H series

Helical and bevel helical gear reducers

rossi.com

Contents

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.


ROSSI

Global presence local service

Local support
Sales, customer service,
technical support, spare parts

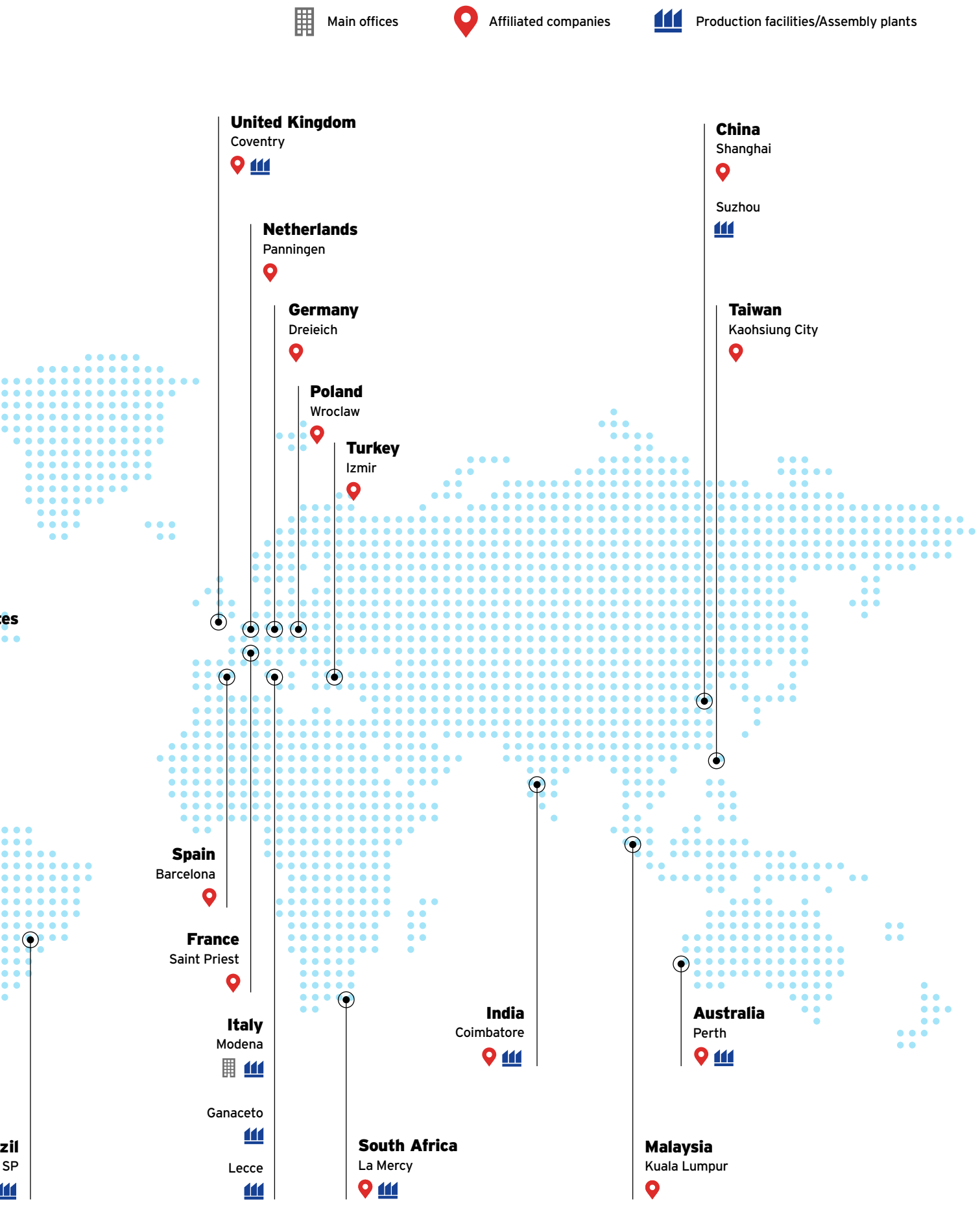
17 branches*

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 contact to our service.

*All contacts available on **www.rossi.com**


Main offices
Affiliated companies
Production facilities/Assembly plants
United Kingdom
Coventry
Netherlands
Panningen
Germany
Dreieich
Poland
Wroclaw
Turkey
Izmir
China
Shanghai
Suzhou
Taiwan
Kaohsiung City
Spain
Barcelona
France
Saint Priest
Italy
Modena
Ganaceto
Lecce
South Africa
La Mercy
India
Coimbatore
Malaysia
Kuala Lumpur
Australia
Perth

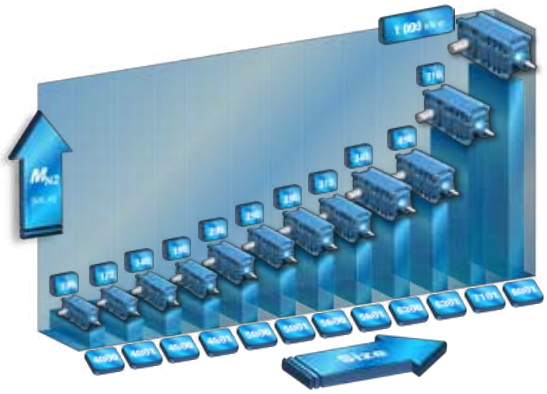
Features and **Benefits**

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 ≤ 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

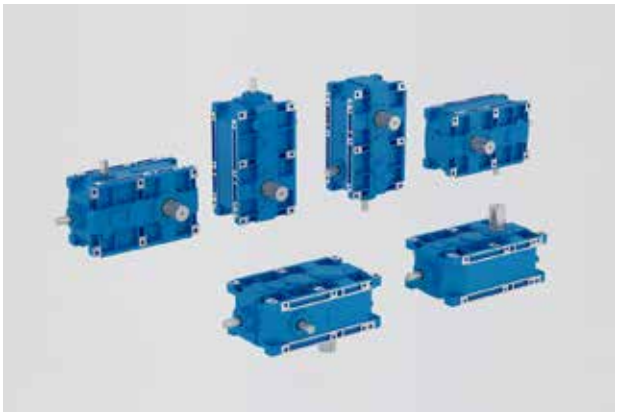
- **Reliable and repeatable performances, suitable to satisfy Customer specifications**

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° C) without installation of accessories**

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

- **Easy maintenance**



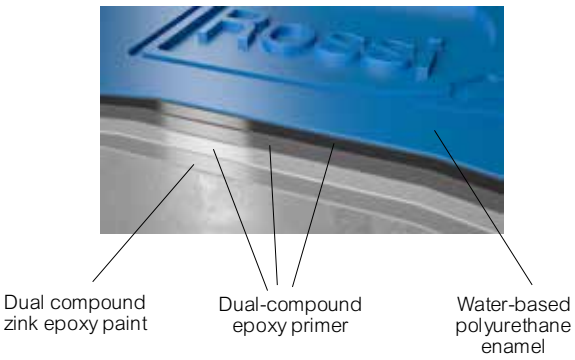
Features and **Benefits**

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)

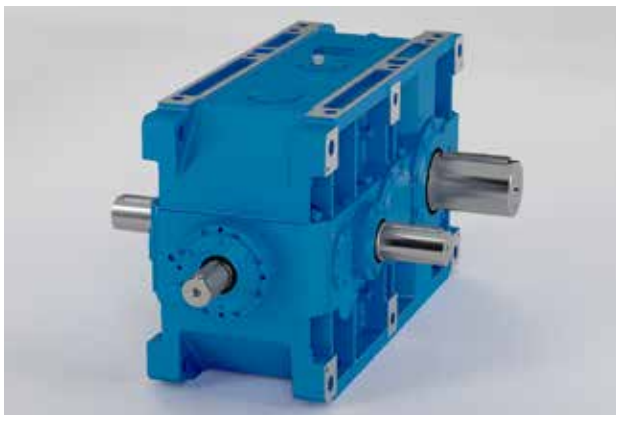


Final on load inspection on test bench for all gear units manufactured, in order to grant high reliability and quality

- **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
f	frequency	Hz
F	force	lb
F_r, F_a	radial (overhung) loads, axial (thrust) loads	lb
fs	service factor	–
ft	thermal factor	–
G	weight (weight force)	lb
i	transmission ratio	–
i_N	nominal transmission ratio	–
L_h	total duration of load cycle	h
L_{WA}	sound power level	dB(A)
m	mass	lb
M_b	bending moment	lb in
n	angular speed	rpm
n_1	gear reducer input speed (high speed)	rpm
n_2	gear reducer output speed (low speed)	rpm
n_{2eq}	load cycle equivalent speed	rpm
n_{N2}	gear reducer nominal output speed	rpm
n_{2i}	gear reducer output speed during load cycle interval i	rpm
P	power	hp
P_1	gear reducer input power (high speed shaft), motor power	hp
P_2	gear reducer output power (low speed shaft)	hp
P_{N2}	gear reducer nominal output power (low speed shaft)	hp
Pt	thermal power	hp
Pt_N	gear reducer nominal thermal power	hp
P_{1th}	gear reducer equivalent thermal power	hp
T	torque	lb in

Symbol	Description	Unit
T_2	gear reducer output torque (low speed shaft), derived from input power and speed	lb in
T_{2eq}	load cycle equivalent torque	lb in
T_{N2}	gear reducer nominal output torque (low speed shaft)	lb in
T_{2i}	gear reducer output torque (low speed shaft), during load cycle interval i	lb in
T_S	screw tightening torque	N m
T_{start}	motor starting torque	lb in
T_{brake}	motor braking torque	lb in
$T_{ambient}$	ambient temperature	°F
T_{oil}	oil temperature	°F
t	time	s
ta	starting time	s
tb	braking time	s
U	voltage	V
W	work, energy	10^6 lb in
WK	moment of inertia	lb ft^2
WK_0^2	moment of inertia (of mass) of the motor	lb ft^2
WK_1^2	moment of inertia (of mass) of the gear reducer referred to high speed shaft	lb ft^2
WK_R^2	external (gear reducer, coupling, driven machine) moment of inertia (of mass) referred to to high speed shaft	lb ft^2
z	starting frequency	starts/h
z_0	no load starting frequency	starts/h
	angular acceleration	rad/s^2
	efficiency	–
φ	plane angle	rad
φa_1	revolution of motor shaft during acceleration	rad
φb_1	revolution of motor shaft during deceleration	rad
ω	agular velocity	rad/s

Additional indexes (subscripts) and other symbols

Index	Description
N	nominal
1	relating to high speed shaft (input)
2	relating to low speed shaft (input)
max	maximum
min	minimum
eq	equivalent

Index	Description
th	thermal
c	cycle
–	from ... to
≈	approximately equal to
⩾	greater than or equal to
⩽	less than or equal to

Unit conversion table

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

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 2I (i_N = 10 ... 25); 3I (i_N = 25 ... 125, excluding i_N = 112), CI (i_N = 8 ... 20) and C2I (i_N = 20 ... 125, excluding i_N = 112); to R 10 series for 4I (i_N = 125 ... 315) and C3I (i_N = 125 ... 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 cylinddrical 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);
- toothing 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.

Page intentionally left blank

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

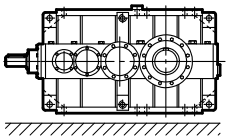
Bevel-helical
CI 1 bevel and 1 helical gear pair
C2I 1 bevel and 2 helical gear pairs
C3I 1 bevel and 3 helical gear pairs

MACHINE
R gear reducer

Gear reducer mounting position

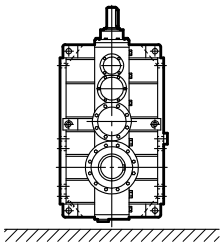
Mounting positions of gear reducers and gearmotors are stated at ch. 8, 10. Here following see some designation examples of important mounting positions.

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).

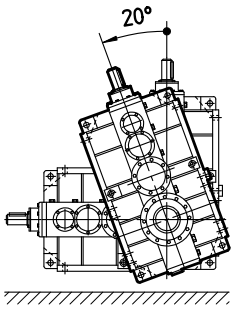


2. **Non-standard** mounting positions

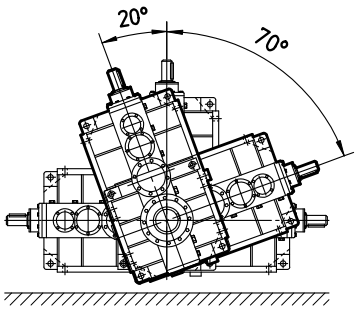
2a. Mounting position to catalog (see ch. 8, 10), **one only** and **fixed**, differing from B3; e.g.: mounting position **B6**



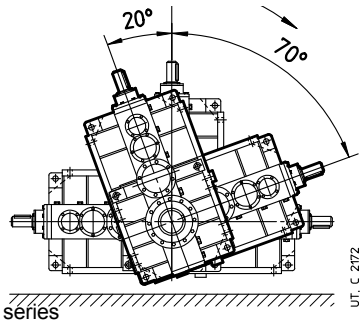
2b. **Inclined** and **fixed** mounting position ; e.g.: mounting position **B6 - 20° B3**



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 *fs*

Service factor *fs* 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 *fs* = 1).

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

$$\boldsymbol{fs} \text{ required} \geqslant \boldsymbol{fs_1} \cdot \boldsymbol{fs_2} \cdot \boldsymbol{fs_3} \cdot \boldsymbol{fs_4} \cdot \boldsymbol{fs_5}$$

where fs_1 … fs_5 are stated in the following tables.

Service factor $\boldsymbol{fs_1}$ based on **nature of load** and **running time**

Nature of load[1] of the driven machine		$\boldsymbol{fs_1}$ Running time [h/d]				
Ref.	Description	**2**	**4**	**8**	**16**	**24**
a	**Uniform**	1	1	1	1.18	1.32
b	**Moderate overloads** (1.6 times the normal load)	1.12	1.18	1.25	1.5	1.7
c	**Heavy overloads** (2.5 times the normal load)	1.4	1.5	1.7	2	2.24

Service factor $\boldsymbol{fs_2}$ based on **nature of load** and of **frequency of starting**

Nature of load[1] of the driven machine		$\boldsymbol{fs_2}$ Frequency of starting *z* [starts/h]					
Ref.	Description	**1**	**2**	**4**	**8**	**16**	**32**
a	**Uniform**	1	1.06	1.12	1.18	1.25	1.5
b	**Moderate overloads** (1.6 times the normal load)	1	1	1.06	1.12	1.18	1.4
c	**Heavy overloads** (2.5 times the normal load)	1	1	1	1.06	1.12	1.32

Service factor $\boldsymbol{fs_3}$ based on **motor type**

Motor type Description		$\boldsymbol{fs_3}$
Electric, turbine		1
Electric three-phase with brake		1.06 [4]
Internal combustion	multi-cylinder	1.25
	single-cylinder	1.5

Service factor $\boldsymbol{fs_4}$ based on **reliability level**

Reliability level [5]	$\boldsymbol{fs_4}$
Standard	1
Average	1.25
High	1.4

Service factor $\boldsymbol{fs_5}$ based on **output angular speed $\boldsymbol{n_2}$**

Output speed n_2 [min^{-1}]	$\boldsymbol{fs_5}$
> 560	1.32
560 – 355	1.25
355 – 224	1.18
224 – 140	1.12
140 – 90	1.06
⩽ 90	1

Details and considerations about service factor.

fs 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, $fs_3 = 1$.
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 *
Stirrers and mixers	
Liquids:	
– constant density	a
– varying density, solids in suspension, high viscosity	b
concrete mixers, mullers, flash mixer-sconcrete mixers, mullers, flash mixers	c
Feeders and batchers	a
rotary (roller, table, sector)	a, b
belt, screw, plate	c
reciprocating, shaker	
Compressors	a
centrifugal (single-stage, multi-stage)	b
rotary (vane, lobe, screw)	b
axial	b
reciprocating:	c
– multi-cylinder	
– single-cylinder	
Elevators	
belt, centrifugal or gravity discharge, screw jacks, escalators	a, b
bucket, arm and tray elevators, paddle wheel, hoists, skips	b
man lifts, mobile scaffolding, passenger transport (cable cars, chair, ski, gondola lifts etc.)	a, b
Excavators and dredges	
cable reels, conveyors, pumps, winches (manoeuvring and utility), stackers, draining wheels	b
cutter head drives, cutters, excavators (bucket ladder, paddle wheel, cutter)	c
vehicles:	b
– on rails	c
– crawlers	
Crushers and granulators	
sugar cane, rubber, plastics	b
minerals, stone	c
Cranes, winches and travelling lifts	b
travel (bridge, trolley, forks)[1]	b
slewing	a, b
hoist [2]	
Food	a
cookers (cereals and malt), mash tubs	
slicers, dough mixers, meat grinders, beet slicers, centrifuges, peelers, winemaking plant, bottle/bin/cratewashers, rinsers, fillers, corkers, cappers, extruders, crate filling and emptying equipment	b
Paper mills	
winders, suction rolls, dryers, embossing machinery, bleachers, press rolls, coating rolls, paper rolls, beaters, and pulpers	a
agitators, mixers, extruders, chip feeders, calenders, felt dryers and stretchers, rag grinders, washers, thickeners	b
cutters, chippers, calenders (super), felt whippers, glazing machines, presses	c
Lumber and woodworking industries	
mechanical loaders, pallet stackers	
conveyors for:	
– boards, chips, waste	
– logs	a, b
machine tools (planing, cutting, cross-cut and re-sawing, tenoning, bevelling, moulding, sanding, sizing and scratch-brushing machinery etc.):	b
– feed drive	c
– cutter drive	
barkers:	b
– mechanical and hydraulic	b, c
– drum	
Oil industry	b
paraffin filter presses, chillers	c
rotary drilling equipment	
pumping equipment	b
Textile industry	c
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	
Clay working machinery	
pug mills, extruders, rotary deslimers	
brick and tile presses	
Rubber and plastics industries	b
extruders:	
– plastics	b
– rubber	c
mixing mills, warming mills, friction calenders, refiners, tubers and strainers, rolling mills	
crackers, masticators	b
Wrapping and stacking machinery	c
wrapping (film, cardboard), binding, strapping and labelling equipment	b
palletizing/depalletizing and stacking/unstacking machinery, palletizing robots	c
Engineering machine tools	
boring, shaping, planing, broaching, gear cutting and FMS machines, etc.:	a
– main drivers (cut and feed)	
auxiliary drives (tools magazine, chip conveyor, workpiece infeed)	b
Mechanisms	
indexing, crank and slotted link, Maltese cross, articulated parallelogram	
rod and crank, cam control (cam and tappet, cam and rocker)	b
Metal mills	a
shears:	
– trimming, cropping, facing	
– for sheet/plate, ingots, billets	b
transverse drive rollers, draw benches, coilers, inverter, draglines, flattening rolls, bending rolls	b
pushers, descaling equipment, pipe welders, mill roll train drives, rolling mills, forging presses, billet croppers, power hammers, punches, impact extruders, tapping machines, straightening presses	c
Rollerways	c
Mills	
rotary (rod, roller, pebble, ball)	b, c [3]
hammer, pin crusher, centrifugal, impact, rolling (ball or roller)	b
Pumps	c
rotary (gear, screw, lobe, vane) and axial	
centrifugal:	
– liquids, constant density	a, b
– liquids, variable density or high viscosity	a
proportioning	
alternative:	b
single acting (⩾ 3 cylinders), ⩾ double acting (⩽ 2 cylinders)	b
– single acting (2 cylinders), double acting single cylinder	b
Rotating drums	
dryers, chillers, rotary kilns, washing machines	c
tumblers, cement kilns	b
Transport conveyors	c
belts (plastic, rubber, metal) for:	
– fine grade loose material	
– coarse grade loose material or discrete items	a
belt, apron, bucket, slat, tray, roller, screw, chain, overhead rail, assembly	b
drag (slat, flight, chain, Redler, etc.) ground level chain, flow accumulating	
reciprocating, shaker	b
overhead power rail	
Sewage treatment	
biological tanks (revolving disk)	b
dewatering screws, collectors, rotary screens, thickeners, vacuum filters, anaerobic digestion tanks [4]	c
aerators, rotary breakers	a
Screen and riddles	
air washing, travelling water intake	
rotary (stone, gravel, cereals)	b
vibrating screens, riddles, jigs	c
Fans	
small diameter (centrifugal, axial-flow)	a
large diameter (mines, furnaces, etc.) cooling towers (inducted or forced draft), ducted, piston	b
	c
	a
	b

* 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-lt us.

3) See cat. S.

4) See supplement to cat. A design.

Page intentionally left blank

Thermal power *P*t [hp]

Thermal power Pt [kW]

The nominal thermal power Pt_N, stated in red in the table, is that which can be applied at the gear reducer input, without exceeding 203 °F[1] (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 ⩾ 4 ft/s (typical value in presence of a self-cooled motor).

Nominal thermal power $\boldsymbol{Pt_N}$

T_{amb}	Train of gears	Gear reducer size Pt_N [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
	CI	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
	CI	300	425	–	–	–	–	–
	C2I	236	265	375	425	530	630	900
	C3I	180	200	280	315	400	475	670

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

$$\boldsymbol{P_1} \leqslant \boldsymbol{Pt_N} \cdot \boldsymbol{ft_1} \cdot \boldsymbol{ft_2} \cdot \boldsymbol{ft_3} \cdot \boldsymbol{ft_4} \cdot \boldsymbol{ft_5}$$

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

$$\boldsymbol{P}_{1eq_{th}} = \frac{1}{\eta}\sqrt[3]{\frac{P_{2_1}^3 \cdot t_1 + P_{2_2}^3 \cdot t_2 + \ldots + P_{2_i}^3 \cdot t_i + \ldots + P_{2_n}^3 \cdot t_n}{t_c}}$$

where:
η 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];
$t_c = t_1 + t_2 + \ldots + t_i + \ldots + t_n$ is the total duration of load cycle [s].

In these cases choose factor $\boldsymbol{ft_2}$ from the continuous duty column S1.

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

Thermal power needs not be taken into account when maximum duration of continuous running time is 1 3 h (from small to large gear reducer sizes) followed by rest periods long enough to restore the gear reducer to near ambient temperature (likewise 2 4 h). For maximum ambient temperature higher than 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 power Pt [kW]

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

Cooling system			ft_{1a} · ft_{1b} input speed n_1 [rpm] ⩾ 750	1 000	1 200	1 500	1 800
ft_{1a}	Natural convection	train of gears 2I. CI	1.18	1.12	1.06	1	0.85
		3I. 4I. C2I. C3I	1.06	1.06	1.03	1	0.95
ft_{1b}	Forced cooling[3) 4) 6)]	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[5)]	2
	with water coil[4)]		2				

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

Maximum ambient temperature °F (°C)	ft_2 Continuous duty **S1**	Intermittent duty **S3 ... S6** Cyclic duration factor [%] for 60 min running[7)] 60	40	25	15
122 (50)	0.6	0.71	0.8	0.95	1
104 (40)	0.75	0.9	1	1.12	1.25
86 (30)	0.9	1.06	1.18	1.32	1.5
68 (20)	**1**	1.18	1.32	1.5	1.7
⩽ **50 (10)**	1.12	1.32	1.5	1.7	1.9

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

Altitude a.s.l. [ft]	ft_4
⩽**3300**	**1**
3300 – 6600	0.95
6562 – 9843	0.9
9843 – 13123	0.85
⩾ **13123**	0.8

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

Train of gears		ft_3 mounting position B3	B6	B7	V5	V6
2I		1	0.9	0.8	0.8	0.9
3I		1	0.9	0.8	0.8	0.9
4I		1	0.9	0.8	0.8	0.9
CI	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	
C2I	UO1A, UO1Asin, UO1F, UO1Fsin, UO1N, UO1Nsin UO1V, UO1Vsin, UO1S, UO1Ssin, UO1L, UO1Lsin	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	
C3I		1	0.9	0.8	0.9 low speed wheel on the bottom 0.8 low speed wheel on the top	

Thermal factor ft_5 according to cooling air speed on housing

Air speed ft/s	Installation environment	ft_5
< 2.07	very small environment or without air movements or with protected gear reducer	consult us
2.07	small environment and with limited air movements	0.71
3.28	wide environment without air movements	0.9
4.10	wide environment with light air movements (e.g. gearmotor with self-cooled motor	**1**
8.2	open and cooled	1.18
13.12	with heavy air movements	1.32

Page intentionally left blank

5

Selection

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 of 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 ($\cos\varphi$) 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**		
	i_N	n_{1max} rpm	n_{1peak} rpm	i_N	n_{1max} rpm	n_{1peak} rpm	i_N	n_{1max} rpm	n_{1peak} rpm	i_N	n_{1max} rpm	n_{1peak} rpm	i_N	n_{1max} rpm	n_{1peak} rpm	i_N	n_{1max} rpm	n_{1peak} rpm
4000, 4001	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
4500, 4501	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
5000, 5001	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
5600, 5601	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
6300, 6301	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
7101	⩽ 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
8001	⩽ 14 ⩾ 16	800 900	1 250	⩽ 35,5 40 ... 50 ⩾ 56	950 1 120 1 400	1850	⩽ 160 ⩾ 200	1 320 1 600	2 000	–	–	–	⩽ 40 ⩾ 45	900 1 180	1 600	⩽ 125 160 ⩾ 200	1 180 1 250 1 600	2 000

5.2 - Determining the gear reducer size

Constant load

- Fill out the questionnaire for the selection on page 31; in particular, make available required output power P_2, the angular speeds n_2 and n_1, the running conditions (nature of load, frequency of starting h/d, frequency of starting z, other considerations) referring to ch. 3.
- Determine service factor *fs* 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 $P_2 \cdot fs$ (ch. 7 and 9).
- Calculate power P_1 required at input side of gear reducer using the formula P_2 / , where =0,97 ÷ 0,94 is the efficiency of gear reducer (ch. 6).

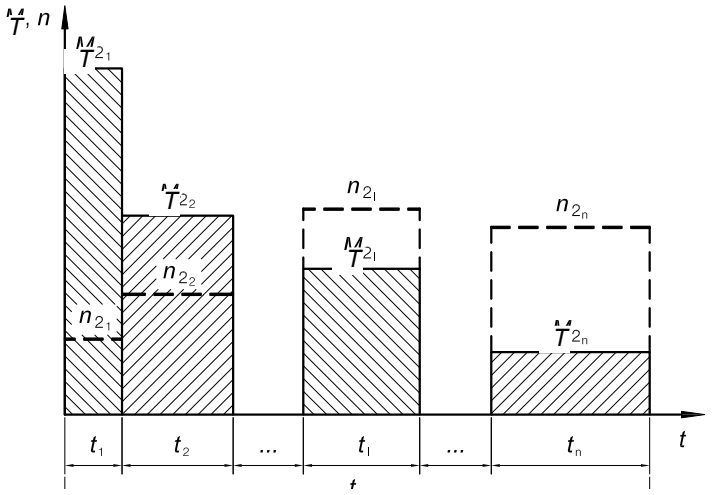
When for reasons of motor standardization, power P_1 applied at input side of gear reducer turns out to be higher than the power required (considering motor/gear reducer efficiency), it must be certain that this excess power applied will never be required, and frequency of starting z is so low as not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



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

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

where:

T_{2eq}	[lbf in] is the equivalent torque of load cycle
T_{2i}	[lbf in] 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 ($t_1 + \ldots + t_i + \ldots + t_n$)
p = 6,61	for a running duration ≤ 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 $\boldsymbol{T}_{2max}$ (see ch. 7, 9), if higher or if it cannot be evaluated in the above cases, install a safety device so that $\boldsymbol{T}_{2max}$ **will bever 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 $\boldsymbol{T}_{2max}$ and that input speed (relevant to output shaft speed n_{2i}) is $n_{1i} \leqslant n_{1max}$ (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 fs, 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} ⩾ 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 ft²]

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 / Δ
☐ soft starter / inverter

Electromagnetic motor
☐ parking brake
☐ work
☐ safety

Braking torque [lbf in]

Starting torque [lbf in]

Moment of inertia [lb ft²]

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

System of motor-gear reducer mounting:
☐ with coupling
☐ with trapezoidal belts

section | No. | d_m [in] | d_1 [in]

☐ with timing belt

section | No. | d_m [on]

Eventual limit to drive dimensions

4 Gear reducer

Mounting position

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

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

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

Type of machine coupling
☐ shaft mounting
☐ with fluid / flexible coupling
☐ with cardan joint
☐ with toothed belt drive

pitch | d_m | d_1 | φ

☐ with chain

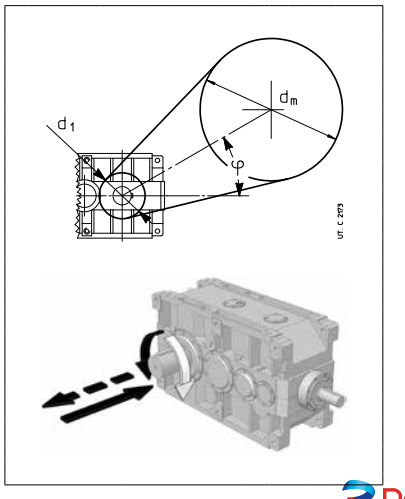
pitch | No. | z_2 | z_3 | overhang [in] | φ

☐ straight tooth cylindrical gear

pitch | No. | z_2 | z_3 | overhang [in] | φ

Eventual axial load F_a [lbf]

Eventual limit to drive dimensions



Page intentionally left blank

6

Structural and operational details

Sound levels L_{WA} and L_{pA}

Standard production sound power level L_{WA} [dB(A)][1] and mean sound pressure level L_{pA} [dB(A)][2] assuming nominal load, and input speed n_1 = 1 500[3] 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	
	$i_N \leq 12{,}5$		$i_N \geq 14$		$i_N \leq 63$		$i_N \geq 71$		$i_N \leq 160$		$i_N \geq 200$		$i_N \leq 16$		$i_N \geq 18$		$i_N \leq 63$		$i_N \geq 71$			
	L_{WA}	L_{pA}	L_{WA}	L_{pA}	L_{WA}	L_{pA}	L_{WA}	L_{pA}	L_{WA}	L_{pA}	L_{WA}	L_{pA}	L_{WA}	L_{pA}	L_{WA}	L_{pA}	L_{WA}	L_{pA}	L_{WA}	L_{pA}	L_{WA}	L_{pA}
4000 ... 4501	**105**	93	**102**	90	**101**	89	**98**	86	**95**	83	**92**	80	**101**	89	**96**	84	**98**	86	**96**	84	**92**	80
5000 ... 5601	**–**	–	**106**	94	**105**	93	**102**	90	**99**	87	**96**	84	**–**	–	**–**	–	**101**	89	**99**	87	**96**	84
6300, 6301	**–**	–	**110**	98	**109**	97	**106**	94	**103**	91	**100**	88	**–**	–	**–**	–	**104**	92	**102**	90	**99**	87
7101	**–**	–	**112**	100	**111**	99	**108**	96	**105**	93	**102**	90	**–**	–	**–**	–	**106**	94	**104**	92	**102**	90
8001	**–**	–	**114**	102	**113**	101	**110**	98	**107**	95	**104**	92	**–**	–	**–**	–	**107**	95	**105**	93	**103**	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^{-1}, 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
η	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 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

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

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

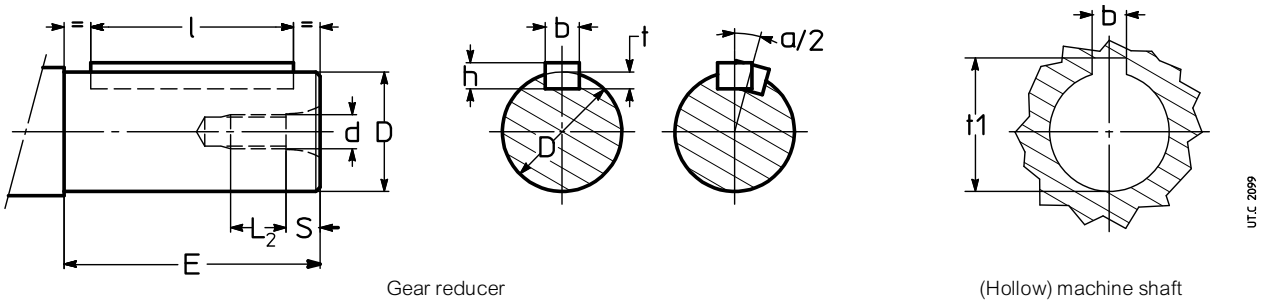
Moment of inertia (of mass) WK_1^2 [lb ft²]

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[1] Moment of inertia of mass WK_1 [lb ft²]									
		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
	22.4	6.621	6.739	7.356	7.451	19.17	19.53	24.28	24.56	55.01	55.53
3I	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

(Hollow) machine shaft

Shaft end						Key			Keyway		
D Ø	**E**	**d** Ø	**S**	**L_2**	**$\alpha/2_{max}$** arc min 1)	**b** h9	**h** h11	**l**	**b** h9 hub N9 shaft	**t** shaft	**t_1** shaft
38 k6	80	M10	7.6	18.4	3.27	10	8	70	10	5	41.3
48 k6	110	M12	9.5	22.5	3.08	14	9	90	14	5.5	51.8
55 m6	110	M12	9.5	22.5	2.75	16	10	90	16	6	59.3
60 m6	140	M16	12.7	27.3	2.46	18	11	110	18	7	64.4
65 m6	140	M16	12.7	27.3	2.33	18	11	110	18	7	69.4
70 m6	140	M16	12.7	27.3	2.55	20	12	125	20	7.5	74.9
75 m6	140	M16	12.7	27.3	2.38	20	12	125	20	7.5	79.9
80 m6	170	M20	16	34	2.23	22	14	140	22	9	85.4
90 m6	170	M20	16	34	1.99	25	14	140	25	9	95.4
100 m6	210	M24	19	41	1.79	28	16	180	28	10	106.4
110 m6	210	M24	19	41	1.63	28	16	180	28	10	116.4
120 m6	210	M30	22	45	1.78	B32	18	170	32	11	127.4
125 m6	210	M30	22	45	1.71	32	18	180	32	11	132.4
140 m6	250	M30	22	45	1.52	36	20	180	36	12	148.4
150 m6	245	M36	27	54	1.42	36	20	220	36	12	158.4
150 m6	250	M36	27	54	1.42	B36	20	210	36	12	158.4
180 m6	300	M36	27	54	1.18	45	25	250	45	15	190.4
190 m6	280	M36	27	54	1.12	B45	25	230	45	15	200.4
200 m6	280	M36	27	54	1.07	B45	25	230	45	15	210.4
200 m6	350	M36	27	54	1.07	45	25	320	45	15	210.4
210 m6	300	M36	27	54	1.02	B50	28	250	50	17	221.4
220 m6	300	M36	27	54	0.97	B50	28	250	50	17	231.4
240 m6	330	M45	33	67	1.06	B56	32	270	56	20	252.4
250 m6	330	M45	33	67	1.02	B56	32	270	56	20	262.4
270 m6	380	M45	33	67	0.94	B63	32	320	63	20	282.4
280 m6	380	M45	33	67	0.91	B63	32	320	63	20	292.4
300 m6	430	M45	33	67	0.85	B70	36	355	70	22	314.4
320 m6	430	M45	33	67	0.80	B70	36	355	70	22	334.4
360 m6	590	M45	33	67	1.45	B80	40	550	90	25	375.4
400 m6	660	M45	33	67	1.50	B90	45	610	90	28	417.4

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

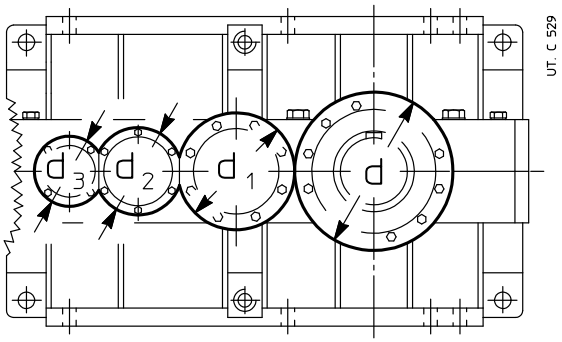
Plug dimensions

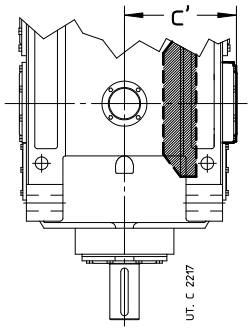
The filler, drain and level plugs have standard threading G 1” for size ⩽ 6301, G 1” for size 7101, G 1” for size 8001.

Side-cover dimensions

The low speed shaft covers are machined for spigot. For cover height, consider the difference **C** – $\mathbf{H_1}$ (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 ± 0.5 (excluding **d** dimension).



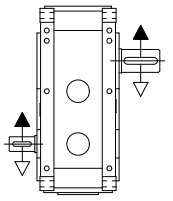


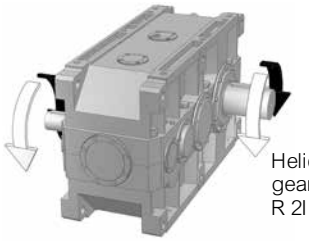
Size	Train of gears									
	2I				**3I, 4I, C2I, C3I**			**2I, 3I, 4I, CI C2I, C3I**		
	$\mathbf{d_3}$ Ø		$\mathbf{d_2}$ Ø		$\mathbf{d_3}$ Ø	$\mathbf{d_2}$ Ø	**c'** (C2I)	$\mathbf{d_1}$ Ø	**c'** (CI)	**d** Ø h7
	$i_N \leq 11.2$	$i_N \geq 12.5$	$i_N \leq 11.2$	$i_N \geq 12.5$						
4000, 4001	170	190	259	248	190	248	318	340	363[1]	432
	$i_N \leq 12.5$	$i_N \geq 14$	$i_N \leq 12.5$	$i_N \geq 14$						
4500, 4501	170	190	259	248	190	248	318	340	363[1]	472
5000, 5001	228		320		228	320	423[1]	388	–	530
5600, 5601	228		320		228	320	423	432	–	590
6300, 6301	248		362		248	362	468	510	–	648
7101	320		490		320	490	518	648	–	782[2]
8001	388		550		388	550	580	782	–	889[2]

1) Overhanging from **C** dimension (see ch. 10.1 and 10.2).

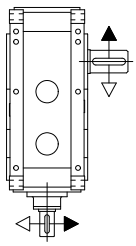
2) For hollow low speed shaf: 842 (size 7101), 969 (size 8001).

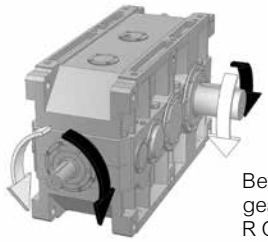
Direction of rotation



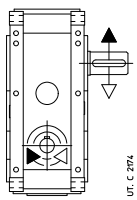


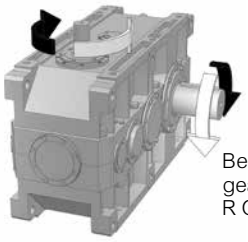
Helical gear reducer: R 2I ... UP1A





Bevel helical gear reducer: R C2I ... UO1A



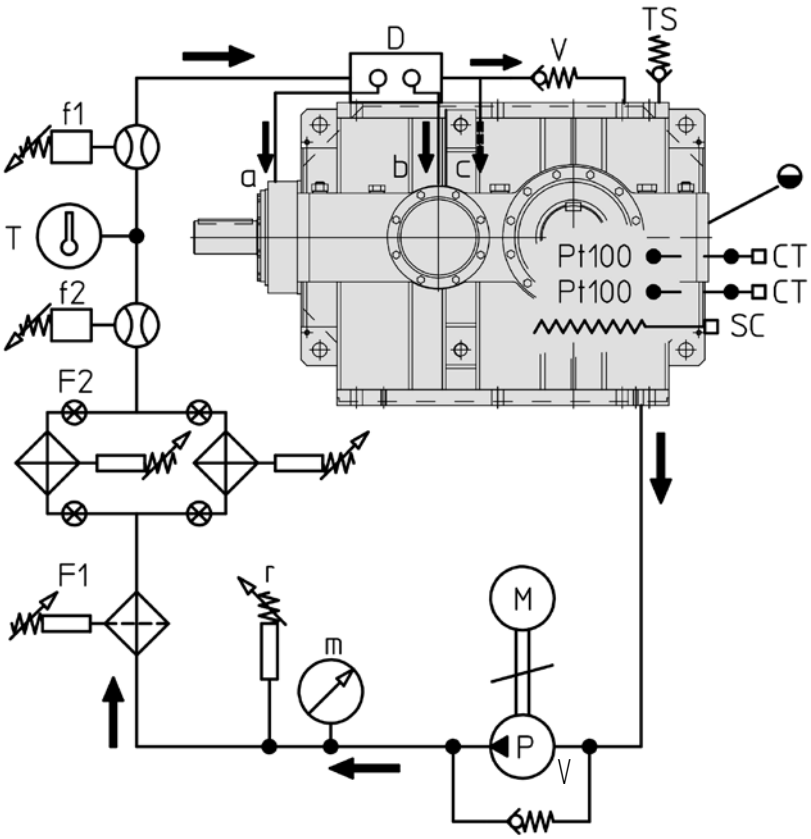


Bevel helical gear reducer: R C2I ... UO1V

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 ft³/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*

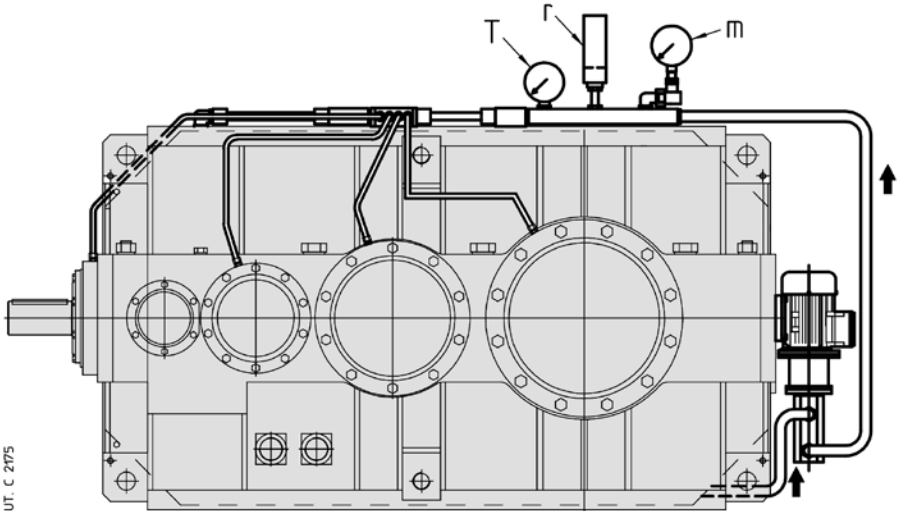
* On request, but necessary for gear reducer starting at $T_{ambient}$ ($= T_{oil}$) ≤ 77 °F (25 °C): pre-heat the oil with the heater.

Starting at low temperature ($T_{oil} = T_{ambient} \leqslant$ 77 °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).

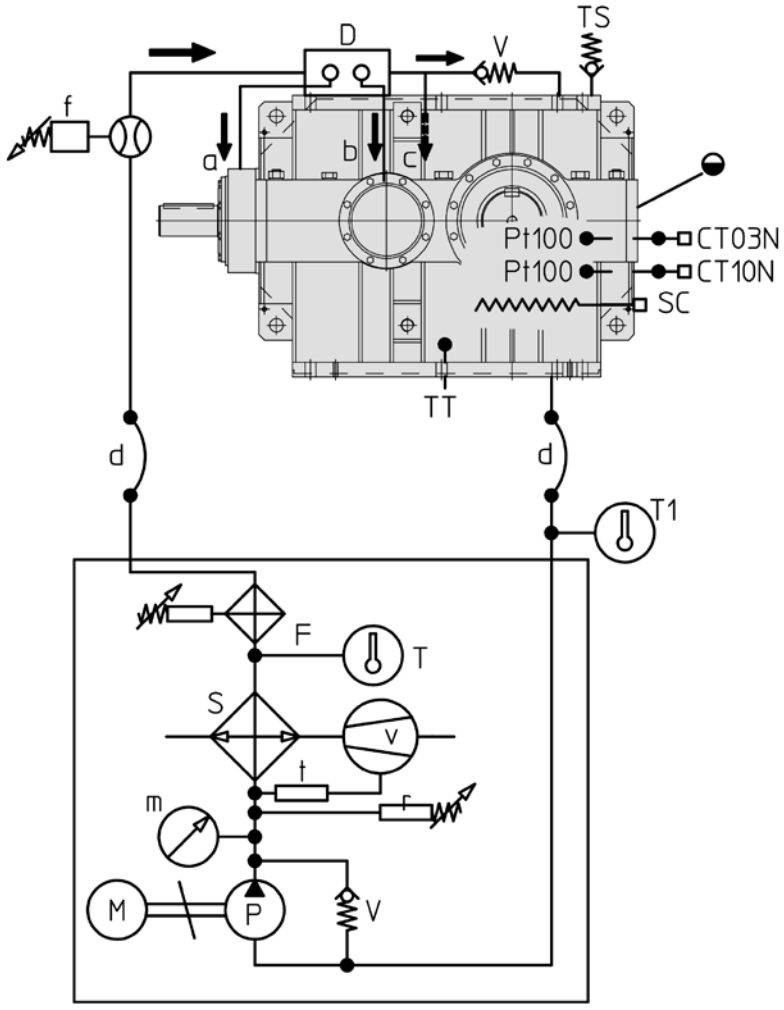
For starting at T_{oil} ($= T_{ambient}$) ⩽ 32 °F (0 °C) it is necessary to adjust the calibration of devices CT03N and CT10N according to real ambient temperature (see also point B1 in the table at ch. 12 (8)).



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.

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

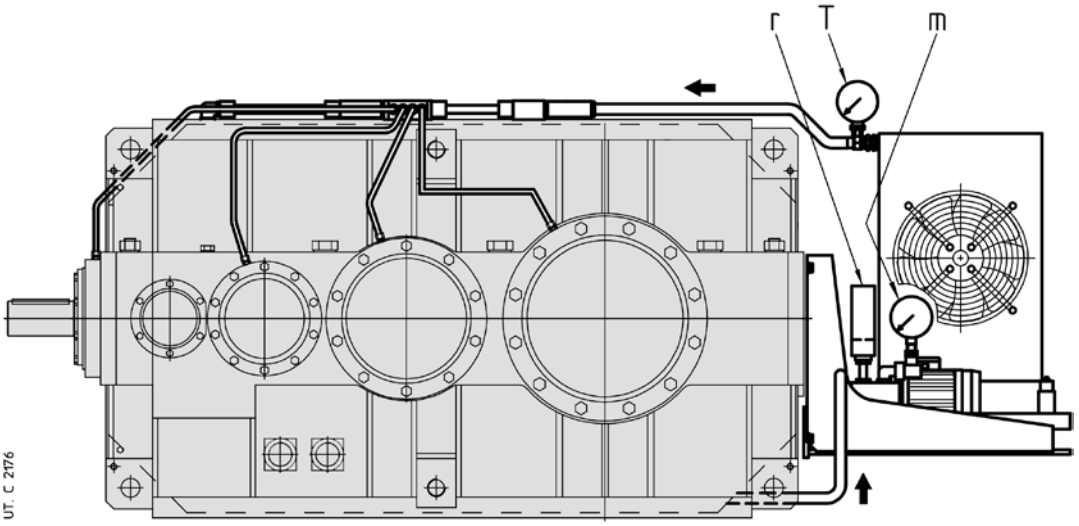
a, b, c	Gear pair/bearing pipes
d	Flexible connection (by Customer)
m	Pressure gauge (0 230 psi)
M	Motor pump (ch. 12 (10))
P	Pump (ch. 12 (10))
S	Oil/air or oil/water exchanger
v	Motor fan (UR O/A)
t	Fan thermostat 32÷194 °F (0 – 90 °C) (UR O/A)
T	Thermometer 32 248 °F (0 – 120 °C)
V	Safety valve
r	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 $T_{ambient}$ ($=T_{oil}$) ⩽ 77 °F (25 °C): pre-heat the oil with the heater.

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



UT. C 2176

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.

Page intentionally left blank

Selection tables (helical gear reducers)

n_1 = 1 800 rpm

Gear reducer size

Nominal output power P_{N2} [hp]

Nominal output torque T_{N2} (T_{2max}) [10^3 lb in]

rain of ears	i_N	n_{N2} rpm	4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
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).

n_1 = 1 500 rpm

Gear reducer size

Nominal output power P_{N2} [hp]

Nominal output torque T_{N2} (T_{2max}) [10^3 lb in]

Train of gears	i_N	n_{N2} rpm	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)	1550 ▲ **8410** (16000
	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).

n_1 = 1 200 rpm

Train of gears	i_N	n_{N2}	Gear reducer size Nominal output power P_{N2} [hp] Nominal output torque T_{N2} (T_{2max}) [10^3 lb in]											
		rpm	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)	6320▲ 8430 (15500)
	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)	1240 8430 (16000)
	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).

n_1 = 1 000 rpm

Gear reducer size

Nominal output power P_{N2} [hp]

Nominal output torque T_{N2} (T_{2max}) [10^3 lb in]

Train of gears	i_N	n_{N2} rpm	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 **2465** (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 **2465** (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 **2465** (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).

n_1 = 750 rpm

Train of gears	i_N	n_{N2}	Gear reducer size											
			Nominal output power P_{N2} [hp] / Nominal output torque T_{N2} (T_{2max}) [10^3 lb in]											
		rpm	4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
2I	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
3I	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)	–	–	–	–
4I	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)	786 8520 (16000
	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

$n_1 \leqslant 90$ 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*											
		4000	**4001**	**4500**	**4501**	**5000**	**5001**	**5600**	**5601**	**6300**	**6301**	**7101**	**8001**
2I	**10**	*9,86*	*9,86*	–	–	–	–	–	–	–	–	–	–
	11,2	*11,2*	*11,2*	*11,4*	*11,4*	–	–	–	–	–	–	–	–
	12,5	*12,4*	*12,4*	*12,9*	*12,9*	–	–	–	–	–	–	–	–
	14	*14,1*	*14,1*	*14,3*	*14,3*	*14**	*14**	*14,2**	*14,2**	*14,3*	*14,3*	*14,1*	*14,6*
	16	*16,3*	*16,3*	*16,2*	*16,2*	*16**	*16**	*16**	*16**	*16,5*	*16,8*	*16,3*	*16,8*
	18	*17,6*	*17,6*	*18,7*	*18,7*	*17,5**	*17,5**	*18,3*	*18,3*	*18,3*	*18,3*	*18**	*18,6*
	20	*20,3*	*20,3*	*20,6*	*20,6*	*20**	*20**	*20**	*20**	*20,9*	*21,3*	*20,3*	*20,4*
	22,4	*22,5**	*22,5**	*23,3*	*23,3*	*22,5**	*22,5**	*22,8*	*22,8*	*23,1*	*23,1*	*22,5**	*22,6*
3I	**25**	*25,2*	*25,2*	*25,7*	*25,7*	*24,8*	*24,8*	*25,7*	*25,7*	–	–	*25,7*	*25,4*
	28	*28,7*	*28,7*	*29,1*	*29,1*	*28,7*	*28,7*	*29,1*	*29,1*	*27,4*	*27,5*	*27,7*	*28,8*
	31,5	*33*	*33*	*32,9*	*32,9*	*32,8*	*32,8*	*32,8*	*32,8*	*31,6*	*32,2*	*31,9*	*33,2*
	35,5	*35,9*	*35,9*	*37,9*	*37,9*	*36,1*	*36,1*	*37,4*	*37,4*	*35,2*	*35,2*	*35,3*	*36,8*
	40	*41,3*	*41,3*	*41,3*	*41,3*	*41,3*	*41,3*	*41*	*41*	*40,5*	*41,3*	*40,7*	*42,3*
	45	*45,2*	*45,2*	*47,4*	*47,4*	*45,5*	*45,5*	*47,1*	*47,1*	*45,5*	*44,9*	*45,9*	*45,8*
	50	*52,1*	*52,1*	*52*	*52*	*52**	*52**	*52**	*52**	*52,3*	*53,3*	*52,9*	*52,7*
	56	*57,4*	*57,4*	*59,7*	*59,7*	*56**	*56**	*59,3**	*59,3**	*57,3*	*56,6*	*56,5*	*59,1*
	63	*66,2*	*66,2*	*66*	*66*	*64**	*64**	*64**	*64**	*65,9*	*67,1*	*65,1*	*68,1*
	71	*70,6*	*70,6*	*75,9*	*75,9*	*71,1*	*71,1*	*73**	*73**	*71,6*	*73,1*	*71,6*	*74,9*
	80	*81,3*	*81,3*	*81,2*	*81,2*	*81,2*	*81,2*	*81,2*	*81,2*	*82,4*	*83,9*	*82,5*	*86,3*
	90	*88,2*	*88,2*	*93,3*	*93,3*	*88,8*	*88,8*	*92,7*	*92,7*	*91,3*	*91,3*	*89,5*	*91*
	100	*102*	*102*	*103*	*103*	*102*	*102*	*102*	*102*	*104*	*106*	*103*	*105*
	125	–	–	*129*	*129*	–	–	*127*	*127*	–	–	–	–
4I	**125**	*125*	*125*	*127*	*127*	*129*	*129*	*131*	*131*	*134*	*136*	*136*	*129*
	160	*159*	*159*	*162*	*162*	*159*	*159*	*161*	*161*	*168*	*171*	*168*	*166*
	200	*191*	*191*	*194*	*194*	*212*	*212*	*215*	*215*	*216*	*220*	*211*	*214*
	250	*243*	*243*	*246*	*246*	*261*	*261*	*265*	*265*	*272*	*277*	*260*	*277*
	315	*299*	*299*	*321*	*321*	*332*	*332*	*341*	*341*	*340*	*347*	*330*	*351*

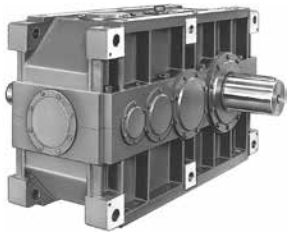
* **Finite** transmission ratio.

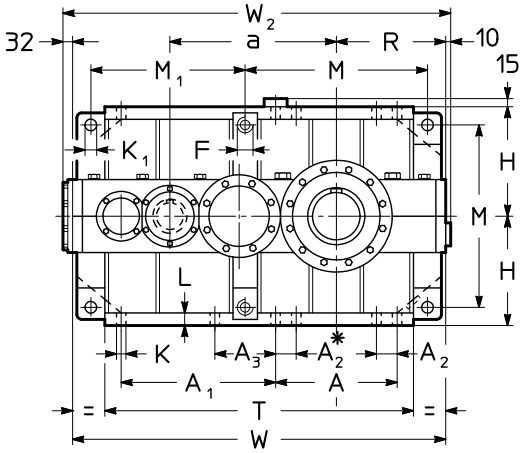
8

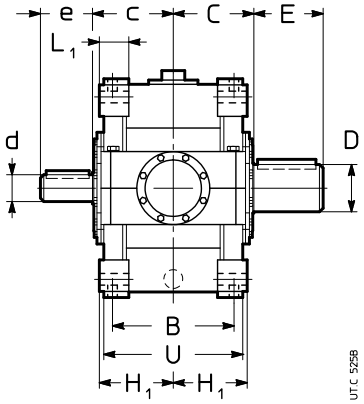
Dimensions, designs, mounting positions (helical gear reducers)

8.1 - Gear reducers R 2I

Dimensions







* For size ⩾ 6300.

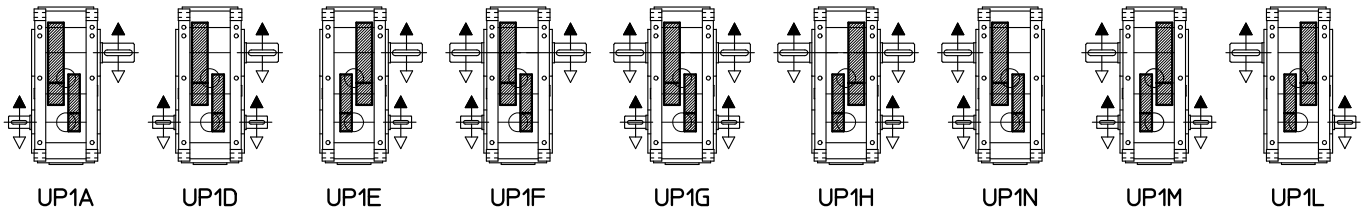
Size	a	A	A_1 M_1	A_2	A_3	B	C	c	F 1)	H h11 R	H_1 h12	K Ø	K_1 Ø H11	L	L_1	M	T	U	W	W_2 2)	lb 4)	
4000	700	505	625	90	–	500	330	330	M45	450	296	39	48	52	116	750	1260	580	1525	1567	5110	5270
4001																					5290	5470
4500	750	505	675	90	–	500	358	330	M45	450	296	39	48	52	116	750	1310	580	1575	1617	5860	6060
4501																					6020	6260
5000	875	630	785	115	–	625	410	426[3]	M56	560	370	48	60	65	148	930	1575	725	1905	1947	10010	10320
5001																					10270	10630
5600	935	630	845	115	–	625	445	426	M56	560	370	48	60	65	148	930	1635	725	1965	2007	11970	12410
5601																					12240	12720
6300	1080	770	970	115	–	695	490	472	M56	630	406	48	60	65	148	1070	1900	795	2230	2272	16870	17480
6301																					17090	17810
7101	1270	930	1228	115	590	843	601	537	M56	710	481	48	66	71	185	1230	2279	943	2648	2676	28550	29650
8001	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
			i_N ⩽ 11,2		i_N ⩾ 12,5	
4000	190	280	110	210	90	170
4001	200					
			i_N ⩽ 12,5		i_N ⩾ 14	
4500	210	300	110	210	90	170
4501	220					
5000	240	330	–	–	110	210
5001	250					
5600	270	380	–	–	110	210
5601	280					
6300	300	430	–	–	125	210
6301	320					
7101	360	590	–	–	180	300
8001	400	660	–	–	200	350

1) Working length on thread 1,7 · 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)

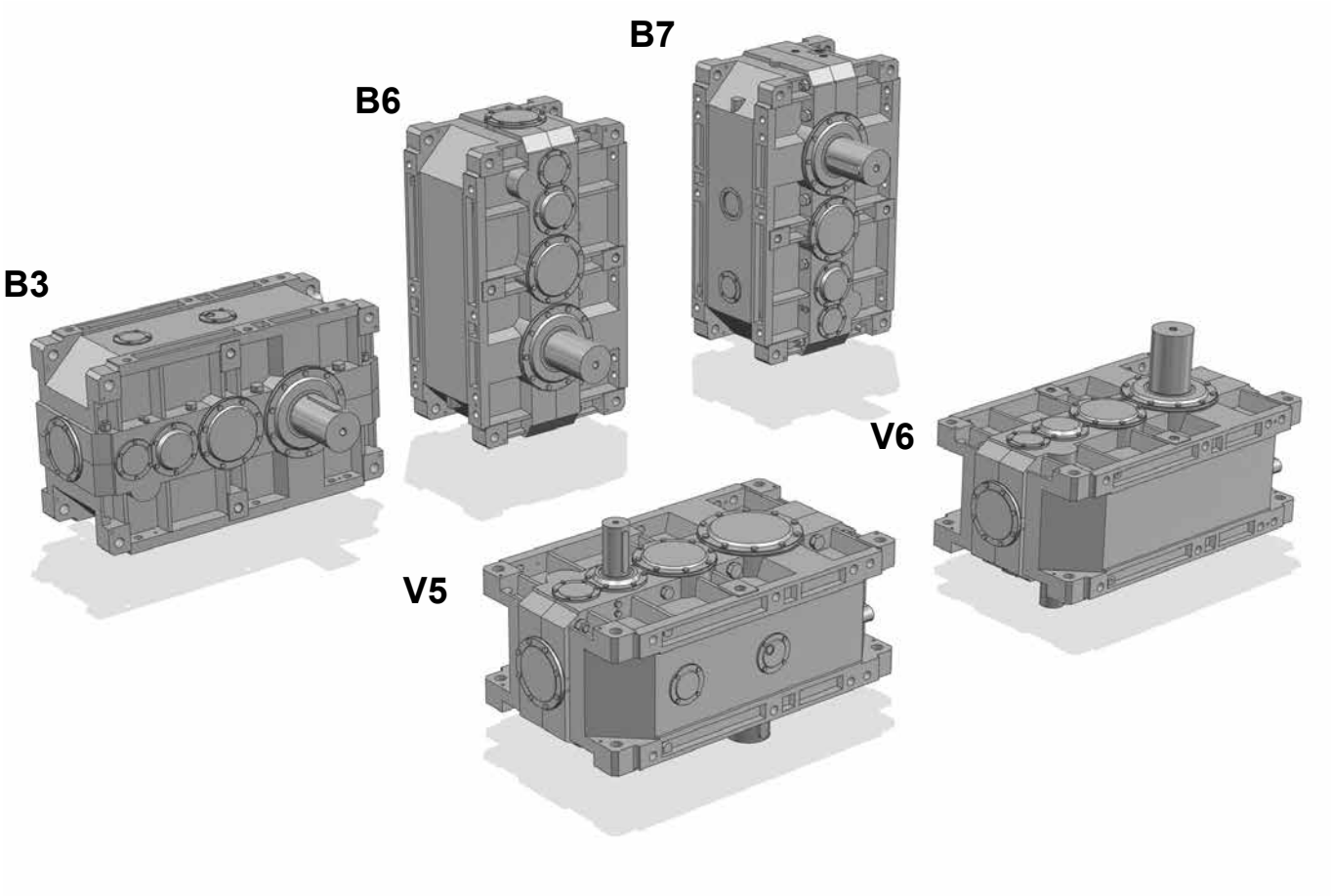
Hollow low speed shaft with shrink disc on machine side (on request)

Hollow low speed shaft with keyway (on request)

UT. C 2177

Mounting positions

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



8

Possible high oil splash: for the corrective factor f_{t_3} of nominal thermal power Pt_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).

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

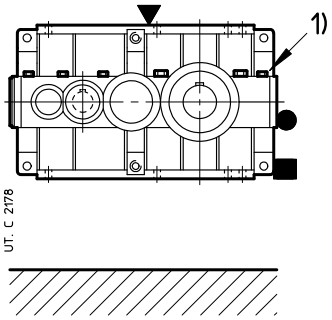
Oil filler plug
Oil level plug
Oil drain plug

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)

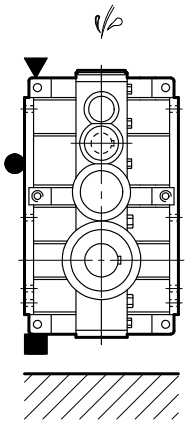
Lubrication - Plug position and oil quantity

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.

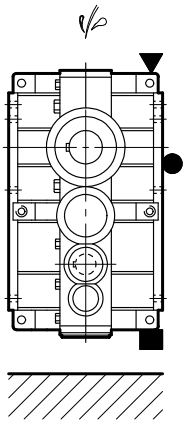
B3



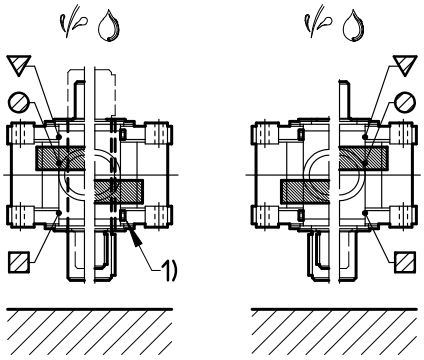
B6



B7

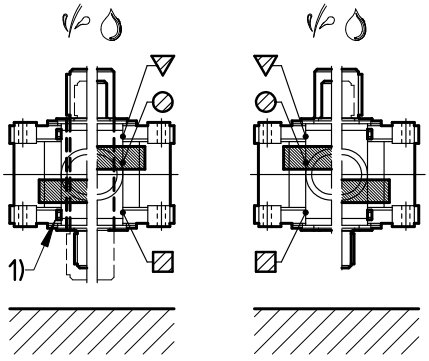


V5



UP1A UP1D UP1F UP1G	UP1E UP1H	UP1N	UP1M UP1L
UP1A* UP1D*	UP1M* UP1L*		

V6



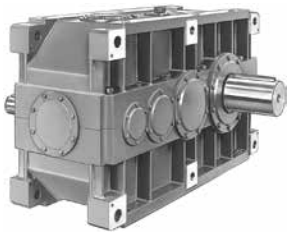
UP1A UP1D UP1F UP1G	UP1E UP1H	UP1N	UP1M UP1L
UP1A* UP1D*	UP1M* UP1L*		

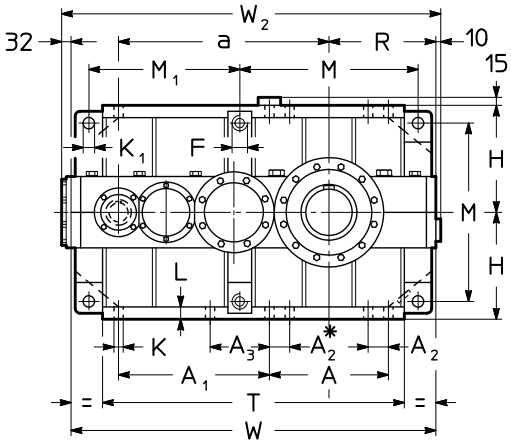
Size	Oil quantity [gal]				
	B3	B6	B7	V5, V6	
				with low speed shaft on bottom	with low speed wheel on top
4000, 4001	31	40	59	62	66
4500, 4501	30	37	62	59	66
5000, 5001	62	79	119	125	132
5600, 5601	59	70	119	119	132
6300, 6301	88	106	177	166	188
7101	148	177	296	264	296
8001	251	280	476	449	502

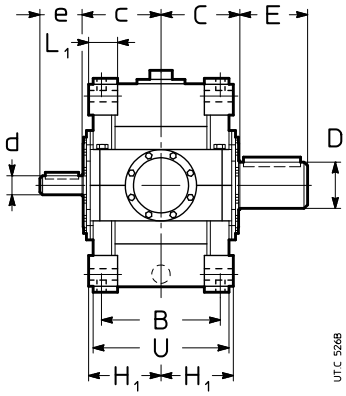
See notes at previous page.

8.2 - Gear reducers R 3I

Dimensions







* For sizes ⩾ 6300.

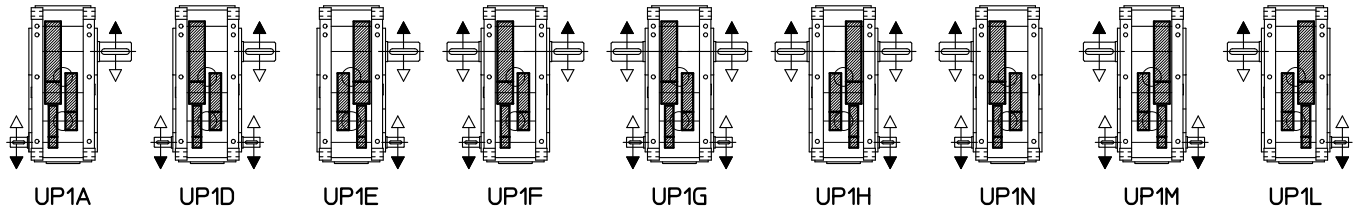
Size	a	A	A_1 M_1	A_2	A_3	B	C	c	F 1)	H h11 R	H_1 h12	K Ø	K_1 Ø H11	L	L_1	M	T	U	W	W_2 2)	lb 3)	
4000	900	505	625	90	–	500	330	325	M45	450	296	39	48	52	116	750	1260	580	1525	1567	5220	5380
4001																					5400	5580
4500	950	505	675	90	–	500	358	325	M45	450	296	39	48	52	116	750	1310	580	1575	1617	5950	6150
4501																					6130	6370
5000	1125	630	785	115	–	625	410	405	M56	560	370	48	60	65	148	930	1575	725	1905	1947	10190	10490
5001																					10450	10800
5600	1185	630	845	115	–	625	445	405	M56	560	370	48	60	65	148	930	1635	725	1965	2007	12190	12630
5601																					12460	12940
6300	1380	770	970	115	–	695	490	455	M56	630	406	48	60	65	148	1070	1900	795	2230	2272	17110	17730
6301																					17330	18060
7101	1630	930	1228	115	590	843	601	510	M56	710	481	48	66	71	185	1230	2279	943	2648	2676	29080	30180
8001	1880	1008	1286	145	596	944	682	577	M90	900	544	60	95	85	250	1574	2590	1064	3086	3114	45040	46630

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

1) Working length on thread 1,7 · 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.

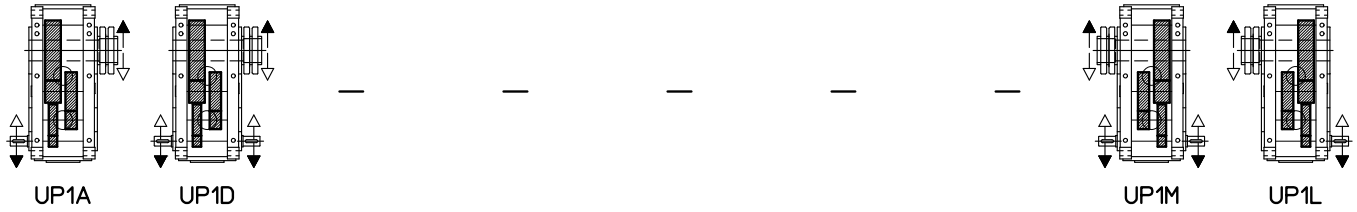
Designs (direction of rotation)

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)

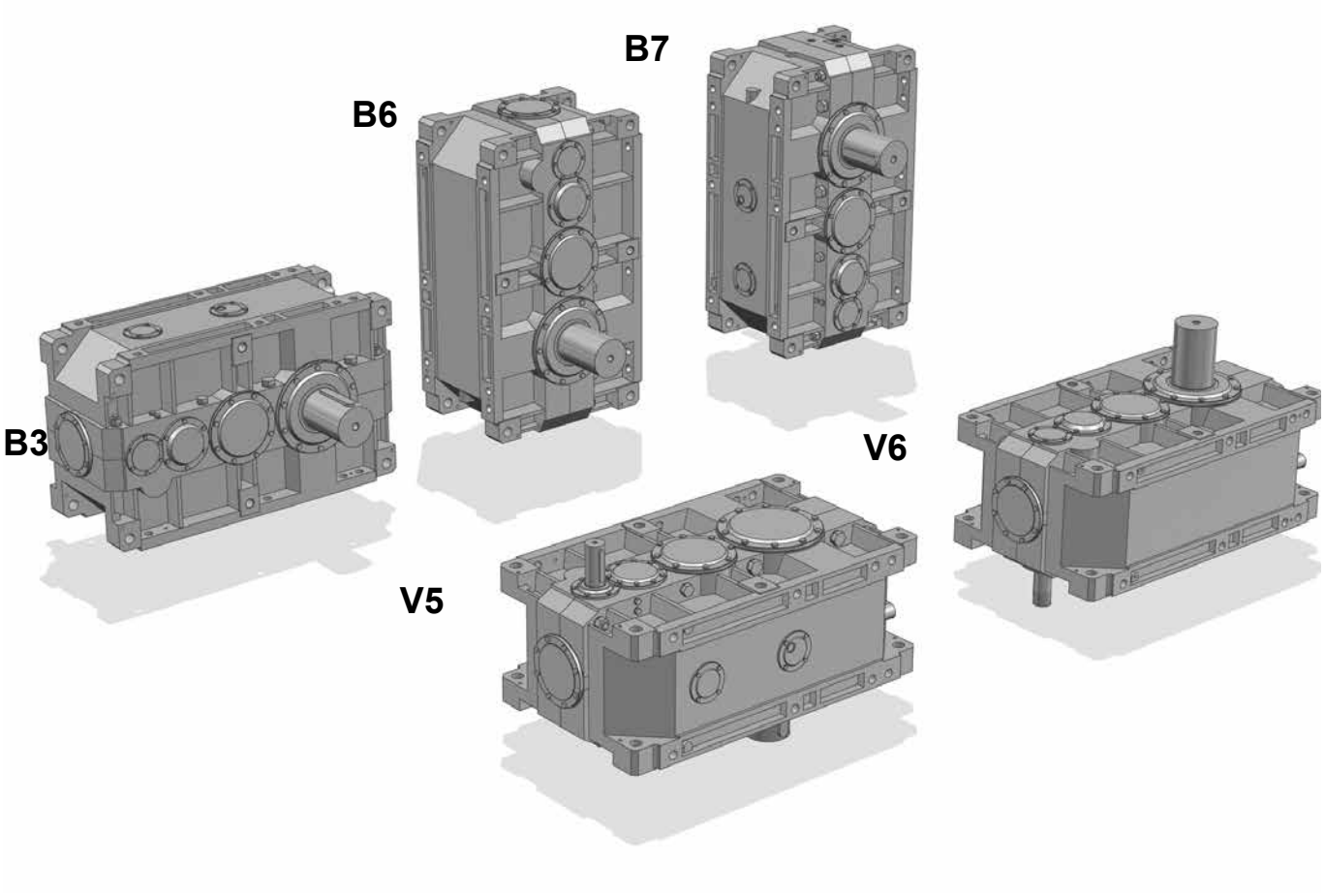


Hollow low speed shaft with keyway (on request)

UT. C 2179

Mounting positions

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



8

Possible high oil splash: for the corrective factor f_{t3} of nominal thermal power Pt_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).

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

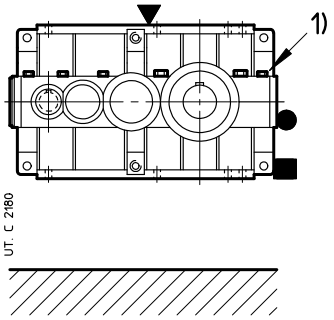
Oil filler plug
Oil level plug
Oil drain plug

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)

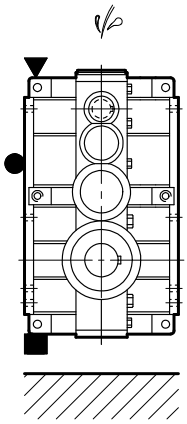
Lubrication - Plug position and oil quantity

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.

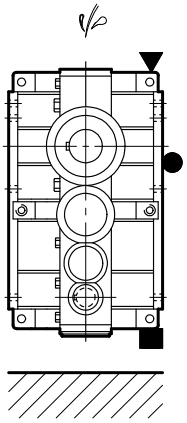
B3



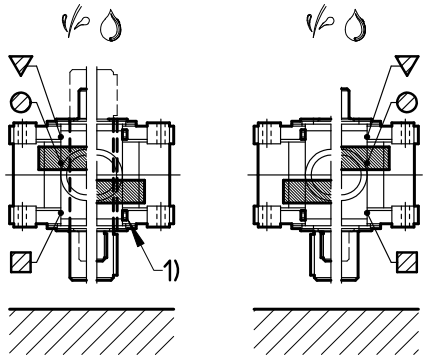
B6



B7

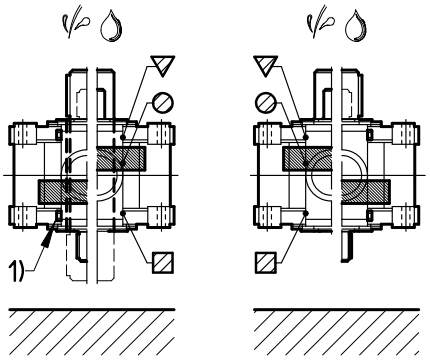


V5



UP1A UP1D UP1F UP1G	UP1E UP1H	UP1N	UP1M UP1L
UP1A* UP1D*	UP1M* UP1L*		

V6

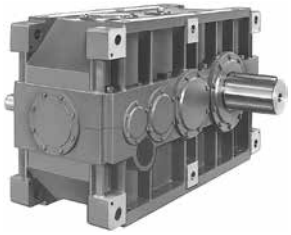


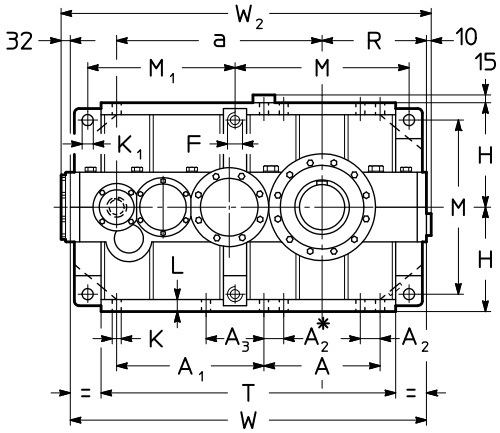
UP1A UP1D UP1F UP1G	UP1E UP1H	UP1N	UP1M UP1L
UP1A* UP1D*	UP1M* UP1L*		

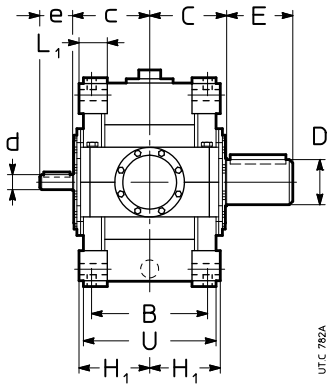
Size	Oil quantity [gal]				
	B3	B6	B7	V5, V6	
				with low speed shaft on bottom	with low speed wheel on top
4000, 4001	37	62	59	62	66
4500, 4501	37	62	59	62	66
5000, 5001	74	119	119	119	132
5600, 5601	74	119	119	119	132
6300, 6301	106	166	177	166	188
7101	166	251	280	264	296
8001	280	476	449	476	502

8.3 - Gear reducers R 4I

Dimensions







* For sizes ⩾ 6300.

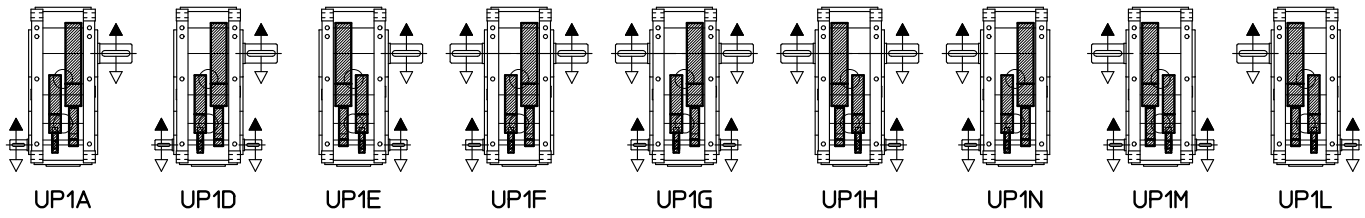
Size	a	A	A_1 / M_1	A_2	A_3	B	C	c	F 1)	H h11 R	H_1 h12	K Ø	K_1 Ø H11	L	L_1	M	T	U	W	W_2 2)	lb 3)	
4000	900	505	625	90	–	500	330	325	M45	450	296	39	48	52	116	750	1260	580	1525	1567	5200	5360
4001																					5360	5530
4500	950	505	675	90	–	500	358	325	M45	450	296	39	48	52	116	750	1310	580	1575	1617	5840	6040
4501																					6000	6240
5000	1125	630	785	115	–	625	410	405	M56	560	370	48	60	65	148	930	1575	725	1905	1947	10210	10520
5001																					10450	10800
5600	1185	630	845	115	–	625	445	405	M56	560	370	48	60	65	148	930	1635	725	1965	2007	12170	12610
5601																					12430	12920
6300	1380	770	970	115	–	695	490	455	M56	630	406	48	60	65	148	1070	1900	795	2230	2272	17040	17660
6301																					17260	17990
7101	1630	930	1228	115	590	843	601	540	M56	710	481	48	66	71	185	1230	2279	943	2648	2676	29170	30270
8001	1880	1008	1286	145	596	944	682	577	M90	900	544	60	95	85	250	1574	2590	1064	3086	3114	45020	46610

Size	D Ø	E	d Ø 4) $i_N \leqslant 160$	e	d Ø $i_N \geqslant 200$	e
4000	190	280	55	110	48	110
4001	200					
4500	210	300	55	110	48	110
4501	220					
5000	240	330	70	140	55	110
5001	250					
5600	270	380	70	140	55	110
5601	280					
6300	300	430	75	140	60	140
6301	320					
7101	360	590	90	170	–	–
8001	400	660	110	210	–	–

1) Working length on thread 1,7 · 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 ⩽ 6301, the second high speed shaft end (UP1D, UP1G, UP1M) has the dimensions of high speed shaft end for $i_N \geqslant 200$.

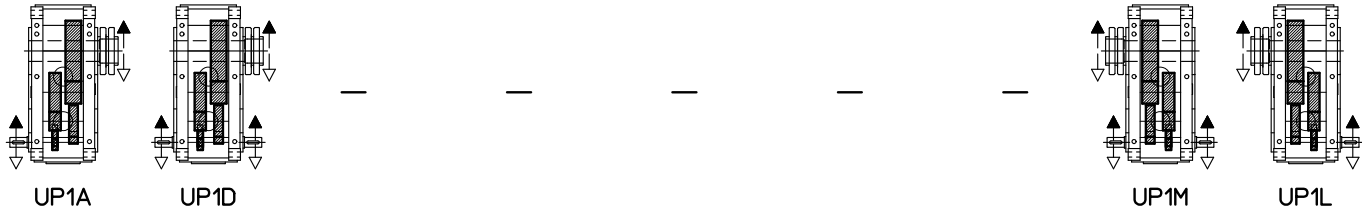
Designs (direction of rotation)

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)

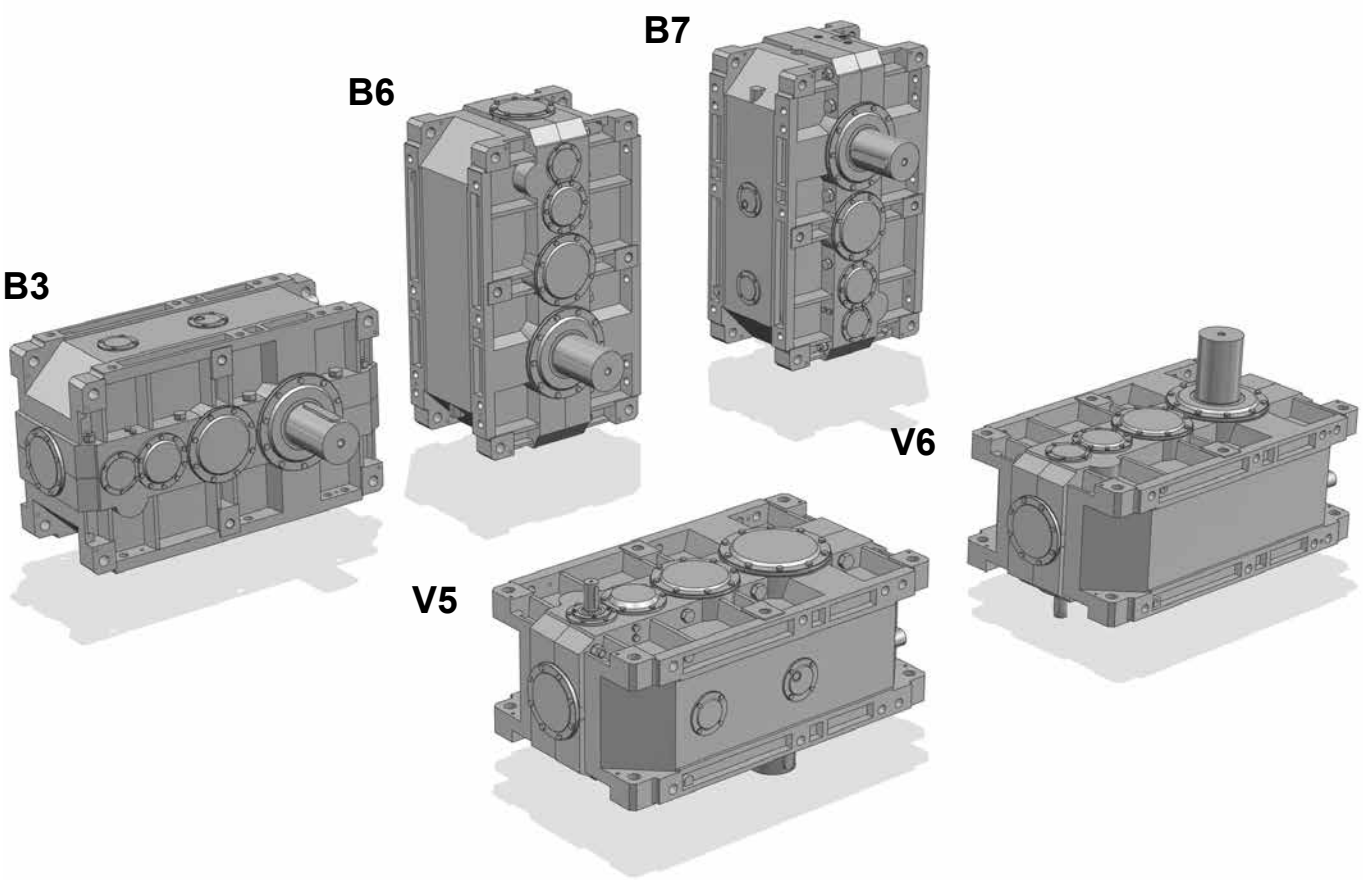


Hollow low speed shaft with keyway (on request)

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 Pt_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).

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

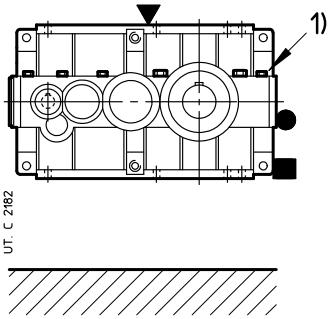
Oil filler plug
Oil level plug
Oil drain plug

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)

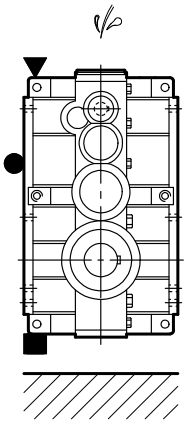
Lubrication - Plug position and oil quantity

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.

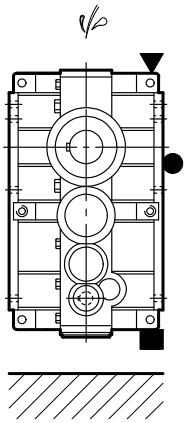
B3



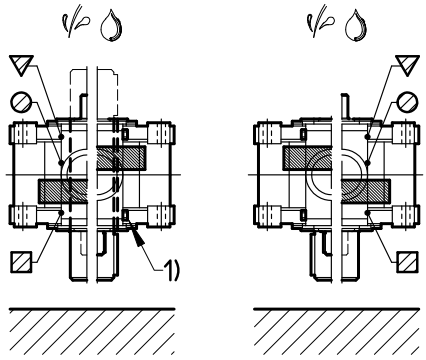
B6



B7

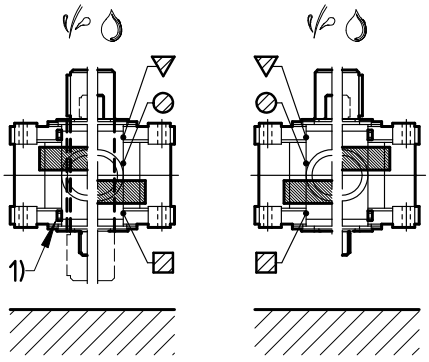


V5



UP1A UP1D UP1F UP1G	UP1E UP1H	UP1N	UP1M UP1L
UP1A* UP1D*	UP1M* UP1L*		

V6



UP1A UP1D UP1F UP1G	UP1E UP1H	UP1N	UP1M UP1L
UP1A* UP1D*	UP1M* UP1L*		

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

Page intentionally left blank

Selection tables (bevel helical gear reducers)

n_1 = 1 800 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	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).

n_1 = 1 500 rpm

Train of gears	i_N	n_{N2} rpm	Gear reducer size: 4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
			Nominal output power P_{N2} [hp] Nominal output torque T_{N2} (T_{2max}) [10^3 lb in]											
CI	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 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	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)	–	–	–	–	–	–	–	–	–
C2I	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 **5450** (10900)	1500 ▲ **8430** (16000
	125	9,5	–	–	173 **1170** (1900)	197 **1330** (2180)	–	–	348 **2285** (3750)	392 **2575** (4250)	–	–	–	–
C3I	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).

n_1 = 1 000 rpm

Train of gears	i_N	n_{N2}	Gear reducer size Nominal output power P_{N2} [hp] Nominal output torque T_{N2} (T_{2max}) [10³ lb in]											
		rpm	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** (3450)	–	–	–	–	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)	986 **8460** (16000
	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

Gear reducer size

Nominal output power P_{N2} [hp]

Nominal output torque T_{N2} (T_{2max}) [10^3 lb in]

Train of gears	i_N	n_{N2} rpm	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

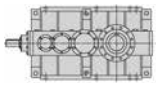
$n_1 \leqslant 90$ rpm

Gear reducer size

Nominal output power P_{N2} [hp]

Nominal output torque T_{N2} (T_{2max}) [10^3 lb in]

Train of gears	i_N	n_{N2} rpm	4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	8001
CI	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)	–	–	–	–	–	–	–	–	–
C2I	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)	–	–	–	–
C3I	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*

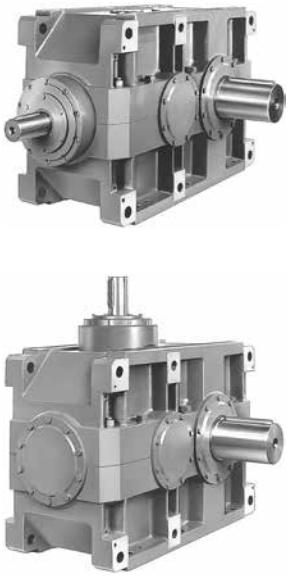
Train of gears	Nominal gear ratio	Gear reducer size — Actual gear ratio *i*											
	i_N	4000	4001	4500	4501	5000	5001	5600	5601	6300	6301	7101	800
CI	8	7,76	7,76	8,12	–	–	–	–	–	–	–	–	–
	9	8,82	8,82	9,33	9,33	–	–	–	–	–	–	–	–
	10	10,2	10,2	10,1	10,3	–	–	–	–	–	–	–	–
	11,2	11,3	11,3	11,7	11,7	–	–	–	–	–	–	–	–
	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

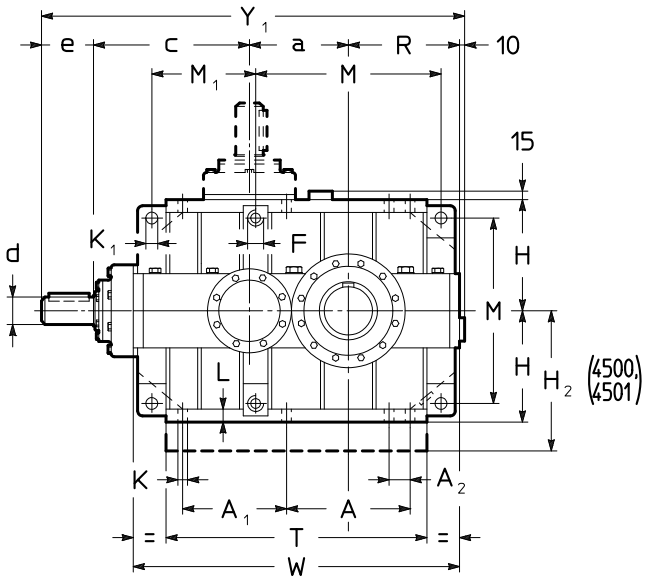
* **Finite** transmission ratio.

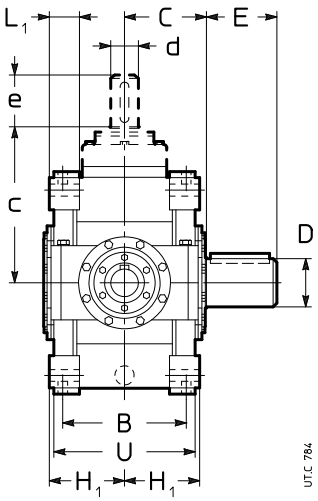
Dimensions, designs, mounting positions (bevel helical gear reducers)

10.1 - Gear reducers R CI

Dimensions







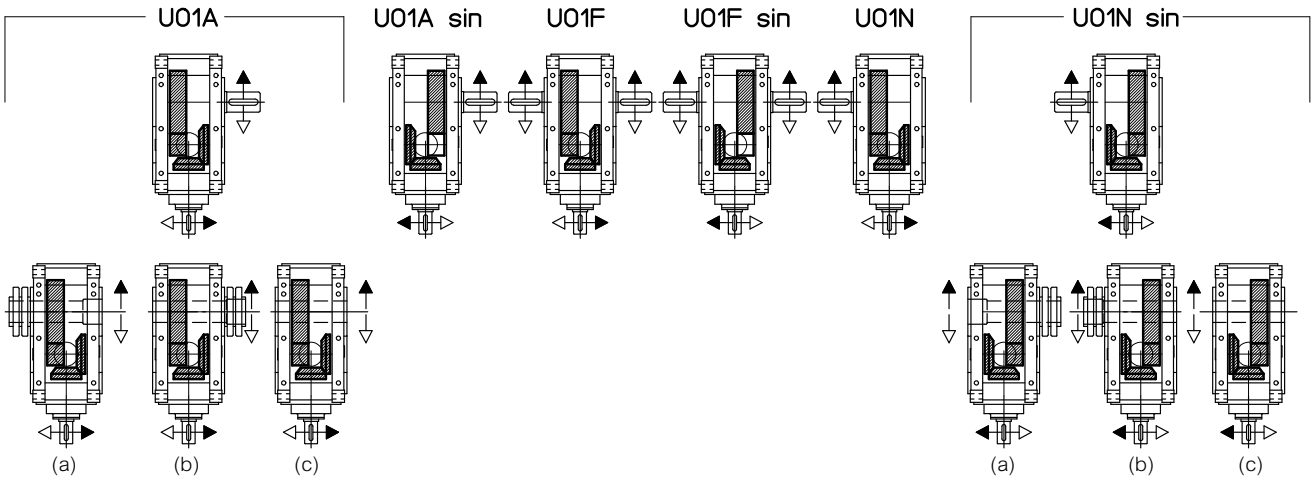
Size	a	A	A_1 M_1	A_2	B	C 3)	c	F 1)	H h11 R	H_1 h12	H_2 h11	K Ø	K_1 Ø H11	L	L_1	M	T	U	W	lb 4)	
4000	400	505	420	90	500	330	605	M45	450	296	–	39	48	52	116	750	1055	580	1320	4940	5090
4001																				5090	5270
4500	450	505	470	90	500	358	605	M45	450	296	560	39	48	52	116	750	1105	580	1370	6060	6260
4501																				6240	6480

Size	D Ø	E	d Ø	e	Y_1 2)	d Ø	e	Y_1 2)
			$i_N \leq 11,2$				$i_N \geq 12,5$	
4000	190	280	110	210	1675	90	170	1635
4001	200							
			$i_N \leq 12,5$				$i_N \geq 14$	
4500	210	300	110	210	1725	90	170	1685
4501	220							

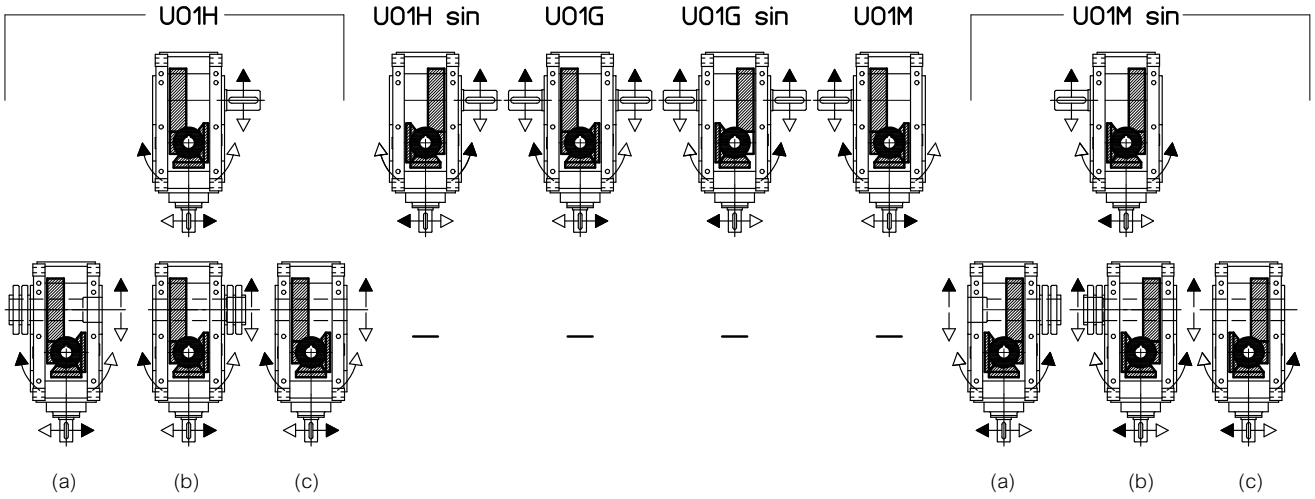
1) Working length of thread 1,7 · F.
2) For mounting positions B6, B7, V5, V6, dimension Y_1 increases by approx. 20 for filler plug overall dimensions.
3) The cover on bevel wheel side overhangs from **C** dimension (see ch. 6) by 33 mm for sizes 4000, 4001 and 5 mm for sizes 5000, 5001.
4) Values valid for double extension low speed shaft.

Designs[1) 2)] (direction of rotation)

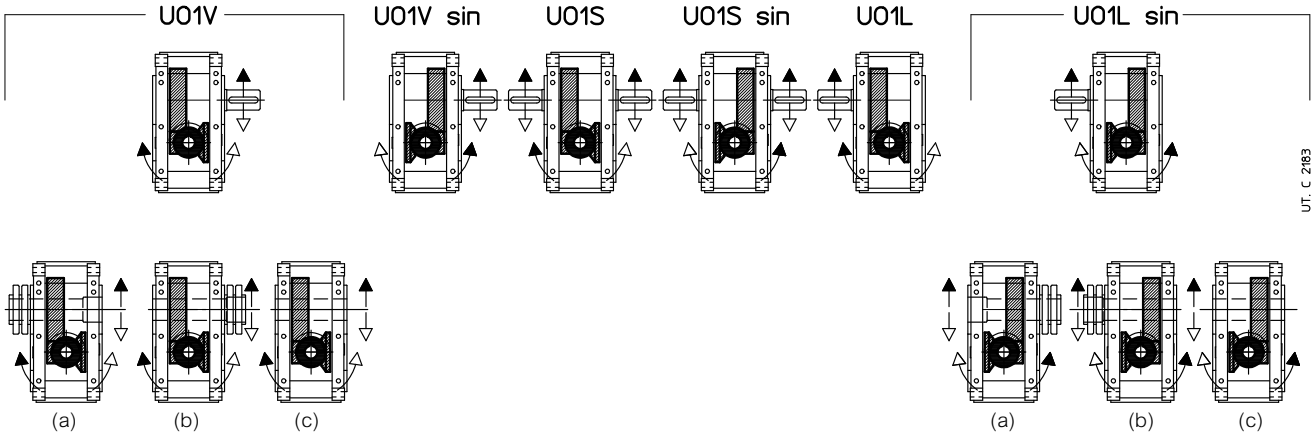
Solid low speed shaft (standard)



Solid low speed shaft (standard)



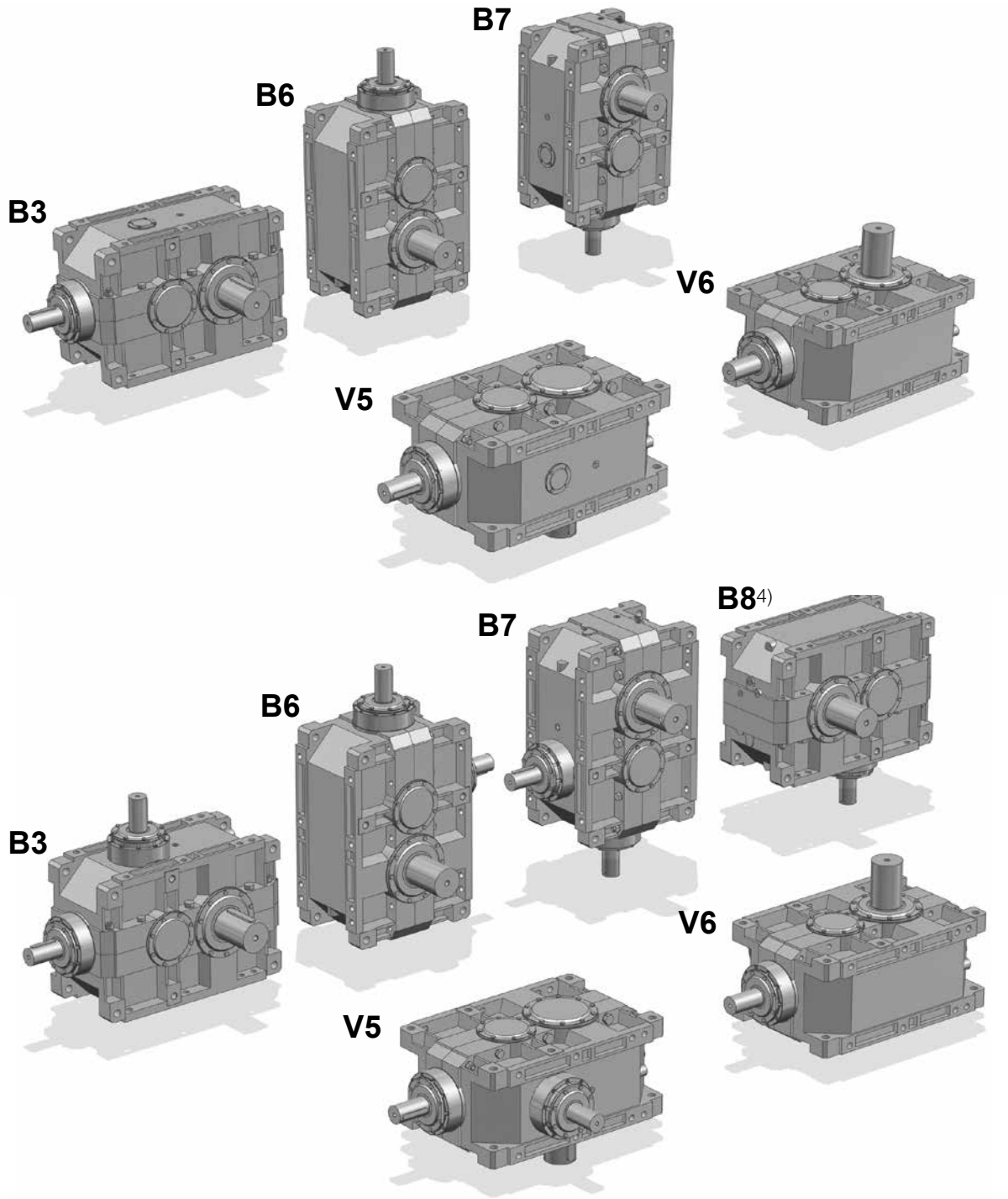
Solid low speed shaft (standard)



(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 UO1A ... UO1N sin is not prearranged for other designs (UO1H ... UO1L sin).
2) For UO1A, UO1H, UO1V designs and derivatives it is recommended to adopt the black arrow direction of rotation; for UO1A sin, UO1H sin, UO1V 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_{t3} of nominal thermal power Pt_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.

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

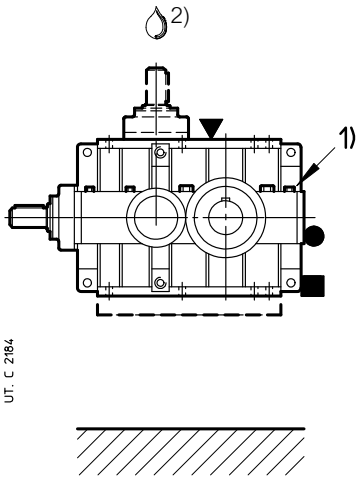
Oil filler plug
Oil level plug
Oil drain plug

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)

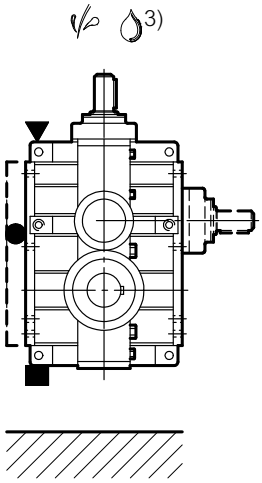
Lubrication - Plug position and oil quantity

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.

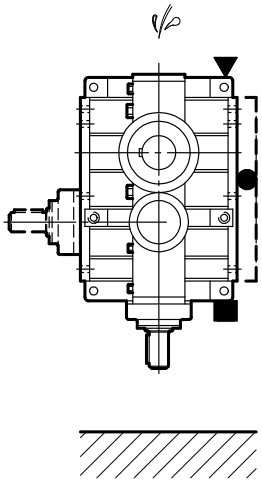
B3



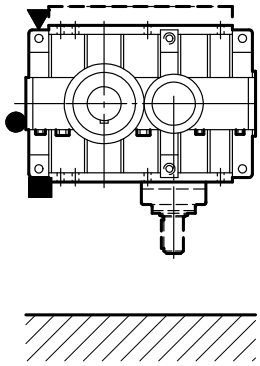
B6



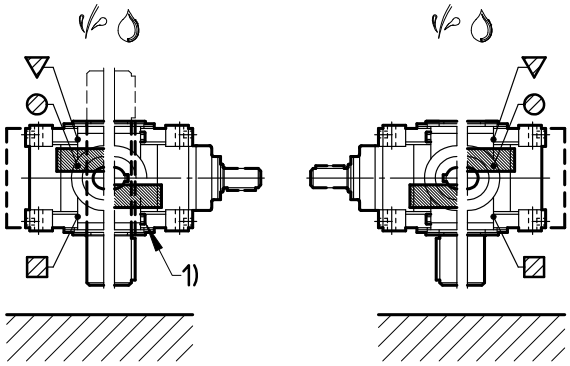
B7



B8[4)]

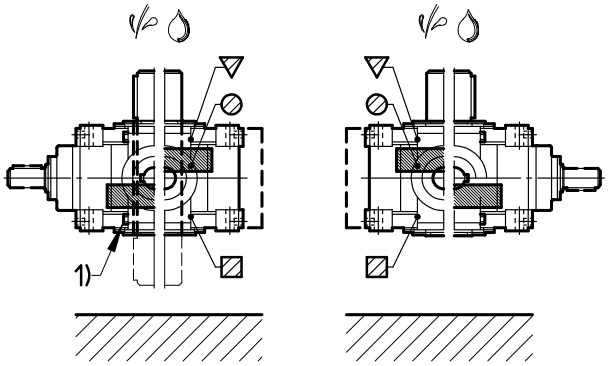


V5



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

V6



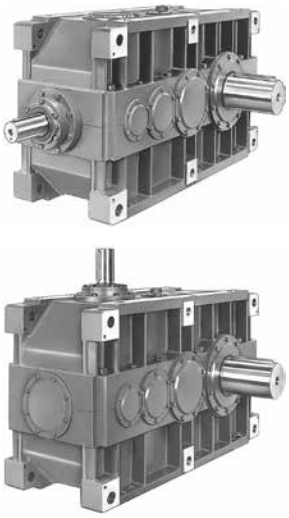
UO1A UO1F	UO1A sin UO1F sin	UO1N	UO1N sin
UO1H UO1G	UO1H sin UO1G sin	UO1M	UO1M sin
UO1V UO1S	UO1V sin UO1S sin	UO1L	UO1L sin
UO1A* UO1H* UO1V	UO1N sin* UO1M sin* UO1L sin*		

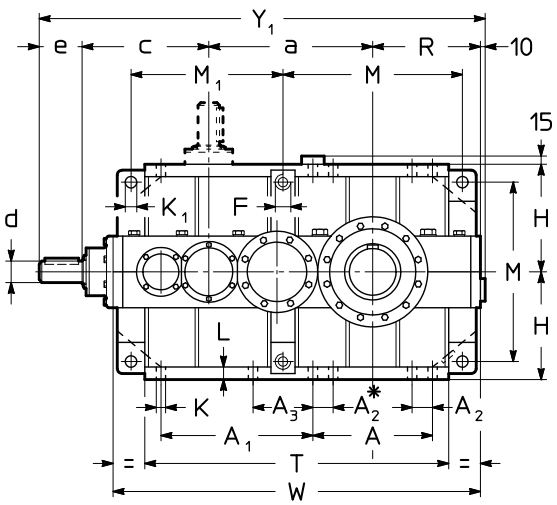
Size	Oil quantity [gal]					
	B3	B6	B7	B8[4)]	V5, V6	
					with low speed shaft on bottom	with low speed wheel on top
4000, 4001	26	40	42	26	30	31
4500, 4501	35	50	56	35	37	45

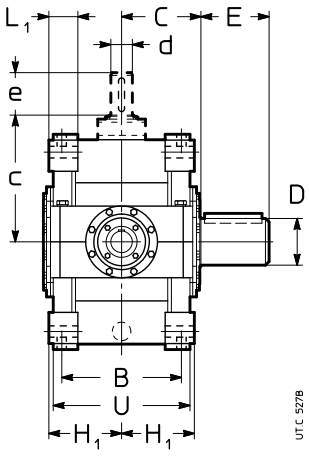
Notes at previous page.

10.2 - Gear reducers R C2I

Dimensions







* For sizes ⩾ 6300, only.

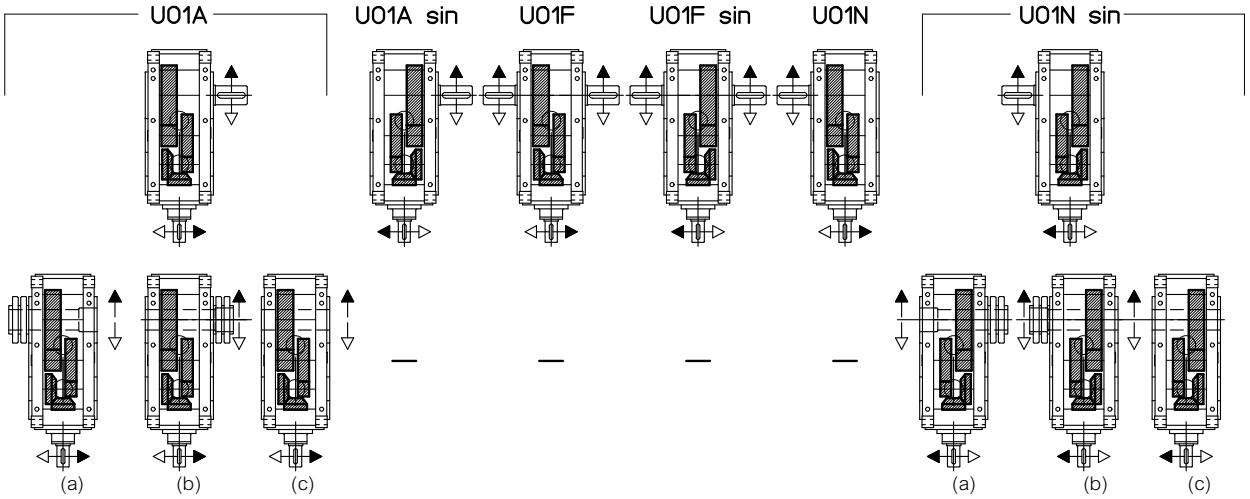
Size	a	A	A_1 M_1	A_2	A_3	B	C	c	F 1)	H h11 R	H_1 h12	K Ø	K_1 Ø H11	L	L_1	M	T	U	W	lb 3)	
4000 **4001**	700	505	625	90	–	500	330	480	M45	450	296	39	48	52	116	750	1260	580	1525	5380 5560	5530 5730
4500 **4501**	750	505	675	90	–	500	358	480	M45	450	296	39	48	52	116	750	1310	580	1575	6130 6280	6330 6530
5000 **5001**	875	630	785	115	–	625	410 4)	605	M56	560	370	48	60	65	148	930	1575	725	1905	10560 10820	10870 11180
5600 **5601**	935	630	845	115	–	625	445	605	M56	560	370	48	60	65	148	930	1635	725	1965	12520 12790	12960 13270
6300 **6301**	1080	770	970	115	–	695	490	605 5)	M56	630	406	48	60	65	148	1070	1900	795	2230	17530 17770	18140 18500
7101	1270	930	1228	115	590	843	601	833	M56	710	481	48	66	71	185	1230	2279	943	2648	29430	30530
8001	1430	1008	1286	145	596	944	682	934	M90	900	544	60	95	85	250	1574	2590	1064	3086	45300	46890

Size	D Ø	E	d Ø	e	Y_1 2)	d Ø	e	Y_1 2)
			$i_N \leqslant 40$			$i_N \geqslant 45$		
4000 **4001**	190 200	280	90	170	1810	70	140	1780
			$i_N \leqslant 45$			$i_N \geqslant 50$		
4500 **4501**	210 220	300	90	170	1860	70	140	1830
			$i_N \leqslant 40$			$i_N \geqslant 45$		
5000 **5001**	240 250	330	110	210	2260	90	170	2220
			$i_N \leqslant 45$			$i_N \geqslant 50$		
5600 **5601**	270 280	380	110	210	2320	90	170	2280
			$i_N \leqslant 50$ 6)			$i_N \geqslant 56$ 6)		
6300 **6301**	300 320	430	110	210	2535	90	170	2495
			$i_N \leqslant 31,5$			$i_N \geqslant 35,5$		
7101	360	590	140	250	3073	110	210	3033
8001	400	660	150	245	3519	125	210	3474

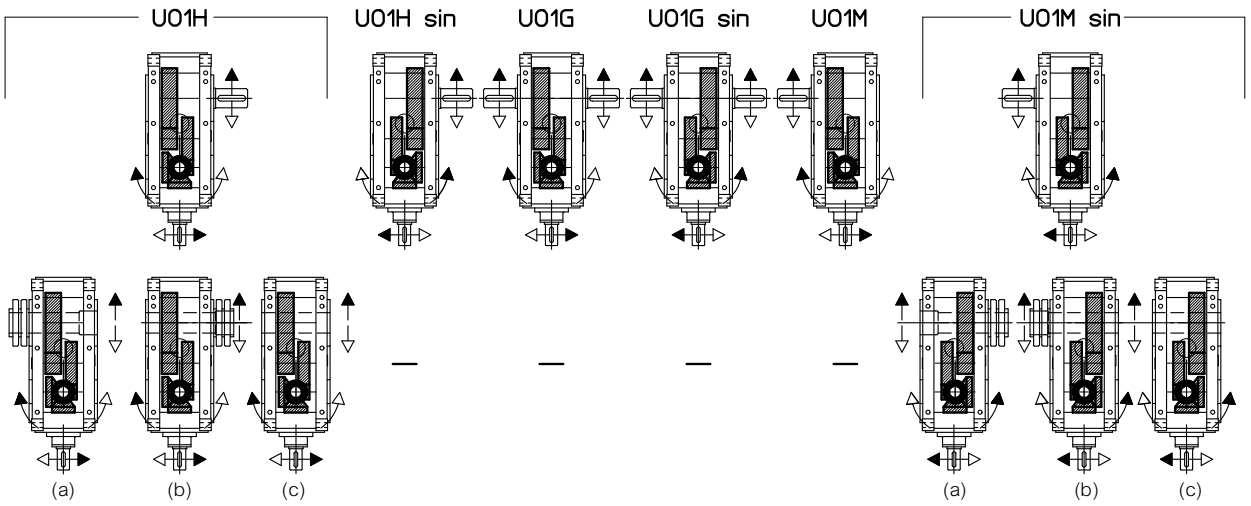
1) Working length of thread 1,7 · F.
2) For mounting positions B6, B7, V5, V6 dimension Y1 increases by approx. 20 for overall dimensions of filler plug.
3) Values valid for double extension low speed shaft.
4) The cover on bevel wheel side overhangs from **C** dimension (see ch. 6) by 13 mm.
5) The high speed shaft end shoulder is within dimension H.
6) For size 6301: $i_N \leqslant 56$ and $i_N \geqslant 63$, respectively.

Designs[1) 2)] (direction of rotation)

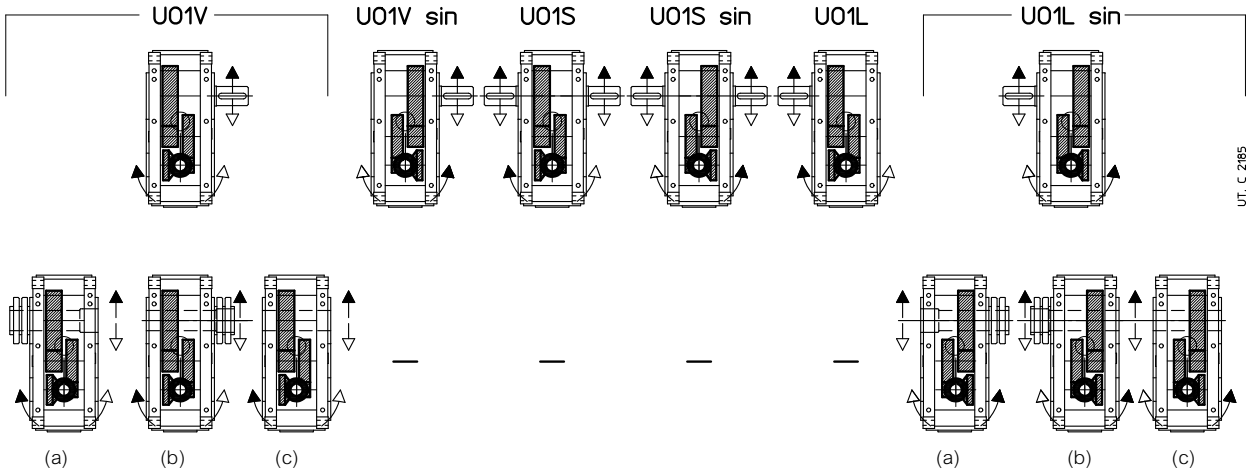
Solid low speed shaft (standard)



Solid low speed shaft (standard)



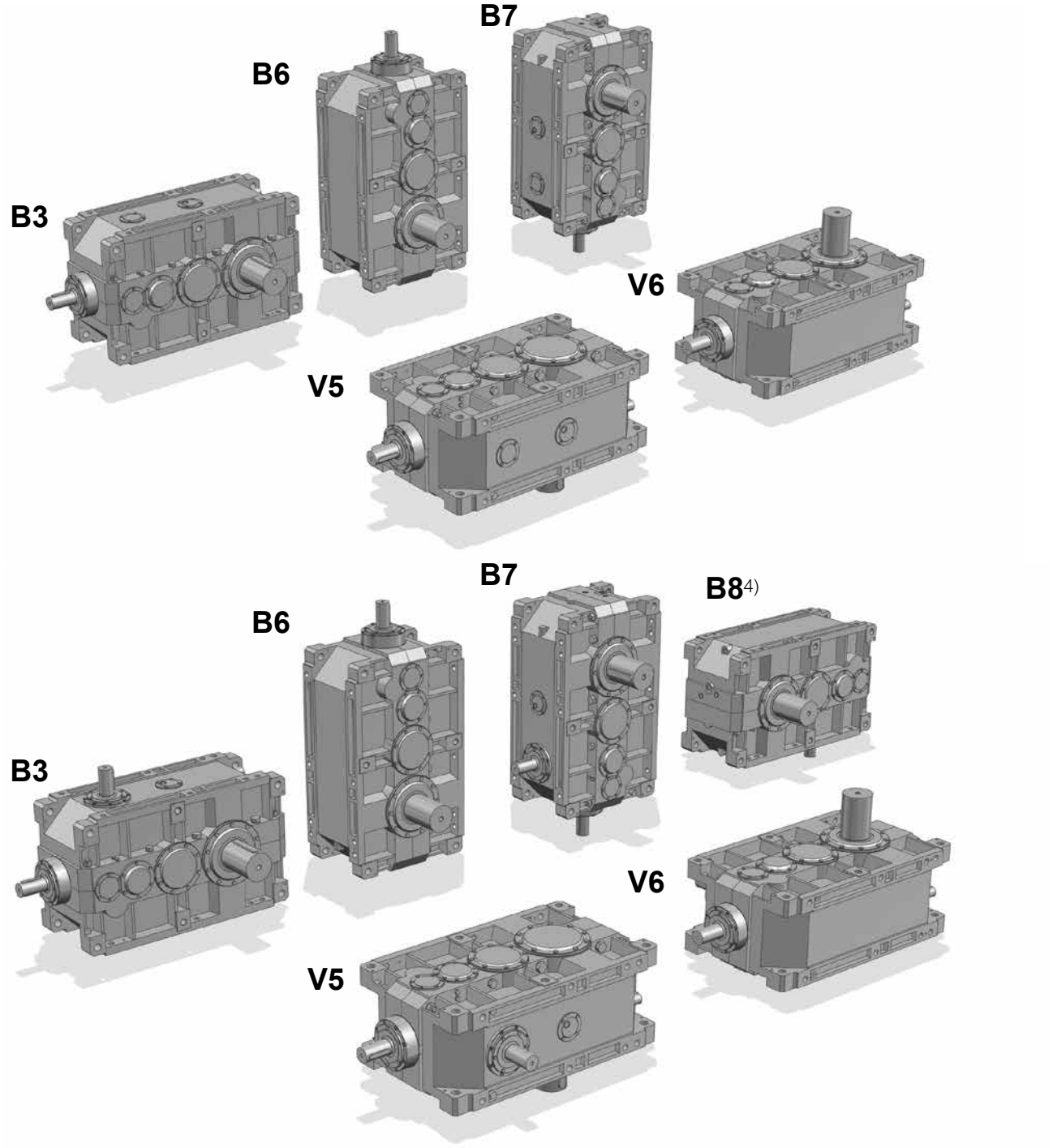
Solid low speed shaft (standard)



(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 UO1 A ... UO1N sin is not prearranged for other designs (UO1H ... UO1L sin).
2) For UO1 A, UO1 H, UO1 V designs and derivatives it is recommended to adopt the black arrow direction of rotation; for UO1 A sin, UO1 H sin, UO1 V 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_{t3} of nominal thermal power Pt_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

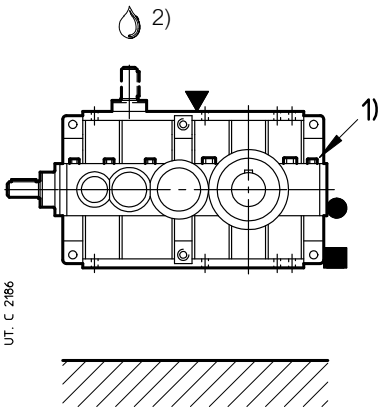
Oil filler plug on opposite side (not in view)
Oil level plug on opposite side (not in view)
Oil drain plug on opposite side (not in view)

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

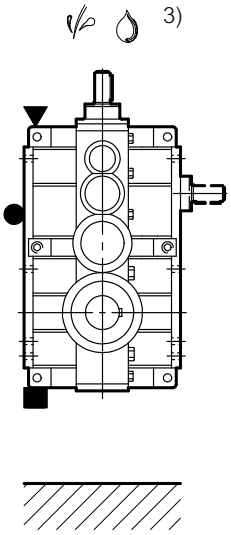
Lubrication - Plug position and oil quantity

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.

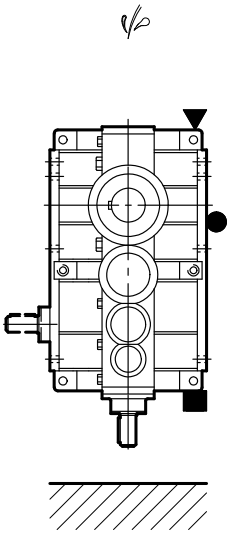
B3



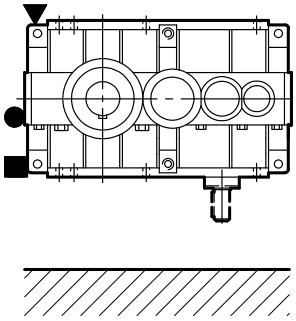
B6



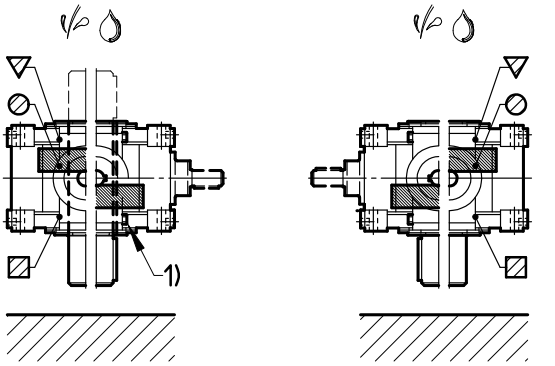
B7



B8[4)]

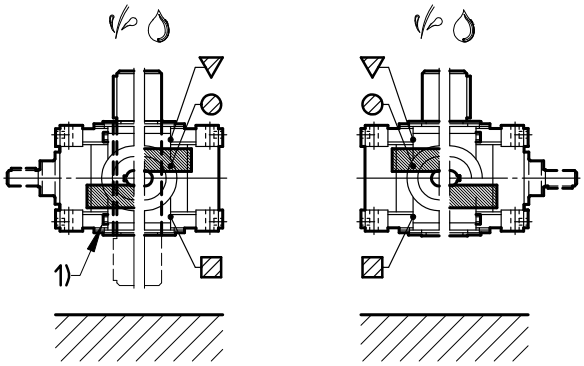


V5



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

V6



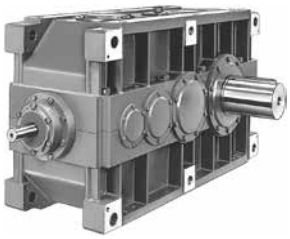
UO1A UO1F	UO1A sin UO1F sin	UO1N	UO1N sin
UO1H UO1G	UO1H sin UO1G sin	UO1M	UO1M sin
UO1V UO1S	UO1V sin UO1S sin	UO1L	UO1L sin
UO1A* UO1H* UO1V	UO1N sin* UO1M sin* UO1L sin*		

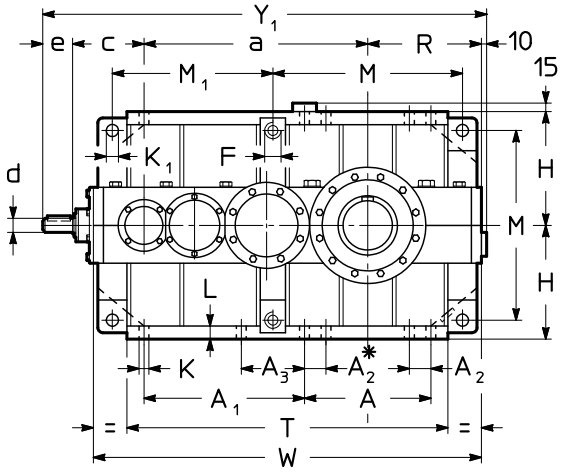
Size	Oil quantity [gal]					
	B3	B6	B7	B8[4)]	V5, V6	
					with low speed shaft on bottom	with low speed wheel on top
4000, 4001	35	59	59	35	59	66
4500, 4501	35	59	59	35	59	66
5000, 5001	70	119	112	70	119	125
5600, 5601	70	119	112	70	119	125
6300, 6301	99	166	166	99	166	188
7001	159	251	280	159	251	280
8001	264	449	449	264	449	476

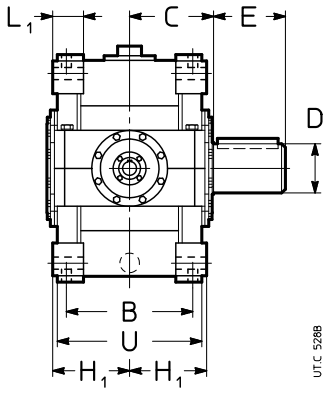
Notes at previous page.

10.3 - Gear reducers R C3I

Dimensions







* For sizes ⩾ 6300, only.

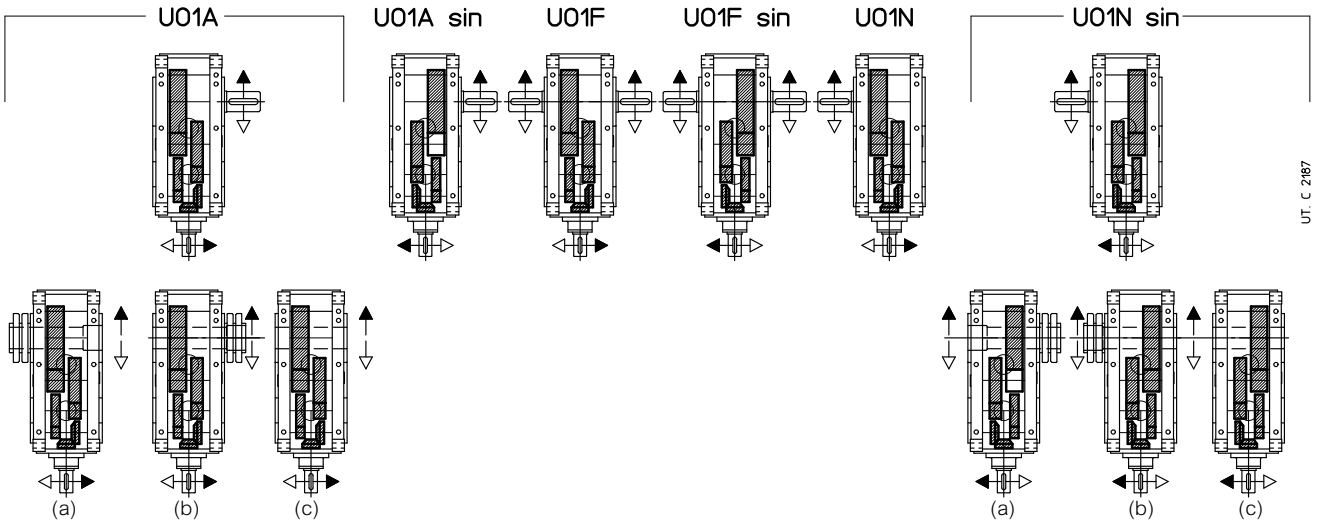
Size	a	A	A_1 M_1	A_2	A_3	B	C	F 1)	H h11 R	H_1 h12	K Ø	K_1 Ø H11	L	L_1	M	T	U	W	lb 3)	
4000	900	505	625	90	–	500	330	M45	450	296	39	48	52	116	750	1260	580	1525	5270	5420
4001																			5420	5600
4500	950	505	675	90	–	500	358	M45	450	296	39	48	52	116	750	1310	580	1575	5840	6040
4501																			6000	6240
5000	1125	630	785	115	–	625	410	M56	560	370	48	60	65	148	930	1575	725	1905	10250	10560
5001																			10520	10870
5600	1185	630	845	115	–	625	445	M56	560	370	48	60	65	148	930	1635	725	1965	12190	12630
5601																			12410	12900
6300	1380	770	970	115	–	695	490	M56	630	406	48	60	65	148	1070	1900	795	2230	17000	17610
6301																			17240	17970
7101	1630	930	1228	115	590	843	601	M56	710	481	48	66	71	185	1230	2279	943	2648	29230	30340
8001	1880	1008	1286	145	596	944	682	M90	900	544	60	95	85	250	1574	2590	1064	3086	45080	46670

Size	D Ø	E	c	d Ø	e	Y_1 2)	c	d Ø	e	Y_1 2)	c	d Ø	e	Y_1 2)
			$i_N \leqslant 125$				$i_N = 160, 200$				$i_N \geqslant 250$			
4000	190	280	282	48	110	1752	282	48	110	1752	282	38	80	1722
4001	200													
			$i_N \leqslant 125$				$i_N = 160, 200$				$i_N \geqslant 250$			
4500	210	300	282	48	110	1802	282	48	110	1802	282	38	80	1772
4501	220													
			$i_N \leqslant 125$				$i_N = 160, 200$				$i_N \geqslant 250$			
5000	240	330	380	70	140	2215	357	55	110	2162	357	48	110	2162
5001	250													
			$i_N \leqslant 125$				$i_N = 160, 200$				$i_N \geqslant 250$			
5600	270	380	380	70	140	2275	357	55	110	2222	357	48	110	2222
5601	280													
			$i_N \leqslant 160$ 4)				$i_N = 200, 250$ 4)				$i_N = 315$			
6300	300	430	380	70	140	2540	357	55	110	2487	357	48	110	2487
6301	320													
			$i_N \leqslant 160$				$i_N = 200, 250$				$i_N = 315$			
7101	360	590	480	90	170	3000	480	70	140	2970	480	70	140	2970
			$i_N \leqslant 160$				$i_N = 200, 250$				$i_N = 315$			
8001	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_1 increases by approx, 20 for overall dimensions of filler plug.
3) Values valid for double extension low speed shaft end.
4) For size 6301: $i_N \leqslant 200$ and $i_N = 250$, respectively.

Designs[1) 2)] (direction of rotation)

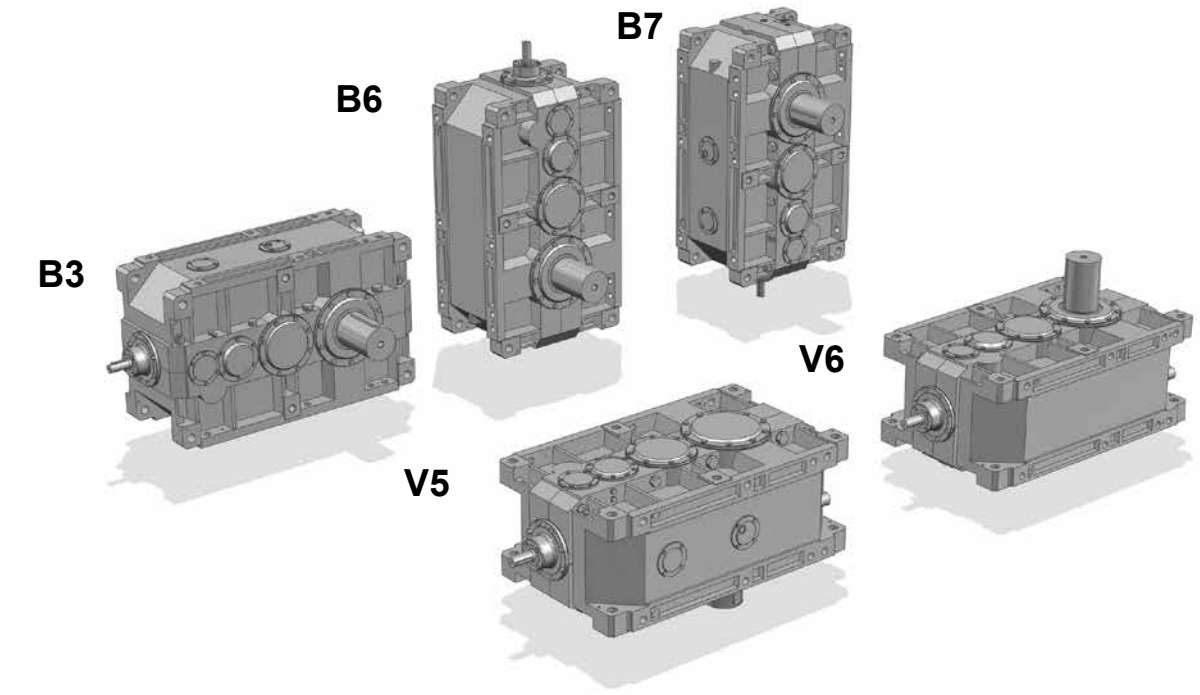
Solid low speed shaft (standard)



(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 UO1A ... UO1N sin is not prearranged for other designs (UO1H ... UO1L sin).
2) For UO1A, UO1H, UO1V designs and derivatives it is recommended to adopt the black arrow direction of rotation; for UO1A sin, UO1H sin, UO1V 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_{t3} of nominal thermal power Pt_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).

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

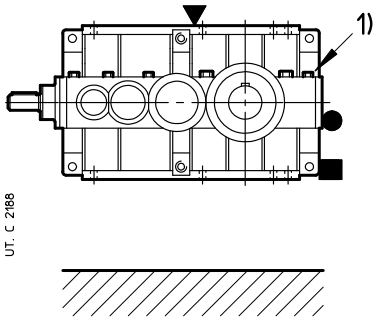
Oil filler plug
Oil level plug
Oil drain plug

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)

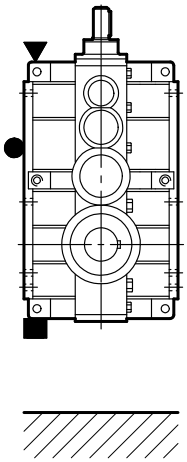
Lubrication - Plug position and oil quantity

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.

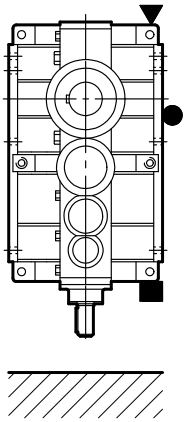
B3



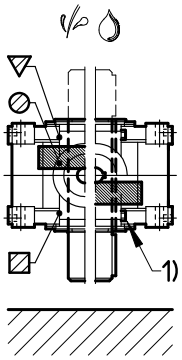
B6

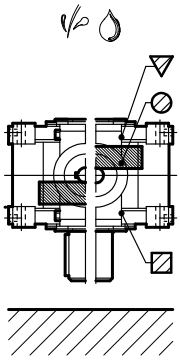


B7



V5

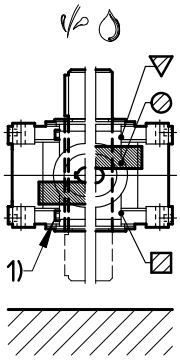


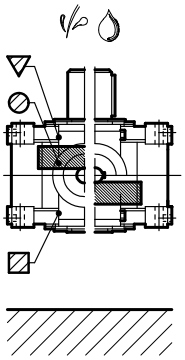


UO1A UO1F	UO1A sin UO1F sin
UO1A*	UO1N sin*

UO1N	UO1N sin

V6





UO1A UO1F	UO1A sin 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
4000, 4001	40	74	59	66	70
4500, 4501	40	74	59	66	70
5000, 5001	79	148	119	132	140
5600, 5601	79	148	119	132	140
6300, 6301	112	225	166	188	198
7001	188	349	264	280	296
8001	296	592	449	476	502

Notes at previous page.

Page intentionally left blank

Radial loads

11.1 - Radial loads[1] (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	F_{r1} [10^3 lbf]																
	4000 ... 4501			5000 ... 5601			6300 ... 6301					7101			8001		
rpm	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
1 800	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
1 500	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
1 200	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
1 000	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
710	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
560	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
450	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
355	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
F_{r1max}	**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**

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

$$F_{r1} = \frac{189\,09 \cdot P_1}{d \cdot n_1}\ [10^3\,\text{lbf}]$$ for timing belt drive

$$F_{r1} = \frac{315\,15 \cdot P_1}{d \cdot n_1}\ [10^3\,\text{lbf}]$$ 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 ⩾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: $(315\,150 \cdot P_1) / (d \cdot n_1)$ 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 ⩾ 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	andpolen.		**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 ⩾ 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.

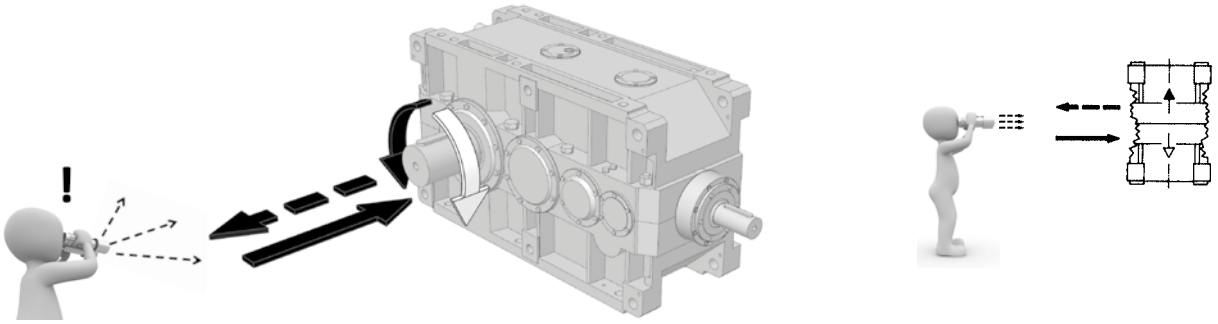
11.2 - Radial loads (OHL) F_{r2} [10^3 lbf] or axial loads F_{a2} [10^3 lbf] on low speed shaft end

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.

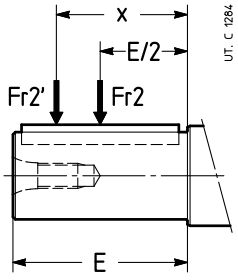
Normally, radial loads on low speed shaft ends are considerable: in fact there is a tendency to connect the gear reducer to the machine by means of a transmission with high transmission ratio (economizing on the gear reducer) and with small diameters (economizing on the drive, and for requirements dictated 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 φ [°] 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 · 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.

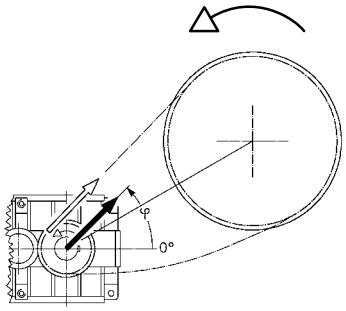
	Gear reducer size											
	4000	**4001**	**4500**	**4501**	**5000**	**5001**	**5600**	**5601**	**6300**	**6301**	**7101**	**8001**
y	561	554	612	594	700	694	765	742	823	823	1010	1142

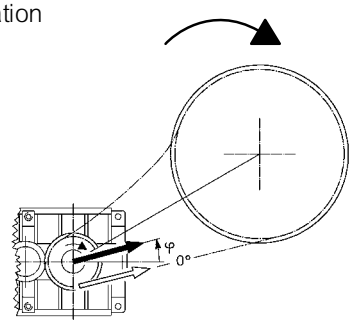
Radial load F_{r2} for the most common drives has the following value and angular position:

Rotation

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

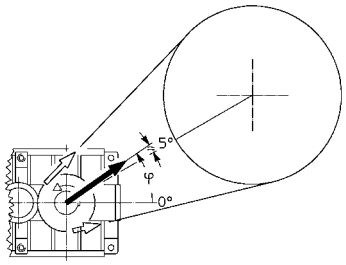
for chain drive (lifting in general); for toothed belt drive replace 126.06 with 189.09

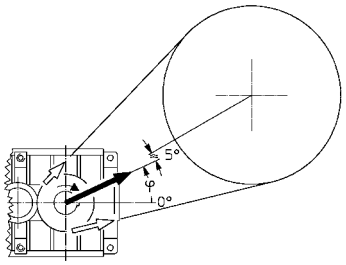




$$F_{r2} = \frac{315.15 \cdot P_2}{d \cdot n_2} \quad [10^3\,\text{lbf}]$$

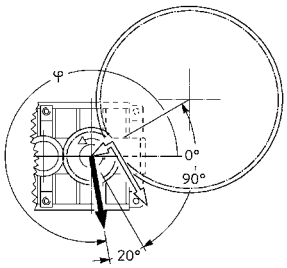
for V-belt drive

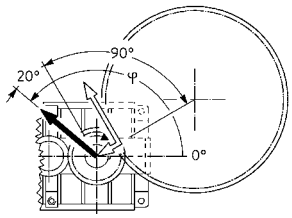




$$F_{r2} = \frac{134.11 \cdot P_2}{d \cdot n_2} \quad [10^3\,\text{lbf}]$$

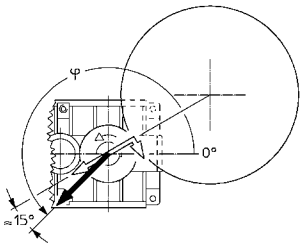
for spur gear pair drive

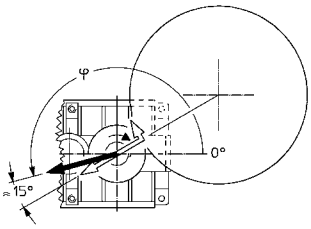




$$F_{r2} = \frac{447.55 \cdot P_2}{d \cdot n_2} \quad [10^3\,\text{lbf}]$$

for friction wheel drive (rubber-on-metal)

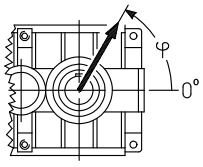


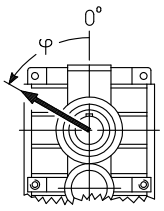


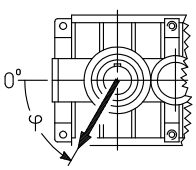
UT.C 787

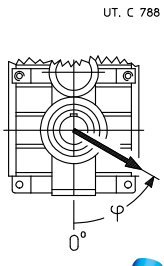
where: P_2[hp] is power required at the output side of the gear reducer, n_2 [rpm] is the speed, d [in] is the pitch diameter.

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









UT. C 788

Radial load on **opposite low speed wheel side**[3]

size **4000**

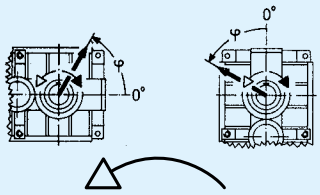
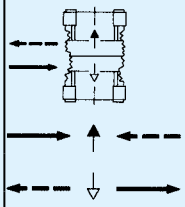
$n_2 \cdot L_h$	T_2	F_{r2} [1) 2)]								F_{a2} [1)]									
rpm h	10 lbf in	0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
355,000	710	45	45	45	45	45	45	45	45	37.5	33.5	35.5	45	45	45	45	45	7.1	18
	500	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	9	18
450,000	710	45	45	45	45	45	45	45	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
560,000	710	45	45	37.5	33.5	45	45	45	45	28	23.6	26.5	35.5	45	45	45	37.5	4	18
	500	45	45	45	45	45	45	45	45	40	35.5	37.5	45	45	45	45	45	9	18
710,000	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
900,000	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
1,120,000	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
1,400,000	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
1,800,000	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
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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**

355,000	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
450,000	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
560,000	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
710,000	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
900,000	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
1,120,000	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
1,400,000	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
1,800,000	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
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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**[3] 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		
355,000	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
450,000	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
560,000	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
710,000	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
900,000	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
1,120,000	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
1,400,000	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
1,800,000	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
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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**

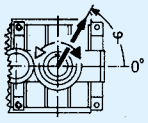
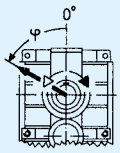
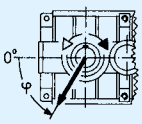
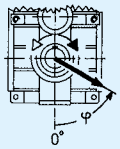
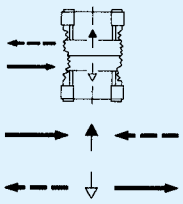
size **4001**

355,000	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
450,000	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
560,000	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
710,000	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
900,000	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
1,120,000	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
1,400,000	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
1,800,000	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
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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**[3]

size **4500**

$n_2 \cdot L_h$	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	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
450,000	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
560,000	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
710,000	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
900,000	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
1,120,000	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
1,400,000	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
1,800,000	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
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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	33.5	35.5	25	22.4	23.6	30	35.5	37.5	35.5	31.5	6	16
		max **56**																max **11**	max **22**

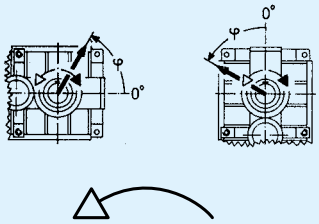
size **4501**

355.000	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
450.000	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
560.000	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
710.000	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
900.000	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
1.120.000	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
1.400.000	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
1.800.000	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
2.240.000	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
2.800.000	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
3.550.000	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
4.500.000	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 · 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**[3]

size **4500**

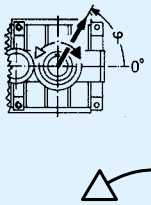
$n_2 \cdot L_h$	T_2	F_{r2} [1) 2)]								F_{a2} [1)]									
																			
rpm h	10 lbf in	0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
355,000	1000	56	56	56	56	56	56	56	56	31.5	23.6	26.5	40	56	56	56	56	8.5	22.4
	710	56	56	56	56	56	56	56	56	50	42.5	45	56	56	56	56	56	11.2	22.4
450,000	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
560,000	1000	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
710,000	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
900,000	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
1,120,000	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
1,400,000	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
1,800,000	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
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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**

355,000	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
450,000	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
560,000	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
710,000	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
900,000	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
1,120,000	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
1,400,000	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
1,800,000	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
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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**[3] size **5000**

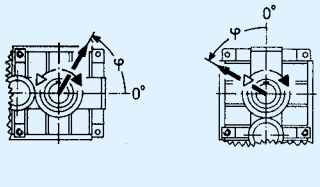
$n_2 \cdot L_h$	T_2	F_{r2} [1) 2)]								F_{a2} [1)]	
											
rpm h	10 lbf in	0	45	90	135	180	225	270	315		
355,000	1400	71	71	71	71	71	71	71	71	9.5	28
	1000	71	71	71	71	71	71	71	71	14	28
450,000	1400	71	71	63	60	71	71	71	71	7.1	28
	1000	71	71	71	71	71	71	71	71	14	28
560,000	1400	71	71	42.5	40	60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

size **5001**

355,000	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
450,000	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
560,000	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
710,000	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
900,000	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
1,120,000	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
1,400,000	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
1,800,000	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
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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 **71**																max **14**	max **28**

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**[3] 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		
355,000	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
450,000	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
560,000	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
710,000	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
900,000	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
1,120,000	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
1,400,000	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
1,800,000	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
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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 **71**																max **14**	max **28**

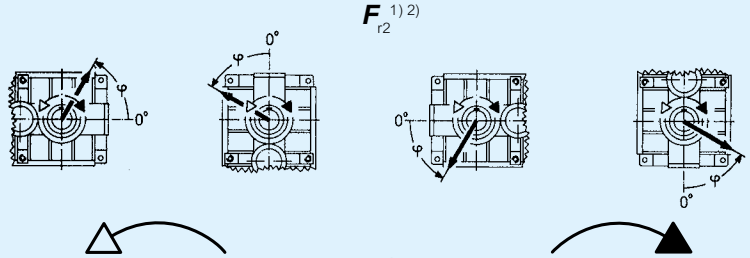
size **5001**

355,000	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
450,000	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
560,000	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
710,000	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
900,000	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
1,120,000	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
1,400,000	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
1,800,000	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
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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 **71**																max **14**	max **28**

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**[3]

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		
355,000	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
450,000	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
560,000	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
710,000	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
900,000	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
1,120,000	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
1,400,000	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
1,800,000	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
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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**

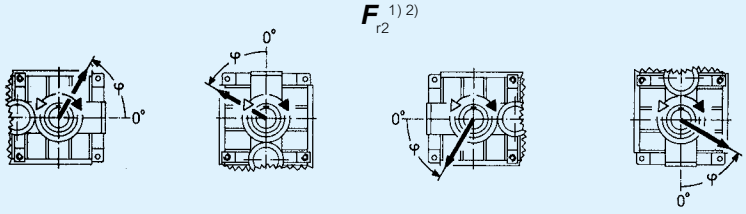
size **5601**

355,000	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
450,000	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
560,000	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
710,000	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
900,000	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
1,120,000	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
1,400,000	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
1,800,000	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
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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**[3]

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		
355,000	2000	90	90	90	90	90	90	90	90	47.5	33.5	35.5	60	90	90	90	85	10.6	35.5
	1400	90	90	90	90	90	90	90	90	75	63	67	85	90	90	90	90	18	35.5
450,000	2000	90	90	90	90	90	90	80	85	35.5	25	26.5	45	90	90	90	71	8	35.5
	1400	90	90	90	90	90	90	90	90	67	53	56	75	90	90	90	90	17	35.5
560,000	2000	90	90	90	90	90	85	71	80	25	16	18	33.5	85	90	90	60	5.3	35.5
	1400	90	90	90	90	90	90	85	90	56	47.5	50	67	90	90	90	85	14	35.5
710,000	2000	90	90	90	75	90	75	63	71	–	–	–	15	71	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	75	11.8	35.5
900,000	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	67	9.5	35.5
	1000	90	90	90	90	90	90	80	85	63	53	56	71	90	90	90	85	16	35.5
1,120,000	1400	85	90	90	90	90	71	63	67	31.5	23.6	25	40	75	90	90	60	7.5	35.5
	1000	90	90	90	90	90	80	75	75	56	45	47.5	63	85	90	90	75	14	35.5
1,400,000	1400	80	90	90	90	90	67	56	63	25	17	19	31.5	67	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	67	11.8	33.5
1,800,000	1400	71	90	85	75	80	60	50	53	16	–	–	22.4	60	90	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	10	31.5
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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**

355,000	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
450,000	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
560,000	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
710,000	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
900,000	2360	90	90	90	90	90	90	85	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
1,120,000	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
1,400,000	1700	90	90	90	90	90	90	85	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
1,800,000	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
2,240,000	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	90	80	85	67	56	56	75	90	90	90	90	18	35.5
2,800,000	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
3,550,000	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
4,500,000	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**[3] size **6300**

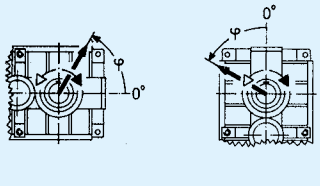
$n_2 \cdot L_h$	T_2	F_{r2} [1) 2)]																F_{a2} [1)]	
rpm h	10 lbf in	0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
355,000	2800	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
	2000	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	35.5	18
450,000	2800	90	90	90	90	90	90	90	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
560,000	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
710,000	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
900,000	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
1,120,000	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
1,400,000	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
1,800,000	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
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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**

355,000	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
450,000	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
560,000	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
710,000	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
900,000	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
1,120,000	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
1,400,000	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
1,800,000	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
2,240,000	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
2,800,000	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
3,550,000	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
4,500,000	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**[3] 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	90	85	67	63	71	35.5	14
	1000	90	71	56	53	63	80	90	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**

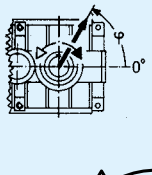
size **6301**

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**[3]

size **7101**

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

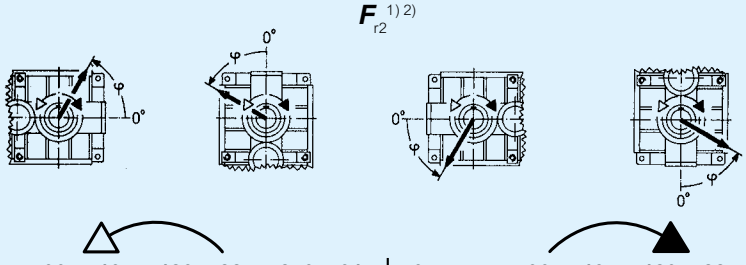
size **8001**

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

size **7101**

$n_2 \cdot L_h$	T_2	F_{r2} [1) 2)]								F_{a2} [1)]									
																			
min^{-1}·h	10 lbf in	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 · 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.

Page intentionally left blank

Accessories and non-standard designs

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

(1) Hollow low speed shaft with shrink disc

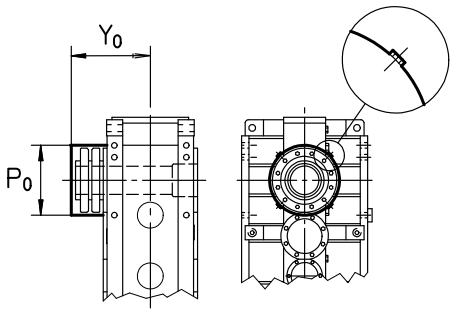
Opposite side to machine

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

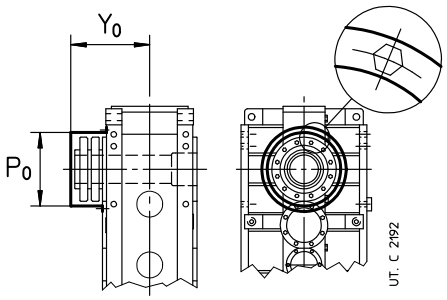
Safety guards made of steel for shrink disc, supplied **as standard**.

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

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

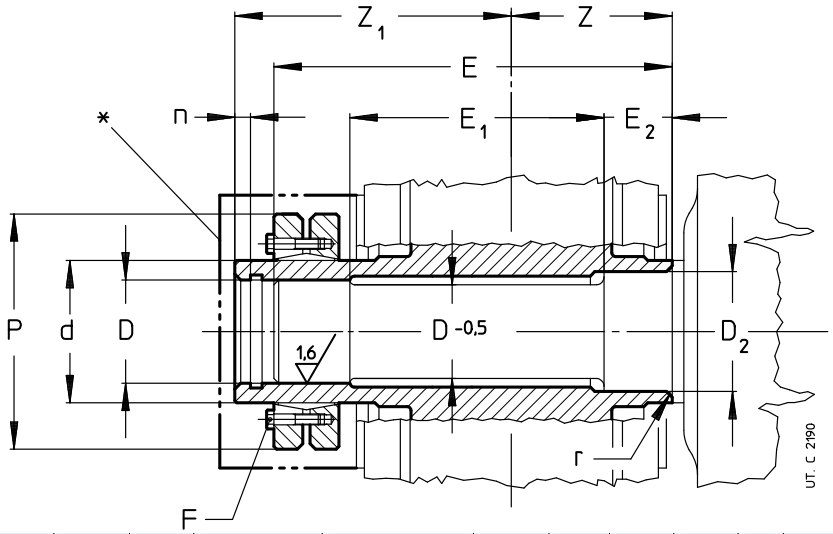


4000 ... 5601
7101, 8001



6300, 6301

Gear reducer size	P_0 Ø	Y_0
4000, 4001	449	522
4500, 4501	479	534
5000, 5001	536	635
5600, 5601	608	659
6300, 6301	750	752
7101	850	990
8001	977	1127



Gear reducer size	D Ø H7 / h6, j6	D_2** Ø	E	E_1	E_2	E_2 1)	F 2)	T_S 3) lbf in	n	d Ø	P Ø	r	Z	Z_1	T_{2SD} 4) 10^3 lbf in	Δm lb
4000, 4001	210	220	788	480	165	130	M20 n. 14	4336	14	260	430	5	330	497	2250	-155
4500, 4501	230	240	799	465	180	130	M20 n. 16	4336	14	280	460	5	330	508	2895	-310
5000, 5001	260	270	970	600	200	165	M20 n. 20	4336	16	320	520	6	410	605	4045	-355
5600, 5601	290	300	992	572	225	180	M20 n. 24	4336	16	360	590	6	410	627	5365	-595
6300, 6301	325	335	1 110	650	250	200	M24 n. 21	7434	18	400	660	7	460	700	7715	-905
7101	360	370	1 394	782	280	225	M27 n.28	11062	20	460	770	7	551	899	14600	-970
8001	400	410	1 606	886	315	250	M27 n. 34	11062	20	530	910	8	626	1036	18760	-795

1) Values valid for **R 4I**.
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_2) 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.

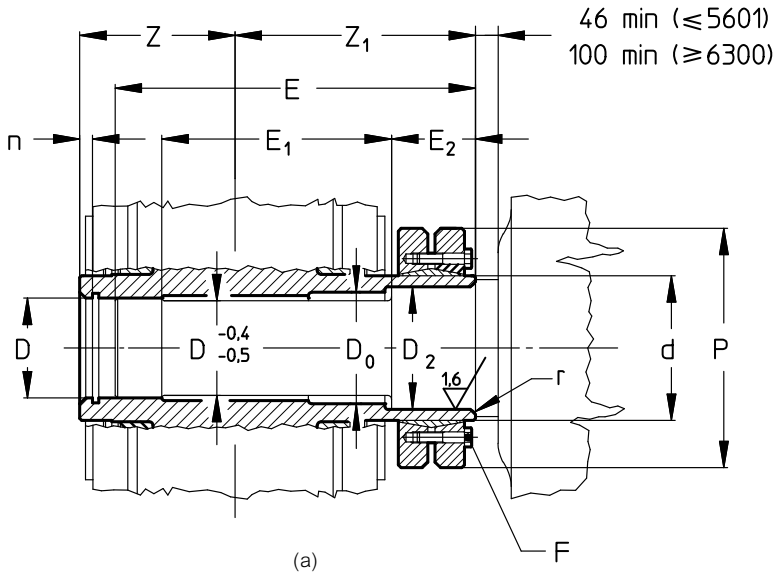
In the first case (fig. a), where the «long» shaft end of driven machine acts as a guide, mounting operations are facilitated.

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).

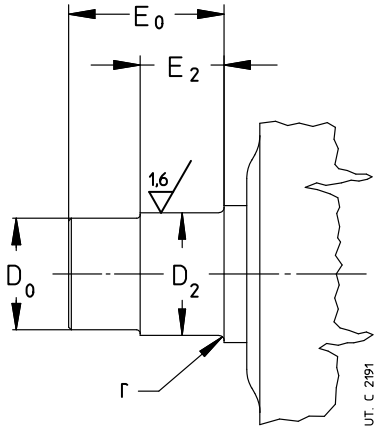
In both cases the rigidity and the resistance to bending and torsional stresses at the shaft and of driven machine do not change, since the only surface through which torque transmission occurs is the D_2 one.

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

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



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



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

12

Gear reducer size	D Ø H7 / h6, j6	D2** Ø H7 / h6, j6	D0 Ø	E	E0	E1	E2	E2 1)	F 2)	Ts 3) lbf in	n	d Ø	P Ø	r	Z	Z1	T2SD 4) 10³ lbf in	Δm lb
4000, 4001	210	220	215	754	307	446	165	130	M20 n. 14	4336	14	260	430	5	330	463	2520	-175
4500, 4501	230	240	232	768	342	434	180	130	M20 n. 14	4336	14	280	460	5	330	477	3210	-330
5000, 5001	260	270	265	935	380	565	200	165	M20 n. 16	4336	16	320	520	6	410	570	4435	-420
5600, 5601	290	300	295	958	428	538	225	180	M20 n. 16	4336	16	360	590	6	410	593	5825	-660
6300, 6301	325	335	330	1 063	475	603	250	200	M24 n. 18	7434	18	400	660	7	460	653	8300	-1015
7101	360	370	–	1 335	–	774	327	327	M27 n. 28	11062	20	460	770	7	551	840	15045	-1015
8001	400	410	–	1 548	–	879	400	400	M27 n. 34	11062	20	530	910	8	626	978	19115	-880

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

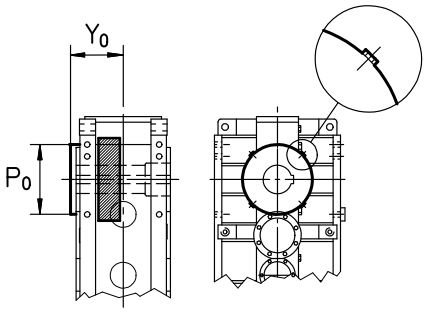
Hollow low speed shaft, normal (fig. a) or stepped (fig. b), with keyway. With required torque higher than table values, two keyways at 120° are necessary.

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).

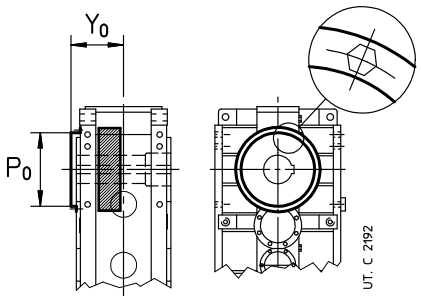
Hollow low speed shaft washer (see ch. 12 (5), available on request.

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

Design not possible for sizes 7101 and 8001.

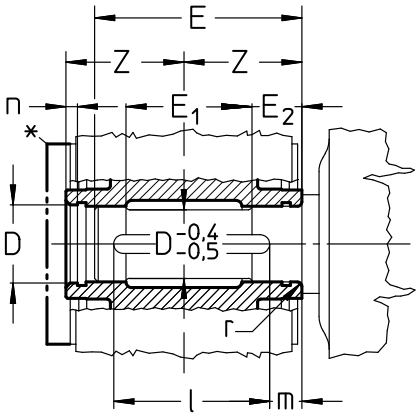


4000 5601

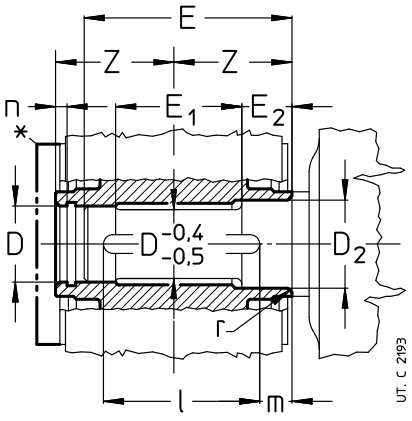


6300, 6301

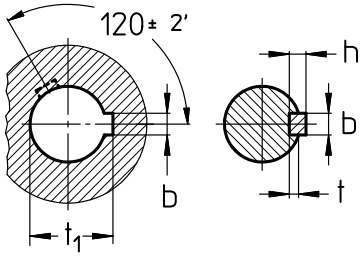
Gear reducer size	P_0 Ø	Y_0 ≈
4000, 4001	437	359
4500, 4501	479	362
5000, 5001	536	445
5600, 5601	598	445
6300, 6301	657	620



(a)
Hollow low speed shaft with keyway



(b)
Stepped hollow low speed shaft with keyway



12

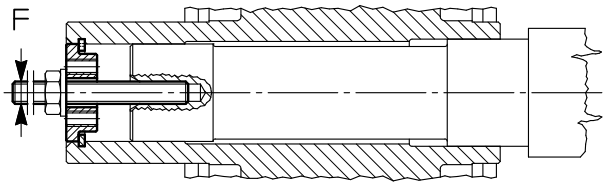
Gear reducer size	Hollow shaft				Shaft end of driven machine						Parallel key			Keyway			T_2	Δm
	D**	D_2**	n	Z	E	E_1	E_2		m	r	b	h	l	b	t	t_1		
	Ø	Ø			3)		3)	1) 3)			h9	h11		$H9_{hub}$			2)	
	H7 / h6, j6													$N9_{shaft}$	shaft	hub	10^3 lbf in	lb
4000, 4001	200	210	14	330	620	300	165	130	10	5	45	25	600	45	15	210,4	**990**	-330
4500, 4501	220	230	14	330	620	300	180	130	10	5	50	28	600	50	17	231,4	**1240**	-530
5000, 5001	250	260	16	410	775	400	200	165	13	6	56	32	750	56	20	262,4	**1980**	-660
5600, 5601	280	290	16	410	775	400	225	180	13	6	63	32	750	63	20	292,4	**2210**	-925
6300, 6301	310	320	18	460	870	400	250	200	15	7	70	36	840	70	22	324,4	**3140**	-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.

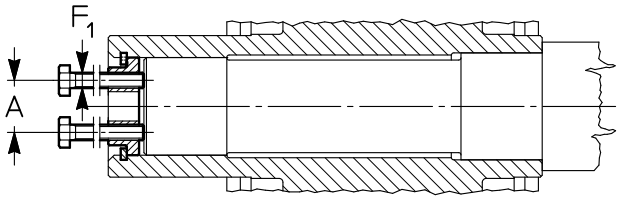
Supplementary description when ordering by **designation**: **hollow low speed shaft with keyway, hollow low speed shaft with two keyways**, **stepped hollow low speed shaft with keyway**, **stepped hollow low speed shaft with two keyways.**

(3) Hollow low speed shaft washer

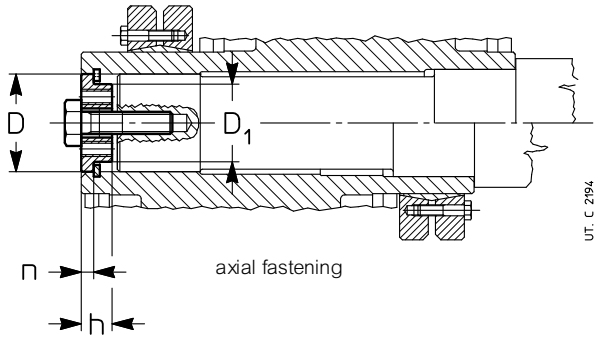
Washer, retaining ring and screw for axial fastening of gear reducer with hollow low speed shaft with shrink disc or with keyway.



installing



removing



axial fastening

12

Gear reducer size	A		D		D_1		F	F_1	h	n	Axial fastening bolt
		1)	Ø	Ø 1)	Ø	1)					UNI 5737-88
4000, 4001	144	134	210	200	180	170	M30	M24	34	14	M30 90
4500, 4501	164	144	230	220	200	190	M30	M24	34	14	M30 90
5000, 5001	178	168	260	250	225	215	M36	M30	40	16	M36 110
5600, 5601	208	198	290	280	255	245	M36	M30	40	16	M36 110
6300, 6301	228	218	325	310	285	270	M36	M30	45	18	M36 110
7101	228	–	360	–	319	–	M45	M36	50	20	M45 150
8001	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**.

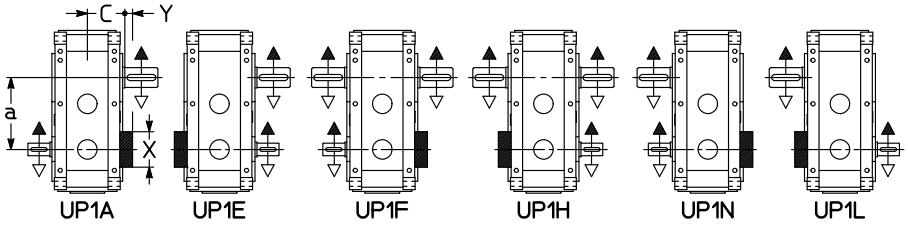
(4) Backstop device

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

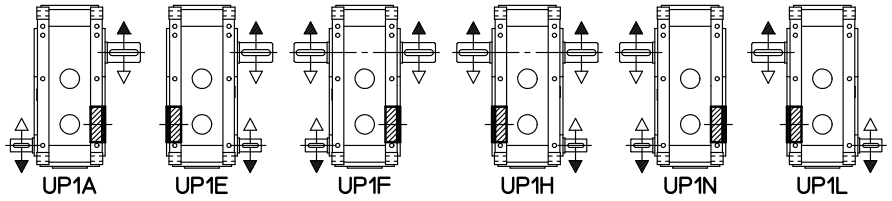
Possible configurations and designs are stated in the following figures.

R 2I

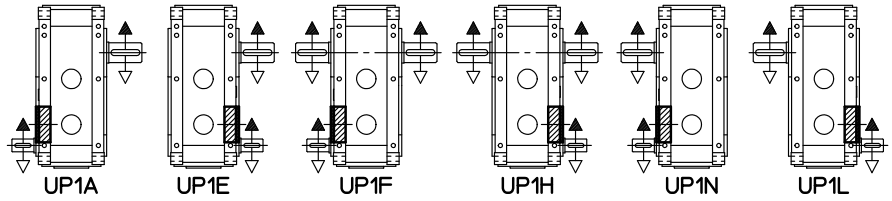
R 2I	X Ø	Y Ø
4000, 4001	248	13
4500, 4501	248	-15
5000, 5001	320	15
5600, 5601	320	-20
6300, 6301	378	-19
7101	460	144
8001	460	167



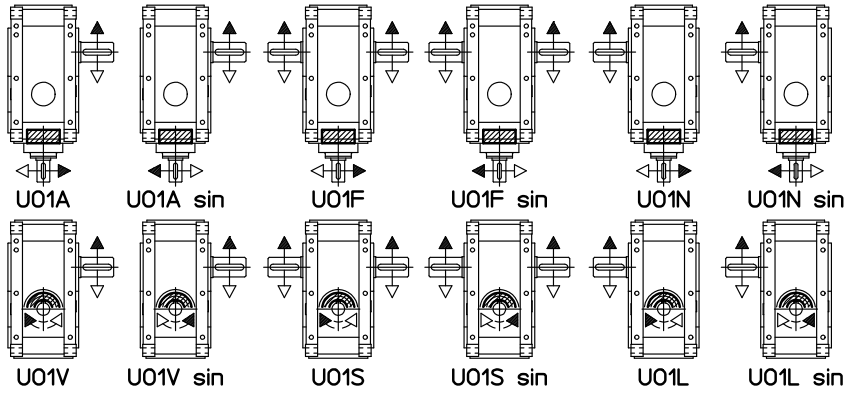
R 3I[1)]



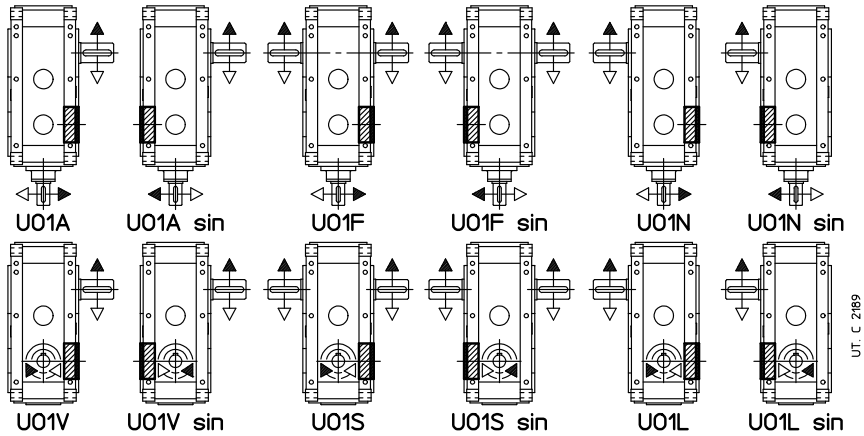
R 4I[1)]



R CI



R C2I[1)], **R C3I**[1) 2)]



1) Backstop device does not project from dimension **C**.
2) Designs UO1V... UO1L 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 · T_{2BS}**.

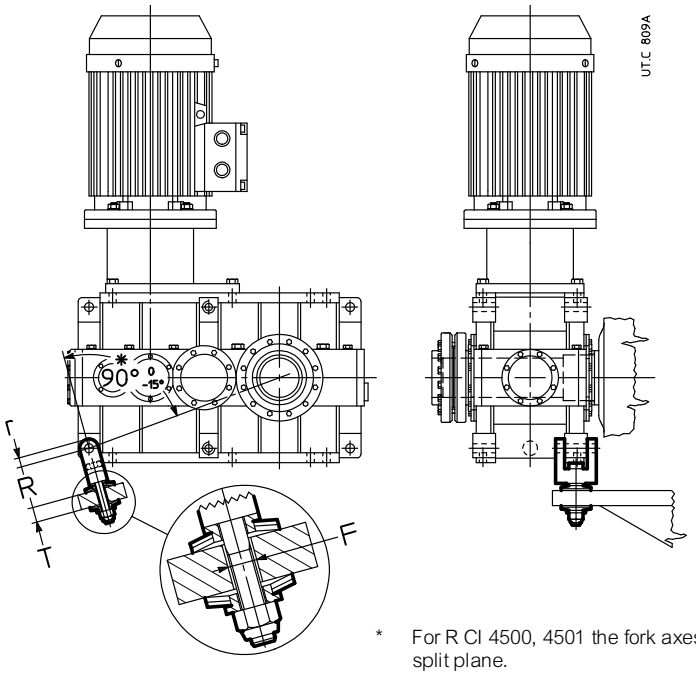
Train of gears	i_N	T_{2BS} [10^3 lbf in]					
		4001	**4501**	**5001**	**5601**	**6301**	**7101**
3I	25	840	–	–	–	–	5575
	28	990	990	1980	1980	2965	–
	31,5	–	1105	–	2210	3320	–
	35,5	990	1240	1980	2480	2965	–
	40	–	1105	–	–	3320	–
	45	–	1240	–	2480	–	–
4I	⩽ 250	–	1240	–	2480	–	–
C2I	20	840	–	–	–	–	–
	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.

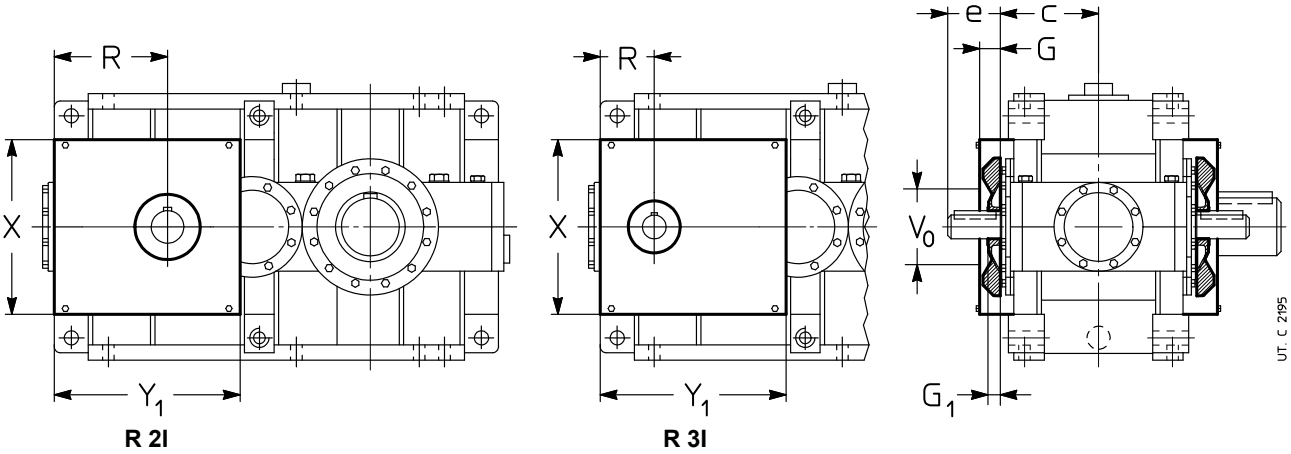
Gear reducer size	Screw UNI 5737-88	Disc spring DIN 2093	T	F Ø	R	r
4000 ... 4501	M45 260	A 125 n. 2	55	50	211	50
5000 ... 5601	M56 300	A 160 n. 2	70	62	274	60
6300, 6301	M56 300	A 160 n. 3	70	62	284	60

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.

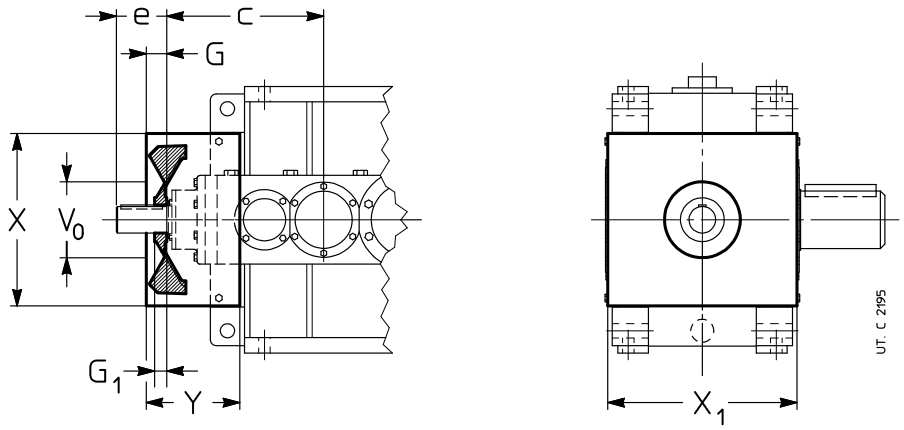


Gear reducer size		2I				3I				
	G 1)	**G1** 2)	**R**	**V0** Ø	**G1** 2)	**R**	**V0** Ø	**X**	**Y1**
4000 ... 4501	63	50	363	220	40	163	175	590	633
5000 ... 5601	75	50	453	290	50	203	220	740	795
6300, 6301	75	–	–	–	50	203	220	880	980

1) Bolts projecting 6 mm from **G** dimension.
2) The high speed shaft end length is equal to **e - G1**.

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.

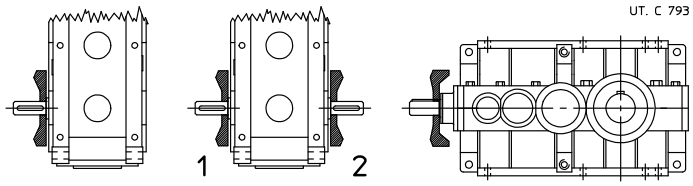


Gear reducer size			**G**	**G1**	**V0** Ø	**X**	**X1**	**Y**
CI	**4000 ... 4501**		80	40	280	590	640	345
C2I	**4000 ... 4501**		72	47	220	590	640	310
	5000 ... 5601		80	40	290	740	800	380
	6300, 6301		80	40	290	880	872	330
C3I	**6300, 6301**	i_N = 160	57	32	220	880	872	380

1) Bolts projecting 6 mm from dimension **X1** each side.
2) The high speed shaft end length is equal to **e - G1**.

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.

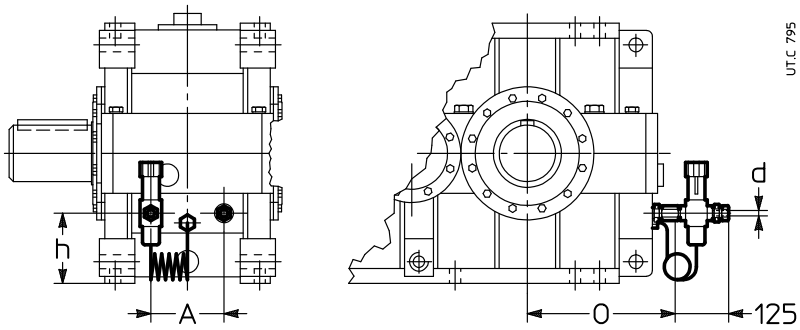
Supplementary description when ordering by **designation**: **fan cooling**; in designs with double extension high speed shaft state – only for helical gear reducers – if pos. **1** or **2** or **... with 2 fans**

(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
4000 ... 4501	180	16	250	472
5000 ... 5601	225	16	310	577
6300, 6301	280	16	320	647

12

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.

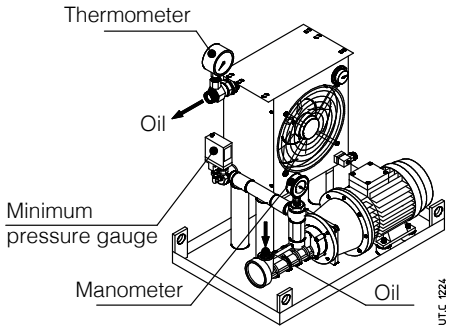
The load loss of coil, according to capacity and water pressure, is approximately 9 12 psi.

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.

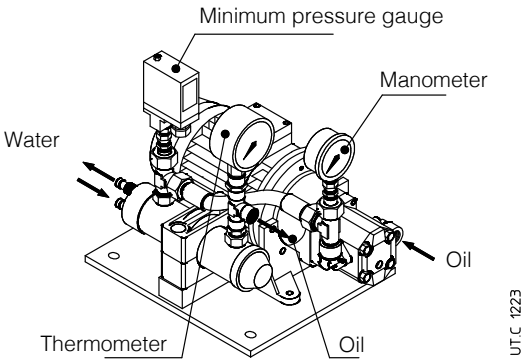
For ambient temperature lower than 32 °F (0 °C) consult us.

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

(29) 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:

$$\boldsymbol{P}s \geqslant (\boldsymbol{P}_1 - \boldsymbol{Pt}_N \cdot \boldsymbol{ft}_1 \cdot \boldsymbol{ft}_2 \cdot \boldsymbol{ft}_3 \cdot \boldsymbol{ft}_4) \cdot (\mathbf{1} - \boldsymbol{\eta}) \cdot \mathbf{K}_1$$

where:

Ps	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).
Pt_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 *Ps* 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 hp	kW	Heat exchanger code	Oil motor pump motor 3~ hp	flow rate ft³/min	Motor fan motor hp	flow rate ft³/min	Oil connections intake	delivery	Exchanger capacity ft³	lb
UR O/A 7hp	**6.7**	5	AP 300 E	2	1.1	0.20 1~	540	1" (1")[2]	1" (1")[2]	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")[1]	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 hp	kW	Heat exchanger code	Oil motor pump motor 3~ hp	flow rate ft³/min	Water pipe flow rate ft³/min	connections	Oil connections intake	delivery	Exchanger capacity ft³	lb
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)	**Gear reducer starting and subsequent motor-pump starting with warm oil**. The motor-pump is managed by the **three-threshold** 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	**Simultaneous starting of gear reducer and motor-pump** Oil filter not possible[4].
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)	**Simultaneous starting of gear reducer and motor-pump after oil pre-heating**[3]. The oil heater is managed by the **two-threshold** oil temperature control system (Pt100 + CT03). The motor-pump and the gear reducer motor are managed by the **three-threshold** 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	**Simultaneous starting of gear reducer and motor-pump**[3] Oil filter not possible[4].

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 continous duty – it is necessary to foresee the bearing lubrication. For other operating conditions, consult us.

Train of gears	Performance	Presence of **lubrication pump** Mounting position					
		B3	**B6**	**B7**	**B8**	**V5**	**V6**
2I	**all**	–	–	–	n.a.	P	P
3I	**all**	–	–	–	n.a.	P	P
4I	**all**	–	–	–	n.a.	P	P
CI	**UO1A ... UO1N sin**	–	P	–	n.a.	P	P
	UO1H ... UO1M sin	P	P	–	n.a.	P	P
	UO1V ... UO1L sin	P	–	–	–	P	P
C2I	**UO1A ... UO1N sin**	–	P	–	n.a.	P	P
	UO1H ... UO1M sin	P	P	–	n.a.	P	P
	UO1V ... UO1L sin	P	–	–	–	P	P
C3I	**all**	–	P	–	n.a.	P	P

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

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

IMPORTANT. For the running at cold starting ($T_{ambient} = T_{oil} \leqslant 77$ °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 particulary 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**.

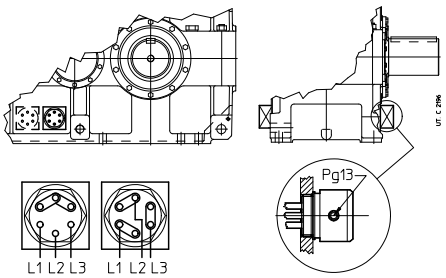
(10) Oil heater

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.



Three-phase connection Y

Three-phase connection Δ

Gear reducer size	**P** kW
4000, 4001	n. 2 1.5
4500, 4501	n. 2 1.5
5000, 5001	n. 2 3
5600, 5601	n. 2 3
6300, 6301	n. 2 3.5
7101	n. 2 7.5
8001	n. 2 9

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

Features:
- specific power 2W/in^2;
- three-phase supply Δ230 Y400 V 50-60 Hz;
- stainless steel resistors AISI 321;
- metallic terminal box; cable gland Pg13; protection IP 65;
- Horizontal mounting with oil bath lubrication;
- max oil temperature 194 °F (90 °C);
- threaded brass joint G 2"1/2 ;
- available also in explosion-proof design ATEX II 2G EExd IIC T4: consult us.

Available also in a version equipped with integrated thermostat.

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

(11) Special painting cycles

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**».

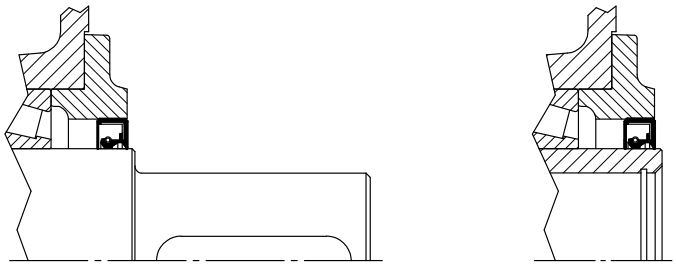
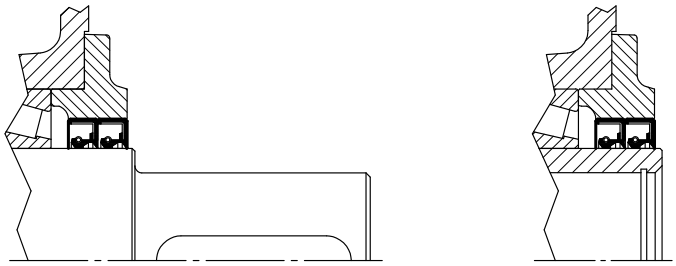
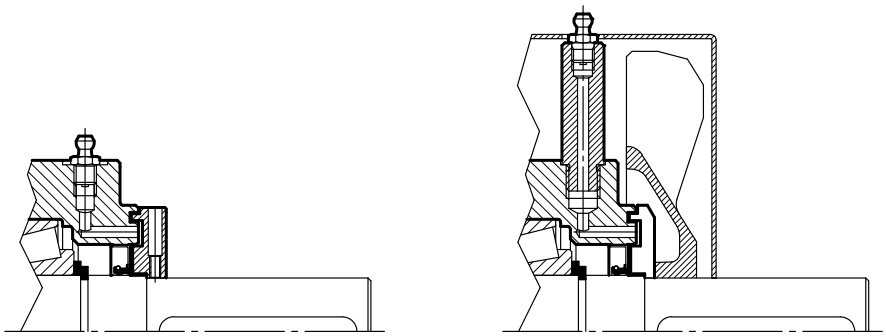
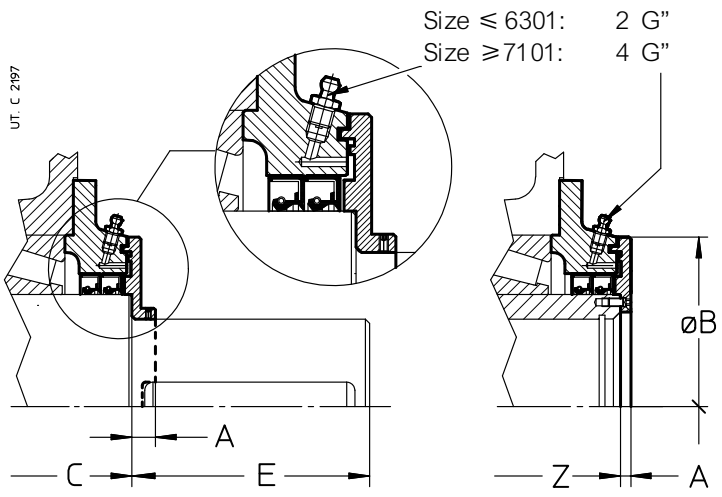
Application field	Features	Corrosivity class ISO 12944-2	Durability classes ISO 12944-2	Description	Average final thickness on machined parts µm	Code
Applications in aggressive environments	Good resistance to atmospheric and aggressive agents	C4	L	Dual-compound, high-thickness epoxy primer Water-based dual-compound polyacrylic enamel	≥ 200	**1HRAL5010** (blue)
			M	Dual-compound, high-thickness epoxy primer Water-based dual-compound polyacrylic enamel	≥ 220	**2HRAL5010** (blue)
			H	Dual-compound, high-thickness epoxy primer Water-based dual-compound polyacrylic enamel	≥ 280	**3HRAL5010** (blue)
Outdoor applications in saline environment	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	**2IRAL5010** (blue)
			H [2)]	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	**2KRAL5010** (blue)
Outdoor applications in chemically aggressive environment and high humidity industrial areas	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	**2LRAL5010** (blue)
			H [2)]	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	**2YRAL5010** (blue)

2) Not available on motors.

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	
Double seal on high speed shaft Quite polluting environment and/or outdoor **Low speed shaft double seal** Quite polluting environment and/or outdoor	 Supplementary description when ordering by **designation**: **double seal on high speed shaft** **double seal on low speed shaft**
High speed shaft seal with labyrinth and grease feeder («taconite») Very polluting environment (e.g.: mining industry)	 Supplementary description when ordering by **designation**: **high speed shaft seal with labyrinth and grease feeder.**
Low speed shaft double seal with labyrinth and grease feeder («taconite») Very polluting environment (e.g.: mining industry) 1)	 Supplementary description when ordering by **designation**: **low speed shaft seal with labyrinth and grease feeder.**

Gear reducer size	A	2)	B 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

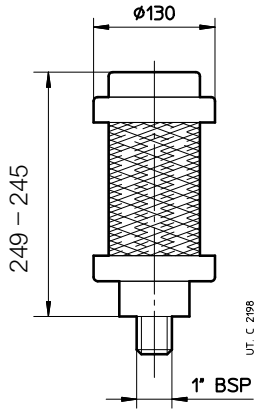
See notes at following page.

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

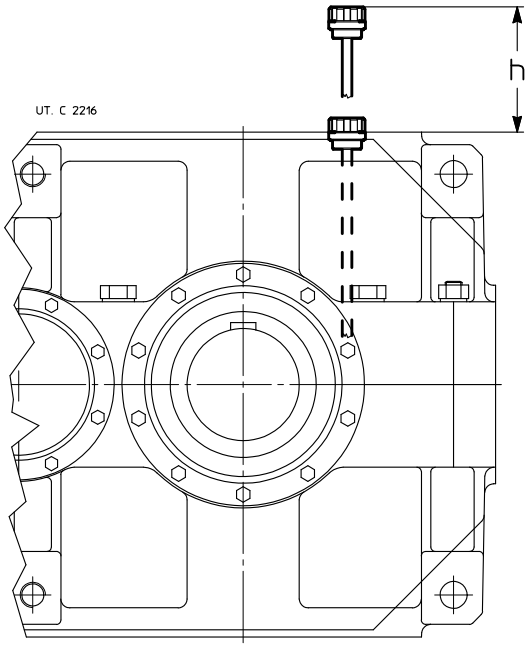


Desiccant breather with 3 stage filtration design: solid contaminant filter 2 µm, water vapor adsorbent bed in silica gel, activated carbon final filter. This filter traps water vapor and solid contaminant particles and keeps them from entering the gear box and simultaneously holds oil vapors inside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

Key features:
– replacement cartridge with true-life indicator of filter conditions
– alkali, oil, non-oxidizing acids, salt water and mineral and synthetic oils resistant;
– shock resistant cover and housing
– temperature range of application: -82 °F +199 °F.

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

(14) Oil level plug with dip stick



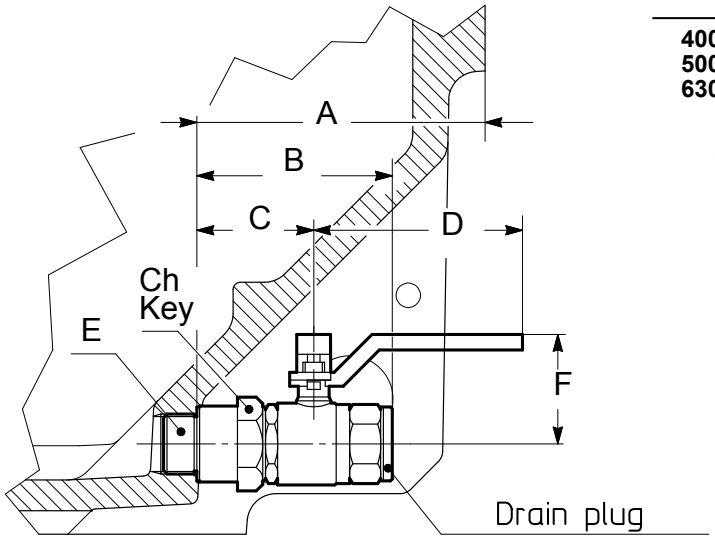
Gear reducer size	h ≈		
	2I, CI	3I, C2I	4I, C3I
4000, 4001	630	630	560
4500, 4501	710	630	560
5000, 5001	800	800	710
5600, 5601	900	800	710
6300, 6301	1000	900	800
7101	1120	1000	900
8001	1250	1120	1000

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

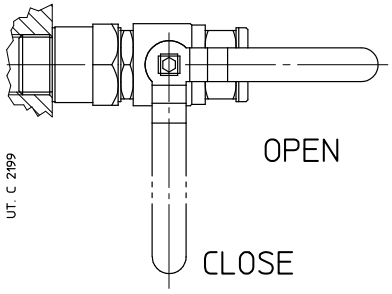
Supplementary description when ordering by **designation**: **Oil level with dip stick**

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

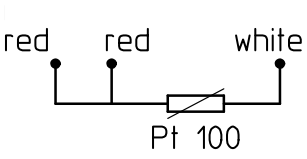


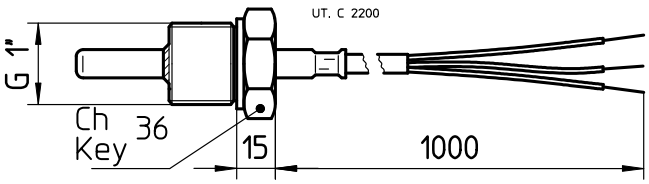
Gear reducer size	A	B	C	D	Ch Key	E	F
4000, 4501	158	106	66	115	46	G1"	60
5000, 5601	208	106	66	115	46	G1"	60
6300, 6301	190	106	66	115	46	G1"	60
7101	225	158	95	138	55	G1"	75
8001	280	170	102	158	60	G1"	91



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

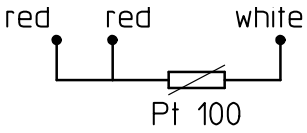
(16) Oil temperature probe

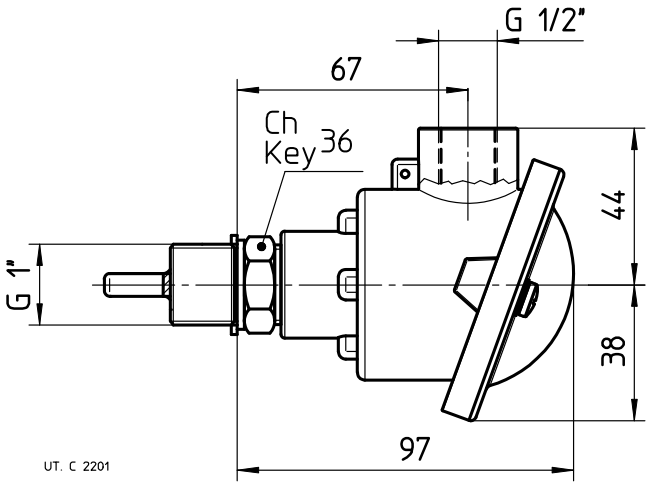




Remote oil temperature gauge; installation (at Buyer's responsibility) instead of an existing drain plug, or into a hole properly pre-arranged. The temperature gauge is realized with a thermo-resistor Pt100 having following features:
– platinum wire with 100 Ω at 32 °F (0 °C) according to EN 60751;
– precision class B according to EN 60751;
– operation temperature field -40 °F – +328 °F (-40 °C – +200 °C);
– max current 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 ⩾ 1.5 mm2 positioned separately from power cables.
In case of gear reducer supplied **filled with oil** foresee the probe equipped with **immersion bulb** (pre-mounted in the factory), its position is to be agreed with Rossi; consult us.
Supplementary description when ordering by **designation**: **oil temperature probe**.

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





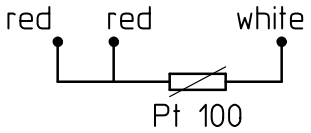
Remote oil temperature gauge, with terminal box and amperometric transducer; installation (at Buyer's responsibility) instead of drain plug. The temperature gauge is realized with a thermo-resistor Pt100 having following features:
– platinum wire with 100 Ω at 32 °F (0 °C) according to EN 60751;
– precision 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;
– alluminium 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 ⩾1,5 mm2 positioned separately from power cables.

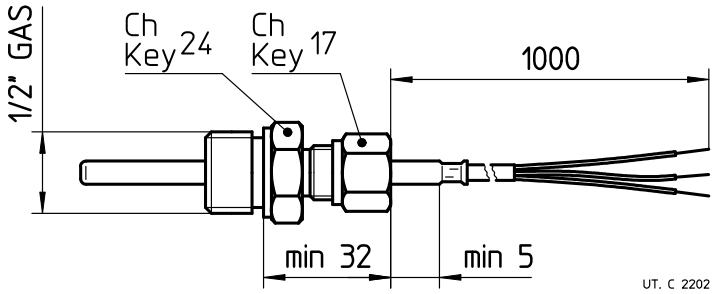
ATTENTION. Accessory available only after technical feasibility evaluation by Rossi: consult us.

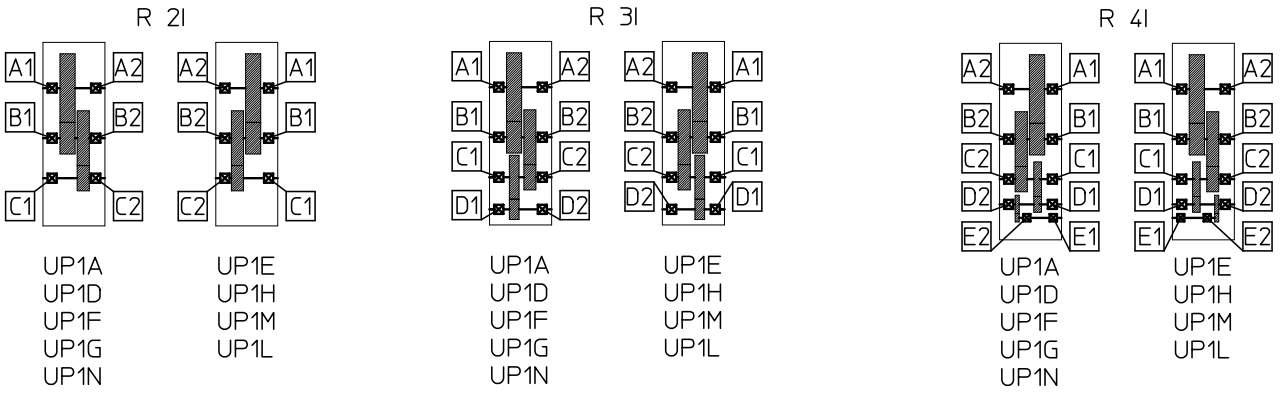
In case of gear reducer supplied **filled with oil** foresee the probe equipped with **immersion bulb** (pre-mounted in the factory), its position is to be agreed with Rossi; consult us.

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

(18) Bearing temperature probe







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:

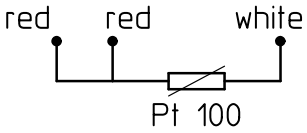
- platinum wire with 100 Ω at 32 °F (0 °C) according to EN 60751;
- precision class B according to EN 60751;
- operation temperature field -40 °F 328 °F (-40 °C – + 200 °C);
- max current 40 mA;
- 3 wire connection according to IEC 751 (see fig. on the top);
- stainless steel AISI 316 flat probe; diameter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

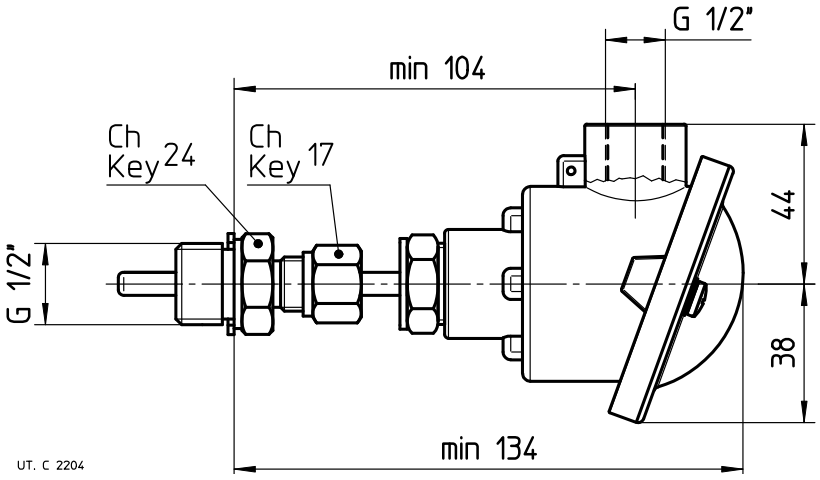
For the connection of probe to relevant signalling device CT03N or CT10N (on request, consult us) use a protected section cable ⩾ 1,5 mm2 positioned separately from power cables.

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:

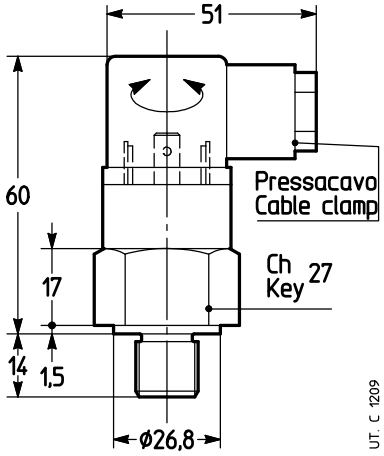
- platinum wire with 100 Ω at 32 °F (0 °C) according to EN 60751;
- precision class B according to EN 60751;
- operation temperature field -40 °F 328 °F (-40 °C – +200 °C);
- 3 wire connection according to IEC 751 (see fig. on the top);
- ammetric transducer with output signal 4 20 mA;
- alluminium terminal 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 ⩾1,5 mm2 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:

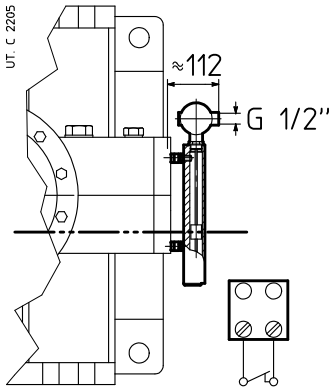
- NC contact with maximum current 10 A 240 V a.c. (5 A - 24 V c.c.);
- G 1/2" thread connection;
- cable gland Pg09 DIN 43650;
- protection IP65;
- operating temperature 194 °F ±9 °F (90 ±5 °C) (further operating temperatures are available on request);
- differential temperature 59 °F (15 °C).

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.

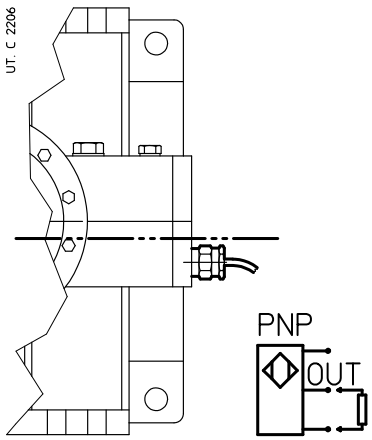
The switch is supplied ready for use; when level goes down approx 5 mm, the switch goes on and contact opens.

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.**

12

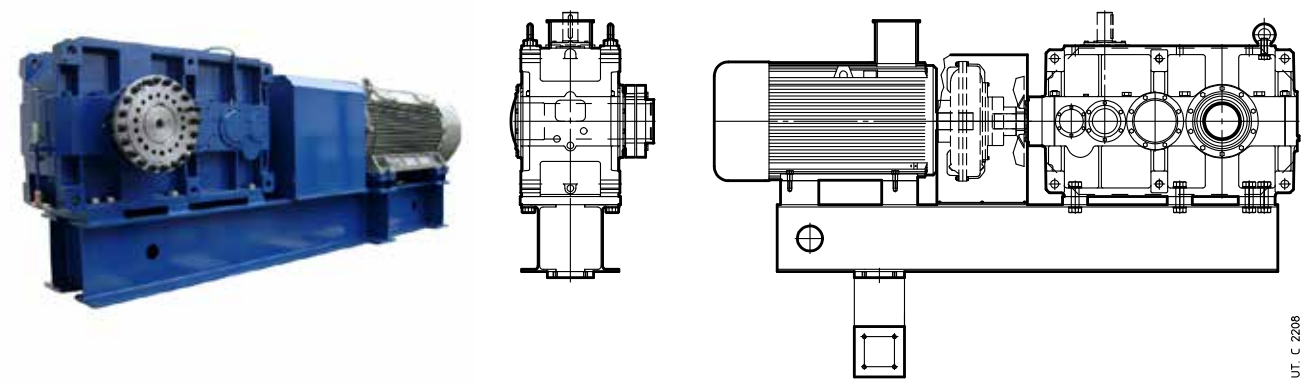
(24) Remote temperature indicator instrument with set point

Digital thermometer (dimensions 7272130 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.

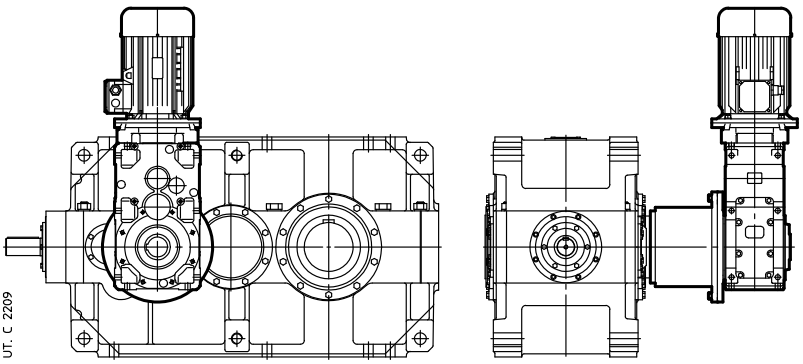
Joint

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.

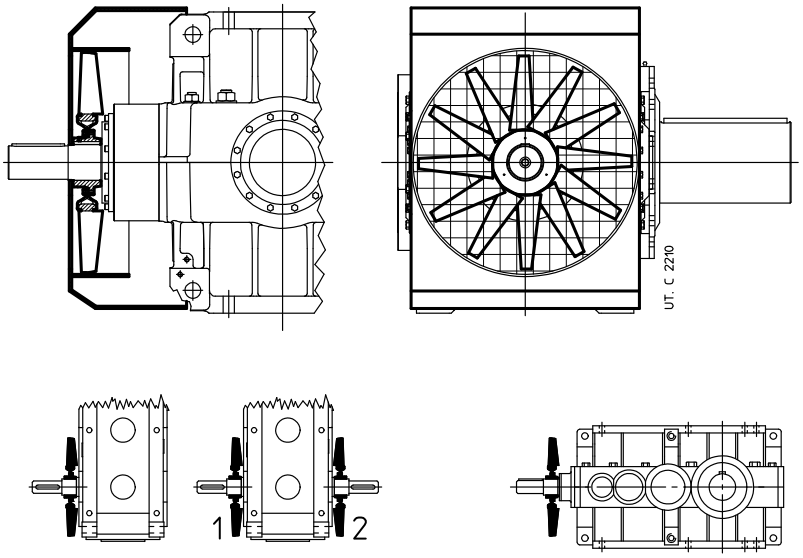
For further details see cat. RE: consult us.

– Auxiliary drive



Additional motor drive with bevel helical gearmotor (cat. G, trains of gears CI, ICI, C2I) connected with main gear reducer through bell, coupling and free wheel.

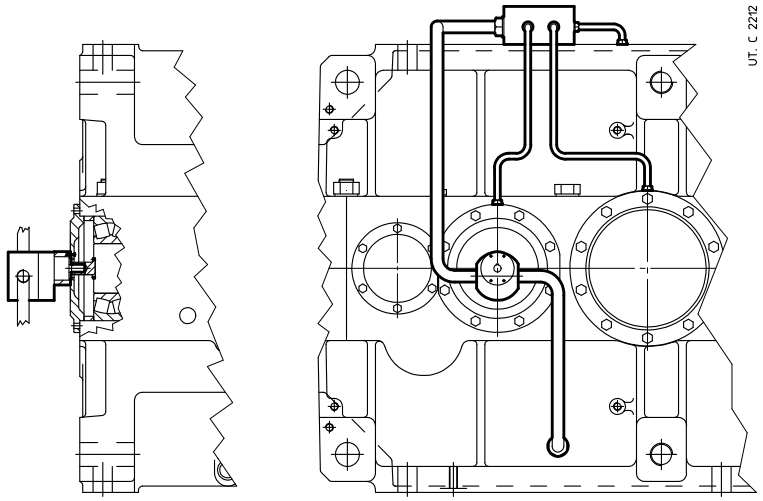
– Axial fan cooling



Forced cooling by axial fan for applications with one direction of rotation only (to be specified when ordering); for thermal factor values ft_{1b} see ch. 4. The possible designs are those illustrated below. Dimensions on request: consult us.

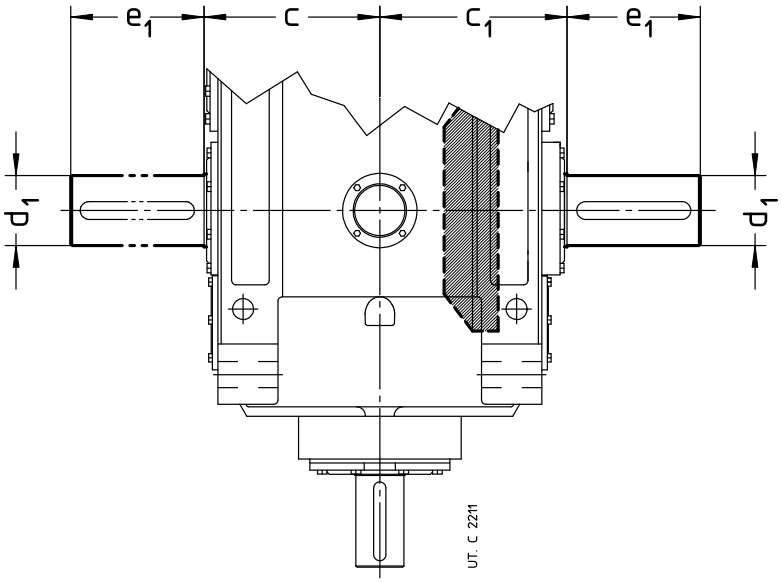
12

– 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.

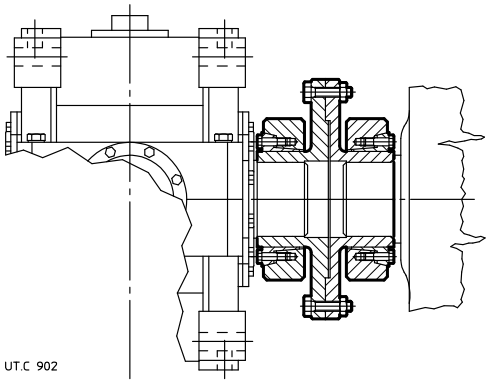
Size	R CI				R C2I				R C3I			
	c	c_1	d_1 Ø	e_1	c	c_1	d_1 Ø	e_1	c	c_1	d_1 Ø	e_1
4000 ... 4501	330	370	120	210	335	335	90	170	325	325	65	140
5000 ... 5601	–	–	–	–	430	430	110	210	405	405	80	170
6300, 6301	–	–	–	–	475	475	125	210	435	435	90	170

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**	
CI	–	$i_N \leq 9$				2
	$i_N \leq 11{,}2$	$10 \leq i_N \leq 12{,}5$				2,5
	$12{,}5 \leq i_N \leq 14$	$14 \leq i_N \leq 16$	–	–	–	3,15
	$i_N \geq 16$	$i_N \geq 18$				4
	–	–				5
C2I	$i_N \leq 25$	$i_N \leq 28$	$i_N \leq 25$	$i_N \leq 28$	$i_N \leq 31{,}5$	2
	$28 \leq i_N \leq 40$	$31{,}5 \leq i_N \leq 45$	$28 \leq i_N \leq 40$	$31{,}5 \leq i_N \leq 45$	$40 \leq i_N \leq 50$	2,5
	$45 \leq i_N \leq 50$	$50 \leq i_N \leq 56$	$45 \leq i_N \leq 50$	$50 \leq i_N \leq 56$	$56^{2)} \leq i_N \leq 71$	3,15
	$56 \leq i_N \leq 80$	$63 \leq i_N \leq 90$	$56 \leq i_N \leq 80$	$63 \leq i_N \leq 90$	$i_N \geq 80$	4
	$i_N \geq 90$	$i_N \geq 100$	$i_N \geq 90$	$i_N \geq 100$		5
C3I	–	–	–	–	$i_N = 125$	2
	$i_N = 125$	$i_N = 125$	$i_N = 125$	$i_N = 125$	$i_N = 160$	2,5
	$160 \leq i_N \leq 200$	$160 \leq i_N \leq 200$	$160 \leq i_N \leq 200$	$160 \leq i_N \leq 200$	$200^{3)} \leq i_N \leq 250$	3,15
	$i_N \geq 250$	$i_N \geq 250$	$i_N \geq 250$	$i_N \geq 250$	$i_N \geq 315$	4
	–	–	–	–		5

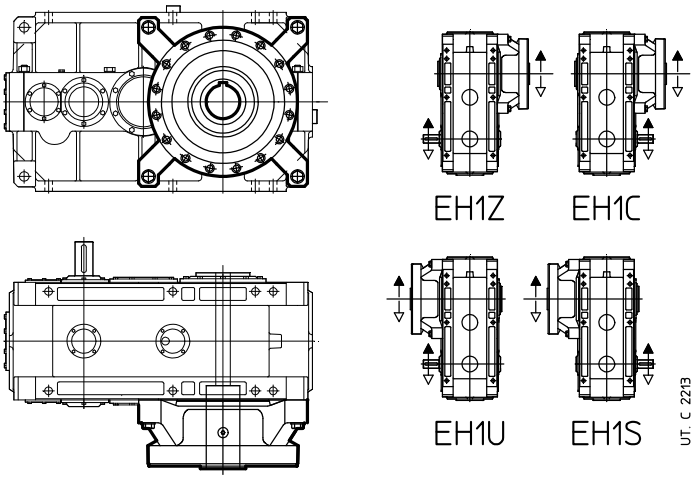
1) First reduction stage nominal transmission ratio.
2) For R C2I 6301 with $i_N = 56$: $u_{N1} = 2{,}5$ instead of 3,15.
3) For R C3I 6301 with $i_N = 200$: $u_{N1} = 2{,}5$ instead of 3,15.

– 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).

12

– Pre-arrangement for vibration monitoring devices

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

– ATEX design

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

These are the main variations of the product:

- fluoro-rubber seal rings (double seal rings on low speed shaft for cat. 2 GD);
- metal plugs; filler plug with filter and valve;
- special name plate with ATEX mark and indication of application limits;
- external protection with water soluble dual compound 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

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.

13

13.2 - Application conditions and use limits

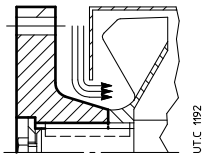
Gear reducers are designed **for industrial applications according to name plate data**, when no vibrations (permissible vibration velocity: $v_{eff} < 0.14$ in/s for $P_1 \leqslant 20$ hp, $v_{eff} < 0.18$ in/s for $P_1 > 20$ hp), no nuclear radiations and important magnetic fields, with ambient temperature -4 °F (-20 °C) +104 °F (+40 °C) with peaks at +122 °F (+50 °C), with air velocity $\geqslant$ 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 recommanded to use **locking adhesives** such as LOCTITE on the fastening screws (also on flange mating surfaces).

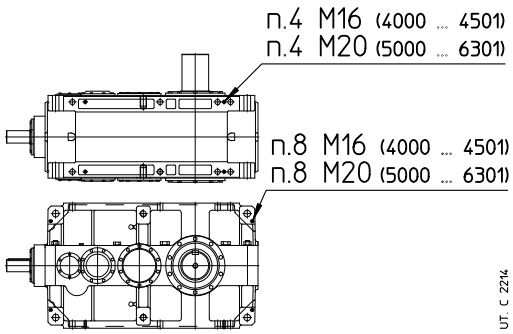
For outdoor installation or in a hostile environment protect the gear reducer or gearmotor with anticorrosion paint. Added protection may be afforded by water-repellent grease (especially around the rotary seating of seal rings and the accessible zones of shaft end).

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 ⩽ 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 ⩾ 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 (≈ 0,03 0,04 ·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[1] 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)
> **224**	150	150	150	150	150
224 – 22.4	150	150	220	220	220
22.4 – 5.6	150	220	320	320	320
< **5.6**	220	320	460	460	460

Oil temperature		Oil change interval [h]	
°F	°C	mineral oil	synthetic oil
⩽ **149**	⩽ 65	8 000	25 000
149 – 176	65 – 80	4 000	18 000
176 – 203	80 – 95	2 000	12 500
203 – 230[1]	95 – 110[1]	—	9 000

Oil types

Manufacturer	**PAO synthetic oil** ISO VG 150 ... 460	mineral oil 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** ($T_{amb} = T_{oil} \leqslant 77$ °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 ($T_{amb} = T_{oil} \leqslant 77$ °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 ⩾ - 4 °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 ⩾ 77 °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).

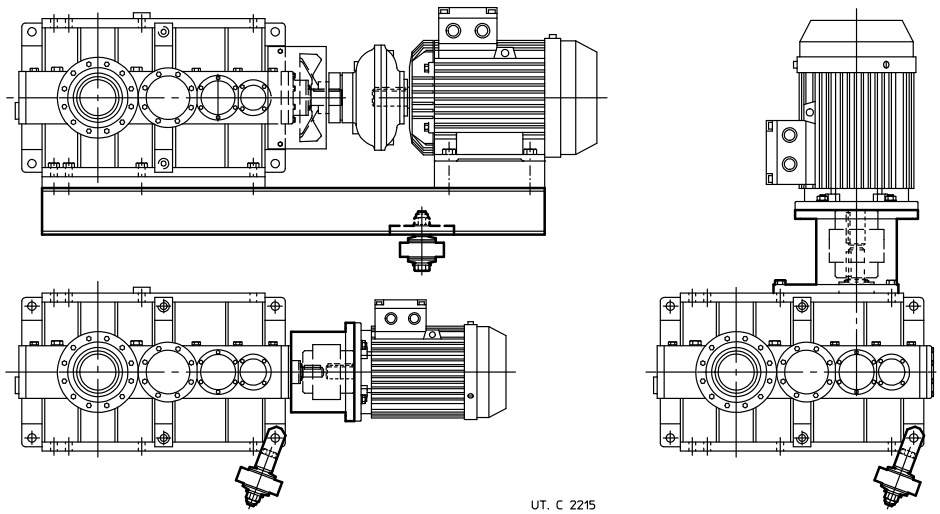
13.8 - Shaft mounting arrangements

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.



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.

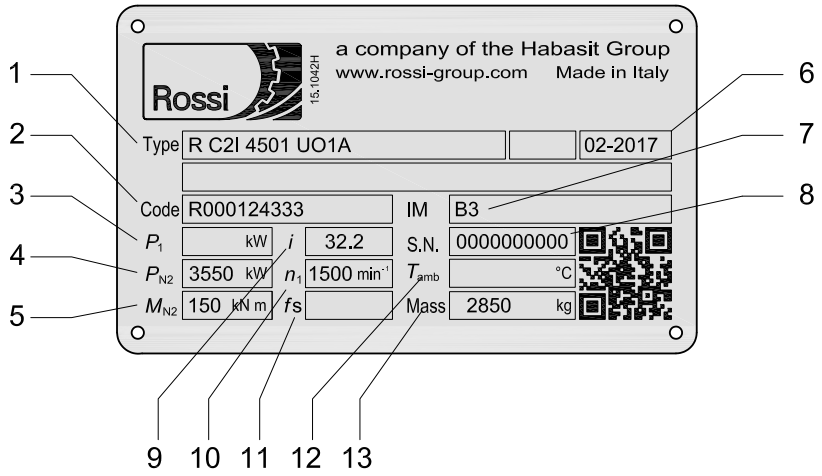
In general, the bolts are to be diagonally tightened with the maximum tightening torque.

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 Loxeal 23-18 or equivalent.

Bolts DIN 931 DIN 912	Tightening torque *Ts* [lbf in]			
	Feet, flanges and threaded holes at the shaft butt-end			Shrink disc
	Class 8.8	Class 10.9	Class 12.9	Class 10.9
M10	442	619	752	–
M12	752	1062	1283	–
M16	1814	2566	3097	–
M20	3540	4956	6018	4336
M24	6283	8850	10619	7434
M27	8938	12389	15044	11062
M30	12212	17257	20796	–
M36	22124	31416	37168	–
M45	44248	61947	74336	–
M56	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 [min^{-1}]
11 Service factor
12 Ambient temperature if different from conditions stated on catalog [°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	With Technical System units	With SI units
starting or stopping **time** as a function of an acceleration or deceleration, of a starting or braking torque	$t = \frac{v}{a}$ [s]	
	$t = \frac{Gd^2 \cdot n}{375 \cdot M}$ [s]	$t = \frac{J \cdot \omega}{M}$ [s]
velocity in rotary motion	$v = \frac{\pi \cdot d \cdot n}{60} = \frac{d \cdot n}{19,1}$ [m/s]	$v = \omega \cdot r$ [m/s]
speed	$n = \frac{60 \cdot v}{\pi \cdot d} = \frac{19,1 \cdot v}{d}$ [min^{-1}]	$\omega = \frac{v}{r}$ [rad/s]
acceleration or deceleration as a function of starting or stopping time	$a = \frac{v}{t}$ [m/s^2]	
angular acceleration or deceleration as a function of a starting or stopping time, of a starting or braking torque	$\alpha = \frac{n}{9,55 \cdot t}$ [rad/s^2]	$\alpha = \frac{\omega}{t}$ [rad/s^2]
	$\alpha = \frac{39,2 \cdot M}{Gd^2}$ [rad/s^2]	$\alpha = \frac{M}{J}$ [rad/s^2]
starting or stopping **distance** as a function of a starting or stopping time, of a starting or braking velocity		$s = \frac{a \cdot t^2}{2}$ [m]
	$s = \frac{v \cdot t}{2}$ [m]	
starting or stopping **angle** as a function of an angular acceleration or deceleration, of a final or initial angular velocity	$\varphi = \frac{\alpha \cdot t^2}{2}$ [rad]	
	$\varphi = \frac{n \cdot t}{19,1}$ [rad]	$\varphi = \frac{\omega \cdot t}{2}$ [rad]
mass	$m = \frac{G}{g}$ $[\frac{kgf\ s^2}{m}]$	m is the unit of mass [kg]
weight (weight force)	G is the unit of weight (weight force) [kgf]	$G = m \cdot g$ [N]
force in vertical (lifting), horizontal, inclined motion of translation (μ = coefficient of friction; φ = angle of inclination)	$F = G$ [kgf]	$F = m \cdot g$ [N]
	$F = \mu \cdot G$ [kgf]	$F = \mu \cdot m \cdot g$ [N]
	$F = G\ (\mu \cdot \cos \varphi + \text{sen}\ \varphi)$ [kgf]	$F = m \cdot g\ (\mu \cdot \cos \varphi + \text{sen}\ \varphi)$ [N]
dynamic moment Gd^2, moment of inertia J due to a motion of translation (numerically $J = \frac{Gd^2}{4}$)	$Gd^2 = \frac{365 \cdot G \cdot v^2}{n^2}$ [kgf m^2]	$J = \frac{m \cdot v^2}{\omega^2}$ [kg m^2]
torque as a function of a force, of a dynamic moment or of a moment of inertia, of a power	$M = \frac{F \cdot d}{2}$ [kgf m]	$M = F \cdot r$ [N m]
	$M = \frac{Gd^2 \cdot n}{375 \cdot t}$ [kgf m]	$M = \frac{J \cdot \omega}{t}$ [N m]
	$M = \frac{716 \cdot P}{n}$ [kgf m]	$M = \frac{P}{\omega}$ [N m]
work, energy in motion of translation, in rotary motion	$W = \frac{G \cdot v^2}{19,6}$ [kgf m]	$W = \frac{m \cdot v^2}{2}$ [J]
	$W = \frac{Gd^2 \cdot n^2}{7160}$ [kgf m]	$W = \frac{J \cdot \omega^2}{2}$ [J]
power in motion of translation, in rotary motion	$P = \frac{F \cdot v}{75}$ [CV]	$P = F \cdot v$ [W]
	$P = \frac{M \cdot n}{716}$ [CV]	$P = M \cdot \omega$ [W]
power available at the shaft of a single-phase motor (cos φ = power factor)	$P = \frac{U \cdot I \cdot \eta \cdot \cos \varphi}{736}$ [CV]	$P = U \cdot I \cdot \eta \cdot \cos \varphi$ [W]
power available at the shaft of a three-phase motor	$P = \frac{U \cdot I \cdot \eta \cdot \cos \varphi}{425}$ [CV]	$P = 1,73 \cdot U \cdot I \cdot \eta \cdot \cos \varphi$ [W]

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

List of updatings - Edition **2642-23.10** available on rossi.com

Graphic updating according to latest Rossi catalog brand image

Solutions for an evolving industry

HEADQUARTERS

Rossi S.p.A.
Via Emilia Ovest 915/A
41123 Modena - Italy

info@rossi.com
www.rossi.com

Rossi North America
3355 Martin Farm Road Suite #400
Suwanee, GA 30024 - United States

Phone +1 800 931 2044 - Fax 678-288-3658

info@rossi.com/northamerica
www.rossi.com/northamerica

2642.PRD.CAT.H.24.07.0-US