



Slewing rings

General catalogue

**LEONESSA *brevini***  
YANCHENG SLEWING BEARING CO. LTD.

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## Company profile



## Leonessa Brevini

As worldwide leading manufacturer, Leonessa Brevini offers its experience in the design and manufacture of slewing rings.

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YANCHENG SLEWING BEARING CO. LTD.



## Company profile

Leonessa Brevini general slewing rings catalogue shows the entire production range and aims to be a valuable aid in choosing the most suitable slewing ring.

The range includes rings with diameters up to 2500 mm with the following features: one row of balls or rollers, two rows of balls. All products are available with internal or external gear, or without gear.

The slewing rings are manufactured exclusively through numerical control machinery. Induction hardening of the bearing raceways and gear is carried out by means of equipments which have the most sophisticated control systems. Grinding of the bearing raceways guarantees high precision and uniformity of rotation.

Technical skills of its engineers and high quality manufacturing processes allow Leonessa Brevini to be a supplier of solutions, rather than just products according to the demands of the most challenging applications and demanding customers.



## Quality

Advanced technology and continuous improvement are the keys of the Company's constant evolution.

The main target of Leonessa Brevini is the improvement of quality in all its aspects. Attention to the specific demands of its clients and to the market, optimization of all production processes and appliance of strict control procedures are just some of the guidelines of the company organization.



# Main applications

Leonessa Brevini slewing rings are used in several fields of application, amongst which:

- **Lifting equipment:**  
Mobile cranes, Gantry cranes, truck cranes, Aerial platforms, Stackers.
- **Building equipment:**  
Concrete pumps, Demolition equipments, Dumpers, Multi purpose lifting machines, Construction cranes, Concrete mixers.
- **Automation:**  
Robots, Transportation lines, Automation systems.
- **Ecology:**  
Water treatment plants.
- **Forestry machinery:**  
Boogie axles, Forestry cranes, Forest harvesters.
- **Rotative machinery:**  
Bottling, Packaging equipments, Palletizers.
- **Earth moving equipments and foundation machines:**  
Excavators, Soil drilling machines and tools, Graders.
- **Rotating tables:**  
Marble cutting machinery, Machine tools/welding machines.

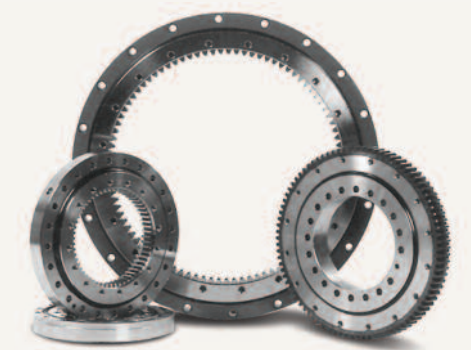


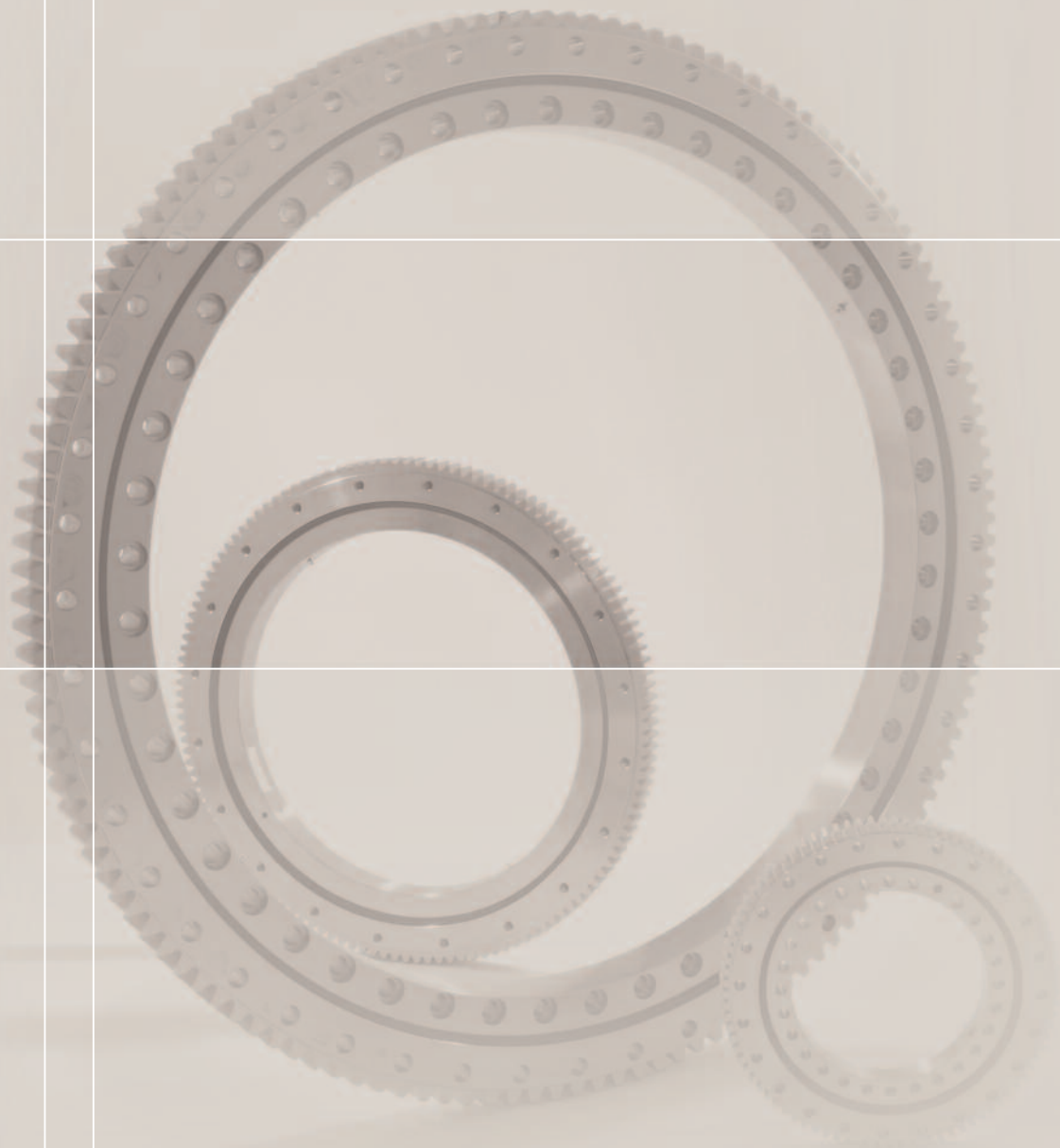
# Range of products

## Types

Leonessa Brevini manufacturers Slewing Rings according to the following features:

	1 Row of balls	2 Rows of balls	1 row of rollers
External gear			
Internal gear			
Without gear			





## Slewing ring choice



## General concepts

The following information helps in choosing the best slewing ring. General indications and formulas, combined with drawings and load charts, offer the best working tool. Leonessa Brevini Technical Department is available to verify the suitability.

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## Load transmission

Slewing rings are designed and produced to connect two parts of a machine, enable a reciprocal rotation and the transmission of axial loads, radial loads and tilting moment in various combinations.

For this purpose, it is defined:

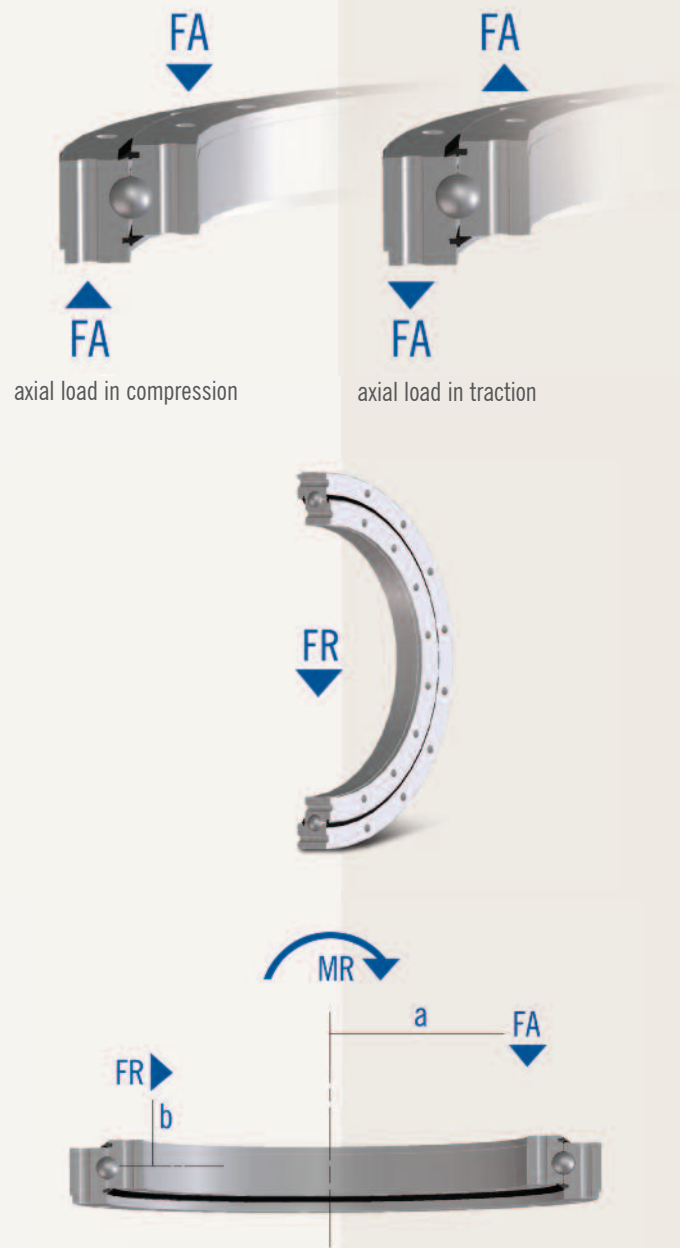
**Axial load FA:** sum of all forces acting parallel to the rotation axis of the slewing ring.

The slewing rings are normally mounted against the connecting structure, with forces acting in compression; in the case of axial load in traction it is necessary to contact the Technical Department of Leonessa Brevini for further examination.

**Radial load FR:** sum of all forces acting in perpendicular to the rotation axis of the slewing ring.

In case the slewing ring is mounted vertically (with horizontal rotation axis), it is necessary to contact the Technical Department of Leonessa Brevini for further examination.

**Tilting Moment MR:** sum of the product of each axial multiplied by its distance from the rotation axis (FA.a) and of each radial force multiplied by its distance from the plane perpendicular to the rotation axis passing through the centre of the rolling elements (FR.b).



## Connecting structure

Leonessa Brevini slewing rings transmit high loads even with their limited stiffness because the sections of the rings they are made of are small in relation to their diameters.

For this reason it is very important for the connecting structure to be sufficiently rigid, for the supporting surfaces to be sufficiently flat and for the bolted connection to be able to avoid any deformations due to high stress.

The maximum admissible out-of-flatness errors [mm] are listed below according to the slewing ring constructive shape and to the bearing raceway diameter.

For the upper and lower supporting surfaces, the sum of circumference error and radial direction error, due to conicity, is to be less than the value listed in the chart.

If this is not the case, after fitting the slewing ring to the connecting structure, an irregular rotation torque may occur and this may cause the lockout of the slewing ring and a premature wear of the bearing raceways.

Stiffness and flatness properties of the connecting structure and surfaces are to be as even as possible in order to guarantee a homogeneous load transmission and to avoid stress concentration.

For this reason, fitting a circular reinforcing ribs in proximity of the bearing raceway is recommended in place of radial ribs. A final mechanical machining of the supporting surfaces is also recommended in order to eliminate any irregularities from previous machining.

Rolling diameter [mm]	Slewing rings with one ball row	Slewing rings with two ball rows	Slewing rings with crossed rollers
Up to 1000	0.15	0.20	0.10
Up to 1500	0.20	0.25	0.15
Up to 2000	0.25	0.30	0.20
Up to 2500	0.28	0.35	0.23

The maximum value is to be reached within a 180° section only once and rude variations of the surveyed measurements are to be avoided.





# Load factors choice

## Slewing ring choice

To choose a slewing ring the following specifications are required:

- Application's description
- Working loads on the Slewing ring
- Operating cycle
- Slewing torque
- Maximum dimensions

At first the design of a slewing ring can be made by comparing the applied loads with the load capacity of the bearing raceway.

The load capacity of a slewing ring is detailed in a load chart and is calculated by taking into consideration:

- Slewing ring geometry
- The ring's material
- The heat treatment parameters of the bearing raceways
- Dimensions, material, heat treatment and number of rolling elements
- The contact parameters

The load chart is represented in a Cartesian diagram having the compression axial force on the X-axis and the tilting moment applied to the slewing ring on the Y-axis.

The point representing the maximum load, multiplied by the coefficients of application, has to be under the application limit curve.

In case of axial forces and tilting moments only, the grid references of the application/points are:

$$FA' = FA \cdot La$$

$$MR' = MR \cdot La$$

Where

- FA** maximum axial load
- MR** maximum tilting moment
- La** coefficient of application

If radial load FR is present, it is necessary to determine the equivalent axial load value FA'eq by using the following formulas:

$$FA'eq = (FA + 5 \cdot FR) \cdot La \text{ for slewing rings with one and two rows of balls}$$

$$FA'eq = (FA + 3 \cdot FR) \cdot La \text{ for slewing rings with rollers where:}$$

**FA** maximum axial load

**FR** maximum radial load

**La** coefficient of application

The application point will have the coordinate (FA'eq;MR').

For radial loads larger than 10% of axial load, it is necessary to verify the calculation with the Technical Department of Leonessa Brevini.

Using the load chart it is possible to define, in the design phase, the appropriate slewing ring suitable to the working conditions with sufficient precision.

The choice must be confirmed before ordering by the Technical Department of Leonessa Brevini.



## Coefficient of application

The coefficient of application is defined according to the particular performance of the slewing ring in compliance with a specific application. These parameters have statistically been set on the basis of our long term experiences.

Application	La coefficient
Truck crane Mobile crane Ship crane Railroad crane Welding equipment Bottling machine Water treatment plants Lift truck Rotating table	1.1
Access platforms Construction machines Shipyards cranes Revolving winch trailer (collection service)	1.25
Steelworks cranes Earth moving machines Forestry machines Loaders Hydraulic excavator with bucket capacity up to 1.5 m3	1.5
Ladle trailer	1.75
Offshore cranes Hydraulic excavator with bucket capacity more than 1.5 m3 Crushers/shears Fair carousel	Dimensions according to specific criteria

If your application is not mentioned in the chart, it is possible to refer to an application with approximate similar conditions.

Lower coefficients of application are admitted only in exceptional cases (for example: test loads) and only if authorized by the Technical Department of Leonessa Brevini.

# Bolts

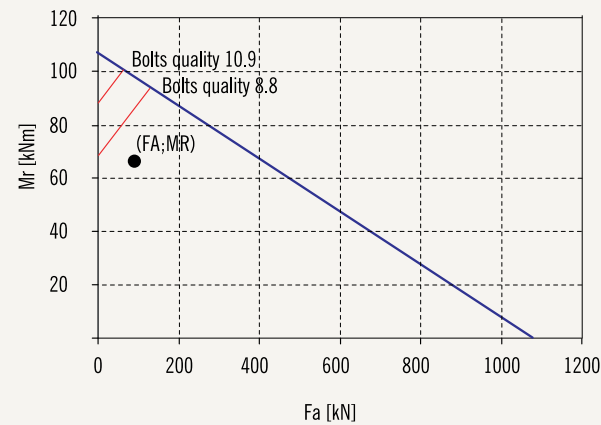
The correct performance of slewing rings depends on a well-designed and well-assembled bolting to the connecting structure.

The appropriate fastening method expects screws and bolts; any other fastening method (welding) is forbidden. Bolts in the quality classes 10.9 or 8.8, in compliance with regulation ISO 898-1, is recommended, while nuts have to be of an equal or greater quality class with respect to the corresponding screws.

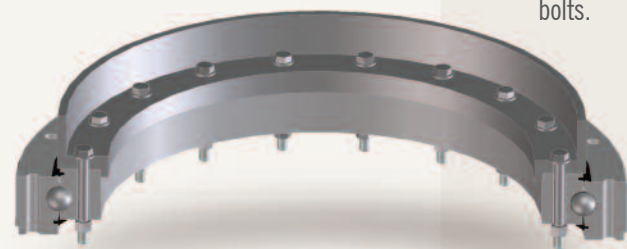
A preliminary test of the connection can be performed using the limit curves of bolts of quality class 8.8 or 10.9 shown in the load chart of the slewing ring. (Compression axial load)

The point representing the worst load conditions (FA;MR), not multiplied by the coefficient of application, must be found under the curve of the used bolt quality.

The point representing the load condition on bolts is (FA;MR) even if there is a radial load.



The axial load applied to the slewing ring must stress the bolts by compressing them; in a contrary case, the bolt limit curves cannot be utilized and the Technical Department of Leonessa Brevini must be contacted to perform specific proofs.



The bolt limit curves are valid only if the following requirements are met:

- "All the holes on the slewing rings must be used;
- The pre-tensioning of the bolts must be executed according to the values listed in table at page 31 utilizing a dynamometric wrench. If bolts with a treated surface (ex. zinc-plated, cadmium-plated, etc.) are used, the tightening torques must be asked to the bolt supplier;
- The bolted connection must be made with an average coefficient of friction equal to 0.14;
- The tightening torque must be checked after testing and before putting into operation, so as to eliminate any loosening due to structure settling;
- The connecting structures must be made of steel and must comply with requirements defined in their appropriate section. When radial loads are present it is necessary to verify that the force of friction under the bolt heads does not permit any sliding of the structure, avoiding a cutting action on the bolts. When important radial loads are present, the use of slewing rings with pilot diameters is recommended, so that these radial loads are not transferred to the bolts.

To calculate the length of the bolt, the following indications must be noted:

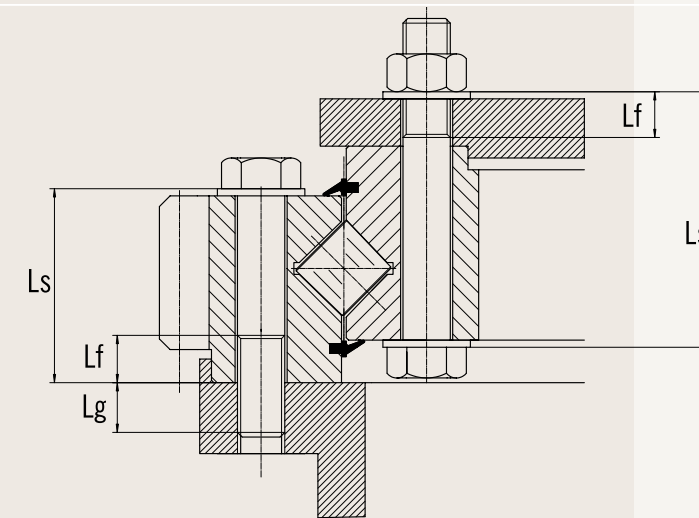
- The Ls tightening length must be at least 5 times the diameter of the bolt:  $L_s/5d$ ;
- The depth of the screw threading must be at least 1.5 times the diameter of the bolt:  $L_g/1.5d$ ;
- There must be at least 6 free threads in the stressed portion of the bolt (Lf)

The  $A_p$  value is determined using the following formula:

$$A_p = \frac{\pi}{4} \times (d_w^2 - d_r^2) \pi$$

with

$d_w$  = diameter of the contact surface under the screw or nut  
 $d_r$  = hole diameter



To avoid a loss of bolt pre-loading after tightening, it is a good idea to verify the specific pressure value exerted by the screw head or by the nut on the supporting surface, using the following formula:

$$p = \frac{F_M}{\frac{0.9}{A_p}} \leq P_L$$

where

$F_M$  = pre-loading force of the bolts [N]  
 $A_p$  = supporting surface of the screw head or the nut [mm<sup>2</sup>]  
 $P_L$  = limit pressure of the material [N/mm<sup>2</sup>]

Whenever the limit pressure value in the following table is exceeded, quenched and tempered flat washers must be used.

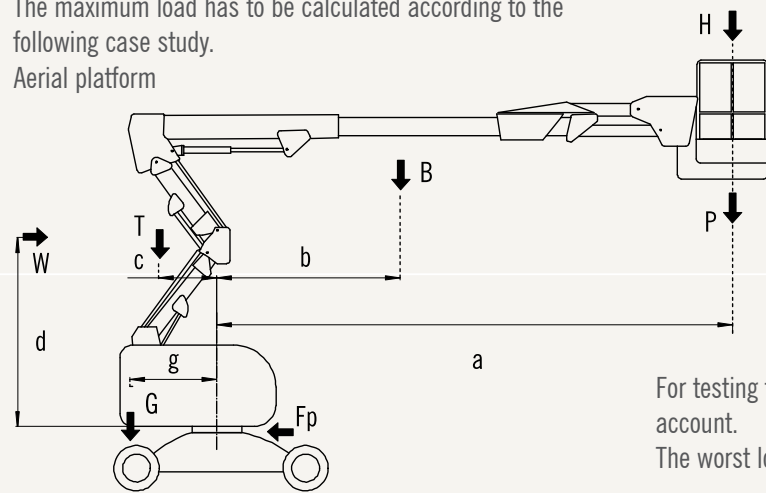
The use of any type of elastic washer is forbidden.

Material	Pressure pL
Fe 37	260 Mpa
Fe 50, C45 N, 42CrMo4 N, 46Cr2 N, 46 Cr4 N	420 Mpa
C45 QT, 42CrMo4 QT, 46Cr4 QT	700 Mpa
GG25	800 Mpa

# Calculation example

## Choice example

The maximum load has to be calculated according to the following case study.  
Aerial platform



Design data:

### Loads Distances

<b>P</b> 250 daN	<b>a</b> 10 m
<b>H</b> 100 daN	<b>b</b> 4.75 m
<b>B</b> 650 daN	<b>c</b> 0.4 m
<b>G</b> 1800 daN	<b>g</b> 0.7 m
<b>T</b> 750 daN	<b>d</b> 4 m
<b>W</b> 150 daN	
<b>Fp</b> 400 daN	

### Load case study 1:

maximum operating load, including wind

$$FA = P + H + B + G + T = 250 + 100 + 650 + 1800 + 750 = 3550 \text{ daN} = 35.5 \text{ kN}$$

$$FR = Fp - W = 400 - 150 = 250 \text{ daN} = 2.5 \text{ kN}$$

$$MR = (P + H) \cdot a + B \cdot b + W \cdot d - T \cdot c - G \cdot g = (250 + 100) \cdot 10 + 650 \cdot 4.75 + 150 \cdot 4 - 750 \cdot 0.4 - 1800 \cdot 0.7 = 5627.5 \text{ daNm} = 56.275 \text{ kNm}$$

### Load case study 2:

operating load, including 25% overload, without wind

$$FA = 1.25 \cdot P + H + B + G + T = 1.25 \cdot 250 + 100 + 650 + 1800 + 750 = 3612.5 \text{ daN} = 36.125 \text{ kN}$$

$$FR = Fp = 400 \text{ daN} = 4 \text{ kN}$$

$$MR = (1.25 \cdot P + H) \cdot a + B \cdot b - T \cdot c - G \cdot g = (1.25 \cdot 250 + 100) \cdot 10 + 650 \cdot 4.75 - 750 \cdot 0.4 - 1800 \cdot 0.7 = 5652.5 \text{ daNm} = 56.525 \text{ kNm}$$

For testing the worst possible load condition is taken into account.

The worst load condition is case study 2 with:

$$FA = 36.125 \text{ kN}$$

$$FR = 4 \text{ kN}$$

$$MR = 56.525 \text{ kNm}$$

We chose to verify a slewing ring with one row of balls. Point A of coordinate (FA;MR) has to be under the bolt limit curve of the 8.8 or 10.9 quality class, while point B of coordinate (FAeq' ; MR') has to be under the working limit curve, with:

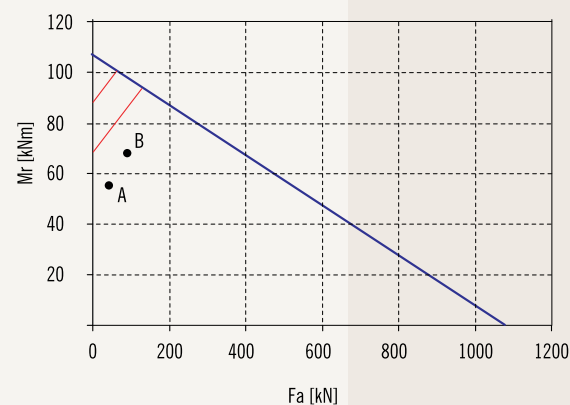
$$FAeq = FA + 5 \cdot FR = 36.125 + 5 \cdot 4 = 56.125 \text{ kN}$$

$$FAeq' = La \cdot FAeq = 56.125 \cdot 1.25 = 70.156 \text{ kN}$$

$$MR' = La \cdot MR = 1.25 \cdot 56.525 = 70.656 \text{ kNm}$$

$$A : (36.125; 56.525) \quad B : (70.156; 70.656)$$

According to the above mentioned calculation the Slewing ring **VE059A10** is suitable to the application; here below the load chart.



# Dynamic load

## Slewing ring life cycle

The concept of the life cycle of a slewing ring is based on the theory of probability, which defines the "life cycle" of a slewing ring in the number of cycles reached by 90% of a group of slewing rings from the same lot, which have identical characteristics and operate in the same working conditions, before showing signs of wear.

The life cycle value is expressed by the formula

$$L_{10} = \left( \frac{Ca}{P} \right)^n$$

Where:

**L<sub>10</sub>** is the duration expressed in millions of revs  
**Ca** is the basic dynamic load  
**P** is the dynamic load applied to the slewing ring  
**n** is an exponent depending on the rolling element (ball or roller).

Slewing rings working mainly at low rotation speed, or with swinging movements, are not usually got into proportion on the basis of their theoretical life cycle, but of static loads. Nevertheless it is possible to apply theoretical life cycle calculation methods, according to the dynamic stress, adjusting the duration L10 with appropriate factors that consider:

- Very low (less than 1 m/s) or very high tangential speeds
- Swinging movements
- High precisions
- High radial loads, or not
- Quality of the connecting structures
- Maintenance requirements of slewing rings

Please contact Leonessa Brevini Technical department for the Slewing ring dynamic load calculations and the Slewing ring theoretical life cycle according to loads and factors that may effect the life cycle.





# Data request form

Notes

LEONESSA <i>brevini</i> YANCHENG SLEWING BEARING CO. LTD.		DATA REQUEST FORM		
Date	Sales	Mr./Ms.	Title	
COMPANY				
address				
phone		email		fax
<input type="checkbox"/> OEM	<input type="checkbox"/> Dealer	<input type="checkbox"/> Spare-parts dealer	<input type="checkbox"/> Other	
<b>APPLICATION</b>				
Describe				Machine Model
Rotation axis position Vertical <input type="checkbox"/> Horizontal <input type="checkbox"/>		Type of rotation Positioning <input type="checkbox"/> Continuous <input type="checkbox"/>		Rotation speed
Loads reacting by means of: Compression <input type="checkbox"/> Traction <input type="checkbox"/>		Working Temperature		Environment
<b>LOADS ON SLEWING BEARING</b>				
Axial load				
Radial load				
Tilting moment				
Required life				
Torque on slewing rings gear				Nr Pinions
<b>DIMENSIONS</b>		Raceway <input type="checkbox"/> 1 Ball <input type="checkbox"/> 2 Balls <input type="checkbox"/> 1 Roller <input type="checkbox"/> Other <input type="checkbox"/>		
Competitor Code		Gear Internal <input type="checkbox"/> External <input type="checkbox"/> Without <input type="checkbox"/>		
External Ø		module	Nr teeth	á xm Km
Internal Ø		Pitch Ø	Tooth width	Hardened Teeth no <input type="checkbox"/> yes <input type="checkbox"/>
Total width		External width		Internal width
External Ring Distance Holes		Nr	Type	Equally spaced Yes <input type="checkbox"/> No <input type="checkbox"/>
Internal Ring Distance Holes		Nr	Type	Equally spaced Yes <input type="checkbox"/> No <input type="checkbox"/>
External Ring Material		C45 <input type="checkbox"/> 42CrMo4 <input type="checkbox"/> 50Mn <input type="checkbox"/>	Normalized <input type="checkbox"/> Quenced&Tempered <input type="checkbox"/>	
Internal Ring Material		C45 <input type="checkbox"/> 42CrMo4 <input type="checkbox"/> 50Mn <input type="checkbox"/>	Normalized <input type="checkbox"/> Quenced&Tempered <input type="checkbox"/>	
Grease holes nr		Type	Seals yes <input type="checkbox"/> no <input type="checkbox"/>	Paint no <input type="checkbox"/> yes <input type="checkbox"/>
External Centering no <input type="checkbox"/> yes <input type="checkbox"/>		Ø	width	Tolerance
Internal Centering no <input type="checkbox"/> yes <input type="checkbox"/>		Ø	width	Tolerance
Other		Clearance		Preload
<b>ANNUAL QUANTITY</b>		<b>Attachments</b>		
Note				

Data 5/12 Rev 0 Sched a n° S-03.14



## Slewing rings



## Features

Leonessa Brevini slewing rings are designed to reach the most demanding performance.

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## Gears

Leonessa Brevini slewing rings can be manufactured with internal or external gear.

Our standard gears are with straight teeth, with pressure angle at 20° and with module from 2.5 to 16 mm, in quality class from IT8 to IT 12, according to ISO standards.

Other types of gears with pressure angles of 25°, 27° or more, helicoidally, chain-shaped, can be made on request.

### Gear resistance

For normalized toothed wheels, the following tension values are admissible:

- 130 Mpa for standard working force
- 260 for maximum working force

For quenched and tempered toothed wheels in, the following tension values are admissible:

- 180 Mpa for standard working force
- 360 Mpa for maximum working force

In order to increase the resistance to wear or flexion of the tooth root, the gear can be heat treated by induction hardening, with side tooth profiles or side and bottom tooth profiles.

Leonessa Brevini Technical Department has an on-going updated software to test the correct geometry of the wheel/pinion mesh and the assessment of gear life cycle.



## Heat treatments

All Leonessa Brevini slewing rings have heat-treated bearing raceways with an induction hardening treatment.

The surface hardness grade is HRC 55-60, with an appropriate treatment depth suitable to the size of the rolling elements.

The treatment quality is guaranteed by modern equipment, ensuring a correct hardening cycle, along continuous controls performed by our own laboratory.



induction hardening of tooth side and bottom



induction hardening of roller raceway



induction hardening of ball raceway



induction hardening of entire gear



# Materials

The steels used in the construction of Leonessa Brevini slewing rings are in accordance with international standards.

The most widely used steels are:

- C45
- 42CrMo4
- 50 Mn

These types of steel are chosen according to the slewing ring design and its application:

- normalized
- quenched and tempered

The below chart shows the average hardness:

	C45				42CrMo4			
	N/mm <sup>2</sup>		HB		N/mm <sup>2</sup>		HB	
	min	max	min	max	min	max	min	max
<b>Normalized</b>	580	-	172	-	800	-	240	-
<b>Quenched and tempered</b>	630	780	190	235	850	950	255	283

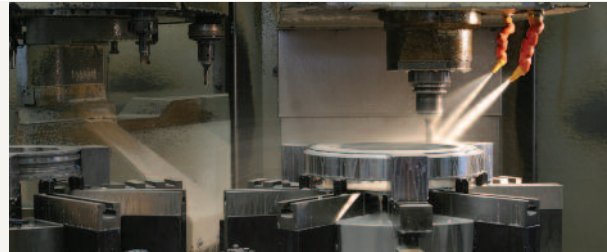
Rolling elements (balls and rollers) are made of tempered steel 100Cr6, with a surface hardness of HRC 63 ± 3 and a precision grade 200 according to ISO 3290.

# Construction tolerances

Leonessa Brevini slewing rings are manufactured with tolerances and backlashes whose values depend on the slewing ring dimensions and its application.

The tolerance values are indicated in the drawings, with an example here below.

As regards dimensions not indicated in the drawings please refer to ISO standard 2768.



Gear 齿轮		Wearing holes - inner 孔		Wearing holes - outer 孔		Quality standard	
Module - 模数	m 8	孔距分布 - 内径	30	孔距分布 - 外径	30	等级	30
No. of teeth - 齿数	z 148	N/N1 Gross holes - 新增轴孔 N° 2 NB x 1 e 18°		T/T1 Position of lancing plug and/or hardness gsp 公差受压最小值/状态		1 Internal diameter 982 instead of 976	
Pressure angle - 压力角	α 20°	Material - 材料 42CrMo4		Material treatment - 材料热处理 Quenched & tempered 淬火		N° Modification - 修改代号 SB-E-1200-	
Addendum modification - 变位值	xn -	EN 20083-1/2 06.98		Dimensional tolerances 公差		Date - 日期 06/09/12	
Fitch diameter - 分度圆	Dp 1184	① 42CrMo4		② C45		Tolerance 公差 EN 22768-1 u	
Truncation - 齿顶修圆	ra -	③ Normalized 正火		④ C45		Weight - 重量 kg	
Measurement on teeth 齿测量	a <sup>+</sup> 齿顶圆直径 ⑤ 2mm 齿顶圆直径	⑥ C45		⑦ Normalized 正火		Date - 日期 06/09/12	
Tangential tooth land 齿切向余量	Normal - 标准值 0.15	⑧ C45		⑨ Normalized 正火		Approved - 批准 S. Ferrari	

# Rotation torque

There are two types of rotation torques:

- **Starting torque (Cavv):** is the torque requested to put a resting slewing ring into rotation;
- **Acceleration torque (Cacc):** is the torque requested to the system containing the slewing ring to increase rotation speed in a determined period of time.

The starting torque is calculated by adding the pre-loading torque (Cp) of the slewing ring to the resistant friction torque (Catt) due to the charged rolling elements:  
 $C_{avv} = C_p + C_{att}$  [kNm]

The value of the pre-loading torque can be requested of La Leonessa, while the resistant friction torque is calculated in function of the friction coefficient, of loads and of dimensions using the following formula:

$$C_{att} = \left( \frac{5MR}{D_{pw}} + FA_{eq} \right) \times f \times \frac{D_{pw}}{2}$$

where

**f** is the coefficient of friction, which assumes the following values

- f** = 0.006 for ball slewing rings
- f** = 0.0075 for roller slewing rings

**Dpw** = rolling diameter [m]

The acceleration torque is calculated by adding the pre-loading torque (Cp) of the slewing ring and the resistant friction torque (Catt) of the charged rolling elements to the moment of inertia of the masses involved:  
 $C_{acc} = C_p + C_{att} + C_{in}$  [kNm]

The calculation of the pre-loading torque and the resistant friction torque was previously illustrated, while the moment of inertia has:

$$C_{in} = \frac{\pi \times (nf - ni) \times I}{30 \times t} \times 10^{-3}$$

where

**nf** = final rotation speed [rpm]

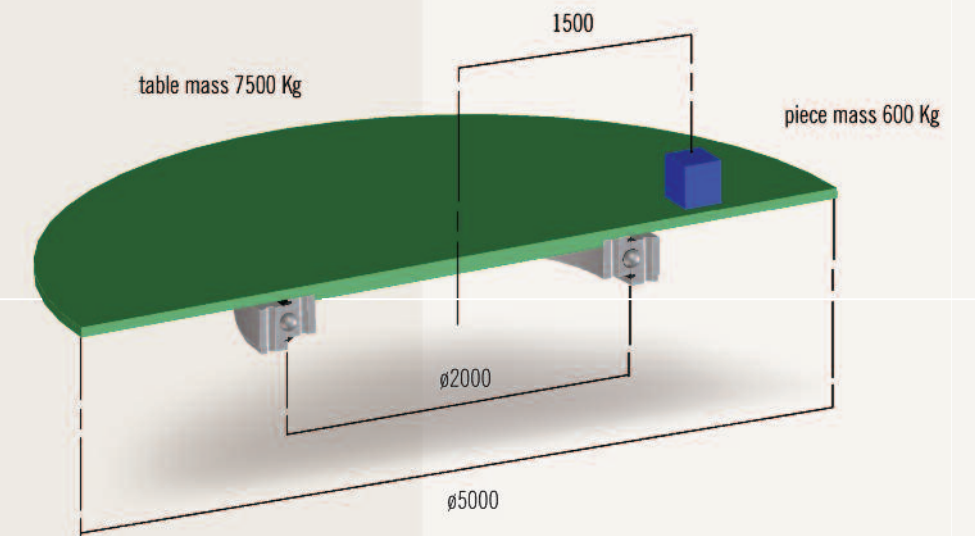
**ni** = initial rotation speed [rpm]

**t** = time interval of acceleration [s]

**I** = sum of the moment of inertia of the masses referred to the rotation axis [kgm<sup>2</sup>]

In general, if the dimensions of the masses are negligible in respect to the distance between their barycentre and the rotation axis, the moment of inertia with respect to the rotation axis is given by the product of the mass expressed in kg multiplied by the square of the distance between the mass barycentre and the rotation axis expressed in meters.

Calculation example:



Rotating table

**Diameter:** 5m  
**Table mass:** 7500 kg  
**Piece mass:** 600 kg  
**Distance between piece and rotation axis:** 1,5m  
**Bearing raceway diameter:** 2 m  
**Pre-loading torque:** 30 kgm

**The applied loads on the slewing ring are:**  
 $F_a = 7500 \text{ kg} + 600 \text{ kg} = 8100 \text{ kg} = 79.43 \text{ kN}$   
 $M_r = 600 \text{ kg} \cdot 1,5 \text{ m} = 900 \text{ kgm} = 8.83 \text{ kNm}$

**Starting torque calculation:**  
 $C_p = 30 \text{ kgm} = 0.294 \text{ kNm}$

$$C_{att} = \left( \frac{5MR}{D_{pw}} + FA_{eq} \right) \times f \times \frac{D_{pw}}{2} = \left( \frac{5 \times 8.83}{2} + 79.43 \right) \times 0.006 \times \frac{2}{2} = 0.609 \text{ kNm}$$

$$C_{avv} = C_p + C_{att} = 0.294 + 0.609 = 0.903 \text{ kNm}$$

Calculation of the acceleration torque to increase rotation speed from 1 rpm to 6 rpm in 20 seconds:  
 Moment of inertia of the table:

$$I_t = \frac{M \times R^2}{2} = \frac{7500 \times 2.5^2}{2} = 23437.5 \text{ kgm}^2$$

Moment of inertia of the piece:  
 $I_p = 600 \cdot 1.5^2 = 1350 \text{ kgm}^2$   
 Total moment of inertia (neglecting the moment of inertia of the rotating ring):  
 $I = I_t + I_p = 23437 + 1350 = 24787 \text{ kgm}^2$

$$C_{in} = \frac{\pi \times (nf - ni) \times I}{30 \times t} \times 10^{-3} = \frac{\pi \times (6-1) \times 24787}{30 \times 20} \times 10^{-3} = 0.649 \text{ kNm}$$

$$C_{acc} = C_p + C_{att} + C_{in} = 0.294 + 0.609 + 0.649 = 1.552 \text{ kNm}$$



## Slewing ring



## Assembly and maintenance

In order to obtain the best performance from slewing rings, the assembly and maintenance procedures must be carefully followed.

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# Slewing ring assembly

## Transport, packaging and preparation

Leonessa Brevini slewing rings must be transported and moved in horizontal position, avoiding any blows or damage, especially in radial direction.

Since it is a machined component, slewing rings of any size must be handled carefully. The slewing ring is packaged on pallets, fastened down, and protected by an anti-corrosion oil film.

This protection allows for good maintenance of the surfaces for about 6 months, but only if the slewing ring is stored in a closed place, protecting it from atmospheric agents.

During unpacking of the slewing ring, take care not to damage the seals. The bearing must be degreased using commercial solvents, taking care that these do not attack the seals or enter the bearing raceways. We advise not to use solvents containing chlorides as these would damage the surfaces.

## Slewing ring identification:

Every Leonessa Brevini slewing ring is identified by stamped lettering close to the ball/roller loading plug. The printing states:

- Year and month of construction
- Progressive serial number

Example: **99061654**

**99** = construction year  
**6** = construction month  
**1654** = internal progressive number

We advise noting the serial number on the machine or system logbook. This will be useful in tracing the product once the part is installed as paint or guards may prevent it being able to be seen.

## Positioning the bearing

Always observe the mark made on Leonessa Brevini bearings to make sure that they are positioned properly and to guarantee them a long and efficient life.

- **Hardness gap of hardening treatment:** it is shown by a letter "S" stamped on a surface on the gear ring. On the smooth ring it can be found close to the ball/roller loading plug. During assembly always make sure that the hardening point of union are outside the maximum load area.
- **Gear teeth eccentricity:** This is detected by means of three blue painted teeth, and during assembly it is necessary to ensure that in this position the clearance between the sides of the teeth on the wheel and that of the pinion is between 0.03 and 0.05 times the gear module.
- **Grease nipples:** Leonessa Brevini slewing rings are provided with an adequate number of grease nipples. These nipples must be easily accessible positions.

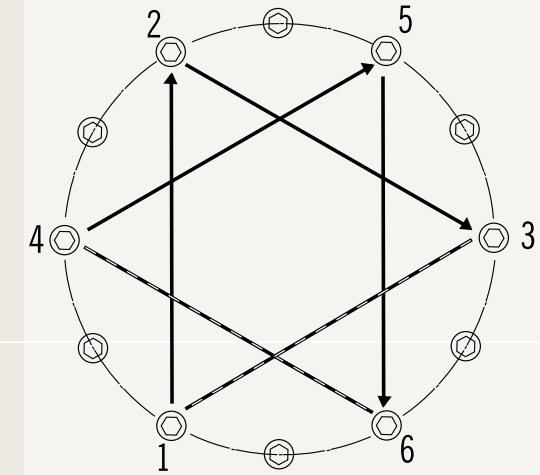
## Fastening bolts

Before connecting together the Leonessa Brevini slewing rings and the support structures, always make sure that the fastening bolts are to the required type (8.8-10.9-12.9).

The bolts must be lightly oiled ( $\mu=0,14$ ).

Hardened and tempered flat washers can be used, above all for normalized steel bearings, while it is strictly forbidden to use any kind of flexible washer which would void any warranty.

Mount all the bolts on the first ring and tighten slightly. Continue to tighten according to the order shown in the figure below.



## Tightening torque

The bolts must be tightened using dynamometric wrenches or hydraulic systems. The following table shows the tightening torques for bolts of quality classes 8.8 and 10.9.

Level of resistance according to UNI EN ISO 898-1				
8,8		10,9		
limit tensile strength Rp 0.2 in N/mm <sup>2</sup>				
640 per <M16 660 per >M16		940		
Metric thread DIN 13	Tensioning force N	Assembly and tighte- ning torque Nm	Tensioning force N	Assembly and tighte- ning torque Nm
<b>M12</b>	38500	78	56000	117
<b>M14</b>	53000	126	77000	184
<b>M16</b>	72000	193	106000	279
<b>M18</b>	91000	270	129000	387
<b>M20</b>	117000	387	166000	558
<b>M22</b>	146000	522	208000	747
<b>M24</b>	168000	666	239000	954
<b>M27</b>	221000	990	315000	1395
<b>M30</b>	270000	1350	385000	1890

## Installing the pinion

The wheel and pinion are coupled by bringing the three red painted teeth on the wheel, which represent the maximum eccentricity, into their corresponding position on the pinion. Then regulate the clearance between the sides of the teeth on the wheel and those of the pinion, making sure that it is at least:

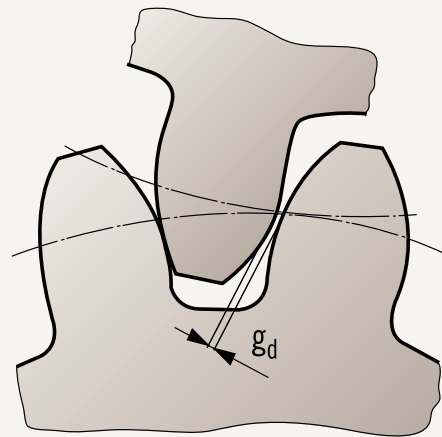
$$gd = 0.03-0,05 * \text{module}$$

This procedure must be repeated when there is more than one pinion.

During installation, always check the vertical alignment between the teeth of the wheel and pinion.

We recommend recording all data in the machine/system logbook.

When installation is completed, we recommend turning the system a few times before lubrication to make sure that the coupling is correct.



## Lubrication

Before starting the system the gear teeth should be greased so that the sides of the teeth are covered completely. Leonessa Brevini slewing ring is supplied with the raceways already lubricated; therefore the lubrication of these is necessary after the first 50 working hours (see paragraph on maintenance).

The standard grease used corresponds to ISO L-X-BCHB-2 and DIN 51825 KP2K-20 classifications.

The lubricants shown in the table are suitable for use at temperatures between -20°C and + 120°C. For use at lower temperatures, special grease must be used.

Periodical checks must be made on lubrication, bolt tightening, the state of the seals and machine clearance.

## Maintenance

The raceways must be lubricated at intervals depending on the operating conditions.

We recommend greasing the raceway after the first 50 hours of use, and then after every 100 hours of use. Before and after long periods of idleness, the bearing must be greased again. The grease is pumped while the bearing is rotating and is considered complete when the grease overflows from the seal forming a light film, which also serves as a seal. The grease should be brushed or sprayed on the gear teeth and must completely cover the sides of the teeth. Where it is not possible to visually check the presence of grease, we recommend greasing every three or six months, according to the use of the machine. The preceding table provides information on the greases to use.

## Bolts

After the first 100 working hours, the tightness of the bolts must be checked. Afterwards, we recommend yearly inspections. Checks should be made more frequently when special working conditions required it. If loose or worn bolts are found during inspections, they must be replaced.

The following table shows some typical values of greases used in raceway systems.

Grease	Rolling system	Gear teeth
AGIP	GRMU EP2	SEAGUS 60
BR	LS-EP2	Energol WRL
ESSO	Becom EP2	Surret fluid NX
SHELL	Calithia EP2	Malleus Fluid C
MOBIL	Mobilux EP2	Mobilnac 81

Consistency NLGI = 2;  
Drip point ASTM °C = 185;  
Worked penetration dmm = 280;  
Basic oil viscosity at 40°C mm<sup>2</sup>/s = 160

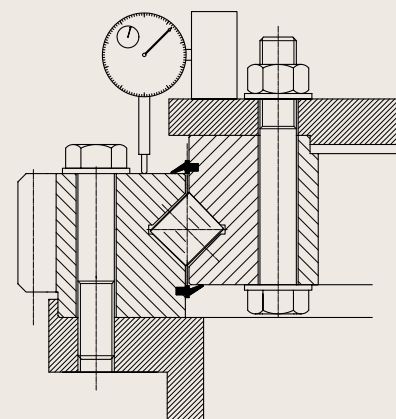
## Estimating machine clearance

After mounting the bearing, machine clearance must be checked. The value recorded will be used as a reference for future measurements during operations and show the bearing's state of wear. The distance must be measured between the upper and lower structure, as close as possible to the bearing raceway to reduce the influence of elastic deformation of the connecting structure.

### Operations

- 1 Use a 0.01 mm precision comparator, positioned as shown and reset to zero.
- 2 Bring the machine to its maximum load capacity
- 3 Record the variation of the instrument
- 4 Repeat the test at various angle positions

The maximum value recorded represents the initial clearance of the machine itself.



## Seals

The seals mounted on the Leonessa Brevini slewing rings are manufactured in a basic nitrile rubber elastomer, which resists well to temperatures and atmospheric agents.

During the life of the slewing ring we recommend regular visual inspections on the state of the seals and do not hesitate to replace them if they appear to have deteriorated or become fragile.

## Machine clearance

As described previously, the first measurement recorded is the reference for future measurements which represent the wear of the slewing ring raceways.

It should be measured once a year. The maximum acceptable increase before replacement of the slewing ring depends on the diameter of the bearing, on the type and size of the rolling elements (balls or rollers), on the type of application for which greater limits of wear can be accepted without operations are not compromised. When clearance reaches four times the initial value, please contact our Technical Department for an evaluation of the state of wear of the slewing ring.



Product range



## Slewing rings

Leonessa Brevini product range includes versions with internal, external and without gear. Slewing rings with one row of balls, two rows of balls or with one row of rollers are available. In addition to the products shown here, Leonessa Brevini can manufacture slewing rings according to customer specifications.

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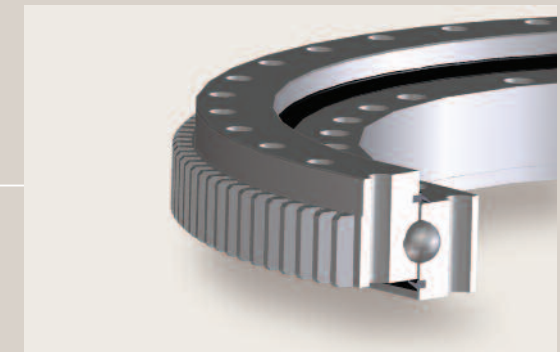
**LEONESSA *brevini***  
YANCHENG SLEWING BEARING CO. LTD.



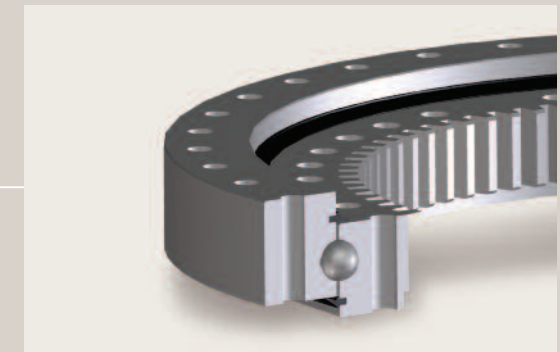
## Slewing Rings

### Single row of balls

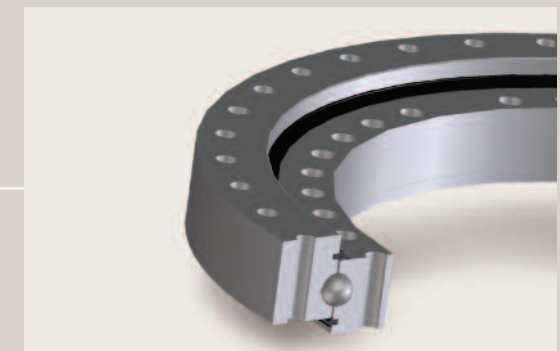
External  
gear



Internal  
gear

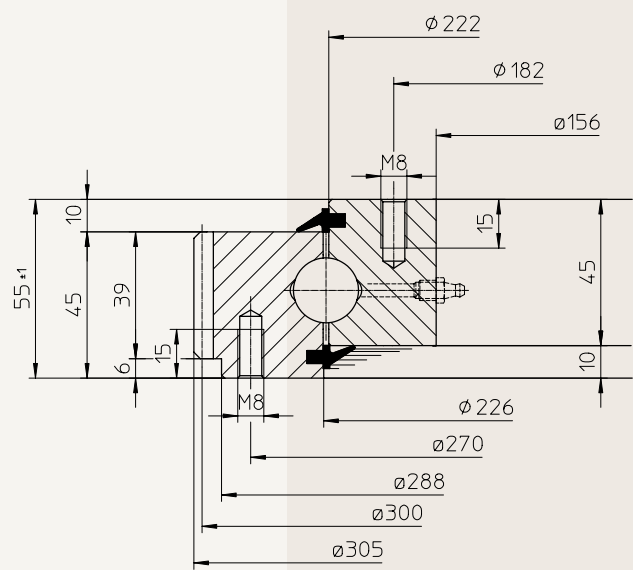


Without  
gear



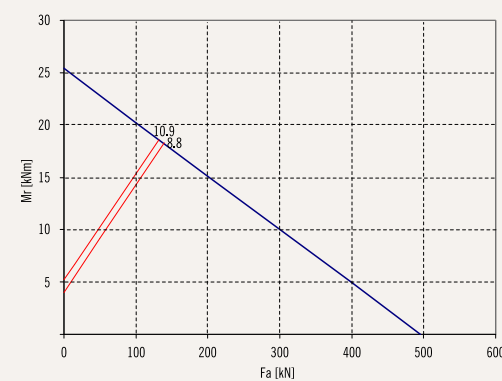
# Single row of balls External gear

## Cod. VE030A00

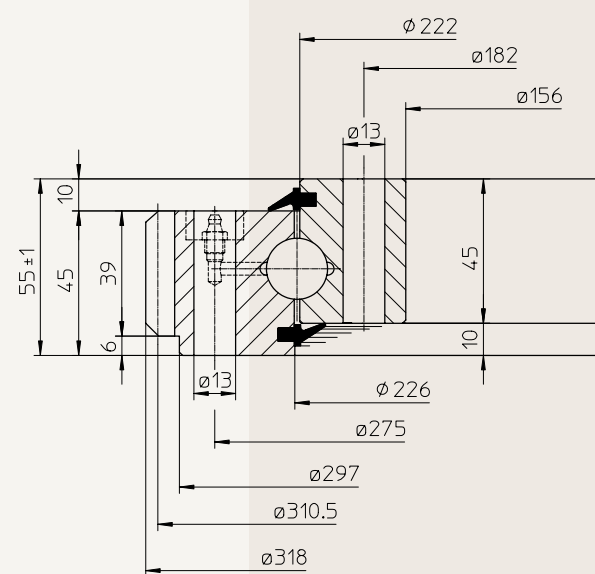


	No.	Type
Internal bolts	12	M8
External bolts	12	M8

Module	2,5
N. of teeth	120
Addendum modification	0
kN - Normal tangential force	3,6
kN - Maximum tangential force	7,2
Weight	17,5

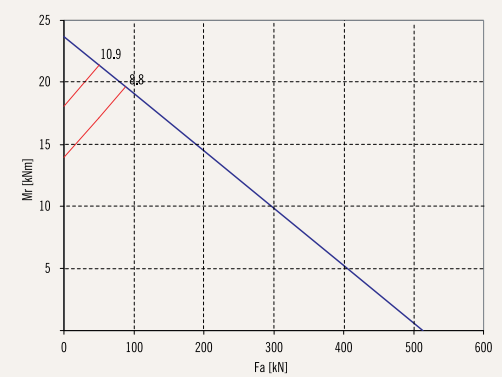


## Cod. VE031A01

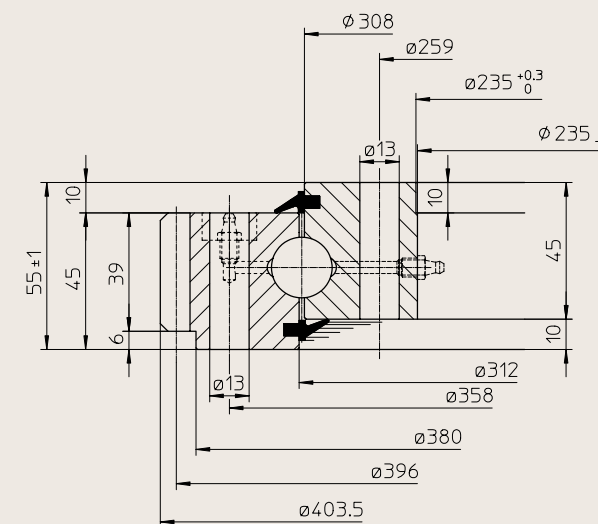


	No.	Type
Internal bolts	20-1	M12
External bolts	20	M12

Module	4,5
N. of teeth.	69
Addendum modification	0
kN - Normal tangential force	11,6
kN - Maximum tangential force	23,2
Weight	17,5

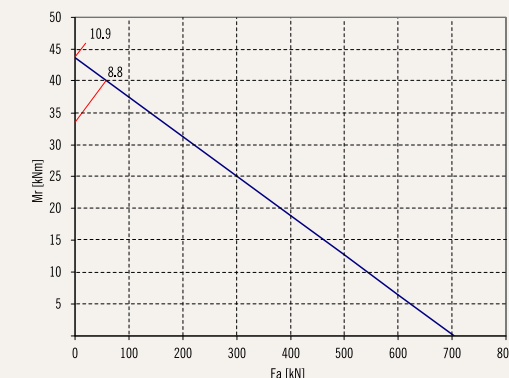


## Cod. VE040A01

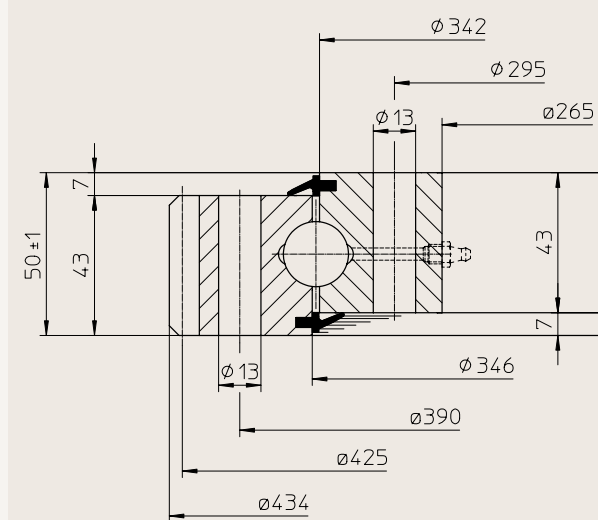


	N.	Tipo
Internal bolts	28-1	M12
External bolts	24	M12

Module	4,5
N. of teeth	88
Addendum modification	0
kN - Normal tangential force	8,4
kN - Maximum tangential force	16,8
Weight	25

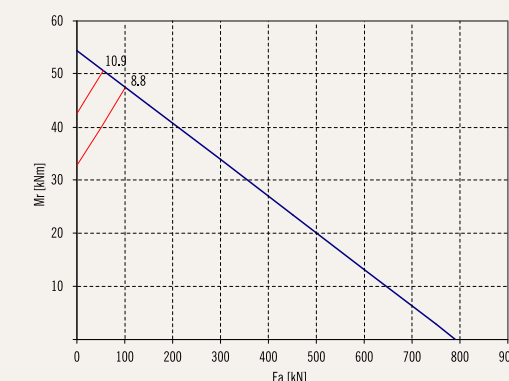


## Cod. VE043A05



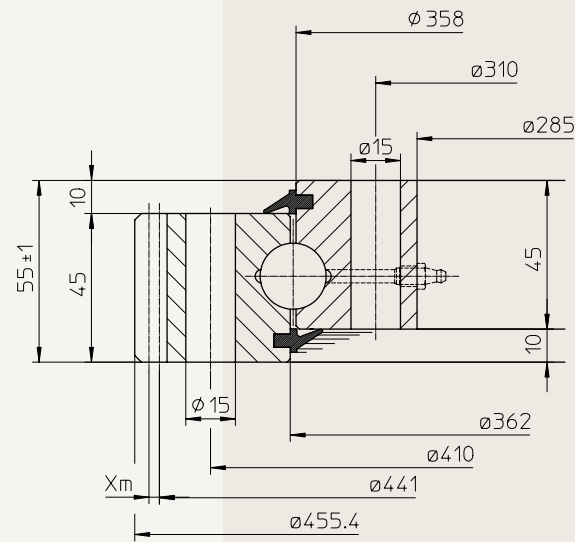
	N.	Tipo
Internal bolts	24	M12
External bolts	24	M12

Module	5
N. of teeth	85
Addendum modification	0
kN - Normal tangential force	14,4
kN - Maximum tangential force	28,8
Weight	30

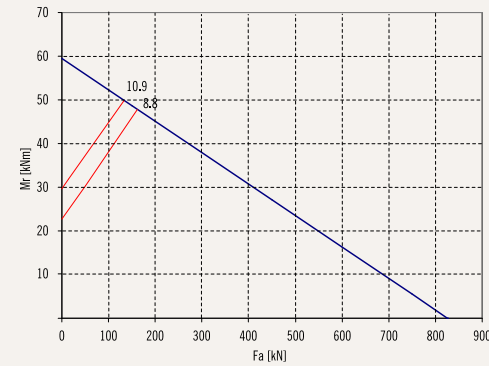


# Single row of balls External gear

## Cod. VE045A00

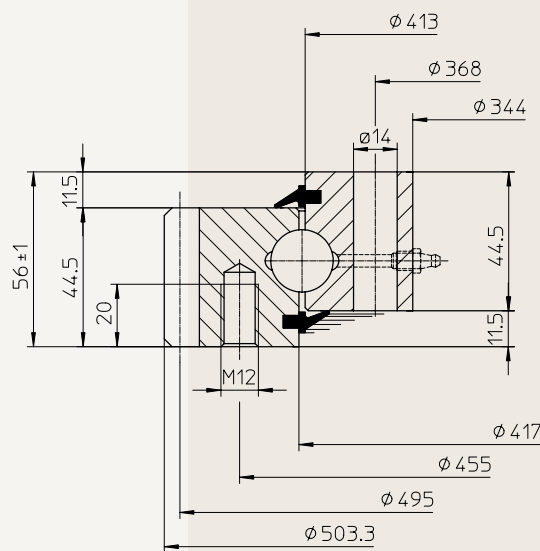


Module	4,5
N. of teeth	98
Addendum modification	3,15
kN - Normal tangential force	10,1
kN - Maximum tangential force	20,2
Weight	29

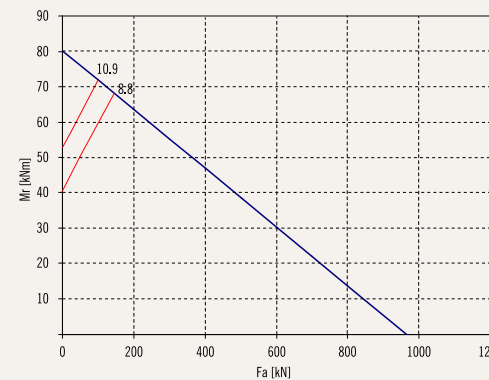


	No.	Type
Internal bolts	12	M14
External bolts	12	M14

## Cod. VE050A02

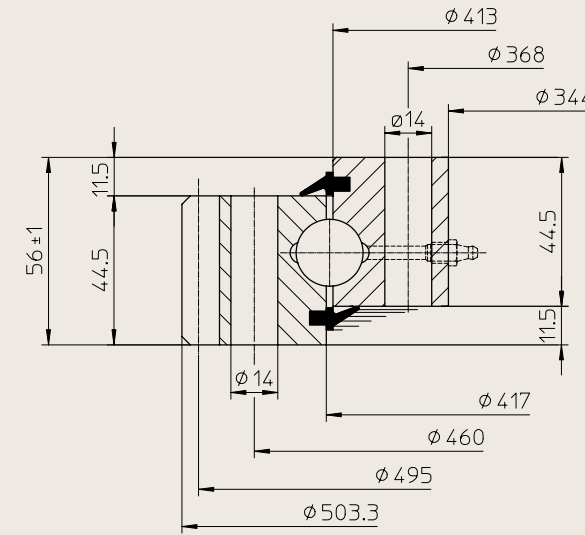


Module	5
N. of teeth	99
Addendum modification	0
kN - Normal tangential force	10,4
kN - Maximum tangential force	20,8
Weight	31



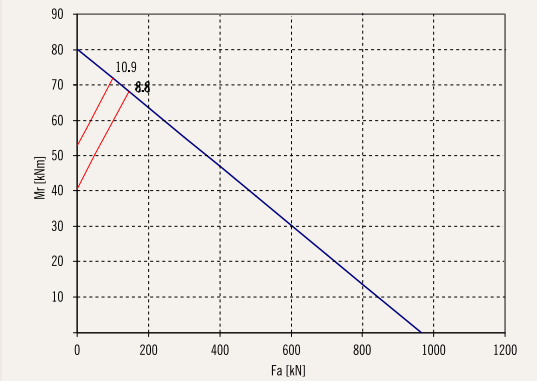
	No.	Type
Internal bolts	24	M12
External bolts	20	M12

## Cod. VE050A10

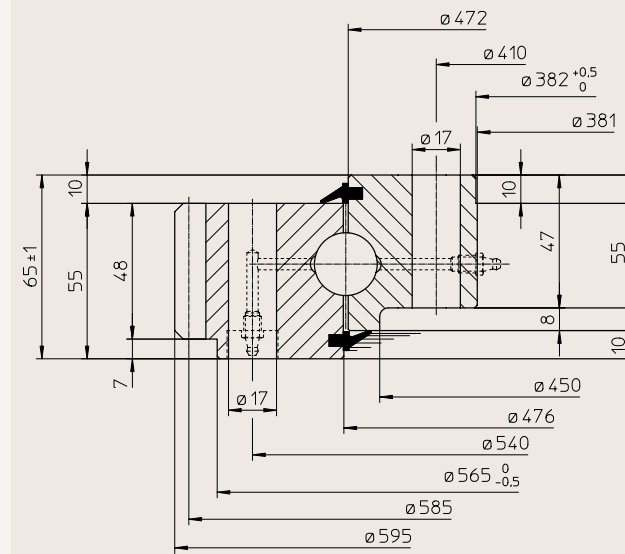


	No.	Type
Internal bolts	24	M12
External bolts	20	M12

Module	5
N. of teeth	99
Addendum modification	0
kN - Normal tangential force	10,4
kN - Maximum tangential force	20,8
Weight	31

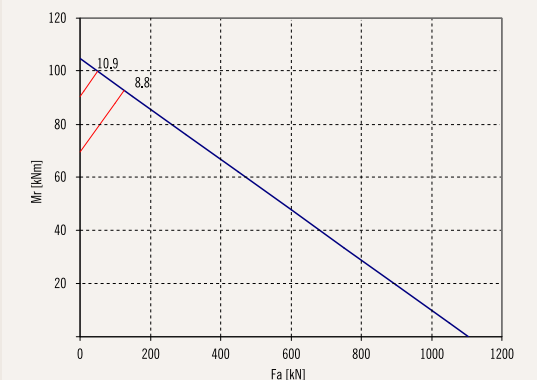


## Cod. VE059A00



	No.	Type
Internal bolts	18	M16
External bolts	18	M16

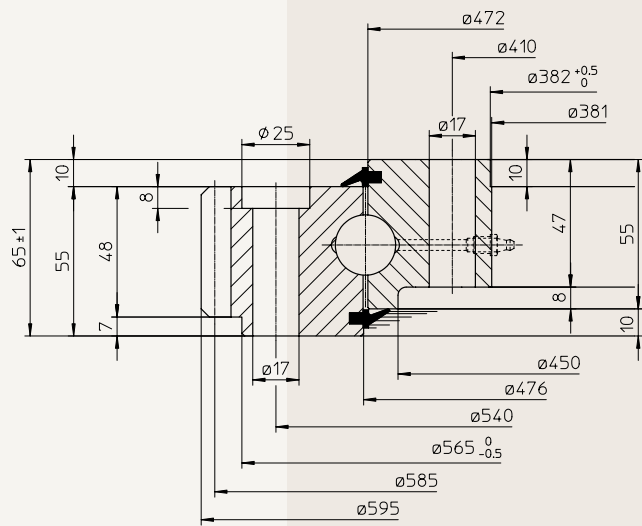
Module	5
N. of teeth	117
Addendum modification	0
kN - Normal tangential force	10,4
kN - Maximum tangential force	20,8
Weight	58





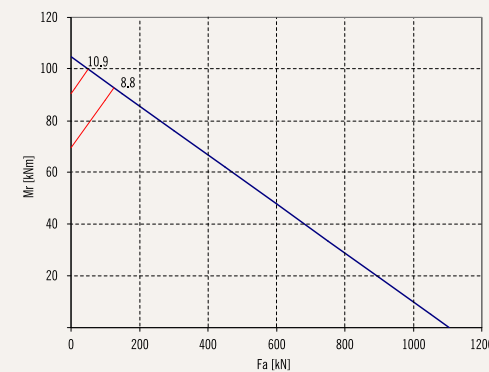
# Single row of balls External gear

## Cod. VE059A10

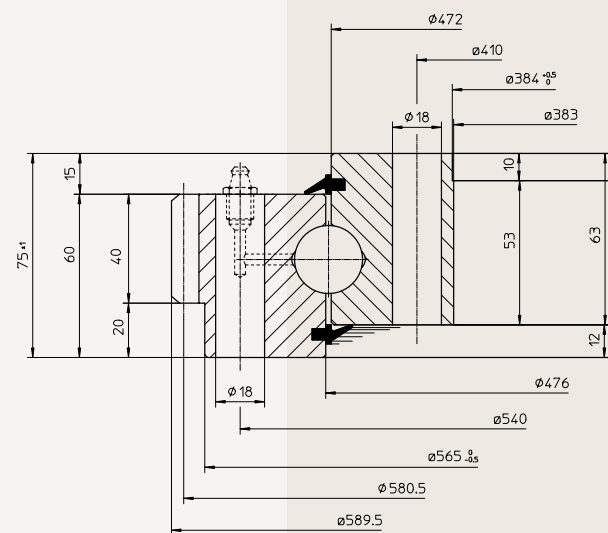


	No.	Type
Internal bolts	18	M16
External bolts	18	M16

Module	5
N. of teeth	117
Addendum modification	0
kN - Normal tangential force	10,4
kN - Maximum tangential force	20,8
Weight	58

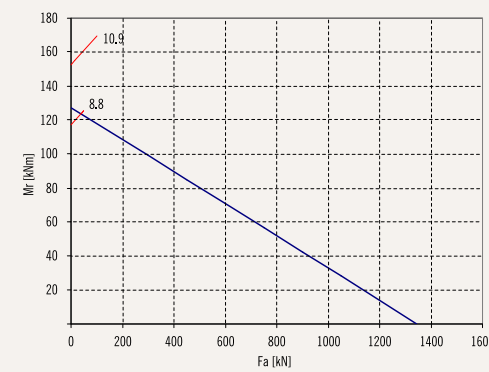


## Cod. VE059A22

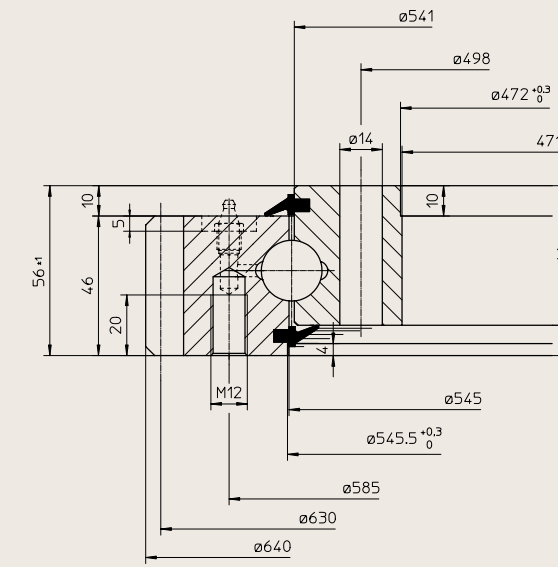


	No.	Type
Internal bolts	36-1	M16
External bolts	36	M16

Module	4,5
N. of teeth.	129
Addendum modification	0
kN - Normal tangential force	9,7
kN - Maximum tangential force	19,4
Weight	62

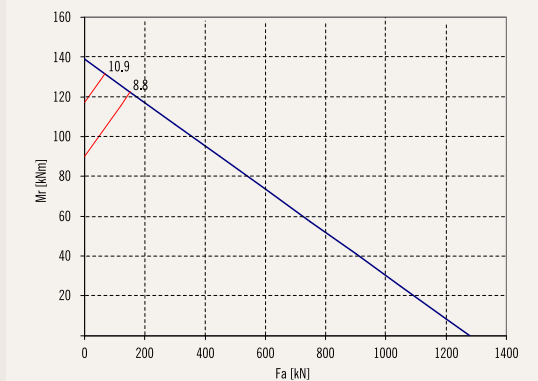


## Cod. VE064A00

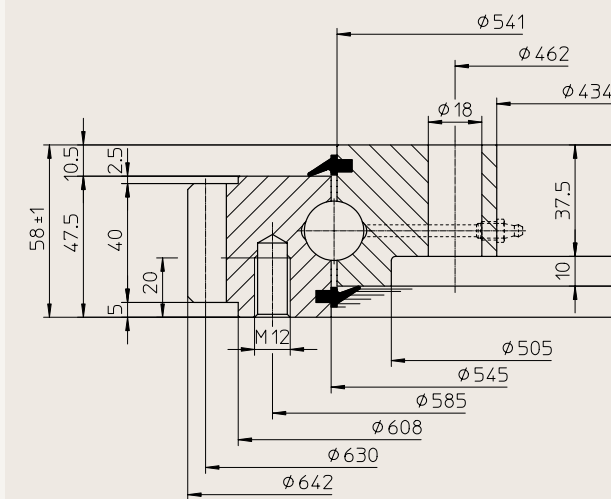


	No.	Type
Internal bolts	40-1	M12
External bolts	40	M12

Module	6
N. of teeth	105
Addendum modification	0
kN - Normal tangential force	14,3
kN - Maximum tangential force	28,6
Weight	45

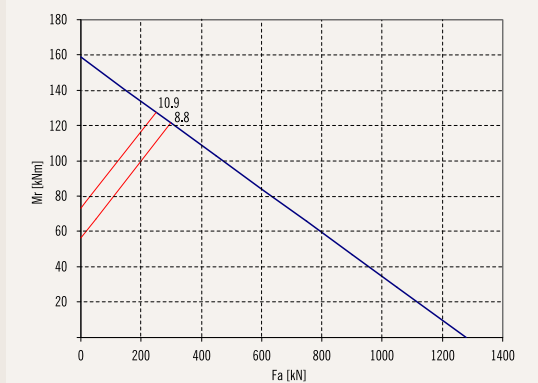


## Cod. VE064A07



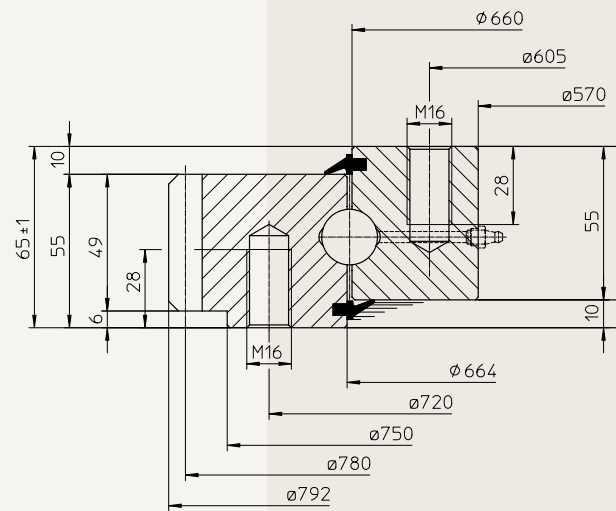
	No.	Type
Internal bolts	14	M16
External bolts	14	M12

Module	6
N. of teeth	105
Addendum modification	0
kN - Normal tangential force	14,4
kN - Maximum tangential force	28,8
Weight	40



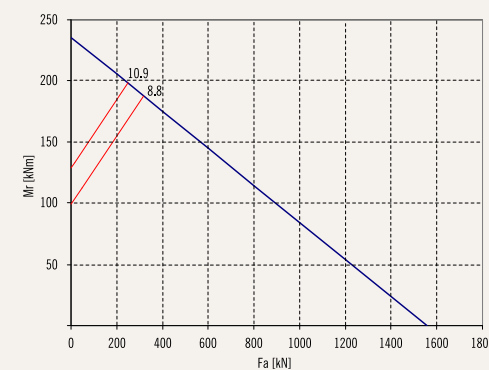
# Single row of balls External gear

## Cod. VE079A00

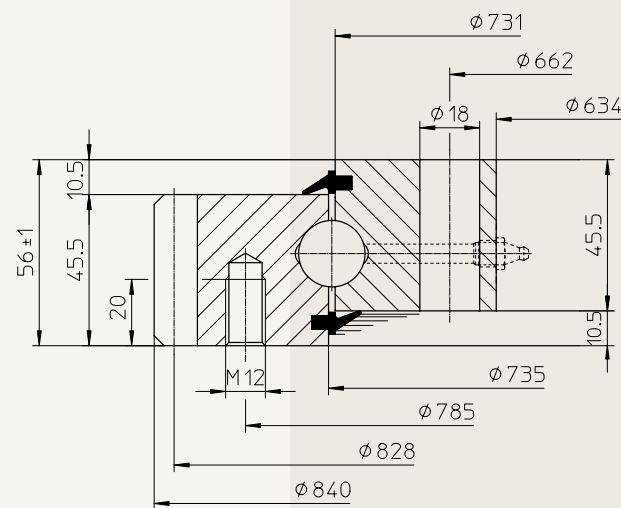


	No.	Type
Internal bolts	20	M16
External bolts	20	M16

Module	6
N. of teeth	130
Addendum modification	0
kN - Normal tangential force	15,0
kN - Maximum tangential force	30,0
Weight	92

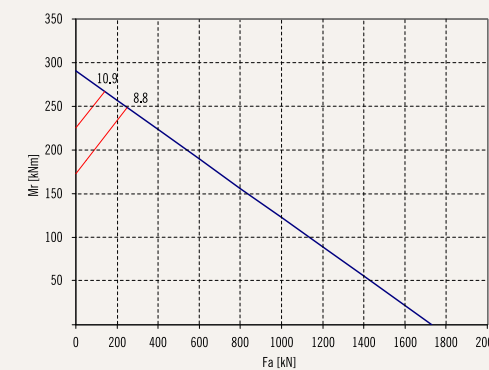


## Cod. VE084A01

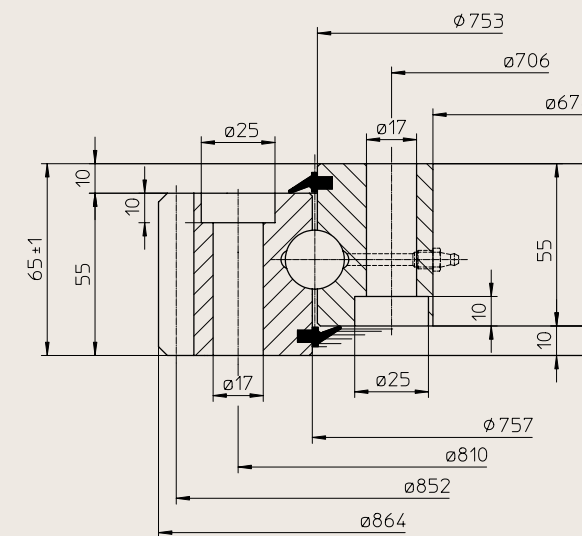


	No.	Type
Internal bolts	32	M16
External bolts	18	M12

Module	6
N. of teeth.	138
Addendum modification	0
kN - Normal tangential force	14,1
kN - Maximum tangential force	28,2
Weight	70

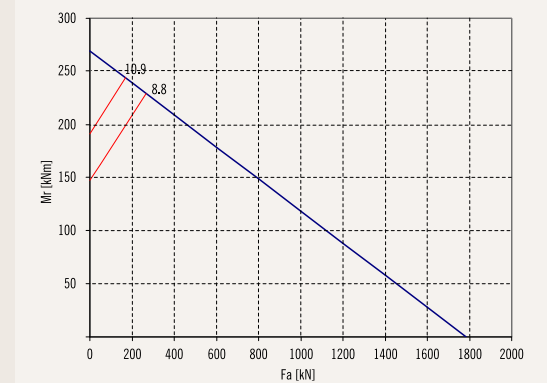


## Cod. VE086A00

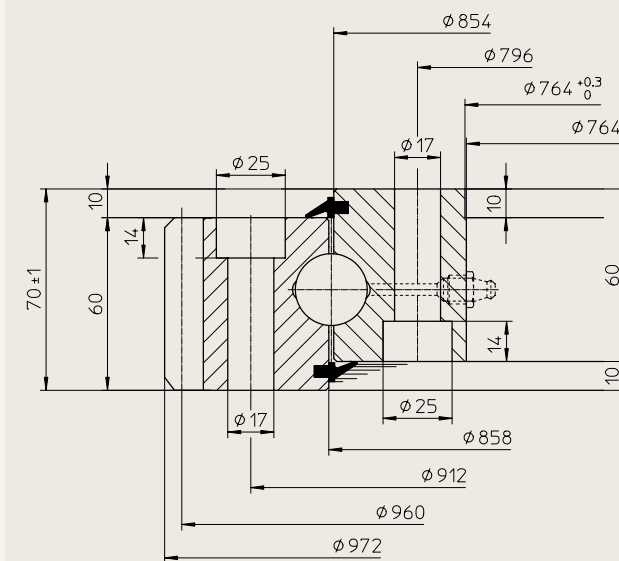


	No.	Type
Internal bolts	24	M16
External bolts	24	M16

Module	6
N. of teeth	142
Addendum modification	0
kN - Normal tangential force	14,9
kN - Maximum tangential force	29,8
Weight	83

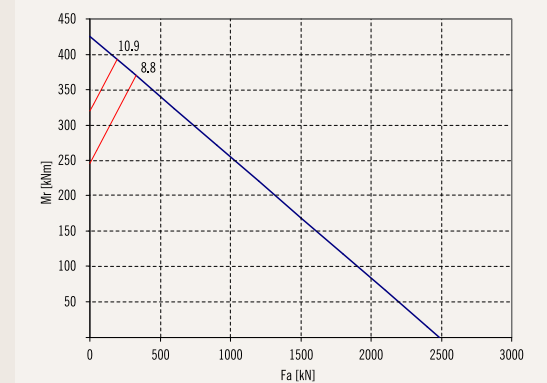


## Cod. VE097A00



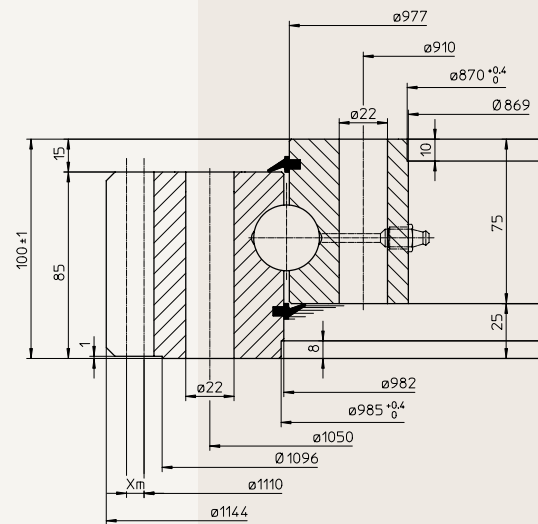
	No.	Type
Internal bolts	36	M16
External bolts	36	M16

Module	6
N. of teeth	160
Addendum modification	0
kN - Normal tangential force	17,3
kN - Maximum tangential force	34,6
Weight	114



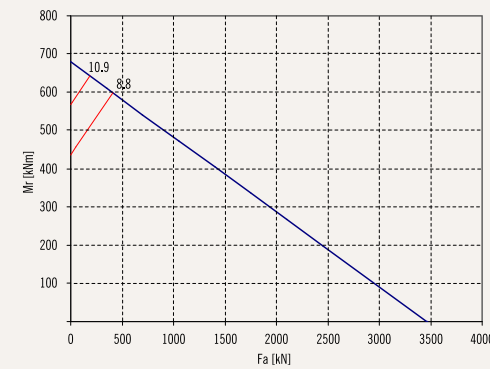
# Single row of balls External gear

## Cod. VE114A05

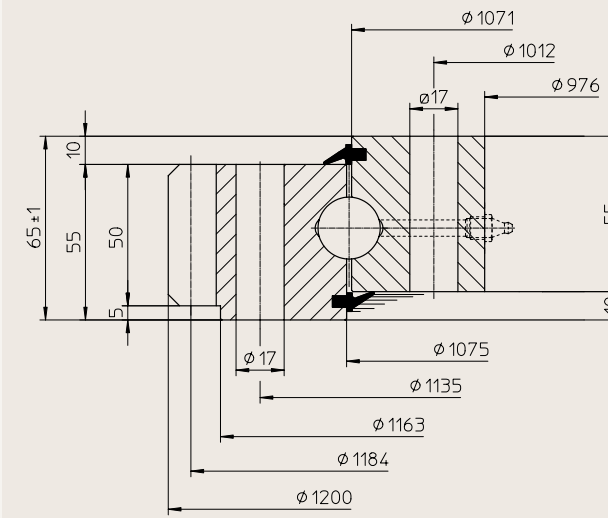


	No.	Type
Internal bolts	36	M20
External bolts	36	M20

Module	10
N. of teeth	111
Addendum modification	8
kN - Normal tangential force	57,3
kN - Maximum tangential force	114,6
Weight	214

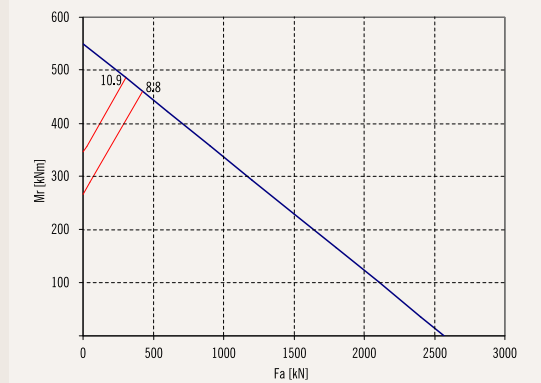


## Cod. VE120A05

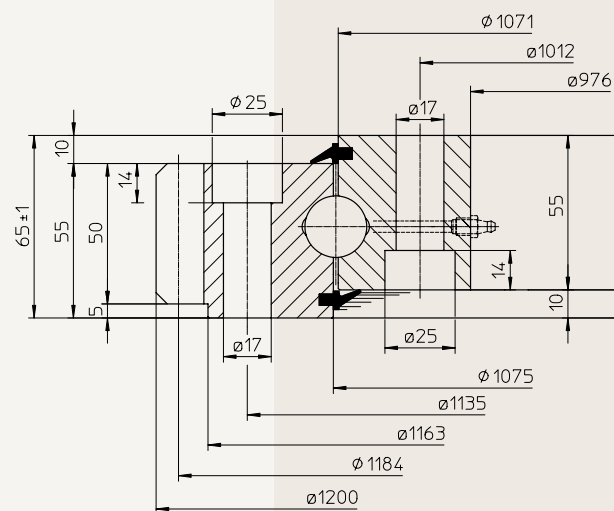


	No.	Type
Internal bolts	30	M16
External bolts	30	M16

Module	8
N. of teeth	148
Addendum modification	0
kN - Normal tangential force	20,8
kN - Maximum tangential force	41,6
Weight	142,5

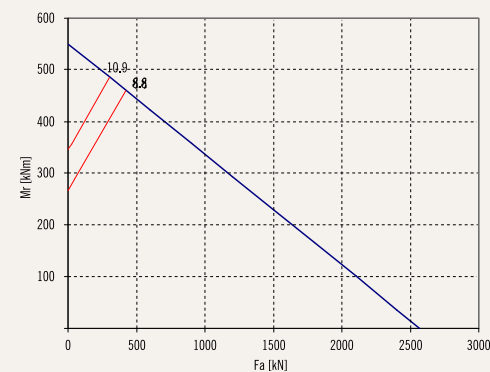


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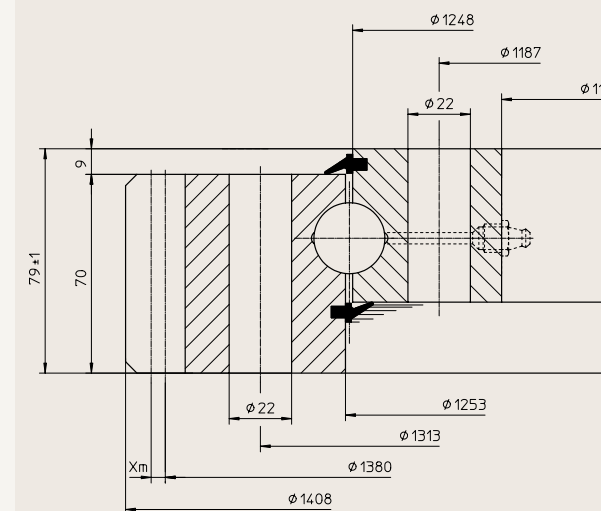


	No.	Type
Internal bolts	30	M16
External bolts	30	M16

Module	8
N. of teeth	148
Addendum modification	0
kN - Normal tangential force	20,8
kN - Maximum tangential force	41,6
Weight	142,5

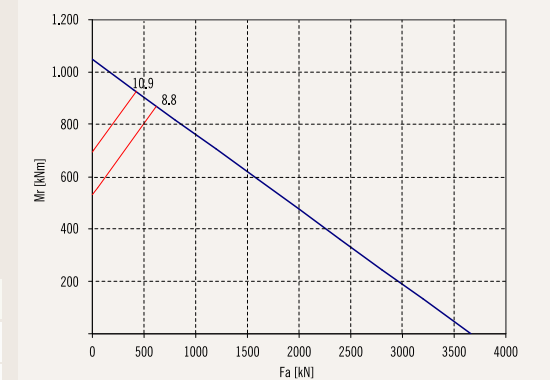


## Cod. VE140A01



	No.	Type
Internal bolts	36	M20
External bolts	36	M20

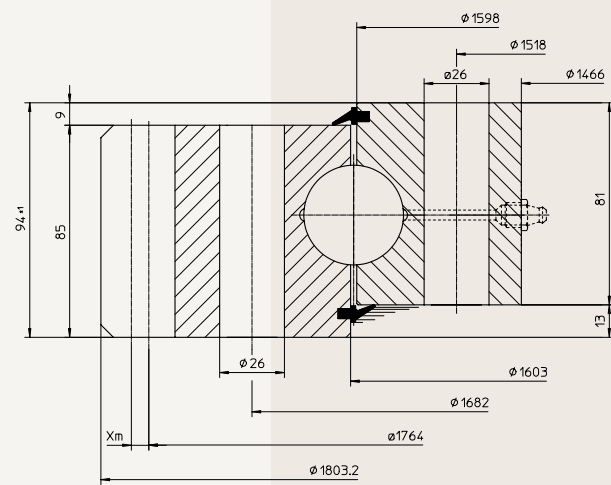
Module	10
N. of teeth	138
Addendum modification	5
kN - Normal tangential force	43,9
kN - Maximum tangential force	87,8
Weight	213





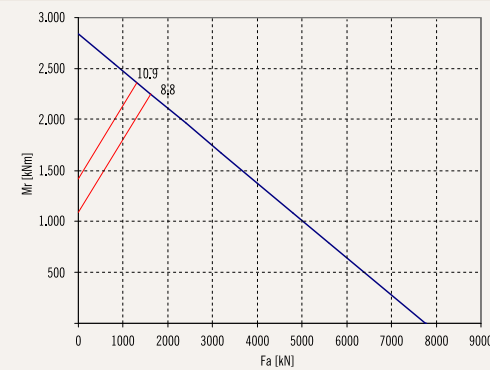
# Single row of balls External gear

Cod. VE180A00



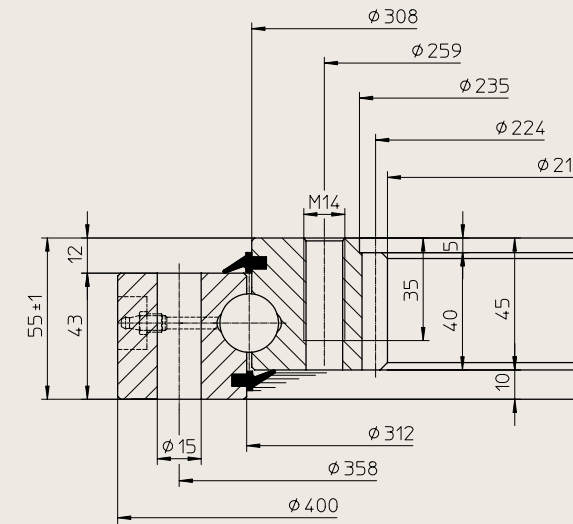
	N.	Tipo
Internal bolts	40	M24
External bolts	40	M24

Module	14
N. of teeth	126
Addendum modification	7
kN - Normal tangential force	104,0
kN - Maximum tangential force	208,0
Weight	479



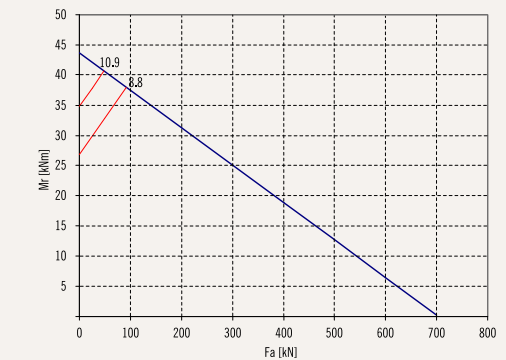
# Internal gear

Cod. VI040A01

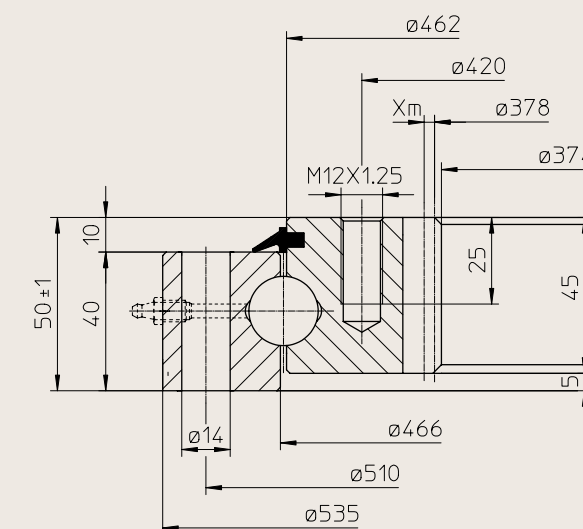


	N.	Tipo
Internal bolts	16	M14
External bolts	24	M14

Modulo	4
N. of teeth	56
Addendum modification	0
kN - Normal tangential force	7,2
kN - Maximum tangential force	14,4
Weight	26,5

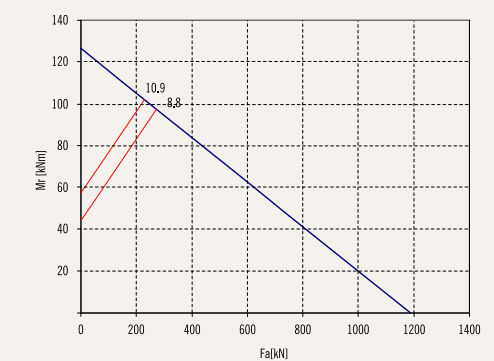


Cod. VI053A00



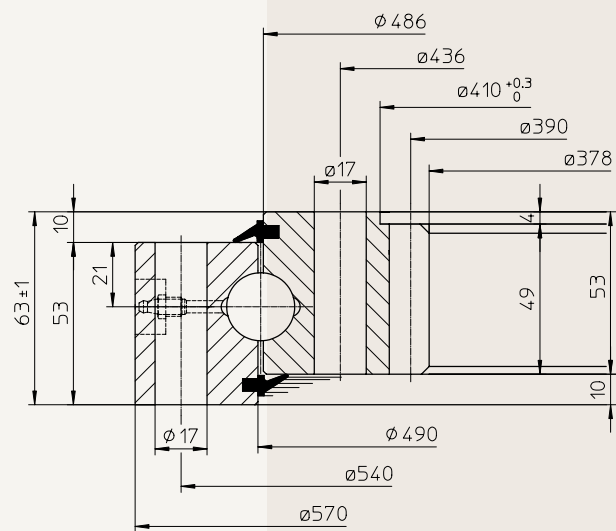
	N.	Tipo
Internal bolts	24	M12
External bolts	24	M12

Module	6
N. of teeth	63
Addendum modification	3
kN - Normal tangential force	19,5
kN - Maximum tangential force	39,0
Weight	35



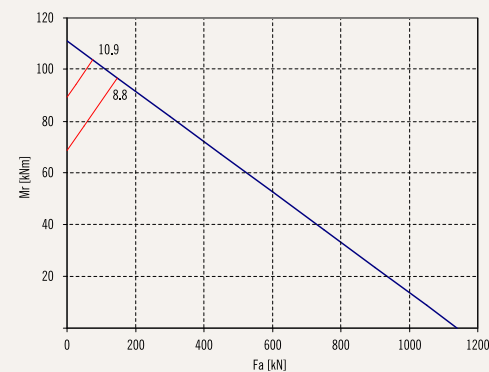
# Single row of balls Internal gear

## Cod. VI057A01

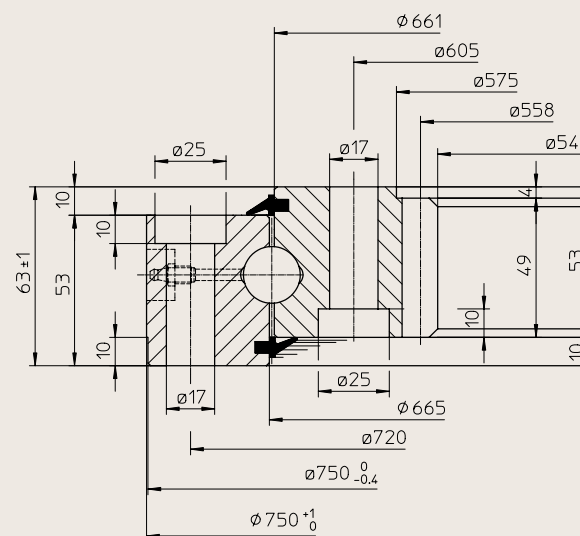


	No.	Type
Internal bolts	18	M16
External bolts	18	M16

Module	6
N. of teeth	65
Addendum modification	0
kN - Normal tangential force	16,2
kN - Maximum tangential force	32,4
Weight	51,5

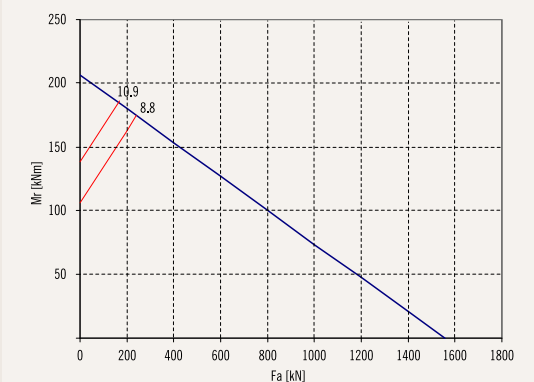


## Cod. VI075A00

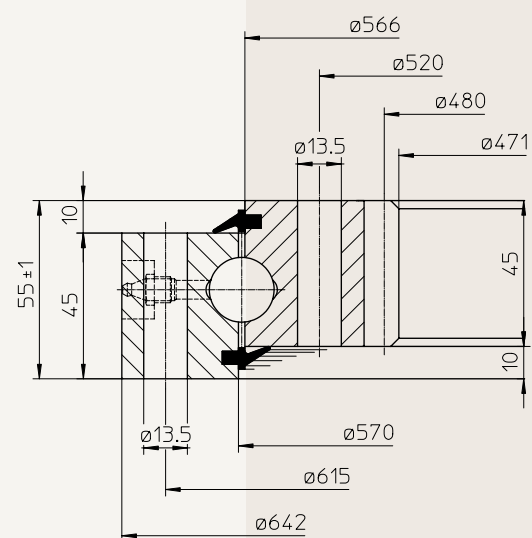


	No.	Type
Internal bolts	20	M16
External bolts	20	M16

Module	6
N. of teeth	93
Addendum modification	0
kN - Normal tangential force	16,2
kN - Maximum tangential force	32,4
Weight	76

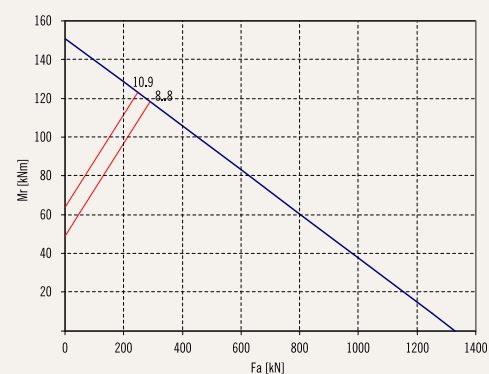


## Cod. VI064A05

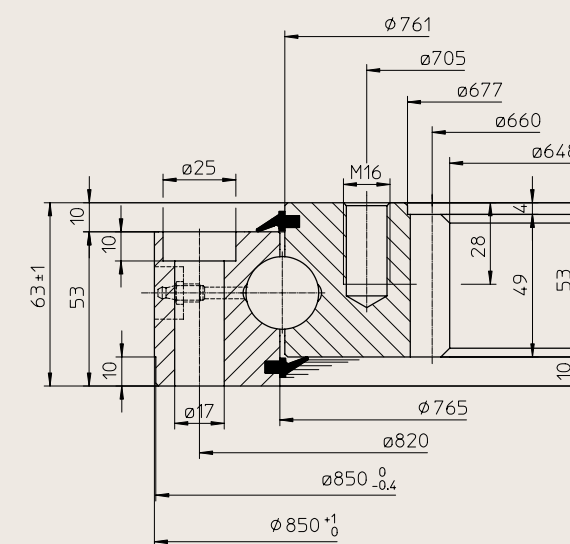


	No.	Type
Internal bolts	20	M12
External bolts	20	M12

Module	5
N. of teeth.	96
Addendum modification	0
kN - Normal tangential force	11,3
kN - Maximum tangential force	22,6
Weight	47

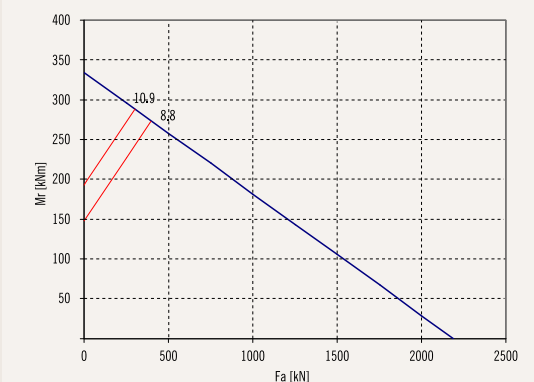


## Cod. VI085A05



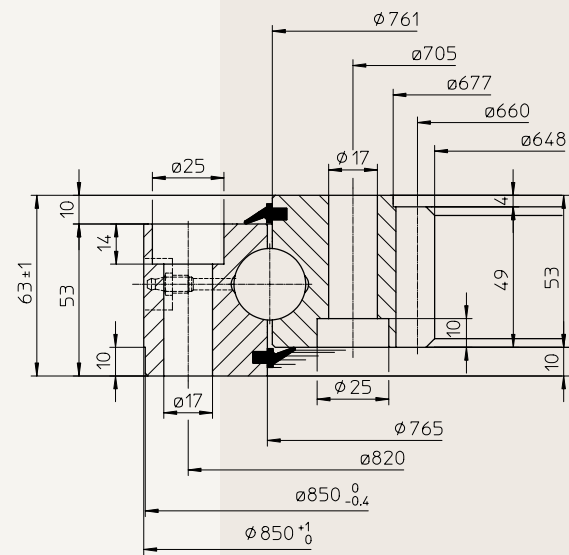
	No.	Type
Internal bolts	24	M16
External bolts	24	M16

Module	6
N. of teeth	110
Addendum modification	0
kN - Normal tangential force	18,7
kN - Maximum tangential force	37,4
Weight	86,5



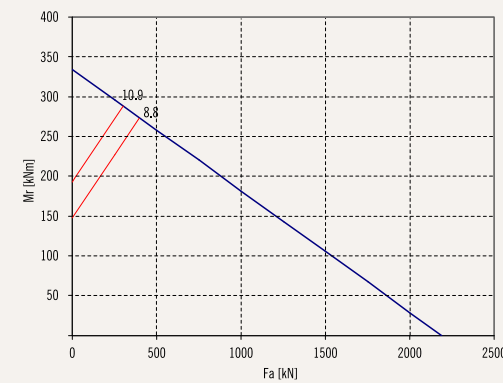
# Single row of balls Internal gear

Cod. VI085A08

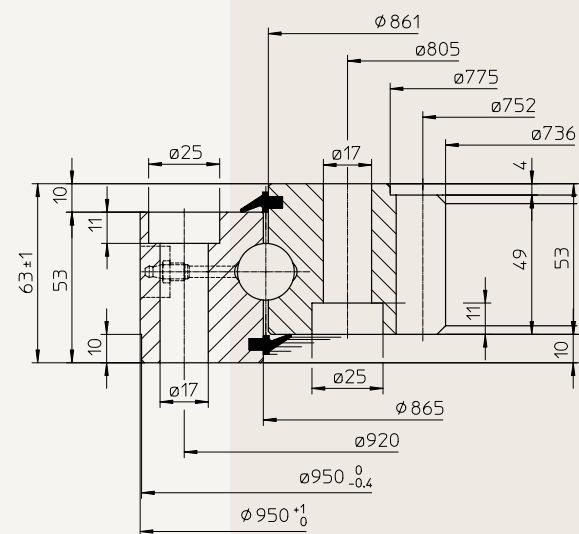


	No.	Type
Internal bolts	24	M16
External bolts	24	M16

Module	6
N. of teeth	110
Addendum modification	0
kN - Normal tangential force	18,7
kN - Maximum tangential force	37,4
Weight	86,5

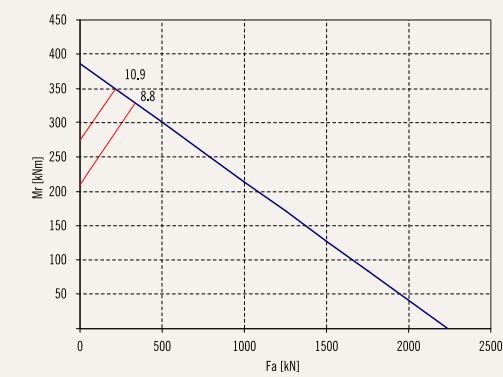


Cod. VI095A01

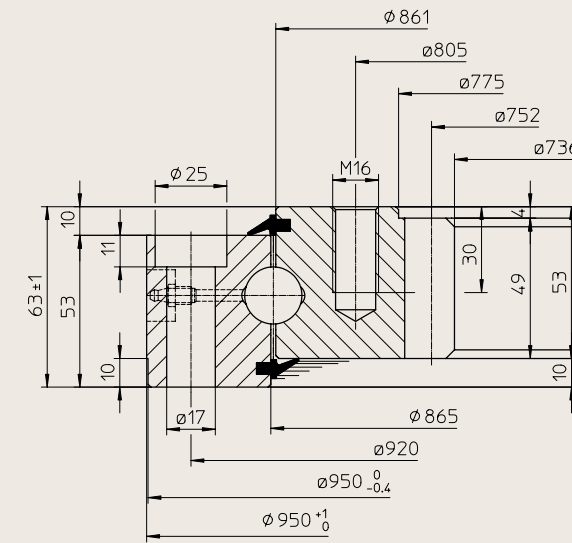


	No.	Type
Internal bolts	30	M16
External bolts	30	M16

Module	8
N. of teeth.	94
Addendum modification	0
kN - Normal tangential force	22,1
kN - Maximum tangential force	44,2
Weight	101,5

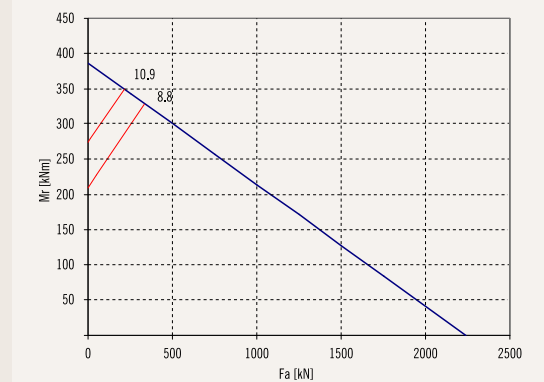


Cod. VI095A14

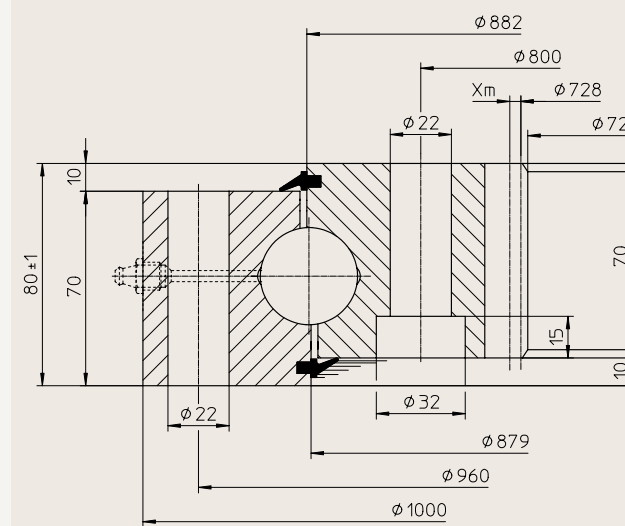


	No.	Type
Internal bolts	30	M16
External bolts	30	M16

Module	8
N. of teeth	94
Addendum modification	0
kN - Normal tangential force	22,1
kN - Maximum tangential force	44,2
Weight	101,5

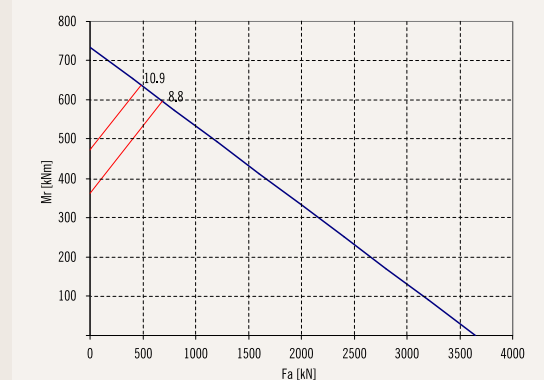


Cod. VI100A00



	No.	Type
Internal bolts	36	M20
External bolts	36	M20

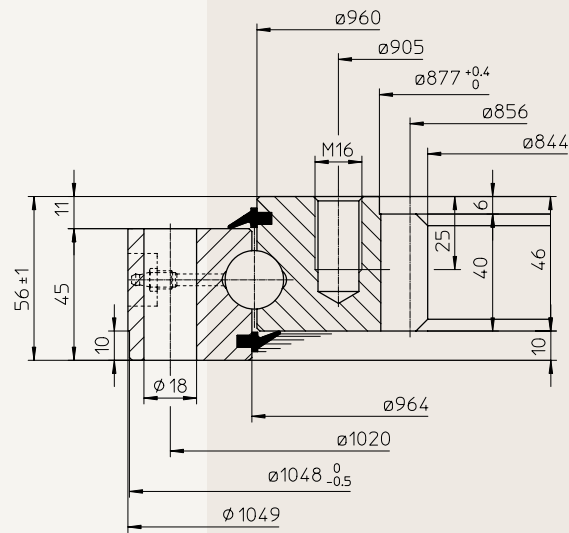
Module	8
N. of teeth	91
Addendum modification	4
kN - Normal tangential force	44,5
kN - Maximum tangential force	89,0
Weight	97,5





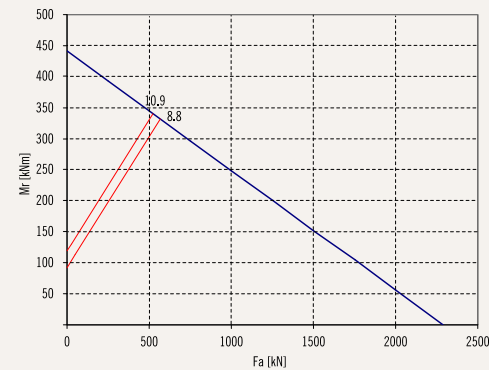
# Single row of balls Internal gear

## Cod. VI104A04

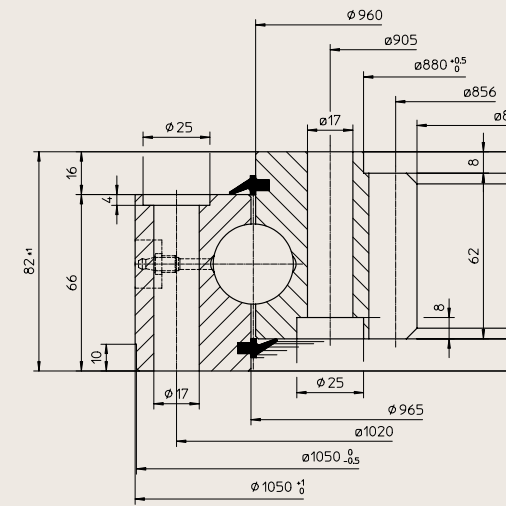


	No.	Type
Internal bolts	12	M16
External bolts	12	M16

Module	8
N. of teeth	107
Addendum modification	0
kN - Normal tangential force	18,0
kN - Maximum tangential force	36,0
Weight	89

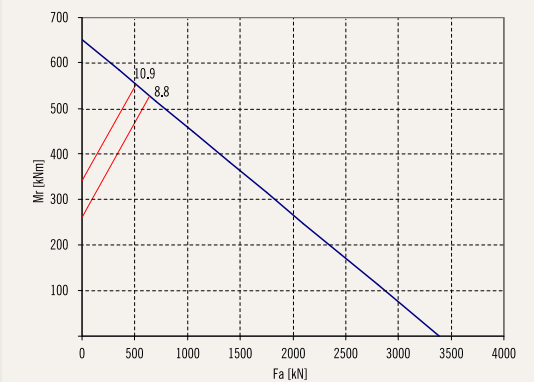


## Cod. VI105A04

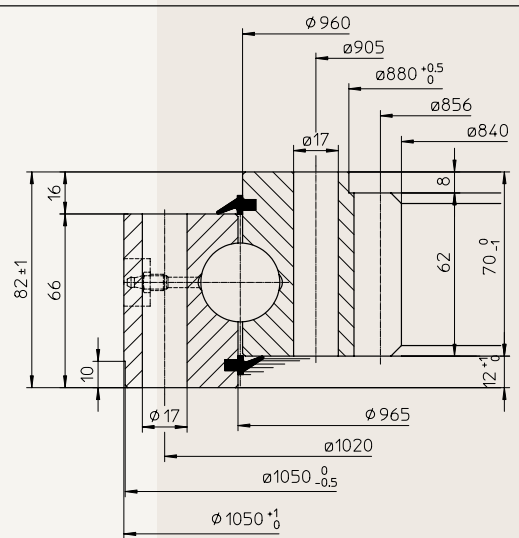


	No.	Type
Internal bolts	36	M16
External bolts	36	M16

Module	8
N. of teeth	107
Addendum modification	0
kN - Normal tangential force	28,9
kN - Maximum tangential force	57,8
Weight	141,5

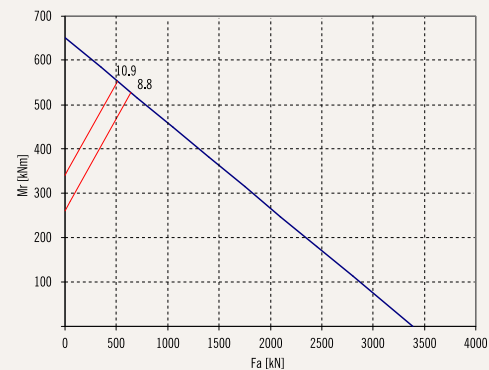


## Cod. VI105A03

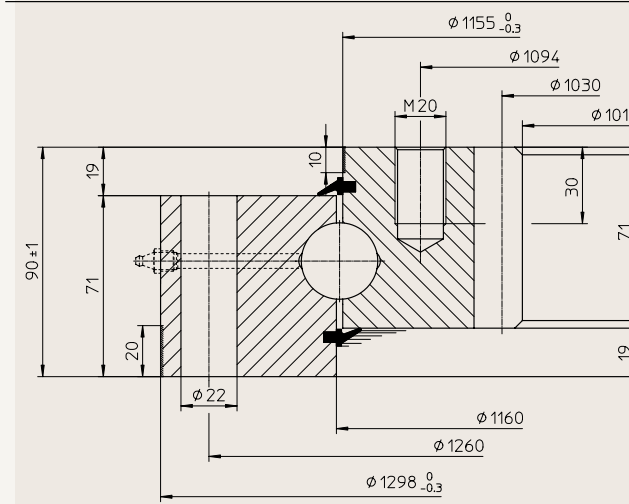


	No.	Type
Internal bolts	36	M16
External bolts	36	M16

Module	8
N. of teeth.	107
Addendum modification	0
kN - Normal tangential force	28,9
kN - Maximum tangential force	57,8
Weight	141,5

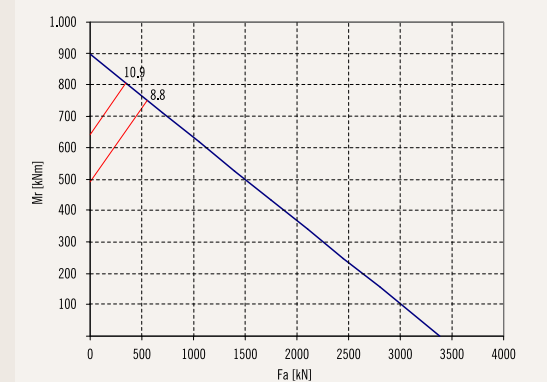


## Cod. VI129A00



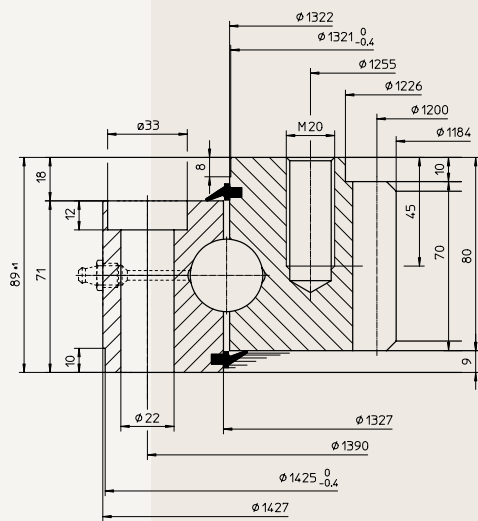
	No.	Type
Internal bolts	36	M20
External bolts	36	M20

Module	10
N. of teeth	103
Addendum modification	0
kN - Normal tangential force	55,5
kN - Maximum tangential force	111,0
Weight	256



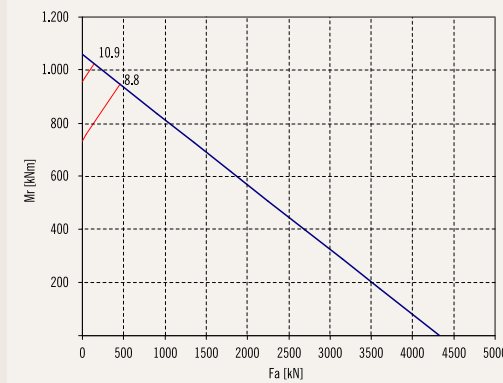
# Single row of balls Internal gear

## Cod. VI142A01

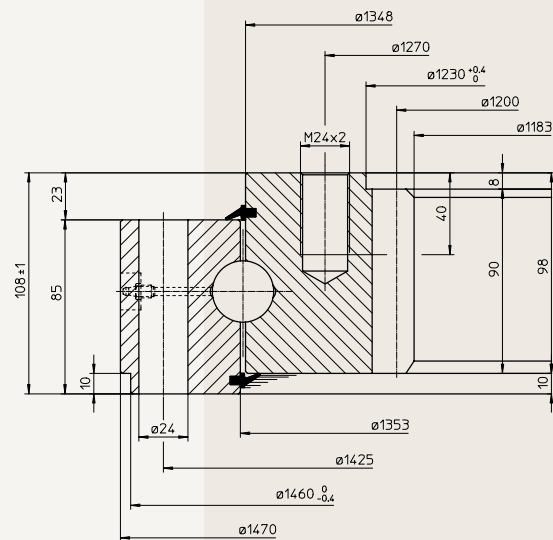


	No.	Type
Internal bolts	18	M20
External bolts	18	M20

Module	8
N. of teeth	150
Addendum modification	0
kN - Normal tangential force	40,0
kN - Maximum tangential force	80,0
Weight	260

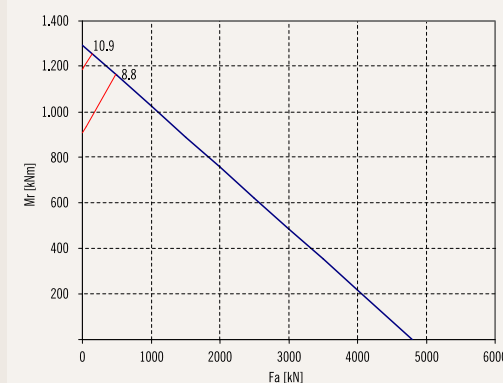


## Cod. VI147A00

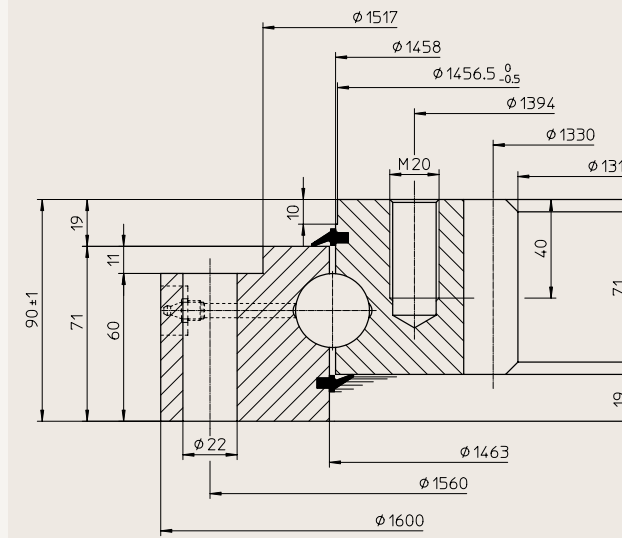


	No.	Type
Internal bolts	40	M24
External bolts	40	M22

Module	10
N. of teeth	120
Addendum modification	0
kN - Normal tangential force	52,1
kN - Maximum tangential force	104,2
Weight	381

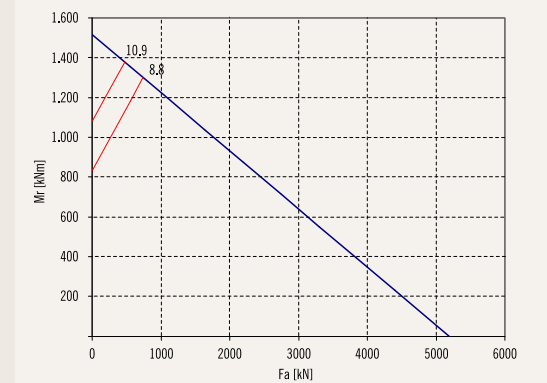


## Cod. VI160A01

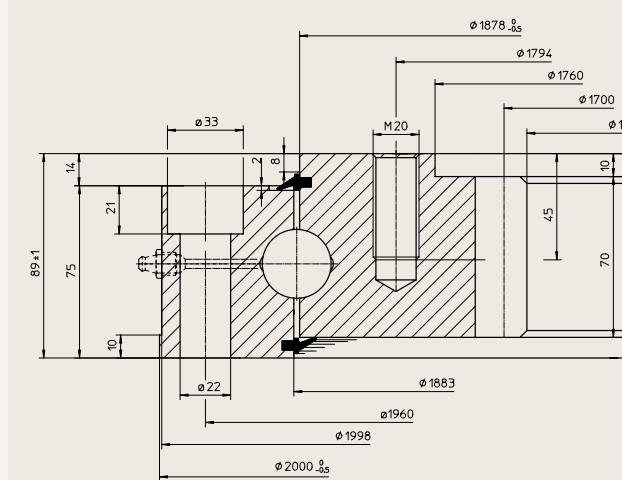


	No.	Type
Internal bolts	48	M20
External bolts	48	M20

Module	10
N. of teeth	133
Addendum modification	0
kN - Normal tangential force	55,5
kN - Maximum tangential force	111,0
Weight	295

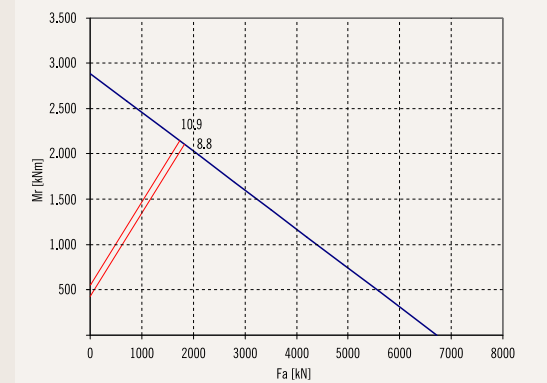


## Cod. VI200A01



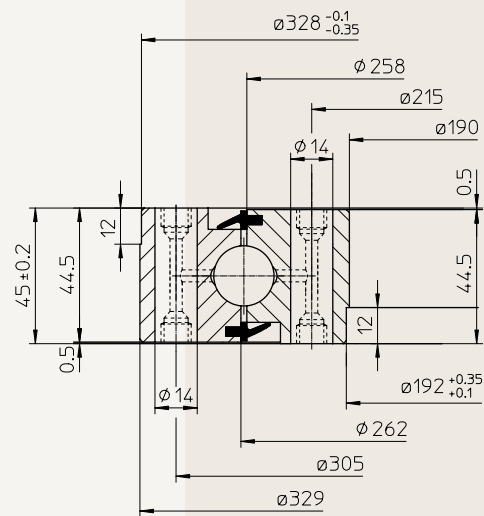
	No.	Type
Internal bolts	18	M20
External bolts	18	M20

Module	10
N. of teeth	170
Addendum modification	0
kN - Normal tangential force	45,6
kN - Maximum tangential force	91,2
Weight	515



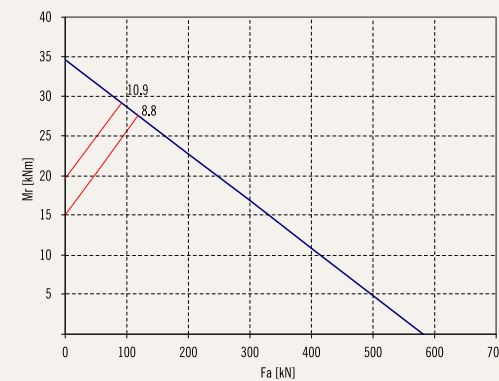
# Single row of balls Without gear

## Cod. VS032A02

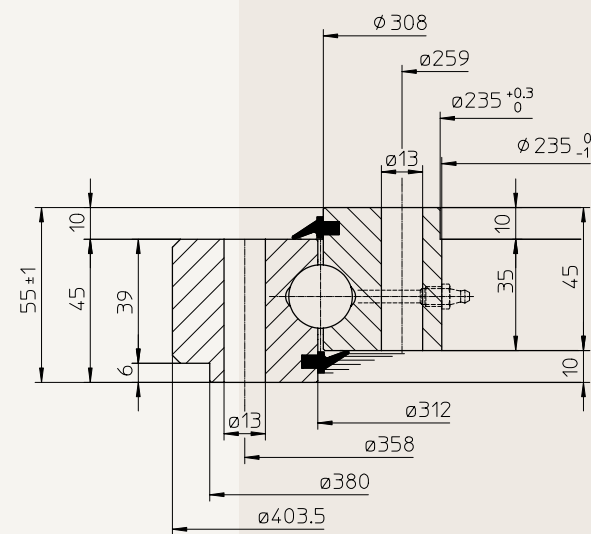


	No.	Type
Internal bolts	16	M12
External bolts	16	M12

Module	-
N. of teeth	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	10,9

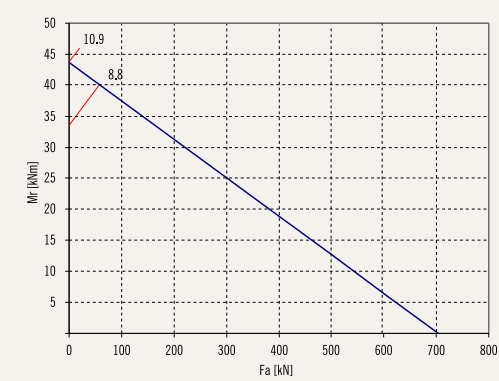


## Cod. VS040A00

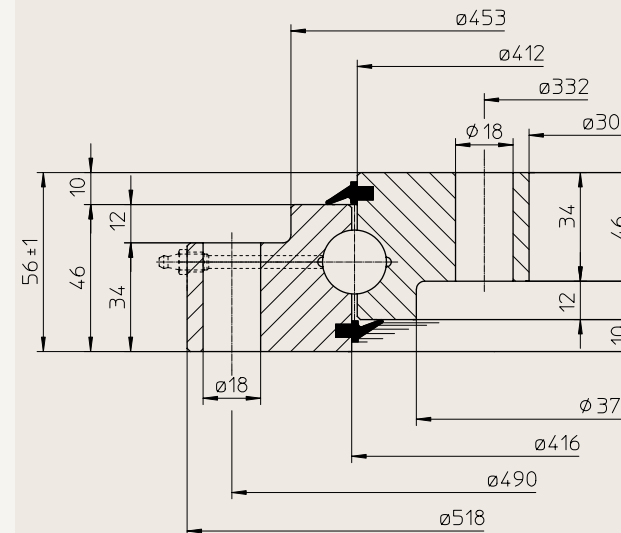


	No.	Type
Internal bolts	28-1	M12
External bolts	24	M12

Module	-
N. of teeth	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	25

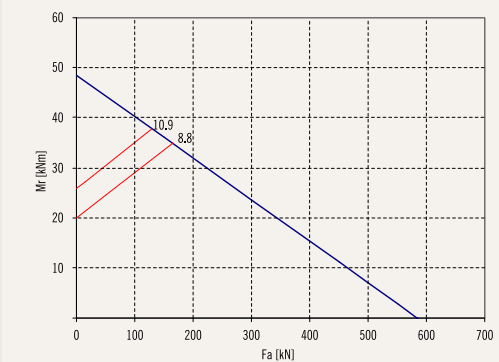


## Cod. VS051A03

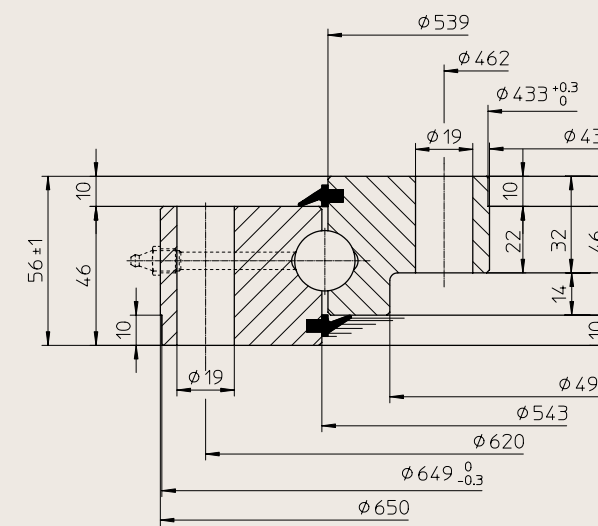


	No.	Type
Internal bolts	12	M16
External bolts	8	M16

Module	-
N. of teeth	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	49

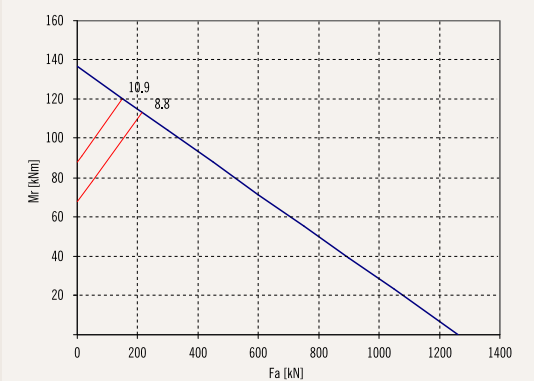


## Cod. VS064A08



	No.	Type
Internal bolts	14	M18
External bolts	10	M18

Module	-
N. of teeth	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	63



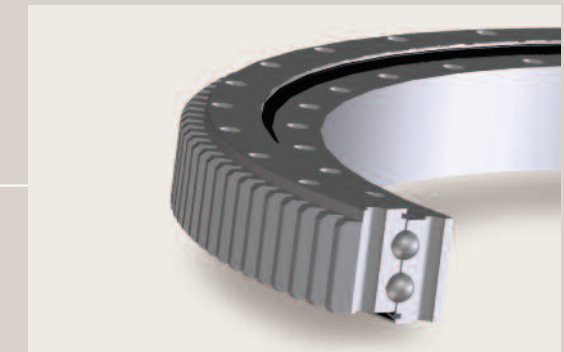




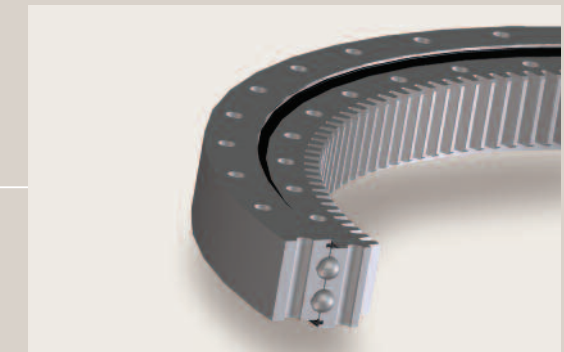
## Slewing Rings

### Double row of balls

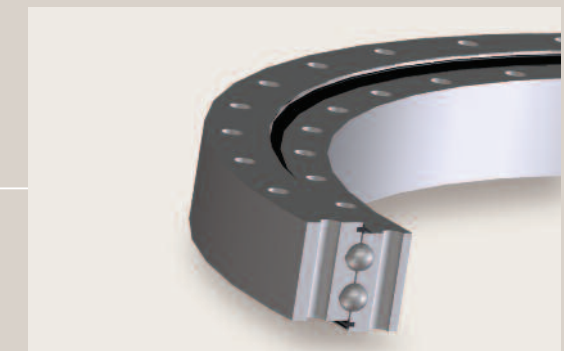
External  
gear



Internal  
gear

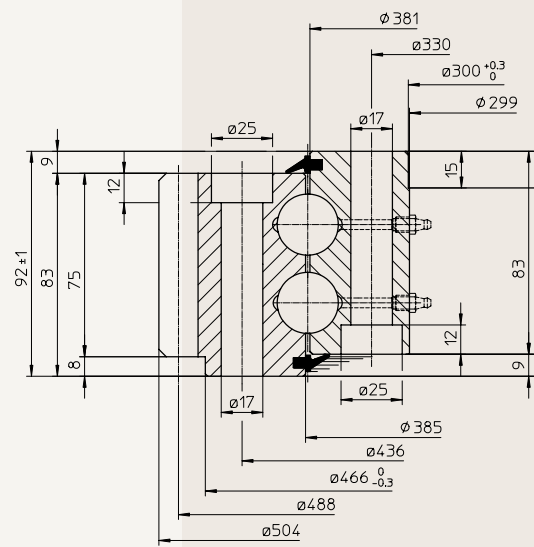


Without  
gear



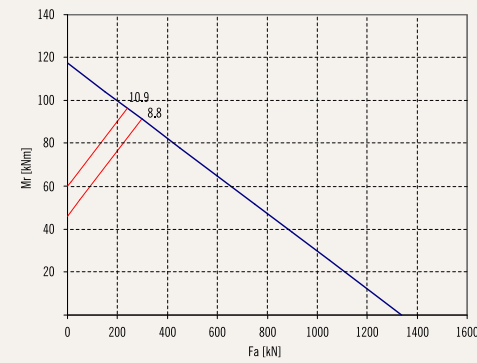
# Double row of balls External gear

Cod. VE050B01

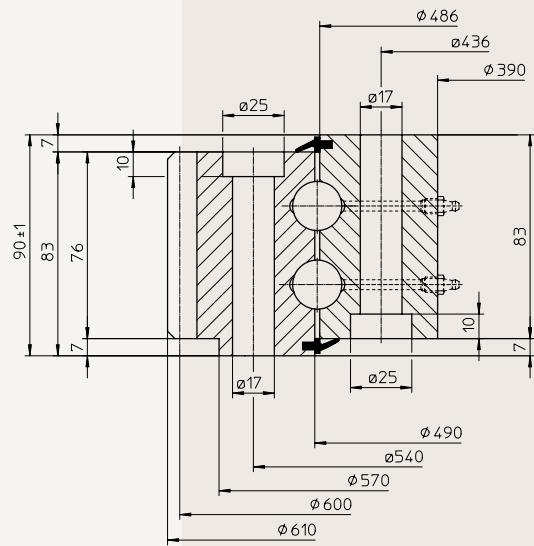


	No.	Type
Internal bolts	16	M16
External bolts	16	M16

Module	8
N. of teeth	61
Addendum modification	0
kN - Normal tangential force	29,2
kN - Maximum tangential force	58,4
Weight	64

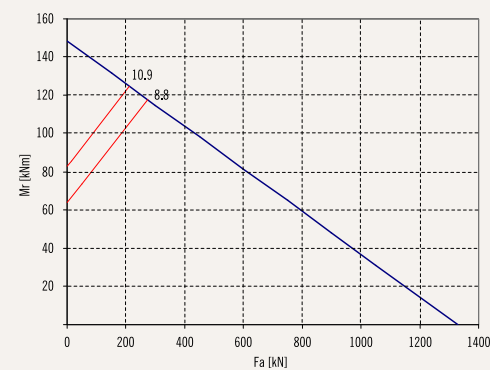


Cod. VE061B00

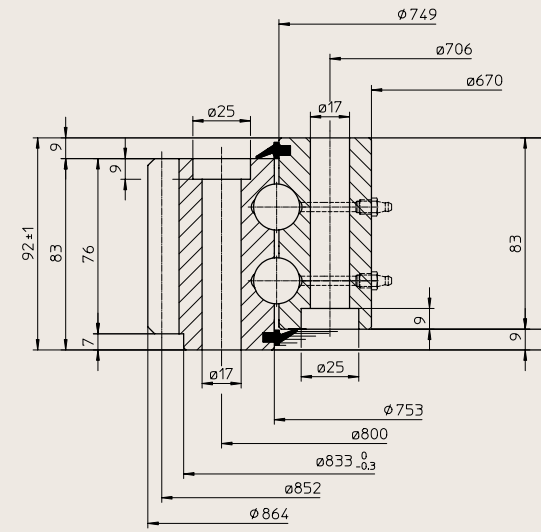


	No.	Type
Internal bolts	18	M16
External bolts	18	M16

Module	6
N. of teeth.	100
Addendum modification	0
kN - Normal tangential force	18,7
kN - Maximum tangential force	37,4
Weight	98

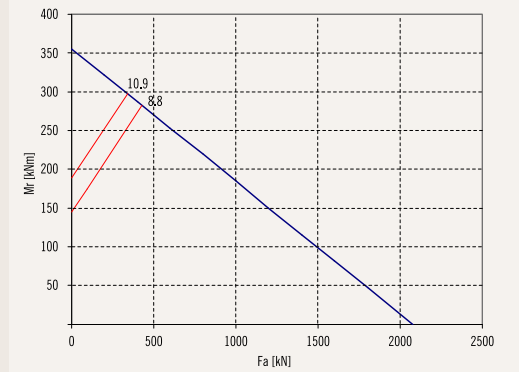


Cod. VE086B03

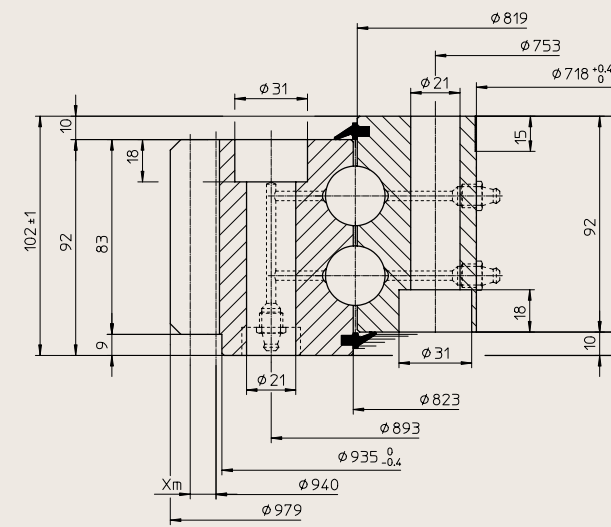


	N.	Type
Internal bolts	24	M16
External bolts	24	M16

Module	6
N. of teeth	142
Addendum modification	0
kN - Normal tangential force	21,6
kN - Maximum tangential force	43,2
Weight	110

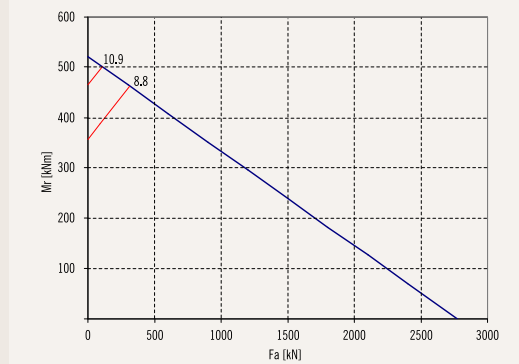


Cod. VE098B00



	N.	Type
Internal bolts	36	M20
External bolts	36	M20

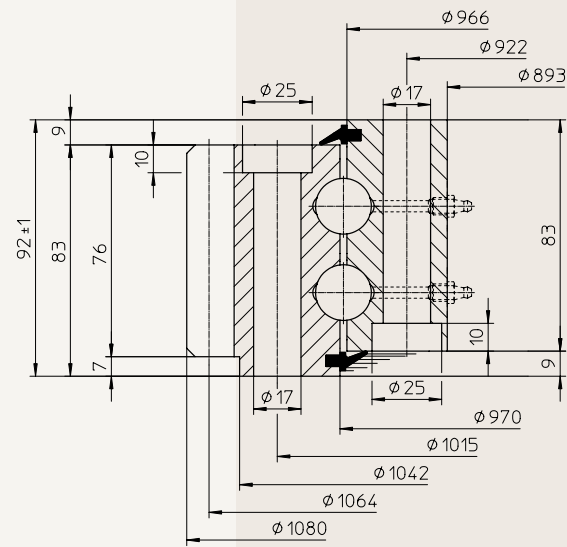
Module	10
N. of teeth	94
Addendum modification	11
kN - Normal tangential force	60,1
FkN - Maximum tangential force	120,2
Weight	208





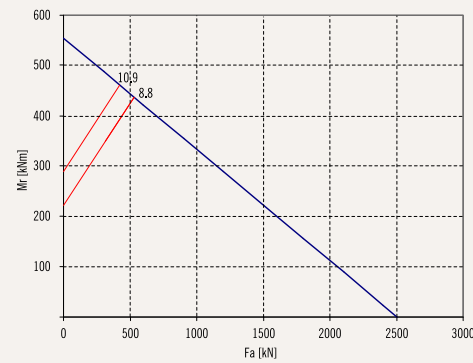
# Double row of balls External gear

## Cod. VE108B03

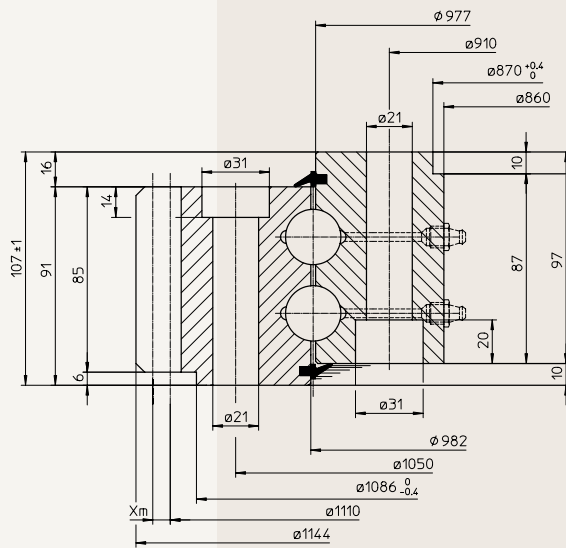


	No.	Type
Internal bolts	30	M16
External bolts	30	M16

Module	8
N. of teeth	133
Addendum modification	0
kN - Normal tangential force	36,4
kN - Maximum tangential force	72,8
Weight	157

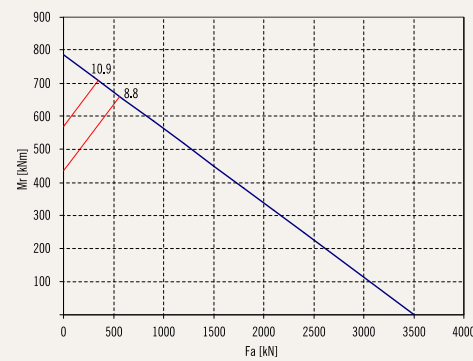


## Cod. VE114B00

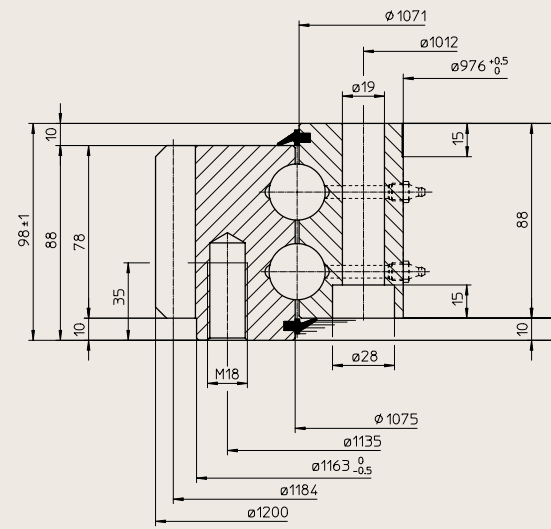


	No.	Type
Internal bolts	36	M20
External bolts	36	M20

Module	10
N. of teeth.	111
Addendum modification	8
kN - Normal tangential force	73,9
kN - Maximum tangential force	147,8
Weight	267

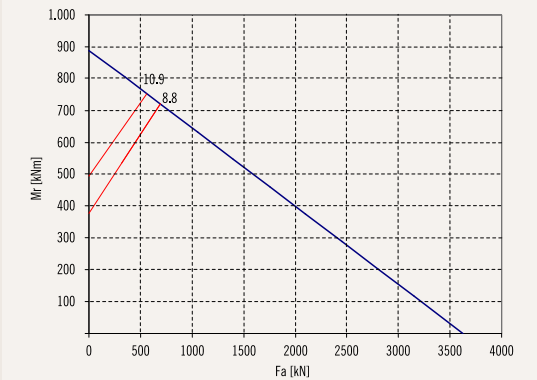


## Cod. VE120B00

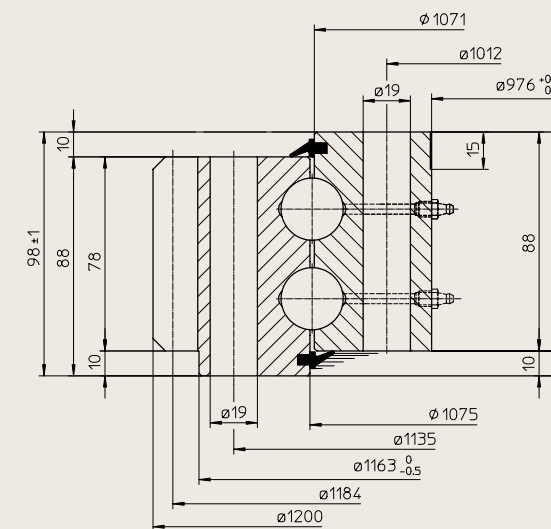


	N.	Type
Internal bolts	36	M18
External bolts	36	M18

Module	8
N. of teeth	148
Addendum modification	0
kN - Normal tangential force	37,4
kN - Maximum tangential force	74,8
Weight	210

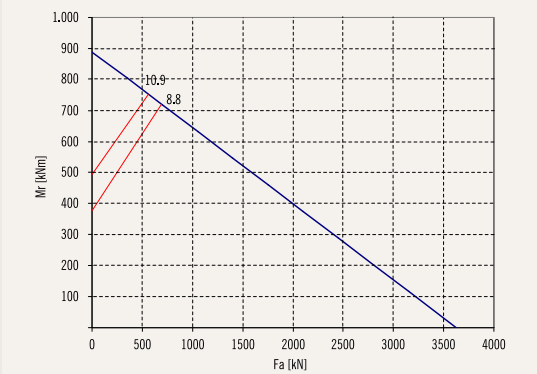


## Cod. VE120B01



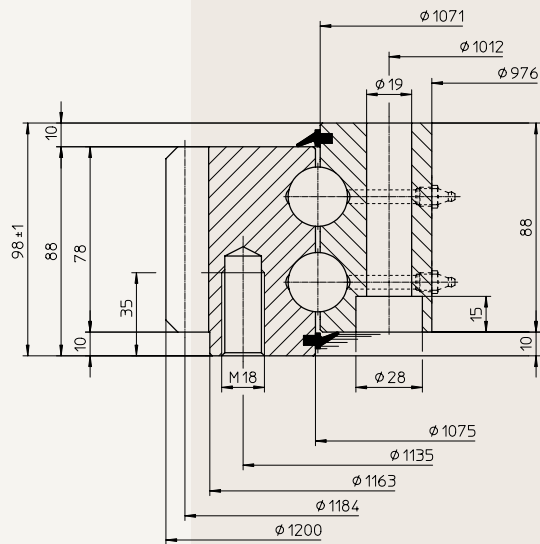
	N.	Type
Internal bolts	36	M18
External bolts	36	M18

Module	8
N. of teeth	148
Addendum modification	0
kN - Normal tangential force	37,4
FkN - Maximum tangential force	74,8
Weight	210



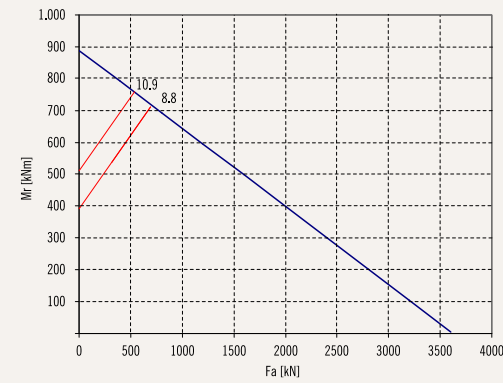
# Double row of balls External gear

## Cod. VE120B12

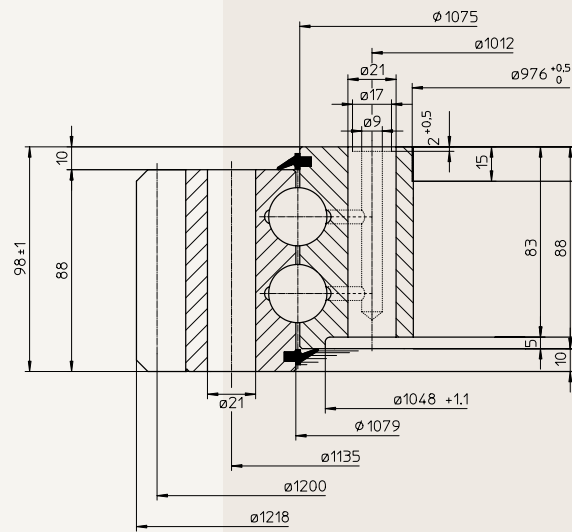


	No.	Type
Internal bolts	40	M18
External bolts	40	M18

Module	8
N. of teeth	148
Addendum modification	0
kN - Normal tangential force	44,9
kN - Maximum tangential force	89,8
Weight	210

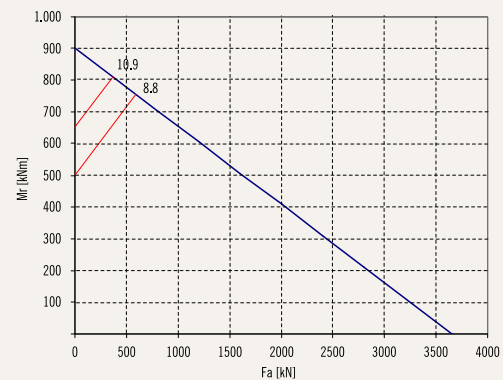


## Cod. VE122B00

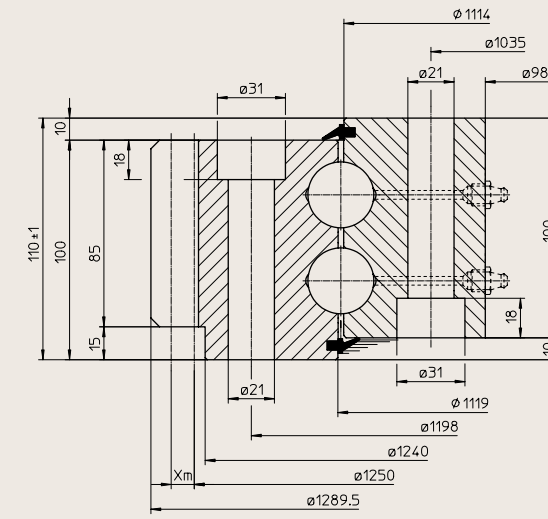


	No.	Type
Internal bolts	40	M20
External bolts	40	M20

Module	10
N. of teeth.	120
Addendum modification	0
kN - Normal tangential force	45,7
kN - Maximum tangential force	91,4
Weight	211

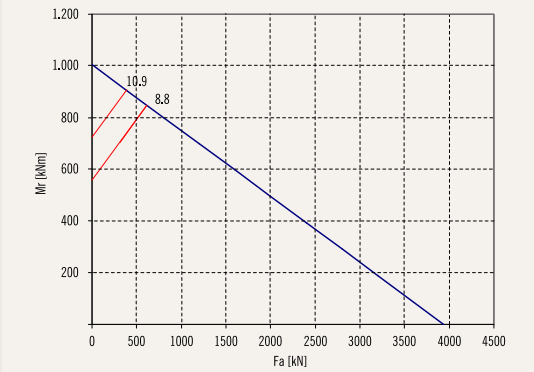


## Cod. VE129B00

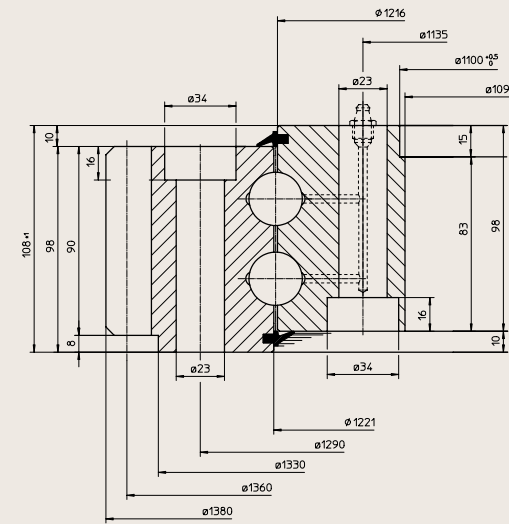


	N.	Type
Internal bolts	40	M20
External bolts	40	M20

Module	10
N. of teeth	125
Addendum modification	10,5
kN - Normal tangential force	73,9
kN - Maximum tangential force	147,8
Weight	340

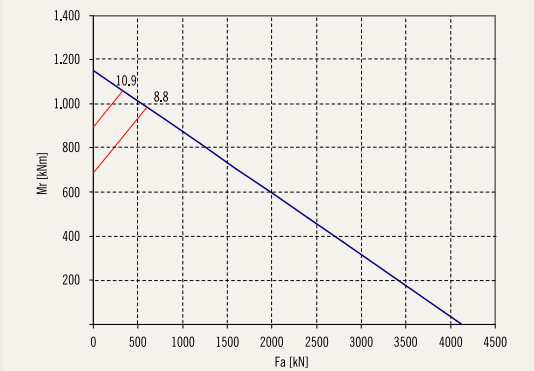


## Cod. VE138B04



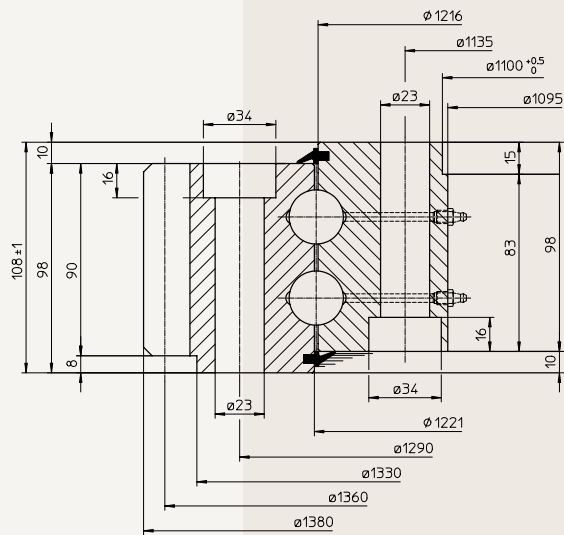
	N.	Type
Internal bolts	36	M22
External bolts	36	M22

Module	10
N. of teeth	136
Addendum modification	0
kN - Normal tangential force	64,8
FkN - Maximum tangential force	129,6
Weight	350



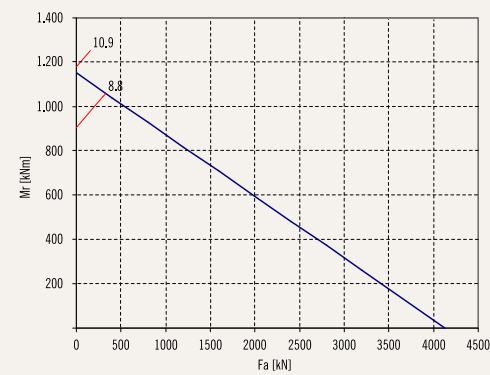
# Double row of balls External gear

## Cod. VE138B05

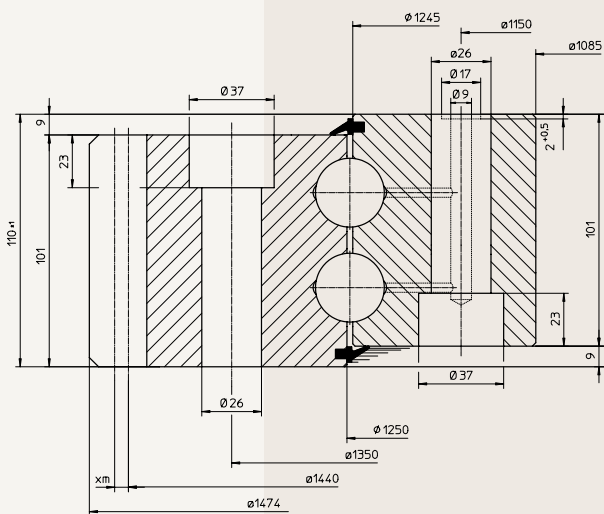


	No.	Type
Internal bolts	48	M22
External bolts	48	M22

Module	10
N. of teeth	136
Addendum modification	0
kN - Normal tangential force	64,8
kN - Maximum tangential force	129,6
Weight	350

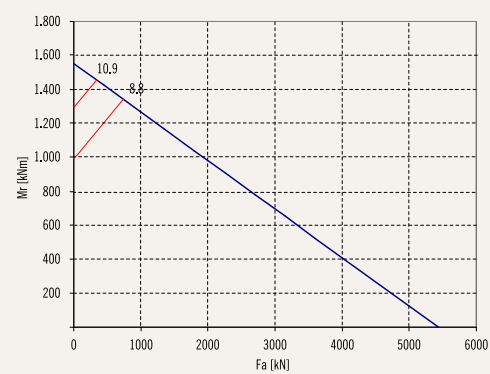


## Cod. VE147B01

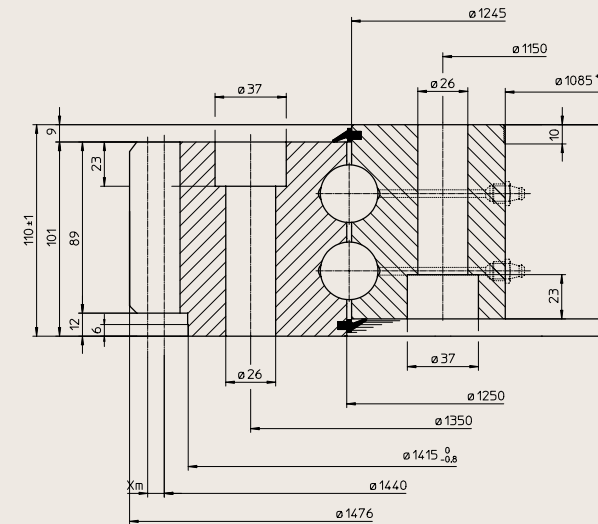


	No.	Type
Internal bolts	48	M24
External bolts	48	M24

Module	12
N. of teeth	120
Addendum modification	6
kN - Normal tangential force	114,7
kN - Maximum tangential force	229,4
Weight	503

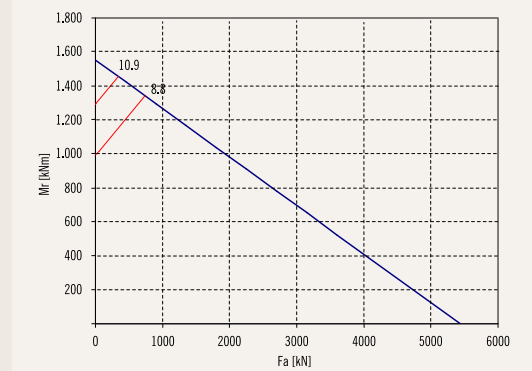


## Cod. VE147B03

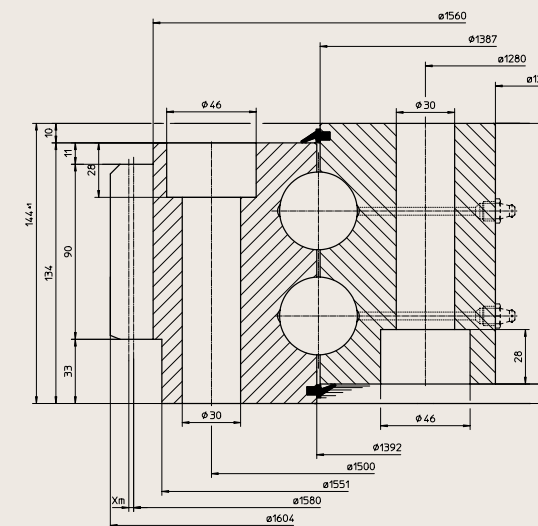


	N.	Type
Internal bolts	48	M24
External bolts	48	M24

Module	10
N. of teeth	144
Addendum modification	8,6
kN - Normal tangential force	77,3
kN - Maximum tangential force	154,6
Weight	503

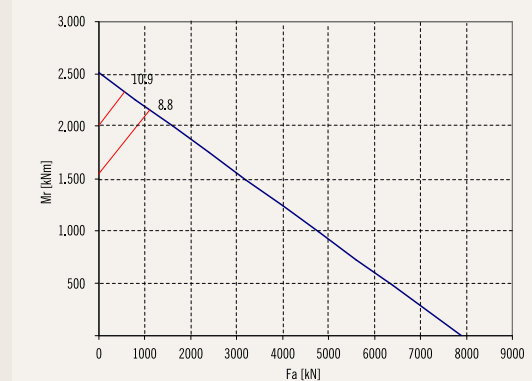


## Cod. VE160B00



	N.	Type
Internal bolts	48	M27
External bolts	48	M27

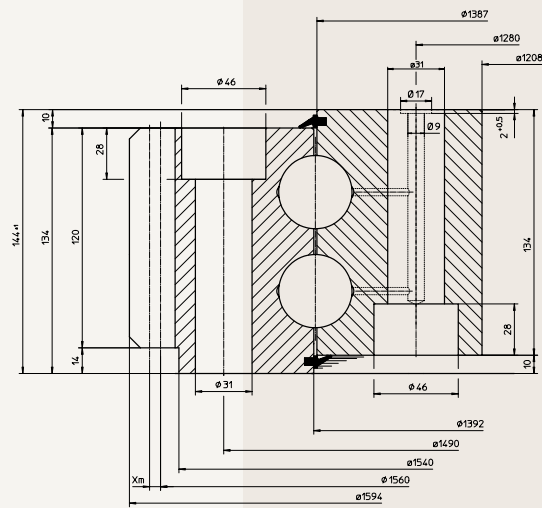
Module	10
N. of teeth	158
Addendum modification	2,5
kN - Normal tangential force	78,2
FkN - Maximum tangential force	156,4
Weight	698





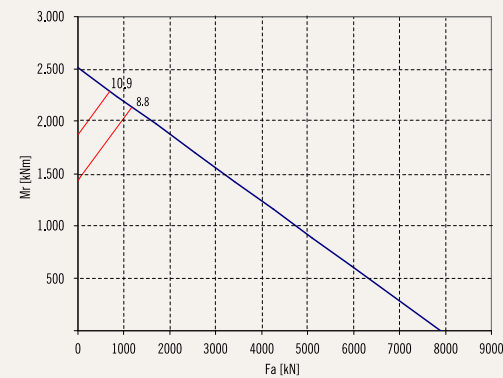
# Double row of balls External gear

Cod. VE160B04

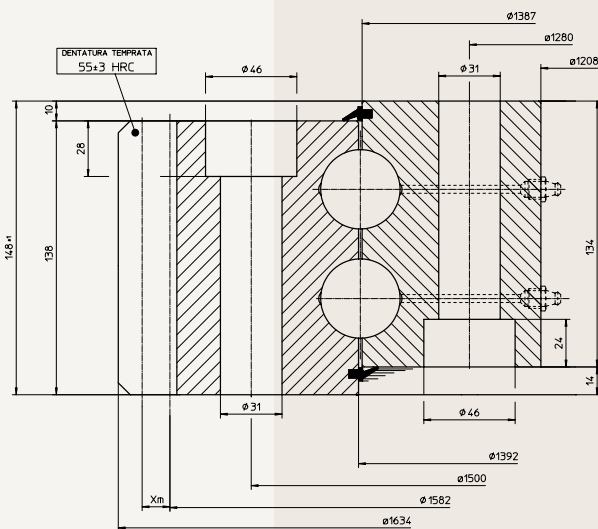


	No.	Type
Internal bolts	48	M27
External bolts	48	M27

Module	12
N. of teeth	130
Addendum modification	6
kN - Normal tangential force	125,2
kN - Maximum tangential force	250,4
Weight	700

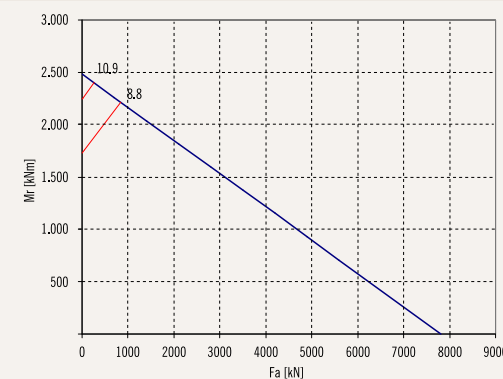


Cod. VE163B01



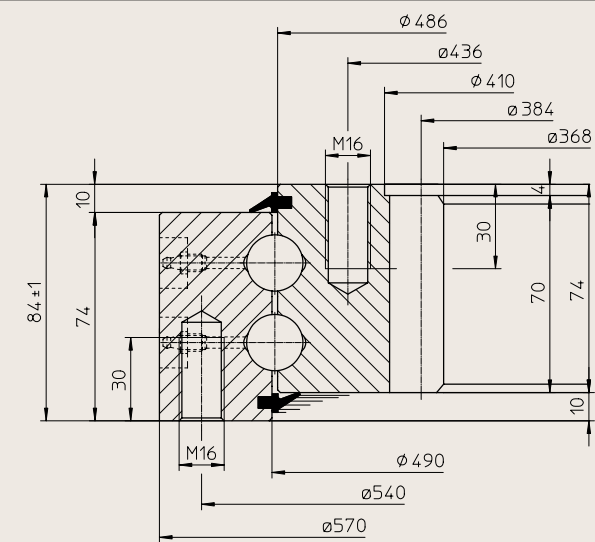
	No.	Type
Internal bolts	48	M30
External bolts	48	M30

Module	14
N. of teeth	113
Addendum modification	14
kN - Normal tangential force	168,0
kN - Maximum tangential force	336,0
Weight	800



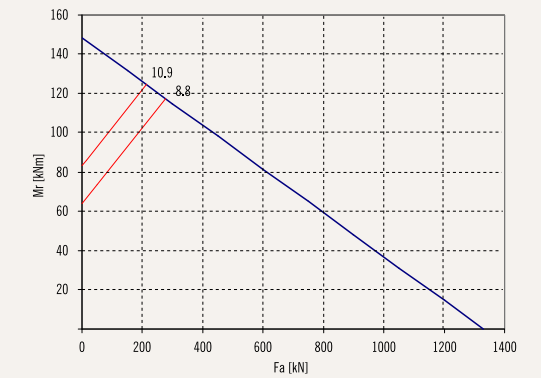
# Internal gear

Cod. VI057B02

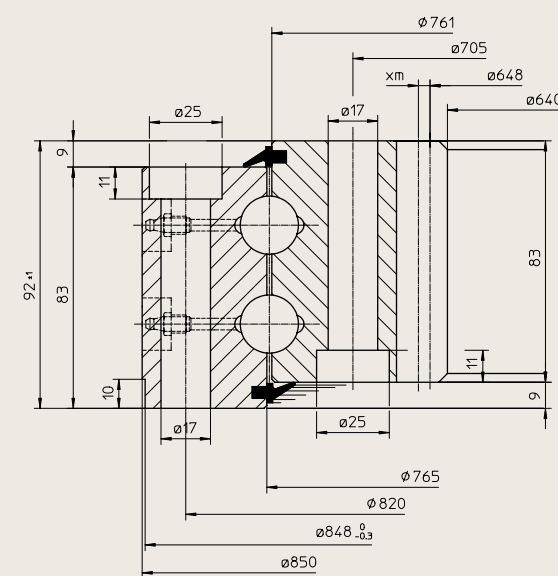


	N.	Type
Internal bolts	18	M16
External bolts	18	M16

Module	8
N. of teeth	48
Addendum modification	0
kN - Normal tangential force	31,6
kN - Maximum tangential force	63,2
Weight	77

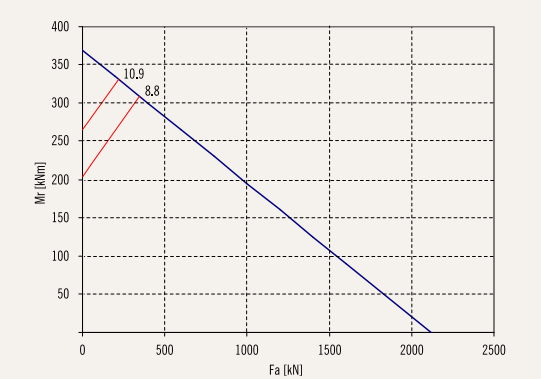


Cod. VI085B00



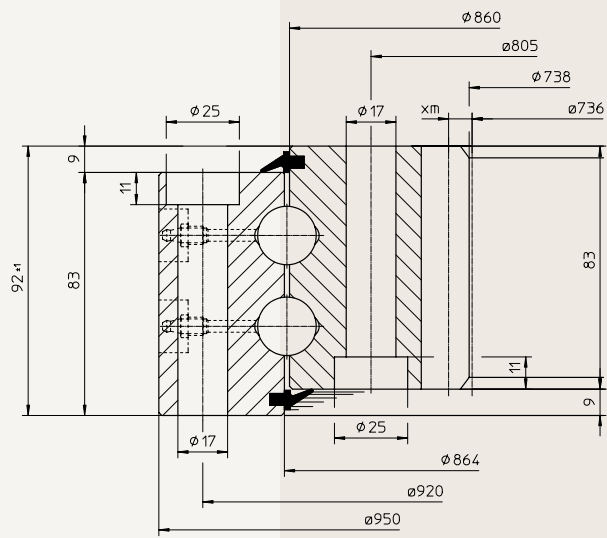
	N.	Type
Internal bolts	36	M16
External bolts	36	M16

Module	8
N. of teeth	81
Addendum modification	4
kN - Normal tangential force	46,3
kN - Maximum tangential force	92,6
Weight	127

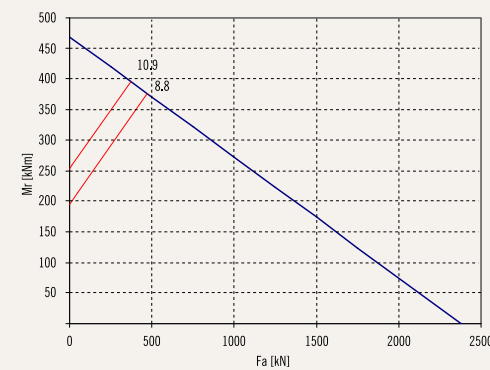


# Double row of balls Internal gear

## Cod. VI095B01

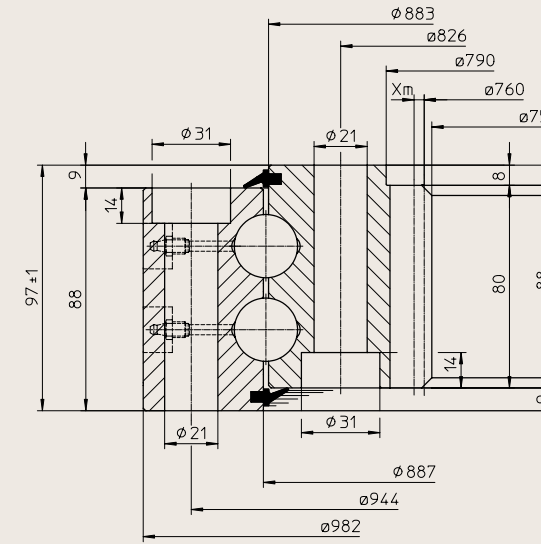


Module	8
N. of teeth	92
Addendum modification	8
kN - Normal tangential force	55,6
kN - Maximum tangential force	111,2
Weight	158

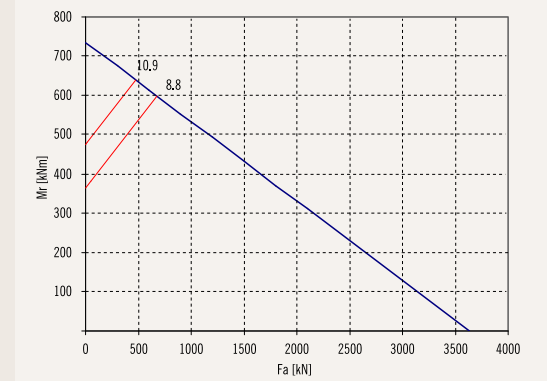


	No.	Type
Internal bolts	30	M16
External bolts	30	M16

## Cod. VI098B03

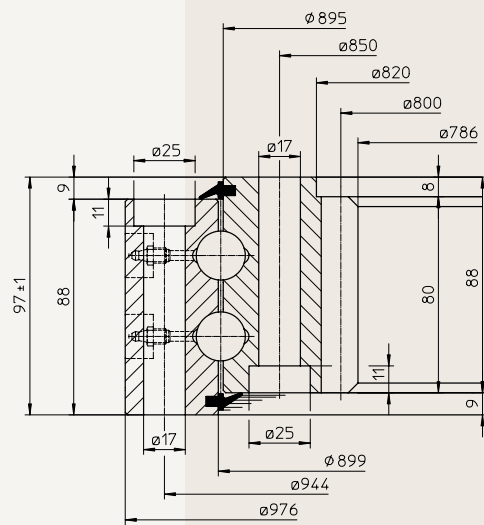


Module	8
N. of teeth	95
Addendum modification	4
kN - Normal tangential force	55,6
kN - Maximum tangential force	111,2
Weight	170

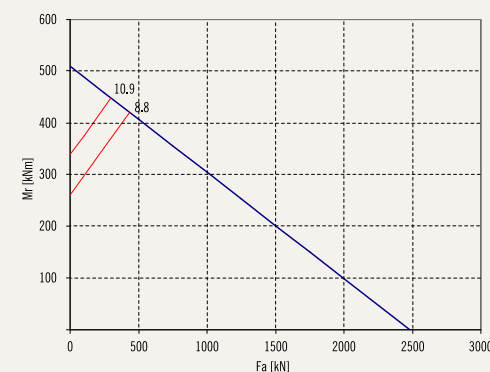


	N.	Type
Internal bolts	36	M20
External bolts	36	M20

## Cod. VI097B06

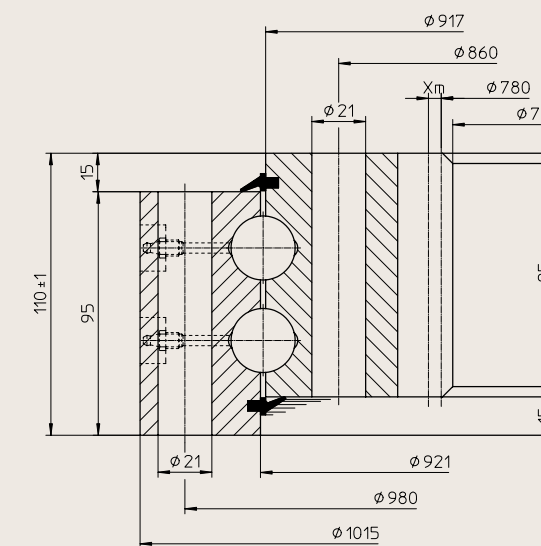


Module	8
N. of teeth	100
Addendum modification	0
kN - Normal tangential force	41,7
kN - Maximum tangential force	83,4
Weight	153

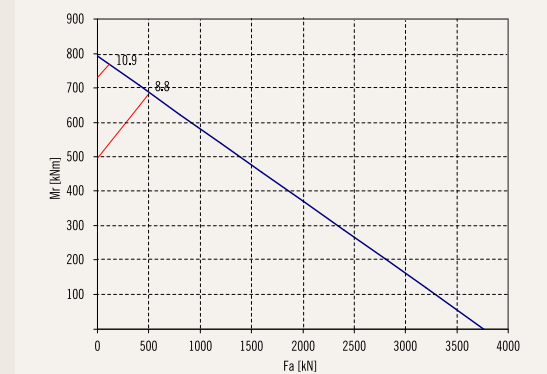


	No.	Type
Internal bolts	36	M16
External bolts	36	M16

## Cod. VI101B00



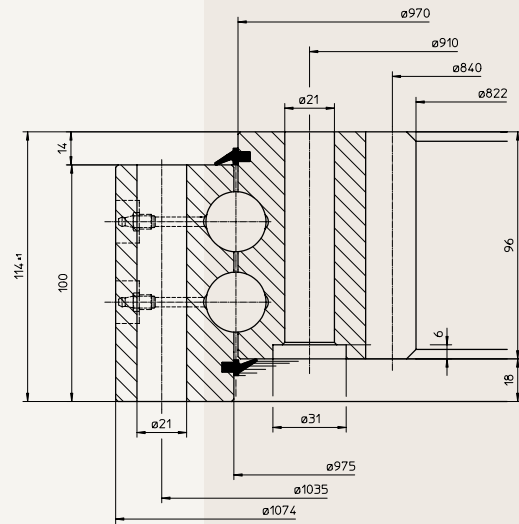
Module	10
N. of teeth	78
Addendum modification	5
kN - Normal tangential force	82,6
FkN - Maximum tangential force	165,2
Weight	207



	N.	Type
Internal bolts	48	M20
External bolts	48	M20

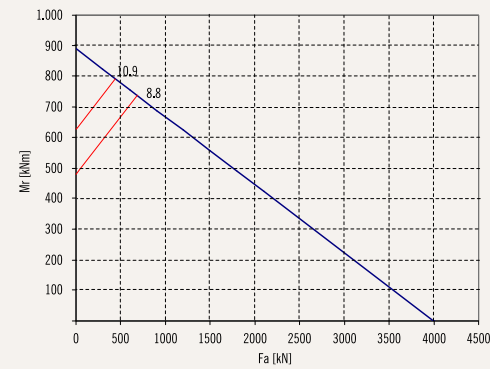
# Double row of balls Internal gear

## Cod. VI107B01

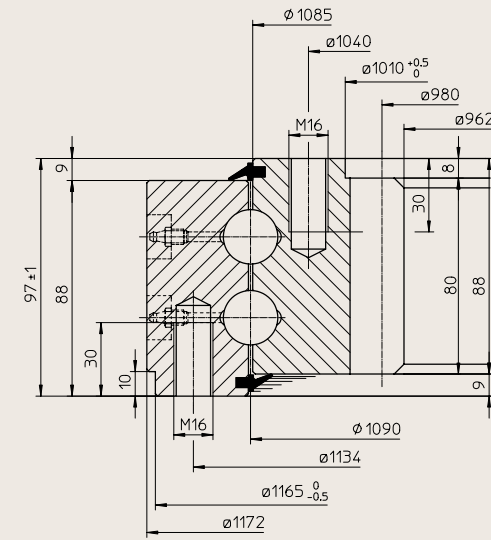


	No.	Type
Internal bolts	40	M20
External bolts	40	M20

Module	10
N. of teeth	84
Addendum modification	0
kN - Normal tangential force	75,1
kN - Maximum tangential force	150,2
Weight	235

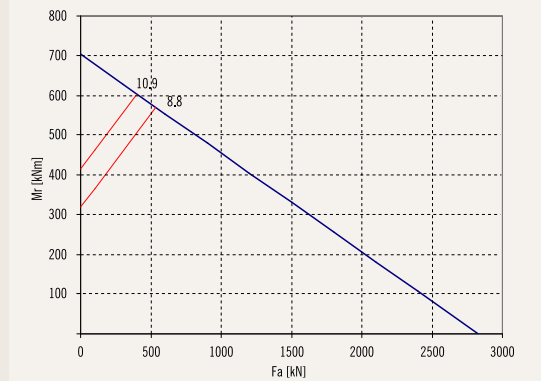


## Cod. VI117B06

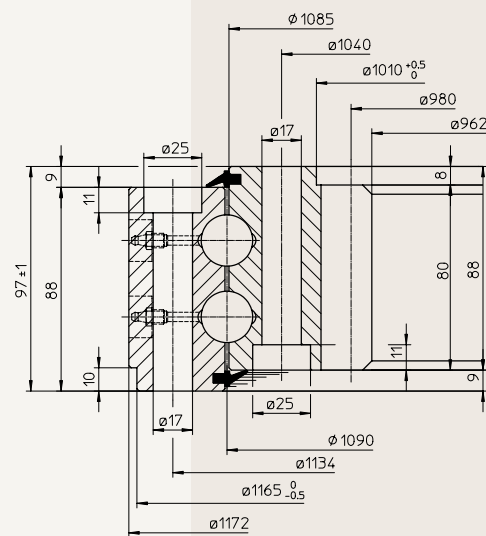


	N.	Type
Internal bolts	36	M16
External bolts	36	M16

Module	10
N. of teeth	98
Addendum modification	0
kN - Normal tangential force	52,1
kN - Maximum tangential force	104,2
Weight	202

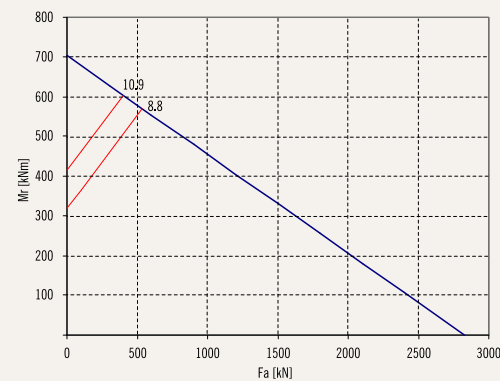


## Cod. VI117B01

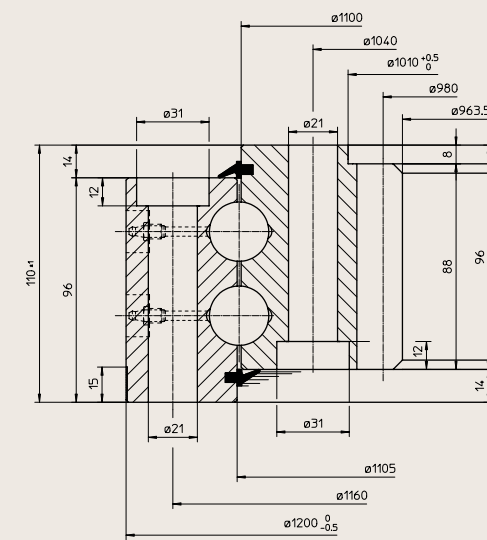


	No.	Type
Internal bolts	36	M16
External bolts	36	M16

Module	10
N. of teeth.	98
Addendum modification	0
kN - Normal tangential force	52,1
kN - Maximum tangential force	104,2
Weight	202

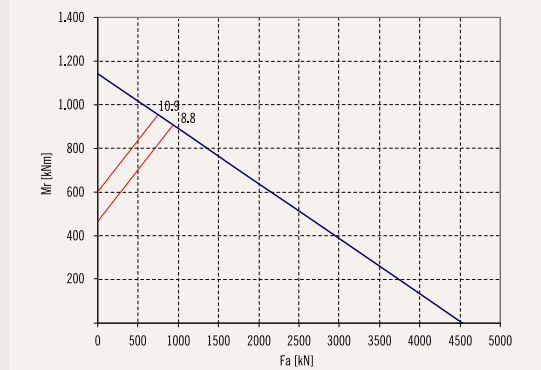


## Cod. VI120B00



	N.	Type
Internal bolts	36	M20
External bolts	36	M20

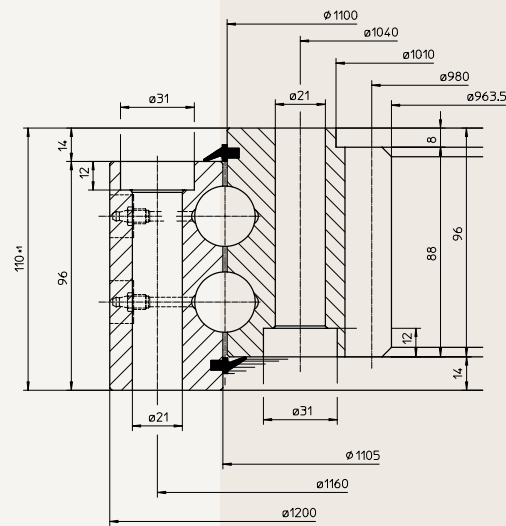
Module	10
N. of teeth	98
Addendum modification	0
kN - Normal tangential force	68,8
FkN - Maximum tangential force	137,6
Weight	247





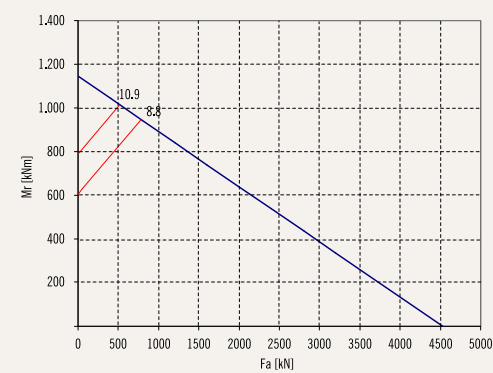
# Double row of balls Internal gear

## Cod. VI120B01

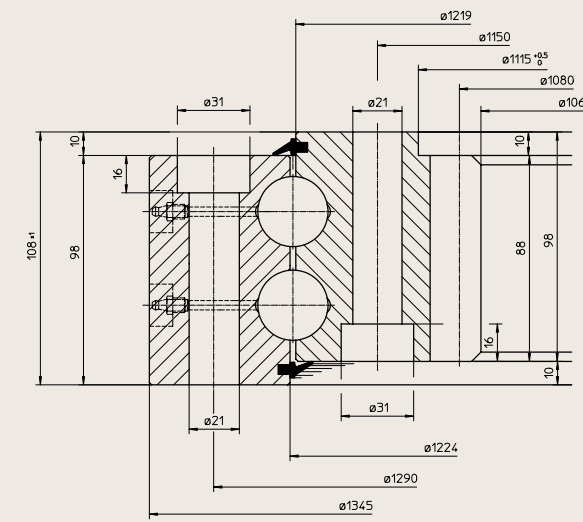


	No.	Type
Internal bolts	48	M20
External bolts	48	M20

Module	10
N. of teeth	98
Addendum modification	0
kN - Normal tangential force	68,8
kN - Maximum tangential force	137,6
Weight	247

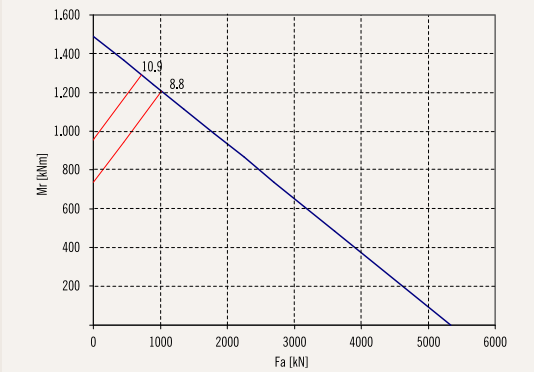


## Cod. VI134B00

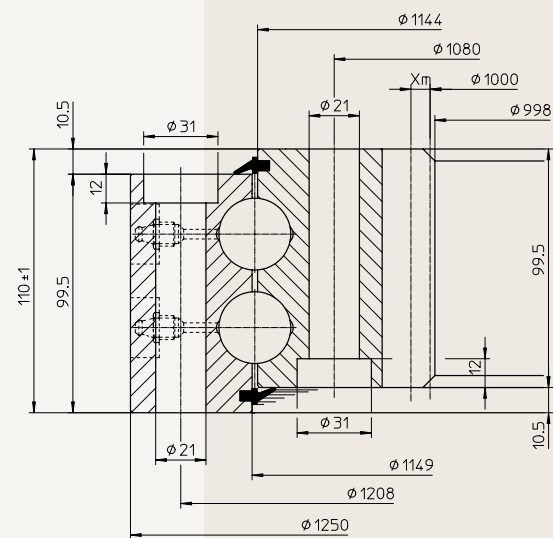


	N.	Type
Internal bolts	48	M20
External bolts	48	M20

Module	10
N. of teeth	108
Addendum modification	0
kN - Normal tangential force	68,8
kN - Maximum tangential force	137,6
Weight	337

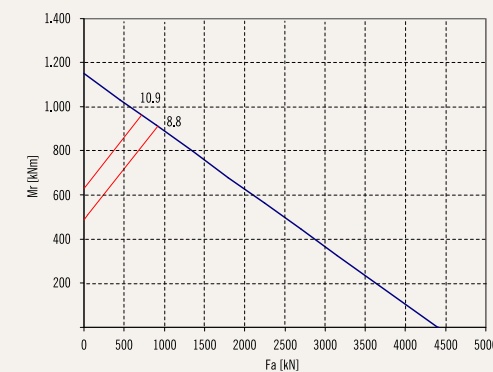


## Cod. VI125B01

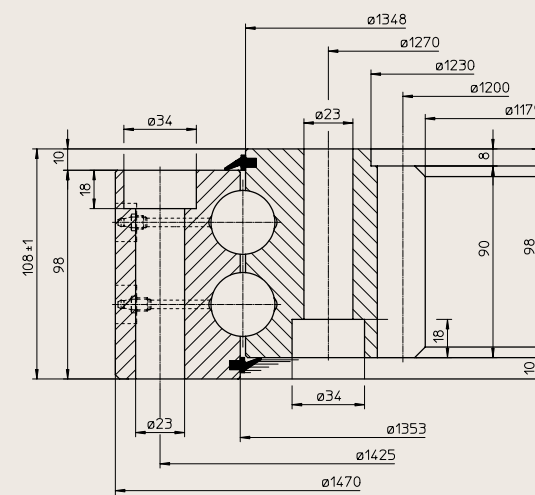


	No.	Type
Internal bolts	36	M20
External bolts	36	M20

Module	10
N. of teeth.	100
Addendum modification	8
kN - Normal tangential force	86,5
kN - Maximum tangential force	173,0
Weight	282

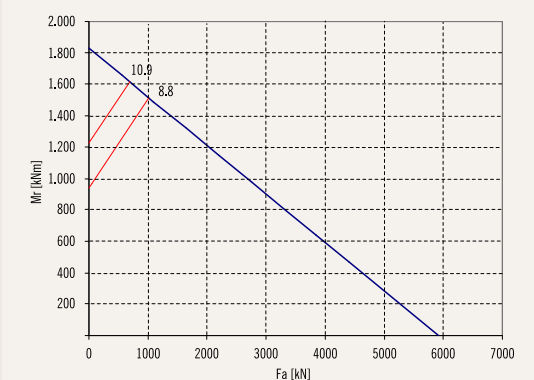


## Cod. VI147B01



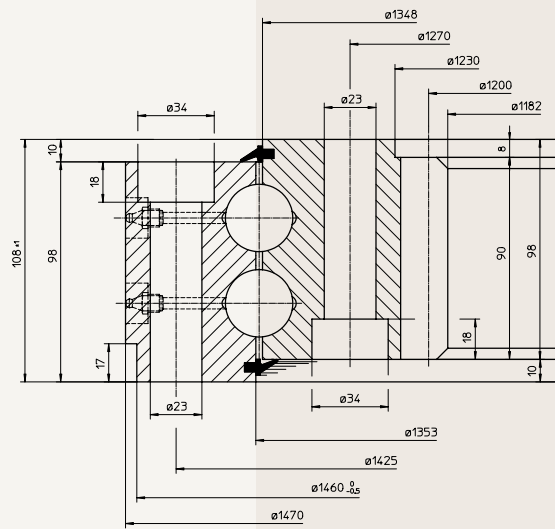
	N.	Type
Internal bolts	48	M22
External bolts	48	M22

Module	12
N. of teeth	100
Addendum modification	0
kN - Normal tangential force	84,5
FkN - Maximum tangential force	169,0
Weight	394



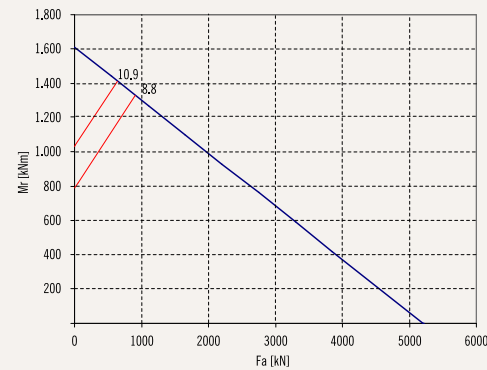
# Double row of balls Internal gear

## Cod. VI147B02

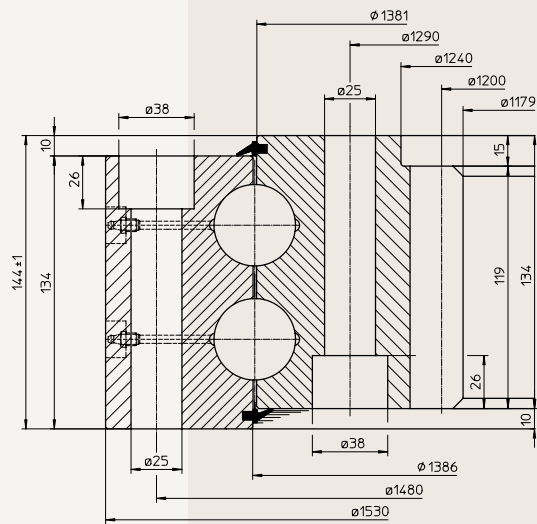


	No.	Type
Internal bolts	40	M22
External bolts	40	M22

Module	10
N. of teeth	120
Addendum modification	0
kN - Normal tangential force	70,4
kN - Maximum tangential force	140,8
Weight	394

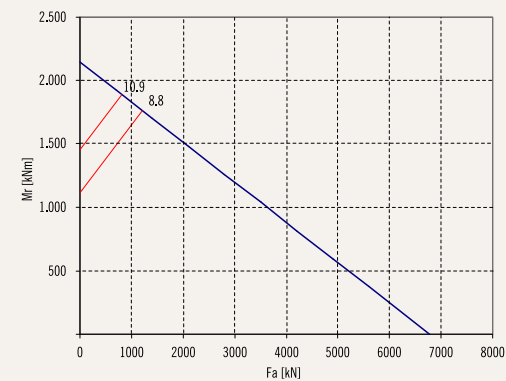


## Cod. VI153B03

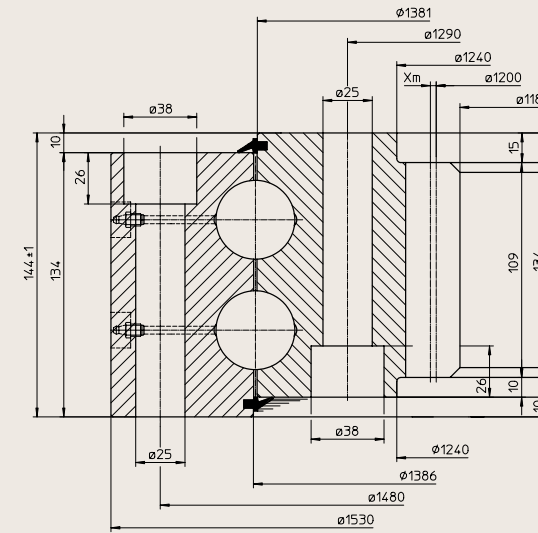


	No.	Type
Internal bolts	48	M24
External bolts	48	M24

Module	12
N. of teeth	100
Addendum modification	0
kN - Normal tangential force	111,7
kN - Maximum tangential force	223,4
Weight	620

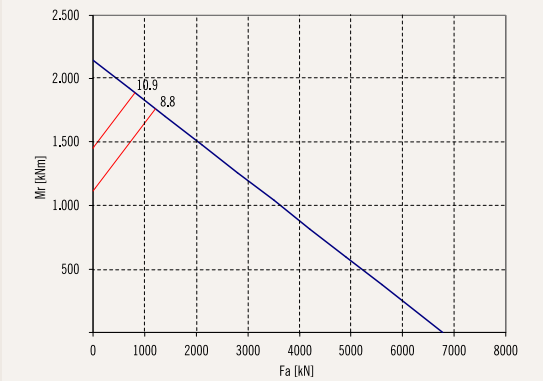


## Cod. VI153B06

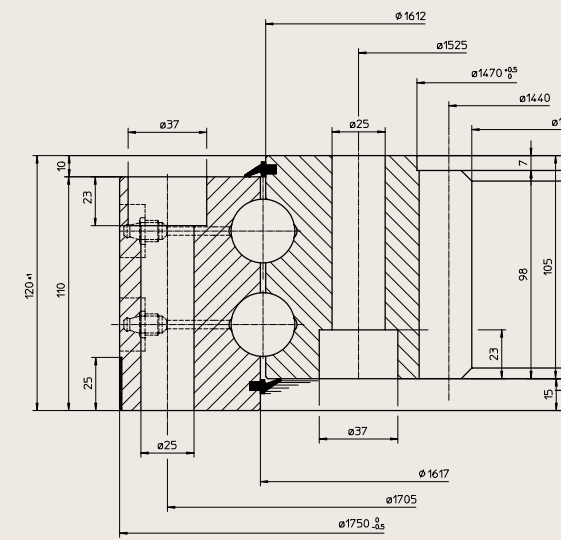


	N.	Type
Internal bolts	48	M24
External bolts	48	M24

Module	10
N. of teeth	120
Addendum modification	3
kN - Normal tangential force	86,9
kN - Maximum tangential force	173,8
Weight	620

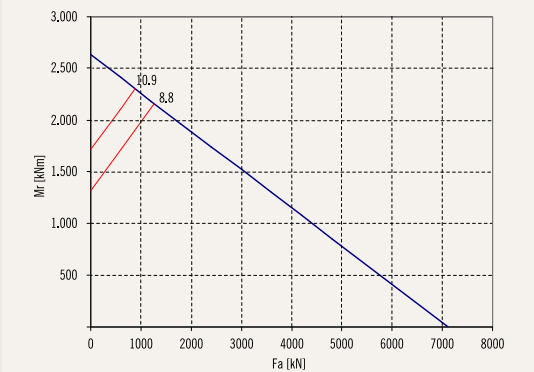


## Cod. VI175B03



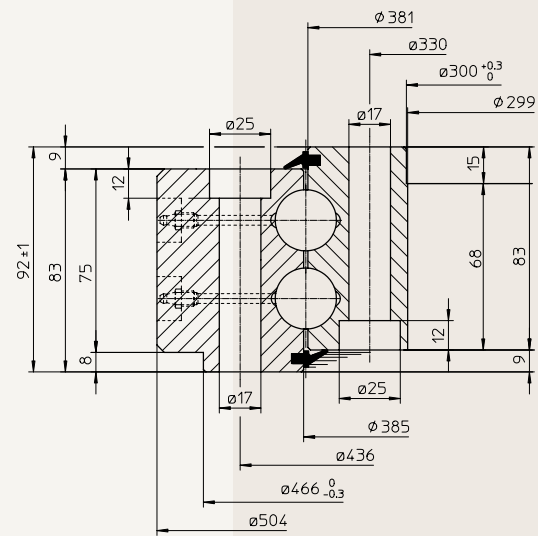
	N.	Type
Internal bolts	48	M24
External bolts	48	M24

Module	12
N. of teeth	120
Addendum modification	0
kN - Normal tangential force	92,0
FkN - Maximum tangential force	184,0
Weight	600



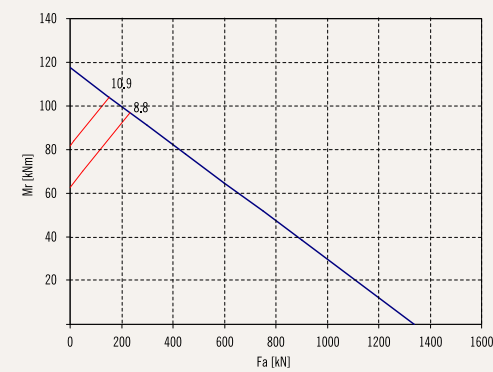
# Double row of balls Without gear

## Cod. VS050B00

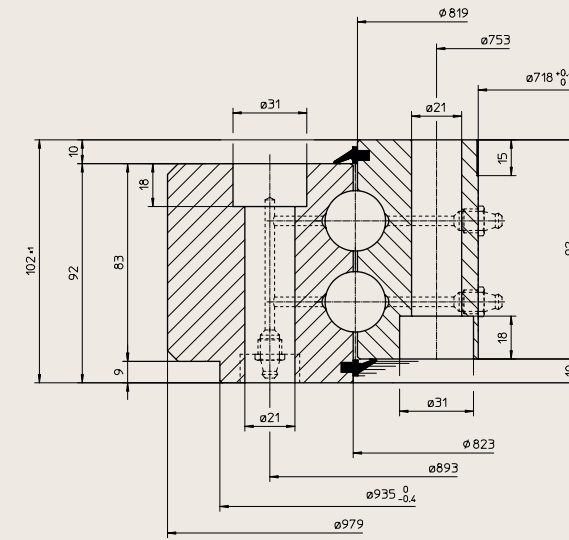


	No.	Type
Internal bolts	24-2	M16
External bolts	24	M16

Module	-
N. of teeth	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	64

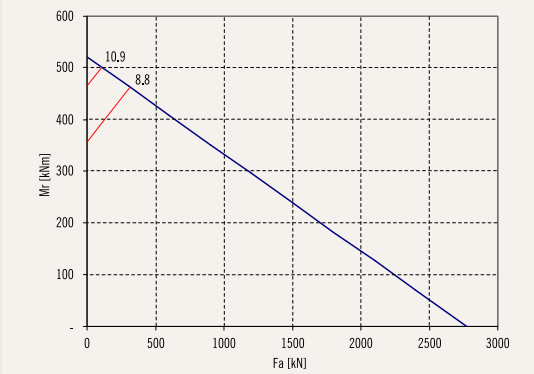


## Cod. VS098B00

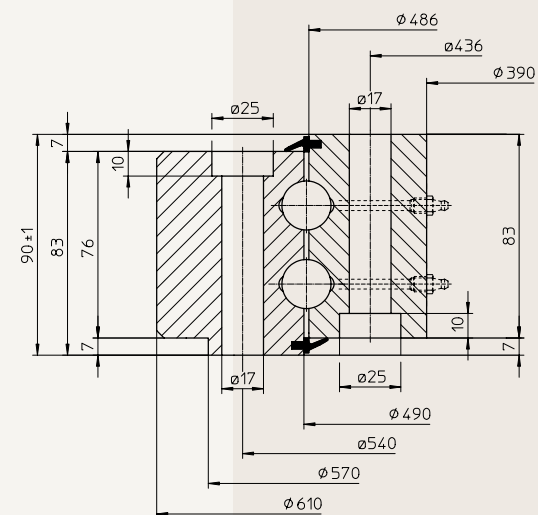


	N.	Type
Internal bolts	36	M20
External bolts	36	M20

Module	-
N. of teeth	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	208

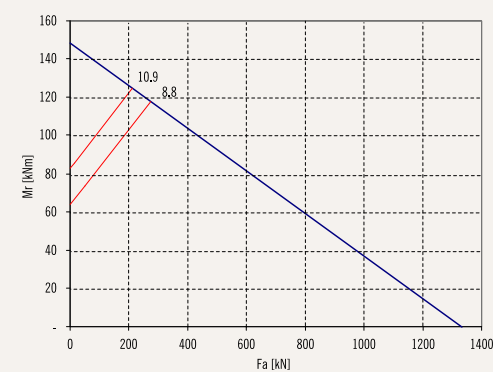


## Cod. VS061B00



	No.	Type
Internal bolts	18	M16
External bolts	18	M16

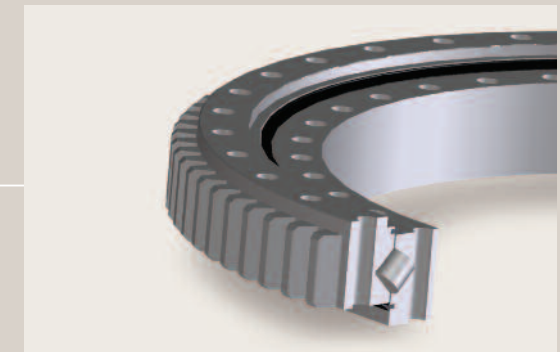
Module	-
N. of teeth.	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	98



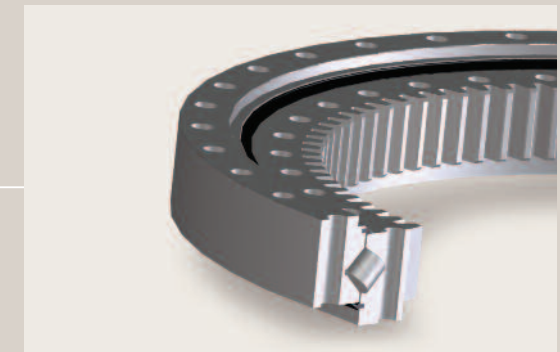
## Slewing rings

### Single row of rollers

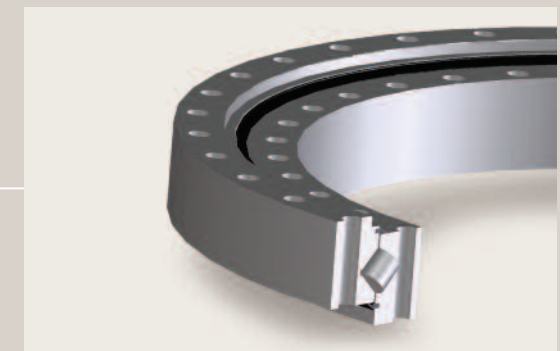
External  
gear



Internal  
gear



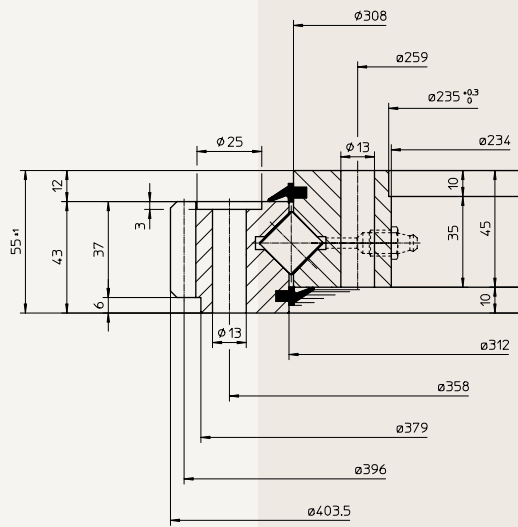
Without  
gear





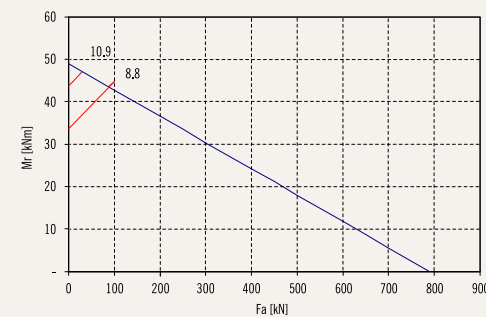
# Single row of rollers External gear

## Cod. V18E089

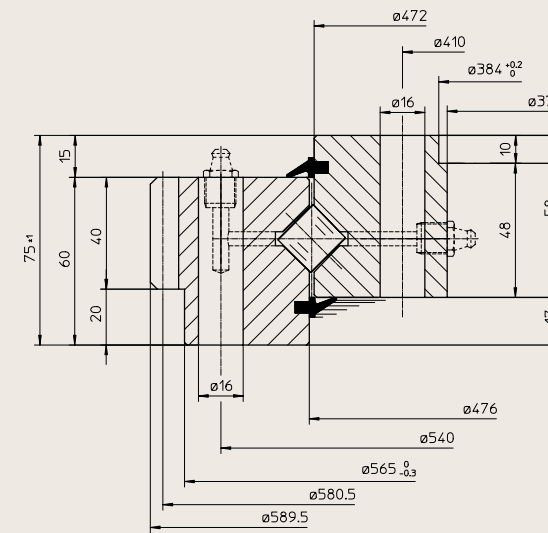


	No.	Type
Internal bolts	28-1	M12
External bolts	24	M12

Module	4,5
N. of teeth	88
Addendum modification	0
kN - Normal tangential force	8,4
kN - Maximum tangential force	16,8
Weight	25

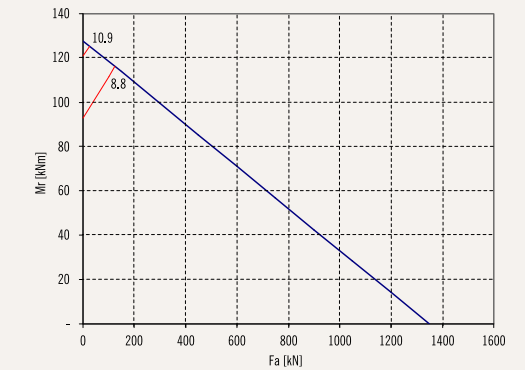


## Cod. V18E083

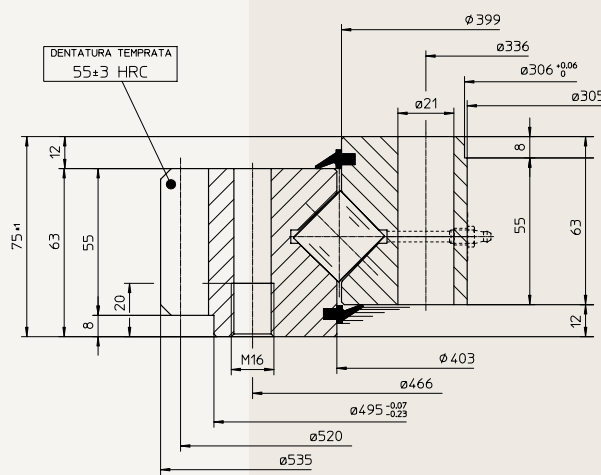


	N.	Type
Internal bolts	36-1	M14
External bolts	36	M14

Module	4,5
N. of teeth	129
Addendum modification	0
kN - Normal tangential force	8,4
kN - Maximum tangential force	16,8
Weight	58

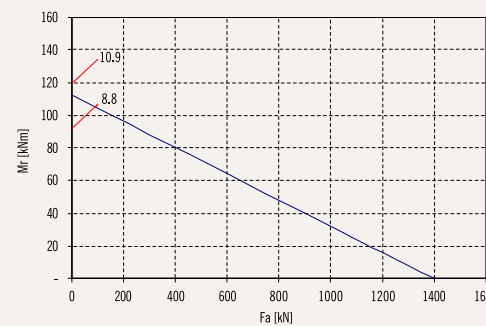


## Cod. V25E139

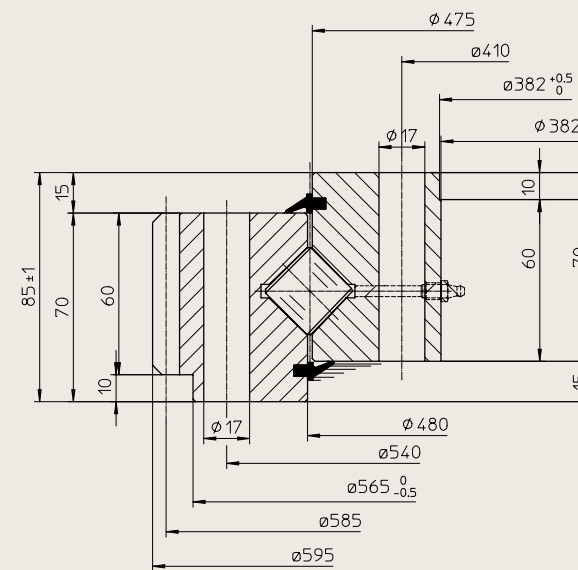


	No.	Type
Internal bolts	18-1	M20
External bolts	18	M16

Module	8
N. of teeth.	65
Addendum modification	0
kN - Normal tangential force	22,8
kN - Maximum tangential force	45,6
Weight	62

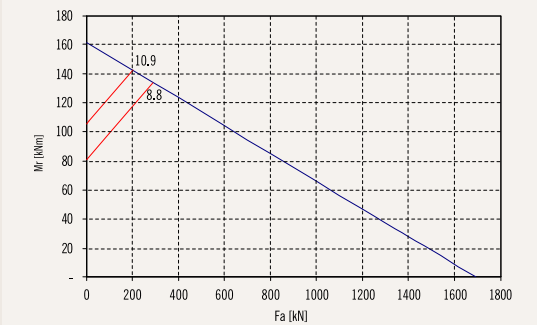


## Cod. V25E013



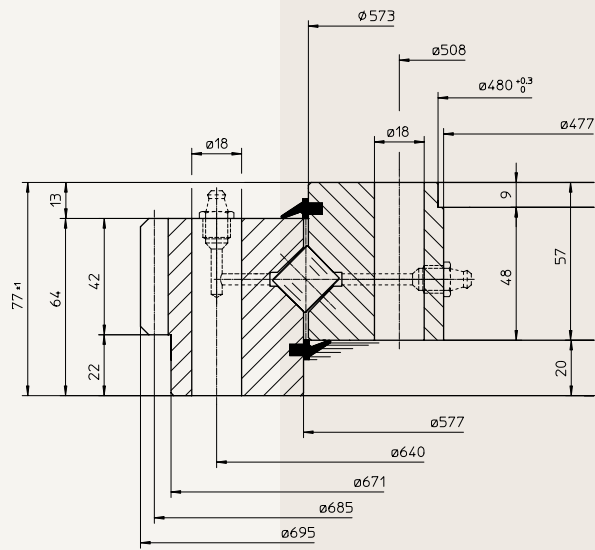
	N.	Type
Internal bolts	24	M16
External bolts	24	M16

Module	5
N. of teeth	117
Addendum modification	0
kN - Normal tangential force	10,4
kN - Maximum tangential force	20,8
Weight	76



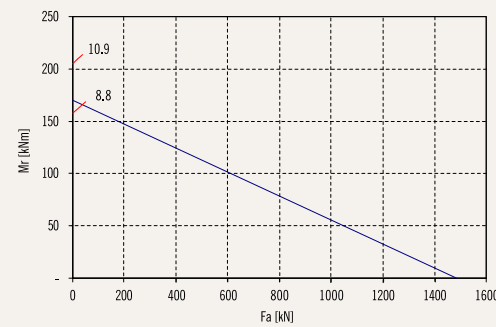
# Single row of rollers External gear

Cod. V18E082

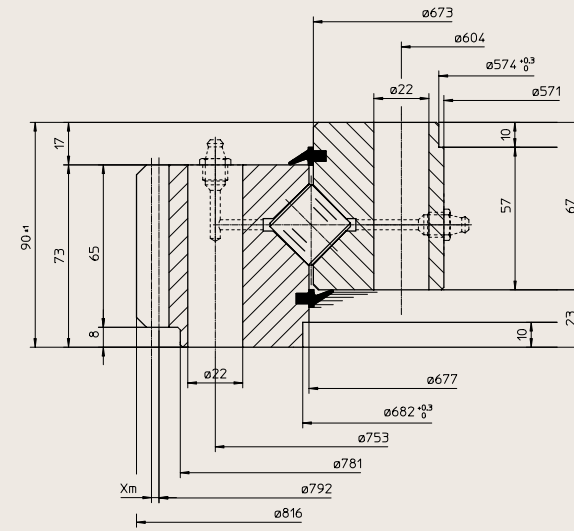


	No.	Type
Internal bolts	36-1	M16
External bolts	36	M16

Module	5
N. of teeth	137
Addendum modification	0
kN - Normal tangential force	10,4
kN - Maximum tangential force	20,8
Weight	85

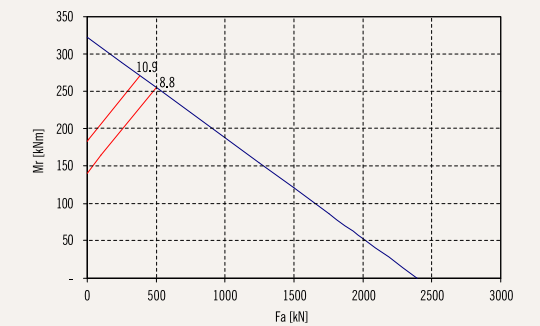


Cod. V25E197

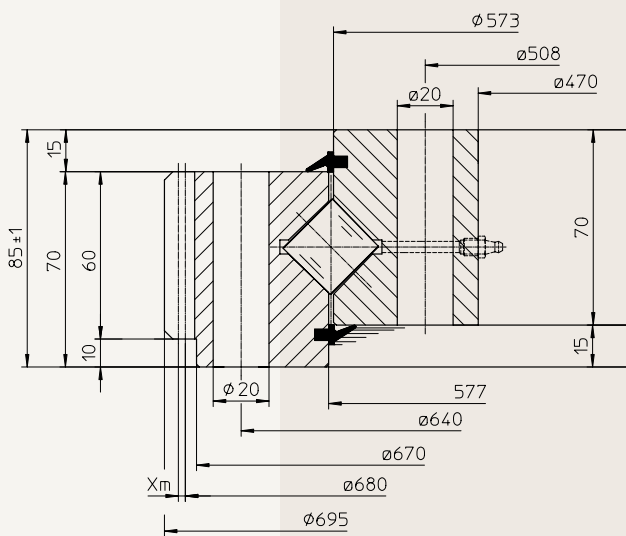


	N.	Type
Internal bolts	18	M20
External bolts	18	M20

Module	6
N. of teeth	132
Addendum modification	6,552
kN - Normal tangential force	18,0
kN - Maximum tangential force	36,0
Weight	118

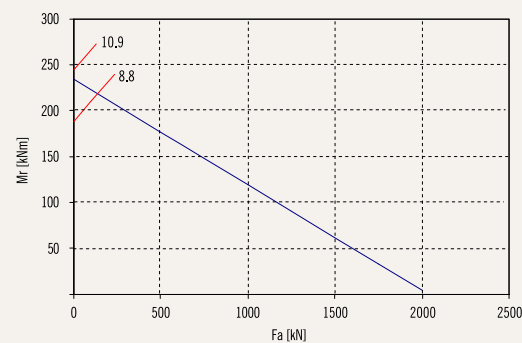


Cod. V25E195

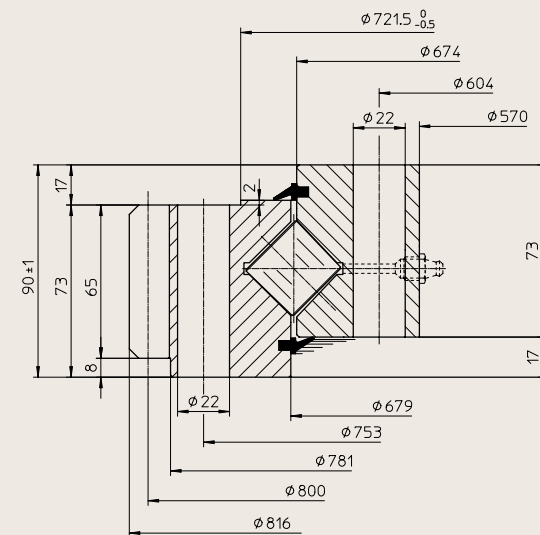


	No.	Type
Internal bolts	36-1	M18
External bolts	36	M18

Module	5
N. of teeth.	136
Addendum modification	2,5
kN - Normal tangential force	14,4
kN - Maximum tangential force	28,8
Weight	97

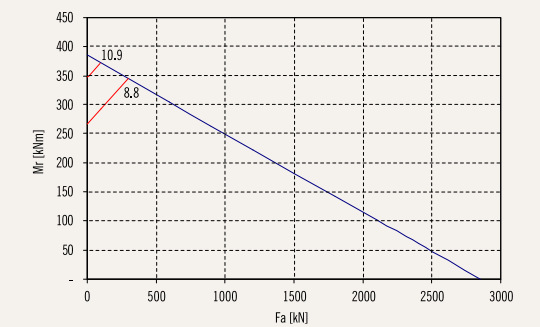


Cod. V30E081



	N.	Type
Internal bolts	36-1	M20
External bolts	36	M20

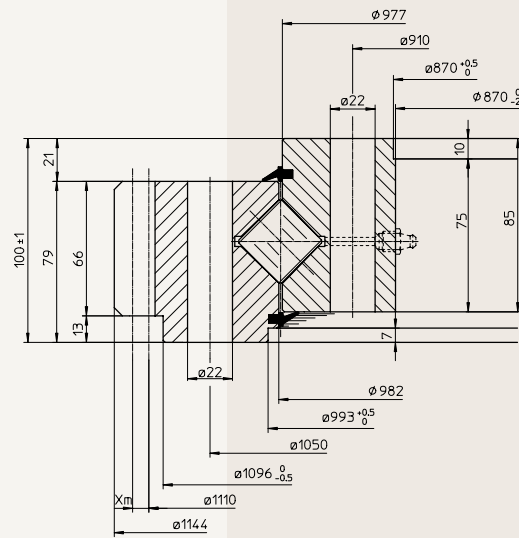
Module	8
N. of teeth	100
Addendum modification	0
kN - Normal tangential force	30,7
kN - Maximum tangential force	61,4
Weight	118





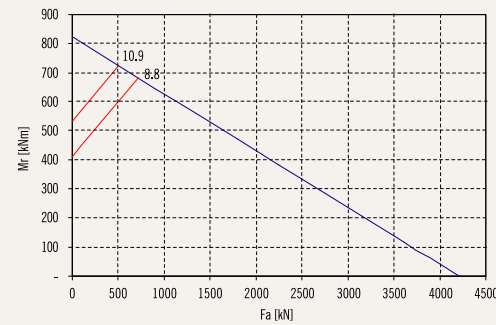
# Single row of rollers External gear

## Cod. V30E013

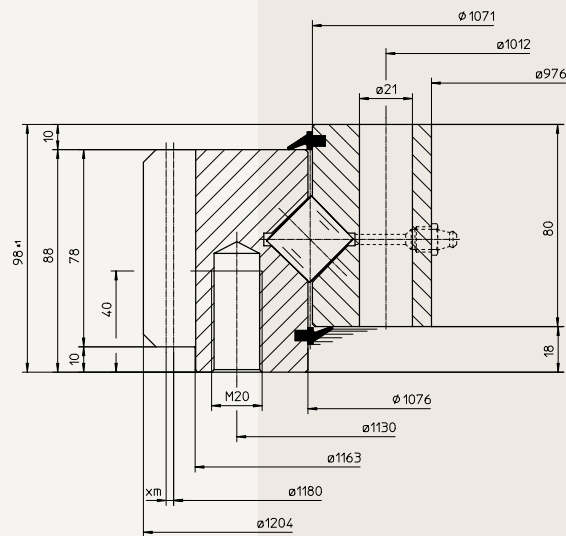


	No.	Type
Internal bolts	36	M20
External bolts	36	M20

Module	10
N. of teeth	111
Addendum modification	8
kN - Normal tangential force	57,3
kN - Maximum tangential force	114,6
Weight	232

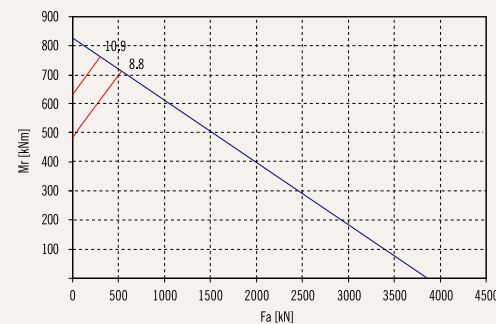


## Cod. V25E250

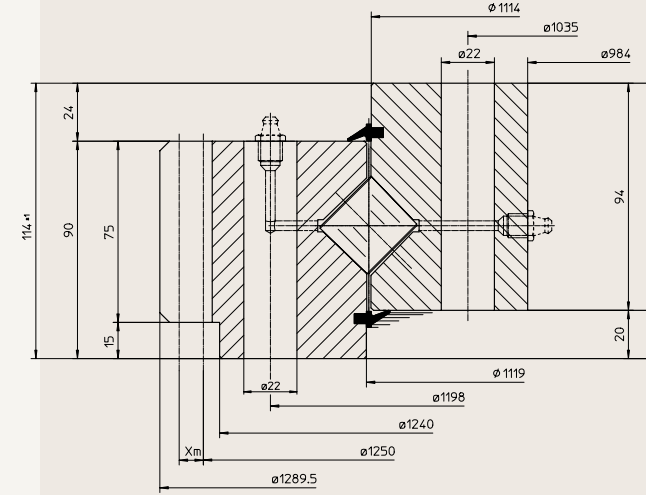


	No.	Type
Internal bolts	36	M20
External bolts	36	M20

Module	10
N. of teeth	118
Addendum modification	3
kN - Normal tangential force	56,5
kN - Maximum tangential force	113,0
Weight	218

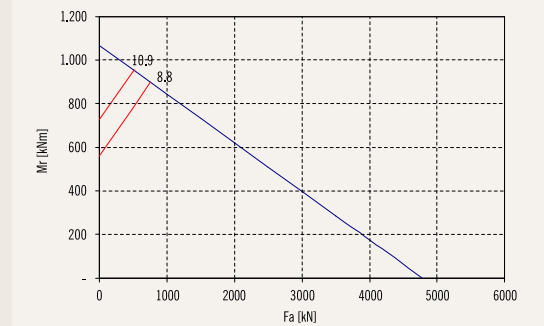


## Cod. V30E088

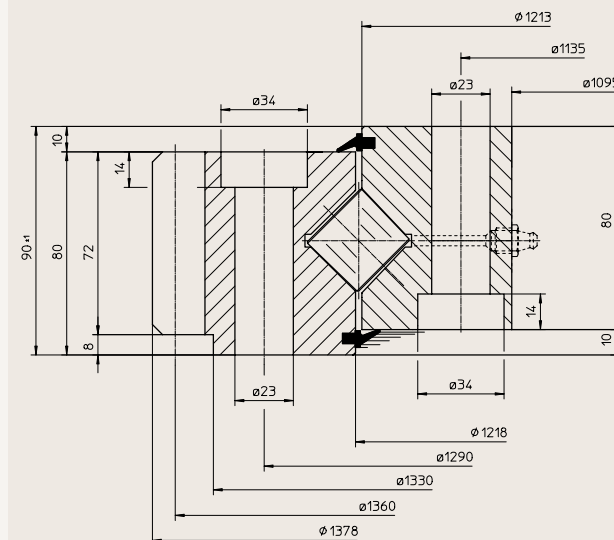


	N.	Type
Internal bolts	40	M20
External bolts	40	M20

Module	10
N. of teeth	125
Addendum modification	10,5
kN - Normal tangential force	54,3
kN - Maximum tangential force	108,6
Weight	335

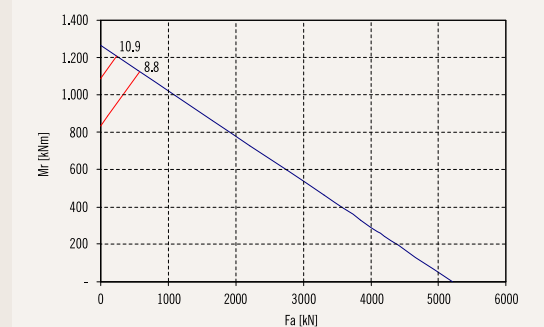


## Cod. V30E123



	N.	Type
Internal bolts	48	M22
External bolts	48	M22

Module	10
N. of teeth	136
Addendum modification	0
kN - Normal tangential force	51,8
kN - Maximum tangential force	103,6
Weight	260

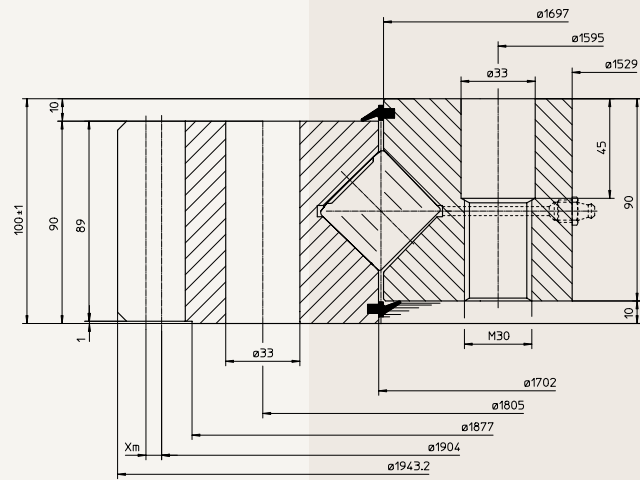






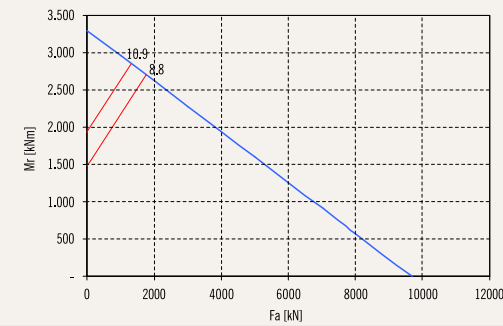
# Single row of rollers External gear

Cod. V40E029



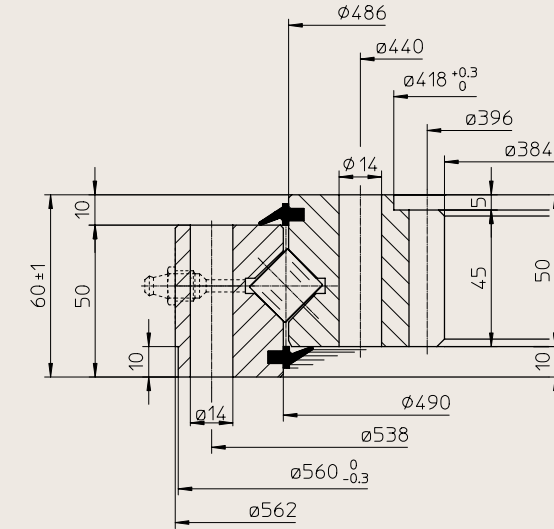
	No.	Type
Internal bolts	32	M30
External bolts	32	M30

Module	14
N. of teeth	136
Addendum modification	7
kN - Normal tangential force	108,3
kN - Maximum tangential force	216,6
Weight	691



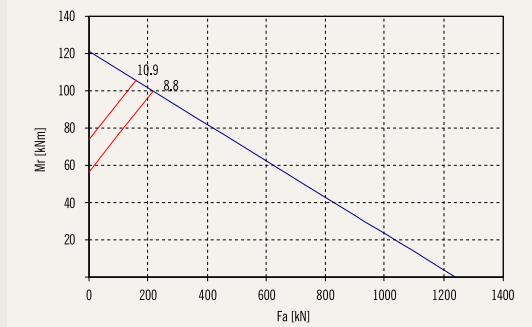
# Internal gear

Cod. V181082

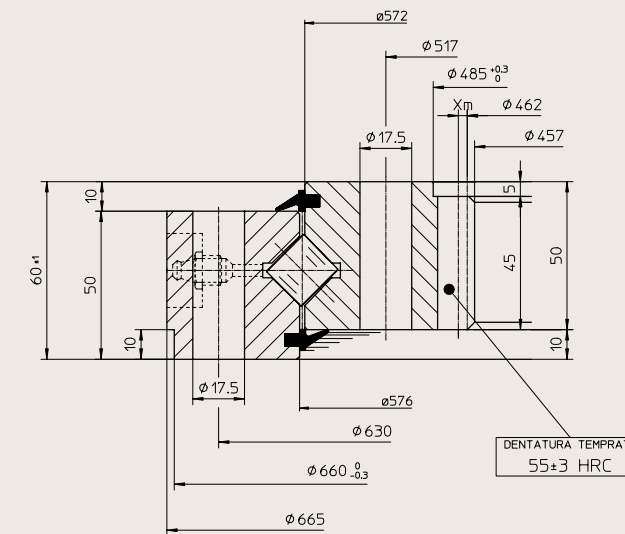


	N.	Tipo
Internal bolts	30	M12
External bolts	30	M12

Module	6
N. of teeth	66
Addendum modification	0
kN - Normal tangential force	15,2
kN - Maximum tangential force	30,4
Weight	44

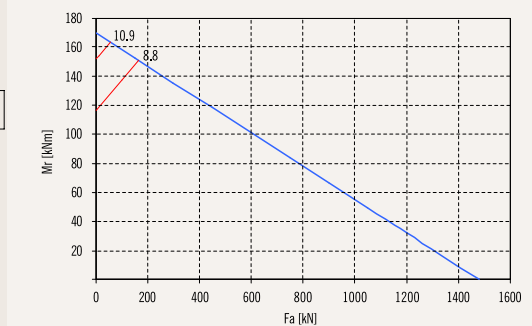


Cod. V181089



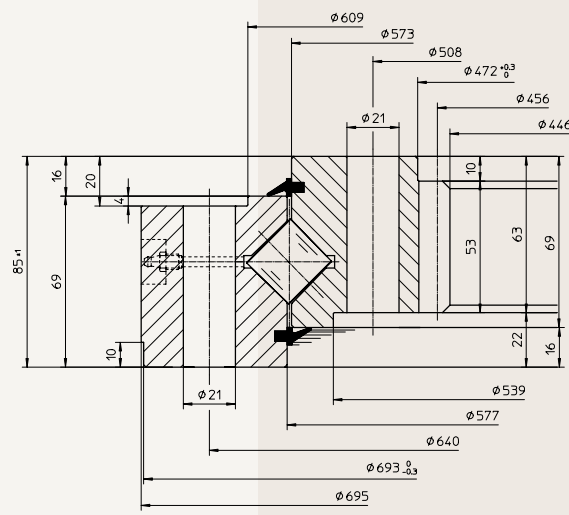
	N.	Tipo
Internal bolts	28	M16
External bolts	28	M16

Module	6
N. of teeth	77
Addendum modification	3
kN - Normal tangential force	23,4
kN - Maximum tangential force	46,8
Weight	75



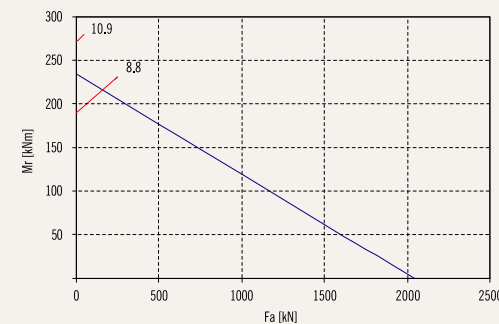
# Single row of rollers Internal gear

## Cod.V25I185

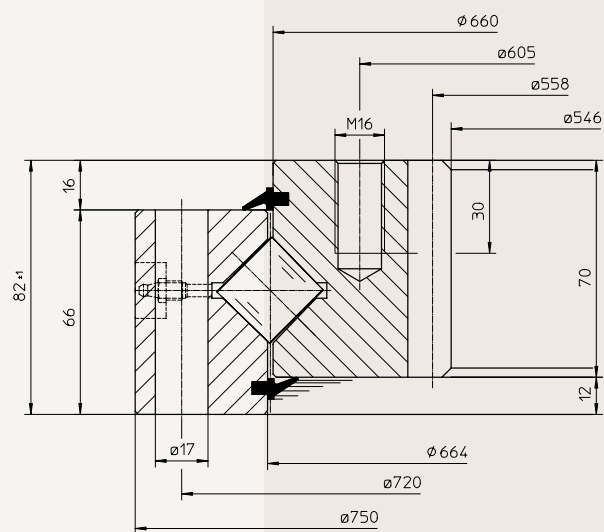


	No.	Type
Internal bolts	30	M20
External bolts	30	M20

Module	6
N. of teeth	76
Addendum modification	0
kN - Normal tangential force	24,8
kN - Maximum tangential force	49,6
Weight	83

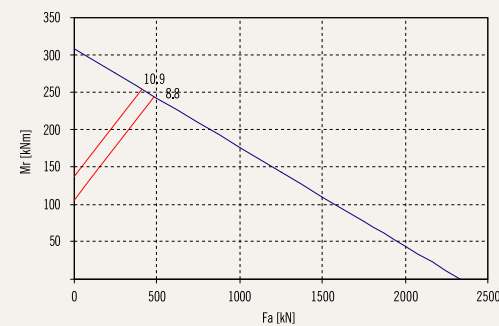


## Cod. V25I001

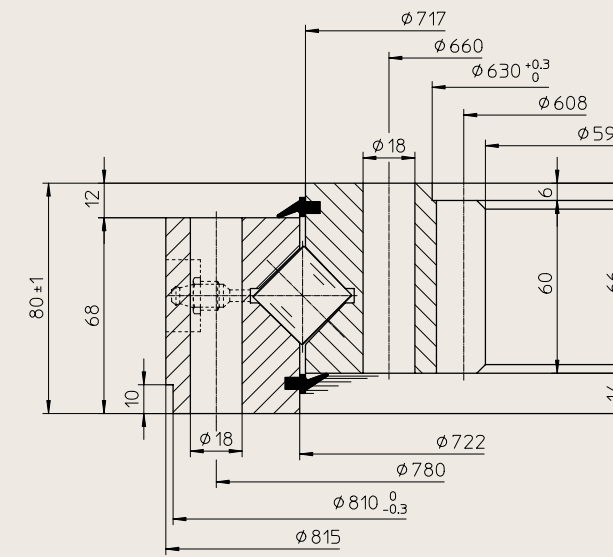


	No.	Type
Internal bolts	20	M16
External bolts	20	M16

Module	6
N. of teeth.	93
Addendum modification	0
kN - Normal tangential force	18,7
kN - Maximum tangential force	37,4
Weight	98

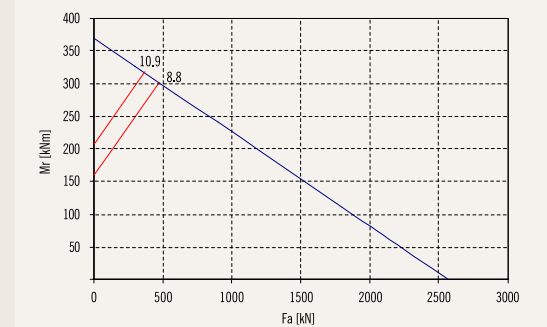


## Cod. V25I192

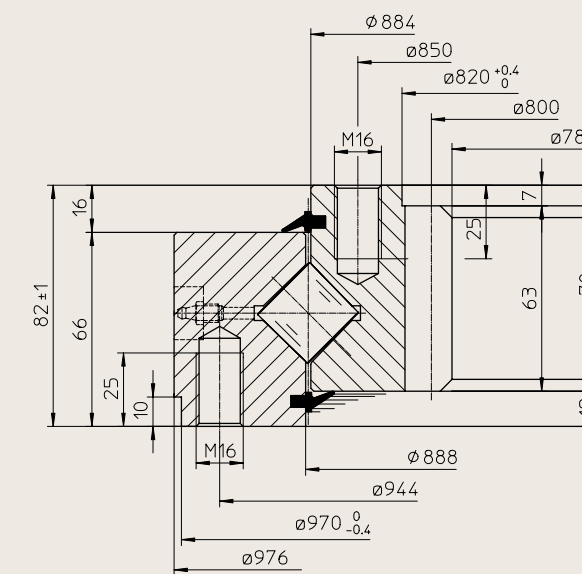


	N.	Type
Internal bolts	30	M16
External bolts	30	M16

Module	8
N. of teeth	76
Addendum modification	0
kN - Normal tangential force	31,3
kN - Maximum tangential force	62,6
Weight	110

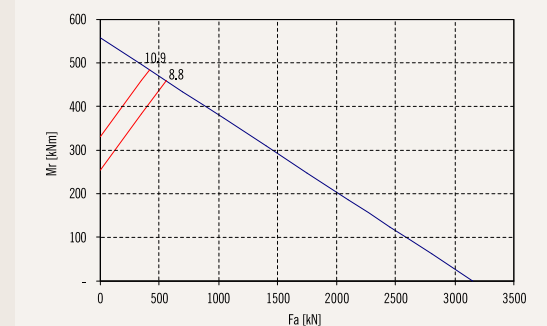


## Cod.V25I161



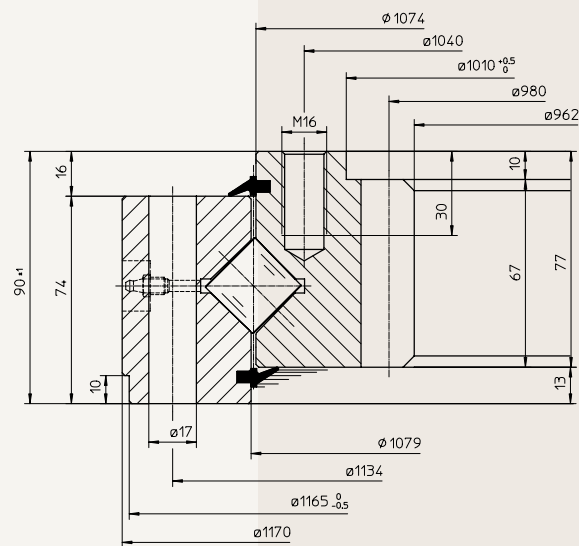
	N.	Type
Internal bolts	36	M16
External bolts	36	M16

Module	8
N. of teeth	100
Addendum modification	0
kN - Normal tangential force	32,8
kN - Maximum tangential force	65,6
Weight	124



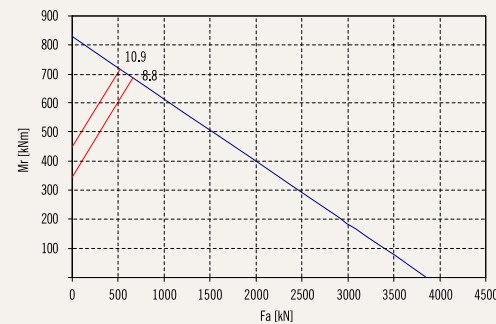
# Single row of rollers Internal gear

Cod. V251040

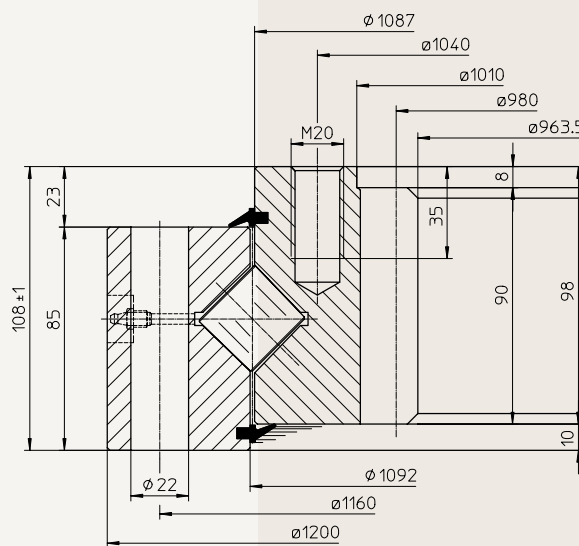


	No.	Type
Internal bolts	36	M16
External bolts	36	M16

Module	10
N. of teeth	98
Addendum modification	0
kN - Normal tangential force	43,6
kN - Maximum tangential force	87,2
Weight	177

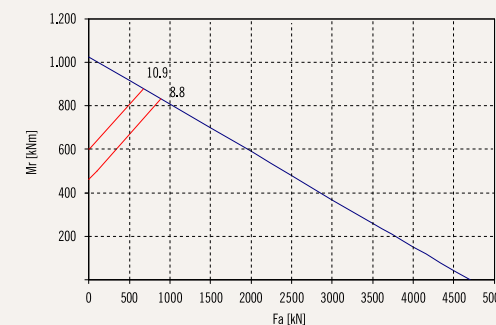


Cod. V301132

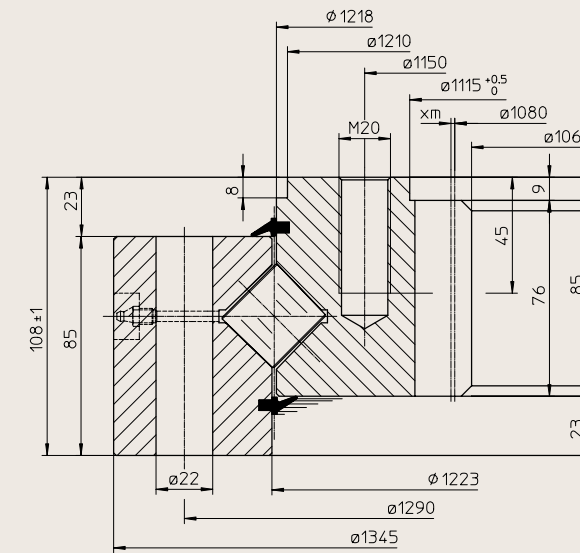


	No.	Type
Internal bolts	36	M20
External bolts	36	M20

Module	10
N. of teeth.	98
Addendum modification	0
kN - Normal tangential force	58,6
kN - Maximum tangential force	117,2
Weight	248

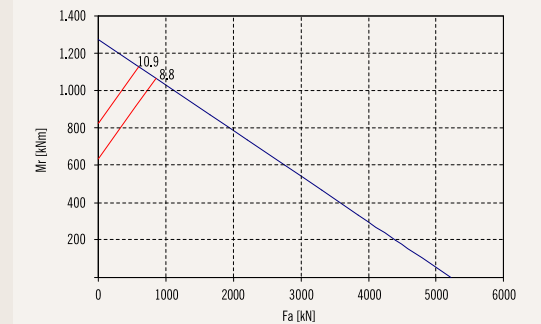


Cod. V301013



	N.	Tipo
Internal bolts	36	M20
External bolts	36	M20

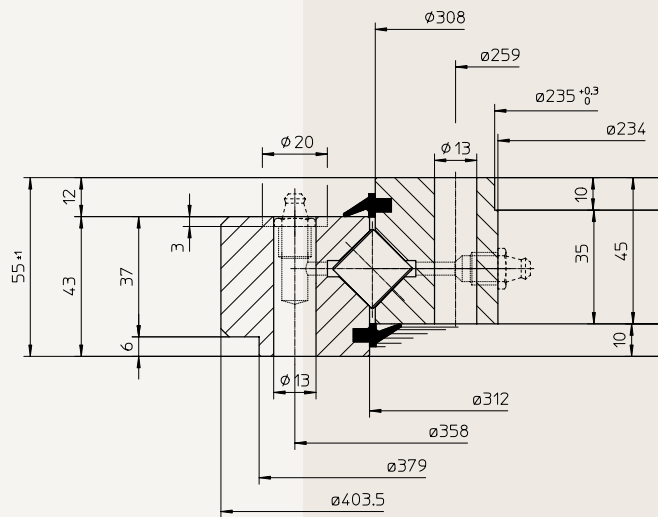
Module	10
N. of teeth	108
Addendum modification	1,5
kN - Normal tangential force	55,0
kN - Maximum tangential force	110,0
Weight	311





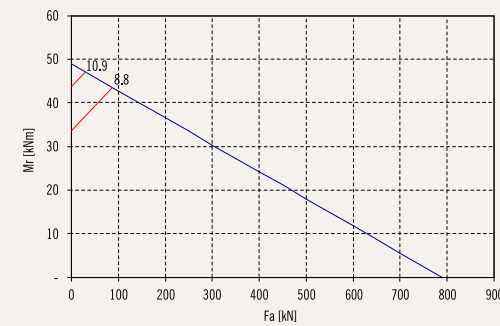
# Single row of rollers Without gear

## Cod. V18S077

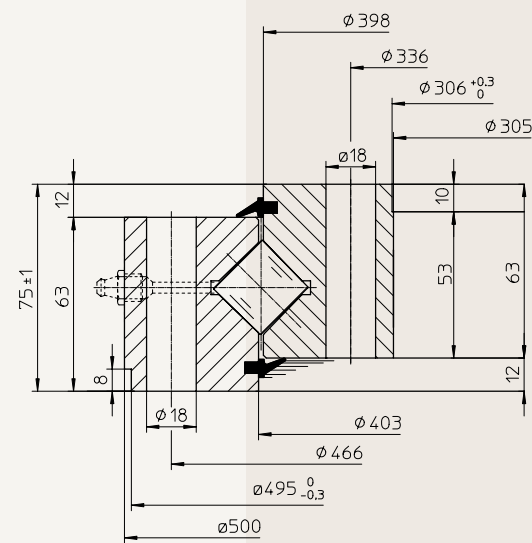


	No.	Type
Internal bolts	28-1	M12
External bolts	24	M12

Module	-
N. of teeth	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	24

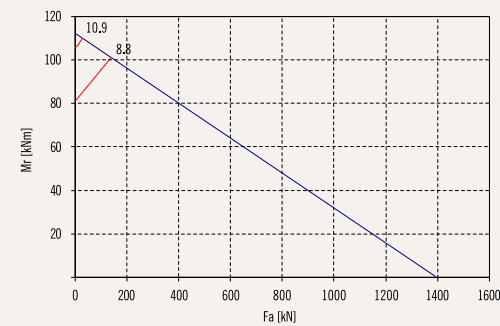


## Cod. V25S084

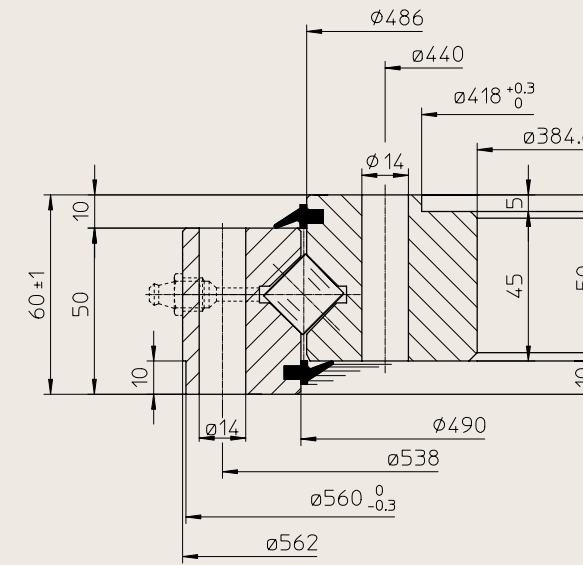


	No.	Type
Internal bolts	30-1	M16
External bolts	30	M16

Module	-
N. of teeth	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	52

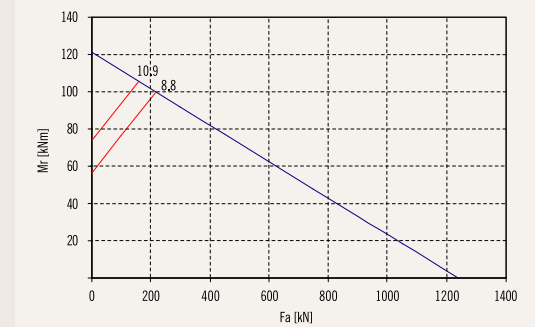


## Cod. V18S080

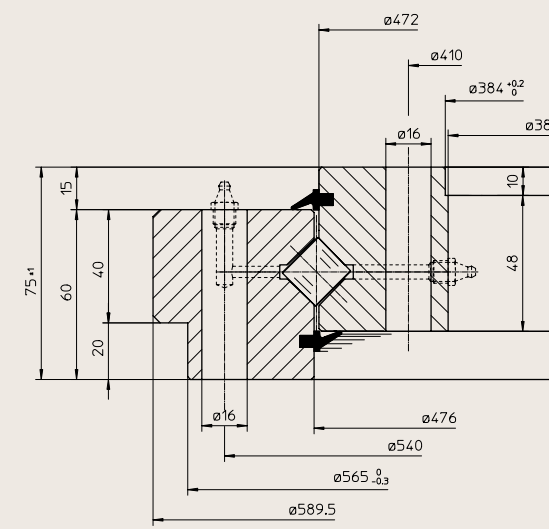


	N.	Type
Internal bolts	30	M12
External bolts	30	M12

Module	-
N. of teeth	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	44

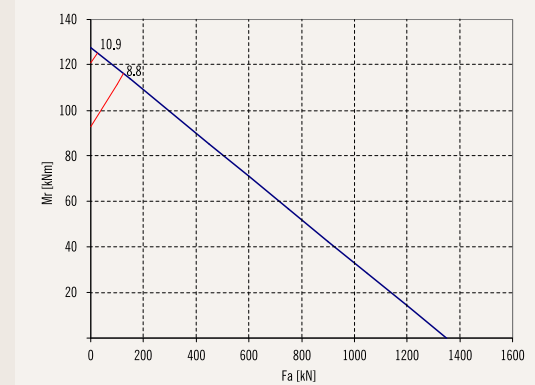


## Cod. V18S074



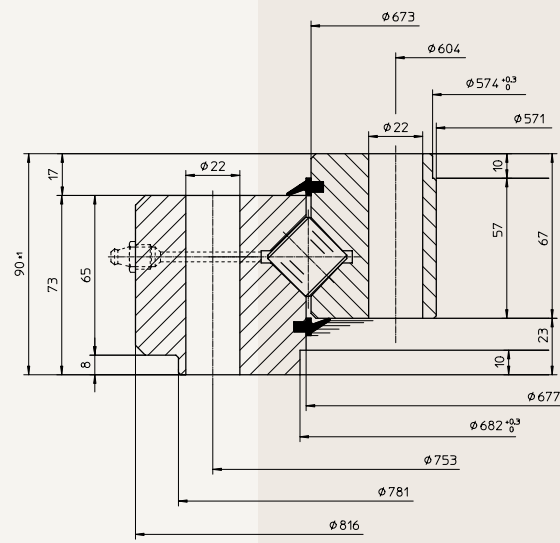
	N.	Type
Internal bolts	36-1	M14
External bolts	36	M14

Module	-
N. of teeth	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	58



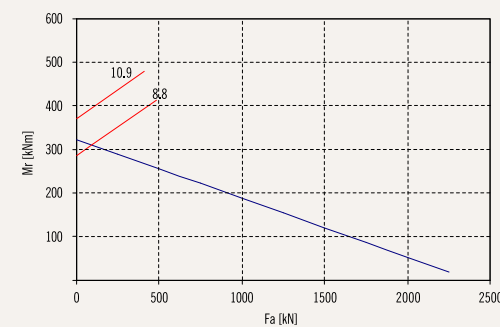
# Single row of rollers Without gear

## Cod. V25S085

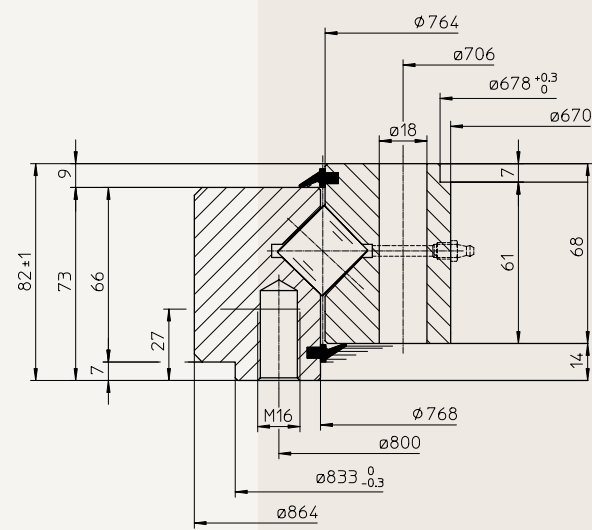


	No.	Type
Internal bolts	18	M20
External bolts	18	M20

Module	-
N. of teeth.	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	120

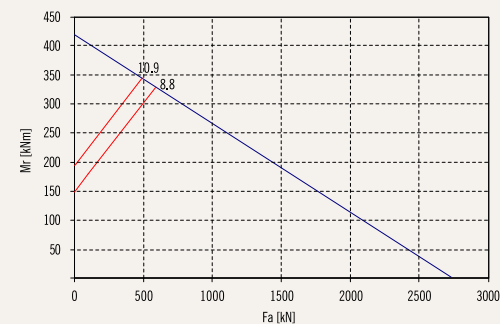


## Cod. V25S091

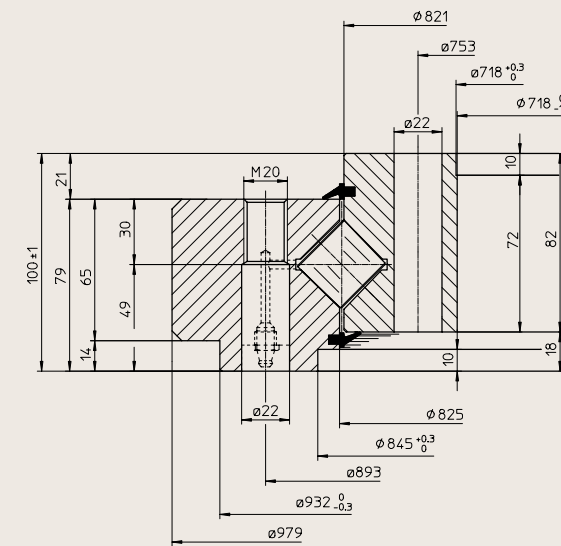


	N.	Type
Internal bolts	24	M16
External bolts	24	M16

Module	-
N. of teeth.	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	109

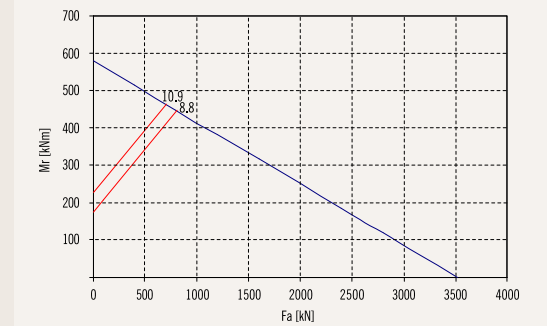


## Cod. V30S018

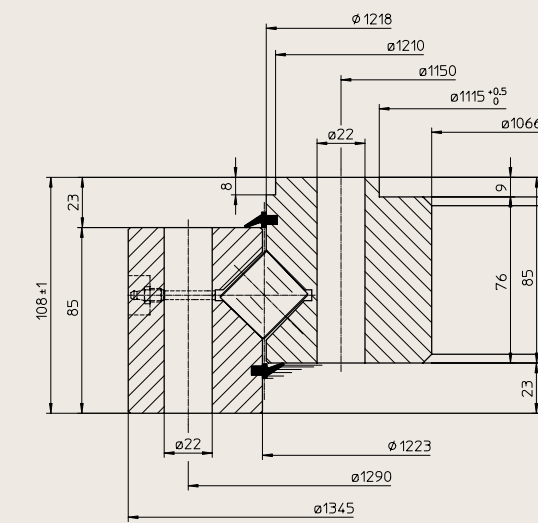


	N.	Tipo
Internal bolts	18	M20
External bolts	18	M20

Module	-
N. of teeth.	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	180

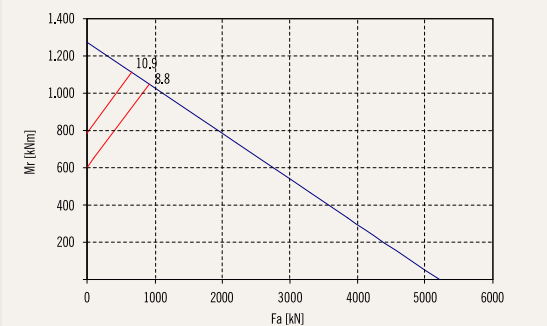


## Cod. V30S023



	N.	Tipo
Internal bolts	42	M20
External bolts	36	M20

Module	-
N. of teeth.	-
Addendum modification	-
kN - Normal tangential force	-
kN - Maximum tangential force	-
Weight	311









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