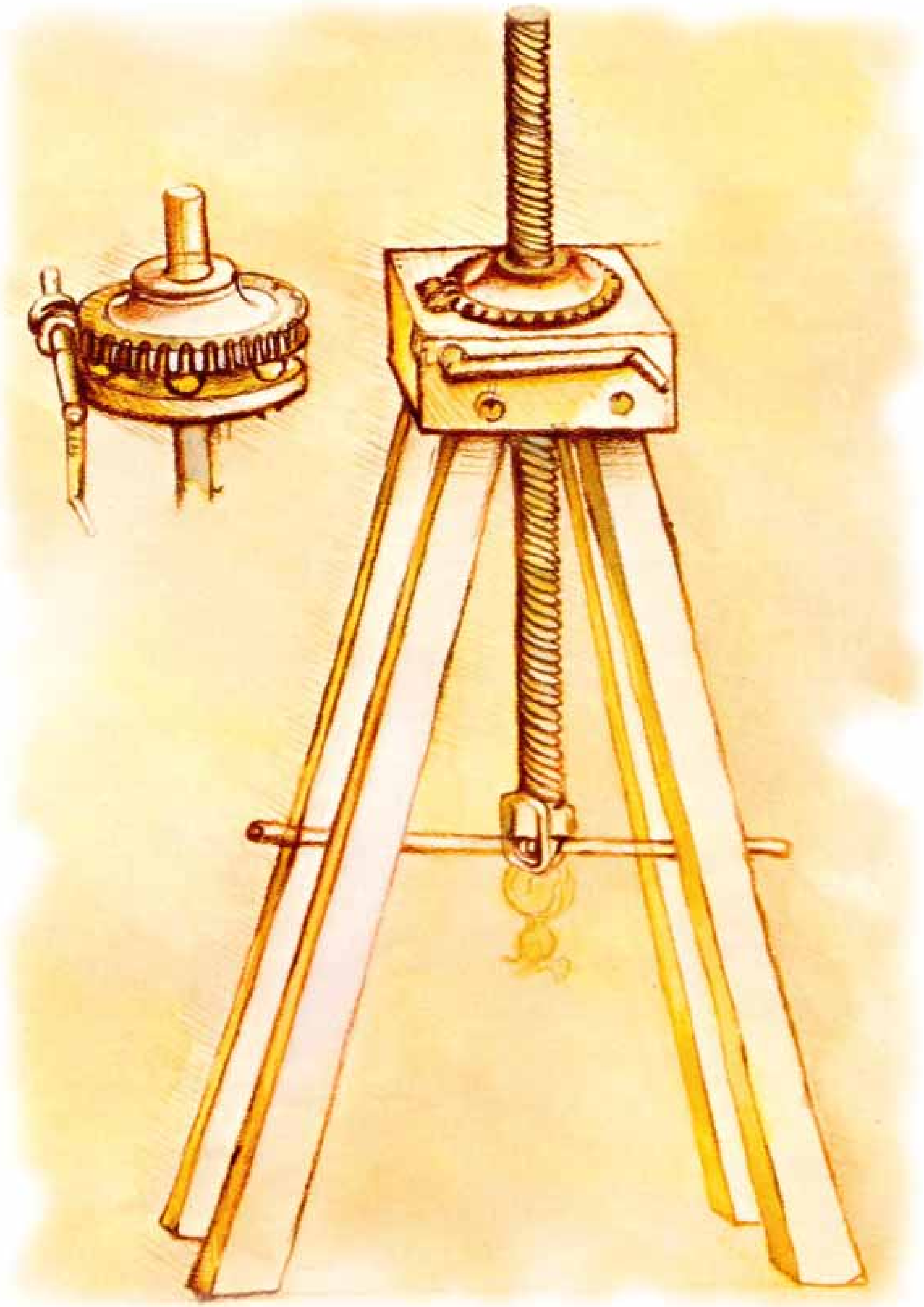
GENERAL CATALOGUE
Ver. 2.1

unimec®

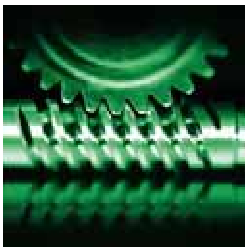


Sanza fine è 'l tempo, a guisa di cotale istrumento in foggia di vite che, pur restando fermo, move sue creste e girando cava l'acqua e portala in alto. Dicesi infatti essa vite sanza fine, e par'mi essa rimembrar lo moto del tempo ove, ancora essendo esso stesso immoto, pur esso move li eventi e secondo natura li conduce. E non v'ha moto contrario a men di picciol spostamento, e pur esso ha tosto termine e lo moto diritto non ne cessa.

Tale ancora mi dico e mi firmo, Leonardo, di ser Piero, da Vinci.

18
Trapezoidal screw jacks

92
Aleph series



120
Ball screw jacks

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Bevel gearboxes

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unimec™

general catalogue

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It was the year 1981 when Mr. Luigi Maggioni started the adventure called UNIMEC; 28 years later our name has become a synonym for screw jacks, bevel gearboxes and speed modulation gears, because the passion for our job and our love for mechanics could not but create a quality product which is highly appreciated all over the world.

welcome to UNIMEC's world

UNIMEC head offices are situated in Usmate-Velate, over 4 buildings in the Milan hinterland and extend on a productive area of 20000 m^2 of which 11000 are covered and have been given over to the production and offices.

Wide areas are assigned to the metrological rooms and to the automated stores, while a big meeting room containing more than 40 seats is the ideal background for our staff's as well as for our agents' training. The harmony and simplicity of our head offices are the witness of the elegance and the precision in the realization of our products.


unimec

In times of recent globalisation UNIMEC has chosen to propose a completely Italian product.

Because we believe that only knowing and understanding a product's creative technology starting from its first manufacturing steps can give that productive elasticity and flexibility which are currently requested in the market of transmission devices.

a "made in Italy" production

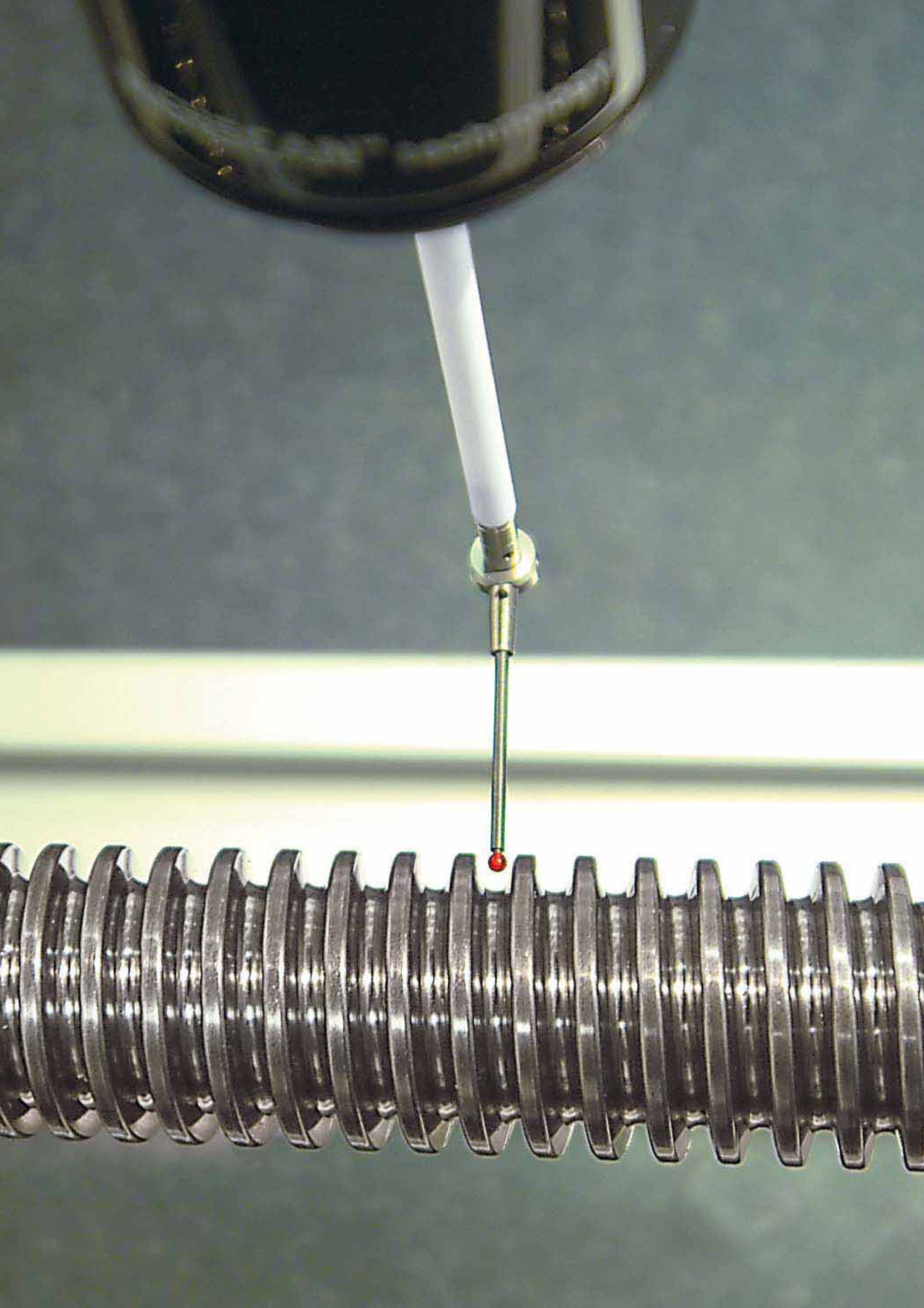
That is why in our factory we have at our disposal cutting-edge machine tools like broaching machines, temperature control rolling machines, lathes, grinders and numeric control gear cutters with warehouses: only if we manufacture our products starting from the raw material we can say we really know them; only in this way we can create according to the state of the art of the mechanical transmissions in order to be a reference point on a world level.

The two activities which are the core of our production are very important for UNIMEC. The design staff is composed by expert and skilled people and it makes use of the most modern technology and in-the-van theories.

there is no product design without control

Words like Solid Modelling, Finite Elements and Triz Methodology are not unknown to our technical office. The cooperation with the local universities is a profitable symbiosis which enhances our competitiveness.

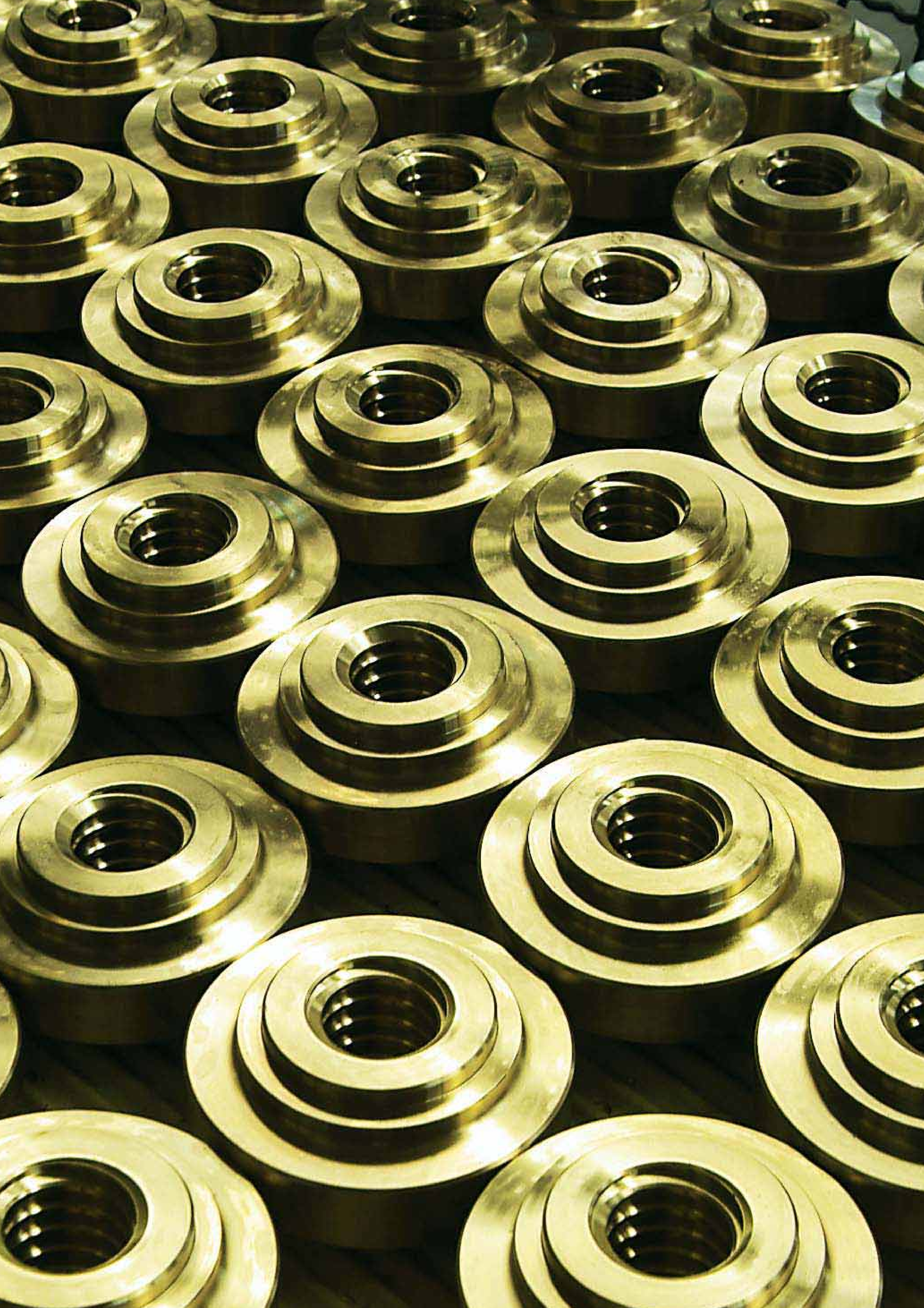
But design and production would have no meaning without control: a perfectly equipped metrological room and the controls carried out along the production process allow us to check the conformity with the design specifications and supply an essential feedback for their overhaul.



There are many ways to appreciate our company's organisation and the harmony of the process which leads from the first contact to the delivery of the ordered products.

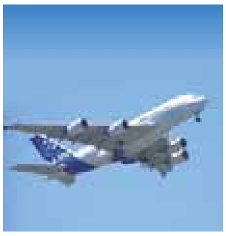
a real orchestra

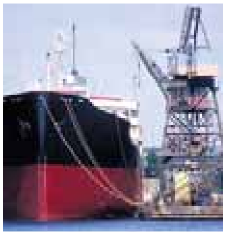
A punctual and qualified business department, an accurate precision in the documentation, a last generation backup and management software, a well-stocked and well organized warehouse are the notes of single instruments which, under a careful and watchful direction, transform themselves in a real symphony. And like an orchestra which is not only composed by instruments but also by musicians, in the same way UNIMEC is not only in-the-van technology and machineries: people are the real beating heart of our company and the synergy between those components becomes a cooperation for a common purpose: your satisfaction.



You maybe did not know that many activities of your everyday life have been made possible thanks to UNIMEC.

UNIMEC meets you everyday





Are you flying on a real Giant of the Skies? UNIMEC made possible its assembling.

Are you watching an opera at the most famous and most important theatre in the world? The stage can move thanks to us.

Are you on a big sailing boat? We can take the credit for its sailing stability.

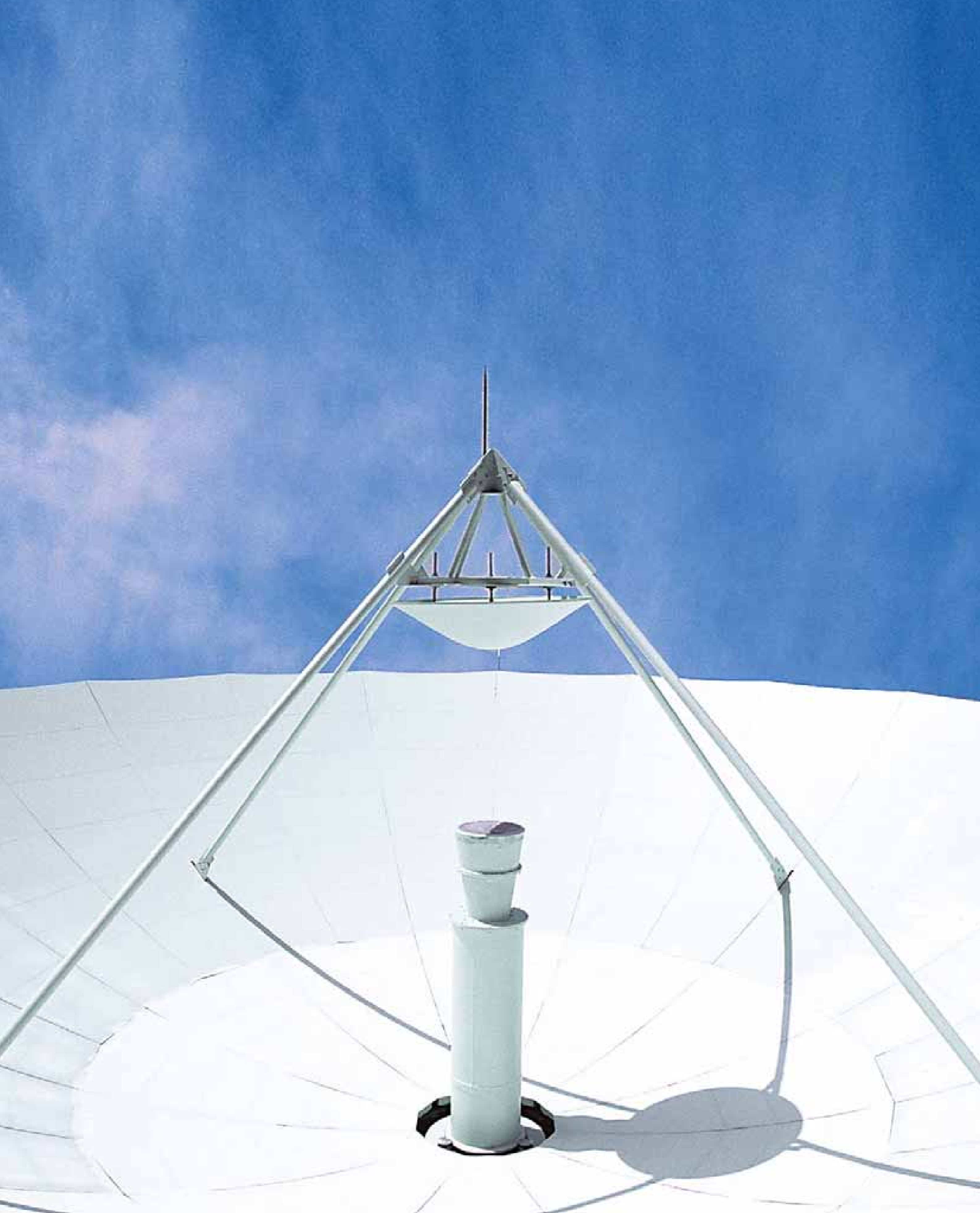
Are your goods being shipped in containers? It would be difficult without UNIMEC.

Are you taking a train? UNIMEC made it possible to lift it for its maintenance.

Would you like to get a clean energy? UNIMEC helps people having an ecological heart.

Are you able to communicate to the antipodes? It is possible thanks to UNIMEC's sat antennas. Are you drinking milk in a glass or from a cardboard packaging for alimentary use? If you could see how it has been made...

Did we excite your curiosity? Just have a look around you and you will discover a little bit of UNIMEC, discrete but present.



If the production is proud of its "made in Italy", the business vocation is different, because it is clearly international: we are widespread present in Italy and in the world.

a presence without boundaries

unimec France

unimec Triveneto

unimec Hispania

We have very skilled and kind resellers, form Australia to South America, passing through Asia and Europe. The quickness in the reply is nowadays a decisive factor to evaluate a company's reliability, and our aim is to made it possible to give you those replies in your own language.

In this optics UNIMEC has been growing not only with resellers and agents, but also with its branches: Unimec France and Unimec Triveneto are solid enterprises able to follow complex markets. They are example for the ultimate Unimec born, the Hispania one, whose duty is to do its name known in all the Spain.

Ease of use and high reliability make UNIMEC trapezoidal screw jacks suitable for a wide variety of uses. They can be employed to lift, pull, move, or align any kind of loads, with a perfect synchronism which can hardly be obtained with other handling methods.
UNIMEC trapezoidal screw jacks are absolutely **irreversible**, that is, they can support their applied loads without needing any brakes or other locking systems.
The screw jacks can be employed singularly or in groups properly connected with shafts, joints, and/or bevel gearboxes.
They can be driven by different motors: electrical, with either alternating or direct current, as well as hydraulic or pneumatic motors. Also they can be driven manually or with any other type of transmission.
In addition to the models shown on the following pages, UNIMEC can produce custom designed screw jacks to meet all the requirements. UNIMEC trapezoidal screw jacks are designed and manufactured using innovative technology so to supply a product which identifies itself with the state of the art in the transmission devices.

trapezoidal screw jacks

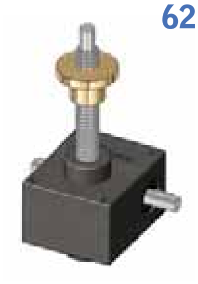
The highest quality and a 28 years long experience are able to meet the most demanding and sophisticated requirements.
The outer surfaces are completely machine finished and the parts are assembled with special care, in order to allow the application of supports, flanges, pins, or any other components a project may require. The application of double guides throughout the product line provides a very good running efficiency even under the most strenuous operating conditions.
Special sealing systems enable the inner gears to operate in a bath of lubricant, which guarantees them a long lasting life.

60 TP

Threaded spindle model with translating threaded spindle.
The rotation of the worm screw is transformed in the axial movement of the threaded spindle by means of the worm wheel. The threaded spindle must have a rotational constraint.

CTP

TP model screw jacks arranged for direct coupling to single phase, three-phase, self-braking, direct current, hydraulic, pneumatic motors, etc. by means of a bell house and a joint.



62 TPR

Threaded spindle model with rotating threaded spindle. The rotation of the worm screw actuates the movement of the worm wheel which causes the threaded spindle to move, being fixedly connected to it. The external support nut (lead nut), transforms the rotational movement of the threaded spindle into a linear movement.
The support nut must have a rotational constraint.

CTPR

TPR model screw jacks arranged for direct coupling to single phase, three-phase, self-braking, direct current, hydraulic, pneumatic motors, etc. by means of a bell house and a joint.

67 MTP

TP model screw jacks arranged for direct coupling to single phase, three-phase, self-braking, direct current, hydraulic, pneumatic motors etc.

RTP

TP model screw jacks arranged for direct coupling to reducers or worm screw or coaxial motor reducers, etc.

67 MTPR

TPR model screw jacks arranged for direct coupling to single phase, three-phase, self-braking, direct current, hydraulic, pneumatic motors etc.

RTPR

TPR model screw jacks arranged for direct coupling to reducers or worm screw or coaxial motor reducers, etc.

Application samples are online at www.unimec.eu - section Applications

VARIOUS END FITTINGS 64

BU 70

TP model screw jack with anti-withdrawing bush

PR 67

TP model screw jacks with rigid protection.

PRF 71

TP model screw jacks with rigid protection and stroke control.

PRO 68

TP model screw jacks with oil bath rigid protection.

PE 72

TP model screw jacks with elastic protection.

CU 69

TP model screw jack oil proof assembled

PE 72

TPR model screw jacks with elastic protection.

Application samples are online at www.unimec.eu - section Applications

74 PRA

TP model screw jacks with rigid protection
and dual-guide anti-rotation.

75 AR

TP model screw jacks with
grooved anti-rotation spindle.

76 CS

TP model screw jacks with safety lead
nut for monitored wear control.

76 CS

TPR model screw jacks with safety lead
nut for monitored wear control.

77 CSU

TP model screw jacks with safety
lead nut for automatic wear control.

77 CSU

TPR model screw jacks with safety
lead nut for automatic wear control.

78 SU

TP model screw jacks with lead
nut for monitored wear control.

78 SU

TPR model screw jacks with lead
nut for monitored wear control.

SUA | **79**

TP model screw jacks with lead nut for automatic wear control.

SUA | **79**

TPR model screw jacks with lead nut for automatic wear control.

RG | **80**

TP model screw jacks with anti axial backlash lead nut.

RG | **80**

TPR model screw jacks with anti axial backlash lead nut.

CR | **81**

TP model screw jacks with worm wheel rotation control.

CR | **81**

TPR model screw jacks with worm wheel rotation control.

CT | **81**

TP-TPR model screw jacks with casing temperature control.

CTC | **81**

TPR model screw jack with lead nut temperature control.

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TP model screw jacks with additional mounting plates.

82 SP
TPR model screw jacks with additional mounting plates.

83 FP
TP model screw jacks with pass-through holes for bolts.

83 FP
TPR model screw jacks with pass-through holes for bolts.

84 PO
TP model screw jacks with rigid rocking protection.

85 P
TP model screw jacks with lateral pins.

85 P
TPR model screw jacks with lateral pins.

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Double action TPR model screw jacks.

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TPR model screw jacks for fast disassembling of the trapezoidal spindle.

TP model screw jacks with special end fittings.

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TP model screw jacks with over-size spindle.

TP model screw jacks with telescopic spindle.

AM

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TPR model screw jacks with over-size spindle.

METAL PROTECTION

TP model screw jacks with metal protection.

Application samples are online at www.unimec.eu - section Applications

Models

TP model: threaded spindle with axial translation.

The input rotation of the worm screw is transformed in the axial translation of the threaded spindle by means of the worm wheel. **The load is applied on the threaded spindle which must have a rotational constraint.**

Trapezoidal screw jacks

TPR model: with rotational threaded spindle and external support nut (lead nut).

The input rotation of the worm screw causes the rotation of the threaded spindle which is attached to the worm wheel. **The load is applied to an external support nut (lead nut) which must have a rotational constraint.**

End fittings

To meet the widest possible range of needs, various types of end fittings are available, which can be custom made upon request.

Casings

Casings are made of various materials depending on the size of screw jacks. For screw jacks of the 183 series, casings are made of cast aluminium AlSi12 (according to the UNI EN 1706:1999 requirements), for the series between the sizes 204 and 9010, casings are made of grey cast iron EN-GJL-250 (according to the UNI EN 1561:1998 requirements); and for the extra heavy series, from size 10012, the casing is made of electro-welded carbon steel S235J0 (according to the UNI EN 10025-2:2005 requirements).

Worm screws

For the entire screw jacks line, worm screws are made of a special steel 16NiCr4 (according to the UNI EN 10084:2000). They undergo thermal treatments like case-hardening and carburizing before being thoroughly ground both on the threads and on the tangs.

Worm wheel and support nut

The worm wheels and support nuts (lead nuts) are made of a special high-resistance aluminium bronze CuAI10Fe2-C (according to the UNI EN 1982:2000 requirements). The trapezoidal geometry of the threading meets the requirements of the ISO 2901:1993 norm. The worm wheels toothing profile has been designed especially for our screw jacks and can easily support a heavy-duty use.

Threaded spindles

The threaded spindles are mainly manufactured by rolling carbon steel C 45 grounded bars (according to the UNI EN 10083-2:1998 requirements). Said process, which is temperature controlled, allows to include in our standard production 6 meter long bars. The trapezoidal geometry of the threading meets the requirements of the ISO 2901:1993 norm. Threaded spindles made of stainless steel AISI 316 or other materials can be manufactured upon request for length up to 12 meters.

Protections

Protections can also be applied in order to prevent dust and foreign matters from coming into contact with the coupling and causing damages to the threaded spindle and its support nut. For TP models, a steel rigid tube can be provided on the back side, while the front side can be protected by polyester and PVC elastic bellows. In TPR models only elastic protections can be applied.

Bearings and market materials

Top-quality bearings and market materials are used for the whole line.

GLOSSARY

C = unit load to be handled [daN]
C_e = equivalent unit load [daN]
C_t = total load to be handled [daN]
DX = left hand spiral threading
F_{rv} = radial forces on the worm screw [daN]
f_a = ambient factor
f_s = service factor
f_t = temperature factor
M_{tm} = torque on the drive shaft [daNm]
M_{tv} = torque on the worm screw [daNm]
N = number of screw jacks and bevel gearboxes under a single handling
n = number of screw jacks under a single handling
P = mounting power requirement [kW]
P_i = input power to the single screw jack [kW]
P_e = equivalent power [kW]
P_u = output power to the single screw jack [kW]
rpm = rounds per minute
SX = left hand spiral threading
v = axial translation speed of the load [mm/min]
η_m = screw jack running efficiency
η_c = configuration running efficiency
η_s = structure running efficiency
ω_m = motor angular speed [rpm]
ω_v = worm screw angular speed [rpm]

Unless otherwise specified all dimensional tables show linear measurements expressed in [mm].
All the reduction ratios are expressed in the form of a fraction, unless otherwise specified.

LOAD ANALYSIS AND COMPOSITION

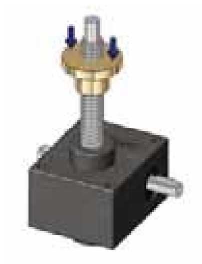
Choosing the right screw jack, and hence also its proper functioning, mostly depends on the identification of the real load acting on the screw jack. Loads can be divided in two main groups: **static** loads and **dynamic** loads; these groups are further made-up of: **traction loads, compression loads, lateral loads, radial loads, eccentric loads, loads from shocks, loads from vibrations**.

STATIC LOADS
A static load is the force that will be applied to the screw jack transmission devices while they are **not in motion.**

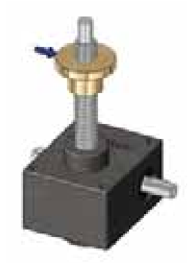
DYNAMIC LOADS
A dynamic load is the force that will be applied to the screw jack transmission devices while they are **in motion.**

TRACTION LOADS
A traction load is the force applied to the threaded spindle axis with an opposite direction to the casing.

COMPRESSION LOADS
A compression load is a force applied to the threaded spindle axis with the same direction as the casing.



LATERAL LOADS
A lateral load is a force applied perpendicular to the threaded spindle axis.



ECCENTRIC LOADS
An eccentric load is a force whose centre of application does not belong to the threaded spindle axis, even having the same direction.

LOADS FROM SHOCKS
A load from shocks is a load where the impulse forces generated by an impact are not quantifiable.

LOADS FROM VIBRATIONS
A load from vibrations is applied when a shock load increases the impulse frequency.

Depending on the type of load some solution must be applied during the design phase:

STATIC TRACTION LOAD
The maximum applicable load for all models and sizes is shown in the specification tables. Shocks and/or lateral loads limit its applications.

DYNAMIC TRACTION LOAD
The maximum dynamic traction load which can be applied to a screw jack does not only depend on its size: it could be limited by the ambient temperature, service factors and possible lateral loads and/or shocks. It is thus necessary to check all those parameters.

STATIC COMPRESSION LOAD
The maximum load which can be applied is determined by the length of the threaded spindle as well as by the constraints it undergoes. The limit applicable load can be obtained on the basis of the Euler diagrams. Its application could be limited by possible shocks and/or lateral loads.

DYNAMIC COMPRESSION LOAD
The maximum compression load which can be applied is determined by many factors: the length of the threaded spindle, the ambient temperature, service factors and possible lateral loads and/or shocks. In addition to all the verifications already foreseen in the case of a traction load, further verifications are necessary relative to the Euler diagrams.

STATIC LATERAL LOAD
This kind of load induces a lateral shifting of the threaded spindle causing a damaging bending which limits the ability of the screw jack. Suitable graphs show the maximum lateral load values according to the length and size of the threaded spindle. For any further and more detailed verifications our technical office is at your disposal.

DYNAMIC LATERAL LOAD
A lateral load in dynamic applications is **not allowed**. In case of essential use of screw jacks with lateral load is for machine requirements, it will be necessary to contact our technical office.

ECCENTRIC STATIC LOAD
An eccentric load in static applications induces the same problems as the lateral loads. For this reason the above considerations are also applicable to this kind of load.

DYNAMIC ECCENTRIC LOAD
In case of handling an eccentric load, in order to avoid problems due to lateral load, it is necessary to create a suitably guided and sized mechanical structure, in order to absorb all the lateral components of the load. The guide must be realized very carefully: too narrow backlashes could cause seizure and stick-slips, while too rough backlashes would make useless the construction of the guide itself.

STATIC LOAD FROM VIBRATIONS OR SHOCKS
A load from vibrations or from shock, if not very heavy, could be the **only reasons for the reversibility** of the transmission moved by the screw jack. In that case it is advisable to contact our technical office in order to verify the screw jack applicability.

DYNAMIC LOAD FROM VIBRATIONS OR SHOCKS
A dynamic load from vibrations or from shock can be damaging for the screw jack: stick-slip phenomena and consequent local overloads can enormously increase the wear conditions. It is necessary to minimize the shocks entity and the vibrations width

BACKLASH

Backlash on the worm screw

The worm screw – worm wheel coupling has a small degree backlash. Due to the reduction ratio and the transformation from the rotation movement to the translation movement, this backlash becomes an error of less than 0,05 mm in the linear positioning of the threaded spindle.

Lateral backlash in TP models

The thread spindle and worm wheel coupling presents a natural and necessary lateral backlash indicated by A in the drawing below. The use of a double serial guide allows to minimize the entity of said backlashes, while keeping the spindle and support nut axes aligned. The angular backlash on the coupling is translated on the spindle end fitting into a linear measure whose value depends on the size of the screw jack and grows according to the length of the spindle itself. Traction loads tend to reduce this backlash, while compression loads induce the opposite effect.

Lateral backlash in TPR models

In TPR models the spindle and the worm wheel are locked by means of a double pins. UNIMEC carries out this operation by means of a suitable machine which keeps the axes of the two components coincident during the two drillings and the consequent pins insertions. Hence, the threaded spindle rotates minimizing the oscillations due to concentricity errors. For a proper operation it is necessary for the user to provide solutions able to keep the spindle and the lead nut aligned. The guides can be external or directly implicate the structure of the lead nut, as can be seen in the following drawings.

Drawing A: the lead nut is connected to the load by means of particular screws which allow it to fit into the threaded spindle position. The guides must be realized externally.

Drawing B: The lead nut, which has been properly milled, is connected to the load by means of brackets which ensure anti-rotation. The brackets must be realized externally.

Drawing C: The lead nut, which has been properly milled, is connected to the load by means of brackets which ensure anti-rotation. The upper additional ring acts as a guide.

Drawing D: The double ring guarantees a higher reliability with respect to the C system.


A

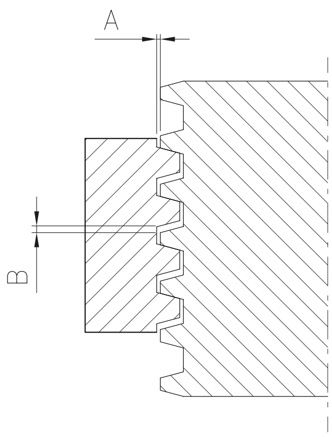

B


C


D

Axial backlash

In B the axial backlash between the threaded spindle and its support nut (either a worm wheel or a lead nut) is caused by the natural and necessary tolerance characterizing this kind of couplings. For construction purposes it is only important in the case where the load changes its direction of application. For applications where there can be reciprocating traction and compression loads, and therefore a need to compensate the axial backlash, it is possible to apply a backlash reduction system. The axial backlash reduction must not be forced in any case, in order to avoid that the screw and the support nut get blocked.



HANDLINGS

Manual operation

All screw jacks in the series can be manually operated. The following table expresses in [daN] the maximum load that can be handled according to the reduction ratio of screw jacks, considering the application of a force of 5 daN on a handwheel having a radius of 250 mm. Obviously, greater loads can be manually handled by applying further reductions to the screw jack or by increasing the radius of the handwheel.

Size	183	204	306	407	559	7010	8010
fast ratio [daN]	500	1000	2000	1500	1000	900	860
normal ratio [daN]	500	1000	2500	2900	2000	1600	1500
slow ratio [daN]	-	1000	2500	5000	4300	3200	3200

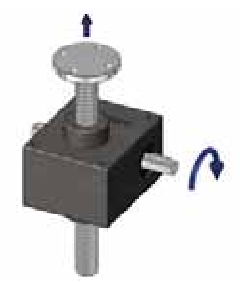
Motorized operation

Motors can be used for all jacks in the series. As a standard production, for the IEC unified motors, it is possible to connect them directly to screw jacks having a size between 204 and 8010. Special flanges can be made for hydraulic, pneumatic, brushless motors, as well as for direct current motors, permanent magnet motors, stepper motors and other special motors. In the case where it is not possible to motorize a screw jack directly, a connection by means of a bell house and a joint can be foreseen. In special cases it is also possible to motorize size 183 and the s over 8010. The power tables determine, in case of unit service factors and for every single screw jack, the moving power and the input torque according to the size, the ratio, the dynamic load and the linear speed.

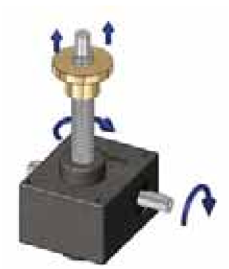
Rotation directions

The rotation directions and the respective linear movements are showed in the drawings below. In standard conditions <u>UNIMEC supplies screw jacks equipped with right handed worm screw, to which the movements illustrated in drawings 1 and 2 correspond.</u> Upon request it is possible to have a left-handed worm screw, which the movements illustrated in drawings 3 and 4 correspond to. The combinations between threaded spindles and left-handed or right-handed worm screw, lead to the four combinations listed in the table below. We remind, that UNIMEC's standard production does not include motorized left-handed worm screw.

Worm screw	DX	DX	SX	SX
Threaded spindle	DX	SX	DX	SX
Direct motorization on the worm screw	Possible	Possible	Impossible	Impossible
Handling	1-2	3-4	3-4	1-2



1



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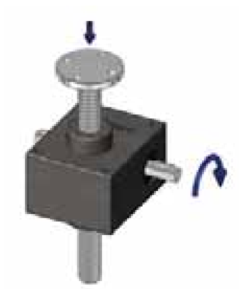

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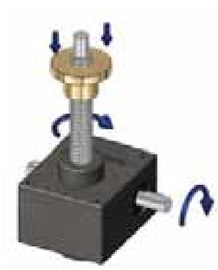


4

Emergency operation

In case of black-out, in order to be able to operate the single screw jacks or the complete structures by means of a crank, a free end on the screw jack worm screw or on the transmission is to be foreseen. In case of self-braking motors or worm screw motor reducers, the brake must firstly be released and then it is necessary to disassemble those components from the transmission as the reducer could also be irreversible.
It is advisable to equip the emergency operation mechanism with a safety device to cut the electric circuit.

LUBRICATION

Inner lubrication

The lubrication of the inner transmission devices to the casing is made, in the serial production, using a long lasting grease: TOTAL CERAN CA. It is an extreme pressure lubricant based on calcium sulfonate.
For size 183, on the contrary, the TOTAL MULTIS MS 2 is used, which is a calcium-soap grease, suited for extreme pressures as well. In any case a plug is foreseen for all sizes (except for 183) in case of lubricant filling up.
The technical specifications and the application field for the lubricant inside the casing are listed below.

Lubricant	Application field	Operating temperature [°C]*	Technical specifications
Total Ceran CA	standard	-15 : +130	DIN 51502: OGPON -25 ISO 6743-9: L-XBDIB 0
Total Multis MS2	standard (183)	-15 : +100	DIN 51502: MPF2K -25 ISO 6743-9: L-XBCEB 2
Total Nevastane HT/AW-1	Food industry	-10 : +150	NSF-USDA: H1

* for operating temperatures included between 80°C and 150°C Viton® seals should be used;
for temperatures higher than 150°C, and lower than -20°C, it is advisable to contact our Technical office.

The quantity of lubricant contained in the screw jacks is listed in the following table.

Size	183	204	306	407	559	7010	8010	9010	10012	12014	14014	16016	20018	25022
Inner lubricant quantity [kg]	0,06	0,1	0,3	0,6	1	1,4	1,4	2,3	4	4	14	14	28	28

The threaded spindle

The end user is responsible for the lubrication of the threaded spindle which must be carried out using an <u>adhesive lubricant, addicted for extreme pressures</u>:

Lubricant	Application field	Operation temperature [°C]	Technical specifications
Rothen 2000/P Special (additive which can also be used pure)	standard	0 : +200	Not foreseen
Total Carter EP 2200 (not compatible with polyglicol oils)	standard	0 : +150	AGMA 9005: D94 DIN 51517-3: CLP-US STEEL 224
Total Nevastane EP 1000	Food industry	0 : +130	NSF-USDA: H1

Lubricating the threaded spindle is an important and determining factor in the proper functioning of the screw jack. <u>It must be carried out at regular intervals that can assure a constant coat of clean lubricant between the contact parts.</u> Insufficient lubrication, the use of an oil without extreme pressure additives or an improper lubrication can lead to abnormal overheating and consequent wear phenomena, which naturally reduce the operating life of the screw jacks. In case the screw jacks are not visible or the threaded spindles are covered by protections, it is necessary to periodically verify the lubrication conditions. For heavier duties than those showed in the relative tables it is recommended to contact our Technical office.

Semi-automatic lubrication

Many different systems of automatic lubrication are feasible, only the most common ones are listed as follows:

1 - For vertically mounted TP model screw jacks, it is possible to provide an oil bath rigid protection (with recirculation option) or, in case of high performances, a single chamber operation. This kind of lubrication will be described in details on page 68-69.

2 - Application of a additional ring on the cover in order to create a lubricant recovery tank.

3 - Use of a lubricant drop-applicator to be applied to a hole made in the cover for TP models, and in the lead nut for TPR models.

1

2

3

Centralized lubrication

Many automatic lubrication systems with a central pump and various distribution points are also possible. The amount of lubricant required depends on the duty and work environment. A centralized dosing system does not exclude a periodic check of the lubrication conditions in the threaded spindle.

INSTALLATION AND MAINTENANCE

Installation

The screw jack must be installed in a manner that does not create lateral loads on the threaded spindle. Great care must be taken to ensure that the threaded spindle is orthogonal to the mounting plane, and that the load and threaded spindle are on the same axis. Employing multiple screw jacks to handle the same load (see the mounting schemes section on pages 90-91) requires further verifications: it is critical that the load support points, (the end fittings for TP models and the lead nuts for TPR models), are perfectly aligned in order that the load can be uniformly distributed; otherwise the misaligned screw jacks would act as brake or counter-load. Whenever several jacks have to be connected by means of transmission shafts, it is recommended that they be perfectly aligned in order to avoid overloading of the worm screws. It is advisable to use joints capable of absorbing alignment errors but having, at the same time, a rigid torsion necessary to keep the synchronization of the transmission. The assembly or disassembly of the joints or pulleys of worm screw must be carried out by means of tie rods or extractors, using, if necessary, the threaded hole on top of the worm screw; striking or hammering could damage the inner bearings.
For heat-shrinking joints or pulleys, we recommend a temperature between 80-100 °C. Installations environments with dust, water, vapors, etc. require precautions to protect the threaded spindle. This can be done by using elastic or rigid protections.
The above protections are also used in order to avoid any accidental human contact with the moving devices. For civil applications it is always advisable to use the safety components.

Preparing for service

All UNIMEC's screw jacks are supplied filled with long lasting lubricant which ensures a perfect lubrication of the worm gear/worm wheel group and all the inner parts. All screw jacks (except for the size 183) are equipped with a lubricant plug for filling-up the lubricant as necessary.
As clearly explained on relative paragraph, **<u>lubrication of the threaded spindle is a user's responsibility</u>** and must be carried out periodically depending on the duty conditions and the operating environment. Special systems are available for holding the screw jacks in any position without creating leakage problems. The application of some accessories can limit these assembly possibilities: the various solutions to be adopted will be explained in the relevant paragraphs.

Start-up

All screw jacks undergo a careful quality examination before being delivered to the client, and **<u>are dynamically tested load-free.</u>** When starting-up a machine where screw jacks are installed, it is critical to check for the lubrication of the threaded spindles and for the absence of foreign material. During the calibration phase of the electrical end-of-stroke systems, the inertia of the moving masses should be taken into account, which for vertical loads will be lower in ascent and greater in descent. It is advisable to start-up the machine with the minimum possible load and to make sure all components are working properly, before assuming regular operation.
Especially at start-up, it is critical to follow the instructions given in the manual: continuous or hazardous testing maneuvers could lead to an abnormal overheating of the screw jacks and cause irreparable damages. **<u>One single temperature peak is enough to cause premature wear or breakdown of the screw jack.</u>**

Routine maintenance

Screw jacks must be periodically inspected, depending on the level of use and working environment. It is advisable to check for lubricant leakages from the casing, and, if this occurs, it is necessary to find and eliminate the cause and fill the lubricant up the correct level.
The lubrication conditions of the threaded spindle must be periodically inspected (and restored if necessary) as well as the presence of any foreign material. The safety components must be inspected according to the applicable norms.

Storage

Screw jacks must be protected from deposits of dust and foreign matter during storage. Particular attention must be paid to saline or corrosive atmospheres.
We also recommend to:

1 - Periodically rotate the input shaft to ensure proper lubrication of the inner parts and avoid that the seals dry up, therefore causing lubricant leakages.
2 - Lubricate and protect the threaded spindle, the worm screw and the non varnished components.
3 - Support the threaded spindle in case of horizontal storage.

Warranty

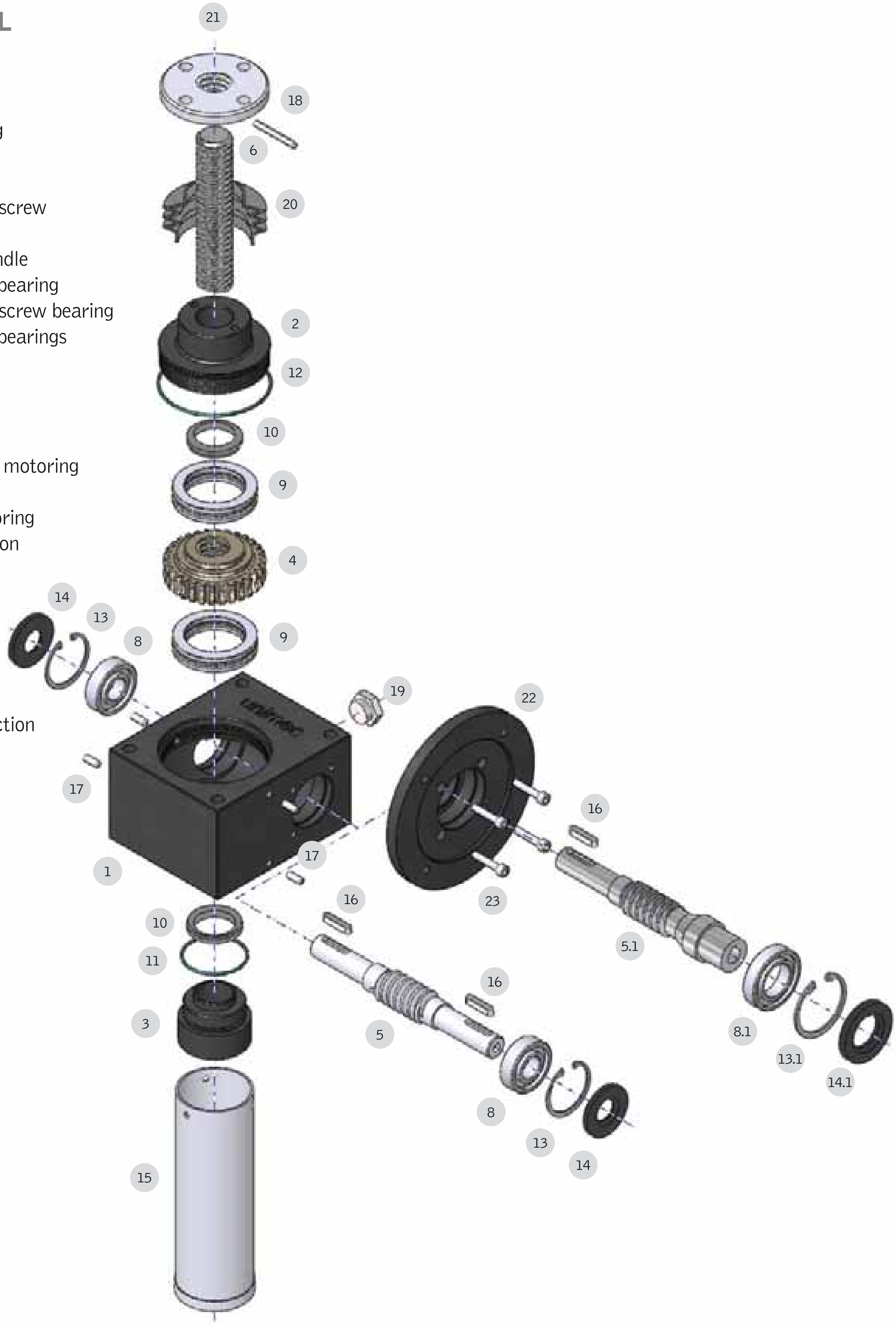
Warranty is valid given when the instructions contained in our manual are carefully followed.

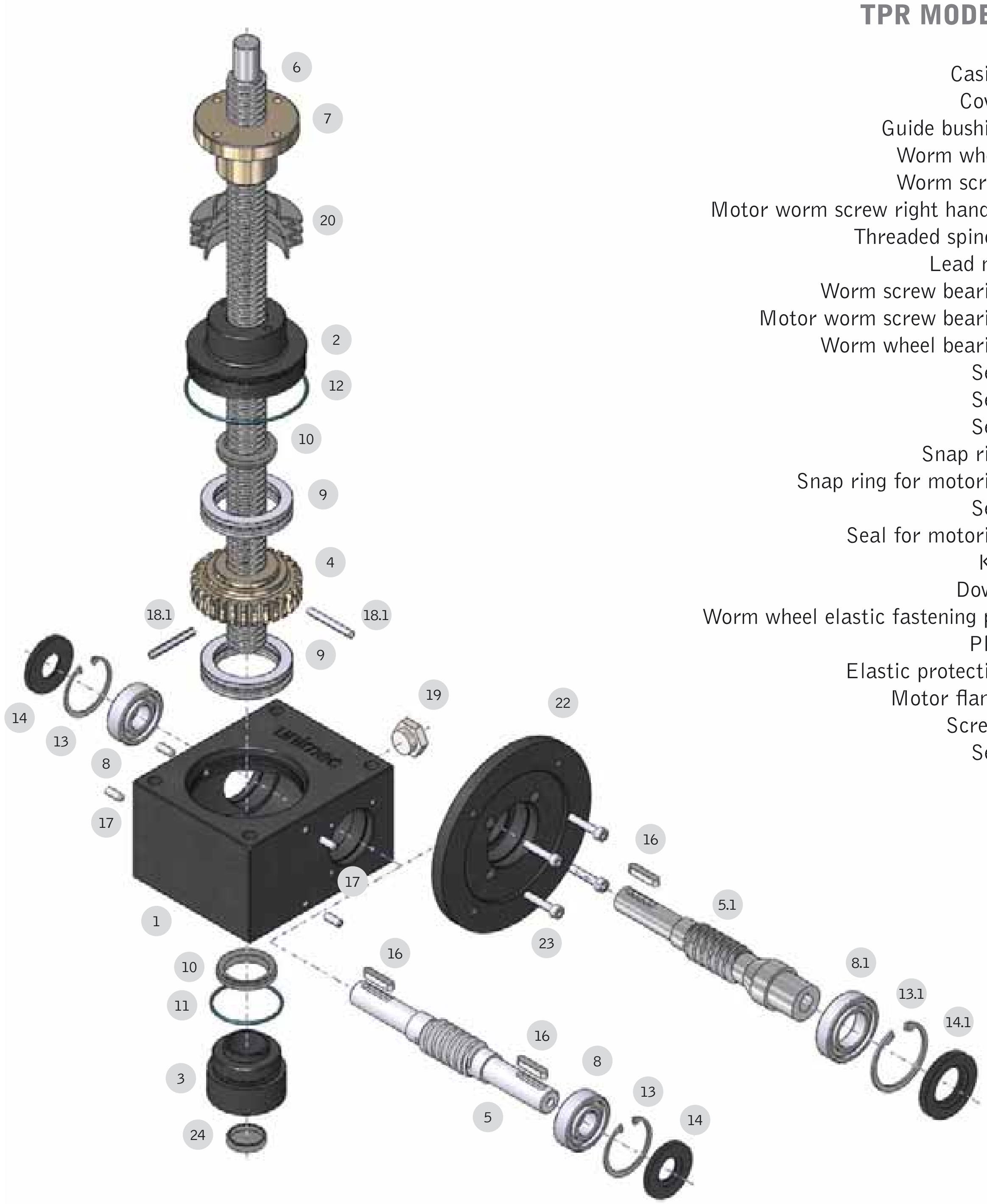
ORDERING CODES

TP	306	1/5	1000	TF	PR-PE	B	IEC 80B5	SU-PO
model (TP/TPR) (MTP/MTPR)	size	reduction ratio	stroke [mm]	end fitting	protections	construction model	motor flange	accessories

TP MODEL

1	Casing
2	Cover
3	Guide bushing
4	Worm wheel
5	Worm screw
5.1	Motor worm screw right-handed
6	Threaded spindle
8	Worm screw bearing
8.1	Motor worm screw bearing
9	Worm wheel bearings
10	Seal
11	Seal
12	Seal
13	Snap ring
13.1	Snap ring for motoring
14	Seal
14.1	Seal for motoring
15	Rigid protection
16	Key
17	Dowel
18	End fitting elastic fastening pin
19	Plug
20	Elastic protection
21	End fitting
22	Motor flange
23	Screws



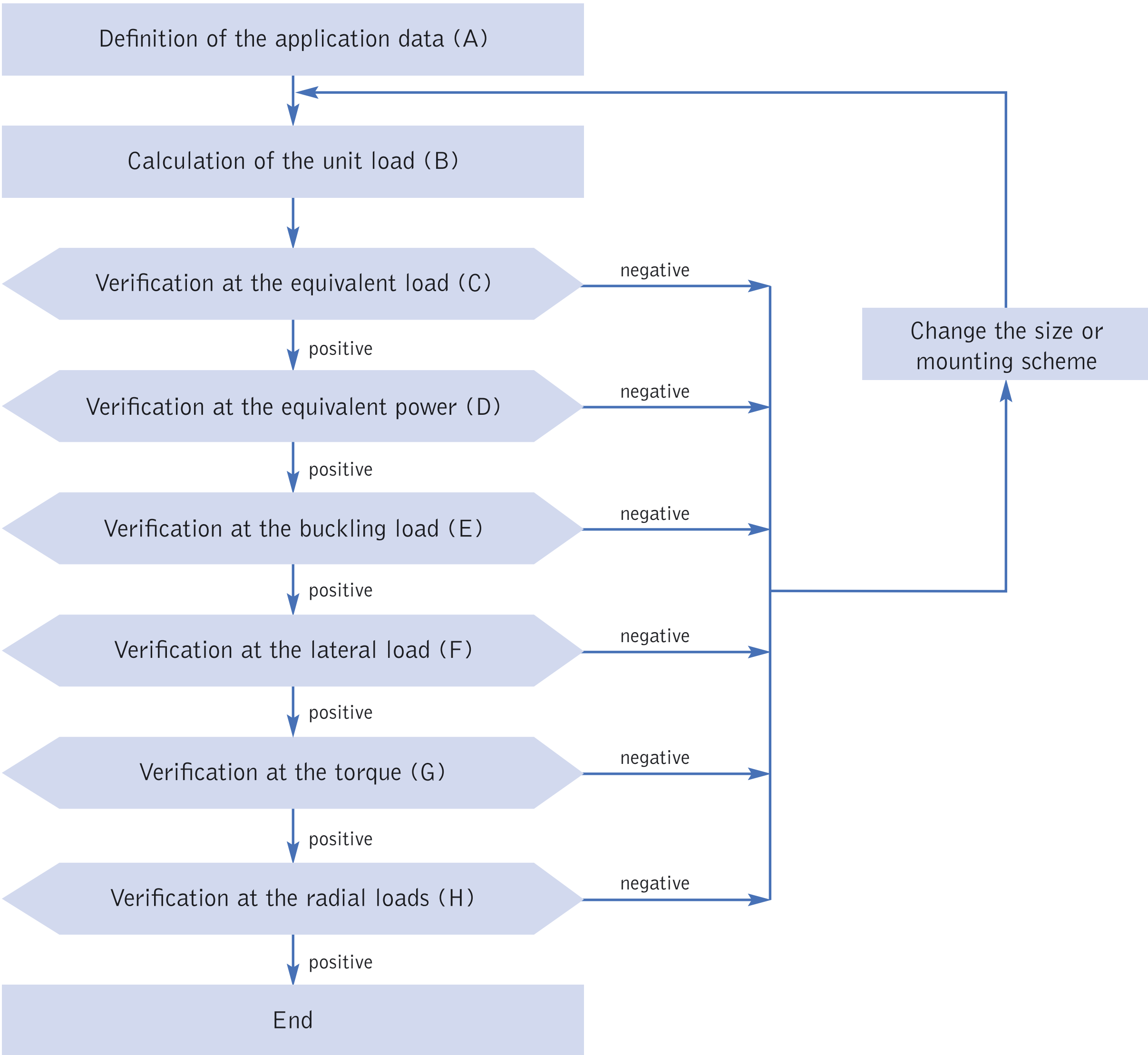


TPR MODEL

Casing	1
Cover	2
Guide bushing	3
Worm wheel	4
Worm screw	5
Motor worm screw right handed	5.1
Threaded spindle	6
Lead nut	7
Worm screw bearing	8
Motor worm screw bearing	8.1
Worm wheel bearing	9
Seal	10
Seal	11
Seal	12
Snap ring	13
Snap ring for motoring	13.1
Seal	14
Seal for motoring	14.1
Key	16
Dowel	17
Worm wheel elastic fastening pin	18.1
Plug	19
Elastic protection	20
Motor flange	22
Screws	23
Seal	24

DIMENSIONING OF THE SCREW JACK

For a correct dimensioning of the screw jack it is necessary to observe the following steps:



DESCRIPTIVE TABLE

Size		183	204	306	407	559	7010	8010
Admissible load [daN]		500	1000	2500	5000	10000	20000	25000
Trapezoidal spindle: diameter per pitch [mm]		18x3	20x4	30x6	40x7	55x9	70x10	80x10
Theoretical reduction ratio	Fast	1/5	1/5	1/5	1/5	1/5	1/5	1/5
	Normal	1/20	1/10	1/10	1/10	1/10	1/10	1/10
	Slow	-	1/30	1/30	1/30	1/30	1/30	1/30
Real reduction ratio	Fast	4/20	4/19	4/19	6/30	6/30	5/26	5/26
	Normal	1/20	2/21	3/29	3/30	3/30	3/29	3/29
	Slow	-	1/30	1/30	1/30	1/30	1/30	1/30
Spindle stroke for a turn of the worm wheel [mm]		3	4	6	7	9	10	10
Spindle stroke for a turn of the worm screw [mm]	Fast	0,6	0,8	1,2	1,4	1,8	2,0	2,0
	Normal	0,15	0,4	0,6	0,7	0,9	1,0	1,0
	Slow	-	0,13	0,2	0,23	0,3	0,33	0,33
Running efficiency [%]	Fast	29	31	30	28	25	23	22
	Normal	24	28	26	25	22	21	20
	Slow	-	20	18	18	17	14	14
Operation temperature [°C]		-10 / 80 (for different conditions please contact our technical office)						
Weight of the trapezoidal screw for 100 mm [kg]		0,16	0,22	0,5	0,9	1,8	2,8	3,7
Weight of the screw jack (screw not included) [kg]		1,8	5,9	10	18	34	56	62

A - THE APPLICATION DATA

For a right dimensioning of the screw jacks it is necessary to identify the application data:

LOAD [daN] = the load is identified with the force applied to the translating device of a screw jack. Normally the dimensioning is calculated considering the maximum applicable load (worst case). It is important to consider the load as a vector, which is defined by a modulus, a direction and a sense: the modulus quantifies the force, the direction orients spatially and gives indications on the eccentricity or on possible lateral loads, the sense identifies the traction or compression load.

TRANSLATION SPEED [mm/min] = the translation speed is the load handling speed. From this speed it is possible to calculate the rotation speed of the rotating devices and the necessary power for the movement. Wear phenomena and the life of the screw jack proportionally depend on the value of the translation speed. Therefore, it is advisable to limit the translation speed in a way not to exceed the input speed of 1500 rpm on the worm screw. Input speeds up to 3000 rpm are possible but in such case we suggest contacting our technical office.

STROKE [mm] = it is the linear measure used to handle a load. It does not always coincide with the total length of the threaded spindle.

AMBIENT VARIABLES = these values identify the environment and the operating conditions of the screw jack. Among them: temperature, oxidizing and corrosive factors, working and non-working periods, vibrations, maintenance and cleaning, lubrication quality and quantity etc.

MOUNTING SCHEMES = There are several ways of handling a load by means of screw jacks. The schemes on pages 90-91 will show you some examples. Choosing a mounting scheme will condition the choice for the size and the power which is necessary for the application.

B - THE UNIT LOAD AND THE DESCRIPTIVE TABLES

According to the n number of screw jacks contained in the mounting scheme it is possible to calculate each screw jack's load by dividing the total load by n. In case the load is not fairly distributed in all screw jacks, it is recommended to consider the transmission having the heaviest load, by virtue of a dimensioning based on the worst case.

9010	10012	12014	14014	16016	20018	25022		Size
35000	40000	60000	80000	100000	150000	200000		Admissible load [daN]
100x12	100x12	120x14	140x14	160x16	200x18	250x22		Trapezoidal spindle: diameter per pitch [mm]
-	-	-	-	-	-	-	Fast	Theoretical reduction ratio
1/10	1/10	1/10	1/12	1/12	1/12	1/12	Normal	
1/30	1/30	1/30	1/36	1/36	1/36	1/36	Slow	
-	-	-	-	-	-	-	Fast	Real reduction ration
3/30	3/31	3/31	3/36	3/36	3/36	3/36	Normal	
1/30	1/30	1/30	1/36	1/36	1/36	1/36	Slow	
12	12	14	14	16	18	22		Spindle stroke for a turn of the worm wheel [mm]
-	-	-	-	-	-	-		Spindle stroke for a turn of the worm screw fast [mm]
1,2	1,2	1,4	1,16	1,33	1,5	1,83	Normal	
0,4	0,4	0,47	0,38	0,44	0,5	0,61	Slow	
-	-	-	-	-	-	-	Fast	Running efficiency [%]
18	18	17	16	15	14	14	Normal	
12	12	11	10	9	9	9	Slow	
								Operation temperature [°C]
5,6	5,6	8,1	11	14	22	35		Weight of the trapezoidal screw for 100 mm [kg]
110	180	180	550	550	2100	2100		Weight of the screw jack (screw not included) [kg]

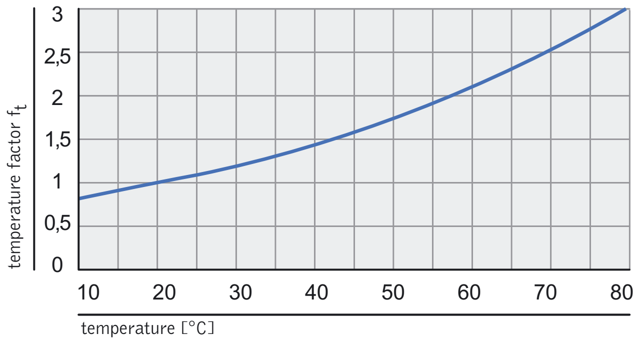
C – THE EQUIVALENT LOAD

All the values listed in the catalogue refer to standard use conditions, i.e. under a temperature of 20 °C and working percentage of 10%.
For different operation conditions the equivalent load should be calculated: it refers to the load which would be applied in standard conditions in order to have the same thermal exchange and wear effects, which the real load achieves in the real conditions of use.
It is therefore advisable to calculate the equivalent load according to the following formula:

$C_e = C \cdot f_t \cdot f_a \cdot f_s$

The temperature factor f_t

By means of the following diagram an f_t factor can be calculated according to the ambient temperature.
In case of temperatures higher than 80 °C we suggest contacting our technical office.



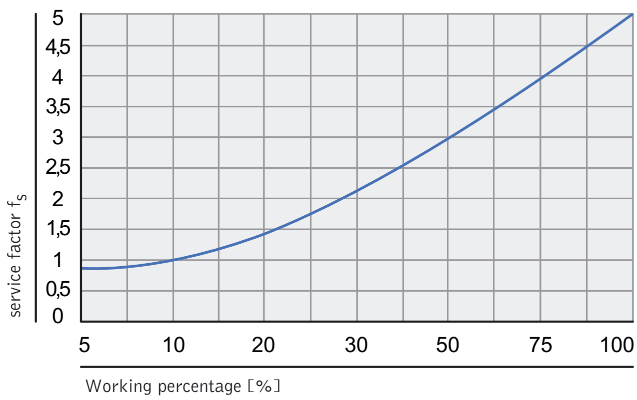
The ambient factor f_a

By means of the following table it is possible to calculate the f_a factor according to the operation conditions.

Type of load	Ambient factor f_a
Light shocks, few insertions, regular movements	1
Medium shocks, frequent insertions, regular movements	1,2
High shocks, many insertions, irregular movements	1,8

The service factor f_s

The service factor f_s is obtained by evaluating the working cycle and calculating the operation percentage on that interval. For example a working time of 10 minutes and non working time of 10 minutes correspond to 50%; similarly a working time of 5 minutes and a non working time of 20 minutes correspond to 20%.
Based on the working data, choosing the cycle time and the operation percentage it is possible to read the f_s value on the ordinate axis.



With the aid of the descriptive tables it is possible to check whether the previously chosen size is able to support an admissible dynamic load equal to the equivalent load.
If not, it is necessary to effect a second choice.

D – THE POWER TABLES AND THE EQUIVALENT POWER

The power tables are listed from page 46 to page 59. Choosing the tables referring to the size selected in paragraph C and putting the equivalent load values as well as the translation speed values in the table, it is possible to obtain the equivalent power P_e value. If the crossing values fall into the coloured area, this means that the application conditions could cause negative phenomena such as overheating and strong wear. It is therefore necessary to reduce the translation speed or to increase the size.

The equivalent power is not the power requested by the single screw jack, unless the three correction factors f_t, f_a and f_s have a unit value.

E – BUCKLING

In case of compression load, even occasional, it is necessary to check the buckling structure.
Firstly the two constraints which support the screw jack have to be determined: the first one is on the end fitting for TP models and on the lead nut for TPR models, while the second one is the way the casing is grounded.
Most part of the real cases can be schematized according to three models, as listed below:

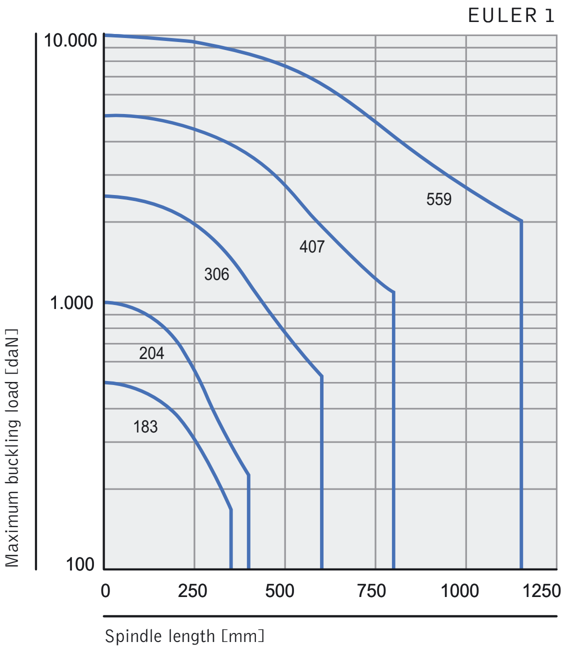
	End fitting – lead nut	Screw jack
Euler I	Free	Fitted in
Euler II	Hinge	Hinge
Euler III	Sleeve	Fitted in

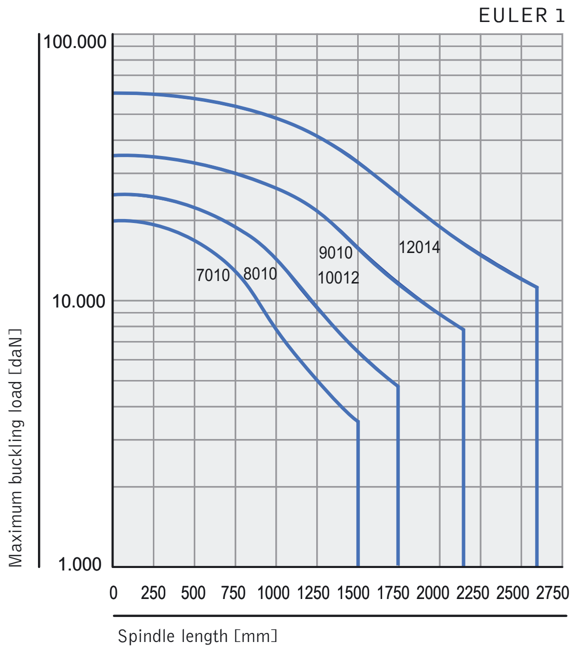
Once the Euler case has been determined which most fits to the current application, it is necessary to find in the corresponding diagram the point corresponding to the coordinates (length; load). The sizes suited to the application are those whose curves subtend the above point. In case the size chosen at paragraph D does not meet such requisites it is necessary to choose a higher size. The Euler-Gordon-Rankine curves have been calculated with a factor of safety equal to 4. For applications which can support factors of safety lower than 4 we suggest contacting our technical office.

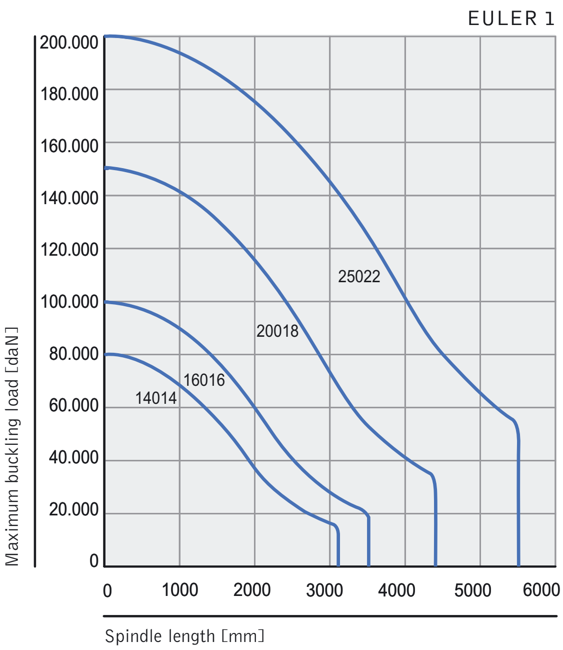
EULER 1

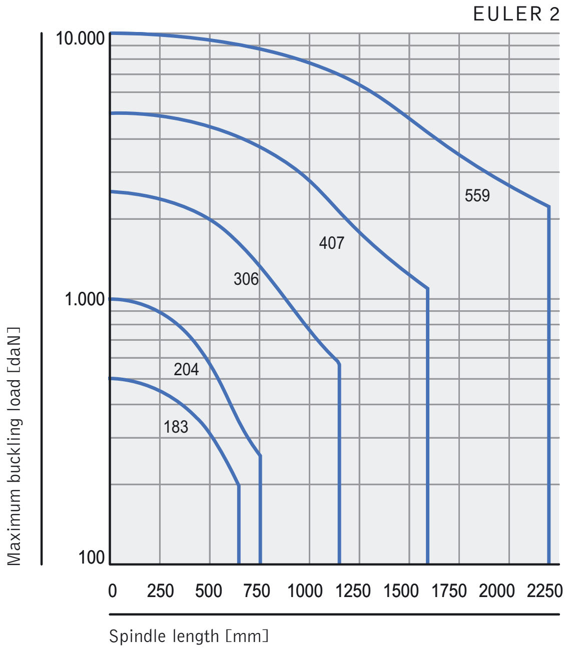
EULER 2

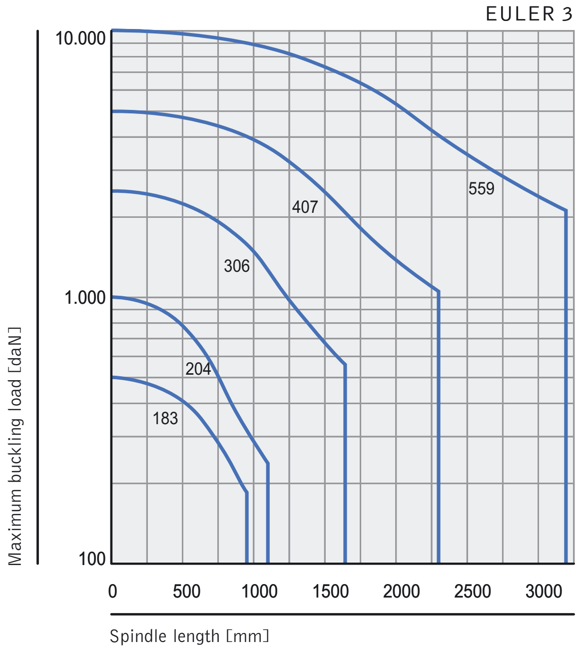
EULER 3

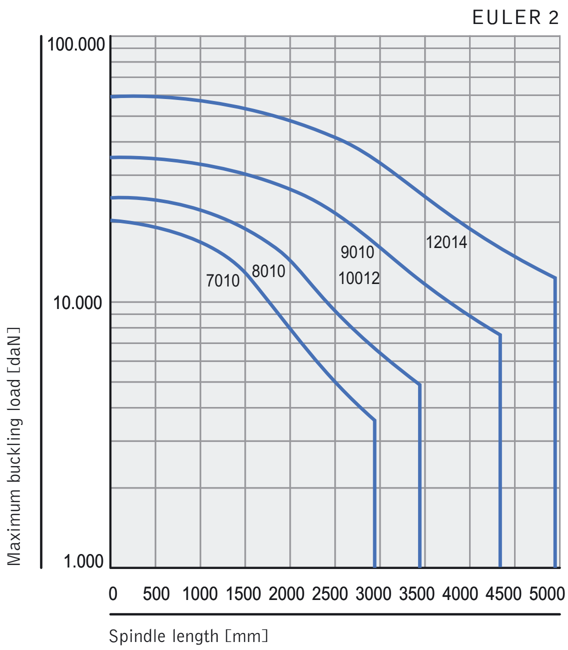


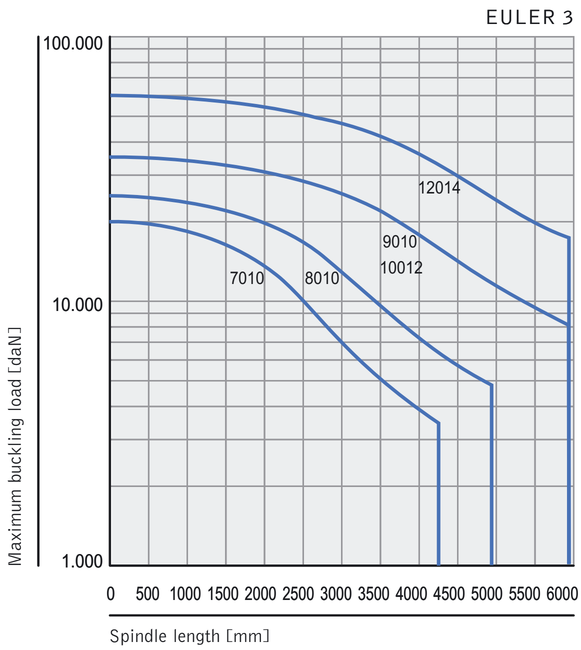


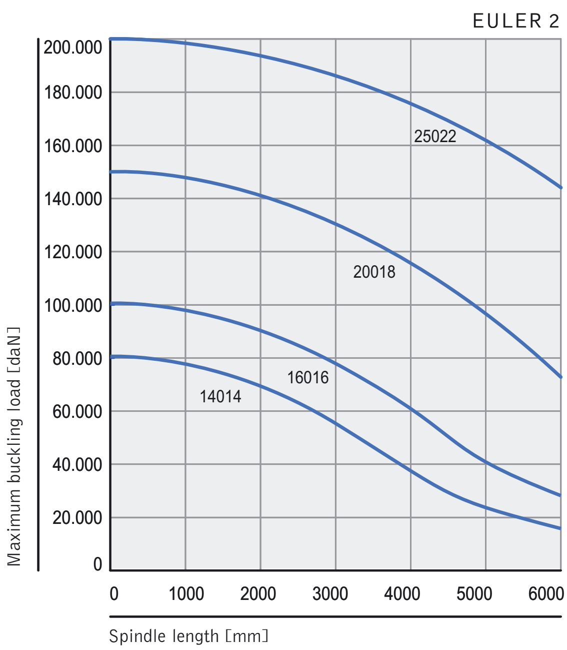


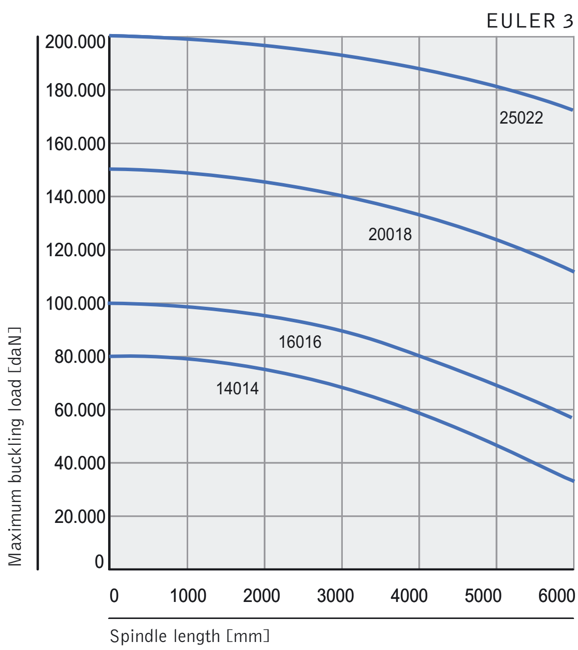

EULER 2
Maximum buckling load [daN]
10.000
1.000
100
559
407
306
204
183
0
250
500
750
1000
1250
1500
1750
2000
2250
Spindle length [mm]


EULER 3
Maximum buckling load [daN]
10.000
1.000
100
559
407
306
204
183
0
500
1000
1500
2000
2500
3000
Spindle length [mm]


EULER 2
Maximum buckling load [daN]
100.000
10.000
1.000
12014
9010
10012
8010
7010
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Spindle length [mm]

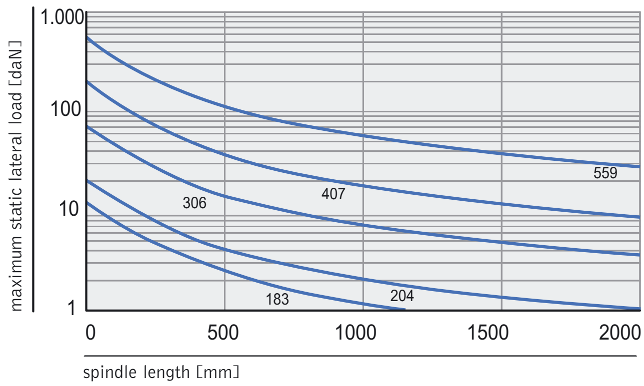

EULER 3
Maximum buckling load [daN]
100.000
10.000
1.000
12014
9010
10012
8010
7010
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000
Spindle length [mm]

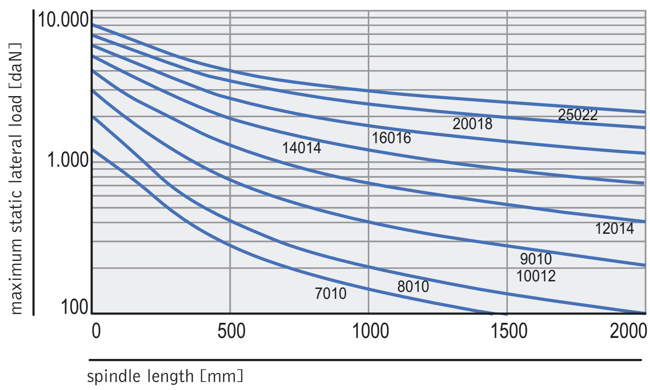

EULER 2
Maximum buckling load [daN]
200.000
180.000
160.000
140.000
120.000
100.000
80.000
60.000
40.000
20.000
0
25022
20018
16016
14014
0
1000
2000
3000
4000
5000
6000
Spindle length [mm]


EULER 3
Maximum buckling load [daN]
200.000
180.000
160.000
140.000
120.000
100.000
80.000
60.000
40.000
20.000
0
25022
20018
16016
14014
0
1000
2000
3000
4000
5000
6000
Spindle length [mm]

F – THE LATERAL LOAD

As stated in the previous paragraphs lateral loads are the main cause of failures. In addition to the misalignment of the threaded spindle and the load, they can be caused by inaccurate mountings which force the threaded spindle in an anomalous position. As a consequence the coupling between lead nut and threaded spindle for TPR model and between the threaded spindle and the worm wheel for the TP model will be wrong. The application of double serial guides allows, for TP models, a partial correction of the anomalous position of the threaded spindle before contacting the worm wheel. The problem is transformed into a sliding of the threaded spindle on the guides themselves. In TPR model, it is the outer support nut which contacts the threaded spindle and it is therefore not possible to apply any corrections, unless particular mountings are applied as illustrated in the paragraph "lateral backlash in TPR models". Lateral loads can even derive from an horizontal mounting: the threaded spindle own weight causes a bending of the same, becoming in this way a lateral load. The border value for the bending and the consequent lateral load depends on the screw jack size and on the threaded spindle length. It is advisable to contact our technical office in order to foresee the suitable supports.
The following diagrams, which are valid for static loads, show the admissible lateral load value, according to the size and the length of the threaded spindle. For dynamic applications it is necessary to ask to the technical office.





In case the size chosen in the previous paragraphs is not enough to support a particular lateral load, a suitable size should be chosen.

G – THE TORQUE

At this stage it is possible to calculate the power requested by the mounting. The following formula will be used to calculate this value:

$$P = \frac{1}{1000} \cdot \frac{n \cdot C \cdot v}{6000 \cdot \eta_m \cdot \eta_c \cdot \eta_s}$$

where:

P = requested power [kW]
n = number of screw jacks
C = unit load [daN]
v = translation speed [mm/min]
η_m = screw jack running efficiency (see descriptive tables)
η_c = configuration running efficiency = 1 - [(N-1) • 0,05], where N is the total number of screw jacks and gear boxes
η_s = structure running efficiency (guides, belts, pulleys, shafts, joints, reducers)

In order to complete the calculation of the requested power it is necessary to calculate the torque which should be transmitted by the drive shaft:

$$M_{tm} = \frac{955 \cdot P}{\omega_m}$$

where:

M_{tm} = is the torque on the drive shaft [daNm]
P = is the motor power [kW]
ω_m = is the angular speed of the motor [rpm]

According to the applied mounting scheme it is necessary to check that the worm screw will be able to hold out under a possible combined torque. In the following table the admissible torque values are listed for the worm screws according to their size and expressed as [daNm].

Size	183	204	306	407	559	7010	8010	9010	10012	12014	14014	16016	20018	25022
Fast ratio [daNm]	2,30	5,43	6,90	49,0	49,0	84,7	84,7	-	-	-	-	-	-	-
Normal ratio [daNm]	2,30	5,43	15,4	12,8	12,8	84,7	84,7	202	522	522	823	823	2847	2847
Slow ratio [daNm]	-	4,18	18,3	15,4	15,4	49,0	49,0	202	441	441	984	984	2847	2847

In case the above values are exceeded it will be necessary to choose a higher size, to change the mounting scheme or to increase the speed, in accordance to what has been indicated in the previous paragraphs.

H - RADIAL LOADS

In case of radial loads on the worm screw it is necessary to check their strength according to the following table:

Size	183	204	306	407	559	7010	8010	9010	10012	12014	14014	16016	20018	25022
F_{rv} [daN]	10	22	45	60	60	90	90	100	250	250	300	300	380	380

In case the above values are exceeded it will be necessary to choose a higher size, to change the mounting scheme or to increase the speed, in accordance to what has been indicated in the previous paragraphs.

Size 183

Ratio 1/5													
Load [daN]		500		400		300		200		100		50	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	900	0,25	0,17	0,21	0,14	0,15	0,10	0,10	0,07	0,07	0,03	0,07	0,03
1000	600	0,17	0,17	0,14	0,14	0,10	0,10	0,07	0,07	0,07	0,03	0,07	0,03
750	450	0,13	0,17	0,10	0,14	0,08	0,10	0,07	0,07	0,07	0,03	0,07	0,03
500	300	0,09	0,17	0,07	0,14	0,07	0,10	0,07	0,07	0,07	0,03	0,07	0,03
300	180	0,07	0,17	0,07	0,14	0,07	0,10	0,07	0,07	0,07	0,03	0,07	0,03
100	60	0,07	0,17	0,07	0,14	0,07	0,10	0,07	0,07	0,07	0,03	0,07	0,03
50	30	0,07	0,17	0,07	0,14	0,07	0,10	0,07	0,07	0,07	0,03	0,07	0,03

Ratio 1/20													
Load [daN]		500		400		300		200		100		50	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	225	0,08	0,06	0,07	0,05	0,07	0,04	0,07	0,04	0,07	0,04	0,07	0,04
1000	150	0,07	0,06	0,07	0,05	0,07	0,04	0,07	0,04	0,07	0,04	0,07	0,04
750	112,5	0,07	0,06	0,07	0,05	0,07	0,04	0,07	0,04	0,07	0,04	0,07	0,04
500	75	0,07	0,06	0,07	0,05	0,07	0,04	0,07	0,04	0,07	0,04	0,07	0,04
300	45	0,07	0,06	0,07	0,05	0,07	0,04	0,07	0,04	0,07	0,04	0,07	0,04
100	15	0,07	0,06	0,07	0,05	0,07	0,04	0,07	0,04	0,07	0,04	0,07	0,04
50	7,5	0,07	0,06	0,07	0,05	0,07	0,04	0,07	0,04	0,07	0,04	0,07	0,04

Size 204

Ratio 1/5

Load [daN]		1000		800		600		400		300		200		100	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	1200	0,64	0,42	0,51	0,33	0,38	0,25	0,26	0,17	0,19	0,13	0,13	0,09	0,07	0,05
1000	800	0,43	0,42	0,34	0,33	0,26	0,25	0,17	0,17	0,13	0,13	0,09	0,09	0,07	0,05
750	600	0,32	0,42	0,26	0,33	0,19	0,25	0,13	0,17	0,10	0,13	0,07	0,09	0,07	0,05
500	400	0,21	0,42	0,17	0,33	0,13	0,25	0,09	0,17	0,07	0,13	0,07	0,09	0,07	0,05
300	240	0,13	0,42	0,11	0,33	0,11	0,25	0,07	0,17	0,07	0,13	0,07	0,09	0,07	0,05
100	80	0,07	0,42	0,07	0,33	0,07	0,25	0,07	0,17	0,07	0,13	0,07	0,09	0,07	0,05
50	40	0,07	0,42	0,07	0,33	0,07	0,25	0,07	0,17	0,07	0,13	0,07	0,09	0,07	0,05

Ratio 1/10

Load [daN]		1000		800		600		400		300		200		100	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	600	0,36	0,23	0,30	0,19	0,22	0,14	0,14	0,09	0,11	0,07	0,08	0,05	0,07	0,03
1000	400	0,24	0,23	0,20	0,19	0,14	0,14	0,09	0,09	0,07	0,07	0,07	0,05	0,07	0,03
750	300	0,18	0,23	0,15	0,19	0,11	0,14	0,07	0,09	0,07	0,07	0,07	0,05	0,07	0,03
500	200	0,12	0,23	0,10	0,19	0,07	0,14	0,07	0,09	0,07	0,07	0,07	0,05	0,07	0,03
300	120	0,07	0,23	0,07	0,19	0,07	0,14	0,07	0,09	0,07	0,07	0,07	0,05	0,07	0,03
100	40	0,07	0,23	0,07	0,19	0,07	0,14	0,07	0,09	0,07	0,07	0,07	0,05	0,07	0,03
50	20	0,07	0,23	0,07	0,19	0,07	0,14	0,07	0,09	0,07	0,07	0,07	0,05	0,07	0,03

Ratio 1/30

Load [daN]		1000		800		600		400		300		200		100	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	200	0,17	0,11	0,13	0,08	0,11	0,07	0,07	0,05	0,07	0,03	0,07	0,03	0,07	0,03
1000	133	0,12	0,11	0,08	0,08	0,07	0,07	0,07	0,05	0,07	0,03	0,07	0,03	0,07	0,03
750	100	0,08	0,11	0,07	0,08	0,07	0,07	0,07	0,05	0,07	0,03	0,07	0,03	0,07	0,03
500	67	0,07	0,11	0,07	0,08	0,07	0,07	0,07	0,05	0,07	0,03	0,07	0,03	0,07	0,03
300	40	0,07	0,11	0,07	0,08	0,07	0,07	0,07	0,05	0,07	0,03	0,07	0,03	0,07	0,03
100	13	0,07	0,11	0,07	0,08	0,07	0,07	0,07	0,05	0,07	0,03	0,07	0,03	0,07	0,03
50	6,7	0,07	0,11	0,07	0,08	0,07	0,07	0,07	0,05	0,07	0,03	0,07	0,03	0,07	0,03

Size 306

Ratio 1/5

Load [daN]		2500		2000		1500		1000		750		500		250	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	1800	2,45	1,60	1,96	1,28	1,47	0,96	0,98	0,64	0,74	0,48	0,49	0,32	0,25	0,17
1000	1200	1,64	1,60	1,31	1,28	0,98	0,96	0,65	0,64	0,49	0,48	0,33	0,32	0,17	0,17
750	900	1,23	1,60	0,98	1,28	0,74	0,96	0,49	0,64	0,37	0,48	0,25	0,32	0,13	0,17
500	600	0,82	1,60	0,66	1,28	0,49	0,96	0,33	0,64	0,25	0,48	0,17	0,32	0,10	0,17
300	360	0,49	1,60	0,40	1,28	0,30	0,96	0,20	0,64	0,15	0,48	0,10	0,32	0,10	0,17
100	120	0,17	1,60	0,13	1,28	0,10	0,96	0,10	0,64	0,10	0,48	0,10	0,32	0,10	0,17
50	60	0,10	1,60	0,10	1,28	0,10	0,96	0,10	0,64	0,10	0,48	0,10	0,32	0,10	0,17

Ratio 1/10

Load [daN]		2500		2000		1500		1000		750		500		250	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	900	1,43	0,93	1,14	0,74	0,86	0,56	0,57	0,37	0,43	0,28	0,29	0,19	0,16	0,10
1000	600	0,96	0,93	0,76	0,74	0,58	0,56	0,38	0,37	0,29	0,28	0,20	0,19	0,10	0,10
750	450	0,72	0,93	0,57	0,74	0,43	0,56	0,29	0,37	0,22	0,28	0,15	0,19	0,10	0,10
500	300	0,48	0,93	0,38	0,74	0,28	0,56	0,19	0,37	0,15	0,28	0,10	0,19	0,10	0,10
300	180	0,28	0,93	0,23	0,74	0,18	0,56	0,12	0,37	0,10	0,28	0,10	0,19	0,10	0,10
100	60	0,10	0,93	0,10	0,74	0,10	0,56	0,10	0,37	0,10	0,28	0,10	0,19	0,10	0,10
50	30	0,10	0,93	0,10	0,74	0,10	0,56	0,10	0,37	0,10	0,28	0,10	0,19	0,10	0,10

Ratio 1/30

Load [daN]		2500		2000		1500		1000		750		500		250	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	300	0,68	0,44	0,56	0,36	0,42	0,27	0,28	0,18	0,22	0,14	0,14	0,09	0,07	0,05
1000	200	0,45	0,44	0,37	0,36	0,28	0,27	0,19	0,18	0,14	0,14	0,10	0,09	0,07	0,05
750	150	0,34	0,44	0,28	0,36	0,21	0,27	0,14	0,18	0,11	0,14	0,07	0,09	0,07	0,05
500	100	0,23	0,44	0,19	0,36	0,14	0,27	0,10	0,18	0,07	0,14	0,07	0,09	0,07	0,05
300	60	0,14	0,44	0,11	0,36	0,08	0,27	0,07	0,18	0,07	0,14	0,07	0,09	0,07	0,05
100	20	0,07	0,44	0,11	0,36	0,08	0,27	0,07	0,18	0,07	0,14	0,07	0,09	0,07	0,05
50	10	0,07	0,44	0,11	0,36	0,08	0,27	0,07	0,18	0,07	0,14	0,07	0,09	0,07	0,05

Size 407

Ratio 1/5															
Load [daN]		5000		4000		3000		2000		1500		1000		500	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	2100	6,13	3,98	4,90	3,18	3,68	2,39	2,45	1,59	1,84	1,20	1,23	0,80	0,62	0,40
1000	1400	4,09	3,98	3,27	3,18	2,15	2,39	1,64	1,59	1,23	1,20	0,82	0,80	0,41	0,40
750	1050	3,06	3,98	2,45	3,18	1,80	2,39	1,23	1,59	0,92	1,20	0,62	0,80	0,31	0,40
500	700	2,04	3,98	1,64	3,18	1,23	2,39	0,82	1,59	0,62	1,20	0,41	0,80	0,21	0,40
300	420	1,23	3,98	0,98	3,18	0,74	2,39	0,49	1,59	0,37	1,20	0,25	0,80	0,13	0,40
100	140	0,41	3,98	0,33	3,18	0,25	2,39	0,17	1,59	0,13	1,20	0,10	0,80	0,10	0,40
50	70	0,21	3,98	0,17	3,18	0,13	2,39	0,10	1,59	0,10	1,20	0,10	0,80	0,10	0,40

Ratio 1/10															
Load [daN]		5000		4000		3000		2000		1500		1000		500	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	1050	3,60	2,30	2,80	1,80	2,10	1,34	1,40	0,90	1,05	0,67	0,70	0,45	0,35	0,23
1000	700	2,40	2,30	1,85	1,80	1,38	1,34	0,92	0,90	0,69	0,67	0,46	0,45	0,23	0,23
750	525	1,77	2,30	1,40	1,80	1,00	1,34	0,70	0,90	0,52	0,67	0,35	0,45	0,18	0,23
500	350	1,18	2,30	0,92	1,80	0,69	1,34	0,46	0,90	0,35	0,67	0,23	0,45	0,12	0,23
300	210	0,71	2,30	0,56	1,80	0,42	1,34	0,28	0,90	0,21	0,67	0,14	0,45	0,10	0,23
100	70	0,24	2,30	0,19	1,80	0,14	1,34	0,10	0,90	0,10	0,67	0,10	0,45	0,10	0,23
50	35	0,12	2,30	0,10	1,80	0,10	1,34	0,10	0,90	0,10	0,67	0,10	0,45	0,10	0,23

Ratio 1/30															
Load [daN]		5000		4000		3000		2000		1500		1000		500	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	350	1,69	1,10	1,26	0,82	0,95	0,62	0,63	0,41	0,48	0,31	0,32	0,21	0,17	0,11
1000	233	1,13	1,10	0,84	0,82	0,64	0,62	0,42	0,41	0,32	0,31	0,21	0,21	0,11	0,11
750	175	0,85	1,10	0,63	0,82	0,48	0,62	0,32	0,41	0,24	0,31	0,16	0,21	0,08	0,11
500	117	0,56	1,10	0,42	0,82	0,32	0,62	0,21	0,41	0,16	0,31	0,11	0,21	0,07	0,11
300	70	0,34	1,10	0,25	0,82	0,19	0,62	0,13	0,41	0,10	0,31	0,07	0,21	0,07	0,11
100	23	0,12	1,10	0,08	0,82	0,07	0,62	0,07	0,41	0,07	0,31	0,07	0,21	0,07	0,11
50	11,7	0,07	1,10	0,07	0,82	0,07	0,62	0,07	0,41	0,07	0,31	0,07	0,21	0,07	0,11

Size 559

Ratio 1/5

Load [daN]		10000		7500		5000		4000		3000		2000		1000	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	2700	17,7	11,5	13,3	8,60	8,83	5,74	7,06	4,58	5,30	3,44	3,53	2,29	1,77	1,15
1000	1800	11,8	11,5	8,83	8,60	5,89	5,74	4,71	4,58	3,53	3,44	2,36	2,29	1,18	1,15
750	1350	8,83	11,5	6,62	8,60	4,42	5,74	3,53	4,58	2,65	3,44	1,77	2,29	0,89	1,15
500	900	5,88	11,5	4,42	8,60	2,94	5,74	2,36	4,58	1,77	3,44	1,18	2,29	0,59	1,15
300	540	3,53	11,5	2,65	8,60	1,77	5,74	1,42	4,58	1,06	3,44	0,71	2,29	0,36	1,15
100	180	1,18	11,5	0,88	8,60	0,59	5,74	0,47	4,58	0,36	3,44	0,24	2,29	0,12	1,15
50	90	0,57	11,5	0,44	8,60	0,30	5,74	0,24	4,58	0,18	3,44	0,12	2,29	0,10	1,15

Ratio 1/10

Load [daN]		10000		7500		5000		4000		3000		2000		1000	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	1350	10,0	6,50	7,50	4,90	5,00	3,25	4,00	2,60	3,10	2,00	2,00	1,30	1,00	0,65
1000	900	6,70	6,50	5,00	4,90	3,40	3,25	2,70	2,60	2,10	2,00	1,35	1,30	0,67	0,65
750	675	5,00	6,50	3,77	4,90	2,50	3,25	2,00	2,60	1,54	2,00	1,00	1,30	0,50	0,65
500	450	3,30	6,50	2,50	4,90	1,67	3,25	1,33	2,60	1,03	2,00	0,67	1,30	0,33	0,65
300	270	2,00	6,50	1,50	4,90	1,00	3,25	0,80	2,60	0,62	2,00	0,40	1,30	0,20	0,65
100	90	0,67	6,50	0,50	4,90	0,33	3,25	0,27	2,60	0,20	2,00	0,13	1,30	0,10	0,65
50	45	0,33	6,50	0,25	4,90	0,17	3,25	0,13	2,60	0,10	2,00	0,10	1,30	0,10	0,65

Ratio 1/30

Load [daN]		10000		7500		5000		4000		3000		2000		1000	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	450	4,30	2,80	3,30	2,10	2,20	1,40	1,73	1,12	1,30	0,84	0,86	0,56	0,43	0,28
1000	300	2,90	2,80	2,16	2,10	1,44	1,40	1,15	1,12	0,86	0,84	0,58	0,56	0,29	0,28
750	225	2,16	2,80	1,62	2,10	1,08	1,40	0,86	1,12	0,65	0,84	0,43	0,56	0,22	0,28
500	150	1,44	2,80	1,10	2,10	0,72	1,40	0,58	1,12	0,43	0,84	0,29	0,56	0,15	0,28
300	90	0,86	2,80	0,65	2,10	0,43	1,40	0,35	1,12	0,26	0,84	0,18	0,56	0,09	0,28
100	30	0,29	2,80	0,22	2,10	0,15	1,40	0,12	1,12	0,09	0,84	0,07	0,56	0,07	0,28
50	15	0,14	2,80	0,11	2,10	0,07	1,40	0,07	1,12	0,07	0,84	0,07	0,56	0,07	0,28

Size 7010

Ratio 1/5

Load [daN]		20000		17500		15000		10000		7500		5000		2500	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	3000	42,6	27,7	37,3	24,3	32,0	20,8	21,3	13,8	16,0	10,4	10,7	6,95	5,33	3,46
1000	2000	28,4	27,7	24,9	24,3	21,3	20,8	14,2	13,8	10,7	10,4	7,10	6,95	3,55	3,46
750	1500	21,3	27,7	18,7	24,3	16,0	20,8	10,7	13,8	8,00	10,4	5,33	6,95	2,66	3,46
500	1000	14,2	27,7	12,4	24,3	10,7	20,8	7,10	13,8	5,33	10,4	3,55	6,95	1,78	3,46
300	600	8,53	27,7	7,46	24,3	6,39	20,8	4,26	13,8	3,20	10,4	2,13	6,95	1,07	3,46
100	200	2,84	27,7	2,49	24,3	2,13	20,8	1,42	13,8	1,07	10,4	0,71	6,95	0,36	3,46
50	100	1,42	27,7	1,24	24,3	1,07	20,8	0,71	13,8	0,53	10,4	0,36	6,95	0,18	3,46

Ratio 1/10

Load [daN]		20000		17500		15000		10000		7500		5000		2500	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	1500	23,4	15,2	20,5	13,3	17,6	11,4	11,7	7,60	8,80	5,70	5,86	3,80	2,93	1,90
1000	1000	15,6	15,2	13,7	13,3	11,7	11,4	7,80	7,60	5,90	5,70	3,90	3,80	1,95	1,90
750	750	11,7	15,2	10,2	13,3	8,80	11,4	5,90	7,60	4,40	5,70	2,92	3,80	1,46	1,90
500	500	7,80	15,2	6,80	13,3	5,90	11,4	3,90	7,60	2,92	5,70	1,95	3,80	0,98	1,90
300	300	4,68	15,2	4,10	13,3	3,50	11,4	2,34	7,60	1,75	5,70	1,17	3,80	0,58	1,90
100	100	1,56	15,2	1,37	13,3	1,17	11,4	0,78	7,60	0,59	5,70	0,39	3,80	0,20	1,90
50	50	0,78	15,2	0,68	13,3	0,58	11,4	0,39	7,60	0,29	5,70	0,20	3,80	0,10	1,90

Ratio 1/30

Load [daN]		20000		17500		15000		10000		7500		5000		2500	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	500	11,7	7,60	10,3	6,70	8,80	5,70	5,90	3,80	4,50	2,90	2,90	1,90	1,46	0,95
1000	333	7,80	7,60	6,90	6,70	5,90	5,70	3,90	3,80	3,00	2,90	2,00	1,90	1,00	0,95
750	250	5,85	7,60	5,16	6,70	4,40	5,70	2,93	3,80	2,23	2,90	1,46	1,90	0,73	0,95
500	167	3,90	7,60	3,44	6,70	2,92	5,70	1,95	3,80	1,49	2,90	0,98	1,90	0,49	0,95
300	100	2,34	7,60	2,06	6,70	1,76	5,70	1,17	3,80	0,89	2,90	0,58	1,90	0,29	0,95
100	33	0,78	7,60	0,69	6,70	0,59	5,70	0,39	3,80	0,30	2,90	0,20	1,90	0,10	0,95
50	16,7	0,39	7,60	0,34	6,70	0,30	5,70	0,20	3,80	0,14	2,90	0,10	1,90	0,07	0,95

Size 8010

Ratio 1/5

Worm screw rotation speed ωv [rpm]	Threaded spindle translation speed v [mm/min]	25000 Pi [kW]	25000 Mtv [daNm]	20000 Pi [kW]	20000 Mtv [daNm]	15000 Pi [kW]	15000 Mtv [daNm]	10000 Pi [kW]	10000 Mtv [daNm]	7500 Pi [kW]	7500 Mtv [daNm]	5000 Pi [kW]	5000 Mtv [daNm]	2500 Pi [kW]	2500 Mtv [daNm]
1500	3000	55,7	36,2	44,6	29,0	33,4	21,7	22,3	14,5	16,7	10,9	11,2	7,24	5,57	3,62
1000	2000	37,2	36,2	29,7	29,0	22,3	21,7	14,9	14,5	11,2	10,9	7,43	7,24	3,72	3,62
750	1500	27,9	36,2	22,3	29,0	16,7	21,7	11,2	14,5	6,68	10,9	5,57	7,24	2,79	3,62
500	1000	18,6	36,2	14,9	29,0	11,2	21,7	7,43	14,5	5,57	10,9	3,72	7,24	1,86	3,62
300	600	11,2	36,2	8,92	29,0	6,68	21,7	4,46	14,5	3,34	10,9	2,23	7,24	1,12	3,62
100	200	3,72	36,2	2,97	29,0	2,23	21,7	1,49	14,5	1,12	10,9	0,75	7,24	0,38	3,62
50	100	1,86	36,2	1,49	29,0	1,12	21,7	0,75	14,5	0,56	10,9	0,38	7,24	0,19	3,62

Load [daN]

Ratio 1/10

Worm screw rotation speed ωv [rpm]	Threaded spindle translation speed v [mm/min]	25000 Pi [kW]	25000 Mtv [daNm]	20000 Pi [kW]	20000 Mtv [daNm]	15000 Pi [kW]	15000 Mtv [daNm]	10000 Pi [kW]	10000 Mtv [daNm]	7500 Pi [kW]	7500 Mtv [daNm]	5000 Pi [kW]	5000 Mtv [daNm]	2500 Pi [kW]	2500 Mtv [daNm]
1500	1500	30,8	20,0	24,5	16,0	18,4	12,0	12,3	8,00	9,20	6,00	6,20	4,00	3,10	2,00
1000	1000	20,5	20,0	16,4	16,0	12,3	12,0	8,20	8,00	6,02	6,00	4,10	4,00	2,05	2,00
750	750	15,4	20,0	12,3	16,0	9,24	12,0	6,16	8,00	4,62	6,00	3,08	4,00	1,54	2,00
500	500	10,3	20,0	8,20	16,0	6,16	12,0	4,10	8,00	3,08	6,00	2,05	4,00	1,03	2,00
300	300	6,16	20,0	4,90	16,0	3,70	12,0	2,50	8,00	1,85	6,00	1,23	4,00	0,62	2,00
100	100	2,06	20,0	1,65	16,0	1,24	12,0	0,82	8,00	0,62	6,00	0,41	4,00	0,21	2,00
50	50	1,02	20,0	0,82	16,0	0,61	12,0	0,41	8,00	0,31	6,00	0,21	4,00	0,11	2,00

Load [daN]

Ratio 1/30

Worm screw rotation speed ωv [rpm]	Threaded spindle translation speed v [mm/min]	25000 Pi [kW]	25000 Mtv [daNm]	20000 Pi [kW]	20000 Mtv [daNm]	15000 Pi [kW]	15000 Mtv [daNm]	10000 Pi [kW]	10000 Mtv [daNm]	7500 Pi [kW]	7500 Mtv [daNm]	5000 Pi [kW]	5000 Mtv [daNm]	2500 Pi [kW]	2500 Mtv [daNm]
1500	500	14,5	9,40	11,7	7,60	8,80	5,70	5,90	3,80	4,50	2,90	2,90	1,90	1,46	0,95
1000	333	9,70	9,40	7,80	7,60	5,90	5,70	3,90	3,80	3,00	2,90	2,00	1,90	1,00	0,95
750	250	7,30	9,40	5,85	7,60	4,40	5,70	2,93	3,80	2,23	2,90	1,46	1,90	0,73	0,95
500	167	4,80	9,40	3,90	7,60	2,92	5,70	1,95	3,80	1,49	2,90	0,98	1,90	0,49	0,95
300	100	2,90	9,40	2,34	7,60	1,76	5,70	1,17	3,80	0,89	2,90	0,58	1,90	0,29	0,95
100	33	0,96	9,40	0,78	7,60	0,59	5,70	0,39	3,80	0,30	2,90	0,20	1,90	0,10	0,95
50	16,7	0,48	9,40	0,39	7,60	0,30	5,70	0,20	3,80	0,14	2,90	0,10	1,90	0,07	0,95

Load [daN]

Size 9010

Ratio 1/10													
Load [daN]		**35000**		**25000**		**20000**		**15000**		**10000**		**5000**	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	1800	57,2	37,2	40,8	26,5	32,7	21,2	24,5	15,9	16,4	10,6	8,20	5,30
1000	1200	38,2	37,2	27,2	26,5	21,8	21,2	16,4	15,9	10,9	10,6	5,50	5,30
750	900	28,6	37,2	20,4	26,5	16,4	21,2	12,3	15,9	8,20	10,6	4,10	5,30
500	600	19,1	37,2	13,6	26,5	10,9	21,2	8,20	15,9	5,50	10,6	2,80	5,30
300	360	11,5	37,2	8,20	26,5	6,60	21,2	4,90	15,9	3,30	10,6	1,70	5,30
100	120	3,90	37,2	2,80	26,5	2,20	21,2	1,70	15,9	1,10	10,6	0,60	5,30
50	60	1,90	37,2	1,40	26,5	1,10	21,2	0,90	15,9	0,60	10,6	0,30	5,30

Ratio 1/30													
Load [daN]		**35000**		**25000**		**20000**		**15000**		**10000**		**5000**	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	600	28,6	18,6	20,4	13,3	16,4	10,7	12,3	8,00	8,20	5,40	4,10	2,70
1000	400	19,1	18,6	13,6	13,3	10,9	10,7	8,20	8,00	5,50	5,40	2,80	2,70
750	300	14,3	18,6	10,2	13,3	8,20	10,7	6,20	8,00	4,10	5,40	2,10	2,70
500	200	9,60	18,6	6,90	13,3	5,50	10,7	4,10	8,00	2,80	5,40	1,40	2,70
300	120	5,80	18,6	4,10	13,3	3,30	10,7	2,50	8,00	1,70	5,40	0,90	2,70
100	40	1,90	18,6	1,40	13,3	1,10	10,7	0,90	8,00	0,60	5,40	0,30	2,70
50	20	1,00	18,6	0,70	13,3	0,60	10,7	0,50	8,00	0,30	5,40	0,20	2,70

Size 10012

Ratio 1/10															
Load [daN]		40000		30000		25000		20000		15000		10000		5000	
Worm screw rotation speed ωy [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	1800	65,4	42,5	49,0	31,8	40,8	26,5	32,7	21,2	24,5	15,9	16,4	10,6	8,16	5,30
1000	1200	43,6	42,5	32,7	31,8	27,2	26,5	21,8	21,2	16,4	15,9	10,9	10,6	5,45	5,30
750	900	32,7	42,5	24,5	31,8	20,4	26,5	16,4	21,2	12,3	15,9	8,16	10,6	4,08	5,30
500	600	21,8	42,5	16,4	31,8	13,6	26,5	10,9	21,2	8,16	15,9	5,45	10,6	2,73	5,30
300	360	13,1	42,5	9,80	31,8	8,17	26,5	6,54	21,2	4,90	15,9	3,27	10,6	1,64	5,30
100	120	4,36	42,5	3,27	31,8	2,72	26,5	2,18	21,2	1,64	15,9	1,09	10,6	0,55	5,30
50	60	2,18	42,5	1,64	31,8	1,36	26,5	1,09	21,2	0,82	15,9	0,55	10,6	0,28	5,30

Ratio 1/30															
Load [daN]		40000		30000		25000		20000		15000		10000		5000	
Worm screw rotation speed ωy [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	600	32,7	21,3	24,5	15,9	20,4	13,3	16,4	10,7	12,3	7,99	8,17	5,32	4,09	2,66
1000	400	21,8	21,3	16,4	15,9	13,6	13,3	10,9	10,7	8,17	7,99	5,45	5,32	2,72	2,66
750	300	16,4	21,3	12,3	15,9	10,2	13,3	8,17	10,7	6,13	7,99	4,09	5,32	2,05	2,66
500	200	10,9	21,3	8,17	15,9	6,81	13,3	5,45	10,7	4,09	7,99	2,72	5,32	1,36	2,66
300	120	6,54	21,3	4,90	15,9	4,08	13,3	3,27	10,7	2,45	7,99	1,64	5,32	0,82	2,66
100	40	2,18	21,3	1,64	15,9	1,36	13,3	1,09	10,7	0,82	7,99	0,55	5,32	0,28	2,66
50	20	1,09	21,3	0,82	15,9	0,68	13,3	0,55	10,7	0,41	7,99	0,28	5,32	0,14	2,66

Size 12014

Ratio 1/10

Load [daN]		60000		50000		40000		30000		20000		15000		10000	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	2100	121	78,6	101	65,6	80,7	52,4	60,6	39,3	40,4	26,2	30,3	19,7	20,2	13,1
1000	1400	80,7	78,6	67,3	65,6	53,8	52,4	40,4	39,3	26,9	26,2	20,2	19,7	13,5	13,1
750	1050	60,1	78,6	50,5	65,6	40,4	52,4	30,3	39,3	20,2	26,2	15,2	19,7	10,1	13,1
500	700	40,3	78,6	33,6	65,6	26,9	52,4	20,2	39,3	13,5	26,2	10,1	19,7	6,73	13,1
300	420	24,2	78,6	20,2	65,6	16,1	52,4	12,1	39,3	8,07	26,2	6,06	19,7	4,04	13,1
100	140	8,07	78,6	6,73	65,6	5,38	52,4	4,04	39,3	2,69	26,2	2,02	19,7	1,35	13,1
50	70	4,04	78,6	3,36	65,6	2,69	52,4	2,02	39,3	1,35	26,2	1,01	19,7	0,67	13,1

Ratio 1/30

Load [daN]		60000		50000		40000		30000		20000		15000		10000	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	700	62,5	40,5	52,0	33,8	41,6	27,0	31,2	20,3	20,8	13,5	15,6	10,2	10,4	6,75
1000	466	41,5	40,5	34,6	33,8	27,7	27,0	20,8	20,3	13,9	13,5	10,4	10,2	6,92	6,75
750	350	31,2	40,5	26,0	33,8	20,8	27,0	15,6	20,3	10,4	13,5	7,80	10,2	5,20	6,75
500	233	20,8	40,5	17,3	33,8	13,8	27,0	10,4	20,3	6,92	13,5	5,20	10,2	3,46	6,75
300	140	12,5	40,5	10,4	33,8	8,32	27,0	6,24	20,3	4,16	13,5	3,12	10,2	2,08	6,75
100	46	4,10	40,5	3,42	33,8	2,73	27,0	2,05	20,3	1,37	13,5	1,03	10,2	0,68	6,75
50	23	2,05	40,5	1,71	33,8	1,37	27,0	1,03	20,3	0,69	13,5	0,52	10,2	0,34	6,75

Size 14014

Ratio 1/12

Load [daN]		80000		60000		40000		30000		20000		10000		5000	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	1750	143	92,9	107	69,6	71,5	46,5	53,6	34,8	35,8	23,3	17,9	11,7	8,94	5,81
1000	1166	95,3	92,9	71,5	69,6	47,6	46,5	35,7	34,8	23,9	23,3	11,9	11,7	5,96	5,81
750	875	71,5	92,9	53,6	69,6	35,8	46,5	26,8	34,8	17,9	23,3	8,94	11,7	4,47	5,81
500	583	47,6	92,9	35,7	69,6	23,8	46,5	17,9	34,8	11,9	23,3	5,96	11,7	2,98	5,81
300	350	28,6	92,9	21,5	69,6	14,3	46,5	10,8	34,8	7,15	23,3	3,58	11,7	1,79	5,81
100	116	9,48	92,9	7,11	69,6	4,74	46,5	3,56	34,8	2,37	23,3	1,19	11,7	0,60	5,81
50	58	4,73	92,9	3,56	69,6	2,37	46,5	1,78	34,8	1,19	23,3	0,60	11,7	0,30	5,81

Ratio 1/36

Load [daN]		80000		60000		40000		30000		20000		10000		5000	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	583	76,1	49,4	57,1	37,1	38,1	24,8	28,6	18,6	19,1	12,4	9,51	6,18	4,76	3,10
1000	388	50,6	49,4	38,0	37,1	25,3	24,8	19,0	18,6	12,7	12,4	6,33	6,18	3,17	3,10
750	291	38,1	49,4	28,6	37,1	19,1	24,8	14,3	18,6	9,51	12,4	4,76	6,18	2,38	3,10
500	194	25,4	49,4	19,1	37,1	12,7	24,8	9,51	18,6	6,34	12,4	3,17	6,18	1,59	3,10
300	116	15,2	49,4	11,4	37,1	7,59	24,8	5,69	18,6	3,80	12,4	1,90	6,18	0,95	3,10
100	38	4,97	49,4	3,73	37,1	2,49	24,8	1,87	18,6	1,25	12,4	0,63	6,18	0,32	3,10
50	19	2,49	49,4	1,87	37,1	1,25	24,8	0,94	18,6	0,63	12,4	0,32	6,18	0,16	3,10

Size 16016

Ratio 1/12															
Load [daN]		100000		80000		60000		40000		30000		20000		10000	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	2000	218	141	174	113	131	85,0	87,0	56,5	65,0	42,5	43,6	28,3	21,8	14,2
1000	1333	145	141	116	113	87,0	85,0	58,0	56,5	43,6	42,5	29,0	28,3	14,5	14,2
750	1000	109	141	87,0	113	65,4	85,0	43,6	56,5	32,7	42,5	21,8	28,3	10,9	14,2
500	667	72,6	141	58,1	113	43,6	85,0	29,0	56,5	21,8	42,5	14,5	28,3	7,26	14,2
300	400	43,6	141	34,9	113	26,1	85,0	17,4	56,5	13,1	42,5	8,71	28,3	4,36	14,2
100	133	14,5	141	11,6	113	8,71	85,0	5,81	56,5	4,36	42,5	2,90	28,3	1,45	14,2
50	66,6	7,26	141	5,81	113	4,36	85,0	2,90	56,5	2,18	42,5	1,45	28,3	0,73	14,2

Ratio 1/36															
Load [daN]		100000		80000		60000		40000		30000		20000		10000	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	666	121	78,6	96,8	62,8	72,6	47,2	48,4	31,5	36,3	23,6	24,2	15,7	12,1	7,86
1000	444	80,7	78,6	64,5	62,8	48,4	47,2	32,3	31,5	24,2	23,6	16,1	15,7	8,07	7,86
750	333	60,5	78,6	48,5	62,8	36,3	47,2	24,2	31,5	18,2	23,6	12,1	15,7	6,05	7,86
500	222	40,4	78,6	32,3	62,8	24,2	47,2	16,1	31,5	12,1	23,6	8,07	15,7	4,03	7,86
300	133	24,2	78,6	19,4	62,8	14,5	47,2	9,68	31,5	7,26	23,6	4,84	15,7	2,42	7,86
100	44	8,06	78,6	6,45	62,8	4,84	47,2	3,22	31,5	2,42	23,6	1,61	15,7	0,81	7,86
50	22	4,03	78,6	3,22	62,8	2,42	47,2	1,61	31,5	1,21	23,6	0,81	15,7	0,41	7,86

Size 20018

Ratio 1/12															
Load [daN]		150000		130000		100000		80000		50000		25000		10000	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	2250	350	239	284	197	219	149	175	119	110	74,4	54,5	37,2	21,8	14,9
1000	1500	237	239	192	197	148	149	119	119	73,9	74,4	36,9	37,2	14,7	14,9
750	1125	179	239	146	197	112	149	89,4	119	55,8	74,4	27,9	37,2	11,1	14,9
500	750	122	239	98,9	197	75,9	149	60,7	119	37,9	74,4	18,9	37,2	7,60	14,9
300	450	75,0	239	60,4	197	46,4	149	37,1	119	23,2	74,4	11,6	37,2	4,64	14,9
100	150	26,8	239	21,8	197	16,7	149	13,3	119	8,37	74,4	4,18	37,2	1,67	14,9
50	75	13,8	239	11,2	197	8,63	149	6,90	119	4,31	74,4	2,16	37,2	0,86	14,9

Ratio 1/36															
Load [daN]		150000		130000		100000		80000		50000		25000		10000	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	750	187	94,9	109	83,2	83,4	64,1	66,7	50,7	41,7	31,7	20,9	15,9	8,33	6,36
1000	500	124	94,9	74,3	83,2	57,2	64,1	47,7	50,7	28,6	31,7	14,3	15,9	5,71	6,36
750	375	93,6	94,9	57,9	83,2	44,5	64,1	35,6	50,7	22,3	31,7	11,2	15,9	4,45	6,36
500	250	63,0	94,9	39,8	83,2	30,6	64,1	24,5	50,7	15,3	31,7	7,65	15,9	3,06	6,36
300	150	37,4	94,9	25,6	83,2	19,7	64,1	15,8	50,7	9,85	31,7	4,92	15,9	1,97	6,36
100	50	11,9	94,9	10,4	83,2	7,95	64,1	6,36	50,7	3,98	31,7	2,00	15,9	0,85	6,36
50	25	6,40	94,9	5,55	83,2	4,26	64,1	3,41	50,7	2,13	31,7	1,06	15,9	0,65	6,36

Size 25022

Ratio 1/12

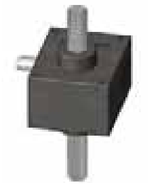
Load [daN]		200000		180000		150000		130000		100000		80000		50000	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	2750	543	370	489	332	407	276	353	240	271	185	217	148	135	92,2
1000	1833	368	370	331	332	276	276	240	240	184	185	147	148	92,0	92,2
750	1375	278	370	250	332	208	276	180	240	139	185	111	148	69,5	92,2
500	916	189	370	170	332	141	276	122	240	94,2	185	75,6	148	47,2	92,2
300	550	115	370	104	332	86,4	276	75,1	240	57,8	185	46,2	148	28,8	92,2
100	183	41,7	370	37,5	332	31,2	276	27,1	240	20,8	185	16,6	148	10,4	92,2
50	92	21,4	370	19,3	332	16,1	276	13,9	240	10,7	185	8,59	148	5,37	92,2

Ratio 1/36

Load [daN]		200000		180000		150000		130000		100000		80000		50000	
Worm screw rotation speed ω_v [rpm]	Threaded spindle translation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	916	207	157	186	141	155	117	134	101	103	78,0	82,9	62,8	51,8	39,1
1000	611	142	157	128	141	106	117	92,4	101	71,1	78,0	56,8	62,8	35,5	39,1
750	458	110	157	99,6	141	83,0	117	72,0	101	55,3	78,0	44,3	62,8	27,6	39,1
500	305	76,2	157	68,5	141	57,1	117	49,5	101	38,1	78,0	30,4	62,8	19,0	39,1
300	183	49,0	157	44,1	141	36,7	117	31,8	101	24,5	78,0	19,6	62,8	12,2	39,1
100	61	19,7	157	17,8	141	14,8	117	12,8	101	9,90	78,0	7,92	62,8	4,95	39,1
50	30	10,6	157	9,54	141	7,95	117	6,89	101	5,30	78,0	4,24	62,8	2,65	39,1

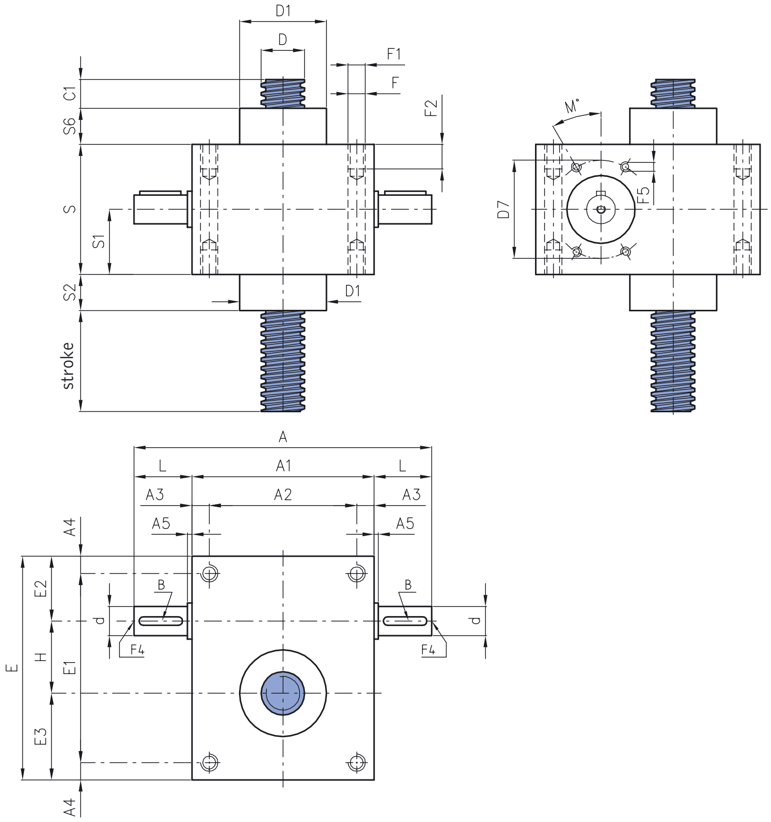
Series construction models

B model



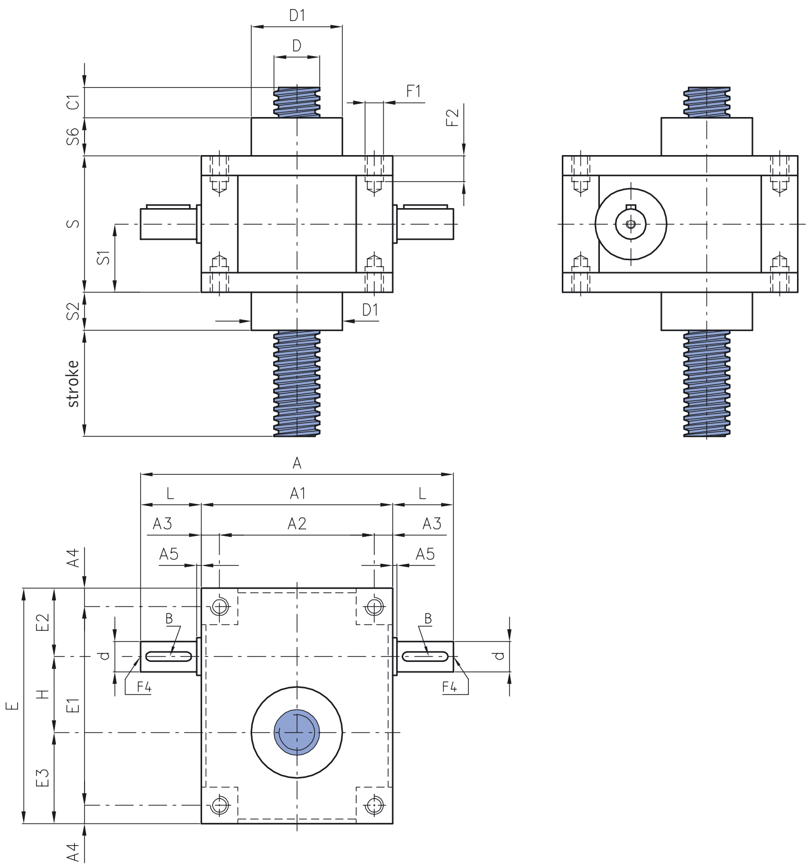
S model

D model

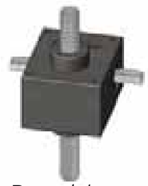


	TP Models							
		XTP Models*						
Size	**183**	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**
A	118	150	206	270	270	350	350	390
A1	70	100	126	160	170	230	230	250
A2	56	80	102	130	134	180	180	200
A3	7	10	12	15	18	25	25	25
A4	7	7,5	12	15	18	25	25	25
A5	4	-	-	-	-	-	-	-
B	3x3x15	4x4x20	6x6x30	8x7x40	8x7x40	8x7x50	8x7x50	12x8x60
C1	15	15	20	25	25	25	25	40
d Ø j6	9	12	20	25	25	30	30	40
D Ø	18x3	20x4	30x6	40x7	55x9	70x10	80x10	100x12
D1 Ø $^{-0,2}_{-0,3}$	30	44	60	69	90	120	120	150
D7 Ø	-	60	68	86	86	74	74	100
E	94	100	155	195	211	280	280	320
E1	80	85	131	165	175	230	230	270
E2	29	32,5	45	50	63	75	75	85
E3	35	37,5	60	75	78	115	115	125
F Ø	9	9	11	13	-	-	-	-
F1	-	-	-	-	M20	M30	M30	M30
F2	-	-	-	-	30	45	45	45
F4	-	M5x10	M6x12	M8x15	M8x15	M10x18	M10x18	M10x18
F5 (n° of holes)	-	M5x12(4)	M6x12(4)	M8X16(4)	M8X16(4)	M8x15(6)	M8x15(6)	M10x18(4)
H	30	30	50	70	70	90	90	110
L	24	25	40	55	50	60	60	70
M [°]	-	30	45	30	30	30	30	45
S	50	70	90	120	150	176	176	230
S1	25	35	45	60	75	88	88	115
S2	10	20	25	35	40	40	40	50
S6	10	20	25	35	40	40	40	50

* XTP Model: stainless steel version

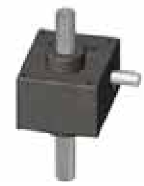


Series construction models



B model

S model



D model

Extra heavy TP models

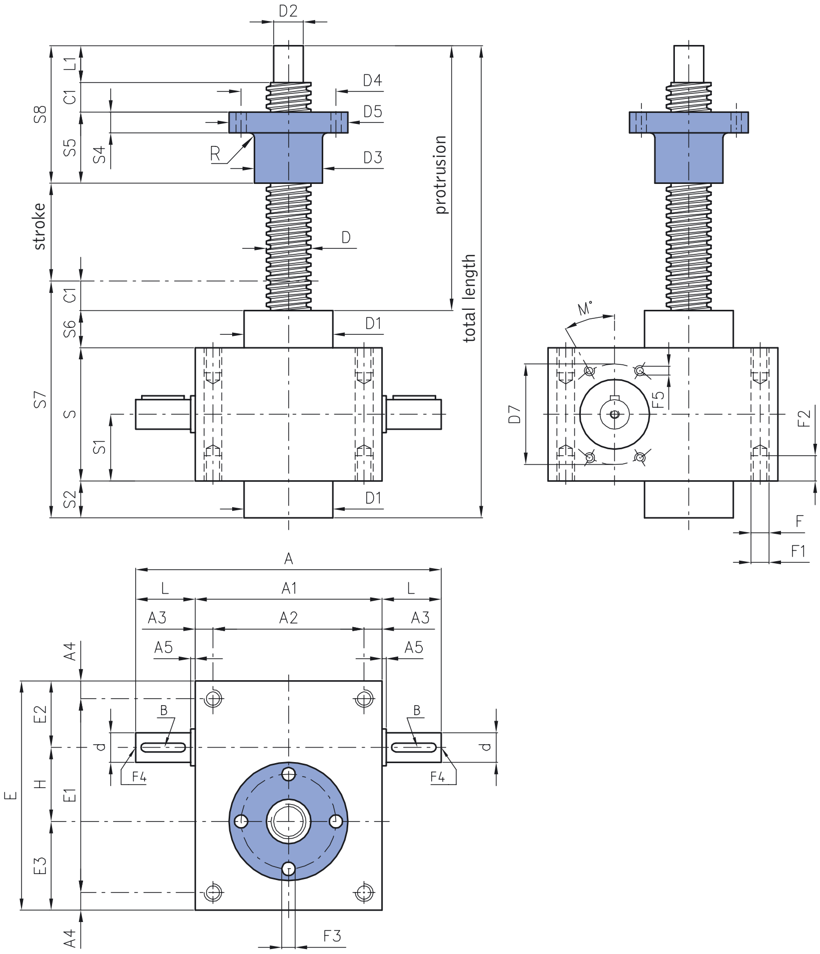
Size	10012	12014	14014	16016	20018	25022
A	490	490	780	780	920	920
A1	320	320	500	500	600	600
A2	230	230	360	360	470	470
A3	45	45	70	70	65	65
A4	25	25	40	40	60	60
A5	5	5	10	10	20	20
B	16x10x70	16x10x70	20x12x110	20x12x110	28x16x120	28x16x120
C1	40	40	50	50	50	50
d Ø j6	55	55	70	70	100	100
D Ø	100x12	120x14	140x14	160x16	200x18	250x22
D1 Ø $^{-0,2}_{-0,3}$	210	210	300	300	370	370
E	405	405	590	590	780	780
E1	355	355	510	510	660	660
E2	105	105	160	160	220	220
E3	160	160	230	230	310	310
F1	M30	M30	M56	M56	M64	M64
F2	45	45	110	110	130	130
F4	M12x25	M12x25	M14x30	M14x30	M16x35	M16x35
H	140	140	200	200	250	250
L	85	85	140	140	160	160
S	270	270	370	370	480	480
S1	135	135	185	185	240	240
S2	50	50	60	60	60	60
S6	50	50	60	60	60	60

Series construction models

B form

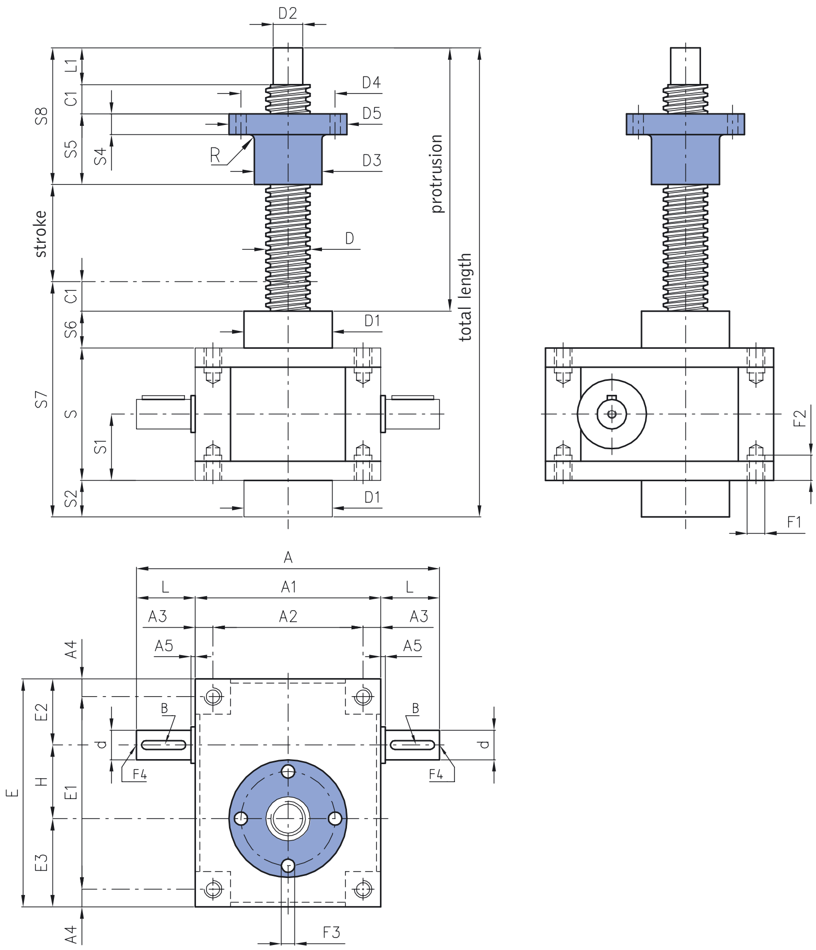
S form

D form



	TPR models							
		XTPR Models*						
Size	**183**	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**
A	118	150	206	270	270	350	350	390
A1	70	100	126	160	170	230	230	250
A2	56	80	102	130	134	180	180	200
A3	7	10	12	15	18	25	25	25
A4	7	7,5	12	15	18	25	25	25
A5	4	-	-	-	-	-	-	-
B	3x3x15	4x4x20	6x6x30	8x7x40	8x7x40	8x7x50	8x7x50	12x8x60
C1	15	15	20	25	25	25	25	40
d Ø j6	9	12	20	25	25	30	30	40
D Ø	18x3	20x4	30x6	40x7	55x9	70x10	80x10	100x12
D1 Ø $^{-0,2}_{-0,3}$	30	44	60	69	90	120	120	150
D2 Ø k6	12	15	20	25	40	55	60	70
D3 Ø	26	32	46	60	76	100	110	150
D4 Ø	40	45	64	78	100	140	150	190
D5 Ø	54	60	80	96	130	180	190	230
D7 Ø	-	60	68	86	86	74	74	100
E	94	100	155	195	211	280	280	320
E1	80	85	131	165	175	230	230	270
E2	29	32,5	45	50	63	75	75	85
E3	35	37,5	60	75	78	115	115	125
F Ø	9	9	11	13	-	-	-	-
F1	-	-	-	-	M20	M30	M30	M30
F2	-	-	-	-	30	45	45	45
F3 (4 holes)	7	7	7	9	13	18	18	20
F4	-	M5x10	M6x12	M8x15	M8x15	M10x18	M10X18	M10x18
F5 (n° holes)	-	M5x12 (4)	M6x12 (4)	M8X16 (4)	M8X16 (4)	M8x15 (6)	M8x15 (6)	M10x18 (4)
H	30	30	50	70	70	90	90	110
L	24	25	40	55	50	60	60	70
L1	14	20	25	30	45	70	75	80
M [°]	-	30	45	30	30	30	30	45
R (radius)	3	3	3	3	3	3	3	3
S	50	70	90	120	150	176	176	230
S1	25	35	45	60	75	88	88	115
S2	10	20	25	35	40	40	40	50
S4	12	12	14	16	20	30	30	45
S5	45	45	48	75	100	105	110	135
S6	10	20	25	35	40	40	40	50
S7	85	125	160	215	255	281	281	370
S8	74	80	93	130	170	200	210	255

* XTPR Models: stainless steel version



Series construction models

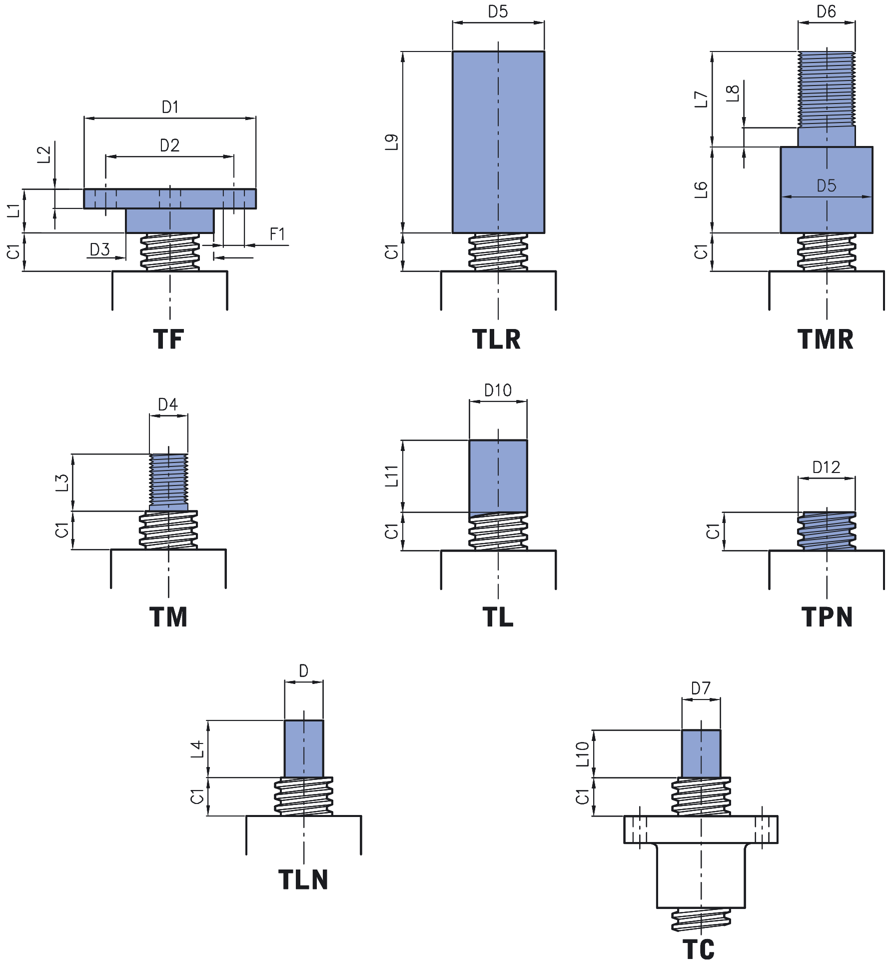
B model

S model

D model

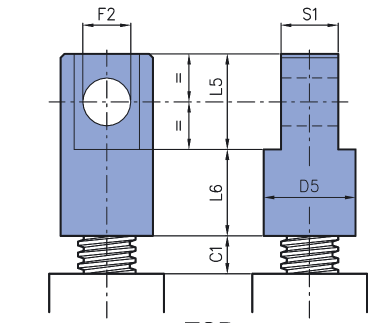
Extra heavy TPR Models

Size	10012	12014	14014	16016	20018	25022
A	490	490	780	780	920	920
A1	320	320	500	500	600	600
A2	230	230	360	360	470	470
A3	45	45	70	70	65	65
A4	25	25	40	40	60	60
A5	5	5	10	10	20	20
B	16x10x70	16x10x70	20x12x110	20x12x110	28x16x120	28x16x120
C1	40	40	50	50	50	50
d Ø j6	55	55	70	70	100	100
D Ø	100x12	120x14	140x14	160x16	200x18	250x22
D1 Ø $^{-0,2}_{-0,3}$	210	210	300	300	370	370
D2 Ø k6	70	90	120	130	160	200
D3 Ø	150	180	210	210	310	310
D4 Ø	190	235	270	270	400	400
D5 Ø	230	280	320	320	480	480
E	405	405	590	590	780	780
E1	355	355	510	510	660	660
E2	105	105	160	160	220	220
E3	160	160	230	230	310	310
F1	M30	M30	M56	M56	M64	M64
F2	45	45	110	110	130	130
F3 (n° holes)	20 (4)	25 (4)	25 (6)	25 (6)	45 (6)	45 (6)
F4	M12x25	M12x25	M14x30	M14x30	M16x35	M16x35
H	140	140	200	200	250	250
L	85	85	140	140	160	160
L1	80	85	120	120	160	180
R (radius)	3	3	4	4	5	5
S	270	270	370	370	480	480
S1	135	135	185	185	240	240
S2	50	50	60	60	60	60
S4	45	55	80	80	100	100
S5	135	160	250	250	300	300
S6	50	50	60	60	60	60
S7	410	410	540	540	650	650
S8	255	285	420	420	510	530



		X Models*			End fittings									
Size	**183**	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
C1	15	15	20	25	25	25	25	40	40	40	50	50	50	50
D Ø	-	15	20	30	40	55	65	85	85	100	120	140	160	200
D 1 Ø	54	79	89	109	149	198	218	278	278	298	378	378	504	574
D2 Ø	40	60	67	85	117	155	170	220	220	240	300	300	420	470
D3 Ø	26	39	46	60	85	105	120	150	150	170	210	210	300	350
D4 Ø	12x1	14x2	20x2,5	30x3,5	36x4	56x5,5	64x6	70x6	70x6	90x6	110x6	125x6	160x6	200x6
D5 Ø	-	38	48	68	88	108	118	138	138	138	168	216	-	-
D6 Ø	-	20x1,5	30x2	39x3	56x4	72x4	80x4	100x4	100x4	120x4	150x4	150x4	-	-
D7 k6	12	15	20	25	40	55	60	70	70	90	120	130	160	200
D12	18x3	20x4	30x6	40x7	55x9	70x10	80x10	100x12	100x12	120x14	140x14	160x16	200x18	250x22
F1(n° holes)	7 (4)	11 (4)	12 (4)	13 (4)	17 (4)	25 (4)	25 (4)	29 (4)	29 (4)	32 (6)	52 (6)	52 (6)	58 (6)	58 (6)
L1	14	21	23	30	50	60	60	70	70	80	100	100	150	150
L2	8	8	10	15	20	30	30	40	40	50	60	60	80	80
L3	20	20	30	30	48	58	58	70	70	90	110	125	140	150
L4	-	25	30	45	60	80	85	120	120	150	150	150	160	180
L6		35	45	55	80	90	95	120	120	150	160	180	-	-
L7	-	40	50	70	90	105	110	120	120	130	170	180	-	-
L8	-	10	10	10	20	25	25	30	30	30	35	35	-	-
L9	-	75	95	125	180	210	225	280	280	350	380	380	-	-
L10	14	20	25	30	45	70	75	80	80	85	120	120	160	180
L11	-	70	80	100	100	120	130	-	-	-	-	-	-	-

* X models: stainless steel version



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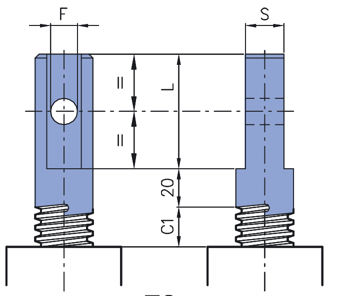

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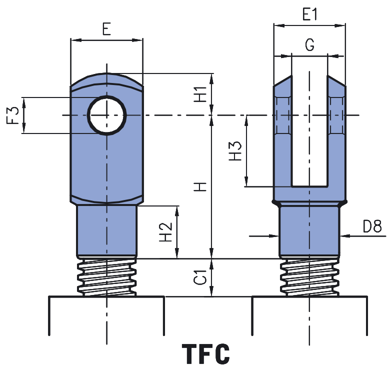
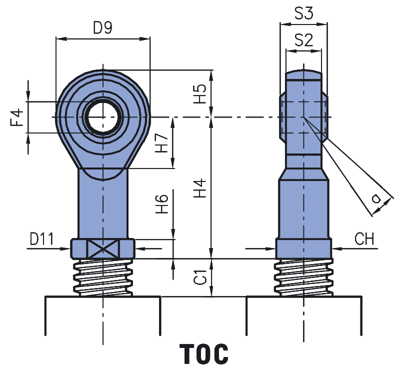


TFC



TOC

End fittings

	X Models*													
Size	**183**	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
C1	15	15	20	25	25	25	25	40	40	40	50	50	50	50
CH	-	19	30	41	50	-	-	-	-	-	-	-	-	-
D5 Ø	-	38	48	68	88	108	118	138	138	168	168	216	-	-
D8 Ø	-	20	34	48	60	-	-	-	-	-	-	-	-	-
D9 Ø	-	32	50	70	80	-	-	-	-	-	-	-	-	-
D11 Ø	-	22	34	50	58	-	-	-	-	-	-	-	-	-
E	-	24	40	55	70	-	-	-	-	-	-	-	-	-
E1	-	24	40	55	70	-	-	-	-	-	-	-	-	-
F Ø H9	-	10	14	22	30	40	45	-	-	-	-	-	-	-
F2 Ø H9	-	20	25	35	50	60	65	80	80	100	140	140	-	-
F3 Ø	-	12	20	30	35	-	-	-	-	-	-	-	-	-
F4 Ø	-	12	20	30	35	-	-	-	-	-	-	-	-	-
G	-	12	20	30	35	-	-	-	-	-	-	-	-	-
H	-	48	80	110	144	-	-	-	-	-	-	-	-	-
H1	-	14	25	38	44	-	-	-	-	-	-	-	-	-
H2	-	18	30	38	40	-	-	-	-	-	-	-	-	-
H3	-	24	40	54	72	-	-	-	-	-	-	-	-	-
H4	-	50	77	110	125	-	-	-	-	-	-	-	-	-
H5	-	16	25	35	40	-	-	-	-	-	-	-	-	-
H6	-	6,5	10	15	17	-	-	-	-	-	-	-	-	-
H7	-	17	27	36	41	-	-	-	-	-	-	-	-	-
L	-	50	60	80	80	100	110	-	-	-	-	-	-	-
L5	-	40	50	70	100	120	130	160	160	200	280	280	-	-
L6	-	35	45	55	80	90	95	120	120	150	170	180	-	-
S	-	14	20	30	42	55	65	-	-	-	-	-	-	-
S1	-	25	30	40	60	75	80	100	100	120	155	155	-	-
S2	-	12	18	25	28	-	-	-	-	-	-	-	-	-
S3	-	16	25	37	43	-	-	-	-	-	-	-	-	-
α [°]	-	13	14	17	16	-	-	-	-	-	-	-	-	-

* X models: stainless steel version

Series construction models

MBD model

MBS model

MD model

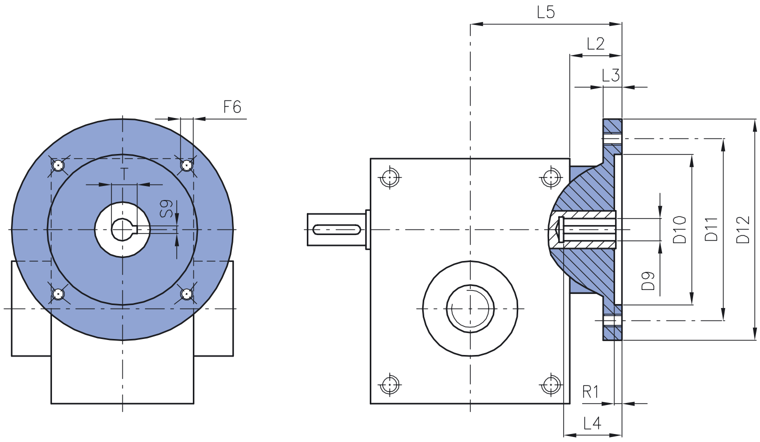
MS model

MBD model

MBS model

MD model

MS model



MTP-MTPR Models

	Size	IEC Flange	D9 H7	D10 H7	D11	D12	F6	L2	L3	L4	L5	R1	S9	T
X Models*	204	56 B5	9	80	100	120	M6	30	10	20	80	4	3	10,4
		63 B5	11	95	115	140	M8	30	10	23	80	4	4	12,8
		71 B5	14	110	130	160	M8	30	10	30	80	4	5	16,3
		71 B14	14	70	85	105	7	30	10	30	80	4	5	16,3
	306	63 B5	11	95	115	140	M8	33	13	23	96	4	4	12,8
		71 B5	14	110	130	160	M8	33	13	30	96	4	5	16,3
		80 B5	19	130	165	200	M10	33	13	40	96	4	6	21,8
		80 B14	19	80	100	120	7	33	13	40	96	4	6	21,8
	407	71 B5	14	110	130	160	9	40	15	30	120	5	5	16,3
		80 B5	19	130	165	200	M10	40	15	40	120	5	6	21,8
		80 B14	19	80	100	120	7	40	15	40	120	5	6	21,8
		90 B5	24	130	165	200	M10	40	15	50	120	5	8	27,3
		90 B14	24	95	115	140	9	40	15	50	120	5	8	27,3
		100-112 B5	28	180	215	250	M12	40	15	60	120	5	8	31,3
		100-112 B14	28	110	130	160	9	40	15	60	120	5	8	31,3
	559	71 B5	14	110	130	160	9	40	15	30	125	5	5	16,3
		80 B5	19	130	165	200	M10	40	15	40	125	5	6	21,8
		80 B14	19	80	100	120	7	40	15	40	125	5	6	21,8
		90 B5	24	130	165	200	M10	40	15	50	125	5	8	27,3
		90 B14	24	95	115	140	9	40	15	50	125	5	8	27,3
		100-112 B5	28	180	215	250	M12	40	15	60	125	5	8	31,3
		100-112 B14	28	110	130	160	9	40	15	60	125	5	8	31,3
	7010	100-112 B5	28	180	215	250	M12	55	17	60	170	5	8	31,3
		100-112 B14	28	110	130	160	9	55	17	60	170	5	8	31,3
		132 B5	38	230	265	300	M12	55	17	80	170	5	10	41,3
		132 B14	38	130	165	200	11	55	17	80	170	5	10	41,3
	8010	100-112 B5	28	180	215	250	M12	55	17	60	170	5	8	31,3
		100-112 B14	28	110	130	160	9	55	17	60	170	5	8	31,3
		132 B5	38	230	265	300	M12	55	17	80	170	5	10	41,3
		132 B14	38	130	165	200	11	55	17	80	170	5	10	41,3

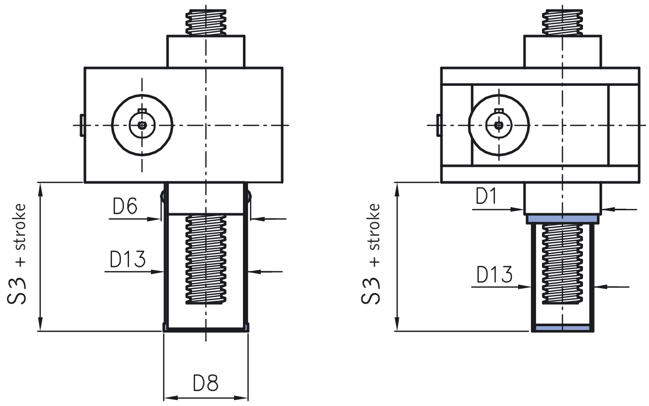
* X models: stainless steel version

For non quoted dimensions see to the relative tables on pages 60-63

PR rigid protection

The application of a rigid protection in the back side of the screw jack is the ideal solution in order to prevent dust and foreign matters from coming into contact with the coupling and causing damages to the threaded spindle. The PR protection can only be applied to TP models. The overall sizes are shown in the following table.

Incompatibility: TPR models



PR rigid protection														
		XPR Models*												
Size	**183**	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
D1 Ø	-	-	-	-	-	-	-	-	210	210	300	300	370	370
D6 Ø	38	52	71	80	104	134	134	169	-	-	-	-	-	-
D8 Ø	34	48	65	74	97	127	127	160	-	-	-	-	-	-
D13 Ø	32	46	63	72	95	125	125	160	160	160	210	210	305	305
S3	30	50	60	75	80	80	80	100	100	100	100	100	100	100

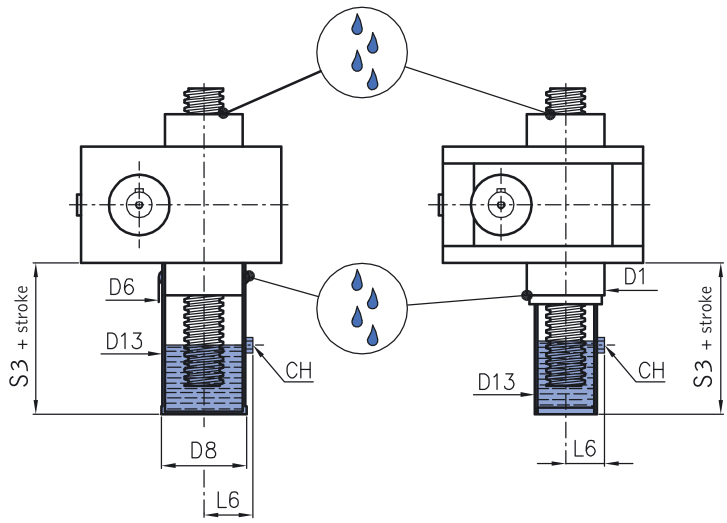
* XPR models: stainless steel version

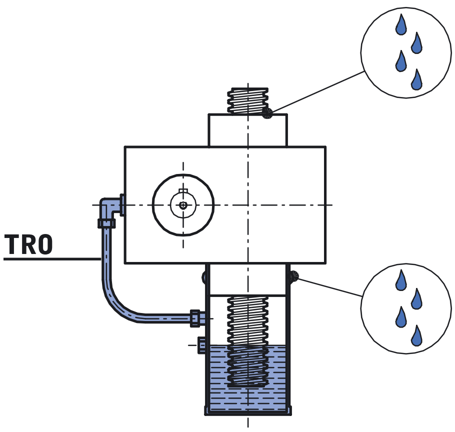
For non quoted dimensions see the relative tables on pages 60-63

PRO oil bath rigid protection

The application of an oil bath rigid protection, apart from representing a rigid protection, also allows to have the advantages of a semi-automatic lubrication. The lubricant must be added when mounting, with the jack completely closed, using the oil fill plug. Upon maneuvering the threaded spindle will be soaked with lubricant. <u>In case the threaded spindle is left out of the protection for a long period, it could dry</u> up so to make the PRO protection useless. <u>For long strokes, in order to compensate the pump effect, it is necessary to mount an oil recirculation pipe (TRO)</u> allowing lubricant to flow back inside the protection from the casing. <u>It's suggested the use of extremely high viscosity oils</u> [2200 mm²/s] or high viscosity oils [220 mm²/s] with EP addictives in percentage of 15 – 20 %. Both solutions must present EP addictives for extreme pressures. We remind that <u>the area indicated in the drawing could present lubricant drops</u>: a vertical mounting will therefore avoid any leakage problems. The PRO protection can only be applied to TP models. The overall dimensions are shown in the following table.

Incompatibility: TPR models – ALEPH series – CS, CSU, SU, SUA (pos.2) - PRF





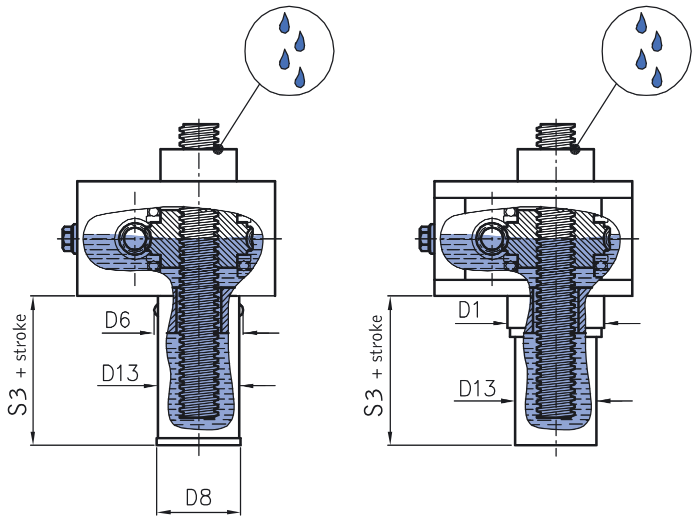
PRO oil bath rigid protection														
		XPRO Models*												
Size	**183**	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
D1 Ø	-	-	-	-	-	-	-	-	210	210	300	300	370	370
D6 Ø	38	52	71	80	104	134	134	169	-	-	-	-	-	-
D8 Ø	34	48	65	74	97	127	127	160	-	-	-	-	-	-
D13 Ø	32	46	63	72	95	125	125	160	160	160	210	210	305	305
S3	30	50	60	75	80	80	80	100	100	100	100	100	100	100
L6	25	32	41	45	57	72	72	89	89	89	114	114	162	162
CH	17	17	17	17	22	22	22	22	22	22	22	22	22	22

* XPRO model: stainless steel version

For non quoted dimensions see to the relative tables on pages 60-63

CU Oil proof assembling

In some applications the service factor can be so high requesting a continuously spindle lubrication.
In these cases, if the screw jack is mounted such a way not to allow oil losses from the indicated areas, it's possible a special oil proof assembling, where internal gears are lubricated in an oil bath. It's imperative that the oil fulfilling will be done with spindle in all-closed position. <u>In case the threaded spindle is left out of the oil proof chamber for a long period, it could dry up, so make the CU assembling useless.</u>
In order to guarantee the right adhesion, <u>it's suggested the use of extremely high viscosity oils</u> [2200 mm^2/s] or high viscosity oils [220 mm^2/s] with EP addictives in percentage of 15 – 20%. Both solutions must present EP addictives for extreme pressures. CU is suitable only for TP models. The overall dimensions are shown in the table below.
Incompatibility: size 183 – TPR models – ALEPH series – CS, CSU, SU, SUA (pos.2) – PRF



Oil proof assembling CU													
	XCU Models*												
Size	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
D1 Ø	-	-	-	-	-	-	-	210	210	300	300	370	370
D6 Ø	52	71	80	104	134	134	169	-	-	-	-	-	-
D8 Ø	48	65	74	97	127	127	160	-	-	-	-	-	-
D13 Ø	46	63	72	95	125	125	160	160	160	210	210	305	305
S3	50	60	75	80	80	80	100	100	100	100	100	100	100

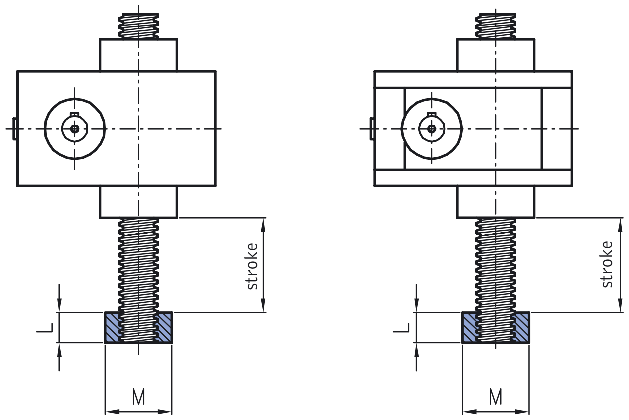
* XCU model: stainless steel version
For non quoted dimensions see to the relative tables on pages 60-63

BU Anti withdrawing bush

If there's the necessity the spindle, in case of extra-stroke, not to withdraw from the jack body, it's possible assembling a steel withdrawing bush. The BU has a trapezoidal thread, able to sustain the load in extra-stroke case. The BU can apply only in TP models. In case of PRF stroke control, the Bu has the function of end-of-stroke too. It's important underline that one only extra-stroke attempt (and the consequent impact between BU and the carter) can hopeless damage the transmission.

The overall dimensions are shown in the table below.

Incompatibility: TPR models – PRA



Anti withdrawing bush BU

		XBU Models*												
Size	**183**	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
L	25	25	25	25	25	25	25	40	40	40	60	60	80	80
M Ø	26	38	48	58	78	88	98	137	137	145	175	190	248	298

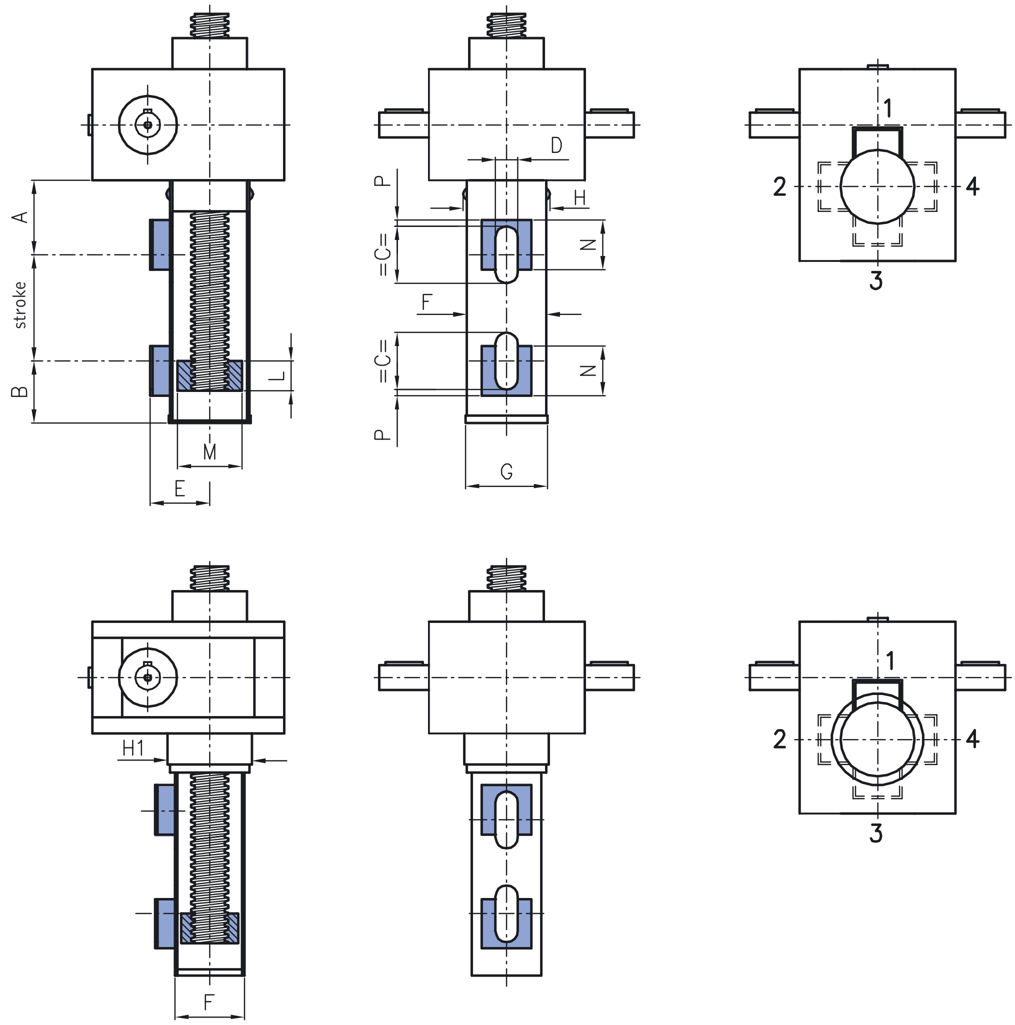
* XBU model: stainless steel version

For non quoted dimensions see to the relative tables on pages 60-63

PRF stroke control

In order to meet the requirement of an electric stroke control it is possible to apply to a rigid protection suitable supports for end-of-stroke. In the standard version these supports are of two types and they are placed at the ends of the stroke in one of the four positions shown below. They are carried out in such a way as to allow a small adjustment. In case more than one end-of-stroke are needed, it is possible to provide intermediate supports or a continuous support for the requested length. In order to enable the end-of-stroke to operate, a steel bushing is mounted on the threaded spindle. More bushings can be mounted upon request. The PRF can only be applied to TP models and <u>in case of missing specifications it will be supplied with the supports mounted according to position 1.</u> Sensor are supplied only on demand. The overall dimensions are shown in the table below. Moreover it's possible assembling magnetic sensors on the protection, avoiding to mill it. The end-of-stroke signal is given by a magnet attached on the bottom of the spindle.

Incompatibility: TPR – PRO models - CU



	PRF stroke control													
		XPRF Models*												
Size	**183**	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
A	45	55	60	70	75	75	75	85	100	100	100	100	120	120
B	30	35	50	50	55	55	55	55	55	55	55	55	55	55
C	30	45	45	45	45	45	45	45	45	45	45	45	45	45
D	18	18	18	18	18	18	18	18	18	18	18	18	18	18
E	30	38	47	51	63	78	78	95	95	95	120	120	165	165
F Ø	32	46	63	72	95	125	125	160	160	160	210	210	305	305
G Ø	34	48	65	74	97	127	127	160	-	-	-	-	-	-
H Ø	38	52	71	80	104	134	134	169	-	-	-	-	-	-
H1 Ø	-	-	-	-	-	-	-	-	210	210	300	300	370	370
L	25	25	25	25	25	25	25	25	25	25	25	25	40	40
M Ø	24	38	48	58	78	88	98	130	130	136	160	180	275	275
N	25	40	40	40	40	40	40	40	40	40	40	40	40	40
P	5	5	5	5	5	5	5	5	5	5	5	5	5	5

* XPRF model: stainless steel version
For non quoted dimensions see the schemes on pages 60-63

PE elastic protection

The purpose of the elastic protections is to protect the threaded spindle by following its own movement during stroke. Standard type protections are elastic bellows, made of polyester covered nylon and can have, as serial, collars or flanges at their ends whose dimensions are shown in the table 1 below.
Special implementations are available upon request, as well as a fixing by means of iron.
Fixing flanges can be in plastic or metal. Special materials for the bellows are also available: Neoprene® and Hypalon® (water sea environment), Kevlar® (resistant to cuts and abrasion), glass fiber (for extreme temperatures, from -50 to 250°C) e aluminized carbon (it's an auto-extinguish material for limit applications with molten metal spits). **The PE standard material is guarantee for ambient temperature between -30 and 70°C.**
If it's needed a waterproof elastic bellow, it's possible to realize protections whose bellows are not sewed but heat-sealed. This kind of protection is not able to solve condensate problem. Moreover, it's possible to have metal protections on demand; such requests are be submitted to the Technical Office. Besides further implementations made of special materials fire-resistant and cold-resistant materials as well as of materials suited for aggressive oxidizing environments can be supplied.
In case of long strokes internal anti-stretching rings are previewed in order to guarantee an uniform bellows opening.

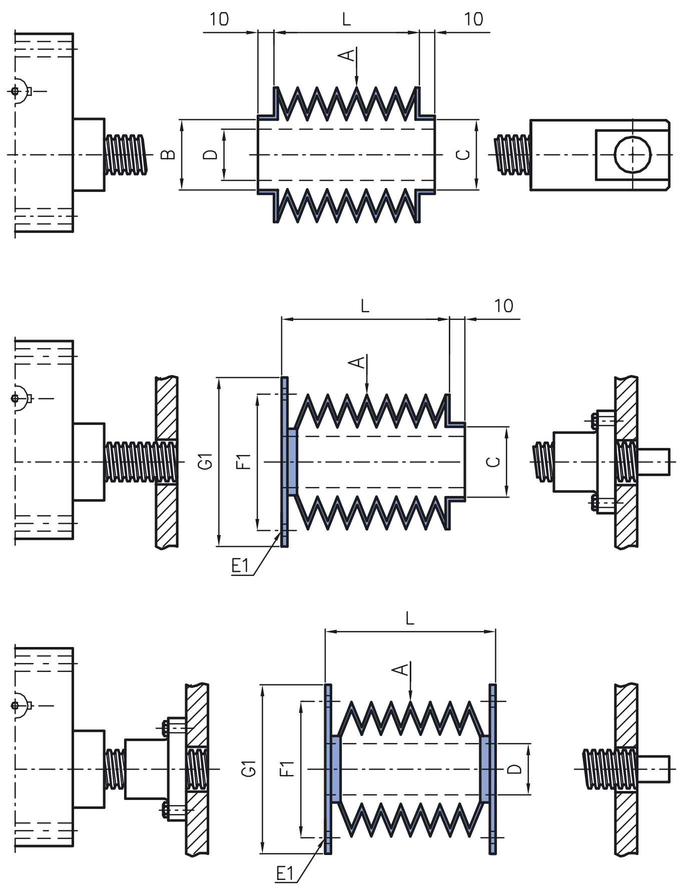


Table 1

PE elastic protection														
Size	**183**	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
A Ø	70	70	85	105	120	130	140	165	165	180	210	240	270	320
B Ø	30	44	60	69	90	120	120	150	210	210	300	300	370	370
D Ø spindle	18	20	30	40	55	70	80	100	100	120	140	160	200	250
C Ø	Dimension function of the end fitting													
E1Ø (n° of holes)	Dimension to be specified by the costumer													
F1 Ø	Dimension to be specified by the costumer													
G1 Ø	Dimension to be specified by the costumer													
L	1/8 of the stroke (completely closed)													

The application of elastic protections on the screw jacks may implicate some dimensioning amendments due to the PE own sizes, as shown in table n.2. Further, in completely close conditions, the PE has an overall dimension equal to 1/8 of the stroke value. In case said value exceeds the C1 quote (which can be taken from the dimension tables on pages 60-63), the total length of the threaded spindle should be fitted to said dimensions. In case of horizontal mounting (of which previous notice should be given) it is necessary to support the protection weight itself in order to avoid that it leans on the threaded spindle; for this purpose special support rings are foreseen. The PE can be applied to TP and TPR models and in case of missing specifications they can be supplied with fabric collars and the dimensions shown in table 1, supposing that a vertical mounting is carried out.

Incompatibility: none

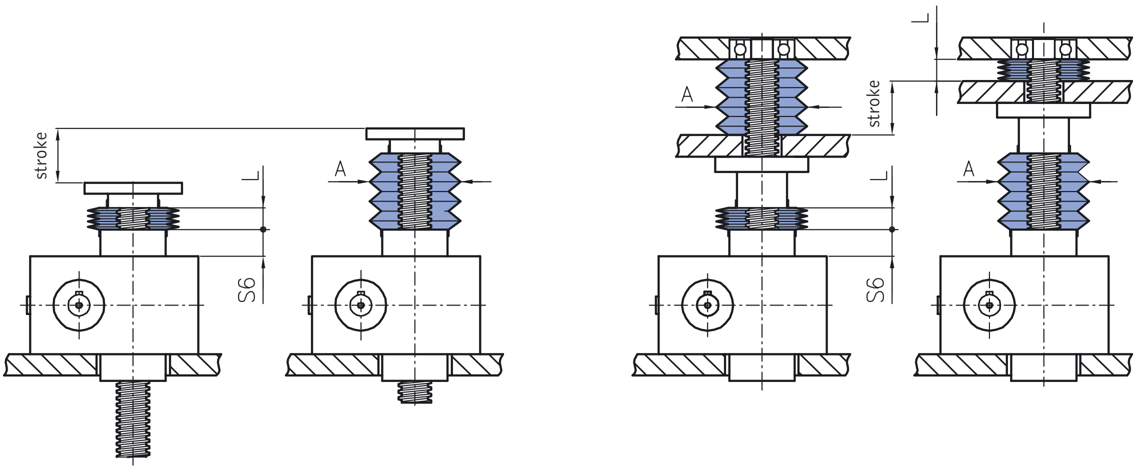


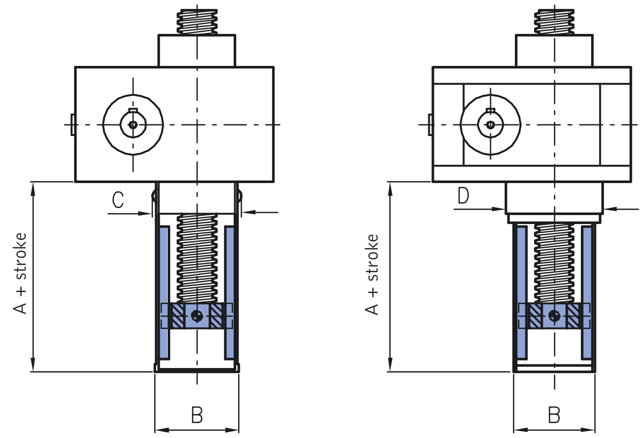
Table 2

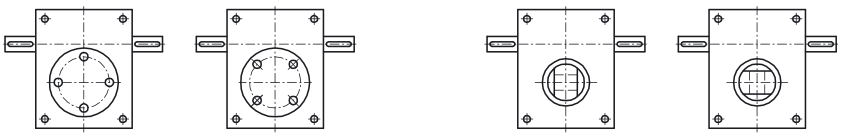
PE elastic protection														
Size	**183**	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
S6	10	20	25	35	40	40	40	50	50	50	60	60	60	60
A Ø	70	70	80	105	120	130	140	170	170	190	230	230	270	320
L	1/8 of the stroke (completely closed)													

For non quoted dimensions see the schemes on pages 60-63

PRA double guide anti-rotation

As all screw jacks must have an anti-rotation, in case such constraint cannot be realized externally, it is possible, for TP models, to have an inner anti-rotation system inside the screw jack. Two guides are mounted on the rigid protection where a bronze bushing, which is attached to the threaded spindle, can slide.
In case of very long strokes it should be checked that the torsional sliding is not such as to force the fixing screws in the guides.
As the inner anti-rotation constraints the threaded spindle and its end fitting, in case of presence of holes, like in TF and TOR end fittings, their position should be indicated, as shown in the drawings below. Unless otherwise stated all screw jacks will be delivered in position 1 or 3. The overall dimensions are shown in the table below.
Incompatibility: TPR models – ALEPH series – AR





1 2 3 4

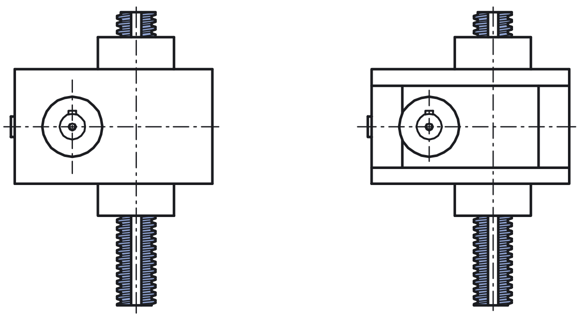
Rigid protection with PRA double guide anti-rotation														
		XPRA Models*												
Size	**183**	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
A	50	80	80	100	105	120	120	140	170	170	170	170	200	200
B	34	48	65	74	97	127	127	160	160	160	210	210	305	305
C	38	52	71	80	104	134	134	169	210	210	300	300	370	370

* XPRA Model: stainless steel version
For non quoted dimensions see the schemes on pages 60-63

AR grooved spindle anti-rotation

Another inner anti-rotation system which is only available for TP models is the grooved spindle. It provides a continuous milling along the threaded spindle length where an hardened key, having seat in the cover of the screw jack, can slide; it ensures an anti-rotation.
As this accessory foresees a cut interrupting the threads continuity, <u>the spindle mechanical strength itself is reduced</u>: a reduction of the load capacity has to be taken into account s reported in the table below.
In addition, also due to said grooving on the threaded spindle, in order to limit wear phenomena, the AR should be used when the f_a factor is lower than or equal to 1.
As the inner anti-rotation constraints the threaded spindle and its end fitting, <u>in case of presence of holes, like in the TF and TOR end fittings their position should be indicated</u>, as shown in the drawings below. <u>Unless otherwise stated all screw jacks will be delivered in position 1 or 3.</u>
Incompatibility: TPR models – ALEPH series – size 183 – X series – PRA

Load reduction %	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
Static	13	8	10	7	9	8	6	6	5	5	5	4	4
Dynamic	40	25	30	20	30	25	20	20	15	15	15	10	10



1 2 3 4

For non quoted dimensions see the schemes on pages 60-63

CS Safety lead nut for monitored wear control

In many applications it is necessary to ensure that the screw jack can safely support the load even under wear conditions of the main support nut, be it the worm wheel or the lead nut.

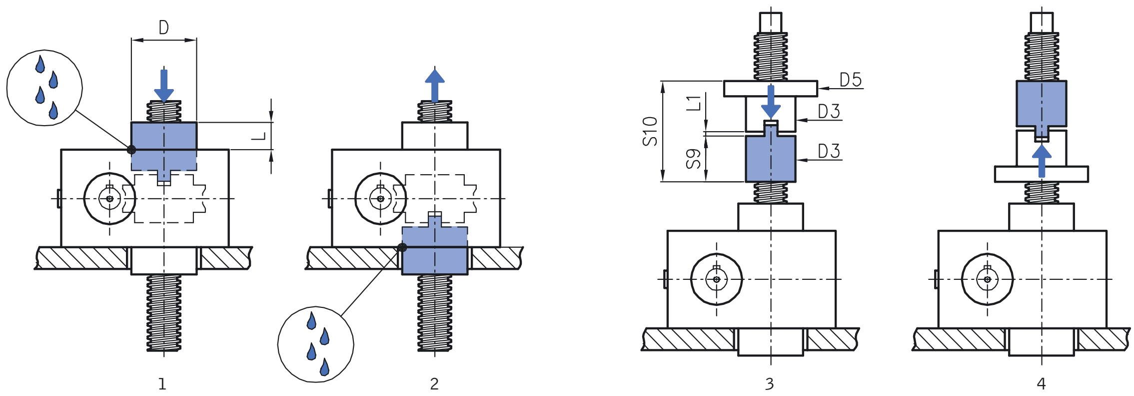
The safety lead nut has been designed for that purpose: it couples to the support nut through an insert and follows its movement.

When the main support nut starts wearing out, the axial backlash in the threaded spindle coupling is increased, and, under a load, the safety lead nut gets closer to the support nut, starting to support part of the force acting on it.

This phenomenon means a reduction of the L or L1 quote (according to the model). <u>When this reduction reaches the X value indicated in the table below, the support nut and the safety lead nut must be replaced</u>, otherwise the wear phenomena could cause a collapse of the load.

Just after mounting, <u>it is therefore necessary to periodically measure the L or L1 quote</u>, in order to check the wear conditions of the components. A safety lead nut only works in one way: either it ensures the traction load or the compression load support. <u>Unless otherwise stated, all screw jacks will be delivered in the drawing configurations 1 and 3</u> and for a compression load. We remind that <u>the area indicated in the drawing could present lubricant drops</u>: a vertical mounting will therefore avoid any leakage problems. The overall dimensions are shown in the following table.

Incompatibility: ALEPH series – size 183 – RG – CSU- SU- SUA



CS Safety lead nut for monitored wear control for TP models	XCS Models*												
Size	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
Wear border value X	1	1,5	1,75	2,25	2,5	2,5	3	3	3,5	3,5	4	5	6
D Ø	40	52	65	82	100	110	150	150	170	220	220	300	300
L ~	17	20	32	42	58	63	66	76	115	200	200	170	170

* XCS model: stainless steel version

For non quoted dimensions see the schemes on pages 60-63

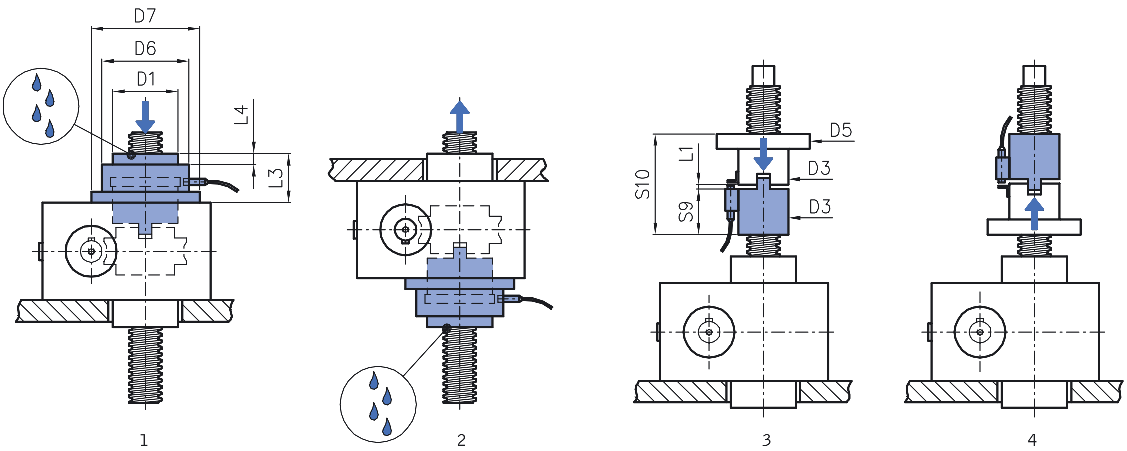
CS Safety lead nut for monitored wear control for TPR models													
Size	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
Wear border value X	1	1,5	1,75	2,25	2,5	2,5	3	3	3,5	3,5	4	5	6
D3 Ø	32	46	60	76	100	110	150	150	180	210	210	310	310
D5 Ø	60	80	96	130	180	190	230	230	280	320	320	480	480
L1 ~	2	3	3,5	4,5	5	5	6	6	7	7	8	9	11
S9	35	38	64	89	90	95	115	115	135	220	220	250	250
S10	82	89	142,5	193,5	200	210	256	256	302	477	478	559	561

For non quoted dimensions see the schemes on pages 60-63

CSU Safety lead nut for automatic wear control

When a CS safety lead nut is combined with an automatic system for controlling the X quote using a proximity switch, a CSU system is obtained. Al the remarks made in the CS paragraph can also be applied to this system. The overall dimensions are shown in the following table.

Incompatibility: ALEPH series – size 183 – RG – CSU- SU- SUA



CSU Safety lead nut for automatic wear control for TP models													
	XCSU Models*												
Size	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
Wear border value X	1	1,5	1,75	2,25	2,5	2,5	3	3	3,5	3,5	4	5	6
D1 Ø	44	60	69	90	120	120	150	210	210	-	-	-	-
D6 Ø	67	88	100	120	150	150	180	200	220	270	270	380	380
D7 Ø	67	92	125,5	132	192	192	215	265	265	375	375	-	-
L3	54	60	74	84	115	115	115	145	165	250	250	295	295
L4	10	10	10	10	10	10	10	10	10	-	-	-	-

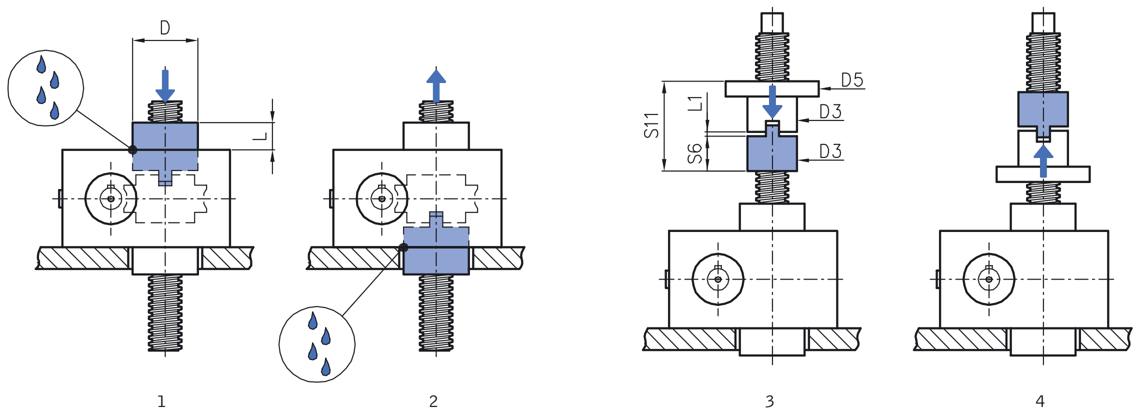
* XCSU model: stainless steel version
For non quoted dimensions see the schemes on pages 60-63

CS Safety lead nut for automatic wear control for TPR models													
Size	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
Wear border value X	1	1,5	1,75	2,25	2,5	2,5	3	3	3,5	3,5	4	5	6
D3 Ø	32	46	60	76	100	110	150	150	180	210	210	310	310
D5 Ø	60	80	96	130	180	190	230	230	280	320	320	480	480
L1 ~	2	3	3,5	4,5	5	5	6	6	7	7	8	9	11
S9	35	38	64	89	90	95	115	115	135	220	220	250	250
S10	82	89	142,5	193,5	200	210	256	256	302	477	478	559	561

For non quoted dimensions see the schemes on pages 60-63

SU Lead nut for monitored wear control

In many applications it is necessary to steady check the wear conditions of the main support nut, be it the worm wheel or the lead nut. The lead nut for monitored wear control has been designed for that purpose: it couples to the support nut through an insert and follows its movement.
When the main support nut starts wearing out, the axial backlash in the threaded spindle coupling is increased, and, under load, the safety lead nut get closer to the support nut.
This phenomenon means a reduction of the L or L1 quote (according to the model). When this reduction reaches the X value indicated in the table below, the support nut and the lead nut must be replaced, otherwise the wear phenomena could cause a collapse of the load.
The lead nut for monitored wear control is not a safety lead nut and it is therefore not designed for supporting the load. After mounting, it is therefore necessary to periodically measure the L or L1 quote, in order to check the wear conditions of the components. A lead nut for monitored wear control only works in one way: either it monitors the wear conditions under a traction load or it controls the wear condition under a compression load. Unless otherwise stated all screw jacks will be delivered in the drawing configurations 1 and 3 and for a compression load. We remind that the area indicated in the drawing could present lubricant drops: a vertical mounting will therefore avoid any leakage problems. The overall dimensions are shown in the following table.
Incompatibility: ALEPH series – size 183 – RG – CS - CSU- SUA



SU lead nut for monitored wear control for TP models

	XSU Models*												
Size	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
Wear border value X	1	1,5	1,75	2,25	2,5	2,5	3	3	3,5	3,5	4	5	6
D Ø	40	52	65	82	110	110	140	150	170	220	220	300	300
L ~	8,5	11	11,5	12	12	12	13	13	14	14	14	20	20

* XSU model: stainless steel version
For non quoted dimensions see the schemes on pages 60-63

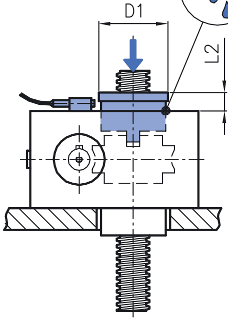
SU lead nut for monitored wear control for TPR models

Size	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
Wear border value X	1	1,5	1,75	2,25	2,5	2,5	3	3	3,5	3,5	4	5	6
D3 Ø	32	46	60	76	100	110	150	150	180	210	210	310	310
D5 Ø	60	80	96	130	180	190	230	230	280	320	320	480	480
L1 ~	2	3	3,5	4,5	5	5	6	6	7	7	8	9	11
S6	16	25	30	35	40	40	50	50	60	60	60	70	70
S11	63	76	108,5	139,5	150	155	191	191	227	317	318	379	381

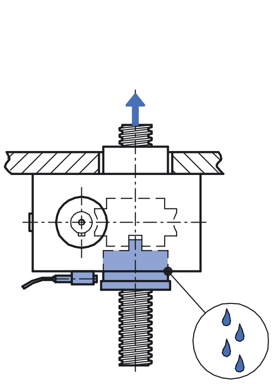
For non quoted dimensions see the schemes on pages 60-63

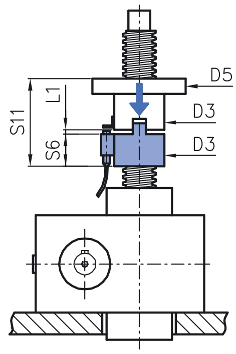
SUA Safety lead nut for automatic wear control

When an SU lead nut for automatic wear control is combined with an automatic system for controlling the X quote using a proximity switch, an SUA system is obtained.
All the remarks made in the SU paragraph can also be applied to this system. The overall dimensions are shown in the following table.
Incompatibility: ALEPH series – size 183 – RG – CS – CSU – SU

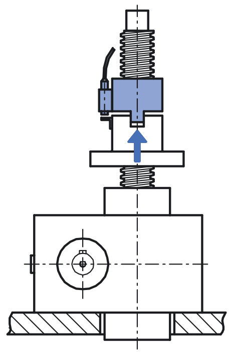


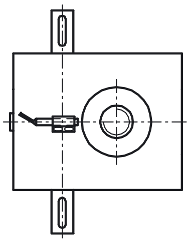
1


2



3


4



SUA lead nut for automatic wear control for TP models

Size	204	306	407	559	7010	8010	9010	10012	12014	14014	16016	20018	25022
	XSUA Models*												
Wear border value X	1	1,5	1,75	2,25	2,5	2,5	3	3	3,5	3,5	4	5	6
D1 Ø	47	60	72	90	120	120	150	160	180	230	230	300	300
L2 ~	29	23	25,5	26	28	28	29	29	30	30	30	30	30

* XSUA model: stainless steel version
For non quoted dimensions see the schemes on pages 60-63

SUA lead nut for automatic wear control for TPR models

Size	204	306	407	559	7010	8010	9010	10012	12014	14014	16016	20018	25022
Wear border value X	1	1,5	1,75	2,25	2,5	2,5	3	3	3,5	3,5	4	5	6
D3 Ø	32	46	60	76	100	110	150	150	180	210	210	310	310
D5 Ø	60	80	96	130	180	190	230	230	280	320	320	480	480
L1 ~	2	3	3,5	4,5	5	5	6	6	7	7	8	9	11
S6	16	25	30	35	40	40	50	50	60	60	60	70	70
S11	63	76	108,5	139,5	150	155	191	191	227	317	318	379	381

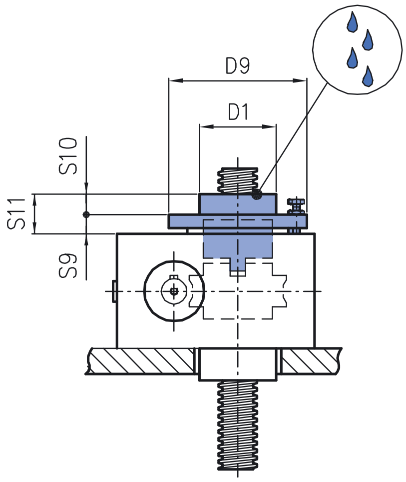
For non quoted dimensions see the schemes on pages 60-63

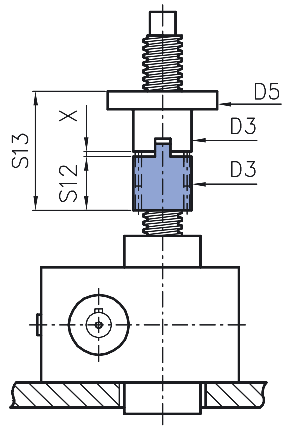
RG Anti axial backlash lead nut

As already explained in the previous paragraphs, the coupling between the threaded spindle and its support nut, be it the worm wheel or the lead nut, represents a natural axial backlash. If, for mounting requirements and under a load which changes its direction, from traction to compression and vice versa, it is necessary to reduce the axial backlash, an anti axial backlash lead nut can be applied. The RG lead nut is linked to the support nut through an insert and it is attached to it by means of dowels in TPR model, and by means of the contrast cover in the TP models. Closing the dowels or rotating the cover are the actions requested to reduce the axial backlash.

Be careful with an excessive backlash reduction: you could assist to huge wear phenomena and the support nut could grip on the spindle due to the difference in the two pitch errors. The application of the anti axial backlash system reduces the screw jack running efficiency by 40%. We remind that the area indicated in the drawing could present lubricant drops: a vertical mounting will therefore avoid any leakage problems. The overall dimensions are shown in the following table.

Incompatibility: ALEPH series – size 183 – CS – CSU – SU – SUA





RG anti axial backlash lead nut for TP models

	XRG Models*						
Size	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**
D1 Ø	44	60	69	90	120	120	150
D9 Ø	62	118	150	150	230	230	215
S9	13	14	21	19	47	47	45
S10	20	15	15	19	23	23	25
S11	33	29	36	38	70	70	70

* XRG model: stainless steel version

For non quoted dimensions see the schemes on pages 60-63

RG anti axial backlash lead nut for TPR models

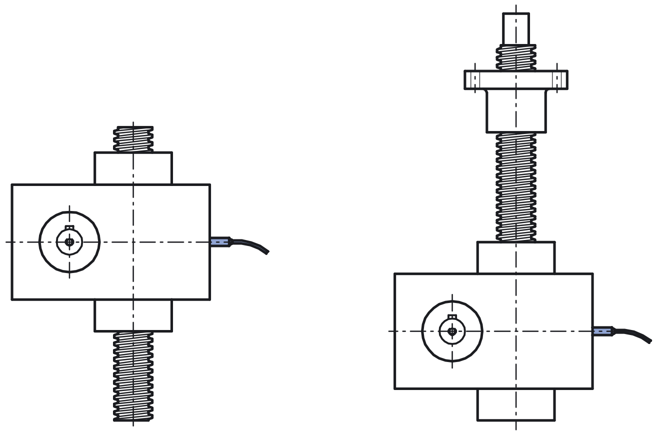
Size	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
D3 Ø	32	46	60	76	100	110	150	150	180	210	210	310	310
D5 Ø	60	80	96	130	180	190	230	230	280	320	320	480	480
X ~	2	3	3,5	4,5	5	5	6	6	7	7	8	9	11
S12	35	38	84	89	90	95	115	115	135	220	220	250	250
S13	82	89	142,5	193,5	200	210	256	256	302	477	478	559	561

For non quoted dimensions see the schemes on pages 60-63

CR worm wheel rotation control

In some cases it can be necessary to check the operation conditions of the screw jack monitoring the worm wheel rotation, both in TP models and in TPR models. A milling is carried out on the worm wheel and a suitable proximity switch supplies an electric impulse for each turn. No impulse means that the transmission is stopped. Special executions with more impulses per round are always possible.

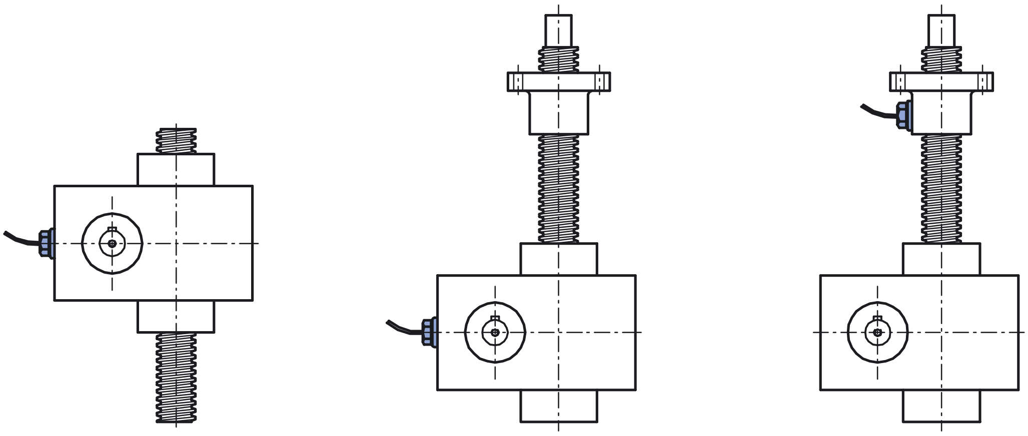
Incompatibility: ALEPH series – size 183



CT- CTC Temperature control

Due to the fact that they are irreversible transmissions, a big amount of input power is lost by mechanical screw jacks and it is therefore transformed into heat. It is possible to control temperature both on the casing (CT) and on the lead nut (CTC) by means of a thermal probe emitting an electric impulse when the preset temperature of 80 °C is reached. Moreover it's possible to apply a sensor able to catch the temperature exact value and to send to a plc an electric signal proportional to the above mentioned value.

Incompatibility: ALEPH series



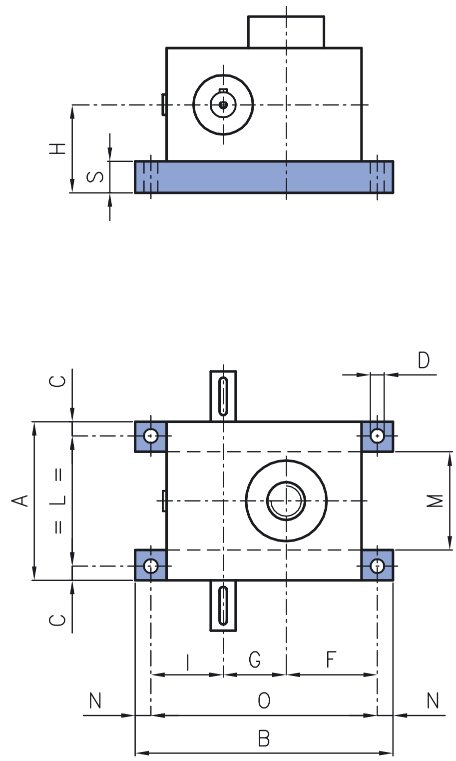
For non quoted dimensions see the schemes on pages 60-63

SP Additional mounting plates

If for mounting requirements it is necessary to fix the screw jacks on holes which do not coincide with the casing holes, steel mounting plates can be supplied.

The overall dimensions for the standard version are shown in the table below, but different fixing holes can be realized upon request.

Incompatibility: ALEPH series – sizes 183, 10012, 12014, 14014, 16016, 20018, 25022 - P - P0



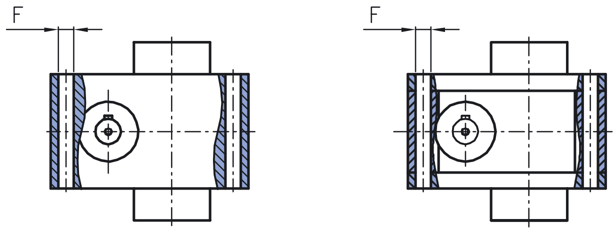
SP Additional mounting plates

Size	204	306	407	559	7010	8010	9010
A	100	126	160	170	230	230	250
B	140	205	255	291	400	400	440
C	10	12	15	18	25	25	25
D Ø	9	11	13	20	30	30	30
F	47,5	72,5	90	98	145	145	155
G	30	50	70	70	90	90	110
H	55	65	85	105	133	133	160
I	42,5	57,5	65	83	105	105	115
L	80	102	130	134	180	180	200
M	50	76	90	100	130	130	150
N	10	12,5	15	20	30	30	30
O	120	180	225	251	340	340	380
S	15	20	25	30	45	45	45

For non quoted dimensions see the schemes on pages 60-63

FP Pass-through holes for bolts

In case for mounting requirements, pass-through holes are needed for the sizes from 559 to 25022 instead of blind holes, they can be provided according to the overall dimensions shown in the table below.
Incompatibility: ALEPH series – sizes 183, 204, 306, 407

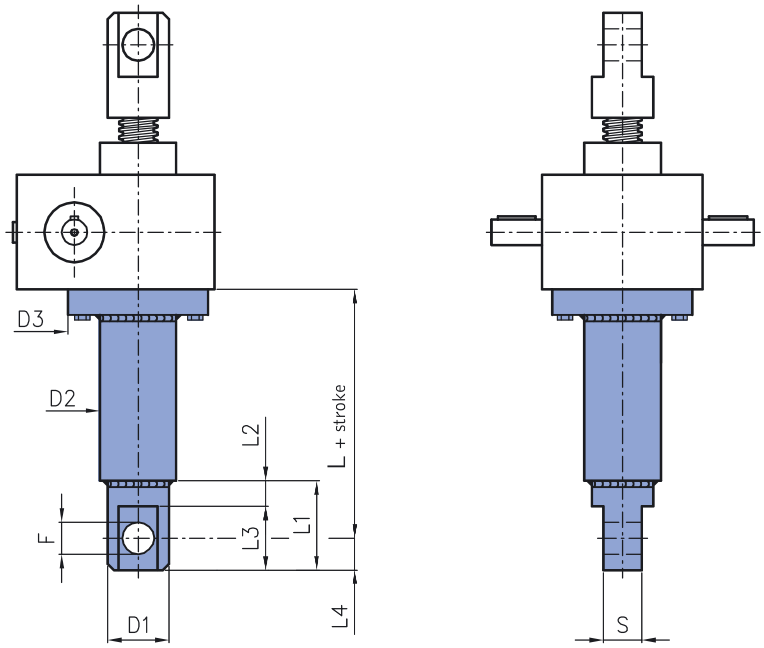


FP Pass-through holes for bolts										
Size	**559**	**7010**	**8010**	**9010**	**10012**	**12014**	**14014**	**16016**	**20018**	**25022**
F Ø	20	30	30	30	30	30	56	56	66	66

For non quoted dimensions see the schemes on pages 60-63

PO Rigid rocking protection

When it is necessary to apply a rocking mounting, UNIMEC is able to offer, for TP models, a special rigid reinforced protection which has an eyelet at its end.
This protection very often supports the load, and it is therefore advisable that this protection be not too long in order to avoid an anomalous bending of the PO. Further, it should be reminded that mounting a PO in combination with an end fitting having an eyelet does not automatically give to the screw jack the status of a connecting rod (absence of lateral loads). In case of compressive loads, the buckling verification must be calculated on a length equal to the hinges distance.
Motors can directly be assembled to the screw jack. The overall dimensions are shown in the following table.
Incompatibility: TPR models - ALEPH series
sizes 183, 10012, 12014, 14014, 16016, 20018, 25022 - P - PR - PRO - SP - PRA

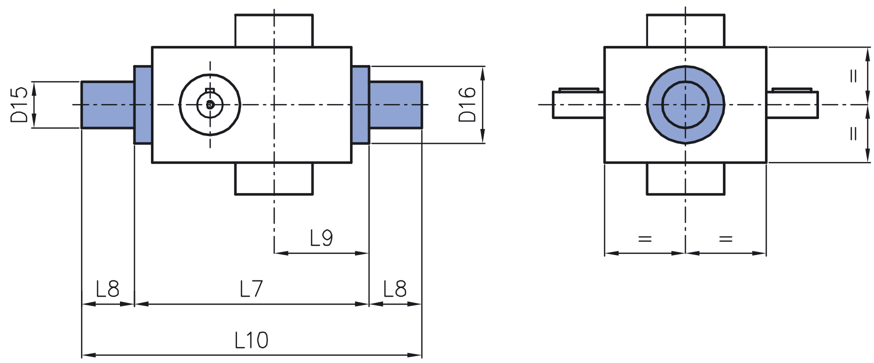


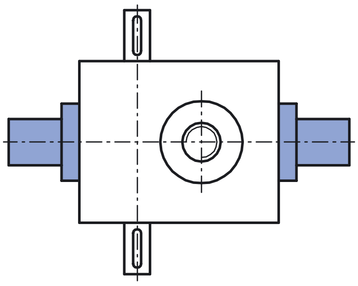
PO rigid rocking protection							
	XPO Models*						
Size	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**
D1 Ø	38	48	68	88	108	118	138
D2 Ø	45	60	85	105	133	133	169
D3 Ø	88	110	150	150	200	200	230
F Ø H9	20	25	35	50	60	65	80
L	90	115	145	180	210	215	280
L1	55	70	95	140	165	175	220
L2	15	20	25	40	45	45	60
L3	40	50	70	100	120	130	160
L4	20	25	35	50	60	65	80
L5	15	20	20	20	25	25	30
S	25	30	40	60	75	80	100

* XPO model: stainless steel version
For non quoted dimensions see the schemes on pages 60-63

P Lateral pins

The purpose of this solution is very similar to the PO one: two lateral pins are fixed on the screw jack body in order to allow a rocking mounting. For some aspects this solution can be preferred as to the rocking protection because, in the slender rod scheme, the distance between the two hinges is exactly half.
Further we remind that mounting lateral pins combined with an end fitting having an eyelet does not automatically give to the screw jack the status of a connecting rod (absence of lateral loads). In case of compressive loads, the buckling verification must be calculated on a length equal to the hinges distance.
Motors can directly be assembled to the screw jack. The overall dimensions are shown in the following table.
Incompatibility: ALEPH series - sizes 183, 10012, 12014, 14014, 16016, 20018, 25022 - PO - SP





P lateral pins	XP Models*						
Size	**204**	**306**	**407**	**559**	**7010**	**8010**	**9010**
D15 Ø k6	25	30	40	50	55	60	65
D16 Ø	55	60	70	80	95	95	100
L7	125	180	225	261	310	310	350
L8	30	35	45	55	60	60	65
L9	50	72,5	90	103	130	130	140
L10	185	250	315	371	430	430	480

* XP model: stainless steel version
For non quoted dimensions see the schemes on pages 60-63

DA double action model

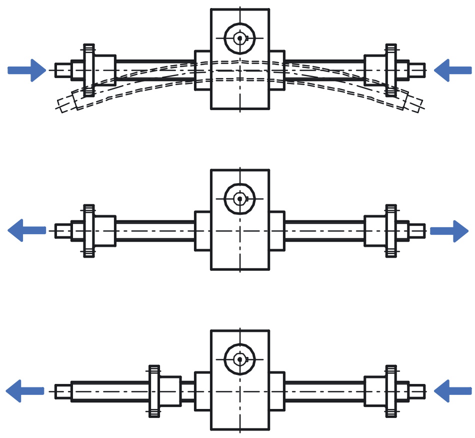
The double action model satisfies the need to move two nuts with a unique kinematic. The spindle protrudes from both screw jack faces and may have two configurations:

DXSX: the spindle is right threaded by one face and left threaded by the other one. The kinematic presents opposite shifts, as shown in fig. 1.

DXDX: the spindle is completely right threaded. The kinematic presents the same shift direction, as shown in fig. 2.

Like kinematics, also loads can have the same or the opposite directions. This is the origin of the problems shown below. Moreover it's important that the verification at the equivalent power must be always done considering both loads.

a) b) c)



a) The verification at buckling must be done on the spindle total length.
The maximum admissible load is the nominal of that size.

b) The maximum admissible load is the nominal of that size

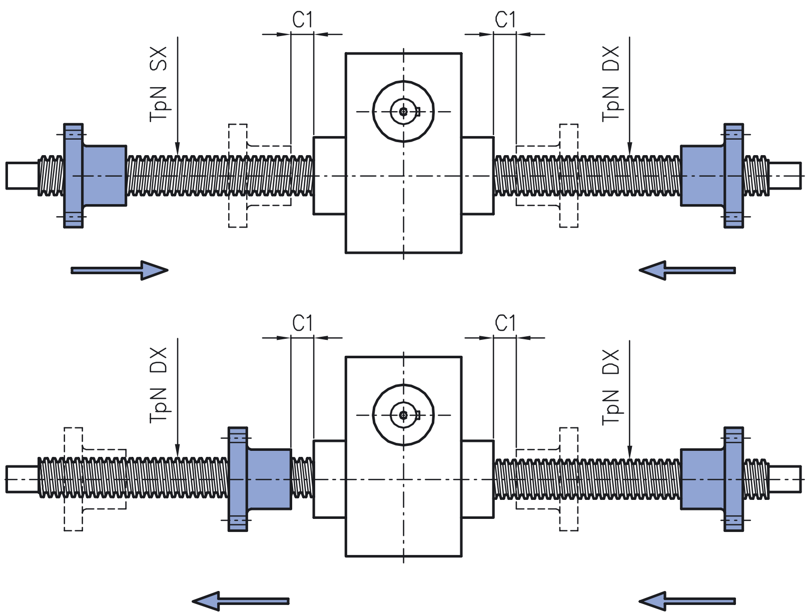
c) The verification at buckling must be done on half spindle total length considering the structure constraints. The maximum admissible load is the half the nominal of that size.

The overall dimension C1 has to be considered on both faces and numerically correspond to the values reported in pag. 62-63 schemes.

Incompatibility: TP models – size 183, 9010, 10012, 12014, 14014, 16016, 20018, 25022

1

2

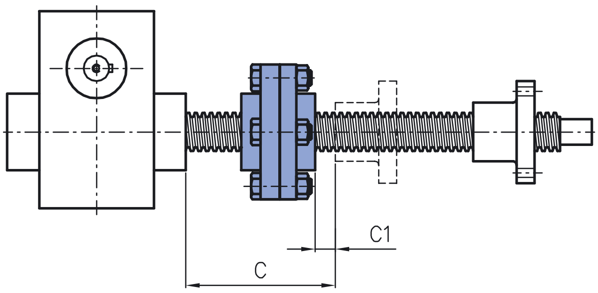


DA double action model							
		XDA Models*					
Size		**204**	**306**	**407**	**559**	**7010**	**8010**
C1		15	20	25	25	25	25

* XDA model: stainless steel version
For non quoted dimensions see schemes on pages 60-63

FD fast disassembling TPR model

In some applications (very long spindles, fast maintenance, rational expeditions) can be a good idea to disassemble a TPR spindle from the jack body without long and expansive operations like le disassembling of the elastic pins between spindle and wheel. In this case it's possible to offer a solution in which spindle is made by two crops ending with two TF terminals (look at page 64) connected by bolts. Disassembling them spindle will become two components easy to re-assemble. Obviously the nut stroke cannot extend over the double TF, and this cause a major overall axial dimension, as shown in the drawing below.
A spigot on the terminals guarantees axial alignment between the crops after reassembling.
The overall dimensions are shown in the table below.
Incompatibility: model TP – size 183, 9010, 10012, 12014, 14014, 16016, 20018, 25022



FD fast disassembling TPR model							
		XFD Models*					
Size		**204**	**306**	**407**	**559**	**7010**	**8010**
C		115	130	160	195	205	205
C1		15	20	25	25	25	25

* XFD model: stainless steel version
For non quoted dimensions see schemes on pages 60-63

GV Viton® seals

Due to the friction phenomena, rotating components and the seals on which they slide can locally reach high temperatures. If the previewed ones overpass 80 °C, commercial seals constitutive materials can lose their properties and damage themselves. In these cases, on demand, it's possible to use seals realized in Viton®, a special material able to be stable, up to continuous temperatures of 200 °C, to brittling and hardening phenomena.

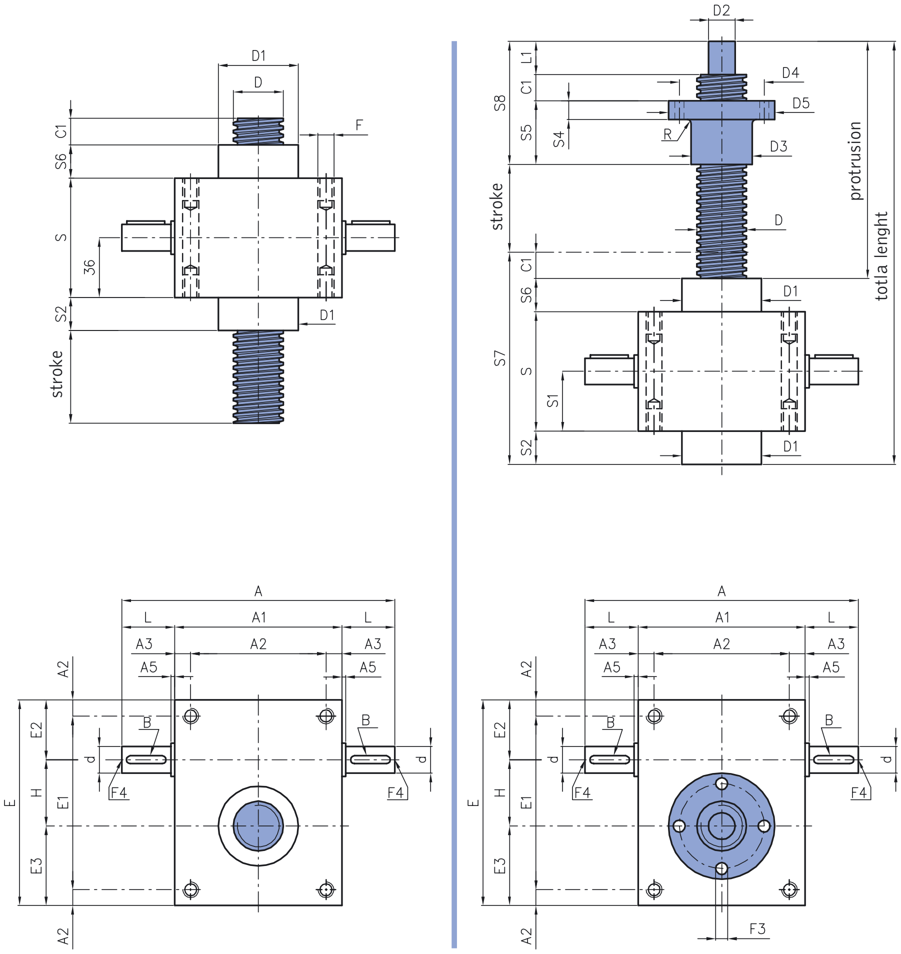
NIPLOY treatment

For applications in oxidizing environments, it is possible to protect some screw jack components, which do not undergo any sliding, by means of a chemical nickel treatment, the so-called Niploy. It creates a <u>non permanent</u> surface coating on casings, covers, bushings, end fittings, and on the protruding shafts of the worm screw. The threaded spindle cannot undergo this treatment.

The stainless steel series

For applications where a permanent resistance to oxidizing is necessary, it is possible to supply the components in stainless steel.
Sizes <u>204, 306 and 407</u> foresee a model in AISI 316, as a <u>standard production</u>, for all components: threaded spindles, covers, bushings, casings, end fittings and motor flanges; <u>the only exception is the worm screw, which, on demand, undergoes a Niploy treatment in case of protrusions.</u>
The X series can be applied in the sea environment without any oxidizing problems. It is possible to supply all the remaining sizes in AISI 304 or 316 steel as special components. For further informations see pages 226-229.

AM Over-size spindle models



AM Over-size spindle models

Size	183	204	306	407	559
A	118	150	206	270	270
A1	70	100	126	160	170
A2	56	80	102	130	134
A3	7	10	12	15	18
A4	7	7,5	12	15	18
A5	4	-	-	-	-
B	3x3x15	4x4x20	6x6x30	8x7x40	8x7x40
C1	15	15	20	25	25
d Ø j6	9	12	20	25	25
D Ø $^{-0,2}_{-0,3}$	20x4	30x6	40x7	55x9	70x10
D1 Ø	30	44	60	69	90
D2 Ø	15	20	25	40	55
D3 Ø	32	46	60	76	100
D4 Ø	45	64	78	100	140
D5 Ø	60	80	96	130	180
E	94	100	155	195	211
E1	80	85	131	165	175
E2	29	32,5	45	50	63
E3	35	37,5	60	75	78
F Ø	9	9	11	13	M20x30
F3 Ø (4 holes)	7	7	9	13	18
F4 Ø	-	M5x10	M6x12	M8x16	M8x16
H	30	30	50	70	70
L	24	25	40	55	50
L1	20	25	30	45	70
R	3	3	3	3	3
S	50	70	90	120	150
S1	25	35	45	60	60
S2	10	20	25	35	40
S4	12	14	16	20	30
S5	45	48	75	100	105
S6	10	20	25	35	40
S7	85	125	160	215	255
S8	80	88	125	170	200

AM Over-size spindle

This construction solution, which is very useful in case a compression static load is very different from its corresponding dynamic load, consists of mounting on the screw jack a threaded spindle having the higher size. This model can be applied to **TP models for sizes 183, 204, 306**, and to **TPR models for sizes between 183 and 559**; it cannot be applied to the ALEPH series. If the model has an over-size spindle the Euler test should be performed on the higher size. **It's important the load and power capacity is related to jack body size, and not to the spindle diameter.** The overall dimensions are indicated in the previous page table.

NORMS

ATEX directive (94/9/CE)

The 94/9/CE directive is better known as the "ATEX directive". All UNIMEC's products may be classified as "components" according to the definition quoted in art.1 par.3 c), and therefore they do not require an ATEX mark.
A conformity declaration in accordance to what stated in art.8 par.3 can be supplied upon end user's request, subject to the filling up of a questionnaire with the indication of the working parameters.

Machinery directive (98/37/CE)

The 98/37/CE directive is better known as the "Machinery directive". UNIMEC's components are included in the products categories which do not need to affix the CE mark, as they are "intended to be incorporated or assembled with other machinery" (art.4 par.2). Upon end user's request a manufacturer declaration can be supplied in accordance to what is foreseen at Annex II, point B. The new machine directory (06/42/CE) will be acknowledged by 29/12/2009. UNIMEC guarantees that every new duty in mechanical transmission will be followed by such date.

ROHS directive (02/95/CE)

The 02/95/CE directive is better known as the "ROHS directive". All UNIMEC's suppliers of electromechanical equipments have issued a conformity certification to the above norms for their products. A copy of said certificates can be supplied upon final user's request.

REACH directive (06/121/CE)

The 06/121/CE is better known as "REACH" directive and applies as the rule CE 1907/2006. UNIMEC products present only inside lubricants as "substances", so being disciplined by art. 7 of above mentioned rule. By art. 7 par. 1 b) UNIMEC declares that its products are not subjected to any declaration or registration because the substances in them are not "to be lost in normal and reasonable previewed usage conditions"; in facts lubricant losses are typical of malfunctions or heavy anomalies. By art. 33 of the rule CE 1907/2006, UNIMEC declares that inside its products there aren't substances identified by art. 57 in percentage to be dangerous.

UNI EN ISO 9001:2000 norm

UNIMEC has always considered the company's quality system management as a very important subject. That is why, since the year 1996, UNIMEC is able to show its UNI EN ISO 9001 certification, at the beginning in accordance to the 1994 norms and now meeting the requirements of the version published in the year 2000. 13 years of company's quality, certified by UKAS, the world's most accredited certification body, take shape into an organization which is efficient at each stage of the working process. In date 31/10/2008 the new version of this norm was published. UNIMEC will evaluate every news reported in this revision.

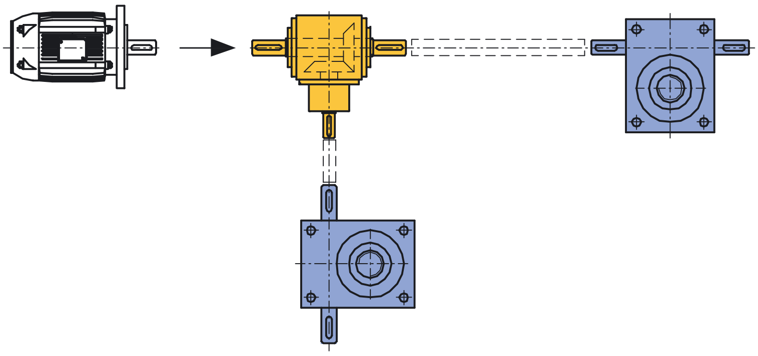
UKAS QUALITY MANAGEMENT

Painting

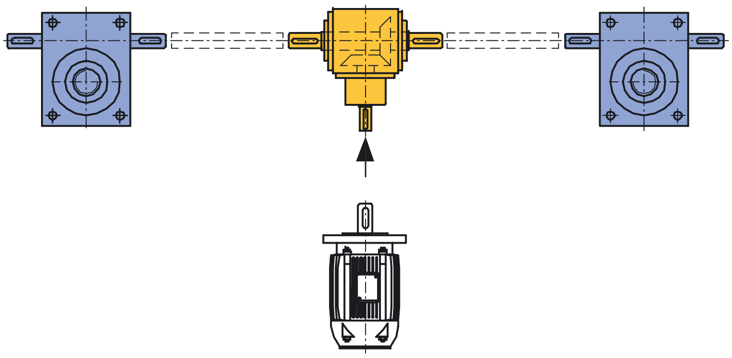
Our products are all painted in color RAL 5015 blue. An oven-dry system enables the products to have a perfect adhesivity. Different colors as well as epoxidic paints are available.

MOUNTING SCHEMES

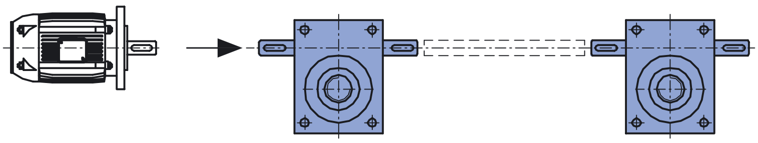
Scheme 1



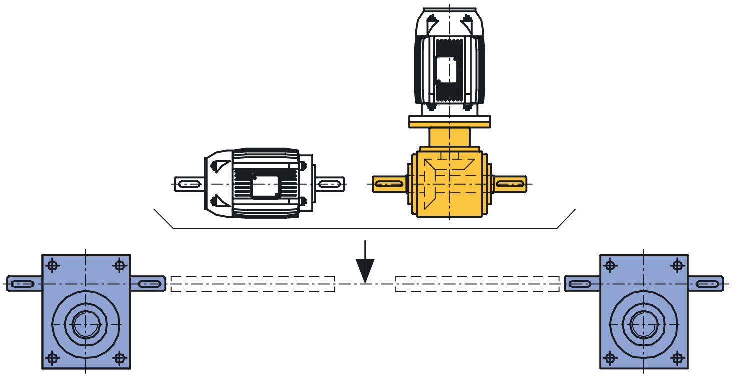
Scheme 2



Scheme 3

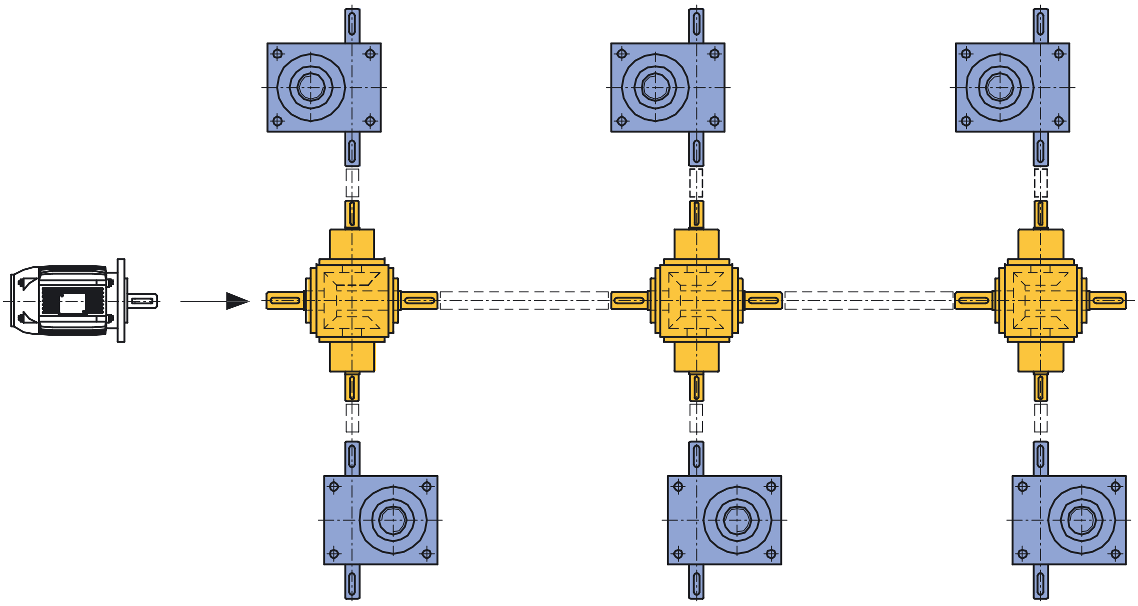


Scheme 4

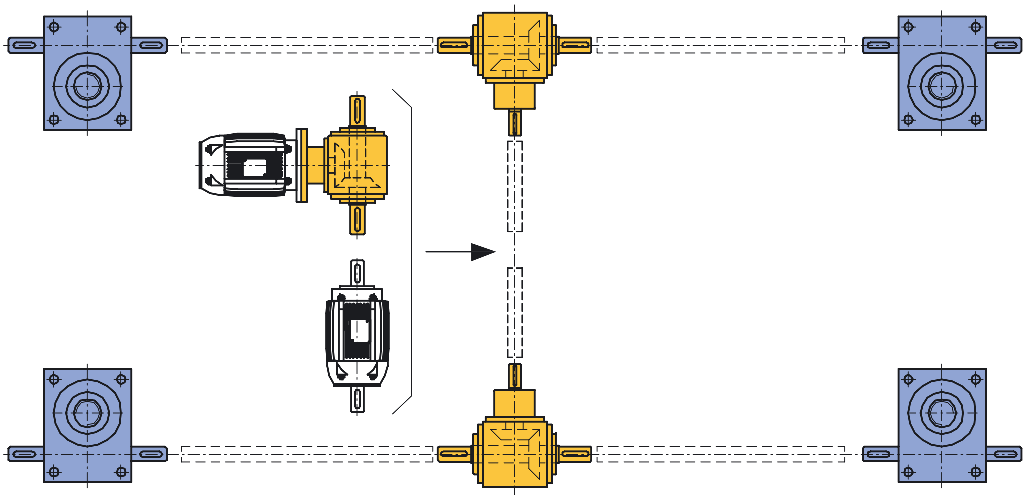


Application samples are online at www.unimec.eu - section Applications

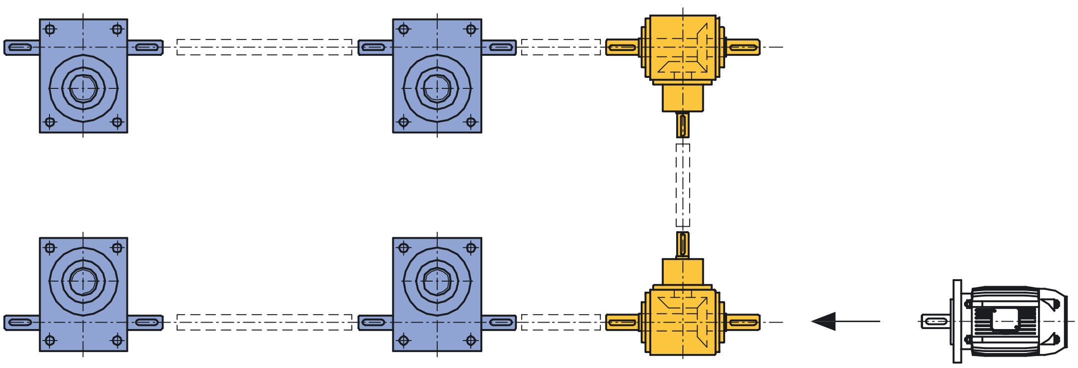
Scheme 5



Scheme 6



Scheme 7



New market demands, the growth of light applications and a spirit of innovation and research have pushed UNIMEC to realize a new trapezoidal screw jack series with an high price-quality ratio: the Aleph series.

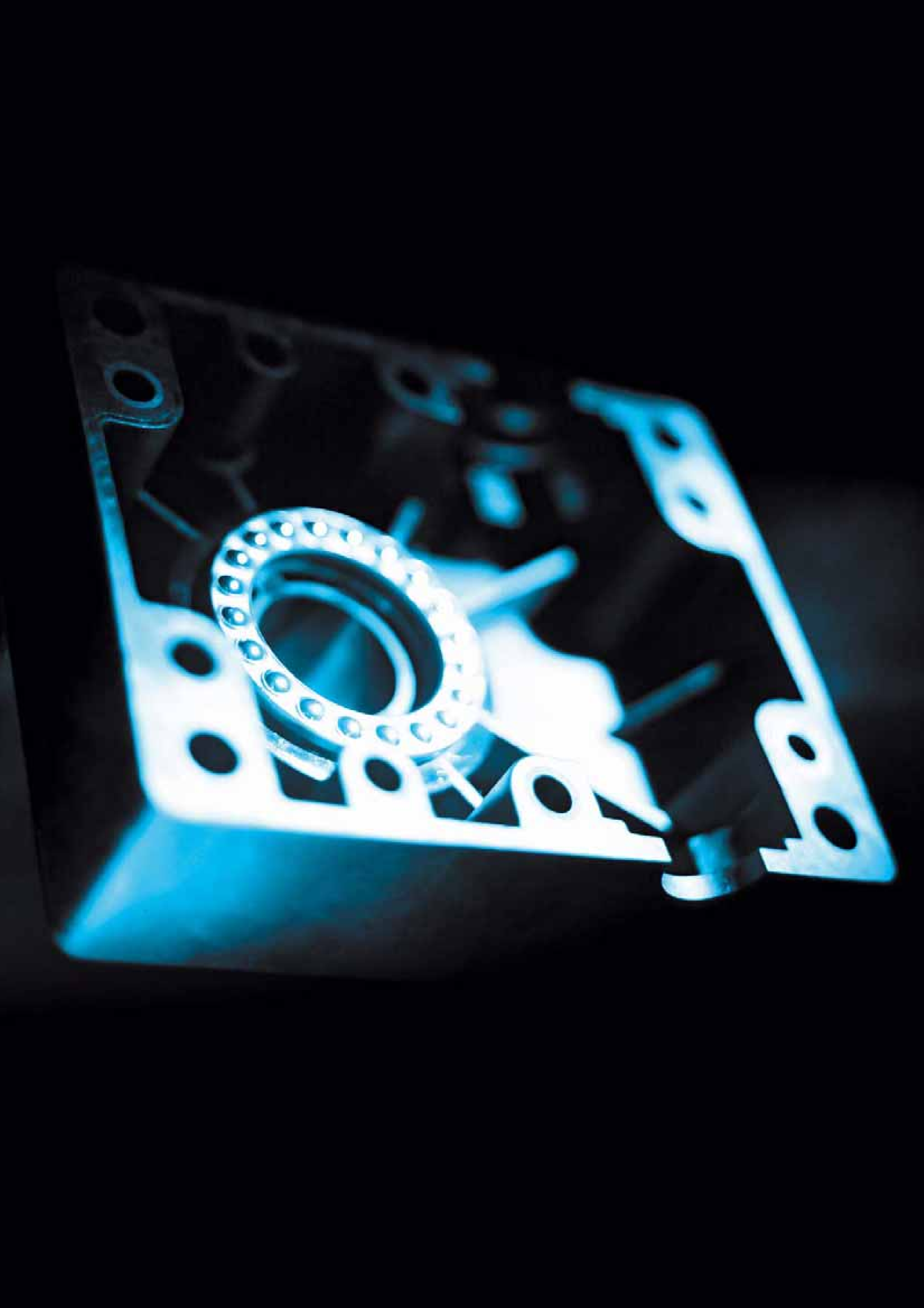
aleph

This new line includes two sizes and its peculiarity is that some components are made of a techno-polymer having very high mechanical features.

Having a structure quite similar to full metal screw jacks, Aleph series screw jacks have the same load handling functions and they also maintain the same **irreversibility** features.

The particular molding system of the gears and the peculiarity of the polyarilammide material employed, allow it to operate even **without lubrication**.

Aleph screw jacks can work singularly or in groups connected by means of joints, shafts and bevel gearboxes.



Models

TP model: threaded spindle with axial translation.

The input rotation of the worm screw is transformed in the axial translation of the threaded spindle by means of the worm wheel. **The load is applied to the threaded spindle which must have a rotational constraint.**

aleph

TPR model: with rotating threaded spindle and external support nut (lead nut).

The input rotation of the worm screw causes the rotation of the threaded spindle which is attached to the worm wheel. **The load is applied to an external support nut (lead nut) which must have a rotational constraint.**

End fittings

To meet the widest possible range of needs, various types of end fittings are available, which can be custom made upon request.

Casings

Casings are made of two identical polymer half-shells. The two halves are connected by means of screws and nuts.

Worm screws

Even for the Aleph series worm screws are made of a special steel 16NiCr4 (according to the UNI EN 10084:2000 requirements). They undergo thermal treatments like case-hardening and carburizing before being thoroughly ground on both the threads and the tangs. Worm screws are available in three different reduction ratios: 1/5, 1/10, 1/30.

Worm wheel and support nuts

The worm wheels and support nuts (lead nuts) are completely made of polymer. This is very important because, obtaining the trapezoidal threading by molding, it is possible to keep the fibers integrity, ensuring better mechanical features. The trapezoidal threading geometry meets the requirements of the ISO 2901:1993 norm. The only machining is carried out for the worm wheel toothing; in this way it is possible to supply the three different ratios highlighted in the previous paragraph.

Threaded spindles

The 20x4, 30x6 and 40x7 threaded spindles reflect the same characteristics listed in the respective paragraphs for the trapezoidal screw jack chapter. They are mainly manufactured by rolling carbon steel C45 grounded bars (according to the UNI EN 10083-2:1998). The trapezoidal threading geometry meets the requirements of the ISO 2901:1993 norm. Threaded spindles made of AISI 316 stainless steel or other materials can be manufactured upon request.

Protections

Protections can also be applied in order to prevent dust and foreign matters from coming into contact with the coupling and causing damages to the threaded spindle and its support nut. For TP models, a steel rigid tube can be provided in the outer side, while the front side can be protected by polyester and PVC elastic bellows. In TPR models only elastic protections can be applied.

Bearings and market materials

Top-quality bearings and market materials are used for the whole line.

LOAD ANALYSIS AND COMPOSITION

For the definition, analysis and characteristics of the various types of loads see the relative paragraph in the trapezoidal screw jack section, on page 28.

BACKLASHES

For the definition, analysis and characteristics of the various types of backlashes see the relative paragraph in the trapezoidal screw jack section, on page 28.

Nevertheless it should be reminded that the axial backlash between the screw jack and its support nut cannot be reduced, being not possible to employ a contrast counter-lead nut system (RG).

GLOSSARY

C = unit load to be handled [daN]
C_e = equivalent unit load [daN]
C_t = total load to be handled [daN]
DX = left hand spiral threading
F_{rv} = radial forces on the worm screw [daN]
f_a = ambient factor
f_d = duration factor
f_s = service factor
f_t = temperature factor
f_u = humidity factor
f_v = speed factor
M_{tm} = torque on the drive shaft [daNm]
M_{tv} = torque on the worm screw [daNm]
N = number of screw jacks and bevel gearboxes under a single handling
n = number of screw jacks under a single handling
P = mounting power requirement [kW]
P_i = input power to the single screw jack [kW]
P_e = equivalent power [kW]
P_u = output power to the single screw jack [kW]
rpm = rounds per minute
SX = left hand spiral threading
v = axial translation speed of the load [mm/min]
η_m = screw jack running efficiency
η_c = configuration running efficiency
η_s = structure running efficiency
ω_m = motor angular speed [rpm]
ω_v = worm screw angular speed [rpm]

Unless otherwise specified all tables show linear measurements expressed in [mm].
All the reduction ratios are expressed in the form of a fraction, unless otherwise specified.

HANDLING

Manual operation

The Aleph series can be manually operated. The following table determines the maximum load, expressed in [daN], that can be handled according to the reduction ratio of screw jacks, considering the application of a force of 5 daN on a handwheel having a radius of 250 mm. Obviously, greater loads can be manually handled by applying further reductions to the screw jack or by increasing the radius of the handwheel.

Size		**420**	**630**	**740**
fast ratio	[daN]	700	1000	1800
normal ratio	[daN]	700	1000	1800
slow ratio	[daN]	700	1000	1800

Motorized operation

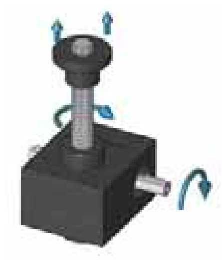
Aleph series can be handled by any kind of motors. Nowadays it’s possible a direct motorization for some IEC flanges (see pag. 114) thanks to an innovative molding process able to shroud bolts in the carter. It’s possible to connect 4, 6 or 8 poles motors, while it’s not suggested to assemble 2 poles motors for not overpass 1500 rpm input rotational speed. Power tables show, in case of unitary service factors and for single jack unit, the input power and torque moment in function of the size, ratio, dynamic load and linear speed.

Rotation directions

The rotation directions and the respective linear movements are showed in the drawings below. In standard conditions, UNIMEC supplies screw jacks equipped with right-handed worm screw, to which the movements illustrated in drawings 1 and 2 correspond. Upon request it is possible to have a left-handed worm screw, to which the movements illustrated in drawings 3 and 4 correspond. The combinations between threaded spindles and left-handed or right-handed worm screw, lead to the four combinations listed in the table below.

Worm screw	DX	DX	SX	SX
Threaded spindle	DX	SX	DX	SX
Direct motorization on the worm screw	Possible	Possible	Impossible	Impossible
Handling	1-2	3-4	3-4	1-2


1


2


3


4

Emergency operation

In case of black-out, in order to be able to operate the single screw jacks or the complete structures by means of a crank, a free end on the screw jack worm screw or on the transmission is to be foreseen. In case of self-braking motors or worm screw motor reducers, the brake must firstly be released and then it is necessary to disassemble those components from the transmission as the reducer could also be irreversible.
It is advisable to equip the emergency operation mechanism with a safety device to cut the electric circuit.

LUBRICATION

Inner lubrication

Thanks to particular solutions during the molding process, a film of pure polymer is formed on the molded components surfaces, which has high sliding properties. This factor, in synergy with light services, enables the Aleph series to work in absence of lubricant. Anyway the presence of a lubricant layer on the threaded spindle can extend the screw jacks life; for the lubricants choice make reference to what has been indicated in the correspondent paragraph in the screw jacks section (page 32).
It should be reminded that **the Aleph series does not foresee any oil plug.**

INSTALLATION AND MAINTENANCE

Installation

The screw jack must be installed in such a manner as not to create lateral loads on the threaded spindle. Great care must be taken to ensure that the threaded spindle is orthogonal to the mounting plane, and that the load and threaded spindle are on the same axis. Employing multiple screw jacks to handle the same load (see the mounting schemes section) requires further verifications: it is critical that the load support points, (the end fittings for TP models and the lead nuts for TPR models), be perfectly aligned in order that the load can be uniformly distributed; otherwise the misaligned screw jacks would act as brake or counter-load. Whenever several jacks have to be connected by means of transmission shafts, it is recommended that they be perfectly aligned in order to avoid overloading on the worm screws.
It is advisable to use joints capable of absorbing alignment errors but having at the same time a rigid torsion necessary to keep the synchronization of the transmission. The assembly or disassembly of the joints or pulleys of worm screw must be carried out by means of tie rods or extractors, using, if necessary, the threaded hole on top of the worm screw; striking or hammering could damage the inner bearings.
For heat-shrinking joints or pulleys, we recommend a temperature between 80-100 °C. Installations environments with dust, water, vapors, etc. require precautions systems to protect the threaded spindle. This can be done by using elastic protections or rigid protections.
The above protections are also used in order to avoid any accidental human contact with the moving devices.

Start-up

All Aleph screw jacks undergo a careful quality examination before being delivered to the client, and **are dynamically tested load-free.** When starting-up a machine where screw jacks are installed, it is critical to check for the lubrication of the threaded spindles (whether foreseen and if possible) and for the absence of foreign material. During the calibration of the electrical end-of-stroke systems, the inertia of the moving masses should be considered, which for vertical loads will be lower in ascent and greater in descent. It is advisable to start the machine with the minimum possible load and to make sure all components are working properly, before assuming regular operation. Especially at start-up, it is critical to follow the instructions given in the manual: continuous or hazardous testing maneuvers could lead to an abnormal overheating and cause irreparable damages.
One only temperature peak is enough to cause premature wear or breakdown of the aleph screw jack.

Routine maintenance

Screw jacks must be periodically inspected, depending on the use and working environment.

Storage

The screw jacks must be protected from deposits of dust and foreign matter during storage. Particular attention must be paid to saline or corrosive atmospheres. We recommend to store Aleph screw jacks in a closed place, in order to avoid an excessive water absorption of the polymer. We also recommend to:
- Lubricate and protect the threaded spindle, the worm screw and the non varnished components
- Support the threaded spindle in case of horizontal storage.

Warranty

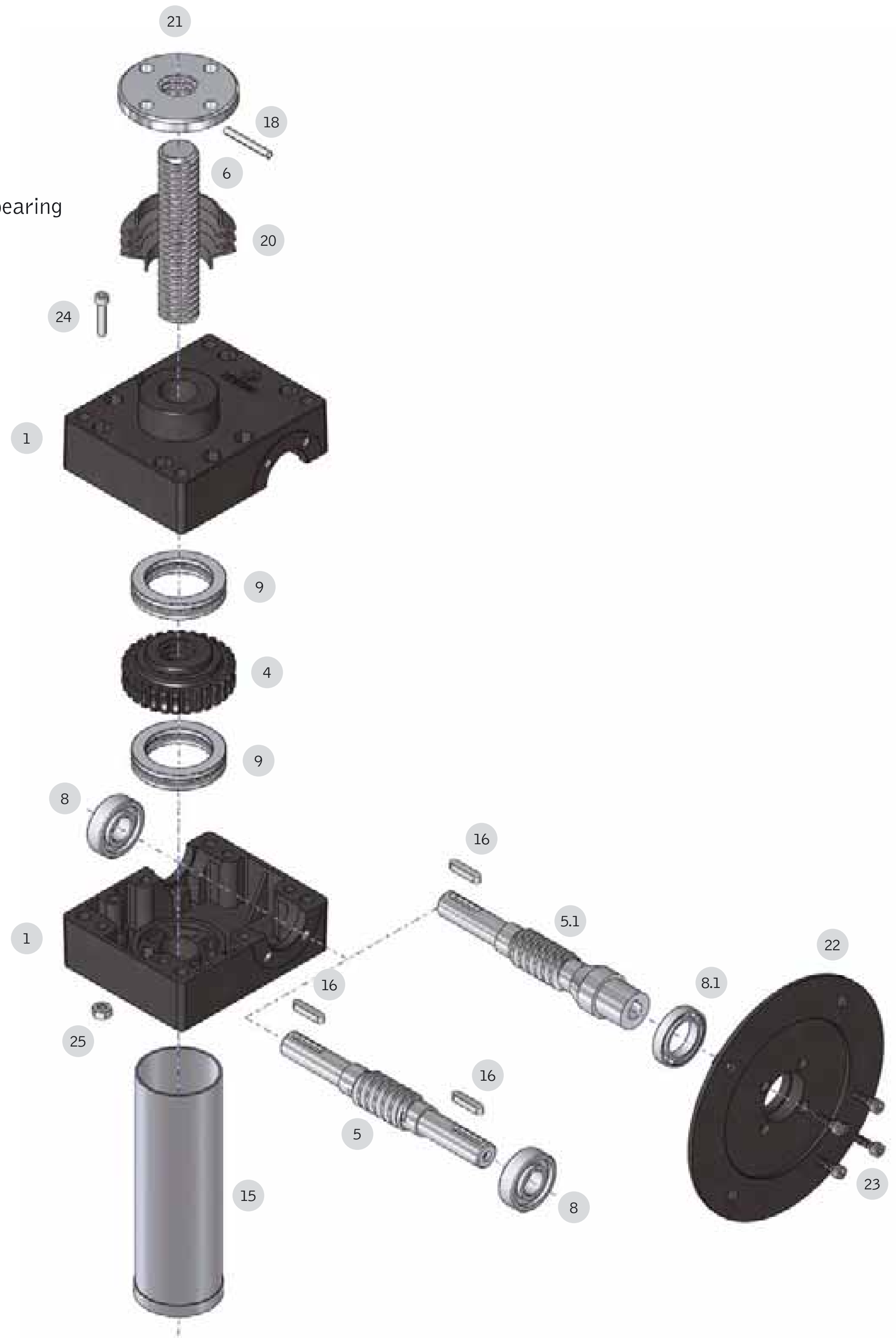
The warranty is valid only when the instructions contained in our manual are carefully followed.

ORDERING CODE

Follow the indications on page 35.

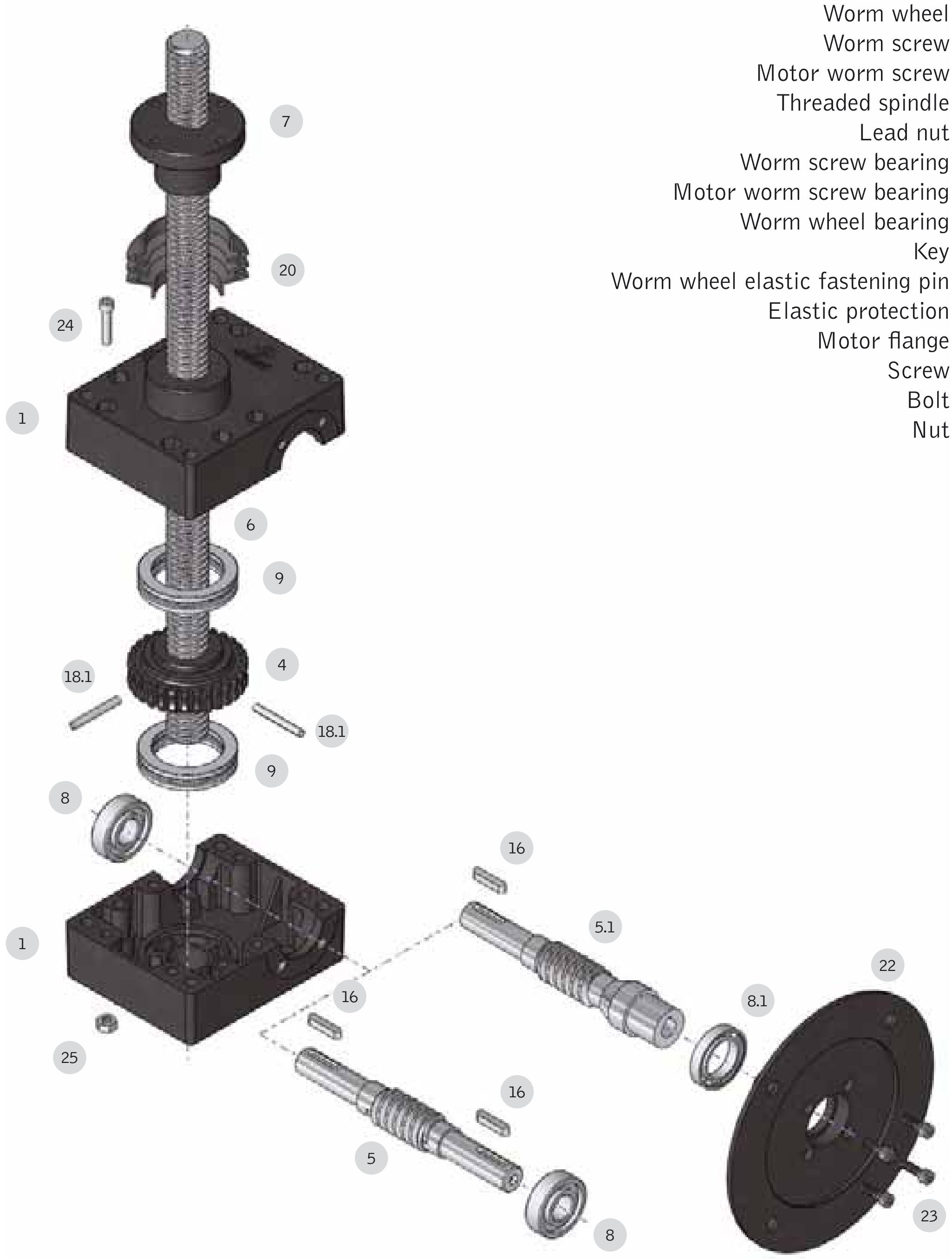
TP MODEL

1 Casing (half-shell)
4 Worm wheel
5 Worm screw
5.1 Motor worm screw right-handed
6 Threaded spindle
8 Worm screw bearing
8.1 Motor worm screw bearing
9 Worm wheel bearing
15 Rigid protection
16 Key
18 End fitting elastic fastening pin
20 Elastic protection
21 End fitting
22 Motor flange
23 Screw
24 Bolt
25 Nut



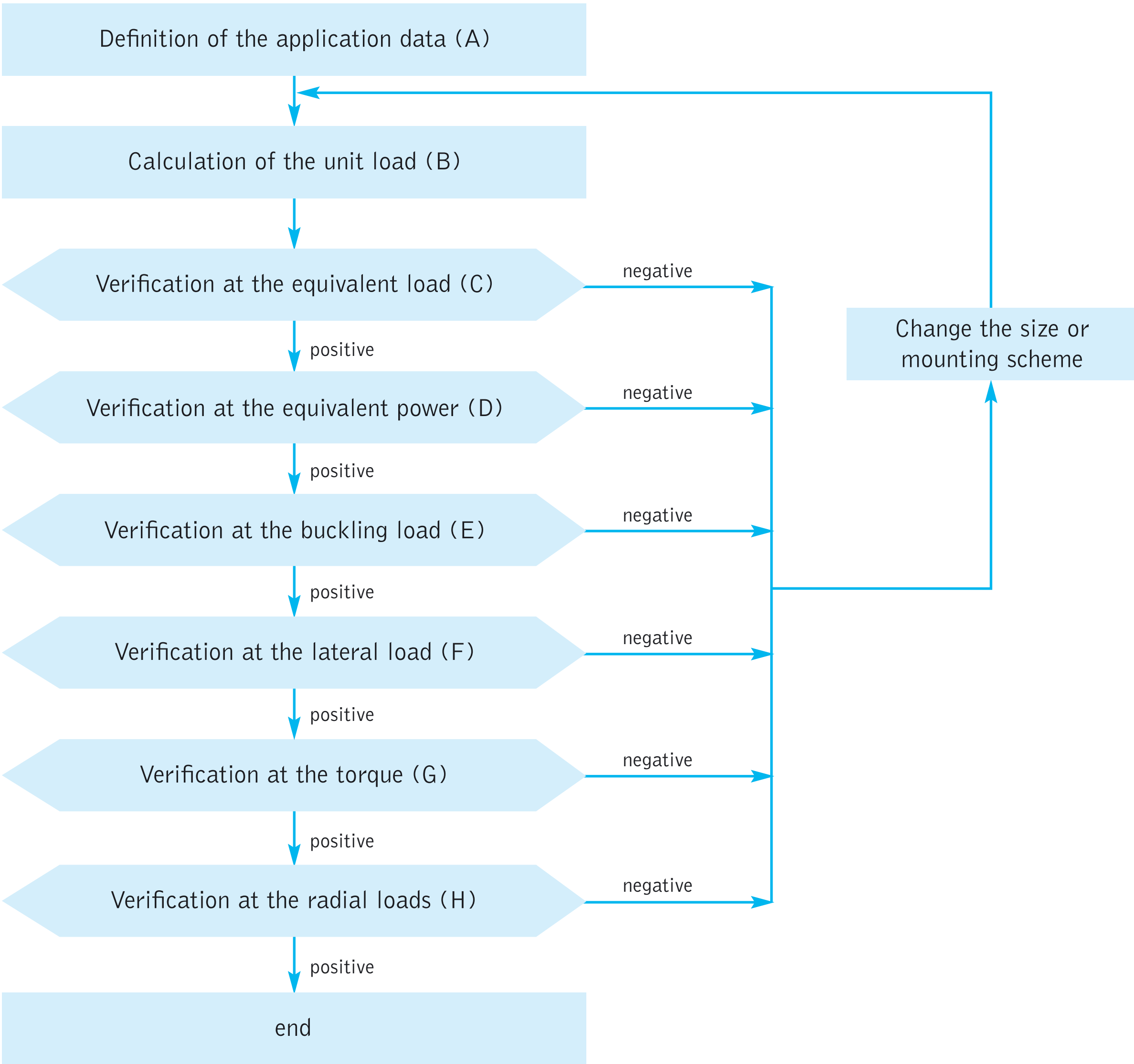
TPR MODEL

Casing (half-shell)	1
Worm wheel	4
Worm screw	5
Motor worm screw	5.1
Threaded spindle	6
Lead nut	7
Worm screw bearing	8
Motor worm screw bearing	8.1
Worm wheel bearing	9
Key	16
Worm wheel elastic fastening pin	18.1
Elastic protection	20
Motor flange	22
Screw	23
Bolt	24
Nut	25



DIMENSIONING OF THE SCREW JACK

For a correct dimensioning of the screw jack it is necessary to observe the following steps:



DESCRIPTIVE TABLES

SIZE		**420**	**630**	**740**
Admissible load [daN]		700	1000	1800
Trapezoidal spindle: diameter per pitch [mm]		20x4	30x6	40x7
Theoretical reduction ratio	fast	1/5	1/5	1/5
	normal	1/10	1/10	1/10
	slow	1/30	1/30	1/30
Real reduction ratio	fast	4/19	4/19	6/30
	normal	2/21	3/29	3/30
	slow	1/30	1/30	1/30
Spindle stroke for a turn of the worm wheel [mm]		4	6	7
Spindle stroke for a turn of the worm screw [mm]	fast	0,8	1,2	1,4
	normal	0,4	0,6	0,7
	slow	0,13	0,2	0,23
Running efficiency [%]	fast	31	30	28
	normal	28	26	25
	slow	20	18	18
Operation temperature [°C]		10/60 (for different conditions contact our Technical office)		
Weight of the trapezoidal screw for 100 mm [kg]		0,22	0,5	0,9
Weight of the screw jack (screw not included) [kg]		1	2,7	3

A - THE APPLICATION DATA

For a right dimensioning of the screw jacks it is necessary to identity the application data:

LOAD [daN] = the load is identified with the force applied to the translating device of a screw jack. Normally the dimensioning is calculated considering the maximum applicable load (worst case). It is important to consider the load as a vector, which is defined by a modulus, a direction and a sense, the modulus quantifies the force, the direction orients spatially and gives indications on the eccentricity or on possible lateral loads, the sense identifies the traction or compression load.

TRANSLATION SPEED [mm/min] = the translation speed is the load handling speed. From this speed it is possible to calculate the rotation speed of the rotating devices and the necessary handling power. Wear phenomena and the life of the screw jack proportionally depend on the value of the translation speed. Therefore, it is advisable to limit the translation speed as much as possible. NEVER exceed 1500 rpm for the Aleph series.

STROKE [mm] = it is the linear measure used to handle a load. It may not always coincide with the total length of the threaded spindle.

AMBIENT VARIABLES = these values identify the environment and the operating conditions of the screw jack. Among them: temperature, oxidizing and corrosive factors, working and non-working periods, vibrations, maintenance and cleaning, lubrication quality and quantity etc.

MOUNTING SCHEMES = There are several ways of handling a load by means of screw jacks. The schemes on pages 90-91 will show some examples. Choosing a mounting scheme will condition the choice for the size and the power which is necessary for the application.

B - THE UNIT LOAD AND THE DESCRIPTIVE TABLES

According to the n number of screw jacks contained in the mounting scheme, it is possible to calculate each screw jack's load by dividing the total load by n In case the load is not fairly distributed in all screw jacks, it is recommended to consider the transmission having the heaviest load, by virtue of a dimensioning based on the worst case. According to that value, reading the descriptive tables, it is possible to effect a preliminary selection choosing between the sizes which present an admissible load value higher than the unit load.

C - THE EQUIVALENT LOAD

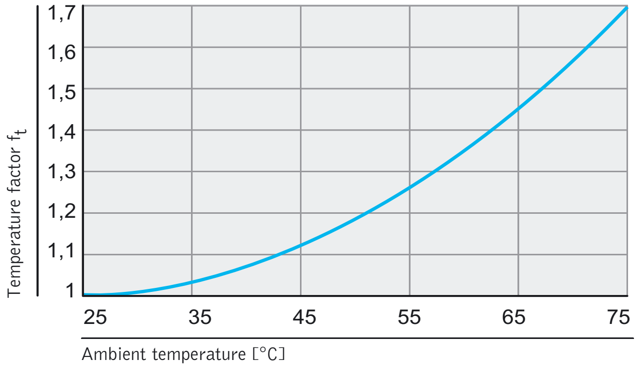
All the values listed in the catalogue refer to standard use conditions, i.e. a temperature of 20 °C, 50% humidity, foreseen lifetime 10000 cycles, manual handling without shocks and working percentage 10%. For different application conditions, the equivalent load should be calculated: it is the load which would be applied in standard conditions in order to have the same thermal exchange and wear effects, which the real load achieves in the real conditions of use.

It is therefore advisable to calculate the equivalent load according to the following formula

$$C_e = C \cdot f_t \cdot f_a \cdot f_s \cdot f_u \cdot f_d \cdot f_v$$

The temperature factor f_t

By means of the following diagram an f_t factor can be calculated according to the ambient temperature. In case of temperatures higher than 75 °C we suggest contacting our technical office.



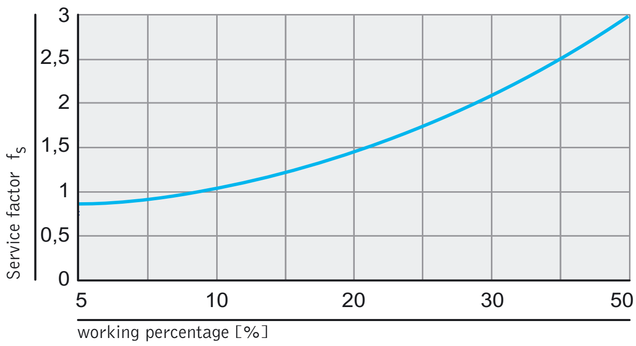
The ambient factor f_a

By means of the following table it is possible to calculate the f_a factor according to the operation conditions.

Type of load	Ambient factor f_a
Light shocks, few insertions, regular movements	1
Medium shocks, frequent insertions, regular movements	1,2
High shocks, many insertions, irregular movements	1,8

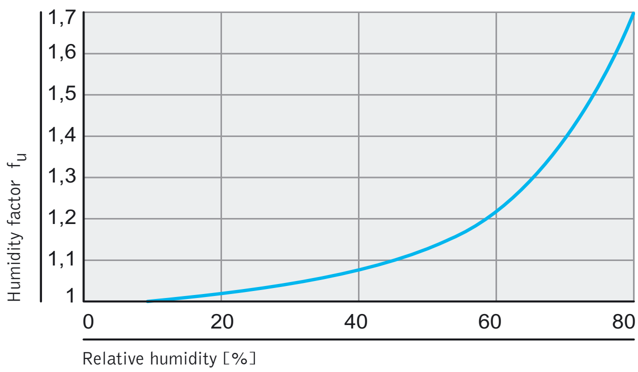
The service factor f_s

The service factor f_s is obtained by evaluating the duty cycle and calculating the operation percentage on that interval. For example a working time of 10 minutes and non working time of 10 minutes correspond to 50%; similarly a working time of 5 minutes and a non working time of 20 minutes correspond to 20%. Based on the working data, choosing the cycle time and the service percentage it is possible to read the f_s value on the ordinate axis. For Aleph series it is recommended to limit the operation conditions to 50% as the plastic material is a bad heat conductor and it makes its dispersion in the environment slower.



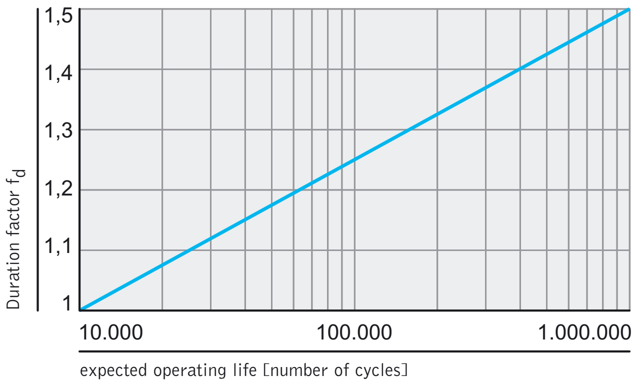
The humidity factor f_u

By means of the following diagram, it is possible to calculate the f_u factor as a function of the relative ambient humidity. The water absorption of the polymer is translated in a reduction of the strength characteristics and an increase in the shocks strength (resiliency). For humidity higher than 80% it is necessary to contact the technical office.



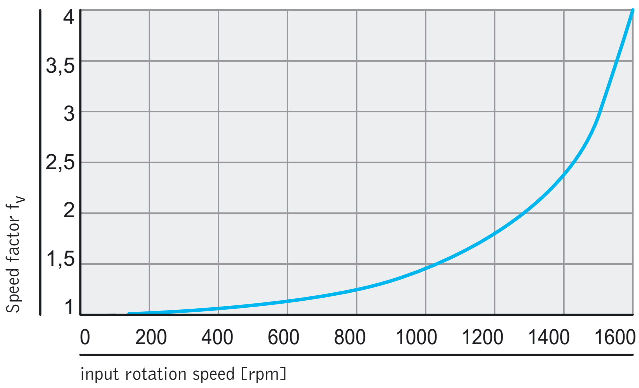
The duration factor f_d

By means of the following diagram it is possible to calculate the f_d factor as a function of the expected operating life expressed in cycle numbers.



The speed factor f_v

By means of the following diagram it is possible to calculate the f_v factor as a function of the input rotation speed on the worm screw expressed in [rpm]. Due to the polymer's physical characteristics, the 1500 rpm speed should never be exceeded, otherwise this could cause very serious wear phenomena.



With the aid of the descriptive tables it is possible to check whether the previously chosen size is able to support an admissible dynamic load equal to the equivalent load. If not it is necessary to effect a second selection.

D - THE POWER TABLES AND THE EQUIVALENT POWER

In the following pages it is possible to find the power tables. Choosing the tables referring to the size selected in paragraph C and putting the equivalent load values as well as the translation speed values in the table, it is possible to obtain the equivalent power P_e value. If the crossing values fall into the colored area, this means that the application conditions could cause negative phenomena such as overheating and strong wear. It is therefore necessary to reduce the translation speed or to increase the size.

<u>The equivalent power is not the power requested by the single screw jack, unless the six correction factors f_t, f_a, f_s, f_u, f_d, and f_v have a unit value.</u>

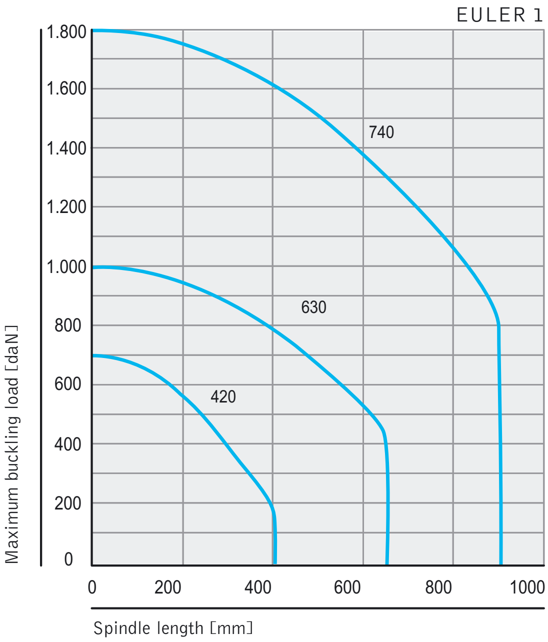
E - BUCKLING

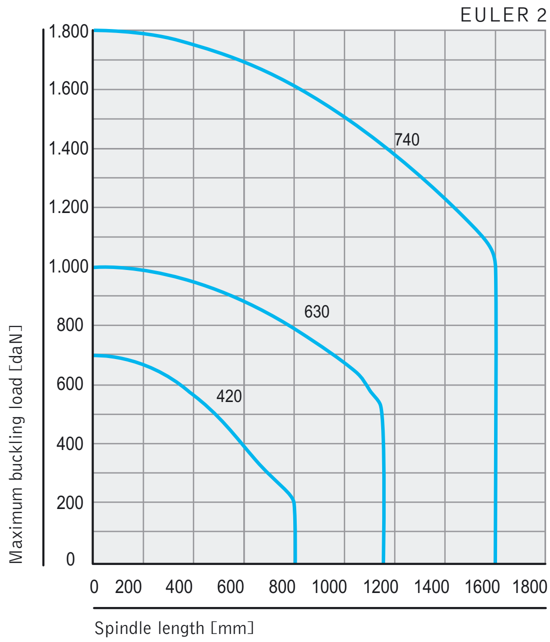
In case of compression load, even occasional, it is necessary to check the buckling structure. Firstly the two support constraints of the screw jack have to be determined: the first one is on the end fitting for the TP models and on the lead nut for the TPR models, while the second one is the way the casing is grounded.
Most part of the real cases can be synthesized according to three models, as listed below:

	End fitting - lead nut	Screw jack
Euler I	Free	Fitted-in
Euler II	Hinge	Hinge
Euler III	Sleeve	Fitted-in

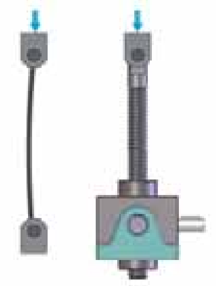
Once the Euler case has been determined which most fits to the current application, it is necessary to find in the corresponding diagram the point corresponding to the coordinates (length; load). The sizes suited to the application are those whose curves subtend the above point. In case the size chosen at paragraph D does not meet such requisites it is necessary to choose a higher size. The Euler-Gordon-Rankine curves have been calculated with a factor of safety equal to 4. For applications which can support factors of safety lower than 4 we suggest contacting our technical office.

EULER 1

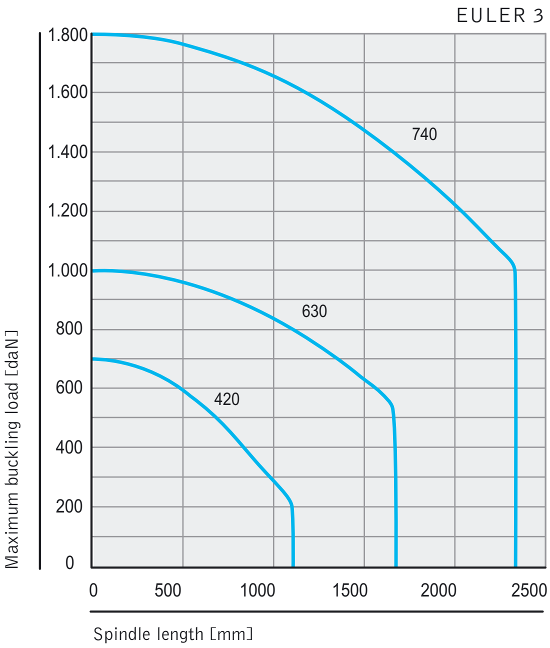




EULER 2

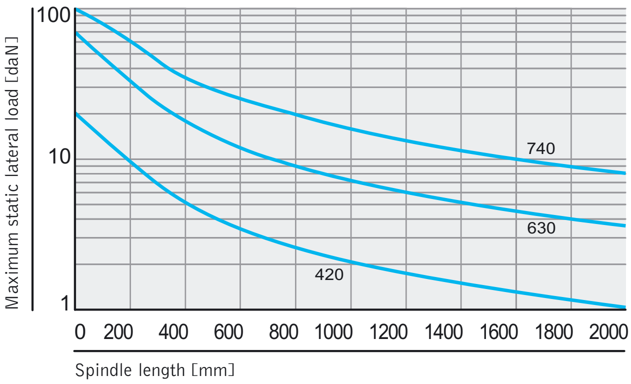


EULER 3



F - THE LATERAL LOAD

As stated in the previous paragraphs lateral loads are the main cause of failures. In addition to the misalignment of the threaded spindle and the load, they can be caused by inaccurate mountings which force the threaded spindle in an anomalous position. As a consequence the coupling between lead nut and threaded spindle for the TPR model and between the threaded spindle and the worm wheel for the TP model will be wrong. The application of double serial guides allow, for TP models, a partial correction of the anomalous position of the threaded spindle before contacting the worm wheel. The problem is transformed into an anomalous sliding of the threaded spindle on the guides themselves. In TPR model, it is the outer support nut which contacts the threaded spindle and it is therefore not possible to apply any corrections, unless particular mountings are applied as illustrated in the paragraph "lateral backlash in TPR models". Lateral loads can even derive from an horizontal mounting: the threaded spindle own weight causes a bending of the same becoming in this way a lateral load. The border value for the bending and the consequent lateral load depends on the screw jack size and on the threaded spindle length. It is advisable to contact our technical office in order to foresee the suitable supports.
The following diagrams, which are valid for static loads, show the admissible lateral load value, according to the size and the length of the threaded spindle. For dynamic applications it is necessary to ask to the technical office.



In case the dimension chosen in the previous paragraphs is not enough to support a particular lateral load a suitable size should be chosen.

G - THE TORQUE

At this stage it is possible to calculate the power requested by the assembling scheme. The following formula will be used to calculate this value:

$$P = \frac{1}{1000} \bullet \frac{n \bullet C \bullet v}{6000 \bullet \eta_m \bullet \eta_c \bullet \eta_s}$$

where:

P = needed power [kW]
n = number of screw jacks
C = unit load [daN]
v = translation speed [mm/min]
η_m = screw jack running efficiency (see descriptive tables)
η_c = configuration running efficiency = 1 - [(N-1) • 0,05], where N is the total number of screw jacks and gear boxes
η_s = structure running efficiency (guides, belts, pulleys, shafts, joints, reducers)

In order to complete the calculation of the requested power, it is necessary to calculate the torque which should be transmitted by the drive shaft:

$$M_{tm} = \frac{955 \cdot P}{\omega_m}$$

where:

M_{tm} = is the torque on the drive shaft [daNm]
P = is the motor power [kW]
ω_m = is the angular speed of the motor [rpm]

According to the applied mounting scheme it is necessary to check that the worm screw will be able to hold out under a possible combined torque. Therefore in the following table the admissible torque values are listed for the worm screws according to their size and expressed as [daNm].

Size		**420**	**630**	**740**
Fast ratio	[daNm]	5,43	6,90	49
Medium ratio	[daNm]	5,43	15,43	12,8
Slow ratio	[daNm]	4,18	18,31	15,4

In case the above values be exceeded, it will be necessary to choose a higher size, to change the mounting scheme or to increase the speed, in accordance to what has been indicated in the previous paragraphs.

H – RADIAL LOADS

In the case of radial loads on the worm screw it is necessary to check their strength according to the following table:

Size	**420**	**630**	**740**
F_{rv} [daN]	22	45	60

In case the above values be exceeded it will be necessary to choose a higher size, to change the mounting scheme or to increase the speed, in accordance to what has been indicated in the previous paragraphs.

Size 420

Ratio 1/5											
Load [daN]		700		400		300		200		100	
Worm screw rotation speed ω_v [rpm]	Threaded spindle rotation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	1200	0,38	0,25	0,26	0,17	0,19	0,13	0,13	0,09	0,07	0,05
1000	800	0,26	0,25	0,17	0,17	0,13	0,13	0,09	0,09	0,07	0,05
750	600	0,19	0,25	0,13	0,17	0,10	0,13	0,07	0,09	0,07	0,05
500	400	0,13	0,25	0,09	0,17	0,07	0,13	0,07	0,09	0,07	0,05
300	240	0,11	0,25	0,07	0,17	0,07	0,13	0,07	0,09	0,07	0,05
100	80	0,07	0,25	0,07	0,17	0,07	0,13	0,07	0,09	0,07	0,05
50	40	0,07	0,25	0,07	0,17	0,07	0,13	0,07	0,09	0,07	0,05

Ratio 1/10											
Load [daN]		700		400		300		200		100	
Worm screw rotation speed ω_v [rpm]	Threaded spindle rotation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	600	0,22	0,14	0,14	0,09	0,11	0,07	0,08	0,05	0,07	0,03
1000	400	0,14	0,14	0,09	0,09	0,07	0,07	0,07	0,05	0,07	0,03
750	300	0,11	0,14	0,07	0,09	0,07	0,07	0,07	0,05	0,07	0,03
500	200	0,07	0,14	0,07	0,09	0,07	0,07	0,07	0,05	0,07	0,03
300	120	0,07	0,14	0,07	0,09	0,07	0,07	0,07	0,05	0,07	0,03
100	40	0,07	0,14	0,07	0,09	0,07	0,07	0,07	0,05	0,07	0,03
50	20	0,07	0,14	0,07	0,09	0,07	0,07	0,07	0,05	0,07	0,03

Ratio 1/30											
Load [daN]		700		400		300		200		100	
Worm screw rotation speed ω_v [rpm]	Threaded spindle rotation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	200	0,11	0,07	0,07	0,05	0,07	0,03	0,07	0,03	0,07	0,03
1000	133	0,07	0,07	0,07	0,05	0,07	0,03	0,07	0,03	0,07	0,03
750	100	0,07	0,07	0,07	0,05	0,07	0,03	0,07	0,03	0,07	0,03
500	67	0,07	0,07	0,07	0,05	0,07	0,03	0,07	0,03	0,07	0,03
300	40	0,07	0,07	0,07	0,05	0,07	0,03	0,07	0,03	0,07	0,03
100	13	0,07	0,07	0,07	0,05	0,07	0,03	0,07	0,03	0,07	0,03
50	6,7	0,07	0,07	0,07	0,05	0,07	0,03	0,07	0,03	0,07	0,03

Size 630

Ratio 1/5

Load [daN]		1000		750		500		250	
Worm screw rotation speed ω_v [rpm]	Threaded spindle rotation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	1800	0,98	0,64	0,74	0,48	0,49	0,32	0,25	0,17
1000	1200	0,65	0,64	0,49	0,48	0,33	0,32	0,17	0,17
750	900	0,49	0,64	0,37	0,48	0,25	0,32	0,13	0,17
500	600	0,33	0,64	0,25	0,48	0,17	0,32	0,10	0,17
300	360	0,20	0,64	0,15	0,48	0,10	0,32	0,10	0,17
100	120	0,10	0,64	0,10	0,48	0,10	0,32	0,10	0,17
50	60	0,10	0,64	0,10	0,48	0,10	0,32	0,10	0,17

Ratio 1/10

Load [daN]		1000		750		500		250	
Worm screw rotation speed ω_v [rpm]	Threaded spindle rotation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	900	0,57	0,37	0,43	0,28	0,29	0,19	0,16	0,10
1000	600	0,38	0,37	0,29	0,28	0,20	0,19	0,10	0,10
750	450	0,29	0,37	0,22	0,28	0,15	0,19	0,10	0,10
500	300	0,19	0,37	0,15	0,28	0,10	0,19	0,10	0,10
300	180	0,12	0,37	0,10	0,28	0,10	0,19	0,10	0,10
100	60	0,10	0,37	0,10	0,28	0,10	0,19	0,10	0,10
50	30	0,10	0,37	0,10	0,28	0,10	0,19	0,10	0,10

Ratio 1/30

Load [daN]		1000		750		500		250	
Worm screw rotation speed ω_v [rpm]	Threaded spindle rotation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	300	0,28	0,18	0,22	0,14	0,14	0,09	0,07	0,05
1000	200	0,19	0,18	0,14	0,14	0,10	0,09	0,07	0,05
750	150	0,14	0,18	0,11	0,14	0,07	0,09	0,07	0,05
500	100	0,10	0,18	0,07	0,14	0,07	0,09	0,07	0,05
300	60	0,07	0,18	0,07	0,14	0,07	0,09	0,07	0,05
100	20	0,07	0,18	0,07	0,14	0,07	0,09	0,07	0,05
50	10	0,07	0,18	0,07	0,14	0,07	0,09	0,07	0,05

Size 740

Ratio 1/5

Load [daN]		1800		1500		1000		500	
Worm screw rotation speed ω_v [rpm]	Threaded spindle rotation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	2100	2,45	1,59	1,84	1,20	1,23	0,80	0,62	0,40
1000	1400	1,64	1,59	1,23	1,20	0,82	0,80	0,41	0,40
750	1050	1,23	1,59	0,92	1,20	0,62	0,80	0,31	0,40
500	700	0,82	1,59	0,62	1,20	0,41	0,80	0,21	0,40
300	420	0,49	1,59	0,37	1,20	0,25	0,80	0,13	0,40
100	140	0,17	1,59	0,13	1,20	0,10	0,80	0,10	0,40
50	70	0,10	1,59	0,10	1,20	0,10	0,80	0,10	0,40

Ratio 1/10

Load [daN]		1800		1500		1000		500	
Worm screw rotation speed ω_v [rpm]	Threaded spindle rotation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	1050	1,40	0,90	1,05	0,67	0,70	0,45	0,35	0,23
1000	700	0,92	0,90	0,69	0,67	0,46	0,45	0,23	0,23
750	525	0,70	0,90	0,52	0,67	0,35	0,45	0,18	0,23
500	350	0,46	0,90	0,35	0,67	0,23	0,45	0,12	0,23
300	210	0,28	0,90	0,21	0,67	0,14	0,45	0,10	0,23
100	70	0,10	0,90	0,10	0,67	0,10	0,45	0,10	0,23
50	35	0,10	0,90	0,10	0,67	0,10	0,45	0,10	0,23

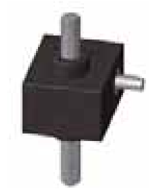
Ratio 1/30

Load [daN]		1800		1500		1000		500	
Worm screw rotation speed ω_v [rpm]	Threaded spindle rotation speed v [mm/min]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]	P_i [kW]	M_{tv} [daNm]
1500	350	0,63	0,41	0,48	0,31	0,32	0,21	0,17	0,11
1000	233	0,42	0,41	0,32	0,31	0,21	0,21	0,11	0,11
750	175	0,32	0,41	0,24	0,31	0,16	0,21	0,08	0,11
500	117	0,21	0,41	0,16	0,31	0,11	0,21	0,07	0,11
300	70	0,13	0,41	0,10	0,31	0,07	0,21	0,07	0,11
100	23	0,07	0,41	0,07	0,31	0,07	0,21	0,07	0,11
50	11,7	0,07	0,41	0,07	0,31	0,07	0,21	0,07	0,11

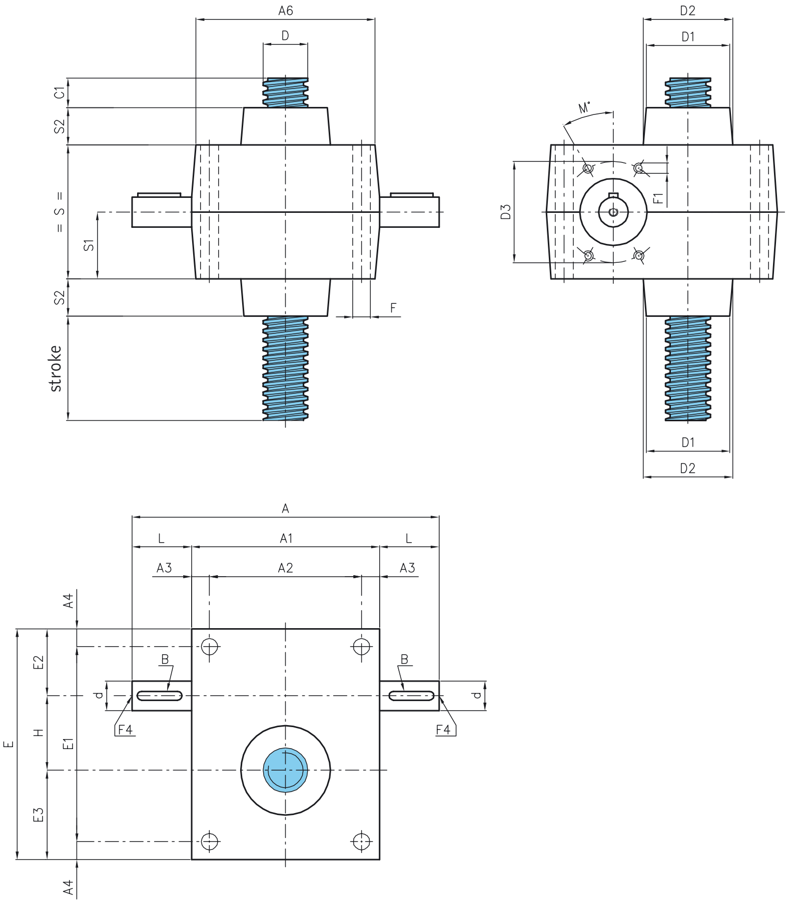
Series construction models

B model

S model

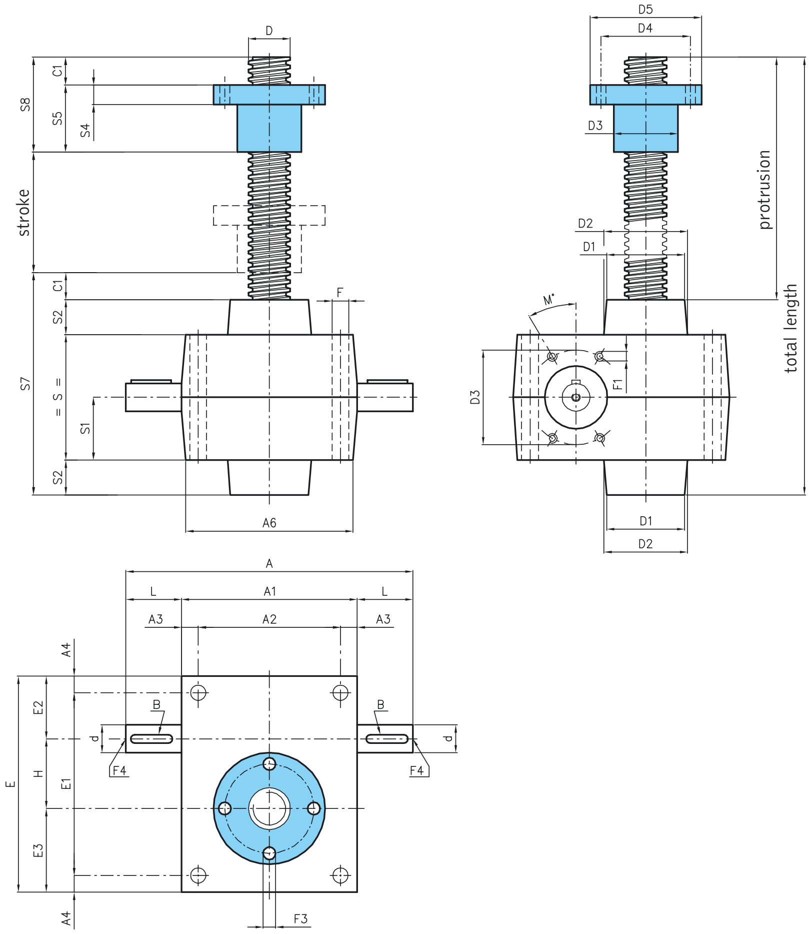


D model



TP - XTP Models*			
Size	**420**	**630**	**740**
A	150	206	270
A1	100	126	160
A2	80	102	130
A3	10	12	15
A4	7,5	12	15
A6	99	125	159
B	4x4x20	6x6x30	8x7x40
C1	15	20	25
d Ø j6	12	20	25
D Ø	20x4	30x6	40x7
D1 Ø	43	59	69
D2 Ø	44	60	70
D3 Ø	52	56	80
E	100	155	195
E1	85	131	165
E2	32,5	45	50
E3	37,5	60	75
F Ø	9	11	13
F1	M6x10	M6x10	M8x10
F4	M5x10	M6x12	M8x15
H	30	50	70
L	25	40	55
M [°]	30	45	30
S	70	90	120
S1	35	45	60
S2	20	25	35

* XTP Model: stainless steel version



Series construction models

B model

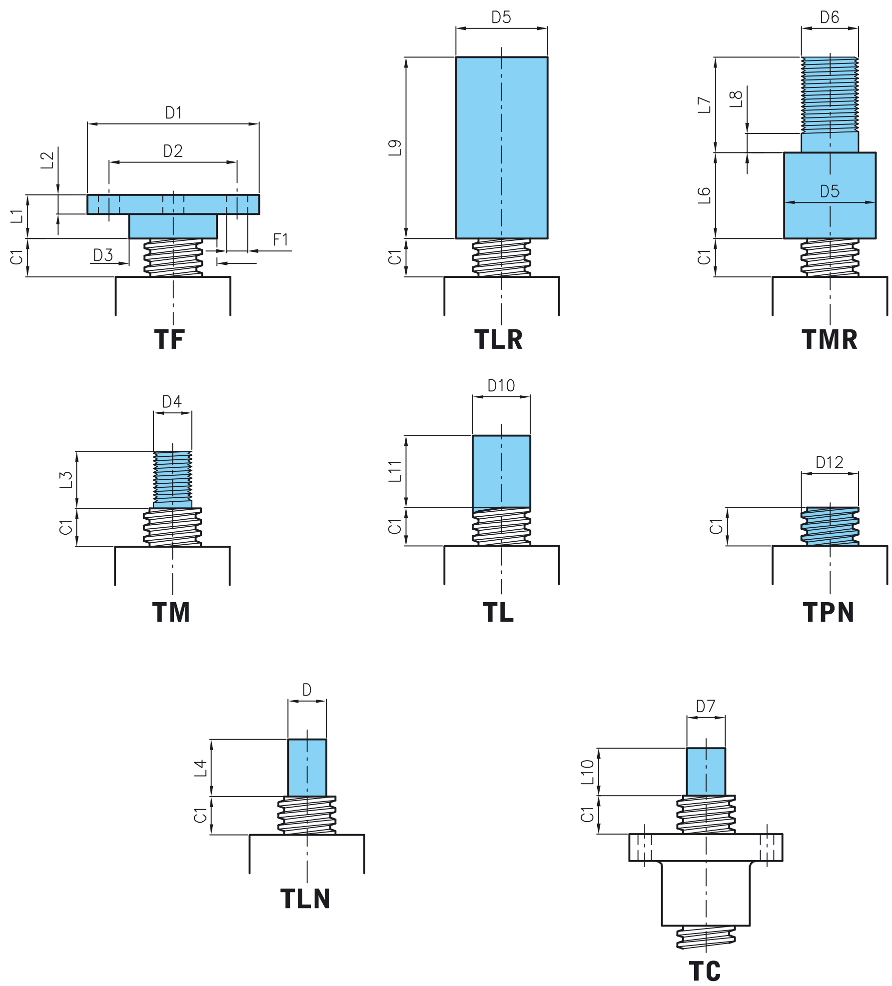
S model

D model

TPR - XTPR Models*

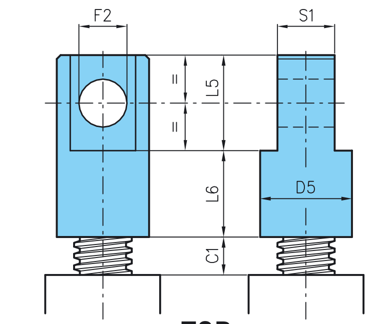
Size	420	630	740
A	150	206	270
A1	100	126	160
A2	80	102	130
A3	10	12	15
A4	7,5	12	15
A6	99	125	159
B	4x4x20	6x6x30	8x7x40
C1	15	20	25
d Ø j6	12	20	25
D Ø	20x4	30x6	40x7
D1 Ø	43	59	69
D2 Ø	44	60	70
D3 Ø	52	56	80
D4 Ø	45	64	78
D5 Ø	60	80	96
E	100	155	195
E1	85	131	165
E2	32,5	45	50
E3	37,5	60	75
F Ø	9	11	13
F1	M6x10	M6x10	M8x10
F3 (4 holes)	9	7	9
F4	M5x10	M6x12	M8x15
H	30	50	70
L	25	40	55
M [°]	30	45	30
S	70	90	120
S1	35	45	60
S2	20	25	35
S4	12	14	16
S5	45	48	75
S7	125	160	215
S8	60	68	100

* XTPR Model: stainless steel version

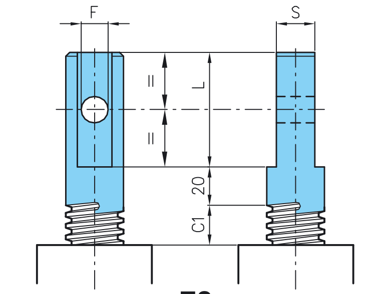


End fittings - X*			
Size	**420**	**630**	**740**
C1	15	20	25
D Ø	15	20	30
D 1 Ø	79	89	109
D2 Ø	60	67	85
D3 Ø	39	46	60
D4 Ø	14x2	20x2,5	30x3,5
D5 Ø	38	48	68
D6 Ø	20x1,5	30x2	39x3
D7 k6	15	20	25
D12	20x4	30x6	40x7
F1 (4 holes)	11	12	13
L1	21	23	30
L2	8	10	15
L3	20	30	30
L4	25	30	45
L6	35	45	55
L7	40	50	70
L8	10	10	10
L9	75	95	125
L10	20	25	30
L11	70	80	100

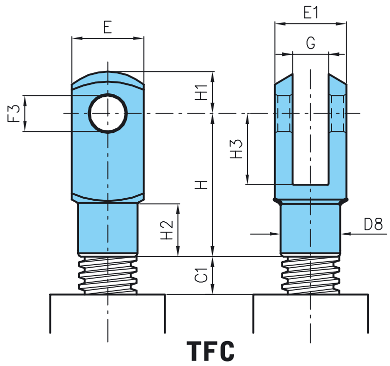
* X Model: stainless steel version



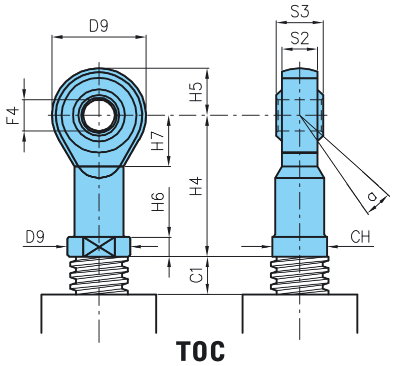
TOR



TO



TFC



TOC

End fittings - X*

Size	420	630	740
C1	15	20	25
CH	19	30	41**
D5 Ø	38	48	68
D8 Ø	20	34	48
D9 Ø	32	50	70**
D11 Ø	22	34	50**
E	24	40	55
E1	24	40	55
F Ø H9	10	14	22
F2 Ø H9	20	25	35
F3 Ø	12	20	30
F4 Ø	12	20	30**
G	12	20	30
H	48	80	110
H1	14	25	38
H2	18	30	38
H3	24	40	54
H4	50	77	110**
H5	16	25	35**
H6	6,5	10	15**
H7	17	27	36**
L	50	60	80
L5	40	50	70
L6	35	45	55
S	14	20	30
S1	25	30	40
S2	12	18	25**
S3	16	25	37**
α [°]	13	14	17**

* X Model: stainless steel version
** Not available in stainless steel

Series construction models

MBD model

MBS model

MD model

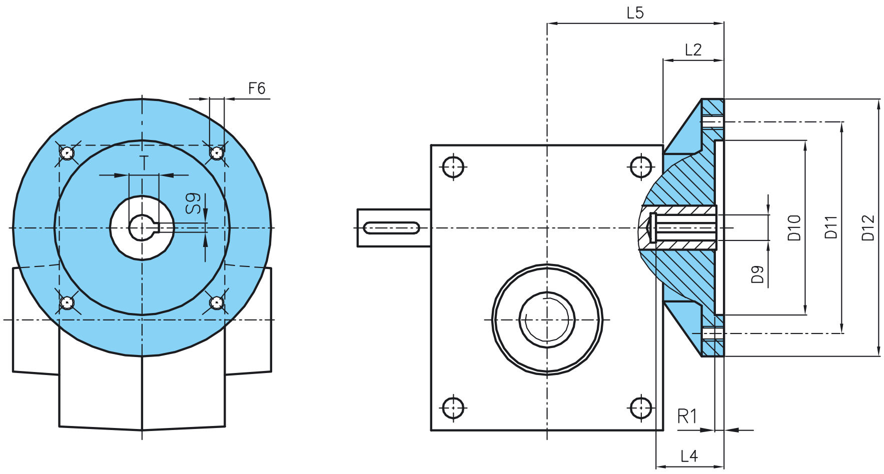
MS model

MBD model

MBS model

MD model

MS model



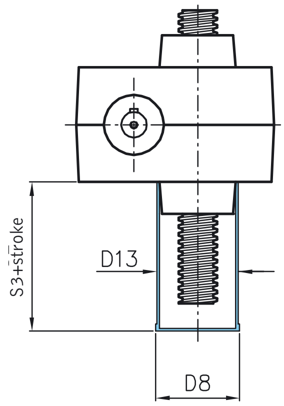
MTP-MTPR Models

Size	IEC Flange	D9 H7	D10 H7	D11	D12	F6	L2	L4	L5	R1	S9	T
420	63 B5	11	95	115	140	M8	15	23	80	4	4	12,8
630	71 B5	14	110	130	160	M8	20	30	96	4	5	16,3
740	80 B5	19	130	165	200	M10	25	40	120	5	6	21,8

For non quoted dimensions see to the relative tables on pages 110-111

PR rigid protection

The application of a rigid protection in the back side of the screw jack is the ideal solution in order to prevent dust and foreign matters from coming into contact with the coupling and causing damages to the threaded spindle. The PR protection can only be applied to TP models. The overall dimensions are shown in the following table. **Incompatibility: TPR models.**

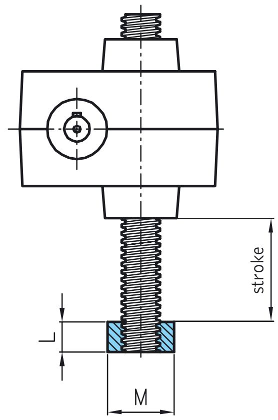


PR rigid protection - XPR Models*			
Size	**420**	**630**	**740**
D8 Ø	48	65	74
D13 Ø	46	63	72
S3	50	60	75

For non quoted dimensions see to the relative tables on pages 110-111
* XPR Model: stainless steel version

BU Anti withdrawing bush

If there's the necessity the spindle, in case of extra-stroke, not to withdraw from the jack body, it's possible assembling a steel withdrawing bush. The BU has a trapezoidal thread, able to sustain the load in extra-stroke case. The BU can apply only in TP models. In case of PRF stroke control, the BU has the function of end-of-stroke too. <u>It's important underline that one only extra-stroke attempt (and the consequent impact between BU and the carter) can hopeless damage the transmission.</u>
The overall dimensions are shown in the table below.
Incompatibility: TPR models – PRA



Anti withdrawing bush BU - XBU Models *			
Size	**420**	**630**	**740**
L	25	25	25
M Ø	38	48	58

* XBU Model: stainless steel version
For non quoted dimensions see to the relative tables on pages 110-111

PE elastic protection

The purpose of the elastic protections is to protect the threaded spindle by following its own movement during stroke. Standard type protections are elastic bellows, made of polyester covered nylon and can have, as serial, collars or flanges at their ends whose dimensions are shown in the table 1 below.
Special implementations are available upon request, as well as a fixing by means of iron.
Fixing flanges can be in plastic or metal. Special materials for the bellows are also available: Neoprene® and Hypalon® (water sea environment), Kevlar® (resistant to cuts and abrasion), glass fiber (for extreme temperatures, from -50 to 250°C) e aluminized carbon (it's an auto-extinguish material for limit applications with molten metal spits). **The PE standard material is guarantee for ambient temperature between -30 and 70°C.**
If it's needed a waterproof elastic bellow, it's possible to realize protections whose bellows are not sewed but heat-sealed. This kind of protection is not able to solve condensate problem. Moreover, it's possible to have metal protections on demand; such requests are be submitted to the Technical Office. Besides further implementations made of special materials fire-resistant and cold-resistant materials as well as of materials suited for aggressive oxidizing environments can be supplied.
In case of long strokes internal anti-stretching rings are previewed in order to guarantee an uniform bellows opening.

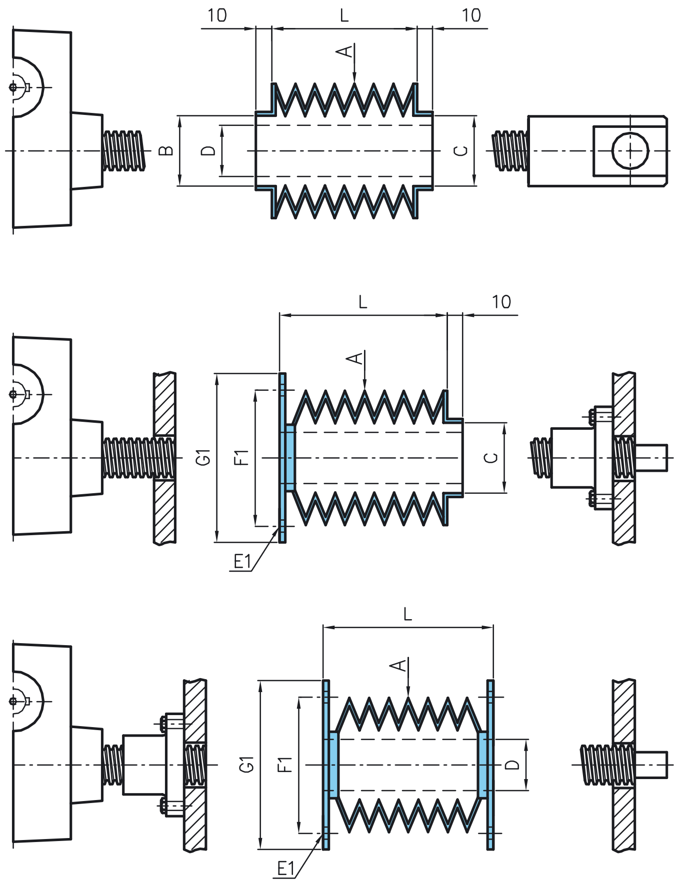


Table 1

PE elastic protection			
Size	**420**	**630**	**740**
A Ø	70	85	105
B Ø	44	60	69
D Ø spindle	20	30	40
C Ø	Dimension function of the end fitting		
E1Ø (n° of holes)	Dimension to be specified by the costumer		
F1 Ø	Dimension to be specified by the costumer		
G1 Ø	Dimension to be specified by the costumer		
L	1/8 of the stroke (completely closed)		

For non quoted dimensions see to the relative tables on pages 110-111

The application of elastic protections on the screw jacks may implicate some dimensioning amendments due to the PE own sizes, as shown in table n.2. Further, in completely close conditions, the PE has an overall dimension equal to 1/8 of the stroke value. In case said value exceeds the C1 quote (which can be taken from the dimension tables on pages 60-63), the total length of the threaded spindle should be fitted to said dimensions. In case of horizontal mounting (of which previous notice should be given) it is necessary to support the protection weight itself in order to avoid that it leans on the threaded spindle; for this purpose special support rings are foreseen. The PE can be applied to TP and TPR models and in case of missing specifications they can be supplied with fabric collars and the dimensions shown in table 1, supposing that a vertical mounting is carried out.

Incompatibility: none

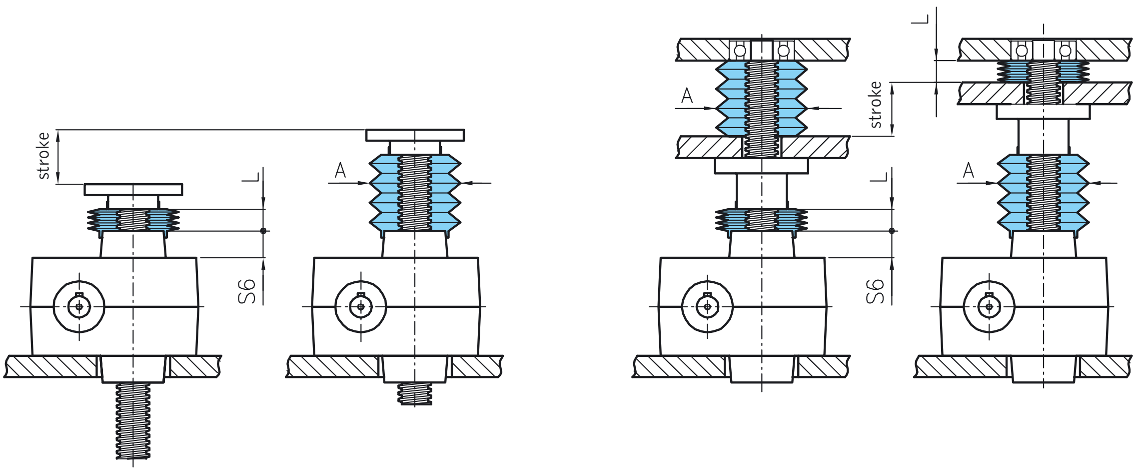


Table 2

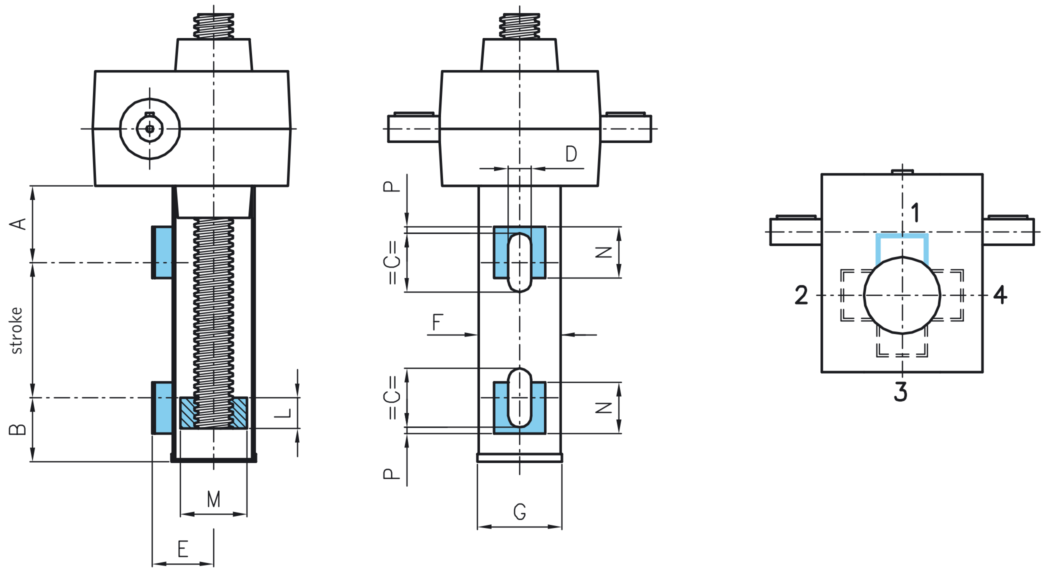
PE elastic protection				
Size		**420**	**630**	**740**
S6		20	25	35
A Ø		70	80	105
L		1/8 of the stroke (completely closed)		

For non quoted dimensions see the schemes on pages 110-111

PRF stroke control

In order to meet the requirement of an electric stroke control it is possible to apply to a rigid protection suitable supports for end-of-stroke. In the standard version these supports are of two types and they are placed at the ends of the stroke in one of the four positions shown below. They are carried out in such a way as to allow a small adjustment. In case more than one end-of-stroke are needed, it is possible to provide intermediate supports or a continuous support for the requested length. In order to enable the end-of-stroke to operate, a steel bushing is mounted on the threaded spindle. More bushings can be mounted upon request. The PRF can only be applied to TP models and in case of missing specifications it will be supplied with the supports mounted according to position 1. Sensor are supplied only on demand. The overall dimensions are shown in the table below. Moreover it's possible assembling magnetic sensors on the protection, avoiding to mill it. The end-of-stroke signal is given by a magnet attached on the bottom of the spindle.

Incompatibility: TPR – PRO models - CU



PRF stroke control - XPRF Models*			
Size	**420**	**630**	**740**
A	55	60	70
B	35	50	50
C	45	45	45
D	18	18	18
E	38	47	51
F Ø	46	63	72
G Ø	48	65	74
L	25	25	25
M Ø	38	48	58
N	40	40	40
P	5	5	5

For non quoted dimensions see to the schemes on pages 110-111
* XPRF Model: stainless steel version

DA and FD models (pages 86-87) can suit Aleph series.

The stainless steel series

For application where a permanent resistance to oxidizing is necessary, it is possible to supply the following components in stainless steel: spindles and terminals. The worm, if it's necessary and on demand, can be realized in stainless steel to or can undergo a Niploy treatment. The stainless steel series can be applied in the sea environment without any oxidizing problems.
For further informations see pages 226-229.

NORMS

ATEX directive (94/9/CE)

The 94/9/CE directive is better known as the "ATEX directive". All UNIMEC's products may be classified as "components" according to the definition quoted in art.1 par.3 c), and therefore they do not require an ATEX mark. A conformity declaration in accordance to what stated in art.8 par.3 can be supplied upon end user's request, subject to the filling up of a questionnaire with the indication of the working parameters.

Machinery directive (98/37/CE)

The 98/37/CE directive is better known as the "Machinery directive". UNIMEC's components are included in the products categories which do not need to affix the CE mark, as they are "intended to be incorporated or assembled with other machinery" (art.4 par.2). Upon end user's request a manufacturer declaration can be supplied in accordance to what is foreseen at Annex II, point B. The new machine directory (06/42/CE) will be acknowledged by 29/12/2009. UNIMEC guarantees that every new duty in mechanical transmission will be followed by such date.

Food law regulations

Polymer which is the constitutive material of the Aleph series is suited to the food industry applications. Upon customer's request it is possible to provide certifications according to the following norms:
NSF 51
BS 6920
90/128/CE DIRECTIVE
MIL-STD 810

UNI EN ISO 9001:2000 norm

UNIMEC has always considered the company's quality system management as a very important subject. That is why, since the year 1996, UNIMEC is able to show its UNI EN ISO 9001 certification, at the beginning in accordance to the 1994 norms and now meeting the requirements of the version published in the year 2000. 13 years of company's quality, certified by UKAS the world's most accredited certification body, take shape into an organization which is efficient at each stage of the working process. In date 31/10/2008 the new version of this norm was published. UNIMEC will evaluate every news reported in this revision.

UKAS QUALITY MANAGEMENT

The ball screw jacks proposed in the K series are born from UNIMEC's experience in trapezoidal screw jacks.

The can be employed for lifting, pulling, moving, aligning any kind of load with a perfect synchronism, which is difficult to obtain by means of other handling devices. The K series screw jacks are suitable for high services as well as for a very rapid, quick and precise positioning. As compared to trapezoidal screw jacks, the K series presents a transmission **reversibility**: it is therefore advisable to provide for brakes, blockings or contrast torques in order to avoid a direction reversal. Screw jacks can be applied singularly or in groups properly connected with shafts, joints, and/or bevel gearboxes.

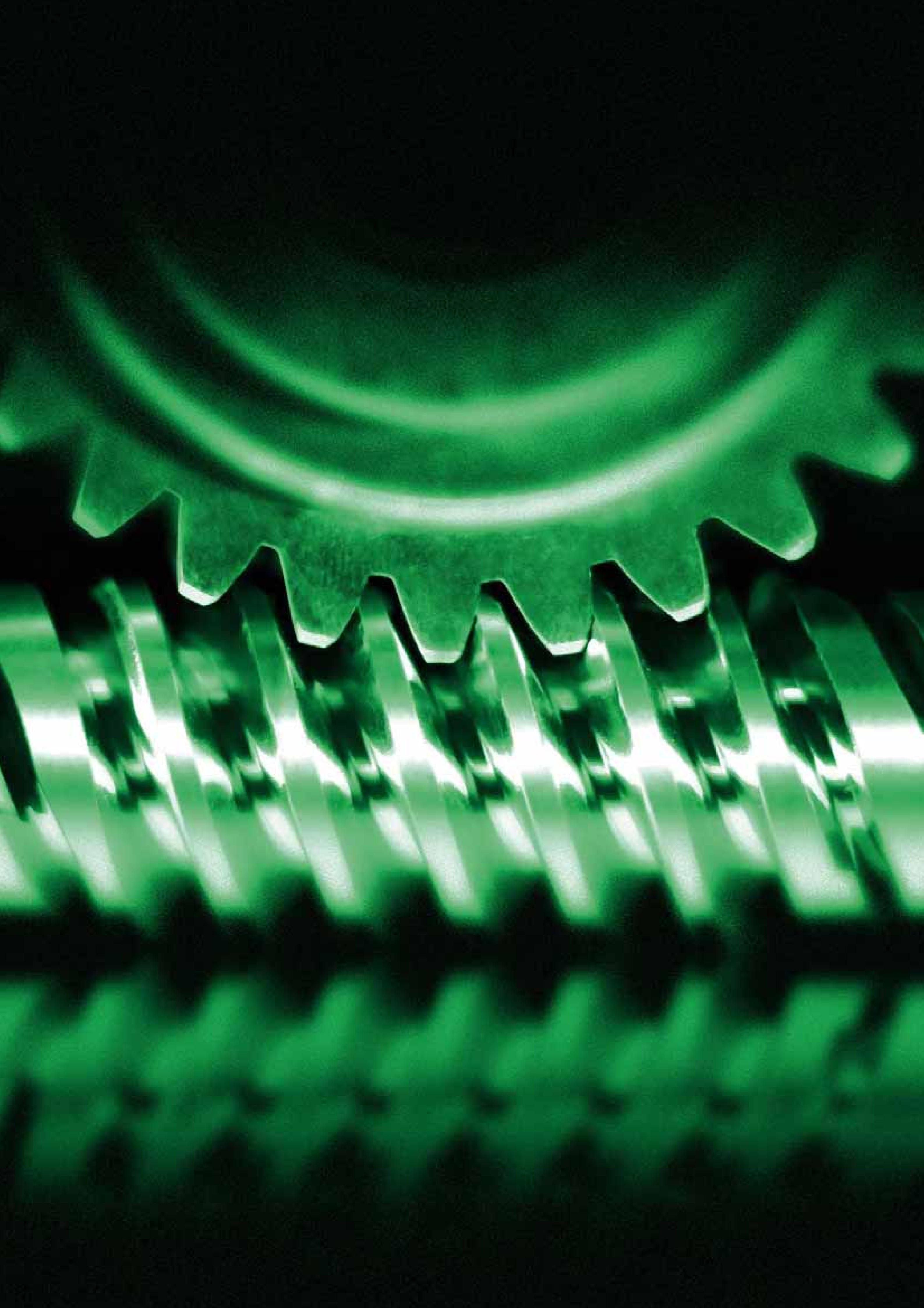
They can be driven by different motors: electrical, with either alternating or direct current, as well as hydraulic or pneumatic motors. Also they can be driven manually or with any other kinds of transmission. UNIMEC ball screw jacks are designed and manufactured using innovative technology so to supply a product which identifies itself with the state of the art in the transmission devices.

Ball screw jacks

The highest quality and a 28 years long experience are able to meet the most demanding and sophisticated requirements.

The special hollow shaft mounting allows to assemble any kind of ball spindles available on the market, making the K series really **universal**. The outer surfaces are completely machine finished and the parts are assembled with special care, in order to allow the application of supports, flanges, pins, or any other components a mounting may require. Special sealing systems enable the inner gears to operate in a bath of lubricant, which guarantees them a long lasting life.

Moreover the following models, UNIMEC can realize any special transmission a design may require.



147

K

Screw jack suitable for mounting various ball spindles.

148

MK

Screw jack suitable for mounting various kinds of ball spindles. Arranged for direct coupling to single phase, three-phase, self-braking, direct current, hydraulic, pneumatic motors, etc.

142

KT

Screw jack with axial translation of ball spindle. The rotation of the worm screw is transformed in the axial movement of the ball spindle which must have a rotational constraint.

148

MKT

Screw jack with axial translation of ball screw, arranged for direct coupling to single phase, three-phase, self-braking, direct current, hydraulic, pneumatic motors, etc.

146

KR

Screw jack with rotating ball spindle. The rotation of the worm screw is transformed in the axial movement of the ball spindle. The load shifting is carried out by the support nut which must have a rotational constraint.

148

MKR

Screw jack with axial translation of ball spindle, arranged for direct coupling to single phase, three-phase, self-braking, direct current, hydraulic, pneumatic motors, etc.

Application samples are online at www.unimec.eu - section Applications

CK

Screw jack suitable for application to various kinds of ball spindles, arranged for direct coupling to single phase, three-phase, self-braking, direct current, hydraulic, pneumatic motors, etc. by means of housing and joint.

GR

KT model screw jack with rotating guide

149

CKT

Screw jack with axial translation of ball spindle arranged for direct coupling to single phase, three-phase, self-braking, direct current, hydraulic, pneumatic motors, etc. by means of housing and joint.

GSI

KT model screw jack with lower static guide.

150

CKR

Screw jack with rotating ball spindle, arranged for direct coupling to single phase, three-phase, self-braking, direct current, hydraulic, pneumatic motors, etc. by means of housing and joint.

GSS

KT model screw jack with upper static guide.

151

152

PR

KT model screw jack with rigid protection.

153

PRO

KT model screw jack with oil bath rigid protection.

154

PE

KT model screw jack with elastic protection.

154

PE

KR model screw jack with elastic protection.

155

PRF

KT model screw jack with rigid protection and stroke control.

156

PRA

KT model screw jack with dual guide anti-rotation rigid protection.

Application samples are online at www.unimec.eu - section Applications

CR | 157

K model screw jack with worm wheel rotation monitoring.

CT | 157

K model screw jack with casing temperature control.

SP | 158

K model screw jack with additional mounting plates.

PO | 159

KT model screw jack with rigid rocking protection.

P | 160

K model screw jack with lateral pins.

VARIOUS END FITTINGS

Models

KT model: ball spindle with axial translation.

The input rotation of the worm screw is transformed in the axial translation of the ballspindle by means of the worm wheel.

The load is applied on the ball spindle, which must have a rotational constraint.

Ball screw jacks

KR model for rotating ball spindle with external support nut (lead nut).

The input rotation of the worm screw causes the rotation of the ball spindle which is attached to the worm wheel.

The load is applied to an external support nut (lead nut) which must have a rotational constraint.

Casings

Casings are made of grey cast iron EN-GJL-250 (according to the UNI EN 1561: 1998 requirements), they have a parallelepiped form, with six completely end finished faces, and having a varnished inner part.

Worm screws

For the entire K series, worm screws are made of a special steel 16NiCr4 (according to the UNI EN 10084:2000 requirements). They undergo thermal treatments like case-hardening and carburizing before being thoroughly ground on both the threads and the tangs.

Worm wheel

Worm wheels are made of bronze type AlSn12 (according to the UNI EN 1982:2000 requirements). They have high mechanical features for non-stop running and high performances. The profile of the worm wheels toothing has been designed especially for our screw jacks and can easily support heavy duties.

Hollow shaft

The hollow shaft is made of a special steel 16NiCr4 (according to the UNI EN 10084:2000 requirements), and it undergoes thermal treatments like case-hardening and carburizing before being thoroughly ground on all its parts.

Ball spindles

All ball spindles available in the market can be mounted on the K series. The mounting system versatility allows to only use three screw jack sizes to cover a range of ball spindles from the 16x5 to the 80x20 one. UNIMEC is able to supply screw jacks equipped with ball spindles of any kind of supplier.

Protections

Protection can also be applied in order to prevent dust and foreign matters from coming into contact with the coupling and causing damages to the ball spindle and its support nut. For KT models, a steel rigid pipe can be provided on the back side, while the front side can be protected by polyester and PVC elastic bellows. In KR models only elastic protections can be applied.

Bearings and market materials

Top-quality bearings and market materials are used for the whole line.

Weight

(as referred to the basic models)

Size	59	88	117
Weight [kg]	15	41	64

GLOSSARY

A = maximum angular speed of the worm screw [rpm]
B = load cycle frequency [Hz]
C = unit load to be handled [daN]
C_e = equivalent unit load [daN]
F_{rv} = radial forces on the worm screw [daN]
f_a = ambient factor
f_d = duration factor
f_g = usage factor
J = total inertia [kgm^2]
J_k = screw jack inertia [kgm^2]
J_v = inertia downstream of the screw jack [kgm^2]
M_{fv} = braking torque on the worm screw [daNm]
M_{tc} = hollow shaft torque [daNm]
M_{tv} = torque on the worm screw [daNm]
n = number of screw jacks under a single handling
P_i = input power to the single screw jack [kW]
P_e = equivalent power [kW]
P_{ei} = input equivalent power to the single screw jack [kW]
P_J = inertia power [kW]
PTC = adjustment factor on thermal power
T = tangential component of the contact forces between the worm wheel and the worm screw (with reference to the worm wheel), [daN]
rpm = rounds per minute
v = axial translation speed of the load [mm/min]
η_a = ball spindle running efficiency
η_k = K screw jack running efficiency
ω_c = hollow shaft angular speed [rpm]
ω_v = worm screw angular speed [rpm]
α_v = worm screw angular acceleration [rad/s^2]

Unless otherwise specified all dimension tables show linear measurements expressed in [mm].
All the reduction ratios are expressed in the form of a fraction, unless otherwise specified.

LOAD ANALYSIS AND COMPOSITION

For the definition, the analysis and the features of the different load types, see the relative paragraph in the trapezoidal screw jack section, on page 28.

BACKLASH

Backlash on the worm screw

The worm screw – worm wheel coupling has a small degree backlash. Under the effect of the reduction ratio and of the transformation from the rotation movement to the translation movement, this backlash becomes an error in the linear positioning of a few hundredths of a millimetre, according to the diameter and pitch of the ball spindle. For all other backlashes (lateral and axial) between the spindle and the lead nut it is necessary to refer to the ball spindle manufacturers catalogues.

RUNNING EFFICIENCY

As a ball screw jack is used to handle loads having high percentage of service, it is necessary that its running efficiency be the maximum possible, in order to minimize the losses of the energy transformed into heat. The meshes precision allows to have a couplings running efficiency higher than 90%. The total running efficiency of the transmission, due to the lubrication splash and to the sliding of the rotating parts, like bearings and shafts, reaches values towards 85%.

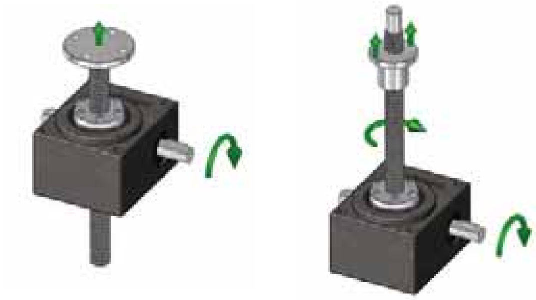
HANDLING

Manual and motorized operation

The K series only presents one ratio for all three sizes: an **exact** 1/5. This allows a great deal of precision in the couplings. All the K series can be manually or motor operated. As a standard production, for the IEC unified motors, it is possible to connect them directly to screw jacks. Special flanges can be made for hydraulic motors, pneumatic motors, brushless motors, as well as for direct current motors, permanent magnet motors, stepper motors and other special motors. In the case where it is not possible to motorize a screw jack directly, a connection by means of an housing and a joint can be foreseen. The power tables determine, in case of unit service factors and for every single screw jack, the moving power and the input torque according to the size and the requested output torque.

Rotation directions

In standard conditions **UNIMEC supplies K series screw jacks equipped with right-handed worm screw, to which correspond the movements illustrated in the drawings below.**



Emergency operation

In case of black-out, in order to be able to manually operate the single screw jacks or the complete structures by means of a crank, a free end on the screw jack worm screw or on the transmission is to be foreseen. In case of self-braking motors or worm screw motor reducers, the brake must be firstly released and then it is necessary to disassemble those components from the transmission as the reducer could also be irreversible.
Attention: it is advisable to equip the emergency operation mechanism with a safety device to cut the electric circuit.

LUBRICATION

Inner lubrication

The lubrication of the inner transmission devices to the casing is made, in the series production, using a synthetic oil having marked tribologic characteristics: TOTAL CARTER SY 320. The technical specifications and the application field for the lubricant inside the casing are shown below.

Lubricant	Application field	Operating temperature [°C]*	Technical specifications
Total Carter SY 320 (not compatible with PAO based mineral and synthetic oils)	standard	-20 : +200	DIN 51517-3: CLP NF ISO 6743-6: CKS/CKT
Total Nevastane SY 320 (not compatible with PAO based mineral and synthetic oils)	food industry	-20 : +250	NSF-USDA: H1

* for operating temperatures between 80°C and 150°C Viton® seals should be used; for temperatures higher than 150°C and lower than -20°C it is advisable to contact our technical office.

A filling cap, a drain cap and an oil level indicator are foreseen for all sizes. Those three caps are diagonally arranged on one face of the casing. The intermediate cap is the level indicator, while the upper one is the filling cap and the lower one is the drain cap, as showed in the drawing below. The quantity of lubricant contained in the K series screw jacks is indicated in the following table.

Size	59	88	117
Inner lubricant quantity [Litres]	0,3	0,8	1,2

Ball spindle

The end user is responsible for the lubrication of the ball spindle which must be carried out using a lubricant suggested by the manufacturer. Lubricating the ball spindle is an important and determining factor for the proper functioning of the screw jack. It must be carried out at regular intervals that can assure a constant coat of clean lubricant between the contact parts. Insufficient lubrication, or an improper lubrication can lead to abnormal overheating and consequent wear phenomena, which naturally reduce the operating life of the screw jacks. In case the screw jacks are not visible or the ball spindles are covered by protections it is necessary to periodically verify the lubrication conditions.

Semi - automatic lubrication

Many different systems of automatic lubrication are feasible, like for example an oil bath rigid protection (with a recirculation option) on KT model screw jacks with vertical mounting (see page 153).

Centralized lubrication

Many automatic lubrication systems with a central pump and various distribution points are also possible. The quantity of lubricant required depends on the service and work environment. A centralized dosing system does not exclude a periodic check of the lubrication conditions in the ball spindle.

INSTALLATION AND MAINTENANCE

Installation

When arranging the ball screw jack and coupling it to machines, pay attention to the axis alignment. Failing an exact alignment, the bearings would be subjected to a greater overloading and anomalous overheating as well as to a greater wear, with a consequent reduction of their operating life. It is important to check that the spindle and the casing mounting plane be orthogonal and that the load and the spindle be on the same axis.
Employing multiple screw jacks to handle the same load (see the mounting schemes section) requires further verifications: it is critical that the load support points, (the end fittings for KT models and the lead nuts for KR models), be perfectly aligned in order that the load can be uniformly distributed; otherwise the misaligned screw jacks would act as brake or counter-load. Whenever several jacks have to be connected by means of transmission shafts, it is recommended that they be perfectly aligned in order to avoid overloading the worm screws.
It is advisable to use joints capable of absorbing alignment errors without loosing the torsion strength necessary to keep the synchronization of the transmission. It is necessary to mount the transmission in a way to avoid any displacement or vibrations, keeping attention to the fixing by means of bolts or tie rods. Before assembling the connection parts it is necessary to properly clean the contact surfaces in order to avoid any seizing and oxidizing problems.
Assembly or disassembly shall occur by means of tie rods or extractors, using the threaded hole on the shaft end. In case of forced couplings , a shrink-fitting is recommended with a temperature up to 80-100°C.
Installations environments with dust, water, vapors, etc. require precautions to protect the ball spindle, such as elastic protections (bellows) and rigid protections. The above protections are also used in order to avoid any accidental human contact with the moving devices. For civil applications it is always advisable to use the safety components.

Preparing for service

All UNIMEC's screw jacks are supplied filled with long lasting lubricant which ensures a perfect lubrication of the worm gear/worm wheel group and all the inner parts.
All K series screw jacks are equipped with a lubricant filling cap, a drain cap and an oil level indicator in order to allow the filling-up of the lubricant as necessary. As clearly explained on the relative paragraph, **lubrication of the ball spindle is a user's responsibility** and it must be carried out periodically depending on the service conditions and the operating environment. Special sealing systems allow to hold the screw jacks in any position without creating leakage problems. The application of some accessories can limit these assembly possibilities: the various solutions to be adopted will be explained in the relevant paragraphs.
Some screw jacks are equipped with an "add oil" label. The installer shall carry out the necessary oil filling when gears are not working. Fillings should not be excessive in order to avoid any overheating, noise, inner pressure increase and power loss problems.

Start-up

All screw jacks undergo a careful quality examination before being delivered to the client, and **are dynamically tested load-free.** When starting-up a machine where screw jacks are installed, it is critical to check for the lubrication of the ball spindles and for the absence of foreign material. During the calibration of the electrical end-of-stroke systems, the inertia of the moving masses should be taken into account, which for vertical loads will be lower in ascent and greater in descent. Some hours of operation at full load are necessary before the screw jack reaches its maximum running efficiency. The screw jacks can be placed under a full load immediately if necessary. If some circumstances, it is nonetheless advisable to operate the screw jack under increasing loads, reaching maximum load after 20-30 hours of operation. It is likewise recommended to take due precautions to avoid overloads in the initial stages of operation. There may be a higher temperature during these initial stages but this will be reduced once the screw jacks is completely run in.

Routine maintenance

Screw jacks must be periodically inspected, depending on the level of use and work conditions. It is advisable to check for losses of lubricant from the casing, and if this occurs, it is necessary to find and eliminate the cause and fill the lubricant up the correct level.
The lubrication conditions of the ball spindle must be periodically inspected (and restored if necessary) as well as the presence of any foreign material. All safety devices should be verified according to the normative in force.

Storage

The screw jacks must be protected from deposits of dust and foreign matter during storage. Particular attention must be paid to saline or corrosive atmospheres.
We also recommend to:

- periodically rotate the worm screw to ensure proper lubrication of inner parts and avoid that the seals dry up, therefore causing lubricant losses.
- lubricate and protect the threaded spindle, the worm screw and the non varnished components
- support the ball spindle in case of horizontal storage.

Warranty

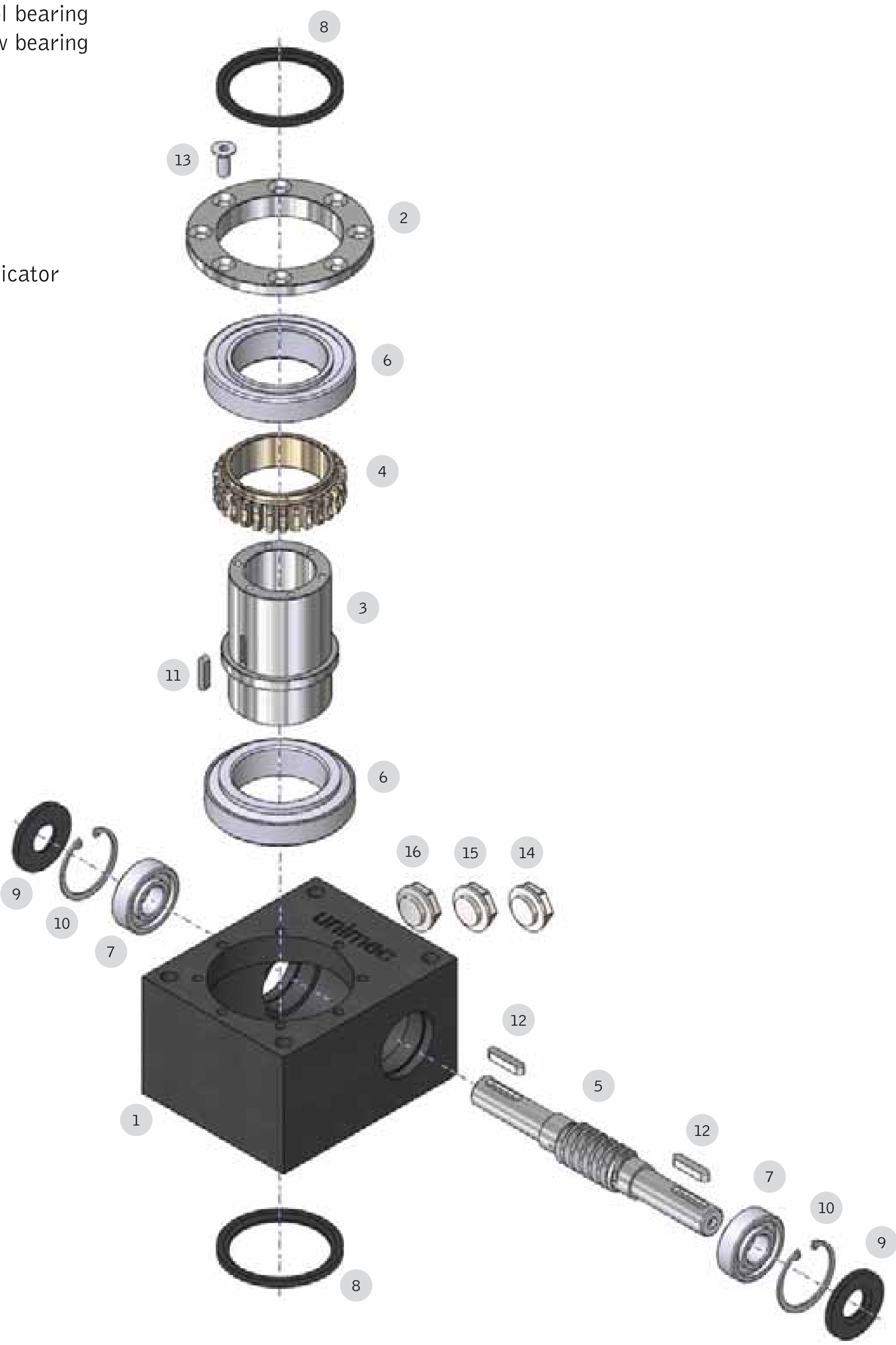
The warranty is valid only if the instructions contained in our manual are carefully followed.

ORDERING CODES

K	59	1/5	B	IEC 90B5	PR
model	size	ratio	construction model	motor flange	accessories

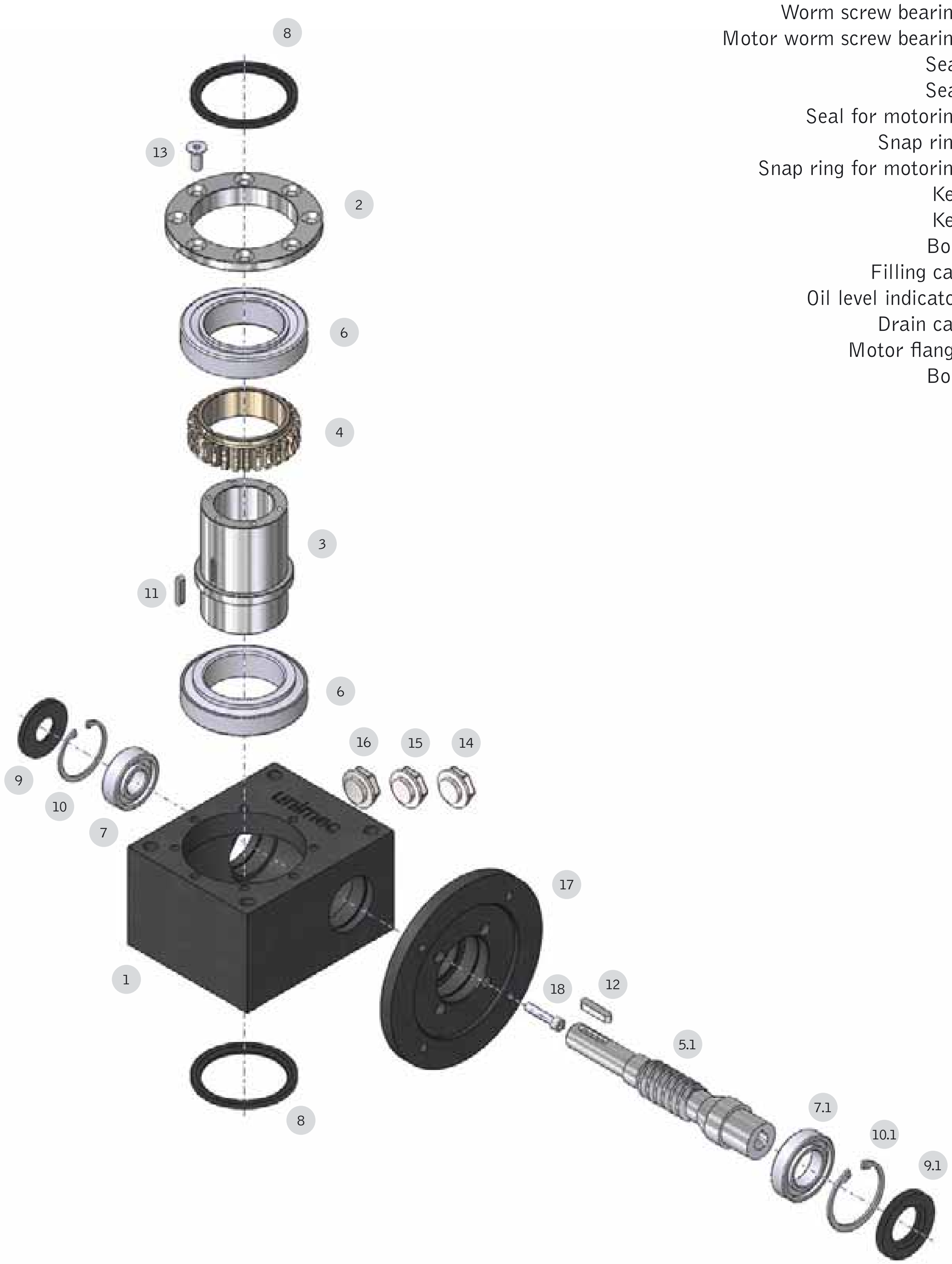
K MODEL

1 Casing
2 Cover
3 Hollow shaft
4 Worm wheel
5 Worm screw
6 Worm wheel bearing
7 Worm screw bearing
8 Seal
9 Seal
10 Snap ring
11 Key
12 Key
13 Bolt
14 Filling cap
15 Oil level indicator
16 Drain cap



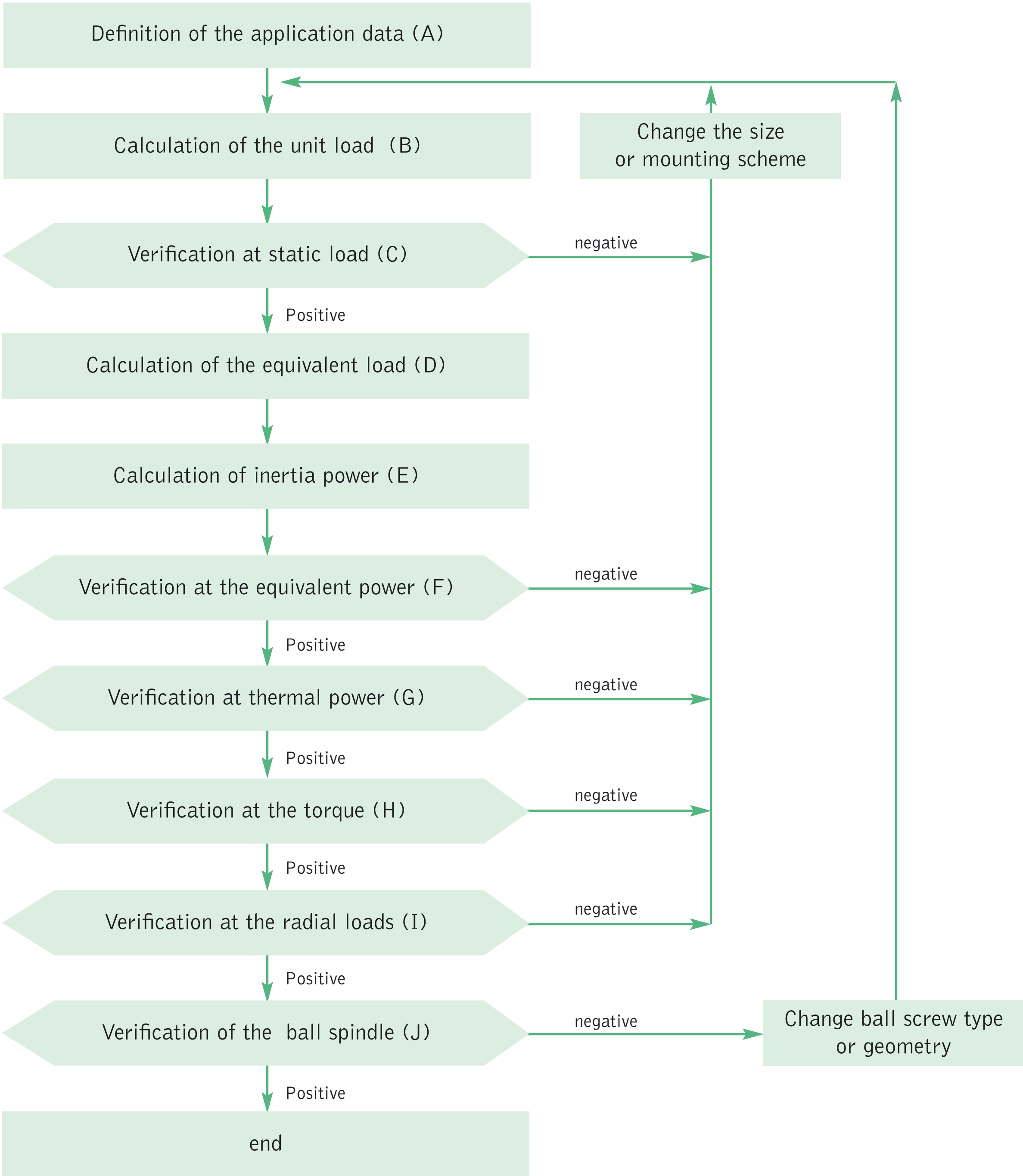
MK MODEL

Casing	1
Cover	2
Hollow shaft	3
Worm wheel	4
Motor worm screw	5.1
Worm wheel bearing	6
Worm screw bearing	7
Motor worm screw bearing	7.1
Seal	8
Seal	9
Seal for motoring	9.1
Snap ring	10
Snap ring for motoring	10.1
Key	11
Key	12
Bolt	13
Filling cap	14
Oil level indicator	15
Drain cap	16
Motor flange	17
Bolt	18



DIMENSIONING OF THE BALL SCREW JACK

For a correct dimensioning of the ball screw jack it is necessary to observe the following steps:



A – THE APPLICATION DATA

For a right dimensioning of the screw jacks it is necessary to identify the application data:
LOAD [daN] = the load is identified with the force applied to the translating device of a screw jack. Normally the dimensioning is calculated considering the maximum applicable load (worst case). It is important to consider the load as a vector, which is defined by a modulus, a direction and a sense, the modulus quantifies the force, the direction orients spatially and gives indications on the eccentricity or on possible lateral loads, the sense identifies the traction or compression load.
TRANSLATION SPEED [mm/min] = the translation speed is the load handling speed. From this speed it is possible to calculate the rotation speed of the rotating devices and the necessary power for the movement. Wear phenomena and the life of the screw jack proportionally depend on the value of the translation speed.
STROKE [mm] = it is the linear measure used to handle a load. It does not always coincide with the total length of the ball spindle.
AMBIENT VARIABLES = these values identify the environment and the operating conditions of the screw jack. Among them: temperature, oxidizing and corrosive factors, working and non-working periods, vibrations, maintenance and cleaning, insertion frequency, foreseen operating life etc.
MOUNTING SCHEMES = There are several ways of handling a load by means of screw jacks. The schemes on pages 162-163 will show you some examples. Choosing a mounting scheme will condition the choice of the size and the power which is necessary for the application.

B – THE UNIT LOAD

According to the **n** number of screw jacks contained in the mounting scheme it is possible to calculate each screw jack's load dividing the total load by **n** In case the load is not fairly distributed in all screw jacks, it is recommended to consider the transmission having the heaviest load, by virtue of a dimensioning based on the worst case.

C – THE STATIC LOAD

As very first step for the verification of the ball screw jack body, it's important verify the internal components resistance. The following table gives, entering with the static load C and the geometry of the ball screw (diameter and pitch), the admissible jack sizes. If a certain size is in a colored area, it means that such application can generate internal strength whose values are next to the bearings or gears limit ones; it's suggested to choose the higher size.
<u>If a jack body can sustain a determined static load C, it's not automatically true that the ball spindle can sustain that load.</u> It's necessary a ball screw verification following the builder's rules (point J).
I<u>f a jack body can sustain a determined static load C, it's not automatically true that the body can sustain that load in dynamic conditions.</u> It's necessary to verify the equivalent power (point F).

	Static load C [daN]								
Ball screw (diameter x pitch)	**1500**	**2000**	**3000**	**5000**	**8000**	**10000**	**15000**	**20000**	**30000**
Ø 16x5	59 88	-	-	-	-	-	-	-	-
Ø 16x16	59 88	-	-	-	-	-	-	-	-
Ø 20x5	59 88	59 88	-	-	-	-	-	-	-
Ø 20x20	59 88	59 88	-	-	-	-	-	-	-
Ø 25x5	59 88	59 88	59 88	-	-	-	-	-	-
Ø 25x10	59 88	59 88	59 88	-	-	-	-	-	-
Ø 25x20	59 88	59 88	59 88	-	-	-	-	-	-
Ø 25x25	59 88	59 88	59 88	-	-	-	-	-	-
Ø 32x5	59 88	59 88	59 88	59 88	-	-	-	-	-
Ø 32x10	59 88	59 88	59 88	59 88	-	-	-	-	-
Ø 32x20	59* 88	59* 88	59* 88	59* 88	-	-	-	-	-
Ø 32x32	59* 88	59* 88	59* 88	59* 88	-	-	-	-	-
Ø 40x5	-	59* 88 117	59* 88 117	59* 88 117	59* 88 117	59* 88 117	-	-	-
Ø 40x10	-	59* 88 117	59* 88 117	59* 88 117	59* 88 117	59* 88 117	-	-	-
Ø 40x20	-	59* 88 117	59* 88 117	59* 88 117	59* 88 117	59* 88 117	-	-	-
Ø 40x40	-	59* 88 117	59* 88 117	59* 88 117	88 117	88 117	-	-	-
Ø 50x5	-	-	88 117	88 117	88 117	88 117	88 117	-	-
Ø 50x10	-	-	88 117	88 117	88 117	88 117	88 117	-	-
Ø 50x16	-	-	88 117	88 117	88 117	88 117	88 117	-	-
Ø 50x20	-	-	88* 117	88* 117	88* 117	88* 117	88* 117	-	-
Ø 50x40	-	-	88* 117	88* 117	88* 117	88* 117	88* 117	-	-
Ø 50x50	-	-	88* 117	88* 117	88* 117	88* 117	117	-	-
Ø 63x10	-	-	-	88* 117	88* 117	88* 117	88* 117	88* 117	-
Ø 63x20	-	-	-	88* 117	88* 117	88* 117	88* 117	88* 117	-
Ø 63x40	-	-	-	88* 117	88* 117	88* 117	88* 117	117	-
Ø 80x10	-	-	-	-	88* 117	88* 117	88* 117	88* 117	88* 117
Ø 80x20	-	-	-	-	88* 117*	88* 117*	88* 117*	88* 117	88* 117*

* This spindle size can be assembled only on KR models. For KT application please contact our technical office

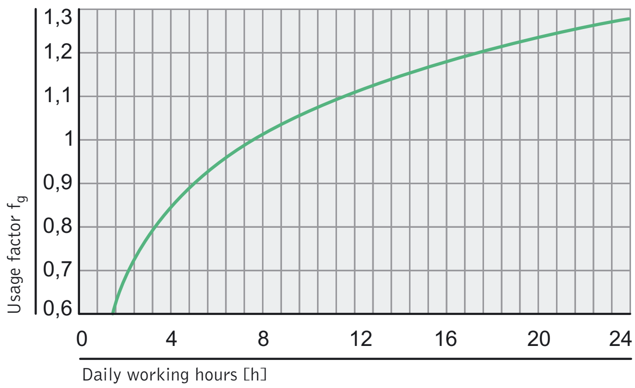
D – THE EQUIVALENT LOAD

All the values listed in the catalogue refer to a standard use conditions, i.e. under a temperature of 20° and a regular daily operation of 8 hours without shocks. Using the screw jack under the above conditions you can foresee a 10.000 hours lifetime (with a working percentage of 70%).
For different application conditions the equivalent load should be calculated: it refers to the load which would be applied in standard conditions in order to have the same thermal exchange and wear effects, which the real load achieves in the real conditions of use.
It is therefore advisable to calculate the equivalent load according to the following formula:

$C_e = C \cdot f_g \cdot f_a \cdot f_d$

The usage factor f_g

By means of the following diagram the fu use factor can be calculated according to the daily working hours.



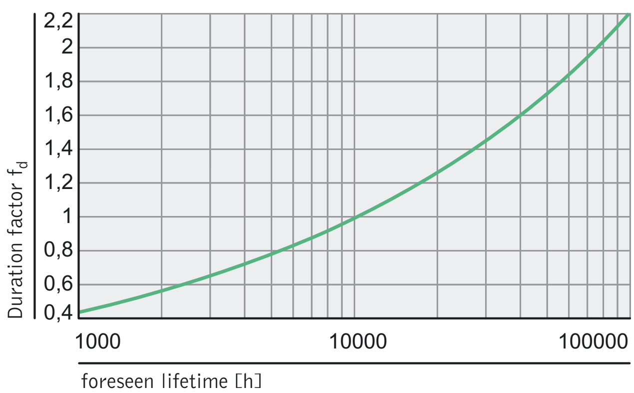
The ambient factor f_a

By means of the following table it is possible to calculate the f_a factor according to the operation conditions.

Type of load	Daily working hours [h]	3	8	24
Light shocks, few insertions, regular movements		0,8	1	1,2
Medium shocks, frequent insertions, regular movements		1	1,2	1,5
High shocks, many insertions, irregular movements		1,2	1,8	2,4

The duration factor f_d

The duration factor f_d is calculated as a function of the theoretical foreseen lifetime (expressed in hours)



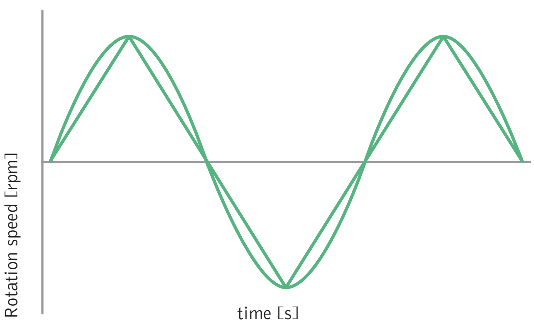
E – THE INERTIA POWER

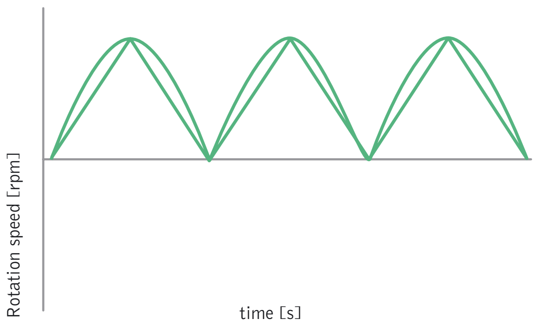
In case of high accelerations and decelerations it is necessary to calculate the inertia power P_J. It is the power necessary to support the inertia forces and torques opposed by the system in presence of a speed change. First the designer should calculate the system inertia downstream of the screw jack J_v by reducing them first to the hollow shaft (on which is mounted the ball screw), and then to the worm screw (input shaft). The J_v inertias are the system inertias (typically masses) as well as the ball spindle and lead nut inertias.
After that, it is necessary to add the inertia of the screw jack J_k, obtainable from the tables below, in order to have the value of the total inertia J reduced to worm screw. We remind that inertia is expressed by [kg•m²].

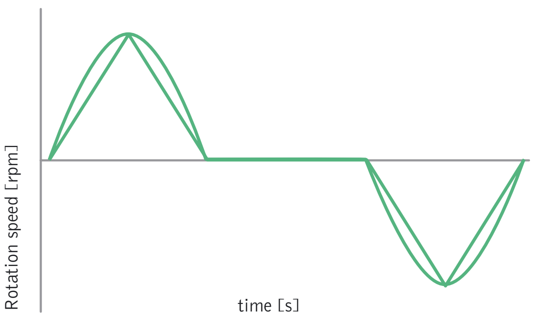
Size	**59**	**88**	**117**
J_k screw jack inertia [kg•m²]	0,0040608	0,0254982	0,0798326

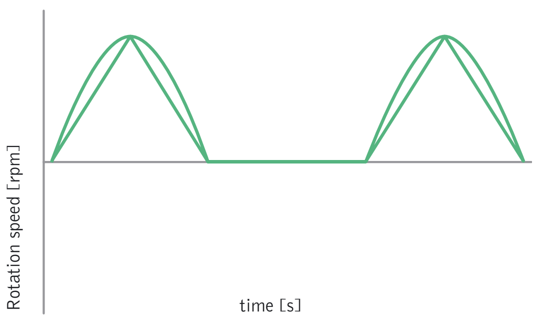
Given ω_v the input rotation speed and α_v the input angular speed the inertia torque applied is equal to $J \bullet \omega_v$ and the respective inertia power P_J is equal to $J \bullet \omega_v \bullet \alpha_v$. If the time changes of the input speed ω_v can be referred to one of the linear of sinusoidal schemes below, where A is the maximum speed in [rpm] and B is the cycle frequency in [Hz], it is possible to simplify the inertia power calculation in [kW], by identifying A and B parameters and by calculating:

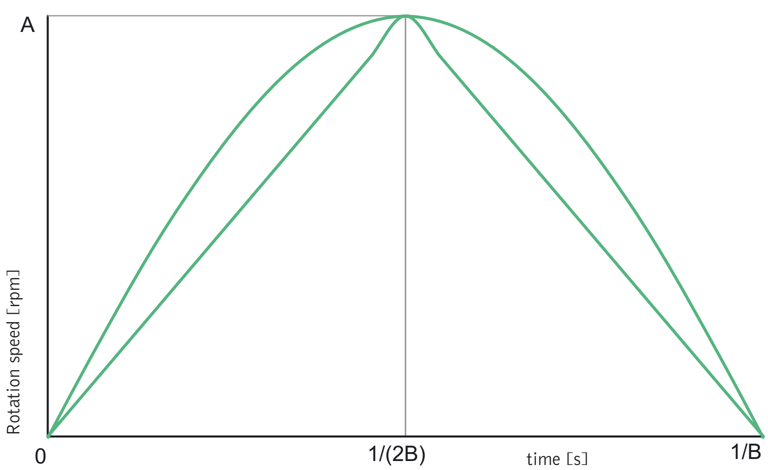
$$P_J = \frac{2 \bullet J \bullet A^2 \bullet B}{91188}$$











F – THE EQUIVALENT POWER

Once the equivalent load C_e is calculated, it's possible to verify the equivalent power (out the jack-ball spindle system) as $P_e=C_e \cdot v$, where v is the load translation speed. Dividing the equivalent power on the ball screw efficiency η_a (this is a ball screw builder's data) and on the jack efficiency η_k and adding this value to the inertia power P_J, the equivalent input power Pei is obtained.

$$P_{ei} = \frac{C_e \cdot v}{\eta_a \cdot \eta_k} + P_J$$

The very first selection of a ball screw jack body is by the power tables (see pag. 140), choosing the size that, at a determined rotating input or output speed, presents an input power P_i higher than P_{ei}. If this value is a colored area, it means that the life of the components or the thermal exchange is not sufficient; It's suggested to change size, to low design requirements or ask to our technical office more a more precise calculation.

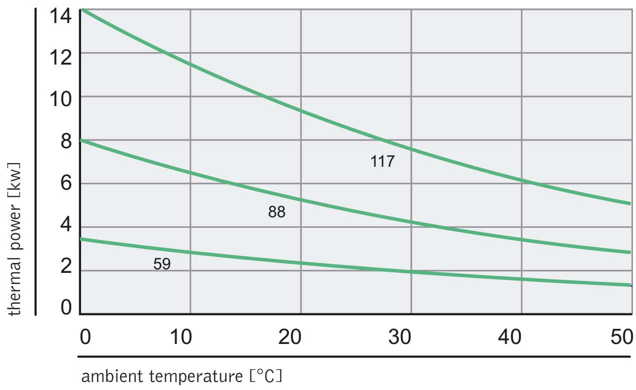
<u>The equivalent power is not the power requested by the single screw jack, unless the three correction factors f_g, f_d and f_a have a unit value.</u>

Please note that, once translation speed v is fixed, <u>the ball screw choice must not cause an input rotation speed higher than 3000 rpm.</u> The following table reports the maximum translation speed in function of the ball screw pitch.

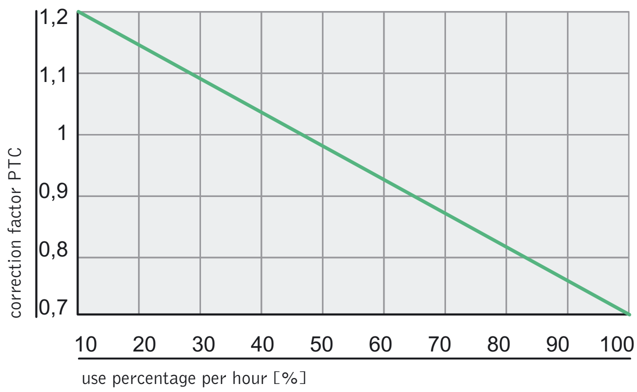
Ball screw pitch [mm]	maximun translation speed at 3000 rpm [mm/min]
5	3000
10	6000
16	9600
20	12000
25	15000
32	19200
40	24000
50	30000

G – THE THERMAL POWER

When the input speed values in the power tables cross a coloured area, this means that it is necessary to check the thermal power. This dimension, which is a function of the screw jack size and of the ambient temperature, indicates the input power establishing a thermal equilibrium with the environment with the screw jack surface temperature of 90 °C. The following graphs show the thermal power curves for the three sizes of the K series.



In case of non-working times of the screw jack, the thermal power can be increased of a PTC factor obtainable from the graph below, where the abscissa is the percentage of use as referred to the hour.



If thermal power was lower than the requested power P_i, it would be necessary to change the screw jack size.

H – THE TORQUE

When screw jacks are serially assembled , as shown in the drawings below, it is necessary to check that the torque moment referred to the common axis does not exceed the value indicated in the following table.

Size	59	88	117
Maximum torque moment M_{tv} [daNm]	31,4	61,3	106

I – RADIAL LOADS

In the case of radial loads on the worm screw it is necessary to check its strength according to the following table. In case the above values be exceeded it will be necessary to choose a higher size:

Size	59	88	117
F_{rv} [daN]	45	60	90

J – VERIFICATION OF THE BALL SPINDLE

The final step for the ball screw jack dimensioning is to check the chosen spindle. All the above described steps refer to a single screw jack capacity. According to the geometry, the construction characteristics, the used materials and the ball spindle manufacturer specifications it is necessary to check for this component to resist to the static and dynamic load, to successfully undergo the Euler verifications, to be able to support lateral loads, to be able to complete the requested duty cycles without overheating or having difficulties, and to check anything else the project may require.

POWER TABLES

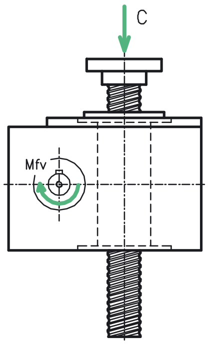
Size 59							
Load [daN]	4000	2000	1000	700	500	100	50
Spinde translation speed [mm/min]	P_i [kW]	P_i [kW]	P_i [kW]	P_i [kW]	P_i [kW]	P_i [kW]	P_i [kW]
24000	-	-	6,77	4,73	3,50	0,70	0,35
20000	-	-	5,64	3,94	2,81	0,56	0,28
15000	-	-	4,22	2,95	2,11	0,42	0,21
10000	-	5,73	2,84	1,97	1,41	0,28	0,14
5000	-	2,92	1,44	1,00	0,71	0,14	0,07
1000	1,24	0,63	0,30	0,21	0,15	0,07	0,07
500	0,70	0,32	0,15	0,11	0,07	0,07	0,07

Size 88							
Load [daN]	7500	5000	4000	2000	1000	500	200
Spinde translation speed [mm/min]	P_i [kW]	P_i [kW]	P_i [kW]	P_i [kW]	P_i [kW]	P_i [kW]	P_i [kW]
24000	-	-	-	-	6,67	3,34	1,33
20000	-	-	-	-	5,61	2,80	1,12
15000	-	-	-	8,47	4,17	2,09	0,83
10000	-	-	-	5,70	2,80	1,40	0,56
5000	-	-	5,85	2,91	1,44	0,71	0,28
1000	2,30	1,56	1,22	0,62	0,30	0,15	0,07
500	1,20	0,78	0,63	0,32	0,15	0,08	0,07

Size 117							
Load [daN]	15000	12000	10000	7500	5000	2000	1000
Spinde translation speed [mm/min]	P_i [kW]	P_i [kW]	P_i [kW]	P_i [kW]	P_i [kW]	P_i [kW]	P_i [kW]
24000	-	-	-	-	-	13,3	6,67
20000	-	-	-	-	-	11,2	5,61
15000	-	-	-	-	-	8,47	4,17
10000	-	-	-	-	-	5,70	2,80
5000	-	-	-	-	7,38	2,91	1,44
1000	-	-	-	2,30	1,54	0,62	0,31
500	-	-	1,63	1,22	0,78	0,31	0,15
200	1,02	0,82	0,68	0,51	0,34	0,14	0,07

THE BREAKING COUPLE

Ball screw jacks are reversible transmissions. In order to maintain load in a determined position, it's necessary to apply a breaking couple on the worm screw, whose values in [daNm] are reported in the table below in function of the load and of the ball screw pitch.



Ball screw type (diameter per pitch)	Static Load C [daN]								
	6000 M_{fv} [daNm]	5000 M_{fv} [daNm]	4000 M_{fv} [daNm]	2000 M_{fv} [daNm]	1500 M_{fv} [daNm]	1000 M_{fv} [daNm]	500 M_{fv} [daNm]	100 M_{fv} [daNm]	75 M_{fv} [daNm]
Ø 16x5	-	-	-	-	0,19	0,13	0,06	0,01	0,01
Ø 16x16	-	-	-	-	0,64	0,42	0,21	0,04	0,03
Ø 20x5	-	-	-	0,26	0,19	0,13	0,06	0,01	0,01
Ø 20x20	-	-	-	1,07	0,80	0,54	0,27	0,05	0,04
Ø 25x5	-	0,63	0,50	0,25	0,18	0,13	0,06	0,01	0,01
Ø 25x10	-	1,30	1,04	0,52	0,39	0,26	0,13	0,03	0,02
Ø 25x20	-	2,67	2,14	1,07	0,80	0,54	0,27	0,05	0,04
Ø 25x25	-	3,34	2,68	1,34	1,00	0,67	0,34	0,07	0,05
Ø 32x5	0,74	0,61	0,49	0,25	0,18	0,12	0,06	0,01	0,01
Ø 32x10	1,55	1,29	1,03	0,51	0,38	0,26	0,13	0,03	0,03
Ø 32x20	3,21	2,68	2,14	1,07	0,80	0,54	0,27	0,06	0,06
Ø 32x32	5,14	4,28	3,42	1,71	1,28	0,86	0,43	0,09	0,09

Ball screw type (diameter per pitch)	Static Load C [daN]								
	30000 M_{fv} [daNm]	20000 M_{fv} [daNm]	15000 M_{fv} [daNm]	10000 M_{fv} [daNm]	8000 M_{fv} [daNm]	5000 M_{fv} [daNm]	3000 M_{fv} [daNm]	2000 M_{fv} [daNm]	1000 M_{fv} [daNm]
Ø 40x5	-	-	-	1,18	0,94	0,59	0,35	0,24	0,12
Ø 40x10	-	-	-	2,55	2,04	1,27	0,76	0,51	0,25
Ø 40x20	-	-	-	5,22	4,18	2,61	1,57	1,04	0,52
Ø 40x40	-	-	-	10,7	8,56	5,35	3,21	2,14	1,07
Ø 50x5	-	-	1,72	1,14	0,95	0,57	0,34	0,23	0,12
Ø 50x10	-	-	3,73	2,48	1,92	1,24	0,75	0,50	0,25
Ø 50x16	-	-	5,76	3,82	3,01	1,91	1,15	0,77	0,38
Ø 50x20	-	-	7,74	5,16	4,10	2,58	1,55	1,03	0,51
Ø 50x40	-	-	15,7	10,4	8,23	5,22	3,13	2,09	1,05
Ø 50x50	-	-	19,8	13,2	10,4	6,60	3,96	2,64	1,32
Ø 63x10	-	4,90	3,67	2,45	2,01	1,23	0,74	0,49	0,25
Ø 63x20	-	10,3	7,74	5,16	4,17	2,58	1,55	1,03	0,52
Ø 63x40	-	21,1	15,8	10,6	83,3	5,28	3,17	2,12	1,06
Ø 80x10	7,16	4,78	3,58	2,39	1,82	1,20	0,72	0,49	0,28
Ø 80x20	15,3	10,2	7,64	5,10	3,82	2,54	1,53	1,02	0,51

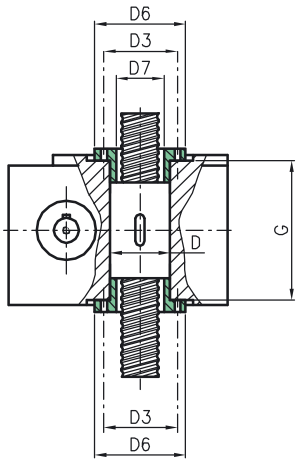
BALL LEAD NUTS MOUNTING

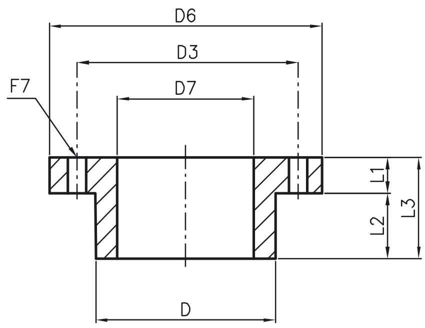
KT Models

Mounting the ball lead nuts on the KT models depends on their geometry (cylindrical or with flanges) and on their diameter (whether smaller, equal or greater than the hollow shaft diameter D, in detail 48, 72 and 105 mm, respectively for sizes 59, 88 and 117).

a) **CYLINDRICAL LEAD NUT WITH DIAMETER = D**

Once inserted the lead nut must be blocked by means of shoulder flanges, as per drawing below.



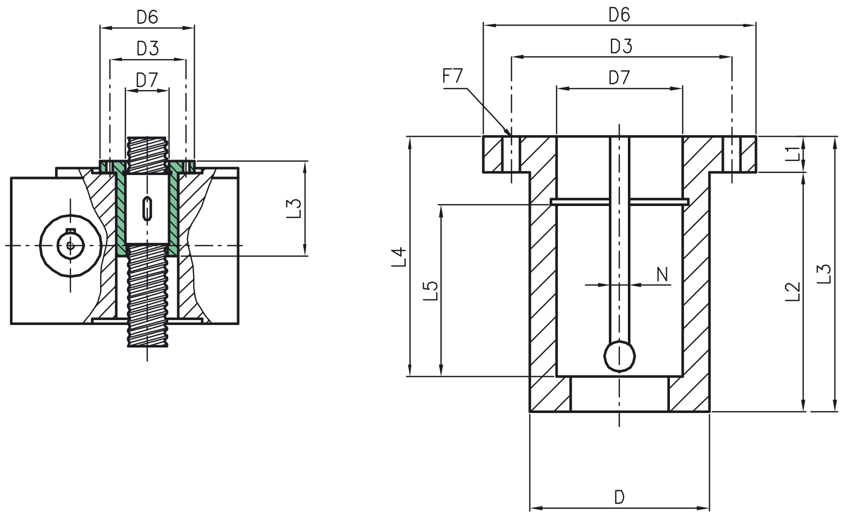


Size	59	88	117
D Ø g6	48	72	105
D3 Ø	59	90	124
D6 Ø	72	110	150
F7 Ø (6 holes)	7	11	13
G	118	148	174
D7	Dimension function of the lead nut to be applied		
L1	Dimension function of the lead nut to be applied		
L2	Dimension function of the lead nut to be applied		
L3	Dimension function of the lead nut to be applied		

For not quoted dimensions see the schemes on page 147.

b) CYLINDRICAL LEAD NUT WITH DIAMETER < D

The nut must be inserted into a <u>reduction sleeve</u> and blocked by means of a snap ring. The sleeve passes through the hollow shaft. The drawing below will show the mounting geometry.



Size	59	88	117
D Ø g6	48	72	105
D3 Ø	59	90	124
D6 Ø	72	110	150
F7 Ø (6 holes)	7	11	13
D7	Dimension function of the lead nut to be applied		
L1	Dimension function of the lead nut to be applied		
L2	Dimension function of the lead nut to be applied		
L3	Dimension function of the lead nut to be applied		
L4	Dimension function of the lead nut to be applied		
L5	Dimension function of the lead nut to be applied		
N	Dimension function of the lead nut to be applied		

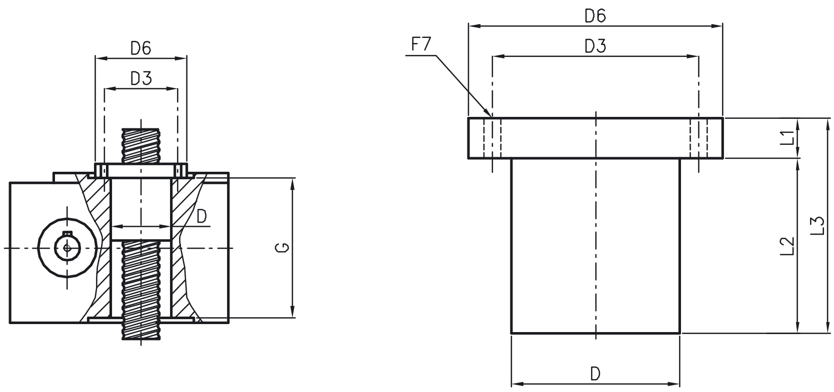
For not quoted dimensions see the schemes on page 147.

c) CYLINDRICAL LEAD NUT WITH DIAMETER > D

Mounting: not possible.

d) FLANGED LEAD NUT WITH DIAMETER = D

The lead nut can be directly mounted on the hollow shaft if the holes position coincide. The drawing below will show the mounting geometry.

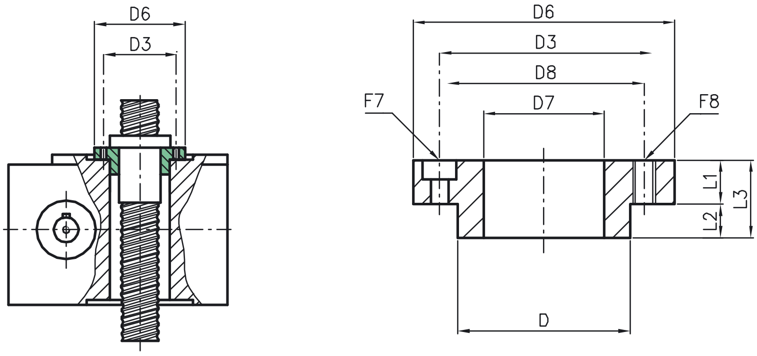


Size	59	88	117
D Ø	48	72	105
D3 Ø	59	90	124
G	118	148	174
F7 Ø (6 holes)	Dimension function of the lead nut to be applied		
D6 Ø	Dimension function of the lead nut to be applied		
L1	Dimension function of the lead nut to be applied		
L2	Dimension function of the lead nut to be applied		
L3	Dimension function of the lead nut to be applied		

For not quoted dimensions see the schemes on page 147.

e) FLANGED LEAD NUT WITH DIAMETER < D

The lead nut must be mounted on a <u>reduction flange</u> connected to the hollow shaft. The drawing below will show the mounting geometry.



Size	59	88	117
D Ø g6	48	72	105
D3 Ø	59	90	124
D6 Ø	75	115	150
F7 Ø (6 holes)	M6	M10	M12
D7	Dimension function of the lead nut to be applied		
D8	Dimension function of the lead nut to be applied		
L1	Dimension function of the lead nut to be applied		
L2	Dimension function of the lead nut to be applied		
L3	Dimension function of the lead nut to be applied		
F8	Dimension function of the lead nut to be applied		

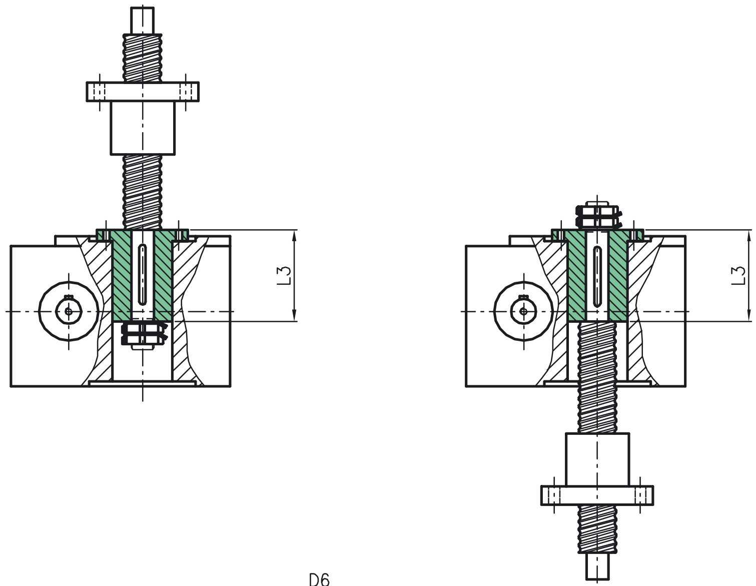
For not quoted dimensions see the schemes on page 147.

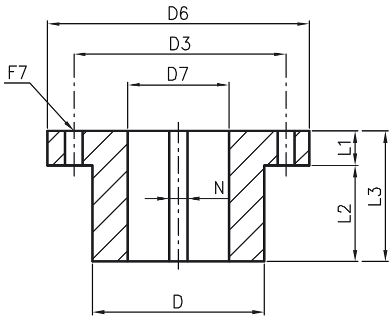
f) FLANGED LEAD NUT WITH DIAMETER > D

Mounting: not possible

KR MODELS

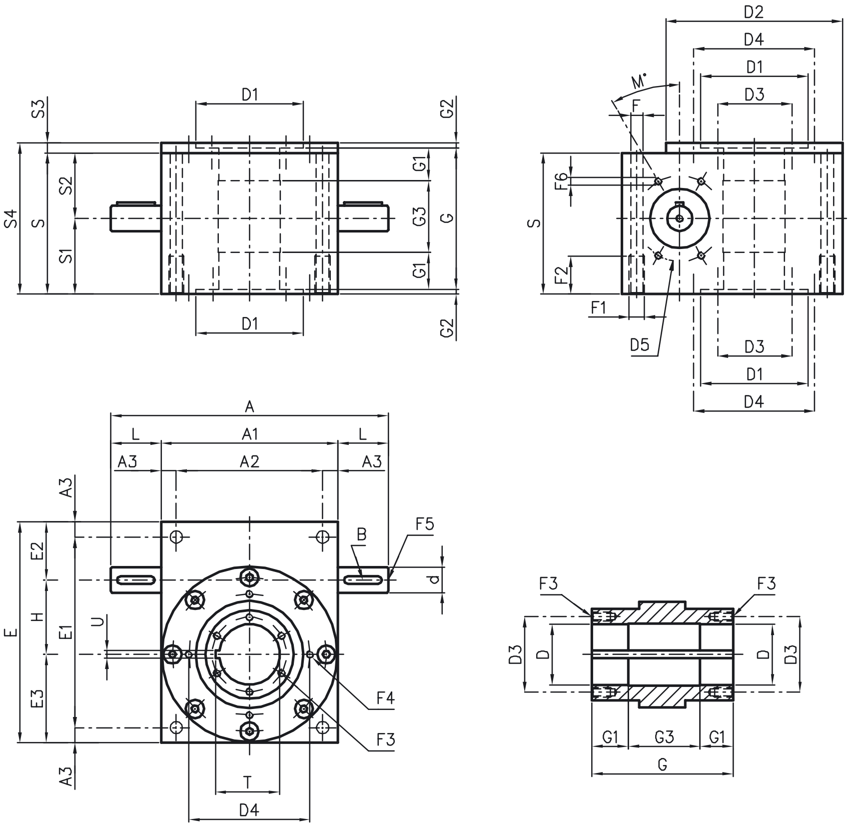
Mounting the ball spindles and lead nuts in the KR models depends on the spindle diameter. This diameter must be smaller than the hollow shaft diameter D (in detail 48, 72 and 105 mm, respectively for sizes 59, 88 and 117) in order to allow mounting **a sleeve for rotating screw** as highlighted in the drawing below.





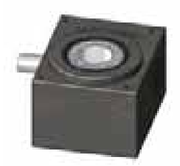
KR Models			
Size	**59**	**88**	**117**
D Ø g6	48	72	105
D3 Ø	59	90	124
D6 Ø	72	110	150
F7 Ø (6 holes)	7	11	13
D7 Ø	Dimension function of the lead nut to be applied		
L1	Dimension function of the lead nut to be applied		
L2	Dimension function of the lead nut to be applied		
L3	Dimension function of the lead nut to be applied		
N	Dimension function of the lead nut to be applied		

For not quoted dimensions see the schemes on page 147.

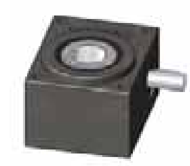


Series construction models

B model



S model



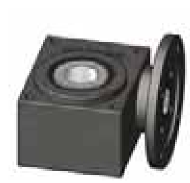
D model

K Model

Size	59	88	117
A	220	300	360
A1	140	200	240
A2	116	174	200
A3	12	13	20
B	6x6x30	8x7x40	8x7x50
d Ø h7	20	25	30
D Ø H7	48	72	105
D1 Ø	85	130	170
D2 Ø	140	200	239
D3 Ø	59	90	124
D4 Ø	96	143	182
D5 Ø	68	86	100
E	175	238	310
E1	151	212	270
E2	46	50	73
E3	70	100	120
F Ø	10,25	12	17,5
F1	M12	M14	M20
F2	30	40	40
F3 (6 holes)	M6x14	M10x25	M12x25
F4 (4 holes)	M6x9	M6x10	M6x10
F5	M6x12	M8x15	M10x18
F6 (4 holes)	M6x12	M8x16	M10x18
G	118	148	174
G1	40	50	55
G2	1	1	3
G3	38	48	64
H	59	88	117
L	40	50	60
M [°]	45	30	45
S	112	138	165
S1	60	75	90
S2	52	63	75
S3	8	12	15
S4	120	150	180
T	50,3	74,3	107,8
U	5	5	6

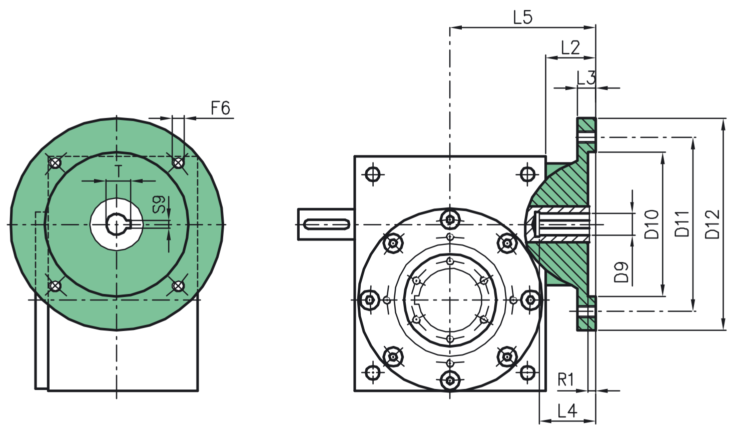
MBD model

MBS model



MD model

MS model



MK Models

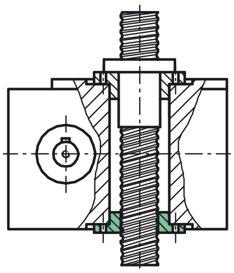
Size	IEC Flange	D9 H7	D10 H7	D11	D12	F6	L2	L3	L4	L5	R1	S9	T
59	63 B5	11	95	115	140	M8	33	13	23	103	4	4	12,8
	71 B5	14	110	130	160	M8	33	13	30	103	4	5	16,3
	80 B5	19	130	165	200	M10	33	13	40	103	4	6	21,8
	80 B14	19	80	100	120	7	33	13	40	103	4	6	21,8
88	71 B5	14	110	130	160	9	40	15	30	140	5	5	16,3
	80 B5	19	130	165	200	M10	40	15	40	140	5	6	21,8
	80 B14	19	80	100	120	7	40	15	40	140	5	6	21,8
	90 B5	24	130	165	200	M10	40	15	50	140	5	8	27,3
	90 B14	24	95	115	140	9	40	15	50	140	5	8	27,3
	100-112 B5	28	180	215	250	M12	40	15	60	140	5	8	31,3
	100-112 B14	28	110	130	160	9	40	15	60	140	5	8	31,3
117	132 B5	38	230	265	300	M12	75	20	80	195	6	10	41,3
	132 B14	38	130	165	200	11	75	20	80	195	6	10	41,3
	160 B5	42	250	300	350	M16	75	20	110	195	6	12	45,3
	160 B14	42	180	215	250	13	75	20	110	195	6	12	45,3

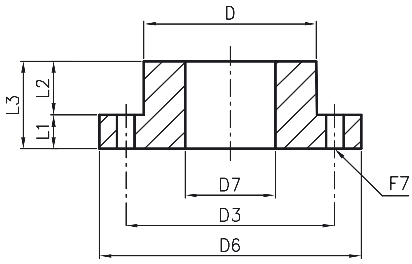
For not quoted dimensions see the schemes on page 147.

GR rotating guide

The rotating guide is a bronze flange applied, for KT models, on the hollow shaft on the opposite side to the lead nut. The guide rotates together with the hollow shaft and gives a valid support in the absorption of lateral loads and in maintaining the spindle translation in the same axis as the worm wheel. The GR can be applied only to KT models. The overall dimensions are indicated in the table below.

Incompatibility: KR models





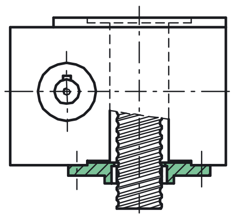
GR rotating guide			
Size	**59**	**88**	**117**
D Ø g6	48	72	105
D3 Ø	59	90	124
D6 Ø	75	115	150
F7 Ø (6 holes)	7	11	13
D7	Dimension function of the lead nut to be applied		
L1	Dimension function of the lead nut to be applied		
L2	Dimension function of the lead nut to be applied		
L3	Dimension function of the lead nut to be applied		

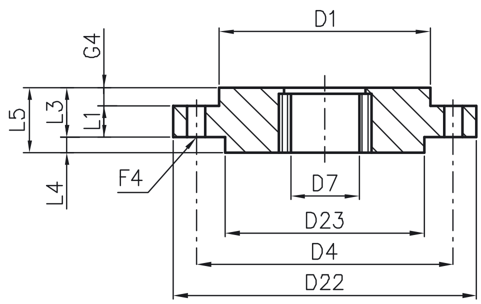
For not quoted dimensions see the schemes on page 147.

GSI lower static guide

The lower static guide is a bronze and steel flange applied, for KT models, on the casing in the lower part of the screw jack. Being connected with the casing, the guide is static and gives a valid support in the absorption of lateral loads and in maintaining the spindle translation in the same axis as the worm wheel. The GSI can be applied only to KT models. The overall dimensions are indicated in the table below.

Incompatibility: KR models - PR



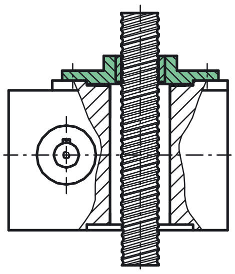


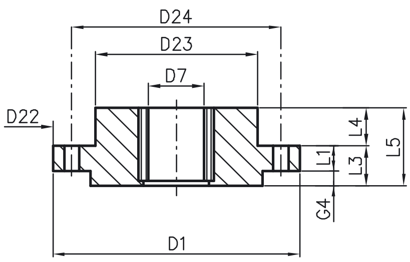
GSI lower static guide			
Size	**59**	**88**	**117**
D1 Ø g6	85	130	170
D4 Ø	96	143	182
D22 Ø	110	160	200
F4 Ø (4 holes)	7	7	7
G4	3	3	3
D7 Ø	Dimension function of the lead nut to be applied		
D23 Ø	Dimension function of the lead nut to be applied		
L1	Dimension function of the lead nut to be applied		
L3	Dimension function of the lead nut to be applied		
L4	Dimension function of the lead nut to be applied		
L5	Dimension function of the lead nut to be applied		

For not quoted dimensions see the schemes on page 147.

GSS upper static guide

The upper static guide is a bronze and steel flange applied, for KT models, on the casing in the upper part of the screw jack. Being connected with the casing, the guide is static and gives a valid support in the absorption of lateral loads and in maintaining the spindle translation in the same axis as the worm wheel. The GSS can be applied only to KT models. The overall dimensions are indicated in the table below.
Incompatibility: KR models





GSS upper static guide

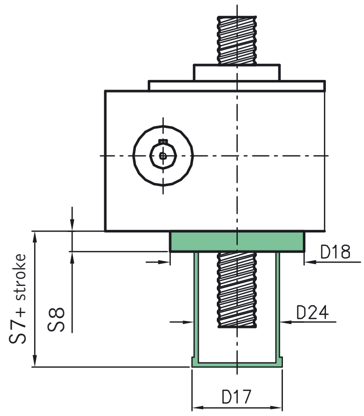
Size	**59**	**88**	**117**
D1 Ø g6	85	130	170
D4 Ø	96	143	182
D22 Ø	110	160	200
F4 Ø (4 holes)	7	7	7
G4	3	3	3
D7	Dimension function of the lead nut to be applied		
D23 Ø	Dimension function of the lead nut to be applied		
L1	Dimension function of the lead nut to be applied		
L3	Dimension function of the lead nut to be applied		
L4	Dimension function of the lead nut to be applied		
L5	Dimension function of the lead nut to be applied		
L6	Dimension function of the lead nut to be applied		

For not quoted dimensions see the schemes on page 147.

PR rigid protection

The application of a rigid protection in the back side of the screw jack is the ideal solution in order to prevent dust and foreign matters from coming into contact with the coupling and causing damages to the ball spindle. The PR protection can only be applied to KT models. In the following table the overall dimensions are shown.

Incompatibility: KR models - GSI - SP



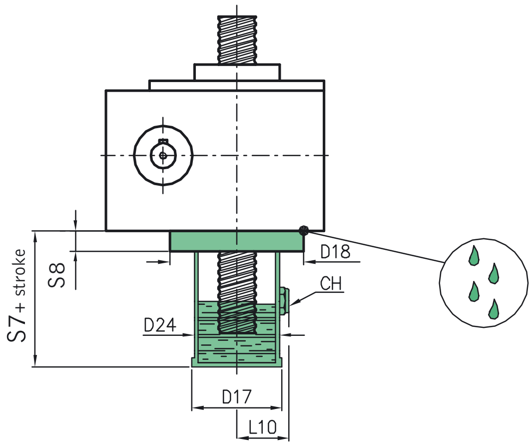
PR rigid protection			
Size	**59**	**88**	**117**
D17 Ø	63	95	125
D18 Ø	110	160	200
S7	30	40	40
S8	10	10	10

For not quoted dimensions see the schemes on page 147.

PRO oil bath rigid protection

The application of an oil bath rigid protection, apart from representing a rigid protection, also allows to have the advantages of a semi-automatic lubrication. The lubricant must be added when mounting with the jack completely closed, using the oil fill cap. Upon manoeuvring, the ball spindle will be soaked with lubricant. In case the spindle is left out of the protection for a long period, it could dry up so to make the PRO protection useless. For long strokes, in order to compensate the pump effect, it is necessary to mount an oil recirculation pipe allowing lubricant to flow back inside the protection from the casing. Alternatively, it is possible to assemble the casing and the protection in a single chamber. We remind you that the area indicated in the drawing could present lubricant drops: a vertical mounting will therefore avoid any leakage problems. The PRO protection can only be applied to KT models. In the following table the overall dimensions are shown.

Incompatibility: KR models - GSI - SP

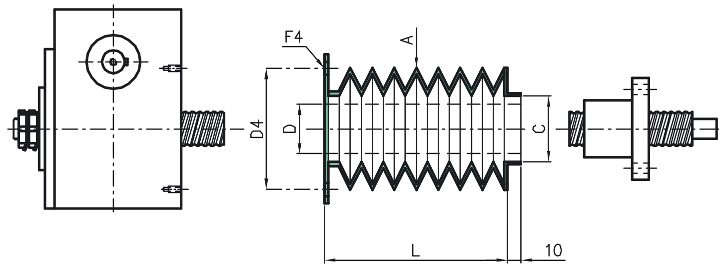


PRO oil bath rigid protection			
Size	**59**	**88**	**117**
D17 Ø	63	95	125
D18 Ø	110	160	200
S7	30	40	40
S8	10	10	10
L10	41	57	72
CH	17	22	22

For not quoted dimensions see the schemes on page 147.

PE elastic protection

The purpose of the elastic protections is to protect the ball spindle by following its own movement during stroke. Standard type protections are elastic bellows, made of polyester covered nylon and ending with a flange from the screw jack side and with a collar from the end fitting side, whose dimensions are shown in table 1 below. Special implementations are available upon request, as well as a fixing by means of iron. Fixing flanges can be in plastic or metal. Special materials for the bellows are also available: Neoprene® and Hypalon® (water sea environment), Kevlar® (resistant to cuts and abrasion), glass fiber (for extreme temperatures, from -50 to 250 °C) e aluminized carbon (it's an auto-extinguish material for limit applications with molten metal spits). **The PE standard material is guarantee for ambient temperature between -30 and 70 °C.** If it's needed a waterproof elastic bellow, it's possible to realize protections whose bellows are not sewed but heat-sealed. This kind of protection is not able to solve condensate problem. Moreover, it's possible to have metal protections on demand; such requests are be submitted to the Technical Office.. Besides further implementations made of special materials fire-resistant, cold-resistant and suited for aggressive oxidizing environments can be supplied. In case of long strokes internal anti-stretching rings are previewed in order to guarantee an uniform bellows opening.



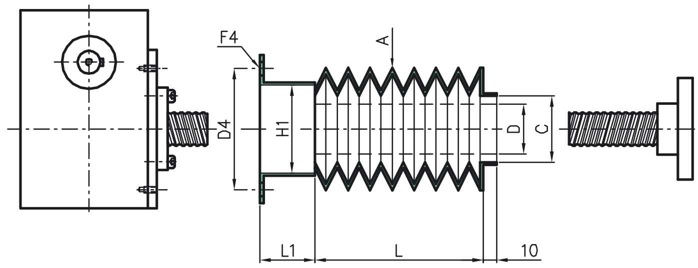


Table 1

PE elastic protection			
Size	**59**	**88**	**117**
A Ø	85	120	140
D4 Ø	96	143	182
F4 Ø (4 holes)	7	7	7
L	1/8 of the stroke (all closed)		
D screw Ø	Dimension function of the spindle to be applied		
C Ø	Dimension function of the end fitting		
H1 Ø	Dimension function of the spindle to be applied		
L1	Dimension function of the spindle to be applied		

The application of elastic protections on the screw jacks may implicate some dimensioning amendments due to the PE own sizes, as shown in table 2. Further, **in completely close conditions, the PE has an overall dimension equal to 1/8 of the stroke value.** **In case of horizontal mounting (of which previous notice should be given) it is necessary to support the protection weight in order to avoid that it leans on the ball spindle;** for this purpose special support rings are foreseen. The PE can be applied to KT and KR models and **in case of missing specifications they can be supplied with a fabric collar at the end fitting and the dimensions shown in table 1.**

Incompatibility: none

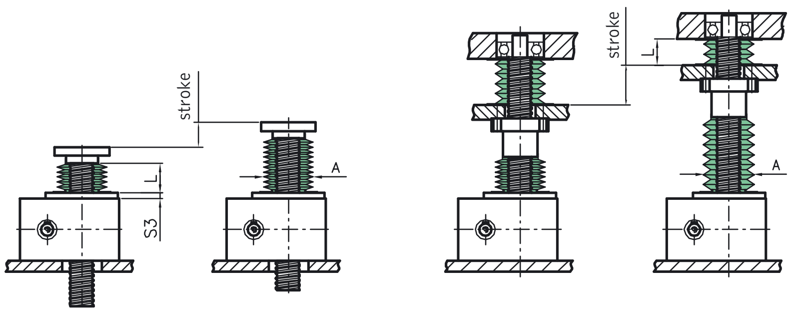


Table 2

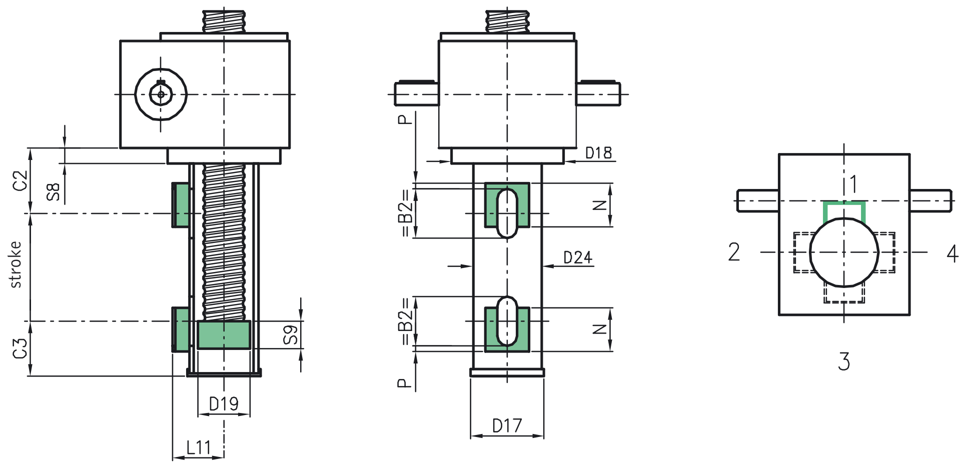
PE elastic protection			
Size	**59**	**88**	**117**
S3	8	12	15
D1 Ø	85	120	140
L1	1/8 of the stroke (all closed)		

For not quoted dimensions see the schemes on page 147.

PRF stroke control

In order to meet the requirement of an electric stroke control, it is possible to apply to a rigid protection suitable end-of-stroke supports. In the standard version these supports are of two types and they are placed at the ends of the stroke in one of the four positions shown below. They are carried out in such a way as to allow a small adjustment. In case more than one end-of-stroke are needed, it is possible to provide intermediate supports or a continuous support for the requested length. In order to enable the end-of-stroke to operate, a steel bushing is mounted on the ball spindle. More bushings can be mounted upon request. The PRF can only be applied to KT models and in case of missing specifications it will be supplied with the supports mounted according to position 1. Moreover it's possible assembling magnetic sensors on the protection, avoiding to mill it. The end-of-stroke signal is given by a magnet attached on the bottom of the spindle. The overall dimensions are shown in the table below.

Incompatibility: KR – PRO models - GSI - SP



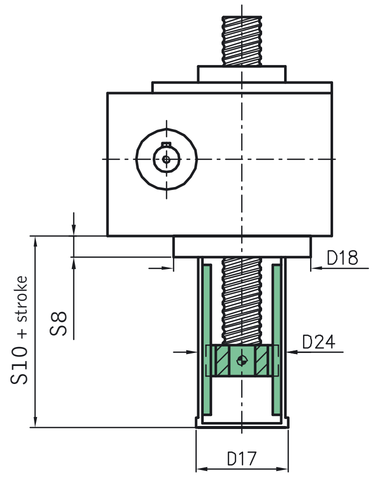
PRF stroke control			
Size	**59**	**88**	**117**
B1	18	18	18
B2	45	45	45
C2	60	60	60
C3	40	40	40
D17 Ø	63	95	125
D18 Ø	110	160	200
D19 Ø	48	78	98
L11	47	63	78
S8	10	10	10
S9	20	20	20
N	40	40	40
P	5	5	5

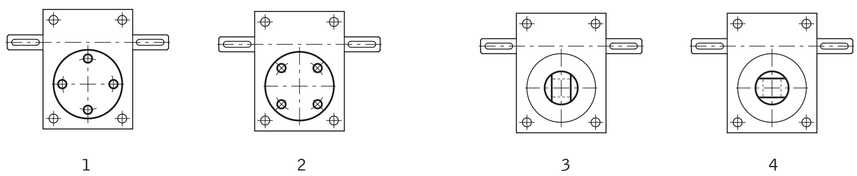
For not quoted dimensions see the schemes on page 147.

PRA double guide anti rotation

As all screw jacks must have an anti-rotation, in case such constraint cannot be realized externally, it is possible, for KT models, to have an inner anti-rotation system inside the screw jack. Two guides are mounted on the rigid protection where a bronze bushing, which is attached to the ball spindle can slide. In case of very long strokes, it should be checked that the torsional sliding is not such as to force the fixing screws in the guides. As the inner anti-rotation constraints the ball spindle and its end fitting, in case of presence of holes, their position should be notified, as indicated in the drawings below. Unless otherwise stated all screw jacks will be delivered in position 1 or 3. The overall dimensions are shown in the table below.

Incompatibility: KR models - GSI - SP





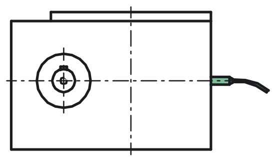
PRA double guide anti-rotation			
Size	**59**	**88**	**117**
D17 Ø	63	95	125
D18 Ø	110	160	200
S10	60	80	100
S8	10	10	10

For not quoted dimensions see the schemes on page 147.

CR rotation control

In some cases it can be necessary to check the operation conditions of the screw jack monitoring the worm wheel rotation, both in KT models and in KR models. A milling is carried out on the worm wheel and a suitable proximity switch supplies an electric impulse for each turn. No impulse means that the transmission is stopped. Special executions with more impulses per round are always possible.

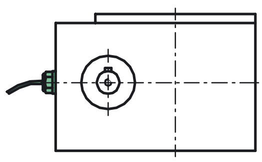
Incompatibility: None



CT temperature control

It is possible to control the casing temperature by means of a thermal probe emitting an electric impulse when the preset temperature of 80 °C is reached. Moreover it's possible to apply a sensor able to catch the temperature exact value and to send to a plc an electric signal proportional to the above mentioned value.

Incompatibility: none

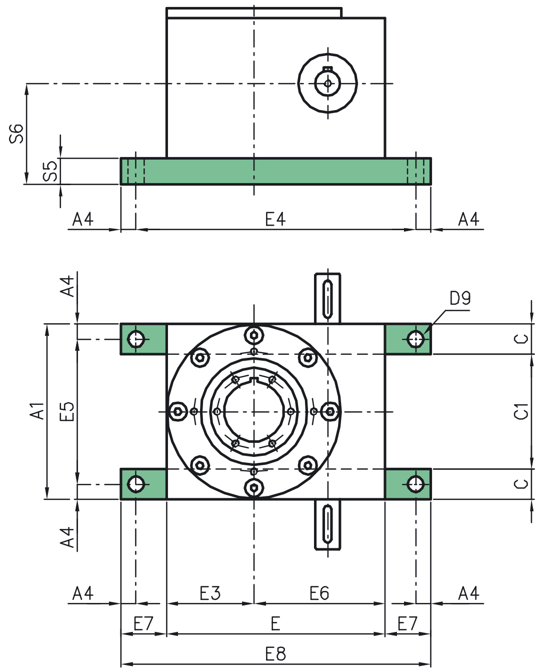


For not quoted dimensions reference should be made to the schemes on pages 147.

SP additional mounting plates

If for project requirements it is necessary to fix the screw jacks on holes which do not coincide with the casing holes, steel mounting plates can be supplied. The overall dimensions for the standard version are shown in the table below, but different fixing holes can be realized upon request.

Incompatibility: P – PO – PR – PRO – PRA



SP additional mounting plates

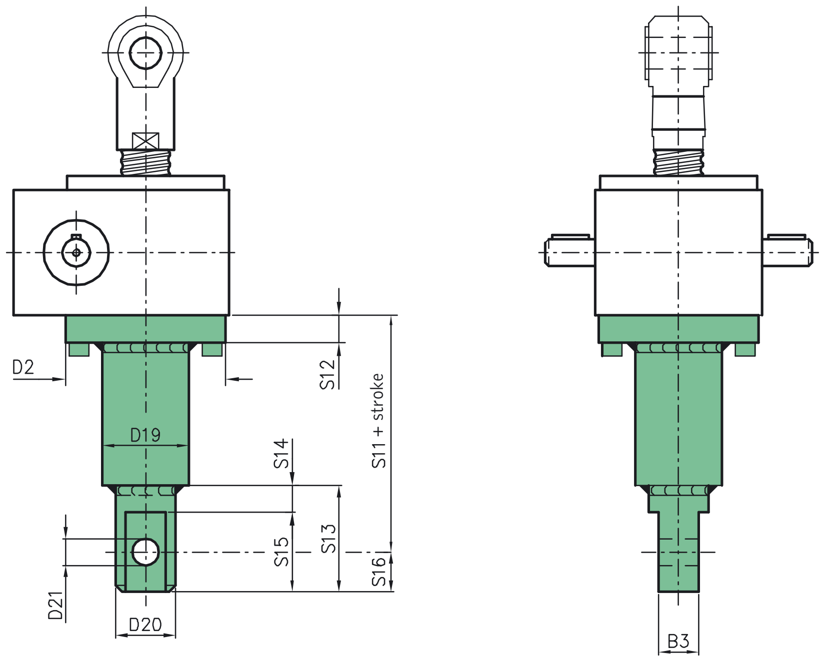
Size	59	88	117
A1	140	200	240
A4	12,5	15	25
C	25	35	50
C1	90	130	140
D9 Ø	11	15	25
E	175	238	310
E3	70	100	120
E4	200	268	360
E5	115	170	190
E6	105	138	190
E7	25	30	50
E8	225	298	410
S5	20	25	45
S6	80	100	135

For not quoted dimensions see the schemes on page 147.

PO rigid rocking protection

When it is necessary to apply a rocking mounting, UNIMEC is able to offer, for KT models, a special rigid reinforced protection which has an eyelet at its end. This protection very often supports the load, and it is therefore advisable that this protection be not too long in order to avoid an anomalous bending of PO. Further it should be reminded that mounting a PO in combination with an end fitting having an eyelet does not automatically give to the screw jack the status of a connecting rod (absence of lateral loads). Motors can directly be assembled to the screw jack. In case of compressive loads, the buckling verification must be calculated on a length equal to the hinges distance. In the following table the overall dimensions are shown.

Incompatibility: KR - P- PR – PRO – SP

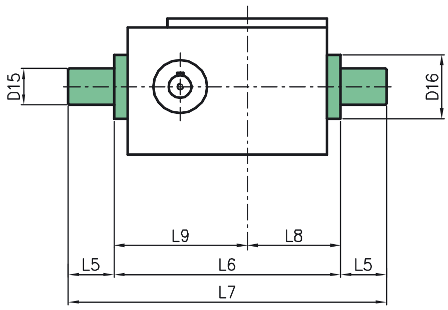


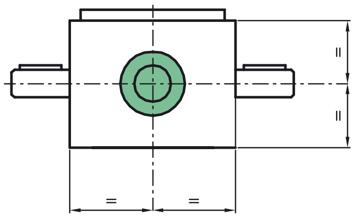
PO rigid rocking protection			
Size	**59**	**88**	**117**
B3	30	60	80
D2 Ø	140	200	239
D19 Ø	60	105	133
D20 Ø	48	88	118
D21 Ø H9	25	50	65
S11	140	210	240
S12	20	20	25
S13	70	140	175
S14	20	40	45
S15	50	100	130
S16	25	50	65

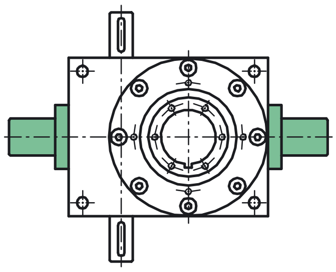
For not quoted dimensions see the schemes on page 147.

P Lateral pins

The purpose of this solution is very similar to the PO one: two lateral pins are fixed on the screw jack body in order to allow a rocking mounting. Under some aspects this solution can be preferred to the rocking protection because, in the slender rod scheme, the distance between the two hinges is exactly half. Further we remind you that mounting lateral pins combined with an end fitting having an eyelet **does not automatically give to the screw jack the status of a connecting rod (absence of lateral loads).** Motors can directly be assembled to the screw jack. In case of compressive loads, the buckling verification must be calculated on a length equal to the hinges distance. In the following table the overall dimensions are shown.
Incompatibility: PO – SP







P lateral pins			
Size	**59**	**88**	**117**
D15 Ø k6	30	40	55
D16 Ø	60	70	95
L5	35	45	60
L6	200	268	340
L7	270	358	460
L8	82,5	115	135
L9	117,5	153	205

For not quoted dimensions see the schemes on page 147.

NIPLOY treatment

For applications in oxidizing environments, it is possible to protect some screw jack components which do not undergo any sliding, by means of a chemical nickel treatment, the so-called Niploy. It creates a non permanent surface coating on casings, covers, bushings, end fittings, and on the protruding shafts of the worm screw. The ball spindle cannot undergo this treatment.

NORMS

ATEX directive (94/9/CE)

The 94/9/CE directive is better known as the "ATEX directive". All UNIMEC's products may be classified as "components" according to the definition quoted in art.1 par.3 c), and therefore they do not require an ATEX mark.
A conformity declaration in accordance to what stated in art.8 par.3 can be supplied upon end user's request, subject to the filling up of a questionnaire with the indication of the working parameters.

Machinery directive (98/37/CE)

The 98/37/CE directive is better known as the "Machinery directive". UNIMEC's components are included in the products categories which do not need to affix the CE mark, as they are "intended to be incorporated or assembled with other machinery" (art.4 par.2). Upon end user's request a manufacturer declaration can be supplied in accordance to what is foreseen at Annex II, point B. The new machine directory (06/42/CE) will be acknowledged by 29/12/2009. UNIMEC guarantees that every new duty in mechanical transmission will be followed by such date.

ROHS directive (02/95/CE)

The 02/95/CE directive is better known as the "ROHS directive". All UNIMEC's suppliers of electromechanical equipments have issued a conformity certification to the above norms for their products. A copy of said certificates can be supplied upon final user's request.

REACH directive (06/121/CE)

The 06/121/CE is better is known as "REACH" directive and applies as the rule CE 1907/2006. UNIMEC products present only inside lubricants as "substances", so being disciplined by art. 7 of above mentioned rule. By art. 7 par. 1 b) UNIMEC declares that its products are not subjected to any declaration or registration because the substances in them are not "to be lost in normal and reasonable previewed usage conditions"; in facts lubricant losses are typical of malfunctions or heavy anomalies. By art. 33 of the rule CE 1907/2006, UNIMEC declares that inside its products there aren't substances identified by art. 57 in percentage to be dangerous.

UNI EN ISO 9001:2000 norm

UNIMEC has always considered the company's quality system management as a very important subject. That is why, since the year 1996, UNIMEC is able to show its UNI EN ISO 9001 certification, at the beginning in accordance to the 1994 norms and now meeting the requirements of the version published in the year 2000. 13 years of company's quality, certified by UKAS, the world's most accredited certification body, take shape into an organization which is efficient at each stage of the working process. In date 31/10/2008 the new version of this norm was published. UNIMEC will evaluate every news reported in this revision.

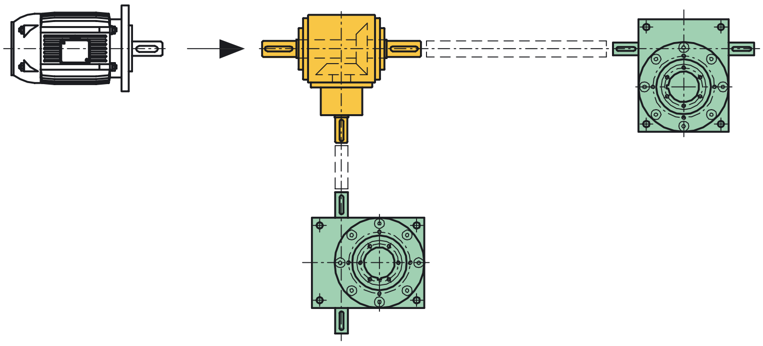
UKAS QUALITY MANAGEMENT

Painting

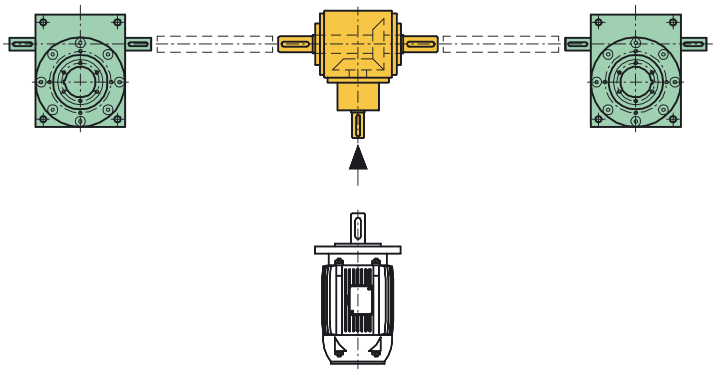
Our products are all painted in color RAL 5015 blue. An oven-dry system enables the products to have a perfect adhesivity. Different colors as well as epoxidic paints are available.

MOUNTING SCHEMES

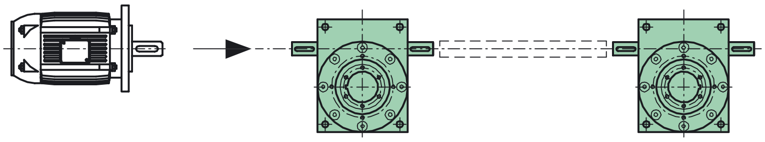
Scheme 1



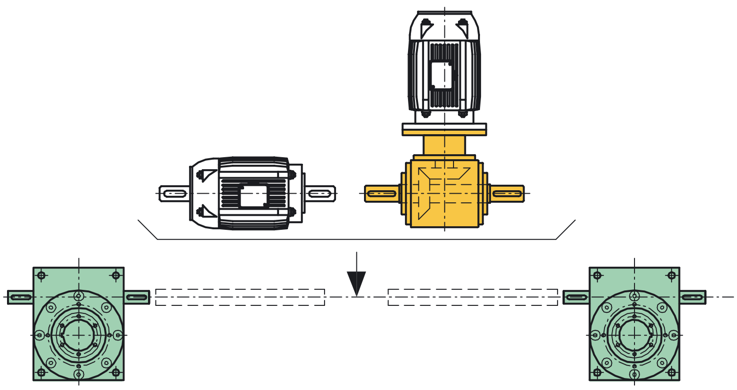
Scheme 2



Scheme 3

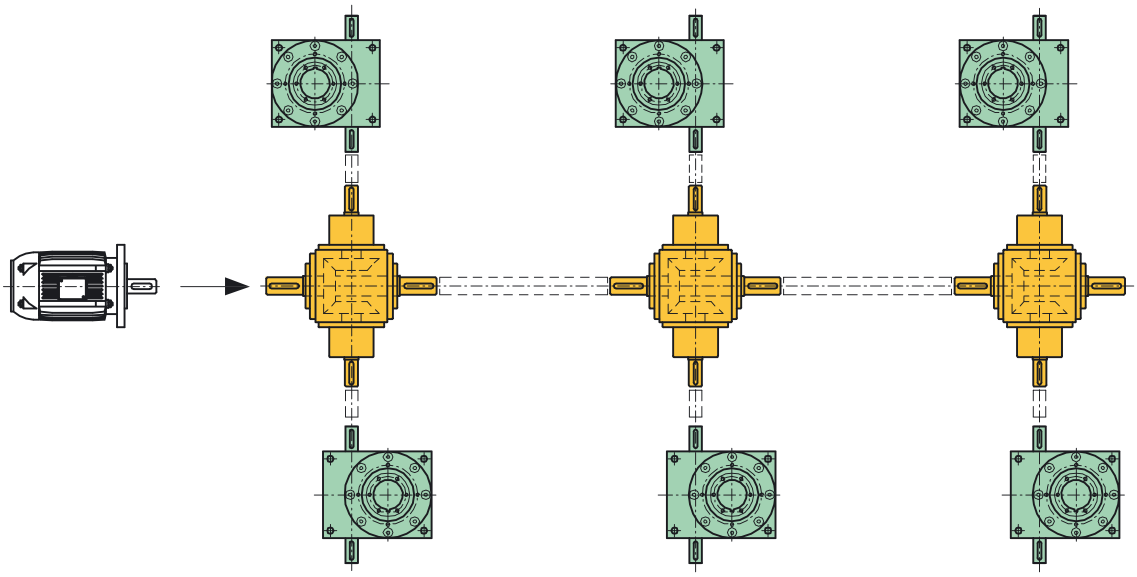


Scheme 4

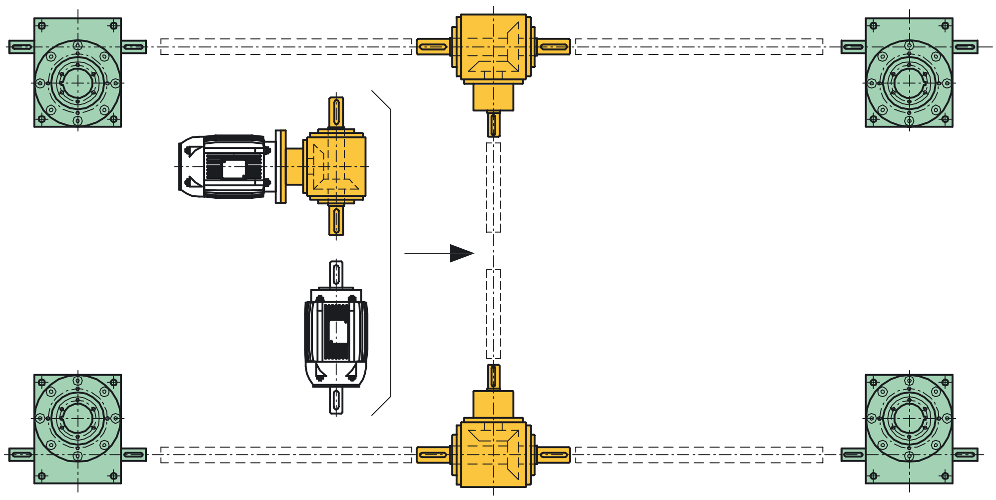


Application samples are online at www.unimec.eu - section Applications

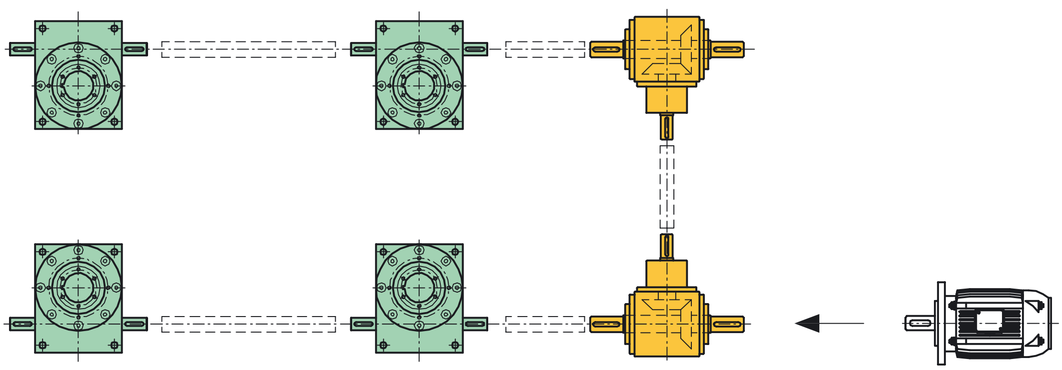
Scheme 5



Scheme 6



Scheme 7

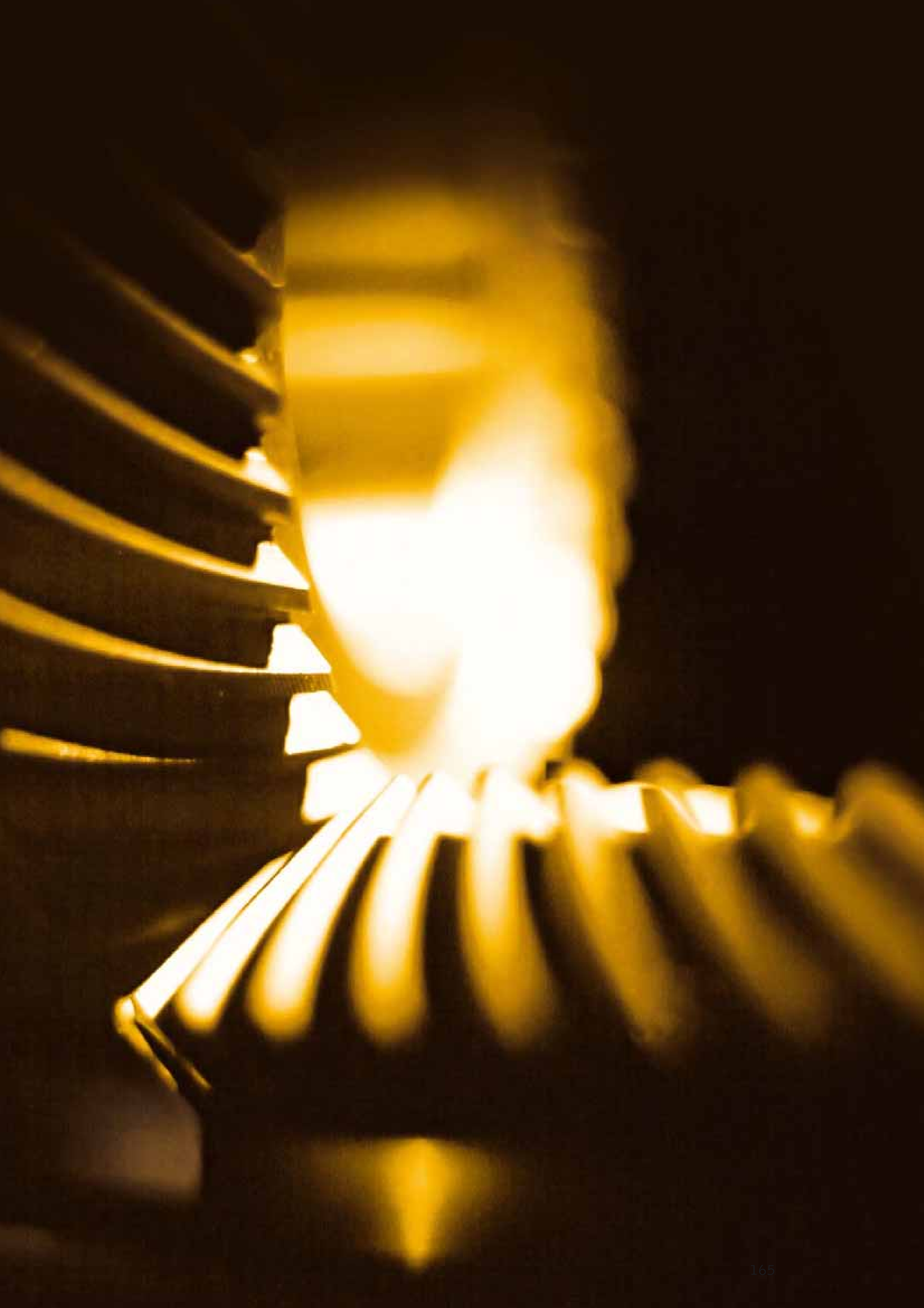


UNIMEC bevel gearboxes have been designed and manufactured since 28 years using an in-the van technology and mechanical solutions according to the state of the art to be able to meet the growing requirements of a demanding and sophisticated market. Nine sizes, tenths of mounting schemes, a range of serial ratios up to 1/12 and the possibility of a customized design having no equal, make of UNIMEC a reliable partner in the field of the motion transmission.

The practical cubic shape of bevel gearboxes allows universal mounting possibilities on every kind of machines.

Bevel gear boxes

Bevel gearboxes are also very versatile with regard to the shafts choice and the possibility of a direct mounting on any kind of motors, from the normal IEC to brushless motors, to pneumatic motors and so on. High running efficiency, low noise are the logical consequences of the application of Gleason® type spiral teeth conical gears; the use of this kind of geometry and suitable thermal treatments place UNIMEC's bevel gearboxes on top of this mechanical sector.



198 RC

Hollow shaft bevel gearboxes.
Ratios:
1/1 - 1/1,5 - 1/2 - 1/3 - 1/4.

199 RR

Hollow shaft bevel gearboxes with reinforced hub shaft.
Ratios:
1/1 - 1/1,5 - 1/2 - 1/3 - 1/4.

200 RB

Broached hollow shaft bevel gearboxes
Ratios:
1/1 - 1/1,5 - 1/2 - 1/3 - 1/4.

201 RA

Hollow shaft bevel gearboxes with shrink-disks.
Ratios:
1/1 - 1/1,5 - 1/2 - 1/3 - 1/4.

202 RS

Protruding shaft bevel gearboxes.
Ratios:
1/1 - 1/1,5 - 1/2 - 1/3 - 1/4.

203 RP

Protruding shaft bevel gearboxes with reinforced hub shaft.
Ratios:
1/1 - 1/1,5 - 1/2 - 1/3 - 1/4.

204 RX

Double hub bevel gearboxes.
Ratios:
1/1 - 1/1,5 - 1/2 - 1/3 - 1/4.

205 RZ

Double hub bevel gearboxes with reinforced shafts.
Ratios:
1/1 - 1/1,5 - 1/2 - 1/3 - 1/4.

Application samples are online at www.unimec.eu - section Applications

RM 206

Bevel gearboxes with fast double shaft – multiplier version.
Ratios: 1/1,5.

RIS 207

Protruding shaft bevel gearboxes with inverter.
Ratios:
1/1 - 1/2.

REC 208

High reduction bevel gearboxes with hollow shaft.
Ratios:
1/4,5 - 1/6 - 1/9 - 1/12.

REB 209

High reduction bevel gearboxes with broached hollow shaft.
Ratios:
1/4,5 - 1/6 - 1/9 - 1/12.

REA 210

High reduction hollow shaft bevel gearboxes with shrink-disks.
Ratios:
1/4,5 - 1/6 - 1/9 - 1/12.

RES 211

High reduction bevel gearboxes with protruding shaft.
Ratios:
1/4,5 - 1/6 - 1/9 - 1/12.

RHC 212

Inverted bevel gearboxes with hollow shaft.
Ratios:
1/2 - 1/3.

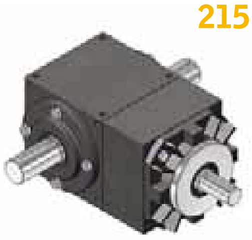
213 **RHB**

Inverted gearboxes with broached hollow shaft.
Ratios:
1/2 - 1/3.

214 **RHA**

Inverted bevel gearboxes with hollow shaft with shrink-disks.
Ratios:
1/2 - 1/3.

215 **RHS**



Inverted bevel gearboxes with protruding shaft.
Ratios:
1/2 - 1/3 - 1/4,5.

216 **MRC**

Hollow shaft motor-gearboxes.
Ratios:
1/1 - 1/1,5 - 1/2 - 1/3 - 1/4.

217 **MRB**

Broached hollow shaft motor-gearboxes.
Ratios:
1/1 - 1/1,5 - 1/2 - 1/3 - 1/4.

218 **MRA**

Hollow shaft motor-gearboxes with shrink-disks.
Ratios:
1/1 - 1/1,5 - 1/2 - 1/3 - 1/4.

219 **MRS**

Protruding shaft motor-gearboxes.
Ratios:
1/1 - 1/1,5 - 1/2 - 1/3 - 1/4.

220 **MRX**

Two hub shafts motor-gearboxes.
Ratios:
1/1 - 1/1,5 - 1/2 - 1/3 - 1/4.

MRZ

Two hub shafts bevel gearboxes with reinforced shaft.
Ratios:
1/1 - 1/1,5 - 1/2 - 1/3 - 1/4.

221

Special bevel gearboxes

MRE

High reduction motor-gearboxes.
Ratios:
1/4,5 - 1/6 - 1/9 - 1/12.

222

Bevel gearboxes with clamps on the motor shaft

Casings

Bevel gearboxes casings have a cubic base form, with six completely machine finished outer faces and varnished inner parts. Each face is supplied with mounting holes, while the finished hubs and flanges show outer tolerance centerings. The casing are made of grey cast iron EN-GJL-250 (according to the UNI EN 1561:1998 requirements), except for size 500 whose casing is made of electro-welded carbon steel S235J0 (according to the UNI EN 10025-2:2005 requirements).

Bevel gearboxes

Gears

All the gears are alloy steel 17NiCrMo 6-4 (according to the UNI EN 10084:2000 requirements).
They have a Gleason® type helicoidal geometry toothing, with variable helix angle depending on the ratio for a better meshing and an optimum torque distribution.
The bevel gear set undergo thermal treatments like case-hardening, and carburizing and then they are run-in in couples with marking of the contact point; all this allows a perfect and noiseless meshing. All the gears planes and holes undergo a grinding process.

Shafts

The bevel gearboxes protruding shafts are made of carbon steel C45 (according to the UNI EN 10083-2:1998 requirements); the hollow shafts on the contrary are made of steel 16NiCr4 (according to the UNI EN 10084:2000 requirements), and they undergo case-hardening, carburizing and grinding treatments for their inner diameters. All shafts are induction ground and case-hardened in the contact area with the seals. A wide range of geometries is available for the shafts: hollow shafts with key, broached or for shrink-disks, protruding or over-size.

Bearings and market materials

Top-quality bearings and market materials are used for the whole line. All UNIMEC's bevel gear boxes are adapted to conical roller bearings, excluded sizes 54 and 86, for which ball bearings are foreseen.

Weight

(referred to base models)

Size	54	86	110	134	166	200	250	350	500	32	42	55
Weight [kg]	2	6,5	10	19	32	55	103	173	1050	29	48	82

GLOSSARY

A = maximum input angular speed [rpm]
B = frequency of the loading cycle [Hz]
C_p = specific heat of lubricant [J/Kg·°C]
F_{r1} = radial force on the hub shaft [daN]
F_{r2} = radial force on the double shaft (Protrusion next to the gear) [daN]
F_{r3} = radial force on the double shaft (protrusion far from the gear) [daN]
F_{a1} = axial compression force on the hub shaft [daN]
F_{a2} = axial traction force on the hub shaft [daN]
F_{a3} = axial compression force on the double shaft [daN]
F_{a4} = axial traction force on the double shaft [daN]
f_a = ambient factor
f_d = duration factor
f_g = usage factor
i = reduction ratio, meant as a fraction (es.1/2)
J = total inertia [kgm²]
J_r = bevel gearbox inertia [kgm²]
J_v = inertia downstream of the bevel gearbox [kgm²]
M_{tL} = torque on the slow shaft [daNm]
M_{tv} = torque on the fast shaft [daNm]
n_1 = fast shaft
n_2 = slow shaft
P_d = power dissipated in the form of heat [kW]
P_i = input power to the single bevel gearbox [kW]
P_L = power on the slow shaft [kW]
P_v = power on the fast shaft [kW]
P_j = inertia power [kW]
P_u = output power to the single bevel gearbox [kW]
P_e = equivalent power [kW]
PTC = adjustment factor on thermal power
Q = lubricant flow-rate [litre/min]
rpm = rounds per minute
t_a = ambient temperature [°C]
t_r = bevel gearbox surface temperature [°C]
η = bevel gearbox running efficiency
ω_L = slow shaft angular speed [rpm]
ω_v = fast shaft angular speed [rpm]
α_L = angular acceleration of the slow shaft [rad/s²]

Unless otherwise specified all tables show linear measurements expressed in [mm].
All the reduction ratios are expressed in the form of a fraction, unless otherwise specified.

components specifications and glossary

LOAD ANALYSIS AND COMPOSITION

The aim of a bevel gearbox is to transmit power through shafts being orthogonal the one to the other; for this reason the gears, the shafts and the bearings have been designed to transmit powers and torques as shown in the power tables. Nevertheless there can also be other forces which have to be considered during the dimensioning phase of bevel gearboxes.
Such loads are generated by the devices connected to the bevel gearbox and they can be caused by belt drives, sudden accelerations and decelerations of the flywheels, structure misalignments, vibrations, shocks, pendular cycles etc. There can be two types of loads acting on the shafts: radial and axial loads, as referred to the shaft axis itself. The tables below show the maximum values for each type of forces according to the model and the size. In case of heavy loads, the table values must be divided by 1,5, while in case of shock load they should be divided by 2.
In case real load do not approach to the table values (modified) it is advisable to contact the technical office.

RADIAL LOADS

RC RB RA RS RX RM RIS

Size		54	86	110	134	166	200	250	350	500
Conditions	Revolution speed of the fast shaft ω_v [rpm]									
Dynamic	50 F_{r1} [daN]	53	109	160	245	476	846	1663	2441	4150
	3000	15	34	135	232	270	384	534	930	1580
Static	F_{r1} [daN]	100	204	300	460	893	1586	3118	4577	7780

RR RP RZ

Size		86	110	134	166	200	250	350	500
Conditions	Revolution speed of the fast shaft ω_v [rpm]								
Dynamic	50 F_{r1} [daN]	316	351	524	1045	1297	2459	3184	5412
	3000	135	179	232	305	379	718	930	1580
Static	F_{r1} [daN]	592	658	982	2100	3326	5715	8373	14235

REC REB REA RES

Size		32	42	55
Conditions	Revolution speed of the fast shaft ω_v [rpm]			
Dynamic	50 F_{r1} [daN]	245	476	846
	3000	232	270	384
Static	F_{r1} [daN]	460	893	1586

RHC RHB RHA RHS

Size		32	42	55	32	42	55
Ratio			1/2 - 1/3			1/4,5	
Conditions	Revolution speed of the fast shaft ω_v [rpm]						
Dynamic	50 F_{r1} [daN]	477	610	927	596	762	1158
	3000	151	198	295	151	198	295
Static	F_{r1} [daN]	982	2000	3838	684	2019	3838

RC RR RB RA RS RP

Size		54	86	110	134	166	200	250	350	500
Conditions	Revolution speed of the fast shaft ω_v [rpm]									
Dynamic	50 F_{r2} [daN]	40	144	351	462	788	953	1444	2784	4732
	3000	10	36	105	135	230	278	421	813	1382
Dynamic	50 Fr3 [daN]	68	241	351	524	1121	1588	2406	4466	7592
	3000	17	61	176	225	384	464	703	1356	2300
Static	Fr2-Fr3 [daN]	349	592	658	982	2100	3326	5715	8373	14234

RM RIS

Size		54	86	110	134	166	200	250	350	500
Conditions	Revolution speed of the fast shaft ω_v [rpm]									
Dynamic	50 F_{r2} [daN]	26	109	160	245	441	561	1044	2441	4150
	3000	5	47	70	94	128	163	421	813	1382
Dynamic	50 Fr3 [daN]	42	109	160	245	476	846	1663	2441	4150
	3000	9	78	117	156	266	273	706	1356	2300
Static	Fr2-Fr3 [daN]	110	204	300	460	893	1586	3118	4577	7780

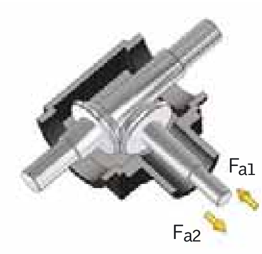
REC REB REA RES

Size		32	42	55
Conditions	Revolution speed of the fast shaft ω_v [rpm]			
Dynamic	50 F_{r2} [daN]	462	788	953
	3000	204	348	421
Dynamic	50 Fr3 [daN]	524	1121	1588
	3000	341	582	703
Static	Fr2-Fr3 [daN]	982	2100	3326

RHC RHB RHA RHS

Size		32	42	55	32	42	55
Ratio			1/2 - 1/3			1/4,5	
Conditions	Revolution speed of the fast shaft ω_v [rpm]						
Dynamic	50 F_{r2} [daN]	462	788	953	245	441	561
	3000	135	230	278	94	128	163
Dynamic	50 Fr3 [daN]	524	1121	1588	245	476	846
	3000	225	384	464	156	266	273
Static	Fr2-Fr3 [daN]	982	2100	3326	460	893	1586

AXIAL LOADS



RC RB RA RS RX RM RIS

Size		54	86	110	134	166	200	250	350	500
Conditions	Revolution speed of the fast shaft ω_v [rpm]									
Dynamic	50 F_{a1} [daN]	59	136	463	794	926	1314	1828	3184	5412
	3000	15	34	135	232	270	384	534	930	1581
Dynamic	50 F_{a2} [daN]	35	81	278	476	555	788	1097	1910	3247
	3000	9	20	81	139	162	230	320	558	948
Static	F_{a1} [daN]	71	327	2327	4153	4250	6535	8733	21538	36614
Static	F_{a2} [daN]	71	327	2044	3464	4250	5196	7830	21538	36614

RR RP RZ

Size		86	110	134	166	200	250	350	500
Conditions	Revolution speed of the fast shaft ω_v [rpm]								
Dynamic	50 F_{a1} [daN]	463	615	794	1045	1297	2459	3184	5412
	3000	135	179	232	305	379	718	930	1581
Dynamic	50 F_{a2} [daN]	278	368	476	627	778	1475	1910	3247
	3000	81	107	139	183	227	431	558	948
Static	F_{a1} [daN]	1060	1620	2670	5700	6300	8600	21538	36614
Static	F_{a2} [daN]	1656	2044	3464	4150	5196	7830	21538	36614

REC REB REA RES

Size		32	42	55
Conditions	Revolution speed of the fast shaft ω_v [rpm]			
Dynamic	50 F_{a1} [daN]	794	926	1314
	3000	232	270	384
Dynamic	50 F_{a2} [daN]	476	555	788
	3000	139	162	230
Static	F_{a1} [daN]	4153	4250	6535
Static	F_{a2} [daN]	3464	4250	5196

RHC RHB RHA RHS

Size		32	42	55	32	42	55
Ratio			1/2 - 1/3			1/4,5	
Conditions	Revolution speed of the fast shaft ω_v [rpm]						
Dynamic	50 F_{a1} [daN]	477	610	927	477	610	927
	3000	152	197	298	152	197	298
Dynamic	50 F_{a2} [daN]	477	610	927	477	610	927
	3000	152	197	298	152	197	298
Static	F_{a1} [daN]	1100	1520	3400	1100	1520	3400
Static	F_{a2} [daN]	1100	1520	3400	1100	1520	3400

RC RR RB RA RS RP

Size			54	86	110	134	166	200	250	350	500
Conditions	Revolution speed of the fast shaft ω_v [rpm]										
Dynamic	50	F_{a3} [daN]	68	241	604	770	1314	1588	2406	4641	7889
	3000		17	61	176	225	384	464	703	1356	2305
Dynamic	50	F_{a4} [daN]	40	144	362	462	788	953	1444	2784	4732
	3000		10	36	105	135	230	278	421	813	1382
Static		Fa3-Fa4 [daN]	182	580	2044	3464	4330	5196	7830	22320	37944

RM RIS

Size			86	110	134	166	200	250	350	500
Conditions	Revolution speed of the fast shaft ω_v [rpm]									
Dynamic	50	F_{a3} [daN]	268	402	536	912	935	2406	4641	7889
	3000		78	117	156	266	273	703	1356	2305
Dynamic	50	F_{a4} [daN]	161	241	322	441	561	1444	2784	4732
	3000		47	70	94	128	163	421	813	1382
Static		Fa3-Fa4 [daN]	1094	1622	2150	3464	5196	7830	22320	37944

REC REB REA RES

Size			32	42	55
Conditions	Revolution speed of the fast shaft ω_v [rpm]				
Dynamic	50	F_{a3} [daN]	770	1314	1588
	3000		341	582	703
Dynamic	50	F_{a4} [daN]	462	788	953
	3000		204	348	421
Static		Fa3-Fa4 [daN]	3464	4330	5196

RHC RHB RHA RHS

Size			32	42	55	32	42	55
Ratio				1/2 - 1/3			1/4,5	
Conditions	Revolution speed of the fast shaft ω_v [rpm]							
Dynamic	50	F_{a3} [daN]	770	1314	1588	536	912	935
	3000		225	384	464	156	266	273
Dynamic	50	F_{a4} [daN]	462	788	953	322	441	561
	3000		135	230	278	94	128	163
Static		Fa3-Fa4 [daN]	3464	4330	5196	2150	3464	5196

BACKLASH

The gears connection presents a natural and necessary backlash which is transmitted to the shafts. A particular care in the assembly allows to keep such value within 15'-20'. For particular applications, where the standard backlash should be further reduced, it is possible to reach a maximum value comprised between 5'-7'. It is important to remember that **an excessive backlash reduction could induce the transmission to be blocked** due to the interference between the gears. Furthermore, a too tight backlash would cause friction phenomena and consequently an efficiency reduction as well as an heating of the transmission.

The gears backlash tends to increase according to the wear ratio of the components, that is why after various running cycles we can logically expect an higher value than the value taken before the start-up. Finally it should be reminded that, due to the axial components of the transmission forces, **the backlash measured under load can be different than the value taken when the bevel gearbox is unloaded.** In case a very high precision is requested, it is advisable to mount shrink disks, both on the output and on the input shafts, because among standard couplings it is the only one ensuring a minimum backlash for the mounting on the machine.

RUNNING EFFICIENCY

As the aim of a bevel gearbox is to transmit power, it is necessary for its running efficiency to be the maximum possible, in order to minimize the loss of power transformed into heat. The meshing precision allows a gear pair running efficiency of 97%. **The overall transmission running efficiency reaches 90%** due to the lubricant splash and the sliding of the rotating devices, such as bearings and shafts. During the first operation hours the running efficiency could be lower than indicated; after a suitable run-in the power which had been lost in friction should reach a value towards 10%.

HANDLING

All bevel gearboxes can be manually operated. Anyway most part of its application foresees a motorized handling, in many cases even direct. For the sizes from 86 to 250 included, it is possible to connect directly a standard IEC motor to the fast shaft of the bevel gearbox. Special flanges can be provided for all sizes made for hydraulic, pneumatic, brushless motors, as well as for direct current motors, permanent magnet motors, stepper motors and other special motors. It is also possible to realize special flanges for fixing the drive shaft by means of a shrink disk, in order to minimize the transmission backlash. The power tables determine the motoring power and the torque on the slow shaft, for each single bevel gearbox, in case of unique service factors, according to the model, size, ratio and revolution speeds.

Rotation directions

The rotation directions depend on the mounting scheme. According to the chosen model, as a function of the required rotation direction, it's possible to choose the mounting scheme which best meets those requirements. We remind that, even if one only rotation direction of a shaft is changed from clockwise into anti-clockwise (and vice-versa), any other rotations of the bevel gearbox shafts direction must be reversed.

Non-stop operation

A non-stop operation occurs when the speed modulation gear is subjected to time constant torque and angular speed. After a transition period the revolutions become stationary, together with the surface temperature of the bevel gearbox and the ambient thermal exchange. It is important to check for wear phenomena and thermal power.

Intermittent operation

An intermittent operation occurs when high grade accelerations and deceleration overlap a revolution speed and torque (even at zero value), make it necessary to verify the ability to counteract the system inertia. A revision of the bevel gearbox and the input power is therefore necessary. It is important to check bending and fatigue strength parameters.

The key phase

Because of gears have a discrete teeth number, keys on shaft will never be perfectly on phase as shown in drawings. Phasing precision changes in function of ratio and size, as reported in the following table.

Ratio	54	86	110	134	166	200	250	350	500
1/1	± 8°	± 6,5°	± 5,5°	± 6,5°	± 6,5°	± 6,5°	± 6°	± 4°	± 4°
1/1,5	± 5°	± 6°	± 5,5°	± 5,5°	± 6°	± 5,5°	± 5,5°	± 4°	± 4°
1/2	± 5°	± 6°	± 6°	± 6,5°	± 6,5°	± 6,5°	± 6°	± 4°	± 4°
1/3	± 5°	± 6°	± 4,5°	± 5,5°	± 5°	± 5°	± 5°	± 3,5°	± 3,5°
1/4	± 5°	± 4,5°	± 4,5°	± 4,5°	± 4,5°	± 4°	± 4,5°	± 3,5°	± 3,5°

If there's the need of a higher precision, it's necessary to proceed with a special assembling.

LUBRICATION

The lubrication of the inner transmission devices (gears and bearings) is made using a mineral oil with extreme pressure additive: TOTAL CARTER EP 220. For size 54 the adopted lubricant is TOTAL CERAN CA. For a proper operation of the transmission it is advisable to steady check for lubricant leakage. For all sizes a plug for lubricant filling-up is foreseen. The technical specifications and the application field for the lubricant inside the bevel gearboxes are listed below.

Lubricant	Application field	Operating temperature [°C]*	Technical specifications
Total Carter EP 220 (not compatible with polyglicol oils)	standard	0 : +200	AGMA 9005: D24 DIN 51517-3: CLP NF ISO 6743-6: CKD
Total Ceran CA	standard (54)	-15 : +130	DIN 51502:OGPON -25 ISO 6743-9: L-XBDIB 0
Total Azolla ZS 68	High speeds**	-10 : +200	AFNOR NF E 48-603 HM DIN 51524-2: HLP ISO 6743-4: HM
Total Dacnis SH 100	High temperatures	-30 : +250	NF ISO 6743: DAJ
Total Nevastane SL 220	Food industry	-30 : +230	NSF-USDA: H1

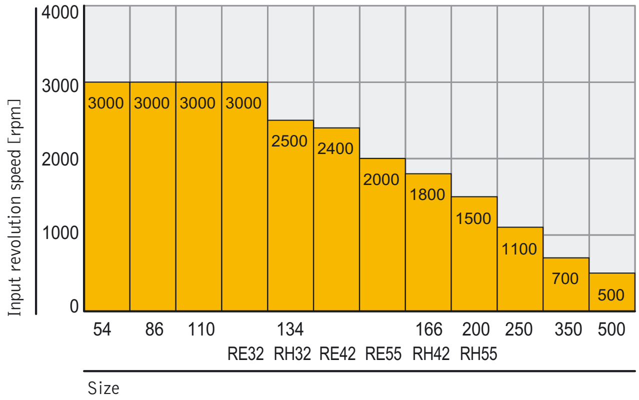
* for operation temperatures between 80°C and 150°C Viton® seals should be used; for temperatures higher than 150°C and lower -20°C it is advisable to contact our technical office.

** for input revolutions higher than 1500 rpm we suggest using Viton® seals in order to better counteract the local temperature increases due to the strong sliding on the seals.

The quantity of lubricant contained in bevel gearboxes is shown in the following table.

Size	54	86	110	134	166	200	250	350	500	32	42	55
Inner lubricant quantity [litres]	0,015	0,1	0,2	0,4	0,9	1,5	3,1	11	28	1	1,8	3,7

The inner devices of the bevel gearboxes can be lubricated in two ways: by means of splash or forced lubrication. Splash lubrication does not require external interventions: when the fast shaft revolutions are lower than indicated in the graph below, its operation ensures that lubricant reaches all the components requiring lubrication. For revolution speeds higher than the indicated values, it may happen that the gears peripheral speed be such as to create centrifugal forces able to overcome the lubricant adhesivity. Therefore, in order to ensure a proper lubrication, a lubricant feeding under pressure is necessary (we suggest 5 bar) by means of a suitable oil cooling circuit. In case of forced lubrication it will be necessary to precise the mounting position and localization of the holes to be provided for the connection to the lubrication circuit.



For revolutions reaching the border values indicated in the above graph it is advisable to contact our technical office in order to evaluate the modus operandi.

For very low revolutions of the fast shaft (lower than 50 rpm) the phenomena which normally generate splash could not be triggered off in a correct way. We suggest contacting our technical office in order to evaluate the most suitable solution to the problem.

In case of vertical axis mounting, the upper bearings and gears could not be properly lubricated. It is therefore necessary to indicate such situation in case of order, so that suitable grease holes can be foreseen. If no indication about lubrication is given at the ordering phase, it is understood that the application conditions fall within the conditions of an horizontal mounting with splash lubrication.

INSTALLATION AND MAINTENANCE

Installation
When positioning the bevel gearboxes and connecting them to the machines, the greatest of care is necessary in the alignment of the axes. In case of an imprecise alignment, the bearing would be overloaded, anomalous overheated, and it would be subjected to a greater wear with a consequent lifetime reduction and a noise increase. The transmission should be mounted so that movements and vibrations are avoided, and they should be properly fixed by means of bolts. We suggest effecting a proper cleaning and lubrication of the contact surfaces before assembling the connecting members, in order that any seizure or oxidizing problems be avoided. The assembly or disassembly must be carried out using tie rods and extractors through the threaded bore at the end of the shaft. For tight fittings, a shrink assembly is recommended, heating the members to be shrunk on to 80-100°C. Thanks to their particular cubic box form, bevel gearboxes can be mounted in any position. It should be given previous notice in case of a vertical mounting in order that a proper lubrication be foreseen.

Preparing for service
All speed modulation gears are supplied filled with long lasting lubricant which ensures a perfect operation of the unit according to the power values indicated in the catalogue. The only exception is represented by the ones having an "add oil" label. The lubricant filling up to the right level is an installer's responsibility and it must be carried out when the gears are not in motion. An excessive filling should be avoided in order that any overheating, noise, inner pressure loss and power loss occur.

Start-up
All the units undergo a brief testing before being delivered to the client. However, several hours of running at full load are necessary before the bevel gearbox reaches its full running efficiency. In case of need, the bevel gearbox can be immediately set to work at full load; but, circumstances permitting, it is nonetheless advisable to subject it to a gradually increasing load to reach maximum load after 20 - 30 hours of running. It is also vital to take the precautions necessary to avoid overloading in the first stages of running. The temperatures reached by the bevel gearbox in these initial phases will be higher than the ones produced after the complete running-in of the same.

Routine maintenance
<u>Bevel gearboxes must be inspected once a month.</u> Lubricant leakage should be checked for, and in case the oil level should be restored and the seals replaced. The lubricant control must be effected when the speed modulation gear is not working. The oil should be changed at intervals which will vary according to the working conditions; generally, in normal conditions and at the normal operation temperatures, it should be possible to obtain a minimum lubricant lifetime of 10.000 hours.

Storage
The bevel gearboxes must be protected from deposits of dust and foreign matter during storage. Particular attention must be paid to saline or corrosive atmospheres.
We also recommend to:
- Periodically rotate the shafts to ensure proper lubrication of inner parts and avoid that the seals dry up, therefore causing lubricant leakage.
- For bevel gearboxes without lubricant completely fill-in the unit with rustproof oil. When servicing for use, completely empty the oil and refill with the recommended oil to the correct level.
- Protect the shafts with suitable products.

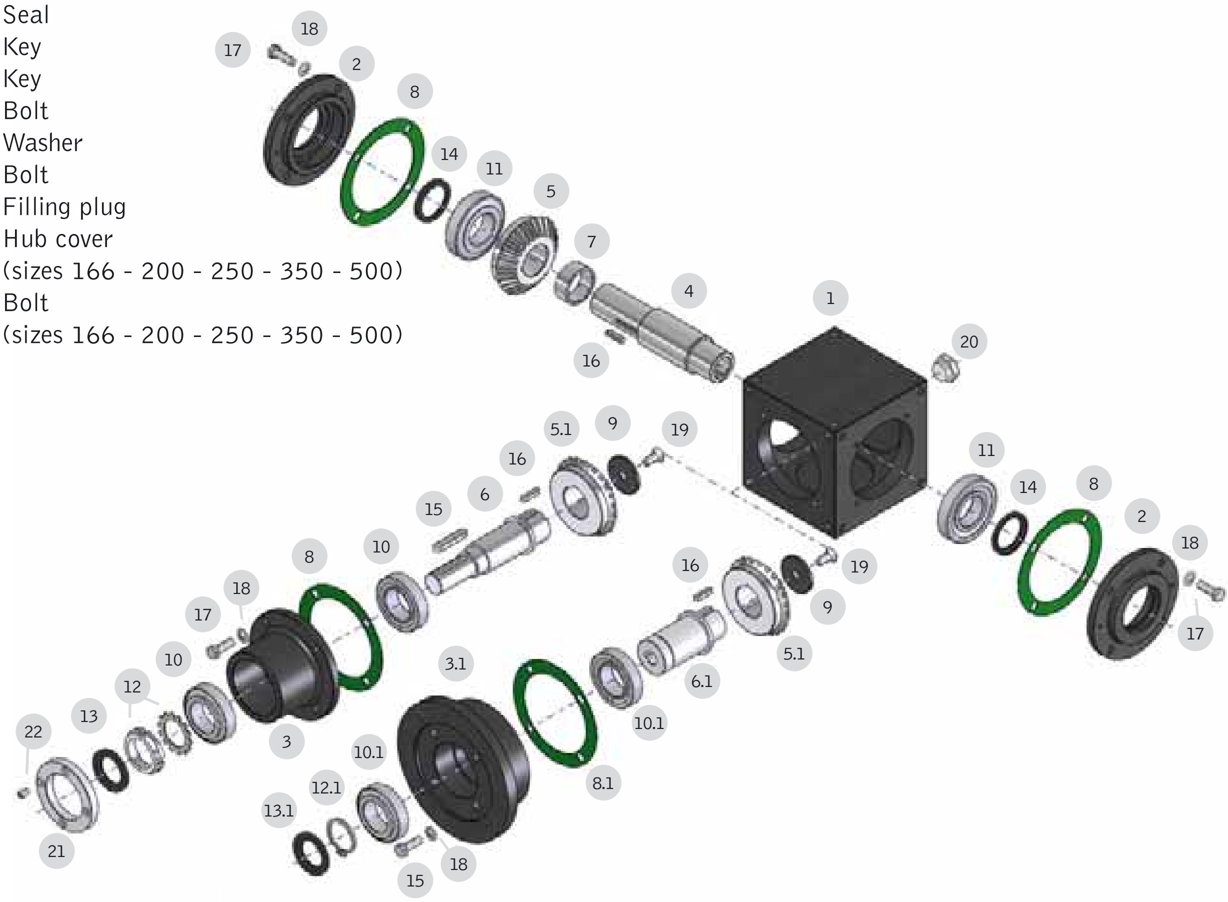
Warranty
The warranty is valid only when the instructions contained in our manual are carefully followed.

ORDERING CODES

RC	86	C1	1/1
model	size	construction model	ratio

Models: RC - RR - RB - RA - RS - RP - RX - RZ - RM* - RIS and motorized

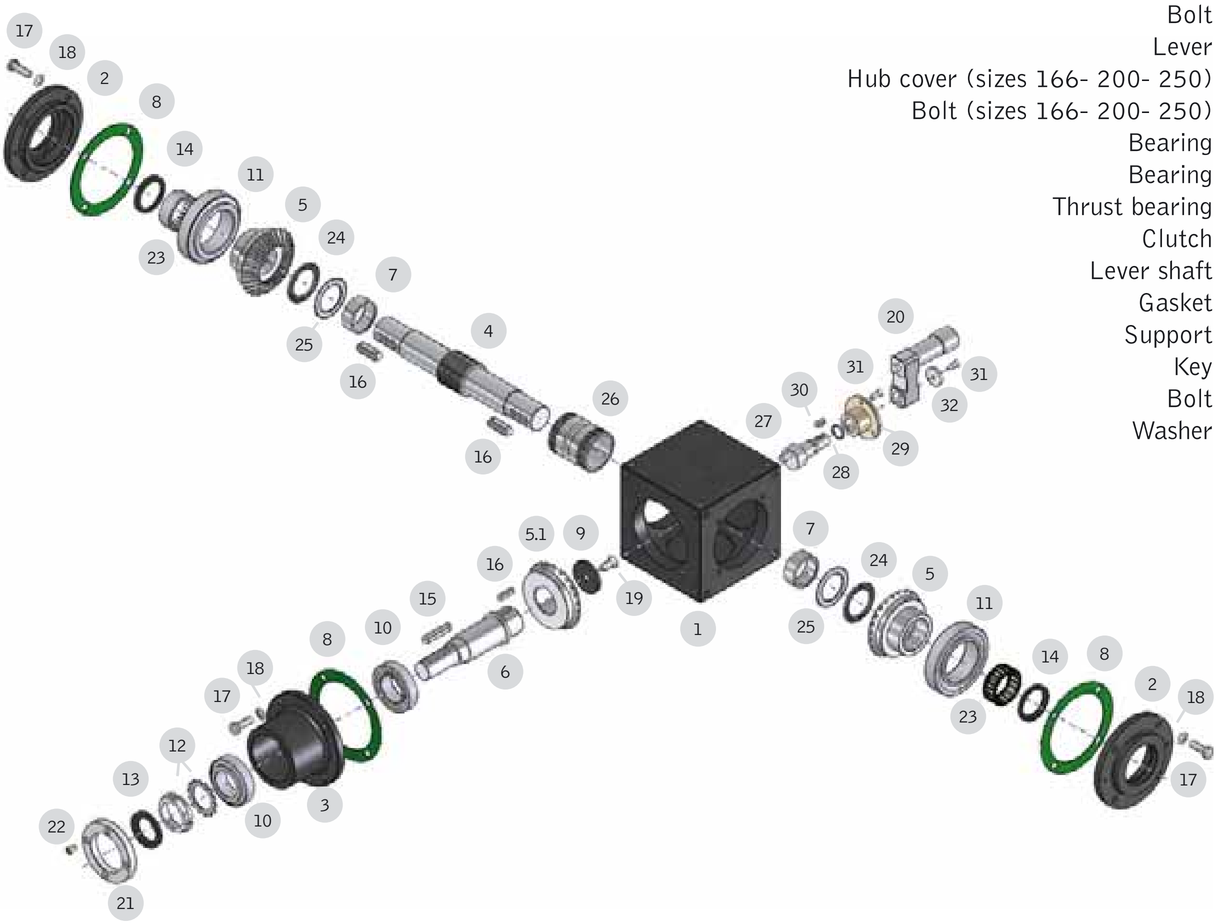
1	Casing
2	Cover
3	Hub
3.1	Motor flange
4	Shaft (hollow-protruding-broached - with shrink disk)
5	Bevel gear
5.1	Bevel pinion
6	Hub shaft
6.1	Drive shaft
7	Spacer
8	Gasket
8.1	Gasket for motorisation
9	Lock washer
10	Bearing
10.1	Bearing for motorisation
11	Bearing
12	Stop ring
12.1	Stop ring for motorisation
13	Seal
13.1	Seal for motorisation
14	Seal
15	Key
16	Key
17	Bolt
18	Washer
19	Bolt
20	Filling plug
21	Hub cover (sizes 166 - 200 - 250 - 350 - 500)
22	Bolt (sizes 166 - 200 - 250 - 350 - 500)



*For the RM model, gear and pinion are inverted

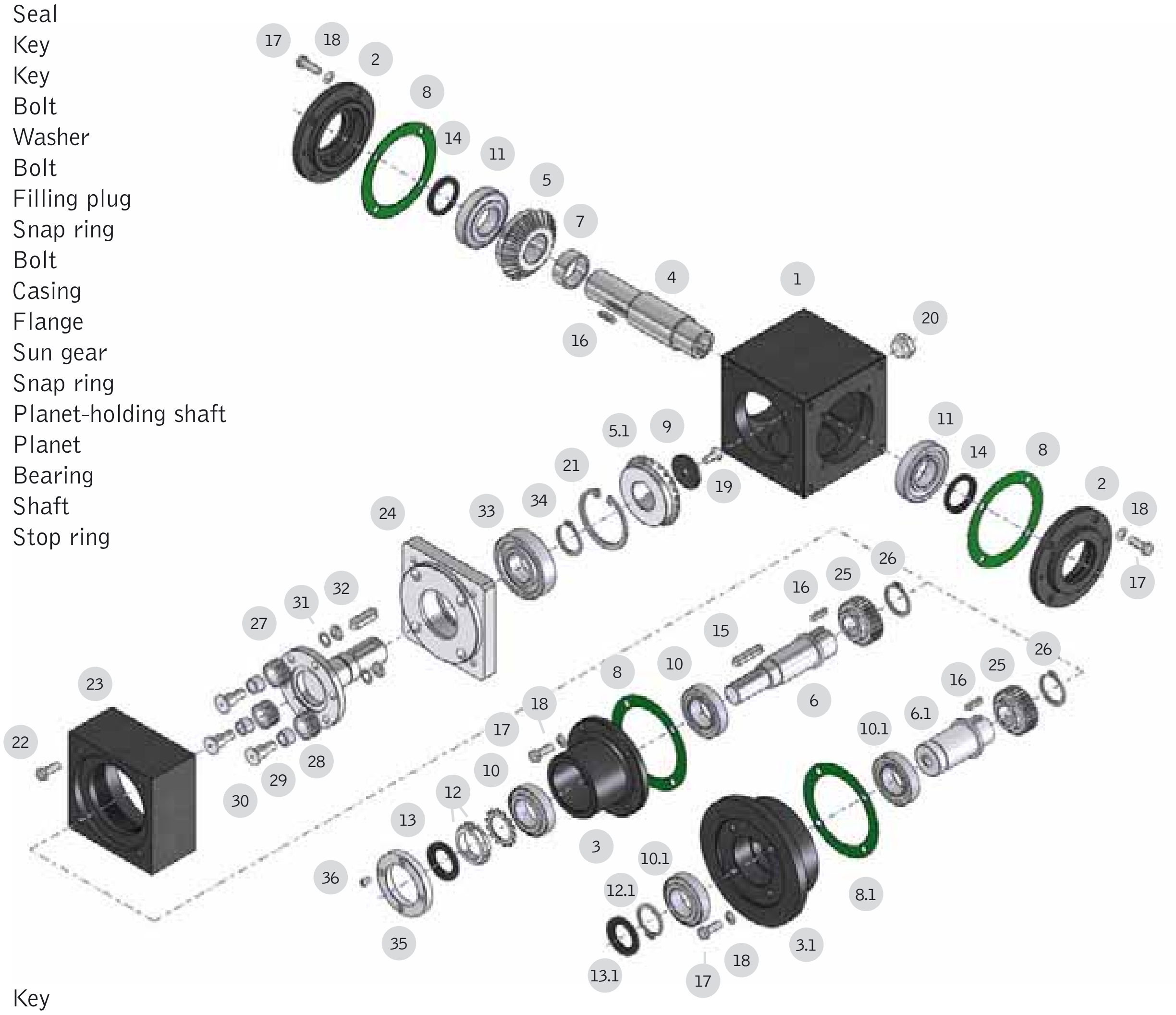
RIS Model

Casing	1
Cover	2
Hub	3
Protruding shaft	4
Bevel gear	5
Bevel pinion	5.1
Hub shaft	6
Spacer	7
Gasket	8
Lock washer	9
Bearing	10
Bearing	11
Stop ring	12
Seal	13
Seal	14
Key	15
Key	16
Bolt	17
Washer	18
Bolt	19
Lever	20
Hub cover (sizes 166- 200- 250)	21
Bolt (sizes 166- 200- 250)	22
Bearing	23
Bearing	24
Thrust bearing	25
Clutch	26
Lever shaft	27
Gasket	28
Support	29
Key	30
Bolt	31
Washer	32



Models: RE - MRE

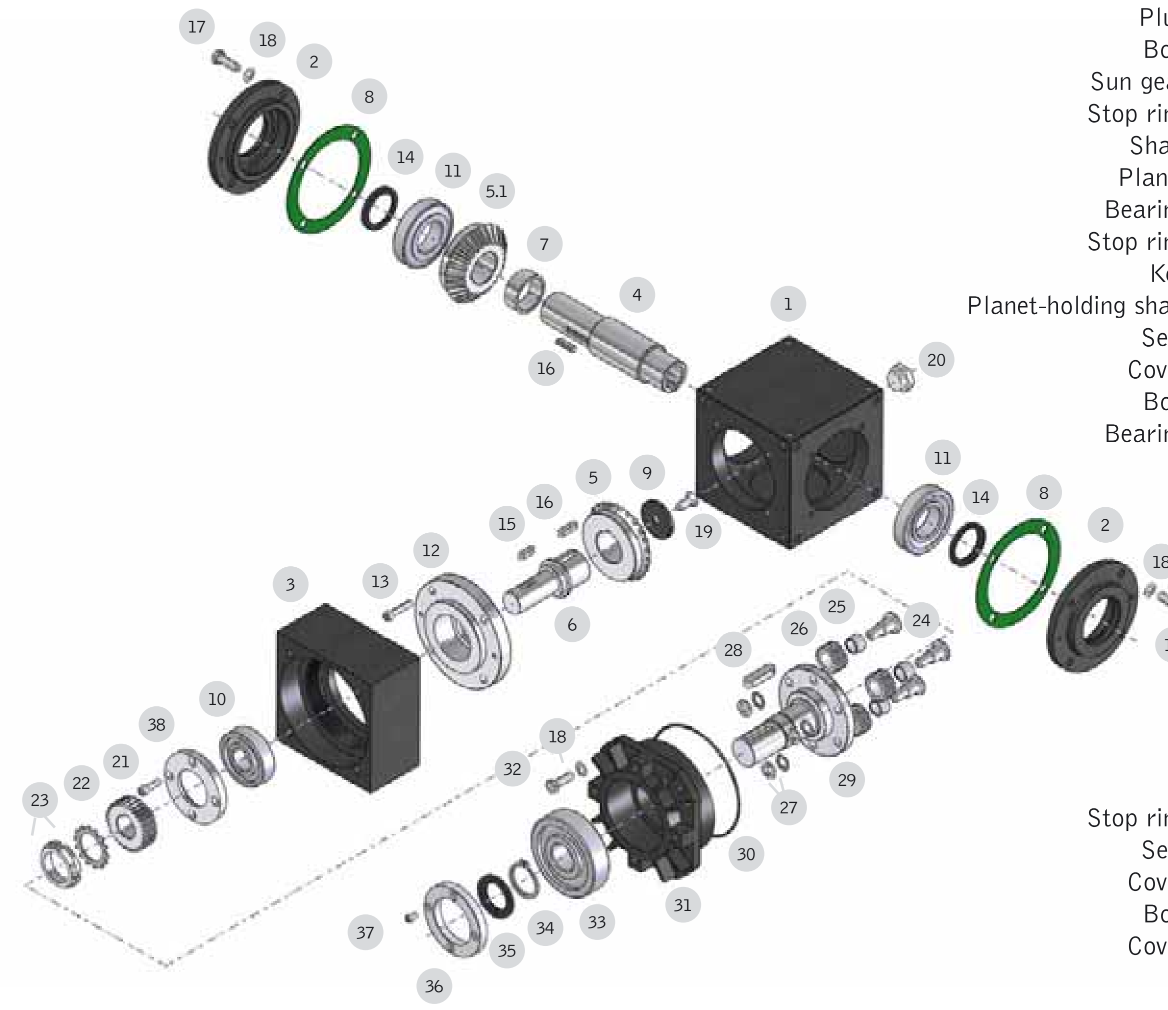
1 Casing
2 Cover
3 Hub
3.1 Motor flange
4 Shaft (hollow-protruding-broached - with shrink disk)
5 Bevel gear
5.1 Bevel pinion
6 Hub shaft
6.1 Drive shaft
7 Spacer
8 Gasket
8.1 Gasket for motorisation
9 Lock washer
10 Bearing
10.1 Bearing for motorisation
11 Bearing
12 Stop ring
12.1 Stop ring for motorisation
13 Seal
13.1 Seal for motorisation
14 Seal
15 Key
16 Key
17 Bolt
18 Washer
19 Bolt
20 Filling plug
21 Snap ring
22 Bolt
23 Casing
24 Flange
25 Sun gear
26 Snap ring
27 Planet-holding shaft
28 Planet
29 Bearing
30 Shaft
31 Stop ring



32 Key
33 Bearing
34 Stop ring
35 Cover (sizes 42 - 55)
36 Bolt (sizes 42 - 55)

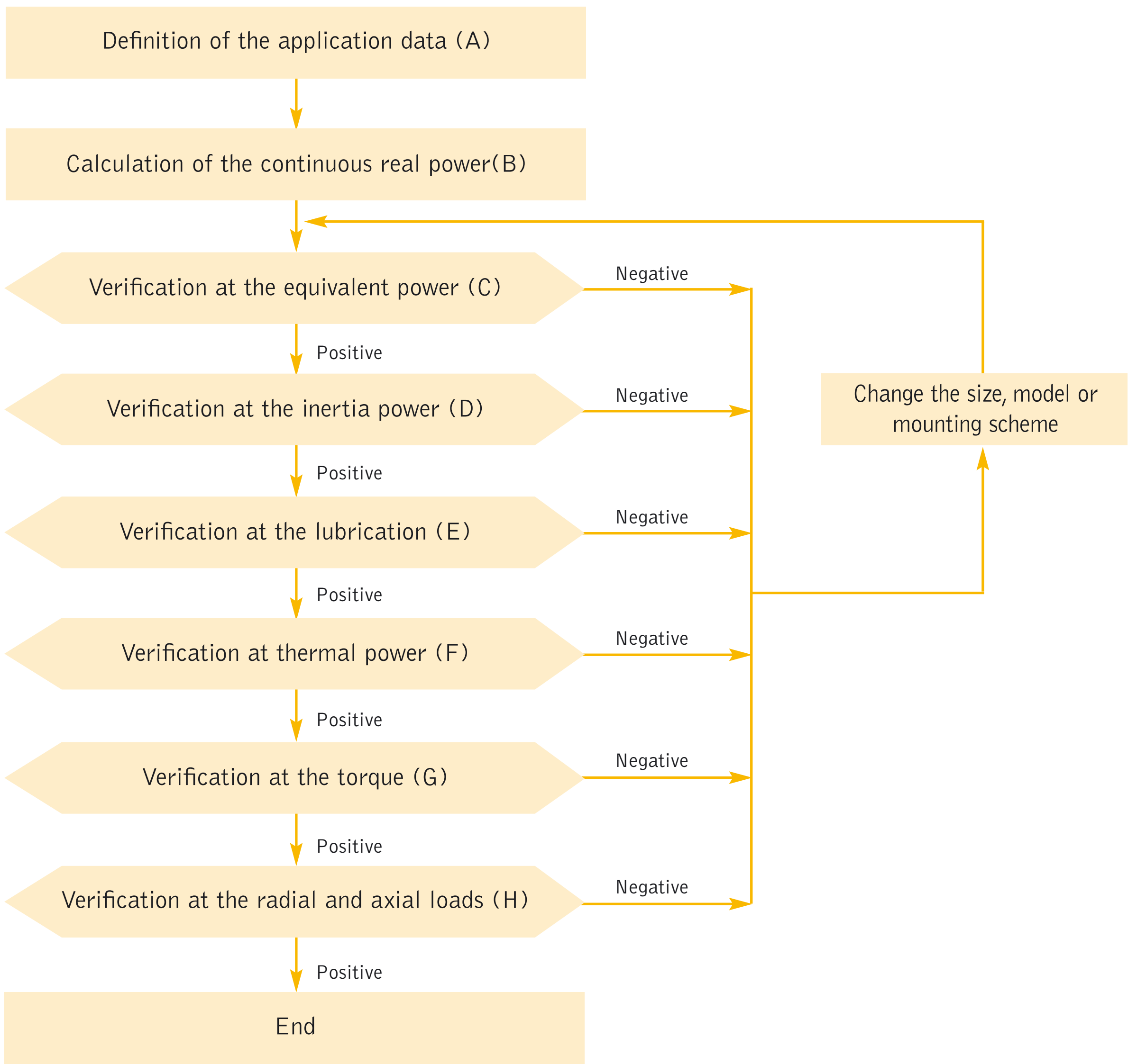
RH Model

Casing	1
Cover	2
Casing	3
Shaft (hollow –protruding- broached – with shrink disk)	4
Bevel gear	5
Bevel pinion	5.1
Shaft	6
Spacer	7
Gasket	8
Lock washer	9
Bearing	10
Bearing	11
Flange	12
Bolt	13
Seal	14
Key	15
Key	16
Bolt	17
Washer	18
Bolt	19
Plug	20
Bolt	21
Sun gear	22
Stop ring	23
Shaft	24
Planet	25
Bearing	26
Stop ring	27
Key	28
Planet-holding shaft	29
Seal	30
Cover	31
Bolt	32
Bearing	33
Stop ring	34
Seal	35
Cover	36
Bolt	37
Cover	38



DIMENSIONING OF THE BEVEL GEARBOX

For a correct dimensioning of bevel gearbox it is necessary to observe the following steps:



A – THE APPLICATION DATA

For a right dimensioning of the bevel gearboxes it is necessary to identify the application data: POWER, TORQUE, AND REVOLUTION SPEED = a P power [kW] is defined as the product between the torque M_t [daNm] and the revolution speed ω [rpm]. The input power (P_i) is equal to the sum of the output power (P_u) and the power dissipated into heat (P_d). The ratio of output power and input power is called running efficiency η of the transmission.

The slow shaft revolution spee ω_L is equal to the fast shaft revolution ω_V multiplied by the reduction ratio i (meant as a fraction). Some useful formulas that link the above variables are shown below

$$P_V = \frac{M_{tv} \bullet \omega_V}{955} \qquad P_L = \frac{M_{tL} \bullet \omega_L}{955} \qquad \omega_L = \omega_V \bullet i \qquad P_i = P_u + P_d = \frac{P_u}{\eta}$$

AMBIENT VARIABLES = these values identify the environment and the operating conditions of the bevel gearbox. Among them: temperature, oxidizing and corrosive factors, working and non-working periods, vibrations, maintenance and cleaning, insertion frequency, expected lifetime etc.

MOUNTING SCHEMES = There are several ways of transferring movement by means of bevel gearboxes. A clear idea on the mounting scheme allows to correctly identify the power flow of the same.

B – THE REAL CONTINUOUS POWER

The first step for the dimensioning of a bevel gear box is to calculate the real continuous power. By means of the formulas indicated at point A the user must calculate the input power P_i according to the scheme parameters. Two calculation criteria can be adopted: using the average parameters calculated on a significant period or adopting the maximum parameters. It is obvious that the second method (the worst case) is much more protective with respect to the average one and it should be used in case you need certainty and reliability.

C – THE POWER TABLES AND THE EQUIVALENT POWER

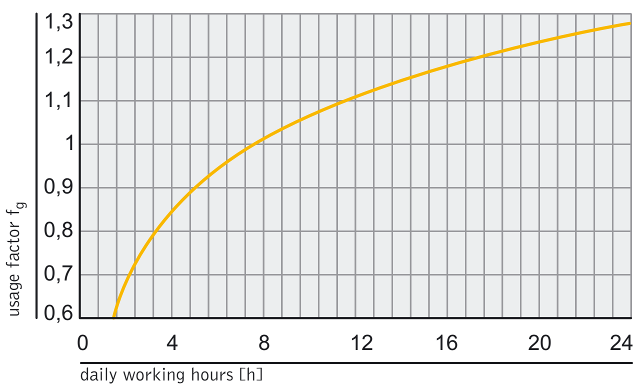
All the values listed in the catalogue refer to a use in standard conditions, that is with a 20° temperature and under a regular running, without shocks for 8 daily working hours. The use under those conditions provides a lifetime of 10.000 hours. For different application conditions the equivalent power P_e should be calculated: it is the power which would be applied in standard conditions in order to have the same thermal exchange and wear effects, which the real load achieves in the real conditions of use. It is therefore advisable to calculate the equivalent load according to the following formula:

$$P_e = P_i \bullet f_g \bullet f_a \bullet f_d$$

It should be remarked that <u>the equivalent power is not the power requested by the speed modulation gearbox:</u> it is and indicator which helps in choosing the most suitable size in order to have higher reliability requisites. The power requested by the application is the input power P_i.

The usage factor f_g

The graph below can be used to calculate the usage factor f_g according to the working hours on a daily basis.



dimensioning

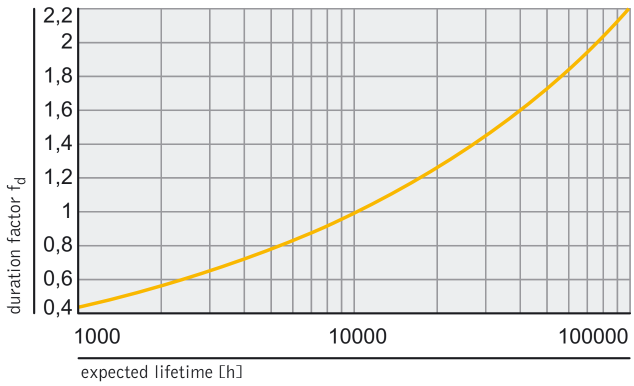
The ambient factor f_a

By means of the following table it is possible to calculate the f_a factor according to the operation conditions.

Type of load	daily working hours [h]:	3	8	24
Light shocks, few insertions, regular movements		0,8	1,0	1,2
Medium shocks, frequent insertions, regular movements		1,0	1,2	1,5
High shocks, many insertions, irregular movements		1,2	1,8	2,4

The duration factor f_d

The duration f_d is obtained according to the theoretical expected lifetime (expressed in hours).



With the equivalent power value P_e and according to the angular speeds and reduction ratio, it is possible to choose, on the descriptive tables the size which presents an input power higher than the one calculated.

D – THE INERTIA POWER

In case of important accelerations and decelerations it is necessary to calculate the inertia power P_J. It is the power necessary to counteract the inertia forces and torques opposed by the system in case of speed changes. First of all it is necessary that the designer calculates the system inertia downstream of the bevel gearbox J_v first reducing them to the slow shaft and than to the fast one. After that the bevel gearbox inertia J_r must be added, which can be taken from the table below, valid for bevel gearboxes with double conical gear, than the total inertia J will be obtained. We remind that the inertia moments are expressed in [kg•m²].

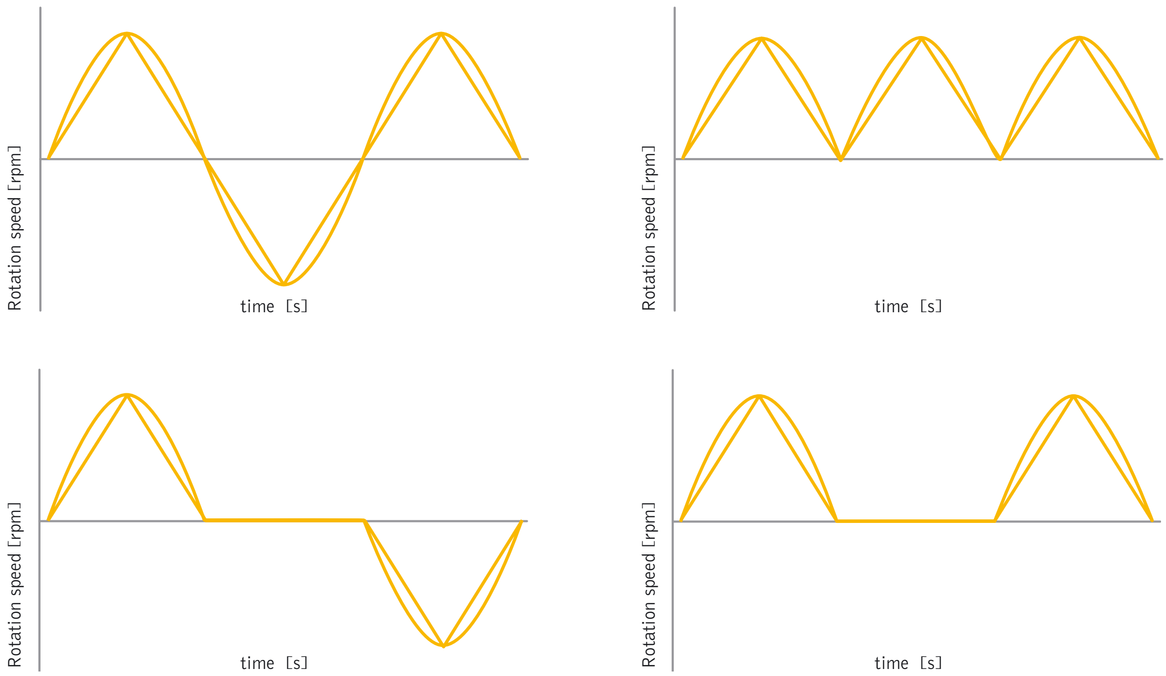
			Ratio				
Size	**Model**		**1/1**	**1/1,5**	**1/2**	**1/3**	**1/4**
54	RC RB RA	[kg•m²]	0,000133	0,000049	0,000026	0,000014	0,000010
	RS RX	[kg•m²]	0,000134	0,000050	0,000027	0,000016	0,000011
86	RC RR RB RA	[kg•m²]	0,000334	0,000122	0,000066	0,000034	0,000024
	RS RP RX RZ RM	[kg•m²]	0,000366	0,000136	0,000074	0,000037	0,000026
110	RC RR RB RA	[kg•m²]	0,000733	0,000270	0,000151	0,000081	0,000059
	RS RP RX RZ RM	[kg•m²]	0,000798	0,000299	0,000168	0,000089	0,000063
134	RC RR RB RA	[kg•m²]	0,002440	0,000887	0,000497	0,000267	0,000197
	RS RP RX RZ RM	[kg•m²]	0,002593	0,000955	0,000535	0,000284	0,000207
166	RC RR RB RA	[kg•m²]	0,010363	0,003609	0,001928	0,000924	0,000618
	RS RP RX RZ RM	[kg•m²]	0,011171	0,003968	0,002130	0,001013	0,000669
200	RC RR RB RA	[kg•m²]	0,024061	0,009037	0,004728	0,002325	0,001576
	RS RP RX RZ RM	[kg•m²]	0,026254	0,010012	0,005276	0,002669	0,001713
250	RC RR RB RA	[kg•m²]	0,083743	0,029423	0,015813	0,007811	0,005348
	RS RP RX RZ RM	[kg•m²]	0,091467	0,032856	0,017744	0,008669	0,005831
350	RC RR RB RA	[kg•m²]	0,740939	0,255341	0,135607	0,060030	0,034340
	RS RP RX RZ RM	[kg•m²]	0,755302	0,261725	0,139198	0,061626	0,035238
500	RC RR RB RA	[kg•m²]	1,704159	0,587284	0,311896	0,138069	0,078982
	RS RP RX RZ RM	[kg•m²]	1,737194	0,601967	0,320155	0,141739	0,081047

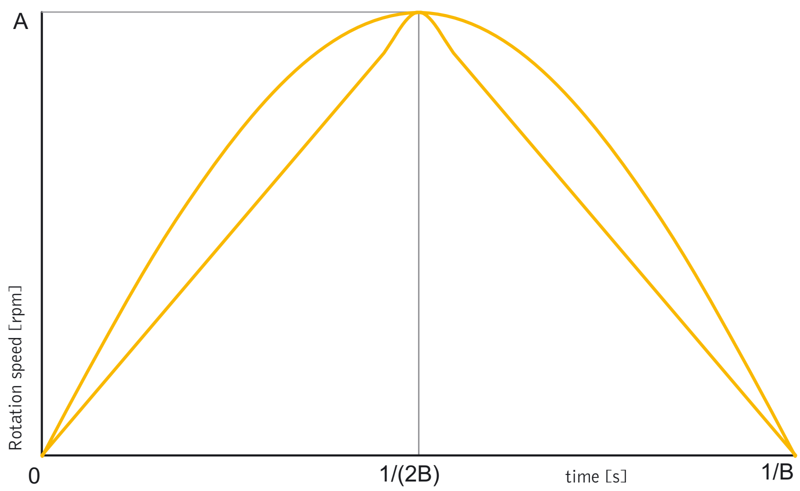
					Ratio			
Size	**Model**		**1/2**	**1/3**	**1/4,5**	**1/6**	**1/9**	**1/12**
32	REC REB	[kg•m²]	-	-	0,003457	0,003067	0,002837	0,002767
	REA RES	[kg•m²]	-	-	0,003525	0,003105	0,002854	0,002777
	RHC RHB RHA	[kg•m²]	0,006230	0,005010	-	-	-	-
	RHS	[kg•m²]	0,006459	0,005163	0,003525	-	-	-
42	REC REB	[kg•m²]	-	-	0,014292	0,012611	0,011607	0,011301
	REA RES	[kg•m²]	-	-	0,014651	0,012813	0,011696	0,011352
	RHC RHB RHA	[kg•m²]	0,26227	0.021046	-	-	-	-
	RHS	[kg•m²]	0,027439	0,021854	0,014651	-	-	-
55	REC REB	[kg•m²]	-	-	0,029678	0,025369	0,022966	0,022217
	REA RES	[kg•m²]	-	-	0,030653	0,025917	0,023310	0,022354
	RHC RHB RHA	[kg•m²]	0,056732	0,044702	-	-	-	-
	RHS	[kg•m²]	0,060022	0,046895	0,030653	-	-	-

Given ω_v the fast revolution speed and α_v the angular acceleration of the fast shaft, the inertia torque which is necessary to counteract is equal to $J \cdot \alpha_v$ and the respective inertia power P_j is equal to $J \cdot \omega_v \cdot \alpha_v$. In case the time curve of the fast shaft speed ω_v can be traced back to one of the four schemes below, linear or sinusoidal, where A is the maximum speed in [rpm] and B is the cycle frequency in [Hz], the calculation of the inertia power in [kW] can be simplified, by taking A and B parameters and by calculating:

$$P_J = \frac{2 \cdot J \cdot A^2 \cdot B}{91188}$$

The power P_j must be added to the equivalent power P_e and a verification of the correctness of the size chosen on the descriptive tables must be carried out. If not correct it will be necessary to change the size and effect new verifications.





E – LUBRICATION

After a first dimensioning according to the power, it is advisable to check whether the only splash lubrication is enough or if a forced lubrication system is necessary. In should be therefore checked, by means of the graph illustrated in the "lubrication" paragraph, whether the average speed of the fast shaft is above or below the border value. In case of speed reaching the border value it will be necessary to contact our technical office. If, in a status of forced lubrication, it is possible to carry out the mounting, it is advisable to calculate the requested lubricant flow-rate Q [l/min.], being known the input power P_i [kW], the running efficiency η, the lubricant specific heat c_p [J/(kg•°C)], the ambient temperature ta and the maximum temperature which can be reached by the bevel gearbox t_r [°C].

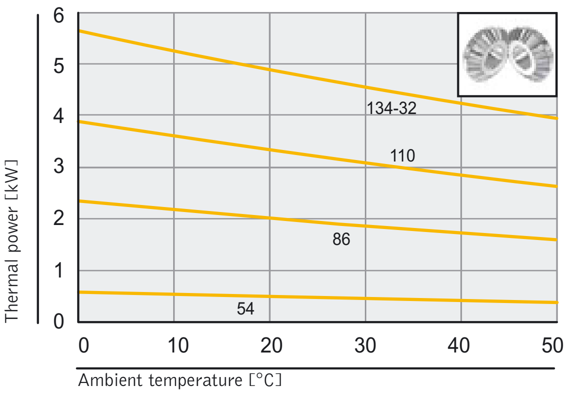
$$Q = \frac{67000 \cdot (1-\eta) \cdot P_i}{c_p \cdot (t_r - t_a)}$$

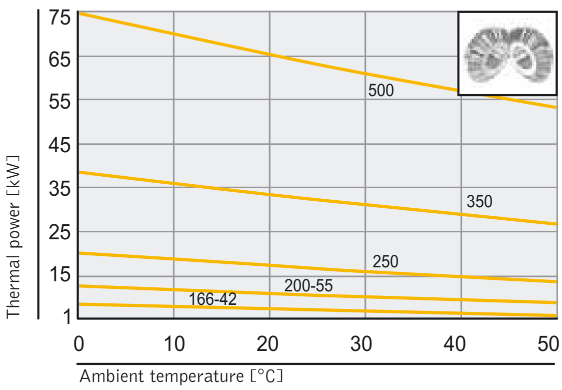
In case it is not possible to provide a forced lubrication system it is necessary to change the size.

F – THE THERMAL POWER

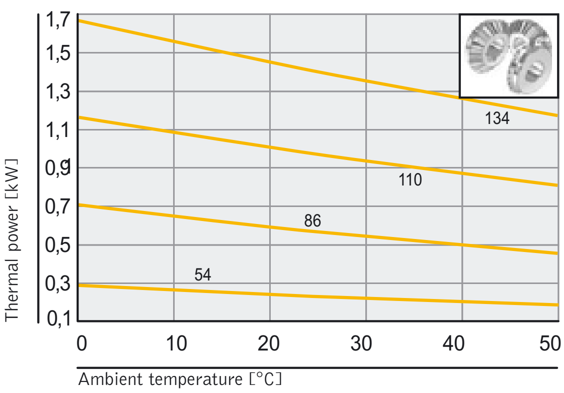
When on the descriptive tables the input power values fall into the coloured area, this means that it is necessary to check the thermal power. This dimension, a function of the bevel gearbox size and of the ambient temperature, indicates the input power establishing a thermal balance with the ambient at the bevel gearbox surface temperature of 90°C. The following graphs show the waves of the thermal power in case of two or three gears transmission.

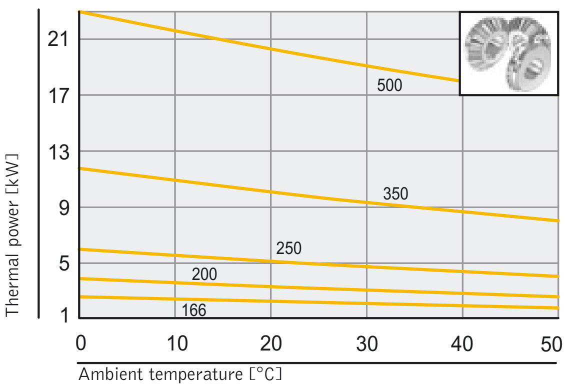
TWO GEARS TRANSMISSION





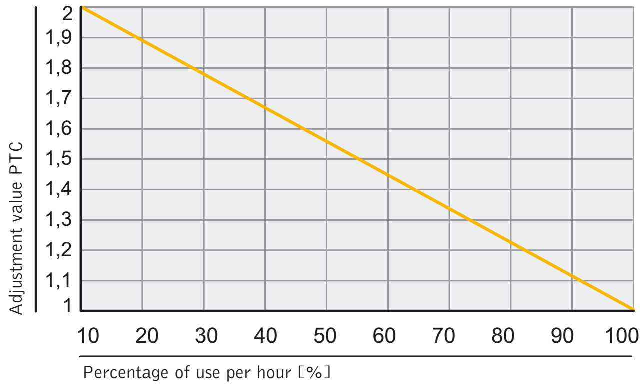
THREE GEARS TRANSMISSION





dimensioning

In case there are non-working times in the bevel gearbox operation, the thermal power can be increased of a factor PTC obtainable from the graph below, where the abscissas is the use percentage as referred to the hour.



In case the thermal power is lower that the requested power Pi, it will be necessary to change the bevel gearbox size or to pass to forced lubrication. For the capacity calculation see paragraph E.

G - THE TORQUE

When one or more bevel gearboxes are mounted in series, it is necessary to check that the torque referred to the common axis does not exceed the value shown in the table below.

Model	Size	54	86	110	134	166	200	250	350	500	32	42	55
RC RA RB	[daNm]	4	9	18	32	77	174	391	1205	5392	-	-	-
RR RM RIS													
RS RP	[daNm]	13	32	41	77	214	391	807	1446	5387	-	-	-
RHA RHB RHC	[daNm]	-	-	-	-	-	-	-	-	-	32	77	174
RHS (1/2 1/3)	[daNm]	-	-	-	-	-	-	-	-	-	77	214	391
RHS (1/4,5)	[daNm]	-	-	-	-	-	-	-	-	-	32	77	174

H- RADIAL AND AXIAL LOADS

The last step is to verify the bevel gearbox strength to radial and axial loads. The border values of said loads are shown on pages 172-175. If the result of such verification is not positive, it will be necessary to change the size.

RC RR RB RA RS RP RX RZ RIS

Ratio 1/1

Fast shaft revolution speed ω_v [rpm]	Fast shaft revolution speed ω_L [rpm]	54 P_i [kW]	54 M_{tL} [daNm]	86 P_i [kW]	86 M_{tL} [daNm]	110 P_i [kW]	110 M_{tL} [daNm]	134 P_i [kW]	134 M_{tL} [daNm]	166 P_i [kW]	166 M_{tL} [daNm]	200 P_i [kW]	200 M_{tL} [daNm]	250 P_i [kW]	250 M_{tL} [daNm]	350 P_i [kW]	350 M_{tL} [daNm]	500 P_i [kW]	500 M_{tL} [daNm]
3000	3000	4,14	1,26	19,4	5,92	29,4	8,98	53,6	16,2	148	44,7	256	76,6	453	135	1184	354	-	-
1500	1500	2,20	1,34	10,4	6,35	15,7	9,59	28,7	17,3	80,3	48,5	140	83,7	249	149	660	394	1650	945
1000	1000	1,80	1,65	7,57	6,94	10,9	9,99	20,0	18,1	56,3	51,0	98,5	88,4	176	158	469	421	1266	1088
750	750	1,45	1,77	6,12	7,48	8,84	10,8	16,2	19,5	45,8	55,4	80,3	96,1	143	171	385	460	1044	1196
500	500	1,07	1,96	4,51	8,26	6,53	11,9	12,0	21,7	34,0	61,6	59,8	107	107	192	290	520	790	1358
250	250	0,62	2,27	2,66	9,75	3,86	14,1	7,15	25,9	20,3	73,6	35,8	128	64,6	231	176	631	483	1660
100	100	0,30	2,75	1,31	12,0	1,90	17,4	3,54	32,1	10,1	91,6	17,9	160	32,4	290	89,0	798	246	2114
50	50	0,18	3,30	0,76	13,9	1,11	20,3	2,06	37,3	5,91	107	10,4	186	19,0	341	52,5	942	146	2510

RC RR RB RA RS RP RM RX RZ

Ratio 1/1,5

Fast shaft revolution speed ω_v [rpm]	Fast shaft revolution speed ω_L [rpm]	54 P_i [kW]	54 M_{tL} [daNm]	86 P_i [kW]	86 M_{tL} [daNm]	110 P_i [kW]	110 M_{tL} [daNm]	134 P_i [kW]	134 M_{tL} [daNm]	166 P_i [kW]	166 M_{tL} [daNm]	200 P_i [kW]	200 M_{tL} [daNm]	250 P_i [kW]	250 M_{tL} [daNm]	350 P_i [kW]	350 M_{tL} [daNm]	500 P_i [kW]	500 M_{tL} [daNm]
3000	2000	2,46	1,12	10,3	4,72	13,0	5,95	28,5	12,9	88,1	39,9	159	71,3	238	106	610	273	-	-
1500	1000	1,28	1,17	5,54	5,07	6,96	6,38	15,3	13,8	47,2	42,8	85,7	76,9	129	115	335	300	907	779
1000	667	0,88	1,21	4,15	5,70	4,91	6,75	10,8	14,6	32,9	44,7	60,0	80,7	90,7	122	237	319	690	890
750	500	0,71	1,30	3,30	6,05	3,96	7,26	8,78	15,9	26,7	48,4	48,7	87,4	73,8	132	193	346	566	973
500	333	0,52	1,43	2,30	6,32	2,91	8,00	6,48	17,6	19,7	53,6	36,2	97,4	54,9	147	145	390	425	1096
250	167	0,30	1,65	1,41	7,75	1,71	9,40	3,82	20,7	11,7	63,6	21,5	115	32,7	176	87,1	469	258	1330
100	66,7	0,15	2,06	0,65	8,93	0,84	11,5	1,88	25,5	5,80	78,9	10,6	142	16,3	219	43,7	588	130	1675
50	33,3	0,08	2,20	0,38	10,4	0,49	13,4	1,09	29,6	3,38	91,9	6,24	168	9,54	256	25,6	689	76,8	1980

RC RR RB RA RS RP RX RZ RIS

Ratio 1/2

Fast shaft revolution speed ω_v [rpm]	Fast shaft revolution speed ω_L [rpm]	54 P_i [kW]	54 M_{tL} [daNm]	86 P_i [kW]	86 M_{tL} [daNm]	110 P_i [kW]	110 M_{tL} [daNm]	134 P_i [kW]	134 M_{tL} [daNm]	166 P_i [kW]	166 M_{tL} [daNm]	200 P_i [kW]	200 M_{tL} [daNm]	250 P_i [kW]	250 M_{tL} [daNm]	350 P_i [kW]	350 M_{tL} [daNm]	500 P_i [kW]	500 M_{tL} [daNm]
3000	1500	1,53	0,93	6,04	3,69	8,20	5,01	20,7	12,5	43,8	26,4	91,2	54,5	170	101	538	321	-	-
1500	750	0,80	0,97	3,20	3,91	4,35	5,31	11,0	13,3	23,5	28,4	49,3	59,0	91,5	109	293	350	588	674
1000	500	0,57	1,04	2,41	4,41	3,32	6,08	8,87	16,0	18,9	34,2	34,8	62,4	63,9	114	206	369	457	785
750	375	0,45	1,10	1,94	4,74	2,67	6,52	7,15	17,2	15,3	37,0	28,2	67,5	51,9	124	168	402	373	855
500	250	0,34	1,24	1,42	5,20	1,96	7,18	5,27	19,1	11,3	41,0	20,8	74,6	38,5	138	125	448	279	960
250	125	0,20	1,46	0,83	6,08	1,15	8,43	3,10	22,5	6,67	48,4	12,3	88,3	22,9	164	75,0	538	168	1155
100	50	0,09	1,65	0,41	7,51	0,57	10,4	1,52	27,5	3,28	59,5	6,09	109	11,4	204	37,4	671	84,6	1454
50	25	0,05	1,83	0,24	8,80	0,33	12,1	0,89	32,2	1,91	69,3	3,55	127	6,61	237	21,9	786	49,7	1710

In case the bevel gearbox is used as multiplier, and for RM models, in order to obtain the output torque value (as referred to the fast shaft) it is necessary to multiply the value on the table by the reduction ratio (meant as a fraction).

RHC RHB RHA RHS

Ratio 1/2

Fast shaft revolution speed ω_V [rpm]	Fast shaft revolution speed ω_L [rpm]	32 P_i [kW]	32 M_{tL} [daNm]	42 P_i [kW]	42 M_{tL} daNm]	55 P_i [kW]	55 M_{tL} [daNm]
2000	1000	11,7	10,0	31,1	26,7	46,0	39,5
1500	750	10,0	11,4	24,2	27,7	36,2	41,4
1000	500	7,15	12,3	18,0	30,9	26,5	45,5
700	350	5,54	13,6	13,5	33,2	19,6	48,1
500	250	4,35	14,9	10,0	34,4	15,2	52,2
300	150	3,02	17,3	7,40	42,4	10,2	58,4
100	50	1,37	23,5	2,78	47,8	4,04	69,4
50	25	0,74	25,4	1,52	52,2	2,26	77,6

RC RR RB RA RS RP RX RZ

Ratio 1/3

Fast shaft revolution speed ω_V [rpm]	Fast shaft revolution speed ω_L [rpm]	54 P_i [kW]	54 M_{tL} [daNm]	86 P_i [kW]	86 M_{tL} [daNm]	110 P_i [kW]	110 M_{tL} [daNm]	134 P_i [kW]	134 M_{tL} [daNm]	166 P_i [kW]	166 M_{tL} [daNm]	200 P_i [kW]	200 M_{tL} [daNm]	250 P_i [kW]	250 M_{tL} [daNm]	350 P_i [kW]	350 M_{tL} [daNm]	500 P_i [kW]	500 M_{tL} [daNm]
3000	1000	0,74	0,67	2,79	2,55	4,09	3,74	9,19	8,33	24,7	22,4	50,1	44,9	76,5	68,9	289	259	-	-
1500	500	0,39	0,71	1,47	2,96	2,15	3,94	4,86	8,81	13,1	23,7	26,8	48,1	41,3	74,1	155	278	300	515
1000	333	0,32	0,88	1,30	3,57	1,57	4,31	4,27	11,6	10,2	27,7	22,4	60,3	34,5	92,9	108	290	225	578
750	250	0,25	0,91	1,14	4,18	1,26	4,62	3,50	12,7	8,27	30,0	18,1	64,9	28,0	100	88,4	317	183	630
500	166	0,19	1,04	0,82	4,51	0,93	5,11	2,56	13,9	6,09	33,1	13,3	71,6	20,6	110	65,5	352	136	700
250	83	0,11	1,21	0,46	5,06	0,54	5,94	1,50	16,3	3,58	38,9	7,86	84,6	12,2	131	39,0	420	81,0	835
100	33	0,06	1,37	0,21	5,77	0,26	7,15	0,74	20,1	1,75	47,6	3,87	104	6,01	161	19,3	519	40,5	1044
50	16,7	0,03	1,65	0,12	6,60	0,15	8,25	0,42	22,8	1,02	55,5	2,24	120	3,50	188	11,2	603	23,8	1227

RHC RHB RHA RHS

Ratio 1/3

Fast shaft revolution speed ω_V [rpm]	Fast shaft revolution speed ω_L [rpm]	32 P_i [kW]	32 M_{tL} [daNm]	42 P_i [kW]	42 M_{tL} [daNm]	55 P_i [kW]	55 M_{tL} [daNm]
3000	1000	13,3	11,4	-	-	-	-
2000	667	9,69	12,4	22,4	28,8	32,9	42,3
1500	500	7,72	13,2	18,0	30,9	26,5	45,6
1000	333	5,81	14,9	13,5	34,8	20,0	51,6
700	233	4,21	15,5	9,82	36,2	14,4	53,1
500	166	3,26	16,7	7,63	39,2	11,1	57,1
300	100	2,27	19,5	5,17	44,4	7,50	64,4
100	33	0,95	24,5	1,94	50,0	3,01	77,7
50	16,7	0,54	27,8	1,05	54,0	1,61	82,5

RC RR RB RA RS RP RX RZ

Ratio 1/4

Fast shaft revolution speed ω_v [rpm]	Fast shaft revolution speed ω_L [rpm]	54 P_i [kW]	54 M_{tL} [daNm]	86 P_i [kW]	86 M_{tL} [daNm]	110 P_i [kW]	110 M_{tL} [daNm]	134 P_i [kW]	134 M_{tL} [daNm]	166 P_i [kW]	166 M_{tL} [daNm]	200 P_i [kW]	200 M_{tL} [daNm]	250 P_i [kW]	250 M_{tL} [daNm]	350 P_i [kW]	350 M_{tL} [daNm]	500 P_i [kW]	500 M_{tL} [daNm]
3000	750	0,45	0,55	1,89	2,31	2,73	3,33	6,37	7,70	12,2	14,7	30,8	36,8	45,3	54,2	189	226	-	-
1500	375	0,24	0,58	1,00	2,44	1,43	3,49	3,36	8,12	6,49	15,7	16,4	39,2	24,2	57,9	100	239	155	355
1000	250	0,21	0,77	0,89	3,26	1,22	4,47	2,86	10,3	5,54	20,1	13,0	46,6	20,8	74,6	70,2	252	144	496
750	188	0,19	0,92	0,73	3,56	0,98	4,79	2,30	11,1	4,46	21,5	10,5	50,2	16,7	79,9	56,8	271	117	536
500	125	0,14	1,02	0,54	3,96	0,71	5,20	1,68	12,1	3,27	23,7	7,73	55,5	12,3	88,3	42,0	301	87,0	600
250	62,5	0,08	1,17	0,31	4,54	0,42	6,16	0,98	14,2	1,92	27,8	4,53	65,0	7,26	104	24,9	357	51,7	711
100	25	0,04	1,46	0,15	5,50	0,20	7,33	0,48	17,4	0,94	34,1	2,22	79,7	3,57	128	12,3	441	25,6	880
50	12,5	0,02	1,68	0,09	6,60	0,12	8,80	0,28	20,3	0,55	39,9	1,30	93,3	2,08	149	7,16	514	14,9	1024

RHS

Ratio 1/4,5

Fast shaft revolution speed ω_v [rpm]	Fast shaft revolution speed ω_L [rpm]	32 P_i [kW]	32 M_{tL} [daNm]	42 P_i [kW]	42 M_{tL} [daNm]	55 P_i [kW]	55 M_{tL} [daNm]
3000	667	9,69	12,4	22,4	28,8	-	-
2000	444	7,07	13,6	16,5	31,9	24,2	46,8
1500	333	5,81	14,9	13,5	34,8	20,0	51,6
1000	222	4,02	15,5	9,70	37,5	13,9	53,8
700	156	3,10	17,1	7,29	40,1	10,4	57,3
500	111	2,35	18,2	5,54	42,9	8,05	62,3
300	66,7	1,65	21,3	3,57	46,0	5,21	67,1
100	22,2	0,65	25,1	1,34	51,8	2,37	91,7
50	11,1	0,44	34,0	0,84	65,0	1,31	101

REC REB REA RES

Ratio 1/4,5

Fast shaft revolution speed ω_v [rpm]	Fast shaft revolution speed ω_L [rpm]	32 P_i [kW]	32 M_{tL} [daNm]	42 P_i [kW]	42 M_{tL} [daNm]	55 P_i [kW]	55 M_{tL} [daNm]
3000	667	11,3	14,5	29,6	38,1	43,7	56,3
2000	444	8,46	16,3	21,3	41,1	31,3	60,5
1500	333	6,82	17,5	17,1	44,0	25,2	64,9
1000	222	5,00	19,3	12,9	49,8	19,2	73,4
700	156	3,81	21,0	9,30	51,3	13,7	75,6
500	111	2,94	22,6	7,20	55,6	10,6	82,0
300	66,7	1,97	25,3	4,90	63,1	7,12	91,5
100	22,2	0,83	32,1	1,90	73,4	2,81	108
50	11,1	0,42	32,4	1,00	77,3	1,52	116

REC REB REA RES

Ratio 1/6							
		32		42		55	
Fast shaft revolution speed ω_V [rpm]	Fast shaft revolution speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
3000	500	9,33	16,0	19,8	34,0	36,6	62,9
2000	333	6,88	17,7	14,7	37,8	27,1	69,8
1500	250	5,54	19,0	11,8	40,5	21,8	74,9
1000	167	4,06	20,9	8,73	45,0	16,1	83,1
700	117	3,08	22,7	6,64	48,9	12,2	90,0
500	83,3	2,37	24,3	5,13	52,8	9,52	97,9
300	50	1,60	27,5	3,45	59,3	6,41	110
100	16,7	0,64	33,0	1,38	71,2	2,56	132
50	8,33	0,34	34,8	0,73	75,1	1,36	139

REC REB REA RES

Ratio 1/9							
		32		42		55	
Fast shaft revolution speed ω_V [rpm]	Fast shaft revolution speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
3000	333	4,49	11,5	10,7	27,5	23,5	60,5
2000	222	3,36	12,9	7,96	30,7	17,3	66,8
1500	167	2,69	13,8	6,41	33,0	14,0	72,1
1000	111	1,96	15,1	4,69	36,3	10,3	79,7
700	77,8	1,49	16,4	3,56	39,3	7,83	86,6
500	55,6	1,14	17,6	2,74	42,3	6,05	93,4
300	33,3	0,77	19,8	1,84	47,4	4,07	104
100	11,1	0,30	23,2	0,75	58,0	1,62	125
50	5,56	0,16	24,7	0,39	60,2	0,86	132

REC REB REA RES

Ratio 1/12							
		32		42		55	
Fast shaft revolution speed ω_V [rpm]	Fast shaft revolution speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
3000	250	3,01	10,3	5,83	20,0	13,6	46,7
2000	167	2,21	11,3	4,28	22,0	10,1	52,0
1500	125	1,76	12,1	3,44	23,6	8,13	55,9
1000	83,3	1,29	13,3	2,51	25,9	5,94	61,3
700	58,3	0,97	14,3	1,90	28,0	4,51	66,5
500	41,7	0,75	15,4	1,46	30,0	3,48	71,6
300	25	0,50	17,1	0,98	33,6	2,33	80,1
100	8,33	0,21	21,6	0,38	39,2	0,93	96,0
50	4,17	0,11	22,6	0,20	41,1	0,49	100

NIPLOY treatment

For applications in oxidizing environments, it is possible to protect some bevel gearbox components which do not undergo any sliding, by means of a chemical nickel treatment, the so-called Niploy. It creates a non permanent surface coating on casings and covers.

The stainless steel series

For applications where a permanent resistance to oxidizing is necessary, it is possible to supply the components in stainless steel. Sizes 86, 110 and 134 foresee a model in AISI 316, as a standard production, for all components: shafts, covers, bolts, casings, and motor flanges; the stainless steel series can be applied in the sea environment without any oxidizing problems. It is possible to supply all the remaining dimensions in AISI 304 or 316 steel as special components. For further information see pages 226-229.

NORMS

ATEX directive (94/9/CE)

The 94/9/CE directive is better known as the "ATEX directive". All UNIMEC's products may be classified as "components" according to the definition quoted in art.1 par.3 c), and therefore they do not require an ATEX mark.
A conformity declaration in accordance to what stated in art.8 par.3 can be supplied upon end user's request, subject to the filling up of a questionnaire with the indication of the working parameters.

Machinery directive (98/37/CE)

The 98/37/CE directive is better known as the "Machinery directive". UNIMEC's components are included in the products categories which do not need to affix the CE mark, as they are "intended to be incorporated or assembled with other machinery" (art.4 par.2). Upon end user's request a manufacturer declaration can be supplied in accordance to what is foreseen at Annex II, point B. The new machine directory (06/42/CE) will be acknowledged by 29/12/2009. UNIMEC guarantees that every new duty in mechanical transmission will be followed by such date.

ROHS directive (02/95/CE)

The 02/95/CE directive is better known as the "ROHS directive". All UNIMEC's suppliers of electromechanical equipments have issued a conformity certification to the above norms for their products. A copy of said certificates can be supplied upon final user's request.

REACH directive (06/121/CE)

The 06/121/CE is better known as "REACH" directive and applies as the rule CE 1907/2006. UNIMEC products present only inside lubricants as "substances", so being disciplined by art. 7 of above mentioned rule. By art. 7 par. 1 b) UNIMEC declares that its products are not subjected to any declaration or registration because the substances in them are not "to be lost in normal and reasonable previewed usage conditions"; in facts lubricant losses are typical of malfunctions or heavy anomalies. By art. 33 of the rule CE 1907/2006, UNIMEC declares that inside its products there aren't substances identified by art. 57 in percentage to be dangerous.

UNI EN ISO 9001:2000 norm

UNIMEC has always considered the company's quality system management as a very important subject. That is why, since the year 1996, UNIMEC is able to show its UNI EN ISO 9001 certification, at the beginning in accordance to the 1994 norms and now meeting the requirements of the version published in the year 2000. 13 years of company's quality, certified by UKAS, the world's most accredited certification body, take shape into an organization which is efficient at each stage of the working process. In date 31/10/2008 the new version of this norm was published. UNIMEC will evaluate every news reported in this revision.

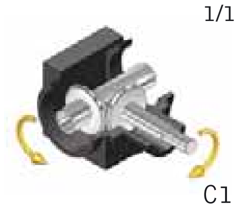
UKAS QUALITY MANAGEMENT

Painting

Our products are all painted in color RAL 5015 blue. An oven-dry system enables the products to have a perfect adhesivity. Different colors as well as epoxidic paints are available.

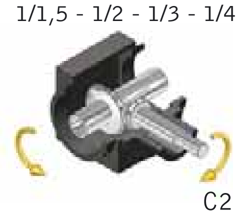
Basic constructive forms

ratio:
1/1

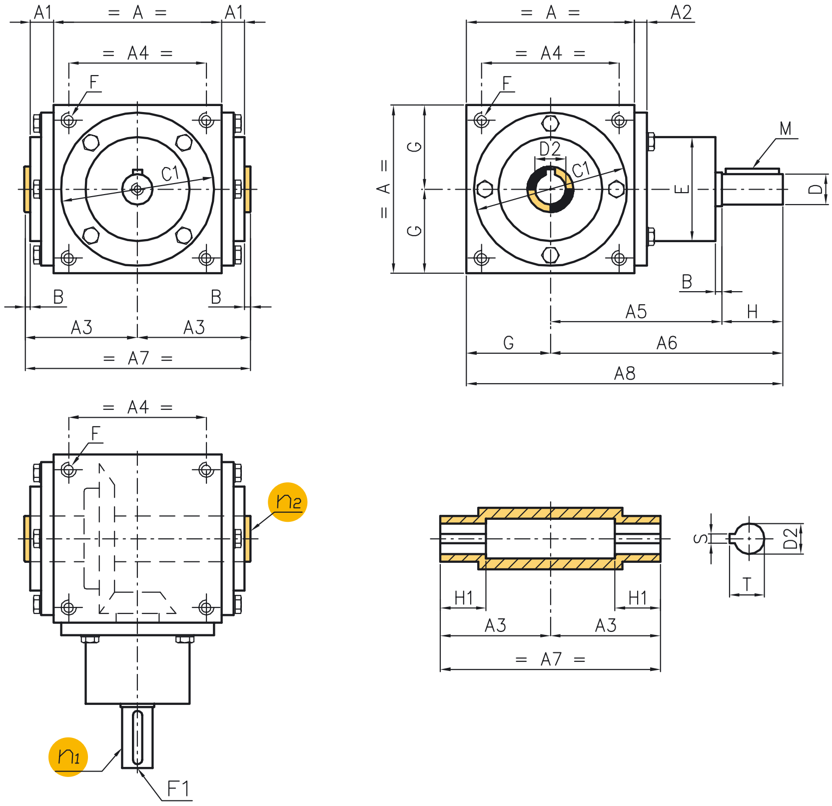


C1

ratio:
1/1,5 - 1/2 - 1/3 - 1/4

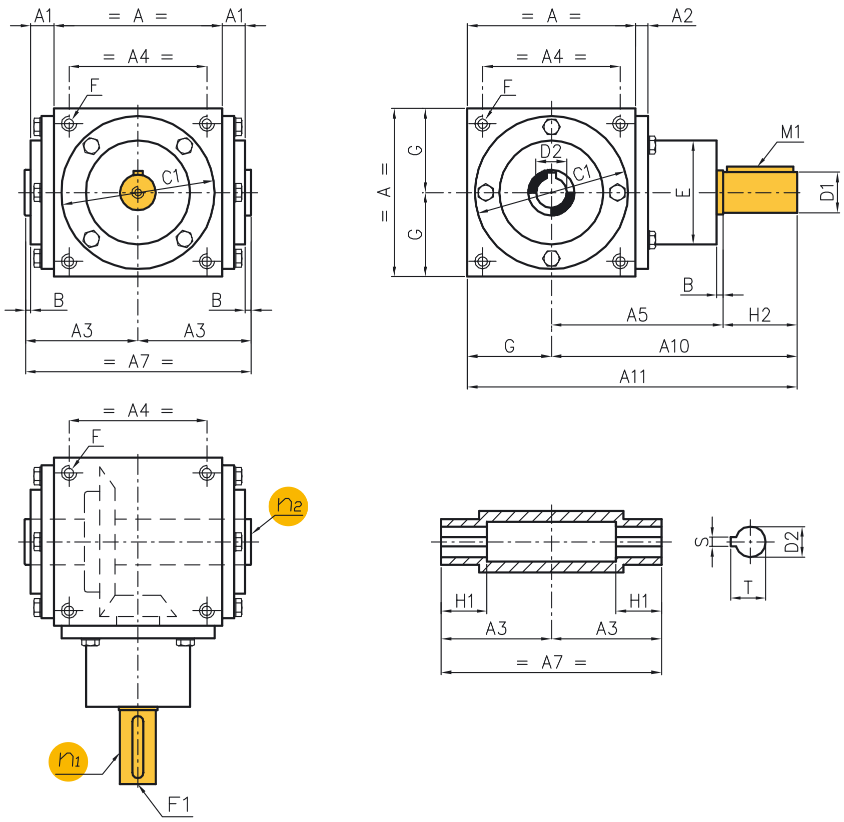


C2



Hollow shaft bevel gearbox RC									
		XRC Models*							
Size	**54**	**86**	**110**	**134**	**166**	**200**	**250**	**350**	**500**
A	54	86	110	134	166	200	250	350	500
A1	8,5	15	15	18	21	23	22	30	35
A2	10	10	8	9	11	11	11	15	20
A3	37	60	72	87	106	125	150	210	295
A4	44	70	90	114	144	174	216	320	450
A5	72	84	110	132	152	182	218	330	415
A6	95	114	150	182	217	267	318	450	585
A7	74	120	144	174	212	250	300	420	590
A8	122	157	205	249	300	367	443	625	835
B	1,5	2	2	2	2	2	3	5	10
C1 Ø f7	53	84	100	122	156	185	230	345	485
D Ø h7	11	16	20	24	32	42	55	65	120
D2 Ø H7	12	16	20	24	32	42	55	80	120
E Ø	52,8	59	68	80	107	120	152	240	320
F	M4x12	M8x20	M10x25	M10x25	M12x30	M14x35	M16x40	M20x60	M30x80
F1	M4x10	M6x12	M8x20	M8x20	M10x25	M10x25	M12x25	M12x25	M20x50
G	27	43	55	67	83	100	125	175	250
H	23	30	40	50	65	85	100	120	170
H1	22	30	30	35	45	50	55	65	100
M	4x4x20	5x5x25	6x6x35	8x7x45	10x8x60	12x8x80	16x10x90	18x11x110	32x18x150
S	4	5	6	8	10	12	16	22	32
T	13,8	18,3	22,8	27,3	35,3	45,3	59,3	85,4	127,4

* XRC model: stainless steel version



Basic constructive forms

ratio:
1/1

C1

ratio:
1/1,5 - 1/2 - 1/3 - 1/4

C2

Hollow shaft bevel gearbox with reinforced hub shaft RR

	XRR Models*							
Size	**86**	**110**	**134**	**166**	**200**	**250**	**350**	**500**
A	86	110	134	166	200	250	350	500
A1	15	15	18	21	23	22	30	35
A2	10	8	9	11	11	11	15	20
A3	60	72	87	106	125	150	210	295
A4	70	90	114	144	174	216	320	450
A5	84	110	132	152	182	218	330	415
A7	120	144	174	212	250	300	420	590
A10	134	165	197	242	292	358	500	625
A11	177	220	264	325	392	483	675	875
B	2	2	2	2	2	3	5	10
C1 Ø f7	84	100	122	156	185	230	345	485
D1 Ø h7	24	26	32	45	55	70	85	140
D2 Ø H7	16	20	24	32	42	55	80	120
E Ø	59	68	80	107	120	152	240	320
F	M8x20	M10x25	M10x25	M12x30	M14x35	M16x40	M20x60	M30x80
F1	M6x12	M8x20	M8x20	M10x25	M10x25	M12x25	M12x25	M20x50
G	43	55	67	83	100	125	175	250
H1	30	30	35	45	50	55	65	100
H2	50	55	65	90	110	140	170	210
M1	8x7x40	8x7x45	10x8x55	14x9x80	16x10x100	20x12x120	22x14x150	36x20x200
S	5	6	8	10	12	12	22	32
T	18,3	22,8	27,3	35,3	45,3	59,3	85,4	127,4

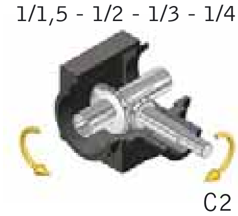
* XRR model: stainless steel version

Basic constructive forms

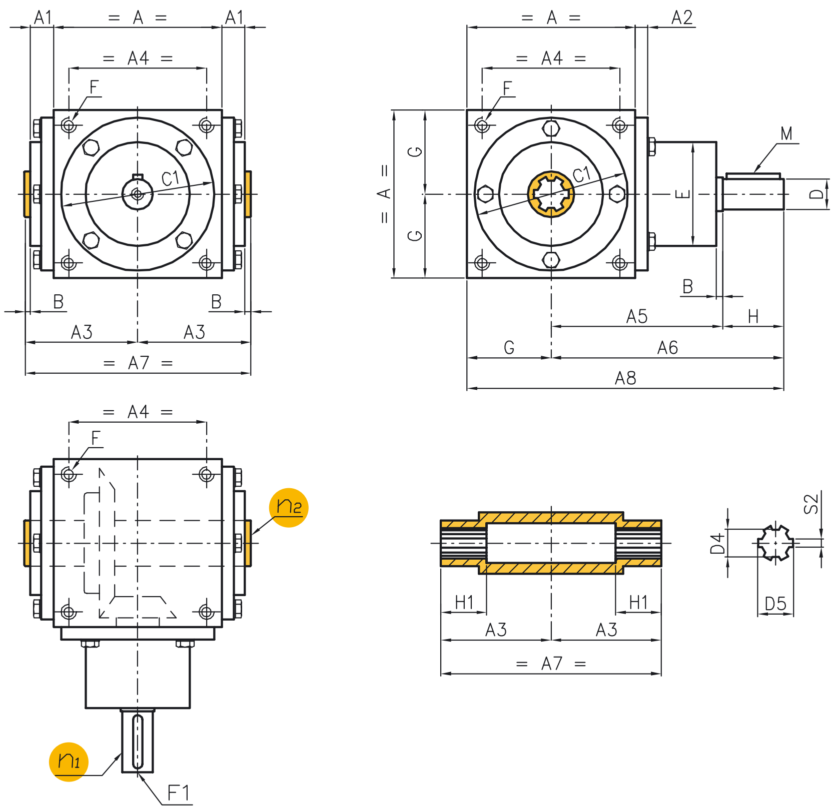
ratio:
1/1

C1

ratio:
1/1,5 - 1/2 - 1/3 - 1/4



C2



Broached hollow shaft bevel gear box RB

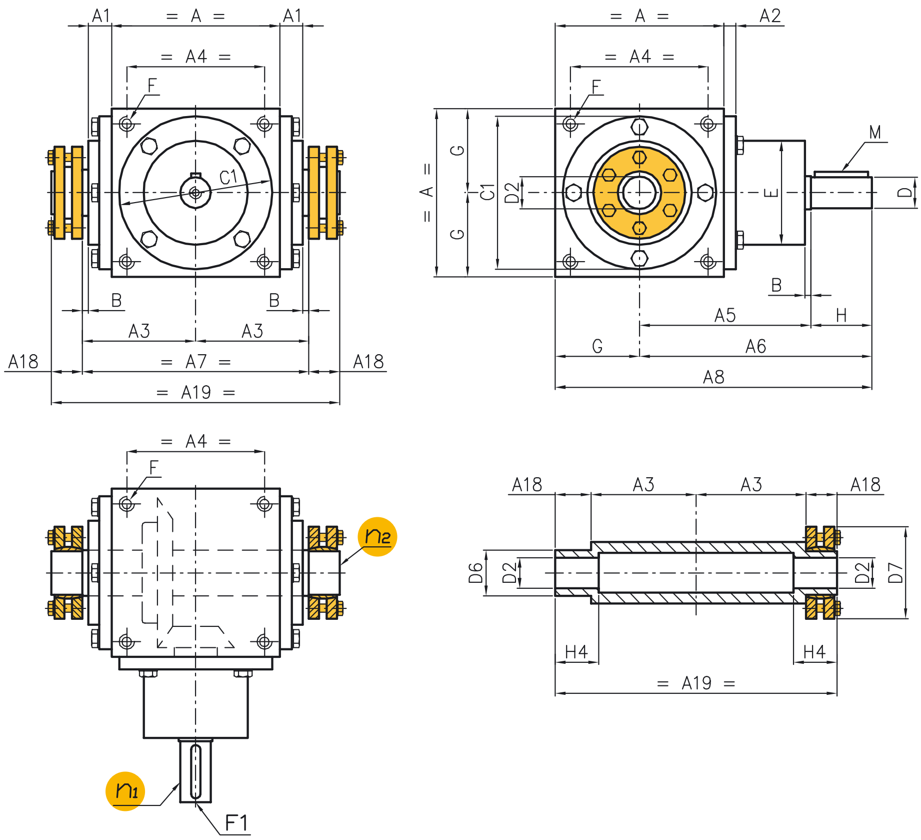
XRB Models*

Size	54	86	110	134	166	200	250	350	500
A	54	86	110	134	166	200	250	350	500
A1	8,5	15	15	18	21	23	22	30	35
A2	10	10	8	9	11	11	11	15	20
A3	37	60	72	87	106	125	150	210	295
A4	44	70	90	114	144	174	216	320	450
A5	72	84	110	132	152	182	218	330	415
A6	95	114	150	182	217	267	318	450	585
A7	74	120	144	174	212	250	300	420	590
A8	122	157	205	249	300	367	443	625	835
B	1,5	2	2	2	2	2	3	5	10
C1 Ø f7	53	84	100	122	156	185	230	345	485
D Ø h7	11	16	20	24	32	42	55	65	120
D4 Ø H7	11	13	18	21	28	36	46	72	102
D5 Ø H10	14	16	22	25	34	42	54	82	112
E Ø	52,8	59	68	80	107	120	152	240	320
F	M4x12	M8x20	M10x25	M10x25	M12x30	M14x35	M16x40	M20x60	M30x80
F1	M4x10	M6x12	M8x20	M8x20	M10x25	M10x25	M12x25	M12x25	M20x50
G	27	43	55	67	83	100	125	175	250
H	23	30	40	50	65	85	100	120	170
H5	13	15	20	25	30	35	40	50	65
M	4x4x20	5x5x25	6x6x35	8x7x45	10x8x60	12x8x80	16x10x90	18x11x110	32x18x150
S2 H9	3	3,5	5	5	7	7	9	12	16
Number of slots	6	6	6	6	6	8	8	10	10
Broached shaft UNI 8953 NT	6x11x14	6x13x16	6x18x22	6x21x25	6x28x34	8x36x42	8x46x54	10x72x82	10x102x112

The broached shaft which is to be coupled with the hollow shaft of the bevel gearbox must respect the following tolerance parameters, depending on whether it is sliding or fixed.

Size	54	86	110	134	166	200	250	350	500
Sliding coupling									
D5 a11	14	16	22	25	34	42	54	82	112
D4 f7	11	13	18	21	28	36	46	72	102
S2 d10	3	3,5	5	5	7	7	9	12	16
Fixed coupling									
D5 a11	14	16	22	25	34	42	54	82	112
D4 h7	11	13	18	21	28	36	46	72	102
S2 h10	3	3,5	5	5	7	7	9	12	16

* XRB model: stainless steel version



Basic constructive forms

ratio:
1/1

C1

ratio:
1/1,5 - 1/2 - 1/3 - 1/4

C2

Hollow shaft bevel gearbox with shrink-disk RA

XRA Models*

Size	54	86	110	134	166	200	250	350	500
A	54	86	110	134	166	200	250	350	500
A1	8,5	15	15	18	21	23	22	30	35
A2	10	10	8	9	11	11	11	15	20
A3	37	60	72	87	106	125	150	210	295
A4	44	70	90	114	144	174	216	320	450
A5	72	84	110	132	152	182	218	330	415
A6	95	114	150	182	217	267	318	450	585
A7	74	120	144	174	212	250	300	420	590
A8	122	157	205	249	300	367	443	625	835
A18	15	23	23	25	30	32	35	50	75
A19	104	166	190	224	272	314	370	370	740
B	1,5	2	2	2	2	2	3	5	10
C1 Ø f7	53	84	100	122	156	185	230	345	485
D Ø h7	11	16	20	24	32	42	55	65	120
D2 Ø H7	12	16	20	24	32	42	55	80	120
D6 Ø h7	14	24	24	30	44	50	68	100	160
D7 Ø	38	50	50	60	80	90	115	170	265
E Ø	52,8	59	68	80	107	120	152	240	320
F	M4x12	M8x20	M10x25	M10x25	M12x30	M14x35	M16x40	M20x60	M30x80
F1	M4x10	M6x12	M8x20	M8x20	M10x25	M10x25	M12x25	M12x25	M20x50
G	27	43	55	67	83	100	125	175	250
H	23	30	40	50	65	85	100	120	170
H4	22	30	30	35	45	50	55	65	90
M	4x4x20	5x5x25	6x6x35	8x7x45	10x8x60	12x8x80	16x10x90	18x11x110	32x18x150

Size		54	86	110	134	166	200	250	350	500
Torque moment	Mt [daNm]	5	12	21	30	62	138	250	900	2860
Axial force	Fa [daN]	900	1900	2700	2900	6400	9200	10600	24000	51000
Fastening	n. of screws	4xM5	6xM5	6xM5	7xM5	7xM6	8xM6	10xM6	12xM8	12xM12
	Torque [daNm]	0,4	0,4	0,4	0,4	1,2	1,2	1,2	3	10

* XRA model: stainless steel version

The table on the left shows the characteristic values for each single shrink-disk.

Basic constructive forms

ratio:
1/1

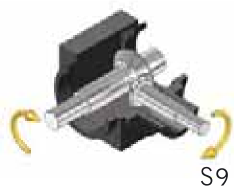
S1

S3

S4

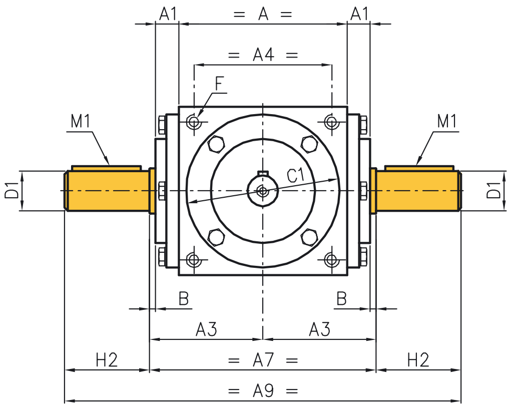
ratio:
1/1,5 - 1/2 - 1/3 - 1/4

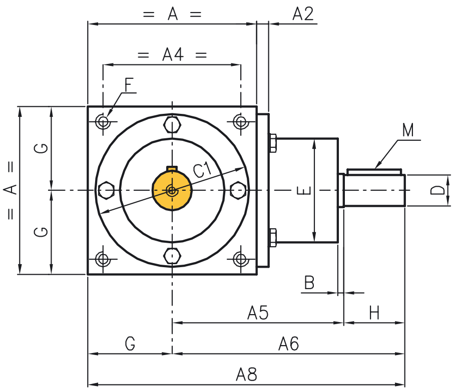
S2

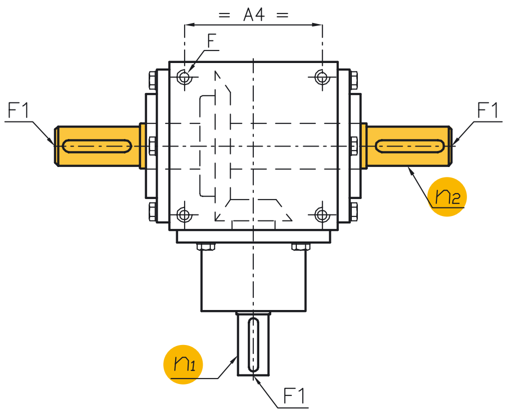


S9

S10

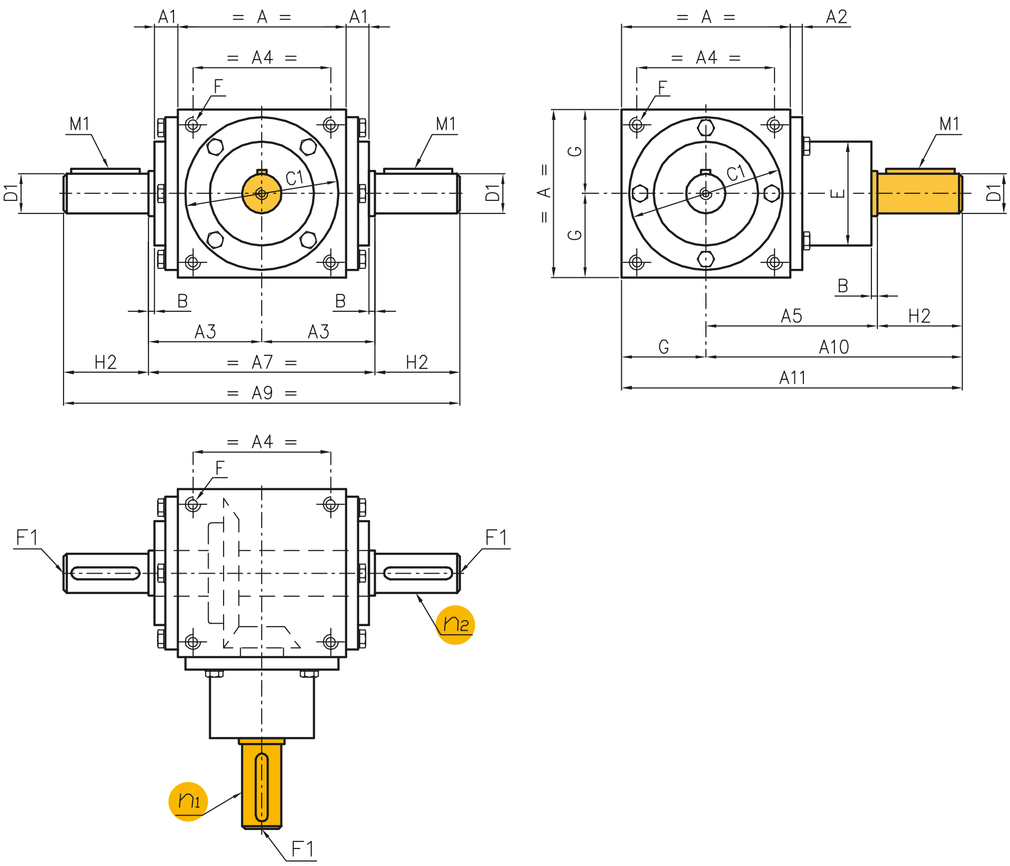






Protruding shaft bevel gearbox RS									
		XRS Models*							
Size	**54**	**86**	**110**	**134**	**166**	**200**	**250**	**350**	**500**
A	54	86	110	134	166	200	250	350	500
A1	8,5	15	15	18	21	23	22	30	35
A2	10	10	8	9	11	11	11	15	20
A3	37	60	72	87	106	125	150	210	295
A4	44	70	90	114	144	174	216	320	450
A5	72	84	110	132	152	182	218	330	415
A6	95	114	150	182	217	267	318	450	585
A7	74	120	144	174	212	250	300	420	590
A8	122	157	205	249	300	367	443	625	835
A9	144	220	254	304	392	470	580	760	1010
B	1,5	2	2	2	2	2	3	5	10
C1 Ø f7	53	84	100	122	156	185	230	345	485
D Ø h7	11	16	20	24	32	42	55	65	120
D1 Ø H7	18	24	26	32	45	55	70	85	140
E Ø	52,8	59	68	80	107	120	152	240	320
F	M4x12	M8x20	M10x25	M10x25	M12x30	M14x35	M16x40	M20x60	M30x80
F1	M4x10	M6x12	M8x20	M8x20	M10x25	M10x25	M12x25	M12x25	M20x50
G	27	43	55	67	83	100	125	175	250
H	23	30	40	50	65	85	100	120	170
H2	35	50	55	65	90	110	140	170	210
M	4x4x20	5x5x25	6x6x35	8x7x45	10x8x60	12x8x80	16x10x90	18x11x110	32x18x150
M1	6x6x30	8x7x40	8x7x45	10x8x55	14x9x80	16x10x100	20x12x120	22x14x150	36x20x200

* XRS model: stainless steel version



Protruding shaft bevel gearbox with reinforced hub-shaft RP

Size	XRP Models*							
	86	**110**	**134**	**166**	**200**	**250**	**350**	**500**
A	86	110	134	166	200	250	350	500
A1	15	15	18	21	23	22	30	35
A2	10	8	9	11	11	11	15	20
A3	60	72	87	106	125	150	210	295
A4	70	90	114	144	174	216	320	450
A5	84	110	132	152	182	218	330	415
A7	120	144	174	212	250	300	420	590
A9	220	254	304	392	470	580	760	1010
A10	134	165	197	242	292	358	500	625
A11	177	220	264	325	392	483	675	875
B	2	2	2	2	2	3	5	10
C1 Ø f7	84	100	122	156	185	230	345	485
D1 Ø h7	24	26	32	45	55	70	85	140
E Ø	59	68	80	107	120	152	240	320
F	M8x20	M10x25	M10x25	M12x30	M14x35	M16x40	M20x60	M30x80
F1	M6x12	M8x20	M8x20	M10x25	M10x25	M12x25	M12x25	M20x50
G	43	55	67	83	100	125	175	250
H2	50	55	65	90	110	140	170	210
M1	8x7x40	8x7x45	10x8x55	14x9x80	16x10x100	20x12x120	22x14x150	36x20x200

* XRP model: stainless steel version

Basic constructive forms

ratio:
1/1

S1

S3

S4

ratio:
1/1,5 - 1/2 - 1/3 - 1/4

S2

S9

S10

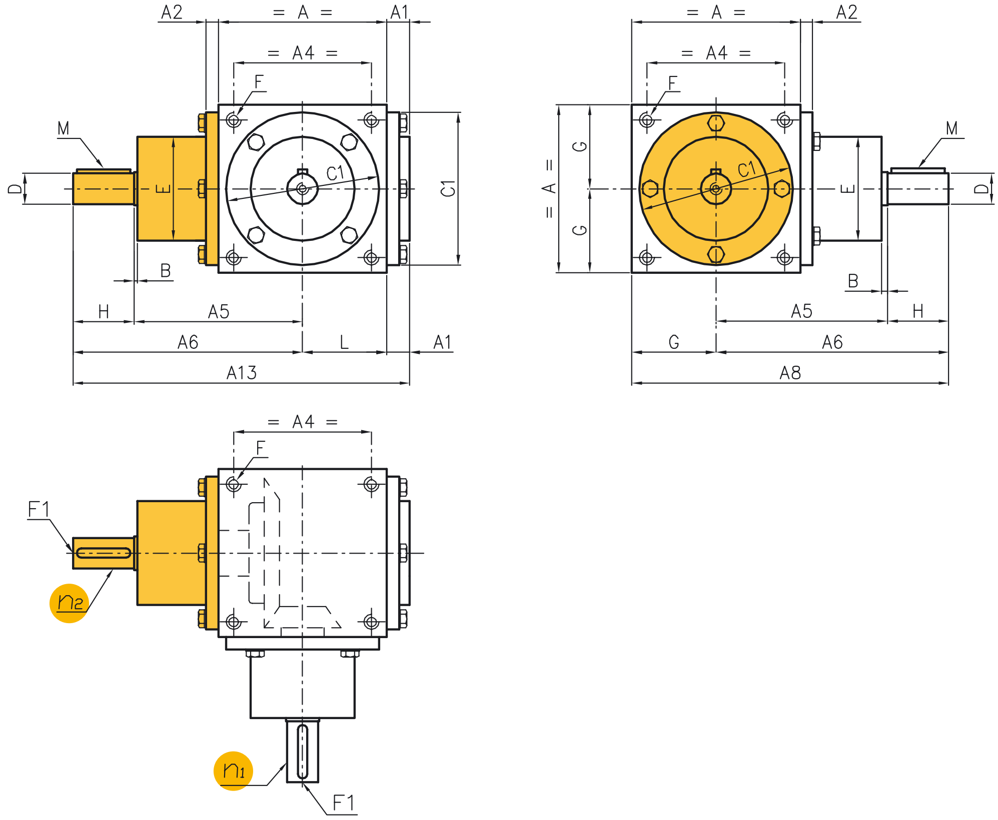
Basic constructive forms

ratio:
1/1

S31

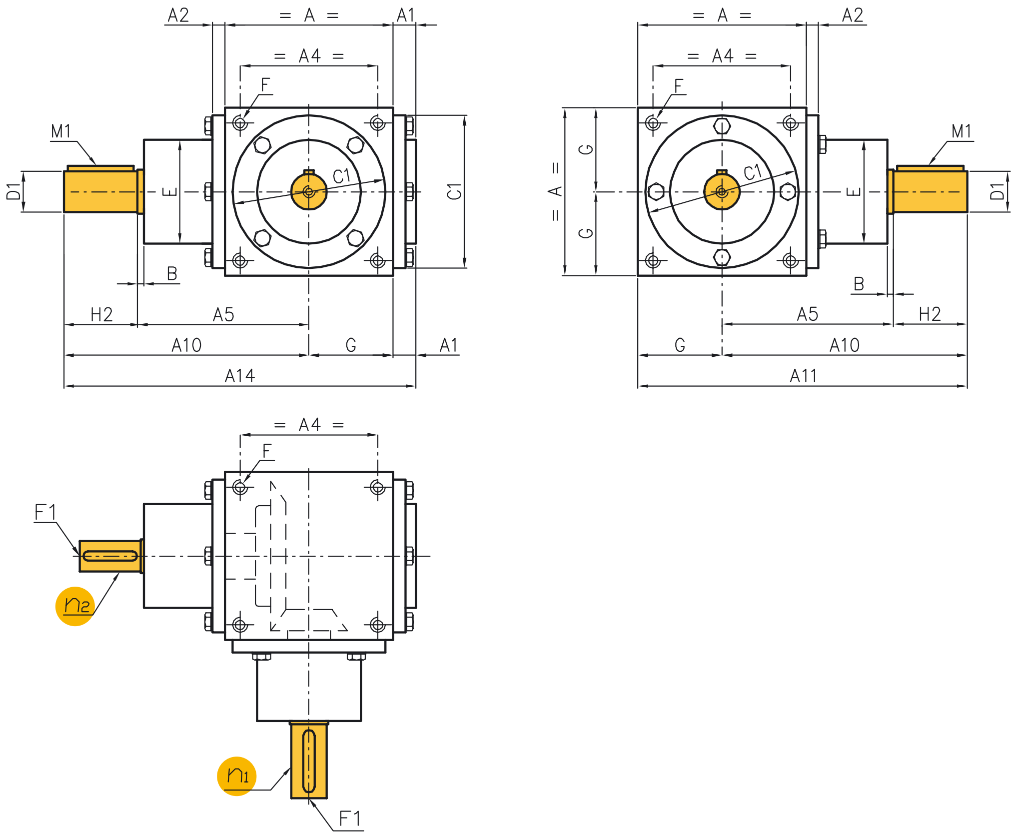
ratio:
1/1,5 - 1/2 - 1/3 - 1/4

S32



Double hub bevel gearbox RX									
		XRX Models*							
Size	**54**	**86**	**110**	**134**	**166**	**200**	**250**	**350**	**500**
A	54	86	110	134	166	200	250	350	500
A1	8,5	15	15	18	21	23	22	30	35
A2	10	10	8	9	11	11	11	15	20
A4	44	70	90	114	144	174	216	320	450
A5	72	84	110	132	152	182	218	330	415
A6	95	114	150	182	217	267	318	450	585
A8	122	157	205	249	300	367	443	625	835
A13	157,5	172	220	267	321	390	465	655	870
B	1,5	2	2	2	2	2	3	5	10
C1 Ø f7	53	84	100	122	156	185	230	345	485
D Ø h7	11	16	20	24	32	42	55	65	120
E Ø	52,8	59	68	80	107	120	152	240	320
F	M4x12	M8x20	M10x25	M10x25	M12x30	M14x35	M16x40	M20x60	M30x80
F1	M4x10	M6x12	M8x20	M8x20	M10x25	M10x25	M12x25	M12x25	M20x50
G	27	43	55	67	83	100	125	175	250
H	23	30	40	50	65	85	100	120	170
M	4x4x20	5x5x25	6x6x35	8x7x45	10x8x60	12x8x80	16x10x90	18x11x110	32x18x150

* XRX model: stainless steel version



Basic constructive forms

ratio:
1/1

S31

ratio:
1/1,5 - 1/2 - 1/3 - 1/4

S32

Size	86	110	134	166	200	250	350	500
	Double hub bevel gearbox with reinforced shafts RZ							
	XRZ Models*							
A	86	110	134	166	200	250	350	500
A1	15	15	18	21	23	22	30	35
A2	10	8	9	11	11	11	15	20
A4	70	90	114	144	174	216	320	450
A5	84	110	132	152	182	218	330	415
A10	134	165	197	242	292	358	500	625
A11	177	220	264	325	392	483	675	875
A14	192	235	282	346	415	505	705	910
B	2	2	2	2	2	3	5	10
C1 Ø f7	84	100	122	156	185	230	345	485
D1 Ø h7	24	26	32	45	55	70	85	140
E Ø	59	68	80	107	120	152	240	320
F	M8x20	M10x25	M10x25	M12x30	M14x35	M16x40	M20x60	M30x80
F1	M6x12	M8x20	M8x20	M10x25	M10x25	M12x25	M12x25	M20x50
G	43	55	67	83	100	125	175	250
H2	50	55	65	90	110	140	170	210
M1	8x7x40	8x7x45	10x8x55	14x9x80	16x10x100	20x12x120	22x14x150	36x20x200

* XRZ model: stainless steel version

Basic constructive forms

ratio:
1/1,5

RM-S1

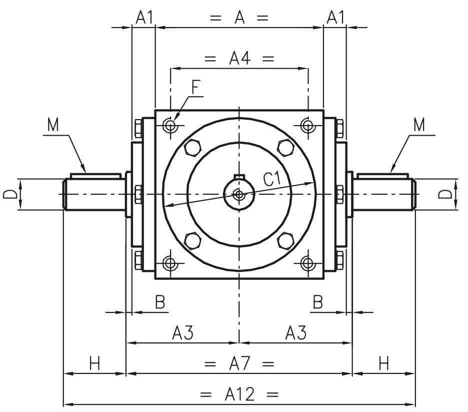
RM-S2

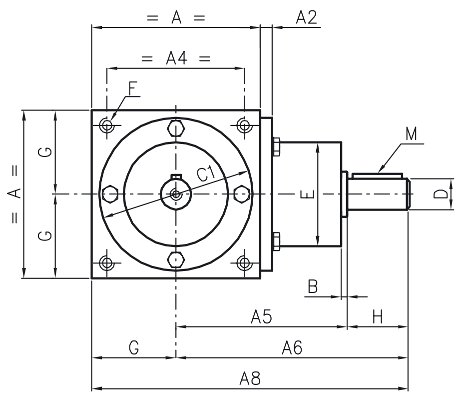
RM-S3

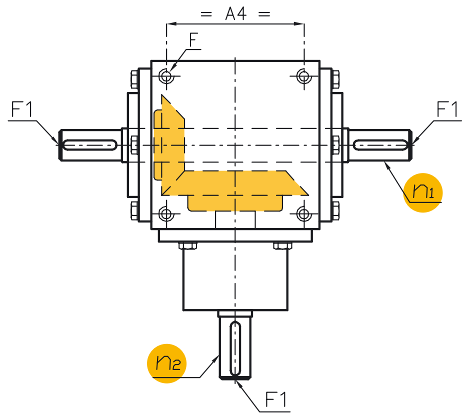
RM-S4

RM-S9

RM-S10

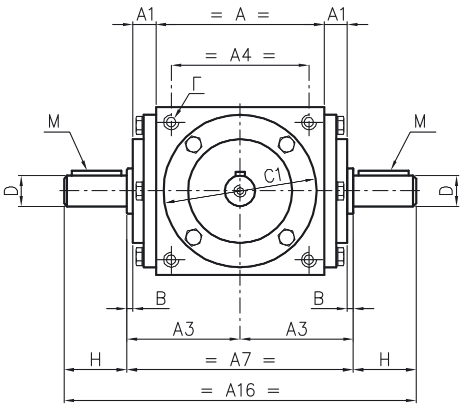


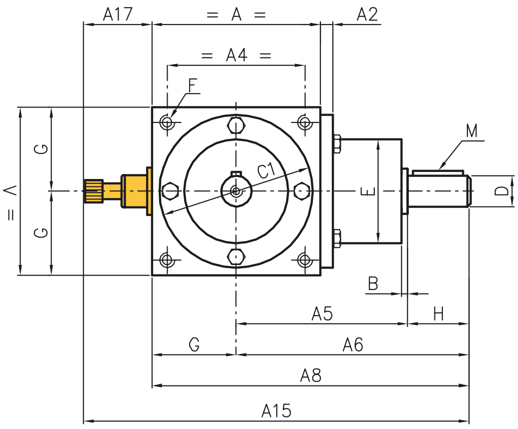


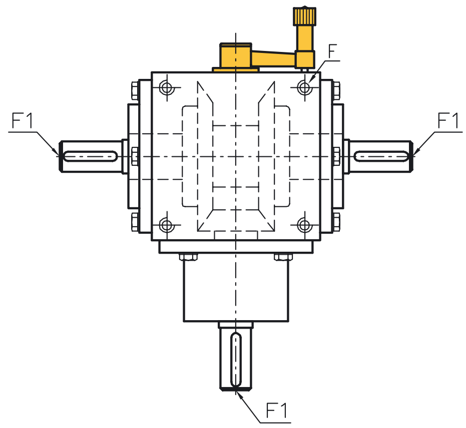


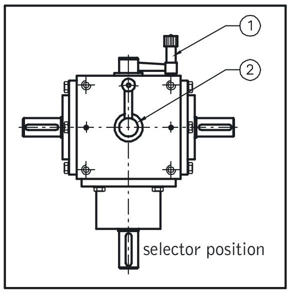
Bevel gearbox with fast protruding shafts RM									
	XRM Models*								
Size	**54**	**86**	**110**	**134**	**166**	**200**	**250**	**350**	**500**
A	54	86	110	134	166	200	250	350	500
A1	8,5	15	15	18	21	23	22	30	35
A2	10	10	8	9	11	11	11	15	20
A3	37	60	72	87	106	125	150	210	295
A4	44	70	90	114	144	174	216	320	450
A5	72	84	110	132	152	182	218	330	415
A6	95	114	150	182	217	267	318	450	385
A7	74	120	144	174	212	250	300	420	590
A8	122	157	205	249	300	367	443	625	835
A12	120	180	224	274	342	420	500	660	930
B	1,5	2	2	2	2	2	3	5	10
C1 Ø f7	53	84	100	122	156	185	230	345	485
D Ø h7	11	16	20	24	32	42	55	65	120
E Ø	52,8	59	68	80	107	120	152	240	320
F	M4x12	M8x20	M10x25	M10x25	M12x30	M14x35	M16x40	M20x60	M30x80
F1	M4x10	M6x12	M8x20	M8x20	M10x25	M10x25	M12x25	M12x25	M20x50
G	27	43	55	67	83	100	125	175	250
H	23	30	40	50	65	85	100	120	170
M	4x4x20	5x5x25	6x6x35	8x7x45	10x8x60	12x8x80	16x10x90	18x11x110	32x18x150

* XRM model: stainless steel version



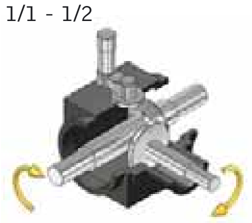






Basic constructive forms

ratio:
1/1 - 1/2



RIS-A

RIS-B

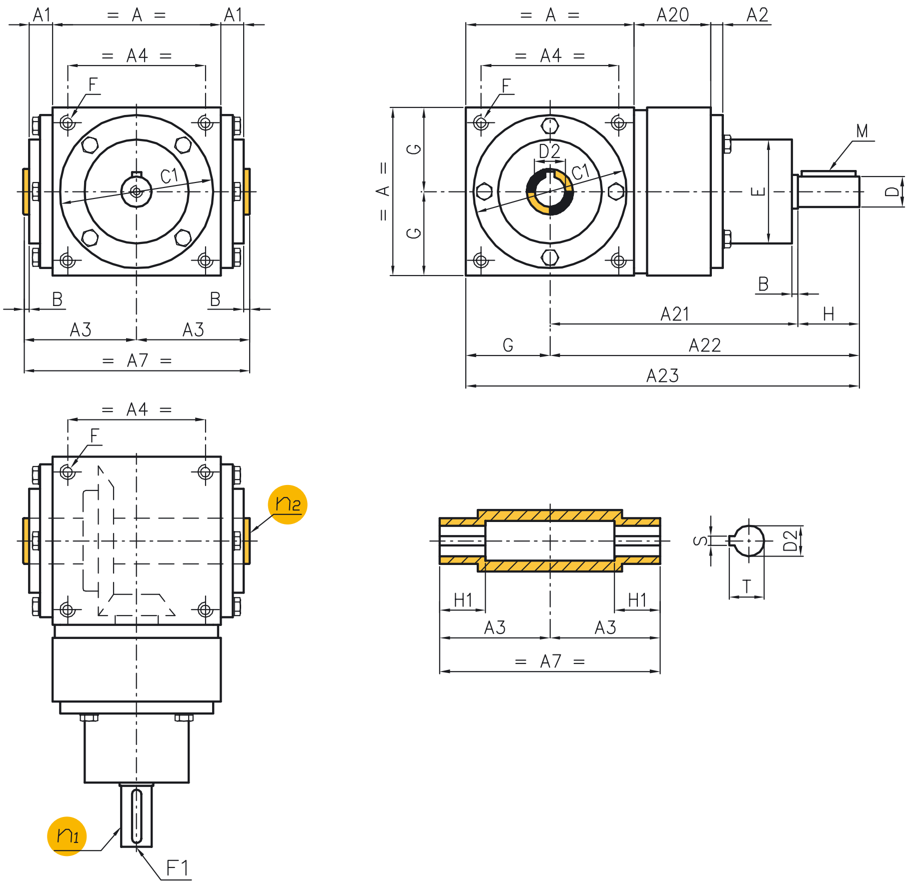
RIS-C

Bevel gearbox with inverter RIS

Size	134	166	200	250
A	134	166	200	250
A1	18	21	23	22
A2	9	11	11	11
A3	87	106	125	150
A4	114	144	174	216
A5	132	152	182	218
A6	177	217	267	318
A7	174	212	250	300
A8	249	300	367	443
A15	333	384	451	527
A16	264	342	420	500
A17	84	84	84	84
B	2	2	2	3
C1 Ø f7	122	156	185	230
D Ø h7	32	42	55	65
E Ø	80	107	120	152
F	M10x25	M12x30	M14x35	M16x40
F1	M8x20	M10x25	M10x25	M12x25
G	67	83	100	125
H	50	65	85	100
H3	45	60	85	100
M	10x8x40	12x8x50	16x10x70	16x10x90

In A and B versions, the lever enables the selection of : inserted shaft or idle shaft.
In C version the lever enables the selection of: inserted shaft, inserted shaft with reversed revolution or neutral. The rotation directions depend on the position of the selection lever. The selection operation by means of the lever must be actuated only when shafts are not running.

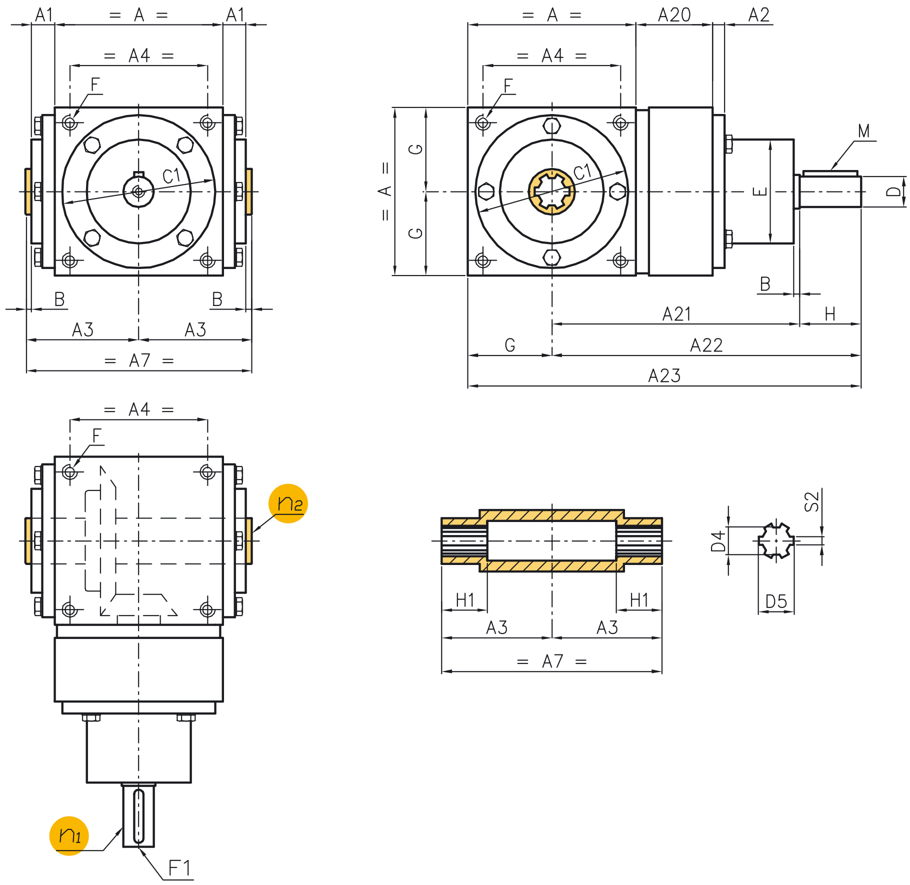
ratio:
1/4,5 - 1/6 - 1/9 - 1/12



High reduction bevel gearbox with hollow shaft REC

Size	32	42	55
A	134	166	200
A1	18	21	23
A2	9	11	11
A4	114	144	174
A7	174	212	250
A20	88	98	128
A21	220	250	310
A22	270	315	395
A23	337	398	495
B	2	2	2
C1 Ø f7	122	156	185
D Ø h7	24	32	42
D2 Ø H7	24	32	42
E Ø	80	107	120
F	M10x25	M12x30	M14x35
F1	M8x20	M10x25	M10x25
G	67	83	100
H	50	65	85
H1	35	45	50
M	8x7x45	10x8x60	12x8x80
S	8	10	12
T	27,3	35,3	45,3

ratio:
1/4,5 - 1/6 - 1/9 - 1/12

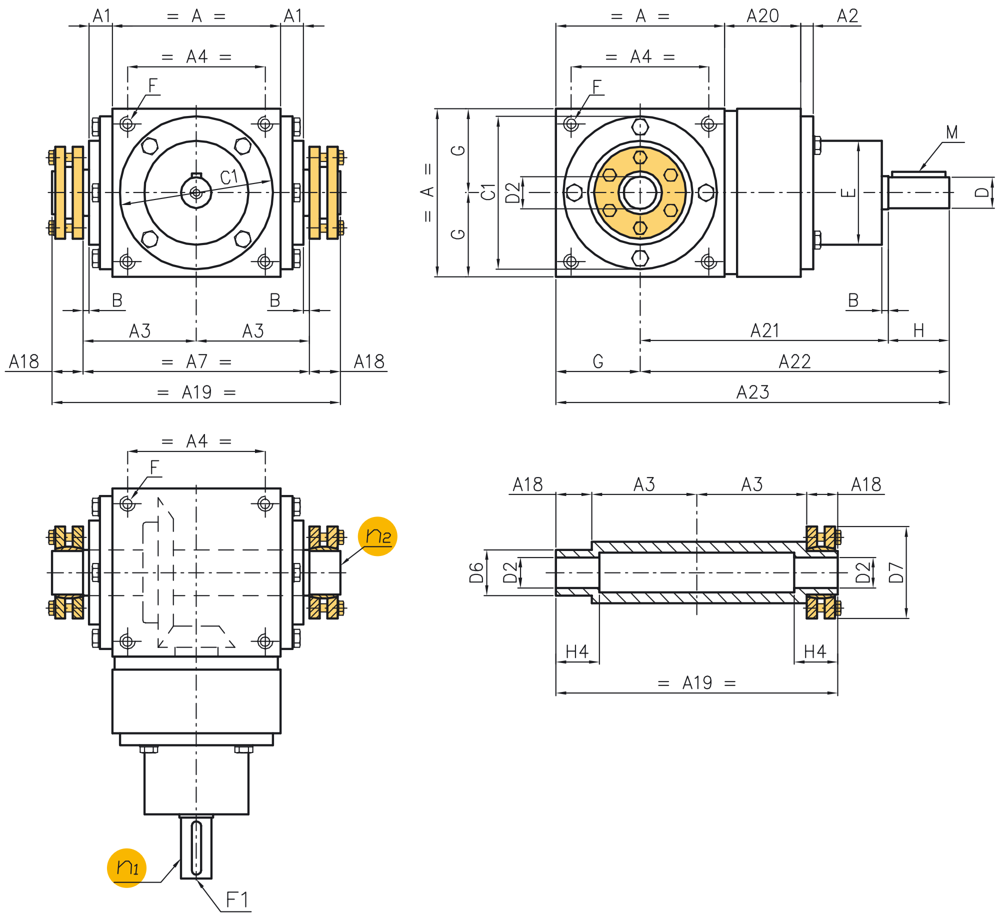


High reduction bevel gearbox with broached hollow shaft REB

Size	**32**	**42**	**55**
A	134	166	200
A1	18	21	23
A2	9	11	11
A4	114	144	174
A7	174	212	250
A20	88	98	128
A21	220	250	310
A22	270	315	395
A23	337	398	495
B	2	2	2
C1 Ø f7	122	156	185
D Ø h7	24	32	42
D4 Ø H7	21	28	36
D5 Ø H10	25	34	42
E Ø	80	107	120
F	M10x25	M12x30	M14x35
F1	M8x20	M10x25	M10x25
G	67	83	100
H	50	65	85
H5	25	30	35
M	8x7x45	10x8x60	12x8x80
S2 H9	5	7	7
Number of slots	6	6	8
Broached shaft UNI 8953 NT	6x21x25	6x28x34	8x36x42

For the broached shaft characteristics make reference to RB models on page 200 (sizes 134, 166 and 200)

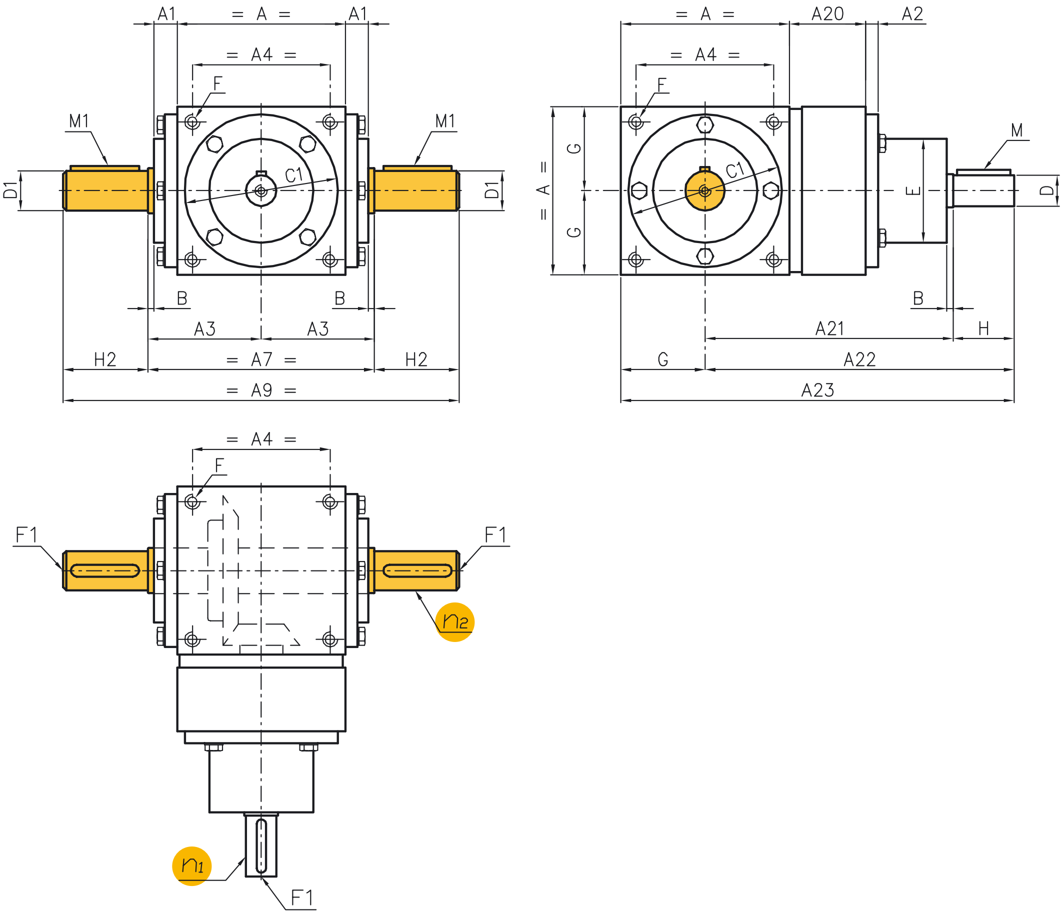
ratio:
1/4,5 - 1/6 - 1/9 - 1/12



High reduction bevel gearbox with shrink disks REA

Size	32	42	55
A	134	166	200
A1	18	21	23
A2	9	11	11
A4	114	144	174
A7	174	212	250
A18	25	30	32
A20	88	98	128
A21	220	250	310
A22	270	315	395
A23	337	398	495
B	2	2	2
C1 Ø f7	122	156	185
D Ø h7	24	32	42
D2 Ø H7	24	32	42
D6 Ø h7	30	44	50
D7	60	80	90
E Ø	80	107	120
F	M10x25	M12x30	M14x35
F1	M8x20	M10x25	M10x25
G	67	83	100
H	50	65	85
H4	35	45	50
M	8x7x45	10x8x60	12x8x80

For the characteristics of shrink-disks, make reference to RA models on page 201 (sizes 134, 166 and 200)

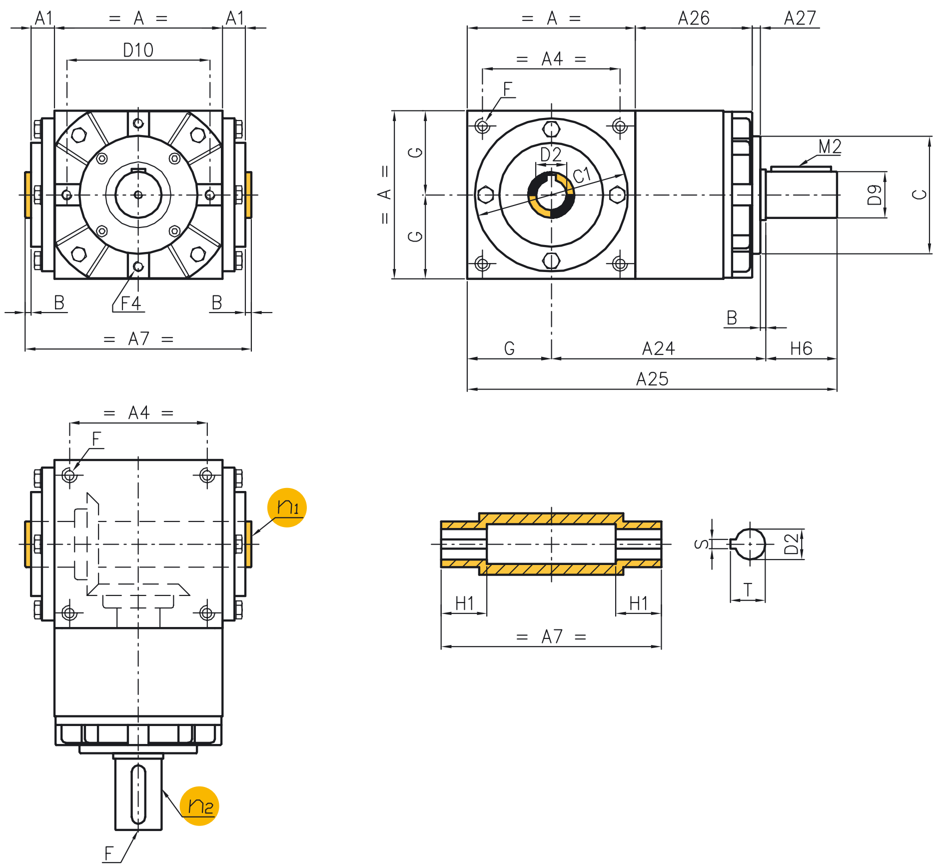


ratio:
1/4,5 - 1/6 - 1/9 - 1/12

High reduction bevel gearbox with protruding shaft RES

Size	32	42	55
A	134	166	200
A1	18	21	23
A2	9	11	11
A4	114	144	174
A7	174	212	250
A9	304	392	470
A20	88	98	128
A21	220	250	310
A22	270	315	395
A23	337	398	495
B	2	2	2
C1 Ø f7	122	156	185
D Ø h7	24	32	42
D1 Ø h7	32	45	55
E Ø	80	107	120
F	M10x25	M12x30	M14x35
F1	M8x20	M10x25	M10x25
G	67	83	100
H	50	65	85
H2	65	90	110
M	8x7x45	10x8x60	12x8x80
M1	10x8x45	14x9x80	16x10x100

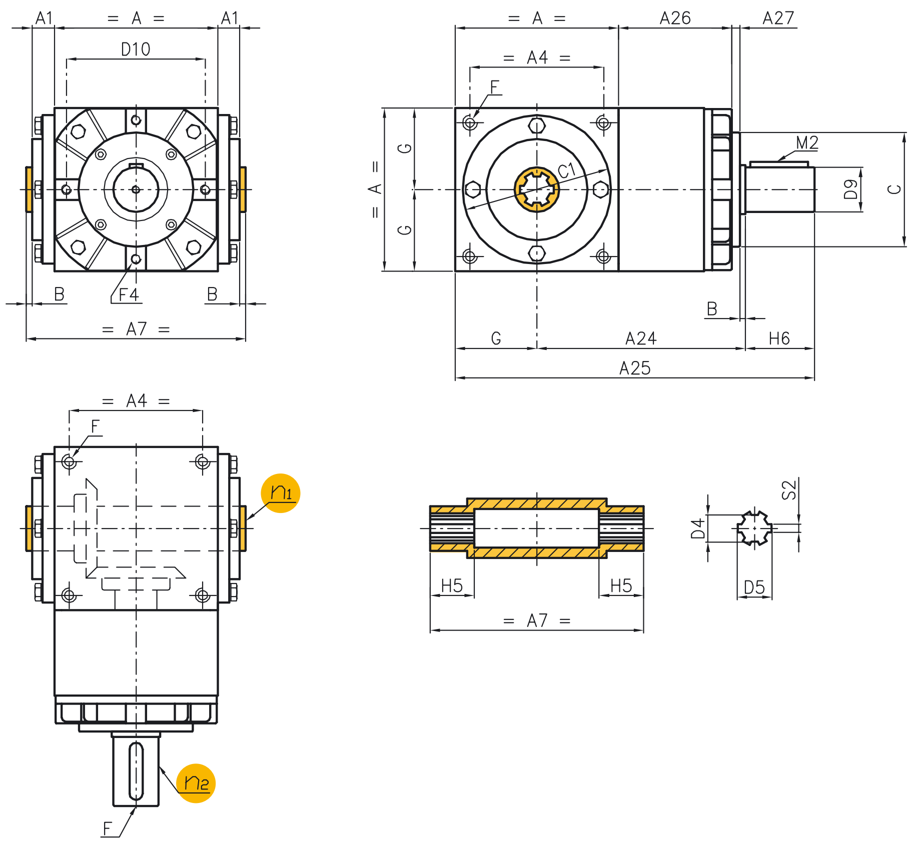
ratio:
1/2 - 1/3



Inverted bevel gearbox with hollow shaft RHC

Size	32	42	55
A	134	166	200
A1	18	21	23
A4	114	144	174
A7	174	212	250
A24	174	203	249
A25	286	346	434
A26	97	110	139
A27	10	10	10
B	2	2	2
C Ø $^{-0,1}_{-0,2}$	99	116	140
C1 Ø f7	122	156	185
D2 Ø h7	24	32	42
D9 Ø h7	32	42	55
D10	116	140	170
F	M10x25	M12x30	M14x35
F3	M8x16	M10x20	M10x20
F4	M8x18	M10x20	M12x24
G	67	83	100
H1	35	45	50
H6	45	60	85
M2	10x8x40	12x8x50	16x10x70
S	8	10	12
T	27,3	35,3	45,3

ratio:
1/2 - 1/3

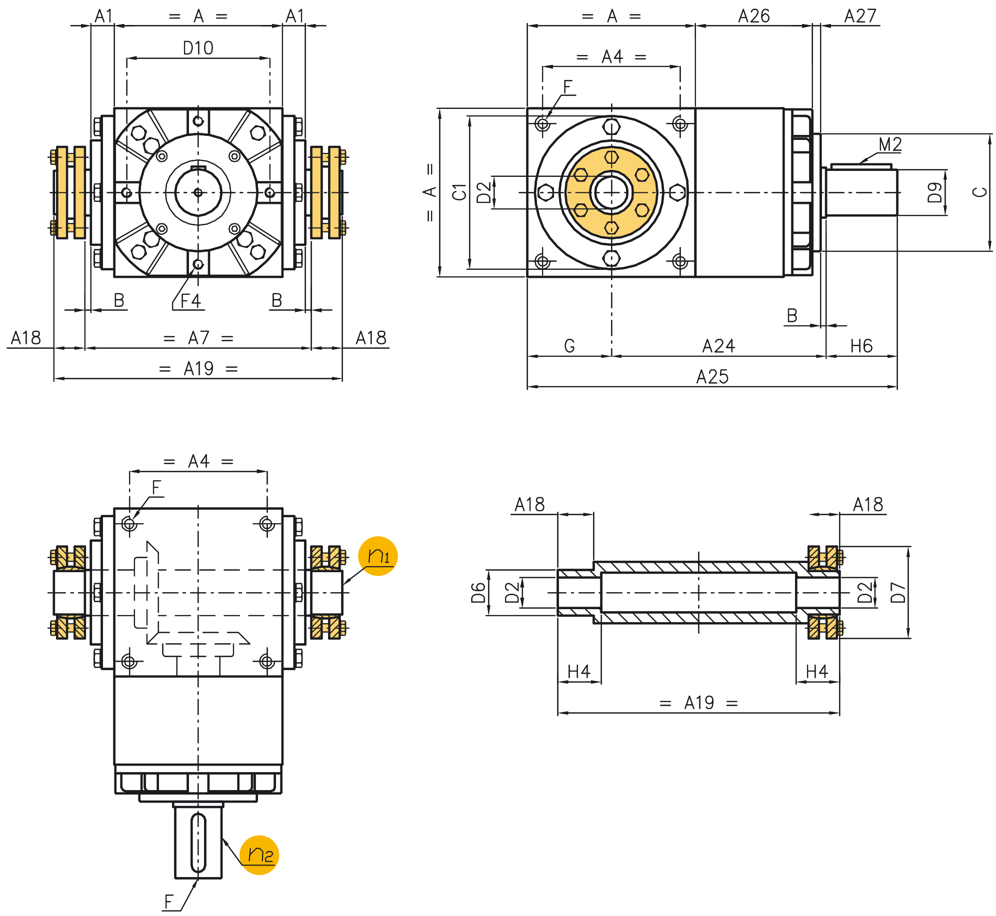


Inverted bevel gearbox with broached hollow shaft RHB

Size	**32**	**42**	**55**
A	134	166	200
A1	18	21	23
A4	114	144	174
A7	174	212	250
A24	174	203	249
A25	286	346	434
A26	97	110	139
A27	10	10	10
B	2	2	2
C Ø $^{-0,1}_{-0,2}$	99	116	140
C1 Ø f7	122	156	185
D4 Ø H7	21	28	36
D5 Ø H10	25	34	42
D9 Ø h7	32	42	55
D10	116	140	170
F	M10x25	M12x30	M14x35
F3	M8x16	M10x20	M10x20
F4	M8x18	M10x20	M12x24
G	67	83	100
H5	25	30	35
H6	45	60	85
M2	10x8x40	12x8x50	16x10x70
S2 H9	5	7	7
N° holes	6	6	8
Broached shaft UNI 8953NT	6x21x25	6x28x34	8x36x42

For the broached shaft characteristics make reference to RB models on page 200 (sizes 134, 166 and 200)

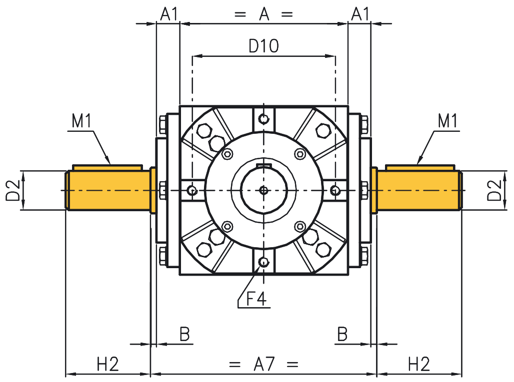
ratio:
1/2 - 1/3

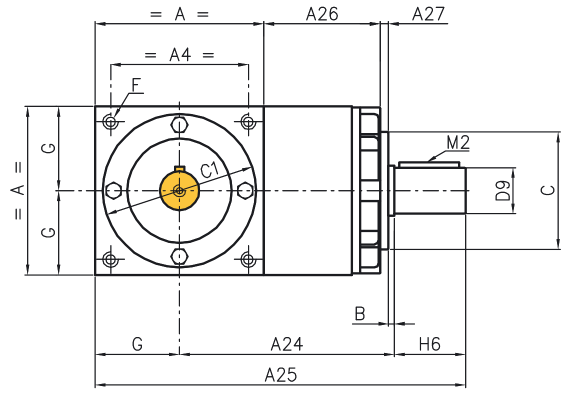


Inverted bevel gearbox with hollow shaft with shrink-disks RHA

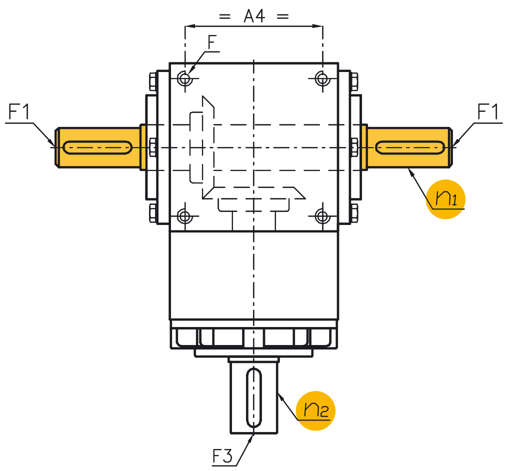
Size	32	42	55
A	134	166	200
A1	18	21	23
A4	114	144	174
A7	174	212	250
A18	25	30	32
A24	174	203	249
A25	286	346	434
A26	97	110	139
A27	10	10	10
B	2	2	2
C Ø $^{-0,1}_{-0,2}$	99	116	140
C1 Ø f7	122	156	185
D2 Ø H7	24	32	42
D6 Ø h7	30	44	50
D7	60	80	90
D9 Ø h7	32	42	55
D10	116	140	170
F	M10x25	M12x30	M14x35
F3	M8x16	M10x20	M10x20
F4	M8x18	M10x20	M12x24
G	67	83	100
H4	35	45	50
H6	45	60	85
M2	10x8x40	12x8x50	16x10x70

For the characteristics of shrink-disks, make reference to RA models on page 201 (sizes 134, 166 and 200)





ratio:
1/2 - 1/3 - 1/4,5



Inverted gearbox with protruding shafts RHS

Size		32	42	55
A		134	166	200
A1		18	21	23
A4		114	144	174
A7		174	212	250
A24		174	203	249
A25		286	346	434
A26		97	110	139
A27		10	10	10
B		2	2	2
C Ø $^{-0,1}_{-0,2}$		99	116	140
C1 Ø f7		122	156	185
D2 Ø h7	Ratio 1/2 1/3	32	45	55
	Ratio 1/4,5	24	32	42
D9 Ø h7		32	42	55
D10		116	140	170
F		M10x25	M12x30	M14x35
F3		M8x16	M10x20	M10x20
F4		M8x18	M10x20	M12x24
G		67	83	100
H2	Ratio 1/2 1/3	65	90	110
	Ratio 1/4,5	50	65	85
H6		45	60	85
M1	Ratio 1/2 1/3	10x8x55	14x9x80	16x10x100
	Ratio 1/4,5	8x7x45	10x8x60	12x8x80
M2		10x8x40	12x8x50	16x10x70

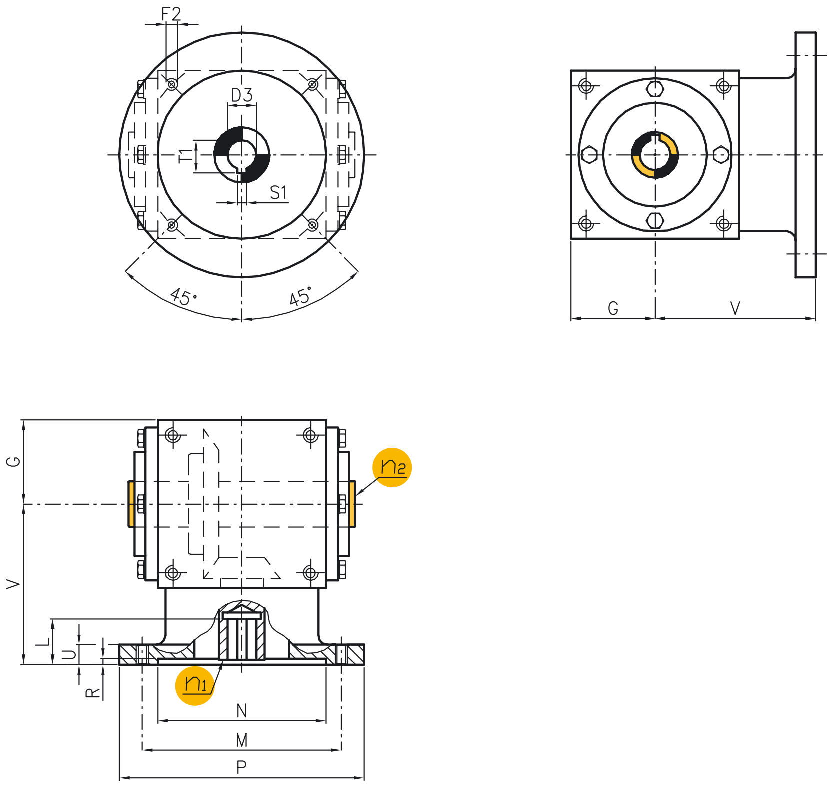
Basic constructive forms

ratio:
1/1

MC1

ratio:
1/1,5 - 1/2 - 1/3 - 1/4

MC2

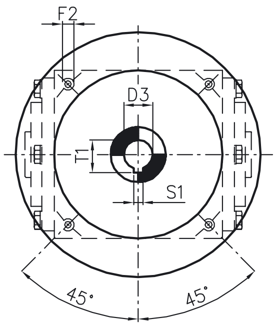


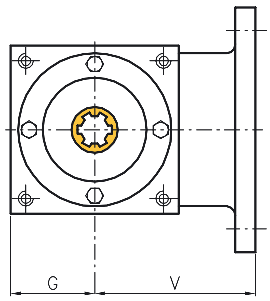
Hollow shaft motor gearbox MRC

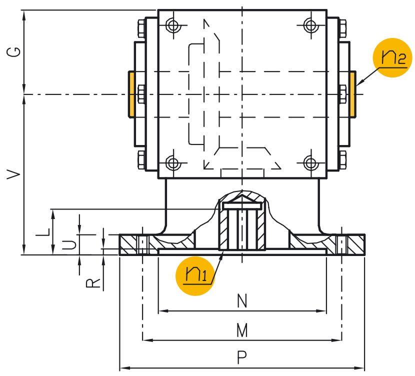
	Size	IEC flange	D3 H7	F2	G	L	M	N	P	R	S1	T1	U	V
XMRC Models*	86	56 B5	9	M6	43	23	100	80	120	4	3	10,4	13	90
		63 B5	11	M8	43	23	115	95	140	4	4	12,8	13	90
		71 B5	14	M8	43	30	130	110	160	4	5	16,3	13	90
		71 B14	14	7	43	30	85	70	105	4	5	16,3	13	90
		80 B5	19	M10	43	40	165	130	200	4	6	21,8	13	100
		80 B14	19	7	43	40	100	80	120	4	6	21,8	13	100
	110	63 B5	11	M8	55	23	115	95	140	4	4	12,8	13	105
		71 B5	14	M8	55	30	130	110	160	4	5	16,3	13	105
		71 B14	14	7	55	30	85	70	105	4	5	16,3	13	105
		80 B5	19	M10	55	40	165	130	200	4	6	21,8	13	105
		80 B14	19	7	55	40	100	80	120	4	6	21,8	13	105
	134	71 B5	14	M8	67	30	130	110	160	5	5	16,3	13	125
		80 B5	19	M10	67	40	165	130	200	5	6	21,8	13	125
		80 B14	19	7	67	40	100	80	120	5	6	21,8	13	125
		90 B5	24	M10	67	50	165	130	200	5	8	27,3	13	125
		90 B14	24	9	67	50	115	95	140	5	8	27,3	13	125
		100-112 B5	28	M12	67	60	215	180	250	5	8	31,3	13	135
		100-112 B14	28	9	67	60	130	110	160	5	8	31,3	13	135
	166	71 B5	14	9	83	30	130	110	160	6	5	16,3	15	160
		80 B5	19	M10	83	40	165	130	200	6	6	21,8	15	160
		90 B5	24	M10	83	50	165	130	200	6	8	27,3	15	160
		100-112 B5	28	M12	83	60	215	180	250	6	8	31,3	15	160
		100-112 B14	28	9	83	60	130	110	160	6	8	31,3	15	160
	200	90 B5	24	11	100	50	165	130	200	6	8	27,3	23	220
		100-112 B5	28	M12	100	60	215	180	250	6	8	31,3	23	220
		132 B5	38	M12	100	80	265	230	300	6	10	41,3	23	220
		132 B14	38	11	100	80	165	130	200	6	10	41,3	23	220
	250	132 B5	38	M12	125	80	265	230	300	6	10	41,3	25	250
		132 B14	38	11	125	80	165	130	200	6	10	41,3	25	250
		160 B5	42	M16	125	110	300	250	350	6	12	45,8	25	250

* XMRC: stainless steel version

For non quoted dimensions make reference to the schemes on page 198.







Basic constructive forms

ratio:
1/1

MC1

ratio:
1/1,5 - 1/2 - 1/3 - 1/4

MC2

Motor gearbox with broached hollow shaft MRB

Size		IEC flange	D3 H7	F2	G	L	M	N	P	R	S1	T1	U	V
XMRB models*	86	56 B5	9	M6	43	23	100	80	120	4	3	10,4	13	90
		63 B5	11	M8	43	23	115	95	140	4	4	12,8	13	90
		71 B5	14	M8	43	30	130	110	160	4	5	16,3	13	90
		71 B14	14	7	43	30	85	70	105	4	5	16,3	13	90
		80 B5	19	M10	43	40	165	130	200	4	6	21,8	13	100
		80 B14	19	7	43	40	100	80	120	4	6	21,8	13	100
	110	63 B5	11	M8	55	23	115	95	140	4	4	12,8	13	105
		71 B5	14	M8	55	30	130	110	160	4	5	16,3	13	105
		71 B14	14	7	55	30	85	70	105	4	5	16,3	13	105
		80 B5	19	M10	55	40	165	130	200	4	6	21,8	13	105
		80 B14	19	7	55	40	100	80	120	4	6	21,8	13	105
	134	71 B5	14	M8	67	30	130	110	160	5	5	16,3	13	125
		80 B5	19	M10	67	40	165	130	200	5	6	21,8	13	125
		80 B14	19	7	67	40	100	80	120	5	6	21,8	13	125
		90 B5	24	M10	67	50	165	130	200	5	8	27,3	13	125
		90 B14	24	9	67	50	115	95	140	5	8	27,3	13	125
		100-112 B5	28	M12	67	60	215	180	250	5	8	31,3	13	135
		100-112 B14	28	9	67	60	130	110	160	5	8	31,3	13	135
	166	71 B5	14	9	83	30	130	110	160	6	5	16,3	15	160
		80 B5	19	M10	83	40	165	130	200	6	6	21,8	15	160
		90 B5	24	M10	83	50	165	130	200	6	8	27,3	15	160
		100-112 B5	28	M12	83	60	215	180	250	6	8	31,3	15	160
		100-112 B14	28	9	83	60	130	110	160	6	8	31,3	15	160
	200	90 B5	24	11	100	50	165	130	200	6	8	27,3	23	220
		100-112 B5	28	M12	100	60	215	180	250	6	8	31,3	23	220
		132 B5	38	M12	100	80	265	230	300	6	10	41,3	23	220
		132 B14	38	11	100	80	165	130	200	6	10	41,3	23	220
	250	132 B5	38	M12	125	80	265	230	300	6	10	41,3	25	250
		132 B14	38	11	125	80	165	130	200	6	10	41,3	25	250
		160 B5	42	M16	125	110	300	250	350	6	12	45,8	25	250

* XMRB: stainless steel version

For the characteristics of the broached shaft, make reference to RB models on page 200.
For non quoted dimensions make reference to the schemes on page 200.

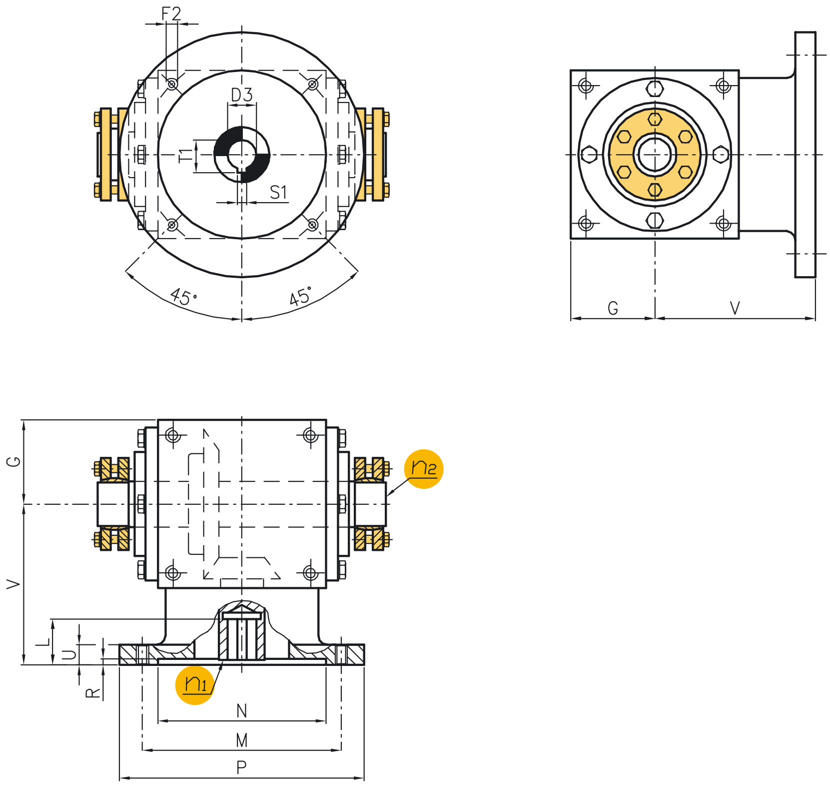
Basic constructive forms

ratio:
1/1

MC1

ratio:
1/1,5 - 1/2 - 1/3 - 1/4

MC2



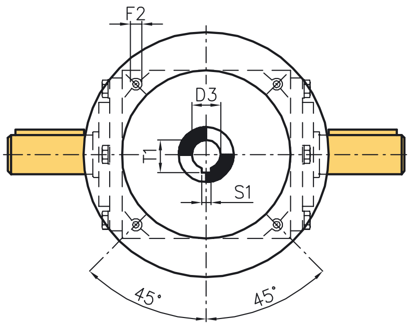
Hollow shaft motor gearbox with shrink disks MRA

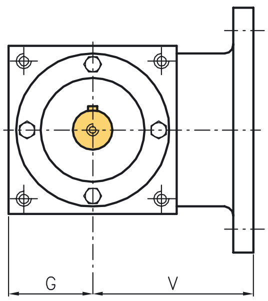
XMRA models*

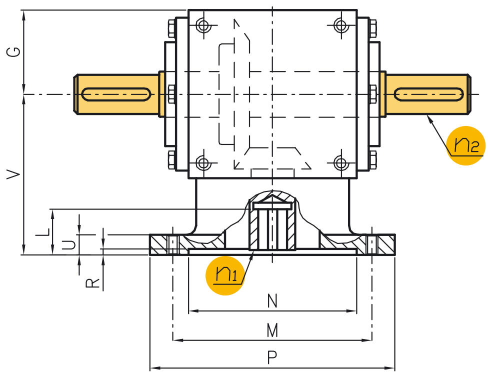
Size	IEC flange	D3 H7	F2	G	L	M	N	P	R	S1	T1	U	V
86	56 B5	9	M6	43	23	100	80	120	4	3	10,4	13	90
	63 B5	11	M8	43	23	115	95	140	4	4	12,8	13	90
	71 B5	14	M8	43	30	130	110	160	4	5	16,3	13	90
	71 B14	14	7	43	30	85	70	105	4	5	16,3	13	90
	80 B5	19	M10	43	40	165	130	200	4	6	21,8	13	100
	80 B14	19	7	43	40	100	80	120	4	6	21,8	13	100
110	63 B5	11	M8	55	23	115	95	140	4	4	12,8	13	105
	71 B5	14	M8	55	30	130	110	160	4	5	16,3	13	105
	71 B14	14	7	55	30	85	70	105	4	5	16,3	13	105
	80 B5	19	M10	55	40	165	130	200	4	6	21,8	13	105
	80 B14	19	7	55	40	100	80	120	4	6	21,8	13	105
134	71 B5	14	M8	67	30	130	110	160	5	5	16,3	13	125
	80 B5	19	M10	67	40	165	130	200	5	6	21,8	13	125
	80 B14	19	7	67	40	100	80	120	5	6	21,8	13	125
	90 B5	24	M10	67	50	165	130	200	5	8	27,3	13	125
	90 B14	24	9	67	50	115	95	140	5	8	27,3	13	125
	100-112 B5	28	M12	67	60	215	180	250	5	8	31,3	13	135
	100-112 B14	28	9	67	60	130	110	160	5	8	31,3	13	135
166	71 B5	14	9	83	30	130	110	160	6	5	16,3	15	160
	80 B5	19	M10	83	40	165	130	200	6	6	21,8	15	160
	90 B5	24	M10	83	50	165	130	200	6	8	27,3	15	160
	100-112 B5	28	M12	83	60	215	180	250	6	8	31,3	15	160
	100-112 B14	28	9	83	60	130	110	160	6	8	31,3	15	160
200	90 B5	24	11	100	50	165	130	200	6	8	27,3	23	220
	100-112 B5	28	M12	100	60	215	180	250	6	8	31,3	23	220
	132 B5	38	M12	100	80	265	230	300	6	10	41,3	23	220
	132 B14	38	11	100	80	165	130	200	6	10	41,3	23	220
250	132 B5	38	M12	125	80	265	230	300	6	10	41,3	25	250
	132 B14	38	11	125	80	165	130	200	6	10	41,3	25	250
	160 B5	42	M16	125	110	300	250	350	6	12	45,8	25	250

* XMRA: stainless steel version

For the characteristics of the shrink-disks, make reference to RA models on page 201.
For non quoted dimensions make reference to the schemes on page 201.







Basic constructive forms

ratio:
1/1

MS1

MS3

MS4

ratio:
1/1,5 - 1/2 - 1/3 - 1/4

MS2

MS9

MS10

Protruding shaft motor gearbox MRS

	Size	IEC flange	D3 H7	F2	G	L	M	N	P	R	S1	T1	U	V
XMRS models*	86	56 B5	9	M6	43	23	100	80	120	4	3	10,4	13	90
XMRS models*		63 B5	11	M8	43	23	115	95	140	4	4	12,8	13	90
XMRS models*		71 B5	14	M8	43	30	130	110	160	4	5	16,3	13	90
XMRS models*		71 B14	14	7	43	30	85	70	105	4	5	16,3	13	90
XMRS models*		80 B5	19	M10	43	40	165	130	200	4	6	21,8	13	100
XMRS models*		80 B14	19	7	43	40	100	80	120	4	6	21,8	13	100
XMRS models*	110	63 B5	11	M8	55	23	115	95	140	4	4	12,8	13	105
XMRS models*		71 B5	14	M8	55	30	130	110	160	4	5	16,3	13	105
XMRS models*		71 B14	14	7	55	30	85	70	105	4	5	16,3	13	105
XMRS models*		80 B5	19	M10	55	40	165	130	200	4	6	21,8	13	105
XMRS models*		80 B14	19	7	55	40	100	80	120	4	6	21,8	13	105
XMRS models*	134	71 B5	14	M8	67	30	130	110	160	5	5	16,3	13	125
XMRS models*		80 B5	19	M10	67	40	165	130	200	5	6	21,8	13	125
XMRS models*		80 B14	19	7	67	40	100	80	120	5	6	21,8	13	125
XMRS models*		90 B5	24	M10	67	50	165	130	200	5	8	27,3	13	125
XMRS models*		90 B14	24	9	67	50	115	95	140	5	8	27,3	13	125
XMRS models*		100-112 B5	28	M12	67	60	215	180	250	5	8	31,3	13	135
XMRS models*		100-112 B14	28	9	67	60	130	110	160	5	8	31,3	13	135
	166	71 B5	14	9	83	30	130	110	160	6	5	16,3	15	160
		80 B5	19	M10	83	40	165	130	200	6	6	21,8	15	160
		90 B5	24	M10	83	50	165	130	200	6	8	27,3	15	160
		100-112 B5	28	M12	83	60	215	180	250	6	8	31,3	15	160
		100-112 B14	28	9	83	60	130	110	160	6	8	31,3	15	160
	200	90 B5	24	11	100	50	165	130	200	6	8	27,3	23	220
		100-112 B5	28	M12	100	60	215	180	250	6	8	31,3	23	220
		132 B5	38	M12	100	80	265	230	300	6	10	41,3	23	220
		132 B14	38	11	100	80	165	130	200	6	10	41,3	23	220
	250	132 B5	38	M12	125	80	265	230	300	6	10	41,3	25	250
		132 B14	38	11	125	80	165	130	200	6	10	41,3	25	250
		160 B5	42	M16	125	110	300	250	350	6	12	45,8	25	250

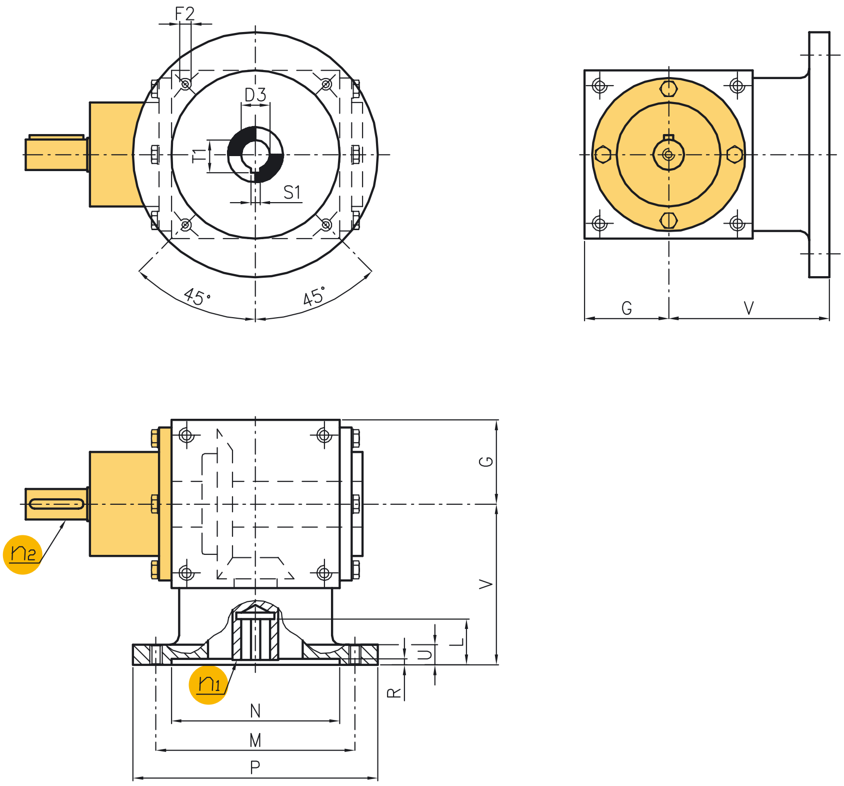
* XMRS: stainless steel version

For non quoted dimensions make reference to the schemes on page 202.

Basic constructive forms

ratio:
1/1

ratio:
1/1,5 - 1/2 - 1/3 - 1/4

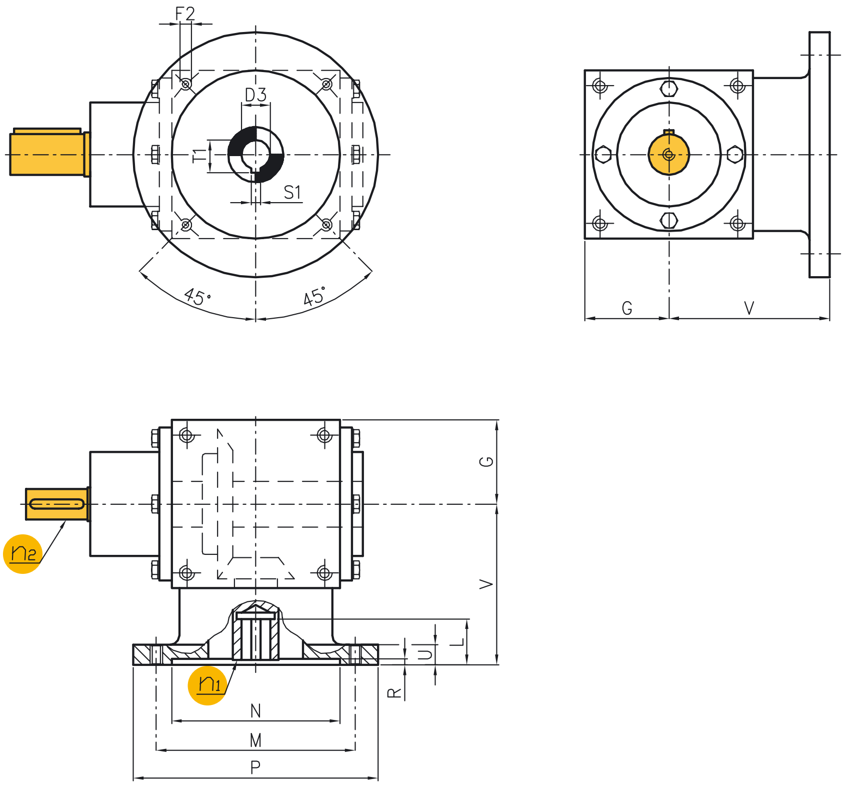


Two hubs motor gearbox MRX

	Size	IEC flange	D3 H7	F2	G	L	M	N	P	R	S1	T1	U	V
XMRX models*	86	56 B5	9	M6	43	23	100	80	120	4	3	10,4	13	90
		63 B5	11	M8	43	23	115	95	140	4	4	12,8	13	90
		71 B5	14	M8	43	30	130	110	160	4	5	16,3	13	90
		71 B14	14	7	43	30	85	70	105	4	5	16,3	13	90
		80 B5	19	M10	43	40	165	130	200	4	6	21,8	13	100
		80 B14	19	7	43	40	100	80	120	4	6	21,8	13	100
	110	63 B5	11	M8	55	23	115	95	140	4	4	12,8	13	105
		71 B5	14	M8	55	30	130	110	160	4	5	16,3	13	105
		71 B14	14	7	55	30	85	70	105	4	5	16,3	13	105
		80 B5	19	M10	55	40	165	130	200	4	6	21,8	13	105
		80 B14	19	7	55	40	100	80	120	4	6	21,8	13	105
	134	71 B5	14	M8	67	30	130	110	160	5	5	16,3	13	125
		80 B5	19	M10	67	40	165	130	200	5	6	21,8	13	125
		80 B14	19	7	67	40	100	80	120	5	6	21,8	13	125
		90 B5	24	M10	67	50	165	130	200	5	8	27,3	13	125
		90 B14	24	9	67	50	115	95	140	5	8	27,3	13	125
		100-112 B5	28	M12	67	60	215	180	250	5	8	31,3	13	135
		100-112 B14	28	9	67	60	130	110	160	5	8	31,3	13	135
	166	71 B5	14	9	83	30	130	110	160	6	5	16,3	15	160
		80 B5	19	M10	83	40	165	130	200	6	6	21,8	15	160
		90 B5	24	M10	83	50	165	130	200	6	8	27,3	15	160
		100-112 B5	28	M12	83	60	215	180	250	6	8	31,3	15	160
		100-112 B14	28	9	83	60	130	110	160	6	8	31,3	15	160
	200	90 B5	24	11	100	50	165	130	200	6	8	27,3	23	220
		100-112 B5	28	M12	100	60	215	180	250	6	8	31,3	23	220
		132 B5	38	M12	100	80	265	230	300	6	10	41,3	23	220
		132 B14	38	11	100	80	165	130	200	6	10	41,3	23	220
	250	132 B5	38	M12	125	80	265	230	300	6	10	41,3	25	250
		132 B14	38	11	125	80	165	130	200	6	10	41,3	25	250
		160 B5	42	M16	125	110	300	250	350	6	12	45,8	25	250

* XMRX: stainless steel version

For non quoted dimensions make reference to the schemes on page 204.



Basic constructive forms

ratio:
1/1

MS31

ratio:
1/1,5 - 1/2 - 1/3 - 1/4

MS32

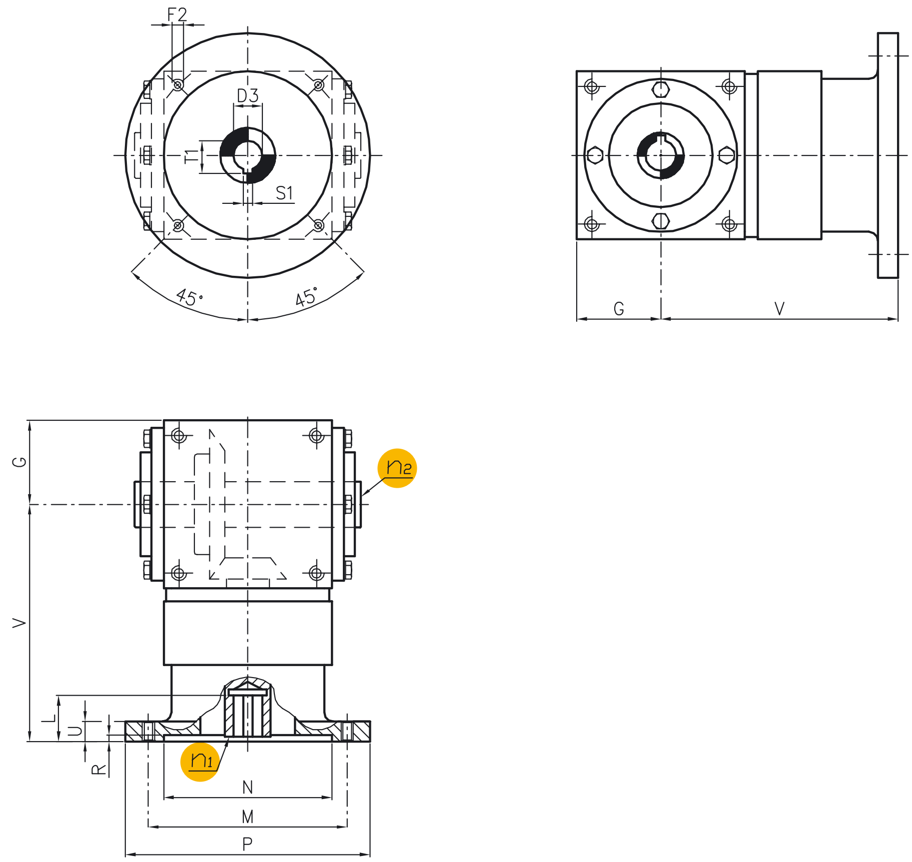
Two hubs motor gearbox with reinforced shafts MRZ

	Size	IEC flange	D3 H7	F2	G	L	M	N	P	R	S1	T1	U	V
XMRZ models*	86	56 B5	9	M6	43	23	100	80	120	4	3	10,4	13	90
		63 B5	11	M8	43	23	115	95	140	4	4	12,8	13	90
		71 B5	14	M8	43	30	130	110	160	4	5	16,3	13	90
		71 B14	14	7	43	30	85	70	105	4	5	16,3	13	90
		80 B5	19	M10	43	40	165	130	200	4	6	21,8	13	100
		80 B14	19	7	43	40	100	80	120	4	6	21,8	13	100
	110	63 B5	11	M8	55	23	115	95	140	4	4	12,8	13	105
		71 B5	14	M8	55	30	130	110	160	4	5	16,3	13	105
		71 B14	14	7	55	30	85	70	105	4	5	16,3	13	105
		80 B5	19	M10	55	40	165	130	200	4	6	21,8	13	105
		80 B14	19	7	55	40	100	80	120	4	6	21,8	13	105
	134	71 B5	14	M8	67	30	130	110	160	5	5	16,3	13	125
		80 B5	19	M10	67	40	165	130	200	5	6	21,8	13	125
		80 B14	19	7	67	40	100	80	120	5	6	21,8	13	125
		90 B5	24	M10	67	50	165	130	200	5	8	27,3	13	125
		90 B14	24	9	67	50	115	95	140	5	8	27,3	13	125
		100-112 B5	28	M12	67	60	215	180	250	5	8	31,3	13	135
		100-112 B14	28	9	67	60	130	110	160	5	8	31,3	13	135
	166	71 B5	14	9	83	30	130	110	160	6	5	16,3	15	160
		80 B5	19	M10	83	40	165	130	200	6	6	21,8	15	160
		90 B5	24	M10	83	50	165	130	200	6	8	27,3	15	160
		100-112 B5	28	M12	83	60	215	180	250	6	8	31,3	15	160
		100-112 B14	28	9	83	60	130	110	160	6	8	31,3	15	160
	200	90 B5	24	11	100	50	165	130	200	6	8	27,3	23	220
		100-112 B5	28	M12	100	60	215	180	250	6	8	31,3	23	220
		132 B5	38	M12	100	80	265	230	300	6	10	41,3	23	220
		132 B14	38	11	100	80	165	130	200	6	10	41,3	23	220
	250	132 B5	38	M12	125	80	265	230	300	6	10	41,3	25	250
		132 B14	38	11	125	80	165	130	200	6	10	41,3	25	250
		160 B5	42	M16	125	110	300	250	350	6	12	45,8	25	250

* XMRZ: stainless steel version

For non quoted dimensions make reference to the schemes on page 205.

ratio:
1/4,5 - 1/6 - 1/9 - 1/12



High reduction motor gearbox with hollow shaft MREC
High reduction motor gearbox with broached hollow shaft MREB
High reduction motor gearbox with hollow shaft with shrink-disks MREA
High reduction motor gearbox with protruding shaft MRES

Size	IEC flange	D3 H7	F2	G	L	M	N	P	R	S1	T1	U	V
32	71 B5	14	M8	67	30	130	110	160	5	5	16,3	13	213
	80 B5	19	M10	67	40	165	130	200	5	6	21,8	13	213
	80 B14	19	7	67	40	100	80	120	5	6	21,8	13	213
	90 B5	24	M10	67	50	165	130	200	5	8	27,3	13	213
	90 B14	24	9	67	50	115	95	140	5	8	27,3	13	213
	100-112 B5	28	M12	67	60	215	180	250	5	8	31,3	13	223
	100-112 B14	28	9	67	60	130	110	160	5	8	31,3	13	223
42	71 B5	14	9	83	30	130	110	160	6	5	16,3	15	258
	80 B5	19	M10	83	40	165	130	200	6	6	21,8	15	258
	90 B5	24	M10	83	50	165	130	200	6	8	27,3	15	258
	100-112 B5	28	M12	83	60	215	180	250	6	8	31,3	15	258
	100-112 B14	28	9	83	60	130	110	160	6	8	31,3	15	258
55	90B5	24	11	100	50	165	130	200	6	8	27,3	23	348
	100-112 B5	28	M12	100	60	215	180	250	6	8	31,3	23	348
	132 B5	38	M12	100	80	265	230	300	6	10	41,3	23	348
	132 B14	38	11	100	80	165	130	200	6	10	41,3	23	348

For non quoted dimensions make reference to the schemes on page 208-211.

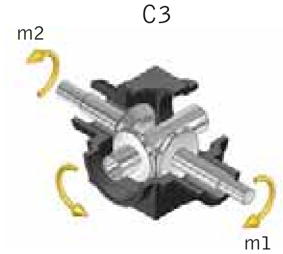
CONSTRUCTIVE FORMS

For every mounting scheme it is possible to apply a motor flange in the positions indicated under letter m.
Order example:
- For a C3 mounting scheme and a m^2 flange: C3/m2

RC - RR - RB - RA

ratio:
1/1

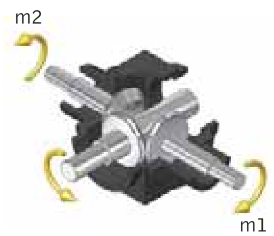
C3



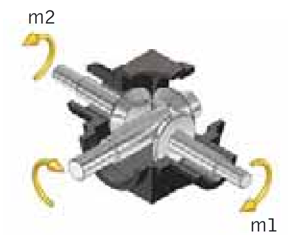
RS - RP

ratio:
1/1

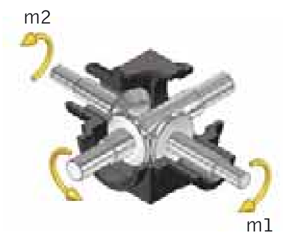
S5



S6



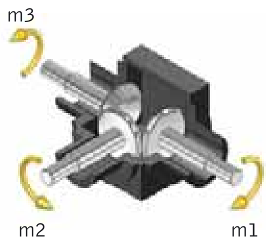
S7



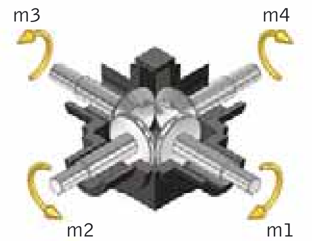
RX - RZ

ratio:
1/1

S8



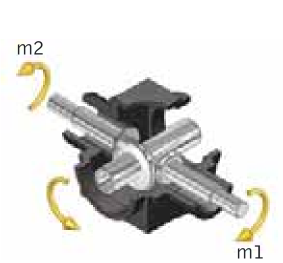
S26



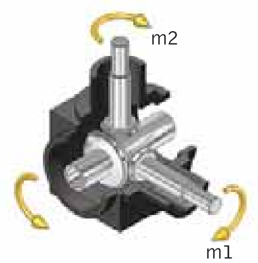
RC - RB - RA

ratio:
1/1,5 - 1/2 - 1/3 - 1/4

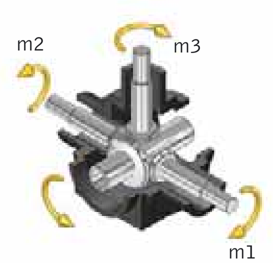
C4



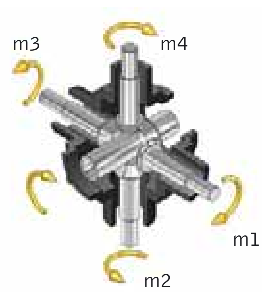
C5



C6



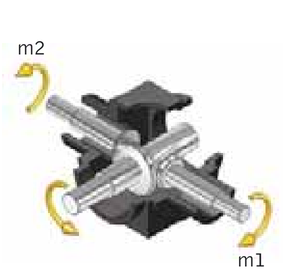
C7



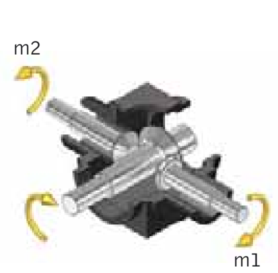
RS - RP

ratio:
1/1,5 - 1/2 - 1/3 - 1/4

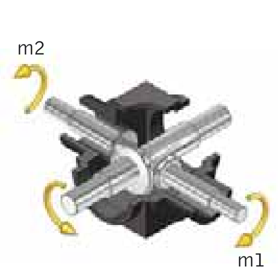
S11



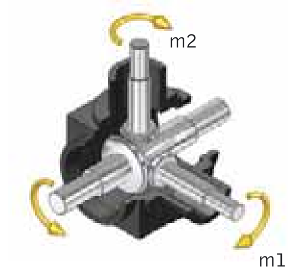
S12



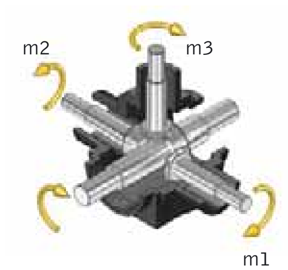
S13



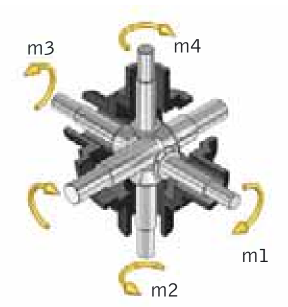
S15



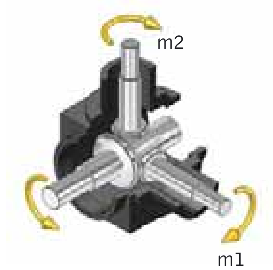
S16



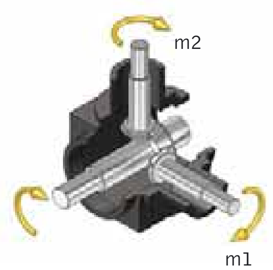
S17



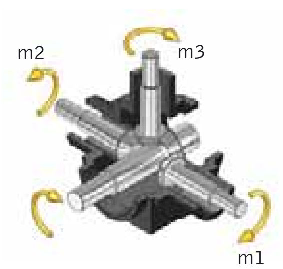
S18



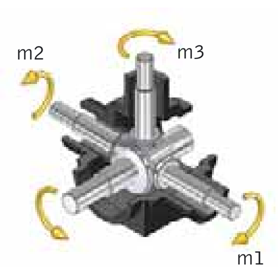
S19



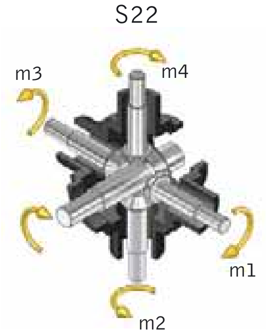
S20



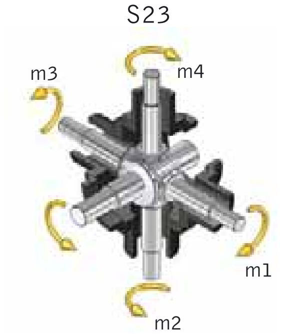
S21



S22



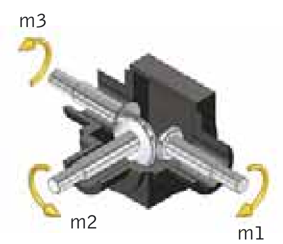
S23



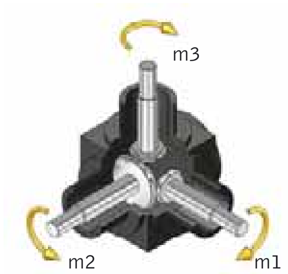
RX - RZ

ratio:
1/1,5 - 1/2 - 1/3 - 1/4

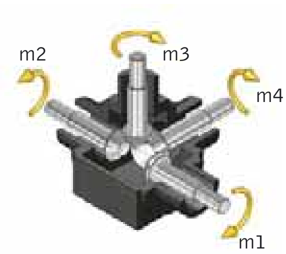
S14



S27



S28



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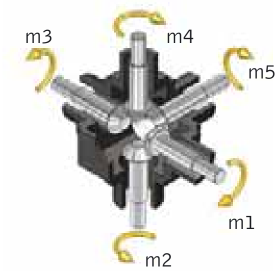

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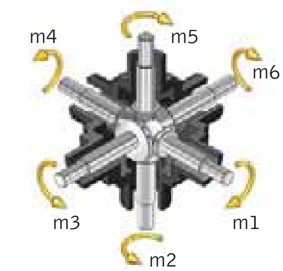
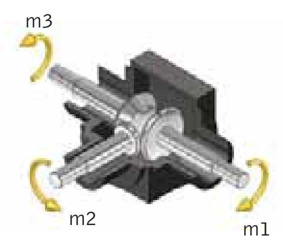


S33



The use of stainless steel has had an exponential growth in the last years. New market demands, hygienic requirements in food industry and the applications in oxidizing environments require an higher and higher employment of stainless materials.

X series

From the beginning UNIMEC has been able to supply its products in stainless steel for its customers. Anyway, realizing those components meant long manufacturing times. For the most requested products and sizes UNIMEC is now able to propose a complete series: the X series. This choice gives multiple advantages: on the one hand a shortening of the delivery times as the components are all available on stock, on the other hand the manufacturing allows to obtain quite interesting costs, because it starts from the row casted pieces.

THE X SERIES

The X series is composed by trapezoidal screw jacks and bevel gearboxes. The material used for the manufacturing of the stainless components is steel type AISI 316. It corresponds to the following European norms: X5 CrNiMo 17-12-2 (UNI EN 10088-1:2005) for laminates and X5 CrNiMo 19-11-2 (UNI EN 10283:2000) for casting.
The main feature of an AISI 316 steel is its high resistance to corrosion, above all in the sea and food environments, where AISI 304 seems to have some problems. The table below lists a series of substances which are normally critical for common type steels and puts in evidence the AISI 316 resistance as compared to the AISI 304 one.

A stainless steel yield point is lower than the typical C45 values of about 30%. Thus, **in order to keep the same safety coefficient used to effect the calculations on screw jacks and bevel gearboxes, it is necessary to multiply the limit load by 0,7 in case they are referred to a stainless steel component with respect to a different type of steel. The only exception to this rule is the verification at the buckling load for thin long spindles:** in this case the limit load is only the function of the elastic module, and the difference between the AISI 316 and the C45 values is only 5%.

X TYPE SCREW JACKS

Screw jacks belonging to the X series are sizes 204, 306, 407, in all the construction models.
The components made of stainless steel are casings, bushings, covers, motor flanges, spindles and all end fittings. Even the accessories are all made of AISI 316 steel or the are compatible with the X series; the only exception are TPR models with over-size spindle and the AR anti-rotation system with grooved spindle.
The only component which is manufactured in non stainless steel is the worm screw. In case the screw tangs are exposed to oxidizing agents it is possible, on demand, to protect them by means of the Niploy treatment which has been described at the end of the trapezoidal screw jacks chapter.

X TYPE BEVEL GEARBOXES

Gear boxes belonging to the X series are sizes 86, 110, 134 in all construction models.
The components made of stainless steel are casings, hubs, covers, motor flanges, and all the hollow as well as the protruding shafts.

- 🟢 Optimum resistance
- 🟡 Medium resistance
- 🔴 Bad resistance

	AISI 304	AISI 316
Acetylene	🟢	🟢
Vinegar	🟢	🟢
Vinegar (vapours)	🟡	🟢
100 °C acetone	🟢	🟢
20% acetic acid	🟢	🟢
5% boric acid	🟢	🟢
5% butyric acid	🟢	🟢
Hydrocyanic acid	🟡	🟡
5% citric acid	🟢	🟢
Hydrochloric acid	🔴	🔴
5% chromic acid	🟢	🟢
Hydrofluoric acid	🔴	🔴
5% Phosphoric acid	🟢	🟢
5% lactic acid	🟢	🟢
100% linoleic acid	🟡	🟢
40% malic acid	🟢	🟢
Muriatic acid	🔴	🔴
10% nitric acid	🟢	🟢
100% oleic acid	🟢	🟢
5% oxalic acid	🟢	🟢
Picric acid	🟢	🟢
100% hydrogen sulphide	🟡	🟢
5% sulphuric acid	🔴	🔴
100% sulphurous acid	🟡	🟡
100% stearic acid	🟢	🟢
100% tartaric acid	🟢	🟢
Fresh water	🟢	🟢
Salt water	🔴	🟢
30% hydrogen peroxide	🟢	🟢
Oil of turpentine	🟢	🟢
Ethyl alcohol	🟢	🟢
Methyl alcohol	🟢	🟢
Molten aluminium	🔴	🔴
Ammonia	🟢	🟢
Acetic anhydride	🟢	🟢
Carbon dioxide	🟢	🟢
90% sulphur dioxide	🔴	🟡
Aniline	🟢	🟢
Tanning baths	🟢	🟢
Chrome plating baths	🟢	🟢
Photo fixing baths	🟢	🟢
Photo developing baths	🟢	🟢
Gasoline	🟢	🟢
Benzene	🟢	🟢
Sodium bicarbonate	🟢	🟢
Beer	🟢	🟢
15% sodium bisulphate	🔴	🔴
Carbon bisulphide	🟢	🟢
5% borax	🟢	🟢
Butane	🟢	🟢
Coffee	🟢	🟢
Bleaching	🔴	🟡
Camphor	🟢	🟢
5% sodium carbonate	🟢	🟢
Sodium citrate	🟢	🟢
Chloroform	🟢	🟢
1% ammonium chloride	🟢	🟢
50% ferric chloride	🔴	🔴
20% ferrous chloride	🔴	🔴
20% Magnesium chloride	🟢	🟢
10% mercuric chloride	🔴	🔴
30% nickel chloride	🔴	🔴
5% potassium chloride	🟢	🟢
5% sodium chloride	🟢	🟢

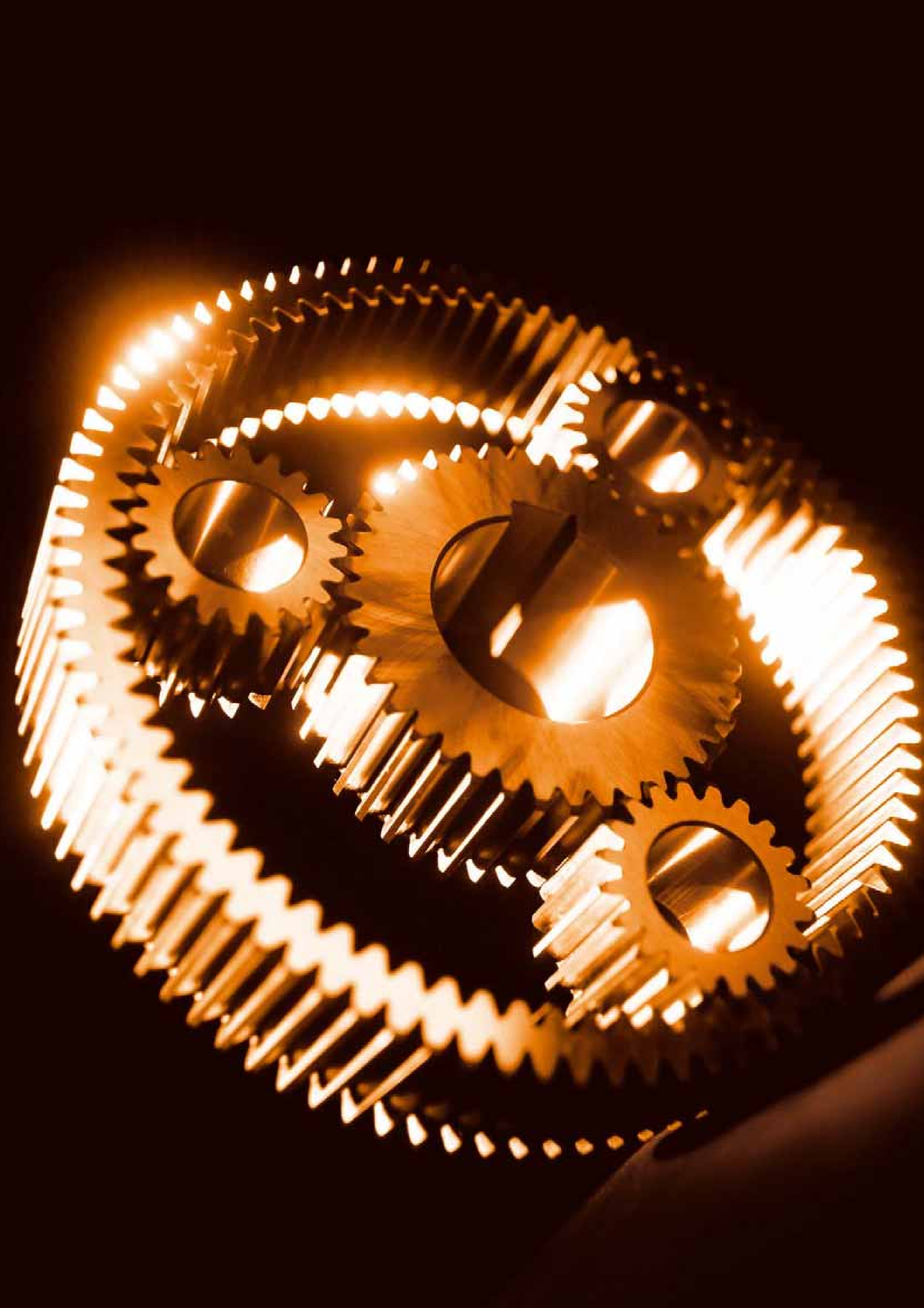
	AISI 304	AISI 316
10% Zinc chloride	🟡	🟢
Sulphur chloride	🟢	🟢
Coke	🟢	🟢
Ether	🟢	🟢
Formaldehyde	🟢	🟢
10% Ammonium phosphate	🟡	🟡
Sodium phosphate	🟡	🟡
Furan	🟢	🟢
Chlorine gas	🔴	🔴
Coke-oven-gas	🟢	🟢
Gelatine	🟢	🟢
Glycerol	🟢	🟢
Ethyl glycol	🟢	🟢
Glucose	🟢	🟢
Lac	🟢	🟢
40% Ammonium hydroxide	🟢	🟢
10% calcium hydroxide	🟡	🟡
10% magnesium hydroxide	🟡	🟡
50% potassium hydroxide	🟡	🟡
20% sodium hydroxide	🟢	🟢
Calcium hypochlorite	🔴	🔴
Sodium hypochlorite	🔴	🔴
Milk	🟢	🟢
Yeast	🟢	🟢
Mayonnaise	🟢	🟢
Molasses	🟢	🟢
Mustard	🟢	🟢
50% ammonium nitrate	🟢	🟢
40% sodium nitrate	🟢	🟢
Medicinal oil	🟢	🟢
Vegetable oil	🟢	🟢
Paraffin	🟢	🟢
10% sodium perborate	🟡	🟡
10% hydrogen peroxide	🟢	🟢
10% sodium peroxide	🟡	🟡
Molten lead	🟡	🟡
Propane	🟢	🟢
Soap	🟢	🟢
Sugar syrup	🟢	🟢
Milk serum	🟢	🟢
Sodium silicate	🟢	🟢
10% aluminium sulphate	🟢	🟢
10% ammonium sulphate	🟡	🟡
10% ferric sulphate	🟢	🟢
40% ferrous sulphate	🟡	🟡
40% magnesium sulphate	🟢	🟢
30% nickel sulphate	🟢	🟢
10% potassium sulphate	🟢	🟢
10% copper sulphate	🟡	🟢
10% sodium sulphate	🟢	🟢
10% zinc sulphate	🟢	🟢
10% sodium sulphide	🟡	🟢
Orange juices	🟢	🟢
Lemon juices	🟢	🟢
Carbon tetrachloride	🔴	🔴
60% sodium thiosulfate	🟡	🟢
Toluene	🟢	🟢
Trichloroethylene	🟡	🟡
Varnishes	🟢	🟢
Wine	🟢	🟢
Whisky	🟢	🟢
Molten zinc	🔴	🔴
Molten sulphur	🟢	🟢

The purpose of a speed modulation gearbox is the possibility to increase or decrease the revolution speed by means of a temporary additional rotation. Said operation is effected manually, with motors or motor reducers, through a worm screw having an high reduction ratio. The angular speed adjustment can also be performed when the machine is running, by overlapping the effects of the different handlings and thus reducing the expensive non-working periods. The operation principle of UNIMEC's speed modulation gearboxes is the same as the planetary gearboxes, the only difference being the external ring gear, is not connected to the body, but is contrasted by an adjustment worm screw. Rotating this device, and as a consequence rotating the planetary system too, it is possible to modify the transmission output revolution speed. Machines made of various working stations, with conveyor belts and feeding lines (typical of the paper, packaging and press sectors, etc.) find their ideal solution in the speed modulation gears, in order to synchronize the various delivery phases.

Mechanical speed modulation gearboxes

Speed modulation gearboxes can also be used as non-stop speed modulators. It is therefore possible, in case for example of coiling lines, to modify the speed of one or more stations in order to obtain constant pulls. Other typical applications for speed modulation gearboxes are the press machines, the sheet working machines, the paper and packaging machines, where the control for waste reduction and for the machines setting requires high handling precisions.

3 versions, 5 models and 85 construction forms, mean a wide range of application for a designer. In addition to standard models, UNIMEC is able to provide special custom designed speed modulation gearboxes suited to the requirements of specific machines.



256

F

One stage speed modulation gearboxes.

257

DF

Two stages speed modulation gearboxes.

258

RC/F

Speed modulation gearboxes with hollow shaft transmission.

259

RS/F

Speed modulation gearboxes with protruding shaft transmission.

260

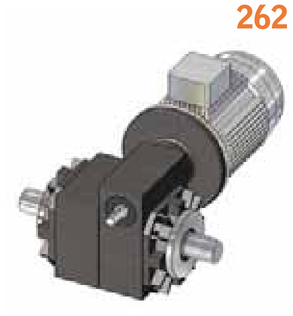
RIS/F

Speed modulation gearboxes with inverter transmission.

262

MF

One stage speed modulation gearboxes with motor on the adjustment worm screw.



262

MDF

Two stages speed modulation gearboxes with motor on the adjustment worm screw.

262

RC/MF

Speed modulation gearboxes with hollow shaft transmission and motor on the adjustment worm screw.

Application samples are online at www.unimec.eu - section Applications

RS/MF

262

Speed modulation gearboxes with protruding shaft transmission and motor on the adjustment worm screw.

RC/MRF

263

Speed modulation gearboxes with hollow shaft transmission and motor reducer on the adjustment worm screw.

RIS/MF

262

Speed modulation gearboxes with inverter transmission and motor on the adjustment worm screw.

RS/MRF

263

Speed modulation gearboxes with protruding shaft transmission and motor reducer on the adjustment worm screw.

MRF

263

One stage speed modulation gearboxes with motor reducer on the adjustment worm screw.

RIS/MRF

263

Speed modulation gearboxes with inverter transmission and motor reducer on the adjustment worm screw.

MRDF

263

Two stages speed modulation gearboxes with motor reducer on the adjustment worm screw.

Reinforced version -P

The 6 planets reinforced models have the suffix **-P**.

Casings

The speed modulation gearboxes casings are supplied with completely machine finished outer faces and varnished inner parts. They are made of grew cast iron EN-GJL-250 (according to the UNI EN 1561:1998 requirements).

Gears

The speed modulation gearboxes gears are made of different materials: the sun gear and planets of the planetary gear are made of alloy steel 17NiCrMo 6-4 (according to the UNI EN 10084:2000 requirements), while the ring gear is made of aluminium bronze CuAl10Fe2-C (according to the UNI EN 1982:2000 requirement), having high mechanical characteristics. The sun gear and planets have straight teeth and a reduction ratio of 1/3, while the ring gear has inner straight teeth and outer helicoidal teeth in order to couple with the adjustment worm screw, which is made of alloy steel 16NiCr4 (according to the UNI EN 10084:2000 requirements).
The planetary gears undergo thermal treatments like case-hardening and carburizing and then they are ground. The screw undergoes case-hardening and carburizing treatments before being thoroughly ground on both the threads and the tangs. In case the speed modulation gearbox couples with a bevel gearbox, the Gleason® conical bevel gear set toothing, made of steel 17NiCrMo 6-4 (according to the UNI EN 20084:2000 requirements) is case-hardened, carburized and run-in in pairs. The planes and holes undergo a grinding process.

Mechanical speed modulation gear boxes

Shafts

The speed modulation gearboxes shafts are made of carbon steel C45 (according to the UNI EN 10083-2:1998 requirements); the hollow shafts on the contrary are made of steel 16NiCr4 (according to the UNI EN 10084:2000 requirements), and they undergo case-hardening, carburizing and grinding treatments for their inner diameters. All shafts are induction ground and case-hardened in the contact area with the bearings and retaining rings.

Bearings and market materials

Top-quality bearings and market materials are used for the whole line.

GLOSSARY

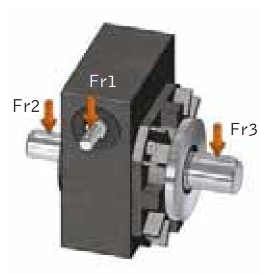
A = maximum input angular speed [rpm]
B = frequency of the loading cycle [Hz]
C_p = specific heat of lubricant [J/Kg•°C]
F_{r1} = radial force on the adjustment shaft [daN]
F_{r2} = radial force on the slow shaft [daN]
F_{r3} = radial force on the fast shaft [daN]
F_{r4} = radial force on the transmission shaft [daN]
F_{a1} = axial force on the adjustment shaft [daN]
F_{a2} = axial force on the slow shaft [daN]
F_{a3} = axial force on the fast shaft [daN]
F_{a4} = axial force on the transmission shaft [daN]
f_a = ambient factor
f_d = duration factor
f_g = usage factor
i_c = reduction ratio between the worm screw and the worm wheel, meant as a fraction (es.1/2)
i_t = reduction ratio between the fast shaft and the slow shaft, meant as a fraction (es.1/2)
J = total inertia [kgm^2]
J_f = speed modulation gearbox inertia [kgm^2]
J_v = inertia downstream of the speed modulation gearbox [kgm^2]
M_{tL} = torque on the slow shaft [daNm]
M_{tv} = torque on the fast shaft [daNm]
n_1 = fast shaft
n_2 = slow shaft
n_3 = adjustment shaft
P_d = power dissipated in the form of heat [kW]
P_i = input power to the single speed modulation gearbox [kW]
P_L = power on the slow shaft [kW]
P_J = inertia power [kW]
P_u = output power to the single speed modulation gearbox [kW]
P_v = power on the fast shaft [kW]
Pe = equivalent power [kW]
PTC = adjustment factor on thermal power
Q = lubricant flow-rate [litre/min]
rpm = rounds per minute
t_a = ambient temperature [°C]
t_f = speed modulation gearbox surface temperature [°C]
η = speed modulation gearbox running efficiency
θ_L = slow shaft rotation angle [°]
θ_v = fast shaft rotation angle [°]
θ_c = adjustment shaft rotation angle [°]
ω_L = slow shaft angular speed [rpm]
ω_v = fast shaft angular speed [rpm]
ω_c = adjustment shaft angular speed [rpm]
α_L = angular acceleration of the slow shaft [rad/s^2]

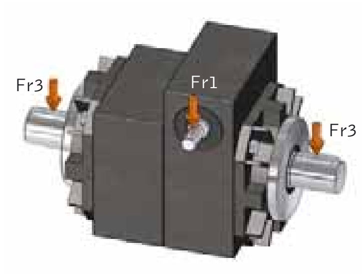
Unless otherwise specified all tables show linear measurements expressed in [mm].
All the reduction ratios are expressed in the form of a fraction, unless otherwise specified.

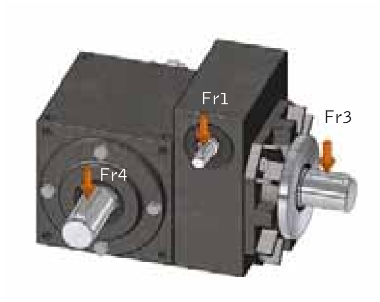
LOAD ANALYSIS AND COMPOSITION

The aim of a speed modulation gearbox is to transmit power through the shafts handling and to adjust their angular speed; for this reason the gears, the shafts and the bearings have been designed to transmit powers and torques as shown in the power tables. Nevertheless there can also be other forces which have to be considered during the dimensioning phase.
Such loads are generated by the devices connected to the speed modulation gearbox and they can be caused by belt drives, sudden accelerations and decelerations of the flywheels, structure misalignments, vibrations, shocks, pendular cycles etc. There can be two types of loads acting on the shafts: radial and axial loads, as referred to the shaft axis itself. The tables below show the maximum values for each type of forces according to the model and the size. In case of heavy loads, the table values must be divided by 1,5, while in case of shock load they should be divided by 2.
In case real load approach to the table values (modified) it is advisable to contact the technical office.

RADIAL LOADS

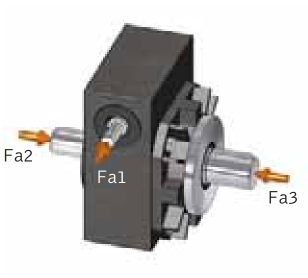


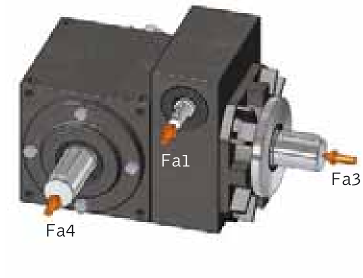




Size		**32**	**42**	**55**
Rotation speed of the fast shaft ω_V [rpm]				
Fr1 [daN]	50	27	75	100
	3000	13	28	65
Fr2 [daN]	50	140	190	230
	3000	65	75	180
Fr3 [daN]	50	180	230	380
	3000	80	90	260
Fr4 [daN]	50	300	600	1000
	3000	180	250	700

AXIAL LOADS





Size		32	42	55
Rotation speed of the fast shaft ω_V [rpm]				
Fa1 [daN]	50	20	34	45
	3000	5	13	16
Fa2 [daN]	50	60	150	250
	3000	25	58	100
Fa3 [daN]	50	110	210	350
	3000	45	90	160
Fa4 [daN]	50	120	260	400
	3000	50	110	180

BACKLASHES

The gears connection presents a natural and necessary backlash which is transmitted to the shafts. The gears backlash tends to increase according to the wear ratio of the components, that is why after various running cycles we can logically expect a higher value than taken before the start-up. It should be reminded that, due to the axial components of the transmission forces, the backlash measured under load can be different than the value taken when the speed modulation gearbox is unloaded.

RUNNING EFFICIENCY

The speed modulation gearboxes running efficiency mostly depends on the type of model used:

F model	90 - 93%
DF model	85 - 90%
RC/F-RS/F model	80 - 85%
RIS/F model	78 - 83%

HANDLING

Handling of speed modulation gearboxes can be manual or motorized. Handling of the worm screw can be manual or motorized, and in this last case a direct connection to the motor or motor reducer can be possible. The power tables determine the motoring power and the torque on the slow shaft, for each single speed modulation gearbox, in case of unique service factors, according to the model, size, ratio and rotation speeds.

The output speed adjustment

The core of the speed modulation gearbox operation is the adjustment of the output speed and the rotation angles by means the worm screw handling which is a variable that can be calculated as follows:

Having defined the parameters:

ω_V = fast shaft rotation speed [rpm]

ω_L = slow shaft rotation speed [rpm]

ω_c = worm screw rotation speed [rpm]

i_c = reduction ratio between the worm screw and the worm wheel, expressed as a fraction

i_c = 1/80 for sizes 32

i_c = 1/86 for sizes 42

i_c = 1/90 for sizes 55

i_t = total ratio of the transmission (expressed as a fraction) = ω_L/ω_V

the following relations result:

$$\omega_L = \omega_V \bullet i_t \pm \frac{2}{3} \bullet i_c \bullet \omega_c$$

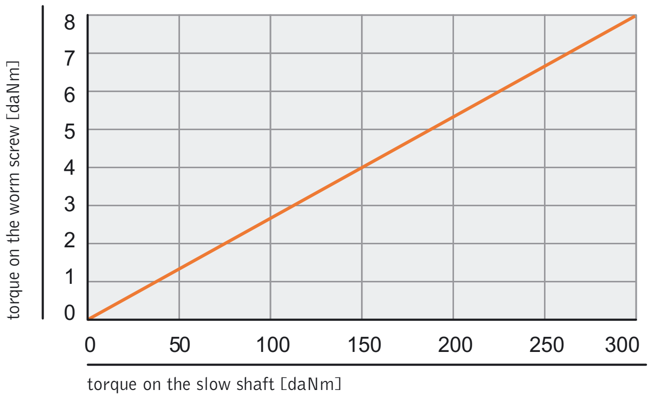
$$\pm\omega_c = (\omega_V \bullet i_t - \omega_L) \bullet \frac{3}{2} \bullet i_c$$

If we wanted to consider the adjustment in terms of grades instead of angular speeds, we should use the following formulas, where θ_L, θ_V and θ_c are the angular variations of the slow shaft, the fast shaft and the adjustment worm screw. Those variables can be expressed in radiant, grades or rounds and fractions of rounds.

$$\theta_L = \theta_V \bullet i_t \pm \frac{2}{3} \bullet i_c \bullet \theta_c$$

$$\pm\theta_c = (\theta_V \bullet i_t - \theta_L) \bullet \frac{3}{2} \bullet i_c$$

The ± sign indicates that the adjustment can be done by increasing or decreasing the number of rounds (or the rotation angles). The following graphs will show the wave of the torque to be applied to the adjustment worm screw as a function of the torque on the slow shaft.
Obviously, the function referred to the torque on the fast shaft can be obtained multiplying the torque value on the slow shaft by the reduction ratio of the speed reduction gearbox i_t.



Rotation directions

The rotation directions depend on the mounting scheme. According to the chosen model, as a function of the required rotation direction, it's possible to choose the mounting scheme which best meets desired requirements.
We remind that, <u>even if one only rotation direction of a shaft is changed from clockwise into anti-clockwise (and vice-versa), any other rotation of the speed modulation gearbox shafts direction must be reversed.</u>

Non-stop operation

A non-stop operation occurs when the speed modulation gear is subjected to time constant torque and angular speed. After a transition period the revolutions become stationary, together with the surface temperature of the speed modulation gearbox and the ambient thermal exchange. It is important to check for wear phenomena and thermal power.

Intermittent operation

An intermittent operation occurs when high grade accelerations and deceleration overlap to a revolution speed and torque (even at 0 value), make it necessary to verify the ability to counteract the system inertia. A revision of the speed modulation gearbox and the input power is therefore necessary. It is important to check bending and fatigue strength parameters.

LUBRICATION

The lubrication of the inner transmission devices (gears and bearings) is made using a mineral oil with extreme pressure additive: TOTAL CARTER EP 220. For a proper operation it is advisable to steady check for lubricant leakage. For all sizes a filling plug, a drain plug and an oil lever indicator are foreseen. The technical specifications and the application field for the lubricant inside the speed modulation gear boxes are listed below.

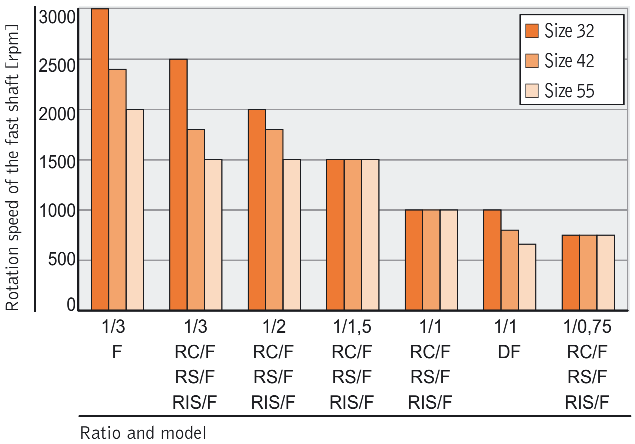
Lubricant	**Application field**	**Operating temperature [°C]***	**Technical specifications**
Total Carter EP 220	standard	0 : +200	AGMA 9005: D24
(not compatible with polyglicol oils)			DIN 51517-3: CLP
			NF ISO 6743-6: CKD
Total Azolla ZS 68	High speeds**	-10 : +200	AFNOR NF E 48-603 HM
			DIN 51524-2: HLP
			ISO 6743-4: HM
Total Dacnis SH 100	High temperatures	-30 : +250	NF ISO 6743: DAJ
Total Nevastane SL 220	Food industry	-30 : +230	NSF-USDA: H1

* for operation temperatures between 80°C and 150°C Viton® seals should be used; for temperatures higher than 150°C and lower then -20°C it is advisable to contact our technical office.
** for input revolutions higher than 1500 rpm we suggest using Viton® seals in order to better counteract the local temperature increases due to the strong sliding on the retaining ring.

The quantity of lubricant contained in speed modulation gearboxes is shown in the following table.

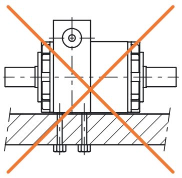
Size		**32**	**42**	**55**
F Model	Inner lubricant quantity [litres]	0,3	1,2	1,2
DF Model	Inner lubricant quantity [litres]	0,6	1,6	2,4
RC/F-RS/F-RIS/F Model	Inner lubricant quantity [litres]	0,7	2,1	2,7

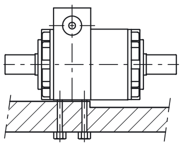
The inner devices of the speed modulation gearboxes can be lubricated in two ways: by means of splash or forced lubrication. Splash lubrication does not require external interventions: when the fast shaft revolutions are lower than indicate in the graph below, its operation ensures that lubricant reaches all the components requiring lubrication. For fast shaft revolution being higher than the indicated values it may happen that the gears peripheral speed be such as to create centrifugal forces able to overcome the lubricant adhesivity. Therefore, in order to ensure a proper lubrication, a lubricant feeding under pressure is necessary (5 bar suggested) by means of a suitable oil cooling circuit. **In case of forced lubrication it will be necessary to precise the mounting position and localization of the holes to be provided for the connection to the lubrication circuit.**



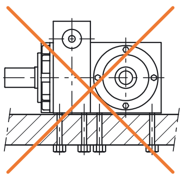
For revolutions reaching the border values indicated in the above graph it is advisable to contact our technical office in order to evaluate the modus operandi.
For very low revolutions of the fast shaft (lower than 50 rpm) the phenomena which normally generate splash could not be triggered off in a correct way. We suggest contacting our technical office in order to evaluate the most suitable solution to the problem.
In case of vertical axis mounting, the upper bearings and gears could not be properly lubricated. **It is therefore necessary to indicate such situation in case of order**, so that suitable grease holes can be foreseen. **If no indication about lubrication is given at the ordering phase, it is understood that the application conditions fall within the conditions of an horizontal mounting with splash lubrication.**

INSTALLATION AND MAINTENANCE

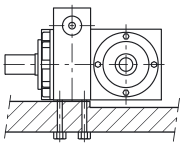




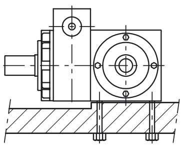
Installation
When positioning the speed modulation gears and connecting them to the machines , the greatest of care is necessary in the alignment of the axes. In case of an imprecise alignment, the bearing would overloaded, would be anomalous overheated, and they would be subjected to a greater wear with a consequent lifetime reduction and a noise increase. The modulation gears should be mounted so that movements and vibrations are avoided, and they should be properly fixed by means of bolts. We suggest effecting a proper cleaning and lubrication of the contact surfaces before assembling the connecting members, in order that any seizure or oxidizing problems be avoided. The assembly or disassembly must be carried out using tie rods and extractors through the threaded bore at the end of the shaft. For tight fittings, a shrink assembly is recommended, heating the members to be shrunk on to 80-100°C. For DF, RC/F, RS/F, RIS/F versions a simultaneous mounting of the two casings is to be avoided. It should be given previous notice in case of a vertical mounting in order that a proper lubrication be foreseen.



Preparing for service
All speed modulation gears are supplied filled with long lasting lubricant which ensures a perfect operation of the unit according to the power values indicated in the catalogue. The only exception is represented by the ones having an "add oil" label. The lubricant filling up to the right level is an installer's responsibility and it must be carried out when the gears are not in motion. An excessive filling should be avoided in order that any overheating, noise, power loss and lubricant leakage occur.



Start-up
All the units undergo a brief testing before being delivered to the client. However, several hours of running at full load are necessary before the modulation gear reaches its full running efficiency. In case of need, the modulation gear can be immediately set to work at full load; but, circumstances permitting, it is nonetheless advisable to subject it to a gradually increasing load to reach maximum load after 20 - 30 hours of running. It is also vital to take the precautions necessary to avoid overloading in the first stages of running. The temperatures reached by the speed modulation gearbox in these initial phases will be higher than the ones produced after the complete running -in of the same



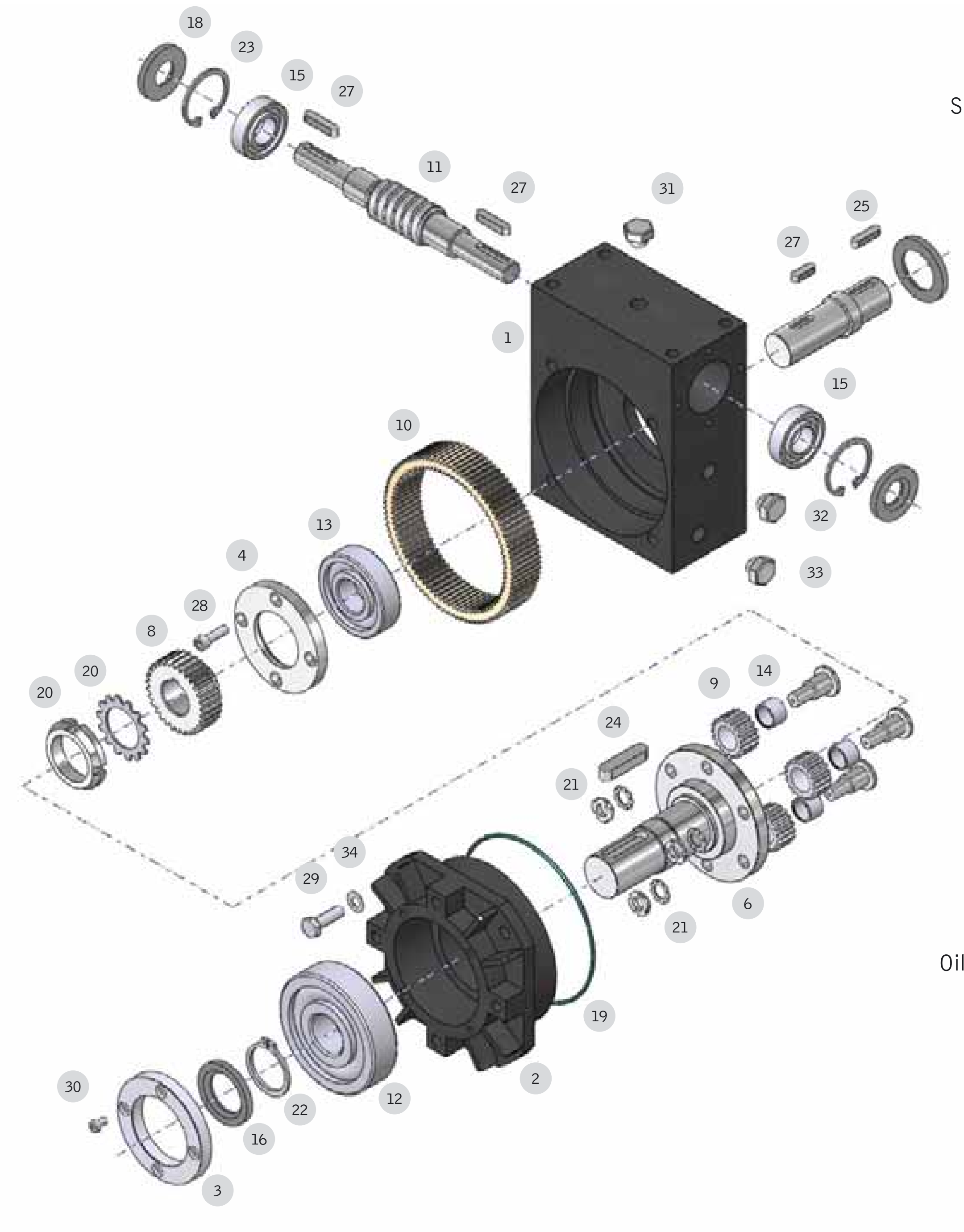
Routine maintenance
The speed modulation gearboxes must be periodically inspected, depending on the level of use and work conditions. Lubricant leakage should be checked for, and in case the oil level should be restored and the seals replaced. The lubricant control must be effected when the speed modulation gear is not working. The oil should be changed at intervals which will vary according to the working conditions; generally, in normal conditions and at the normal operation temperatures, it should be possible to obtain a minimum lubricant lifetime of 10.000 hours.

Storage
The speed modulation gearboxes must be protected from deposits of dust and foreign matter during storage. Particular attention must be paid to saline or corrosive atmospheres. We also recommend to:
- Periodically rotate the shafts to ensure proper lubrication of inner parts and avoid that the seals dry up, therefore causing lubricant leakage.
- For speed modulation gearboxes without lubricant completely fill-in the unit with rustproof oil. When servicing for use, completely empty the oil and refill with the recommended oil to the correct level.
- Protect the shafts with suitable products.

Warranty
The warranty is valid only when the instructions contained in our manual are carefully folowed.

ORDERING CODES

F	32	P	1	1/3
model	size	reinforced version	construction model	ratio

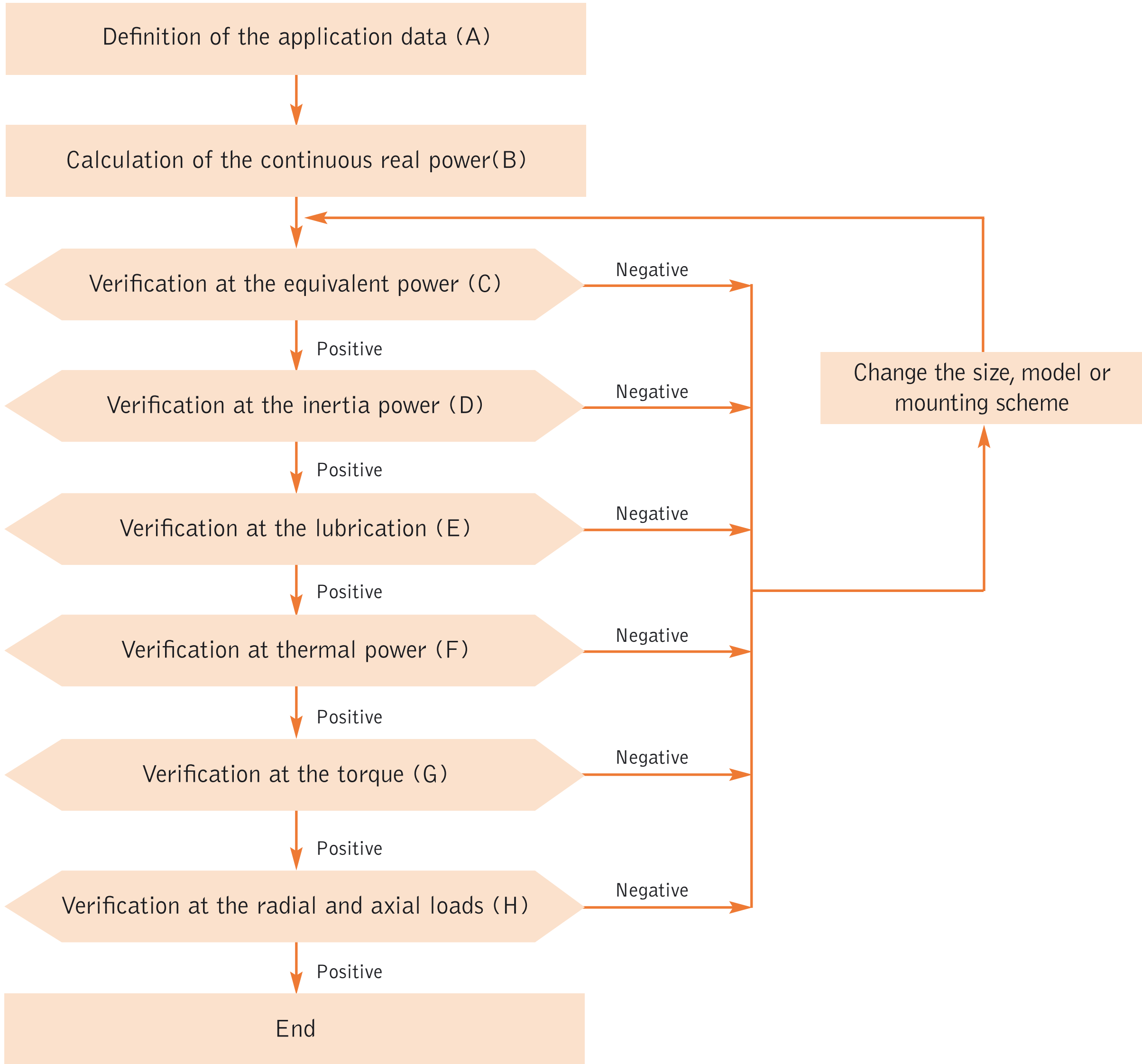


F MODEL

Casing	1
Slow shaft cover	2
Small cover	3
Cover	4
Fast shaft	5
Slow shaft	6
Shaft	7
Sun gear	8
Planets	9
Worm wheel	10
Worm screw	11
Bearing	12
Bearing	13
Bearing	14
Bearing	15
Seal	16
Seal	17
Seal	18
Seal	19
Stop ring	20
Stop ring	21
Snap ring	22
Snap ring	23
Key	24
Key	25
Key	26
Key	27
Bolt	28
Bolt	29
Bolt	30
Filling cap	31
Oil level indicator	32
Drain cap	33
Washer	34

DIMENSIONING OF THE SPEED MODULATION GEARBOX

For a correct dimensioning of speed modulation gearbox it is necessary to observe the following steps:



A – THE APPLICATION DATA

For a right dimensioning of the speed modulation gearboxes it is necessary to identify the application data: POWER, TORQUE, and REVOLUTION SPEED = a P power [kW] is defined as the product between the torque M_t [daNm] and the revolution speed ω [rpm]. The input power (P_i) is equal to the sum of the output speed (P_u) and the power dissipated into heat (P_d). The ratio of output power and input power is called running efficiency η of the transmission. The slow shaft revolution speed ω_L is equal to the fast shaft revolution ω_V multiplied by the reduction ratio i (meant as a fraction). Some useful formulas that link the above variables are shown below.

$$P_v = \frac{M_{tv} \cdot \omega_v}{955} \qquad P_L = \frac{M_{tL} \cdot \omega_L}{955} \qquad \omega_L = \omega_v \cdot i \qquad P_i = P_u + P_d = \frac{P_u}{\eta}$$

AMBIENT VARIABLES = these values identify the environment and the operating conditions of the speed modulation gearbox. Among them: temperature, oxidizing and corrosive factors, working and non-working periods, vibrations, maintenance and cleaning, insertion frequency, expected lifetime etc.

MOUNTING SCHEMES = there are several ways of transferring movement by means of speed modulation gear boxes. A clear idea on the mounting scheme allows to correctly identify the power flow of the same.

B – THE REAL CONTINUOUS POWER

The first step for the dimensioning of a speed modulation gear box is to calculate the real continuous power. By means of the formulas indicated at point A the user must calculate the input power P_i according to the scheme parameters. Two calculation criteria can be adopted: using the average parameters calculated on a significant period or adopting the maximum parameters. It is obvious that the second method (the worst case) is much more protective with respect to the average one and it should be used in case you need certainty and reliability.

C – THE POWER TABLES AND THE EQUIVALENT POWER

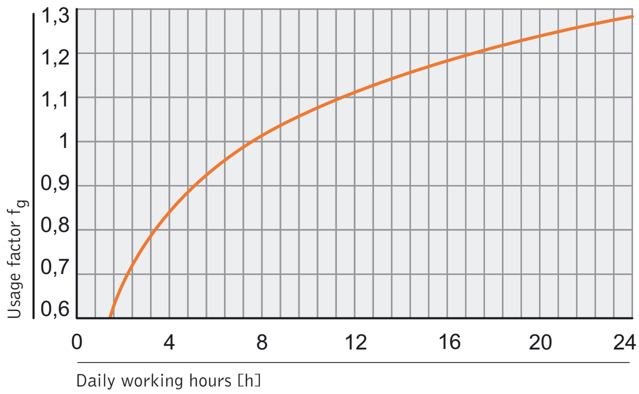
All the values listed in the catalogue refer to a use in standard conditions, that is with a 20°C temperature and under a regular running, without shocks for 8 daily working hours. The use under those conditions provides a lifetime of 10.000 hours. For different application conditions the equivalent power P_e should be calculated: it is the power which would be applied in standard conditions in order to have the same thermal exchange and wear effects, which the real load achieves in the real conditions of use. It is therefore advisable to calculate the equivalent load according to the following formula:

$$P_e = P_i \cdot f_g \cdot f_a \cdot f_d$$

It should be remarked that **the equivalent power is not the power requested by the speed modulation gearbox:** it is and indicator which helps in choosing the most suitable size in order to have higher reliability requisites. The power requested by the application is the input power P_i.

The usage factor f_g

The graph below can be used to calculate the usage factor f_g according to the working hours on a daily basis.



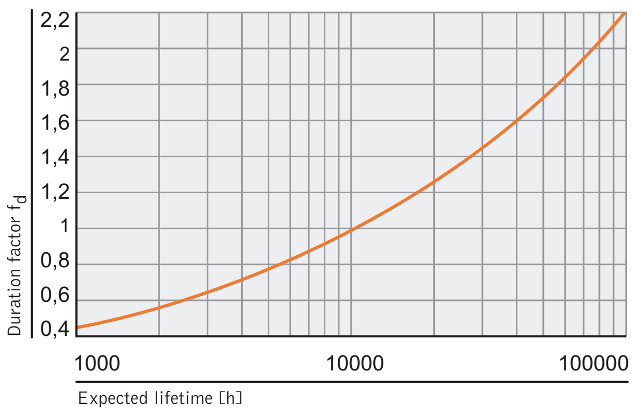
The ambient factor f_a

By means of the following table it is possible to calculate the f_a factor according to the operation conditions.

Type of load	daily running hours [h]	3	8	24
Light shocks, few insertions, regular movements		0,8	1	1,2
Medium shocks, frequent insertions, regular movements		1	1,2	1,5
High shocks, many insertions, irregular movements		1,2	1,8	2,4

The duration factor f_d

The duration factor f_d is obtained according to the theoretical expected lifetime (expressed in hours).

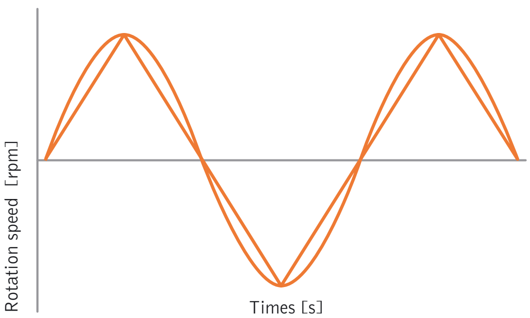


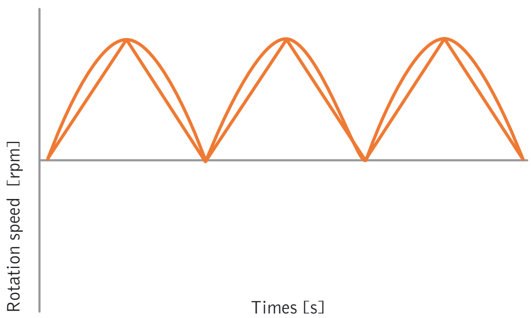
With the equivalent power value P_e and according to the angular speeds and the reduction ratio, it is possible to chose on the descriptive tables the size presenting an input power higher that the calculated one.
At the same time it is possible to check, through the graph on page 239 the torque necessary on the adjustment worm screw.

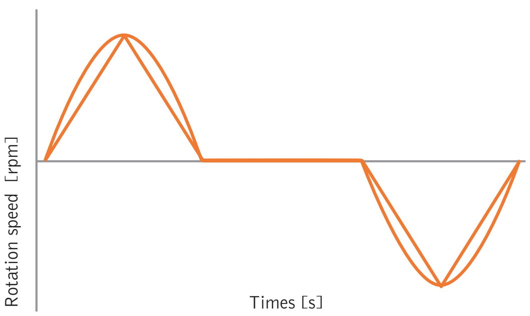
D – THE INERTIA POWER

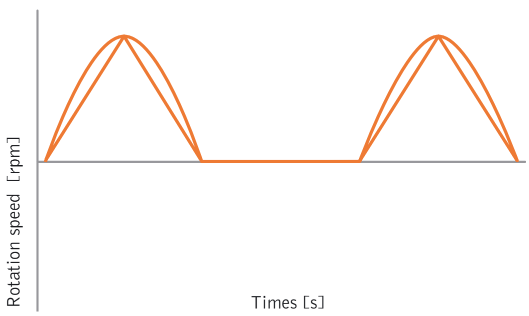
In case of important accelerations and decelerations it is necessary to calculate the inertia power P_J. It is the power necessary to counteract the inertia forces and torques opposed by the system in case of speed changes. First of all it is necessary that the designer calculates the system inertia downstream of the speed modulation gear box J_v reducing them first to the slow shaft and then to the fast one. After that the speed modulation gear box inertia J_f must be added, which can be taken from the table below, so that the total inertia J will be obtained. We remind that the inertia moments are expressed in [kg•m²].

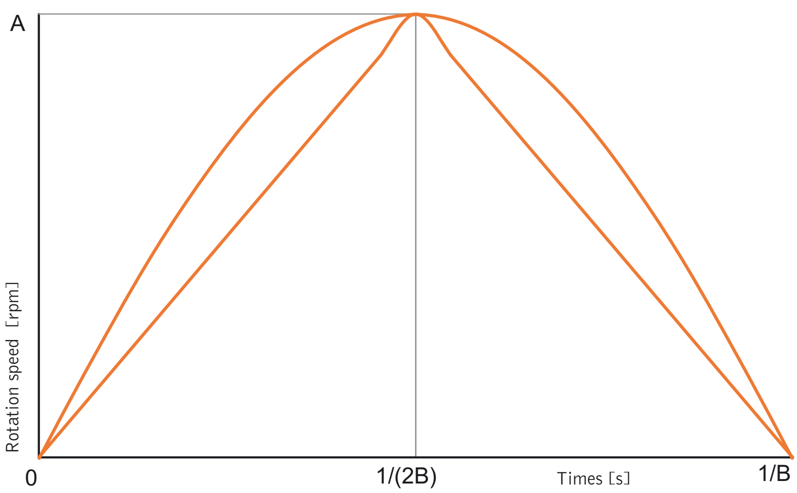
Size			**32**	**42**	**55**
Model	**Ratio**				
F	1/3	[kg•m²]	0,002570	0,010683	0,020641
DF	1/1	[kg•m²]	0,005140	0,021366	0,041282
RC/F	1/3	[kg•m²]	0,005010	0,021046	0,044702
RC/F	1/2	[kg•m²]	0,004565	0,018803	0,040974
RC/F	1/1,5	[kg•m²]	0,004558	0,018395	0,039553
RC/F	1/1	[kg•m²]	0,004973	0,018999	0,041566
RC/F	1/0,75	[kg•m²]	0,005722	0,020571	0,045857
RS/F	1/3	[kg•m²]	0,005163	0,021854	0,046895
RS/F	1/2	[kg•m²]	0,004718	0,019611	0,043168
RS/F	1/1,5	[kg•m²]	0,004710	0,019203	0,041745
RS/F	1/1	[kg•m²]	0,005126	0,019800	0,044662
RS/F	1/0,75	[kg•m²]	0,005882	0,021387	0,048049











dimensioning

Given ω_V the fast revolution speed and α_V the angular speed of the fast shaft, the inertia torque which is necessary to counteract is equal to $J \bullet \omega_V$ and the respective inertia power P_j is equal to $J \bullet \omega_V \bullet \alpha_V$. In case the time curve of the fast shaft speed ω_V can be traced back to one of the four schemes above, linear or sinusoidal, where A is the maximum speed in [rpm] and B is the cycle frequency in [Hz], the calculation of the inertia power in [kW] can be simplified, by taking A and B parameters and by calculating:

$$P_J = \frac{2 \bullet J \bullet A^2 \bullet B}{91188}$$

The power P_j must be added to the equivalent power P_e and a verification of the correctness of the size chosen on the descriptive tables must be carried out. If not correct it will be necessary to change the size and effect new verifications. Even the torque applied on the adjustment shaft must be recalculated on the basis of the new equivalent power.

E - LUBRICATION

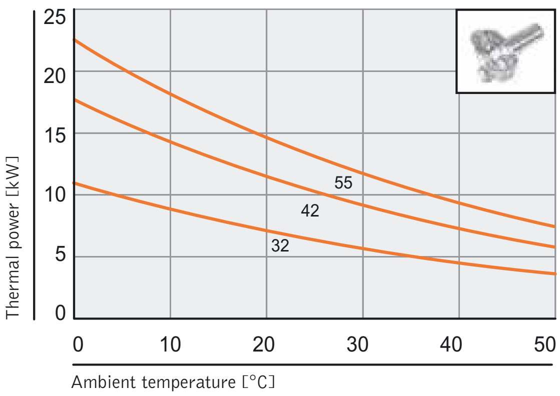
After a first dimensioning according to the power, it is advisable to check whether the only splash lubrication is enough or if a forced lubrication system is necessary. In should be therefore checked, by means of the graph illustrated in the "lubrication" paragraph, whether the average speed of the fast shaft is above or below the border value. In case of speed reaching the border value it will be necessary to contact our technical office. If it is possible to carry out the mounting even in a status of forced lubrication it is advisable to calculate the requested lubricant flow-rate Q [l/min.], being known the input power P_i [kW], the running efficiency η, the lubricant specific heat Cp [J/(kg•°C)], the ambient temperature t_a and the maximum temperature which can be reached by the speed modulation gearbox t_f [°C].

$$Q = \frac{67000 \bullet (1-\eta) \bullet P_i}{c_p \bullet (t_f - t_a)}$$

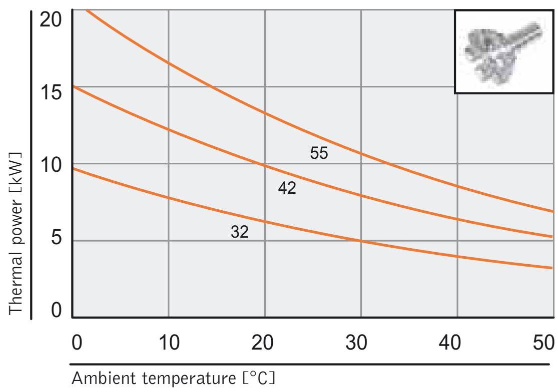
F – THE THERMAL POWER

When on the descriptive tables the input power values fall into the coloured area, this means that it is necessary to check the thermal power. This dimension, a function of the speed modulation gearbox size and of the ambient temperature, indicates the input power establishing a thermal balance with the ambient at the speed modulation gear surface temperature of 90°C. The following graphs show the waves of the thermal power in case of simple and reinforced speed modulation gearboxes with two or three gears transmission.

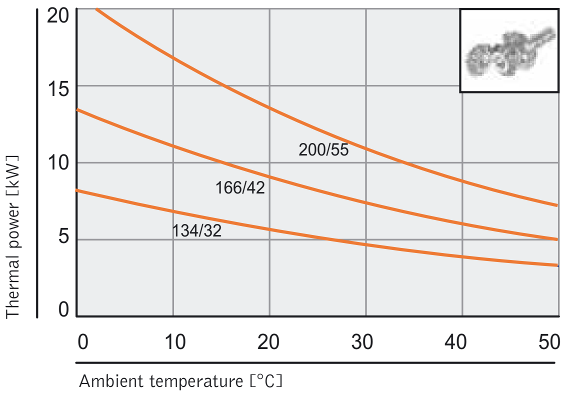
SIMPLE SPEED MODULATION GEARBOX



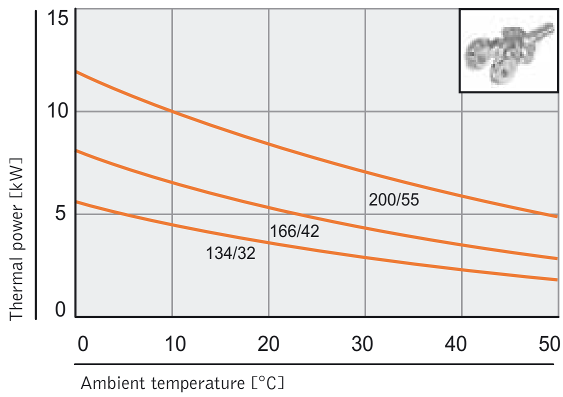
REINFORCED SPEED MODULATION GEARBOX



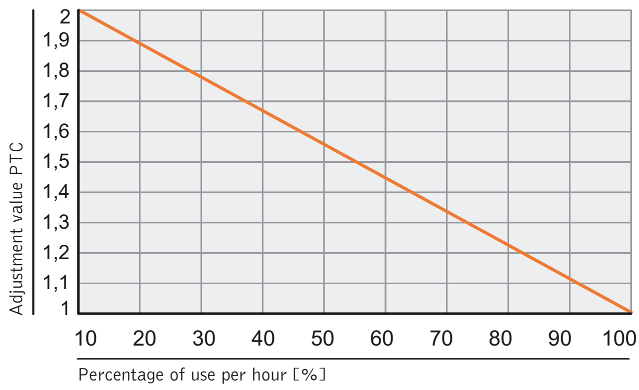
SPEED MODULATION GEAR BOX WITH 2 GEARS TRANSMISSION



SPEED MODULATION GEARBOX WITH 3 GEARS TRANSMISSION



In case there are non-working times in the speed modulation gearbox operation, the thermal power can be increased of a factor PTC obtainable from the graph below, where the abscissa is the use percentage as referred to the hour.

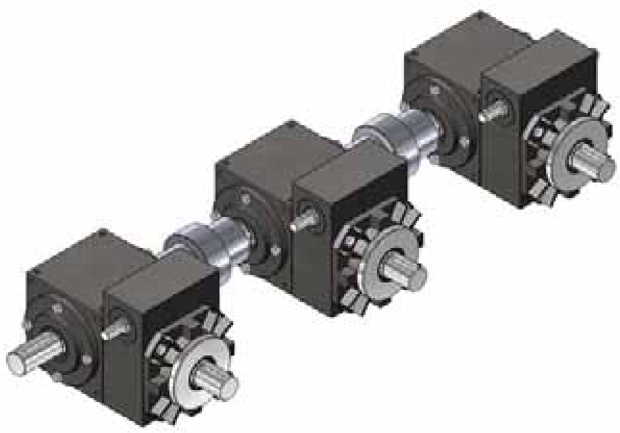


In case the thermal power is lower that the requested power P_i, it will be necessary to change the speed modulation gearbox size or to pass to forced lubrication. For the capacity calculation see paragraph E.

G - THE TORQUE

When one or more speed modulation gearboxes with transmission (RS, RC and RIS models) are mounted in series, it is necessary to check that the torque referred to the common axis does not exceed the value shown in the table below.

Size		134/32	166/42	200/55
RC/F - RIS/F Model	[daNm]	22	52	111
RS/F Model	[daNm]	52	146	266



H- RADIAL AND AXIAL LOADS

The last step is to verify the speed modulation gearbox strength to radial and axial loads. The border values of said loads are shown on pages 236-237. If the result of such verification is not positive, it will be necessary to change the size.

F Model

Ratio 1/3							
Size		32		42		55	
Fast shaft rotation speed ω_V [rpm]	Slow shaft rotation speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
3000	1000	12,7	10,9	29,6	25,4	43,7	37,5
2000	666	9,20	11,7	21,3	27,4	31,3	40,4
1500	500	7,30	12,6	17,1	29,4	25,2	43,3
1000	333	5,50	14,2	12,9	33,3	19,0	49,1
700	233	4,00	14,7	9,30	34,3	13,7	50,6
500	166	3,10	15,9	7,20	37,2	10,6	54,9
300	100	2,10	17,6	4,90	41,1	7,10	60,7
100	33	0,90	21,0	1,90	49,0	2,80	72,2
50	16	0,50	23,1	1,00	53,9	1,50	79,4

DF Model

Ratio 1/1							
Size		32		42		55	
Fast shaft rotation speed ω_V [rpm]	Slow shaft rotation speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
1000	1000	5,50	4,76	12,9	11,1	19,0	16,3
700	700	4,00	4,90	9,30	11,4	13,7	16,8
500	500	3,10	5,33	7,20	12,4	10,6	18,3
400	400	2,60	5,60	6,10	13,0	9,00	19,2
300	300	2,10	5,89	4,80	13,7	7,10	20,2
200	200	1,50	6,30	3,40	14,7	5,00	21,6
100	100	0,90	7,00	1,90	16,3	2,80	24,0
50	50	0,50	7,71	1,00	17,9	1,50	26,4
30	30	0,30	8,13	0,70	18,9	1,00	27,9

In case the speed modulation gearbox is used as multiplier, in order to obtain the output torque value (as referred to the fast shaft) it is necessary to multiply the value on the table by the reduction ratio (meant as a fraction).

RC/F-RS/F-RIS/F Model

Ratio 1/3

Size		32		42		55	
Fast shaft rotation speed ω_V [rpm]	Slow shaft rotation speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
3000	1000	12,7	10,9	29,6	25,4	43,7	37,5
2000	666	9,20	11,7	21,3	27,4	31,3	40,4
1500	500	7,30	12,6	17,1	29,4	25,2	43,3
1000	333	5,50	14,2	12,9	33,3	19,0	49,1
700	233	4,00	14,7	9,30	34,3	13,7	50,6
500	166	3,10	15,9	7,20	37,2	10,6	54,9
300	100	2,10	17,6	4,90	41,1	7,10	60,7
100	33	0,90	21,0	1,90	49,0	2,80	72,2
50	16	0,50	23,1	1,00	53,9	1,50	79,4

Ratio 1/1,5

Size		32		42		55	
Fast shaft rotation speed ω_V [rpm]	Slow shaft rotation speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
1500	1000	9,20	7,12	22,1	17,0	42,4	32,8
1000	666	7,10	8,25	17,0	19,7	32,5	37,7
700	466	5,40	8,96	12,8	21,2	24,2	40,1
500	333	4,00	9,29	9,60	22,3	18,5	42,9
400	266	3,30	9,60	8,10	23,5	16,2	47,1
300	200	2,60	10,0	6,40	24,7	12,8	49,5
200	133	2,00	11,9	4,70	27,3	9,10	52,9
100	66	1,20	14,0	2,80	32,8	5,30	62,1
50	33	0,70	16,4	1,60	37,5	3,00	70,3

RC/F-RS/F Model

Ratio 1/2

Size		32		42		55	
Fast shaft rotation speed ω_V [rpm]	Slow shaft rotation speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
2000	1000	12,7	10,9	29,6	25,4	43,7	37,5
1500	750	10,2	11,7	23,9	27,4	35,2	40,4
1000	500	7,30	12,6	17,1	29,4	25,2	43,3
700	350	5,60	13,8	13,1	32,3	19,4	47,6
500	250	4,20	14,7	9,90	34,3	14,7	50,5
300	150	2,80	16,1	6,50	37,7	9,70	55,6
100	50	1,10	19,5	2,60	45,5	3,90	67,1
50	25	0,60	21,4	1,40	50,0	2,10	73,6
30	15	0,40	22,7	0,90	52,9	1,30	78,0

Ratio 1/1

Size		32		42		55	
Fast shaft rotation speed ω_V [rpm]	Slow shaft rotation speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
1000	1000	6,00	4,64	15,7	12,1	31,3	24,0
700	700	4,40	4,86	12,6	13,9	22,8	25,2
500	500	3,60	5,57	9,40	14,5	18,7	28,9
400	400	3,00	5,81	7,90	15,2	15,6	30,1
300	300	2,50	6,45	6,40	16,5	12,6	32,4
200	200	1,80	6,96	4,60	17,8	9,10	35,2
100	100	1,10	8,51	2,70	20,8	5,30	40,9
50	50	0,60	9,28	1,60	24,7	3,10	47,9
30	30	0,40	10,3	1,10	28,3	2,00	51,5

Ratio 1/0,75

Size		32		42		55	
Fast shaft rotation speed ω_V [rpm]	Slow shaft rotation speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
750	1000	4,10	3,52	8,00	6,88	20,7	17,8
600	800	3,90	4,19	7,70	8,27	19,2	20,6
500	666	3,50	4,51	6,70	8,65	17,4	22,4
400	533	3,00	4,84	5,80	9,35	15,5	25,0
300	400	2,40	5,16	4,70	10,1	12,7	27,3
200	266	1,80	5,81	3,50	11,3	9,50	30,7
100	133	1,10	7,11	2,10	13,5	5,70	36,8
50	66	0,70	9,12	1,30	16,9	3,50	45,6
30	40	0,50	10,7	0,90	19,3	2,40	51,6

FP Model

Ratio 1/3							
Size		32		42		55	
Fast shaft rotation speed ω_V [rpm]	Slow shaft rotation speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
3000	1000	22,8	17,6	53,2	41,1	78,6	60,7
2000	666	16,5	19,1	38,3	44,4	56,3	65,3
1500	500	13,1	20,2	30,7	47,4	45,3	70,0
1000	333	9,90	22,9	23,2	53,8	34,2	79,3
700	233	7,20	23,8	16,7	55,4	24,6	81,6
500	166	5,58	25,9	12,9	60,0	19,0	88,4
300	100	3,70	29,2	8,80	68,1	12,7	98,1
100	33	1,60	37,9	3,40	80,1	5,00	118
50	16	0,90	43,4	1,80	86,8	2,70	130

DF/P Model

Ratio 1/1							
Size		32		42		55	
Fast shaft rotation speed ω_V [rpm]	Slow shaft rotation speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
1000	1000	9,90	7,65	23,2	17,9	34,2	26,4
700	700	7,20	7,95	16,7	18,4	24,6	27,1
500	500	5,60	8,62	12,9	19,9	19,0	29,3
400	400	4,70	9,04	19,9	21,0	16,2	31,3
300	300	3,80	9,73	8,60	22,2	12,7	32,7
200	200	2,70	10,4	6,10	23,6	9,00	34,7
100	100	1,60	12,5	3,40	26,4	5,00	38,9
50	50	0,90	13,9	1,80	27,8	2,70	41,7
30	30	0,50	15,0	1,30	32,4	1,80	46,3

RC/FP-RS/FP-RIS/FP Model

Ratio 1/3

Size		32		42		55	
Fast shaft rotation speed ω_V [rpm]	Slow shaft rotation speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
3000	1000	22,8	16,5	53,2	38,5	78,6	56,9
2000	666	16,5	17,9	38,3	41,6	56,3	61,2
1500	500	13,1	18,9	30,7	44,5	45,3	65,6
1000	333	9,90	21,5	23,2	50,5	34,2	74,4
700	233	7,20	22,4	16,7	51,9	24,6	76,5
500	166	5,50	24,0	12,9	56,3	19,0	82,9
300	100	3,70	26,8	8,80	63,8	12,7	92,0
100	33	1,60	35,1	3,40	74,6	5,00	109
50	16	0,90	40,7	1,80	81,5	2,70	122

Ratio 1/1,5

Size		32		42		55	
Fast shaft rotation speed ω_V [rpm]	Slow shaft rotation speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
1500	1000	11,2	8,12	26,4	19,1	53,1	38,4
1000	666	8,60	9,40	20,3	22,1	40,6	44,2
700	466	6,80	10,5	14,7	22,8	31,0	48,2
500	333	5,10	11,1	11,9	25,9	24,1	52,4
400	266	4,40	11,9	10,0	27,2	20,0	54,5
300	200	3,40	12,5	7,90	28,7	15,7	57,2
200	133	2,70	14,8	5,80	31,7	11,2	61,2
100	66	1,60	17,5	3,50	38,1	6,50	71,8
50	33	1,00	21,9	2,20	48,3	4,60	101

RC/FP-RS/FP Model

Ratio 1/2							
Size		32		42		55	
Fast shaft rotation speed ω_V [rpm]	Slow shaft rotation speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
2000	1000	16,5	11,9	46,7	33,8	78,6	56,9
1500	750	14,7	14,2	43,0	41,5	63,3	61,1
1000	500	10,0	14,5	28,4	41,1	45,3	65,6
700	350	7,60	15,7	21,8	45,1	34,9	72,2
500	250	6,10	17,6	17,3	50,1	26,4	76,5
300	150	4,20	20,3	11,7	56,5	17,4	84,1
100	50	1,90	27,5	4,60	66,7	7,00	101
50	25	1,00	29,0	2,50	72,5	3,70	107
30	15	0,70	33,8	1,60	77,3	2,30	111

Ratio 1/1							
Size		32		42		55	
Fast shaft rotation speed ω_V [rpm]	Slow shaft rotation speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
1000	1000	6,00	4,35	15,7	11,3	31,1	22,5
700	700	4,40	4,55	12,6	13,0	22,8	23,6
500	500	3,60	5,22	9,40	13,6	18,7	27,1
400	400	3,00	5,43	7,90	14,3	15,6	28,2
300	300	2,50	6,04	6,40	15,4	12,6	30,4
200	200	1,80	6,52	4,60	16,6	9,10	32,9
100	100	1,10	7,97	2,70	19,5	5,30	38,4
50	50	0,60	8,70	1,60	23,2	3,10	44,9
30	30	0,40	9,66	1,10	26,5	2,00	48,3

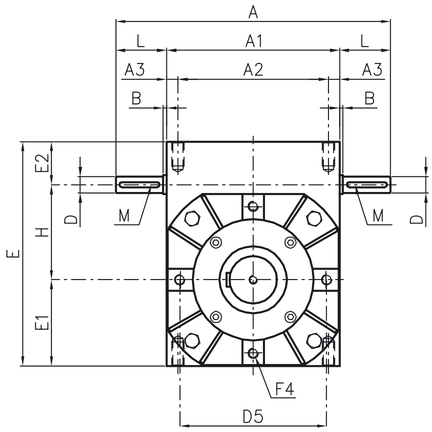
Ratio 1/0,75							
Size		32		42		55	
Fast shaft rotation speed ω_V [rpm]	Slow shaft rotation speed ω_L [rpm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]	P_i [kW]	M_{tL} [daNm]
750	1000	4,10	2,97	8,00	5,80	20,7	15,0
600	800	3,90	3,53	7,70	6,97	19,2	17,4
500	666	3,50	3,81	6,70	7,29	17,4	18,9
400	533	3,00	4,08	5,80	7,88	15,5	21,0
300	400	2,40	4,35	4,70	8,51	12,7	23,0
200	266	1,80	4,90	3,50	9,53	9,50	25,8
100	133	1,10	5,99	2,10	11,4	5,70	31,0
50	66	0,70	7,68	1,30	14,2	3,50	38,4
30	40	0,50	9,06	0,90	16,3	2,40	43,5

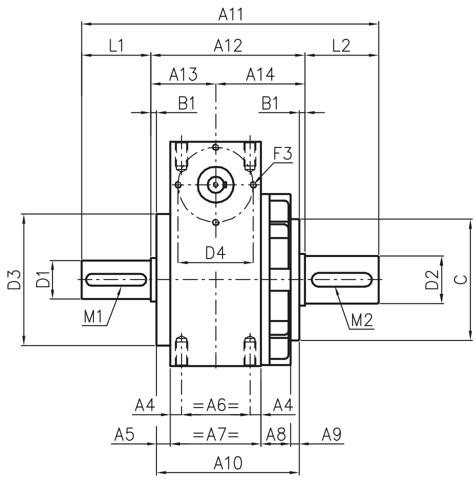
Basic constructive forms

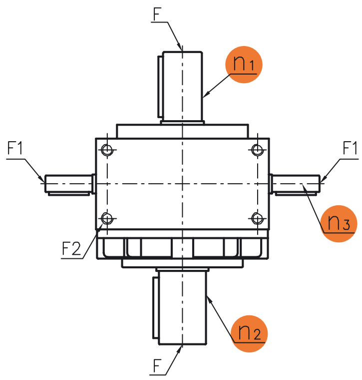
model 1

model 2

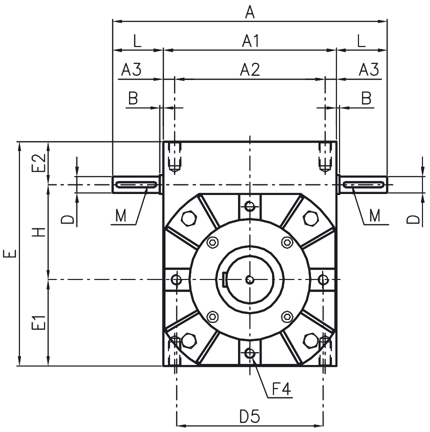
model 3

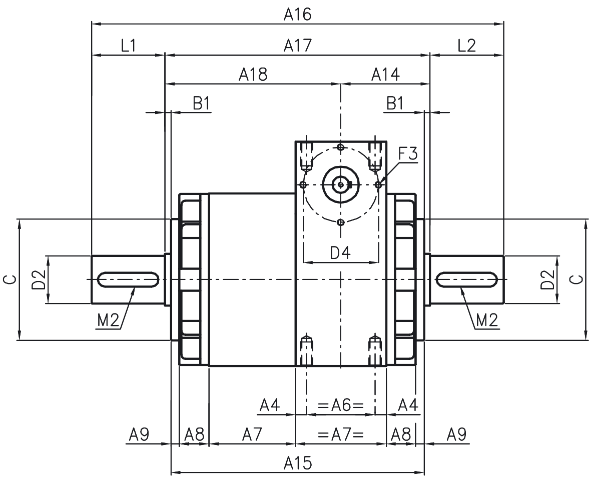


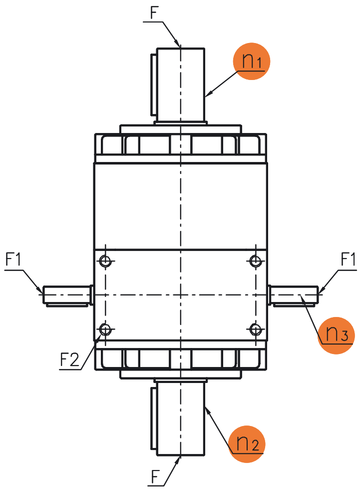




F Model			
Size	**32**	**42**	**55**
A	198	234	318
A1	134	166	200
A2	116	144	174
A3	9	11	13
A4	10	11	13
A5	10	18	16
A6	50	58	79
A7	70	80	105
A8	27	30	34
A9	10	10	10
A10	117	138	165
A11	206	262	334
A12	121	142	169
A13	47	60	70,5
A14	74	82	98,5
B	2	4	4
B1	2	2	2
C Ø	99	116	140
D Ø h7	14	19	19
D1 Ø h7	25	35	45
D2 Ø h7	32	42	55
D3 Ø g6	90	125	152
D4 Ø	60	68	87
D5 Ø	116	140	170
E	172	213	260
E1	67	83	100
E2	35	40	50
F	M8x16	M10x20	M10x20
F1	M5x10	M6x12	M6x12
F2	M10x18	M12x24	M14x28
F3	M5x10	M6x12	M8x15
F4	M8x18	M10x20	M12x24
H	70	90	110
L	32	34	59
L1	40	60	80
L2	45	60	85
M	5x5x25	6x6x25	6x6x50
M1	8x7x35	10x8x50	14x9x70
M2	10x8x40	12x8x50	16x10x70







Basic constructive forms

model 4

model 5

model 6

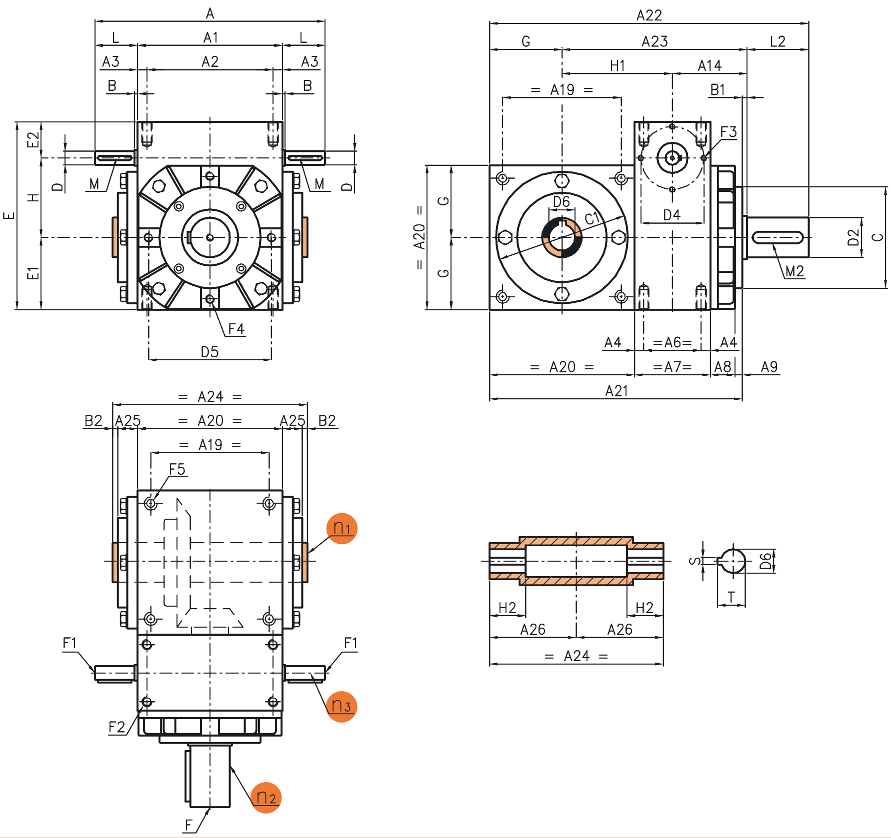
DF Model

Size	32	42	55
A	198	234	318
A1	134	166	200
A2	116	144	174
A3	9	11	13
A4	10	11	13
A5	10	18	16
A6	50	58	79
A7	70	80	105
A8	27	30	34
A9	10	10	10
A14	74	82	98,5
A15	214	240	298
A16	308	364	472
A17	218	244	302
A18	144	162	203,5
B	2	4	4
B1	2	2	2
C Ø	99	116	140
D Ø h7	14	19	19
D2 Ø h7	32	42	55
D4 Ø	60	68	87
D5 Ø	116	140	170
E	172	213	260
E1	67	83	100
E2	35	40	50
F	M8x16	M10x20	M10x20
F1	M5x10	M6x12	M6x12
F2	M10x18	M12x24	M14x28
F3	M5x10	M6x12	M8x15
F4	M8x18	M10x20	M12x24
H	70	90	110
L	32	34	59
L2	45	60	85
M	5x5x25	6x6x25	6x6x50
M2	10x8x40	12x8x50	16x10x70

Basic constructive forms

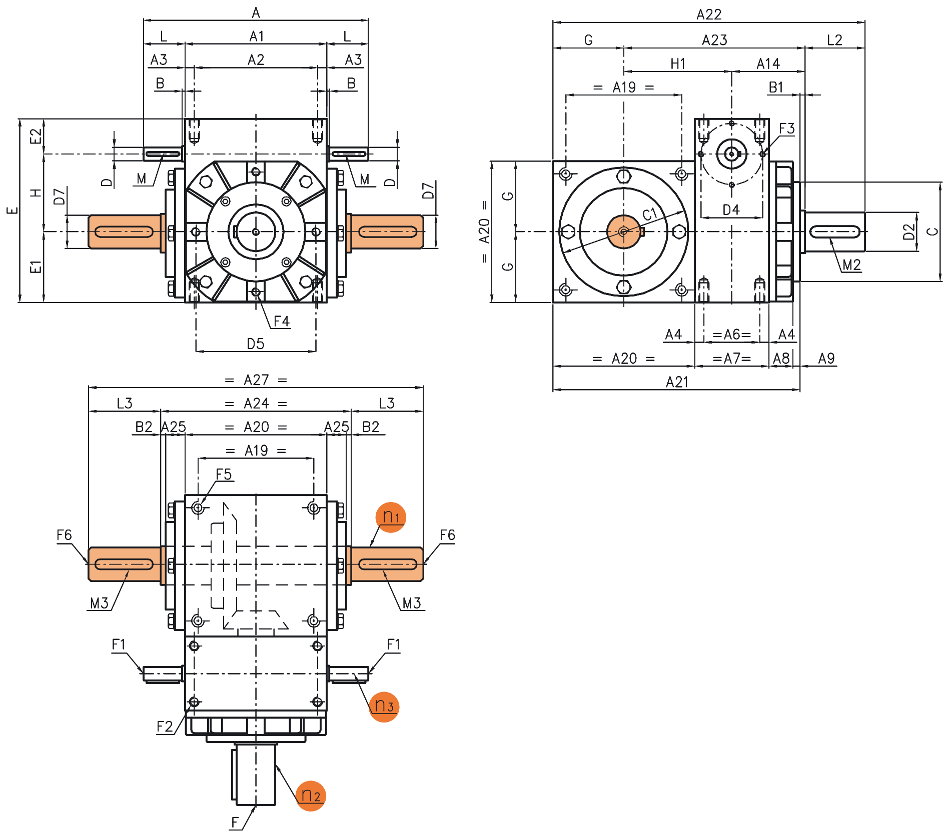
model 7

model 8



RC/F Model

Size	32	42	55
A	198	234	318
A1	134	166	200
A2	116	144	174
A3	9	11	13
A4	10	11	13
A6	50	58	79
A7	70	80	105
A8	27	30	34
A9	10	10	10
A14	74	82	98,5
A19	114	144	174
A20	134	166	200
A21	241	286	349
A22	288	348	436
A23	176	205	251
A24	174	212	250
A25	18	21	23
A26	87	106	125
B	2	4	4
B1	2	2	2
B2	2	2	2
C Ø	99	116	140
C1 Ø f7	122	156	185
D Ø h7	14	19	19
D2 Ø h7	32	42	55
D4 Ø	60	68	87
D5 Ø	116	140	170
D6 Ø	24	32	42
E	172	213	260
E1	67	83	100
E2	35	40	50
F	M8x16	M10x20	M10x20
F1	M5x10	M6x12	M6x12
F2	M10x18	M12x24	M14x28
F3	M5x10	M6x12	M8x15
F4	M8x18	M10x20	M12x24
F5	M10x25	M12x30	M14x35
G	67	83	100
H	70	90	110
H1	102	123	152,5
H2	35	45	50
L	32	34	59
L2	45	60	85
M	5x5x25	6x6x25	6x6x50
M2	10x8x40	12x8x50	16x10x70
S	8	10	12
T	27,3	35,3	45,3



Basic constructive forms

model 9

model 10

RS/F Model

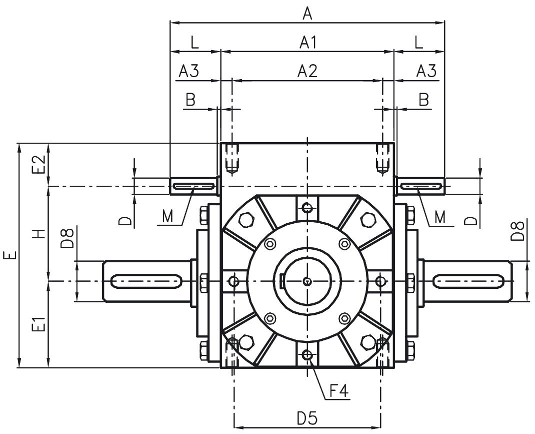
Size	32	42	55
A	198	234	318
A1	134	166	200
A2	116	144	174
A3	9	11	13
A4	10	11	13
A6	50	58	79
A7	70	80	105
A8	27	30	34
A9	10	10	10
A14	74	82	98,5
A19	114	144	174
A20	134	166	200
A21	241	286	349
A22	288	348	436
A23	176	205	251
A24	174	212	250
A25	18	21	23
A27	304	392	470
B	2	4	4
B1	2	2	2
B2	2	2	2
C Ø	99	116	140
C1 Ø f7	122	156	185
D Ø h7	14	19	19
D2 Ø h7	32	42	55
D4 Ø	60	68	87
D5 Ø	116	140	170
D7 Ø h7	32	45	55
E	172	213	260
E1	67	83	100
E2	35	40	50
F	M8x16	M10x20	M10x20
F1	M5x10	M6x12	M6x12
F2	M10x18	M12x24	M14x28
F3	M5x10	M6x12	M8x15
F4	M8x18	M10x20	M12x24
F5	M10x25	M12x30	M14x35
F6	M8x20	M10x25	M10x25
G	67	83	100
H	70	90	110
H1	102	123	152,5
L	32	34	59
L2	45	60	85
L3	65	90	110
M	5x5x25	6x6x25	6x6x50
M2	10x8x40	12x8x50	16x10x70
M3	10x8x55	14x9x80	16x10x100

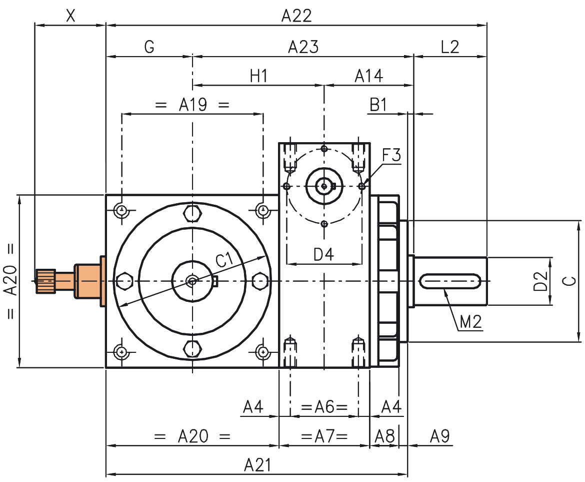
Basic constructive forms

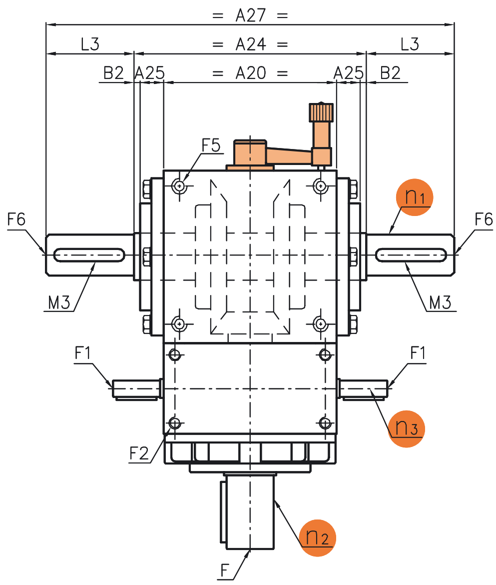
model 11

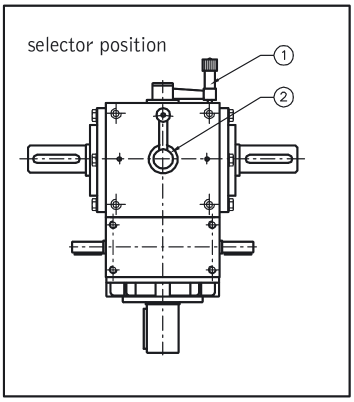
model 12

model 13



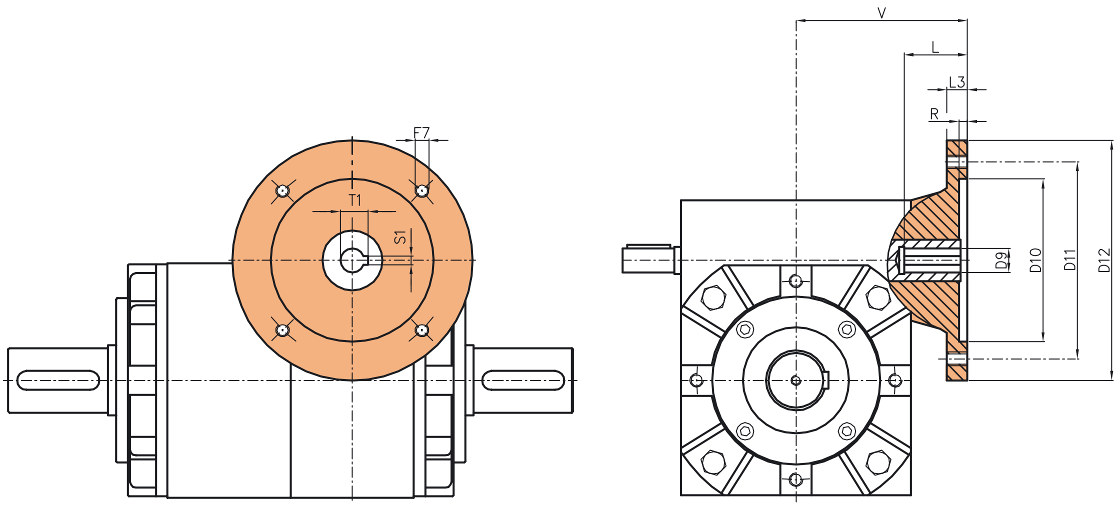






RIS/F Model			
Size	**32**	**42**	**55**
A	198	234	318
A1	134	166	200
A2	116	144	174
A3	9	11	13
A4	10	11	13
A6	50	58	79
A7	70	80	105
A8	27	30	34
A9	10	10	10
A14	74	82	98,5
A19	114	144	174
A20	134	166	200
A21	241	286	349
A22	288	348	436
A23	176	205	251
A24	174	212	250
A25	18	21	23
A27	264	325	420
B	2	4	4
B1	2	2	2
B2	2	2	2
C Ø	99	116	140
C1 Ø f7	122	156	185
D Ø h7	14	19	19
D2 Ø h7	32	42	55
D4 Ø	60	68	87
D5 Ø	116	140	170
D8 Ø h7	32	42	55
E	172	213	260
E1	67	83	100
E2	35	40	50
F	M8x16	M10x20	M10x20
F1	M5x10	M6x12	M6x12
F2	M10x18	M12x24	M14x28
F3	M5x10	M6x12	M8x15
F4	M8x18	M10x20	M12x24
F5	M10x25	M12x30	M14x35
F6	M8x20	M10x25	M10x25
G	67	83	100
H	70	90	110
H1	102	123	152,5
L	32	34	59
L2	45	60	85
L3	45	60	85
M	5x5x25	6x6x25	6x6x50
M2	10x8x40	12x8x50	16x10x70
M3	10x8x40	12x8x50	16x10x70
X	84	84	84

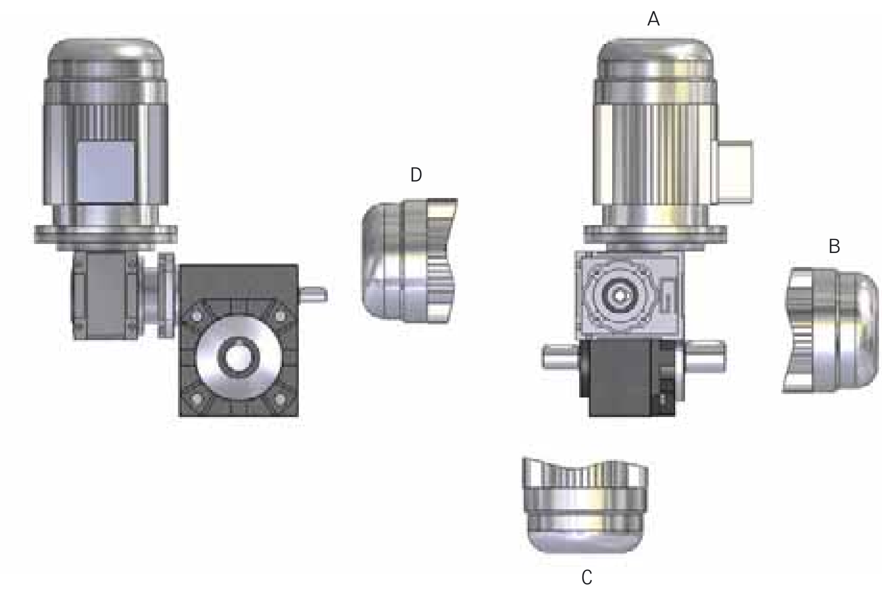
M Model



M Models											
Size	**IEC Flange**	**D9** H7	**D10** H7	**D11**	**D12**	**F7**	**L**	**R**	**S**	**T**	**V**
32	56 B5	9	80	100	120	M6	20	4	3	10,4	97
	63 B5	11	95	115	140	M8	23	4	4	12,8	97
	71 B5	14	110	130	160	M8	30	4	5	16,3	97
	71 B14	14	70	85	105	7	30	4	5	16,3	97
42	63 B5	11	95	115	140	M8	23	4	4	12,8	116
	71 B5	14	110	130	160	M8	30	4	5	16,3	116
	80 B5	19	130	165	200	M10	40	4	6	21,8	116
	80 B14	19	80	100	120	7	40	4	6	21,8	116
55	71 B5	14	110	130	160	M8	30	5	5	16,3	140
	80 B5	19	130	165	200	M10	40	5	6	21,8	140
	80 B14	19	80	100	120	7	40	5	6	21,8	140
	90 B5	24	130	165	200	M10	50	5	8	27,3	140
	90 B14	24	95	115	140	9	50	5	8	27,3	140

MR Model

Special dimensions according to the motor reducer specifications.



for not quoted dimensions see the schemes on pages 256-261.

Motorized speed modulation gearboxes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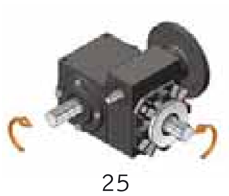
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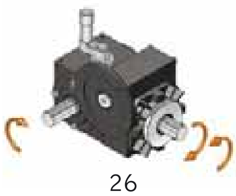
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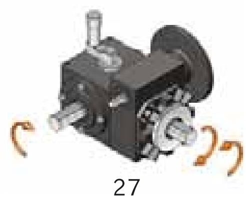
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Application samples are online at www.unimec.eu - section Applications

Speed modulation gearboxes with motor reducers


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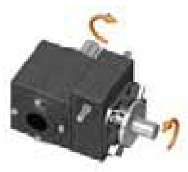
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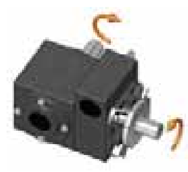
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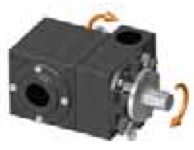
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NIPLOY treatment

For applications in oxidizing environments, it is possible to protect some bevel gearbox components which do not undergo any sliding, by means of a chemical nickel treatment, the so-called Niploy. It creates a non permanent surface coating on casings and covers.

NORMS

ATEX directive (94/9/CE)

The 94/9/CE directive is better known as the "ATEX directive". All UNIMEC's products may be classified as "components" according to the definition quoted in art.1 par.3 c), and therefore they do not require an ATEX mark.
A conformity declaration in accordance to what stated in art.8 par.3 can be supplied upon end user's request, subject to the filling up of a questionnaire with the indication of the working parameters.

Machinery directive (98/37/CE)

The 98/37/CE directive is better known as the "Machinery directive". UNIMEC's components are included in the products categories which do not need to affix the CE mark, as they are "intended to be incorporated or assembled with other machinery" (art.4 par.2). Upon end user's request a manufacturer declaration can be supplied in accordance to what is foreseen at Annex II, point B. The new machine directory (06/42/CE) will be acknowledged by 29/12/2009. UNIMEC guarantees that every new duty in mechanical transmission will be followed by such date.

ROHS directive (02/95/CE)

The 02/95/CE directive is better known as the "ROHS directive". All UNIMEC's suppliers of electromechanical equipments have issued a conformity certification to the above norms for their products. A copy of said certificates can be supplied upon final user's request.

REACH directive (06/121/CE)

The 06/121/CE is better known as "REACH" directive and applies as the rule CE 1907/2006. UNIMEC products present only inside lubricants as "substances", so being disciplined by art. 7 of above mentioned rule. By art. 7 par. 1 b) UNIMEC declares that its products are not subjected to any declaration or registration because the substances in them are not "to be lost in normal and reasonable previewed usage conditions"; in facts lubricant losses are typical of malfunctions or heavy anomalies. By art. 33 of the rule CE 1907/2006, UNIMEC declares that inside its products there aren't substances identified by art. 57 in percentage to be dangerous.

UNI EN ISO 9001:2000 norm

UNIMEC has always considered the company's quality system management as a very important subject. That is why, since the year 1996, UNIMEC is able to show its UNI EN ISO 9001 certification, at the beginning in accordance to the 1994 norms and now meeting the requirements of the version published in the year 2000. 13 years of company's quality, certified by UKAS, the world's most accredited certification body, take shape into an organization which is efficient at each stage of the working process. In date 31/10/2008 the new version of this norm was published. UNIMEC will evaluate every news reported in this revision.

UKAS QUALITY MANAGEMENT

Painting

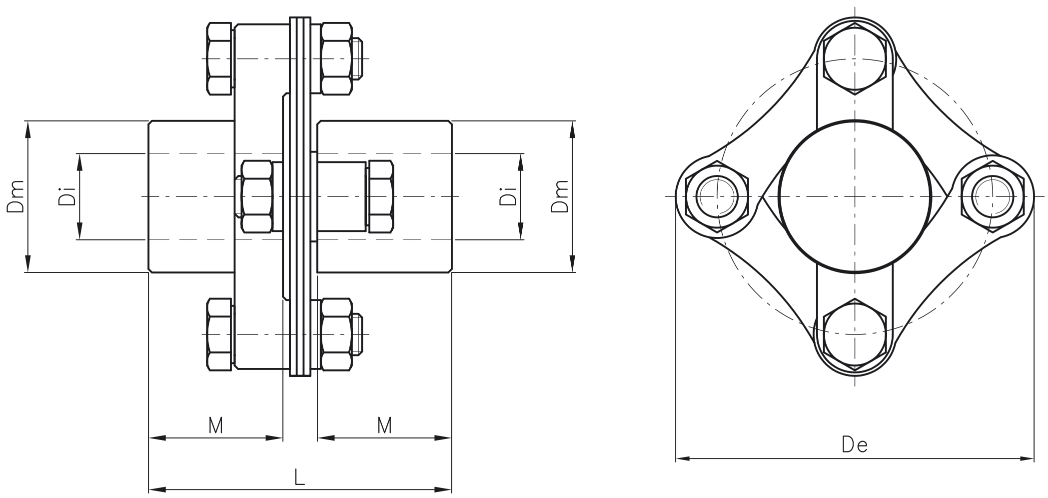
Our products are all painted in color RAL 5015 blue. An oven-dry system enables the products to have a perfect adhesivity. Different colors as well as epoxidic paints are available.

To complete its range of production UNIMEC is also able to supply high torsion stiffness blade couplings. They show an absolute torsion rigidity in both rotation directions together with the ability to support high torques.

blade couplings

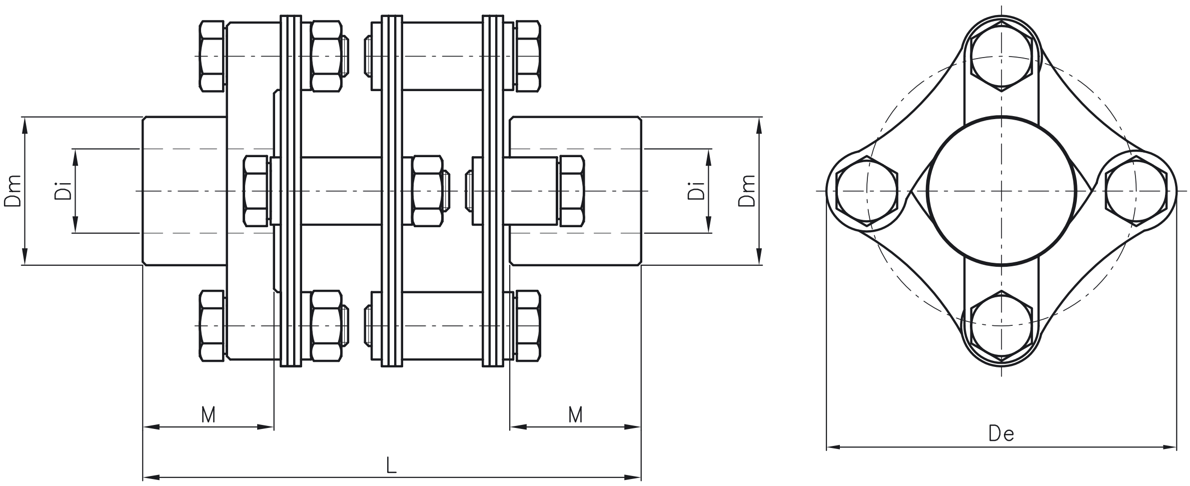
The resistance to corrosive agents, the absorption of vibrations, the possibility to be used in any temperature conditions and an almost unlimited life, without any kind of maintenance, make of them an excellent product. The UNIMEC couplings manufacturing foresees a completely metallic construction, pressed steel up to size 11 and nodular cast iron for the bigger sizes; the blade series is made of spring steel. UNIMEC couplings are able to absorb axial and parallel movement errors, and can support angular misalignments of ± 1°

The following tables show, in addition to the overall dimensions, some technical features of the simple models (UM) and the double models (UMM), like the weight P, the inertia moments J_g, the maximum admissible rotation speed ω_g, the maximum torque supported M_{tg}.



UM couplings										
	UM6	**UM7**	**UM8**	**UM9**	**UM10**	**UM11**	**UM12**	**UM13**	**UM14**	**UM15**
D_e [mm]	90	104	130	153	185	225	165	3300	350	400
D_m [mm]	39	44	56	64	80	98	120	145	165	180
L [mm]	68	87	104	128	151	194	216	250	270	316
M [mm]	30	39	45	55	66	86	95	110	120	140
D_i [mm]	-	-	-	-	-	-	-	40	40	40
D_{max} [mm]	22	30	35	40	50	65	75	90	100	120
P [kg]	0,90	1,45	2,50	4,15	7,10	14	22	43	48	59
J_g [kg•m²]	0,00462	0,0113	0,0302	0,0709	0,1752	0,5378	1,2046	3,4682	4,9152	7,4774
ω_g [rpm]	3000	3000	2500	2500	2000	1750	1500	1200	1000	1000
M_{tg} [daNm]	1,80	4,38	7,99	15	38,5	77,9	146	233	384	535

D_i = standard row hole
D_{max} = maximum obtainable hole



UMM couplings										
	UM6M	**UM7M**	**UM8M**	**UM9M**	**UM10M**	**UM11M**	**UM12M**	**UM13M**	**UM14M**	**UM15M**
D_e [mm]	90	104	130	153	185	225	265	300	350	400
D_m [mm]	39	44	56	64	80	98	120	145	165	180
L [mm]	114	147	175	218	250	308	352	412	452	524
M [mm]	30	39	45	55	66	86	95	110	120	140
D_i [mm]	-	-	-	-	-	-	-	40	40	40
D_{max} [mm]	22	30	35	40	50	65	75	90	100	120
P [kg]	1,1	1,8	3	5	8	17	26	50	60	72
J_g [kg•m2]	0,00635	0,0146	0,0363	0,0845	0,1947	0,6531	1,4236	4,0328	6,144	9,1249
ω_g [rpm]	3000	3000	2500	2500	2000	1750	1500	1200	1000	1000
M_{tg} [daNm]	1,80	4,38	7,99	15	38,5	77,9	146	233	384	535

D_i = standard row hole
D_{max} = maximum obtainable hole

Via del Lavoro 20
20040 Usmate Velate (MB)
Italy
tel. +39.039.6076900
fax +39.039.6076909
info@unimec.eu

QUESTIONNAIRE FOR COMPONENTS INTENDED FOR USE IN POTENTIALLY EXPLOSIVE ATMOSPHERES (94/9/CE – ATEX Directive)

The Customer is liable for the machine on which Unimec components will be installed. The Customers must certify, according to directives 94/9/CE and 06/42/CE, the machine on which the Unimec components will be assembled while considering the risks deriving by the same. This questionnaire must be used as an analysis tool for a better understanding of some of these risk typologies and is an integral part of orders for components intended for use in potentially explosive atmospheres and therefore subject to the 94/9/CE directive. The conformity certification and warranty will be rendered null in the case all parts are not filled in. The user must respect the conditions of use and maintenance applicable to Unimec components, under penalty of cancellation of the conformity certification and warranty. The user must avoid explosive atmospheres and eliminate or reduce the risk of explosions.

Company ______ Address ______

Tel. ______ Fax ______

E-mail ______ Name of compiler ______

TYPE OF EXPLOSIVE ATMOSPHERE (definitions according to EN 1127-1)

Name of substance ______ Minimum ignition temperature [°C] ______

Atmosphere ☐ Explosive ☐ Flammable

Type of substance ☐ Gas, mist, steam ☐ Dust

Zone ☐ 0* ☐ 1 ☐ 2

	Size	Ratio	Form	Stroke [mm]**	Accessories	Imput power [kW]***	Imput rotation speed [rpm]	Load [daN]****	% functioning	Number of cycles/hour	Required ATEX category (2-3)	Maximum superficial temperature [°C]
Trapezoidal screw jacks												
Aleph screw jacks												
Ball screw jacks												
Bevel gear boxes												
Couplins												

* Unimec does not issue ATEX certifications for zone 0 applications

** Valid for screw jack category only

*** Values referring to a single unit

**** For screw jacks the load value refers to the racking load applied to the same while, in the case of gearboxes and speed modulators, it refers to the maximum value of the forces exerted on the shafts (specify on which shaft and in which direction). Values referring to a single unit. Specify if static (S) or dynamic (D).

Conformity certification can not be requested for components which are not produced by Unimec, e.g. engines and reductions.

What is ambient temperature [°C]? ______

Does any specific legislation regarding the application in question exist? ☐ no ☐ yes

If yes, which one? ______

Are vibrations present? ☐ no ☐ yes

Are impacts or blows possible? ☐ no ☐ yes

Are lateral loads present? ☐ no ☐ yes

Will lubrication and level control be guaranteed according to user and maintenance manual? ☐ no ☐ yes

Are transmissions operated manually? ☐ no ☐ yes

Is temperature control applicable? ☐ no ☐ yes

Is rotation control applicable? ☐ no ☐ yes

Is wear control applicable? ☐ no ☐ yes

Is a hard protection device applicable? ☐ no ☐ yes

Is an elastic protection device applicable? ☐ no ☐ yes

Is stroke control applicable? ☐ no ☐ yes

Is a security system applicable? ☐ no ☐ yes

Customer's further notes ______

Date - Customer's stamp and signature

QUESTIONNAIRE FOR THE INSPECTION OF TRAPEZOIDAL AND ALEPH SERIES SCREW JACKS

The Customer is liable for the machine on which Unimec trapezoidal screw jacks will be installed. The Customer must certify, according to directive 06/42/CE, the machine on which Unimec trapezoidal screw jacks will be assembled while considering the risks deriving by the same. This questionnaire is an analysis tool for a better understanding of the application conditions involving trapezoidal screw jacks. The user must respect the conditions of use and maintenance applicable to Unimec components, under penalty of cancellation of the conformity certification and warranty.

unimec™

Via del Lavoro 20
20040 Usmate Velate (MB)
Italy
tel. +39.039.6076900
fax +39.039.6076909
info@unimec.eu

Company ____________________ Address ____________________

Tel ____________________ Fax ____________________

E-mail ____________________ Name of compiler ____________________

All requested data refer to a single unit

Model ☐ TP ☐ TPR

Size ____________________

Ratio ____________________

Form ____________________

Accessories ____________________

Stroke [mm] ____________________ total lenght [mm] ____________________

Type of load ☐ traction ☐ compression ☐ both

Type of Eulerian constraints ☐ 1 ☐ 2 ☐ 3

Maximum dynamic load [daN] ____________________

Maximum static load [daN] ____________________

Lateral static loads [daN] ____________________

Load translation speed [mm/min] ____________________

% functioning* ____________________

Number of cycles/hour ____________________

Hours of work per day [h] ____________________

Input power [kW] ____________________

Input rotation speed [rpm] ____________________

Ambient temperature [°C]? ____________________

Relative humidity (compulsory for ALEPH series) [%] ____________________

Type of environment (dust, outdoors, solar radiation, etc.) ____________________

Lubricant for the threaded spindle (attach technical chart if different from those included in the catalogue) ____________________

Are naked flames present (compulsory for ALEPH series)? ☐ no ☐ yes

Is electrostatic charge build-up possible (compulsory for ALEPH series)? ☐ no ☐ yes

Does any specific legislation regarding the application in question exist? ☐ no ☐ yes

If yes, which one? ____________________

Are vibrations present? ☐ no ☐ yes

Are impacts or blows possible? ☐ no ☐ yes

Customer's further notes ____________________

Date - Customer's stamp and signature

* if not specified, working cycle is the same the functioning one.

Via del Lavoro 20
20040 Usmate Velate (MB)
Italy
tel. +39.039.6076900
fax +39.039.6076909
info@unimec.eu

QUESTIONNAIRE FOR THE INSPECTION OF BALL SCREW JACKS

The Customer is liable for the machine on which Unimec ball screw jacks will be installed. The Customer must certify, according to 06/42/CE directive, the machine on which Unimec ball screw jacks will be assembled while considering the risks deriving from the same. This questionnaire is an analysis tool for a better understanding of the applicative conditions involving ball screw jacks. The user must respect the conditions of use and maintenance applicable to Unimec components, under penalty of cancellation of the conformity certification and warranty.

Company ____________________ Address ____________________

Tel ____________________ Fax ____________________

E-mail ____________________ Name of compiler ____________________

All requested data refer to a single unit

Model ☐ KT ☐ KR

Size ____________________

Form ____________________

Accessories ____________________

Description of ball screw:

Brand ____________________

Model ____________________

Diameter [mm] ____________________

Pitch [mm] ____________________

Dynamic load [daN] ____________________

Static load [daN] ____________________

Stoke [mm] ____________________

Total lenght [mm] ____________________

Maximum dynamic load [daN] ____________________

Maximum static load [daN] ____________________

Lateral static loads [daN] ____________________

Load translation speed [mm/min] ____________________

Inertia downstream the worm screw [kg•m^2] ____________________

Is load inversion possible? ☐ no ☐ yes
If yes, which is the frequence? ____________________

% functioning* ____________________

* if not specified, working cycle is the same the functioning one.

Number of cycles/hour ____________________

Hours of work per day [h] ____________________

Foreseen life [h] ____________________

Input power [kW] ____________________

Maximum input rotation speed [rpm] ____________________

Time necessary for reaching maximum input rotation speed [sec] ____________________

Ambient temperature [°C]? ____________________

Type of environment (dust, outdoors, solar radiation, etc.) ____________________

Does any specific legislation regarding the application in question exist? ☐ no ☐ yes
If yes, which one? ____________________

Are vibrations present? ☐ no ☐ yes

Are impacts or blows possible? ☐ no ☐ yes

Customer's further notes ____________________

Date - Customer's stamp and signature

QUESTIONNAIRE FOR THE INSPECTION OF BEVEL GEARBOXES

unimec™
Via del Lavoro 20
20040 Usmate Velate (MB)
Italy
tel. +39.039.6076900
fax +39.039.6076909
info@unimec.eu

The Client is liable for the machine on which Unimec bevel gearboxes will be installed. The Client must certify, according to 06/42/CE directive, the machine on which Unimec bevel gearboxes will be assembled while considering the risks deriving from the same. This questionnaire is an analysis tool for a better understanding of the applicative conditions involving bevel gearboxes. The user must respect the conditions of use and maintenance applicable to Unimec components, under penalty of cancellation of the conformity certification and warranty.

Company ____________________ Address ____________________

Tel ____________________ Fax ____________________

E-mail ____________________ Name of compiler ____________________

All requested data refer to a single unit

Model ____________________

Size ____________________ Ratio ____________________

Form ____________________

% functioning* ____________________

Number of cycles/hour ____________________

Hours of work per day [h] ____________________

Foreseen life [h] ____________________

Inertia downstream the fast shaft [kg•m²] ____________________

Is rotation sense inversion possible? ☐ no ☐ yes
If yes, which is the frequence? ____________________

Input power [kW] ____________________

Maximum input rotation speed [rpm] ____________________

Time necessary fir reaching maximum input rotation speed [sec] ____________________

Ambient temperature [°C]? ____________________

Type of environment (dust, outdoors, solar radiation, etc.) ____________________

Are vertical shafts present? ☐ no ☐ yes
If yes, which are they? ____________________

Does any specific legislation regarding the application in question exist? ☐ no ☐ yes
If yes, which one? ____________________

Are radial loads present on the shafts? ☐ no ☐ yes [daN]

Are axial loads present on the shafts? ☐ no ☐ yes [daN]

Are vibrations present? ☐ no ☐ yes

Are impacts or blows possible? ☐ no ☐ yes

Is forced lubrication possible? ☐ no ☐ yes

* if not specified, working cycle is the same the functioning one.

Customer's further notes ____________________

____

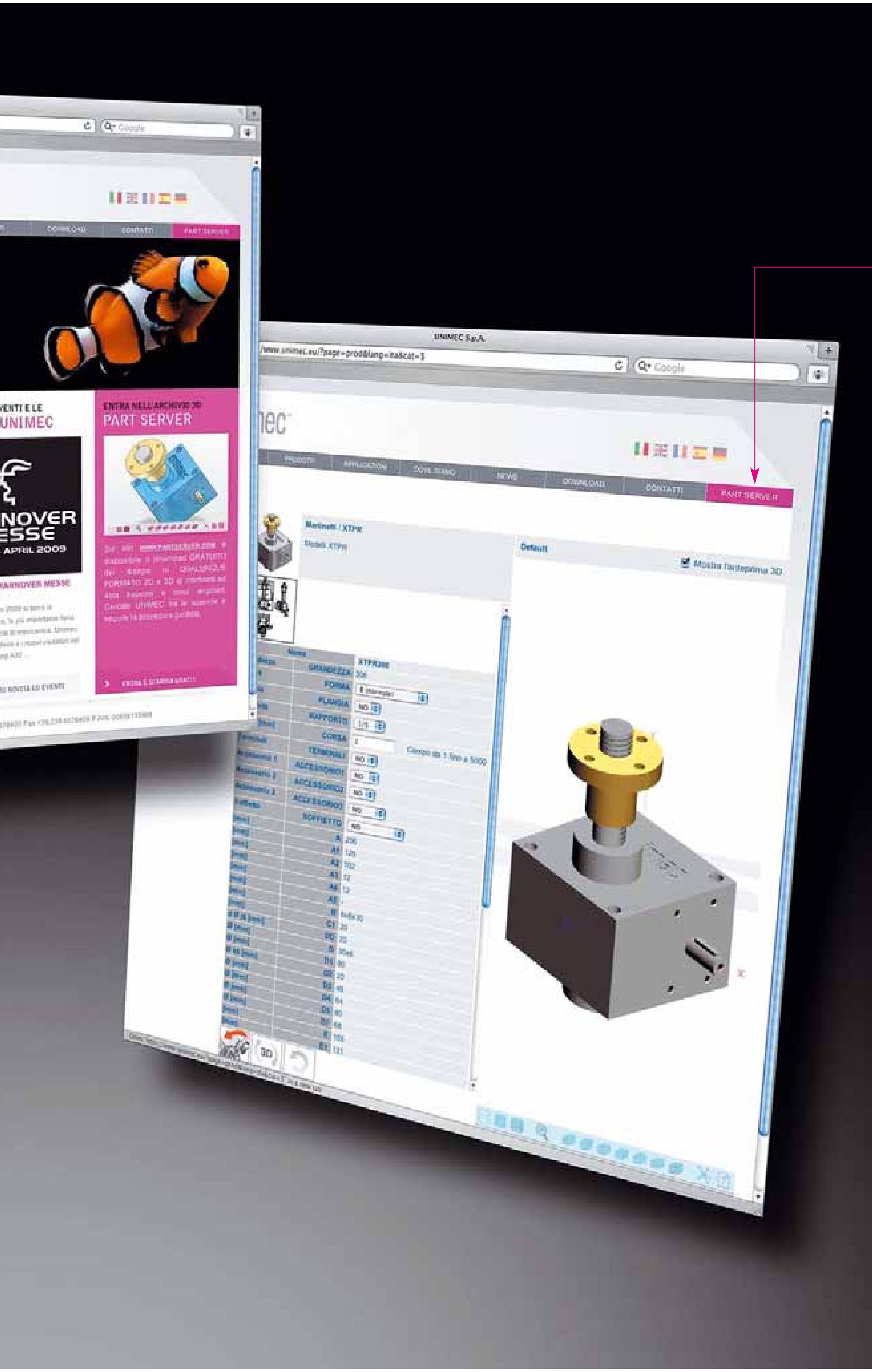
____

Date - Customer's stamp and signature

____

Unimec is present worldwide thanks to its capillary network of retailers and its own branch offices.

To find out which are the closest premises in your area browse the «**contact**» section of our website **www.unimec.eu**



Unimec knows that time is precious; this is why it has developed an extremely powerful tool dedicated to planning supervisors wishing to use their own transmissions.

The website «**partserver**» section on **www.unimec.eu** features a totally free configurator able to generate the transmissions and accessories included in this catalogue in the file format of any native 2D and 3D drawing programme. The drawings will be sent to a valid e-mail address once initial registration is completed.

UNITS OF MEASURE

PREFIXES	Symbol	Value
giga-	G	10^9
mega-	M	10^6
kilo-	k	10^3
deca-	da	10^1
deci-	d	10^{-1}
centi-	c	10^{-2}
milli-	m	10^{-3}
micro-	μ	10^{-6}

CONVERSION FACTORS						
Angular measurements	1°	=	0,0174 rad	1 rad	=	57,47°
	1 rpm	=	0,1047 rad/s	1 rad/s	=	9,55 rpm
Linear measurements	1 mm	=	0,03937 in	1 in	=	25,4 mm
	1 m	=	3,281 ft	1 ft	=	0,304 m
Surface measurements	1 mm^2	=	0,00155 in^2	1 in^2	=	645 mm^2
	1 m^2	=	10,76 ft^2	1 ft^2	=	0,093 m^2
Volume measurements	1 l	=	0,001 m^3	1 m^3	=	1000 l
	1 gal	=	4,54 l	1 l	=	0,22 gal
	1 mm^3	=	$61 \cdot 10^{-6}$ in^3	1 in^3	=	16393 mm^3
	1 m^3	=	35,32 ft^3	1 ft^3	=	0,028 m^3
Temperature measurements	1 °C	=	1 K	1 K	=	1 °C
	1 °C	=	0,56•(°F - 32)	1 °F	=	1,8•(°C) + 32
Speed measurements	1 mm/s	=	0,03937 in/s	1 in/s	=	25,4 mm/s
	1 m/s	=	3,281 ft/s	1 ft/s	=	0,304 m/s
Mass measurements	1 kg	=	2,205 lbm	1 lbm	=	0,453 kg
	1 q	=	100 kg	1 t	=	1000 kg
Force measurements	1 N	=	0,2248 lbf	1 lbf	=	4,45 N
Pressure measurements	1 MPa	=	10^6 N/mm^2	1 N/mm^2	=	10^{-6} MPa
	1 MPa	=	145 psi	1 psi	=	0,0069 MPa
Moment measurements	1 N•m	=	0,7376 lbf•ft	1 lbf•ft	=	1,356 N•m
Inertia measurements	1 kg•m^2	=	23,72 lbm•ft	1 lbm•ft	=	0,042 kg•m^2
Energy measurements	1 J	=	0,2389 cal	1 cal	=	4,186 J
	1 Btu	=	0,948 kJ	1 Btu	=	1,055 kJ
	1 kWh	=	3600 kJ	1 kJ	=	0,2778 Wh
Power measurements	1 kW	=	1,34 hp	1 hp	=	0,75 kW

We are pleased to thank the companies:
A.Celli Nonwovens, A.Celli Paper, Acr Macchine Teatrali, Agnati, Gruppo Cerutti, Cisam Impianti, Cogne Acciai Speciali, Debasol, Euroslitter, Fimi, Gasparini, Gdm, Imeas, Adelio Lattuada, Oms Group, Fabio Perini, Remacut, Salico, Tetra Pak, Uniloy Milacron, Viganò, Willy Italiana e l'Università degli Studi di Bergamo
that have taken pride in entering into partnership with Unimec with their own brand for their constant professional reliability in a business relationship which has consolidated over the years.

Unimec is part of the Confindustria (Association of Italian Industries) system as a member of the local Monza and Brianza Confindustria section.

Social issues are very important for Unimec and countless initiatives are the expression of its strong and well established presence throughout the territory.

Sponsorship of the local sports association, with special attention for football. Unimec has also borne the costs of the association's new sports centre, a multipurpose facility including a volley and a basket ball pitch as well as a fully equipped area for any kind of gymnastic activity.

Sponsorship of the local branch of the Club Alpino Italiano (Italian Alpine Club), which is involved in several activities dedicated to the mountains.

On the occasion of the company's 20th anniversary, in 2001, an ambulance was donated to the local section of the Italian Red Cross of Villasanta.

Design:
Ing. Alessandro Maggioni

Drawings:
Davide Beretta
Tomas Teruzzi

Project and general coordination:

Art Director:
Andrea Caldi

Graphic designer:
Antonella Raimondi

Photographer:
Gianni Lavano

Printer:
Arti Grafiche Trassini

08/09 English

Unimec - Head office and factory
via del Lavoro 20 | 20040 Usmate-Velate (MB) | Italy
tel. +39.039.6076900 | fax +39.039.6076909
info@unimec.eu

Unimec Hispania
C/Permanyer 34 | 08025 Sabadell (Barcelona) | Spain
tel. +34.93.1147067 | fax +34.93.1147068
unimechispania@unimec.eu

Unimec France
29, Rue des Cayennes | Z. A. Boutries
BP 215 | 78702 Conflans Cedex | France
tel. +33.1.39196099 | fax +33.1.39193594
unimecfrance@unimec.eu

Unimec Triveneto
via della Tecnica 10 | 35035 Mestrino (Pd) | Italy
tel. +39.049.9004977 | fax +39.049.9004524
unimectriveneto@unimec.eu

unimec®
www.unimec.eu