

A series



Worm gear reducers and gearmotors



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Rossi for You



Innovation

Rossi offers a wide range of **solutions for an evolving industry**, flexible and innovative gearboxes and gearmotors for customer tailored solutions to maximize performance and minimize the total cost of ownership.



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** support 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 more than 60 years of history Rossi meets your unique needs whether you need a standard design or a customized solution.



Global presence local service



Local support

Sales, customer service,
technical support, spare parts



15 branches*



Worldwide distribution network*

A widespread sales network of subsidiaries and dealers in nearly all industrialized countries. By your side from the design to after-sale phase, Rossi is a flexible and dependable partner throughout the world.

Rossi for You, our customer web portal, provides a 24/7 global coordination of the ordering, supply and service processes.

*All contacts available on www.rossi.com



United States

Suwanee, GA



Brazil

Cordeiropolis, SP





Headquarters



Branches



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



India

Coimbatore



South Africa

La Mercy



Australia

Perth

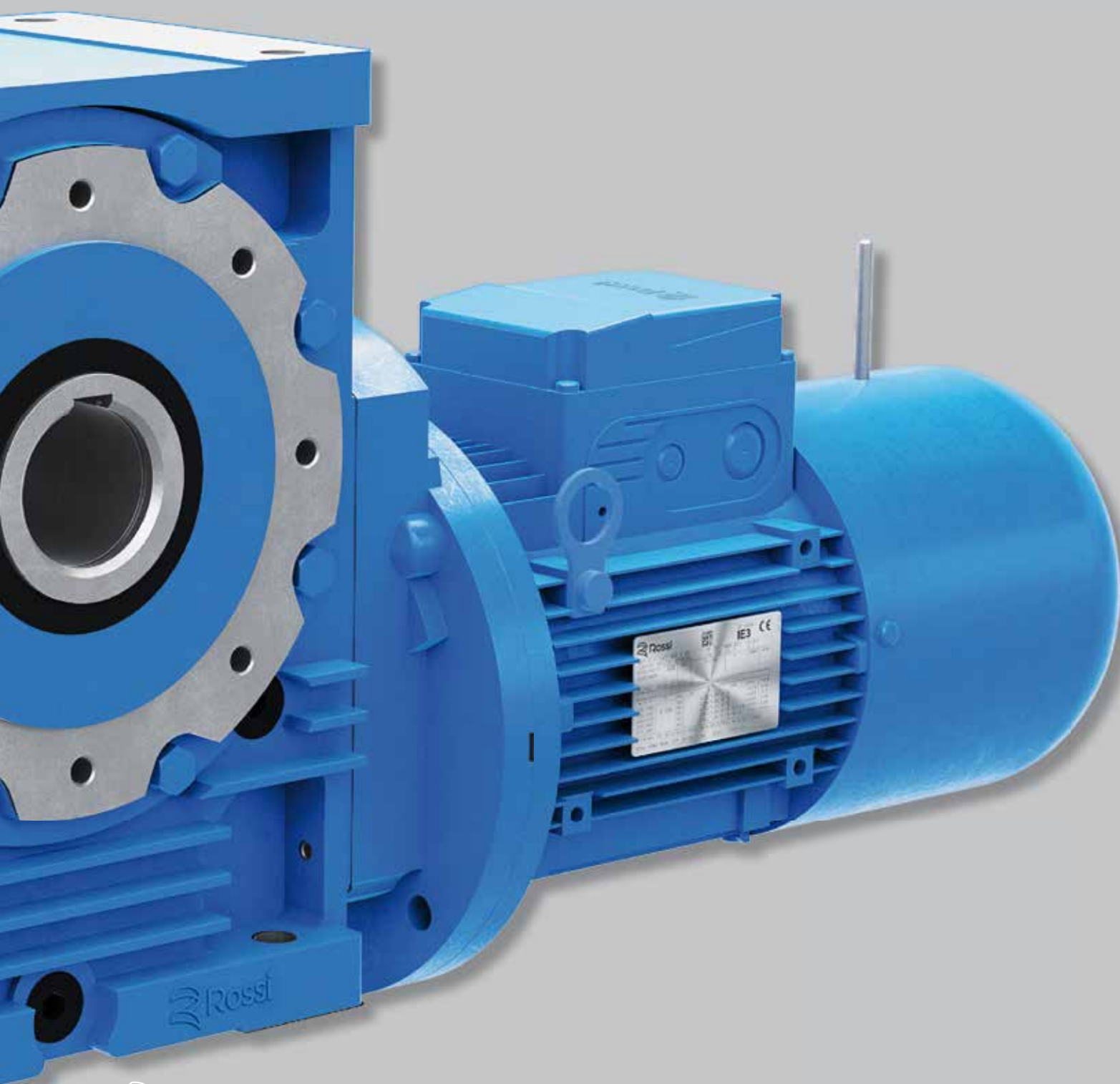


Malaysia

Kuala Lumpur



Features, benefits and range





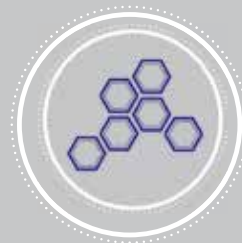
Maximum performance

Suitable for wide variety of applications



Gear accuracy rating

High performance thanks to maximum gear accuracy rating



Modularity

Modular product for customized solutions



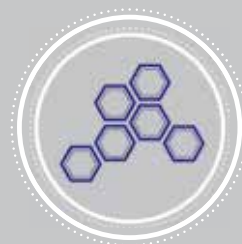
Reliability

Minimum maintenance, high efficiency and noiselessness



Digitalization

Rossi for You, the digital platform always available



Know-how

Our experience at your service

Worm gear reducers

32 ... 81



RV
with worm gear pair



R IV
with 1 cylindrical gear pair plus worm

100 ... 250



Worm gearmotors

32 ... 81



MR V
with worm gear pair

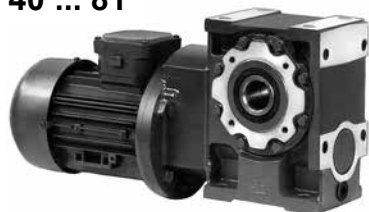


MR IV
with 1 cylindrical gear pair plus worm

100 ... 250



40 ... 81



MR 2IV
with 2 cylindrical gear pairs plus worm

100 ... 126



Combined gear reducer and gearmotors units



RV + RV



RV + R IV



MR V + R 2I, 3I



MR IV + R 2I, 3I



RV + MR V



RV + MR IV



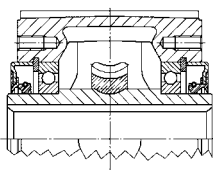
MR V + MR 2I, 3I



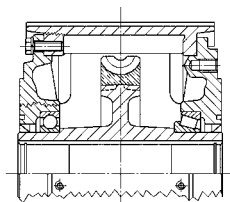
MR IV + MR 2I, 3I

Gear reducers and gearmotors (worm wheel)

32 ... 50

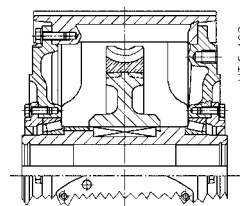


63 ... 160



161

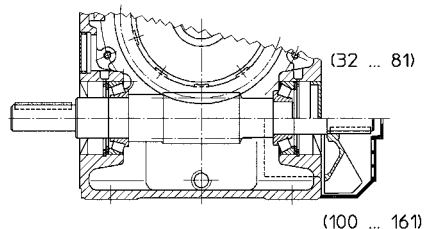
200, 250



UTC 662

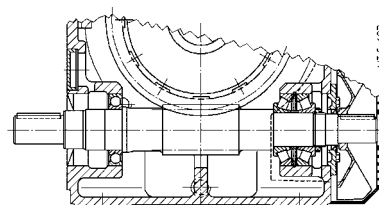
Gear reducers (worm)

32* ... 161

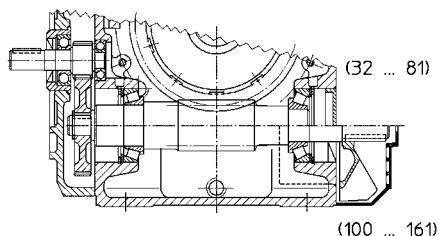


(100 ... 161)

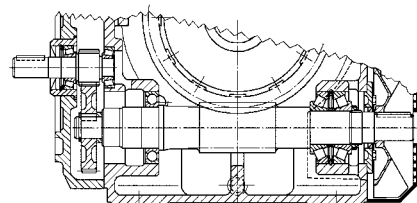
200, 250



UTC 663

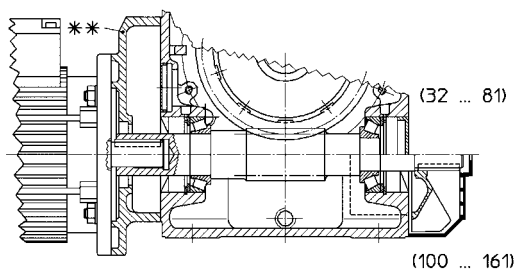


(100 ... 161)



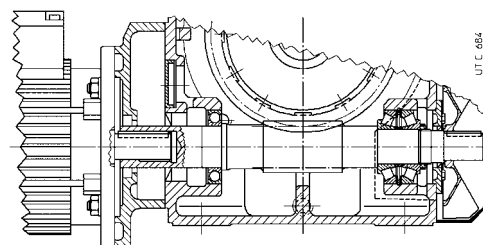
Gearmotors (worm)

32* ... 161

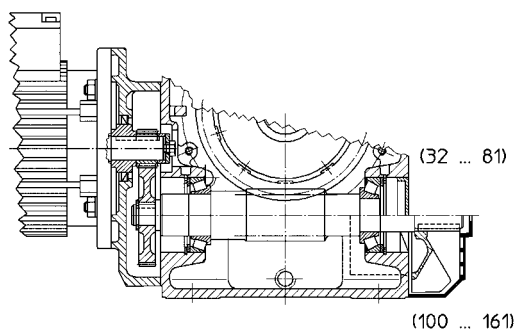


(100 ... 161)

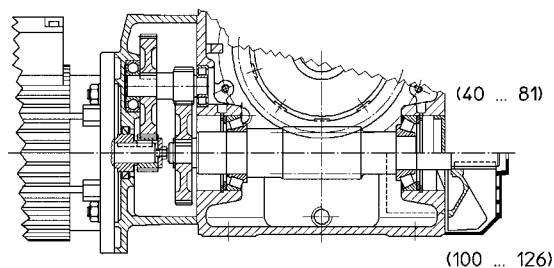
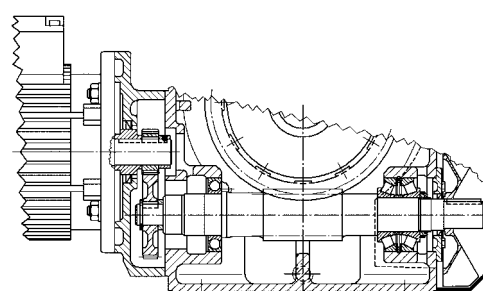
200, 250



UTC 664



(100 ... 161)



(100 ... 126)

** Size : double row angular contact ball bearing plus ball bearing.

** For: MR V 32, 40 with motor size **63** (11x140) and **71** (14x160) (see ch. 2b),

MR V 50 with motor size **71** (14x160) and **80** (19x200) (see ch. 2b),

MR V 63 ... 81 with motor size **80** (19x200) and **90** (24x200) (see c. 2b), motor flange is usually integral with housing.

Universal mounting having **feet integral with housing** on 3 faces (sizes 32 .. 81) or on 2 faces (sizes 100 ... 250) and **B14 flange** on 2 faces. Design and strength of the casing permit **interesting shaft mounting solutions**

Thickened size and performance gradation (some sequential sizes are obtained with the same housing and many components in common)

High, reliable and tested performances (Ni bronze); optimization of worm gear pair performances (ZI involute profile and adequately conjugate worm wheel profile)

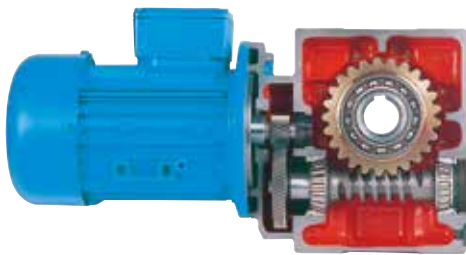
Compactness, standardized dimensions and compliance with standards

Motor standardized to IEC

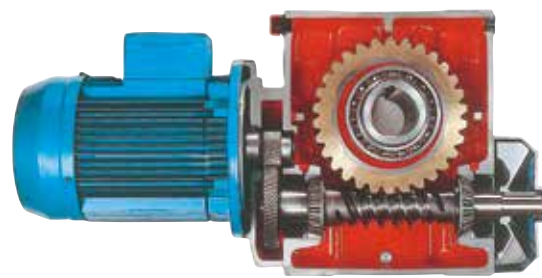
Rigid and precise cast iron single-piece housing

Generous internal space between train of gears and housing allowing:

- high oil capacity;
- lower oil contamination;
- greater duration of worm wheel and worm bearings;
- lower running temperature.



32 ... 81



100 ... 250

Possibility of fitting particularly powerful motors and transmitting high nominal and maximum torques

Improved and up-graded modular construction both for component parts and assembled product which ensures manufacturing and product management flexibility

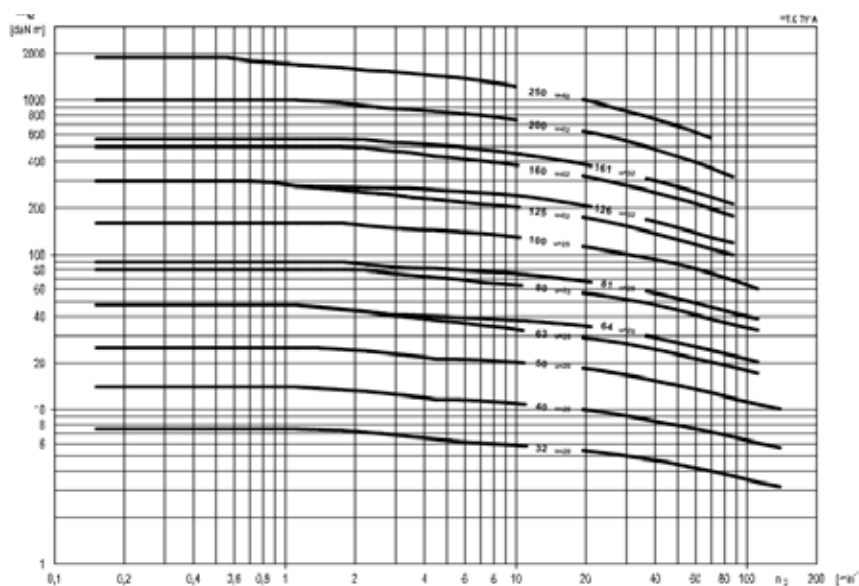
High manufacturing quality standard

Possibility of obtaining multiple drives and at synchronous speed

Wide design and accessory availability: shaft-mounting arrangements, mixed keying systems with key and locking elements (rings for sizes 32 ... 50, bush for sizes 63 ... 250), **reduced backlash**, etc.

Reduced maintenance

A combination of modern concepts, analytical calculations carried out on **each single part**, use of the very latest machine tools, plus systematic checks on materials, assembling and workmanship, gives this series of gear reducers **high efficiency**, running **precision**, **regular motion** and **noiselessness**, **constant performance**, **life and reliability**, strength and overload withstanding and suitability for **heaviest applications**, wide size and ratio range, excellent service - **the advantages typically associated with high quality worm gear reducers produced in large series.**

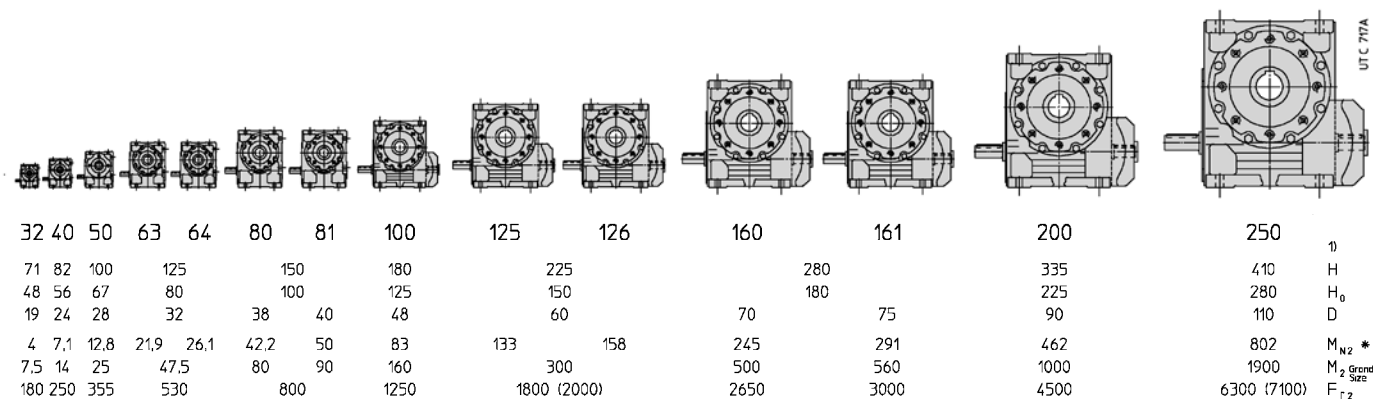


a - Gear reducer

Structural features

Main specifications are:

- **universal mounting** having **feet integral with housing** (lower, upper feet and vertical on the face opposite to motor for sizes 32 ... 81; lower and upper feet for sizes 100 ... 250) and **B14 flange** (integral with housing for sizes 32 ... 50) on 2 faces of hollow low speed shaft output. **B5 flange** with spigot «recess» which can be mounted onto B14 flanges (see chap. 5). Design and strength of the housing permit **interesting shaft mounting solutions**;



* concerning $n_1 = 1400 \text{ min}^{-1}$ and transmission ratio stated in the scheme.

1) H, H₀ shaft height; D Ø low speed shaft end [mm]; M_{N2}, M₂ _{Size} torque [daN m]; F_{r2} radial load [daN].

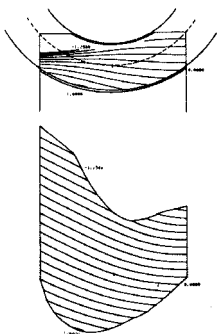
- thickened size (10 sizes with 4 size pairs with final centre distance 32 ... 250) and performance gradation; the size pairs are obtained with the same housing and with many components in common;
- gear reducer structure sized so as to accept particularly powerful motors — both MR V and MR IV — and to permit the transmission of high nominal and maximum torques at low output speeds, this being the particular advantage of worm gear pairs;
- gearmotor sizes 40 ... 126 with **2** cylindrical coaxial gear pair **first stage** in order to obtain high — **reversible** and irreversible — transmission ratios with standardized motor (63 ... 112) in a compact and economy way;
- normally, gearmotors MR V sizes 32, 40 (with motor sizes 63 and 71) 50 (with motor sizes 71 and 80) and 63 ... 81 (with motor sizes 80 and 90) have motor flange **integral** with the housing;
- hollow low speed shaft with keyway, and (sizes 63 ... 250) with circlip groove for removal purposes: in spheroidal cast iron (grey cast iron for sizes 32 and 40) integral with wormwheel (sizes 32 ... 161) or steel (sizes 200 and 250); standard (left or right extension) or double extension low speed shaft (see ch. 5).
- gear reducers: input face with machined surface (R V) or flange (R IV) and with fixing holes: wormshaft end with key, and reduced wormshaft end with circlip groove (the same as for R IV, MR IV, MR 2IV, MR V 160 ... 250 with coupling);
- gearmotors: **motor standardized to IEC directly** keyed into the worm (MR V), for motor sizes 200 ... 250 **patented** keying system to obtain easier installing and removing and avoid fretting corrosion; standardized motor with pinion directly mounted onto the shaft end (MR IV, MR 2IV);
- **fan cooling** (sizes 100 ... 250); use of **double extension worm-shaft** simply obtained by removing the fan cowl centre disc; for MR V 81 with motor 100 and 112, fan incorporated in motor mounting flange;
- bearings on worm: double row angular contact ball bearing plus ball bearing (size 32); face-to-face taper roller bearings (sizes 40 ... 161); paired back-to-back taper roller bearings plus one ball bearing (sizes 200 and 250);
- bearings on wormwheel: ball bearings (sizes 32 ... 160); taper roller bearings (sizes 161 ... 250);
- 200 UNI ISO 185 **cast iron single-piece housing** with transverse stiffening ribs, and high oil capacity;
- oil bath lubrication with **synthetic oil** (ch. 4) for «**long-life**» lubrication: units provided with one plug (sizes 32 ... 64) or two plugs (sizes 80 and 81) supplied **filled with oil**; with filler plug with **valve**, drain plug and level plug (sizes 100 ... 250) supplied **without oil**; sealed;
- **paint: external** coating in epoxy powder paint (sizes 32 ... 81) or water based dual compound acrylic-polyurethane resin basis enamel (sizes 100 ... 250) resistant to atmospheric and aggressive agents (corrosivity category 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); **internal** protection with epoxy powder paint (sizes 32 ... 81) suitable to resist to synthetic oils or with synthetic paint (sizes 100 ... 250) suitable to resist synthetic oils.
- possibility of obtaining combined gear reducer and gearmotor units providing high transmission ratios with different train of gears depending on overall dimension, efficiency, and final output speed requirements.

Train of gears:

- worm gear pair; 1 cylindrical gear pair plus worm; with 2 cylindrical gear pairs plus worm gear pair (garmotor only);
- worm gear pairs, with **whole-number** transmission ratios ($i = 10 \dots 63$) **identical** for the different sizes; $i = 7$ for MR V 32 ... 81;
- 10 sizes having 4 sizes pairs (standard and strengthened) with final reduction center distance to R 10 series (32 ... 250) for a total of **14 sizes**;
- nominal transmission ratios to R 10 series (10 ... 315; up to 16 000 for combined units);
- casehardened and hardened cylindrical worm in 16CrNi4 or 20 MnCr5 UNI 7846-78 steel (depending on size) with ground and **superfinished involute** profile (**ZI**);
- wormwheel with profile especially conjugate to the worm through hob optimization, with hub in spheroidal or grey cast iron (depending on size) and **Ni bronze** CuSn12Ni2-B (EN1982-98) gear rim with high pureness and controlled phosphor contents;
- casehardened and hardened cylindrical gear pair in 16CrNi4 UNI 7846-78 steel with ground profile and helical toothing;
- train of gear load capacity calculated for breakage and wear; thermal capacity verified.

Specific standards:

- nominal transmission ratios and principal dimensions according to UNI 2016 standard numbers (DIN 323-74, NF X 01.001, BS 2045-65, ISO 3-73);
- basic rack to BS 721-83; involute profile (ZI) to UNI 4760/4-77 (DIN 3975-76), ISO/R 1122/2-69);
- shaft heights to UNI 2946-68 (DIN 747-67, NF E 01.051, BS 5186-75, ISO 496-73);
- fixing flanges B14 and B5 (the latter with spigot «recess») taken from UNIL 13501-69 (DIN 42948-65, IEC 72.2);
- medium series fixing holes to UNI 1728-83 (DIN 69-71, NF E 27.040, BS 4186-67, ISO/R 273);
- cylindrical shaft ends (long or short) to UNI ISO 775-88 (DIN 748, NF E 22.051, BS 4506-70, ISO/R 775/88) with tapped butt-end hole to UNI 9321 (DIN 332 Bl. 2-70, NF E 22.056) excluding d-D diameter ratio;
- parallel keys to UNI 6604-69 (DIN 6885 Bl. 1-68, NF E 27.656 and 22.175, BS 4235.1-72, ISO/R 773-69) except for specific cases of motor-to-gear reducer coupling where key height is reduced;
- mounting positions taken from UNEL 05513-67 (DIN 42950-64, IEC 34;7);
- worm gear pair load capacity and efficiency to **BS 721-83** integrated with ISO/CD 14521.



Lines of contact and area of action determined by computer to check on each individual gear pair design.



Fan cowl centre disc removed so as to utilize double extension wormshaft.



Gear reducer design UO2B:
reduced wormshaft end (also suitable for R IV, MR IV, MR 2IV, MR V 160 ... 250 with coupling). Double extension low speed shaft.

b - Electric motor

Gearmotor dimensions and masses of present catalog (see ch. 3.8 and 3.10) refer to HB and HBZ motors (cat. TX).

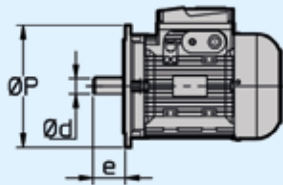
- motor **standardized to IEC**;
- asynchronous three-phase, totally-enclosed, externally ventilated, with cage rotor;
- single polarity, frequency 50 Hz, voltage Δ 230 V Y 400 V (size ≤ 132), Δ 400 V (size ≥ 160);
- IP 55 protection, insulation class F, temperature rise class B;
- rated power delivered on continuous duty S1 (excluding some cases of motor sizes with power not according to standard; see specific documentation) and referred to nominal voltage and frequency; maximum ambient temperature 40 °C and altitude 1 000 m;
- capacity to withstand one or more overloads up to 1,6 times the nominal load for a maximum total period of 2 min per single hour;
- starting torque with direct on-line start at least 1,6 times the nominal one (it is usually higher);
- mounting position B5 and derivatives as shown in the following table;
- **suitable for inverter duty** (generous electromagnetic sizing, low-loss electrical stamping, phase separators, etc.)
- designs available for every application need: flywheel, independent cooling fan, independent cooling fan and encoder, etc.

Constructive features of HBZ brake motor

- particularly strong construction to withstand braking stresses; **maximum reduction of noise level**;
- spring-loaded d.c. electromagnetic brake; feeding from the terminal box; brake can also be independently fed directly from the line;
- braking torque **proportioned** to motor torque (usually $M_f \approx 2 M_N$) and adjustable by adding or removing spring pairs;
- possibility of high frequency of starting;
- quick and rapid stop;
- hand lever for manual release with automatic return (on request for size $\leq 160S$); removable lever rod.

For other specifications and details see **specific documentation of cat. TX**

Main coupling dimensions

Motor size	 IEC 60072 (UNEL 13117-17, DIN 43677 Bl. 1.A-65) Motor mounting position											
	IM B5				B5R				B5A			
	Ød	e	-	ØP	Ød	e	-	ØP	Ød	e	-	ØP
63	11	23	-	140	-	-	-	-	-	-	-	-
71	14	30	-	160	11	23	-	140	14	30	-	140
80	19	40	-	200	14	30	-	160	19	40	-	160
90	24	50	-	200	19	40	-	200	-	-	-	-
100, 112	28	60	-	250	24	50	-	200	-	-	-	-
132	38	80	-	300	28	60	-	250	-	-	-	-
160	42	110	-	350	38	80	-	300	-	-	-	-
180	48	110	-	350	-	-	-	-	-	-	-	-
200	55	110	-	400	48	110	-	350	-	-	-	-
225	60	140	-	450	-	-	-	-	-	-	-	-
250	65	140	-	550	60	140	-	450	-	-	-	-

Short time duty (S2) and intermittent periodic duty (S3); duty cycles S4 ... S10

In case of a duty-requirement type S2 ... S10 the motor power can be increased as per the following table; starting torque keeps unchanged.

Short time duty (S2). — Running at constant load for a given period of time less than that necessary to reach normal running temperature, followed by a rest period long enough for motor's return to ambient temperature.

Intermittent periodic duty (S3). — Succession of identical work cycles consisting of a period of running at constant load and a rest period. Current peaks on starting are not to be of an order that will influence motor heat to any significant extent.

$$\text{Cyclic duration factor} = \frac{N}{N + R} \cdot 100\%$$

where: N being running time at constant load,
 R the rest period and $N + R \leq 10$ min (if longer consult us).

Duty			Motor size ¹⁾		
			63 ... 90	100 ... 132	160 ... 280
S2	duration of running	90 min	1	1	1,06
		60 min	1	1,06	1,12
		30 min	1,12	1,18	1,25
		10 min	1,25	1,25	1,32
S3	cyclic duration factor	60%	1,12		
		40%	1,18		
		25%	1,25		
		15%	1,32		
S4 ... S10			consult us		

1) For motor sizes 90LC 4, 112MC 4, 132MC 4, consult us.

Frequency 60 Hz

Normal motors up to size 132 wound for 50 Hz can be fed at 60 Hz; in this case speed increases by 20%. If input-voltage corresponds to winding voltage, power remains unchanged, providing that higher temperature rise values are acceptable, and that the power requirement is not unduly demanding, whilst starting and maximum torques decrease by 17%. If input-voltage is 20% higher than winding voltage, power increases by 20% whilst starting and maximum torques keep unchanged.

For **brake** motors see **specific literature**.

From size 160 upwards motors — both standard and brake ones — should be would for 60 Hz exploiting the 20% power increase as a matter of course.

Power available with high ambient temperature or high altitude

When motor has to run at an ambient temperature higher than 40 °C or at altitude above sea level higher than 1 000 m, it has to be derated according to the following tables:

Ambient temperature [°C]		30	40	45	50	55	60
P/P_N [%]		106	100	96,5	93	90	86,5
Altitude a.s.l. [m]	1 000	1 500	2 000	2 500	3 000	3 500	4 000
P/P_N [%]	100	98	92	88	84	80	76

Specific standards:

- nominal powers and dimensions to CENELEC HD 231 (IEC 72-1, DIN 42677, NF C51-120, BS 5000-10 and BS 4999-141) for mounting positions IM B5, IM B14 and derivatives;
- nominal performances and running specifications to CENELEC EN 60034-1 (IEC 34-1, CEI EN 60034-1, DIN VDE 0530-1, NF C51-111, BS EN 60034-1);
- protection to CENELEC EN 60034-5 (IEC 34-5, CEI 2-16, DIN EN 60034-5, NF C51-115, BS 4999-105);
- mounting positions to CENELEC EN 60034-7 (IEC 34-7, CEI EN 60034-7, DIN IEC 34-7, NF C51-117, BS EN 60034-7);
- balancing and vibration velocity (vibration under standard rating N) to CENELEC HD 53.14 S1 (IEC 34-14, ISO 2373 CEI 2-23, BS 4999-142); motors are balanced with half key inserted into shaft extension;
- cooling to CENELEC EN 60034-6 (CEI 2-7, IEC 34-6): standard type IC 411; type IC 416 for non-standard design with axial independent cooling fan.

Asynchronous three-phase motors, brake motors



HE - HB

Asynchronous three-phase motor



HEZ - HBZ

Asynchronous three-phase **brake motor**
with **d.c. brake**



HBF

Asynchronous three-phase **brake motor**
with **a.c. brake**



HBV

Asynchronous three-phase **brake motor**
with **d.c. safety brake**

Advanced design motors sharing the **same stator windings**, the same **rotors**, the same **housings**, the same **flanges**, the same performance, and the majority of technical solutions with its twin brake motor series (**HEZ, HBZ, HBF, and HBV**).

The generous electromagnetic sizing allow to achieve **high efficiency values** complying **with different energy saving regulations**:

- Efficiency class **IE3 (ErP)** for HB and HE;
- Efficiency class **IE3 (ErP)** for HEZ, on request for HBZ

The electric design (terminal block, name plate, etc.) has been studied to comply, as standard, also with **NEMA MG1-12** for the maximum application flexibility and facility.

The strength and the precision of mechanical construction, the generous bearings and the wide range of non-standard designs available on catalog make this motor particularly suitable for coupling with gearmotors.

Thanks to its outstanding **low noise, progressivity** and **dynamic** characteristics, it is specifically suitable for **coupling with gearmotor minimizing the dynamic overloads** deriving from **starting and braking phases** (especially in case of motion reversals) and maintaining a **very good braking torque value**.

The excellent **operation progressivity** - when starting and braking - is assured by the brake anchor which is less quick in the impact (compared to a.c. HBF) and by the slight quickness of d.c. brakes.

Offering a comprehensive **range of accessories and non-standard designs** in order to satisfy all possible gearmotor application fields.

The **high reactivity** typical of **a.c. brake** and the **high braking capacity** make this brake motor **particularly suitable for heavy duties** requiring **quick brakings** and a **high number of operations** (e.g.: lifts with high frequency of starting, usually for size > 132, and/or for jog operations).

Vice versa, its very **high dynamic characteristics** (rapidity and frequency of starting) **are not advisable for the use in gearmotor** coupling, especially when these features are not strictly necessary for the application (avoiding useless overloads on the whole transmission).

Comprehensive **range of accessories and non-standard designs** in order to satisfy all application needs of gearmotors (in particular for HBF: IP 56, IP 65, encoder, independent cooling fan, independent cooling fan and encoder, double extension shaft, etc.).

Featuring **maximum economy, very reduced overall dimensions and moderate braking torque**, it is suitable for the coupling with gearmotor and can be applied as brake for **safety or parking stops** (e.g. cutting machines) and for operations at deceleration ramp end **during the running with inverter**.

The standard cast iron fan supplies a flywheel effect increasing the very good progressivity of starting and braking (typical of d.c. brake) being particularly **suitable for «light»¹⁾ traverse movements**.

1) Mechanism group M4 (max 180 starts/h) and on-load running L1 (light) or L2 (moderate) to ISO 4301/1, F.E.M./II 1997.

Symbols and units of measure

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

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

Additional indexes and other signs

Ind.	Definition
max	maximum
min	minimum
N	nominal
1	relating to high speed shaft (input)
2	relating to low speed shaft (output)
÷	from ... to
≈	approximately equal to
≥	greater than or equal to
≤	less than or equal to

1) SI are the initials of the International Unit System, defined and approved by the General Conference on Weights and Measures as the only system of units of measure.
Ref. CNR UNI 10 003-84 (DIN 1 301-93 NF X 02.004, BS 5 555-93, ISO 1 000-92).

UNI: Ente Nazionale Italiano di Unificazione.

DIN: Deutscher Normenausschuss (DNA).

NF: Association Française de Normalisation (AFNOR).

BS: British Standards Institution (BSI).

ISO: International Organization for Standardization.

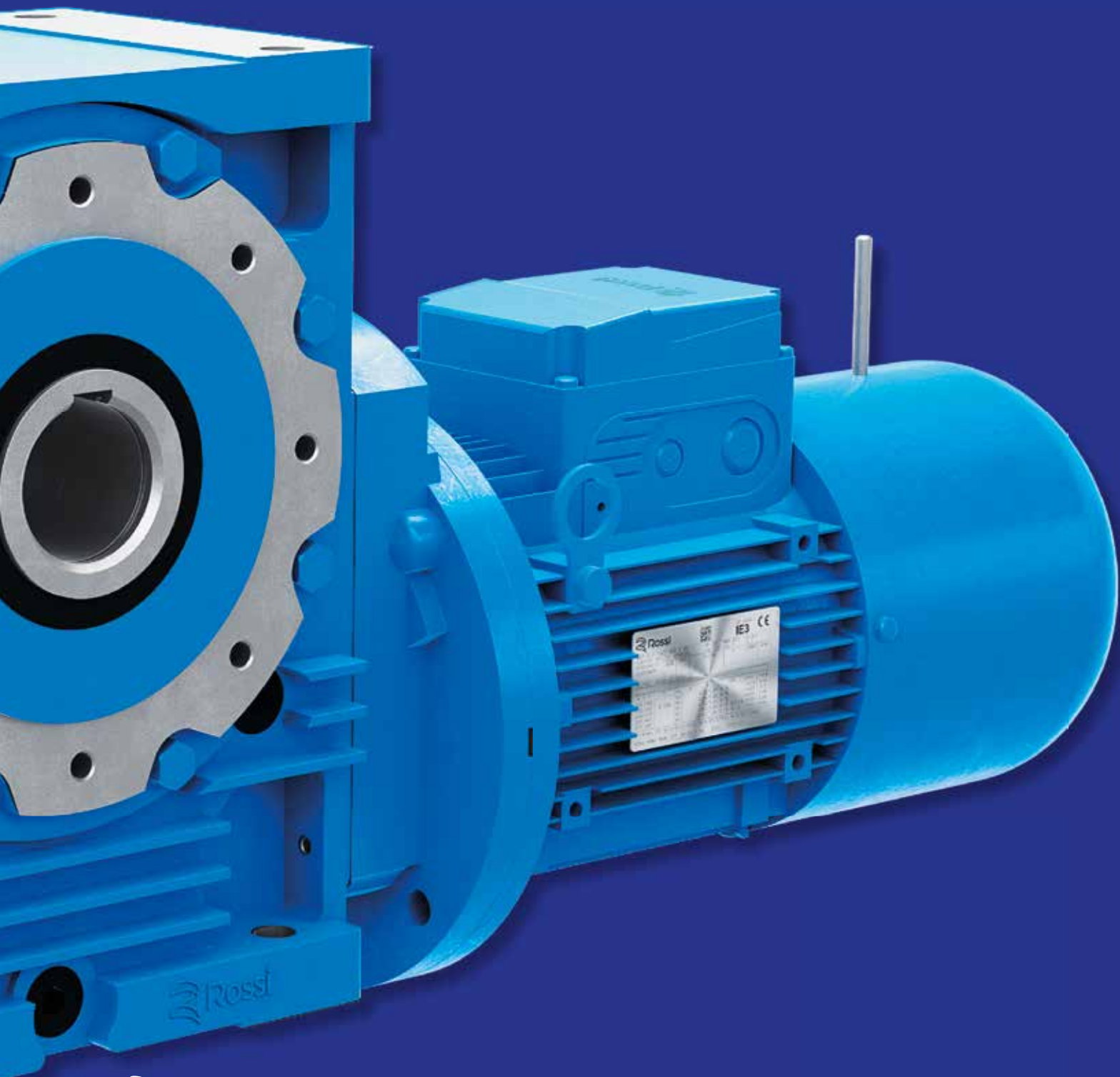
2) Newton [N] is the force imparting an acceleration of 1 m/s² to a mass of 1 kg.

3) Kilogramme [kg] is the mass of the prototype kept at Sèvres (i.e. 1 dm³ of distilled water at 4 °C).

4) Joule [J] is the work done when the point of application of a force of 1 N is displaced through a distance of 1 m.

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Product overview





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Designation code

R V 250 U O 2 A - 50 B3
MR V 80 U O 3 A - 24 x 200 - 25 V5 HB3 90L4 230.400-50 B5 TB3

TERMINAL BOX POSITION
(see page 25)

MOTOR DESIGNATION
(see page 25)

INPUT SPEED
(see page 25)

MOUNTING POSITION
(see page 25)

TRANSMISSION RATIO

IEC MOTOR COUPLING DIMENSIONS
 $\varnothing d \times \varnothing P$ (see ch. 2b)

DESIGN
A normal
B reduced worm shaft end
C double extension worm shaft with reduced end
D double extension worm shaft

MODEL
3 sizes 32 ... 81
2 sizes 100 ... 250

SHAFT POSITION
O orthogonal

MOUNTING
U universal

SIZE
32 ... 250 final reduction center distance [mm]

TRAIN OF GEARS
V worm gear pair
IV 1 cylindrical and 1 worm gear pair
2IV 2 cylindrical gear pairs and 1 worm gear pair

MACHINE
R gear reducer
MR gearmotor

Gear reducer mounting position

Gear reducer and gearmotor mounting positions are described in ch. 3.6, 3.8 (the mounting position designation refers to foot mounting only, even if gear reducers are for universal mounting; e.g.: B14 flange fastening and derivatives; B5 flange fastening and derivatives, see ch.5).

When having no particular needs, **prefer B3 mounting position** for its technical and economic cost effectiveness (maximum simplification of lubrication system, lower oil splash, lower gear reducer heating, stock availability).

Input speed

Complete the designation stating the input speed n_1 , in the following cases:

- $n_1 > 1400 \text{ min}^{-1}$;
- for gear reducer sizes 200 and 250 mounting position B7

Example:

R V 250 UO2A / 50 $n_1 = 560 \text{ min}^{-1}$, **mounting position B7**

Motor

When the gearmotor is supplied **equipped with a standard Rossi motor**, fill in the designation stating the motor designation (ref. cat. TX).

Example:

MR V 200 UO2A - 48 x 350 – 25

HB3 180M 4 400-50 B5

When **brake motor** is required, insert the letters **HBZ** (ref. cat. TX).

Example:

MR V 200 UO2A - 48 x 350 – 25

HBZ 180M 4 400-50 B5

When the gearmotor is equipped **without motor**, omit the designation and add «without motor».

Esempio:

MR V 200 UO2A - 48350 – 25

without motor

When motor is supplied by the **Buyer**¹⁾, complete the designation by stating the description of «motor supplied by us».

1) The motor, supplied by the Buyer must be to IEC with mating surfaces machined under accuracy rating IEC 60072-1 and is to be sent carriage and expenses paid to our factory for fitting to the gear reducer.

Example:

MR V 200 UO2A - 48350 – 25

motore supplied by us

Motor terminal box position

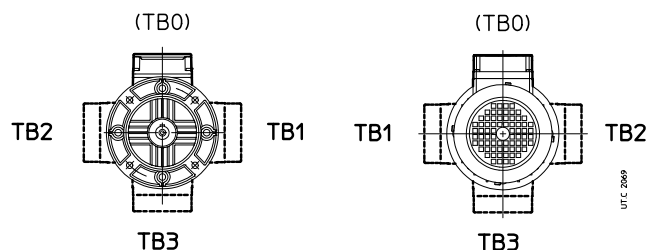
Complete the designation stating the motor terminal box position if differing from the standard one (TB0; see ch. 10 and scheme below); the cable input is Buyer's responsibility.

Example:

MR V 200 UO2A - 48350 / 25

HB3 180M 4 400-50 B5 **TB3**

View from drive end (D)



Accessories and non-standard designs

In the event of a gear reducer or gearmotor being required in a design different from those stated above, specify it in detail (ch. 5).

Nominal thermal power P_{tN} , written in red in the tables in the following page, is that which can be applied at the gear reducer input without exceeding 95 °C¹⁾ approximately oil temperature when operating in following running conditions:

- input speed $n_1 = 1\ 400\ \text{min}^{-1}$;
- mounting position B3;
- continuous duty S1;
- maximum ambient temperature 40 °C;
- maximum altitude 1 000 m above sea level;
- air speed $\geq 1,25\ \text{m/s}$ (typical value in presence of a gearmotor with self cooled motor).

Wherever nominal thermal power P_{tN} is indicated in ch 3.5 and 3.7 it should be always verified that the applied power P_1 is less than or equal to gear reducer nominal thermal power P_{tN} multiplied by the corrective coefficients f_{t2} , f_{t3} , f_{t4} , f_{t5} (stated in the following tables) considering the several operational conditions:

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

When this condition is not satisfied consider the use of special lubricant or a cooling unit with heat exchanger: 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 1 ÷ 3 h). In case of maximum ambient temperature above 50 °C or below 0 °C consult us.

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

Maximum ambient temperature [°C]	Continuous duty S1	f_{t2} Intermittent duty S3 ... S6 Cyclic duration factor for 60 min running ²⁾			
		60	40	25	15
50	0,8	0,95	1,06	1,18	1,32
40	1	1,18	1,32	1,5	1,7
30	1,18	1,4	1,6	1,8	2
20	1,32	1,6	1,8	2	2,24
10	1,5	1,8	2	2,24	2,5

Thermal factor f_{t3} according to **mounting position**

Train of gears	f_{t3} Mounting position	
	B3, B8, V5, V6	B6, B7
V	1	0,9
IV, 2IV	1	1

Thermal factor f_{t4} according to **altitude**

Altitude a.s.l. [m]	f_{t4}
$\leq 1\ 000$	1
1 000 ÷ 2 000	0,95
2 000 ÷ 3 000	0,9
3 000 ÷ 4 000	0,85
$\geq 4\ 000$	0,8

Thermal factor f_{t5} according to **air speed** on the housing

Air speed m/s	Working environment	f_{t5}
< 0,63	very small or no air movement or gear reducer shielded	consult us
0,63	small and with limited air movement	0,71
1	large and without ventilation	0,9
1,25	large and with slight ventilation (e.g. gearmotor with self-cooled motor)	1
2,5	outdoor ventilated	1,18
4	strong air movement	1,32

1) Corresponding to an average temperature of the external housing surface of approximately 85 °C; locally housing temperature can achieve the oil temperature.

2) (Duration of running on load / 60) · 100 [%].

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

The powers and torques shown in the catalogue are nominal (i.e. valid for $f_s = 1$) for gear reducers, corresponding to the f_s indicated for gearmotors.

Service factor based: on the nature of load and running time (this value is to be multiplied by the values shown in the tables alongside).

Service factor based on frequency of starting referred to the nature of load.

Nature of load of the driven machine		Running time [h]				
Ref.	Description	3 150 ≤ 2 h/d	6 300 2 ÷ 4 h/d	12 500 4 ÷ 8 h/d	25 000 8 ÷ 16 h/d	50 000 16 ÷ 24 h/d
a	Uniform	0,67	0,85	1	1,25	1,6
b	Moderate overloads (1,6 × normal)	0,85	1,06	1,25	1,6	2
c	Heavy overloads (2,5 × normal)	1	1,25	1,5	1,9	2,36

Load ref.	Frequency of starting z [starts/h]							
	4	8	16	32	63	125	250	500
a	1	1,06	1,12	1,18	1,25	1,32	1,4	1,5
b	1	1	1,06	1,12	1,18	1,25	1,32	1,4
c	1	1	1	1,06	1,12	1,18	1,25	1,32

Details of service factor and considerations.

Given f_s values are valid for:

- electric motor with cage rotor, direct on-line starting up to 9,2 kW, star-delta starting for higher power ratings; for direct on-line starting above 9,2 kW or for brake motors, select f_s according to a frequency of starting double the actual frequency; for internal combustion engines multiply f_s by 1,25 (multicylinder) or 1,5 (single-cylinder);
- 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 overloads should be assumed;
- **standard** level of reliability; if a **higher** degree of reliability is required (particularly difficult maintenance conditions, key importance of gear reducer to production, personnel safety, etc.) multiply f_s by **1,25 ÷ 1,4**.

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 if need be.

a - Gear reducer

Determining the gear reducer size

- Make available all necessary data: required output power P_2 of gear reducer, speeds n_2 and n_1 , running conditions (nature of load, running time, frequency of starting z , other considerations) with reference to ch. 3.3.
- Determine service factor f_s on the basis of running conditions (ch. 3.3).
- Select the gear reducer size (also, the train of gears and transmission ratio i at the same time) on the basis of n_2 , n_1 and of a power P_{N2} greater than or equal to $P_2 \cdot f_s$ (ch. 3.5).
- Calculate power P_1 required at input side of gear reducer using — the formula $\frac{P_2}{\eta}$, where $\eta = \frac{P_{N2}}{P_{N1}}$ is the efficiency of the gear reducer (ch. 3.5).

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. 3.3).

Otherwise, make the selection by multiplying P_{N2} by $\frac{P_1 \text{ applied}}{P_1 \text{ required}}$

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

Verifications

- Verify possible radial loads F_{r1} , F_{r2} and axial load F_{a2} by referring to instructions and values given in ch. 3.11 and 3.13.
- When the load chart is available, and/or there are overloads — due to starting on full load (mainly for high inertias and low transmission ratios), braking, shocks, irreversible or with low reversibility gear reducers in which the wormwheel becomes driving member due to the driven machine inertia, applied power higher than that required, other static or dynamic causes — verify that the maximum torque peak (ch. 3.13) is always less than M_{2max} (ch. 3.5); if it is higher or cannot be evaluated, in the above cases, install a safety device so that M_{2max} will never be exceeded.
- When nominal thermal power P_{tN} is indicated in red in ch. 3.5, verify that $P_1 \leq P_t$ (ch. 3.2).

b - Gearmotor

Determining the gearmotor size

- Make available all necessary data: required output power P_2 of gearmotor, speed n_2 , running conditions (nature of load, running time, frequency of starting z , other considerations) with reference to ch. 3.3.
- Determine service factor f_s on the basis of running conditions (ch. 3.3).
- Select the gearmotor size on the basis of n_2 , f_s , P_2 (ch. 3.7).

When for reasons of motor standardization, power P_2 available in catalog is much greater than that required, the gearmotor can be selected on the

basis of a lower service factor ($f_s \cdot \frac{P_2 \text{ required}}{P_2 \text{ available}}$)

provided it is certain that this excess power available will never be required and frequency of starting z is low enough not to affect service factor (ch. 3.3).

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

Verifications

- Verify possible radial load F_{r2} and axial load F_{a2} referring to directions and values given in ch. 3.12.
- For the motor, verify frequency of starting z when higher than that normally permissible, referring to directions and values given in ch. 2b; this will normally be required for brake motors only.
- Verify, in case of **motors supplied by the customer**, that the **static bending moment M_b** generated by motor weight on the counter flange of gear reducer is lower than the value allowed M_{bmax} stated in the ch. 3.13.

Loads higher than permissible loads may be present in dynamical applications where the gearmotor is subjected to translations, rotations or oscillations (e.g.: **shaft mounting arrangements**): consult us for the study of every specific case

- 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, irreversible or with low reversibility gear reducers in which the wormwheel becomes driving member due to the driven machine inertia, other static or dynamic causes — verify that the maximum torque peak (ch. 3.13) is always less than M_{2max} (ch. 3.5); if it is higher or cannot be evaluated, in the above instances, install suitable safety devices so that M_{2max} will never be exceeded. M_{2max} value can be read off in ch. 3.5 against the corresponding speed n_2 and transmission ratio i of the worm gear pair.
- When nominal thermal power P_{tN} is indicated in red in ch. 3.7, verify that $P_1 \leq P_t$ (ch. 3.2).

c - Combined gear reducer and gearmotor units

Combined units are obtained by coupling together **normal single** gear reducers and/or gearmotors.

Determining the final gear reducer size

- Make available all necessary data relating to the output of the final gear reducer: required torque M_2 speed n_2 , running conditions (nature of load, running time, frequency of starting Z , other considerations) with reference to ch. 3.3.
- Determine service factor f_s on the basis of running conditions (ch. 3.3) and of n_2 (see *, ** ch. 3.9).
- Select the final gear reducer size and the corresponding efficiency η (ch. 3.9, table A), on the basis of n_2 and a torque value M_{N2} greater than or equal to $M_2 \cdot f_s$ (the η value shown can be taken as valid even if the final gear reducer's train of gears is type IV).
For $f_s < 1$ verify that $M_2 \leq M_{2 \text{ Size}}$.

Determining the type of combined unit

- Select the final gear reducer basic reference, and the type and size of initial gear reducer or gearmotor (ch. 3.9 table B), on the basis of the final gear reducer size, and of the type of combined unit selected.

When selecting the type of unit, refer to the drawings in table B bearing in mind the following considerations:

gear reducer: gives greater operational flexibility; stress deriving from starting and heavy duty can be diminished thanks to the possibility of locating couplings (flexible, centrifugal, fluid, safety or friction type), belt drives, etc. between gear reducer and motor;

gearmotor: provides a more compact and economical solution compared to the equivalent gear reducer combined unit;

combined units **R V** + R V or MR V; **R V** + R IV or MR IV: input and output shafts can be either parallel or orthogonal, overall dimensions are kept to a minimum, especially within the plane perpendicular to the low speed shafts; these units are normally irreversible; the latter two types give higher transmission ratios than the former two types as well as higher efficiency, with the same transmission ratio;

combined units **MR V** + R 2l, 3l or MR 2l, 3l: input and output shafts are orthogonal, overall dimensions kept at minimum along the direction of the low speed shaft; high efficiency;

combined units **MR IV** + R 2l, 3l or MR 2l, 3l: the same as above but with the possibility of higher transmission ratios, and with overall dimensions of the initial gear reducer or gearmotor contained within those planes defined by the mounting feet.

Selection of initial gear reducer or gearmotor

- Calculate the speed n_2 and the required power P_2 at the initial gear reducer or gearmotor output, using the following formulae:

$$n_2 \text{ initial} = n_2 \text{ final} \cdot i \text{ final}$$

$$P_2 \text{ initial} = \frac{M_2 \text{ final} \cdot n_2 \text{ final}}{955 \cdot \eta \text{ final}} [\text{kW}]$$

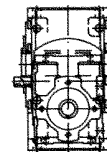
- In the case of gear reducer, establish input speed n_1 at the input of the initial gear reducer.
- Make the selection of initial gear reducer or gearmotor as shown in ch. 3.4, paragraph a) or b) of this catalog (in the case of worm gear reducers and gearmotors), or of catalogue E (in the case of coaxial gear reducers and gearmotors), bearing in mind that sizes are pre-established (and cannot be changed on account of couplings being standard) and that it is not necessary to verify the service factor.

Designation for ordering

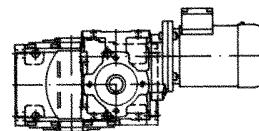
When ordering combined units, the single gear reducers or gearmotors must be designed **separately**, as indicated in ch. 3.1 paragraph a) or b), of this catalog (for the final gear reducer and initial worm gear reducer or gearmotor) or of catalog E (for initial coaxial gear reducer or gearmotor), bearing in mind the following:

- for all combined units, insert the words **coupled with** between the final gear reducer designation and that of the initial gear reducer or gearmotor;
- in the case of **R V** + R V or MR V and **R V** + R IV or MR IV, select the initial gear reducer or gearmotor stating the coupling **position** where applicable (ch. 3.10);
- when ordering **MR V** + R 2I, 3I or MR 2I, 3I and **MR IV** + R 2I, 3I or MR 2I, 3I always add the words **without motor** to the final gear reducer designation and select for the initial gear reducer or gearmotor **oversized B5 flange** design (for size 63 also add – Ø 28); in case of initial gear reducer or gearmotor size 32 or 40 select **FC1A** flange design;
- in order to make easier the individualization of mounting position of initial gear reducer or gearmotor see ch. 3.10.

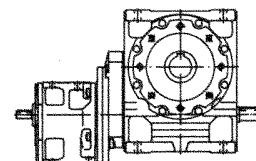
E.g: R V 100 UO2A/25
coupled with
R V 50 UO3A/32



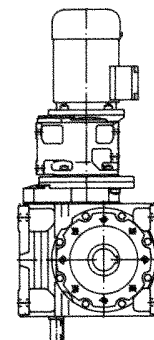
R V 100 UO2A/25 mounting position V5
coupled with
MR V 50 UO3A – 14 160 – 50 pos. 3
HB 71 A 4 230.400 B5



MR V 200 UO2A – 48 350 – 32 without motor
coupled with
R 2I 100 UC2A/29,3 oversized B5 flange



MR IV 200 UO2A – 138 300 – 81,8 without motor, mounting position B6, double extension low speed shaft
coupled with
MR 3I 80 UC2A – 19 200 – 49,8 mounting position V5
oversized B5 flange
HB3 80 A 4 230.400 B5



Considerations on selection

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 several requirements of the work to be carried out, to friction (starting, sliding or rolling friction) and inertia (particularly when mass and/or acceleration or deceleration are considerable). It can also be determined experimentally on the basis of tests, comparison with existing applications, or readings taken with amperometers 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.

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

Driving machines with high kinetic energy

When driving machines with high inertias and/or speeds, **avoid** the use of **irreversible** gear reducers or gearmotors, rather select a train of gears with higher efficiency (e.g. IV, 2IV in place of V), keeping the same transmission ratio, as stopping and braking can cause very high overloads (cap. 3.13).

Drives with low input speed ($n_1 < 355 \text{ min}^{-1}$)

Wherever possible select the following transmission $i = 20$ for sizes 32 ... 50, $i = 25$ for sizes 63 ... 100, $i = 32$ for sizes 125 ... 200, $i = 40$ for size 250, these being the ratios capable of transmitting highest torque (for performance figures see table A ch. 11; for sizes 32 and 40, consult us).

Input speed

For n_1 higher than $1\,400 \text{ min}^{-1}$, **power** and **torque** ratings relating to a given transmission ratio vary as shown in the table alongside. In this case no loads should be imposed on the high speed shaft end.

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

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 (our catalog favours this method of selection as it shows a number of input speed values n_1 relating to a determined output speed n_{N2} in the same section).

Input speed should not be higher than $1\,400 \text{ min}^{-1}$, unless conditions make it necessary; better to take advantage of the transmission, and use an input speed lower than 900 min^{-1} .

n_1 min^{-1}	P_{N2}	M_{N2}
2 800	1,4	0,71
2 240	1,25	0,8
1 800	1,12	0,9
1 400	1	1

Operation at 60 Hz

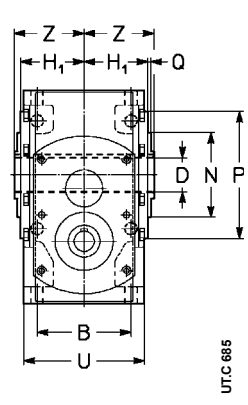
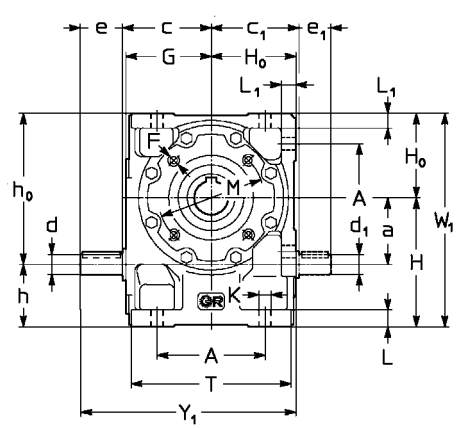
When motor is supplied at 60 Hz frequency (ch. 2 b), the gearmotor specifications vary as follows.

- Speed n_2 increases by 20%.
- Power P_1 may either remain constant or increase (ch. 2 b).
- Torque M_2 and service factor f_s vary as follows:

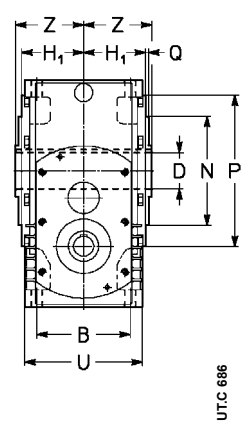
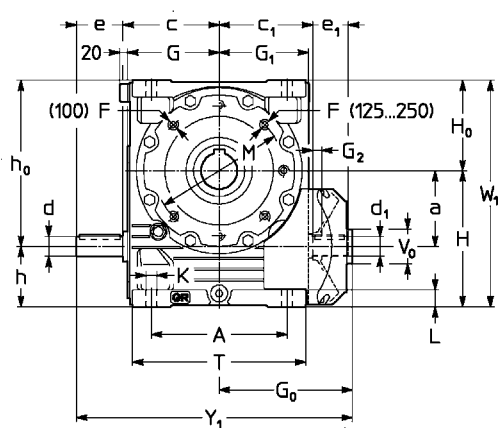
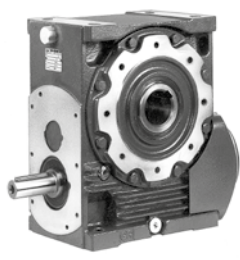
$$M_{2 \text{ at } 60 \text{ Hz}} = M_{2 \text{ at } 50 \text{ Hz}} \cdot \frac{P_{1 \text{ at } 60 \text{ Hz}}}{1,2 \cdot P_{1 \text{ at } 50 \text{ Hz}}}$$

$$f_{s \text{ at } 60 \text{ Hz}} = f_{s \text{ at } 50 \text{ Hz}} \cdot \frac{1,12 \cdot P_{1 \text{ at } 50 \text{ Hz}}}{P_{1 \text{ at } 60 \text{ Hz}}}$$

Designs, dimensions, mounting positions & oil quantity 3.6



RV 32 ... 81	
Design	
standard	UO3A ^{1) 5)}
double extension worm	UO3D ^{1) 5)}
reduced worm shaft end	UO3B ^{1) 5)}
double extension worm with reduced shaft end	UO3C ^{1) 5)}



RV 100 ... 250	
Design	
standard	UO2A ^{5) 5)}
reduced worm shaft end	UO2B ^{1) 5)}

Size	a	A	B	D Ø H7	c	d Ø	e	c	d Ø	e	Y1 Ø	d1	e1	F	G0	G1	G2	H h11	H0 h11	H1 h12	h h11	h0 h11	K Ø	L	L1	M Ø h6	N Ø	P Ø	Q	T	U max	V0 Ø	W1	Y1	Z	Mass kg
					c1			UO3B ¹⁾ UO3C ¹⁾ UO2B ¹⁾						2)					G																	
32	32	61	52	19	51	14	25	50	10	14	112	11	20	M5 ⁶⁾	—	—	—	71	48	34,5	39	80	7	10	8,5	75	55 ⁷⁾	90	3	91	66	—	119	124	39	3
40	40	70	62	24	59,5 ⁴⁾	16	30	59,5	12	14	130	14	25	M6 ⁶⁾	—	—	—	82	56	41,5	42	96	9,5	12	10	85	68 ⁷⁾	105	3	106	80	—	138	146	46	5
50	50	86	75	28	70,5	19	30	70,5	12	14	152	16	30	M6 ⁶⁾	—	—	—	100	67	49	50	117	9,5	13	12	100	85 ⁷⁾	120	3	126	95	—	167	168	53	9
63, 64	63	102	90	32	83	19	40	85	17	17	182	19	30	M8	—	—	—	125	80	58,5	62	143	11,5	16	14	100	80	120	3	151	114	—	205	203	63	14
80 81	80	132	106	38	103	24	50	105	17	17	222	24	36	M10	—	—	—	150	100	69,5	70	180	14	20	17	130	110	160	3,5	189	135	—	250	253	75	24
100	100	180	131	48	130	28	60	130	20	21	331	28	42	M12	180	122	11	180	125	84,5	80	225	16	23	—	165	130	200	3,5	236	165	45	305	370	90	43
125, 126	125	225	155	60	155	32	80	155	25	26	402	32	58	M12 ⁸⁾	221	148	15	225	150	99,5	100	275	18	28	—	215	180	250	4	287	194	50	375	456	106	74
160 161	160	272	183	70	187	38	80	181	35	36	472	38	58	M14 ⁸⁾	255	178	15	280	180	118,5	120	340	22	33	—	265	230	300	4	345	232	60	460	522	125	130
200	200	342	214	90	232 ⁴⁾	48	110	226	35	36	586	48	82	M16 ⁸⁾	324	222	20	335	225	137,5	135	425	27	40	—	300	250	350	5	431	270	80	560	666	150	233
250	250	425	250	110	292 ⁴⁾	60	105	281	40	46	706	55	82	M20 ^{8) 3)}	379	277	20	410	280	163	160	530	33	50	—	400	350	450	5	537	320	80	690	776	180	382

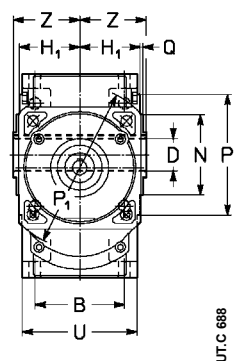
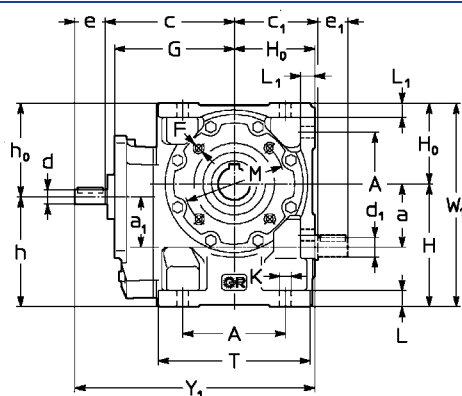
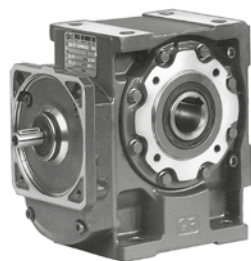
1) Only for i ≥ 16.
2) Working length of thread 2 · F.
3) Holes turned through 22° 30' with respect to the drawing.
4) Size 40: c1 = 57,5; size 200: c1 = 235; size 250: c1 = 287.
5) Prearranged design for double extension worm shaft (see ch. 2).
6) Holes turned through 45° with respect to the drawing.
7) Tolerance t8.

Mounting positions - direction of rotation - and oil quantities [l]

Size						B3	B6, B7	B8	V5, V6
32 40 50 63, 64 80, 81						0,16 0,26 0,4 0,8 1,3	0,2 0,35 0,6 1,15 2,2	0,16 0,26 0,4 0,8 1,7	0,16 0,26 0,4 0,8 1,3
100 125, 126 160, 161 200 250						1,9 3,4 5,6 9,5 17	5,4 10 18 33 57	4,2 8,2 15 30 51	3 5,7 10 20 34

1) Sizes 200 and 250 in mounting position B7, with n1 > 710 min-1 carry a price addition.

Designs, dimensions, mounting positions & oil quantity 3.6



R IV 32 ... 81

Design

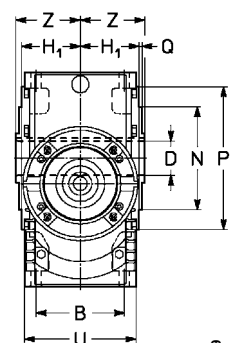
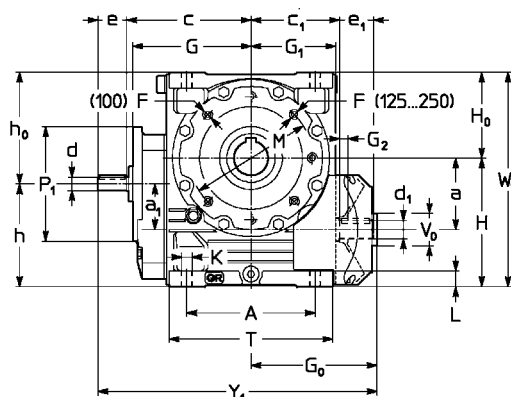
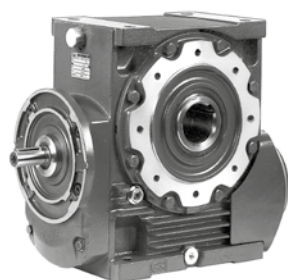
standard

UO3A¹⁾

worm extension

UO3D¹⁾

UT.C 688



R IV 100 ... 250

Design

standard

UO2A¹⁾

UT.C 689

Size	a	a ₁	A	B	c	c ₁	D Ø H7	d Ø	e	d ₁ Ø	e ₁	F	G	G ₀	G ₁	G ₂	H	H ₀	H ₁	h	h ₀	K Ø	L	L ₁	M Ø	N Ø h6	P Ø	P ₁ Ø	Q	T	U	V ₀ Ø max	W ₁	Y ₁	Z	Mass kg	
												2)					h11	h11	h12	h11	h11																
32	32	32	61	52	81	51	19	11	20	11	20	M5 ⁴⁾	76	—	—	—	71	48	34,5	71	48	7	10	8,5	75	55 ⁵⁾	90	140 ⁶⁾	3	91	66	—	124	149	39	5	
40	40	40	70	62	96	57,5	24	11	23	14	25	M6 ⁴⁾	87	—	—	—	82	56	41,5	82	56	9,5	12	10	85	68 ⁵⁾	105	140 ⁶⁾	3	106	80	—	138	175	46	7	
50	50	40	86	75	107	70,5	28	11	23	16	30	M6 ⁴⁾	98	—	—	—	100	67	49	90	77	9,5	13	12	100	85 ⁵⁾	120	140 ⁶⁾	3	126	95	—	167	197	53	11	
63, 64	63	50	102	90	127	83	32	14	30	19	30	M8	118	—	—	—	125	80	58,5	112	93	11,5	16	14	100	80	120	160 ⁶⁾	3	151	114	—	205	237	63	17	
80 81	80	50	132	106	147	103	38	14	30	24	36	M10	138	—	—	—	150	100	69,5	120	130	14	20	17	130	110	160	160 ⁶⁾	3,5	189	135	—	250	277	75	27	
100	100	63	180	131	181	130	48	19*	40*	28	42	M12	170	180	122	11	180	125	84,5	143	162	16	23	—	165	130	200	200	3,5	236	165	45	305	401	90	48	
125, 126	125	80	225	155	216	155	60	24*	50*	32	58	M12 ⁶⁾	205	221	148	15	225	150	99,5	180	195	18	28	—	215	180	250	200	4	287	194	50	375	487	106	82	
160 161	160	100	272	183	258	187	70	28*	60*	38	58	M14 ⁶⁾	247	255	178	15	280	180	118,5	220	240	22	33	—	265	230	300	250	4	345	232	60	460	573	125	146	
200	200	100	342	214	303	235	90	28*	60*	48	82	M16 ⁶⁾	292	324	222	20	335	225	137,5	235	325	27	40	—	300	250	350	250	5	431	270	80	560	687	150	249	
250	250	125	425	250	373	287	110	32	80	55	82	M20 ^{6,3)}	360	379	277	20	410	280	163	285	405	33	50	—	400	350	450	300	5	537	320	80	690	832	180	408	

1) Prearranged design for worm shaft extension (see ch. 2).

2) Working length of thread 2 · F.

3) Holes turned through 22° 30' with respect to the drawing.

4) Holes turned through 45° with respect to the drawing.

5) Tolerance t8.

6) Square flange: for dimensions see ch. 15.

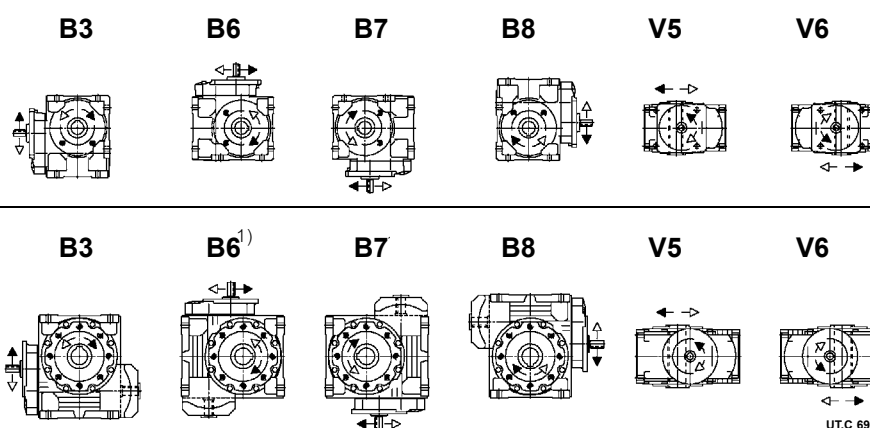
* When $i_{\text{w}} \geq 200$ the shaft end will be:

size 100: d = 16, e = 30;

sizes 125, 126: d = 19, e = 40;

sizes 160 ... 200: d = 24, e = 50.

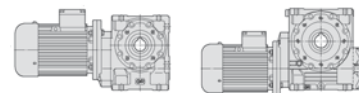
Mounting positions - direction of rotation - and oil quantities [l]



Size	B3	B6, B7	B8	V5, V6
32	0,2	0,25	0,2	0,2
40	0,32	0,4	0,32	0,32
50	0,5	0,7	0,5	0,5
63, 64	1	1,3	1	1
80, 81	1,5	2,5	2	1,5
100	2,1	6,3	4,5	3,3
125, 126	3,8	11,6	8,8	6,3
160, 161	6,5	20,8	16,5	11,2
200	10,4	38	31,5	21,2
250	18,3	67	53	35,7

UT.C 690

1) Sizes 100 ... 250 in mounting position **B6** carry a price addition.



P_1 kW	n_2 min ⁻¹	P_2 kW	M_2 daN m	f_s	Riduttore - Motore Gear reducer - Motor				i
1)					2)				
22	45	19,5	413	2,24	MR	V 250 - 55 × 400	200 L	6	20
16,1	56	19,2	327	0,71	MR	V 160 - 48 × 350	180 L	4	25
16,1	56	19,2	327	0,85	MR	V 161 - 48 × 350	180 L	4	25
	56	19,4	331	1,32	MR	V 200 - 48 × 350	180 L	4	25
	56,3	19,7	334	1,5	MR	V 200 - 55 × 400	200 L	6	16
	56	19,6	333	2,36	MR	V 250 - 48 × 350	180 L	4	25
17,4	70	19,4	265	0,85	MR	V 160 - 48 × 350	180 L	4	20
17,4	70	19,4	265	1	MR	V 161 - 48 × 350	180 L	4	20
	70	19,6	267	1,6	MR	V 200 - 48 × 350	180 L	4	20
	69,2	19,8	274	1,8	MR	V 200 - 55 × 400	200 L	6	13
	70	19,7	268	2,8	MR	V 250 - 48 × 350	180 L	4	20
	87,5	19,6	214	1	MR	V 160 - 48 × 350	180 L	4	16
	87,5	19,6	214	1,18	MR	V 161 - 48 × 350	180 L	4	16
	87,5	19,9	217	1,9	MR	V 200 - 48 × 350	180 L	4	16
	108	19,9	177	1,18	MR	V 160 - 48 × 350	180 L	4	13
	108	19,9	177	1,4	MR	V 161 - 48 × 350	180 L	4	13
	108	20	177	2,12	MR	V 200 - 48 × 350	180 L	4	13
	140	20,1	137	1,4	MR	V 160 - 48 × 350	180 L	4	10
	140	20,1	137	1,6	MR	V 161 - 48 × 350	180 L	4	10
30	14,9	13,7	24,1	0,67	MR	IV 250 - 55 × 400	200 L	4	102
17,3	17,5	24,4	1332	0,8	MR	IV 250 - 55 × 400	200 L	4	80
21,4	21,9	25,9	1129	1	MR	IV 250 - 48 × 350	200 L	* 4	63,9
22,2	21,9	25,6	1119	0,85	MR	IV 250 - 55 × 400	200 L	4	64
23,2	22,2	24,3	1046	0,71	MR	V 250 - 55 × 400	200 L	4	63
22,8	27,4	26,1	912	1,25	MR	IV 250 - 48 × 350	200 L	* 4	51,1
25	28	26,1	891	1,18	MR	IV 250 - 55 × 400	200 L	4	50
	28	24,9	849	0,95	MR	V 250 - 55 × 400	200 L	4	50
17	35	26,1	713	0,8	MR	IV 200 - 48 × 350	200 L	* 4	40
17,7	35	24,9	680	0,67	MR	V 200 - 55 × 400	200 L	4	40
	35	26,3	719	1,4	MR	IV 250 - 55 × 400	200 L	4	40
	35	25,2	687	1,18	MR	V 250 - 55 × 400	200 L	4	40
19,9	43,8	26,7	582	0,95	MR	IV 200 - 48 × 350	200 L	* 4	32
19,4	43,8	25,4	554	0,85	MR	V 200 - 55 × 400	200 L	4	32
	43,8	26,9	587	1,7	MR	IV 250 - 55 × 400	200 L	4	32
	43,8	26,3	574	1,25	MR	V 250 - 55 × 400	200 L	4	32
25,1	56	26,4	451	0,95	MR	V 200 - 55 × 400	200 L	4	25

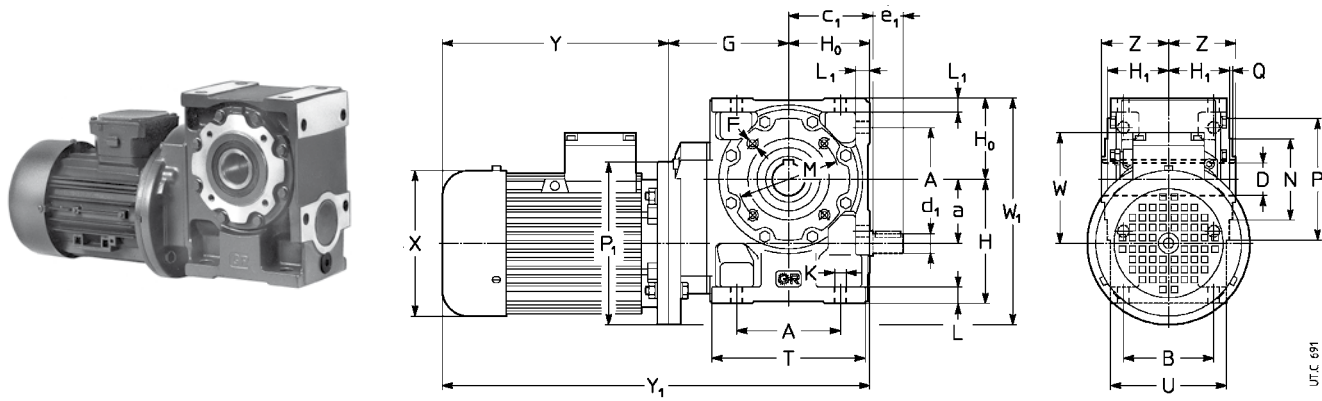
P_1 kW	n_2 min ⁻¹	P_2 kW	M_2 daN m	f_s	Riduttore - Motore Gear reducer - Motor				i	
1)					2)					
30	56	26,7	455	1,7	MR	V 250 - 55 × 400	200 L	4	25	
	70	26,7	364	1,18	MR	V 200 - 55 × 400	200 L	4	20	
	70	26,8	366	2,12	MR	V 250 - 55 × 400	200 L	4	20	
	87,5	27,1	296	1,4	MR	V 200 - 55 × 400	200 L	4	16	
	87,5	27,3	298	2,5	MR	V 250 - 55 × 400	200 L	4	16	
	108	27,3	242	1,6	MR	V 200 - 55 × 400	200 L	4	13	
37	25	28	32,2	1099	0,95	MR	IV 250 - 60 × 450	225 S	4	50
	25,7	28	30,7	1047	0,75	MR	V 250 - 60 × 450	225 S	4	50
	26,4	35	32,5	886	1,12	MR	IV 250 - 60 × 450	225 S	4	40
	27,3	35	31,1	848	0,95	MR	V 250 - 60 × 450	225 S	4	40
	19,4	43,8	31,3	683	0,67	MR	V 200 - 55 × 400	200 LG	4	32
	31,2	43,8	33,2	724	1,32	MR	IV 250 - 60 × 450	225 S	4	32
		43,8	32,4	708	1	MR	V 250 - 60 × 450	225 S	4	32
	25,1	56	32,6	556	0,75	MR	V 200 - 55 × 400	200 LG	4	25
		56	32,9	561	1,4	MR	V 250 - 60 × 450	225 S	4	25
	27	70	32,9	449	0,95	MR	V 200 - 55 × 400	200 LG	4	20
		70	33,1	451	1,7	MR	V 250 - 60 × 450	225 S	4	20
	31,3	87,5	33,5	365	1,12	MR	V 200 - 55 × 400	200 LG	4	16
		87,5	33,7	367	2	MR	V 250 - 60 × 450	225 S	4	16
		108	33,7	299	1,32	MR	V 200 - 55 × 400	200 LG	4	13
45	25	28	39,2	1336	0,8	MR	IV 250 - 60 × 450	225 M	4	50
	26,4	35	39,5	1078	0,95	MR	IV 250 - 60 × 450	225 M	4	40
	27,3	35	37,8	1031	0,8	MR	V 250 - 60 × 450	225 M	4	40
	31,2	43,8	40,3	881	1,12	MR	IV 250 - 60 × 450	225 M	4	32
	35,5	43,8	39,4	861	0,85	MR	V 250 - 60 × 450	225 M	4	32
		56	40	682	1,12	MR	V 250 - 60 × 450	225 M	4	25
		70	40,2	549	1,4	MR	V 250 - 60 × 450	225 M	4	20
		87,5	40,9	447	1,6	MR	V 250 - 60 × 450	225 M	4	16
	55	35,5	43,8	48,2	1052	0,71	MR	V 250 - 60 × 450	250 M	* 4
39,4		56	48,9	834	0,95	MR	V 250 - 60 × 450	250 M	* 4	25
41,2		70	49,2	671	1,12	MR	V 250 - 60 × 450	250 M	* 4	20
		87,5	50	546	1,32	MR	V 250 - 60 × 450	250 M	* 4	16

Values in red state nominal thermal power P_{th} (ambient temperature 40 °C, continuous duty, see ch. 3.2).

1) Powers valid for continuous duty S1; **increase** possible for S2 ... S10 (see ch. 2b) in which case P_2 , M_2 increase and f_s decreases proportionately.

2) For complete designation when ordering see ch. 3.1.

* Mounting position **B5R** (see table ch. 2b).



Design¹⁾

standard
worm extension

UO3A
UO3D

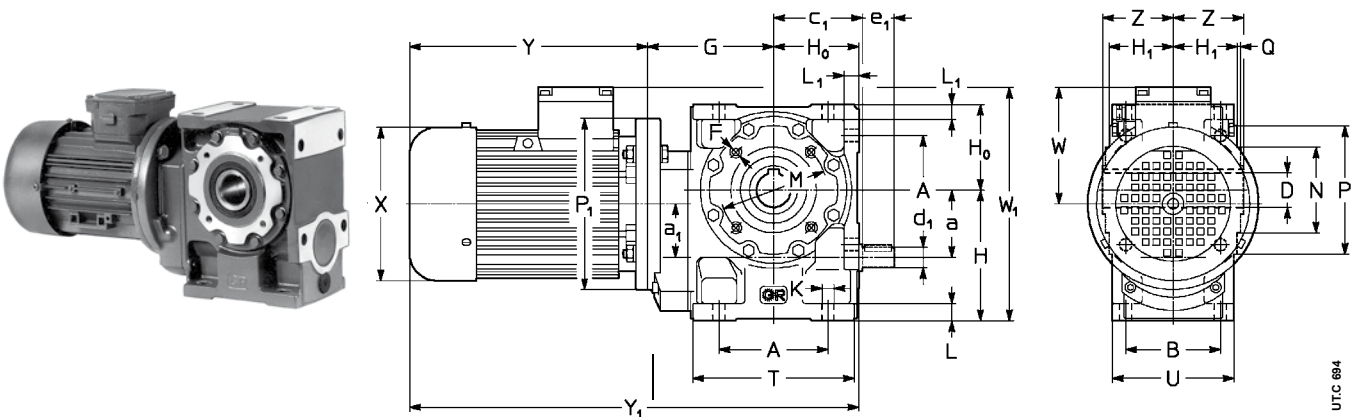
Size		a	A	c	D Ø H7	d Ø	F	G	H	H ₀	H	K Ø	L	M Ø	N Ø h6	P Ø	T	Z	P Ø	X Ø ≈	Y ≈	Y ≈	W ≈	W ≈	Mass				
red.	motor								h11	h11	h12															kg			
	B5		B			e ₁	2)						L ₁			Q	U				3)	3)		8)		3)			
32	63 71 71 B5R	32	61 52	51	19	11 20	M5 4)	76	71	48	34,5	7	10 8,5	75	55 5)	90 3	91 66	39	140 160 140	123 138 138	189 216 235	244 278 297	313 340 359	368 402 421	95 112 112	165 192 182	4 4 4	9 11 11	11 14 14
40	63 71 80 ⁹⁾ 80 B5R ⁹⁾	40	70 62	57,5	24	14 25	M6 4)	87 87 99 87	82	56	41,5	9,5	12 10	85	68 5)	105 3	106 80	46	140 160 200 160	123 138 156 156	189 216 233 254	244 278 302 323	332 387 421 397	359 421 376 466	95 112 121 121	166 192 221 201	7 7 8 7	12 12 20 19	14 17 23 22
50	63 71 80 ⁶⁾ 90 ⁹⁾ 90 B5R ⁹⁾	50	86 75	70,5	28	16 30	M6 4)	98 98 98 110 98	100	67	49	9,5	13 12	100	85 5)	120 3	126 95	53	140 160 200 200	123 138 156 176	189 216 233 287	244 278 302 —	354 381 398 —	409 443 467 —	95 112 121 —	167 187 221 141	10 11 12 12	15 18 24 31	17 21 27 —
63 64	71 80 90 100 100 B5R	63	102 90	83	32	19 30	M8	118 118 118 130 118	125	80	58,5	11,5	16 14	100	80	120 3	151 114	63	160 200 200 200	138 156 176 250	216 233 287 194	278 302 366 405	414 431 485 508	476 500 564 603	112 121 141 151	223 243 243 276	16 17 17 18	23 29 36 44	26 32 42 48
80 81	80 90 100 ⁷⁾ 112 ⁷⁾ 9)	80	132 106	103	38 (80) 40 (81)	24 36	M10	138	150	100	69,5	14	20 17	130	110	160 3,5	189 135	75	200 200 250	156 176 194	233 287 310	302 366 405	471 525 604	540 604 141	121 280 151	280 26 305	26 26 28	38 45 58	41 51 58

1) See ch. 3.1 for motor design.
2) Working length of thread 2 · F.
3) Values valid for brake motor.
4) Holes turned through 45° with respect to the drawing.
5) Tolerance 18.
6) Option of P₁ = 160 (m.p. B5A, see ch. 2b), with price addition: consult us.
7) On request for 100L 4, 112M 4 excluded size 81 also available mounting position B5R (see ch. 2b).
8) Values valid for gearmotor without motor.
9) Brake motor (cat. TX) not possible.

Mounting positions - direction of rotation - and oil quantities [l]

B3	B6	B7	B8	V5	V6	Size	B3	B6, B7	B8	V5, V6
						32	0,16	0,2	0,16	0,16
						40	0,26	0,35	0,26	0,26
						50	0,4	0,6	0,4	0,4
						63, 64	0,8	1,15	0,8	0,8
						80, 81	1,3	2,2	1,7	1,3

MR IV 32 ... 81



Design¹⁾

standard UO3A
worm extension UO3D

Size		a	A	c	D Ø H7	d Ø	F	G	H	H ₀	H ₁	K Ø	L	M Ø	N Ø h6	P Ø	T	Z	P Ø	X	Y ≈	Y ≈	W ≈	W ≈	Mass				
red.	motor	a	B			e	2)		h11	h11	h12		L			Q	U				3)		3)			8)		3)	
32	63	32 32	61 52	51	19	11 20	M5 4)	76	71	48	34,5	7	10 8,5	75	55 5)	90 3	91 66	39	140	123	189	244	313	368	95	166	4	9	11
40	63 71	40 40	70 62	57,5	24	14 25	M6 4)	87	82	56	41,5	9,5	12 10	85	68 5)	105 3	106 80	46	140 160	123 138	189 216	244 278	332 359	387 421	95 112	177 194	7	12	14
50	63 71 80 ⁶⁾	50 40	86 75	70,5	28	16 30	M6 4)	98	100	67	49	9,5	13 12	100	85 5)	120 3	126 95	53 69	140 160 200	123 138 156	189 216 233	244 278 302	354 381 398	409 443 467	95 112 121	185 202 221	10 11 12	15 18 24	17 21 27
63 64	71 80 90	63 50	102 90	83	32	19 30	M8	118	125	80	58,5	11,5	16 14	100	80	120 3	151 114	63	160 200 200	138 156 176	216 233 287	278 302 366	414 431 485	476 500 564	112 121 141	224 233 253	16 17 17	23 29 34	26 32 40
80 81	71 80 90 100 ⁷⁾	80 50	132 106	103	38 (80) 40 (81)	24 36	M10	138	150	100	69,5	14	20 17	130	110	160 3,5	189 135	75	160 200 200	138 156 176	216 233 287	278 302 366	454 471 525	516 540 604	112 121 141	250 250 261	26 27 27	33 39 44	36 42 50
																			200	194	337	432	575	670	151	271	27	51	55

1) See ch. 3 for motor design.
2) Working length of thread 2 · F.
3) Values valid for brake motor.
4) Holes turned through 45° with respect to the drawing.
5) Tolerance it8.
6) Option of P₁ = 160 (m.p. B5A, ved. cap. 2b), with price addition: consult us.
7) Mounting position B5R (see ch. 2b);
8) Values valid for gearmotor without motor.

Mounting positions - direction of rotation - and oil quantities [l]

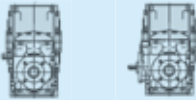
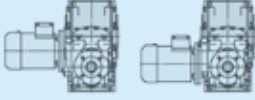
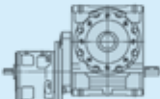
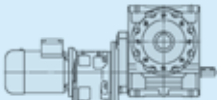
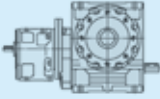
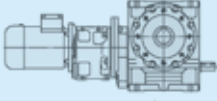
B3	B6	B7	B8	V5	V6	Size	B3	B6, B7	B8	V5, V6
						32 40 50 63, 64 80, 81	0,2 0,32 0,5 1 1,5	0,25 0,4 0,7 1,3 2,5	0,2 0,32 0,5 1 2	0,2 0,32 0,5 1 1,5

Table A - Nominal torques for final gear reducer

n_2 min ⁻¹	Final gear reducer size / i worm gear pair								
	100/25			125/32			160/32		
	M_{N2} daN m	η	M_{2max} daN m	M_{N2} daN m	η	M_{2max} daN m	M_{N2} daN m	η	M_{2max} daN m
11,2	129	0,74	215	200	0,74	339	372	0,76	636
9	133	0,73	229	208	0,73	361	391	0,75	680
4,5	145	0,69	257	230	0,69	413	435	0,71	784
2,24	154	0,67	268	254	0,66	458	494	0,68	850
1,12	160	0,65	268	279	0,64	468	500	0,65	850
0,56	160*	0,63	268	300	0,61	468	500*	0,63	850
0,28	160**	0,61	268	300*	0,6	468	500**	0,61	850
0,14	160**	0,59	268	300*	0,58	468	500**	0,59	850
≤ 0,071	160**	0,57	268	300*	0,56	468	500**	0,57	850
M_2 Size [daN m]	160			300			500		

*, ** In these cases f_s required, provided that it always results ≥ 1 , can be reduced of 1,12 (*) or 1,18 (**).

Table B - Types of combined units

Type of combined unit	Final gear reducer size		
	100	125	160
RV + RV RV + RV  RV + MR V RV + MR IV  1) $i_N \approx 315 \dots 8\,000$	R V 100/25 + R V, IV or MR V, IV 50 $i_{final} = 25$	R V 125/32 + R V, IV or MR V, IV 63 $i_{final} = 32$	R V 160/32 + R V, IV or MR V, IV 80 $i_{final} = 32$
MR V + R 2I, 3I  MR V + MR 2I, 3I  $i_N \approx 200 \dots 5\,000$	MR V 100 – 28×250 – 25 + R 2I, 3I or MR 2I, 3I 63⁴⁾ for $M_{N2} \leq 112$ daN m MR V 100 – 24×200 – 25 + R 2I, 3I or MR 2I, 3I 50⁴⁾ $i_{final} = 25$	MR V 125 – 28×250 – 32 + R 2I, 3I or MR 2I, 3I 63⁴⁾ $i_{final} = 32$	MR V 160 – 38×300 – 32 + R 2I, 3I or MR 2I, 3I 80⁴⁾ for $M_{N2} \leq 400$ daN m MR V 160 – 38×250 – 32⁵⁾ + R 2I, 3I or MR 2I, 3I 64⁴⁾ for $M_{N2} \leq 315$ daN m MR V 160 – 28×250 – 32 + R 2I, 3I or MR 2I, 3I 63⁴⁾ $i_{final} = 32$
MR IV + R 2I, 3I  MR IV + MR 2I, 3I  $i_N \approx 500 \dots 12\,500$	MR IV 100 – 24×200 – 63,5 + R 2I, 3I or MR 2I, 3I 50⁴⁾ $i_{final} = 63,5$	MR IV 125 – 28×250 – 81,1 + R 2I, 3I or MR 2I, 3I 63⁴⁾ $i_{final} = 81,1$	MR IV 160 – 28×250 – 102 + R 2I, 3I or MR 2I, 3I 63⁴⁾ $i_{final} = 102$

For initial gear reducer performance see: this catalog ch. 3.5 or 3.7 for worm gear reducer, and catalog E for coaxial gear reducer.

1) An anchor link is fitted between initial and final gear reducer.

4) Gear reducer in «oversized B5 flange» (see cat. E); size 63 has a low speed shaft reduced to 28 mm: «oversized B5 flange - Ø 28».

5) The gearmotor has 250 mm motor mounting flange (dimension P_{ϕ} , ch. 3.10).

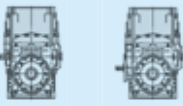
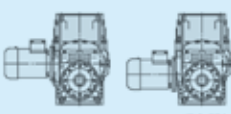
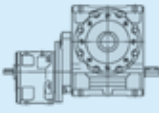
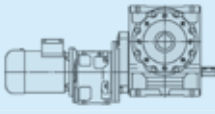
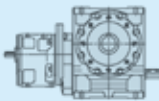
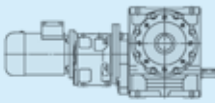
6) The gearmotor has 300 mm motor mounting flange (dimension P_{ϕ} , ch. 3.10).

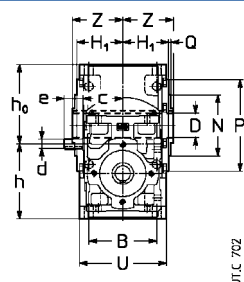
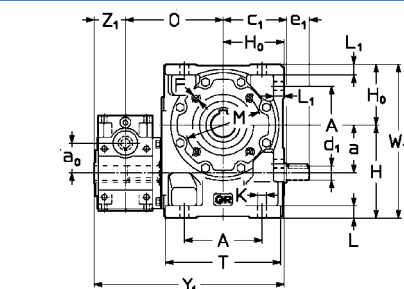
7) The gearmotor has 350 mm motor mounting flange (dimension P_{ϕ} , ch. 3.10).

Table A - Nominal torques for final gear reducer

n_2 min ⁻¹	Final gear reducer size / i worm gear pair								
	161/32			200/32			250/40		
	M_{N2} daN m	η	M_{2max} daN m	M_{N2} daN m	η	M_{2max} daN m	M_{N2} daN m	η	M_{2max} daN m
11,2	442	0,76	691	730	0,78	1 201	1 190	0,79	2 013
9	466	0,75	739	767	0,77	1 258	1 270	0,78	2 072
4,5	516	0,71	851	851	0,73	1 487	1 440	0,73	2 467
2,24	556	0,68	921	923	0,69	1 662	1 562	0,69	2 812
1,12	560	0,65	921	1 000	0,67	1 736	1 704	0,66	3 034
0,56	560*	0,63	921	1 000*	0,64	1 736	1 900	0,64	3 134
0,28	560**	0,61	921	1 000**	0,63	1 736	1 900*	0,61	3 134
0,14	560**	0,59	921	1 000**	0,61	1 736	1 900**	0,60	3 134
≤ 0,071	560**	0,57	921	1 000**	0,58	1 736	1 900**	0,57	3 134
M_2 Size [daN m]	560			1 000			1 900		

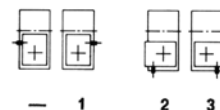
Table B - Types of combined units

Type of combined unit	Final gear reducer size		
	161	200	250
R V + R V R V + R IV  R V + MR V R V + MR IV  1) $i_N \approx 315 \dots 10\,000$	R V 161/32 + R V, IV or MR V, IV 80 $i_{final} = 32$	R V 200/32 + R V, IV or MR V, IV 100 $i_{final} = 32$	R V 250/40 + R V, IV or MR V, IV 125 $i_{final} = 40$
MR V + R 2I, 3I  MR V + MR 2I, 3I  $i_N \approx 200 \dots 6\,300$	MR V 161 - 38x300 - 32 + R 2I, 3I or MR 2I, 3I 80⁽⁴⁾ for $M_{N2} \leq 400$ daN m MR V 161 - 38x250 - 32⁽⁵⁾ + R 2I, 3I or MR 2I, 3I 64⁽⁴⁾ $i_{final} = 32$	MR V 200 - 48x350 - 32 + R 2I, 3I or MR 2I, 3I 100⁽⁴⁾ for $M_{N2} \leq 800$ daN m MR V 200 - 48x300 - 32⁽⁶⁾ + R 2I, 3I or MR 2I, 3I 81⁽⁴⁾ for $M_{N2} \leq 670$ daN m MR V 200 - 38x300 - 32 + R 2I, 3I or MR 2I, 3I 80⁽⁴⁾ $i_{final} = 32$	MR V 250 - 55x350 - 40⁽⁷⁾ + R 2I, 3I or MR 2I, 3I 101⁽⁴⁾ for $M_{N2} \leq 1\,400$ daN m MR V 250 - 48x350 - 40 + R 2I, 3I or MR 2I, 3I 100⁽⁴⁾ $i_{final} = 40$
MR IV + R 2I, 3I  MR IV + MR 2I, 3I  $i_N \approx 500 \dots 16\,000$	MR IV 161 - 28x250 - 102 + R 2I, 3I or MR 2I, 3I 63⁽⁴⁾ $i_{final} = 102$	MR IV 200 - 38x300 - 81,8 + R 2I, 3I or MR 2I, 3I 80⁽⁴⁾ $i_{final} = 81,8$	MR IV 250 - 48x350 - 102 + R 2I, 3I or MR 2I, 3I 100⁽⁴⁾ $i_{final} = 102$

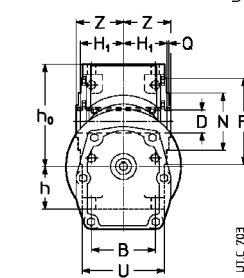
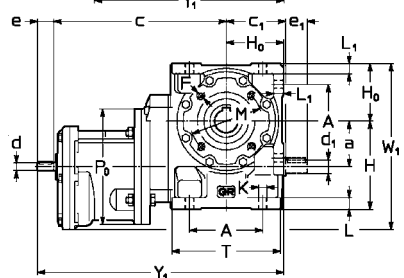


UTC 702

Final gear reducer size
50 ... 81
RV ... + RV ... ²⁾

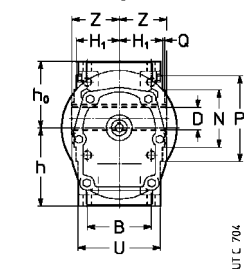
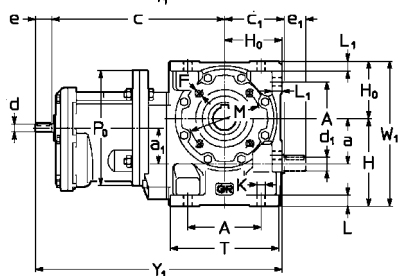


— 1 2 3



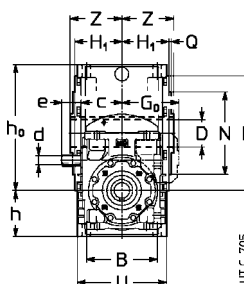
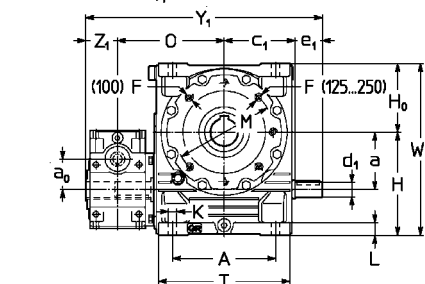
UTC 703

MR V ... + R 2I, 3I ...



UTC 704

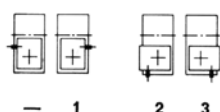
MR IV ... + R 2I ...



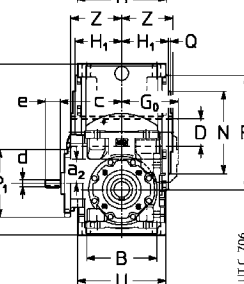
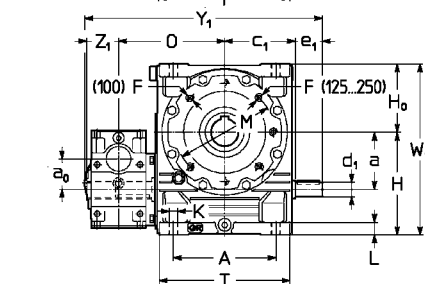
UTC 705

Final gear reducer size
100 ... 250

RV ... + RV ... ²⁾

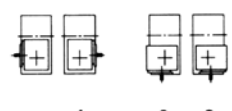


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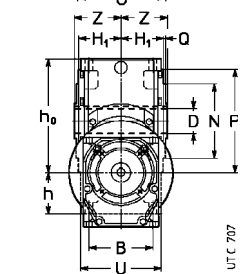
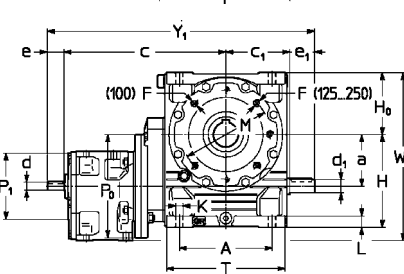


UTC 706

RV ... + R IV ... ²⁾

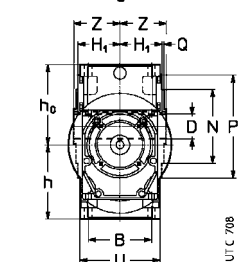
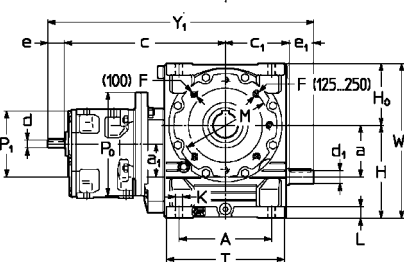
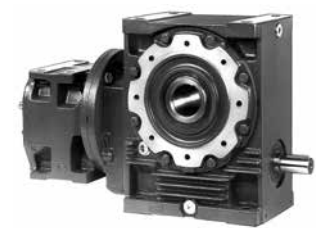


— 1 2 3



UTC 707

MR V ... + R 2I, 3I ...



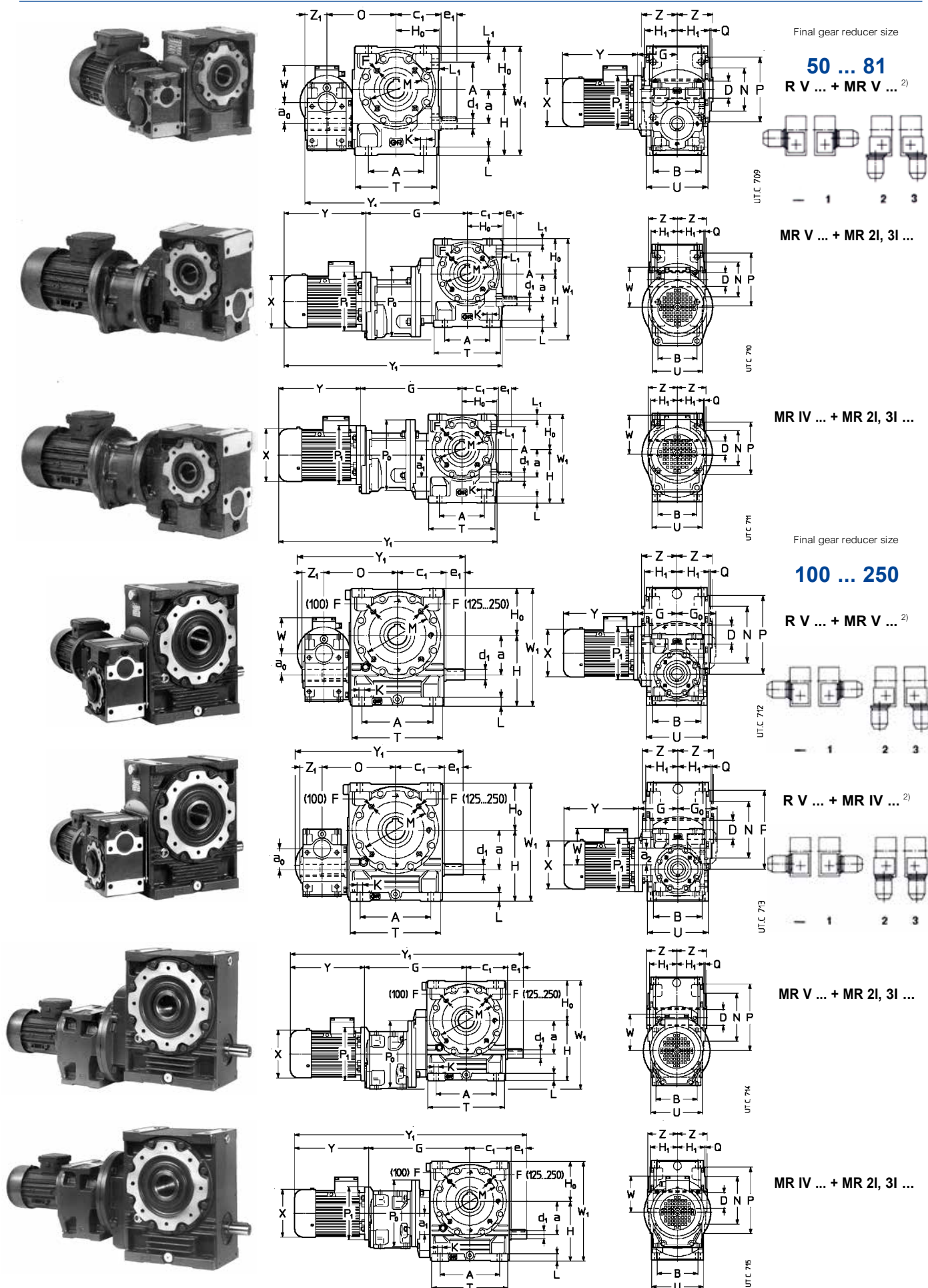
UTC 708

MR IV ... + R 2I, 3I ...

¹⁾ See catalogues for design, mounting position and oil quantities of single gear reducers.

²⁾ The coupling position of the initial gear reducer with respect to the final one should be described in detail, though only in the case of 1, 2 or 3.

Important: personal safety-guards are the Buyer's responsibility (2006/42/EC).



1) See relevant catalogues for design, mounting position and oil quantities of single gear reducers.

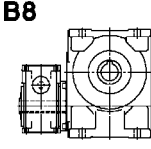
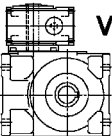
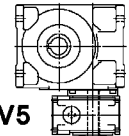
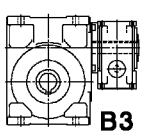
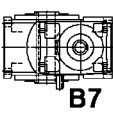
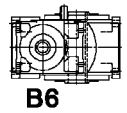
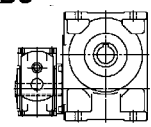
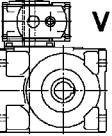
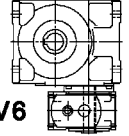
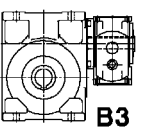
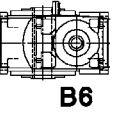
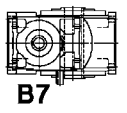
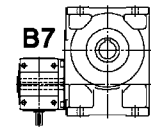
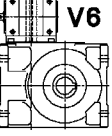
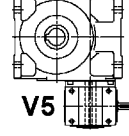
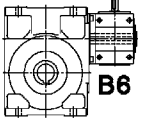
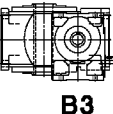
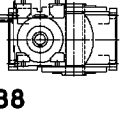
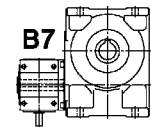
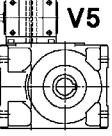
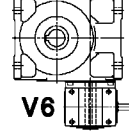
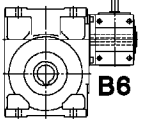
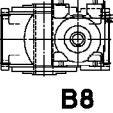
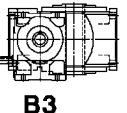
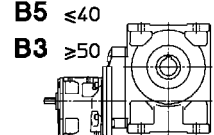
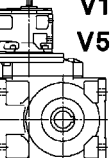
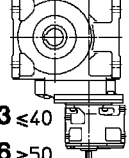
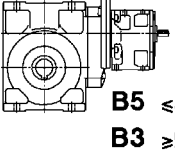
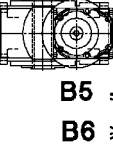
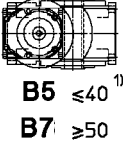
2) The coupling position of the initial gear reducer with respect to the final one should be described in detail, though only in the case of 1, 2 or 3.

Important: personal safety-guards are the Buyer's responsibility (2006/42/EC).

Initial gear reducer or gearmotor mounting position

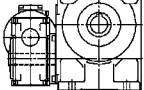
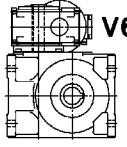
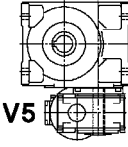
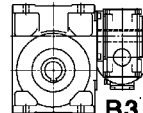
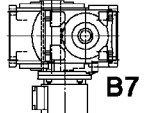
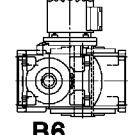
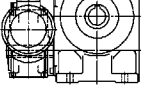
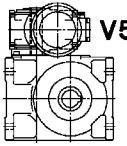
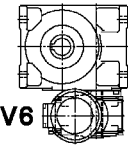
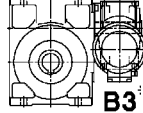
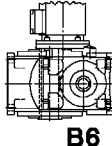
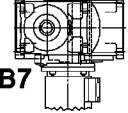
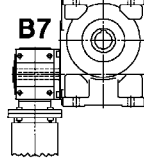
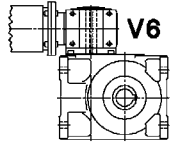
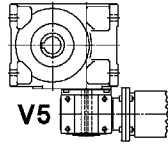
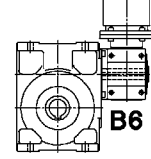
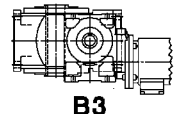
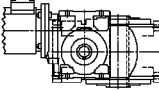
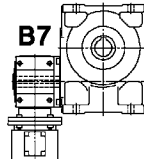
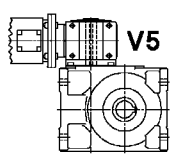
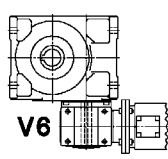
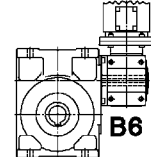
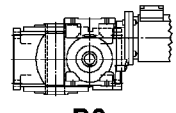
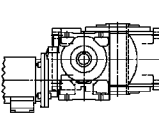
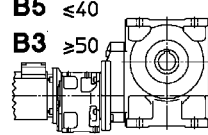
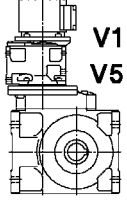
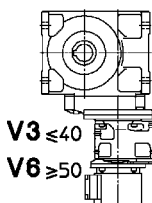
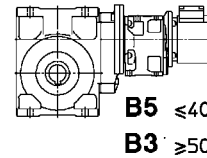
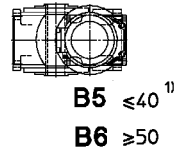
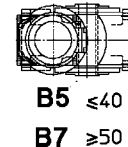
In order to make easier the individualization of the combined gear reducer and gearmotor mounting position refer to following table where, according to the final gear reducer mounting position and to the initial gear reducer or gearmotor coupling position, the mounting positions of the same initial gear reducer or gearmotor are stated.

Initial gear reducer mounting position

Coupling position	Final gear reducer mounting position					
	B3	B6	B7	B8	V5	V6
-	RV ... + RV ...		RV ... + RIV ...			
						
1	RV ... + RV ...		RV ... + RIV ...			
						
2	RV ... + RV ...		RV ... + RIV ...			
						
3	RV ... + RV ...		RV ... + RIV ...			
						
	MR V ... + R 2I, 3I ...		MR IV ... + R 2I, 3I ...			
						

1) Grease quantity is the same foreseen for B3 mounting position of cat. E.
On name plate there is a * in correspondence of mounting position.

Initial **gearmotor** mounting position²⁾

Coupling position	Final gear reducer mounting position					
	B3	B6	B7	B8	V5	V6
—	R V ... + MR V ...			R V ... + MR IV ...		
						
1	R V ... + MR V ...			R V ... + MR IV ...		
						
2	R V ... + MR V ...			R V ... + MR IV ...		
						
3	R V ... + MR V ...			R V ... + MR IV ...		
						
	MR V ... + MR 2I, 3I ...			MR IV ... + MR 2I, 3I ...		
						

1) Grease quantity is the same foreseen for B3 mounting position of cat. E.

On name plate there is a * in correspondence of mounting position.

1) For initial worm gearmotor the motor terminal box position is always in TB3 position see ch. 3.1).

Radial loads¹⁾ F_{r1} [daN] on high speed shaft end 3.11

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.

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

$$F_{r1} = \frac{2\,865 \cdot P_1}{d \cdot n_1} \text{ [daN]} \quad \text{for timing belt drive}$$

$$F_{r1} = \frac{4\,775 \cdot P_1}{d \cdot n_1} \text{ [daN]} \quad \text{for V-belt drive}$$

where: P_1 [kW] is power required at the input side of the gear reducer, n_1 [min^{-1}] is the speed, d [m] 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 they operate at $0,315 \cdot e$ multiply by 1,25; if they operate at $0,8 \cdot e$ multiply by 0,8.

n_1 min^{-1}	Gear reducer size															
	32		40		50		63, 64		80, 81		100		125, 126		160, 161	
	R V	R IV	R V	R IV	R V	R IV	R V	R IV	R V	R IV	R V	R IV	R V	R IV	R V	R IV
1 400	14	11,2	21,2	17	31,5	17	47,5	26,5	71	26,5	106	42,5	160	75	236	170
1 120	15	11,8	22,4	18	33,5	18	50	28	75	28	112	45	170	80	250	180
900	16	12,5	23,6	19	35,5	19	53	30	80	30	118	47,5	180	85	265	190
710	18	14	26,5	21,2	40	21,2	60	33,5	90	33,5	132	53	200	95	300	212
560	19	15	28	22,4	42,5	22,4	63	35,5	95	35,5	140	56	212	100	315	224
450	20	16	30	23,6	45	23,6	67	37,5	100	37,5	150	60	224	106	335	236
355	22,4	18	33,5	26,5	50	26,5	75	42,5	112	42,5	170	67	250	118	375	265
															425	265
															600	400

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.

Radial F_{r2} or axial loads F_{a2} [daN] on low speed shaft end 3.12

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 force may be established viewing the gear reducer from any point, providing the same point adopted for both.

Wherever possible, choose the load conditions corresponding the column on the **right**

Radial loads F_{r2}

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

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 unfavourably) and low speed shaft strength, clearly impose limits on permissible radial load.

The high value which radial load may take on, and the importance of not exceeding permissible values, make it necessary to take full advantage of the gear reducer's possibilities.

Permissible radial loads given in the table are therefore based on: the product of speed n_2 [min^{-1}] multiplied by bearing life L_h [h] required, the direction of rotation, the angular position ϕ [$^\circ$] of the load and torque M_2 [daN m] required.

Radial loads given in the table are valid for overhung loads on centre line of low speed shaft end, i.e. operating at a distance of $0,5 \cdot E$ (E = shaft end length) from the shoulder. If operating at $0,315 \cdot E$ multiply by 1,25; if operating at $0,8 \cdot E$ multiply by 0,8.

Radial F_{r2} or axial loads F_{a2} [daN] on low speed shaft end 3.12

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

$$F_{r2} = \frac{1\,910 \cdot P_2}{d \cdot n_2} \text{ [daN]}$$

for chain drive (lifting in general); for timing belt drive replace 1 910 with 2 865

$$F_{r2} = \frac{4\,775 \cdot P_2}{d \cdot n_2} \text{ [daN]}$$

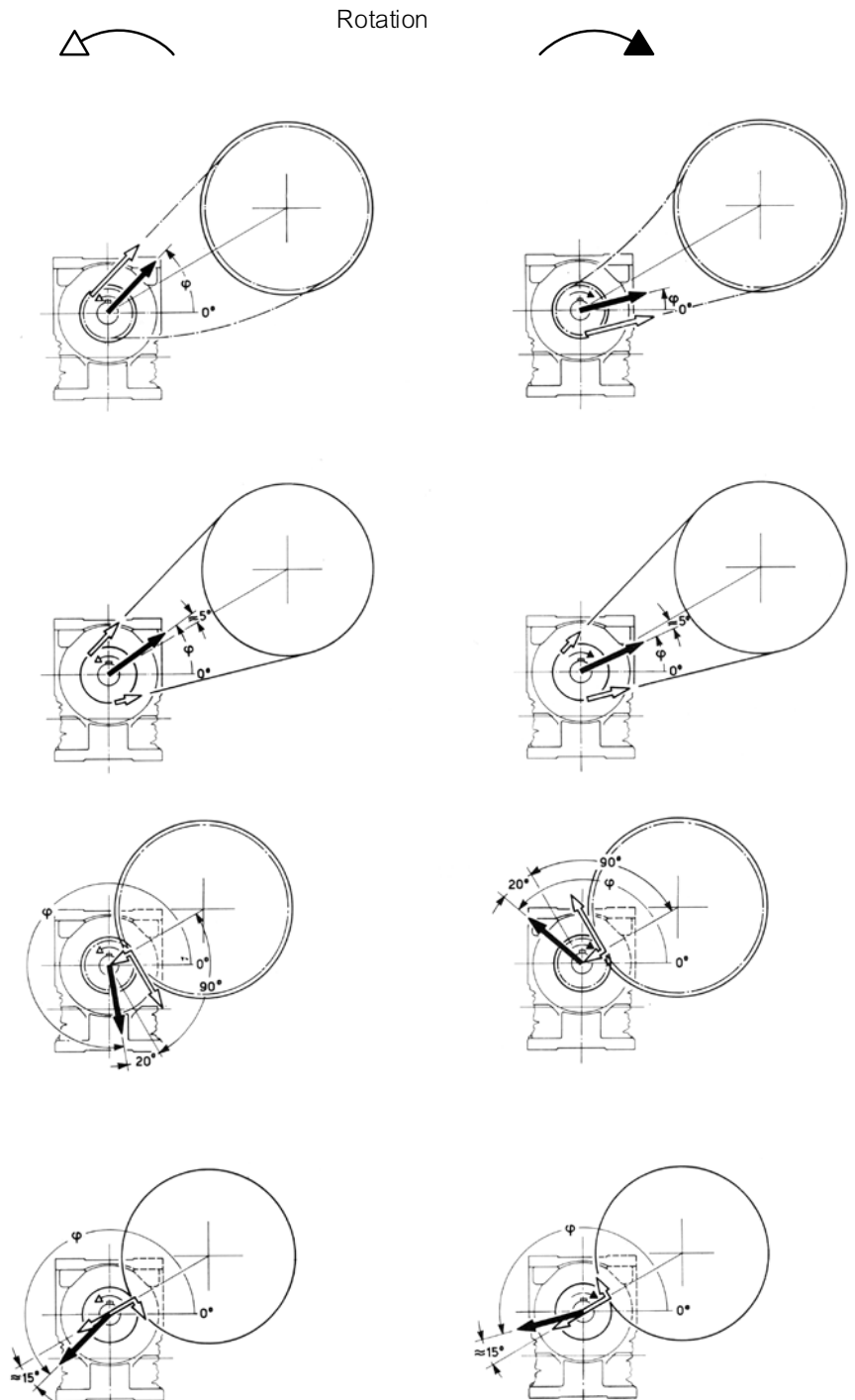
for V-belt drive

$$F_{r2} = \frac{2\,032 \cdot P_2}{d \cdot n_2} \text{ [daN]}$$

for spur gear pair drive

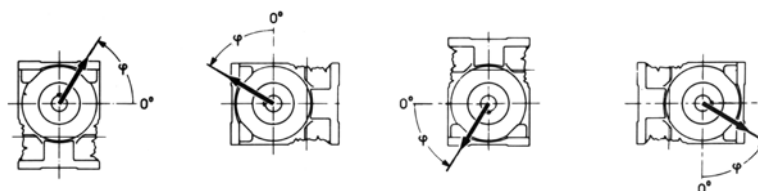
$$F_{r2} = \frac{6\,781 \cdot P_2}{d \cdot n_2} \text{ [daN]}$$

for friction wheel drive (rubber-on-metal)



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

IMPORTANT: 0° coincides with a half line lying parallel to the worm axis, and oriented as shown above, and therefore it follows the rotation of the worm axis as shown below.



Radial F_{r2} or axial loads F_{a2} [daN] on low speed shaft end 3.12

size **100 bis³⁾**

$n_2 \cdot L_n$ min ⁻¹ · h	M_2 daN m	$F_{r2}^{1)}$																$F_{a2}^{2)}$	
		0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
≤ 280 000	160	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
	112	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
355 000	80	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
	56	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
450 000	80	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
	56	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
560 000	80	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
	56	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
710 000	56	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
	40	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
900 000	56	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
	40	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
1 120 000	56	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
	40	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
	28	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
1 400 000	56	1180	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1180	1180	1250	1250	1250	560	850
	40	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
	28	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	900
1 800 000	56	1120	1180	1250	1250	1250	1250	1250	1180	1250	1250	1180	1120	1120	1250	1250	1250	560	800
	40	1180	1250	1250	1250	1250	1250	1250	1250	1250	1250	1180	1180	1180	1250	1250	1250	560	850
	28	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	1250	560	850
2 240 000	40	1120	1120	1250	1250	1250	1250	1250	1180	1250	1250	1180	1060	1120	1180	1250	1250	560	750
	28	1180	1180	1250	1250	1250	1250	1250	1180	1250	1250	1180	1120	1180	1250	1250	1250	560	800
2 800 000	40	1060	1060	1180	1250	1250	1250	1180	1060	1250	1180	1060	1000	1000	1120	1250	1250	560	710
	28	1060	1120	1180	1250	1250	1250	1180	1120	1250	1180	1120	1060	1060	1120	1250	1250	560	750
3 550 000	40	950	1000	1060	1180	1250	1180	1120	1000	1250	1120	1000	950	950	1060	1180	1250	560	670
	28	1000	1000	1060	1180	1180	1180	1120	1000	1180	1120	1000	1000	1000	1060	1180	1180	560	670
	20	1000	1060	1060	1120	1180	1120	1120	1060	1180	1120	1060	1000	1000	1060	1120	1180	560	710
max 1 250																		max 560	max 900

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) A radial load of up to 0,2 times the value in the table is permissible, simultaneously with the axial load. If exceeded consult us.
3) Values valid for taper roller bearings on low speed shaft (ch. 5).

Radial F_{r2} or axial loads F_{a2} [daN] on low speed shaft end 3.12

size 125 bis³⁾, 126 bis³⁾

$n_2 \cdot L_n$ min ⁻¹ · h	M_2 daN · m	$F_{r2}^{1)}$																$F_{a2}^{2)}$	
		0	45	90	135	180	225	270	315	0	45	90	135	180	225	270	315		
≤224 000	300 212	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	900 900	1400 1400
280 000	150 106	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	900 900	1400 1400
355 000	150 106	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	900 900	1400 1400
450 000	150 106	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	2000 2000	900 900	1400 1400
560 000	150 106 75	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	900 900 900	1400 1400 1400
710 000	150 106 75 53	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	900 900 900 900	1400 1400 1400 1400
900 000	106 75 53	1900 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	1900 2000 2000	1900 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	2000 2000 2000	900 900 900	1400 1400 1400
1 120 000	106 75 53 37,5	1800 1900 2000 2000	1900 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	1900 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	1900 2000 2000 2000	1800 1900 2000 2000	1800 1900 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	900 900 900 900	1320 1400 1400 1400
1 400 000	106 75 53 37,5	1700 1700 1800 1800	1700 1800 1900 1900	1900 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	1800 1800 1900 1900	1800 1800 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	1800 1700 1800 1800	1600 1700 1800 1800	1700 1700 1900 1900	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	900 900 900 900	1250 1320 1320 1320
1 800 000	106 75 53 37,5	1500 1600 1700 1700	1600 1600 1800 1800	1800 1800 1900 1900	2000 2000 2000 2000	2000 2000 2000 2000	1800 1800 1900 1900	1600 1700 1800 1800	1600 1700 1800 1800	2000 2000 2000 2000	2000 2000 2000 2000	1500 1600 1700 1700	1500 1600 1700 1700	1700 1700 1800 1800	2000 2000 2000 2000	2000 2000 2000 2000	2000 2000 2000 2000	900 900 900 900	1180 1180 1250 1250
2 240 000	75 53 37,5	1600 1600 1700	1600 1700 1800	1800 1800 1900	1900 1900 2000	1900 1900 2000	1800 1800 1900	1600 1700 1800	1600 1700 1800	2000 1900 1900	1800 1700 1700	1500 1600 1600	1500 1600 1700	1600 1600 1700	1700 1700 1800	1900 1900 2000	2000 2000 2000	900 900 900	1120 1180 1180
2 800 000	75 53 37,5	1500 1500 1600	1500 1600 1700	1600 1700 1800	1800 1800 1900	1800 1800 2000	1700 1700 1800	1500 1600 1600	1500 1600 1700	1900 1800 1800	1700 1600 1600	1400 1500 1500	1400 1500 1600	1500 1500 1600	1600 1600 1700	1800 1800 1900	1900 1800 1800	900 900 900	1060 1060 1120
3 550 000	75 53 37,5	1320 1400 1500	1400 1400 1500	1500 1600 1700	1700 1700 1800	1800 1700 1700	1600 1600 1600	1400 1500 1500	1400 1500 1500	1800 1700 1700	1600 1600 1500	1320 1400 1400	1320 1400 1500	1500 1500 1600	1700 1600 1700	1800 1700 1700	1800 1700 1700	850 900 900	1000 1000 1000
max 2 000																		max 900	max 1 400

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) A radial load of up to 0,2 times the value in the table is permissible, simultaneously with the axial load. If exceeded consult us.
3) Values valid for taper roller bearings on low speed shaft (ch. 5).

Worm gear pair

Number of teeth – wormwheel z_2 and worm z_1 , axial module m_x , reference lead angle γ_m , static efficiency η_s and worm gear pair moment of inertia J_1 for gear reducers and gearmotors **R V, R IV, MR V, MR IV, MR 2IV**.

In the case of **R IV, MR IV** and **MR 2IV** gear reducers and gearmotors, the moment of inertia on the high speed shaft (disregarding motor) is that of the worm divided by the cylindrical gear pair total ratio squared.

i		Gear reducer size									
		32	40	50	63, 64	80, 81	100	125, 126	160, 161	200	250
7	z_2/z_1	21/3	21/3	21/3	28/4	28/4					
	m_x	2,2	2,8	3,4	3,5	4,5					
	γ_m	22° 29'	22° 29'	22° 35'	28° 35'	28° 30'	—	—	—	—	—
	η_s	0,71	0,71	0,71	0,74	0,74					
10	z_2/z_1	20/2	20/2	20/2	30/3	30/3	30/3	30/3	30/3		
	m_x	2,3	2,8	3,5	3,3	4,2	5,3	6,6	8,6		
	γ_m	15° 10'	15° 10'	15° 7'	19° 52'	20° 28'	21° 20'	21° 53'	23° 1'	—	—
	η_s	0,65	0,65	0,65	0,69	0,7	0,7	0,7	0,72		
13	z_2/z_1	26/2	26/2	26/2	26/2	26/2	26/2	39/3	39/3	39/3	
	m_x	1,8	2,3	2,9	3,7	4,7	5,9	5,2	6,8	8,5	
	γ_m	13° 28'	13° 14'	13° 36'	14° 23'	14° 48'	15° 24'	18° 48'	19° 52'	20° 38'	—
	η_s	0,62	0,62	0,63	0,64	0,64	0,65	0,68	0,69	0,7	
16	z_2/z_1	32/2	32/2	32/2	32/2	32/2	32/2	32/2	32/2	48/3	48/3
	m_x	1,5	1,9	2,4	3,1	3,9	4,9	6,2	8	7,1	9
	γ_m	11° 52'	11° 53'	12° 4'	12° 47'	13° 14'	13° 47'	14° 7'	14° 52'	19° 4'	20° 21'
	η_s	0,6	0,6	0,6	0,61	0,62	0,63	0,63	0,64	0,68	0,69
20	z_2/z_1	20/1	20/1	20/1	40/2	40/2	40/2	40/2	40/2	40/2	40/2
	m_x	2,3	2,8	3,5	2,5	3,2	4,1	5,1	6,6	8,3	10,4
	γ_m	7° 41'	7° 40'	7° 46'	11° 46'	12° 1'	12° 29'	12° 24'	13° 6'	13° 36'	14° 3'
	η_s	0,5	0,5	0,5	0,6	0,6	0,61	0,61	0,62	0,63	0,63
25	z_2/z_1	25/1	25/1	25/1	25/1	25/1	25/1	50/2	50/2	50/2	50/2
	m_x	1,9	2,4	3	3,8	4,8	6,1	4,2	5,4	6,8	8,6
	γ_m	6° 55'	6° 52'	6° 58'	7° 21'	7° 34'	7° 53'	11° 33'	11° 49'	12° 28'	13° 18'
	η_s	0,48	0,48	0,48	0,5	0,5	0,51	0,59	0,6	0,61	0,62
32	z_2/z_1	32/1	32/1	32/1	32/1	32/1	32/1	32/1	32/1	32/1	64/2
	m_x	1,5	1,9	2,4	3,1	3,9	4,9	6,2	8	10,1	6,8
	γ_m	6°	6°	6° 3'	6° 25'	6° 38'	6° 55'	7° 5'	7° 27'	7° 43'	11° 22'
	η_s	0,45	0,45	0,45	0,46	0,47	0,48	0,49	0,5	0,51	0,59
40	z_2/z_1	40/1	40/1	40/1	40/1	40/1	40/1	40/1	40/1	40/1	40/1
	m_x	1,3	1,6	2	2,5	3,2	4,1	5,1	6,6	8,3	10,4
	γ_m	5° 12'	5° 10'	5° 16'	5° 54'	6° 2'	6° 16'	6° 13'	6° 34'	6° 50'	7° 3'
	η_s	0,42	0,42	0,42	0,44	0,45	0,46	0,46	0,47	0,48	0,49
50	z_2/z_1	50/1	50/1	50/1	50/1	50/1	50/1	50/1	50/1	50/1	50/1
	m_x	1	1,3	1,6	2,1	2,7	3,3	4,2	5,4	6,8	8,6
	γ_m	4° 29'	4° 25'	4° 32'	5° 7'	5° 15'	5° 27'	5° 48'	5° 56'	6° 15'	6° 41'
	η_s	0,38	0,38	0,38	0,41	0,42	0,43	0,44	0,45	0,46	0,47
63	z_2/z_1		63/1	63/1	63/1	63/1	63/1	63/1	63/1	63/1	63/1
	m_x		1	1,3	1,7	2,1	2,7	3,4	4,4	5,5	6,9
	γ_m		3° 43'	3° 50'	4° 21'	4° 27'	4° 39'	4° 57'	5° 5'	5° 22'	5° 46'
	η_s		0,34	0,35	0,38	0,38	0,39	0,4	0,41	0,42	0,44
Moment of inertia (of mass) J_1 [kg m ²] on the worm $\approx$		—	—	—	—	—	0,0014	0,0037	0,0078	0,0192	0,0376

Low speed shaft angular backlash

A rough guide for low speed shaft angular backlash is given in the table (the worm being held stationary). Values vary according to design and temperature.

Gear reducers with **controlled** or **reduced backlash** can be supplied on request (see ch. 5), subject to longer delivery times and price addition; choose a **higher** service factor.

Gear reducer size	Angular backlash [rad] ¹	
	min	max
32	0,0030	0,0118
40	0,0025	0,0100
50	0,0020	0,0080
63, 64	0,0018	0,0071
80, 81	0,0016	0,0063
100	0,0013	0,0050
125, 126	0,0011	0,0045
160, 161	0,0010	0,0040
200	0,0008	0,0032
250	0,0007	0,0028

¹) At a distance of 1 m from the low speed shaft centre, angular backlash in mm is obtained multiplying the table value by 1 000 (1 rad = 3438').

Gear ratio of input helical gear stage (garmotors MR IV, MR 2IV)

The partial transmission ratio of input helical gear stage is given in the table; this ratio has to be used when calculating the input speed of the intermediate worm shaft.

i _N	MR IV gearmotor size																		
	Motor main coupling dimensions Ød ØP																		
	32		40, 50			63 ... 100			125, 126			160 ... 200			250				
	11×140	11×140	14×160	19×200	14×160 (19×200) ¹⁾	19×200 (24×200) ¹⁾	24×200 (28×250) ¹⁾	24×200	28×250	38×300	28×250	38×300	42×350 48×350	38×300	42×350 48×350	55×400 60×450			
	i 2)	i 2)	i 2)	i 2)	i 2)	i 2)	i 2)	i 2)	i 2)	i 2)	i 2)	i 2)	i 2)	i 2)	i 2)	i 2)			
31,5	–	–	–	–	32,5 2,03	–	–	32 2	–	–	–	32,5 2,03	–	–	–	32 2			
40	41,5 2,59	–	–	40,6 2,54	40,6 2,03	–	–	40,6 2,54	40,6 2,03	–	–	40,9 2,56	40 2	–	–	40,9 2,56	40 2		
50	51,8 2,59	56 3,5	50,7 2,54	50,8 2,03	50,9 3,18	50,8 2,54	50 2	–	50,7 2,54	50,8 2,03	50,8 3,17	51,1 2,56	50 2	–	–	51,1 2,56	50 2		
63	64,8 2,59	70 3,5	63,4 2,54	65 2,03	63,6 3,18	63,5 2,54	64 2	–	63,4 2,54	65 2,03	63,5 3,17	63,9 2,56	64 2	–	–	63,9 2,56	64 2		
80	82,9 2,59	87,5 3,5	81,1 2,54	–	79,5 3,18	81,2 2,54	80 2	78,1 3,13	81,1 2,54	81,2 2,03	79,3 3,17	81,8 2,56	80 2	79,3 3,17	81,8 2,56	80 2			
100	104 2,59	112 3,5	101 2,54	–	102 3,18	102 2,54	100 2	100 3,13	101 2,54	–	102 3,17	102 2,56	102 2,56	102 3,17	102 2,56	102 2,56			
125	–	–	140 3,5	127 2,54	–	122 3,8	127 2,54	126 2	125 3,13	125 3,13	–	127 3,17	128 2,56	128 2,56	127 3,17	127³⁾ 3,17 ³⁾	–	–	
160	–	–	175 3,5	–	–	152 3,8	160 2,54	–	154 3,86	156 3,13	–	160 4	161 2,56	–	152 3,8	159 3,17	–	–	
200	–	–	221 3,5	–	–	190 3,8	–	–	193 3,86	197 3,13	–	200 4	–	–	190 3,8	200 3,17	–	–	
250	–	–	–	–	–	239 3,8	–	–	243 3,86	–	–	252 4	–	–	239 3,8	–	–	–	–

i_N	MR 2IV gearmotor size									
	Motor main coupling dimensions Ød ØP									
	40, 50		63 ... 81		100		125, 126			
	11x140	14x160	14x160	19x200	19x200	24x200	24x200	28x250		
	i	2)	i	2)	i	2)	i	2)	i	2)
80	–	–	82,4	5,15	–	–	81,2	5,08	–	–
100	114	7,11	103	5,15	–	–	102	5,08	–	–
125	142	7,11	129	5,15	–	–	127	5,08	–	–
160	178	7,11	158	7,91	159	6,36	162	5,08	159	6,34
200	218	10,9	198	7,91	204	6,36	202	8,08	203	6,34
250	273	10,9	–	–	253	10,1	258	8,08	254	6,34
315	349	10,9	–	–	302	12,1	323	8,08	302	9,75
400	437	10,9	–	–	387	12,1	–	–	387	12
500	–	–	–	–	484	12,1	–	–	484	12
630	–	–	–	–	605	12,1	–	–	605	12

- 1) Motor coupling dimensions valid for gearmotor size 100.
2) Partial transmission ratio of input helical gear stage.
3) With motor size 180 values are **128** and **2,56** respectively.

Efficiency η

Efficiency η is derived from the P_{N2} / P_{N1} ratio in the case of gear reducers (ch. 3.5) and P_2 / P_1 in the case of gearmotors (ch. 9). The values obtained will be valid assuming normal working conditions, worm operating as driving member, proper lubrication, adequate running-in (ch. 4), and a load near to the nominal value.

During the **initial working period** (about 50 hours) and generally at every cold start, efficiency will be lower (by about 12% for worms with $z_1 = 1$; 6% for worms with $z_1 = 2$ and 3% for worms with $z_1 = 3$).

«**Static**» efficiency η_s on starting (see table in the preceding section) is much lower than η («starting friction») must be overcome at speed 0; as speed picks up gradually, efficiency will rise correspondingly until the catalogue value is reached.

Inverse efficiency η_{inv} – produced by the wormwheel as driver – is always less than η . It can be calculated approximately as follows:

$$\eta_{inv} \approx 2 - 1 / \eta; \quad \text{likewise:} \quad \eta_s \approx 2 - 1 / \eta_s$$

Irreversibility

A worm gear reducer or gearmotor is **dynamically irreversible** (that is, it ceases to turn the instant the wormshaft receives no further stimulus that would keep the worm itself in rotation e.g. motor torque, inertia from the worm and related fan, motor flywheels, couplings, etc.) when $\eta < 0,5$ as η_{inv} then drops below 0.

This state becomes necessary wherever there is a **need for stopping and holding** the load, even without the aid of a brake. Where continuous vibration occurs, dynamic irreversibility may not be obtainable.

A gear reducer or gearmotor is **statically irreversible** (that is, rotation cannot be imparted by way of the low speed shaft) when $\eta_s < 0,5$. This is a state **necessary to keep the load at standstill**; taking into account, however, that efficiency can increase with time spent in operation, it would be advisable to assume $\eta_s \leq 0,4$ ($\gamma_m < 5^\circ$).

Where continuous vibration occurs, static irreversibility may not be obtainable.

A gear reducer or gearmotor has **low static reversibility** (i.e. rotation may be imparted by way of the low speed shaft with high torque and/or vibration) when $0,5 < \eta_s \leq 0,6$ ($7^\circ 30' < \gamma_m \leq 12^\circ$).

A gear reducer or gearmotor has **complete static reversibility** (i.e. rotation may be imparted by way of the low speed shaft) when $\eta_s > 0,6$ ($\gamma_m > 12^\circ$).

This state is advisable where there is a **need for easy start-up of the gear reducer by way of the low speed shaft**.

Overloads

Since worm gear pairs are often subject to high static and dynamic overloads by dint of the fact that they are especially suited to bear them, the need arises – more so than with other gear pairs – for verifying that such overloads will always remain lower than $M_{2\max}$ (ch. 3.5).

Overloads are normally generated when one has:

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

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

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

Starting torque

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

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

where:

$M_{2\text{ required}}$ is torque absorbed by the machine through work and friction;

$M_{2\text{ available}}$ is output torque derived from the motor's nominal power rating;

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

J is the external moment of inertia (of mass) in kg m² (gear reducers, couplings, driven machine) referred to the motor shaft;

for other symbols see ch. 2b.

NOTE: When seeking to verify that starting torque is sufficiently high for starting, take into account efficiency η when evaluating $M_{2\text{ available}}$, and starting friction, if any, in evaluating $M_{2\text{ required}}$.

Stopping machines with high kinetic energy (high moments of inertia combined with high speeds) with or without braking (braking applied to wormshaft, or use of brake motor)

Select a gear reducer with static reversibility ($\eta_s > 0,5$); if using a brake motor, verify braking stress with the following formula:

$$\left(\frac{Mf}{\eta_{s\text{ inv}}} \cdot i + M_{2\text{ required}} \right) \frac{J}{J + J_0 / \eta_{s\text{ inv}}} - M_{2\text{ required}} \leq M_{2\max}$$

where:

Mf is the braking torque setting (see table in ch. 2b).

$\eta_{s\text{ inv}}$ is static inverse efficiency (see previous heading);

for other symbols see above and ch.1.

Where selection of a statically reversible gear reducer is not possible (i.e. $\eta_s \leq 0,5$) slowing-down should be sufficiently gradual (avoiding application of excessive stress to the unit itself) as to ensure that:

$$\frac{J_2 \cdot \alpha_2}{10} - M_2 \leq M_{2\max}$$

where:

J_2 [kg m²] is the moment of inertia (of mass) of the driven machine referred to the gear reducer's low speed shaft;

M_2 [daN m] is torque absorbed by the machine through work and friction;

α_2 [rad/s²] is the low speed shaft's angular deceleration; this may be reduced by flywheel fitted to the wormshaft, electric deceleration ramps, lowering of braking torque when braking systems are in use, etc.

α_2 may be arrived at theoretically (within broadly safe limits) or experimentally (by testing against stopping time and distance etc.).

If a brake motor is in use, the following formula may be used for a safe evaluation of α_2 :

$$\alpha_2 = \frac{10 \cdot Mf}{J_0 \cdot i}$$

in which the motor is presumed without load and subject to its braking torque setting Mf [daN m] (see table in ch. 2b).

Operation with brake motor

Stating time t_a and revolutions of motor φ_{a_1}

$$t_a = \frac{(J_0 + J/\eta) \cdot n_1}{95,5 \left(M_{\text{start}} - \frac{M_2 \text{ required}}{i \cdot \eta} \right)} \text{ [s];} \quad \varphi_{a_1} = \frac{t_a \cdot n_1}{19,1} \text{ [rad]}$$

Braking time t_f and revolutions of motor φ_{f_1}

$$t_f = \frac{(J_0 + J/\eta_{\text{inv}}) \cdot n_1}{95,5 \left(M_{\text{f}} + \frac{M_2 \text{ required} \cdot \eta_{\text{inv}}}{i} \right)} \text{ [s];} \quad \varphi_{f_1} = \frac{t_f \cdot n_1}{19,1} \text{ [rad]}$$

where:

M_{start} [daN m] is motor starting torque $\left(\frac{955 \cdot P_e}{n_1} \cdot \frac{M_{\text{start}}}{M_N} \right)$ (see ch. 2b);
 M_{f} [daN m] is the braking torque setting of the motor (see ch. 2b);
 for other symbols see above and ch. 1.

With the gear reducer run in and operating at normal running temperature — assuming a regular air-gap and ambient humidity and utilizing suitable electrical equipment — repetition of the braking action, as affected by variation in temperature of the brake and by the state of wear of friction surface, is approx $\pm 0,1 \cdot \varphi_{f_1}$.
 During warm-up ($1 \div 3$ h, small through to large sizes), braking times and distances tend to increase to the point of stabilizing at or around values corresponding to rated catalogue efficiency.

Duration of friction surface

As a rough guide, the number of applications permissible between successive adjustments of the air-gap is given by the following formula:

$$\frac{W \cdot 10^5}{M_{\text{f}} \cdot \varphi_{f_1}}$$

where:

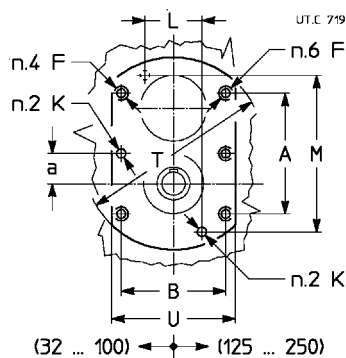
W [MJ] is the work of friction between successive adjustments of the air-gap as indicated in the table. For other symbols see above.

The air-gap should measure between 0,25 minimum and 0,7 maximum; as a rough guide, 5 adjustments can be made.

Grandezza motore Motor size	W MJ
63	10,6
71	14
80	18
90	24
100	24
112	45
132	67
160, 180M	90
180L, 200	125

Gear reducers input face

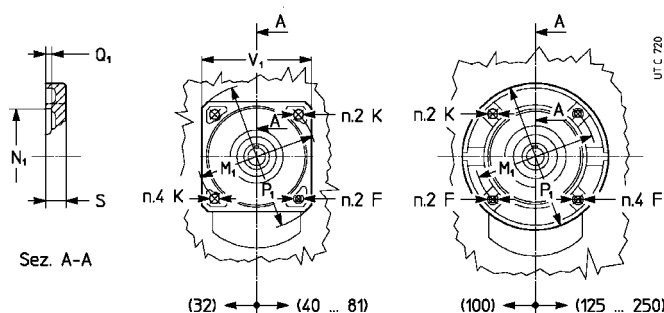
The **R V** gear reducer input face has a machined surface with tapped holes for fitting motor mounting etc.



Grandezza riduttore Gear reducer size	a	A	B	F	K Ø H8	L	M	T Ø	U
				1)	2)				
32	16	72	54	M 5	5	—	—	103	66
40, 50	20	81,5	66,5	M 5	5	—	—	119	80
63 ... 81	25	106	80	M 6	6	—	—	149	96
100	31,3	125	108	M 8	8	—	—	187	129
125, 126	40	166	136	M 8	8	78	216	252	157
160 ... 200	50	214	168	M 10	10	98	268	312	194
250	62,5	274	210	M 12	12	128	332	387	241

1) Working length of thread 2 · F.
 2) Working length of hole 1,6 · K.

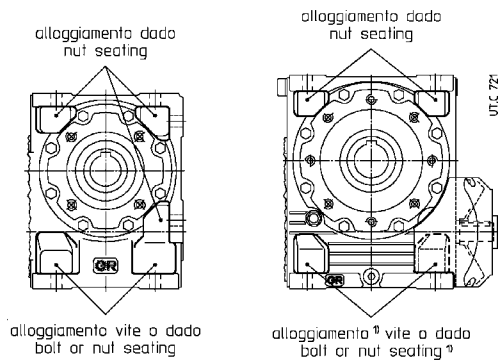
The **R IV** gear reducer input face has a machined flange with holes for fitting motor mountings etc.



Grandezza riduttore Gear reducer size	F	K Ø	M1 Ø	N1 Ø H7	P1 Ø	V1 □	Q1	S
	1)							
32	—	9,5	115	95	140	105	4	10
40, 50	M 8	9,5	115	95	140	105	4	11
63 ... 81	M 8	9,5	130	110	160	120	4,5	12
100	M 10	11,5	165	130	200	—	4,5	14
125, 126	M 10	—	165	130	200	—	4,5	16
160 ... 200	M 12	—	215	180	250	—	5	18
250	M 12	—	265	230	300	—	5	20

1) Working length of thread 1,25 · F.

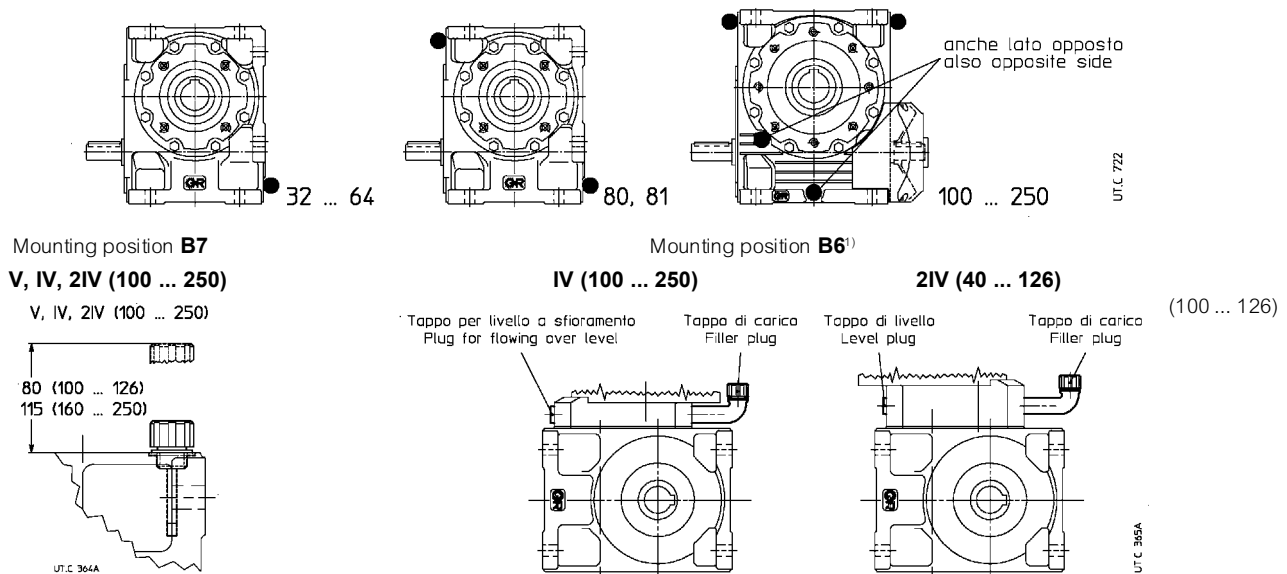
Fixing bolt dimensions for gear reducer feet



1) When tightening bolts at the fan side (sizes 100 ... 250) the fan cowl (which must enclose the fan assembly in order to enhance air-flow) needs to be removed for the purpose. When installing, ensure the cowl clears any surrounding walls by at least half the gear reducer's centre distance.

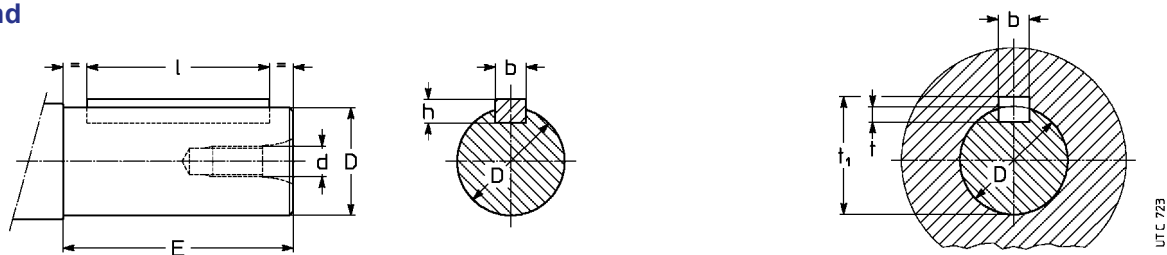
Grandezza riduttore Gear reducer size	Vite Bolt UNI 5737-88 (l max)
32	M 6 × 25
40	M 8 × 35
50	M 8 × 40
63, 64	M 10 × 50
80, 81	M 12 × 60
100	M 14 × 55
125, 126	M 16 × 65
160, 161	M 20 × 80
200	M 24 × 90
250	M 30 × 120

Plug position



1) For high input speed duty an expansion tank is envisaged.

Shaft end



Shaft end

Shaft end				Parallel key		Keyway		
D ⁽¹⁾ Ø		E ⁽²⁾	d Ø	b × h × l ⁽²⁾		b	t	t ₁
11	j 6	23 (20)	M 5	4 × 4 × 18	(12)	4	2,5	12,7
14	j 6	30 (25)	M 6	5 × 5 × 25	(16)	5	3	16,2
16	j 6	30	M 6	5 × 5 × 25		5	3	18,2
19	j 6	40 (30)	M 6	6 × 6 × 36	(25)	6	3,5	21,7
24	j 6	50 (36)	M 8	8 × 7 × 45	(25)	8	4	27,2
28	j 6	60 (42)	M 8	8 × 7 × 45	(36)	8	4	31,2
32	k 6	80 (58)	M 10	10 × 8 × 70	(50)	10	5	35,3
38	k 6	80 (58)	M 10	10 × 8 × 70	(50)	10	5	41,3
40	h 7	58	M 10	12 × 8 × 50		12	5	43,3
48	k 6	110 (82)	M 12	14 × 9 × 90	(70)	14	5,5	51,8
55	m 6	110 (82)	M 12	16 × 10 × 90	(70)	16	6	59,3
60	m 6	105	M 16	18 × 11 × 90		18	7	64,4
70	j 6	105	M 16	20 × 12 × 90		20	7,5	74,9
75	j 6	105	M 16	20 × 12 × 90		20	7,5	79,9
90	j 6	130	M 20	25 × 14 × 110		25	9	95,4
110	j 6	165	M 24	28 × 16 × 140		28	10	116,4

1) Tolerance valid only for high speed shaft end. Diameter D tolerance for low speed shaft end (ch. 5) is h7 for D ≤ 60, j6 for D ≥ 70.

2) Values in brackets are for short shaft end.

Hollow low speed shaft

Hole	Parallel key	Keyway		
D Ø H7	b × h × l*	b	t	t ₁
19	6 × 6 × 36	6	3,5	21,7
24	8 × 7 × 45	8	4	27,2
28	8 × 7 × 63	8	4	31,2
32	10 × 8 × 70	10	5	35,3
38	10 × 8 × 90	10	5	41,3
40	12 × 8 × 90	12	5	43,3
48	14 × 9 × 110	14	5,5	51,8
60	18 × 11 × 140	18	7	64,4
70	20 × 12 × 180	20	7,5	74,9
75	20 × 12 × 180	20	7,5	79,9
90	25 × 14 × 200	25	9	95,4
110	28 × 16 × 250	28	10	116,4

* Recommended length.

Shaft end of driven machine

Dimensions of shaft end to which the gear reducer's hollow shaft is to be keyed are those recommended in the table on following page and shown in the figures below.

Sizes 32 ... 50: fitting with key (fig. a) or fitting with key and locking rings (fig. b).

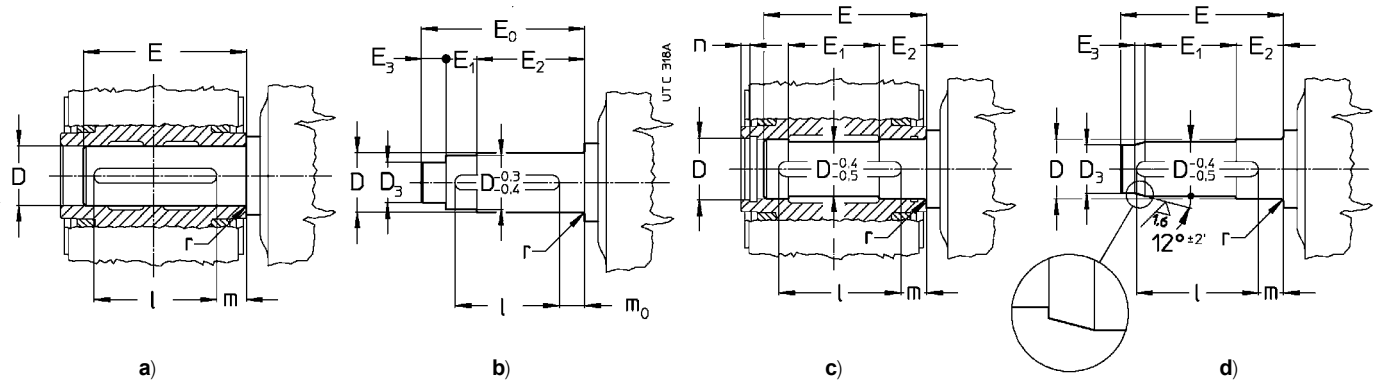
Sizes 63 ... 250: fitting with key (fig. c) or fitting with key and locking bush (fig. d); see also ch.4 and 5.

In the case of cylindrical shaft end with only diameter D (fig. a, c), for the seat D on input side, we recommend tolerance h6 or j6 instead of j6 or k6 to facilitate mounting.

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

32 ... 50

63 ... 250



Gear reducer size	D Ø H7/j6, k6	D ₃ Ø H7/h6	E	E ₀	E ₁	E ₂	E ₃	l	m	m ₀	n	r
32	19	15	62,5	67	0	59	8	36	21	19,5	—	1,5
40	24	19	76,5	81	13	54	14	45	23,5	18,5	—	1,5
50	28	24	87	91,5	16,5	61	14	63	21,5	11	—	1,5
63, 64	32	27	110	—	57	34	10	70	28	—	6	1,5
80	38	32	134	—	71	39,5	12	90	30	—	6	1,5
81	40	34	134	—	71	39,5	12	90	30	—	6	1,5
100	48	41	162	—	87	46,5	14	110	35	—	7	2
125, 126	60	52	193	—	102	55	16	140	32	—	7	2
160	70	62	228	—	124	63	16	180	35	—	8	2
161	75	66	228	—	124	63	18	180	35	—	8	2
200	90	80	274	—	150	75	21	200	50	—	9	3
250	110	98	331	—	180	90	25	250	55	—	10	3

Maximum bending moment of flange MR

In case of assembly of motors supplied by the customer, verify that the static bending moment M_b generated by motor weight on the counter flange of gear reducer is lower than the value allowed M_{bmax} stated in the table:

$$M_b \leq M_{bmax}$$

where:

$$M_b = G \cdot (X + HF) / 1000 \text{ [daN m]}$$

G [daN] motor weight; numerically nearly equal to motor mass, expressed in kg

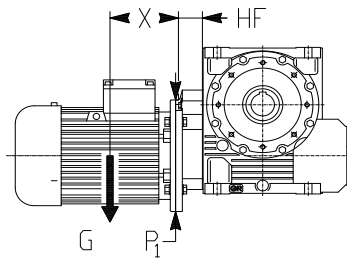
X [mm] distance from motor center of gravity from flange surface

HF [mm] given in the table, according to gear reducer size and flange diameter P_1 .

Very long and thin motors, though with bending moments within the prescribed limits, may generate anomalous vibrations during the operation. In these cases it is necessary to foresee a proper additional motor support (see motor specific documentation).

Loads higher than permissible loads may be present in dynamical applications where the gearmotor is subjected to translations, rotations or oscillations (e.g.: **shaft mounting arrangements**): consult us for the study of every specific case

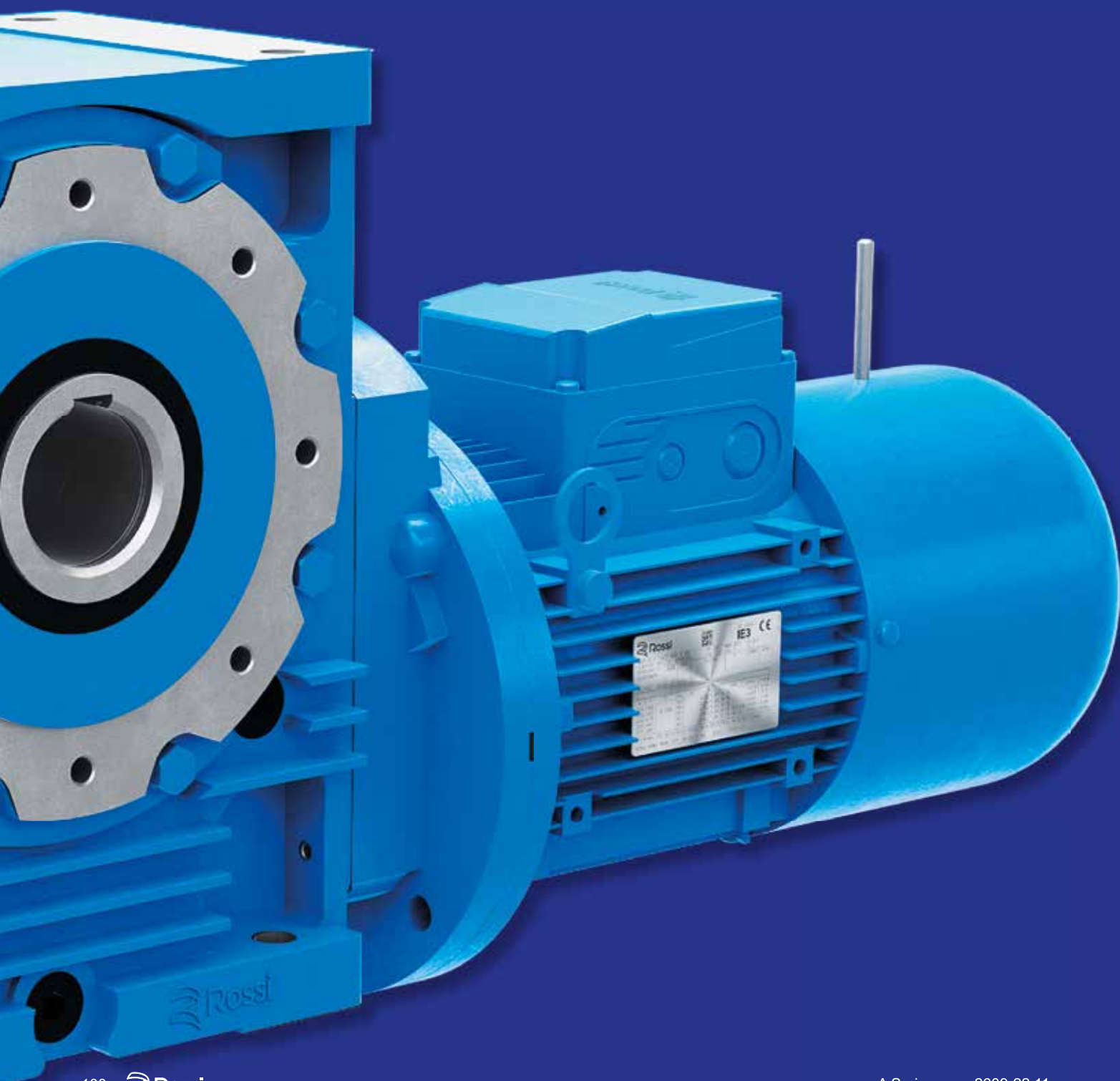
Max allowable bending moment to M_{bmax} and HF dimension



Gear reducer size	P_1 Ø	V, IV		2IV	
		HF mm	M_{bmax} daN m	HF mm	M_{bmax} daN m
32	140	28	5,6	—	—
	160	30	5,6	—	—
40, 50	140	31	6,3	50	6,3
	160	31	6,3	50	6,3
	200	43	6,3	—	—
63 ... 81	160	38	11,2	65	11,2
	200	38	11,2	65	11,2
	250	38	11,2	—	—
100	200	45	28	78	28
	250	45	28	—	—
	300	65	28	—	—
125, 126	200	55	50	99	50
	250	55	50	99	50
	300	56	56	—	—
160 ... 200	250	67	100	—	—
	300	67	100	—	—
	350	80	112	—	—
	400	80	112	—	—
250	300	80	180	—	—
	350	80	180	—	—
	400	80	180	—	—
	450	90	200	—	—

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Installation and maintenance





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4.1- 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).

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 and/or gear reducer and eventual flange **B5** it is recommended to use **locking adhesives** such as LOCTITE on the fastening screws (also on flange mating surfaces).

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

Gear reducers and gearmotors 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, or where the motor is installed vertical with fan uppermost.

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

Before wiring-up the gearmotor, make sure that motor voltage corresponds to input voltage. If the direction of rotation is not as desired, invert two phases at the terminals.

Star-delta starting should be adopted for starting on no load (or with a very small load) and/or when the necessity is for smooth starts, low starting current and limited stresses.

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

Where duty cycles involve a high number of starts on-load, it is advisable to utilize **thermal probes** (fitted on the wiring) for motor protection; a thermal overload relay is unsuitable since its threshold must be set higher than the motor's nominal current rating.

Use varistors to limit voltage peaks due to contactors.

Caution! 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.

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.

Gear reducer or gearmotor should not be put into service before it has been incorporated on a machine which is conform to 2006/42/EC directive.

For brake or special motors, consult us for specific information.

Fitting of components to shaft ends

It is recommended that the bore of parts keyed to shaft ends is machined to H7 tolerance; G7 is permissible for high speed shaft ends $D \geq 55$ mm, provided that load is uniform and light; for low speed shaft ends, tolerance must be **K7** when load is not uniform and light. Other details are given in the «Shaft end» table (ch. 3.13).

Before mounting, clean mating surfaces thoroughly and lubricate against seizure and fretting corrosion.

Installing and removal operations should be carried out with **pullers** and **jacking screws** using the tapped hole at the shaft butt-end; for H7/m6 and K7/j6 fits it is advisable that the part to be keyed is pre-heated to a temperature of $80 \div 100$ °C.

Hollow low speed shaft

For the shaft end of machines where the hollow shaft of the gear reducer is to be keyed, j6 or k6 tolerances are recommended (according to requirements). Other details are given under «Shaft end» and «Shaft end of driven machine» (ch. 3.13).

In order to have an easier installing and removing of gear reducer sizes 63 ... 250 (with circlip groove) proceed as per the drawings a, b, respectively.

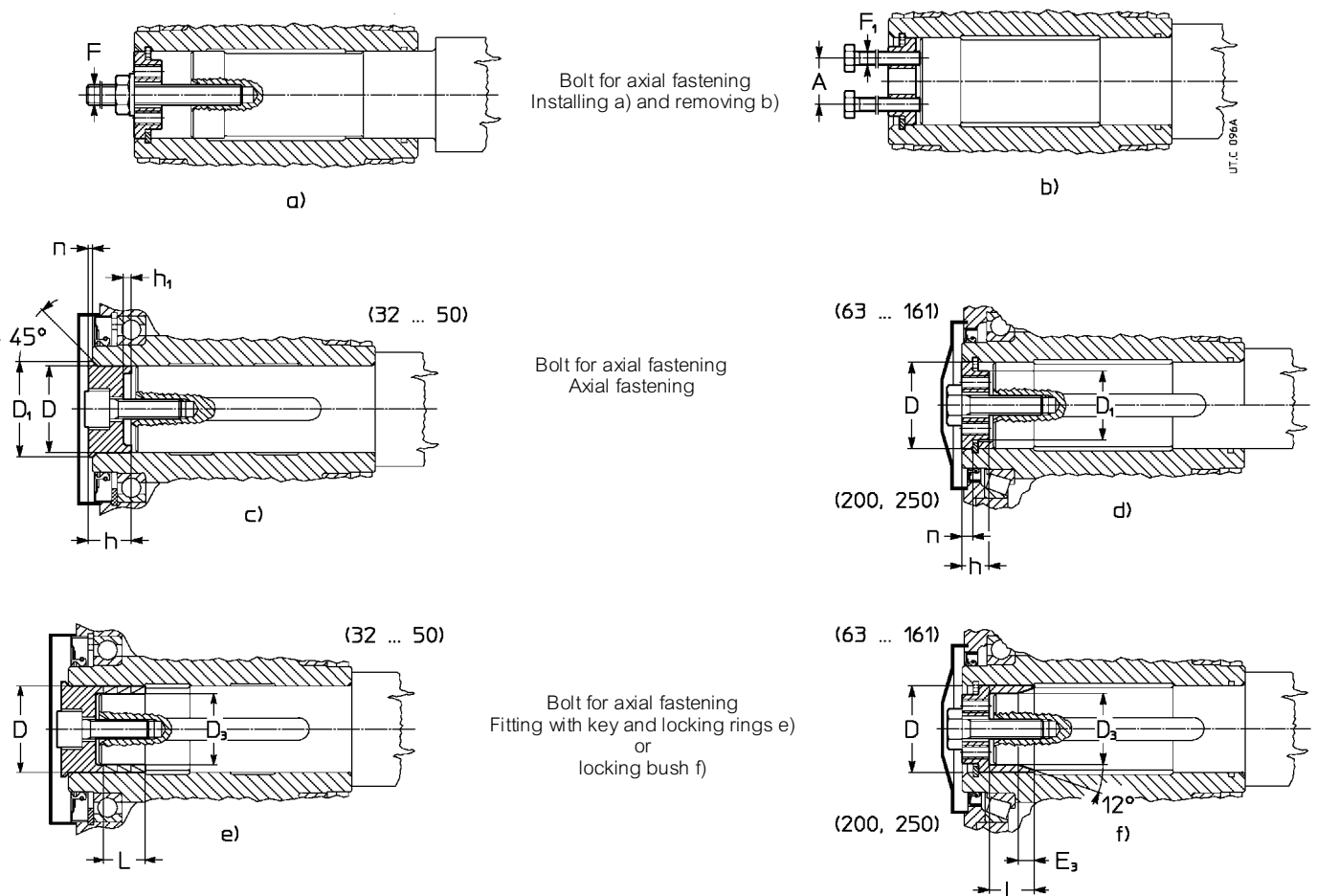
The system illustrated in the fig. c, d is good for axial fastening.

For sizes 63 ... 250, when shaft end of driven machine has no shoulder a spacer may be located between the circlip and the shaft end itself (as in the lower half of the fig. d).

The use of **locking rings** (sizes 32 ... 50, fig. e), or of **locking bush** (sizes 63 ... 250, fig. f) will permit easier and more accurate installing and removing and to eliminate backlash between key and keyway.

The locking rings or the locking bush are fitted after mounting, the shaft end of the driven machine must be as prescribed at ch. 3.13. Do not use molybdenum bisulphide or equivalent lubricant for the lubrication of the parts in contact. We recommend the use of a **locking adhesive** such as LOCTITE 601. For vertical ceiling-type mounting, contact us.

A **washer** for installing, removing (excluding sizes 32 ... 50) and axial fastening of gear reducer (ch. 5) with or without **locking rings** or **locking bush** (dimensions shown in the table) and a **protection cap** for the hollow low speed shaft can be supplied on request. Parts in contact with the circlip must have sharp edges.



Gear reducer size	A	D Ø	D ₁ Ø	D ₃ Ø	E ₃ ≈	F	F ₁	h	h ₁	L	n	Bolt for axial fastening	
												UNI 5737-88	M [daN m] ³⁾
32	—	19	22,5	15	—	—	—	14,8	2,8	6,3	1,1	M 8 × 25 ¹⁾	2,9
40	—	24	27,5	19	—	—	—	14,8	2,8	12,6	1,2	M 8 × 25 ¹⁾	3,2
50	—	28	32	24	—	—	—	18,5	3,2	12,6	1,2	M 10 × 30 ¹⁾	4,3
63,64	18	32	23	27	9	M 10	M 6	10	—	19	6	M 10 × 35	4,3
80	18	38	27	32	11	M 10	M 6	12	—	23	6	M 10 × 35	5,3
81	18	40	28	34	11	M 10	M 6	12	—	23	6	M 10 × 35	5,3
100	23	48	35	41	13	M 12	M 8	14	—	28	7	M 12 × 45	9,2
125, 126	30	60	45	52	15	M 14	M 10	16	—	35	7	M 14 × 45	17
160	36	70	54	62	15	M 16	M 12	19	—	40	8	M 16 × 50	21
161	36	75	59	66	17	M 16	M 12	19	—	40	8	M 16 × 50 ³⁾	21
200	49	90	72	80	20	M 20	M 16	23	—	49	9	M 20 × 60 ²⁾	43
250	64	110	89	98	24	M 24	M 16	24	—	60	10	M 24 × 70 ²⁾	83

1) UNI 5931-84.

2) For locking bush: M 20 × 65 and M 24 × 80 UNI 5737-88 class 10.9.

3) Tightening torque for locking rings or bush.

4.2 - Lubrication

Gear pairs and bearings on worm are oil-bath lubricated; sizes 200 and 250 mounting position B7 with worm speed $> 710 \text{ min}^{-1}$ have upper bearings on worm lubricated by a pump inside the casing. Other bearings are likewise lubricated by oil-bath, or splashed, with the exception of upper-bearings on wormwheel in mounting position V5 and V6, where life-grease lubrication is employed (NILOS ring in sizes 161 ... 250).

All sizes are envisaged with **synthetic oil** lubrication.

Synthetic oil can withstand temperature up to **95 ÷ 110 °C**.

Sizes 32 ... 81: gear reducers are supplied filled with synthetic oil (KLÜBER Klübersynth GH 6-320, MOBIL Glygoyle 320, SHELL Omala S4 WE 320; when worm speed $< 280 \text{ min}^{-1}$ KLÜBER Klübersynth GH 6-680), providing **«long life»** lubrication, assuming pollution-free surroundings; quantities as indicated in ch. 8 and 10, and on the lubrication plate. Ambient temperature $0 \div 40 \text{ °C}$ with peaks of -20 °C and $+50 \text{ °C}$.

Important: verify mounting position keeping in mind that if gear reducer is installed in a mounting position which differs from the one indicated on the name plate, it could require the addition of the difference between the two quantities of lubricant given in ch. 3.6 and 3.8, by way of the housing filler hole.

Sizes 100 ... 250: gear reducers are supplied without oil; before putting into service, fill to the specified level¹⁾ with polyglycol basis (PAG) synthetic oil having the ISO viscosity-grade given in the table. Under normal conditions, the first speed range is for train of gears **V**, the second **IV** and **V**, (low speed), and the third **combined units** and **V, IV, 2IV** (low speed).

1) Lubricant quantities stated on ch. 3.6 and 3.8 are approximate for provisioning. The exact oil quantity the gear reducer is to be filled with is definitely given by the level.

Produttore Manufacturer	Olio sintetico PAG PAG synthetic oil
AGIP	Blasia S
ARAL	Degol GS
BP	Energyn SG-XP
CASTROL	Optiflex A
FUCHS	Renolin PG
KLÜBER	Klübersynth GH6
MOBIL	Mobil Glygoyle
SHELL	Omala S4 WE
TEXACO	Synlube CLP
TOTAL	Carter SY

ISO viscosity grade

Mean kinematic viscosity [cSt] at 40 °C .

Velocità vite Worm speed min^{-1}	Temperatura ambiente $0 \div 40 \text{ °C}$ ¹⁾ – Olio sintetico / Ambient temperature $0 \div 40 \text{ °C}$ ¹⁾ – Synthetic oil					
	Grandezza riduttore - Gear reducer size					
	100	125 ... 161		200, 250		
		B3, V5, V6	B6, B7, B8	B3, V5, V6	B6, B7, B8	
2 800 ÷ 1 400 ²⁾	320	320	220	220		
1 400 ÷ 710 ²⁾	320	320		320	220	
710 ÷ 355 ²⁾	460	460		460	320	
355 ÷ 180 ²⁾	680	680	460	460		
< 180	680	680		680		

1) Peaks of 10 °C above and 10 °C (20 °C for $\leq 460 \text{ cSt}$) below the ambient temperature range are acceptable.

2) For these speeds we advise to replace oil after running-in.

Combined gear reducer and gearmotor units: lubrication remains independent, thus data relative to each single gear reducer hold good.

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

Temperatura olio [°C]	Intervallo di lubrificazione [h] - Olio sintetico	Oil temperature [°C]	Oil-change interval [h] - Synthetic oil
≤ 65	18 000	≤ 65	18 000
65 ÷ 80	12 500	65 ÷ 80	12 500
80 ÷ 95	9 000	80 ÷ 95	9 000
95 ÷ 110	6 300	95 ÷ 110	6 300

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 thorough clean-out.

Running-in: a period of about $400 \div 1\,600 \text{ h}$ is advisable, by which time the gear pair will have reached maximum efficiency (ch. 3.13); oil temperature during this period is likely to reach higher levels than would normally be the case.

Sealings: 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: for gear reducers sizes 100 ... 250, before unscrewing the filler plug with valve (symbol ) wait until the unit has cooled and then open with caution.

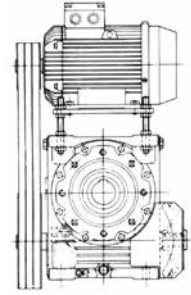
4.3 - Shaft-mounting arrangements

The strength and shape of the housing offer: **advantageous** possibilities for shaft mounting even – for instance – in the case of gearmotor with belt drive.

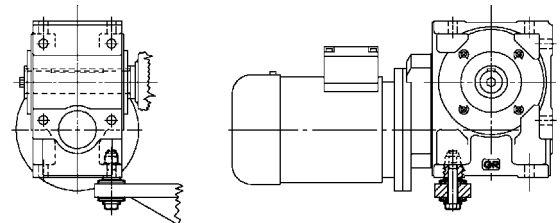
A few shaft mounting arrangements are shown here with the relative details as to selection, and installation.

In ch. 3.4 are shown the shaft-mounting arrangements which **can be supplied**.

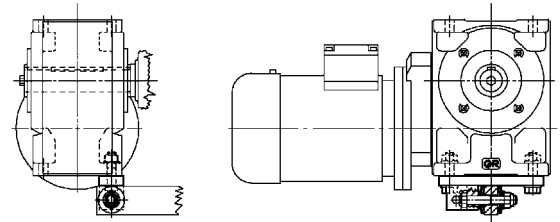
IMPORTANT. When shaft mounted, the gearmotor must be supported both axially and radially by the shaft end of the driven machine, as well as anchored against rotation only, by means of a reaction having **freedom of axial movement** and sufficient **clearance in its couplings** to permit minor oscillations – always in evidence – without provoking dangerous overloads on the actual gearmotor. Pivots and components subject to sliding have to be properly lubricated; we recommend the use of a locking adhesive such as LOCTITE 601 when fitting the bolts.



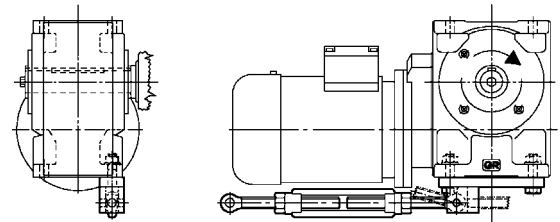
For sizes 32 ... 126 can be supplied (ch. 3.4) a semi-flexible and economical reaction arrangement, with bolt using disc springs.



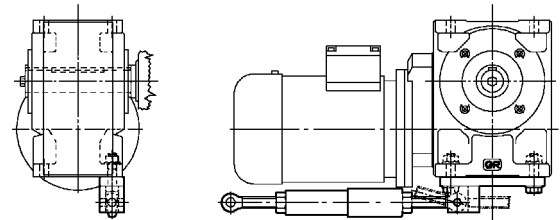
Semi-flexible reaction arrangement for sizes 63 ... 250 (ch. 5) using disc springs and bracket.



Rigid reaction arrangement for variable-distance anchorage for sizes 63 ... 250 (ch. 5) using a torque arm. Where direction of rotation is opposite to the one shown in the drawing, turn the torque arm through 180°.

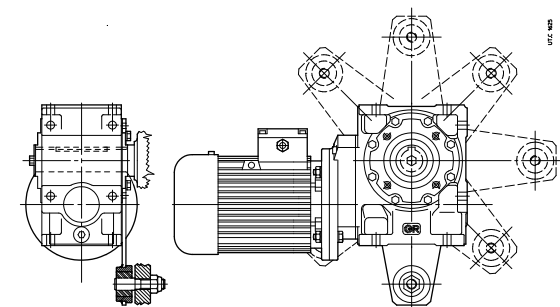


Similar to the previous arrangement for sizes 100 ... 250 (ch. 5), but using a flexible torque arm; safety devices may be installed to prevent accidental overloads. The flexible torque arm may be turned through 180° regardless of direction of rotation.



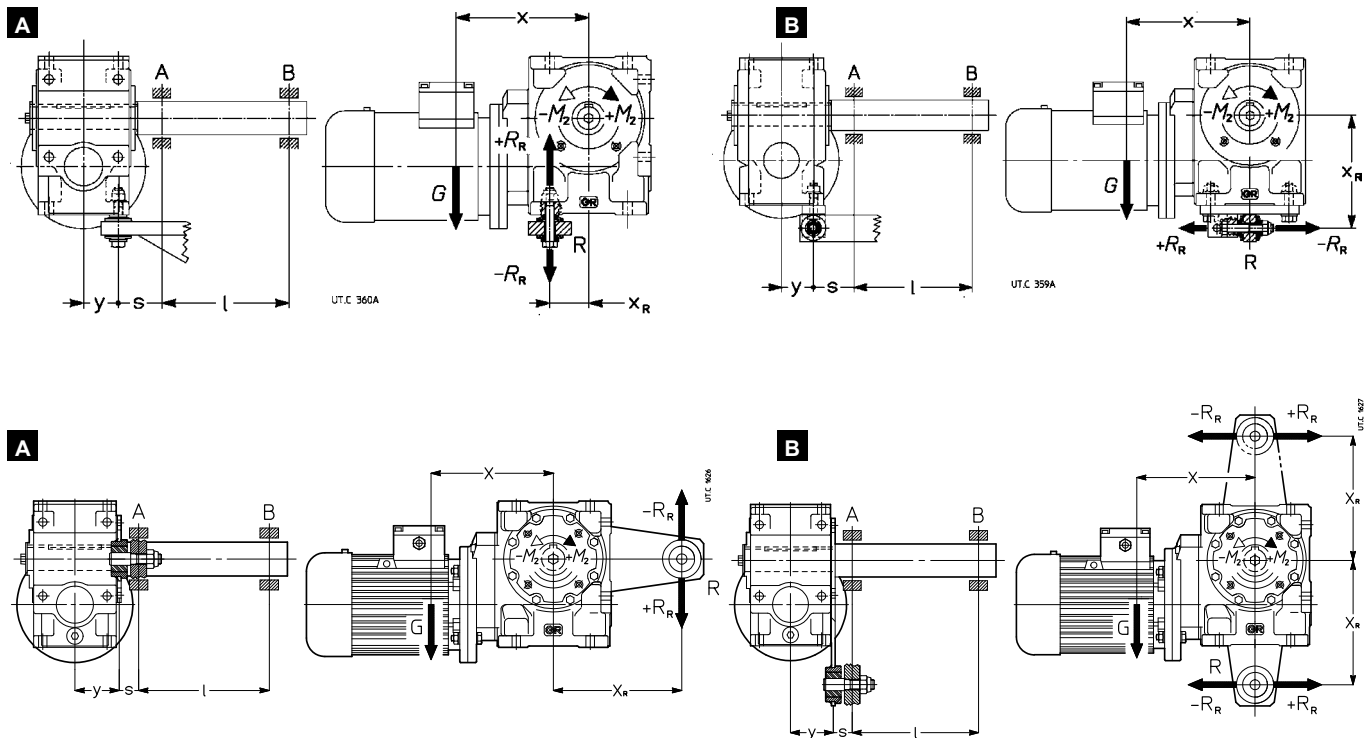
UTC 748

Reaction arrangement using torque arm, fitted onto B14 flange, with plastic damping bush (see ch. 5).



UTC 749

For the majority of normal cases, where weight force G is orthogonal or parallel to reaction R_R as illustrated in the drawings, reactions are calculated thus:



1) reaction R_R [daN] produced by support R:

$$R_R = (1 / x_R) \cdot [G \cdot x + (\pm M_2)]$$

2) bending moment M_{iA} [daN m] through the cross-section of bearing A:

A $M_{iA} = [G \cdot (y + s)] - [(\pm R_R) \cdot s]$

B $M_{iA} = \sqrt{[G \cdot (y + s)]^2 + [R_R \cdot s]^2}$

3) bearing A radial reaction R_A [daN]:

A $R_A = \frac{1}{l} \{ [G \cdot (y + s + l)] - [(\pm R_R) \cdot (s + l)] \}$

B $R_A = \frac{1}{l} \sqrt{[G \cdot (y + s + l)]^2 + [R_R \cdot (s + l)]^2}$

4) bearing B radial reaction R_B [daN]:

$$R_B = \frac{M_{iA}}{l}$$

where:

- G [daN]: weight force almost equal numerically to gearmotor mass (ch.3.8);
- M_2 [daN m]: output torque expressed by + or – according to the direction of rotation in the drawing;
- x [m]: dimension to $x = G + 0,2 \cdot Y$ (ch. 3.8);
- y [m]: dimension $y = 0,5 \cdot B$ (ch. 3.8);
- x_R [m] (for reaction bolt with disc spring): dimension $x_R = 0,5 \cdot A$ (drawing on the left) or $x_R = H + S$ (drawing on the right) (ch. 3.8 and 5);
- x_R [m] (for torque arm): see table at ch. 5;
- l, s [m]: dimension s must be as short as possible.

4.4 - Motor replacement

As all gearmotors are fitted with **standard** motors, motor replacement is extremely easy. Simply observe the following instructions:

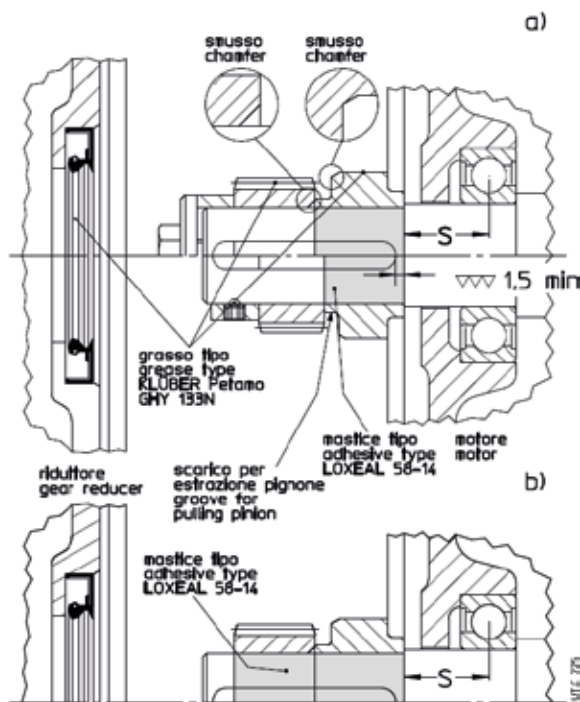
- be sure that the mating surfaces are machined under accuracy rating (IEC 60072-1);
- clean surfaces to be fitted thoroughly;
- in the event of a lowered keyway, replace the motor keyway with the one supplied with the gear reducer; adjust the keyway length to the motor shaft, if need be; check that between the top and the bottom of the hole keyway there is a backlash of 0,1 - 0,2 mm; in the event of output shaft keyway, lock the key by pins.

for MR V:

- check that the fit-tolerance (push-fit) between holes hole-shaft end is G7/j6 for $D < 28$ mm, F7/k6 for $D > 38$ mm;
- lubricate surfaces to be fitted against fretting corrosion;

For MR IV, 2IV

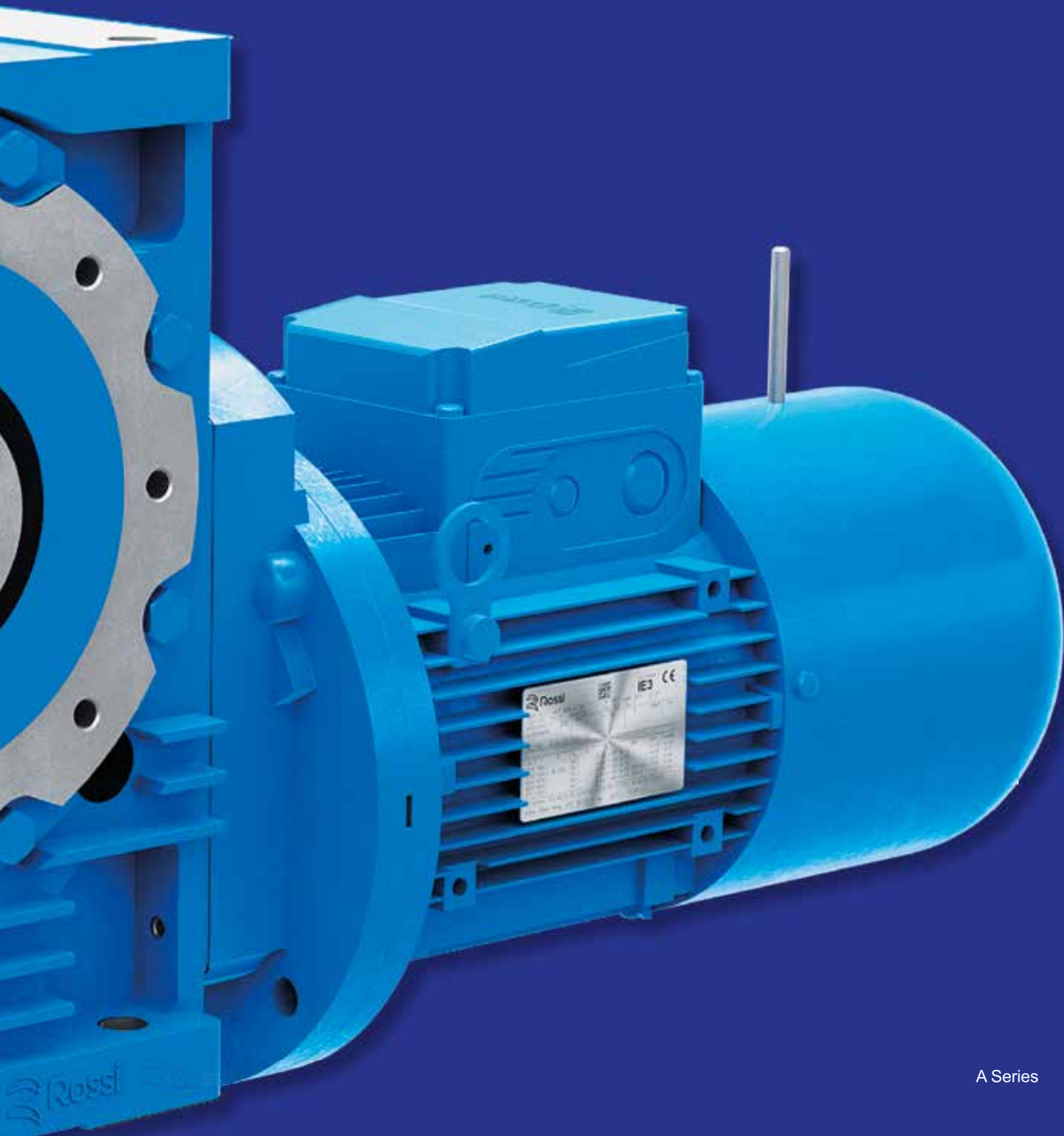
- check that the fit-tolerance (push-fit) between hole and shaft end is K6/j6 for $D \leq 28$ mm, J6/k6 for $D \geq 38$ mm;
- make sure that the motors have bearing location and overhang (distance S) as shown in the table;



Motor size	Min. dynamic load capacity [daN]		Max dimension 'S' mm
	Front	Rear	
63	450	335	16
71	630	475	18
80	900	670	20
90	1 320	1 000	22,5
100	2 000	1 500	25
112	2 500	1 900	28
132	3 550	2 650	33,5
160	4 750	3 350	37,5
180	6 300	4 500	40
200	8 000	5 600	45
225	10 000	7 100	47,5

- assemble on motor shaft, as follows:
 - the **spacer** pre-heated at **65 °C** sealing the motor shaft part with **locking adhesive type LOXEAL 58-14** and ensuring that between keyway and motor shaft shoulder there is a ground cylindrical section of at least 1,5 mm; pay attention **not to damage the external surface of spacer**;
 - the **key** in the keyway, taking care that a brief segment of at least 0,9 times the pinion width;
 - the pinion pre-heated at **80 ÷ 100 °C**;
 - the **axial fastening system** where foreseen (head self-locking screw with base, spacer, or hub clamp with one or more dowels, fig. a); for the cases foreseen **without axial fastening** (fig. b), seal with **locking adhesive type LOXEAL 58-14** also the motor shaft section below the **pinion**;
- in the event of axial fastening system with hub clamp and dowels, be sure that these ones do not overhang from spacer external surface: screw the dowel and matrix the motor shaft with a tip;
- grease the pinion teeth, the sealing ring rotary seat and the seal ring (with KLÜBER Petamo GHY 133N), and assemble carefully, **paying attention not to damage the seal ring lip due to accidental shock with the pinion toothing**.

Accessories and non-standard designs



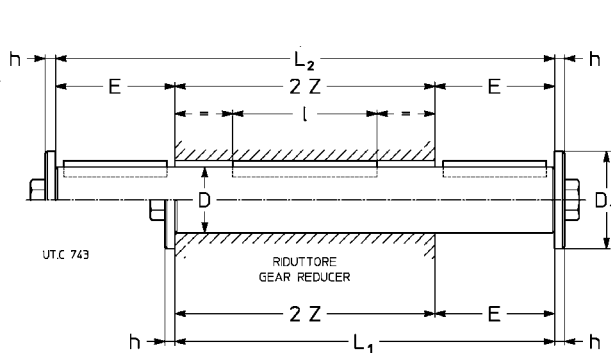


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5.1 - Low speed shafts

Supplementary description when ordering by **designation: standard**, or **double extension low speed shaft**



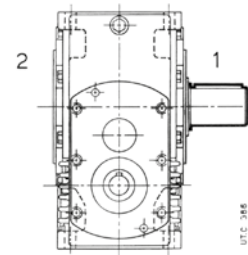
Gear. reducer size	D Ø	E	D ₁ Ø	h	L ₁	L ₂	l	2 Z	Bolt	Mass	
										Standard	Double extens.
32	19 h7	30	28	4	108	138	36	78	M 6 × 20	0,3	0,4
40	24 h7	36	35	5	128	164	45	92	M 8 × 25	0,6	0,7
50	28 h7	42	35	5	148	190	63	106	M 8 × 25	0,8	1
63, 64	32 h7	58	47	5	184	242	70	126	M 10 × 30	1,2	1,5
80	38 h7	58	47	5	208	266	90	150	M 10 × 30	1,9	2,4
81	40 h7	58	47	5	208	266	90	150	M 10 × 30	2,1	2,7
100	48 h7	82	57	6	262	344	110	180	M 12 × 40	3,7	4,9
125, 126	60 h7	105	82	8	317	422	140	212	M 16 × 45	7	9,4
160	70 j6	105	82	8	355	460	180	250	M 16 × 45	11	14
161	75 j6	105	82	8	355	460	180	250	M 16 × 45	12,6	16
200	90 j6	130	102	10	430	560	200	300	M 20 × 60	21	28
250	110 j6	165	135	12	525	690	250	360	M 24 × 60	39	51

The shoulder outer diameter of the part, or of spacer abutting with the gear reducer must be $(1,25 \div 1,4) \cdot D$.

5.2 - Solid low speed shaft (size 250)

In order to permit the high radial loads given in the catalog (250 bis), the gear reducer size 250 can be supplied with solid low speed shaft and strengthened bearings. Dimensions remain unchanged (missing the washer on shaft end).

Supplementary description when ordering by **designation: solid low speed shaft pos. 1** or **2** or **double extension**.



5.3 - Oversized hollow low speed shaft

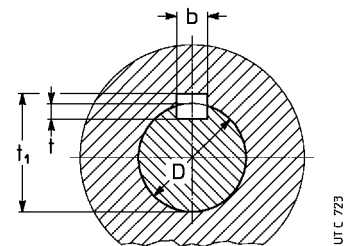
The gear reducers and gearmotors sizes 32 ... 64 and 100 can be supplied with oversized hollow low speed shaft; dimensions are according to table on the left.

Gear reducer size	D Ø	Parallel key b x h x l*	Keyway		
			b	t	t ₁
32	20	6 × 6 × 36	6	4 ¹⁾	22,2 ¹⁾
40	25	8 × 7 × 45	8	4,5 ¹⁾	27,7 ¹⁾
50	30	8 × 7 × 63	8	5 ¹⁾	32,2 ¹⁾
63 ²⁾ , 64 ²⁾	35	10 × 8 × 90	10	6 ¹⁾	37,3 ¹⁾
100	50	14 × 9 × 110	14	5,5 ¹⁾	53,8

* Recommended length.

1) Not unified values.

2) Without circlip groove.



Supplementary description when ordering by **designation: oversized hollow low speed shaft**

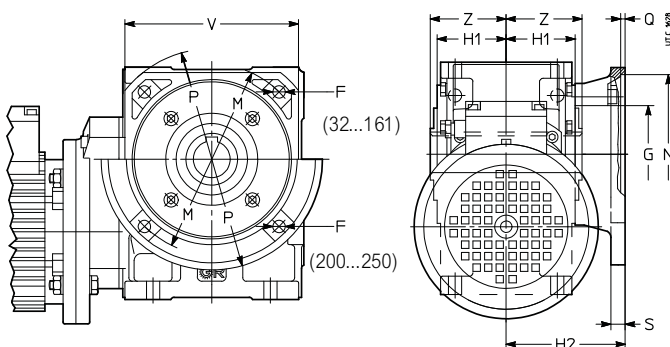
5.4 - Flange

B5 flange having clearance holes and spigot «recess».

Available in 2 different options with different mating dimensions: **B5 flange** and **B5 flange Type B**

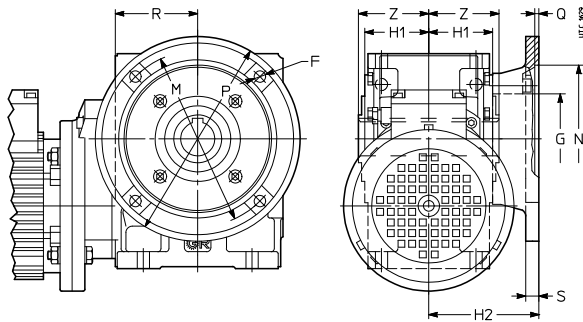
The accessory is supplied fitted onto the gear reducer. If not differently stated, the standard mounting position is on the gear reducer right side - seen from motor side. For reverse mounting, specify in designation «**mounted on opposite side**».

Locking adhesives are recommended both around threads and on mating surface.



B5 flange

Grandezza riduttore Gear reducer size	F Ø	G Ø	H ₁	H ₂	M Ø	N Ø	P	Q	S	V Ø	Z	Massa Mass kg
32	7	55	34,5	71	100	80	120	4	10	95	39	0,5
40	9,5	68	41,5	80	115	95	140	4	11	110	46	0,8
50	9,5	85	49	80	130	110	160	4,5	12	125	53	1
63, 64	11,5	80	58,5	100	165	130	200	4,5	14	152	63	2
80, 81	14	110	69,5	112	215	180	250	5	16	196	75	3,2
100	14	130	84,5	132	265	230	300	5	18	248	90	5,5
125, 126	18	180	99,5	150	300	250	350	6	20	290	106	8,5
160, 161	18	230	118,5	180	350	300	400	6	22	350	125	13
200	18 ^s	250	137,5	200	400	350	450	6	22	—	150	20
250	22 ^s	350	163	236	500	450	550	6	25	—	180	31



B5 flange type B

Gear reducer size	F Ø	G Ø	H ₁	H ₂	M Ø	N Ø	P Ø	Q	R	S	Z	Mass
			h12	h12		H7						
32	9,5	55	34,5	75	87	60	110	5	—	9	39	0,8
40	11,5	68	41,5	82	150	115	180	5	80	11	46	1,7
50	14	85	53	98	165	130	200	5	91	12	53	2,4
63, 64	14	80	63,5	107	176	152	210	6	—	14	63	2,9
80, 81	14	110	74,5	129	230	170	280	6	121	16	75	5,8

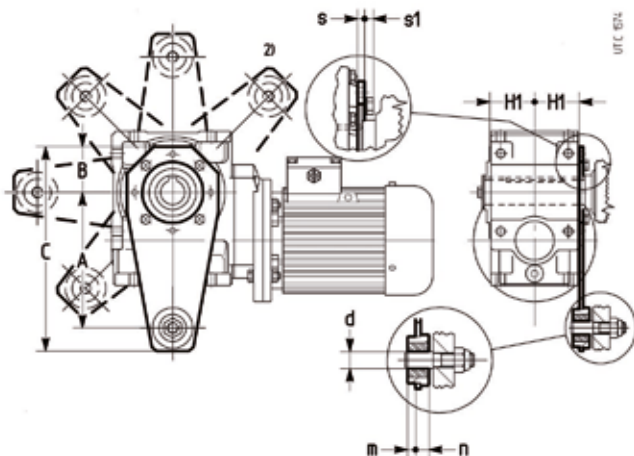
Supplementary description when ordering by **designation: flange B5 or B5 flange type B**.

In case of separate order from the gear reducer's one, the accessory designation must include the catalog and reducers size data.

5.5 - Torque arm

See technical explanations at ch. 4.

The accessory, including fixing bolts for gear reducer, is supplied not assembled. Fitting towards motor is not possible.



Gear reducer size	A	B	C	d Ø	H ₁	m	n	s	s ₁	x _R	M ₂
				H11	h12				≈	m	daN m
32	100	45	157	8 ¹⁾	31,5	5	9	4	4,7	0,100	9,5
40	150	52,5	230	10	44,5	7	13	6	5,6	0,150	15
50	200	60	294	20	53	9,5	15,5	6	5,6	0,200	18
63, 64	200	60	294	20	63,5	9,5	15,5	6	7,5	0,200	33,5
80, 81	250	80	364	20	74,5	9,5	15,5	6	9,2	0,250	67

1) Plastic damping bush not present.

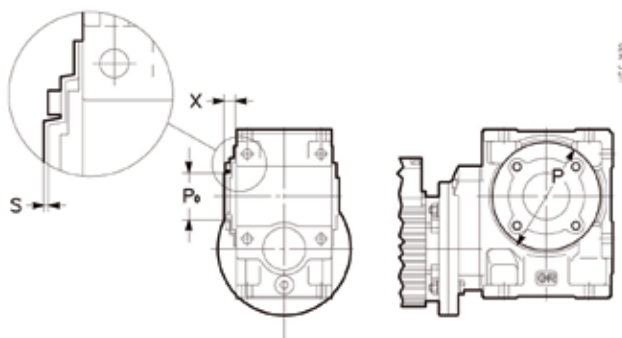
2) Position not possible for MR V 32 ... 50, MR IV 32 ... 81

Supplementary description when ordering by **designation: torque arm**.

5.6 - Hollow low speed shaft **STANDARDFIT** protection

Protection hollow low speed shaft free area, made of plastic (polypropylene PP material color black)

The accessory is supplied disassembled and complete with fastening screws. We recommend the use of locking adhesive on the screws.



Gear reducer size	P	P ₀	X	s	Screws	M _{tightening}
	Ø	Ø		H11	UNI 5931	1) N m
32	90	48	20,5	1,5	M5x14	1,5
40	105	50	20,5	1,6	M6x18	2,8
50	120	61	24	1,7	M6x18	2,8
63, 64	120	61	24	1,7	M8x20	6,3
80, 81	160	78	27,5	1,8	M10x20	12,3

1) Tightening torque.

Non standard design code for designation:

Hollow low speed shaft STANDARDFIT protection

In case of separate order from the gear reducer's one, the accessory designation must include the catalog and gear reducers size data.

5.7 - Strengthened low speed shaft bearings

Gear reducers and gearmotors sizes 63 ... 126 can be supplied with taper roller bearings supporting the low speed shaft, allowing increased radial and/or axial loads. Values for sizes 100 ... 126 are given in ch. 3.12, other values, consult us.

Supplementary description when ordering by **designation: strengthened low speed shaft bearings**.

5.8 - Strengthened high speed shaft bearings

Gear reducers R IV sizes 80 ... 126 with $i_N \leq 160$ can be supplied with cylindrical roller bearings supporting the high speed shaft allowing increased radial loads, values **x 1,6** for sizes 80 ... 100, **x 1,4** for sizes 125 and 126 (ch. 3.11); this design is standard for sizes 160 ... 250.

Supplementary description when ordering by **designation: strengthened high speed shaft bearing**.

5.9 - Controlled or reduced backlash

Gear reducers and gearmotors with worm gear pair **controlled or reduced backlash**.

Values are 1/2 (controlled backlash) or 1/4 (reduced backlash) those stated on ch. 3.13; reduced backlash designed not possible for R V and MR V with input speed $n_1 > 1\,400 \text{ min}^{-1}$.

Supplementary description when ordering by designation: **controlled backlash** or **reduced backlash**.

5.10 - Hollow low speed shaft washer

All gear reducers and gearmotors can be supplied with washer, circlip (excluding sizes 32 ... 50), bolt for axial fastening and protection cap (ch. 4).

Supplementary description when ordering by **designation: hollow low speed shaft washer**.

5.11 - Hollow low speed shaft washer with locking rings or bush

All gear reducers and gearmotors can be supplied with washer, circlip (excluding sizes 32 ... 50), locking rings (sizes 32 ... 50) or locking bush (sizes 63 ... 250), bolt for axial fastening and protection cap (ch. 4).

Supplementary description when ordering by **designation: hollow low speed shaft washer with locking rings** or **bush**.

5.12 - Hollow low speed shaft protection

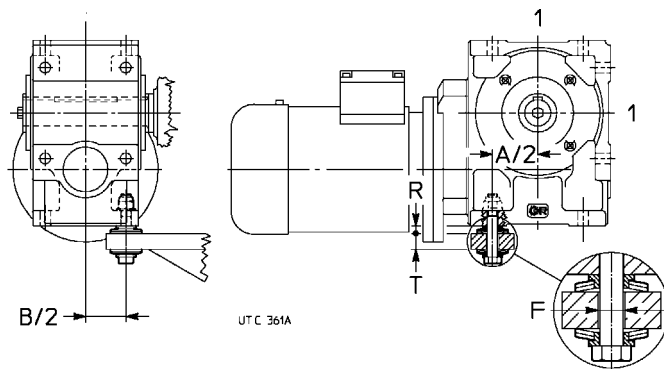
Gear reducers and gearmotors, sizes 32 ... 161, can be supplied with only the protection cap for the area not utilized by the hollow low speed shaft (ch. 4).

Supplementary description when ordering by **designation: hollow low speed shaft protection**.

5.13 - Shaft-mounting arrangements

See technical explanations at ch. 4.

For dimensions **A**, **B** see ch. 3.6 and 3.8.



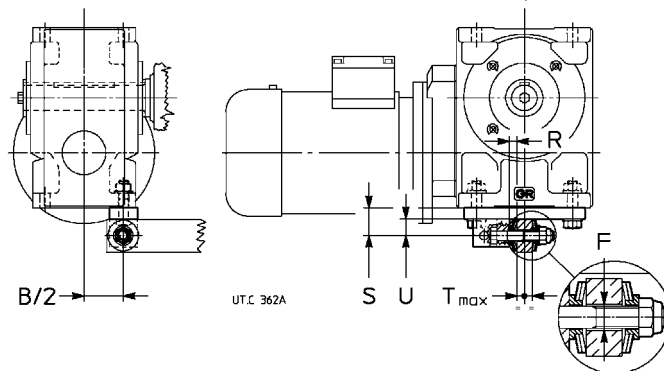
Gear reducer size	Bolt	Disc spring	T	F Ø	R 1)	$M_2 \leq$ 2)
	UNI 5737-88	DIN 2093				daN m
32	M 6 × 40	A 18 n. 2	8 ÷ 10	8	4,9	—
40	M 8 × 55	A 25 n. 2	10 ÷ 14	11	6,5	—
50	M 8 × 55	A 25 n. 2	10 ÷ 14	11	6,5	20
63, 64	M 12 × 70*	A 35,5 n. 2	14 ÷ 17	20	8,8	31,5
80, 81	M 12 × 90	A 35,5 n. 3	18 ÷ 25	20	10,8	56
100	M 16 × 110	A 50 n. 2	23 ÷ 32	20	13,1	100
125, 126	M 16 × 110	A 50 n. 2	23 ÷ 32	20	13,1	160

1) Theoretical value: tolerance 0 ÷ -1.

2) For higher M_2 values, utilize 2 reaction bolts or the arrangement with bracket (see below).
* Modified bolt.

It is **better** if this arrangement is applied on sides 1.

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

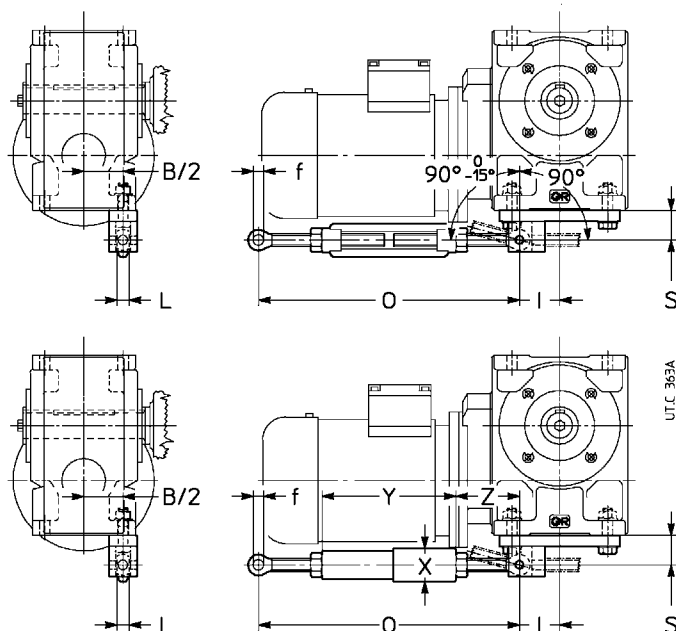


Gear reducer size	Bolt	Disc spring	T	F Ø	S	U	R 1)
	UNI 5737-88	DIN 2093					
63, 64	M 12 × 70*	A 35,5 n. 1	14 ÷ 17	20	38	23	6,8
80, 81	M 12 × 90	A 35,5 n. 2	18 ÷ 25	20	38	23	8,8
100	M 16 × 110	A 50 n. 2	25 ÷ 32	20	50	30	13,1
125, 126	M 16 × 110	A 50 n. 2	25 ÷ 32	20	50	30	13,1
160, 161	M 20 × 130	A 63 n. 3	23 ÷ 38	24	65	40	17,9
200	M 24 × 160	A 80 n. 2	29 ÷ 48	30	80	48	20,7
250	M 30 × 200	A 100 n. 2	37 ÷ 60	36	100	60	26,2

1) Theoretical value: tolerance 0 ÷ -1.

* Modified bolt.

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



Gear reducer size	f Ø	O	S	L	X Ø	Y	Z ≈	I
63, 64	12	280 ÷ 350	38	14	—	—	—	50
80, 81	12	280 ÷ 350	38	14	—	—	—	56
100	16	410 ÷ 510	50	17	52	242	84	74
125, 126	16	410 ÷ 510	50	17	52	242	84	74
160, 161	22	580 ÷ 680	65	24	64	285	147	92
200	28	580 ÷ 680	80	30	88	305	137	113
250	28	580 ÷ 680	100	30	88	305	137	141

Supplementary description when ordering by **designation: rigid** (for torque arm positioning, see ch. 4) or **flexible torque arm using bracket**

5.14 - Gear reducer design ATEX II 2 GD and 3 GD

Worm gear reducers and gearmotors may be supplied according to European Community Directive ATEX 2014/34/EU in order to be used in potentially explosive atmospheres - category **2 GD** (for operation in zones 1 (gas), 21 (dust): presence of **probable** explosive atmosphere) and **3 GD** (for operation in zones 2 (gas) 22 (dust): **improbable** presence of explosive atmosphere) with surface temperature 135 °C (T4). These are the main variations of the product:

- fluoro-rubber seal rings;
- metal plugs; filler plug with filter and valve;
- special name plate with ATEX mark and indication of application limits;
- external protection based on a water-soluble dual-compound polyurethane **conductive** enamel, **color grey** RAL 7040, corrosivity class C3 ISO 12944-2;
- «ATEX Instructions» manual.

For category 2 GD, depending on **minimum control intervals**, also

2 GD monthly control

- double seal rings on low speed shaft;

2 GD quarterly control (sizes 200, 250)

- double seal rings on low speed shaft (size ≥ 63);

- oil temperature probe;

this solution is advisable when the gear reducer has difficult access or when a decrease in control frequency is required.

Operating ambiente temperature: $-20 \div +40$ °C.

The «**ATEX Operating instructions**» (with the additional documentation, if any) are **integral part of the supply of each gear reducer**, every indication stated in it must be carefully applied. In case of necessity consult us.

Gear reducer size selection

Determine the size of gear reducer as indicated in ch. 6 considering following additional limitations:

a) maximum input speed $n_1 \leq 1\,500 \text{ min}^{-1}$.

b) **service factor requested** determined according to ch. 6 increased with the factors stated in the following table - **never lower than 0,85**.

Verify, at last, that the **applied power** P_1 is lower than or equal to nominal thermal power P_{tN} multiplied by thermal factors $f_{t2}^{1)} \dots f_{t5}$ (see ch. 3.2) and by correlative factor f_{ATEX} given in the following table.

ATEX design **corrective factors** for required service factor **f_s** and nominal thermal power **P_{tN}** .

ATEX category	$f_{s\,ATEX}$	$f_{t\,ATEX}$
2GD	1,18	0,8
3GD	1,06	0,9

Motor category selection

In the table on the right the minimum features of motors to be installed with Rossi gear reducers in ATEX design, in potentially explosive atmosphere areas.

Protection methods of electric tools:

- EEEx **e** increased safety;
- EEEx **d** flameproof enclosure;
- EEEx **de** combination of «d» and «e»;
- EEEx **nA** reduced sparking

Zone	Rossi Gear reducer ATEX II design	Required motor category ¹⁾
1	2 GD	2 G EEEx e 2 G EEEx d 2 G EEEx de
21		2 D IP65
1, 21		2 GD EEEx e 2 GD EEEx d 2 GD EEEx de
		with thermistors or Pt100
2	3 GD	3 G EEEx nA —
22		3 D IP54 ²⁾ —
2, 22		3 GD EEEx nA

1) The devices suitable for zone 1 are also suitable for zone 2, similarly the devices suitable for zone 21 are also suitable for zone 22.

2) For conductive dusts motor must be 2 D IP65.

Additional description when ordering by **designation**:

Design ATEX II ...

... 3 GD T4 sizes 32 ... 250

... 2 GD T4 monthly control sizes 32 ... 250

... 2 GD T4 quarterly control sizes 200, 250

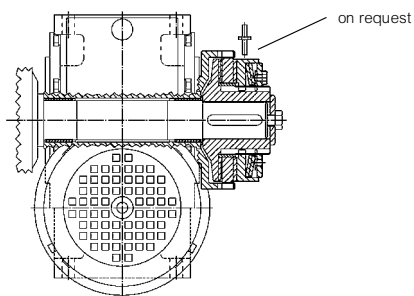
2) For gearmotors, this designation refers to the only **gear reducer part**

Miscellaneous

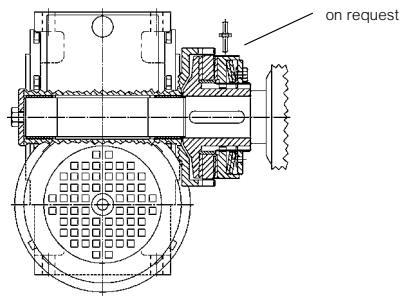
- Expansion tank for continuous duty and high speed running of gear reducers and gearmotors **IV 100 ... 250** and **2IV 100 ... 126** mounting position **B6**.
- Gear reducers and gearmotors sizes **100 ... 250** supplied **filled with synthetic oil**.
- Gearmotors with:
 - **brake motor** (also single-phase) with d.c. **safety and/or parking brake** (sizes 63 ... 132) having overall dimensions nearly the same of a standard motor and braking torque $M_f \geq M_N$, maximum economy;
 - **two-speed motor** (standard motor, brake motors, brake motors with safety and/or parking brake, with flywheel) 2.4, 2.6, 2.8, 2.12, 4.6, 4.8, 6.8 poles;
 - **brake motor for traverse movements**: 2, 2.4, 2.6, 2.8, 2.12 poles (always with low noise d.c. brake, see picture);



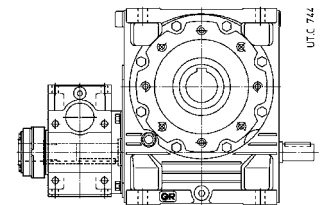
- motor featuring: d.c. supply; single-phase; explosion-proof; with second shaft end; with non-standard protection, voltage and frequency; provided with devices against overloads and overheating;
- **motor without fan** cooled **by natural convection** (size 63 ... 112); design for textile industry.
- Gear reducers and gearmotors with **mechanical torque limiter** on **output** shaft, gear reducer sizes **32 ... 160** (excluding size 81).
- Gear reducer design with mechanical **friction** type torque limiter (friction surfaces without asbestos), compact and with high transmissible torque — up to **300 daN m** — and top quality standards.
- It protects the drive from accidental overloads by excluding the effect of inertia loads transmitted from up-line masses and, also if the gear reducer is irreversible (the torque limiter being mounted on the output shaft), inertia loads transmitted from down-line masses.
- When the transmitted torque tends to exceed the setting value the drive «slips» although it **remains** engaged with torque equal to the limiter setting value; slipping stops as soon as the load returns to normal; in the case of very brief overloads the driven machine will continue normal operation (after decelerating or stopping) without requiring reset procedures.



External limiter mounting



Intermediate limiter mounting



Limiter mounting onto combined units

The system, as the unit is mounted externally to the gear pair, will not alter if the direction of rotation changes and it does not affect the rigidity and meshing precision between worm and worm wheel (this is important to ensure the correct transmission of torque and the limitation of undue backlash between teeth through time). The system also permits **shaft mounting** with the limiter mounted **ex-ternally** (easily accessible) or in the **intermediate** position (better safety protection). It can be interposed, in the **combined units**, between initial worm gear reducer and final worm gear reducer, sizes **100 ... 250**.

On request slide detector. For more details see **specific literature**.

– **MLA unit, mechanical torque limiter on input shaft**, motor sizes **80 ... 200**.

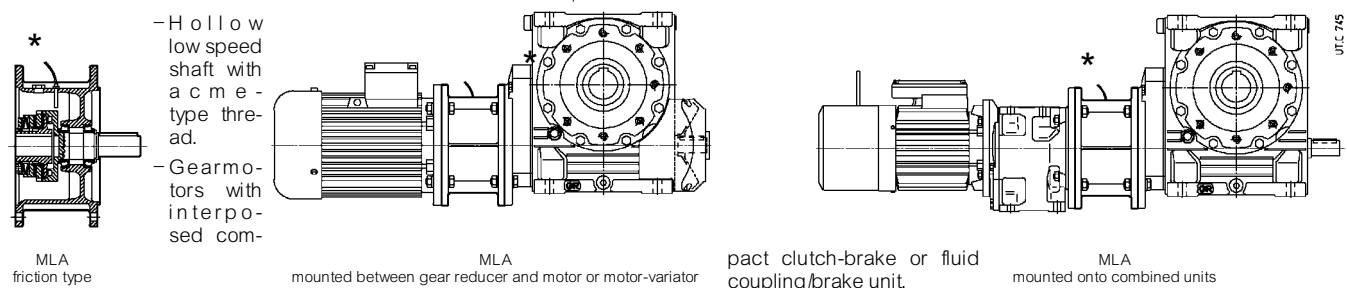
Mechanical torque limiter unit to be interposed between gear reducer and B5 mounting position motor standardized to IEC or (wide belt or planetary motor-variator) or, in **combined units**, between the initial gear reducer and the final worm gear reducer, sizes **50 ... 250**.

Axially ultra-compact design: excellent load bearing with life lubricated double row angular contact ball bearings (motor size ≤ 112) or «O» disposed taper roller bearings.

The unit protects the drive from accidental overloads by excluding inertia loads transmitted from up-line masses and if the gear reducer is reversible (the torque limiter being on the input shaft), inertia loads transmitted from down-line masses.

LA unit is friction type (friction surfaces without asbestos). When the transmitted torque tends to exceed the setting, the drive «slips» although **it remains** engaged and transmits torque equal to the limiter setting value; slipping stops as soon as the load returns to normal; in the case of very brief overloads the driven machine will continue normal operation (after decelerating or stopping) without requiring reset procedures.

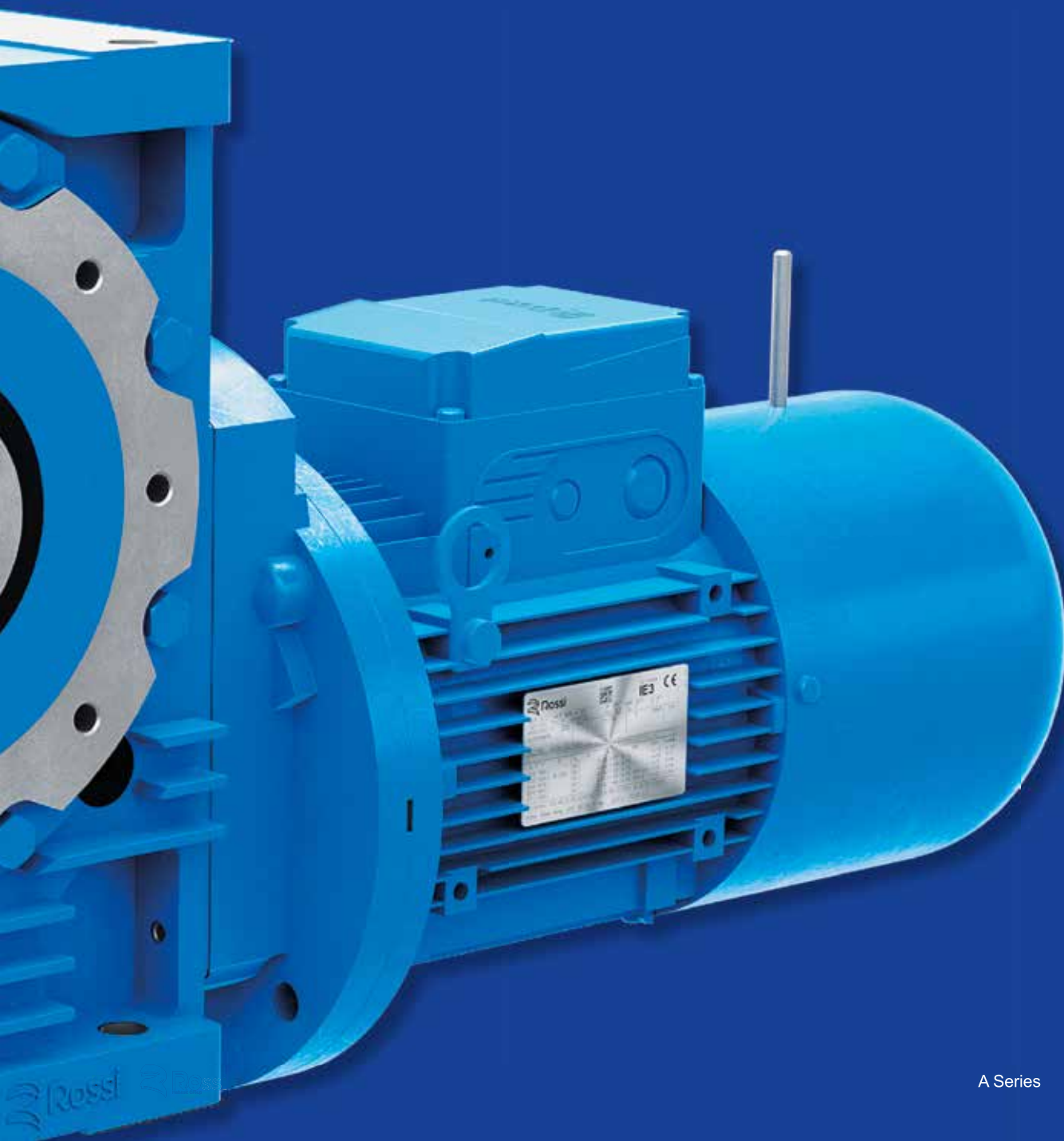
On request slide detector. For more details see **specific literature**.



- Semi-flexible and hydrodynamic couplings.
- Special paints
- Special seal rings; **double seal** (excluding sizes 32 ... 50).
- For high transmission ratios combined units can be also obtained with initial gearmotor **MR IV** with final gear reducer size ≤ 81 and with initial gearmotor **MR 2IV** for final gear reducer size ≥ 100 .

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Technical formulae





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

Size	Con unità Sistema Tecnico With Technical System units	Con unità SI With SI units
starting or stopping time as a function of an acceleration or deceleration, of a starting or braking torque	$t = \frac{Gd^2 \cdot n}{375 \cdot M} [s]$	$t = \frac{J \cdot \omega}{M} [s]$
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 and angular velocity ω	$n = \frac{60 \cdot v}{\pi \cdot d} = \frac{19,1 \cdot v}{d} [min^{-1}]$	$\omega = \frac{v}{r} [rad/s]$
acceleration or deceleration as a function of starting or stopping time	$a = \frac{v}{t} [m/s^2]$	$a = \frac{\omega}{t} [rad/s^2]$
angular acceleration or deceleration as a function of a starting or stopping time, of a starting or braking torque	$\alpha = \frac{n}{9,55 \cdot t} [rad/s^2]$ $\alpha = \frac{39,2 \cdot M}{Gd^2} [rad/s^2]$	$\alpha = \frac{\omega}{t} [rad/s^2]$ $\alpha = \frac{M}{J} [rad/s^2]$
starting or stopping distance as a function of an acceleration or deceleration, of a final or initial velocity	$s = \frac{a \cdot t^2}{2} [m]$ $\varphi = \frac{\alpha \cdot t^2}{2} [rad]$	$s = \frac{v \cdot t}{2} [m]$ $\varphi = \frac{\omega \cdot t}{2} [rad]$
starting or stopping angle as a function of an angular acceleration or deceleration, of a final or initial angular velocity	$\varphi = \frac{n \cdot t}{19,1} [rad]$	
mass	$m = \frac{G}{g} \left[\frac{kgf \cdot s^2}{m} \right]$ G è l'unità di peso (forza peso) [kgf] G = m · g [N] G is the unit of weight (weight force) [kgf]	m è l'unità di massa [kg] m is the unit of mass [kg]
weight (weight force)	$F = G [kgf]$ $F = \mu \cdot G [kgf]$ $F = G (\mu \cdot \cos \varphi + \sin \varphi) [kgf]$	$F = m \cdot g [N]$ $F = \mu \cdot m \cdot g [N]$ $F = m \cdot g (\mu \cdot \cos \varphi + \sin \varphi) [N]$
force in vertical (lifting), horizontal, inclined motion of translation (μ = coefficient of friction; φ = angle of inclination)		
dynamic moment Gd², moment of inertia J due to a motion of translation (numerically $J = \frac{Gd^2}{4}$)	$Gd^2 = \frac{365 \cdot G \cdot v^2}{n^2} [kgf \cdot m^2]$	$J = \frac{m \cdot v^2}{\omega^2} [kg \cdot m^2]$
torque as a function of a force, of a dynamic moment or of a moment of inertia, of a power	$M = \frac{F \cdot d}{2} [kgf \cdot m]$ $M = \frac{Gd^2 \cdot n}{375 \cdot t} [kgf \cdot m]$ $M = \frac{716 \cdot P}{n} [kgf \cdot m]$	$M = F \cdot r [N \cdot m]$ $M = \frac{J \cdot \omega}{t} [N \cdot m]$ $M = \frac{P}{\omega} [N \cdot m]$
work, energy in motion of translation, in rotary motion	$W = \frac{G \cdot v^2}{19,6} [kgf \cdot m]$ $W = \frac{Gd^2 \cdot n^2}{7160} [kgf \cdot m]$	$W = \frac{m \cdot v^2}{2} [J]$ $W = \frac{J \cdot \omega^2}{2} [J]$
power in motion of translation, in rotary motion	$P = \frac{F \cdot v}{75} [CV]$ $P = \frac{M \cdot n}{716} [CV]$ $P = \frac{U \cdot I \cdot \eta \cdot \cos \varphi}{736} [CV]$	$P = F \cdot v [W]$ $P = M \cdot \omega [W]$ $P = U \cdot I \cdot \eta \cdot \cos \varphi [W]$
power available at the shaft of a single-phase motor ($\cos \varphi$ = power factor)		
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.

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