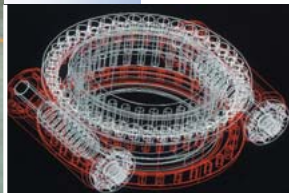


ST 105 E

Slew Drive
Product Catalog

Strong Partnership

Strong Partnership



The strong partnership IMO has with Brück GmbH in Saarbrücken for seamless rolled rings and Brück AM in Zamsrk, Czech Rep., for CNC pre-machining, enables IMO to present a line of high performance, high quality Slewing Rings and Slew Drives.

Brück is running five rolling mills with a monthly capacity up to 3,500 tons (7,700,000 lbs)!

A strong partnership is created by Brück owners holding a 50 percent stake in IMO's equity. For you as our customer, this enables IMO to be a fast, flexible and reliable Slewing Ring and Slew Drive manufacturer.



Preface & Imprint

IMO has developed, manufactured and sold innovative Slew Drives to global customers for many years.

Our range of products is presented in this catalog.

Our wide range of standard size Slew Drives is unique on the market.

Special designs are also available, please contact our Engineering Department for assistance (the contact details are on the back of the catalog).

This catalog has a reference number on the front cover. Please always check this is the latest edition before using the information contained within it.

You will find the "Application Data Sheet" on page 108/109 in this catalog. If you require assistance with any Slew Drive application, please fill in this form. This gives us an overview of the application and represents a record of your requirements.

Slew Drives are high-tech products. They have to meet your requirements exactly and perform in the environmental conditions of your application. Therefore, it is important to fill in the form completely, with as much detail as possible and send it to us. You will then receive our recommendation for the right IMO product for your application and gain the benefit of years of experience meeting challenging customer requirements and operating conditions!

The application data sheet can also be downloaded from our homepage www.goimo.com.

You can find information on our Slewing Ring product line in the Slewing Ring catalog DV 105 E, which we will send you on request. Further details of our company, products, and their application and utilization can be found in our detailed brochure IM 104 E.

IMO terms and conditions shall apply to all quotations and purchase orders.

Further we would like to ask you to follow closely our Installation and Maintenance Instructions which contain important data. You can find these on pages 46 to 51 of this catalog, or on our homepage which has the latest revision.

The observance of our Installation and Maintenance Instructions is important for the reliability and safety of our product and has a great influence on the service-life.

The Installation and Maintenance Instructions are also available in other languages. Please contact us or visit our homepage if you need the instructions in a different language.

Our product range and designs are being continually updated and revised. Please always check with us for the latest information.


All the information in this catalog has been carefully evaluated and checked. We cannot accept responsibility for omissions and errors in this publication.

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The innovative business group IMO, with headquarters in Gremsdorf, Germany, has been designing, manufacturing and supplying Slewing Rings and self-contained Slew Drives for more than 16 years. IMO currently holds EN ISO 9001:2000 approval and has been certified since 1995.

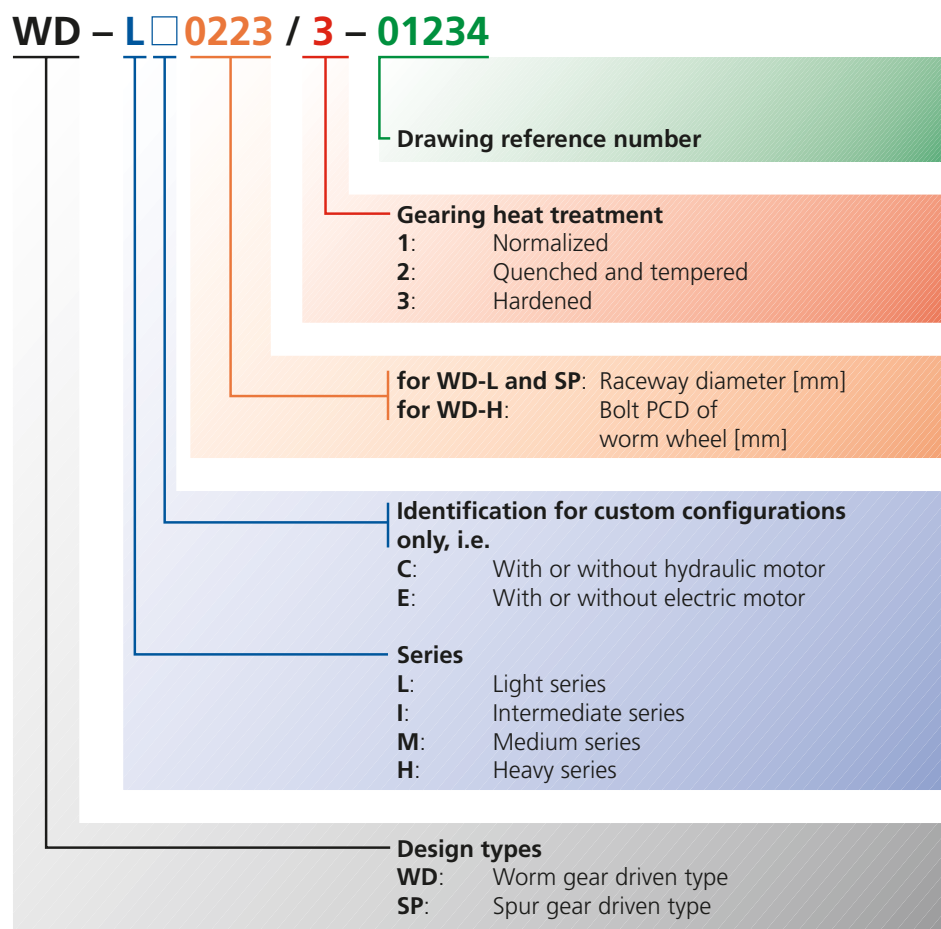
IMO, with its modern manufacturing facilities, manufactures and delivers over 10,000 Ball and Roller Slewing Rings and Slew Drives each year, in diameters up to 5,200 mm (204 in). IMO is a globally recognized supplier of Slewing Rings and patented Slew Drives.

IMO is proud to have been recently named one of Bavaria's Top 50 companies by the State Minister of Economy. IMO has also earned several technical awards at international exhibitions for new and innovative product introductions.

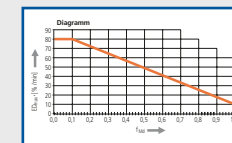


 Rolling mill
Ensheim/Saarbrücken

Nomenclature **Table of Contents**



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Series **SP-I** P. 84 - 89









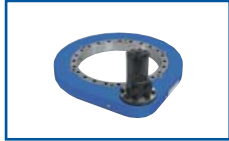







Series **SP-M** P. 90 - 99



Series **SP-H** P. 100 - 107

Product Line Overview/Comparison

Design types	Series	Sizes	Raceway diameters DL [mm]	Maximum torque ¹⁾	Maximum tilting moment ^{1) 2)}	Load carrying capacity ¹⁾		Weight ¹⁾	Clearance
				$M_{d \max}$ [Nm]	$M_{k \max}$ [kNm]	Static axial load rating $C_{0 \text{ ax}}$ [kN]	Static radial load rating $C_{0 \text{ rad}}$ [kN]	G [kg]	
		0223	223	from 9303 to 42824	from 28 to 318	from 547 to 2364	from 204 to 883	from 48 to 250	Preloaded raceway system
		0343	343						
		0419	419	from 4010 to 152610	from 51 to 1052	from 1208 to 7199	from 451 to 3528	from 63 to 480	Preloaded raceway system
		0478	478						
		0625	625	from 4010 to 152610	from 51 to 1052	from 1208 to 7199	from 451 to 3528	from 63 to 480	Preloaded raceway system
		0146	205						
		0220	280	from 4010 to 152610	from 51 to 1052	from 1208 to 7199	from 451 to 3528	from 63 to 480	Preloaded raceway system
		0300	370						
		0373	452	from 4010 to 152610	from 51 to 1052	from 1208 to 7199	from 451 to 3528	from 63 to 480	Preloaded raceway system
		0490	569						
		0645	725	from 4010 to 152610	from 51 to 1052	from 1208 to 7199	from 451 to 3528	from 63 to 480	Preloaded raceway system
		0311	311						
		0411	411	from 3118 to 9702	from 14 to 146	from 208 to 733	from 89 to 313	from 45 to 120	Radial clearance 0 - 0,2 mm Axial tilting clearance 0 - 0,4 mm
		0541	541						
		0641	641	from 3462 to 5900	from 22 to 118	from 426 to 922	from 156 to 394	from 42 to 85	Radial clearance 0 - 0,2 mm Axial tilting clearance 0 - 0,4 mm
		0741	741						
		0841	841	from 8622 to 25482	from 31 to 299	from 447 to 1570	from 191 to 672	from 80 to 200	Radial clearance 0 - 0,2 mm Axial tilting clearance 0 - 0,4 mm
		0941	941						
		1091	1091	from 8622 to 25482	from 31 to 299	from 447 to 1570	from 191 to 672	from 80 to 200	Radial clearance 0 - 0,2 mm Axial tilting clearance 0 - 0,4 mm
		0455	455						
		0555	555	from 27673 to 51888	from 144 to 548	from 1432 to 3006	from 535 to 1123	from 190 to 320	Radial clearance 0 - 0,25 mm Axial tilting clearance 0 - 0,4 mm
		0655	655						
		0755	755	from 27673 to 51888	from 144 to 548	from 1432 to 3006	from 535 to 1123	from 190 to 320	Radial clearance 0 - 0,25 mm Axial tilting clearance 0 - 0,4 mm
		0855	855						
		0955	955	from 27673 to 51888	from 144 to 548	from 1432 to 3006	from 535 to 1123	from 190 to 320	Radial clearance 0 - 0,25 mm Axial tilting clearance 0 - 0,4 mm
		0955	955						

1) The data refers to the minimum and maximum diameter per series

2) The tilting moment capacity for each unit should be confirmed by referring to the limiting load diagram for each individual model.

Slew Drive – what is it? What does it do? Where is it used?

A complete system, ready to install, consists of

- A Ball or Roller Slewing Ring to handle simultaneously occurring radial, axial and moment loads
- Hydraulic or electric motor to pitch or rotate the Slewing Ring
- A totally enclosed housing

Bolt, connect, run... done!



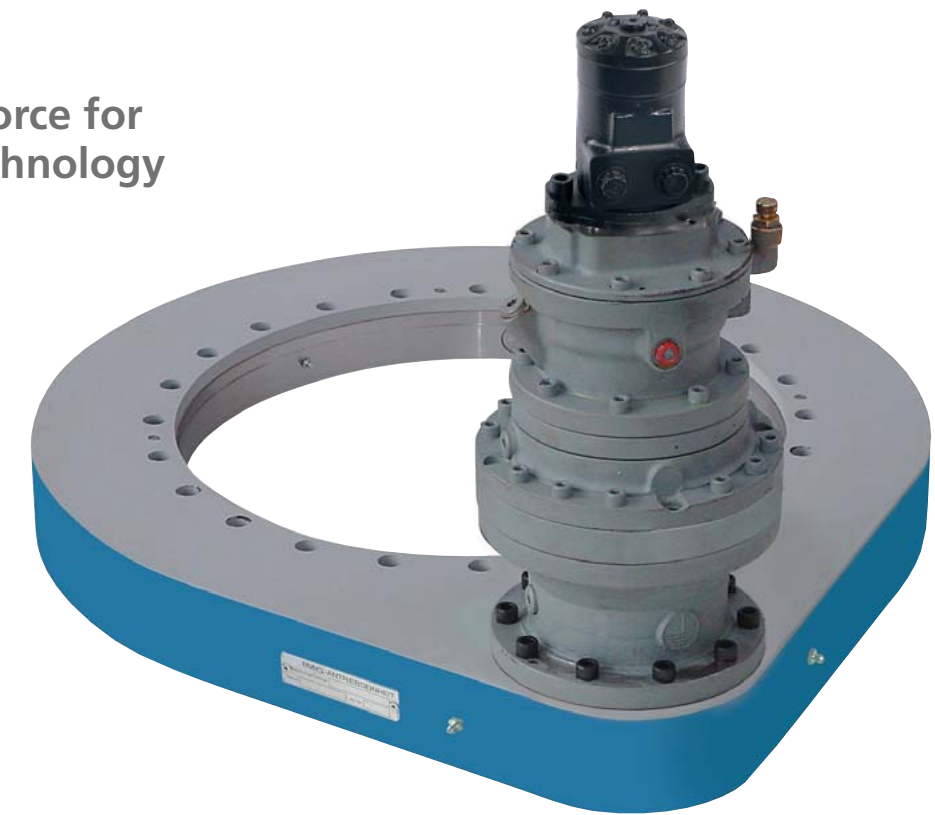
Advantages of IMO Slew Drives

- Compact packages for space saving installations
- Maximum load capacity in compact design
- Extended life
- Reduced maintenance costs
- Easy to integrate into existing applications
- Modular construction allows very quick modifications
- Special designs available

Used by customers around the globe in:

- Vehicle and crane steering systems
- Manlift systems for boom and basket rotation
- Light crane systems
- Rotation of attachments such as excavators, grabs and fork lifts
- Handling equipment (automation systems)
- Loading and unloading devices
- Positioning systems / turntables

**IMO -
the driving force for
innovative technology**



Slew Drives
Introduction

A complete unit

- All components guaranteed to work together
- Easy to order - simple to install
- Eliminates component assembly
- One source - total system responsibility

Easy selection

- Complete line of various standard sizes
- Immediate, off-the-shelf availability
- Online sizing and selection programs available at www.goimo.com
- Extensive technical support

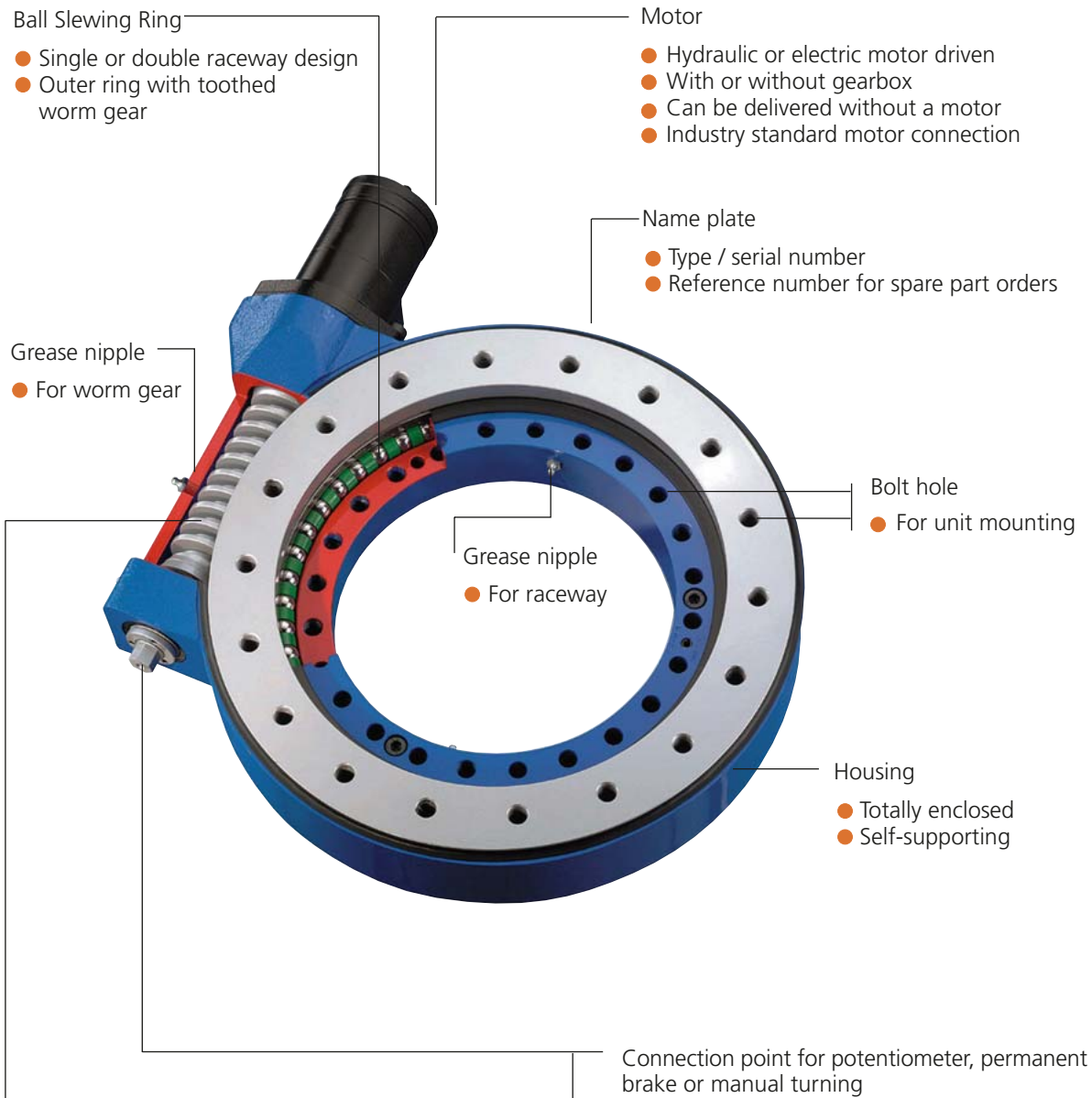
IMO Slew Drive in a totally enclosed housing

- Slew Drive protected from:
 - Contamination
 - Damage
 - Loss of lubrication
- Provides:
 - Extended life
 - Reduced maintenance costs
 - Enhanced operator safety
 - Sleek, clean appearance

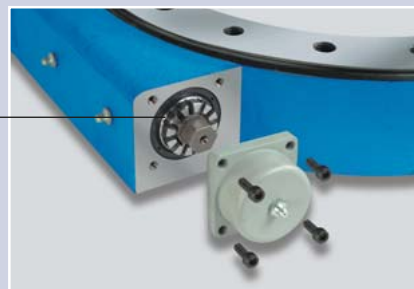
Wide range of load capacities

- Peak torque up to 152610 Nm
- Tilting moment load up to 1052 kNm
- Raceway diameters: 205 up to 1091 mm
- Special designs are also available in larger diameters

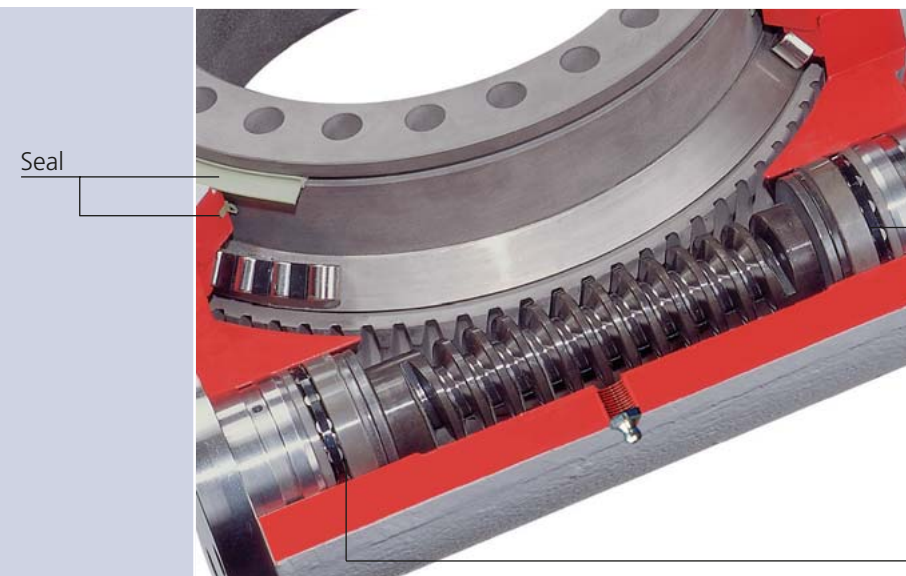
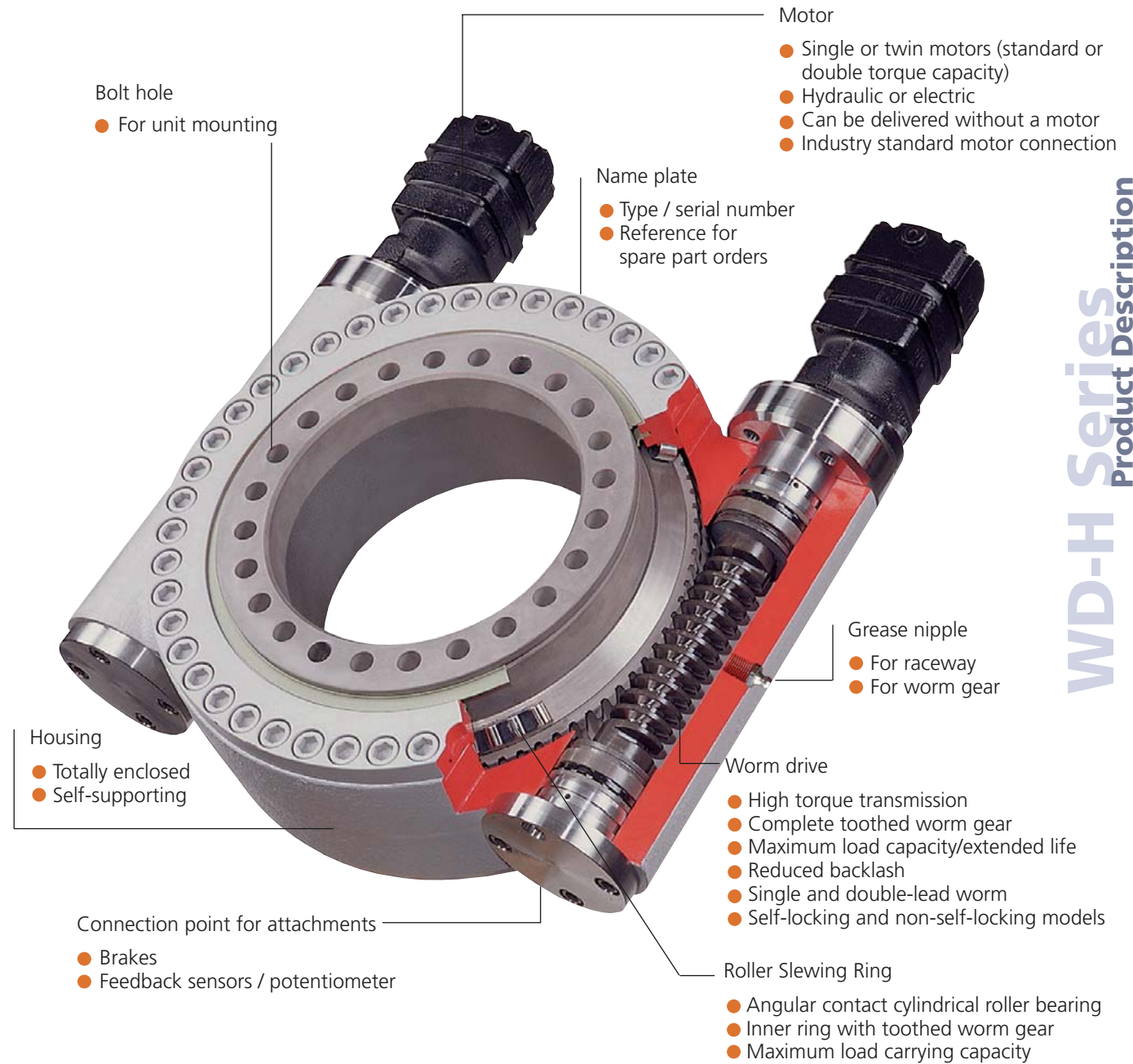
WD-L Series
Product Description



- Worm drive**
- High torque transmission
 - Complete toothed worm gear
 - Maximum load capacity and extended life
 - Reduced backlash
 - Self-locking and non-self-locking models

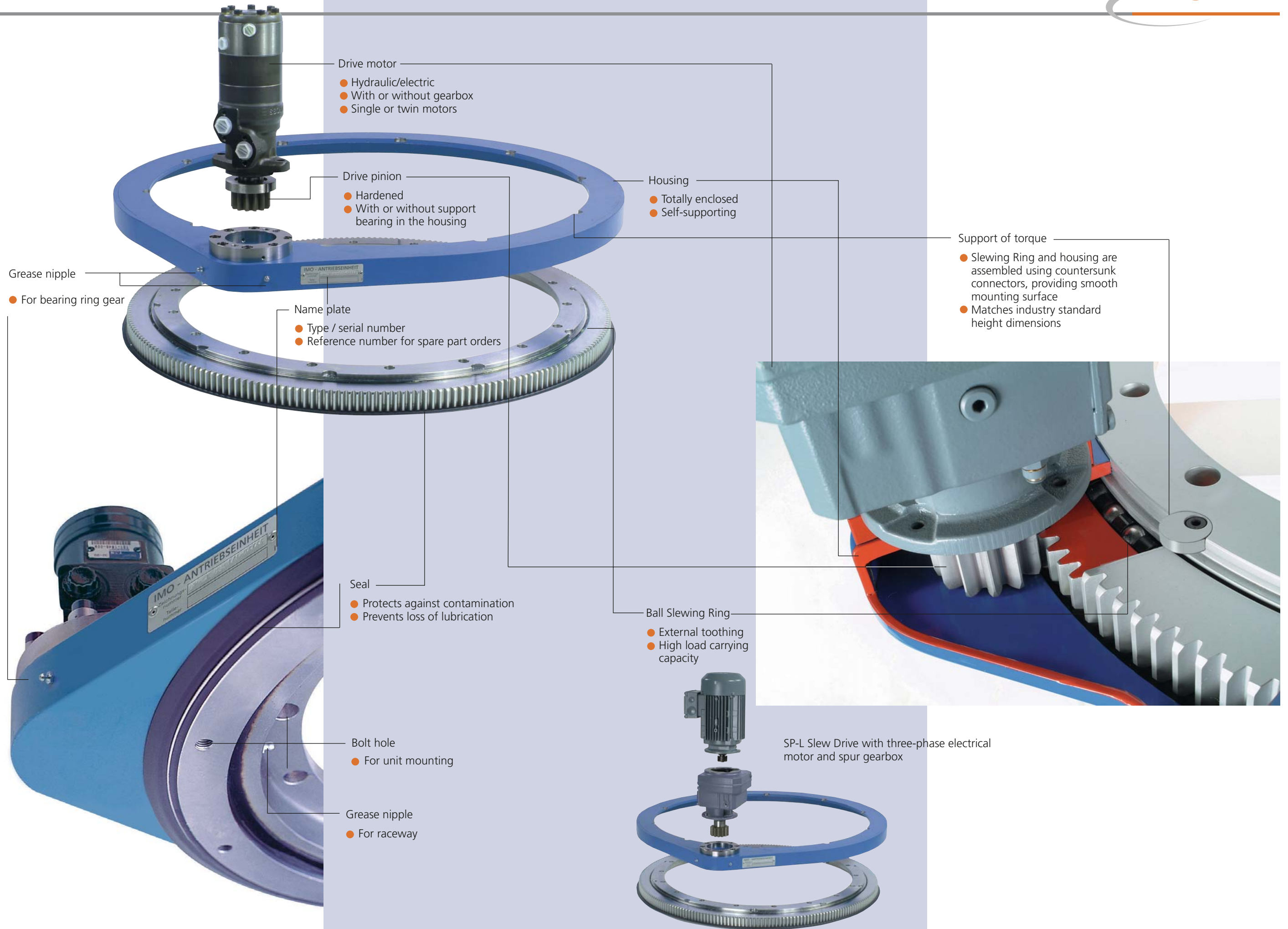


WD-H Series
Product Description



Axial bearing for the worm shaft

SP Series
Product Description



- Drive motor
- Hydraulic/electric
 - With or without gearbox
 - Single or twin motors

- Drive pinion
- Hardened
 - With or without support bearing in the housing

- Housing
- Totally enclosed
 - Self-supporting

- Support of torque
- Slewing Ring and housing are assembled using countersunk connectors, providing smooth mounting surface
 - Matches industry standard height dimensions

- Grease nipple
- For bearing ring gear

- Name plate
- Type / serial number
 - Reference number for spare part orders

- Seal
- Protects against contamination
 - Prevents loss of lubrication

- Ball Slewing Ring
- External tothing
 - High load carrying capacity

- Bolt hole
- For unit mounting

- Grease nipple
- For raceway

SP-L Slew Drive with three-phase electrical motor and spur gearbox

WD-L Slew Drives from IMO have an impressive combination of unique features.

WD-L series comprises 7 standard models

WD-L Slew Drives
Overview



WD-L 0223 Single Row Slewing Ring

WD-L 0223 Double Row Slewing Ring

WD-L 0343 Single Row Slewing Ring

WD-L 0419 Single Row Slewing Ring

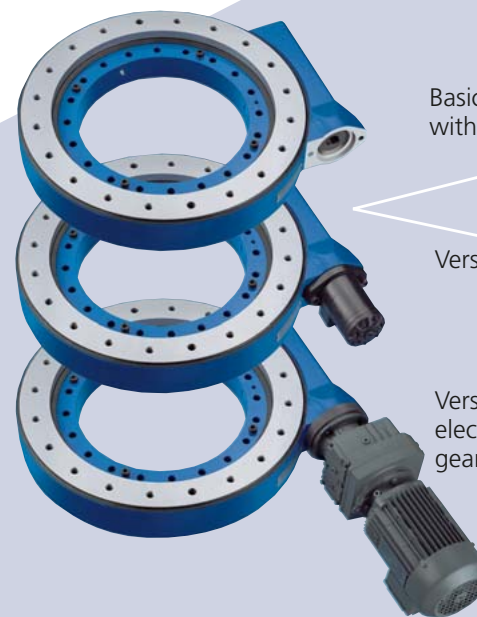
WD-L 0419 Double Row Slewing Ring

WD-L 0478 Single Row Slewing Ring

WD-L 0625 Single Row Slewing Ring

IMO Slew Drives, with a wide range of **industry standard sizes** and torque capacities offer fast, cost effective slewing solutions.

Modular system enables the utilization of various motors (e.g. WD-L 0419)



Basic version WD-L 0419 without motor

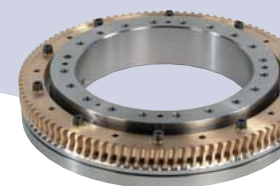
Version with hydraulic motor

Version with a three-phase electrical motor and spur gearbox

Drives are easily modified to meet special operating conditions.



Standard steel ring of a Double Row Slew Drive WD-L 0419, optimized for a high capacity, short cycle application



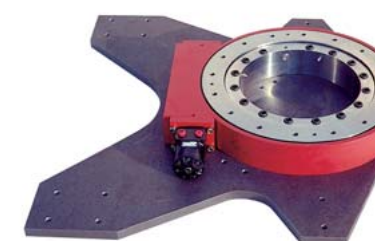
Modified worm gear of the WD-L 0419 made of bronze for applications with extended duty cycle



Worm shaft with appropriate worm gear (WD-L 0419)



WD-L 0419 with flanged spring energised multi-plate disk brake and motor, in a manlift system



The subsystem consists of a WD-L special design which is bolted to a base plate for a paver stone laying machine turning device



WD-L 0343 with the attached potentiometer, used in manlift systems



Frameless worm gear with integrated Slewing Ring suitable for extreme high temperatures for a forklift rotator (IMO is providing the worm gear and the customer is assembling them in its own housing)

Our WD-H family - which model do you need?

WD-H series comprises **6 standard sizes**

Standard units easily adaptable to meet specific applications (i.e: WD-H 0300)

WD-H Slew Drives
Overview



WD-H 0146

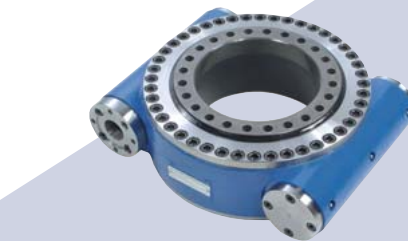
WD-H 0220

WD-H 0300

WD-H 0373

WD-H 0490

WD-H 0645



Basic version WD-H 0300 without motor



Version with single motor



Version with twin motors (double torque capacity) available from size WD-H 0300 and above



Version with twin motors and additional brakes (mounted between motors and housing)



Version with twin motors and flanged feedback sensors (gearing potentiometer)

Best possible application solution to meet our customers **design requirements**



WD-HE 0373 with twin three phase electrical motors and spur gearboxes



WD-HC 0373 bronze worm gear for increased operating life expectancy (amusement park ride)



WD-HC 0220 with integral clutch to protect unit from overloading (for a rock drill rig)



WD-HC 0300 with special housing (seamless rolled, quenched and tempered steel) and a special designed worm gear pair for a higher capacity load

The WD-H series is unique on the market!

Our design solution is protected by international patents, allowing IMO to offer the unique combination of high torque and tilting moment capacities in the industries smallest footprints.

SP-Slew Drives with totally enclosed housing.

Standard Slew Ring mounting hole patterns provide full product interchangeability.

Overview

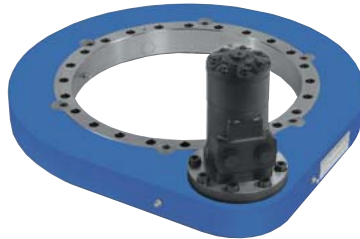
SP-L



SP-L, light series

- mounting hole patterns and height identical to IMO Ball Slew Ring series 920
- ball diameter 20 mm
- module 4 mm
- direct drive

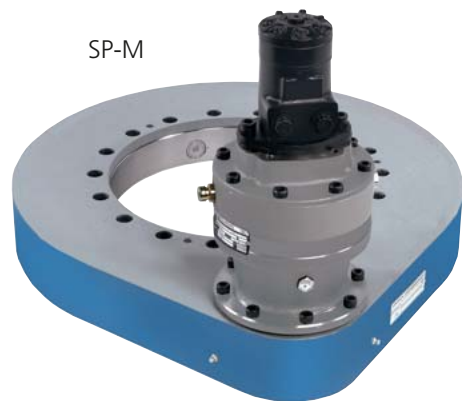
SP-I



SP-I, intermediate series

- mounting hole patterns and height identical to IMO Ball Slew Ring series 120
- ball diameter 20 mm
- module 4 mm
- direct drive

SP-M



SP-M, medium series

- mounting hole patterns identical to IMO Ball Slew Ring series 120
- height increased by base plate thickness of 15 mm
- ball diameter 20 mm
- module 6 mm
- one or multistage planetary gearbox

SP-H



SP-H, heavy series

- mounting hole patterns identical to IMO Ball Slew Ring series 125
- height increased by base plate thickness of 15 mm
- ball diameter 25 mm
- module 8 mm
- one or multistage planetary gearbox

Examples of customer initiated special designs

SP-LE 0841



SP-L series Slew Drive with electrical motor and spur gearbox for handling equipment.

SP-HC 0755



SP-H series Slew Drive with two motor modules (hydraulic motor/planetary gearbox) for a ship rescue crane.

SP-HC 0655

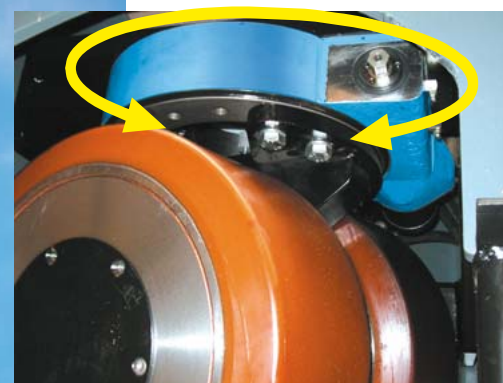


Custom design with a feedback potentiometer as well as a planetary gearbox. Application is a rotation device for a special excavator attachment.

Applications
Steering Gears For Special Vehicles



◁ **Heavy load transporters** present big technical challenges. Each single axle is steered by an IMO Slew Drive requiring the maximum axial, radial and tilting moment capacity. The **WD-H 0300** with steering torques of 27000 Nm is an excellent solution.



△ **Side loader** with the steering gears of the **WD-L 0223** and **WD-L 0419** series; the high operating time requires the use of bronze worm gears.

Straddle carrier with eight independently steered axles.



Applications
Smart Steering Solutions



The combination of IMO steering gears with additional hydraulic, electrical and electromechanical components and the system integration into the vehicle enables an effective solution, including "steering by wire".



We stand ready to work closely with an experienced design team to provide the optimum **Slew Drive** solution.

Unlike typical hydraulic push rod actuated steering solutions IMO Slew Drives offer 360 degree steering capability.



With the capacity to handle extreme tilting moments, high output torques, all in a compact design, the IMO **WD-H Slew Drives** are especially suited as **steering devices**.

In addition, integrated position feedback sensors support computer controlled steering systems.

Using IMO Slew Drives, cranes and special vehicles achieve **unique maneuvering capabilities** including turning on the spot.

Applications Steering Gears For Undercarriages



Undercarriage of a **harbor mobile crane** with **WD-HC 0300** steering gears; In combination with the hydraulic motor, the gear potentiometer indicates the position of the wheel.



In concrete factories, large **movable gantry cranes** displace heavy and bulky prefabricated concrete. With the Slew Drive **WD-HC 0645**, each axle can be turned individually. The steering torque required at the maximum load while turning on the spot is about 150000 Nm.



Ship lifting device to lift and place ships up to a weight of 650 tons. Eight Slew Drives of the **WD-HC** series carry this load capacity.



Small manlift on a crawler chassis with a **WD-L 0223** Slew Drive.

This bridge inspection equipment uses Slew Drive **WD-HC 0300** in the boom joint. The unit is able to accommodate the suspended loads and is fitted with a worm drive and multi-plate disk brake.

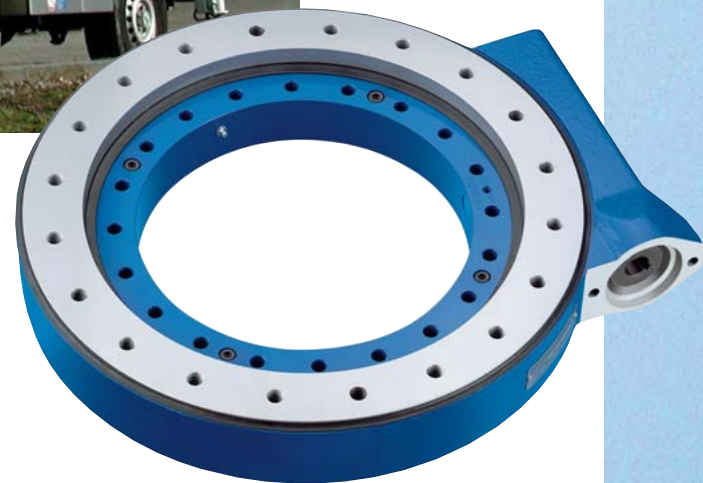


This working platform with a height of 35 m uses two IMO Slew Rings on a synchronous rotating **turntable** which are driven by an IMO **WD-HC 0146** Slew Drive.

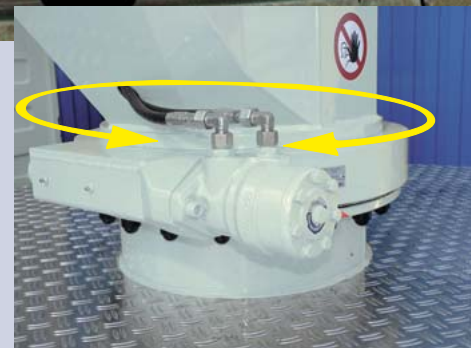


The high capacity and low profile of the **WD-L** series are perfectly suited for **manlift platforms**.

The wide variety of sizes in this series enables their use in many different kinds of platforms (heights ranging between 7 and 27 meters). Design standardisation "at its best"!



Combining low unit weight and high capacity, the Single and Double Row Slew Drives of the series **WD-L 0223** perfectly match **basket rotator requirements** of large manlift systems.



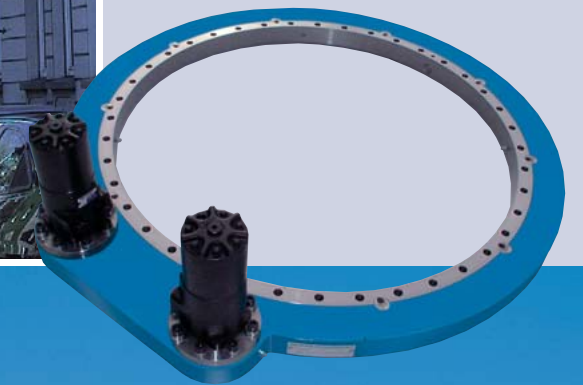
Telescopic working platform with a **WD-L 0419** Slew Drive.



The IMO Slew Drive, model **WD-L 0478** is used for **railway slewing cranes** used to position track sections.



Applications
Cranes



This functional but elegant twin worm Slew Drive **WD-H 0645**, is ideally suited for the slewing gear of a **yacht crane**.



Light cranes - the standard equipment of **service trucks**, using the IMO **WD-L 0343** Slew Drive (also available with special flanges).



The special series **SP-IC 0841** with two direct hydraulic motors was developed for this **special crane**, used for roof top operations.



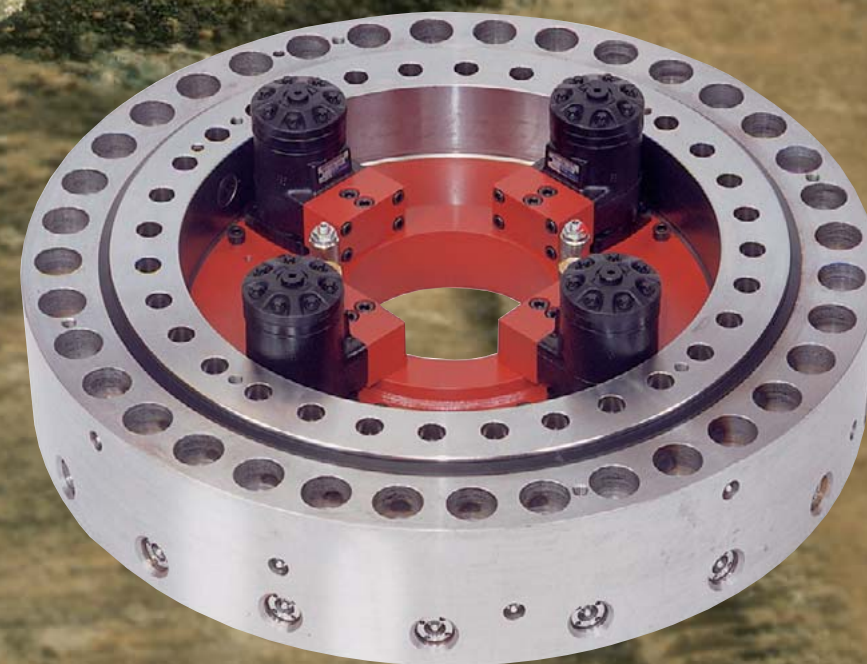
Cement mixer equipped with a conveyor belt with a length of 16.5 m, which is rotated with two **WD-LC 0419**; the considerable length of the belt leads to high tilting moments. Therefore a double row design with a reinforced housing is used.



This rotation and tilting device of a **front loader** uses an IMO Slew Drive, model **WD-LC 0419** with twin motors (double the torque).

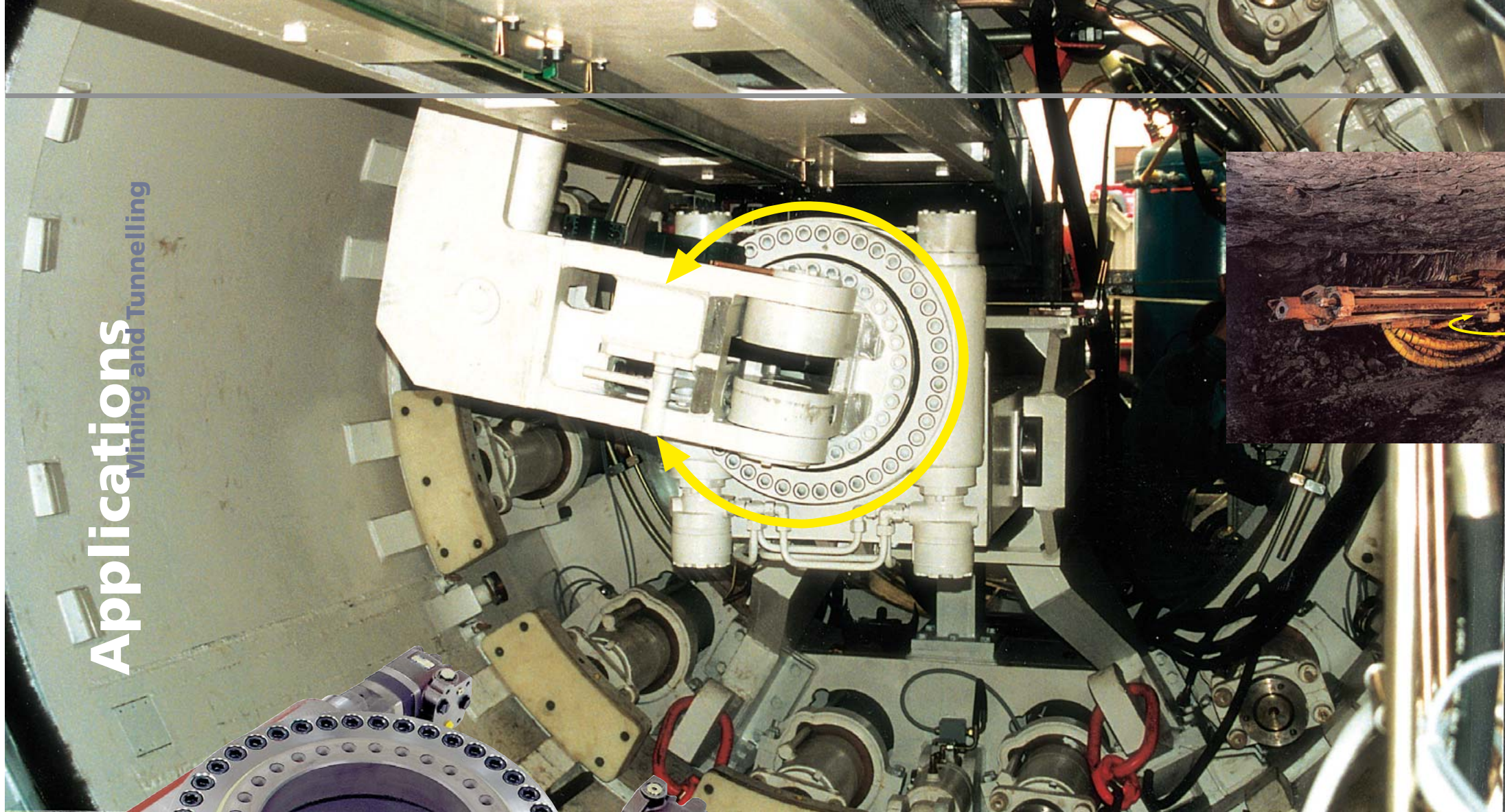


Cemetery excavator with the IMO Slew Drive **WD-L 0343**.

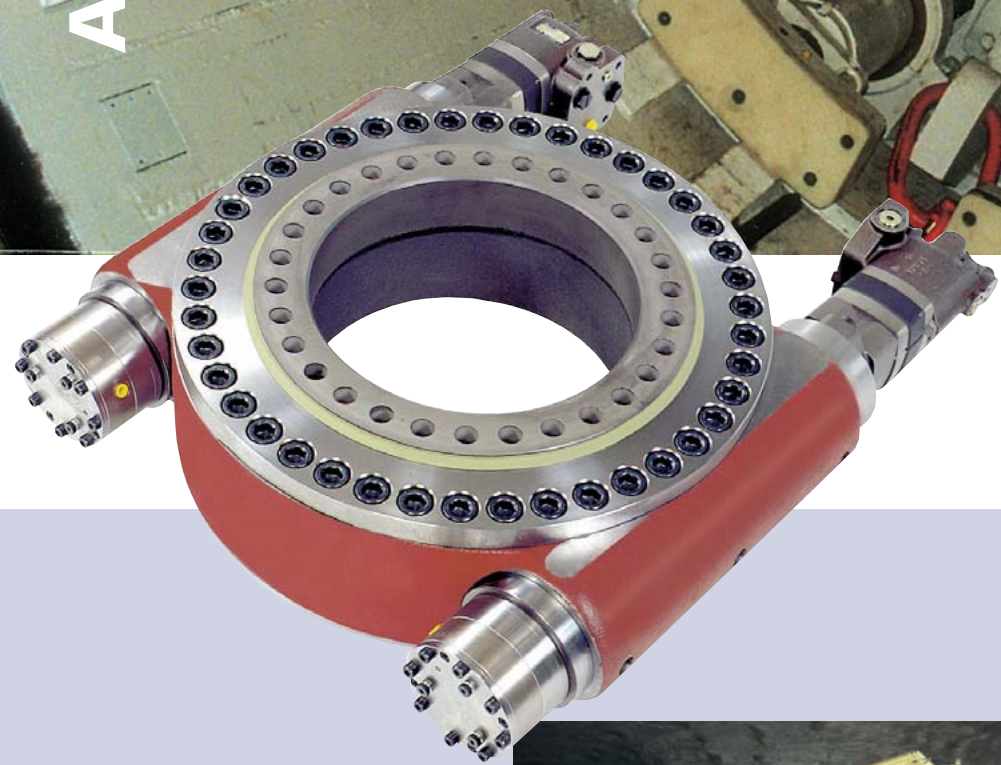


To protect the teeth of this **demolition equipment** from overload damages, a friction coupling is integrated in the spur gear driven Slew Drive **SP-OP 0580** (OP= "overload protected").

Applications
Mining and Tunnelling



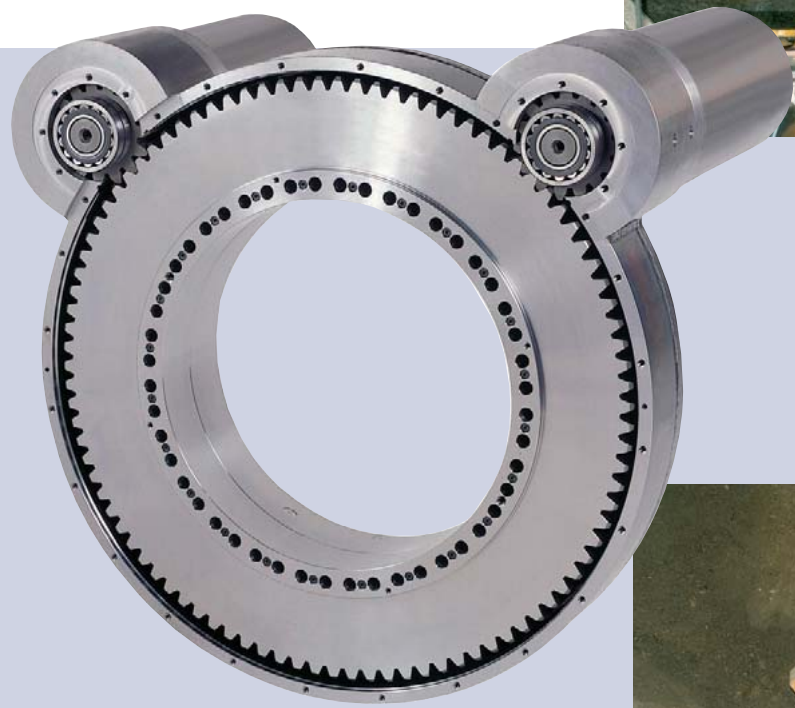
To ensure that the **blasthole boring tool** remains locked in place during the boring process, the **WD-HC 0220** shown has an integrated locking system with a position holding device.



Instead of a traditional large diameter toothed Slew Ring, this **manipulator** uses a compact Slew Drive **WD-HC 0373** with twin worm and locking brakes.



Working in aggressive environmental conditions, the Slew Drive **WD-HC 0373** is adapted for the use by a **crane in a salt mine**. Brakes ensure position holding at extreme crane decline.

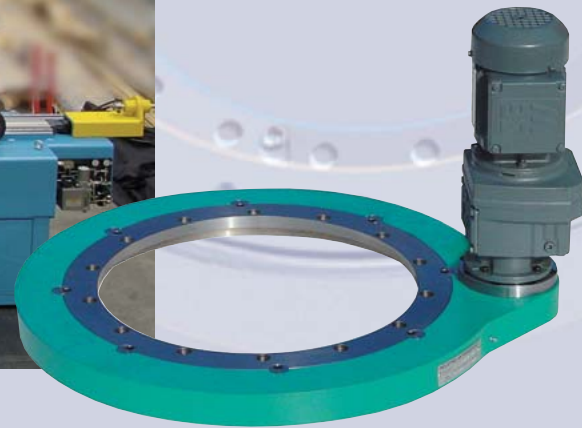


Slew Drive **SP-HC 0698** with hydraulic motors and gear boxes for turning an **excavator boom**, part of a cutter bar of a tunnel boring machine.





SP-Slew Drives are used in automation systems. Picture: Slew Drive **SP-LE 0641** with three-phase electrical motor and spur gearbox.



▽ **Manipulator** for turning concrete parts with Slew Drive **WD-HE 0373**.



△ This is a **facility** to cover car fascia panels with leather. It contains Slew Drive **WD-HC 0300**. Because of its operating condition, it is fitted with a spring energised multi-plate disk brake.



Applications
Positioning / Automation



Bank mower with Slew Drive **WD-L 0419**, double row series.



Slew Drives of **WD-series** fitted with electric motors used for the yaw and pitch controls of this **solar table**.

Technical Information

Symbols and units

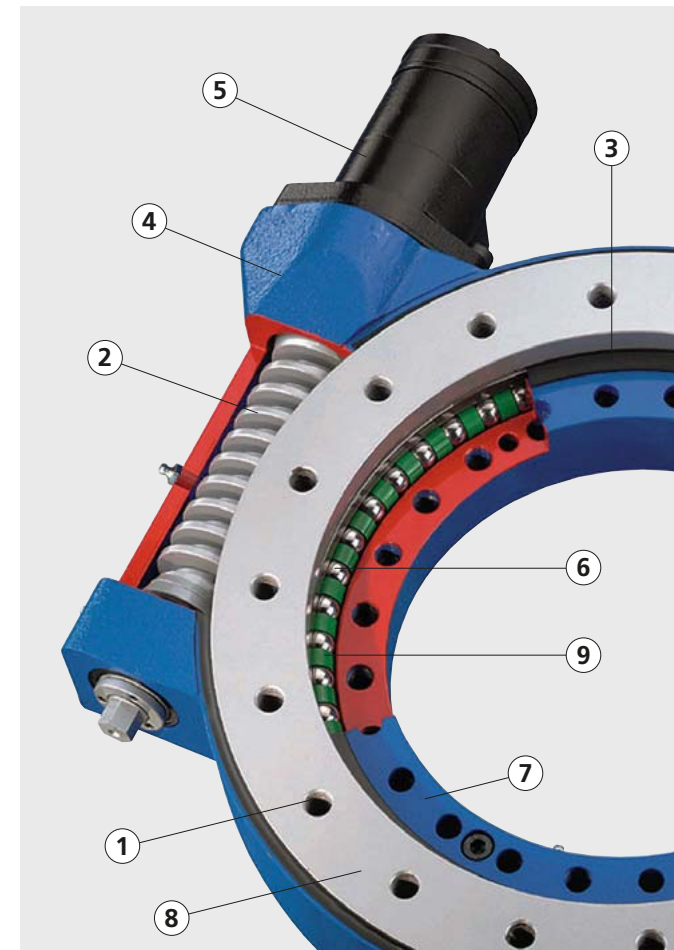
B_h	h	Basic rating life in operating hours	M_k	kNm	Equivalent tilting moment including all occurring impact loads and required safety factors, calculated from all axial and radial forces that cause the tilting effect
C_{ax}	kN	Basic axial dynamic load rating	M_{kD}	kNm	Equivalent tilting moment including radial load and application service factor for determining the load point in the limiting load diagram
C_{rad}	kN	Basic radial dynamic load rating	M_W	Nm	Friction torque of the Slew Drive under operating load in the installed state
$C_{0 ax}$	kN	Basic axial static load rating	M_{WA}	Nm	Friction torque of the Slew Drive, unloaded
$C_{0 rad}$	kN	Basic radial static load rating	n	rpm	Operating speed of Slew Ring
D_L	mm	Raceway diameter (see Product Overview P. 4/5)	n_{perm}	rpm	Permissible operating speed of Slew Ring
ED_B	%	Duty	n_b	—	Number of fastening holes per bearing ring
$ED_B \cdot$	%/min	Duty per minute	SF1	—	Series SP: Safety factor against tooth base fatigue Series WD: Safety factor against tooth wear
$ED_{max} \cdot$	%/min	Maximum permissible duty of rotation per minute (see diagram series description)	SFS 1	—	Series WD: Safety factor against tooth fracture
f_a	—	Application service factor	SFS 1.75	—	Series SP: Safety factor against static tooth base fracture
f_{Md}	—	Ratio of operating torque to maximum torque	S_w	—	Calculation safety factor 1.3 for wear diagram
F_{ax}	kN	Equivalent axial load including all occurring shock loads and required safety factors, calculated from all axial forces	Q	l/min	Oil flow
F_{axD}	kN	Equivalent axial load including application service factor for determining the load point in the limiting load diagram	z_1	—	Number of teeth, pinion
F_{rad}	kN	Equivalent radial load including all occurring shock loads and required safety factors, calculated from all radial forces; the effective gearing circumferential force has to be considered	z_2	—	Number of teeth, Slew Ring
$F_{rad max}$	kN	Limit value for checking frictional contact	α_A	—	Bolt tightening factor
F_{sp}	kN	Initial preload on bolt	Δp	bar	Pressure differential
G_w	h	Limit value	δ_k	mm	Tilting clearance increase
i	—	Gear ratio	$\delta_{k perm}$	mm	Maximum permissible tilting clearance increase
m	mm	Module	δ_p	mm	Maximum permissible flatness deviation
M_A	Nm	Tightening torque for mounting bolts	δ_v	mm	Maximum permissible deformation of mounting structure
M_{dB}	Nm	Operating torque	δ_w	mm	Maximum permissible perpendicularity deviation
$M_{d nom}$	Nm	Nominal torque			
$M_{d max}$	Nm	Maximum torque			
M_h	Nm	Maximum holding torque			

General

Function of Slew Drive

Slew drives comprise a highly robust Slew Ring provided with gear teeth (1), one or several toothed drive elements (2), a worm gear in this case, seal (3), housing (4) and a hydraulic or an electric drive (5). Slew Drives are designed for grease lubrication.

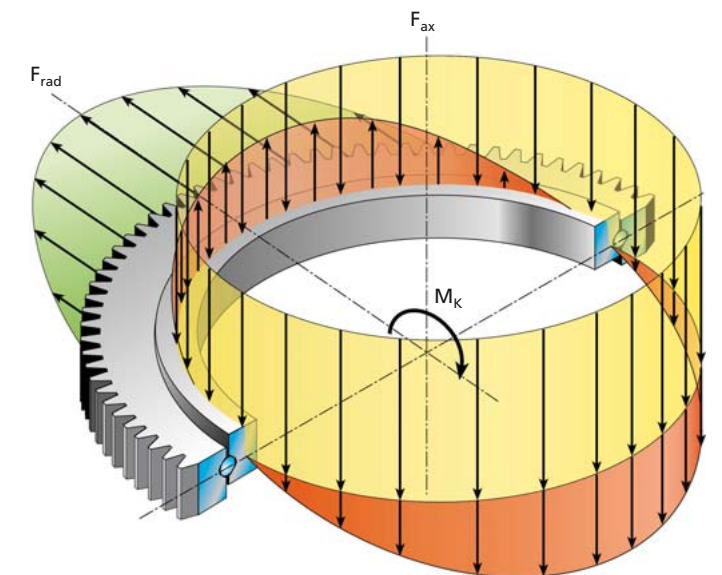
In a Slew Drive the rolling elements (6) carry the load between the inner ring (7) and outer ring (8). The raceway system's capacity is determined predominantly by Slew Ring design, the depth of hardening and the number and size of the rolling elements. Spacers (9) separate the rolling elements and minimise friction and wear.



Load distribution

Depending on external load, the load distribution contact and the angle around the rolling elements will vary.

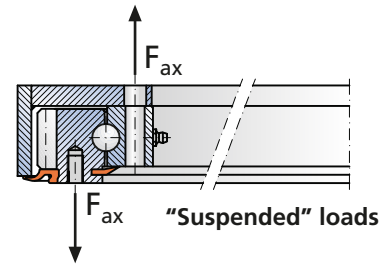
- In the case of axial load, all rolling elements are loaded in the same direction.
- In the case of radial load, a segment of the rolling elements carries the load.
- In the case of tilting moment load, a segment on one side and a segment on the opposite side carry the load.
- Mostly, a combination of axial, radial and tilting moment loads occur.



Technical Information

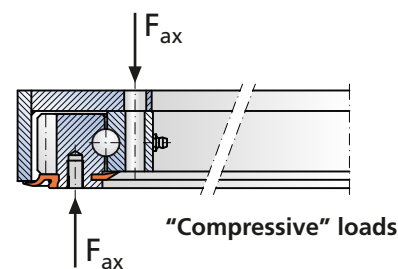
- Axial loads can be “compressive” or “suspended”.
- A “suspended” axial load and the load on a rising segment in tilting moments must be adequately resisted by mounting bolts.

Caution: Catalog bolt data is not valid in this case!



- Radial loads must be transmitted by means of frictional contact between Slew Drive and the attached structure.
- A good bolt connection is vital for satisfactory function of the Slew Drive. Bolt connection and tilting clearance of a Slew Drive must be checked regularly.

All catalog bolt data is valid only for “compressive” loads!



Gear

Slew Drives of series WD are designed with worm gear. Slew Drives of series SP are designed with spur gear. Permissible torque is specified in the Technical Information section.

Drive

Drive is provided by either an attached hydraulic or electric motor. Both motor mountings as well as the shaft/hub connection conform to industrial standards, hence hydraulic motors available on the market can be mounted without difficulty. For electric motors, corresponding adapter pieces are necessary. The design specification for drive motors is undertaken by IMO, based upon rotational speed and torque information provided by the customer.

Housing

Housing is designed as a welded or cast component and adapted to the size of the Slew Drive. As a standard feature, housings are supplied with a priming paint.

Sealing

Polymer seals protect the Slew Drive from normal dirt penetration, dust and light sprayed water. For very dirty and wet environments, the seals shall be protected with pre-mounted labyrinth seals on the mounting structure. Performance and reliability of a Slew Drive depend strongly on avoiding ingress of contaminants to the interior of the unit.

Pressure washing must not be used to clean Slew Drives.

Operating temperature

Standard version IMO Slew Drives can be used in ambient temperatures from -20°C up to $+70^{\circ}\text{C}$.

Selection criteria

The following criteria must be considered for the correct selection of a Slew Drive.

Position of the output shaft

Vertical: Slew Drives of all series can be used (even with a self-locking gear).

Horizontal: Slew Drives of all series can be used with exception of series WD-H. Here, it is necessary to use a Slew Drive with a 2-start gear, since using gear with self-locking and external driving force does not ensure smooth (jerk free) operation.

Alternating: Slew Drives provided with self-locking gear cannot be used. Using a Slew Drive of series WD-H with 1-start gear without self-locking is possible only up to 10° inclination angle to the vertical, otherwise smooth operation cannot be guaranteed.

Slew Drives that are not self-locking can, as an option, be equipped with a locking brake, if required.

Loads

External forces such as axial load, radial load and tilting moment must lie below the static limiting load curve, as regards their operating load point. For this, please refer to the chapters “Static capacity of raceway” and “Mounting bolts”.

Shocks, vibrations

To account for the peculiarities of different applications, the shock factors for gears should be considered. Slew Drives of the series WD are not suitable for applications under permanent vibration.

Back load

Keep in mind that in the case of series WD Slew Drives, due to the high gear ratio, that in the case of back load (e.g. caused by boom impacting on obstacle), there is danger of irreparable damage to the worm gearbox, so long as the driving torque exceeds the maximum permissible table values $M_{d\ max}$.

Torque

The operating torque may not exceed the maximum torque specified in the Technical Data section, calculated with application service factor 1. Explanations of different torque specifications are as follows:

Series SP:

Maximum torque $M_{d\ max}$:

Slew Drive series SP-H, SP-M: Maximum torque is limited by maximum radial load of the planetary gear-set used.

Slew Drive series SP-L, SP-I:

The maximum torque is calculated with a safety factor against static tooth base fracture SFS 1.75.

Nominal torque $M_{d\ nom}$:

The nominal torque is calculated with a safety factor against tooth base fatigue SF1, at the rotational output speed specified in the Technical Data section, under one-way varying load.

Series WD:

Maximum torque $M_{d\ max}$:

The calculation of the maximum torque with a safety factor against tooth fracture SFS 1 is done according to G. Niemann / H. Winter, Machine Elements, Band III, 1986, for worm gears and is influenced by:

- Limiting value of tooth base stress
- Module
- Gearing width

Nominal torque $M_{d\ nom}$:

The nominal torque is calculated with a safety factor against tooth wear of SF1,

- at the output speed specified in the table
- for a calculated service life of 10000 h
- at a duty of 5%

For Slew Drives with two motors, the specified values are valid for a slewing angle of $\leq 170^{\circ}$.

Series SP and WD:

Maximum holding torque M_h :

The maximum holding torque determines which retroactive torque can be transmitted or held without damage being caused to the gearing. In general, the value of the maximum torque is assumed.

Rotational speed

Slew Drive series SP:

The maximum permissible speed is $n_{perm} = \frac{40000}{D_L}$

Slew Drive series WD:

The maximum permissible speed is specified in the Technical Data section. For higher speeds, our Engineering Department should be consulted.

Duty

Slew Drive series WDs are designed for intermittent duty. Application with continuous running or with higher rate of duty and simultaneously high output torque are not permissible. This would lead to unacceptable temperature increase in the gearing and thus to premature failure of the Slew Drive. Transmission of the maximum torque is to be limited to 10% of each minute. Please check the diagram for the maximum permissible duty per minute of the respective series on P. 53 and P. 63.

Static capacity of raceway

Static capacity of the Slew Drive is determined by:

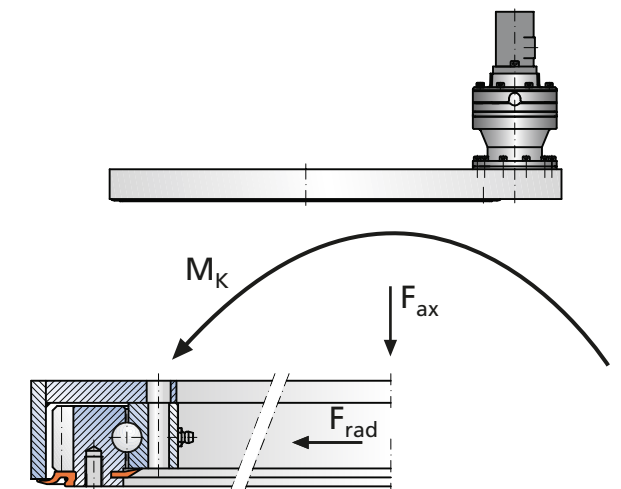
- Hardening depth of the raceway
- Number and size of the rolling elements
- Slewing Ring design
- Raceway geometry

The limiting load diagram shows permissible axial and tilting moment loads for a respective size unit.

Every loading case including the required or recommended safety must lie below the limiting load line.

Limiting load diagrams are valid under the following condition:

- Static loading
- Limiting load line with safety 1
- Clamping length of bolts, minimum 5-times, maximum 10-times the bolt diameter
- Continuous threads up to the bolt head is not permissible
- Bolts of quality class 10.9
- All mounting holes used
- “Compressive” load
- Adequately stiff and level mounting structure (see chapter “Installation and Maintenance Instructions” on P. 46 - 51)
- Minimum strength of the mounting structure $500\ \text{N/mm}^2$
- Radial loading considered as specified
- Compliance with “Installation and Maintenance Instructions”



Technical Information

To address the peculiarities of different applications, the following application service factors are to be considered in the prevailing loads:

Application	Application service factor f_a	Remark
Construction machinery	1.25	Normal operation
Forestry machinery	1.50	Rough operation
Foundries	1.75	Rough operation
Manlift platforms	1.30	Normal operation
Mech. engineering, general	1.25	Normal operation
Mech. engineering, general	1.50	Heavy operation
Measuring technique	2.00	Accuracy
Robot / mech. handling sys.	1.50	Accuracy
Rail vehicles	1.50	Rough operation
Special vehicles	1.50	Rough operation
Deep mining	1.75	Rough operation
Machine tools	1.50	Accuracy

Application service factors are to be considered in the following equations for the prevailing loads:

$$F_{axD} = F_{ax} \cdot f_a$$

$$M_{kD} = (M_k + 1.73 \cdot F_{rad} \cdot \frac{D_L}{1000}) \cdot f_a$$

To account for the prevailing radial load, the tilting moment is increased accordingly.

This equation applies only if:

$$F_{rad} \leq 220 \cdot \frac{M_k}{1000} + 0.5 \cdot F_{ax}$$

Should the value be exceeded, the limiting load diagram no longer applies.

Please contact our Engineering Department.

Calculation example:

Application: Slewing equipment for a construction machine under normal operation

Load:	Axial load	55 kN
	Radial load	6 kN
	Tilting moment load	86 kNm

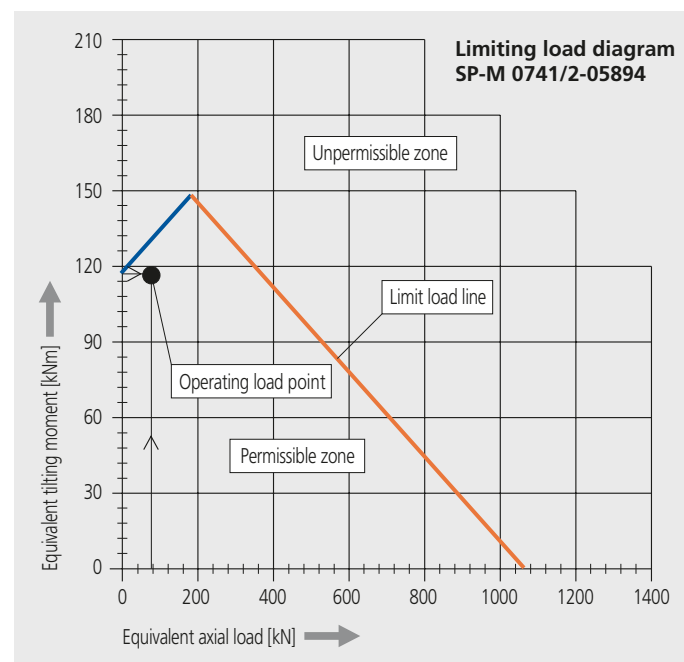
Slew Drive: pre-selected SP-M 0741/2-05894

The following values are achieved with an application service factor of 1.25:

$$F_{axD} = 55 \cdot 1.25 = 68.75 \text{ kN}$$

$$M_{kD} = (86 + 1.73 \cdot 6 \cdot \frac{741}{1000}) \cdot 1.25 = 117.11 \text{ kNm}$$

At this point it can be verified in the limiting load diagram, whether or not the pre-selected Slew Drive is statically adequate.



If the operating load point lies below the limiting load line then the Slew Drive is statically adequately dimensioned. If loads frequently occur during the slewing process, the selected type should be reevaluated dynamically for lifespan. For this, please contact our Engineering Department.

Mounting bolts

Prevailing loads must be safely transmitted. To ensure this, mounting bolts should be sized to handle the raceway loading. The bolt curve is depicted in the static limiting load diagram, subject to the following conditions:

- Quote the fulfillment of the conditions in the case of considering the static load Slew Drive capacity of the raceway.
- Bolts are appropriately tightened with a torque wrench (bolt tightening factor $\alpha_A = 1.6$). For tightening torques, see table P. 48
- For Slew Drives with through holes, use the largest possible metric bolts with regular threads.

Caution: In the case of "suspended" loads, the bolts are subject to additional tensional forces.

Please contact our Engineering Department.

Static load carrying capacity of mounting bolts

Determining the operation load level, both with and without radial load, occurs along with the verification of the static load carrying capacity of the raceway.

If the prevailing load case lies below the limiting load line in the static limiting load diagram then the bolt connection is statically adequately dimensioned.

Dynamic load Slew Drive capacity of mounting bolts

Mostly, static dimensioning of a mounting bolt is sufficient. In cases where very high numbers of stress reversals act on the Slew Drive, dynamic verification is necessary. For this, please contact our Engineering Department.

Pressure lock of mounting bolts

When radial loads act on the Slew Drive, it must be ensured that these loads can be transmitted without shearing forces occurring inside the bolts. Therefore, it must be determined whether the radial load can be transmitted via frictional contact between the mounting structure and the Slew Drive.

$$F_{rad \max} = \frac{n_b \cdot F_{sp}}{18.8}$$

n_b = number of fixing holes per ring

F_{sp} = pre-stressing force on a mounting bolt

If the prevailing radial load exceeds the limit value, we request that you contact our Engineering Department.

For Slew Drives with a different number or size of bolts in the inner and outer ring, the permissible radial load is to be determined for both rings. The smaller value is the limiting value. Frictional contact prevails if $F_{rad \max}$ is greater than the prevailing radial load.

Slew Drives, series WD-H, are basically to be centralized.

Securing the mounting bolts

When a customer desires that the mounting bolts be secured, we recommend the following products (manufacturer specification is valid):

Loctite®

Application of Loctite 270 is suitable for the highest level of connections. This prevents loosening and the threads are also sealed.

Nord lock®

Nord lock, self-locking washers, are recommended for cases of vibration or dynamic loading cycles. Due to a pair of square tapered washers with tapered surface gradients between both Nord-lock securing washers greater than the gradient of the bolt threads, any loosening tendency of the bolt is immediately prevented.

Other bolt securing systems are not recommended.

Friction torque

The friction torque in Slew Drives depends upon many influence factors, e.g.:

- Rigidity and flatness of the mounting structure
- Load and loading combination
- Rotational speed and operating temperature
- Design of Slew Drive
- Number and frictional torque of seals
- Lubrication grease and level of filling
- Manufacturing tolerances
- Other factors

The friction torque of an unloaded Slew Drive can be determined approximately with the following equations:

Slew Drive series SP, with minimum Slew Drive clearance greater than zero

$$M_{wA} = 0.2 \cdot \frac{D_L^2}{2000}$$

Slew Drive series WD-L, with preloaded Slew Drive

$$M_{wA} = 2.0 \cdot \frac{D_L^2}{2000}$$

Slew Drive series WD-H, with preloaded Slew Drive

$$M_{wA} = 4.0 \cdot \frac{D_L^2}{2000}$$

The friction torque for a Slew Drive under load can be determined with the following equation, approximately:

$$M_w = 0.005 \cdot (4400 \cdot M_k + 4 \cdot D_L \cdot F_{rad} + D_L \cdot F_{ax}) + M_{wA}$$

Gear

Slew Drive series SP

Type of gear

Slew Drives series SP are provided with spur gear according to DIN 3960, DIN 3962 and DIN 3967.

If higher torque is necessary or longer operating lifespan is required, it is possible to manufacture the gear in tempered or hardened form.

Permissible torque

Corresponding data is available in the Technical Information section.

Drive pinion

The pinions used in different sizes are provided with hardened gear. In the Technical Data section you will find data about transmission ratios and numbers of teeth.

For the direct drive (SP-L, SP-I), the drive pinion is equipped with a radial bearing that is integrated in the motor flange.

In the case of Slew Drives equipped with planetary transmission, the drive pinion is mounted via the planetary transmission.

Technical Information

Tooth backlash

Tooth backlash is factory-set at the highest point of the gear. It depends on the module of the gear and is calculated according to the following formula:

Tooth backlash to be set = 0.03 to 0.04 • module

Slew Drive series WD

Design of the gear

Slew Drive series WD is designed with a hardened worm gear according to DIN 3960, DIN 3962 and DIN 3967,

Permissible torque

Corresponding data is provided in the published Technical Information section.

Worm shaft

Worm shafts are made of hardened steel, with ground tooth flanks.

Tooth backlash

The tooth backlash is set at approx. 0.3 mm for Slew Drive series WD.

Self-locking

Series SP Slew Drives

Series SP Slew Drives are not self-locking.

Series WD Slew Drives

Self-locking only exists in the case of series WD Slew Drives if it cannot be driven from the output side. Self-locking is directly related to the efficiency of the Slew Drive, which depends on very many factors, e.g.

- Lead angle
- Angle of friction
- Rotation speed
- Lubrication
- Material matching
- Surface finish, etc.

Theory indicates self-locking occurs if the gear efficiency is < 50%. Data in the Technical Data section conforms to this statement. However, it is vital to determine the actual existence of the self-locking characteristics in the supplied Slew Drive individually during actual usage.

We take no responsibility for conformity of the theoretical data in the Technical Data section with the practically prevailing self-locking or non-self-locking characteristics.

Shock coefficient

As for the applications in which impact is expected, the appropriate impact coefficients must be considered when determining the Slew Drives' maximum torque rating.

Lifespan

The expected lifespan of the gear depends on the operating conditions. The following factors are key:

- Torque
- Output speed
- Duty factor
- Ambient temperature, etc.

Lubrication

To ensure flawless operation and long usable life, adequate and regular lubrication is necessary. The grease fulfills the following functions:

For the raceway:

- Reduction of friction and wear in the rolling contacts
- Corrosion protection
- Lubrication of seals
- Additional sealing effect of the grease "collar"

For the gears:

- Smooth running
- Less wear
- Reduced operation noise
- Longer operating life
- Less heat development

Initial greasing

IMO Slew Drives are supplied pre-lubricated. High-quality lithium-complex grease, based on mineral oil, with EP-additives according to DIN 51825, KP2P-20 is the standard lubrication.

Regreasing intervals

Regreasing must be done at regular intervals, depending on frequency of use and ambient operating conditions. General attention must be paid to ensure that the grease used during the greasing is compatible with the sealing material. Special attention should be paid to ensure that lubricating grease types originally specified are used throughout the life of the unit.

Should you wish to use other types of grease, it must be verified whether the grease is compatible with that used for initial greasing. Please contact your grease manufacturer.

Please observe also the data in the "Installation and Maintenance Instructions" chapter.

Beside regular regreasing during operation, it is also necessary to grease the Slew Drive after long standstill periods. Equally important is to grease the equipment in which the Slew Drive is integrated after cleaning.

ATTENTION:

Slew Drives must not be cleaned with pressure washing equipment. During pressure washing, large amounts of pressurized water can penetrate into the Slew Drive through the sealing gap and cannot be removed, even by massive re-greasing. This will strongly reduce the usable lifespan of a Slew Drive.

Mixing greases

Grease with different thickener and base oil should generally not be mixed. The manufacturer should always confirm if different grease types can be mixed.

Shelf life of lubricants

Lubricants are subject to ageing even if unused. If after 3 years grease is not yet used, it should be replaced.

Design of mounting structure

Safe transmission of application loads and reliable operation of Slew Drives is achieved, along with other factors, through using adequately designed mounting structures.

To ensure safe operation of Slew Drives, there are certain minimum requirements to the mounting structure.

- Sufficient rigidity (see "Installation and Maintenance Instructions")
- Maintain flatness according to "Installation and Maintenance Instructions"
- No hard points (e.g. through cross beams)
- Surfaces for bolts must be machined plane
- Hollow mounting structure is preferred
- Use all mounting bolts
- Bolts of recommended strength should be used
- Minimum strength of attached structure 500 N/mm²

Very different mounting structure solutions can be used, depending upon maximum load and application.

If hollow mounting structure is designated for attached structure, flange thickness should be at least 50 % of Slew Drive's overall height. The thickness of the hollow mounting structure should be about 30% of flange thickness. For weight-critical applications, flange thickness can only be reduced if appropriate stiffening ribs are provided and the specifications on permissible flatness and perpendicularity deviations and deformation under load are upheld. Values on this are specified in the "Installation and Maintenance Instructions" P. 46 - 51.

A few simple steps for selecting a Slew Drive

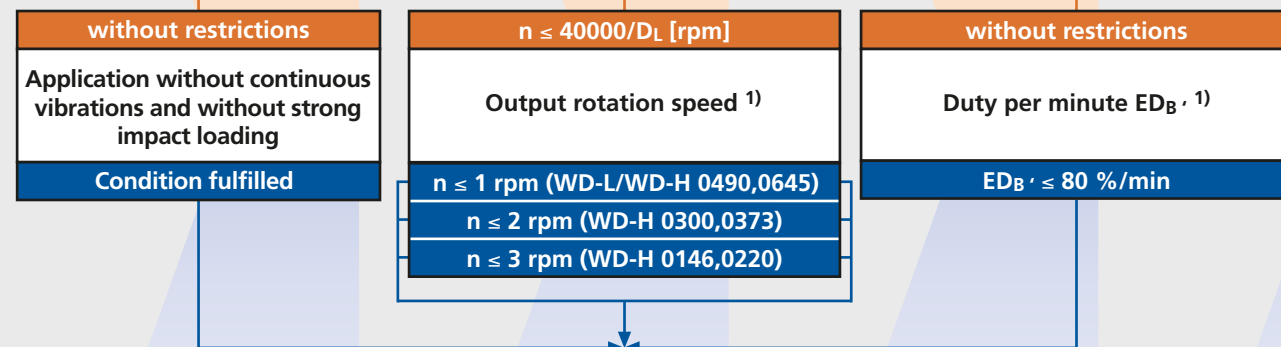
You will find a detailed procedure on the following pages!



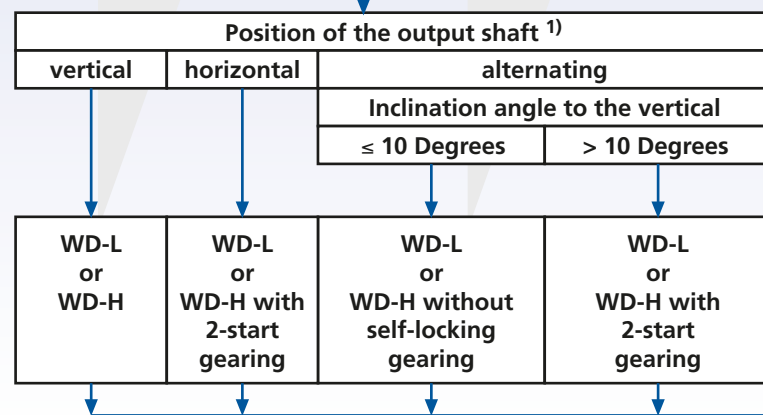
Spur gear driven type SP Series



START

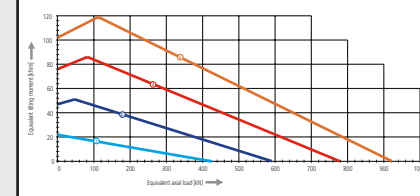


Worm gear driven type WD Series

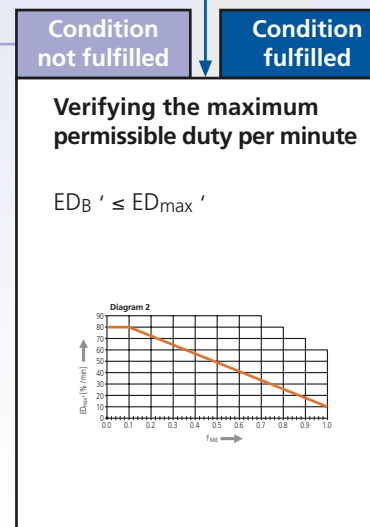
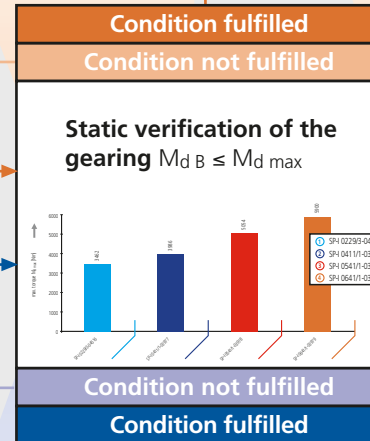
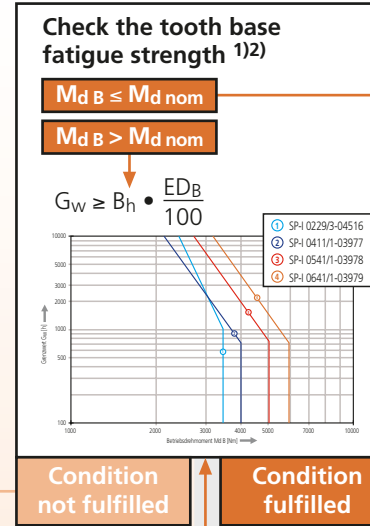


Selecting Slew Drive with larger maximum torque M_d max

Selecting a Slew Drive using the limiting load diagram ¹⁾²⁾
Operating point must lie below the selected curve.



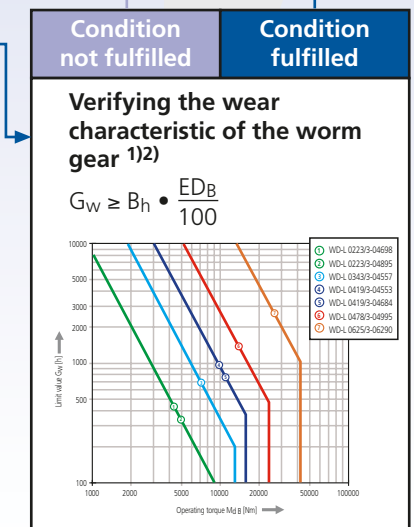
Selecting Slew Drive with a larger maximum torque M_d max



Verifying the selected Slew Drive by IMO Engineering Department

Please fill out an Application Data Sheet and supply a sketch of the application.

SOLUTION



1) Selection criteria can be used only as rough typical values; if limit value is exceeded, please contact IMO.
 2) Please accurately consider operating conditions.

Technical Information

Procedure for selecting a Slew Drive in only 5 steps:

Pre-selecting a suitable Slew Drive is described using the following example:

Example:

Application: Steering gears for an in-house transport vehicle; rough operation; limited assembly space; "compressive" load.

Load data:

Axial load:	$F_{ax} = 100 \text{ kN}$
Radial load:	$F_{rad} = 35 \text{ kN}$
Tilting moment:	$M_k = 75 \text{ kNm}$
Operating torque:	$M_{dB} = 13200 \text{ Nm}$
Output speed:	$n = 1.0 \text{ rpm}$
Operating time:	$B_h = 14000 \text{ h}$
Duty:	$ED_B = 5 \%$

Rotation cycle description under operating torque:
 60° rotation in 10 seconds in clockwise direction
 60° rotation in 10 seconds in counter-clockwise direction
 Pause for 40 seconds
 Operation of Slew Drive per minute:
 20 seconds rotating – 40 seconds standing still
 → 0,333 minute, rotating per minute
 → Duty per minute:

$$ED_B = \frac{0,333}{\text{min.}} \cdot 100\% = \frac{33,3\%}{\text{min.}}$$

1. Step: Selecting a suitable design (WD or SP)

Comparing product characteristics

WD design:

- Exhibits high torque at low output speeds and transmits high tilting moments, axial and radial loads
- Attains highest capacity with smallest diameter configuration
- Flat design, due to tangentially located drives
- Provides high torque transmission (however, the duty must be taken into consideration)
- Self-locking and non-self-locking Slew Drives are available
- Non-self-locking Slew Drives can be equipped with locking brakes
- Consider the position of the output shaft when selecting the Slew Drive
- Not recommended in case of continuous vibrations and heavy impact loading

Typical application:

Manlift platforms, steering gears for undercarriages of cranes and heavy-duty vehicles, loading cranes, turntables, forklift rotators, mining equipment, etc.

SP design:

- Enables higher output rotary speeds
- Very narrow in size around the Slewing Ring, but the drive is broad in axial direction
- Offers a large, open internal diameter
- Very suitable for upper structures with larger radial diameters
- Basically not self-locking in design
- Can be equipped with locking brakes
- The position of output shaft is insignificant
- Preferred design for vibration and impact loading applications

Typical applications:

Handling and automation equipment, packaging machines, tool changers, grippers, construction machines, land and forestry machines, etc.

Typical selection:

Worm gear driven types have proven themselves as steering gears. Features such as high torque, low output rotary speed with smaller assembly height and diameter clearly speak for the application of WD design. The smallest assembly height of a worm gear driven Slew Drive is provided by the WD-L series.

2. Step: Selecting a suitable design size in the limiting load diagram for "compressive" load:

A suitable Slew Drive is selected iteratively. For a pre-selected Slew Drive, (e.g. WD-L 0478/3-04995), an operation load point is calculated depending on external loading, the application service factor and the raceway diameter D_L .

Loading is permissible for raceway and bolt connection, provided that the operating point lies below the limiting load line of a pre-selected Slew Drive.

If the operation load point lies above the corresponding limiting load line, a Slew Drive with higher power rating must be selected, for which the limiting load line lies above the current operation load point. For the newly selected size, the operation load point must be calculated again and the permissibility of the new operation load point must be verified against the limiting load line.

On the contrary, if the operating load point also lies below the limiting load line of a smaller size, then, for this size, permissibility of the newly calculated operating point can be verified within the limiting load diagram.

This iterative approach is repeated until an optimally suitable size is determined, by which the operation load point lies below the corresponding limiting load line.

The following conditions must be fulfilled:

- Preconditions for limiting load diagram apply.
- Equation $F_{rad} \leq 220 \cdot \frac{M_k}{1000} + 0.5 \cdot F_{ax}$ fulfilled

Example:

- Preconditions for the limiting load diagram apply
- Verifying the operating parameters:

$$F_{rad} \leq 220 \cdot \frac{M_k}{1000} + 0.5 \cdot F_{ax}$$

$$35 \leq 220 \cdot \frac{75}{1000} + 0.5 \cdot 100 = 66.5 \text{ (condition fulfilled)}$$

Calculation of the operation load point:

Application service factor $f_a = 1.5$ (special vehicles)

Raceway diameter for WD-L 0478/3-04995: $D_L = 478 \text{ mm}$ (see product program overview / compare P. 4 and P. 5)

$$F_{axD} = F_{ax} \cdot f_a$$

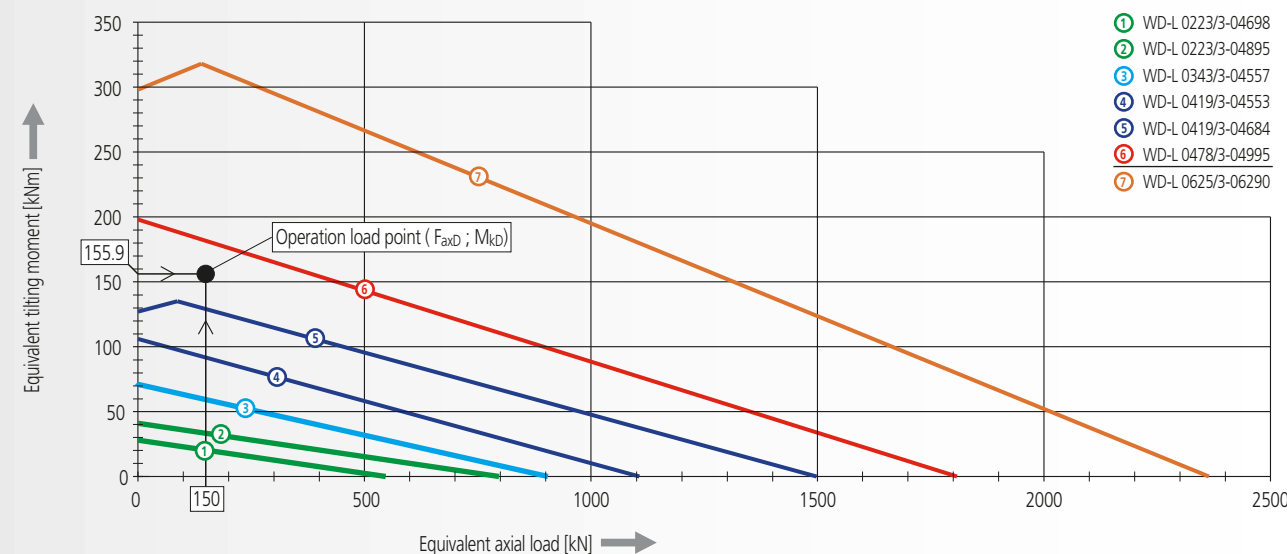
$$F_{axD} = 100 \text{ kN} \cdot 1.5 = 150 \text{ kN}$$

$$M_{kD} = (M_k + 1.73 \cdot F_{rad} \cdot \frac{D_L}{1000}) \cdot f_a$$

$$M_{kD} = (75 + 1.73 \cdot 35 \cdot \frac{478}{1000}) \cdot 1.5 = 155.9 \text{ kNm}$$

The operation load point lies below the limiting load line of the selected Slew Drive WD-L 0478/3-04995 and is permissible.

The operation load point of the selected Slew Drive lies above the limiting load line of the smaller size, which would not be permissible. A Slew Drive that is larger than the selected Slew Drive WD-L 0478/3-04995 would not be the best solution from the economic point of view.



Technical Information

Step 3: Static reliability verification of operation torque M_{dB} :

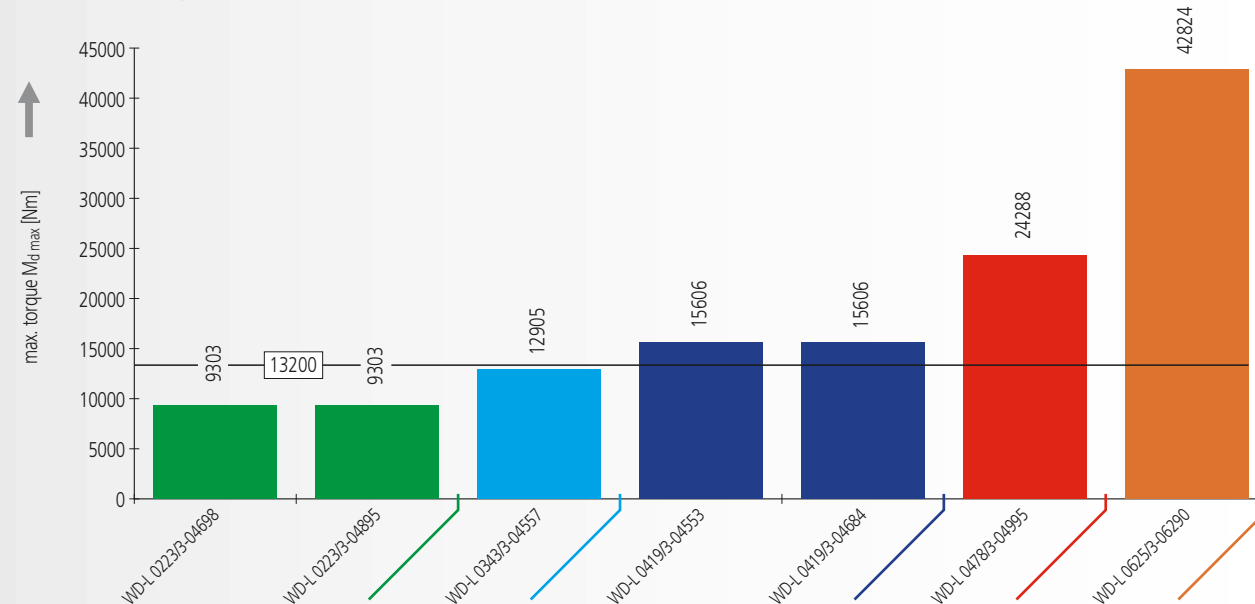
The following condition must be fulfilled:
Operating torque $M_{dB} \leq$ maximum torque $M_{d \max}$
(see series overview WD-L P. 52)

Example: $13200 \text{ Nm} \leq 24288 \text{ Nm}$ (condition fulfilled)

Slew Drives WD-L 0419/3-04553, WD-L 0419/3-04684, WD-L 0478/3-04995 and WD-L 0625/3-06290 can statically transmit the operating torque M_{dB} .

Since the operation load points of series WD-L 0419/3-04553 and WD-L 0419/3-04684 lie above their limiting load lines (cf. Step 2), the size WD-L 0478/3-04995 selected in Step 2 has to be selected. If the operating torque M_{dB} is greater than 24288 Nm, then WD-L 0625/3-06290 must be selected; in this example, however, WD-L 0625/3-06290 is not an economical solution.

Maximum torque $M_{d \max}$ of individual sizes



Step 4: Verifying the maximum permissible duty per minute ED_{\max} :

The following condition must be fulfilled:

- Preconditions for the diagram of maximum permissible duty per minute ED_{\max} apply (see series overview WD-L P. 53)

Duty per minute $ED_B \leq$ maximal permissible duty per minute ED_{\max}
(see series overview WD-L P. 53)

Example:

- Pre-conditions for the diagram of maximum permissible duty per minute ED_{\max} apply.

Verifying the condition: $ED_B \leq ED_{\max}$

Duty per minute $ED_B = 33.3 \text{ \% / min}$

Determining the maximum permissible duty per minute (see series overview WD-L P. 53)

$$\text{Factor } f_{Md} = \frac{M_{dB}}{M_{d \max}} = \frac{13200 \text{ Nm}}{24288 \text{ Nm}} = 0.543$$

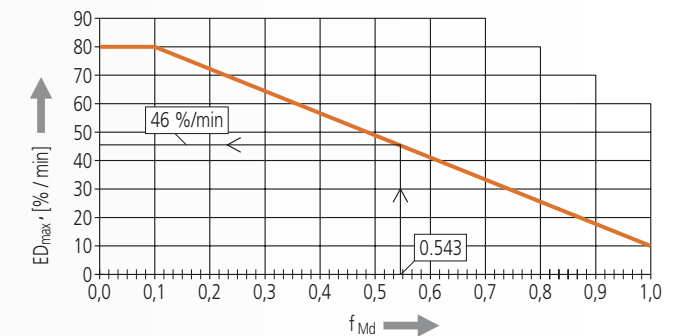
Maximum permissible duty per minute

$ED_{\max} = 46 \text{ \% / min}$

Verifying the condition: $ED_B \leq ED_{\max}$

$33.3 \text{ \% / min} \leq 46 \text{ \% / min} \rightarrow$ condition fulfilled

Duty per minute is permissible.



Step 5: Verifying wear characteristics of worm gear

The following condition must be fulfilled:

- Preconditions for wear diagram apply (see series overview WD-L P. 53)

$$\text{Limit value } G_w \geq \text{operation time } B_h \cdot \frac{\text{duty } ED_B}{100}$$

Example:

- Preconditions for wear diagram apply

$$\text{Verifying the condition: } G_w \geq B_h \cdot \frac{ED_B}{100}$$

Determining the limit value G_w at the operating torque M_{dB} from the diagram for the selected Slew Drive WD-L 0478/3-04995 (see series overview WD-L S. 53)

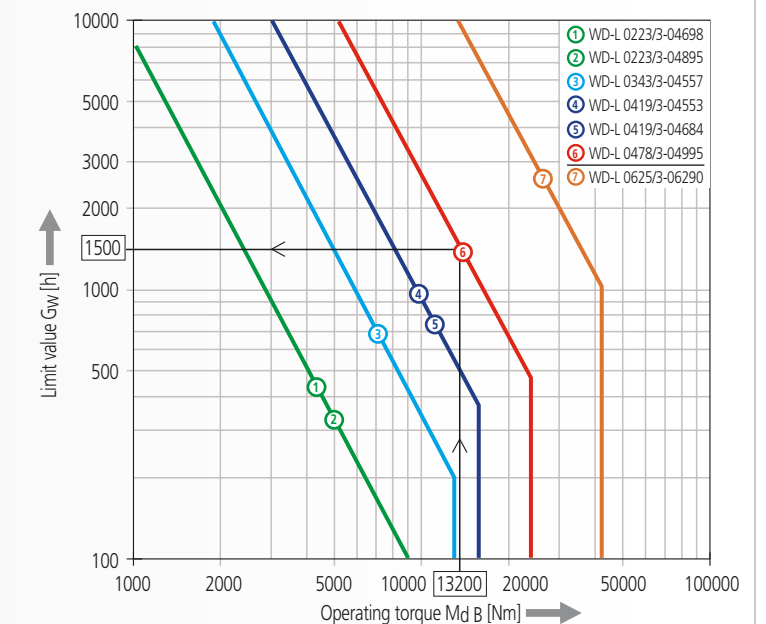
$$\text{Verifying the condition: } G_w \geq B_h \cdot \frac{ED_B}{100}$$

Limit value $G_w = 1500$ hours (from diagram)

$$B_h \cdot \frac{ED_B}{100} = 14000 \text{ hours} \cdot \frac{5 \text{ \%}}{100} = 700 \text{ hours}$$

$1500 \text{ hours} \geq 700 \text{ hours} \rightarrow$ condition fulfilled

Operation is permissible as regards wear characteristics.



Result:

- Verification as regards:
- Suitability of design
 - Load carrying capacity of raceway and bolt connection in the limiting load diagram
 - Permissibility of the operating torque
 - Maximum permissible duty per minute
 - Wear characteristic of worm gearing was considered and the Slew Drive WD-L 0478/3-04995 evaluated as applicable in all aspects.

Verification of the selected Slew Drive by IMO is recommended.

Please enclose Application Data Sheet and a sketch of the application (see P. 108 and P. 109).

Installation and Maintenance Instructions for Slew Drives (EW ST Rev. 5.02)

Preface

The following instructions give you the information you need to be able to correctly install and maintain an IMO Slew Drive.

These instructions replace earlier versions for series SP and WD. All instructions are provided with a revision number. Installation and maintenance instructions with previous revision numbers are invalid. The latest version is published on our homepage and can be downloaded from there (www.goimo.com). Please always check that you are working with the latest revision!

These instructions shall be attached to your product or to the final product or to the Installation and Maintenance Instructions. All work steps listed here are to be executed by suitably qualified personnel.

Please do not hesitate to contact our Engineering Department for any further assistance.

Contents

0. Transport, handling and storage provisions

0.1 Transport, handling and storage

1. Installation

- 1.1 Preparation for installation
 - 1.1.1 Cleaning the Slew Drive and the mounting structure
 - 1.1.2 Determining permissible deviations and/or deformation of mounting structure
 - 1.1.3 Lubricating or checking oil level
 - 1.1.4 Choice of mounting bolts
 - 1.1.5 Choice of tightening torques
- 1.2 Installing the Slew Drive
 - 1.2.1 Positioning the Slew Drive
 - 1.2.2 Securing the Slew Drive with bolts
 - 1.2.3 Determining the existing tilting clearance
 - 1.2.4 Operating test

2. Maintenance / safety checks and lubrication

- 2.1 Checking the mounting bolts
- 2.2 Checking the tilting clearance
- 2.3 Checking the rotational clearance of series WD
- 2.4 Relubrication or checking oil level
- 2.5 Relubrication intervals
- 2.6 Lubricants

IMO accepts no liability for:



1. Non-compliance with Installation and Maintenance Instructions.
2. Failure to pass on content to third party.

Notice

The following text includes special notices and procedures that shall be observed. Technical properties of Slew Drives are found in our product catalog or in the technical offer.

0. Transport, handling and storage provisions

0.1 Transport, handling and storage

Transport only in horizontal position. Impacts shall be avoided.

Wear work gloves when handling the Slew Drives.

Slew Drives are generally provided with threaded holes in which eye bolts can be fixed. This enables safe handling on a hoisting device. Please observe relevant legal regulations when doing this.

Store only in a horizontal position and in closed rooms. The surface corrosion protection holds for approx. 3 months in closed packaging. Longer storage periods require special protective measures.

1. Installation

1.1 Preparation for installation

1.1.1 Cleaning the Slew Drive and the mounting structure

1. Remove extraneous material from supporting surfaces (including paint residue, welding beads, burr formation)
2. Clean corrosion protection coating from supporting surfaces of the Slew Drive.

In doing this, ensure that:



- Cleaning material does not penetrate into the Slew Drive.
- Applicable provisions for cleaning media are observed (e.g. manufacturer provisions, protection of workers, environment protection).
- Cleaning material that attacks the sealing material is not used.

Applicable cleaning materials:
Cold solvents (e.g. white spirit, diesel oil, Kaltryl KEV etc.)

1.1.2 Determining permissible flatness deviation δ_p , perpendicularity deviation δ_w and the permissible deformation δ_v of the mounting surface of the supporting structure

Table 1: Permissible flatness including perpendicularity deviations for Slew Drives series WD-H

Size of Slew Drive	146	220	300	373	490	645
Flatness including perpendicularity deviation per supporting surface [mm]	0.06	0.06	0.07	0.07	0.08	0.09

Table 2: Permissible flatness including perpendicularity deviations for Slew Drives series WD-L and all SP

Raceway diameter [mm]	100	250	500	750	1000	1250
Flatness including perpendicularity deviation per supporting surface [mm]	0.04	0.06	0.08	0.09	0.10	0.11

Table 3: Permissible deformation of mounting structure under maximum load for Slew Drive series WD-H

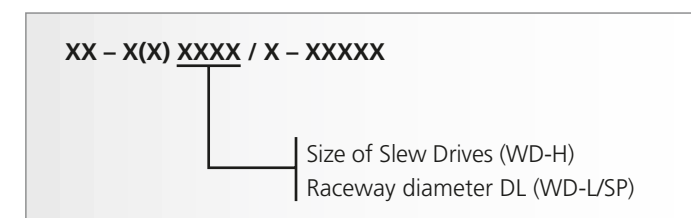
Size of Slew Drive	146	220	300	373	490	645
Deformation of mounting structure per support surface [mm]	0.10	0.11	0.12	0.13	0.15	0.16

Table 4: Permissible deformation of mounting structure under maximum load for Slew Drive series WD-L and all SP

Raceway diameter [mm]	100	250	500	750	1000	1250
Deformation of mounting structure per supporting surface [mm]	0.13	0.16	0.21	0.24	0.27	0.29

For Slew Drives between specified sizes, the closest smaller value shall be taken. For Slew Drives larger than type 645, the value for size 645 shall be used. For Slew Drives with a raceway diameter above 1250 mm, the value for 1250 mm shall be used.

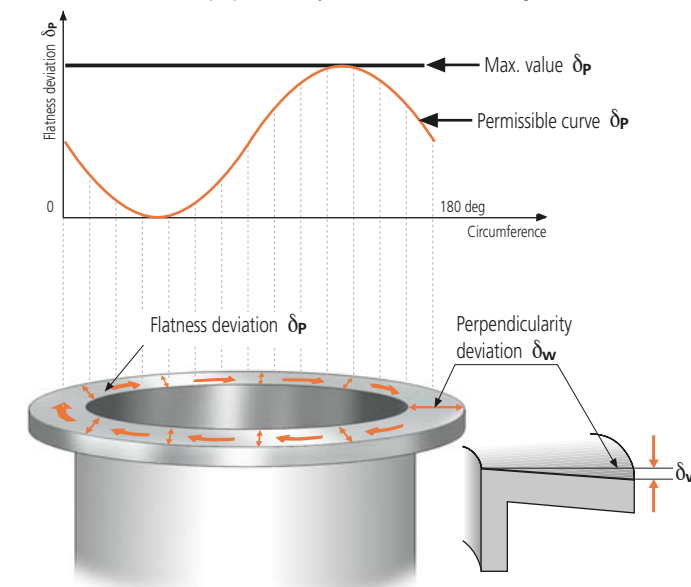
The size of Slew Drives (WD-H) or raceway diameter D_L (WD-L, SP) can be found on our Drawings.



Permissible perpendicularity deviation δ_w (tilting) is based on the actual flange width and may only amount to one half of the values in Table 1 and 2.

The maximum residual value for flatness deviation δ_p (waviness) along the circumference may total to only once per 180 deg. The form must resemble a sine curve that gradually rises and falls.


Sketch: Permissible curve of flatness deviation of the mounting structure and flatness and perpendicularity deviations on the mounting structure



Installation and Maintenance Instructions for Slew Drives (EW ST Rev. 5.02)

1.1.3 Lubricating the Slew Drive or checking oil level

Slew Drives are supplied fully lubricated. They shall be greased again prior to initial operation. It is essential to use the grease specified on the delivery drawing. Suitable grease types for normal cases are listed on Table 9.

-  1. Inject grease into the grease nipples one after the other while rotating the drive until a bead of fresh grease forms at least on one sealing lip.
- 2. For Slew Drives equipped with an intermediate device using gears (For example: Planetary gear), the oil level should be checked and refilled if necessary. For this see Installation and Maintenance Instructions of the intermediate transmission manufacturer.

1.1.4 Choice of mounting bolts

Prescribed sizes, number and quality grades shall be used.

- Grip ratio (grip length to diameter of bolt) shall be observed, from minimum ≥ 5 to maximum ≤ 10 .
- Bolts with a fully threaded shaft are not permissible.
- Slew Drive function, lifespan, and durability can be affected in case of non-compliance.
- When the permissible interfacial pressure is exceeded, use suitable washers of appropriate size and strength.
- Do not reuse bolts, nuts and washers.

Table 5: Permissible interfacial pressure for different materials

Materials	Max. surface pressure in N/mm ²
St52 / C45N / 46Cr2N	420
42CrMo4V	700

1.1.5 Choice of tightening torques

Mounting bolts are in normal cases adequately secured by correct preloading.

- Mounting bolts can be secured by Loctite. Nord-Lock bolt lock washers may be necessary in case of shock loading or vibration.
- Use of split rings, split washers, etc. is not permissible.

Table 6: Tightening torques for mounting bolts according to DIN13

Mounting bolt Dimension	Tightening torque $M_A^{(1)}$ in Nm bolt strength class			Mounting bolt Dimension	Tightening torque $M_A^{(1)}$ in Nm bolt strength class		
	8.8	10.9	12.9		8.8	10.9	12.9
M4	2.25	3.31	3.87	M16	168	246	288
M5	4.61	6.77	7.92	M18	229	336	394
M6	7.80	11.5	13.4	M20	327	481	562
M8	19.1	28.0	32.8	M22	450	661	773
M10	38.0	55.8	65.3	M24	565	830	972
M12	66.5	97.7	114	M27	837	1230	1439
M14	107	156	183	M30	1131	1661	1944

¹⁾ M_A according to VDI-guideline 2230 (February 2003) for $\mu_k=0.08$ and $\mu_v=0.12$


1.2 Installing the Slew Drive

1.2.1 Positioning the Slew Drive

1. Determine the main load-carrying zone.
2. For all Slew Drives except series WD-H, the soft spot of the bearing raceway shall be placed at a 90° point to the maximum load zone. The soft spot is designated with a filling plug or a punched "S" mark.
3. With a gauge, check whether the supporting surface of the Slew Drive is fully supported by the mounting structure.

1.2.2 Securing the Slew Drive with bolts


The Slew Drive shall be mounted in the unloaded condition. First the housing or toothless bearing ring is attached and then the worm wheel or the gear bearing ring.

-  The following procedure shall be followed in order to avoid deviations between bolt tightening forces.

1. Lightly lubricate bolt threads and head in order to ensure uniform frictional resistance (does not apply to bolts with adhesive).
2. Preload the bolts, including washers, if required, crosswise in 3 steps - 30%, 80%, 100% of the tightening torque.
3. Repeat the procedure for the worm wheel / bearing ring.

When applying a hydraulic fastening device, the tightening forces for preloading shall not exceed 90% of yield stress.

1.2.3 Determining the existing tilting clearance

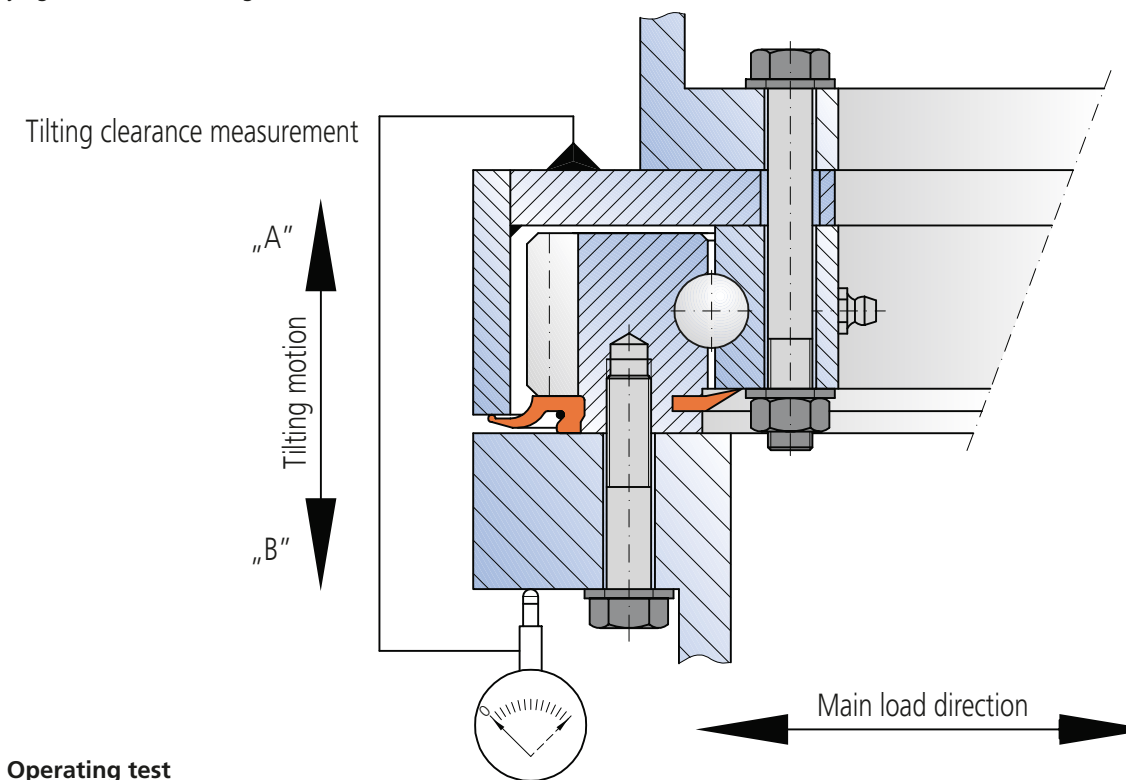
-  The tilting clearance increases with additional raceway wear. To determine the increase in tilting clearance, it is necessary to take basic measurements after installation prior to putting the drive into operation for the first time.

- Permanently designate the measuring point in the mainload direction.
- Record all measured values.

Procedure

1. Determine and mark the measuring point at the point of load, both on the housing as well as on the worm wheel or on the gear ring.
2. Fix the dial gauge – see sketch.
3. Apply the defined tilting torque, minimum of 50% of the maximum operational load in "A" direction.
4. Set the dial gauge on zero.
5. Apply the defined tilting torque, minimum of 50% of the maximum operational load in "B" direction.
6. The measured difference between "A" and "B" corresponds to the tilting clearance and serves as the basis for comparison for later inspections.

- All subsequent measurements are performed at the same measuring point, with the same loads, at the same position of the housing relative to the worm wheel or gear ring and in the same sequence.
- All the measured values are to be recorded.
- For purely axial or radial loads, tilting clearance is inspected by applying an additional tilting load.



1.2.4 Operating test


If the mounting bolts are properly tightened and the drive motor is correctly connected, then the Slew Drive shall rotate uniformly. Deviations of the mounting structure and the effect of extraneous loads can strongly impact the friction torque.

1. Rotate mounted Slew Drive several times.
2. Check whether Slew Drive runs smoothly without jumping.
3. Perform further test runs under full load.

After operating test, recheck the tightening torques of mounting bolts.

2. Maintenance / safety checks and lubrication

2.1 Checking mounting bolts

-  To compensate for possible settling, it is necessary to retighten the bolts to the prescribed torque. This shall be done without externally loading the bolts after the first 100 hours in operating. This inspection shall be repeated after every 700 hours in operation. The inspection period may be reduced under special operating conditions. In case of loose bolts, replace all bolts, nuts and washers with new ones.

Installation and Maintenance Instructions for Slew Drives (EW ST Rev. 5.02)

2.2 Checking the tilting clearance



Wear in the raceway system leads to increased tilting clearance. It is therefore necessary to check the clearance after 700 operating hours, or at the latest after 6 months.

Checking the increase in tilting clearance δ_k directly on a Slew Drive

For the procedure to check the increase in the tilting clearance, see P. 48 and P. 49. The value (m1) determined after installation of the Slew Drive is considered as the basic value and is deducted from the latest inspection value (mx). The difference between mx and m1 may not exceed 0.45 mm

$$\delta_k = mx - m1 \leq \delta_k \text{ perm}$$

$$\delta_k \text{ perm} = 0.45 \text{ mm}$$

Checking the increase in tilting clearance δ_k not directly on Slew Drive

Increase in tilting clearance is to be converted proportionally for each measurement (after the installation measurement) and compared with δ_k permissible.

For both checks:

- Reduce the inspection interval to 200 operating hours if the measured increase in tilting clearance amounts to approx. 75% of the maximum permissible increase in tilting clearance.
- Reduce the inspection interval once again after further increase in tilting clearance (to 50 – 100 operating hours).
- Replace the Slew Drive if the maximum permissible increase in tilting clearance is reached.

2.3 Checking the rotational clearance of series WD



Gear wear leads to increased rotational backlash. Therefore it is necessary to check the rotational backlash after 700 operating hours, at the latest after 6 months. The values specified in Table 7 for rotational backlash shall not be exceeded.

Procedure

1. Determine and permanently mark the measuring point in the main loading zone, both on the housing as well as on the worm wheel or on the gear ring.
2. Secure the Slew Drive against rotation.
3. Remove the drive to enable the worm wheel to be easily rotated by hand.

- For front-end-brake application (brake flanged between motor and Slew Drive), the brake shall be removed with the motor.
- For an application with a brake mounted to the Slew Drive, the brake shall be disengaged.
- For a Slew Drive with an attached permanent brake (series WD-L), the brake shall be removed.

4. Determine the rotational play of the worm shaft.
5. The established rotational play serves as the basis for comparison after later checks.

- All subsequent checks are performed at the same measuring point, at the same position on the housing and worm wheel or gear ring relative to another and in the same sequence.
- All measured values are to be recorded.

Table 7: Rotational play – limit values

Module of Slew Drive gearing	Rotational play – limit value	Module of Slew Drive gearing	Rotational play – limit value
3	34°	6	28°
4	32°	6 / 2 start	14°
4 / 2 start	16°	7	28°
4.5	31°	7 / 2 start	14°
5	30°	8	27°
5 / 2 start	15°	8 / 2 start	13.5°

The size of the module is listed on the unit name plate.

- Reduce the inspection intervals to 200 operating hours if the measured rotational play amounts to approx. 75% of the maximum permissible limit value.
- Reduce the inspection interval once again after further increase (to 50 – 100 operating hours).
- Replace the Slew Drive if the maximum permissible rotational play is reached.

2.4 Relubrication of Slew Drive or checking oil level / oil change



Grease types specified in the delivery drawing shall be used. Suitable substitute lubricants can be found in Table 9.

Legal and manufacturer provisions about handling the respective lubricants must be observed.

1. While rotating the Slew Drive, inject grease into all the cleaned grease nipples consecutively until a bead of fresh grease forms at least on one seal or at the bearing gap.
2. Ensure that old grease can flow out of the drive freely.
3. For Slew Drives equipped with an intermediate transmission device (ie - planetary gear), oil shall be changed according to manufacturer instructions.

2.5 Relubrication intervals



Relubrication intervals depend mainly on the prevailing work and environmental conditions as well as on the version of the Slew Drive. Exact relubrication intervals can only be determined by tests under actual operating conditions. Intermediate transmissions are filled with oil; prescribed maintenance intervals are found in the maintenance instruction of the respective manufacturer. In case no comparative results are available, the following table can be used for a reference value.

Table 8:

Work conditions	Grease-filled Slew Drive Lubrication intervals
Dry and clean workshop (rotary tables / robots, etc.)	every 300 hours of operation or once every 6 months
Difficult conditions in open grounds (crane / bulldozer, etc.)	every 200 hours of operation or once every 6 months
Aggressive climatic conditions sea/deserts/ Arctic climate/very dirty surrounding/more than 70 operating hours per week	every 150 hours of operation or once every 4 months
Extreme conditions (tunnelling machines/steel mills)	every 50 operating hours, at least, however, every 2 months

The specified values are valid for the following conditions:

- Operating temperature on Slew Drive < 70° C
- Circumferential velocity < 0,5 m/s for SP Slew Drives
- Driver rotational speed < 5 rpm for WD Slew Drives
- Low to medium loads

The table can never replace values established through experience; the most frequent cause of failure of Slew Drives is insufficient lubrication.

Slew Drives shall generally be relubricated:

- After every cleaning.
- Before and after long inactive periods, e.g. for cranes and construction machines during winter months.
- Cleaning a Slew Drive with steam jet or high-pressure cleaner is not permissible!

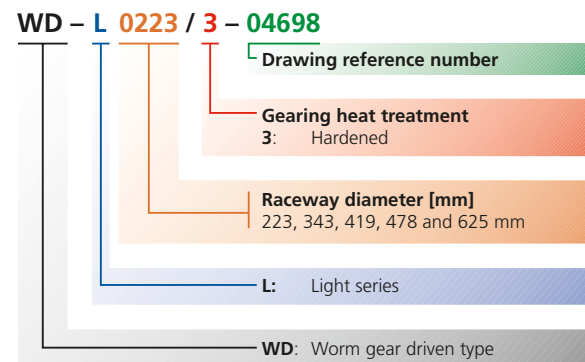


2.6 Lubricants

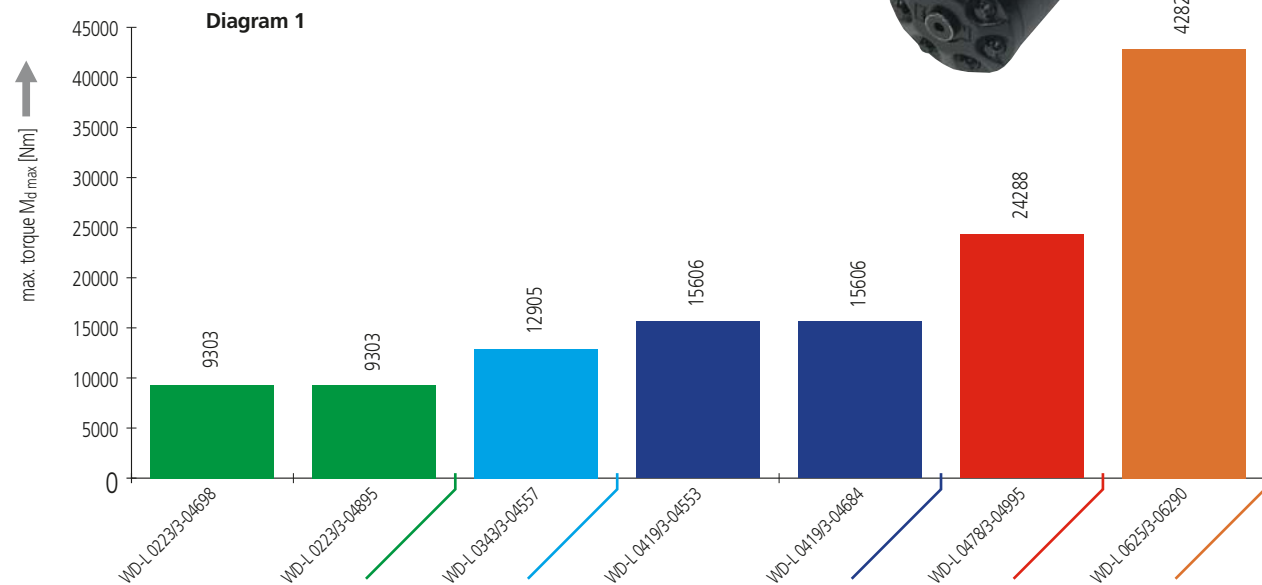
Table 9:

Supplier	Product name	Applicable temperature range in °C	
Avia	Avialith 2 EP	-30	+130
Bechem	High-Lub L 474-2	-20	+120
Bechem	Beruplex EP-O	-35	+150
Bechem	RHUS LT 2 EP	-25	+120
Castrol	Longtime PDO	-40	+140
Fuchs	Renolit Duraplex EP2	-30	+160
Rhenus	Norplex LKP2	-20	+150

Series Overview

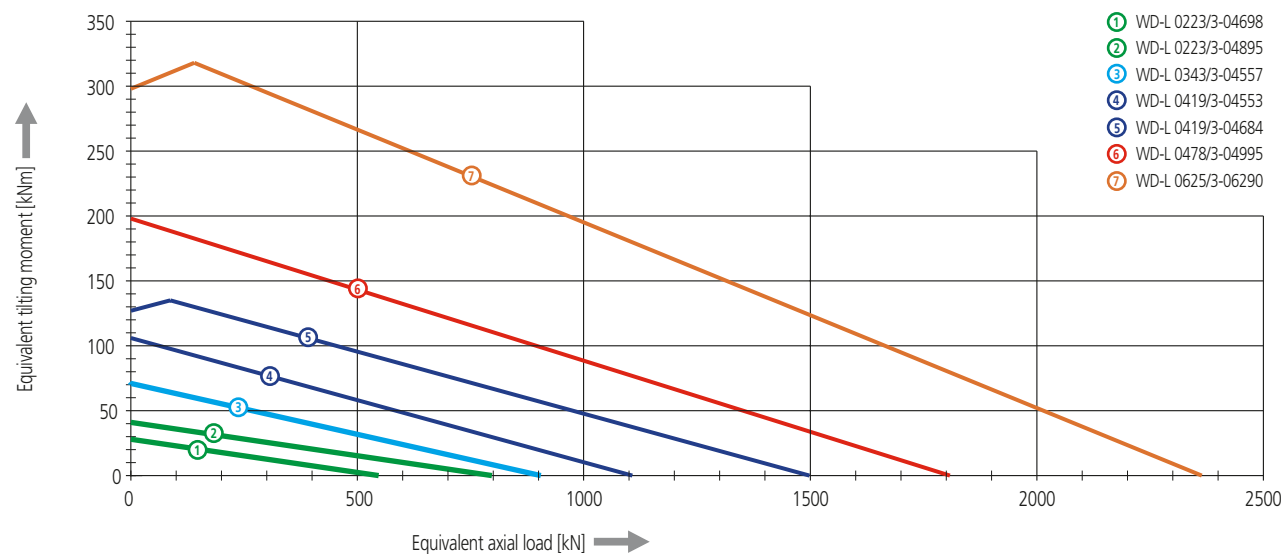


Maximum torque $M_{d \max}$ of individual sizes



Limiting load diagrams of individual sizes for "compressive" load

Please refer to the explanations in the Technical Information section of the catalog



Due to the high gear ratio and the large surface contact between worm and worm gear, very high torque values can be transmitted using very small sized Slew Drives (highest power density). Worm gear driven Slew Drives of the light series WD-L are short-cycle drives for rotation and swiveling applications. Use in continuous rotation applications is not permissible due to higher duty. The duty should be selected so that over-heating around the gearing contact cannot occur. Diagram 2 exhibits the maximum permissible duty per minute, depending upon operation torque. When this maximum permissible duty per minute ED_{\max} is exceeded, the permissibility must be checked by the IMO Engineering Department.

The following conditions apply when determining the maximum permissible duty per minute and when verifying the wear characteristic of worm gearing:

- Output speed: $n = 1.0$ rpm
- Wear safety factor of worm gearing: $S_W = 1.3$
- Observance of the maximum permissible duty ED_{\max} (see diagram 2)
- Ambient temperature 20°C

Determining the maximum permissible duty per minute ED_{\max} :

The maximum permissible duty per minute should never be exceeded

ED_{\max} : Maximum permissible duty per minute in percent per minute [% / min] (see diagram 2)

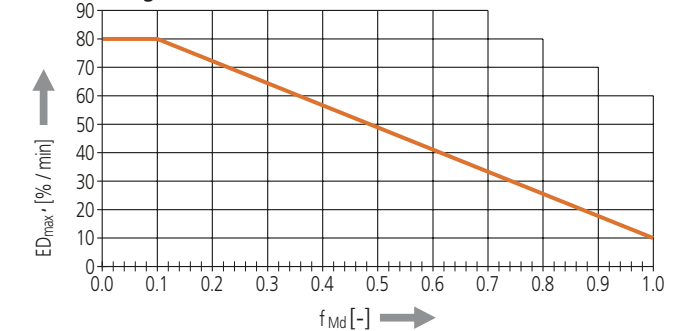
$$f_{Md} = M_{dB} / M_{d \max}$$

f_{Md} : Ratio of operating torque to maximum torque [-]

M_{dB} : Operating torque [Nm]

$M_{d \max}$: Maximum torque [Nm] (see diagram 1)

Diagram 2



Wear characteristics of the worm gearing:

G_w : Limit value [h] (see diagram 3)

B_h : Operation time [h]

The operation is permissible as regards wear characteristics, if the following relationship prevails:

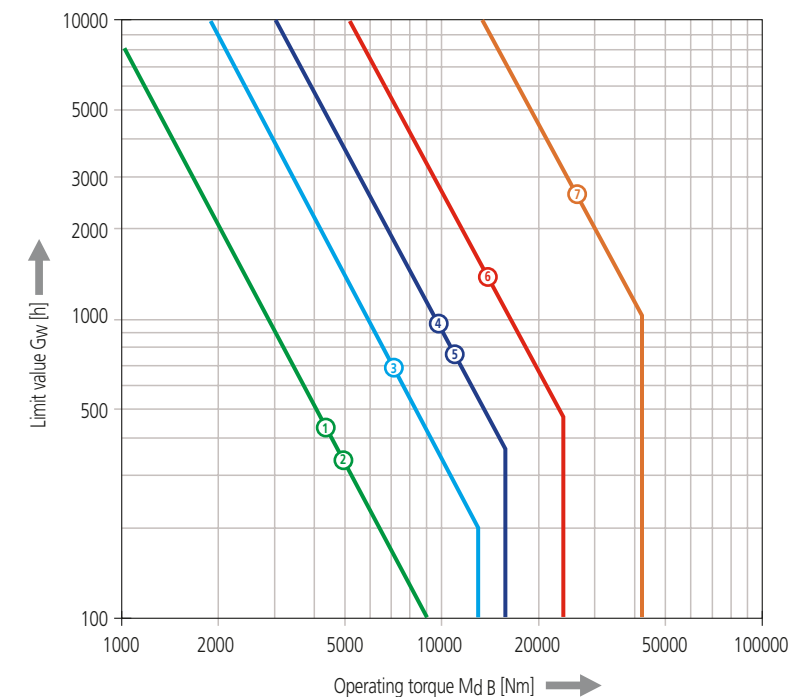
$$G_w \geq B_h \cdot \frac{ED_B}{100}$$

ED_B : Duty in operation [%]

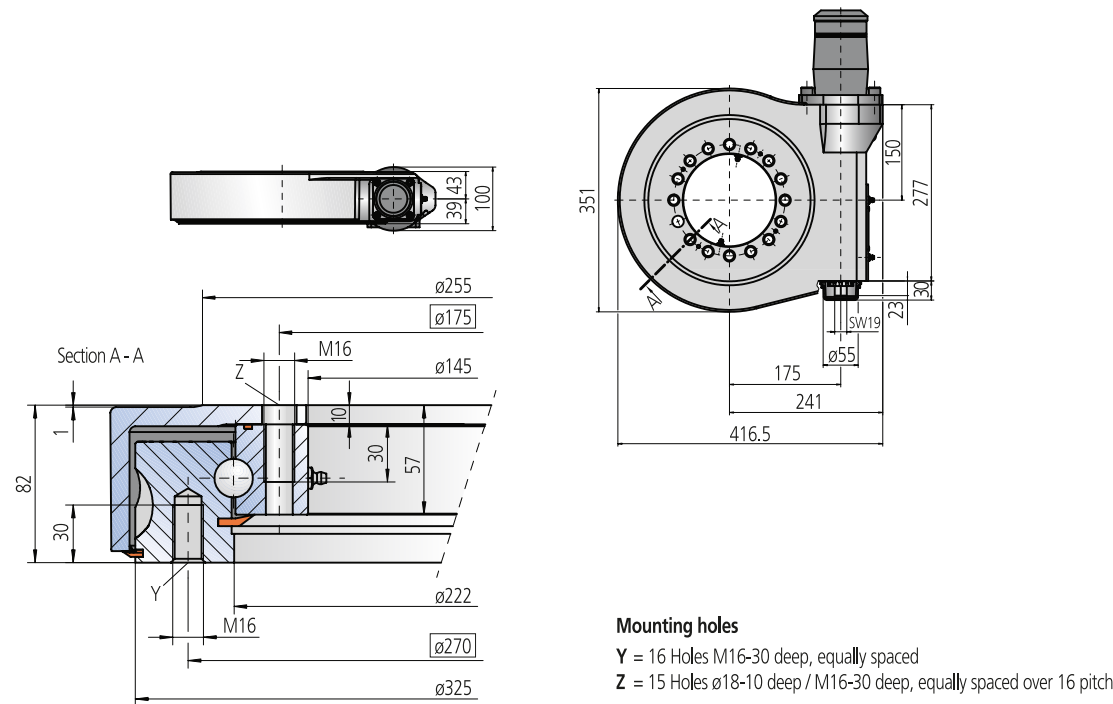
M_{dB} : Operating torque [Nm]

If this relationship is not fulfilled, a high rate of wear must be expected.

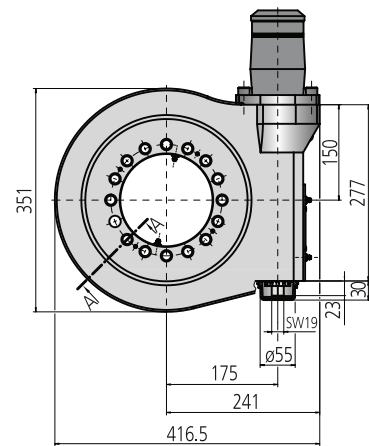
Diagram 3



Size 0223 / single row



Note, mounting face against upper surface shall be within the limits of $\varnothing 223$ and $\varnothing 329$



Mounting holes
Y = 16 Holes M16-30 deep, equally spaced
Z = 15 Holes $\varnothing 18$ -10 deep / M16-30 deep, equally spaced over 16 pitch

Lubrication ports
 2 Taper type grease nipples on the internal diameter
 2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Drawing reference number WD-L 0223/3-04698

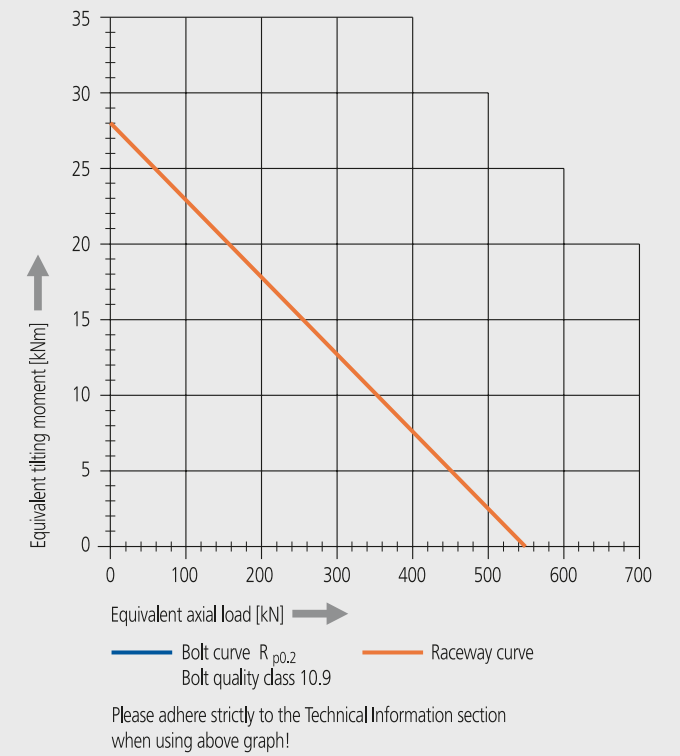
Module	m	[mm]	5
Number of starts of the worm	-		1
Gear ratio	i	-	62
Self-locking gears			no**
Maximum torque $s_{FS} = 1$	M_{d max}	[Nm]	9303
Nom. torque $s_{FS} = 1$ at $n = 1$ rpm	M_{d nom}	[Nm]	4795
Maximum holding torque*	M_h	[Nm]	9303
Static load rating, radial	C_{o rad}	[kN]	204
Static load rating, axial	C_{o ax}	[kN]	547
Dynamic load rating, radial	C_{rad}	[kN]	132
Dynamic load rating, axial	C_{ax}	[kN]	154
Weight		[kg]	48

*Optional with brake
 **Self-locking with mounted permanent brake or with mounted hydraulic motor and oil return stop

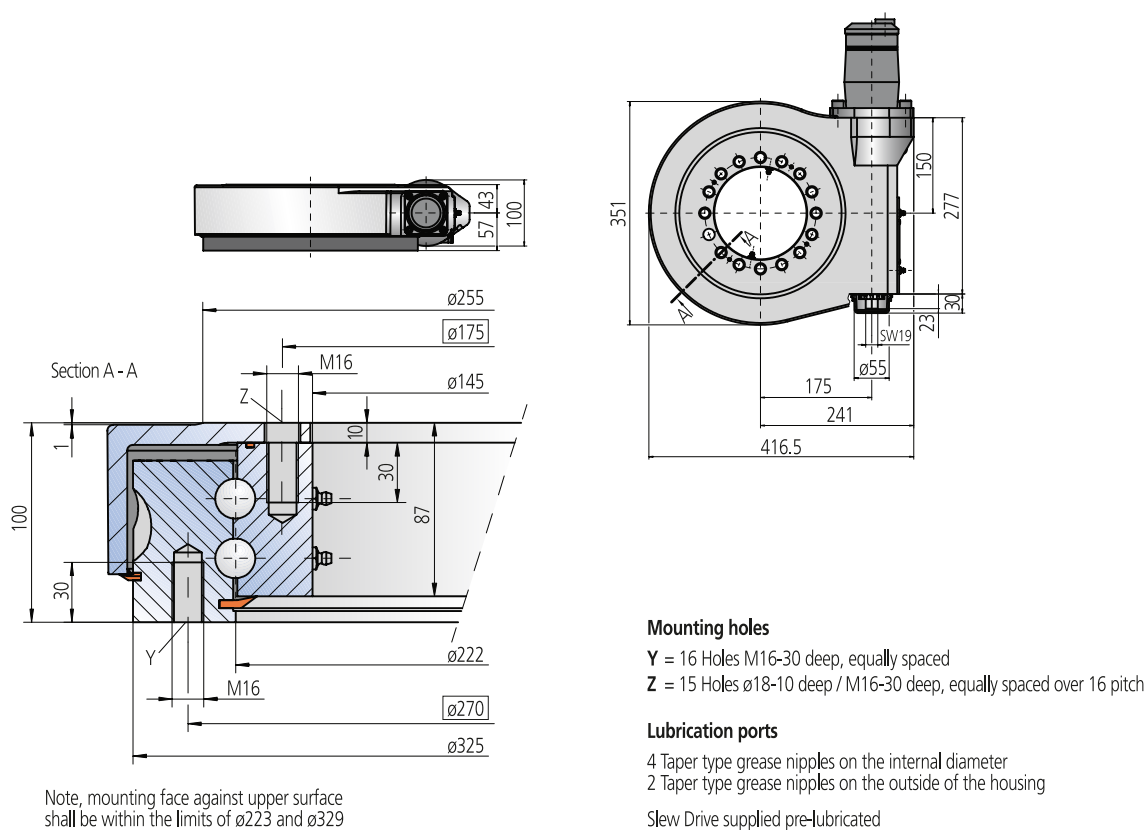
The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
 Selection example: performance data with hydraulic motor H-160

Pressure differential	Δp	[bar]	145
Oil flow	Q	[l/min]	14
Output speed	n	[rpm]	1
Maximum achievable torque	M_d	[Nm]	9303

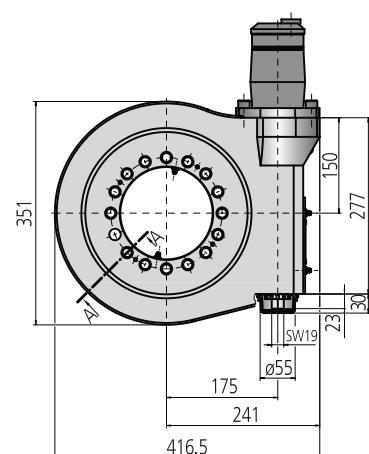
Limiting load diagram for 'compressive' load



Size 0223 / double row



Note, mounting face against upper surface shall be within the limits of $\varnothing 223$ and $\varnothing 329$



Mounting holes
Y = 16 Holes M16-30 deep, equally spaced
Z = 15 Holes $\varnothing 18$ -10 deep / M16-30 deep, equally spaced over 16 pitch

Lubrication ports
 4 Taper type grease nipples on the internal diameter
 2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Drawing reference number WD-L 0223/3-04895

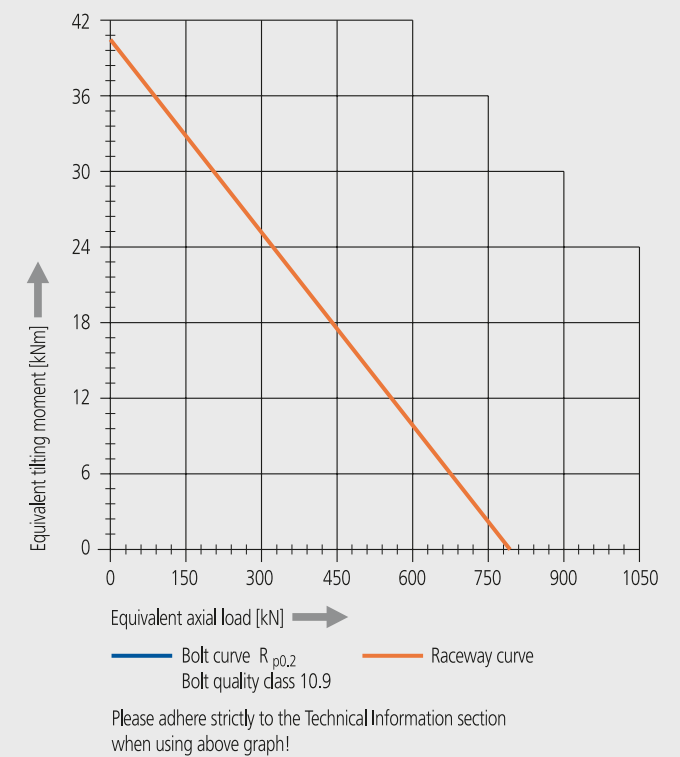
Module	m	[mm]	5
Number of starts of the worm	-		1
Gear ratio	i	-	62
Self-locking gears			no**
Maximum torque $s_{FS} = 1$	M_{d max}	[Nm]	9303
Nom. torque $s_{FS} = 1$ at $n = 1$ rpm	M_{d nom}	[Nm]	4795
Maximum holding torque*	M_h	[Nm]	9303
Static load rating, radial	C_{o rad}	[kN]	297
Static load rating, axial	C_{o ax}	[kN]	797
Dynamic load rating, radial	C_{rad}	[kN]	215
Dynamic load rating, axial	C_{ax}	[kN]	250
Weight		[kg]	64

*Optional with brake
 **Self-locking with mounted permanent brake or with mounted hydraulic motor and oil return stop

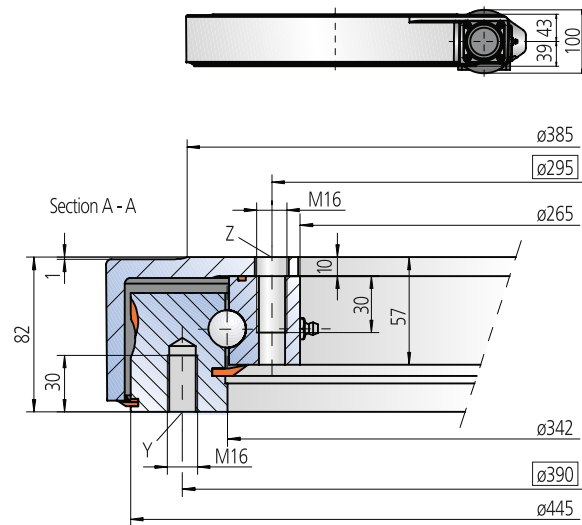
The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
 Selection example: performance data with hydraulic motor H-160

Pressure differential	Δp	[bar]	145
Oil flow	Q	[l/min]	14
Output speed	n	[rpm]	1
Maximum achievable torque	M_d	[Nm]	9303

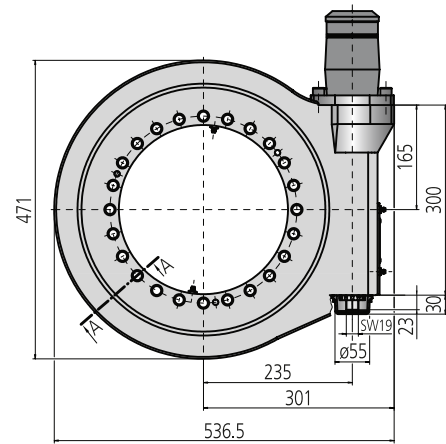
Limiting load diagram for 'compressive' load



Size 0343 / single row



Note, mounting face against upper surface shall be within the limits of $\varnothing 343$ and $\varnothing 449$



Mounting holes

Y = 18 Holes M16-30 deep, equally spaced
Z = 24 Holes $\varnothing 18-10$ deep / M16-30 deep, equally spaced

Lubrication ports

2 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Drawing reference number WD-L 0343/3-04557

Module	m [mm]	5
Number of starts of the worm	[-]	1
Gear ratio	i [-]	86
Self-locking gears		no**
Maximum torque $s_{FS} = 1$	M_{d max} [Nm]	12905
Nom. torque $s_{FS} = 1$ at $n = 1$ rpm	M_{d nom} [Nm]	10150
Maximum holding torque*	M_h [Nm]	12905
Static load rating, radial	C_{o rad} [kN]	338
Static load rating, axial	C_{o ax} [kN]	905
Dynamic load rating, radial	C_{rad} [kN]	157
Dynamic load rating, axial	C_{ax} [kN]	183
Weight	[kg]	72

*Optional with brake

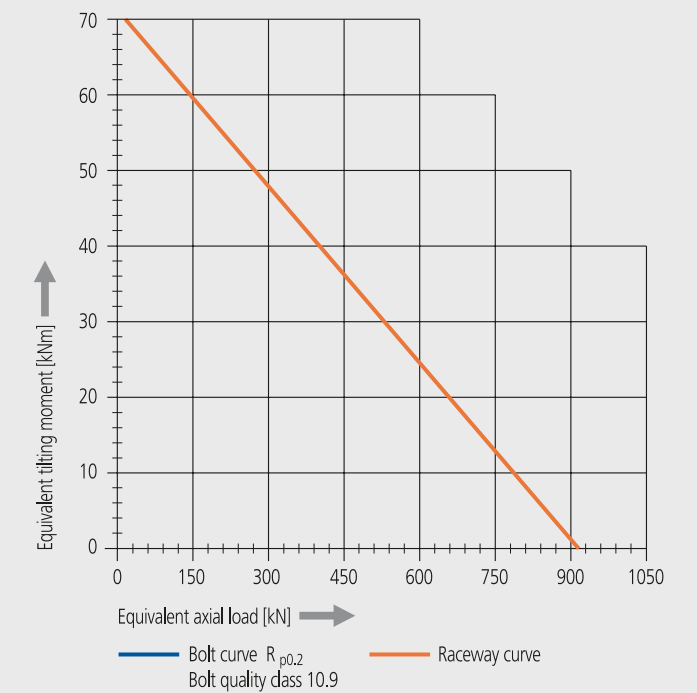
**Self-locking with mounted permanent brake or with mounted hydraulic motor and oil return stop

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.

Selection example: performance data with hydraulic motor H-160

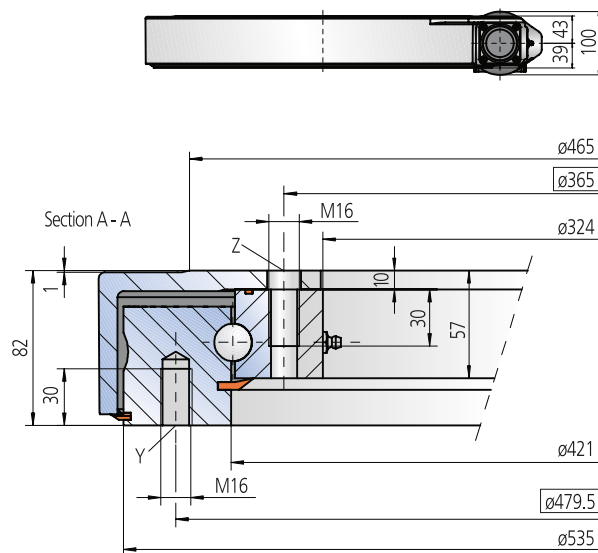
Pressure differential	Δp [bar]	145
Oil flow	Q [l/min]	18
Output speed	n [rpm]	1
Maximum achievable torque	M_d [Nm]	12905

Limiting load diagram for 'compressive' load

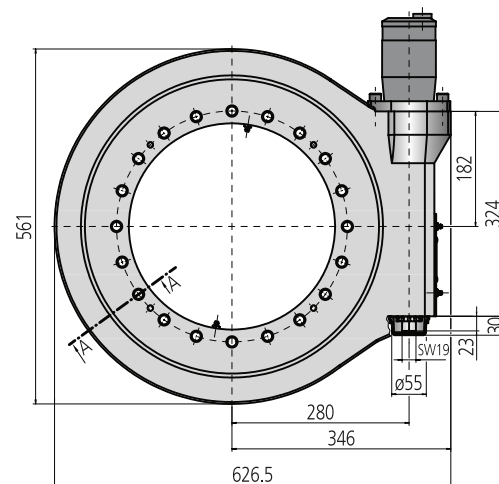


Please adhere strictly to the Technical Information section when using above graph!

Size 0419 / single row



Note, mounting face against upper surface shall be within the limits of $\varnothing 419$ and $\varnothing 539$



Mounting holes

Y = 20 Holes M16-30 deep, equally spaced
Z = 20 Holes $\varnothing 18-10$ deep / M16-30 deep, equally spaced

Lubrication ports

2 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Drawing reference number WD-L 0419/3-04553

Module	m [mm]	5
Number of starts of the worm	[-]	1
Gear ratio	i [-]	104
Self-locking gears		no**
Maximum torque $s_{FS} = 1$	M_{d max} [Nm]	15606
Nom. torque $s_{FS} = 1$ at $n = 1$ rpm	M_{d nom} [Nm]	15606
Maximum holding torque*	M_h [Nm]	15606
Static load rating, radial	C_{o rad} [kN]	413
Static load rating, axial	C_{o ax} [kN]	1107
Dynamic load rating, radial	C_{rad} [kN]	170
Dynamic load rating, axial	C_{ax} [kN]	198
Weight	[kg]	89

*Optional with brake

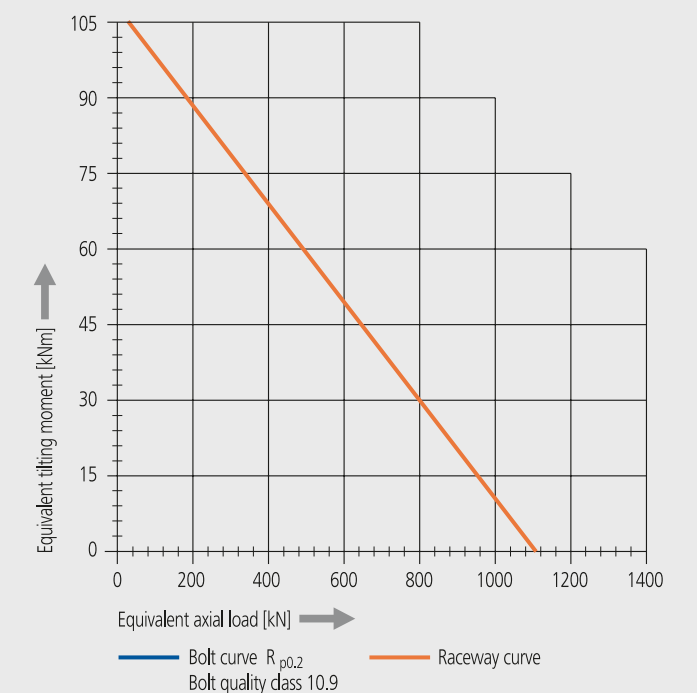
**Self-locking with mounted permanent brake or with mounted hydraulic motor and oil return stop

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.

Selection example: performance data with hydraulic motor H-160

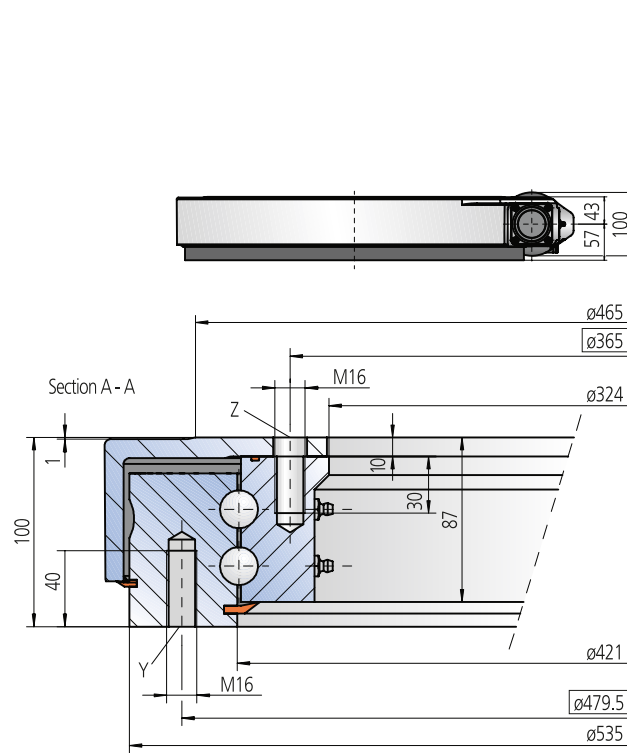
Pressure differential	Δp [bar]	145
Oil flow	Q [l/min]	20
Output speed	n [rpm]	1
Maximum achievable torque	M_d [Nm]	15606

Limiting load diagram for 'compressive' load

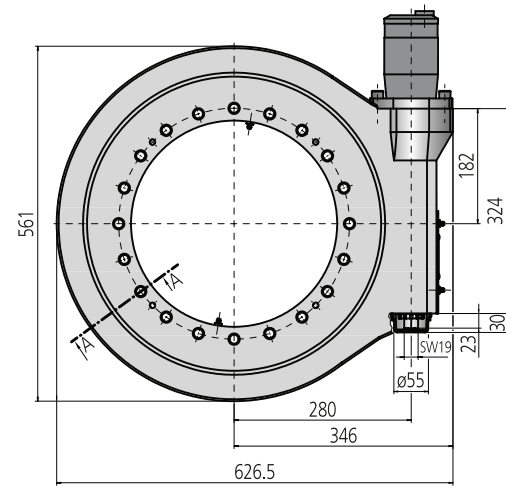


Please adhere strictly to the Technical Information section when using above graph!

Size 0419 / double row



Note, mounting face against upper surface shall be within the limits of 419 and 4539



Mounting holes

Y = 20 Holes M16-40 deep, equally spaced
Z = 20 Holes 18-10 deep / M16-30 deep, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Drawing reference number WD-L 0419/3-04684

Module	m	[mm]	5
Number of starts of the worm	-		1
Gear ratio	i	-	104
Self-locking gears			no**
Maximum torque sfs = 1	M_{d max}	[Nm]	15606
Nom. torque sfs = 1 at n = 1 rpm	M_{d nom}	[Nm]	15606
Maximum holding torque*	M_h	[Nm]	15606
Static load rating, radial	C_{o rad}	[kN]	559
Static load rating, axial	C_{o ax}	[kN]	1498
Dynamic load rating, radial	C_{rad}	[kN]	277
Dynamic load rating, axial	C_{ax}	[kN]	323
Weight		[kg]	117

*Optional with brake

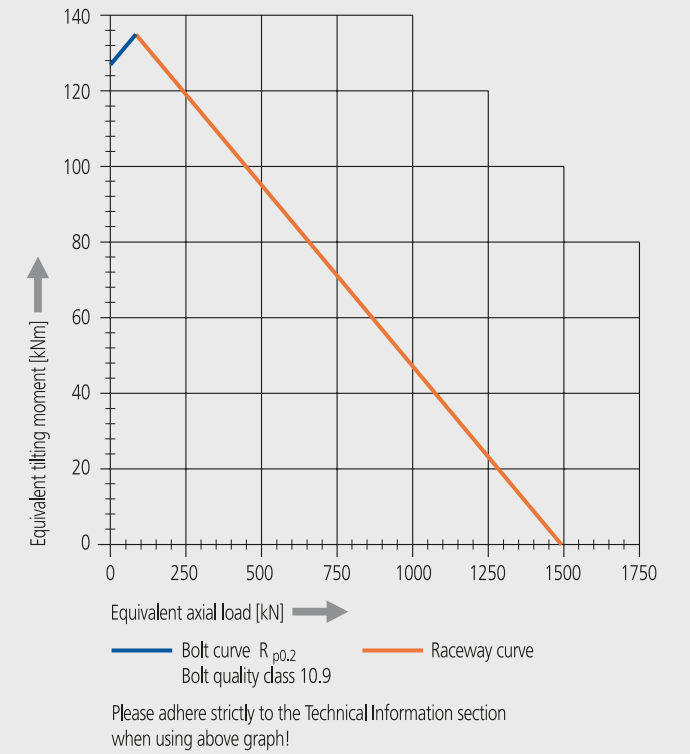
**Self-locking with mounted permanent brake or with mounted hydraulic motor and oil return stop

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.

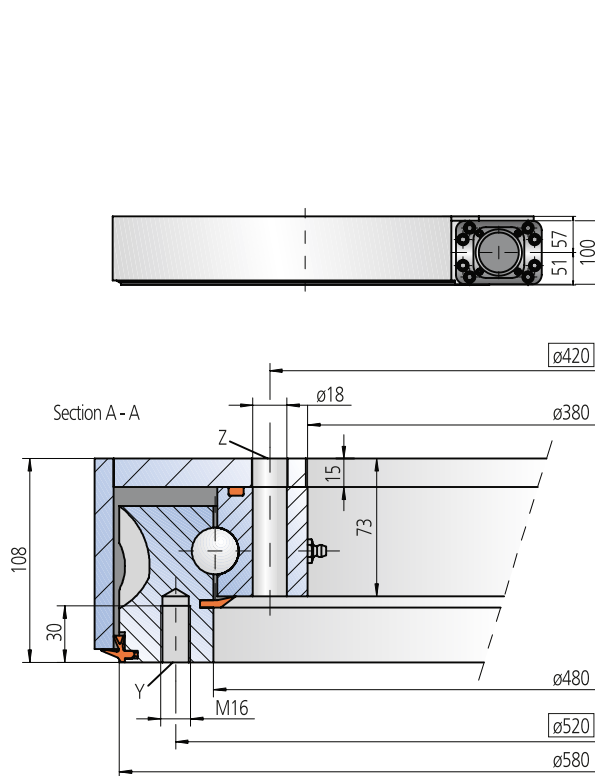
Selection example: performance data with hydraulic motor H-160

Pressure differential	Δp	[bar]	145
Oil flow	Q	[l/min]	20
Output speed	n	[rpm]	1
Maximum achievable torque	M_d	[Nm]	15606

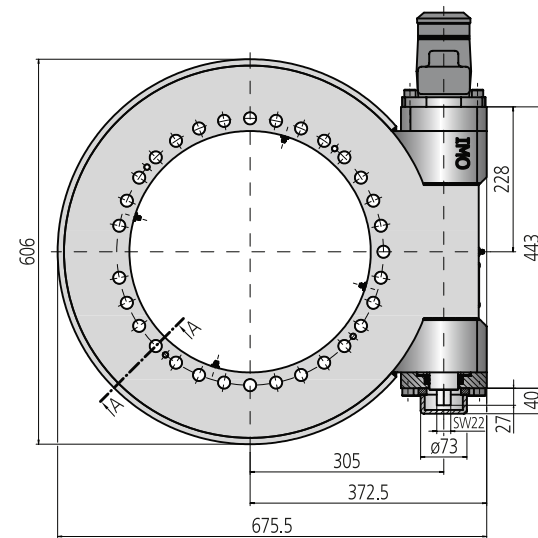
Limiting load diagram for 'compressive' load



Size 0478 / single row



Note, mounting face against upper surface shall be within the limits of 478 and 584



Mounting holes

Y = 32 Holes M16-30 deep, equally spaced
Z = 31 Holes 18, equally spaced over 32 pitch

Lubrication ports

4 Taper type grease nipples on the internal diameter
1 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Drawing reference number WD-L 0478/3-04995

Module	m	[mm]	6
Number of starts of the worm	-		1
Gear ratio	i	-	93
Self-locking gears			no**
Maximum torque sfs = 1	M_{d max}	[Nm]	24288
Nom. torque sfs = 1 at n = 1 rpm	M_{d nom}	[Nm]	24288
Maximum holding torque*	M_h	[Nm]	24288
Static load rating, radial	C_{o rad}	[kN]	675
Static load rating, axial	C_{o ax}	[kN]	1808
Dynamic load rating, radial	C_{rad}	[kN]	251
Dynamic load rating, axial	C_{ax}	[kN]	293
Weight		[kg]	130

*Optional with brake

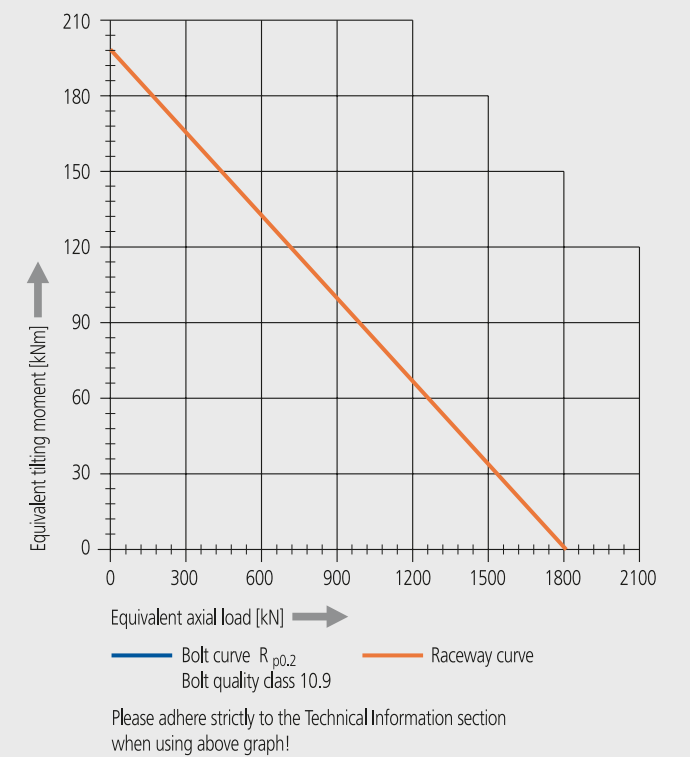
**Self-locking with mounted permanent brake or with mounted hydraulic motor and oil return stop

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.

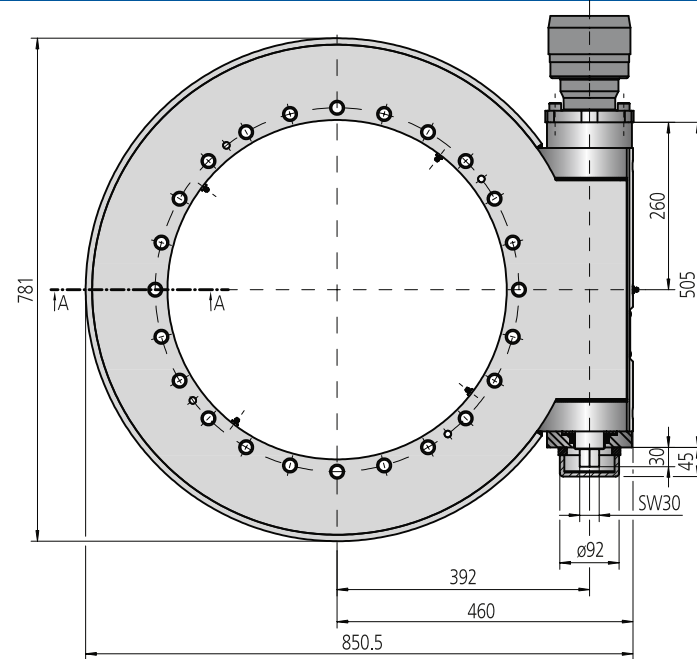
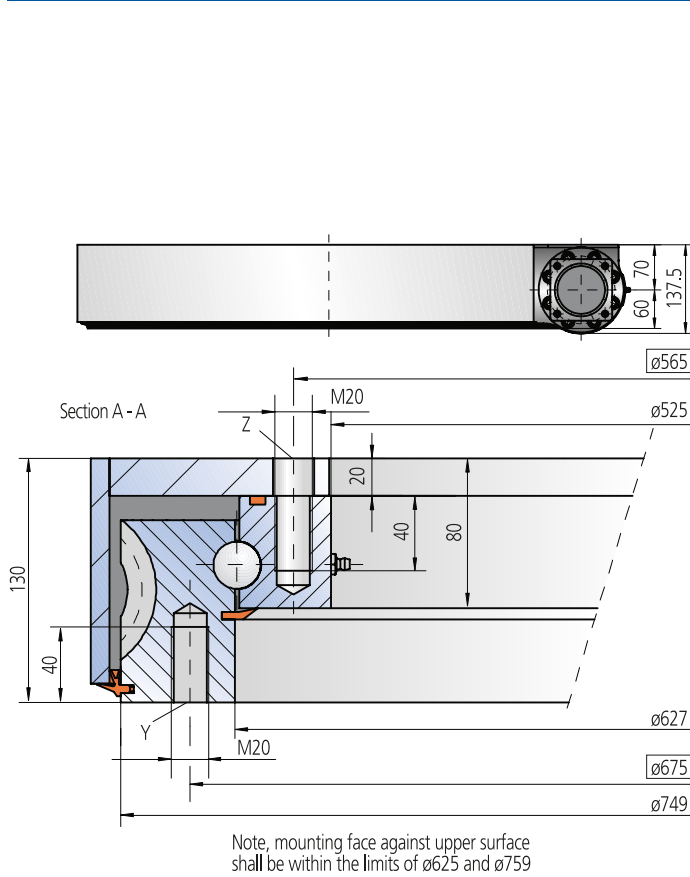
Selection example: performance data with hydraulic motor 2-200

Pressure differential	Δp	[bar]	200
Oil flow	Q	[l/min]	24
Output speed	n	[rpm]	1
Maximum achievable torque	M_d	[Nm]	24288

Limiting load diagram for 'compressive' load



Size 0625 / single row



Mounting holes
Y = 24 Holes M20-40 deep, equally spaced
Z = 24 Holes $\varnothing 20$ -22 deep / M20-40 deep, equally spaced

Lubrication ports
 4 Taper type grease nipples on the internal diameter
 1 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Drawing reference number WD-L 0625/3-06290

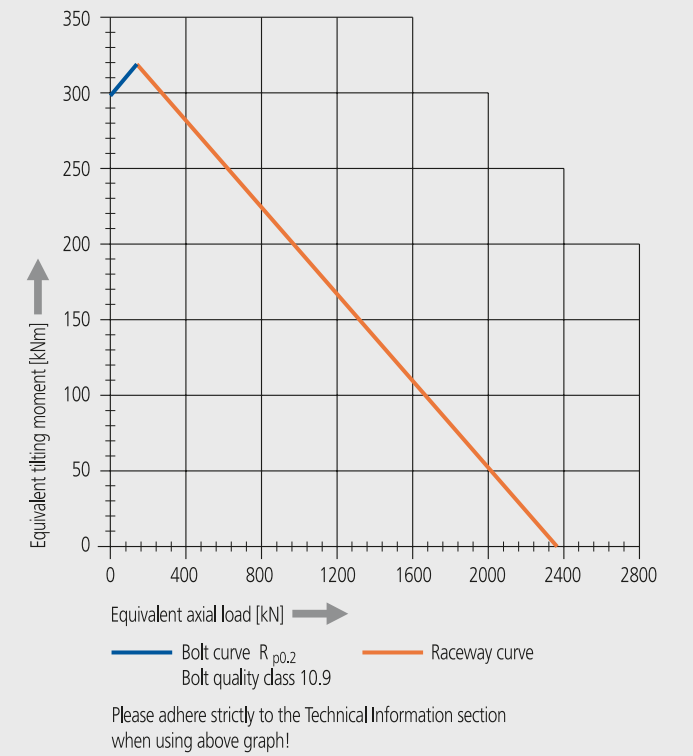
Module	m [mm]	7
Number of starts of the worm	[-]	1
Gear ratio	i [-]	104
Self-locking gears		no**
Maximum torque $sfs = 1$	M_{d max} [Nm]	42824
Nom. torque $sfs = 1$ at $n = 1$ rpm	M_{d nom} [Nm]	42824
Maximum holding torque*	M_h [Nm]	42824
Static load rating, radial	C_{o rad} [kN]	883
Static load rating, axial	C_{o ax} [kN]	2364
Dynamic load rating, radial	C_{rad} [kN]	280
Dynamic load rating, axial	C_{ax} [kN]	327
Weight	[kg]	250

*Optional with brake
 **Self-locking with mounted permanent brake or with mounted hydraulic motor and oil return stop

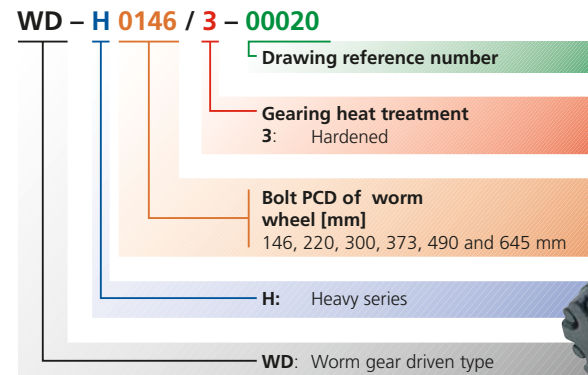
The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
 Selection example: performance data with hydraulic motor RE-18

Pressure differential	Δp [bar]	210
Oil flow	Q [l/min]	40
Output speed	n [rpm]	1
Maximum achievable torque	M_d [Nm]	42824

Limiting load diagram for 'compressive' load



Series Overview



Due to the high gear ratio and the large surface contact between worm and worm gear, very high torque values can be transmitted using very small sized Slew Drives (highest power density). Worm gear driven Slew Drives of the heavy series, WD-H, are short-cycle units for rotation and swiveling applications. Use in applications with continuous rotation is not permissible, due to the higher duty. The duty is to be selected so that over-heating around the gearing contact cannot occur. Diagram 2 exhibits maximum permissible duty per minute, depending upon operation torque. When this maximum permissible duty per minute ED_{max} is exceeded, the permissibility must be checked by the IMO Engineering Department.

The following conditions apply when determining the maximum permissible duty per minute and when verifying the wear characteristic of worm gearing:

- Output speed: $n = 1.0$ rpm
- Wear safety factor of worm gearing: $S_w = 1.3$
- Observance of the maximum permissible duty per minute ED_{max} (see diagram 2)
- Ambient temperature 20°C

Determining the maximum permissible duty per minute ED_{max} :

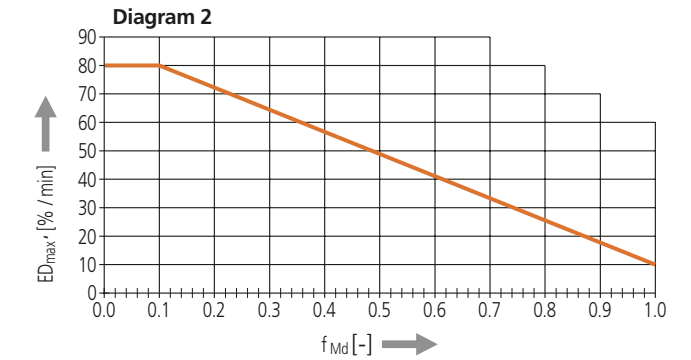
The maximum permissible duty per minute may never be exceeded

ED_{max} : Maximum permissible duty per minute in percent per minute [% / min] (see diagram 2)

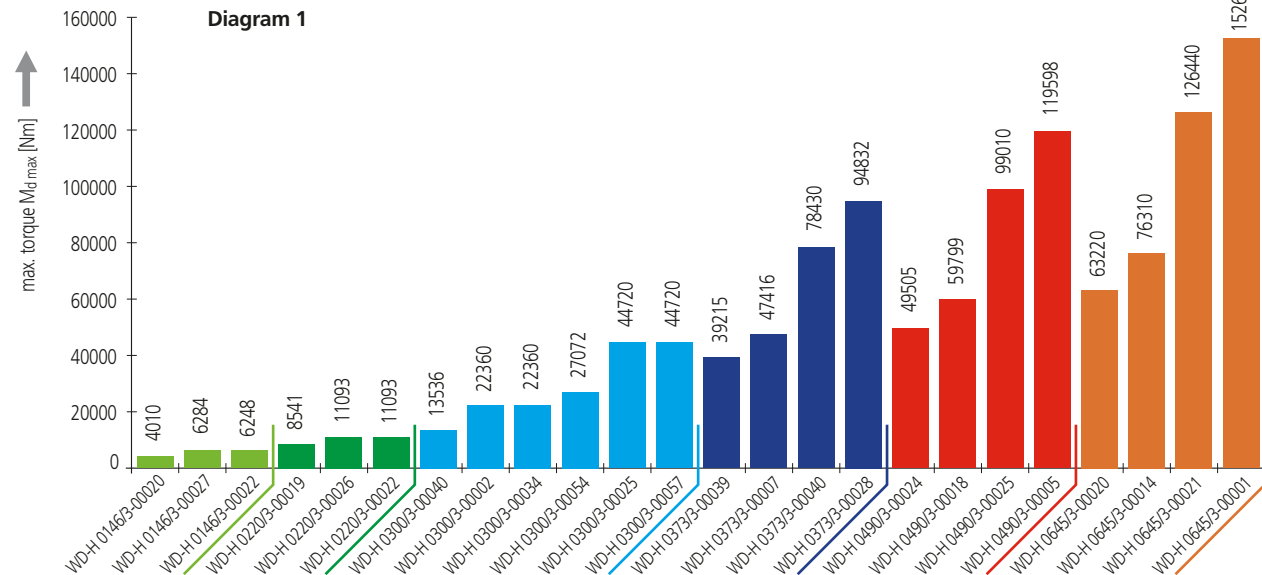
$$f_{Md} = M_{dB} / M_{d\max}$$

f_{Md} : Ratio of operating torque to maximum torque [-]

M_{dB} : Operating torque [Nm]
 $M_{d\max}$: Maximum torque [Nm] (see diagram 1)

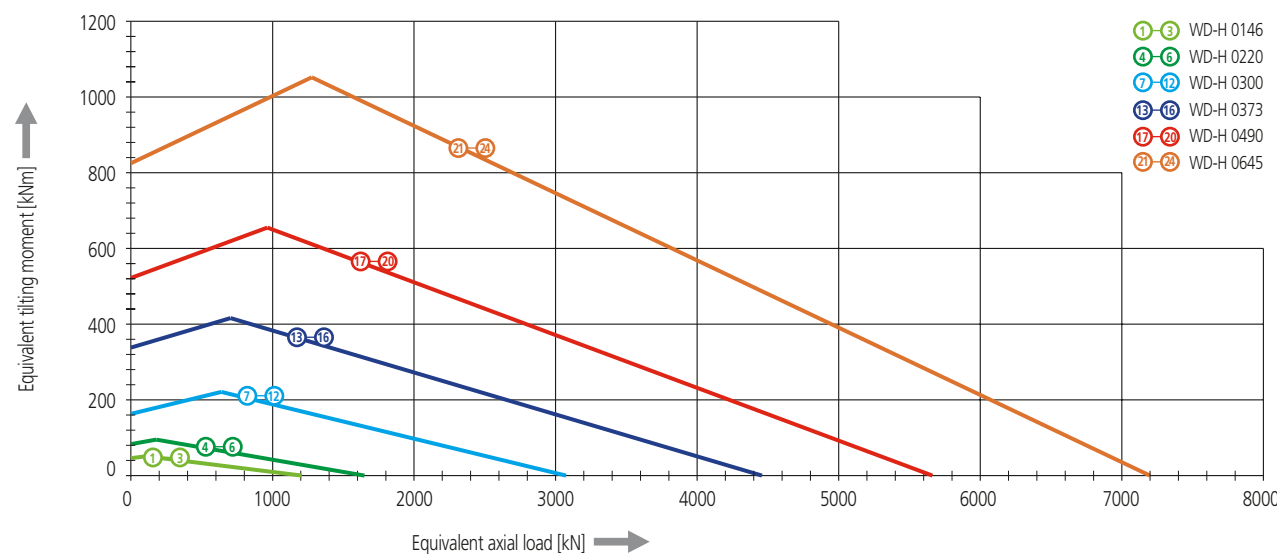


Maximum torque $M_{d\max}$ of individual sizes



Limiting load diagrams of individual sizes for "compressive" load

Please refer to the explanations in the Technical Information section of the catalog



Wear characteristics of the worm gear:

G_w : Limit value [h] (see diagram 3)
 B_h : Operation time [h]

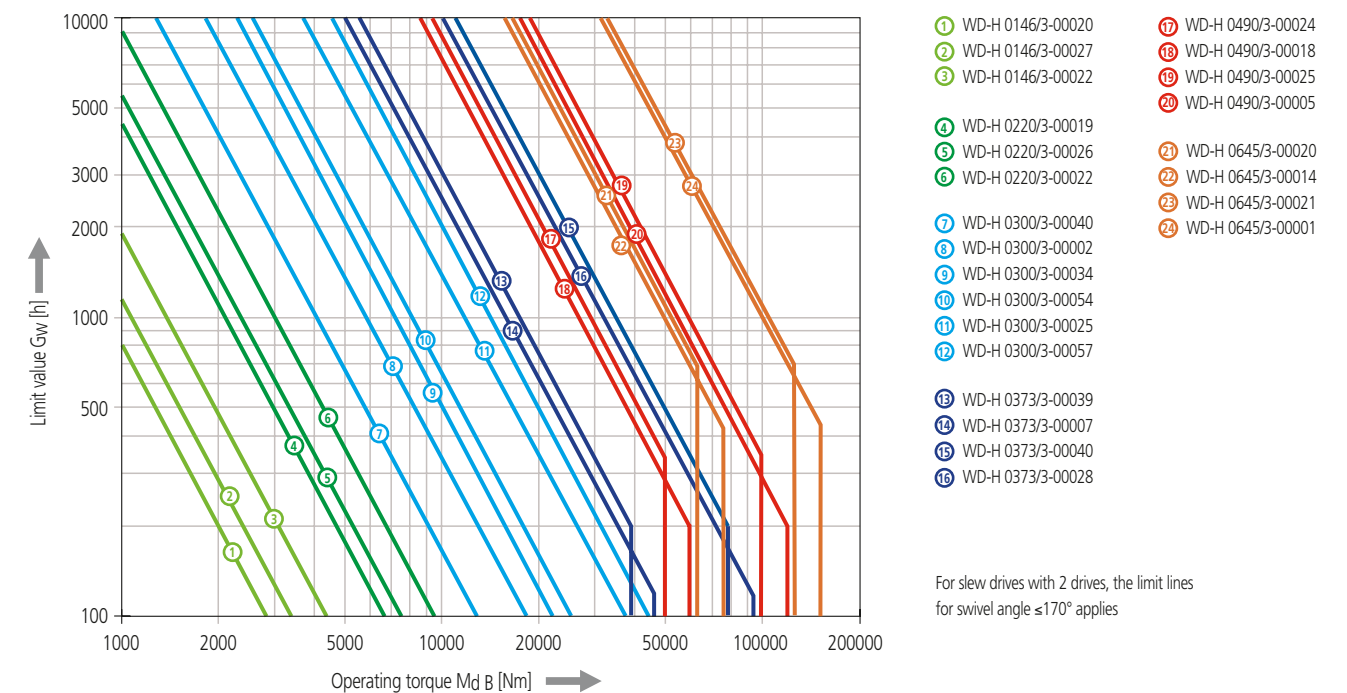
The application is permissible as regards wear characteristics, if the following relationship prevails:

ED_B : Duty [%]
 M_{dB} : Operating torque [Nm]

$$G_w \geq B_h \cdot \frac{ED_B}{100}$$

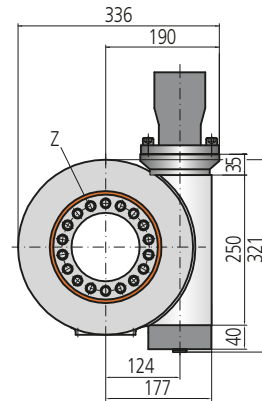
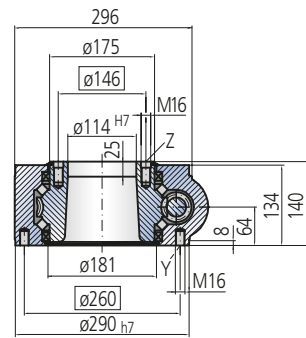
If this relationship is not fulfilled, a high rate of wear must be expected.

Diagram 3



For slew drives with 2 drives, the limit lines for swivel angle $\leq 170^\circ$ applies

Size 0146



Mounting holes

Y = 20 Holes M16-24 deep, equally spaced
Z = 18 Holes \varnothing 17-10 deep / M16-25 deep, equally spaced

Lubrication ports

1 Taper type grease nipple on the outside of the housing
Slew Drive supplied pre-lubricated

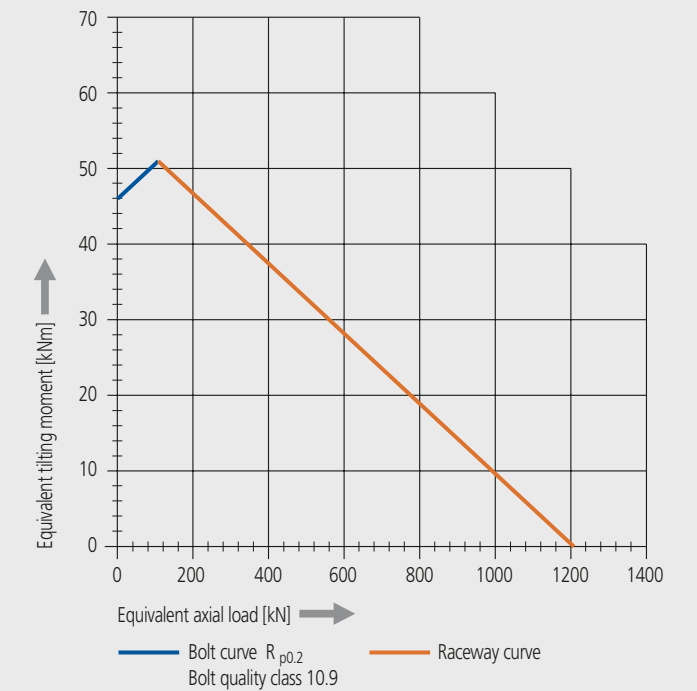
Drawing reference number WD-H 0146/3-00022				
Drawing reference number WD-H 0146/3-00027				
Drawing reference number WD-H 0146/3-00020				
Module	m [mm]	3	4	4
Number of starts of the worm	[-]	1	1	2
Gear ratio	i [-]	68	51	25.5
Self-locking gears**		yes	yes	no
Maximum torque $s_{FS} = 1$	$M_{d\ max}$ [Nm]	4010	6284	6284
Nom. torque $s_{FS} = 1$ at $n = 3$ rpm	$M_{d\ nom}$ [Nm]	1950	2100	2300
Maximum holding torque*	M_h [Nm]	4010	6284	6284
Static load rating, radial	$C_{o\ rad}$ [kN]	451	451	451
Static load rating, axial	$C_{o\ ax}$ [kN]	1208	1208	1208
Dynamic load rating, radial	C_{rad} [kN]	172	172	172
Dynamic load rating, axial	C_{ax} [kN]	199	199	199
Weight	[kg]	63	63	63

*Optional with brake
**See technical data

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor H-300

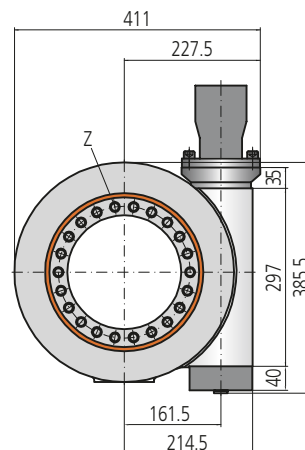
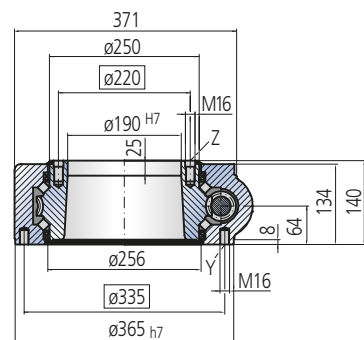
Pressure differential	Δp [bar]	50	80	110
Oil flow	Q [l/min]	60	46	28
Output speed	n [rpm]	3	3	3
Maximum achievable torque	M_d [Nm]	4010	6284	6284

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0220



Mounting holes

Y = 24 Holes M16-24 deep, equally spaced
Z = 22 Holes \varnothing 17-10 deep / M16-25 deep, equally spaced

Lubrication ports

1 Taper type grease nipple on the outside of the housing
Slew Drive supplied pre-lubricated

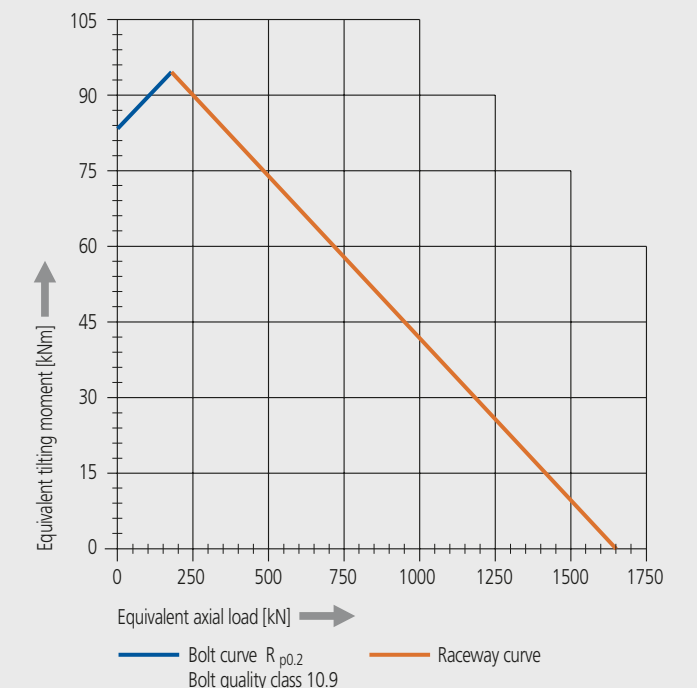
Drawing reference number WD-H 0220/3-00022				
Drawing reference number WD-H 0220/3-00026				
Drawing reference number WD-H 0220/3-00019				
Module	m [mm]	4	5	5
Number of starts of the worm	[-]	1	1	2
Gear ratio	i [-]	70	56	28
Self-locking gears**		yes	no	no
Maximum torque $s_{FS} = 1$	$M_{d\ max}$ [Nm]	8541	11093	11093
Nom. torque $s_{FS} = 1$ at $n = 3$ rpm	$M_{d\ nom}$ [Nm]	4550	4800	5150
Maximum holding torque*	M_h [Nm]	8541	11093	11093
Static load rating, radial	$C_{o\ rad}$ [kN]	616	616	616
Static load rating, axial	$C_{o\ ax}$ [kN]	1650	1650	1650
Dynamic load rating, radial	C_{rad} [kN]	193	193	193
Dynamic load rating, axial	C_{ax} [kN]	224	224	224
Weight	[kg]	80	80	80

*Optional with brake
**See technical data

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor HB-12

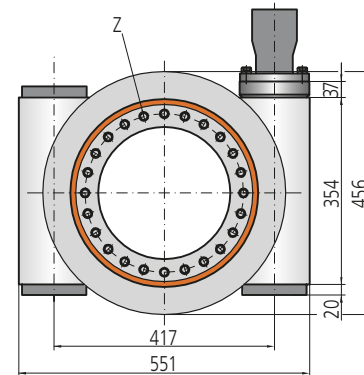
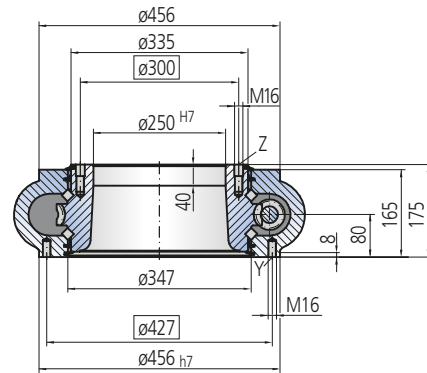
Pressure differential	Δp [bar]	110	150	220
Oil flow	Q [l/min]	44	37	25
Output speed	n [rpm]	3	3	3
Maximum achievable torque	M_d [Nm]	8541	11093	11093

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0300 / single drive



Mounting holes

Y = 24 Holes M16-30 deep, equally spaced
Z = 24 Holes ø17-22 deep / M16-30 deep, equally spaced

Lubrication ports

1 Taper type grease nipple on the outside of the housing on the right side
3 Taper type grease nipples on the outside of the housing on the left side

Slew Drive supplied pre-lubricated

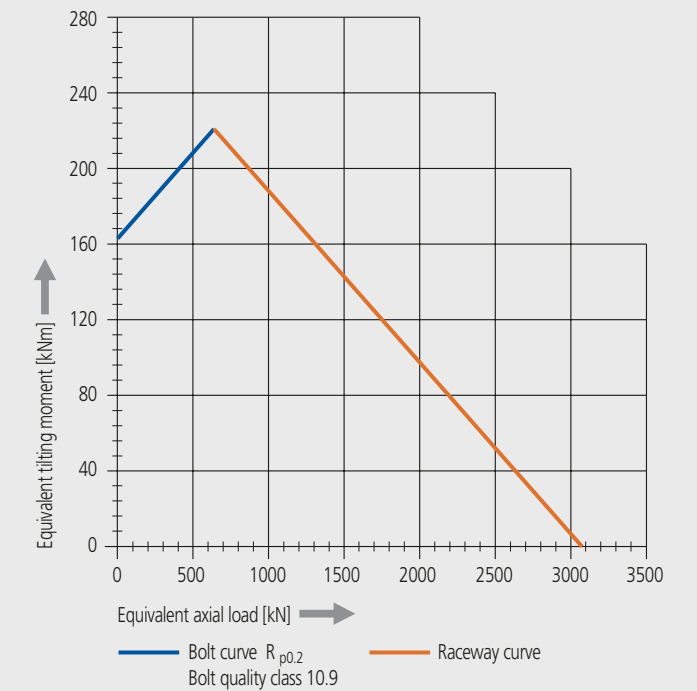
Drawing reference number WD-H 0300/3-00034					
Drawing reference number WD-H 0300/3-00002					
Drawing reference number WD-H 0300/3-00040					
Module	m	[mm]	4.5	6	6
Number of starts of the worm	-		1	1	2
Gear ratio	i	-	84	61	30.5
Self-locking gears**			yes	no	no
Maximum torque $s_{FS} = 1$	$M_{d\ max}$	[Nm]	13536	22360	22360
Nom. torque $s_{FS} = 1$ at $n = 2$ rpm	$M_{d\ nom}$	[Nm]	9000	12600	14000
Maximum holding torque*	M_h	[Nm]	13536	22360	22360
Static load rating, radial	$C_{o\ rad}$	[kN]	1506	1506	1506
Static load rating, axial	$C_{o\ ax}$	[kN]	3074	3074	3074
Dynamic load rating, radial	C_{rad}	[kN]	316	316	316
Dynamic load rating, axial	C_{ax}	[kN]	445	445	445
Weight		[kg]	160	160	160

*Optional with brake
**See technical data

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor RE-26

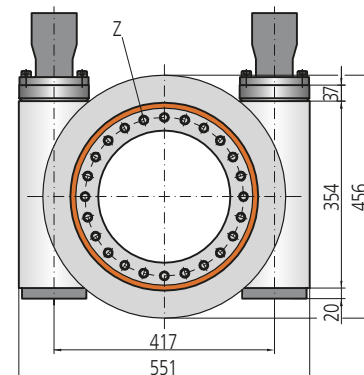
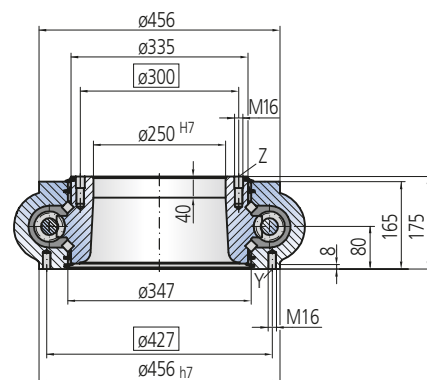
Pressure differential	Δp	[bar]	85	125	180
Oil flow	Q	[l/min]	80	61	35
Output speed	n	[rpm]	2	2	2
Maximum achievable torque	M_d	[Nm]	13565	22360	22360

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0300 / twin drive



Mounting holes

Y = 24 Holes M16-30 deep, equally spaced
Z = 24 Holes ø17-22 deep / M16-30 deep, equally spaced

Lubrication ports

1 Taper type grease nipple on the outside of the housing on the right side and on the left side

Slew Drive supplied pre-lubricated

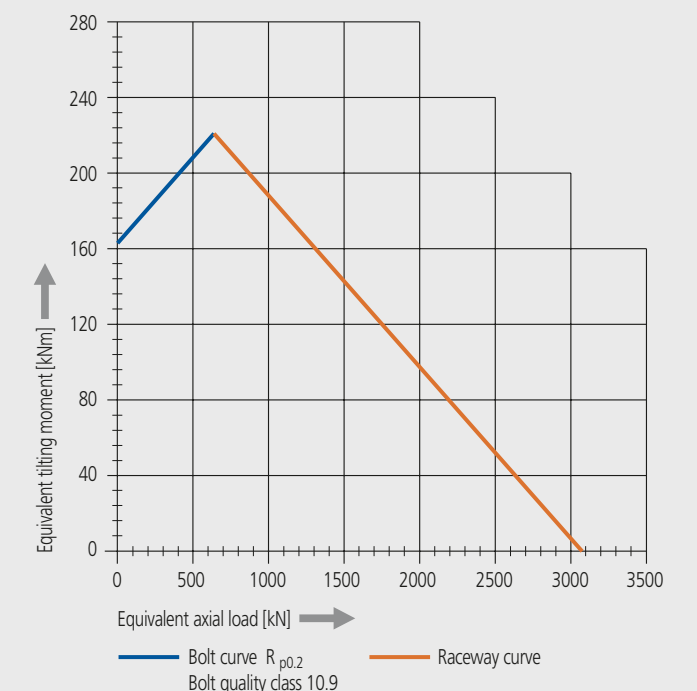
Drawing reference number WD-H 0300/3-00057					
Drawing reference number WD-H 0300/3-00025					
Drawing reference number WD-H 0300/3-00054					
Module	m	[mm]	4.5	6	6
Number of starts of the worm	-		1	1	2
Gear ratio	i	-	84	61	30.5
Self-locking gears**			yes	no	no
Maximum torque $s_{FS} = 1$	$M_{d\ max}$	[Nm]	27072	44720	44720
Nom. torque $s_{FS} = 1$ at $n = 2$ rpm	$M_{d\ nom}$	[Nm]	18000	25200	28000
Maximum holding torque*	M_h	[Nm]	27072	44720	44720
Static load rating, radial	$C_{o\ rad}$	[kN]	1506	1506	1506
Static load rating, axial	$C_{o\ ax}$	[kN]	3074	3074	3074
Dynamic load rating, radial	C_{rad}	[kN]	316	316	316
Dynamic load rating, axial	C_{ax}	[kN]	445	445	445
Weight		[kg]	191	188	180

*Optional with brake
**See technical data

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor RE-26

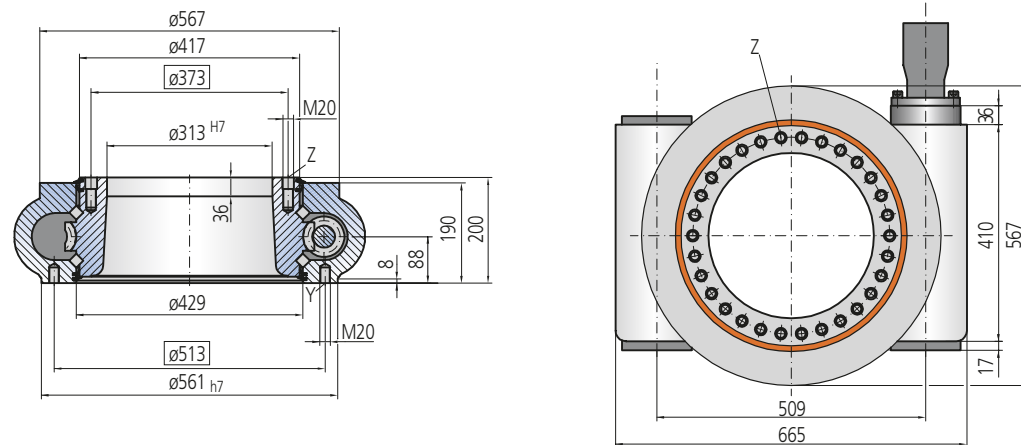
Pressure differential	Δp	[bar]	85	125	180
Oil flow	Q	[l/min]	160	122	70
Output speed	n	[rpm]	2	2	2
Maximum achievable torque	M_d	[Nm]	27072	44720	44720

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0373 / single drive



Mounting holes

Y = 32 Holes M20-30 deep, equally spaced
 Z = 30 Holes ø22-22 deep / M20-36 deep, equally spaced

Lubrication ports

1 Taper type grease nipple on the outside of the housing on the right side
 3 Taper type grease nipples on the outside of the housing on the left side

Slew Drive supplied pre-lubricated

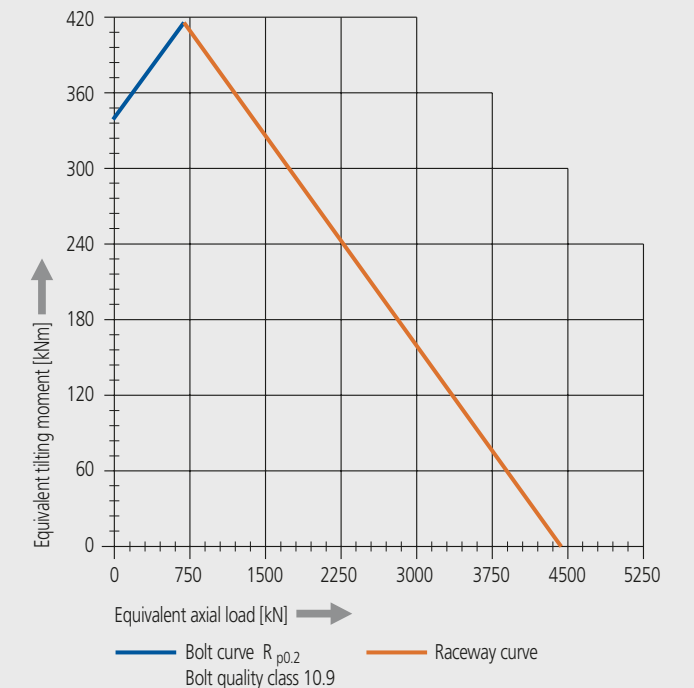
Drawing reference number WD-H 0373/3-00007			
Drawing reference number WD-H 0373/3-00039			
Module	m [mm]	7	8
Number of starts of the worm	[-]	2	1
Gear ratio	i [-]	31.5	56
Self-locking gears**		no	no
Maximum torque $s_{FS} = 1$	M_{d max} [Nm]	39215	47416
Nom. torque $s_{FS} = 1$ at $n = 2$ rpm	M_{d nom} [Nm]	36000	35500
Maximum holding torque*	M_h [Nm]	39215	47416
Static load rating, radial	C_{o rad} [kN]	2185	2185
Static load rating, axial	C_{o ax} [kN]	4458	4458
Dynamic load rating, radial	C_{rad} [kN]	442	442
Dynamic load rating, axial	C_{ax} [kN]	622	622
Weight	[kg]	285	285

*Optional with brake
 **See technical data

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
 Selection example: performance data with hydraulic motor DT-56

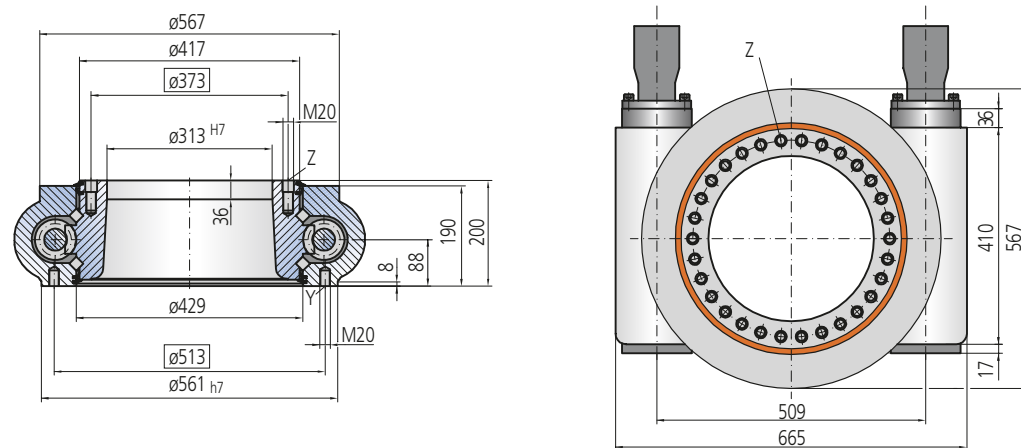
Pressure differential	Δp [bar]	165	160
Oil flow	Q [l/min]	75	114
Output speed	n [rpm]	2	2
Maximum achievable torque	M_d [Nm]	39215	47416

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0373 / twin drive



Mounting holes

Y = 32 Holes M20-30 deep, equally spaced
 Z = 30 Holes ø22-22 deep / M20-36 deep, equally spaced

Lubrication ports

1 Taper type grease nipple on the outside of the housing on the right side and on the left side

Slew Drive supplied pre-lubricated

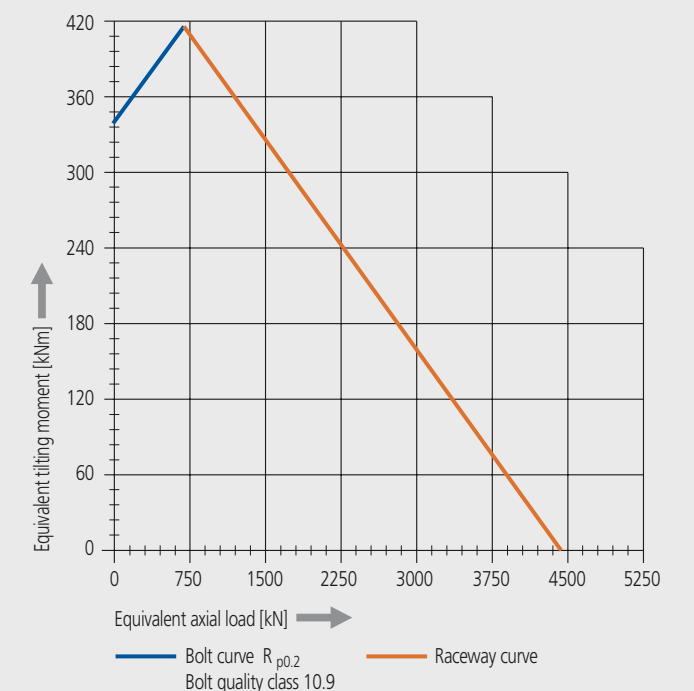
Drawing reference number WD-H 0373/3-00028			
Drawing reference number WD-H 0373/3-00040			
Module	m [mm]	7	8
Number of starts of the worm	[-]	2	1
Gear ratio	i [-]	31.5	56
Self-locking gears**		no	no
Maximum torque $s_{FS} = 1$	M_{d max} [Nm]	78430	94832
Nom. torque $s_{FS} = 1$ at $n = 2$ rpm	M_{d nom} [Nm]	72000	71000
Maximum holding torque*	M_h [Nm]	78430	94832
Static load rating, radial	C_{o rad} [kN]	2185	2185
Static load rating, axial	C_{o ax} [kN]	4458	4458
Dynamic load rating, radial	C_{rad} [kN]	442	442
Dynamic load rating, axial	C_{ax} [kN]	622	622
Weight	[kg]	335	335

*Optional with brake
 **See technical data

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
 Selection example: performance data with hydraulic motor DT-56

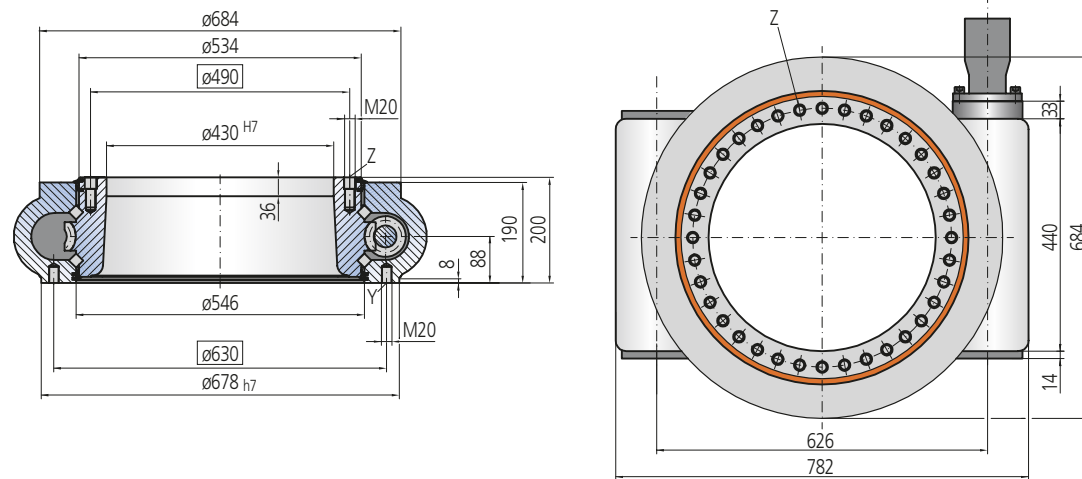
Pressure differential	Δp [bar]	165	150
Oil flow	Q [l/min]	150	228
Output speed	n [rpm]	2	2
Maximum achievable torque	M_d [Nm]	78430	94832

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0490 / single drive



Mounting holes

Y = 36 Holes M20-30 deep, equally spaced
Z = 36 Holes ø22-22 deep / M20-36 deep, equally spaced

Lubrication ports

1 Taper type grease nipple on the outside of the housing on the right side
3 Taper type grease nipples on the outside of the housing on the left side

Slew Drive supplied pre-lubricated

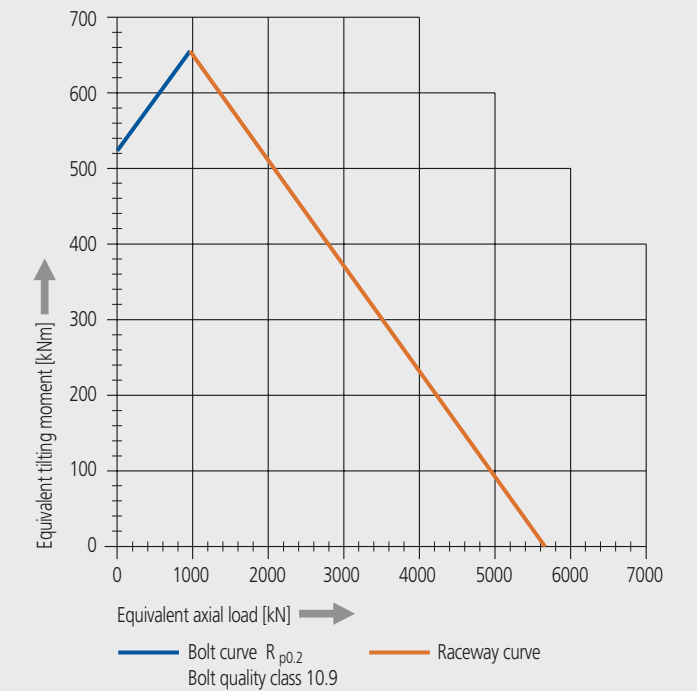
Drawing reference number WD-H 0490/3-00018			
Drawing reference number WD-H 0490/3-00024			
Module	m [mm]	7	8
Number of starts of the worm	[-]	2	1
Gear ratio	i [-]	40	70
Self-locking gears**		no	no
Maximum torque $s_{FS} = 1$	$M_{d max}$ [Nm]	49505	59799
Nom. torque $s_F = 1$ at $n = 1$ rpm	$M_{d nom}$ [Nm]	49505	59799
Maximum holding torque*	M_h [Nm]	49505	59799
Static load rating, radial	$C_{o rad}$ [kN]	2775	2775
Static load rating, axial	$C_{o ax}$ [kN]	5662	5662
Dynamic load rating, radial	C_{rad} [kN]	502	502
Dynamic load rating, axial	C_{ax} [kN]	707	707
Weight	[kg]	360	360

*Optional with brake
**See technical data

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor DT-46

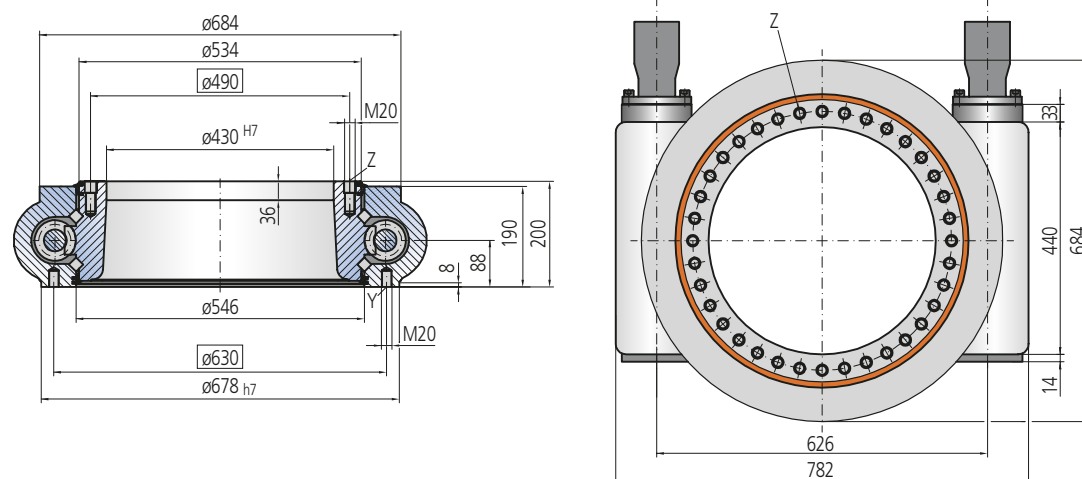
Pressure differential	Δp [bar]	190	170
Oil flow	Q [l/min]	53	68
Output speed	n [rpm]	1	1
Maximum achievable torque	M_d [Nm]	49505	59799

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0490 / twin drive



Mounting holes

Y = 36 Holes M20-30 deep, equally spaced
Z = 36 Holes ø22-22 deep / M20-36 deep, equally spaced

Lubrication ports

1 Taper type grease nipple on the outside of the housing on the right side and on the left side

Slew Drive supplied pre-lubricated

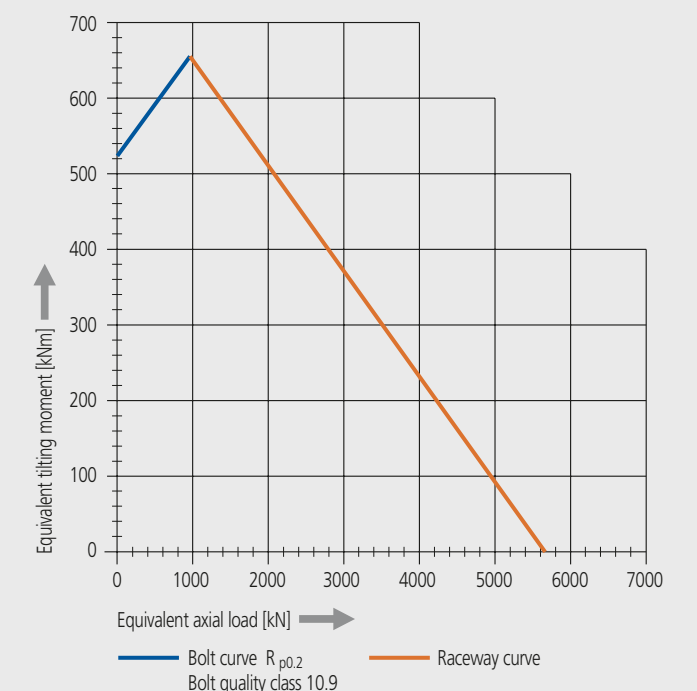
Drawing reference number WD-H 0490/3-00005			
Drawing reference number WD-H 0490/3-00025			
Module	m [mm]	7	8
Number of starts of the worm	[-]	2	1
Gear ratio	i [-]	40	70
Self-locking gears**		no	no
Maximum torque $s_{FS} = 1$	$M_{d max}$ [Nm]	99010	119598
Nom. torque $s_F = 1$ at $n = 1$ rpm	$M_{d nom}$ [Nm]	99010	119598
Maximum holding torque*	M_h [Nm]	99010	119598
Static load rating, radial	$C_{o rad}$ [kN]	2775	2775
Static load rating, axial	$C_{o ax}$ [kN]	5662	5662
Dynamic load rating, radial	C_{rad} [kN]	502	502
Dynamic load rating, axial	C_{ax} [kN]	707	707
Weight	[kg]	400	400

*Optional with brake
**See technical data

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor DT-46

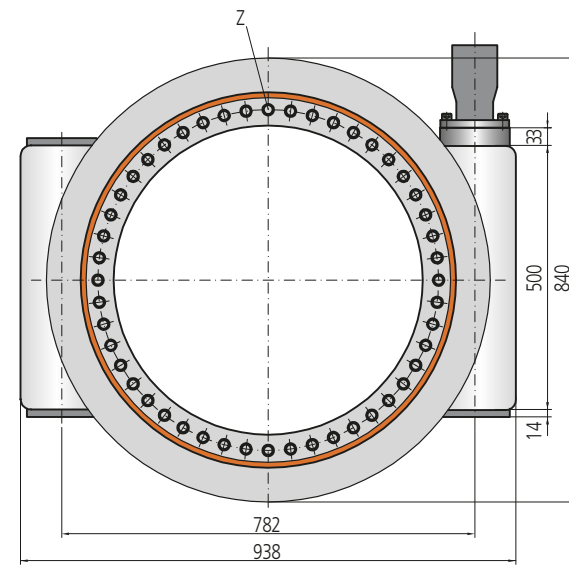
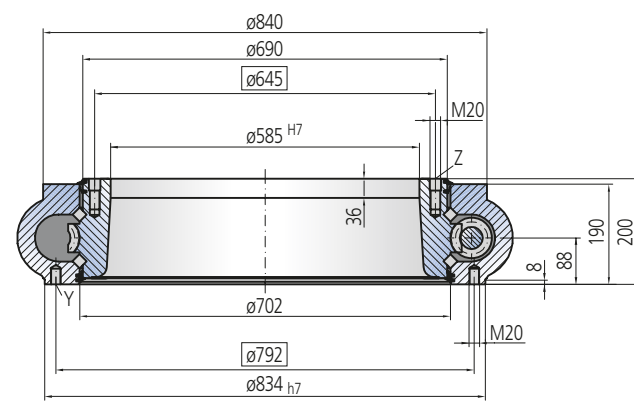
Pressure differential	Δp [bar]	190	170
Oil flow	Q [l/min]	106	132
Output speed	n [rpm]	1	1
Maximum achievable torque	M_d [Nm]	99010	119598

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0645 / single drive



Mounting holes

Y = 48 Holes M20-30 deep, equally spaced
Z = 48 Holes ø22-22 deep / M20-36 deep, equally spaced

Lubrication ports

1 Taper type grease nipple on the outside of the housing on the right side
3 Taper type grease nipples on the outside of the housing on the left side

Slew Drive supplied pre-lubricated

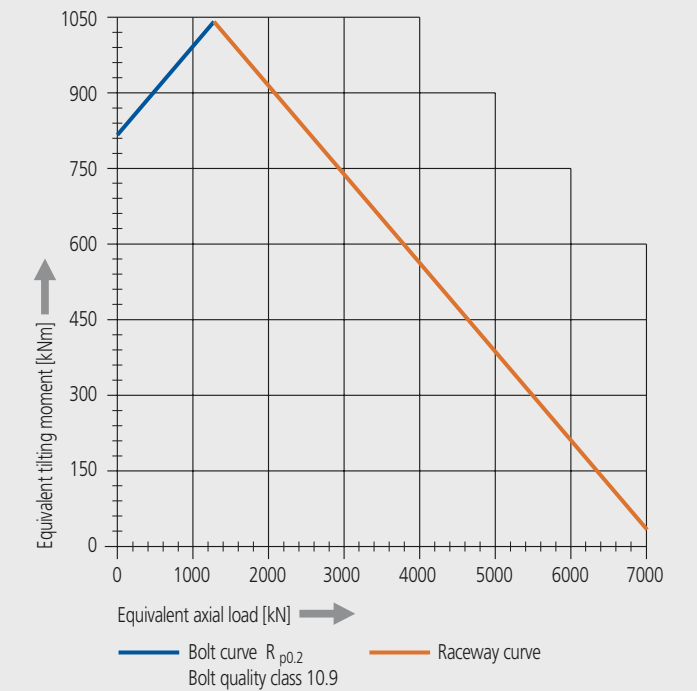
Drawing reference number WD-H 0645/3-00014			
Drawing reference number WD-H 0645/3-00020			
Module	m	[mm]	7 8
Number of starts of the worm		[-]	2 1
Gear ratio	i	[-]	51 90
Self-locking gears**			no no
Maximum torque $s_{FS} = 1$	$M_{d\ max}$	[Nm]	63220 76310
Nom. torque $s_{FS} = 1$ at $n = 1$ rpm	$M_{d\ nom}$	[Nm]	63220 76310
Maximum holding torque*	M_h	[Nm]	63220 76310
Static load rating, radial	$C_{o\ rad}$	[kN]	3528 3528
Static load rating, axial	$C_{o\ ax}$	[kN]	7199 7199
Dynamic load rating, radial	C_{rad}	[kN]	570 570
Dynamic load rating, axial	C_{ax}	[kN]	803 803
Weight		[kg]	440 440

*Optional with brake
**See technical data

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor DT-56

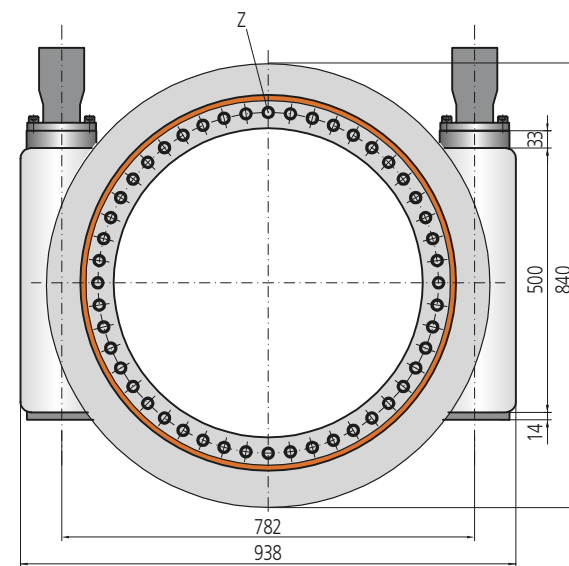
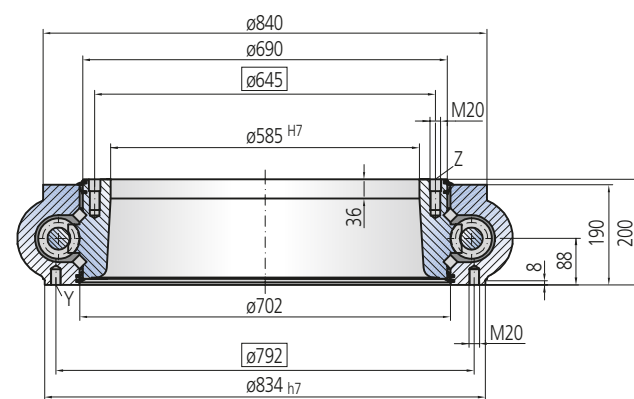
Pressure differential	Δp	[bar]	160 150
Oil flow	Q	[l/min]	62 95
Output speed	n	[rpm]	1 1
Maximum achievable torque	M_d	[Nm]	63220 76310

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0645 / twin drive



Mounting holes

Y = 48 Holes M20-30 deep, equally spaced
Z = 48 Holes ø22-22 deep / M20-36 deep, equally spaced

Lubrication ports

1 Taper type grease nipple on the outside of the housing on the right side and on the left side

Slew Drive supplied pre-lubricated

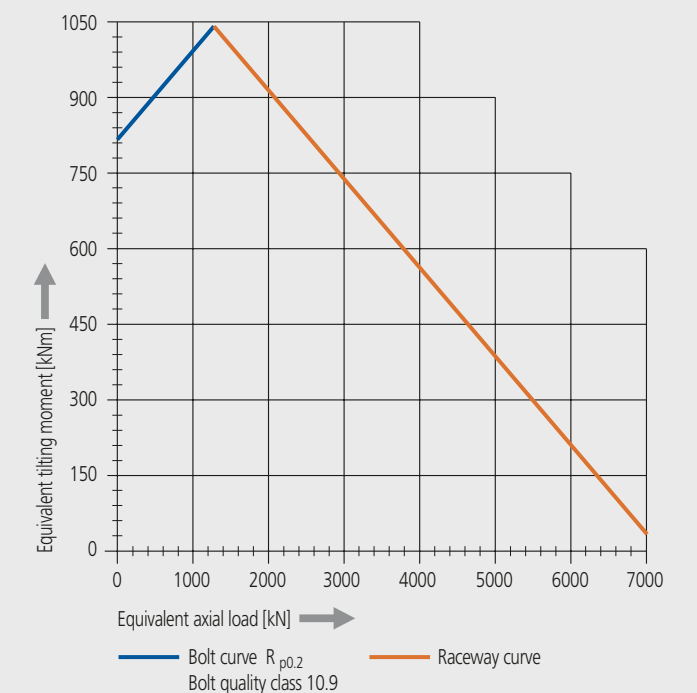
Drawing reference number WD-H 0645/3-00001			
Drawing reference number WD-H 0645/3-00021			
Module	m	[mm]	7 8
Number of starts of the worm		[-]	2 1
Gear ratio	i	[-]	51 90
Self-locking gears**			no no
Maximum torque $s_{FS} = 1$	$M_{d\ max}$	[Nm]	126440 152610
Nom. torque $s_{FS} = 1$ at $n = 1$ rpm	$M_{d\ nom}$	[Nm]	126440 152610
Maximum holding torque*	M_h	[Nm]	126440 152610
Static load rating, radial	$C_{o\ rad}$	[kN]	3528 3528
Static load rating, axial	$C_{o\ ax}$	[kN]	7199 7199
Dynamic load rating, radial	C_{rad}	[kN]	570 570
Dynamic load rating, axial	C_{ax}	[kN]	803 803
Weight		[kg]	480 480

*Optional with brake
**See technical data

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor DT-56

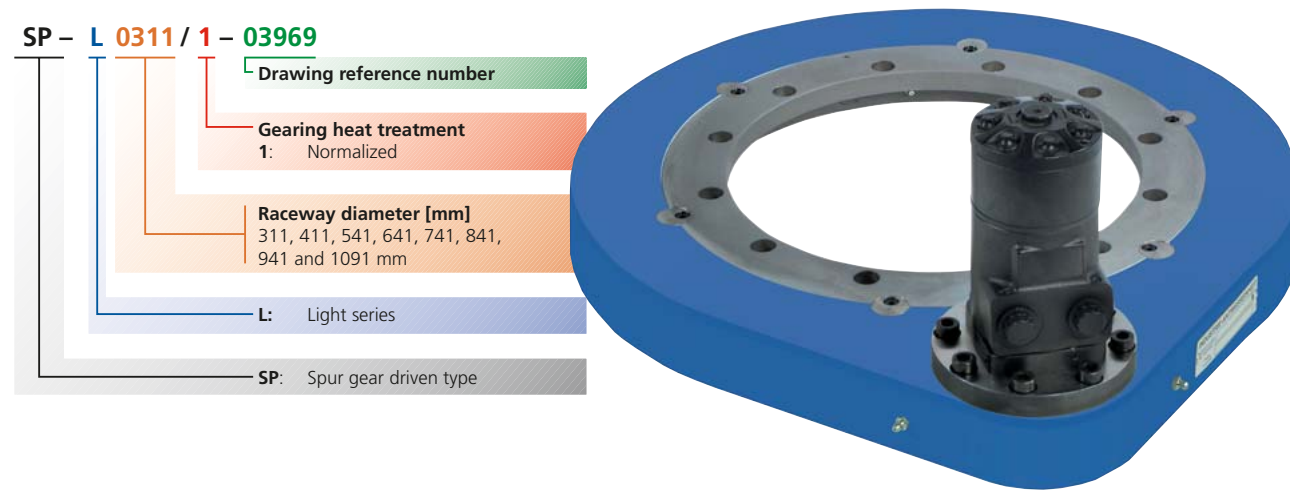
Pressure differential	Δp	[bar]	160 150
Oil flow	Q	[l/min]	124 190
Output speed	n	[rpm]	1 1
Maximum achievable torque	M_d	[Nm]	126440 152610

Limiting load diagram for 'compressive' load

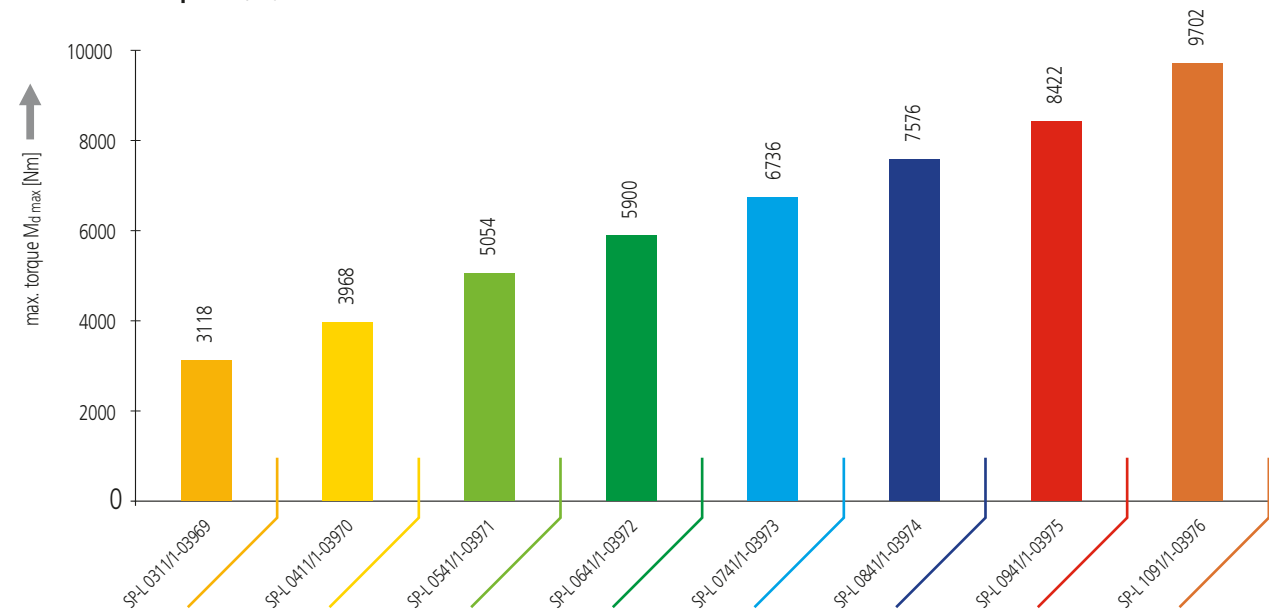


Please adhere strictly to the Technical Information section when using above graph!

Series Overview

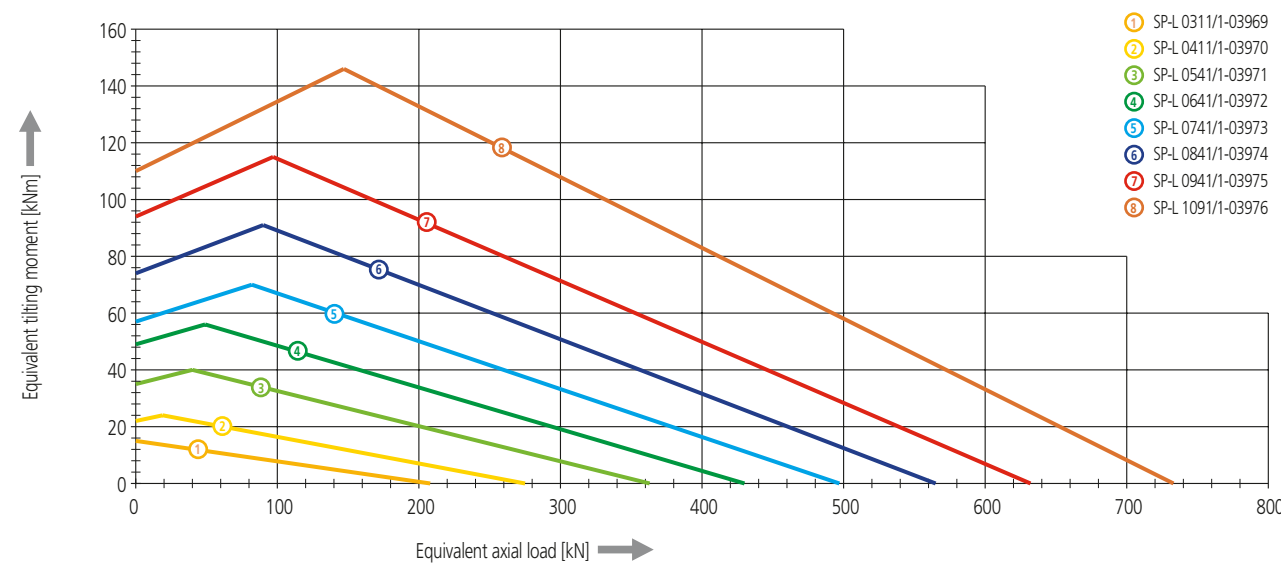


Maximum torque $M_{d\ max}$ of individual sizes



Limiting load diagrams of individual sizes for "compressive" load

Please refer to the explanations in the Technical Information section of the catalog



Verifying tooth base fatigue strength:

Valid for the following conditions:
 - Output speed: $n = 5.0$ rpm
 - Repeated load
 - Ambient temperature of 20°C

M_{dB} : Operation torque [Nm]
 $M_{d\ nom}$: Nominal torque [Nm] for $SF = 1$ and $n = 5.0$ rpm (see dimensions table)

If the following equation is met, the stress level of tooth base is below the endurance limit and fatigue is infinite:

$$M_{dB} \leq M_{d\ nom}$$

Fatigue stress of tooth base needs to be considered however, if the following equation is met (if so, refer to below additional steps to verify life):

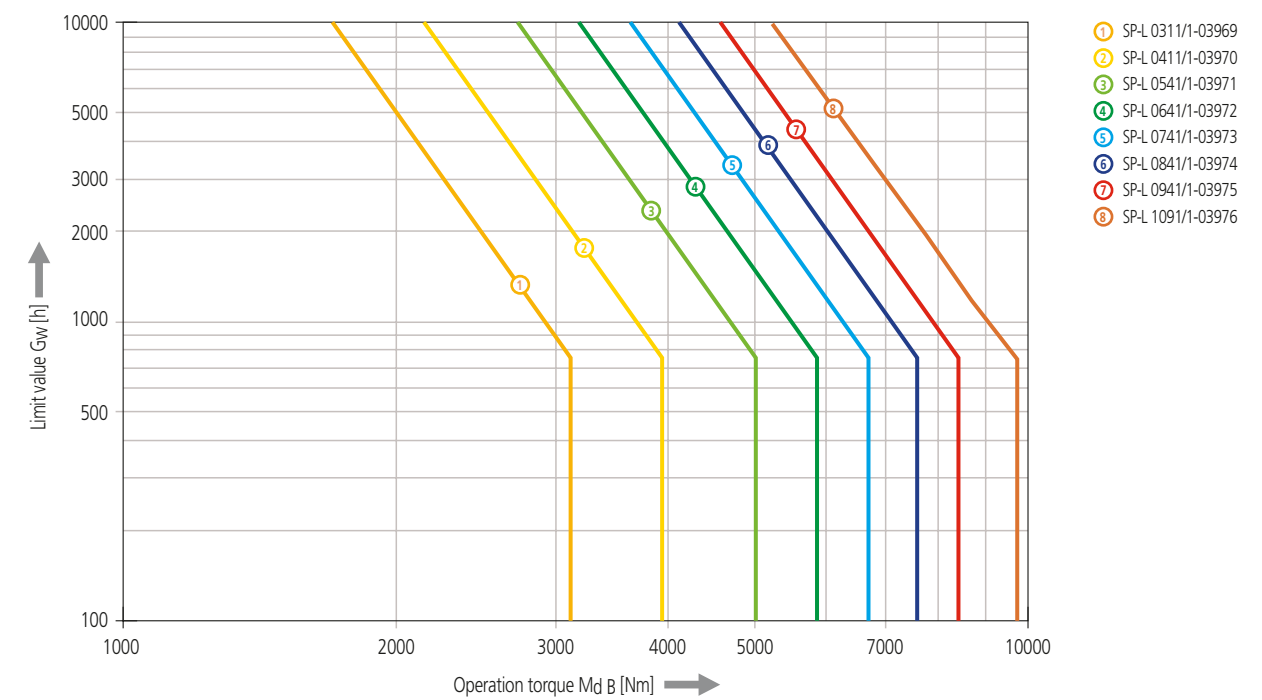
$$M_{dB} > M_{d\ nom}$$

The operation is permissible as regards the fatigue stress of tooth base, if the following equation is fulfilled.

$$G_w \geq B_h \cdot \frac{ED_B}{100}$$

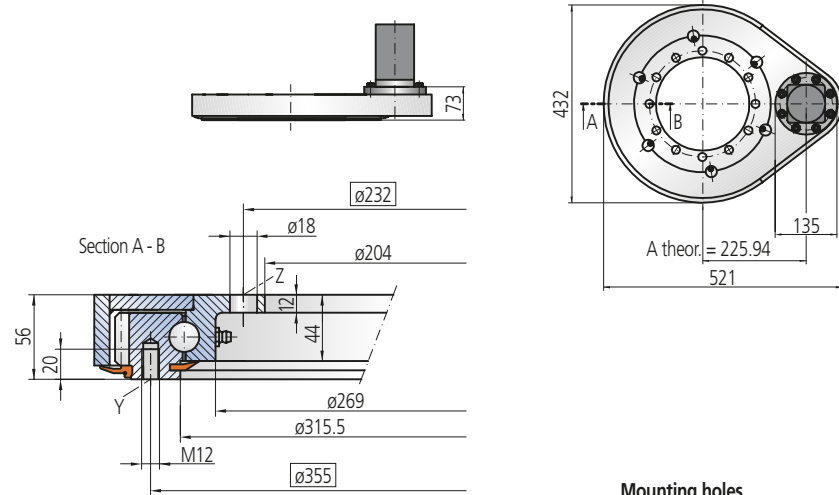
If this relationship is not fulfilled, then there is imminent danger of fatigue fracture of the tooth base.

G_w : Limit value from diagram [h]
 B_h : Operation time [h]
 ED_B : Duty [%]



Verification of the pitting and wear safety of tooth flanks must be done by the IMO Engineering Department!

Size 0311



Mounting holes

Y = 10 Holes M12-20 deep, equally spaced
Z = 12 Holes ø18, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be ø311, minimum

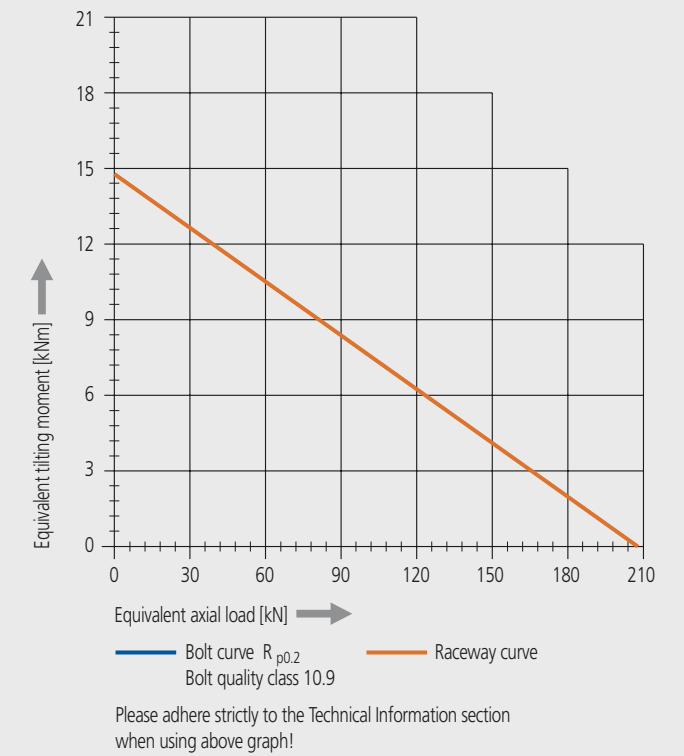
Drawing reference number SP-L 0311/1-03969			
Module	m [mm]	4	
Number of teeth, wheel	z₂ [-]	99	
Number of teeth, pinion	z₁ [-]	13	
Overall gear ration	i [-]	7.61	
Maximum torque $SFS = 1.75$	M_{d max} [Nm]	3118	
Nom. torque $SF = 1$ at $n = 5$ rpm	M_{d nom} [Nm]	1683	
Maximum holding torque*	M_h [Nm]	3118	
Static load rating, radial	C_{o rad} [kN]	89	
Static load rating, axial	C_{o ax} [kN]	208	
Dynamic load rating, radial	C_{rad} [kN]	140	
Dynamic load rating, axial	C_{ax} [kN]	140	
Weight	[kg]	45	

*Optional with brake

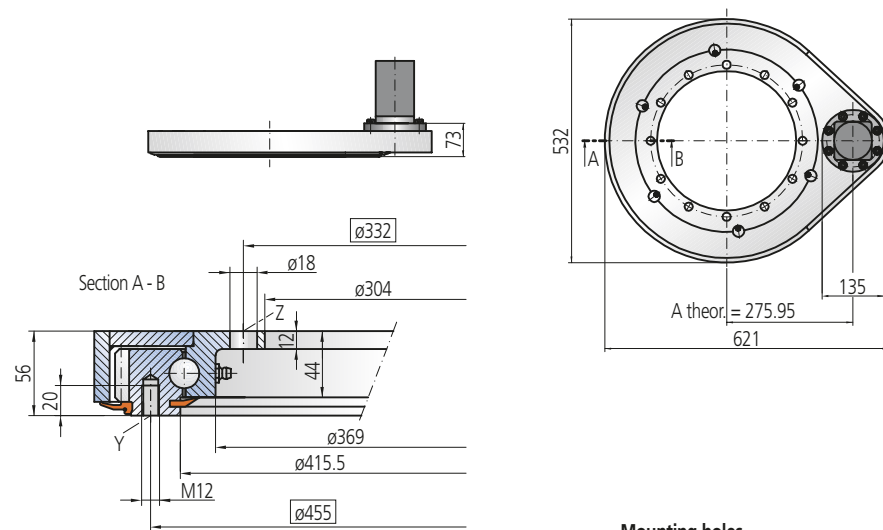
The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor H-300

Pressure differential	Δp [bar]	115
Oil flow	Q [l/min]	17
Output speed	n [rpm]	5
Maximum achievable torque	M_d [Nm]	3118

Limiting load diagram for 'compressive' load



Size 0411



Mounting holes

Y = 10 Holes M12-20 deep, equally spaced
Z = 12 Holes ø18, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be ø411, minimum

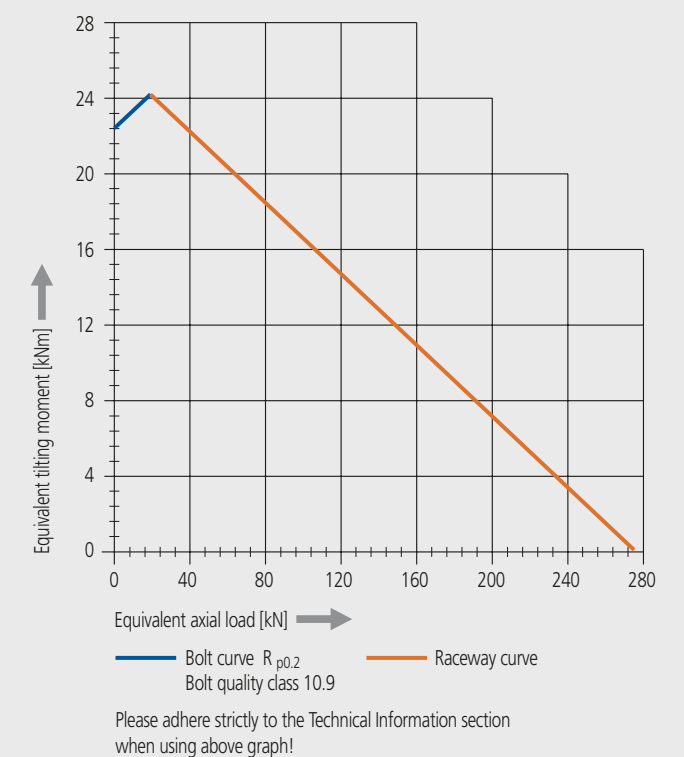
Drawing reference number SP-L 0411/1-03970			
Module	m [mm]	4	
Number of teeth, wheel	z₂ [-]	124	
Number of teeth, pinion	z₁ [-]	13	
Overall gear ration	i [-]	9.53	
Maximum torque $SFS = 1.75$	M_{d max} [Nm]	3968	
Nom. torque $SF = 1$ at $n = 5$ rpm	M_{d nom} [Nm]	2145	
Maximum holding torque*	M_h [Nm]	3968	
Static load rating, radial	C_{o rad} [kN]	118	
Static load rating, axial	C_{o ax} [kN]	275	
Dynamic load rating, radial	C_{rad} [kN]	155	
Dynamic load rating, axial	C_{ax} [kN]	156	
Weight	[kg]	58	

*Optional with brake

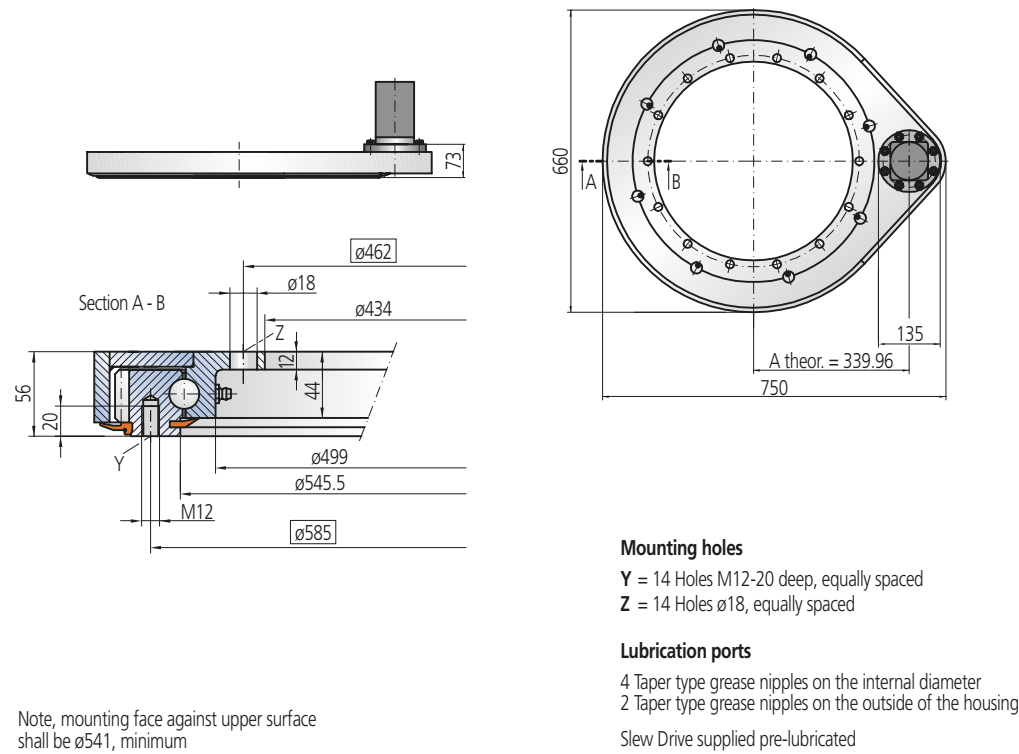
The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor H-300

Pressure differential	Δp [bar]	120
Oil flow	Q [l/min]	20
Output speed	n [rpm]	5
Maximum achievable torque	M_d [Nm]	3968

Limiting load diagram for 'compressive' load



Size 0541



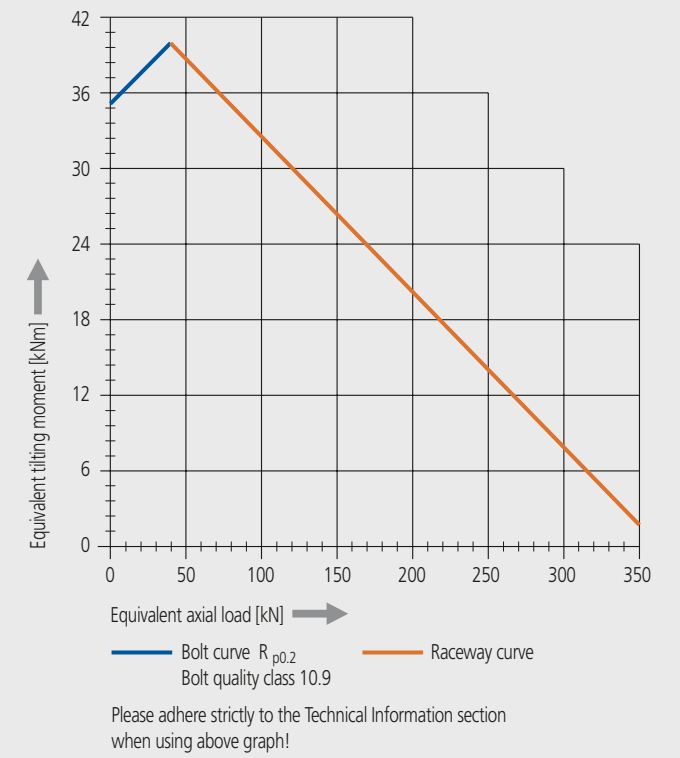
Drawing reference number SP-L 0541/1-03971			
Module	m	[mm]	4
Number of teeth, wheel	z₂	[-]	156
Number of teeth, pinion	z₁	[-]	13
Overall gear ration	i	[-]	12
Maximum torque sfs = 1.75	M_{d max}	[Nm]	5054
Nom. torque SF = 1 at n = 5 rpm	M_{d nom}	[Nm]	2714
Maximum holding torque*	M_h	[Nm]	5054
Static load rating, radial	C_{o rad}	[kN]	155
Static load rating, axial	C_{o ax}	[kN]	363
Dynamic load rating, radial	C_{rad}	[kN]	173
Dynamic load rating, axial	C_{ax}	[kN]	174
Weight		[kg]	65

*Optional with brake

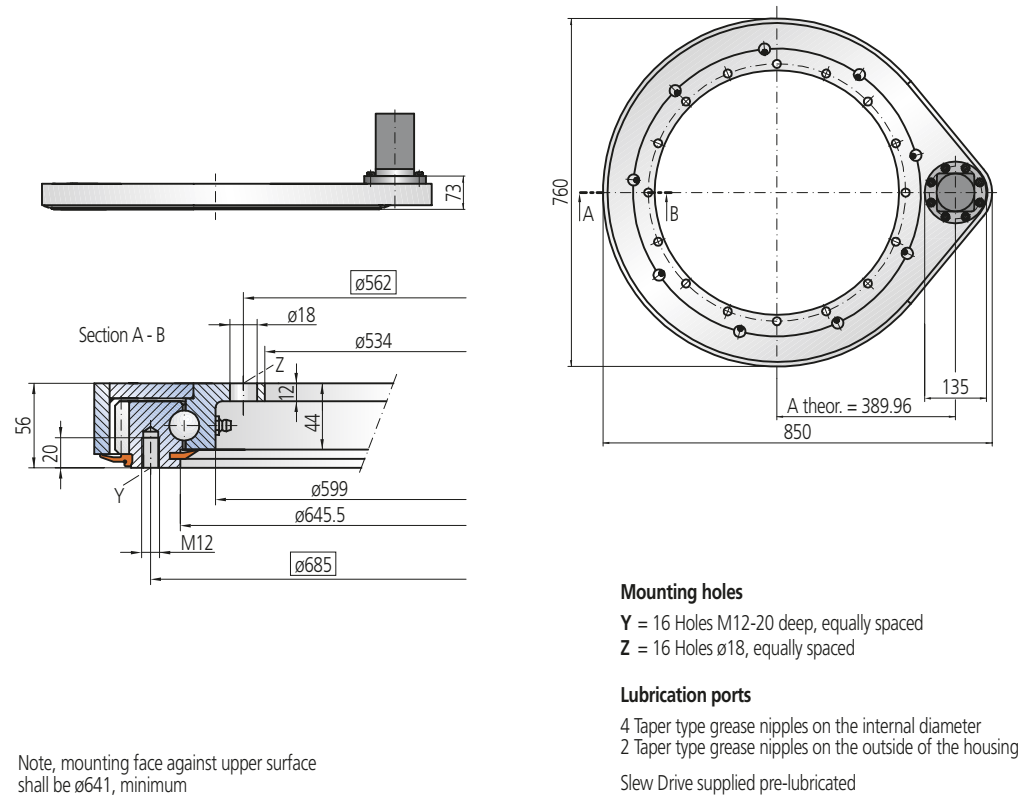
The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
 Selection example: performance data with hydraulic motor H-300

Pressure differential	Δp	[bar]	120
Oil flow	Q	[l/min]	23
Output speed	n	[rpm]	5
Maximum achievable torque	M_d	[Nm]	5054

Limiting load diagram for 'compressive' load



Size 0641



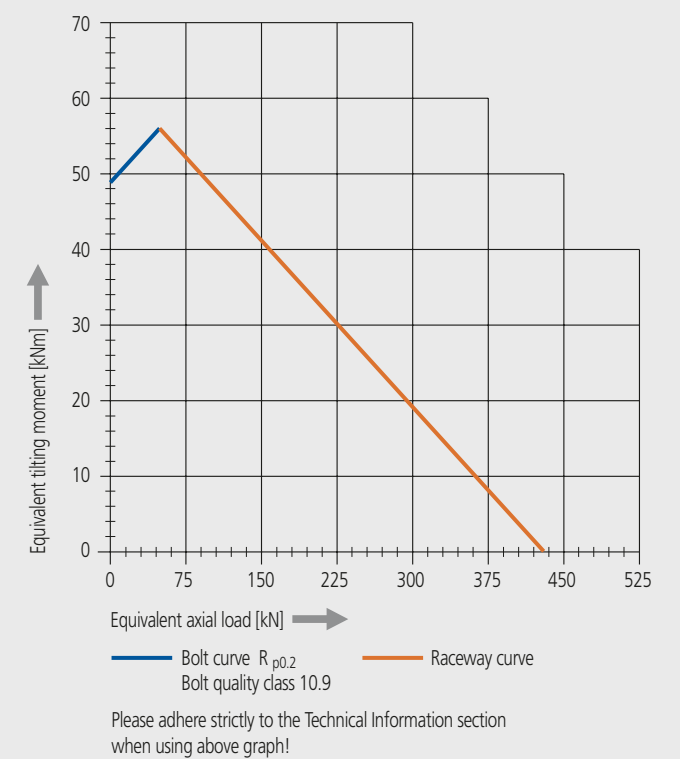
Drawing reference number SP-L 0641/1-03972			
Module	m	[mm]	4
Number of teeth, wheel	z₂	[-]	181
Number of teeth, pinion	z₁	[-]	13
Overall gear ration	i	[-]	13.92
Maximum torque sfs = 1.75	M_{d max}	[Nm]	5900
Nom. torque SF = 1 at n = 5 rpm	M_{d nom}	[Nm]	3160
Maximum holding torque*	M_h	[Nm]	5900
Static load rating, radial	C_{o rad}	[kN]	184
Static load rating, axial	C_{o ax}	[kN]	430
Dynamic load rating, radial	C_{rad}	[kN]	184
Dynamic load rating, axial	C_{ax}	[kN]	185
Weight		[kg]	75

*Optional with brake

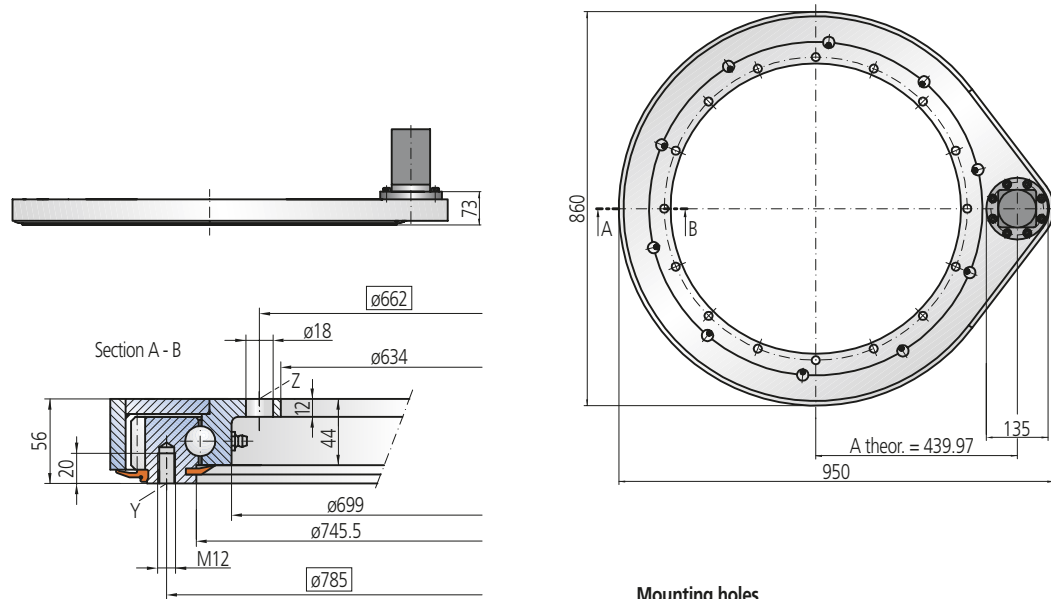
The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
 Selection example: performance data with hydraulic motor H-300

Pressure differential	Δp	[bar]	120
Oil flow	Q	[l/min]	27
Output speed	n	[rpm]	5
Maximum achievable torque	M_d	[Nm]	5900

Limiting load diagram for 'compressive' load



Size 0741



Mounting holes
 Y = 18 Holes M12-20 deep, equally spaced
 Z = 16 Holes ϕ 18, equally spaced

Lubrication ports
 4 Taper type grease nipples on the internal diameter
 2 Taper type grease nipples on the outside of the housing
 Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be ϕ 741, minimum

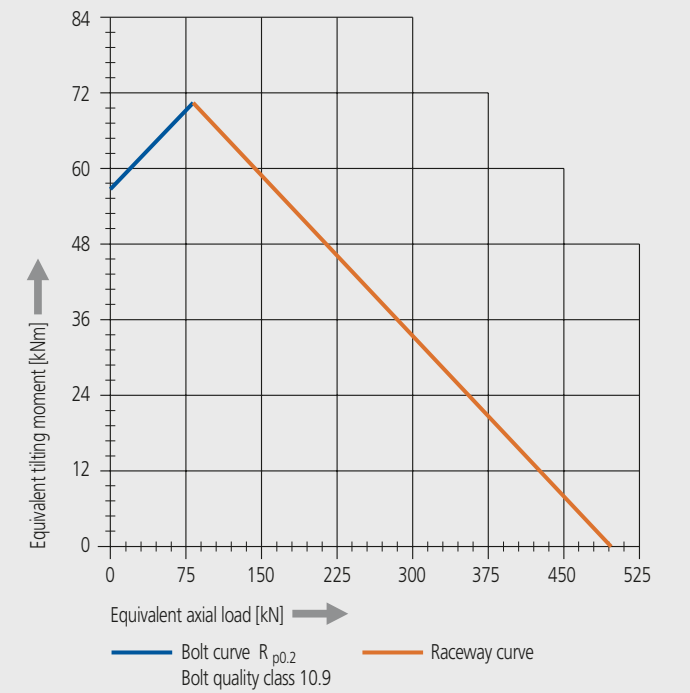
Drawing reference number SP-L 0741/1-03973			
Module	m	[mm]	4
Number of teeth, wheel	z₂	[-]	206
Number of teeth, pinion	z₁	[-]	13
Overall gear ration	i	[-]	15.84
Maximum torque sfs = 1.75	M_{d max}	[Nm]	6736
Nom. torque SF = 1 at n = 5 rpm	M_{d nom}	[Nm]	3605
Maximum holding torque*	M_h	[Nm]	6736
Static load rating, radial	C_{o rad}	[kN]	213
Static load rating, axial	C_{o ax}	[kN]	497
Dynamic load rating, radial	C_{rad}	[kN]	194
Dynamic load rating, axial	C_{ax}	[kN]	195
Weight		[kg]	85

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
 Selection example: performance data with hydraulic motor H-300

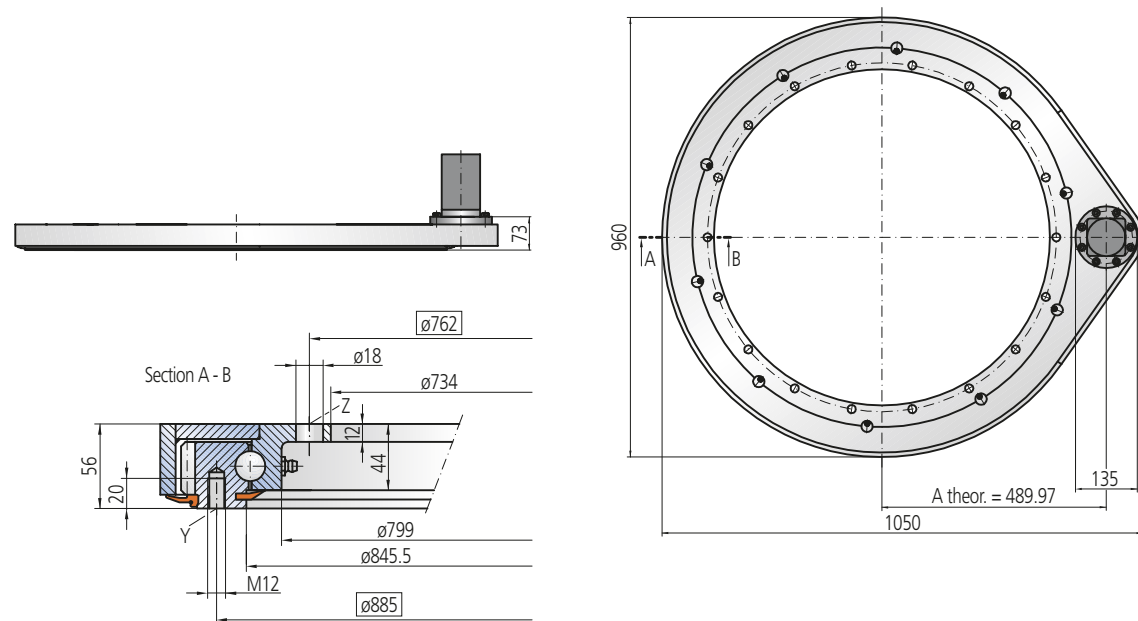
Pressure differential	Δp	[bar]	120
Oil flow	Q	[l/min]	30
Output speed	n	[rpm]	5
Maximum achievable torque	M_d	[Nm]	6736

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0841



Mounting holes
 Y = 18 Holes M12-20 deep, equally spaced
 Z = 18 Holes ϕ 18, equally spaced

Lubrication ports
 4 Taper type grease nipples on the internal diameter
 2 Taper type grease nipples on the outside of the housing
 Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be ϕ 841, minimum

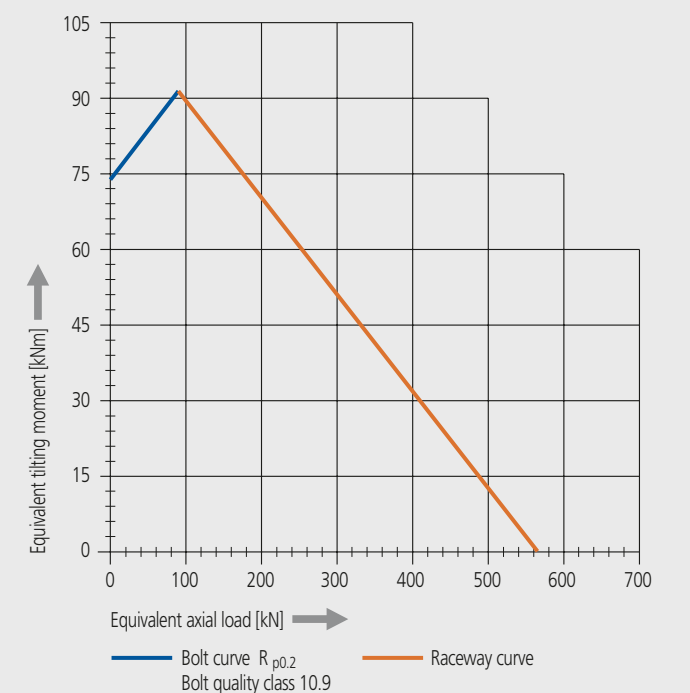
Drawing reference number SP-L 0841/1-03974			
Module	m	[mm]	4
Number of teeth, wheel	z₂	[-]	231
Number of teeth, pinion	z₁	[-]	13
Overall gear ration	i	[-]	17.76
Maximum torque sfs = 1.75	M_{d max}	[Nm]	7576
Nom. torque SF = 1 at n = 5 rpm	M_{d nom}	[Nm]	4042
Maximum holding torque*	M_h	[Nm]	7576
Static load rating, radial	C_{o rad}	[kN]	241
Static load rating, axial	C_{o ax}	[kN]	565
Dynamic load rating, radial	C_{rad}	[kN]	204
Dynamic load rating, axial	C_{ax}	[kN]	206
Weight		[kg]	95

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
 Selection example: performance data with hydraulic motor H-300

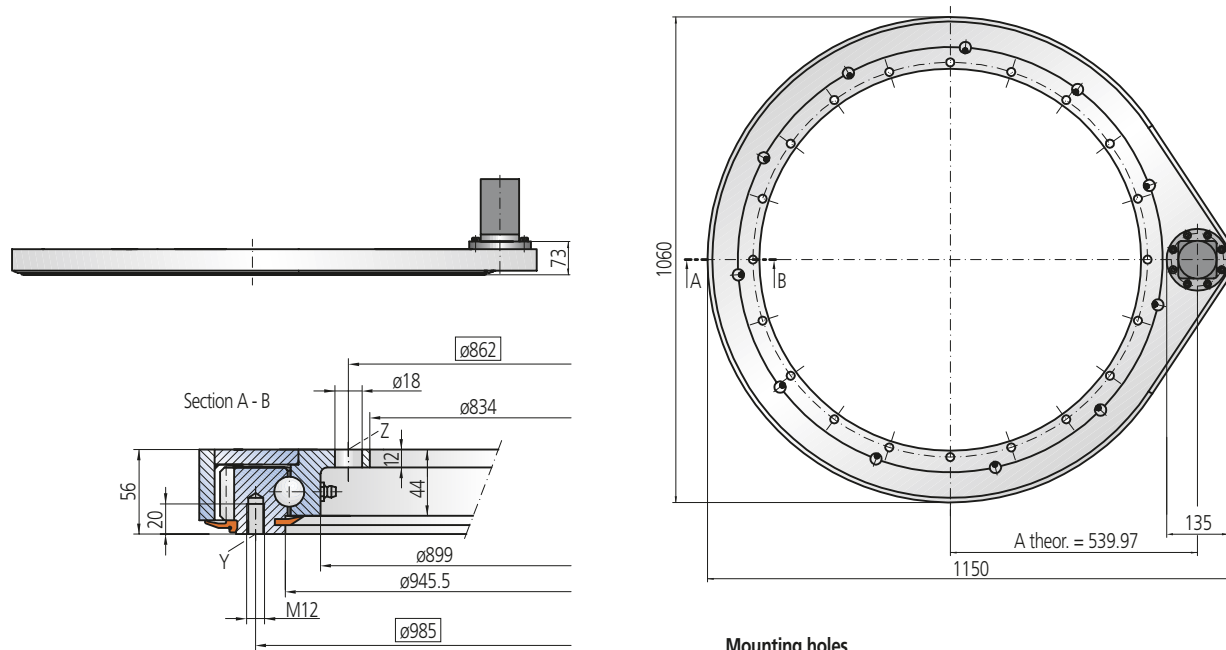
Pressure differential	Δp	[bar]	120
Oil flow	Q	[l/min]	32
Output speed	n	[rpm]	5
Maximum achievable torque	M_d	[Nm]	7576

Limiting load diagram for thrust loading



Please adhere strictly to the Technical Information section when using above graph!

Size 0941



Note, mounting face against upper surface shall be $\varnothing 941$, minimum

Mounting holes

Y = 20 Holes M12-20 deep, equally spaced
Z = 20 Holes $\varnothing 18$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing
Slew Drive supplied pre-lubricated

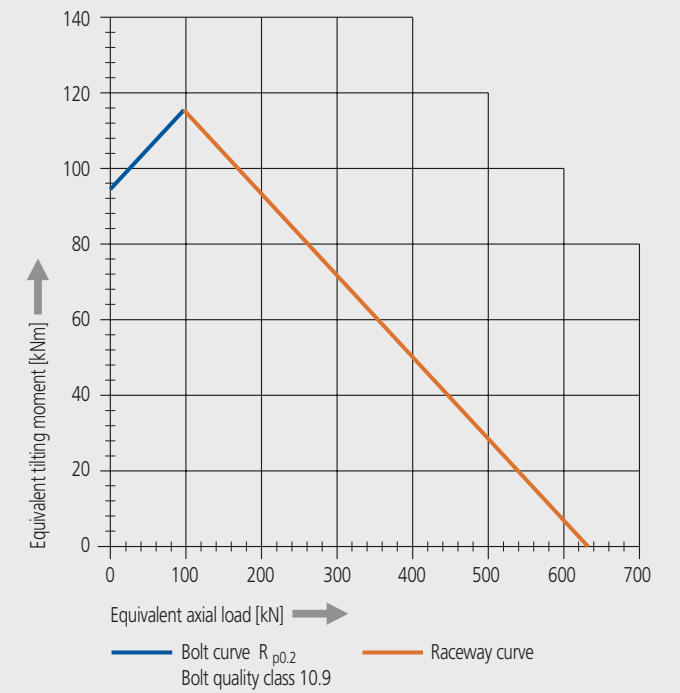
Drawing reference number SP-L 0941/1-03975			
Module	m	[mm]	4
Number of teeth, wheel	z₂	[-]	256
Number of teeth, pinion	z₁	[-]	13
Overall gear ration	i	[-]	19.69
Maximum torque sfs = 1.75	M_{d max}	[Nm]	8422
Nom. torque SF = 1 at n = 5 rpm	M_{d nom}	[Nm]	4480
Maximum holding torque*	M_h	[Nm]	8422
Static load rating, radial	C_{o rad}	[kN]	270
Static load rating, axial	C_{o ax}	[kN]	632
Dynamic load rating, radial	C_{rad}	[kN]	212
Dynamic load rating, axial	C_{ax}	[kN]	214
Weight		[kg]	105

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor H-300

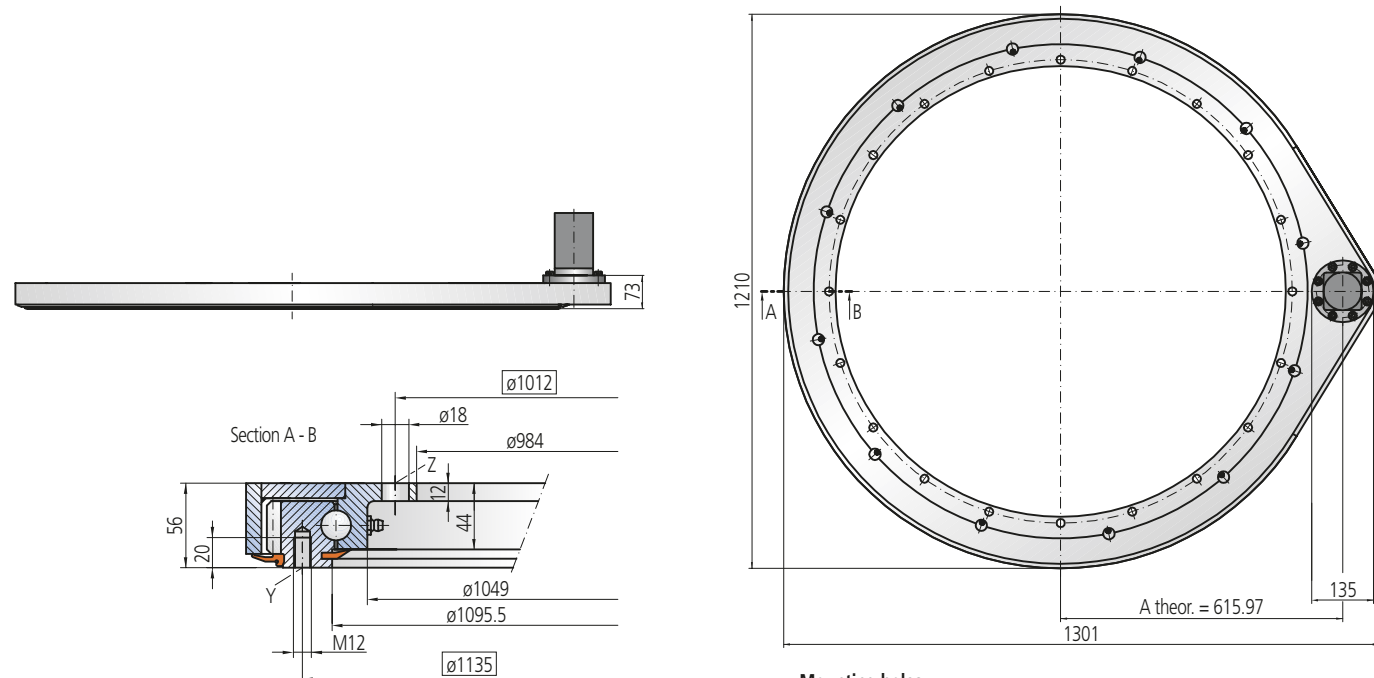
Pressure differential	Δp	[bar]	120
Oil flow	Q	[l/min]	36
Output speed	n	[rpm]	5
Maximum achievable torque	M_d	[Nm]	8422

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 1091



Note, mounting face against upper surface shall be $\varnothing 1091$, minimum

Mounting holes

Y = 22 Holes M12-20 deep, equally spaced
Z = 20 Holes $\varnothing 18$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing
Slew Drive supplied pre-lubricated

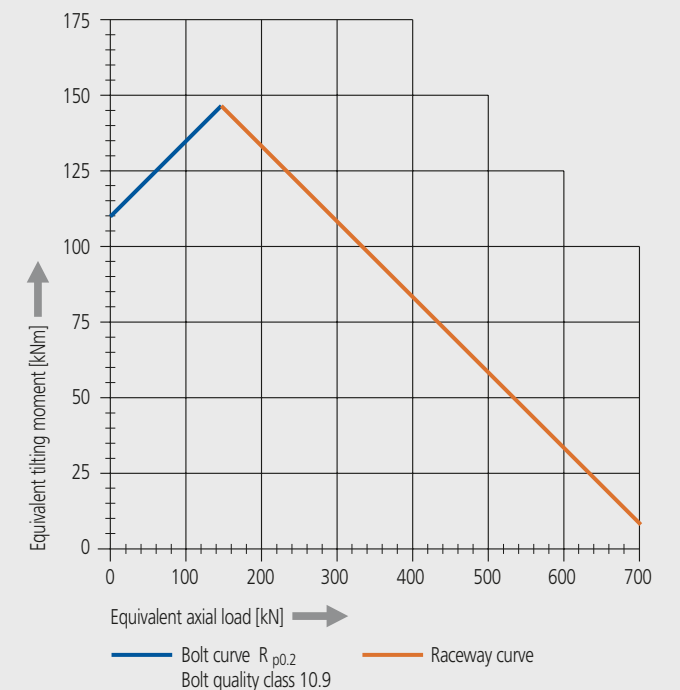
Drawing reference number SP-L 1091/1-03976			
Module	m	[mm]	4
Number of teeth, wheel	z₂	[-]	294
Number of teeth, pinion	z₁	[-]	13
Overall gear ration	i	[-]	22.61
Maximum torque sfs = 1.75	M_{d max}	[Nm]	9702
Nom. torque SF = 1 at n = 5 rpm	M_{d nom}	[Nm]	5174
Maximum holding torque*	M_h	[Nm]	9702
Static load rating, radial	C_{o rad}	[kN]	313
Static load rating, axial	C_{o ax}	[kN]	733
Dynamic load rating, radial	C_{rad}	[kN]	224
Dynamic load rating, axial	C_{ax}	[kN]	226
Weight		[kg]	120

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor H-300

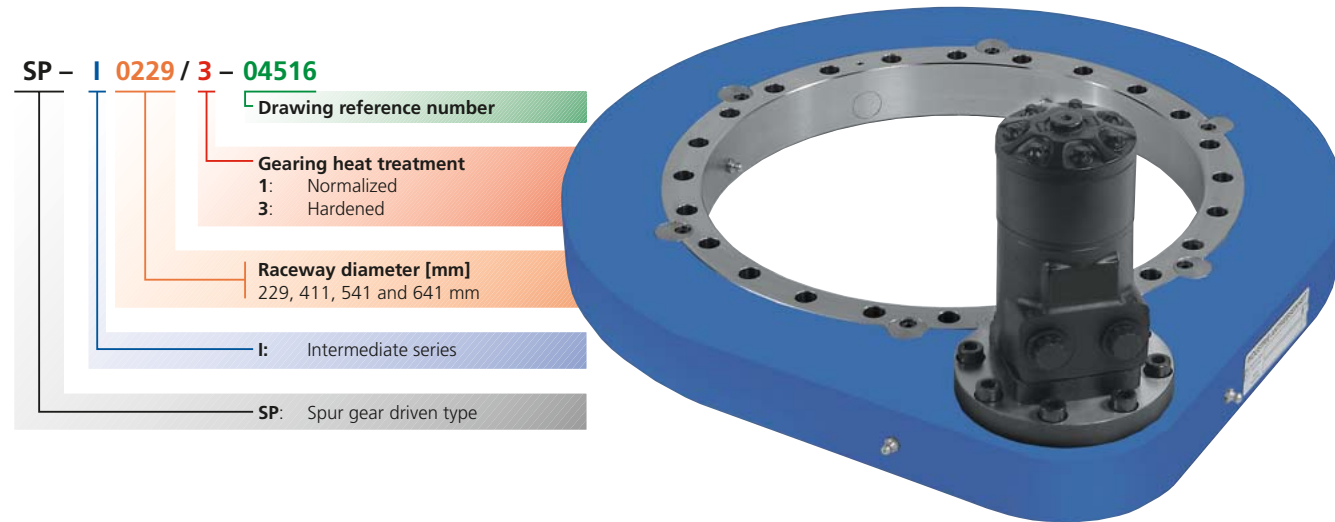
Pressure differential	Δp	[bar]	120
Oil flow	Q	[l/min]	40
Output speed	n	[rpm]	5
Maximum achievable torque	M_d	[Nm]	9702

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Series Overview



Verifying tooth base fatigue strength:

Valid for the following conditions:
 - Output speed: $n = 5.0$ rpm
 - Repeated load
 - Ambient temperature of 20°C

M_{dB} : Operation torque [Nm]
 M_{dnom} : Nominal torque [Nm] for $SF = 1$ and $n = 5.0$ rpm (see dimensions table)

If the following equation is met, the stress level of tooth base is below the endurance limit and fatigue is infinite:

$$M_{dB} \leq M_{dnom}$$

Fatigue stress of tooth base needs to be considered however, if the following equation is met (if so, refer to below additional steps to verify life):

$$M_{dB} > M_{dnom}$$

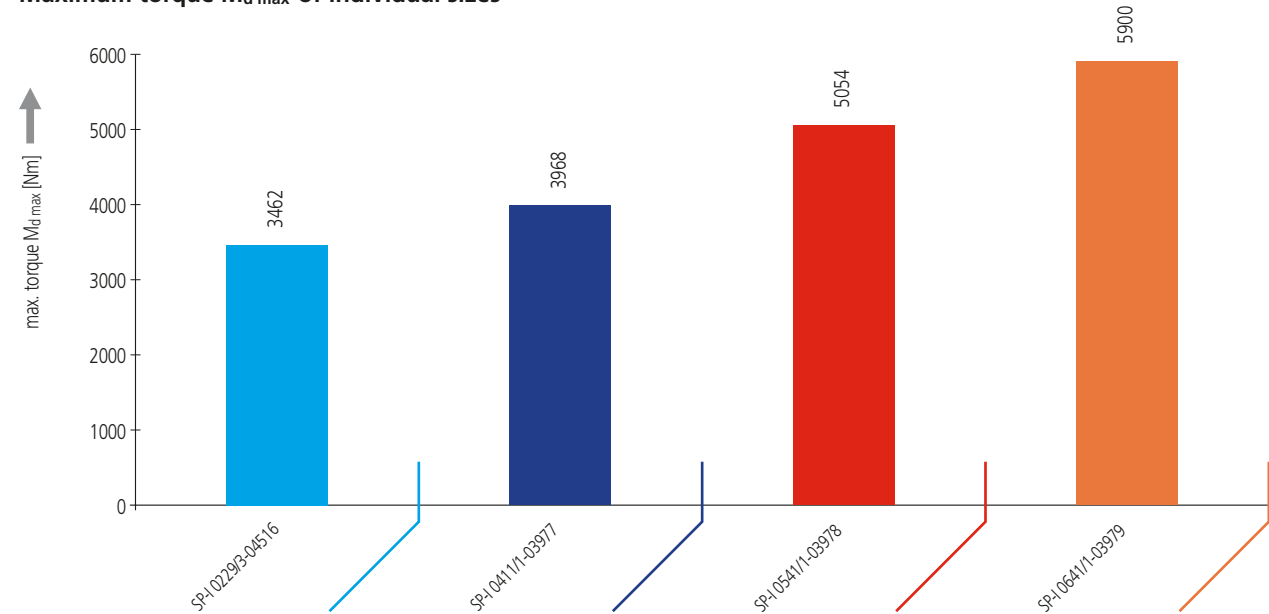
The operation is permissible as regards the fatigue stress of tooth base, if the following equation is fulfilled.

$$G_w \geq B_h \cdot \frac{ED_B}{100}$$

If this relationship is not fulfilled, then there is imminent danger of fatigue fracture of the tooth base.

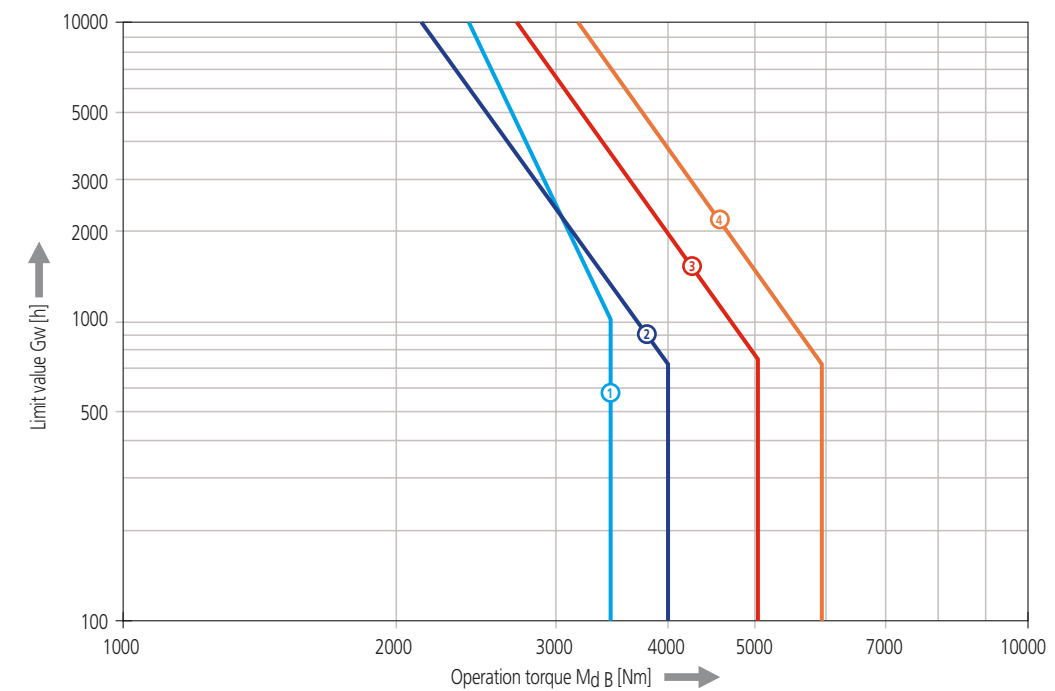
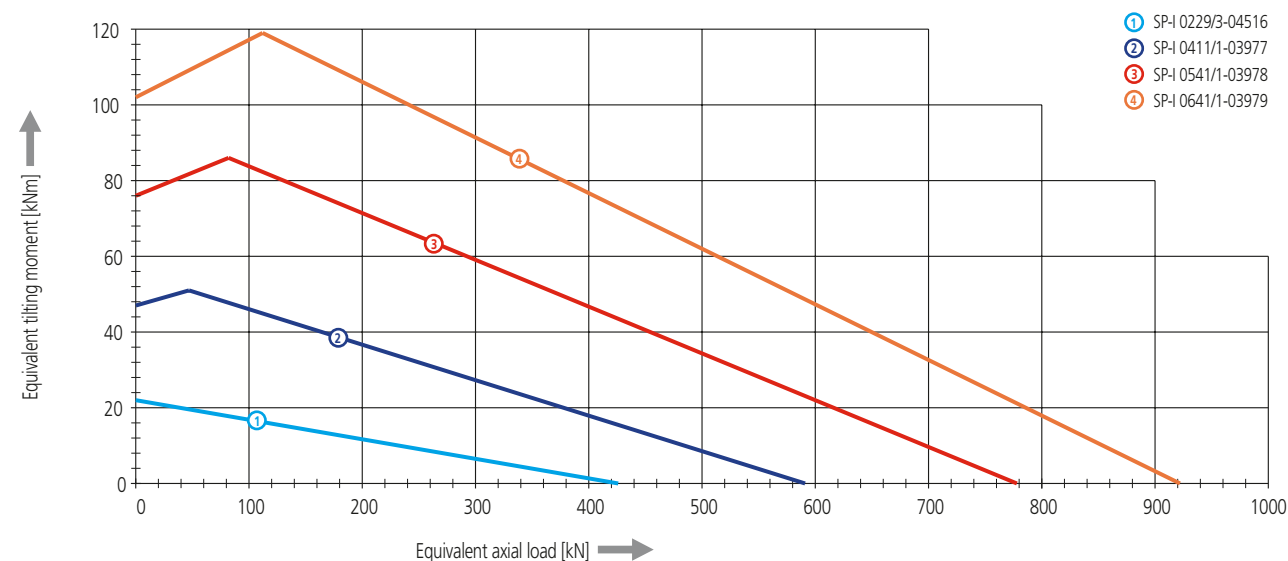
G_w : Limit value from diagram [h]
 B_h : Operation time [h]
 ED_B : Duty [%]

Maximum torque M_{dmax} of individual sizes



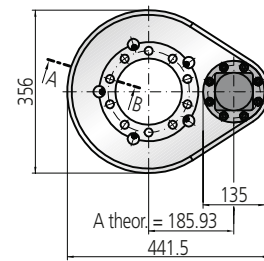
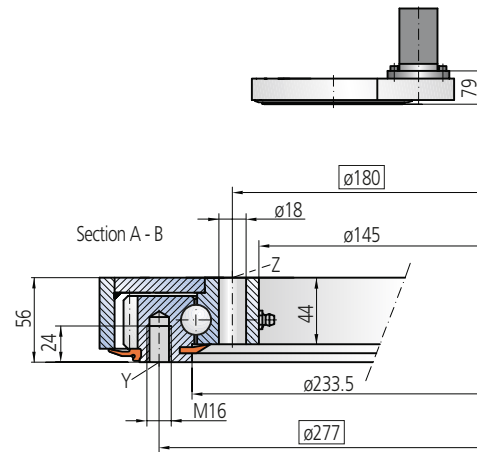
Limiting load diagrams of individual sizes for "compressive" load

Please refer to the explanations in the Technical Information section of the catalog



Verification of the pitting and wear safety of tooth flanks must be done by the IMO Engineering Department!

Size 0229



Mounting holes

Y = 12 Holes M16-24 deep, equally spaced
Z = 10 Holes $\phi 18$, equally spaced

Lubrication ports

2 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be $\phi 229$, minimum

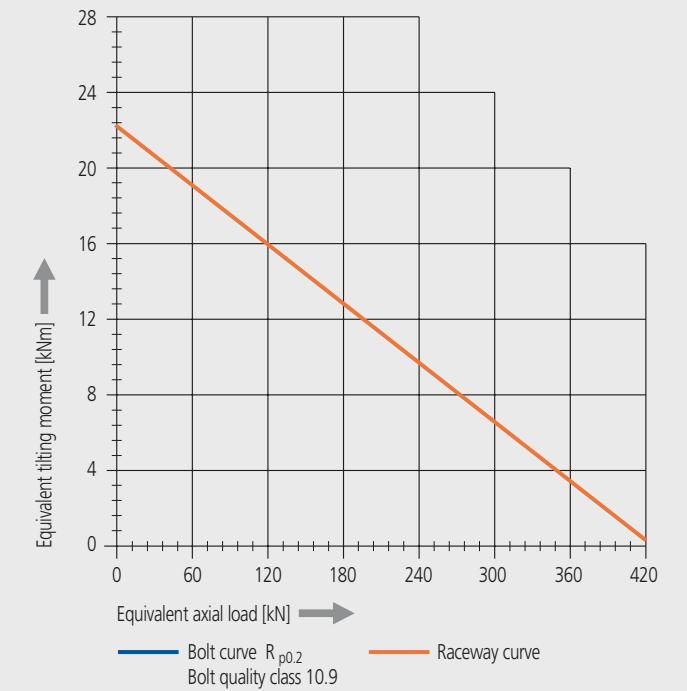
Drawing reference number SP-I 0229/3-04516			
Module	m	[mm]	4
Number of teeth, wheel	z₂	[-]	79
Number of teeth, pinion	z₁	[-]	13
Overall gear ration	i	[-]	6.07
Maximum torque	M_{d max}	[Nm]	3462
Nom. torque SF = 1 at n = 5 rpm	M_{d nom}	[Nm]	2370
Maximum holding torque*	M_h	[Nm]	3462
Static load rating, radial	C_{o rad}	[kN]	156
Static load rating, axial	C_{o ax}	[kN]	426
Dynamic load rating, radial	C_{rad}	[kN]	134
Dynamic load rating, axial	C_{ax}	[kN]	156
Weight		[kg]	42

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor OMR 315

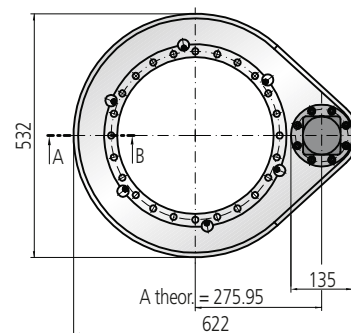
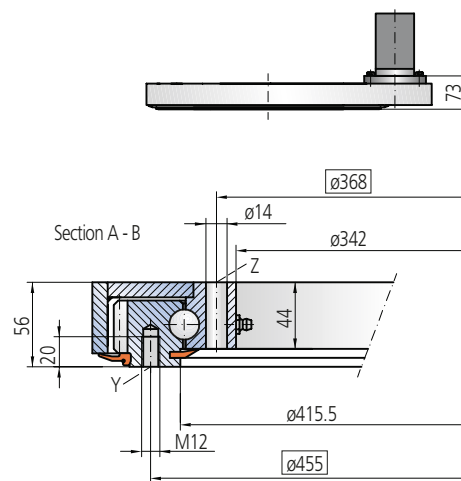
Pressure differential	Δp	[bar]	145
Oil flow	Q	[l/min]	15
Output speed	n	[rpm]	5
Maximum achievable torque	M_d	[Nm]	3462

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0411



Mounting holes

Y = 20 Holes M12-20 deep, equally spaced
Z = 24 Holes $\phi 14$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be $\phi 411$, minimum

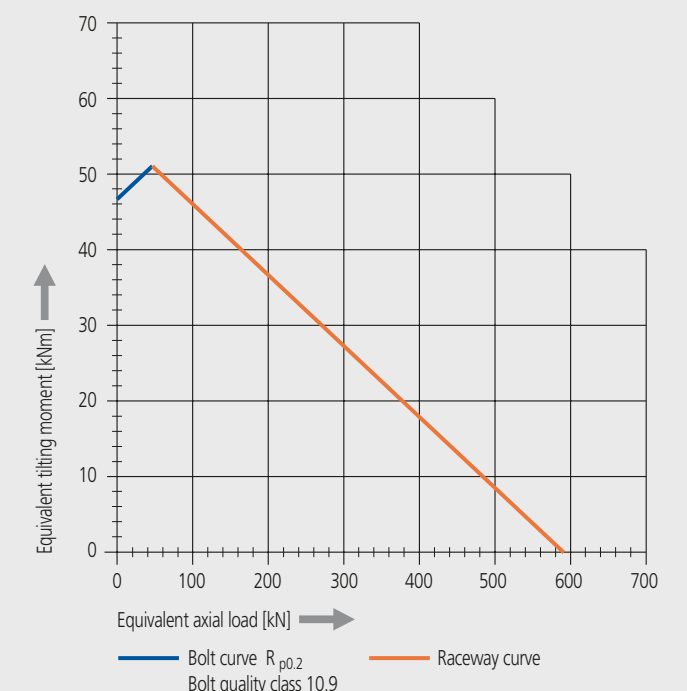
Drawing reference number SP-I 0411/1-03977			
Module	m	[mm]	4
Number of teeth, wheel	z₂	[-]	124
Number of teeth, pinion	z₁	[-]	13
Overall gear ration	i	[-]	9.54
Maximum torque SF = 1.75	M_{d max}	[Nm]	3968
Nom. torque SF = 1 at n = 5 rpm	M_{d nom}	[Nm]	2145
Maximum holding torque*	M_h	[Nm]	3968
Static load rating, radial	C_{o rad}	[kN]	253
Static load rating, axial	C_{o ax}	[kN]	591
Dynamic load rating, radial	C_{rad}	[kN]	155
Dynamic load rating, axial	C_{ax}	[kN]	156
Weight		[kg]	60

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor H-300

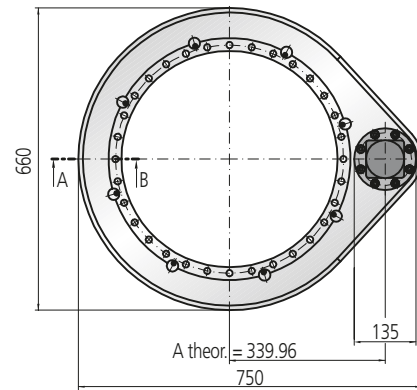
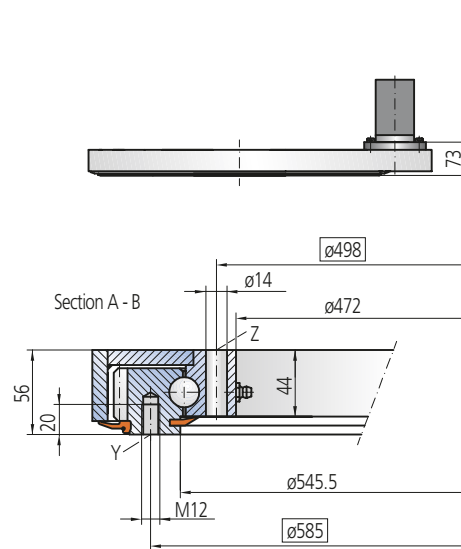
Pressure differential	Δp	[bar]	120
Oil flow	Q	[l/min]	20
Output speed	n	[rpm]	5
Maximum achievable torque	M_d	[Nm]	3968

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0541



Mounting holes

Y = 28 Holes M12-20 deep, equally spaced
Z = 32 Holes $\phi 14$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be $\phi 541$, minimum

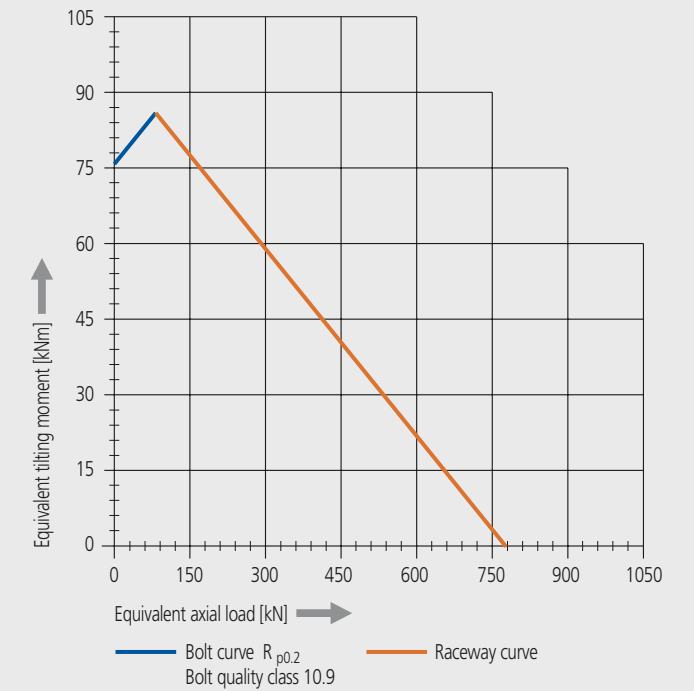
Drawing reference number SP-I 0541/1-03978			
Module	m [mm]	4	
Number of teeth, wheel	z₂ [-]	156	
Number of teeth, pinion	z₁ [-]	13	
Overall gear ration	i [-]	12	
Maximum torque $s_{FS} = 1.75$	M_{d max} [Nm]	5054	
Nom. torque $s_F = 1$ at $n = 5$ rpm	M_{d nom} [Nm]	2714	
Maximum holding torque*	M_h [Nm]	5054	
Static load rating, radial	C_{o rad} [kN]	155	
Static load rating, axial	C_{o ax} [kN]	363	
Dynamic load rating, radial	C_{rad} [kN]	173	
Dynamic load rating, axial	C_{ax} [kN]	174	
Weight	[kg]	75	

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor H-300

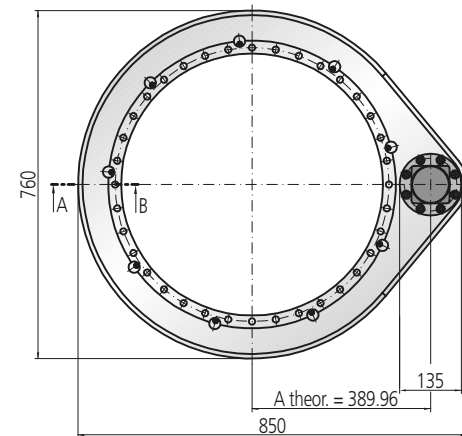
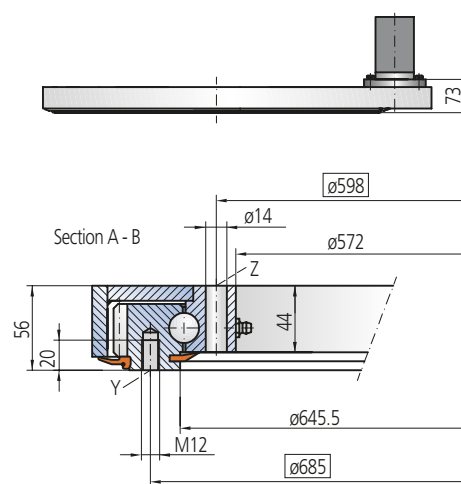
Pressure differential	Δp [bar]	120
Oil flow	Q [l/min]	23
Output speed	n [rpm]	5
Maximum achievable torque	M_d [Nm]	5054

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0641



Mounting holes

Y = 32 Holes M12-20 deep, equally spaced
Z = 36 Holes $\phi 14$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be $\phi 641$, minimum

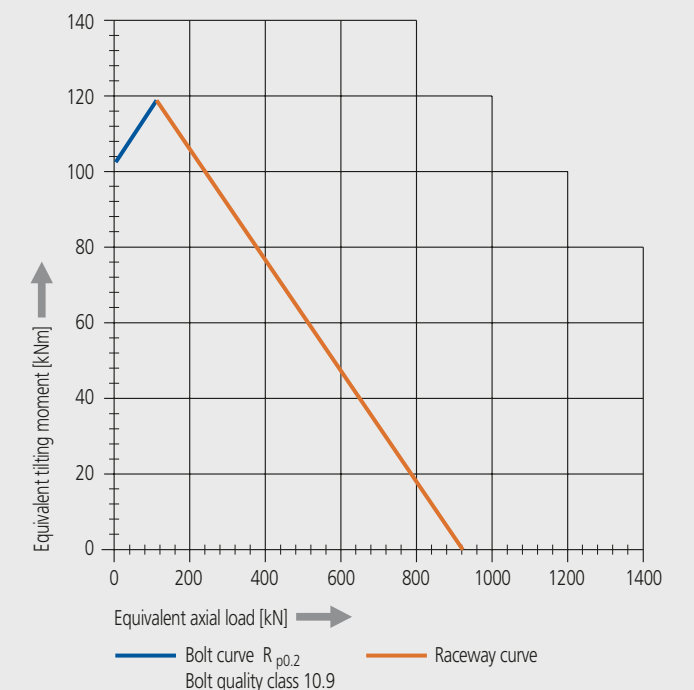
Drawing reference number SP-I 0641/1-03979			
Module	m [mm]	4	
Number of teeth, wheel	z₂ [-]	181	
Number of teeth, pinion	z₁ [-]	13	
Overall gear ration	i [-]	13.92	
Maximum torque $s_{FS} = 1.75$	M_{d max} [Nm]	5900	
Nom. torque $s_F = 1$ at $n = 5$ rpm	M_{d nom} [Nm]	3160	
Maximum holding torque*	M_h [Nm]	5900	
Static load rating, radial	C_{o rad} [kN]	394	
Static load rating, axial	C_{o ax} [kN]	922	
Dynamic load rating, radial	C_{rad} [kN]	184	
Dynamic load rating, axial	C_{ax} [kN]	185	
Weight	[kg]	85	

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor H-300

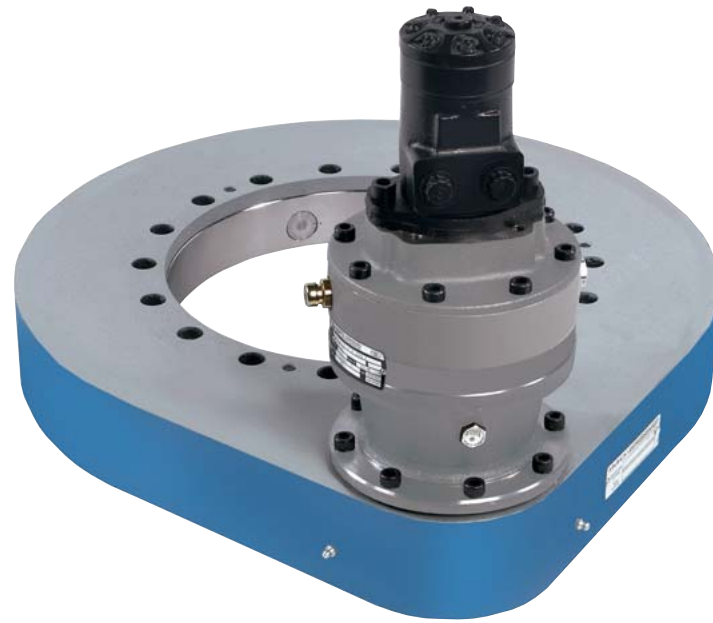
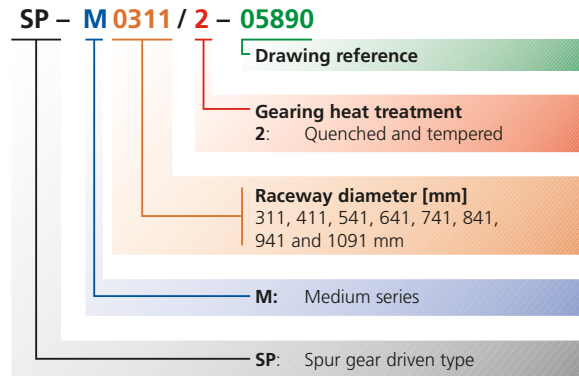
Pressure differential	Δp [bar]	120
Oil flow	Q [l/min]	27
Output speed	n [rpm]	5
Maximum achievable torque	M_d [Nm]	5900

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Series Overview



Verifying tooth base fatigue strength:

Valid for the following conditions:
 - Output speed: $n = 5.0$ rpm
 - Repeated load
 - Ambient temperature of 20°C

M_{dB} : Operation torque [Nm]
 $M_{d\text{nom}}$: Nominal torque [Nm] for $SF = 1$ and $n = 5.0$ rpm (see dimensions table)

If the following equation is met, the stress level of tooth base is below the endurance limit and fatigue is infinite:

$$M_{dB} \leq M_{d\text{nom}}$$

Fatigue stress of tooth base needs to be considered however, if the following equation is met (if so, refer to below additional steps to verify life):

$$M_{dB} > M_{d\text{nom}}$$

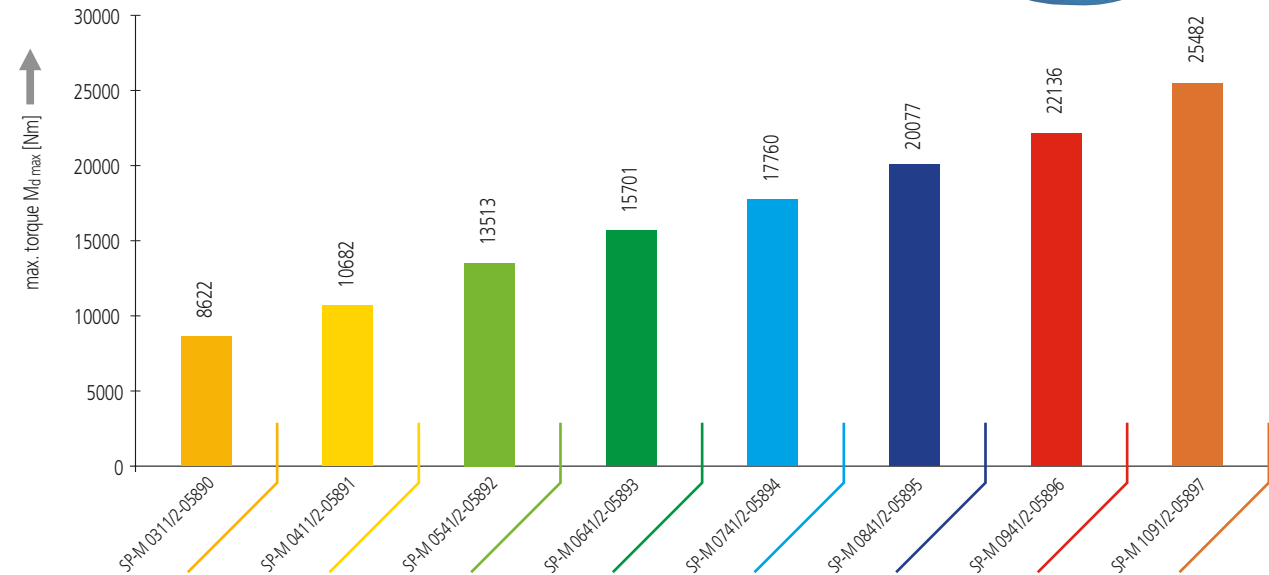
The operation is permissible as regards the fatigue stress of tooth base, if the following equation is fulfilled.

$$G_w \geq B_h \cdot \frac{ED_B}{100}$$

If this relationship is not fulfilled, then there is imminent danger of fatigue fracture of the tooth base.

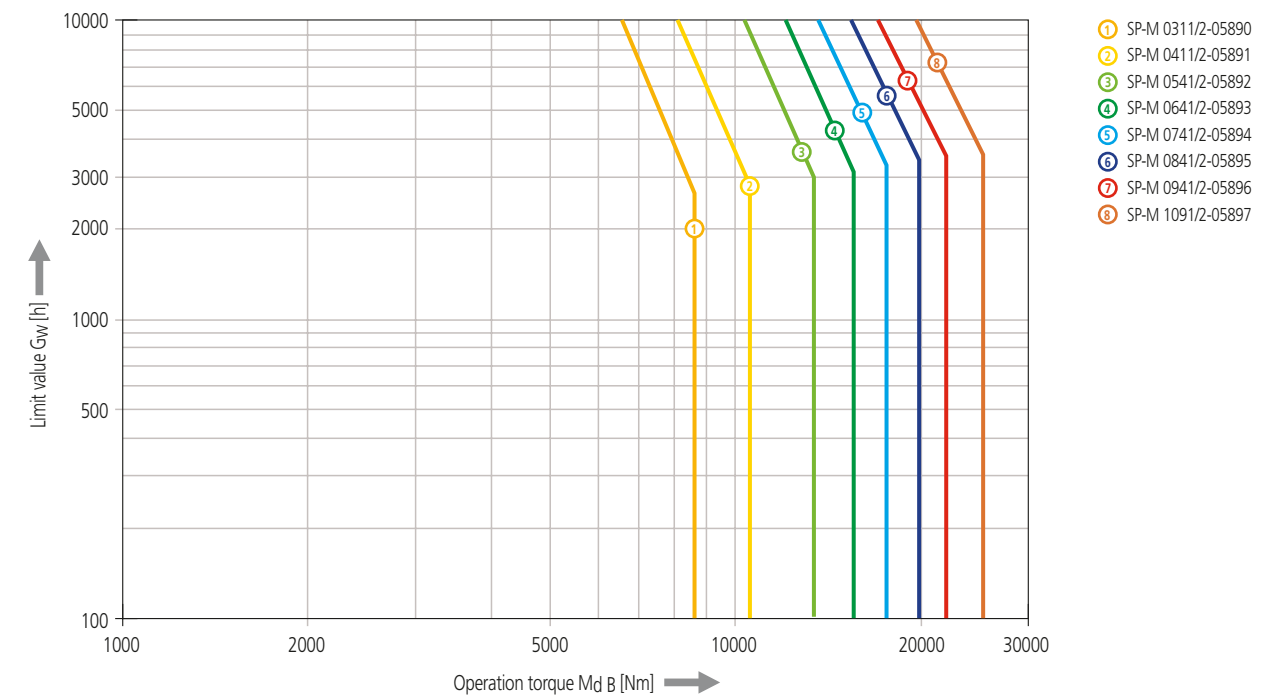
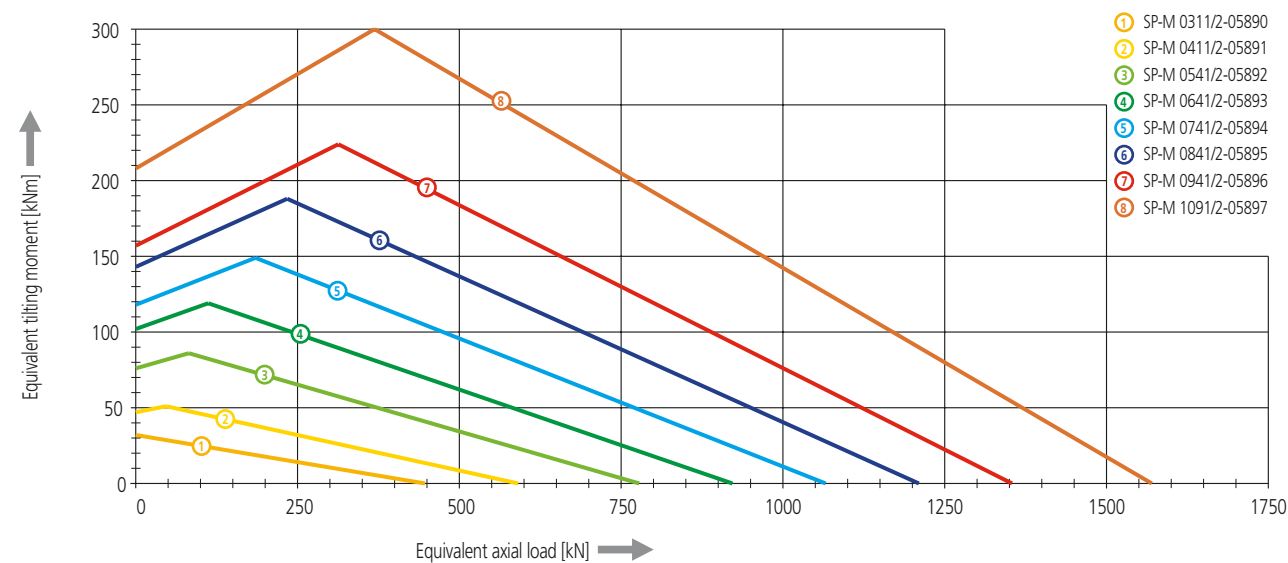
G_w : Limit value from diagram [h]
 B_h : Operation time [h]
 ED_B : Duty [%]

Maximum torque $M_{d\text{max}}$ of individual sizes



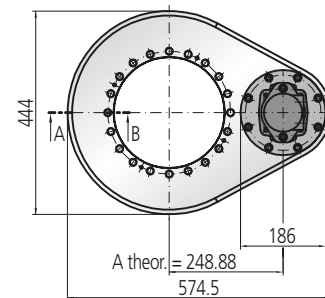
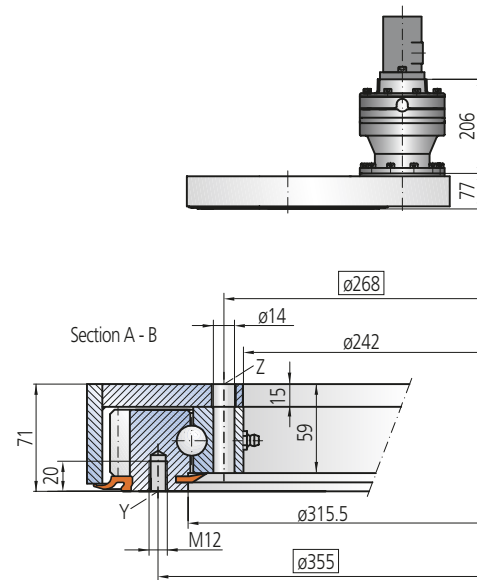
Limiting load diagrams of individual sizes for "compressive" load

Please refer to the explanations in the Technical Information section of the catalog



Verification of the pitting and wear safety of tooth flanks must be done by the IMO Engineering Department!

Size 0311



Mounting holes

Y = 20 Holes M12-20 deep, equally spaced
Z = 20 Holes $\varnothing 14$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be $\varnothing 308$, minimum

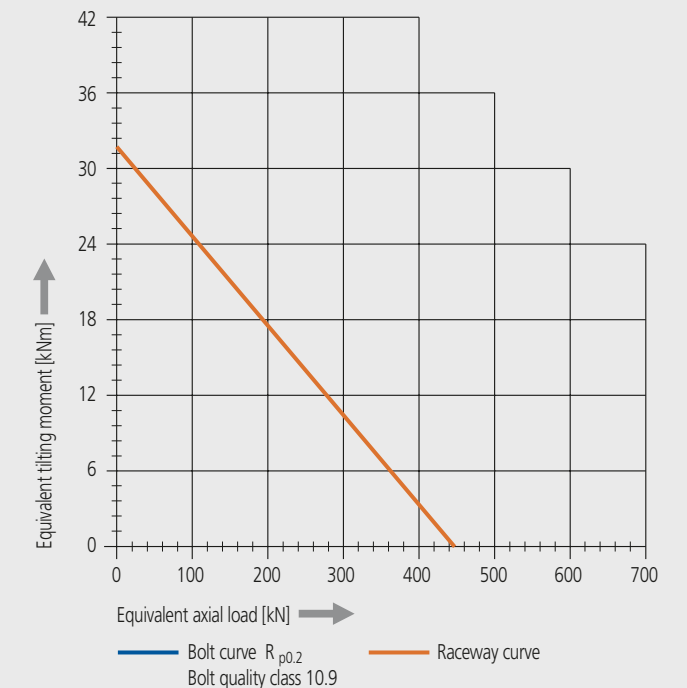
Drawing reference number SP-M 0311/2-05890			
Module	m [mm]	6	
Number of teeth, wheel	z₂ [-]	67	
Number of teeth, pinion	z₁ [-]	15	
Overall gear ration	i [-]	19.02	
Maximum torque	M_{d max} [Nm]	8622	
Nom. torque SF = 1 at n = 5 rpm	M_{d nom} [Nm]	6462	
Maximum holding torque*	M_h [Nm]	8622	
Static load rating, radial	C_{o rad} [kN]	191	
Static load rating, axial	C_{o ax} [kN]	447	
Dynamic load rating, radial	C_{rad} [kN]	140	
Dynamic load rating, axial	C_{ax} [kN]	140	
Weight	[kg]	80	

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor F-306

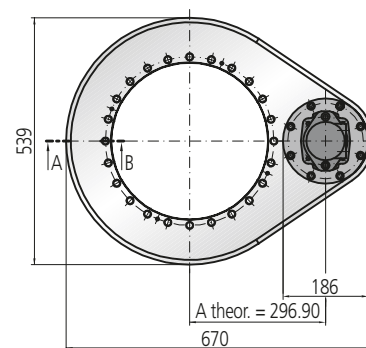
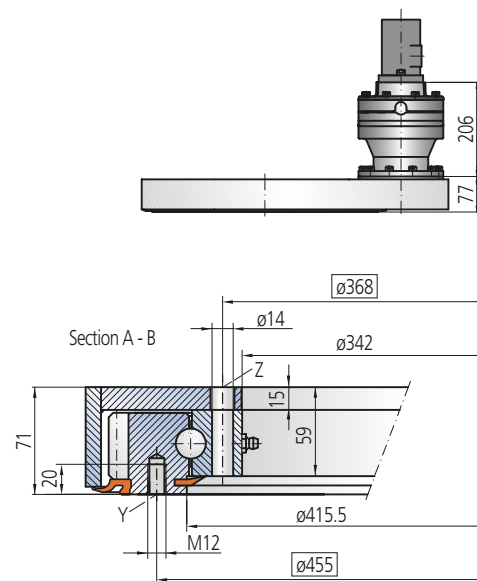
Pressure differential	Δp [bar]	124
Oil flow	Q [l/min]	39
Output speed	n [rpm]	5
Maximum achievable torque	M_d [Nm]	8622

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0411



Mounting holes

Y = 20 Holes M12-20 deep, equally spaced
Z = 24 Holes $\varnothing 14$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be $\varnothing 405$, minimum

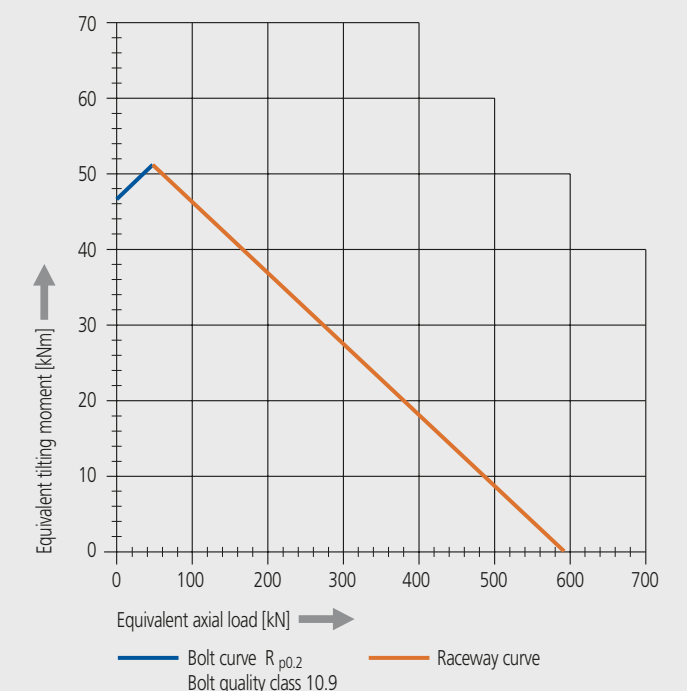
Drawing reference number SP-M 0411/2-05891			
Module	m [mm]	6	
Number of teeth, wheel	z₂ [-]	83	
Number of teeth, pinion	z₁ [-]	15	
Overall gear ration	i [-]	23.57	
Maximum torque	M_{d max} [Nm]	10682	
Nom. torque SF = 1 at n = 5 rpm	M_{d nom} [Nm]	8092	
Maximum holding torque*	M_h [Nm]	10682	
Static load rating, radial	C_{o rad} [kN]	253	
Static load rating, axial	C_{o ax} [kN]	591	
Dynamic load rating, radial	C_{rad} [kN]	155	
Dynamic load rating, axial	C_{ax} [kN]	156	
Weight	[kg]	95	

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor 2-200

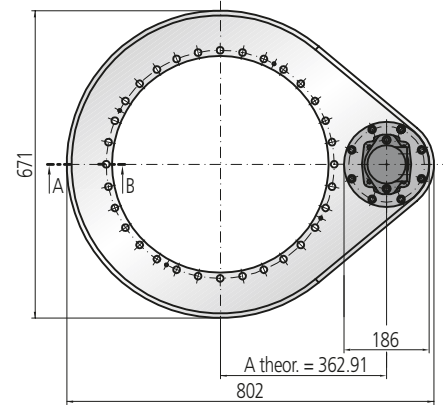
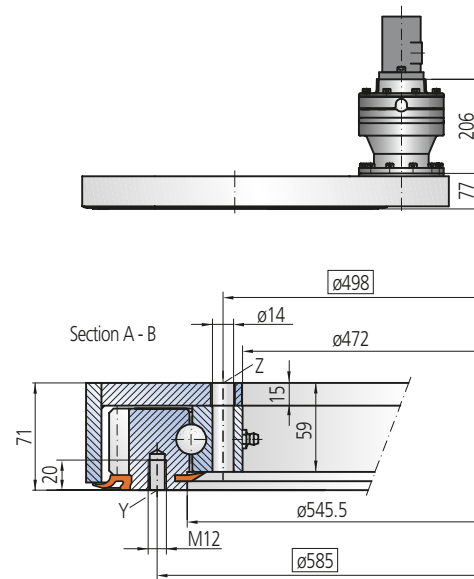
Pressure differential	Δp [bar]	190
Oil flow	Q [l/min]	28
Output speed	n [rpm]	5
Maximum achievable torque	M_d [Nm]	10682

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0541



Mounting holes

Y = 28 Holes M12-20 deep, equally spaced
Z = 32 Holes $\phi 14$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be $\phi 537$, minimum

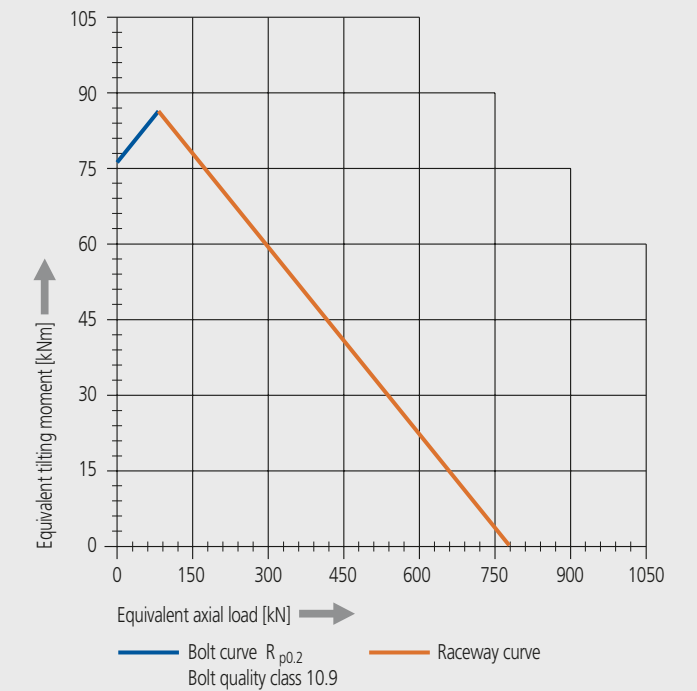
Drawing reference number SP-M 0541/2-05892			
Module	m	[mm]	6
Number of teeth, wheel	z₂	[-]	105
Number of teeth, pinion	z₁	[-]	15
Overall gear ration	i	[-]	29.82
Maximum torque	M_{d max}	[Nm]	13513
Nom. torque SF = 1 at n = 5 rpm	M_{d nom}	[Nm]	10363
Maximum holding torque*	M_h	[Nm]	13513
Static load rating, radial	C_{o rad}	[kN]	333
Static load rating, axial	C_{o ax}	[kN]	778
Dynamic load rating, radial	C_{rad}	[kN]	173
Dynamic load rating, axial	C_{ax}	[kN]	174
Weight		[kg]	110

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor 2-200

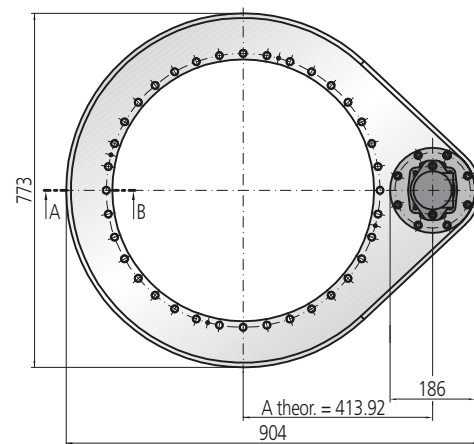
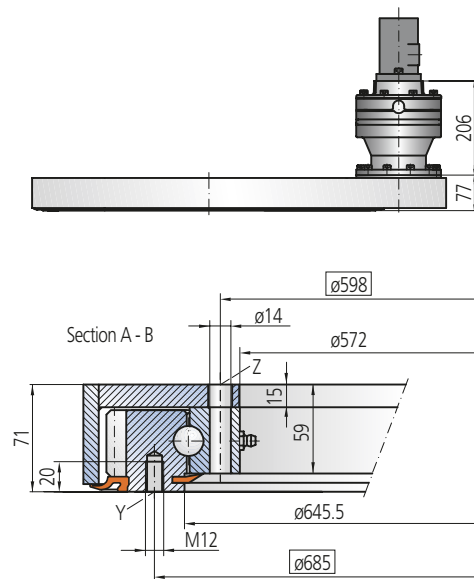
Pressure differential	Δp	[bar]	190
Oil flow	Q	[l/min]	34
Output speed	n	[rpm]	5
Maximum achievable torque	M_d	[Nm]	13513

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Size 0641



Mounting holes

Y = 32 Holes M12-20 deep, equally spaced
Z = 36 Holes $\phi 14$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be $\phi 639$, minimum

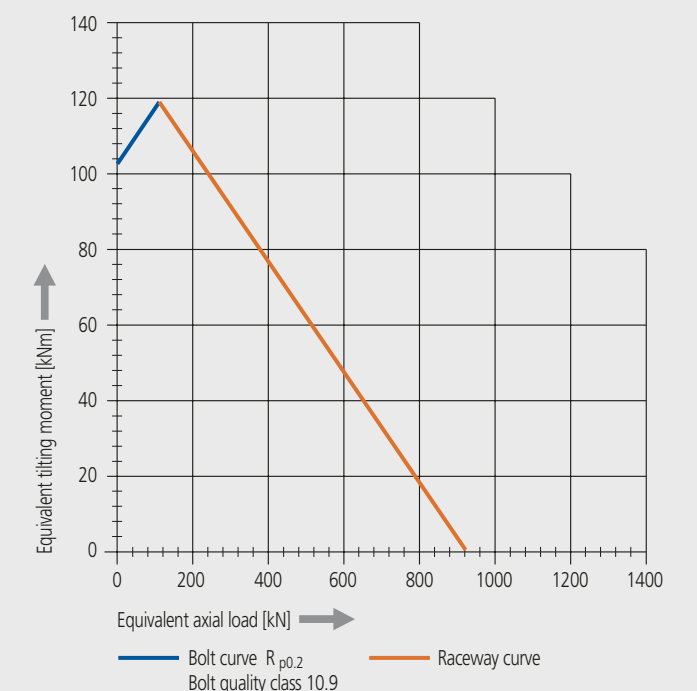
Drawing reference number SP-M 0641/2-05893			
Module	m	[mm]	6
Number of teeth, wheel	z₂	[-]	122
Number of teeth, pinion	z₁	[-]	15
Overall gear ration	i	[-]	34.64
Maximum torque	M_{d max}	[Nm]	15701
Nom. torque SF = 1 at n = 5 rpm	M_{d nom}	[Nm]	12114
Maximum holding torque*	M_h	[Nm]	15701
Static load rating, radial	C_{o rad}	[kN]	394
Static load rating, axial	C_{o ax}	[kN]	922
Dynamic load rating, radial	C_{rad}	[kN]	184
Dynamic load rating, axial	C_{ax}	[kN]	185
Weight		[kg]	125

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor 2-200

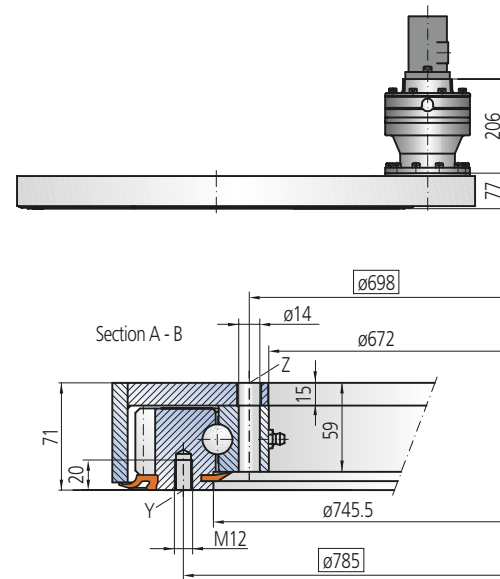
Pressure differential	Δp	[bar]	190
Oil flow	Q	[l/min]	38
Output speed	n	[rpm]	5
Maximum achievable torque	M_d	[Nm]	15701

Limiting load diagram for 'compressive' load

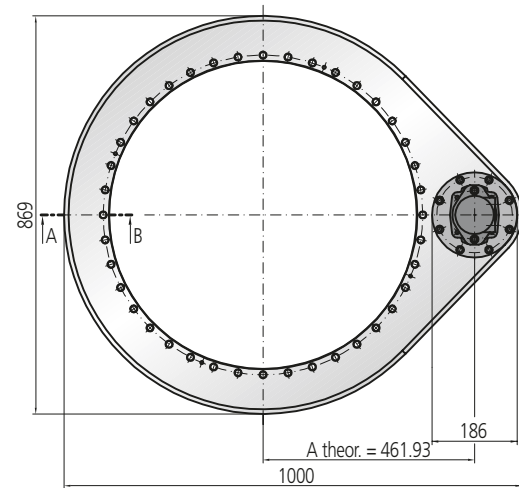


Please adhere strictly to the Technical Information section when using above graph!

Size 0741



Note, mounting face against upper surface shall be $\varnothing 739$, minimum



Mounting holes

Y = 36 Holes M12-20 deep, equally spaced
Z = 40 Holes $\varnothing 14$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

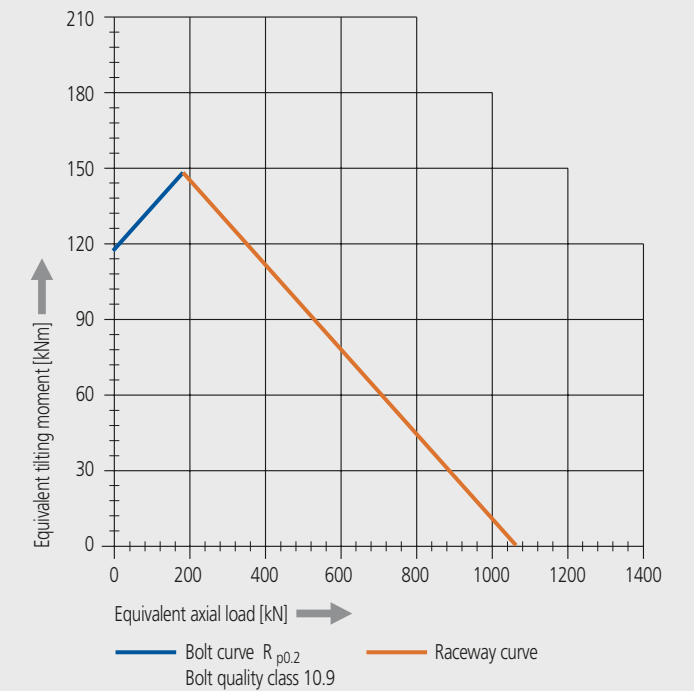
Drawing reference number SP-M 0741/2-05894			
Module	m [mm]	6	
Number of teeth, wheel	z₂ [-]	138	
Number of teeth, pinion	z₁ [-]	15	
Overall gear ration	i [-]	39.19	
Maximum torque	M_{d max} [Nm]	17760	
Nom. torque SF = 1 at n = 5 rpm	M_{d nom} [Nm]	13744	
Maximum holding torque*	M_h [Nm]	17760	
Static load rating, radial	C_{o rad} [kN]	456	
Static load rating, axial	C_{o ax} [kN]	1066	
Dynamic load rating, radial	C_{rad} [kN]	194	
Dynamic load rating, axial	C_{ax} [kN]	195	
Weight	[kg]	140	

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor 2-200

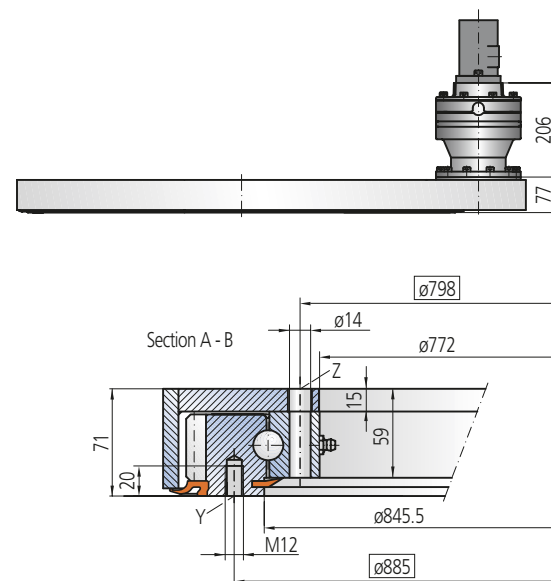
Pressure differential	Δp [bar]	190
Oil flow	Q [l/min]	43
Output speed	n [rpm]	5
Maximum achievable torque	M_d [Nm]	17760

Limiting load diagram for 'compressive' load

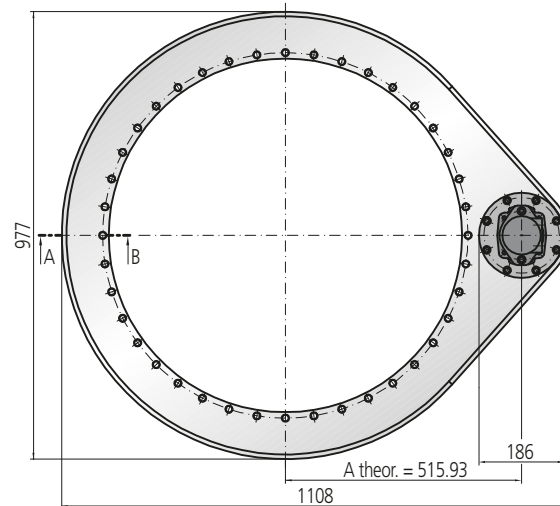


Please adhere strictly to the Technical Information section when using above graph!

Size 0841



Note, mounting face against upper surface shall be $\varnothing 841$, minimum



Mounting holes

Y = 36 Holes M12-20 deep, equally spaced
Z = 40 Holes $\varnothing 14$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

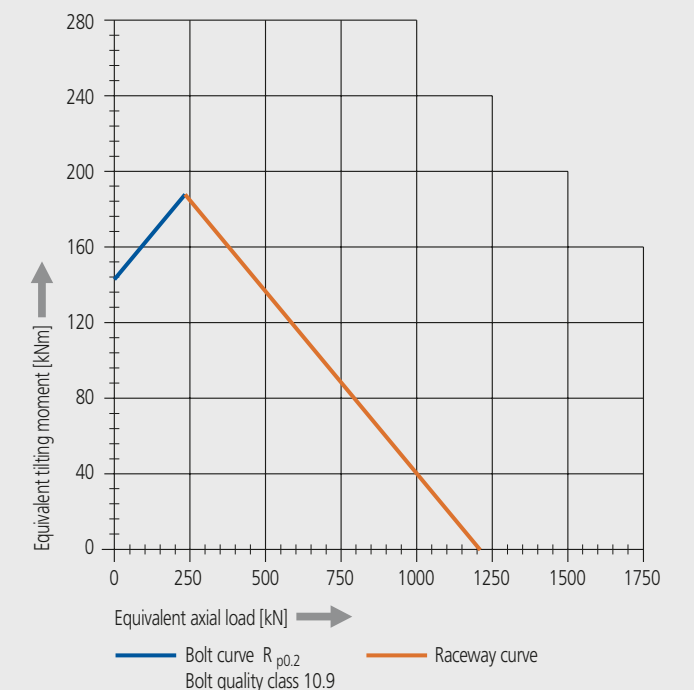
Drawing reference number SP-M 0841/2-05895			
Module	m [mm]	6	
Number of teeth, wheel	z₂ [-]	156	
Number of teeth, pinion	z₁ [-]	15	
Overall gear ration	i [-]	44.30	
Maximum torque	M_{d max} [Nm]	20077	
Nom. torque SF = 1 at n = 5 rpm	M_{d nom} [Nm]	15584	
Maximum holding torque*	M_h [Nm]	20077	
Static load rating, radial	C_{o rad} [kN]	518	
Static load rating, axial	C_{o ax} [kN]	1210	
Dynamic load rating, radial	C_{rad} [kN]	204	
Dynamic load rating, axial	C_{ax} [kN]	206	
Weight	[kg]	155	

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor 2-200

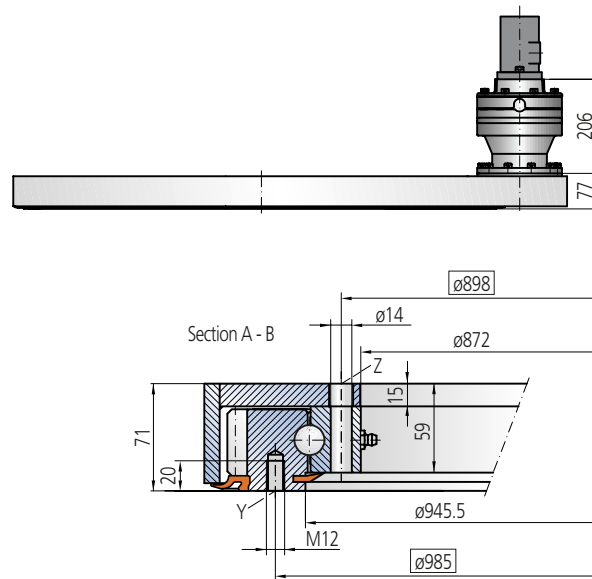
Pressure differential	Δp [bar]	190
Oil flow	Q [l/min]	48
Output speed	n [rpm]	5
Maximum achievable torque	M_d [Nm]	20077

Limiting load diagram for 'compressive' load

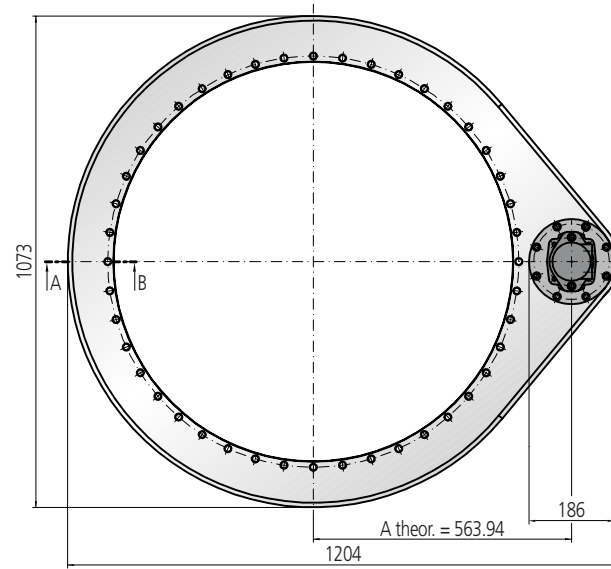


Please adhere strictly to the Technical Information section when using above graph!

Size 0941



Note, mounting face against upper surface shall be 0941, minimum



Mounting holes

Y = 40 Holes M12-20 deep, equally spaced
Z = 44 Holes $\phi 14$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

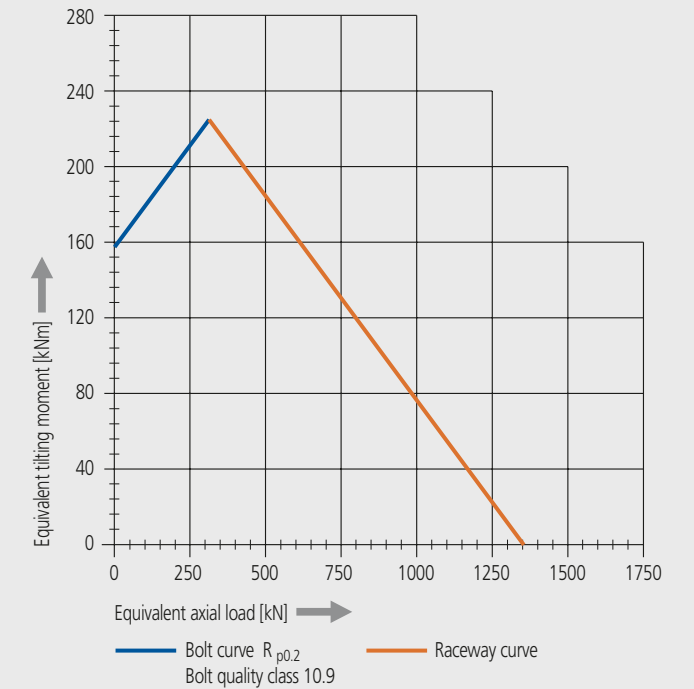
Drawing reference number SP-M 0941/2-05896			
Module	m	[mm]	6
Number of teeth, wheel	z₂	[-]	172
Number of teeth, pinion	z₁	[-]	15
Overall gear ration	i	[-]	48.84
Maximum torque	M_{d max}	[Nm]	22136
Nom. torque SF = 1 at n = 5 rpm	M_{d nom}	[Nm]	17182
Maximum holding torque*	M_h	[Nm]	22136
Static load rating, radial	C_{o rad}	[kN]	579
Static load rating, axial	C_{o ax}	[kN]	1354
Dynamic load rating, radial	C_{rad}	[kN]	212
Dynamic load rating, axial	C_{ax}	[kN]	214
Weight		[kg]	170

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor 2-200

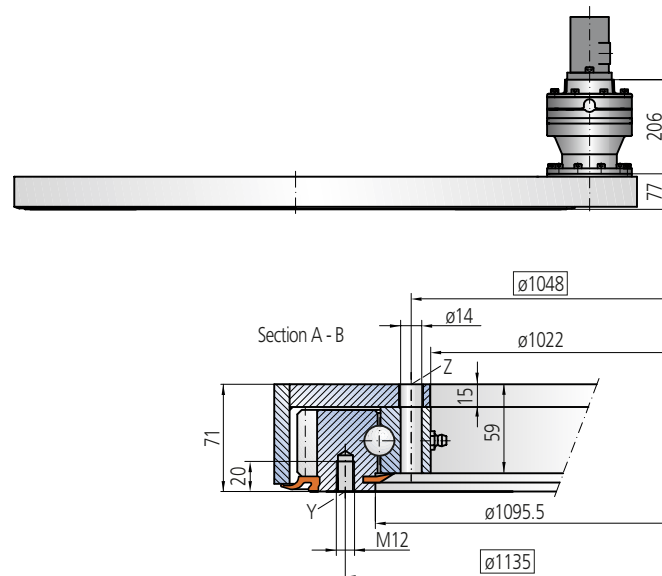
Pressure differential	Δp	[bar]	190
Oil flow	Q	[l/min]	51
Output speed	n	[rpm]	5
Maximum achievable torque	M_d	[Nm]	22136

Limiting load diagram for 'compressive' load

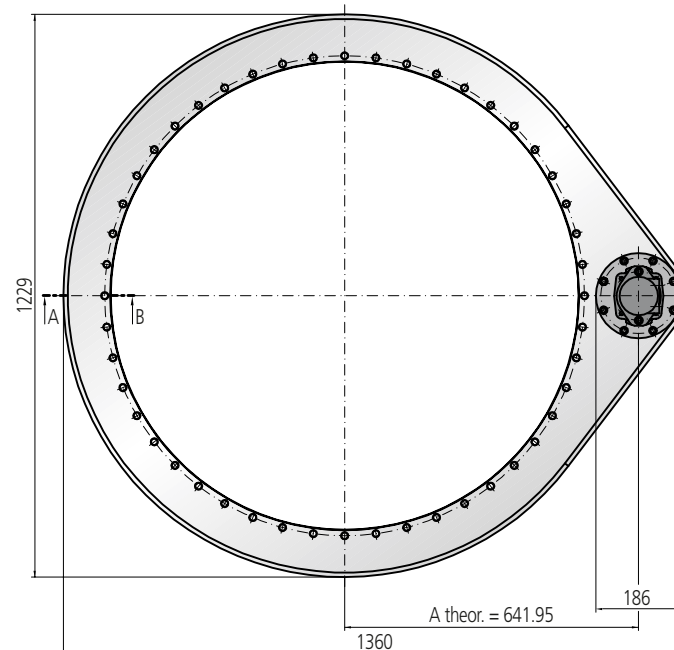


Please adhere strictly to the Technical Information section when using above graph!

Size 1091



Note, mounting face against upper surface shall be 1091, minimum



Mounting holes

Y = 44 Holes M12-20 deep, equally spaced
Z = 48 Holes $\phi 14$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

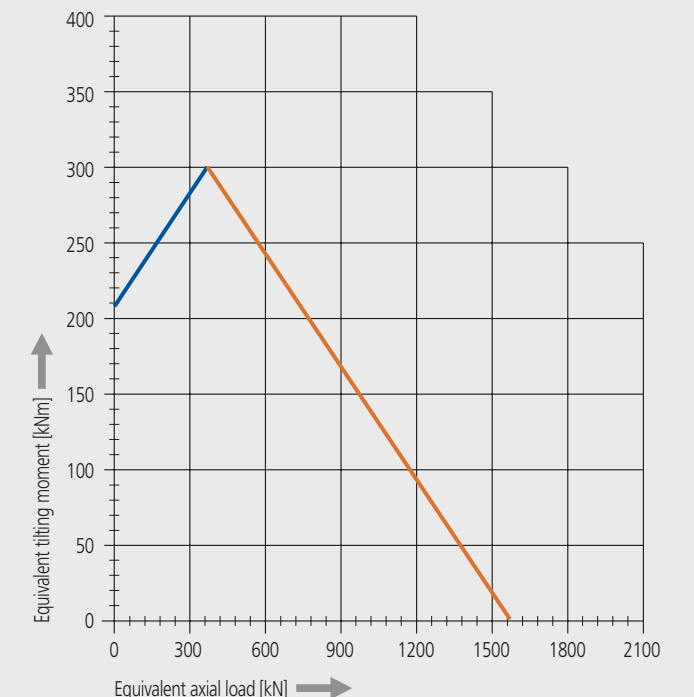
Drawing reference number SP-M 1091/2-05897			
Module	m	[mm]	6
Number of teeth, wheel	z₂	[-]	198
Number of teeth, pinion	z₁	[-]	15
Overall gear ration	i	[-]	56.23
Maximum torque	M_{d max}	[Nm]	25482
Nom. torque SF = 1 at n = 5 rpm	M_{d nom}	[Nm]	19839
Maximum holding torque*	M_h	[Nm]	25482
Static load rating, radial	C_{o rad}	[kN]	672
Static load rating, axial	C_{o ax}	[kN]	1570
Dynamic load rating, radial	C_{rad}	[kN]	224
Dynamic load rating, axial	C_{ax}	[kN]	226
Weight		[kg]	200

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor 2-200

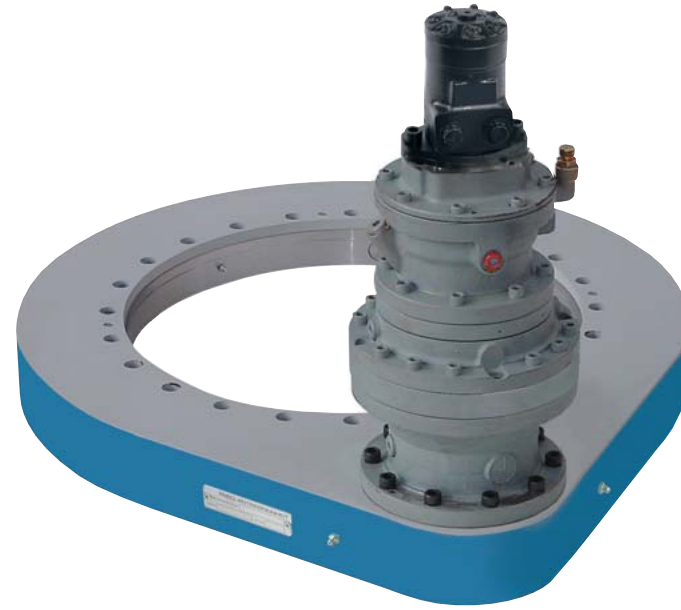
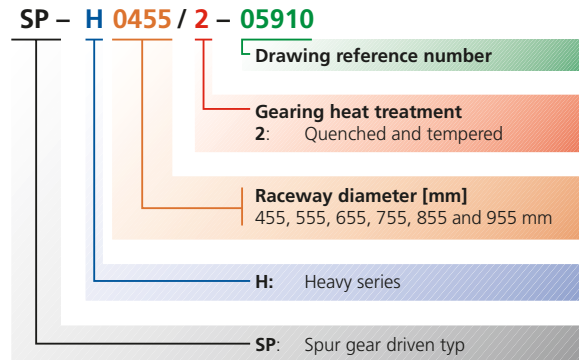
Pressure differential	Δp	[bar]	190
Oil flow	Q	[l/min]	62
Output speed	n	[rpm]	5
Maximum achievable torque	M_d	[Nm]	25482

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Series Overview



Verifying tooth base fatigue strength:

Valid for the following conditions:
 - Output speed: $n = 3.0$ rpm
 - Repeated load
 - Ambient temperature of 20°C

M_{dB} : Operation torque [Nm]
 $M_{d\text{nom}}$: Nominal torque [Nm] for $SF = 1$ and $n = 3.0$ rpm (see dimensions table)

If the following equation is met, the stress level of tooth base is below the endurance limit and fatigue is infinite:

$$M_{dB} \leq M_{d\text{nom}}$$

Fatigue stress of tooth base needs to be considered however, if the following equation is met (if so, refer to below additional steps to verify life):

$$M_{dB} > M_{d\text{nom}}$$

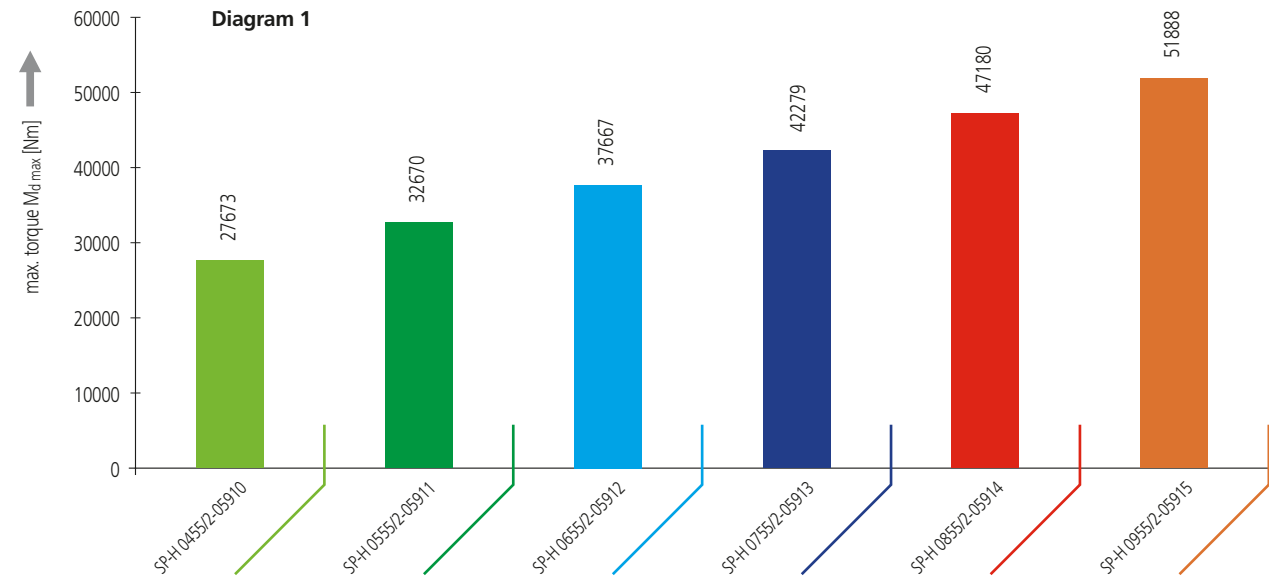
The operation is permissible as regards the fatigue stress of tooth base, if the following equation is fulfilled.

$$G_w \geq B_h \cdot \frac{ED_B}{100}$$

If this relationship is not fulfilled, then there is imminent danger of fatigue fracture of the tooth base.

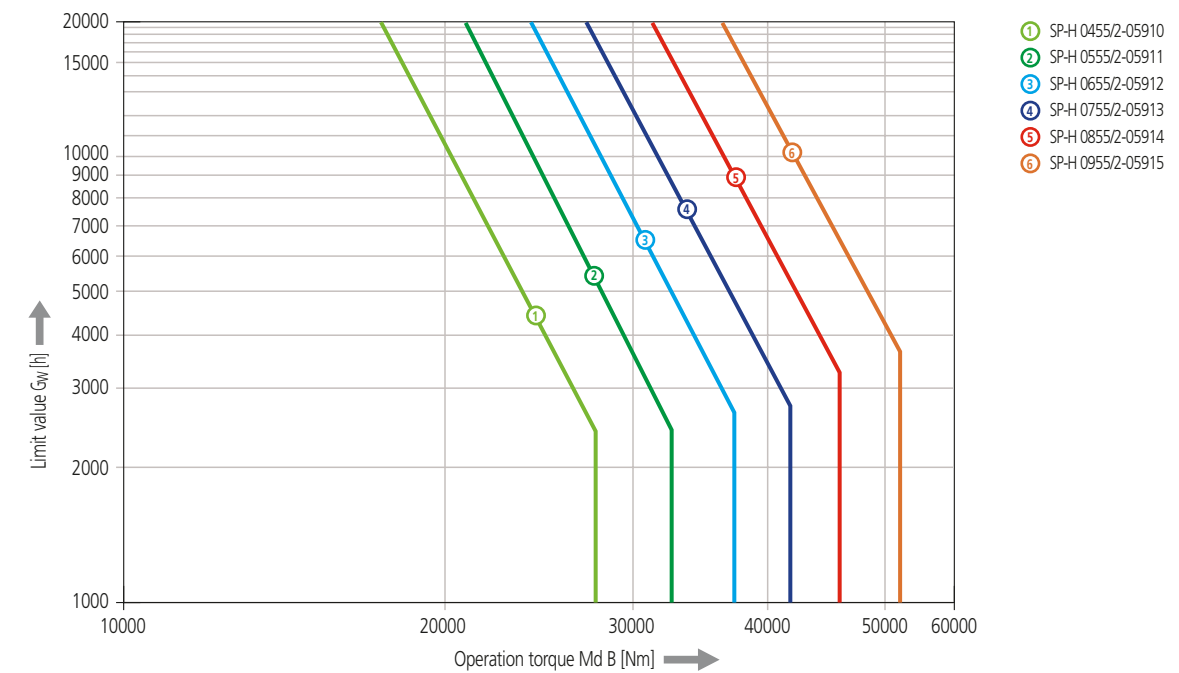
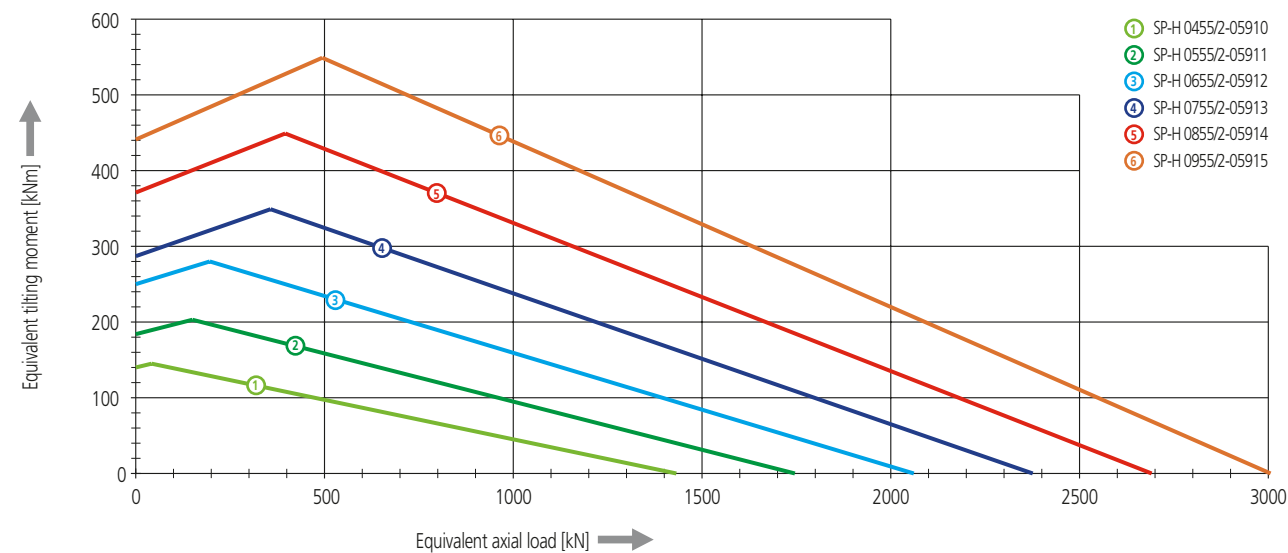
G_w : Limit value from diagram [h]
 B_h : Operation time [h]
 ED_B : Duty [%]

Maximum torque $M_{d\text{max}}$ of individual sizes



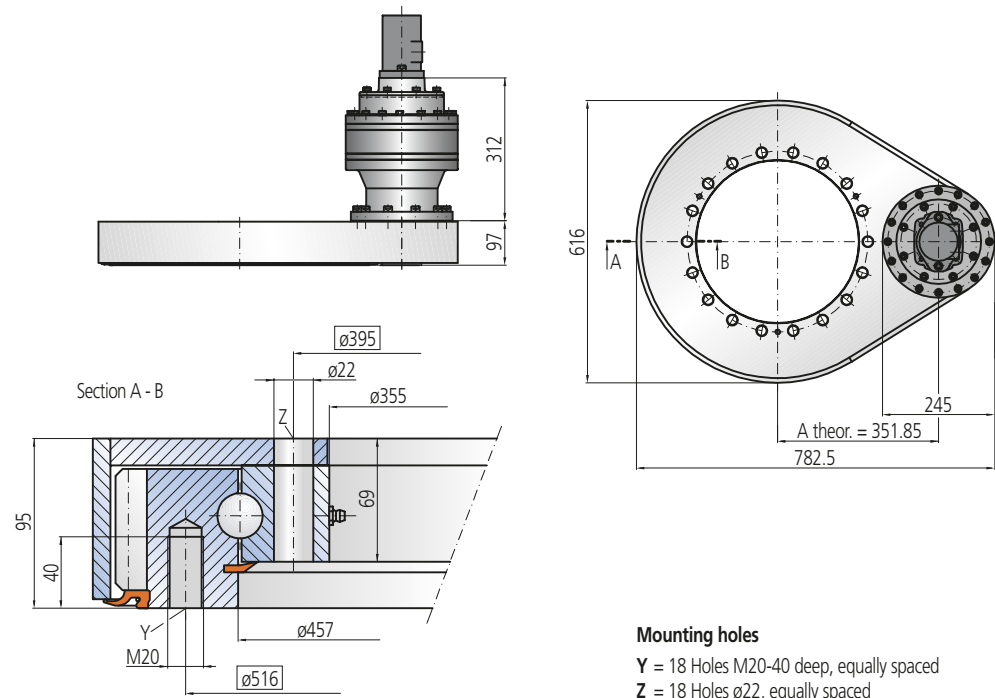
Limiting load diagrams of individual sizes for "compressive" load

Please refer to the explanations in the Technical Information section of the catalog



Verification of the pitting and wear safety of tooth flanks must be done by the IMO Engineering Department!

Size 0455



Mounting holes

Y = 18 Holes M20-40 deep, equally spaced
Z = 18 Holes $\phi 22$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing
Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be $\phi 455$, minimum

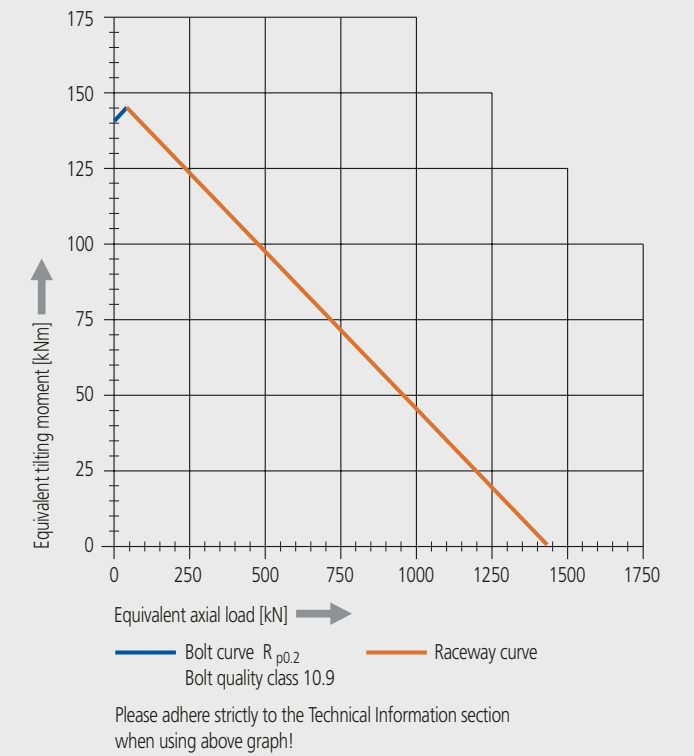
Drawing reference number SP-H 0455/2-05910			
Module	m [mm]	8	
Number of teeth, wheel	z₂ [-]	72	
Number of teeth, pinion	z₁ [-]	15	
Overall gear ration	i [-]	86.88	
Maximum torque	M_{d max} [Nm]	27673	
Nom. torque SF = 1 at n = 3 rpm	M_{d nom} [Nm]	18115	
Maximum holding torque*	M_h [Nm]	27673	
Static load rating, radial	C_{o rad} [kN]	535	
Static load rating, axial	C_{o ax} [kN]	1432	
Dynamic load rating, radial	C_{rad} [kN]	249	
Dynamic load rating, axial	C_{ax} [kN]	290	
Weight	[kg]	190	

*Optional with brake

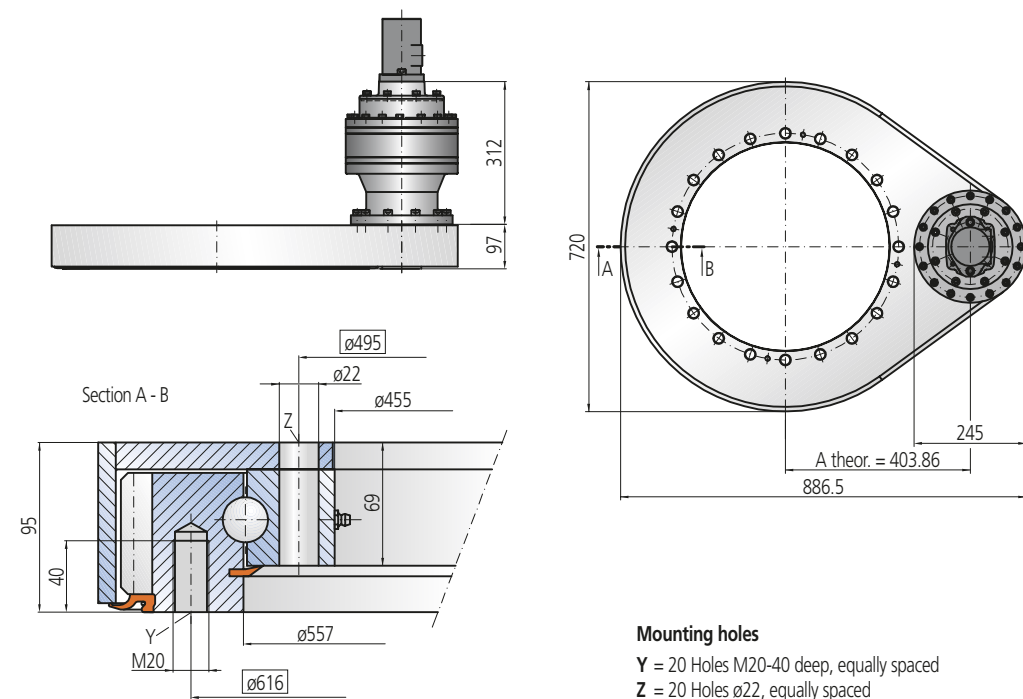
The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor 2-132

Pressure differential	Δp [bar]	195
Oil flow	Q [l/min]	38
Output speed	n [rpm]	3
Maximum achievable torque	M_d [Nm]	27673

Limiting load diagram for 'compressive' load



Size 0555



Mounting holes

Y = 20 Holes M20-40 deep, equally spaced
Z = 20 Holes $\phi 22$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing
Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be $\phi 555$, minimum

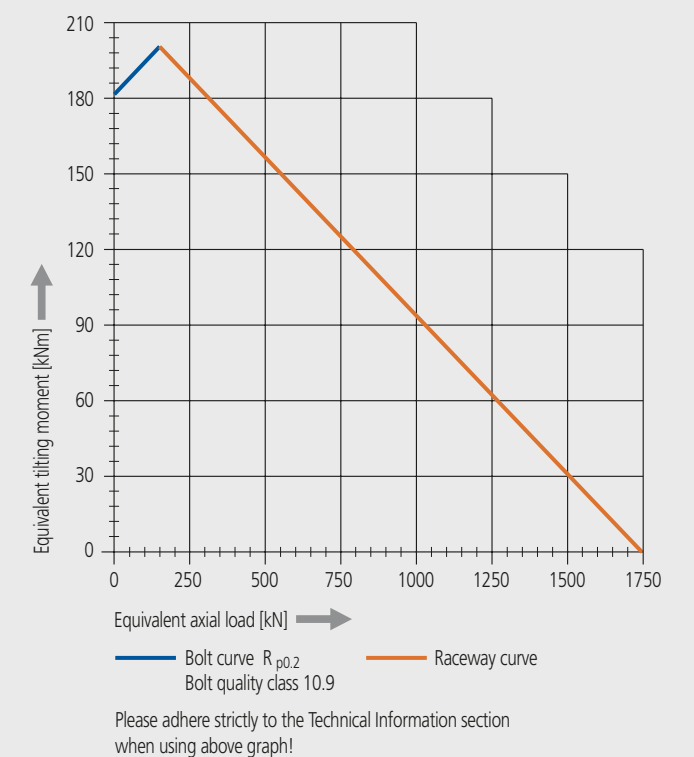
Drawing reference number SP-H 0555/2-05911			
Module	m [mm]	8	
Number of teeth, wheel	z₂ [-]	85	
Number of teeth, pinion	z₁ [-]	15	
Overall gear ration	i [-]	102.56	
Maximum torque	M_{d max} [Nm]	32670	
Nom. torque SF = 1 at n = 3 rpm	M_{d nom} [Nm]	21590	
Maximum holding torque*	M_h [Nm]	32670	
Static load rating, radial	C_{o rad} [kN]	652	
Static load rating, axial	C_{o ax} [kN]	1746	
Dynamic load rating, radial	C_{rad} [kN]	267	
Dynamic load rating, axial	C_{ax} [kN]	312	
Weight	[kg]	215	

*Optional with brake

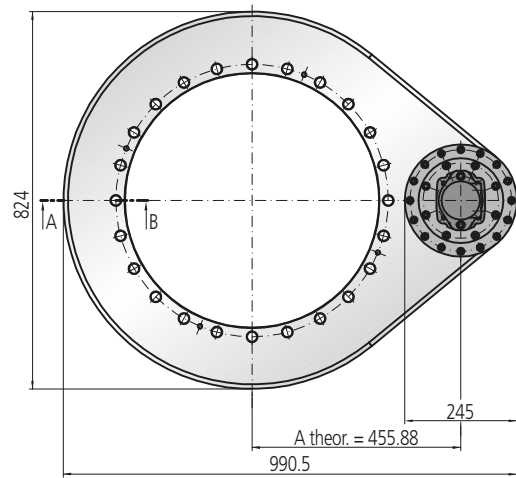
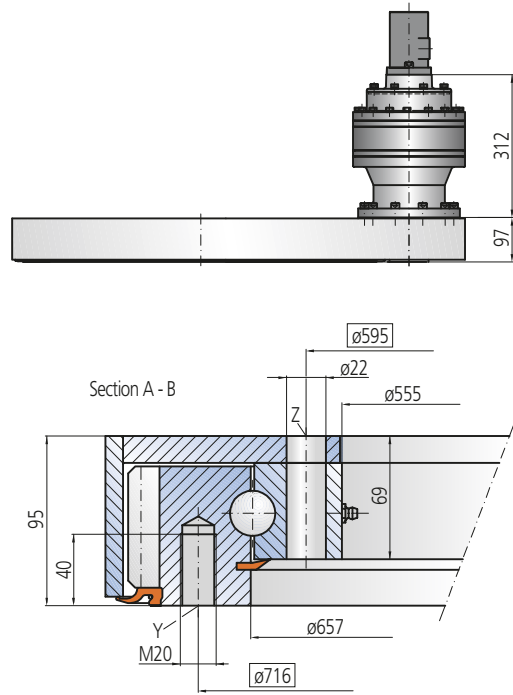
The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor 2-132

Pressure differential	Δp [bar]	195
Oil flow	Q [l/min]	45
Output speed	n [rpm]	3
Maximum achievable torque	M_d [Nm]	32670

Limiting load diagram for 'compressive' load



Size 0655



Mounting holes

Y = 24 Holes M20-40 deep, equally spaced
Z = 24 Holes ø22, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be ø655, minimum

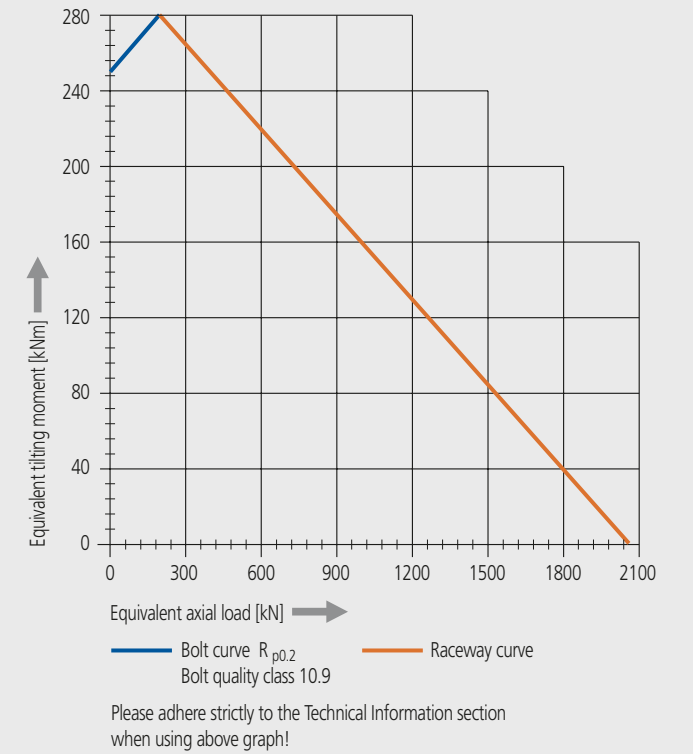
Drawing reference number SP-H 0655/2-05912			
Module	m	[mm]	8
Number of teeth, wheel	z_2	[-]	98
Number of teeth, pinion	z_1	[-]	15
Overall gear ration	i	[-]	118.25
Maximum torque	$M_{d \max}$	[Nm]	37667
Nom. torque SF = 1 at n = 3 rpm	$M_{d \text{ nom}}$	[Nm]	25048
Maximum holding torque*	M_h	[Nm]	37667
Static load rating, radial	$C_{o \text{ rad}}$	[kN]	770
Static load rating, axial	$C_{o \text{ ax}}$	[kN]	2061
Dynamic load rating, radial	C_{rad}	[kN]	284
Dynamic load rating, axial	C_{ax}	[kN]	331
Weight		[kg]	245

*Optional with brake

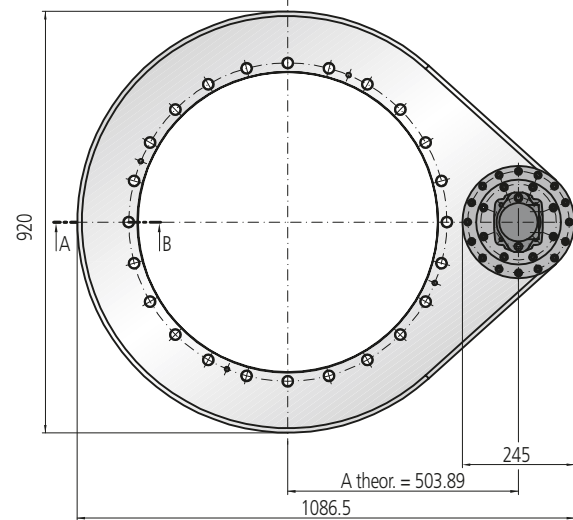
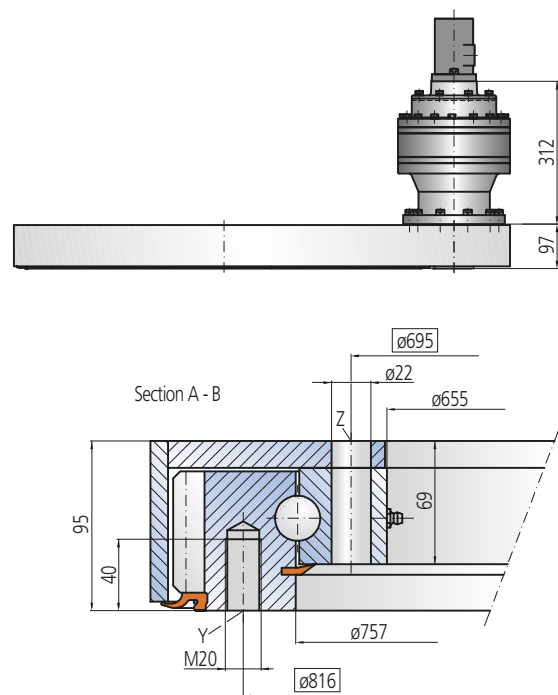
The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor 2-132

Pressure differential	Δp	[bar]	195
Oil flow	Q	[l/min]	52
Output speed	n	[rpm]	3
Maximum achievable torque	M_d	[Nm]	37667

Limiting load diagram for 'compressive' load



Size 0755



Mounting holes

Y = 24 Holes M20-40 deep, equally spaced
Z = 24 Holes ø22, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

Note, mounting face against upper surface shall be ø755, minimum

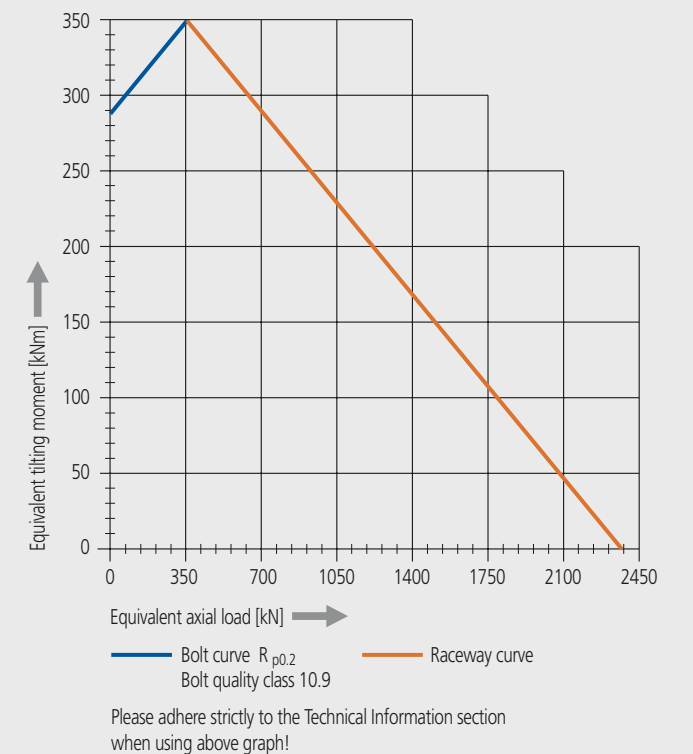
Drawing reference number SP-H 0755/2-05913			
Module	m	[mm]	8
Number of teeth, wheel	z_2	[-]	110
Number of teeth, pinion	z_1	[-]	15
Overall gear ration	i	[-]	132.73
Maximum torque	$M_{d \max}$	[Nm]	42279
Nom. torque SF = 1 at n = 3 rpm	$M_{d \text{ nom}}$	[Nm]	28204
Maximum holding torque*	M_h	[Nm]	42279
Static load rating, radial	$C_{o \text{ rad}}$	[kN]	888
Static load rating, axial	$C_{o \text{ ax}}$	[kN]	2376
Dynamic load rating, radial	C_{rad}	[kN]	299
Dynamic load rating, axial	C_{ax}	[kN]	349
Weight		[kg]	265

*Optional with brake

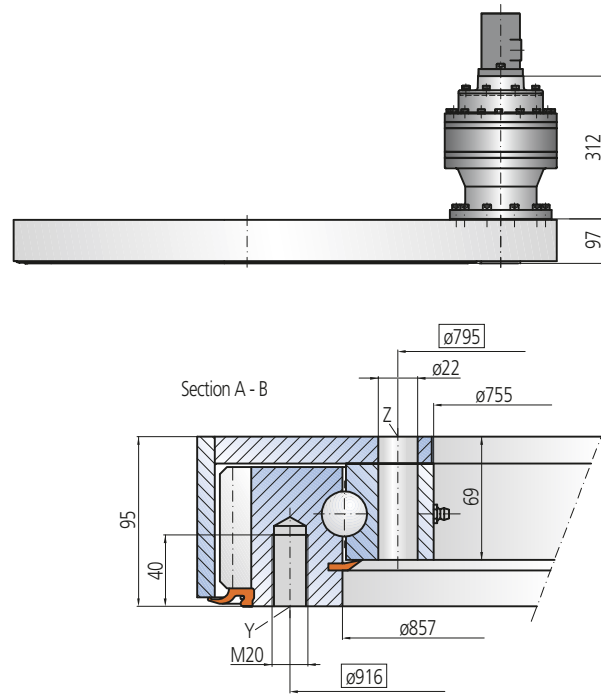
The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor 2-132

Pressure differential	Δp	[bar]	195
Oil flow	Q	[l/min]	57
Output speed	n	[rpm]	3
Maximum achievable torque	M_d	[Nm]	42279

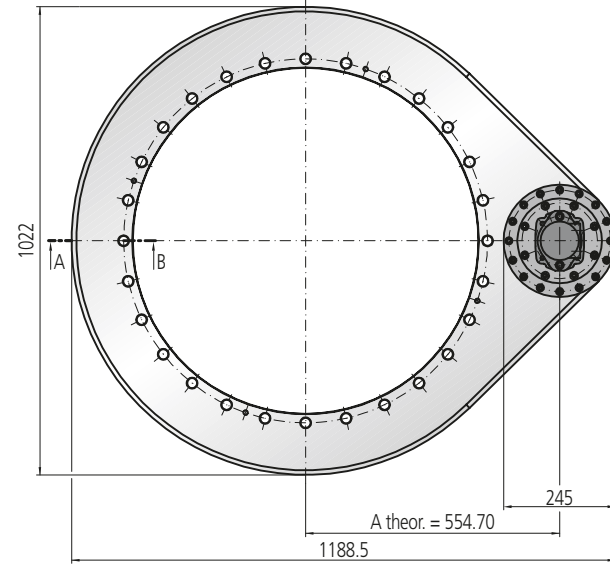
Limiting load diagram for 'compressive' load



Size 0855



Note, mounting face against upper surface shall be $\varnothing 855$, minimum



Mounting holes

Y = 28 Holes M20-40 deep, equally spaced
Z = 28 Holes $\varnothing 22$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

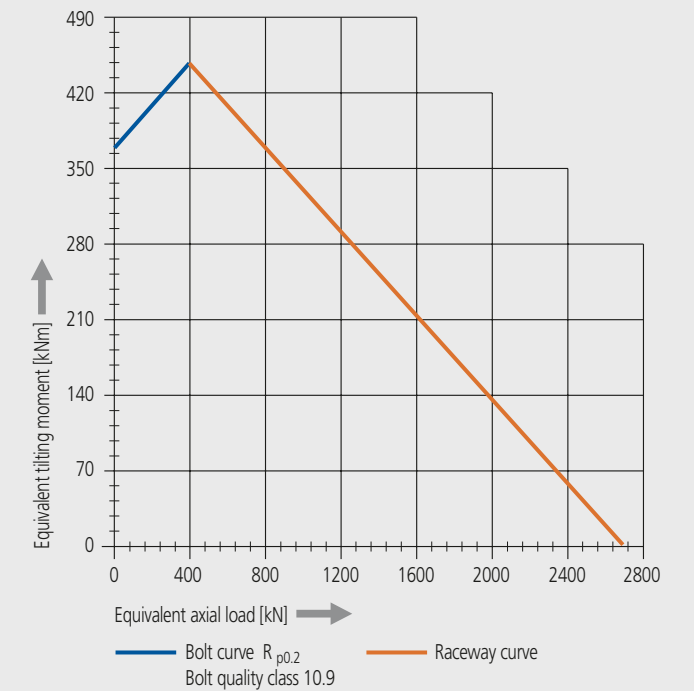
Drawing reference number SP-H 0855/2-05914			
Module	m [mm]	8	
Number of teeth, wheel	z₂ [-]	122	
Number of teeth, pinion	z₁ [-]	15	
Overall gear ration	i [-]	147.21	
Maximum torque	M_{d max} [Nm]	47180	
Nom. torque SF = 1 at n = 3 rpm	M_{d nom} [Nm]	32749	
Maximum holding torque*	M_h [Nm]	47180	
Static load rating, radial	C_{o rad} [kN]	1005	
Static load rating, axial	C_{o ax} [kN]	2691	
Dynamic load rating, radial	C_{rad} [kN]	315	
Dynamic load rating, axial	C_{ax} [kN]	368	
Weight	[kg]	295	

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor 2-132

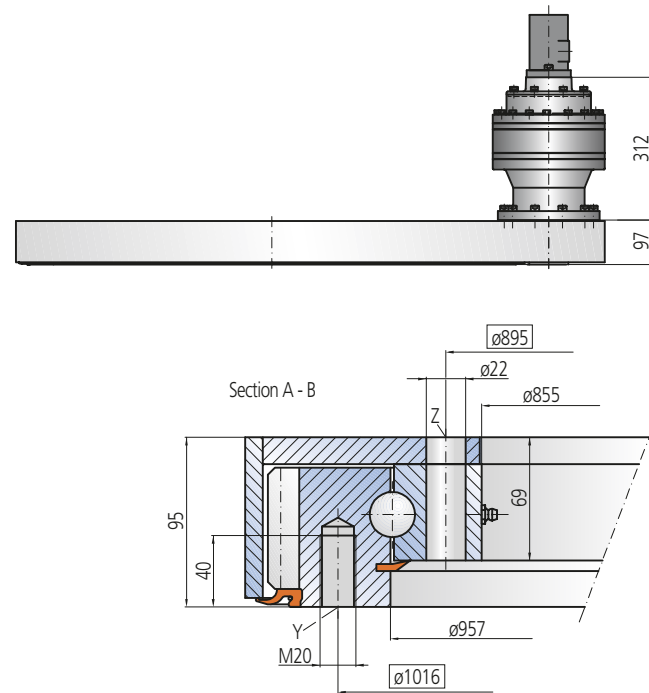
Pressure differential	Δp [bar]	195
Oil flow	Q [l/min]	64
Output speed	n [rpm]	3
Maximum achievable torque	M_d [Nm]	47180

Limiting load diagram for 'compressive' load

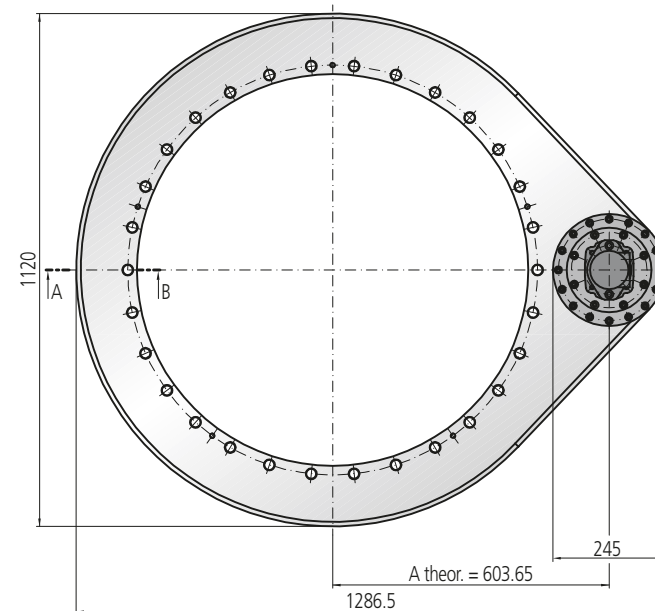


Please adhere strictly to the Technical Information section when using above graph!

Size 0955



Note, mounting face against upper surface shall be $\varnothing 955$, minimum



Mounting holes

Y = 30 Holes M20-40 deep, equally spaced
Z = 30 Holes $\varnothing 22$, equally spaced

Lubrication ports

4 Taper type grease nipples on the internal diameter
2 Taper type grease nipples on the outside of the housing

Slew Drive supplied pre-lubricated

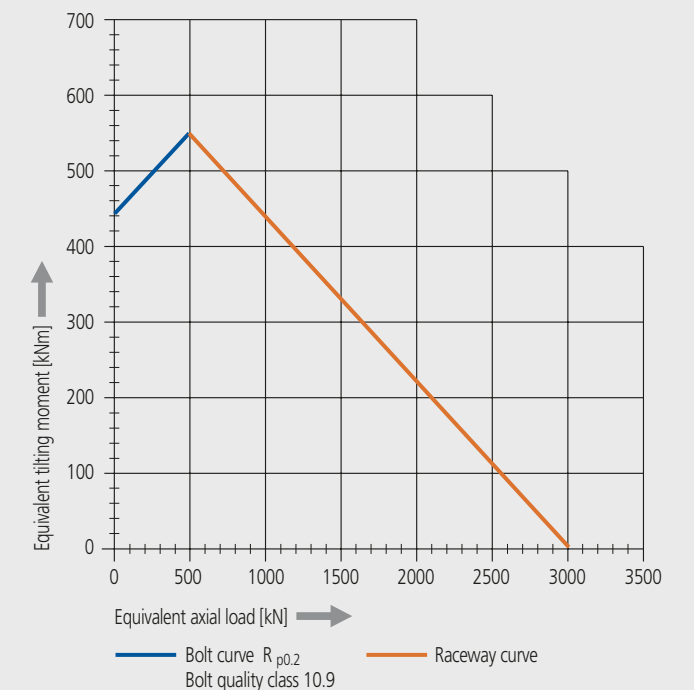
Drawing reference number SP-H 0955/2-05915			
Module	m [mm]	8	
Number of teeth, wheel	z₂ [-]	134	
Number of teeth, pinion	z₁ [-]	15	
Overall gear ration	i [-]	161.69	
Maximum torque	M_{d max} [Nm]	51888	
Nom. torque SF = 1 at n = 3 rpm	M_{d nom} [Nm]	36342	
Maximum holding torque*	M_h [Nm]	51888	
Static load rating, radial	C_{o rad} [kN]	1123	
Static load rating, axial	C_{o ax} [kN]	3006	
Dynamic load rating, radial	C_{rad} [kN]	328	
Dynamic load rating, axial	C_{ax} [kN]	383	
Weight	[kg]	320	

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications.
Selection example: performance data with hydraulic motor 2-132

Pressure differential	Δp [bar]	195
Oil flow	Q [l/min]	70
Output speed	n [rpm]	3
Maximum achievable torque	M_d [Nm]	51888

Limiting load diagram for 'compressive' load



Please adhere strictly to the Technical Information section when using above graph!

Application Data Sheet - Slew Drives

Please copy, fill in and send to: IMO Antriebseinheit GmbH
Gewerbepark 16 - 91350 Gremsdorf/Germany - Fax: +49-9193/50818-40

Alternatively, you can fill in this sheet online at
www.goimo.com

1. Contact:

Firm: _____ Homepage: _____
Contact person: _____ Email: _____
Address: _____ Phone: _____
City: _____ Fax: _____
Zip Code: _____

2. Application description (please attach additional sketch):

New Application: No Yes

Exchangeable with existing solution: No Yes If yes: what should be considered? Replacement for: pls fill in below!

Position of rotation axis:

Vertical Horizontal Inclined/Changing

α Degrees Middle position of rotation axis
 $\pm\beta$ Degrees Angle range

Type of load:

"Compressive" axial load
"Suspended" axial load

Ambient temperature: minimum °C normal °C maximum °C
Do shocks or vibrations occur? No Yes
Self-locking/brake required? No Yes
Special seals required? No Yes * against: _____
Works Certificate? No Yes * type: _____ (e.g. ISO 10474 3.1B according to EN 10204)
Test certificate from authority required? No Yes * type: _____ (e.g. ISO 10474 3.2 according to EN 10204)
Special conditions or specifications to be considered? No Yes * which: _____ (e.g. Lloyds; ABS; API; BV; DNV etc.)

*Please provide specific requirements.

3. Drive concept:

With hydraulic motor with electric motor without motor
max. available pressure differential Δp bar rated voltage Volt
max. available oil flow Q l/min main frequency Hz
Peculiarities: _____

Application Data Sheet - Slew Drives

4. Load parameters:

			Operating load		Test load	Extreme load
			Normal	Maximum		
(Equivalent) axial load	F_{ax}	kN				
(Equivalent) radial load	F_{rad}	kN				
(Equivalent) tilting moment	M_k	kNm				
Operating torque	M_{dB}	Nm				
Holding torque	M_h	Nm				
Accelerating torque	M_b	Nm				
Moment of inertia about rotation axis	J	kg • m ²				
Duty (% of rotation)	ED_B	%				
Duty per minute (% of rotation)	$ED_B \cdot$	%/min				
Continuous rotation or slewing without interruption (continuous operation)		<input type="checkbox"/>				
Rotational speed	n	rpm				
if: interrupted rotation or slewing (intermittent operation)		<input type="checkbox"/>				
then: fill additional cycle description						
Slewing angle	δ_{s1}	degrees				
Slewing time	t_{s1}	s				
Interruption time	t_{u1}	s				
Angular acceleration	α_b	rad/s ²				

Slewing direction: One direction only Alternating directions

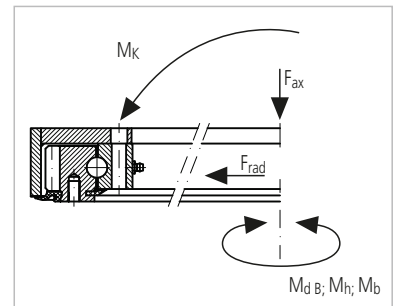
Peculiarities: _____

Any additional application service factor? No Yes Which one: _____

Equipment utilization time in years: yrs
Average operating hours per year: hrs

5. Offer data:

Yearly usage: pieces per year
Lot size: pieces per delivery lot
Required delivery time: weeks
Proposal required by: date
Target price: price per unit

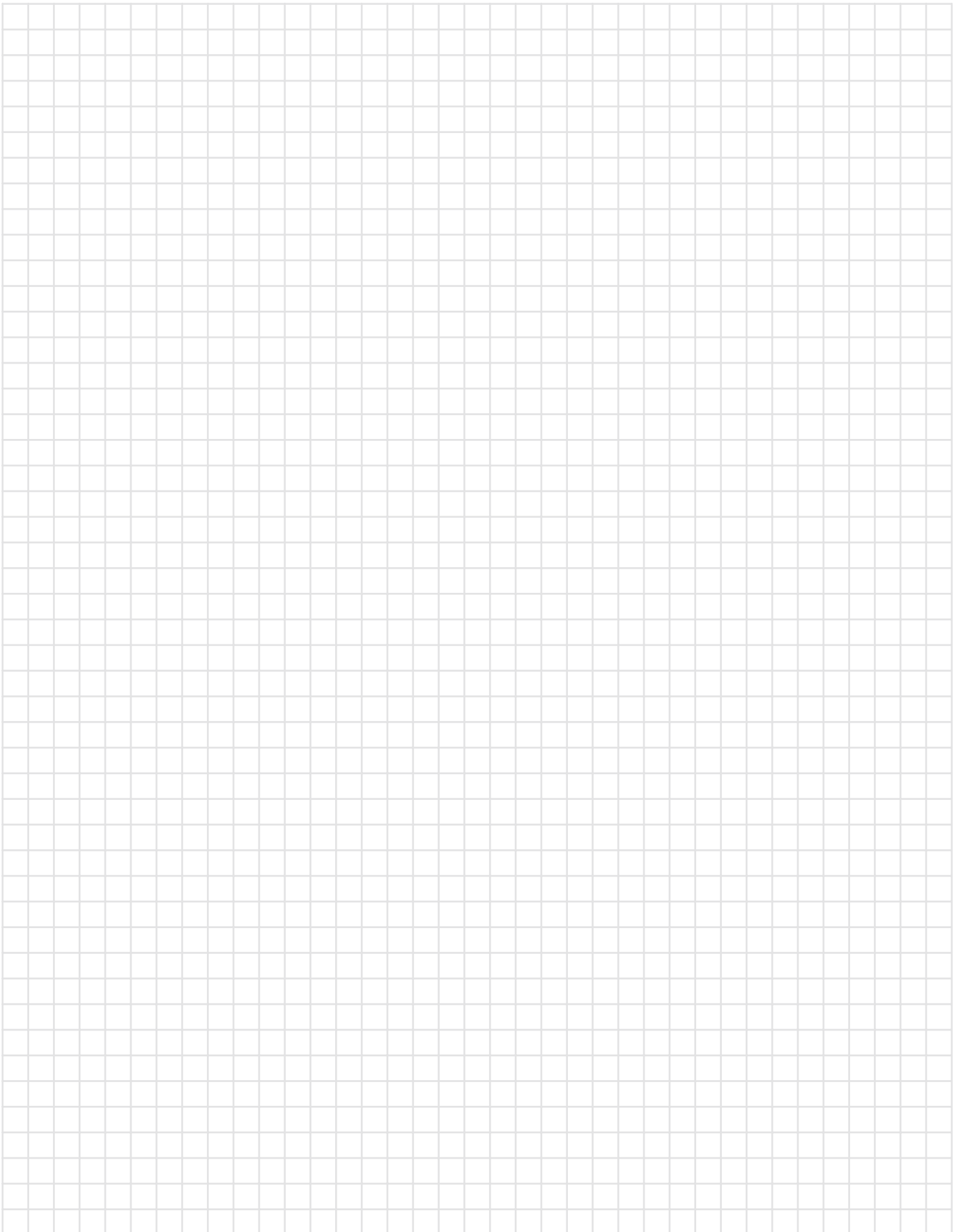


6. Remarks:

Date: _____

Processed by: _____

Notes



For custom configurations, we also supply material certificates according to EN 10204-3.1. B. This certificate logs the actual values of material characteristics such as tensile strength, apparent yielding point, notched bar impact work, extension and chemical analysis.

Material tests are performed according to the latest industry recognized methods (i.e. ultrasonic testing-developed by the Fraunhofer Institute).



Quality Assurance
EN ISO 9001:2000 certified

Quality Assurance

EN ISO 9001:2000 certified

***We want
you to be
satisfied!***

IMO Slew Drives have to meet the highest quality requirements because they are often used as safety critical components. Development, design, calculation and sales are performed strictly according to EN ISO 9001:2000 certified procedures.



The quality chain starts with the choice of the raw material (i.e. for the production of seamless rolled rings of the SP-series) and is continuous, including the ongoing testing of the current production series.



IMO Holding GmbH
IMO Energy GmbH & Co. KG
IMO Momentenlager GmbH & Co. KG



IMO Antriebseinheit GmbH & Co. KG

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