IMO Anlagenbau develops and manufactures efficient tracking technology for photovoltaic systems. Our single and dual axis solar tracking systems consist of matching high quality components for optimum performance. IMO’s expertise begins at component level offering support throughout the project and spans the entire field of solar applications, including turn-key implementation of large-scale projects.

IMO Antriebseinheit is specialized in developing and manufacturing pinion or worm driven Slew Drives. These patented component systems are used for example in manlift platforms, steering gears, construction machinery and solar trackers.

IMO Energy is one of the leading suppliers of yaw and blade bearings for onshore and offshore wind turbines. Slewing Rings manufactured by IMO Energy are also used as single main bearing for gear- and shaftless wind turbines and as blade bearing for tidal stream systems.

IMO Momentenlager is developing, manufacturing and supplying Ball and Roller Slewing Rings up to a diameter of 5,200 mm / 204.724 in in a wide range of products. They are used for instance in the following applications: special purpose machinery, construction machinery, cranes and manlift platforms, tunnel boring machines, ship building, medical technology and bulk handling.

IMO Holding acts as service provider for the other companies of the IMO Group. IMO Holding comprises the central departments of the Group such as quality assurance, finance, human resource, IT and marketing.
Nomenclature

Design types
WD: Worm gear driven type
SP: Spur gear driven type

Drawing reference number
WD – L 0156 / 3 – 01234

Gearing heat treatment
1: Normalized
2: Quenched and tempered
3: Hardened

for WD-L and SP: Raceway diameter [mm]
for WD-H: Bolt PCD of worm wheel [mm]

Identification for custom configurations only, i.e.
C: With or without hydraulic motor
E: With or without electric motor

Series
L: Light series
I: Intermediate series
M: Medium series
H: Heavy series

Design types
WD: Worm gear driven type
SP: Spur gear driven type
IMO has developed, manufactured and sold innovative Slew Drives to global customers for many years.

This catalog presents our comprehensive range of Slew Drives, covering a wide range of standard sizes and customization options that is unprecedented in the market.

The standard sizes listed in this publication cover common industry requirements. If your application has special needs our Engineering Department will support you to find the right Slew Drive - see the back cover for contact details. This catalog replaces all previous editions. It has a reference number on the front cover. Data of earlier catalogs that do not agree with the data of this version are therefore no longer valid.

This catalog includes an “Application Data Sheet” on page 100-102. Filling this in ensures that our application engineering receives all the information they need to recommend the optimum Slew Drive for your application and represents a record of your requirements. Slew Drives are high-tech products that are optimized to the specific demands and environmental conditions of your application. Thus it is important to fill in the form as exactly and as detailed as possible before returning it to us.

You will then receive our recommendation for the right IMO product for your application and benefit directly from our many years of experience.

IMO terms and conditions shall apply to all quotations and purchase orders. Also, please make sure that you follow our Installation and Maintenance Instructions exactly. Refer to our homepage for the latest version of this important document.

Following the Installation and Maintenance Instructions is important for the reliability and safety of our product and has considerable influence on its service-life.

The latest versions of all mentioned documents can be downloaded at www.imo.de. Please contact us to receive a paper copy.

Separate brochures about the IMO group and our comprehensive product portfolio of Slewing Rings, Slew Drives and Solar Tracking Technology can be downloaded from our website. If you need more information, please do not hesitate to contact us.

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

Applications presented in this catalog show potential fields of application and demonstrate the capabilities of our products and are not intended to be understood as fundamental designs. All engineering design work is to be based on the technical data listed in this catalog. Please contact our Engineering Department for specific questions.

Our product ranges and designs are continuously updated and revised. Products and specifications contained in this publication are subject to change without notice.

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The innovative business group IMO, headquartered in Gremsdorf, Germany, has been designing, manufacturing and supplying Slewing Rings and self-contained Slew Drives for more than 20 years.

IMO currently holds DIN EN ISO 9001, ISO 14001 and OHSAS 18001 approvals and has been certified since 1995.

IMO has earned several technical awards at international exhibitions for new and innovative product introductions and has repeatedly been honored for continued sustainable growth.

We are a recognized supplier in our industry and around the globe.
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<th>Series</th>
<th>Sizes</th>
<th>Raceway diameters</th>
<th>Maximum torque $^1$</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>DL [mm]</td>
<td>$M_{DL_{\text{max}}}$ [Nm]</td>
<td>$M_{DL_{\text{max}}}$ [kNm]</td>
<td>$C_{ax}$ [kN]</td>
<td>$C_{rad}$ [kN]</td>
<td></td>
</tr>
<tr>
<td>Worm gear driven types</td>
<td>Series WD-L</td>
<td>0156, 0223, 0343, 0419, 0478, 0625</td>
<td>156, 223, 343, 419, 478, 625</td>
<td>from 3280 to 42824</td>
<td>from 9 to 318</td>
<td>from 253 to 2364</td>
<td>from 94 to 883</td>
<td>from 40 to 242</td>
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<td>Series WD-H</td>
<td>0140, 0170, 0220, 0370, 0430, 0490, 0630</td>
<td>205, 280, 370, 452, 569, 725</td>
<td>from 4010 to 152610</td>
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<td>from 1208 to 7199</td>
<td>from 451 to 3528</td>
<td>from 73 to 516</td>
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<td></td>
<td>Axial tilting clearance 0 - 0,4 mm</td>
</tr>
<tr>
<td>Spur gear driven types</td>
<td>Series SP-I</td>
<td>0210, 0280, 0370, 0430, 0490, 0630</td>
<td>229, 311, 411, 541, 641, 741</td>
<td>from 3000 to 11172</td>
<td>from 22 to 353</td>
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<td>from 40 to 132</td>
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<td></td>
<td></td>
<td>Axial tilting clearance 0 - 0,4 mm</td>
</tr>
<tr>
<td></td>
<td>Series SP-M</td>
<td>0311, 0411, 0541, 0641, 0741, 0841, 0941, 1091</td>
<td>311, 411, 541, 641, 741, 841, 941, 1091</td>
<td>from 8622 to 25482</td>
<td>from 31 to 299</td>
<td>from 447 to 1570</td>
<td>from 191 to 672</td>
<td>from 80 to 200</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Axial tilting clearance 0 - 0,4 mm</td>
</tr>
<tr>
<td></td>
<td>Series SP-H</td>
<td>0405, 0505, 0605, 0755, 0855, 0955</td>
<td>455, 555, 655, 755, 855, 955</td>
<td>from 27673 to 51888</td>
<td>from 144 to 548</td>
<td>from 1432 to 3006</td>
<td>from 535 to 1123</td>
<td>from 190 to 320</td>
</tr>
</tbody>
</table>

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.
- Modularity enables rapid customization of the unit.
- Custom 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 e.g. for solar tracking systems.

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

**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.imo.de.
- Extensive technical support.

**IMO Slew Drive is an encapsulated unit**
- Optimum protection against:
  - 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 from 156 - 1091 mm.
- Larger diameter variants available on request.
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

Bolt hole
- For unit mounting

Grease nipple
- For raceway

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

Housing
- Totally enclosed
- Self-supporting

Drive pinion
- Hardened
- Double supported

Ball Slewing Ring
- External toothing
- High load carrying capacity

SP-I 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 8 standard models:

- WD-L 0156 Single Row Slewing Ring
- 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

-WD-L 0419 with the attached potentiometer, used in manlift systems

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

-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 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)

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.

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
SP-Slew Drives with totally enclosed housing.
Standard Slew Ring mounting hole patterns provide full product interchangeability.

Overview

SP-I, intermediate series
- mounting hole patterns and height identical to IMO Ball Slew Ring series 120
- ball diameter 20 mm
- module 6 mm
- direct drive

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 8 mm
- one or multistage planetary gearbox

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-H series Slew Drive with four electric motors and planetary gearboxes for a stirring unit in a recycling plant.

SP-HC 0755
Custom design with planetary gearbox and feedback potentiometer used to rotate a special excavator attachment.

SP-HC 0655
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.

Different applications for special vehicles require different solutions. IMO Slew Drives offer 360-degree steering capability.

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

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".
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 manoeuvring capabilities including turning on the spot.

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.

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.

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

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

The IMO Slew Drive, model WD-L 0343 (also available with special flanges) is used in light cranes - the standard equipment of service trucks.

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

Applications

Cranes
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).

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”).

Cementery excavator with the IMO Slew Drive WD-L 0343.
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.

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

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.

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-IE 0411 with three-phase electrical motor and spur gearbox.

This is a facility to cover car facia panels with leather. It contains Slew Drive WD-HE 0373. Because of its operating condition, it is fitted with a spring energised multi-plate disk brake.

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

Applications Positioning/Automation

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

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

Slew Drives of WD-series fitted with electric motors used for the yaw and pitch controls of this solar table.
Designed for high accuracy positioning: WD-LC (top) and WD-LB (bottom) Slew Drives.
### Technical Information

#### Symbols and units

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
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<tbody>
<tr>
<td>Bh</td>
<td>Basic rating life in operating hours</td>
</tr>
<tr>
<td>Cax</td>
<td>Basic axial dynamic load rating</td>
</tr>
<tr>
<td>Crad</td>
<td>Basic radial dynamic load rating</td>
</tr>
<tr>
<td>C0 ax</td>
<td>Basic axial static load rating</td>
</tr>
<tr>
<td>C0 rad</td>
<td>Basic radial static load rating</td>
</tr>
<tr>
<td>D</td>
<td>mm Raceway diameter (see Product Overview P. 4/5)</td>
</tr>
<tr>
<td>EDb</td>
<td>% Duty</td>
</tr>
<tr>
<td>EDb max</td>
<td>%/min Maximum permissible duty of rotation per minute (see diagram series description)</td>
</tr>
<tr>
<td>F</td>
<td>kN Equivalent axial load including all occurring shock loads and required safety factors, calculated from all axial forces</td>
</tr>
<tr>
<td>FaxD</td>
<td>kN Equivalent axial load including application service factor for determining the load point in the limiting load diagram</td>
</tr>
<tr>
<td>Frad</td>
<td>kN Equivalent radial load including all occurring axial loads and required safety factors, calculated from all radial forces; the effective gearing circumferential force has to be considered</td>
</tr>
<tr>
<td>Frad max</td>
<td>kN Limit value for checking frictional contact</td>
</tr>
<tr>
<td>Fwb</td>
<td>kN Initial preload on bolt</td>
</tr>
<tr>
<td>Gax</td>
<td>h Limit value</td>
</tr>
<tr>
<td>i</td>
<td>— Gear ratio</td>
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<tr>
<td>m</td>
<td>mm Module</td>
</tr>
<tr>
<td>MxB</td>
<td>Nm Operating torque</td>
</tr>
<tr>
<td>MxB nom</td>
<td>Nm Nominal torque</td>
</tr>
<tr>
<td>MxB max</td>
<td>Nm Maximum torque</td>
</tr>
<tr>
<td>Mb</td>
<td>Nm Maximum holding torque</td>
</tr>
<tr>
<td>MkB</td>
<td>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</td>
</tr>
<tr>
<td>MkB2</td>
<td>kNm Equivalent tilting moment including radial load and application service factor for determining the load point in the limiting load diagram</td>
</tr>
<tr>
<td>MW</td>
<td>Nm Friction torque of the Slew Drive under operating load in the installed state</td>
</tr>
<tr>
<td>MWFA</td>
<td>Nm Friction torque of the Slew Drive, unloaded</td>
</tr>
<tr>
<td>n</td>
<td>rpm Operating speed of Slewing Ring</td>
</tr>
<tr>
<td>nperm</td>
<td>rpm Permissible operating speed of Slewing Ring</td>
</tr>
<tr>
<td>φb</td>
<td>— Number of fastening holes per bearing ring</td>
</tr>
<tr>
<td>SF1</td>
<td>— Series SP: Safety factor against tooth base fatigue Series WD: Safety factor against tooth wear</td>
</tr>
<tr>
<td>SFS 1</td>
<td>— Series WD: Safety factor against tooth fracture</td>
</tr>
<tr>
<td>SFS 1.75</td>
<td>— Series SP: Safety factor against static tooth base fracture</td>
</tr>
<tr>
<td>Sw</td>
<td>— Calculation safety factor 1.3 for wear diagram</td>
</tr>
<tr>
<td>Q</td>
<td>l/min Oil flow</td>
</tr>
<tr>
<td>z1</td>
<td>— Number of teeth, pinion</td>
</tr>
<tr>
<td>z2</td>
<td>— Number of teeth, Slewing Ring</td>
</tr>
<tr>
<td>εA</td>
<td>— Bolt tightening factor</td>
</tr>
<tr>
<td>Δp</td>
<td>bar Pressure differential</td>
</tr>
<tr>
<td>k</td>
<td>mm Tilting clearance increase</td>
</tr>
<tr>
<td>k perm</td>
<td>mm Maximum permissible tilting clearance increase</td>
</tr>
<tr>
<td>δp</td>
<td>mm Maximum permissible flatness deviation</td>
</tr>
<tr>
<td>δv</td>
<td>mm Maximum permissible deformation of mounting structure</td>
</tr>
<tr>
<td>δw</td>
<td>mm Maximum permissible perpendicularity deviation</td>
</tr>
</tbody>
</table>

#### General

**Function of Slew Drive**

Slew drives comprise a highly robust Slewing 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 Slewing 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.

![Diagram of Slew Drive](image-url)
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!

Axial 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!

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°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: All Slew Drives can be used with the exception of the WD-H series and WD-I series sizes 0478 and 0625. 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 5° 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 Md 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 Md 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-I: The maximum torque is limited by the input torque of the attached hydraulic motor and the strength of the parallel key connection for a 25 mm shaft.

Nominal torque Mdm 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 Md max:
The calculation of the maximum torque with a safety factor against tooth fracture SF5.1 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 Mdm 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 ±170°.

Series SP and WD:
- Maximum holding torque Mh:
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

\[ n_{\text{perm}} = \frac{40000}{D_l} \]

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. 49 and P. 59.

Static capacity of raceway

Series 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 Minimum strength of the mounting structure 500 N/mm²)
- Radial loading considered as specified
- Compliance with “Installation and Maintenance Instructions”

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

<table>
<thead>
<tr>
<th>Application</th>
<th>Application service factor fα</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction/machinery</td>
<td>1.25</td>
<td>Normal operation</td>
</tr>
<tr>
<td>Forestry machinery</td>
<td>1.50</td>
<td>Rough operation</td>
</tr>
<tr>
<td>Foundries</td>
<td>1.75</td>
<td>Rough operation</td>
</tr>
<tr>
<td>Maritime platforms</td>
<td>1.30</td>
<td>Normal operation</td>
</tr>
<tr>
<td>Mach. engineering, general</td>
<td>1.25</td>
<td>Normal operation</td>
</tr>
<tr>
<td>Mach. engineering, general</td>
<td>1.50</td>
<td>Heavy operation</td>
</tr>
<tr>
<td>Measuring technique</td>
<td>2.00</td>
<td>Accuracy</td>
</tr>
<tr>
<td>Robot / instr. handling sys.</td>
<td>1.50</td>
<td>Accuracy</td>
</tr>
<tr>
<td>Rail vehicles</td>
<td>1.50</td>
<td>Rough operation</td>
</tr>
<tr>
<td>Special vehicles</td>
<td>1.50</td>
<td>Rough operation</td>
</tr>
<tr>
<td>Deep mining</td>
<td>1.75</td>
<td>Rough operation</td>
</tr>
<tr>
<td>Machine tools</td>
<td>1.50</td>
<td>Accuracy</td>
</tr>
</tbody>
</table>

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

\[
F_{AxO} = F_{Ax} \cdot f_{α}
\]

\[
M_{LB} = (M_{L} + 1.73 \cdot F_{rad} \cdot \frac{D_2}{1000}) \cdot f_{α}
\]

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

This equation applies only if:

\[
F_{rad} \leq 0.5 \cdot F_{Ax}
\]

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

<table>
<thead>
<tr>
<th>Load</th>
<th>Axial load</th>
<th>55 kN</th>
<th>Radial load</th>
<th>6 kN</th>
<th>Tilting moment load</th>
<th>86 kNm</th>
</tr>
</thead>
</table>

**Slew Drive:** pre-selected SP-M 07412-05894

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

\[
F_{AxO} = 55 \cdot 1.25 = 68.75 \text{ kN}
\]

\[
M_{LB} = (86 + 1.73 \cdot 6 \cdot \frac{741}{1000}) \cdot 1.25 = 117.11 \text{ kNm}
\]

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

**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 shear 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.

\[
F_{rad \ max} = nb \cdot F_{sp}
\]

\[
F_{ps} = \frac{nb \cdot F_{sp}}{18.8}
\]

\[
n_b = \text{number of fixing holes per ring}
\]

\[
F_{ps} = \text{pre-stressing force on a mounting bolt}
\]

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.

**Tilting moment load**

\[
M_{wA} = 4.0 \cdot \frac{D_2}{2000}
\]

**Axial load**

\[
M_{wA} = 2.0 \cdot \frac{D_2}{2000}
\]

Slew Drive series WD-H, with preloaded Slew Drive

**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

\[
M_{wA} = 0.2 \cdot D_2^2
\]

**Slew Drive series WD-L, with preloaded Slew Drive**

\[
M_{wA} = 2.0 \cdot D_2^2
\]

**Slew Drive series WD-H, with preloaded Slew Drive**

\[
M_{wA} = 4.0 \cdot D_2^2
\]

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

**Security of the mounting bolts**

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

**Lociﬁte®**

Application of Lociﬁte 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.

**Gears**

**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.

The drive pinion in direct drive units is supported by two radial bearings integrated into the housing and the drive mount.
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:

\[
\text{Tooth backlash to be set} = 0.03 \text{ to } 0.04 \times \text{module}
\]

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, KP20-20 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 stand-still 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 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”.

Shelf life of greases

Grease is not yet used, it should be replaced.

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

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.

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Please follow the Installation and Maintenance Instructions. Following the Installation and Maintenance Instructions is important for the reliability and safety of our product and has considerable influence on its service-life. The latest revision of the Installation and Maintenance Instructions can be downloaded at www.imo.de. Contact us to receive a paper copy.
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

Worm gear driven type
WD Series
### 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: \( M_{B} = 13200 \text{ Nm} \)
    - Output speed: \( n = 1 \text{ rpm} \)
    - Operating time: \( B_b = 14000 \text{ h} \)
  - **Duty:** \( E_D = 5 \% \)

By rotating the drive for 40 seconds, the following data are determined:
- 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
  - \( 0.333 \text{ min. rotating per minute} \)
  - \( 0.333 \text{ Duty per minute} \)

**Equation:**
\[
E_{D} = \frac{33.3}{100} \times 100 = 33.3 \%
\]

**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.

**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 0478/3-04904), an operation load point is calculated depending on external loading, the application service factor and the raceway diameter \( D_r \).

Loading is permissible for raceway and bolt connection, provided that the operation 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 line. On the contrary, if the operating load point also lies below the limiting load line of a smaller size, then, for this size, permissible size of the newly calculated operation 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:**
  \[
  F_{rad} \leq 220 \times \frac{M_{k}}{1000} + 0.5 \times F_{ax} \text{ fulfilled}
  \]

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

\[
F_{rad} \leq 220 \times \frac{M_{k}}{1000} + 0.5 \times F_{ax} \]

\[
35 \leq 220 \times \frac{75}{1000} + 0.5 \times 100 = 66.5 \text{ (condition fulfilled)}
\]

Calculation of the operation load point:
- Application service factor \( f_a = 1.5 \) (special vehicles)
- Raceway diameter for WD-L 0478/3-04904: \( D_r = 478 \text{ mm} \) (see product program overview / compare P. 4 and P. 5)

\[
F_{axD} = F_{ax} \cdot f_a
\]

\[
F_{axD} = 100 \text{ kN} \times 1.5 = 150 \text{ kN}
\]

\[
M_{kD} = (M_k + 1.73 \times F_{rad} \cdot D_r) \times f_a
\]

\[
M_{kD} = (75 + 1.73 \times 100 \times 478) \times 1.5 = 155.9 \text{ kNm}
\]

The operation load point lies below the limiting load line of the selected Slew Drive WD-L 0478/3-04904 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 0478/3-04904 would not be the best solution from the economic point of view.
Step 3: Static reliability verification of operation torque $M_{dB}$.

The following condition must be fulfilled:

- Operating torque $M_{d}$ ≤ maximum torque $M_{d\max}$

(see series overview WD-L P. 48)

Example: 13200 Nm ≤ 24288 Nm (condition fulfilled)

Slew Drives WD-L 0419/3-04553, WD-L 0419/3-04684, WD-L 0478/3-04904 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 0478/3-04904 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 $E_{D\max}$

The following condition must be fulfilled:

- Preconditions for the diagram of maximum permissible duty per minute $E_{D\max}$

(see series overview WD-L P. 49)

Duty per minute $E_{DB}$ ≤ maximal permissible duty per minute $E_{D\max}$

(see series overview WD-L P. 49)

Example:

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

Verifying the condition: $E_{DB} \leq E_{D\max}$

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

Determining the maximum permissible duty per minute (see series overview WD-L P. 49)

Factor $f_{MD} = \frac{M_{d}}{M_{d\max}} = \frac{13200}{24288} = 0.543$

Maximum permissible duty per minute $E_{D\max} = 46 \% / \text{min}$

Verifying the condition: $E_{DB} \leq E_{D\max}$

33.3 \% / min ≤ 46 \% / min (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. 49)

Example:

Preconditions for wear diagram apply

Verifying the condition: $G_{W} \geq B_{N} \cdot E_{D_{B}}$

Determining the limit value $G_{W}$ at the operating torque $M_{d}$ from the diagram for the selected Slew Drive WD-L 0478/3-04904 (see series overview WD-L S. 49)

Verifying the condition: $G_{W} \geq B_{N} \cdot E_{D_{B}}$

Limit value $G_{W} = 1500$ hours (from diagram)

$B_{N} \cdot E_{D_{B}} = 14000$ Stunden \cdot 5 \% = 700 Stunden

1500 hours ≥ 700 hours (condition fulfilled)

Operation is permissible as regards wear characteristics.

Verification as regards:

1. Suitability of design
2. Load carrying capacity of raceway and bolt connection in the limiting load diagram
3. Permissibility of the operating torque
4. Maximum permissible duty per minute
5. Wear characteristic of worm gearing was considered and the Slew Drive WD-L 0478/3-04904 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. 100 and P. 102).
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 overheating 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 $\text{ED}_{\text{max}}\%$ 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: $n = 1.0 \text{ rpm}$
- Wear safety factor of worm gearing: $\text{SW} = 1.3$
- Observed of the maximum permissible duty $\text{ED}_{\text{max}}\%$ (see diagram 2)
- Ambient temperature $20^\circ\text{C}$

Determining the maximum permissible duty per minute $\text{ED}_{\text{max}}\%$:
The maximum permissible duty per minute should never be exceeded.

Wear characteristics of the worm gearing:

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

If this relationship is not fulfilled, a high rate of wear must be expected.
**WD-L Series**

**Size 0156 / single row**

Note, mounting face against upper surface shall be within the limits of ø156 and ø223

Mounting holes
- Y = 12 Holes M12-24 deep, equally spaced
- Z = 11 Holes M12-24 deep, equally spaced over 12 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

**Size 0223 / single row**

Note, mounting face against upper surface shall be within the limits of ø223 and ø329

Mounting holes
- Y = 16 Holes M16-30 deep, equally spaced
- Z = 15 Holes 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 0156/3-07771**

| Module | \( m \) [\( \text{mm} \)] | 5 |
| Gear ratio | \( i \) [-] | 1 |
| Self-locking gears | \( \text{via}^{*} \) |
| Maximum torque \( \mathcal{M}_{\text{max}} \) [\( \text{Nm} \)] | 3280 |
| Nom. torque \( \mathcal{M}_{\text{nom}} \) [\( \text{Nm} \)] | 2530 |
| Maximum holding torque* | \( \mathcal{M}_{\text{h}} \) [\( \text{Nm} \)] | 3280 |
| Static load rating, radial \( C_{\text{rad}} \) [\( \text{kN} \)] | 94 |
| Static load rating, axial \( C_{\text{ax}} \) [\( \text{kN} \)] | 253 |
| Dynamic load rating, radial \( C_{\text{rad}} \) [\( \text{kN} \)] | 83 |
| Dynamic load rating, axial \( C_{\text{ax}} \) [\( \text{kN} \)] | 97 |
| Weight, incl. 6 kg for hydraulic motor H-159 [\( \text{kg} \)] | 40 |

---

**Drawing reference number WD-L 0223/3-04698**

| Module | \( m \) [\( \text{mm} \)] | 5 |
| Gear ratio | \( i \) [-] | 1 |
| Self-locking gears | \( \text{via}^{*} \) |
| Maximum torque \( \mathcal{M}_{\text{max}} \) [\( \text{Nm} \)] | 9303 |
| Nom. torque \( \mathcal{M}_{\text{nom}} \) [\( \text{Nm} \)] | 4795 |
| Maximum holding torque* | \( \mathcal{M}_{\text{h}} \) [\( \text{Nm} \)] | 9303 |
| Static load rating, radial \( C_{\text{rad}} \) [\( \text{kN} \)] | 204 |
| Static load rating, axial \( C_{\text{ax}} \) [\( \text{kN} \)] | 547 |
| Dynamic load rating, radial \( C_{\text{rad}} \) [\( \text{kN} \)] | 132 |
| Dynamic load rating, axial \( C_{\text{ax}} \) [\( \text{kN} \)] | 154 |
| Weight, incl. 6 kg for hydraulic motor H-159 [\( \text{kg} \)] | 50 |

---

If in doubt, please contact IMO!
WD-L Series

Size 0223 / double row

Mounting holes
Y = 16 Holes M16-30 deep, equally spaced
Z = 15 Holes 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

Note, mounting face against upper surface shall be within the limits of ø223 and ø329

Size 0343 / single row

Mounting holes
Y = 18 Holes M16-30 deep, equally spaced
Z = 24 Holes 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

Note, mounting face against upper surface shall be within the limits of ø343 and ø449

Limiting load diagram for ‘compressive’ load

Drawing reference number WD-L 0223/3-04895

| Module | m [mm] | 5 |
| Gear ratio | i | 1 |
| Self-locking gears | | 86 |
| Maximum torque | Md_nom [Nm] | 3930 |
| Nom. torque | M_m [Nm] | 4795 |
| Maximum holding torque* | M_h [Nm] | 3930 |
| Static load rating, radial | C_rad [kN] | 297 |
| Static load rating, axial | C_ax [kN] | 797 |
| Dynamic load rating, radial | C_d [kN] | 215 |
| Dynamic load rating, axial | C_d [kN] | 250 |
| Weight, incl. 6 kg for hydraulic motor H-159 [kg] | 60 |

*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-159

Pressure differential

Oil flow

Output speed

Maximum achievable torque

Drawing reference number WD-L 0343/3-04557

| Module | m [mm] | 5 |
| Gear ratio | i | 1 |
| Self-locking gears | | 86 |
| Maximum torque | Md_nom [Nm] | 12905 |
| Nom. torque | M_m [Nm] | 10150 |
| Maximum holding torque* | M_h [Nm] | 12905 |
| Static load rating, radial | C_rad [kN] | 338 |
| Static load rating, axial | C_ax [kN] | 905 |
| Dynamic load rating, radial | C_d [kN] | 157 |
| Dynamic load rating, axial | C_d [kN] | 183 |
| Weight, incl. 6 kg for hydraulic motor H-159 [kg] | 68 |

*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-159

Pressure differential

Oil flow

Output speed

Maximum achievable torque

If in doubt, please contact IMO!
**WD-L Series**

### Size 0419 / single row

- **Mounting holes**:
  - $Y = 20$ Holes M16-30 deep, equally spaced
  - $Z = 20$ Holes ø18-10 deep / ø18-30 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

Note: Mounting face against upper surface shall be within the limits of ø419 and ø439.

---

### Size 0419 / double row

- **Mounting holes**:  
  - $Y = 20$ Holes M16-40 deep, equally spaced
  - $Z = 20$ Holes ø18-10 deep / ø18-30 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

Note: Mounting face against upper surface shall be within the limits of ø419 and ø439.

---

**Limiting load diagram for “compressive” load**

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**: n/a**
- **Maximum torque**: $M_{dc} [\text{Nm}]$
  - 15906
- **Nom. torque**: $M_{dc} [\text{Nm}]$
  - 15906
- **Maximum holding torque**
  - $M_h [\text{Nm}]$
  - 15906
- **Static load rating, radial**: $C_{rad} [\text{kN}]$
  - 403
- **Static load rating, axial**: $C_{ax} [\text{kN}]$
  - 1107
- **Dynamic load rating, radial**: $C_{d} [\text{kN}]$
  - 170
- **Dynamic load rating, axial**: $C_{a} [\text{kN}]$
  - 188
- **Weight, incl. 6 kg for hydraulic motor H-159**: [kg]
  - 92

---

**Limiting load diagram for “compressive” load**

Drawing reference number WD-L 0419/3 04664

- **Module**: m [mm]
  - 5
- **Number of starts of the worm**: [-]
  - 1
- **Gear ratio**: i [-]
  - 104
- **Self-locking gears**: n/a**
- **Maximum torque**: $M_{dc} [\text{Nm}]$
  - 15906
- **Nom. torque**: $M_{dc} [\text{Nm}]$
  - 15906
- **Maximum holding torque**
  - $M_h [\text{Nm}]$
  - 15906
- **Static load rating, radial**: $C_{rad} [\text{kN}]$
  - 593
- **Static load rating, axial**: $C_{ax} [\text{kN}]$
  - 1498
- **Dynamic load rating, radial**: $C_{d} [\text{kN}]$
  - 277
- **Dynamic load rating, axial**: $C_{a} [\text{kN}]$
  - 323
- **Weight, incl. 6 kg for hydraulic motor H-159**: [kg]
  - 112

---

*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-159

- **Pressure differential**: $p [\text{bar}]$
  - 150
- **Oil flow**: $Q [\text{l/min}]$
  - 20
- **Output speed**: $n [\text{min}^{-1}]$
  - 1
- **Maximum achievable torque**: $M_{a} [\text{Nm}]$
  - 15906

---

**If in doubt, please contact IMO!**
**WD-L Series**

### Size 0478 / single row

**Mounting holes**
- Y = 32 holes M16-10 deep, equally spaced
- Z = 31 holes ø18-10 deep / M16-30 deep, equally spaced over 32 pitch

**Lubrication parts**
- 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 0478/3-04904

<table>
<thead>
<tr>
<th>Module</th>
<th>m [mm]</th>
<th>6</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of starts of the worm</td>
<td>[-]</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Gear ratio</td>
<td>i [-]</td>
<td>59</td>
<td>47</td>
</tr>
<tr>
<td>Self-locking gears</td>
<td></td>
<td>M4</td>
<td>M4</td>
</tr>
<tr>
<td>Maximum torque ( \tau = 1 )</td>
<td>( M_{\text{max}} ) [Nm]</td>
<td>24288</td>
<td>24288</td>
</tr>
<tr>
<td>Non- torque ( \tau = 1 )</td>
<td>( M_{\text{max}} ) [Nm]</td>
<td>24288</td>
<td>24288</td>
</tr>
<tr>
<td>Maximum holding torque*</td>
<td>( M_h ) [Nm]</td>
<td>24288</td>
<td>24288</td>
</tr>
<tr>
<td>Static load rating, radial</td>
<td>( C_{\text{ra}} ) [kN]</td>
<td>675</td>
<td>675</td>
</tr>
<tr>
<td>Static load rating, axial</td>
<td>( C_{\text{ax}} ) [kN]</td>
<td>1808</td>
<td>1808</td>
</tr>
<tr>
<td>Dynamic load rating, radial</td>
<td>( C_{\text{rd}} ) [kN]</td>
<td>251</td>
<td>251</td>
</tr>
<tr>
<td>Dynamic load rating, axial</td>
<td>( C_{\text{ad}} ) [kN]</td>
<td>293</td>
<td>293</td>
</tr>
<tr>
<td>Weight incl. 12 kg for hydraulic motor 2-300 [kg]</td>
<td></td>
<td>144</td>
<td>144</td>
</tr>
</tbody>
</table>

*Optional with brake
**Self-locking with mounted spring loaded disc brake

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

| Pressure differential \( \Delta p \) [bar] | 125 | 195 |
| Oil flow \( Q \) [l/min] | 32 | 22 |
| Output speed \( n \) [min⁻¹] | 1 | 1 |
| Maximum achievable torque \( M_h \) [Nm] | 24288 | 24288 |

### Size 0625 / single row

**Mounting holes**
- Y = 24 holes M20-40 deep, equally spaced
- Z = 23 holes ø22-20 deep / M20-40 deep, equally spaced

**Lubrication parts**
- 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

<table>
<thead>
<tr>
<th>Module</th>
<th>m [mm]</th>
<th>7</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of starts of the worm</td>
<td>[-]</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Gear ratio</td>
<td>i [-]</td>
<td>104</td>
<td>51.5</td>
</tr>
<tr>
<td>Self-locking gears</td>
<td></td>
<td>M4</td>
<td>M4</td>
</tr>
<tr>
<td>Maximum torque ( \tau = 1 )</td>
<td>( M_{\text{max}} ) [Nm]</td>
<td>42824</td>
<td>42824</td>
</tr>
<tr>
<td>Non- torque ( \tau = 1 )</td>
<td>( M_{\text{max}} ) [Nm]</td>
<td>42824</td>
<td>42824</td>
</tr>
<tr>
<td>Maximum holding torque*</td>
<td>( M_h ) [Nm]</td>
<td>42824</td>
<td>42824</td>
</tr>
<tr>
<td>Static load rating, radial</td>
<td>( C_{\text{ra}} ) [kN]</td>
<td>883</td>
<td>883</td>
</tr>
<tr>
<td>Static load rating, axial</td>
<td>( C_{\text{ax}} ) [kN]</td>
<td>2564</td>
<td>2564</td>
</tr>
<tr>
<td>Dynamic load rating, radial</td>
<td>( C_{\text{rd}} ) [kN]</td>
<td>280</td>
<td>280</td>
</tr>
<tr>
<td>Dynamic load rating, axial</td>
<td>( C_{\text{ad}} ) [kN]</td>
<td>327</td>
<td>327</td>
</tr>
<tr>
<td>Weight incl. 24 kg for hydraulic motor 2-300 [kg]</td>
<td></td>
<td>242</td>
<td>242</td>
</tr>
</tbody>
</table>

*Optional with brake
**Self-locking with mounted spring loaded disc brake

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

| Pressure differential \( \Delta p \) [bar] | 105 | 130 |
| Oil flow \( Q \) [l/min] | 80 | 46 |
| Output speed \( n \) [min⁻¹] | 1 | 1 |
| Maximum achievable torque \( M_h \) [Nm] | 42824 | 42824 |

---

If in doubt, please contact IMO!
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: $n = 1.5 \text{ rpm}$
- 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 $20^\circ C$

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

The maximum permissible duty per minute may never be exceeded

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

$$f_{Md} = \frac{Md_B}{Md_{max}}$$

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

$Md_B$: Operating torque [Nm]

$Md_{max}$: Maximum torque [Nm] (see diagram 1)

**Wear characteristics of the worm gear:**

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

$B_h$: Duty [%]

$Md_B$: Operating torque [Nm]

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

$G_w \geq B_h \cdot ED_g \cdot 100$

If this relationship is not fulfilled, a high rate of wear must be expected.
**WD-H Series**

**Size 0146**

**Mounting holes**

- Y = 22 Holes M16-24 deep, equally spaced
- Z = 18 Holes ø17-10 deep / M16-25 deep, equally spaced

**Lubrication ports**

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

**Limiting load diagram for “compressive” load**

**Drawing reference number WD-H 0146/3-00022**

<table>
<thead>
<tr>
<th>Module</th>
<th>( \text{mm} )</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of starts of the worm</td>
<td>[-]</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Gear ratio</td>
<td>( i )</td>
<td>68</td>
<td>51</td>
<td>25.5</td>
</tr>
<tr>
<td>Self-locking gears**</td>
<td>ja</td>
<td>nein</td>
<td>nein</td>
<td></td>
</tr>
<tr>
<td>Maximum torque ( M_{\text{Max}} ) [Nm]</td>
<td>4010</td>
<td>6284</td>
<td>6284</td>
<td></td>
</tr>
<tr>
<td>Static load rating, radial</td>
<td>( C_{\text{rad}} ) [kN]</td>
<td>451</td>
<td>451</td>
<td>451</td>
</tr>
<tr>
<td>Dynamic load rating, radial</td>
<td>( C_{\text{rad}} ) [kN]</td>
<td>1208</td>
<td>1208</td>
<td>1208</td>
</tr>
<tr>
<td>Weight, incl. 8 kg for hydraulic motor H-293</td>
<td>[kg]</td>
<td>73</td>
<td>73</td>
<td>73</td>
</tr>
</tbody>
</table>

*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-293

- Pressure differential | \( \Delta p \) [bar] | 62 | 80 | 110 |
- Oil flow | \( Q \) [l/min] | 61 | 65 | 77 |
- Output speed | \( n \) [min⁻¹] | 3 | 3 | 3 |
- Maximum achievable torque | \( M_{\text{M}} \) [Nm] | 4010 | 6284 | 6284 |

**Size 0220**

**Mounting holes**

- Y = 24 Holes M16-24 deep, equally spaced
- Z = 22 Holes ø17-10 deep / M16-25 deep, equally spaced

**Lubrication ports**

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

**Limiting load diagram for “compressive” load**

**Drawing reference number WD-H 0220/3-00022**

<table>
<thead>
<tr>
<th>Module</th>
<th>( \text{mm} )</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of starts of the worm</td>
<td>[-]</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Gear ratio</td>
<td>( i )</td>
<td>70</td>
<td>56</td>
<td>28</td>
</tr>
<tr>
<td>Self-locking gears**</td>
<td>ja</td>
<td>nein</td>
<td>nein</td>
<td></td>
</tr>
<tr>
<td>Maximum torque ( M_{\text{Max}} ) [Nm]</td>
<td>8541</td>
<td>11093</td>
<td>11093</td>
<td></td>
</tr>
<tr>
<td>Static load rating, radial</td>
<td>( C_{\text{rad}} ) [kN]</td>
<td>615</td>
<td>616</td>
<td>616</td>
</tr>
<tr>
<td>Dynamic load rating, radial</td>
<td>( C_{\text{rad}} ) [kN]</td>
<td>193</td>
<td>193</td>
<td>193</td>
</tr>
<tr>
<td>Weight, incl. 11 kg for hydraulic motor H-293</td>
<td>[kg]</td>
<td>89</td>
<td>89</td>
<td>89</td>
</tr>
</tbody>
</table>

*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-293

- Pressure differential | \( \Delta p \) [bar] | 105 | 145 | 230 |
- Oil flow | \( Q \) [l/min] | 45 | 38 | 22 |
- Output speed | \( n \) [min⁻¹] | 3 | 3 | 3 |
- Maximum achievable torque | \( M_{\text{M}} \) [Nm] | 8541 | 11093 | 11093 |
Size 0300 / single drive

Mounting holes
Y = 24 Holes M16-30 deep, equally spaced
Ø = 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

Size 0300 / twin drive

Mounting holes
Y = 24 Holes M16-30 deep, equally spaced
Ø = 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
**WD-H Series**

### Size 0373 / single drive

<table>
<thead>
<tr>
<th>Drawing reference number</th>
<th>WD-H 0373/3-00067</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mod. m</td>
<td>[mm]</td>
</tr>
<tr>
<td>Number of starts of the worm</td>
<td>[-]</td>
</tr>
<tr>
<td>Gear ratio</td>
<td>[-]</td>
</tr>
<tr>
<td>Self-locking gears**</td>
<td>[-]</td>
</tr>
<tr>
<td>Maximum torque ( m \times n \times \text{rpm} )</td>
<td>( M_{\text{peak}} ) [Nm]</td>
</tr>
<tr>
<td>Non. torque ( m \times n \times \text{rpm} )</td>
<td>( M_{\text{peak}} ) [Nm]</td>
</tr>
<tr>
<td>Maximum holding torque*</td>
<td>( M_h ) [Nm]</td>
</tr>
<tr>
<td>Static load rating, radial ( C_{\text{rad}} ) [kN]</td>
<td></td>
</tr>
<tr>
<td>Static load rating, axial ( C_{\text{ax}} ) [kN]</td>
<td></td>
</tr>
<tr>
<td>Dynamic load rating, radial ( C_{\text{rad}} ) [kN]</td>
<td></td>
</tr>
<tr>
<td>Dynamic load rating, axial ( C_{\text{ax}} ) [kN]</td>
<td></td>
</tr>
<tr>
<td>Weight, incl. 25 kg for hydraulic motor DT930 [kg]</td>
<td></td>
</tr>
</tbody>
</table>

*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 DT930

### Size 0373 / twin drive

<table>
<thead>
<tr>
<th>Drawing reference number</th>
<th>WD-H 0373/3-00028</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mod. m</td>
<td>[mm]</td>
</tr>
<tr>
<td>Number of starts of the worm</td>
<td>[-]</td>
</tr>
<tr>
<td>Gear ratio</td>
<td>[-]</td>
</tr>
<tr>
<td>Self-locking gears**</td>
<td>[-]</td>
</tr>
<tr>
<td>Maximum torque ( m \times n \times \text{rpm} )</td>
<td>( M_{\text{peak}} ) [Nm]</td>
</tr>
<tr>
<td>Non. torque ( m \times n \times \text{rpm} )</td>
<td>( M_{\text{peak}} ) [Nm]</td>
</tr>
<tr>
<td>Maximum holding torque*</td>
<td>( M_h ) [Nm]</td>
</tr>
<tr>
<td>Static load rating, radial ( C_{\text{rad}} ) [kN]</td>
<td></td>
</tr>
<tr>
<td>Static load rating, axial ( C_{\text{ax}} ) [kN]</td>
<td></td>
</tr>
<tr>
<td>Dynamic load rating, radial ( C_{\text{rad}} ) [kN]</td>
<td></td>
</tr>
<tr>
<td>Dynamic load rating, axial ( C_{\text{ax}} ) [kN]</td>
<td></td>
</tr>
<tr>
<td>Weight, incl. 50 kg for 2 hydraulic motors DT930 [kg]</td>
<td></td>
</tr>
</tbody>
</table>

*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 DT930

---

**Mounting holes**
- 32 Holes M20-30 deep, equally spaced
- 30 Holes ø22-22 deep / M20-36 deep, equally spaced

**Lubrication ports**
- 3 Taper type grease nipples on the outside of the housing on the left side
- 1 Taper type grease nipple on the outside of the housing on the right side

**Slew Drive supplied pre-lubricated**

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**Limiting load diagram for “compressive” load**

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**Equivalent tilting moment [kNm]**

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**Equivalent axial load [kN]**

---

**Raceway curve**

---

**Bolt curve**

---

**R p0.2**

---

**Raceway cone**

---

**Bolt curve**

---

**R p0.2**

---

**Bolt quality class 10.9**

---

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

---

**If in doubt, please contact IMO!**
Size 0490 / single drive

 WD-H Series

Mounting holes
Y = 36 Holes M20-30 deep, equally spaced
Z = 36 Holes M22-22 deep / M20-36 deep, equally spaced

Lubrication ports
1. Taper type grease nipple on the outside of the housing on the right side
2. Taper type grease nipples on the outside of the housing on the left side
3. Slow Drive supplied pre-lubricated

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

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

Mounting holes
= 36 Holes ø22-22 deep, equally spaced

Drawing reference number WD-H 0490/3-00025

Drawing reference number WD-H 0490/3-00024

Limiting load diagram for “compressive” load

Size 0490 / twin drive

Mounting holes
Y = 36 Holes M20-30 deep, equally spaced
Z = 36 Holes M22-22 deep / M20-36 deep, equally spaced

Lubrication ports
1. Taper type grease nipple on the outside of the housing on the right side
2. Taper type grease nipples on the outside of the housing on the left side
3. Slow Drive supplied pre-lubricated

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

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

Mounting holes
= 36 Holes M20-30 deep, equally spaced

Drawing reference number WD-H 0490/3-00005

Drawing reference number WD-H 0490/3-00018

Limiting load diagram for “compressive” load

---

If in doubt, please contact IMO!
If in doubt, please contact IMO!

### Size 0645 / single drive

- **Mounting holes**:
  - Y = 48 Holes M20-30 deep, equally spaced
  - Z = 48 Holes d2.2-22 deep / M20-36 deep, equally spaced

- **Lubrication ports**:
  - 1 Taper type grease nipple on the outside of the housing on the right side
  - 1 Taper type grease nipple on the outside of the housing on the left side

- **Slew Drive** supplied pre-lubricated

### Size 0645 / twin drive

- **Mounting holes**:
  - Y = 48 Holes M20-30 deep, equally spaced
  - Z = 48 Holes d2.2-22 deep / M20-36 deep, equally spaced

- **Lubrication ports**:
  - 1 Taper type grease nipple on the outside of the housing on the right side
  - 1 Taper type grease nipple on the outside of the housing on the left side

- **Slew Drive** supplied pre-lubricated

---

#### Limiting load diagram for “compressive” load

- **Raceway curve**: Bolt curve
- **Bolt quality class**: 10.9

---

#### 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**:
  - [ ]

- **Maximum torque**:
  - \( M_{\text{max}} \) [Nm] 63220 76710

- **Non. torque**:
  - \( M_{\text{nom}} \) [Nm] 63220 76710

- **Maximum holding torque**:
  - \( M_{\text{h}} \) [Nm] 63220 76710

- **Static load rating, axial**:
  - \( C_{\text{ax}} \) [kN] 3528 3528

- **Static load rating, radial**:
  - \( C_{\text{rad}} \) [kN] 7199 7199

- **Dynamic load rating, axial**:
  - \( C_{\text{ax}} \) [kN] 570 570

- **Dynamic load rating, radial**:
  - \( C_{\text{rad}} \) [kN] 803 803

- **Weight, incl. 2 hydraulic motors DT930 [kg]**: 430 460

---

#### 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**:
  - [ ]

- **Maximum torque**:
  - \( M_{\text{max}} \) [Nm] 63220 76710

- **Non. torque**:
  - \( M_{\text{nom}} \) [Nm] 63220 76710

- **Maximum holding torque**:
  - \( M_{\text{h}} \) [Nm] 63220 76710

- **Static load rating, axial**:
  - \( C_{\text{ax}} \) [kN] 3528 3528

- **Static load rating, radial**:
  - \( C_{\text{rad}} \) [kN] 7199 7199

- **Dynamic load rating, axial**:
  - \( C_{\text{ax}} \) [kN] 570 570

- **Dynamic load rating, radial**:
  - \( C_{\text{rad}} \) [kN] 803 803

- **Weight, incl. 2 hydraulic motors DT930 [kg]**: 430 460

---

#### Drawing reference number WD-H 0645/3-00001

- **Module**: m [mm] 7 8
- **Number of starts of the worm**: [-] 2 1
- **Gear ratio**: i [-] 51 90
- **Self-locking gears**:
  - [ ]

- **Maximum torque**:
  - \( M_{\text{max}} \) [Nm] 63220 76710

- **Non. torque**:
  - \( M_{\text{nom}} \) [Nm] 63220 76710

- **Maximum holding torque**:
  - \( M_{\text{h}} \) [Nm] 63220 76710

- **Static load rating, axial**:
  - \( C_{\text{ax}} \) [kN] 3528 3528

- **Static load rating, radial**:
  - \( C_{\text{rad}} \) [kN] 7199 7199

- **Dynamic load rating, axial**:
  - \( C_{\text{ax}} \) [kN] 570 570

- **Dynamic load rating, radial**:
  - \( C_{\text{rad}} \) [kN] 803 803

- **Weight, incl. 50 kg for 2 hydraulic motors DT930 [kg]**: 430 460

---

#### Drawing reference number WD-H 0645/3-00014

- **Module**: m [mm] 7 8
- **Number of starts of the worm**: [-] 2 1
- **Gear ratio**: i [-] 51 90
- **Self-locking gears**:
  - [ ]

- **Maximum torque**:
  - \( M_{\text{max}} \) [Nm] 63220 76710

- **Non. torque**:
  - \( M_{\text{nom}} \) [Nm] 63220 76710

- **Maximum holding torque**:
  - \( M_{\text{h}} \) [Nm] 63220 76710

- **Static load rating, axial**:
  - \( C_{\text{ax}} \) [kN] 3528 3528

- **Static load rating, radial**:
  - \( C_{\text{rad}} \) [kN] 7199 7199

- **Dynamic load rating, axial**:
  - \( C_{\text{ax}} \) [kN] 570 570

- **Dynamic load rating, radial**:
  - \( C_{\text{rad}} \) [kN] 803 803

- **Weight, incl. 50 kg for 2 hydraulic motors DT930 [kg]**: 430 460

---

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: \( n = 5.0 \text{ rpm} \)
- Repeated load
- Ambient temperature of 20°C

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

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

\[ M_{d_B} \leq M_{d_{\text{nom}}} \]

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):

\[ M_{d_B} > M_{d_{\text{nom}}} \]

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

\[ G_{w} \geq B_{\text{p}} \times M_{d_{\text{nom}}} \]

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

\[ G_{w} : \text{Limit value from diagram [h]} \]
\[ B_{\text{p}} : \text{Operation time [h]} \]
\[ M_{d_{\text{nom}}} : \text{Duty [%]} \]

Verification of the pitting and wear safety of tooth flanks must be done by the IMO Engineering Department!
**SP-I Series**

**Size 0229**

Note, mounting face against upper surface shall be ø229, minimum.

**Mounting holes**
- Y = 12 holes M16-24 deep, equally spaced
- Z = 10 holes ø14, 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

**Size 0311**

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

**Mounting holes**
- Y = 20 holes M12-20 deep, equally spaced
- Z = 24 holes ø14, 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

---

**If in doubt, please contact IMO!**
**Size 0411**

- **Mounting holes**: Y = 20 Holes M12-20 deep, equally spaced
  Z = 24 Holes ø14, equally spaced
- **Lubrication ports**: 4 Taper type grease nipples on the internal diameter
  2 Taper type grease nipples on the outside of the housing

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

| Module | m (mm) | 4 |
| Number of teeth, wheel | z2 | 124 |
| Number of teeth, pinion | z1 | 15 |
| Overall gear ratio | i | 8.21 |
| Maximum torque | Mmax (Nm) | 4712 |
| Nom. torque | Mnom (Nm) | 3348 |
| Maximum holding torque | Mh (Nm) | 4712 |
| Static load rating, radial | Cbr (kN) | 275 |
| Static load rating, axial | Cax (kN) | 736 |
| Dynamic load rating, radial | Cdr (kN) | 190 |
| Dynamic load rating, axial | Cad (kN) | 222 |
| Weight, incl. 12 kg for hydraulic motor RE300 | [kg] | 62 |

*Optional with brake

If in doubt, please contact IMO!

---

**Size 0541**

- **Mounting holes**: Y = 20 Holes M12-20 deep, equally spaced
  Z = 32 Holes ø14, equally spaced
- **Lubrication ports**: 4 Taper type grease nipples on the internal diameter
  2 Taper type grease nipples on the outside of the housing

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

| Module | m (mm) | 4 |
| Number of teeth, wheel | z2 | 156 |
| Number of teeth, pinion | z1 | 15 |
| Overall gear ratio | i | 10.4 |
| Maximum torque | Mmax (Nm) | 5028 |
| Nom. torque | Mnom (Nm) | 4240 |
| Maximum holding torque | Mh (Nm) | 5028 |
| Static load rating, radial | Cbr (kN) | 362 |
| Static load rating, axial | Cax (kN) | 970 |
| Dynamic load rating, radial | Cdr (kN) | 212 |
| Dynamic load rating, axial | Cad (kN) | 248 |
| Weight, incl. 12 kg for hydraulic motor RE300 | [kg] | 75 |

*Optional with brake

If in doubt, please contact IMO!
SP-I Series

Size 0641

Mounting holes
- Y = 32 holes M12-20 deep, equally spaced
- Z = 36 holes ø14, 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 ø641, minimum

Size 0741

Mounting holes
- Y = 36 holes M12-20 deep, equally spaced
- Z = 40 holes ø14, 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 ø741, minimum

If in doubt, please contact IMO!
SP-I Series

**Size 0841**

![Diagram of Size 0841](attachment:image1)

Mounting holes
- Υ = 36 holes M12-20 deep, equally spaced
- Ζ = 40 holes ø14, 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

**Size 0941**

![Diagram of Size 0941](attachment:image2)

Mounting holes
- Υ = 40 holes M12-20 deep, equally spaced
- Ζ = 44 holes ø14, 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-I 0841/2-10086**

<table>
<thead>
<tr>
<th>Module</th>
<th>m (mm)</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of teeth, wheel</td>
<td>z₂</td>
<td>231</td>
</tr>
<tr>
<td>Number of teeth, pinion</td>
<td>z₁</td>
<td>15</td>
</tr>
<tr>
<td>Overall gear ratio</td>
<td>i</td>
<td>15.4</td>
</tr>
<tr>
<td>Maximum torque M₁ = i × 15</td>
<td>Mₐₐₓ [Nm]</td>
<td>8778</td>
</tr>
<tr>
<td>Nom. torque M₀ = i × 14.5</td>
<td>M₀ [Nm]</td>
<td>6329</td>
</tr>
<tr>
<td>Maximum holding torque*</td>
<td>Mₕ [Nm]</td>
<td>8778</td>
</tr>
<tr>
<td>Static load rating, radial</td>
<td>C₀ [kN]</td>
<td>563</td>
</tr>
<tr>
<td>Static load rating, axial</td>
<td>Cₐ [kN]</td>
<td>1508</td>
</tr>
<tr>
<td>Dynamic load rating, radial</td>
<td>Cₐ [kN]</td>
<td>250</td>
</tr>
<tr>
<td>Dynamic load rating, axial</td>
<td>Cₐ [kN]</td>
<td>293</td>
</tr>
<tr>
<td>Weight, incl. 12 kg for hydraulic motor RE300</td>
<td>[kg]</td>
<td>106</td>
</tr>
</tbody>
</table>

*Optional with brake

---

**Drawing reference number SP-I 0941/2-10087**

<table>
<thead>
<tr>
<th>Module</th>
<th>m (mm)</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of teeth, wheel</td>
<td>z₂</td>
<td>256</td>
</tr>
<tr>
<td>Number of teeth, pinion</td>
<td>z₁</td>
<td>15</td>
</tr>
<tr>
<td>Overall gear ratio</td>
<td>i</td>
<td>17.07</td>
</tr>
<tr>
<td>Maximum torque M₁ = i × 15</td>
<td>Mₐₐₓ [Nm]</td>
<td>9728</td>
</tr>
<tr>
<td>Nom. torque M₀ = i × 14.5</td>
<td>M₀ [Nm]</td>
<td>7040</td>
</tr>
<tr>
<td>Maximum holding torque*</td>
<td>Mₕ [Nm]</td>
<td>9728</td>
</tr>
<tr>
<td>Static load rating, radial</td>
<td>C₀ [kN]</td>
<td>630</td>
</tr>
<tr>
<td>Static load rating, axial</td>
<td>Cₐ [kN]</td>
<td>1688</td>
</tr>
<tr>
<td>Dynamic load rating, radial</td>
<td>Cₐ [kN]</td>
<td>250</td>
</tr>
<tr>
<td>Dynamic load rating, axial</td>
<td>Cₐ [kN]</td>
<td>305</td>
</tr>
<tr>
<td>Weight, incl. 12 kg for hydraulic motor RE300</td>
<td>[kg]</td>
<td>116</td>
</tr>
</tbody>
</table>

*Optional with brake

---

If in doubt, please contact IMO!
Size 1091

Mounting holes
Y = 44 Holes M12-20 deep, equally spaced
Z = 48 Holes ø14, equally spaced

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

Note, mounting face against upper surface shall be ø1091, minimum

Drawing reference number SP-I 1091/2-10088

<table>
<thead>
<tr>
<th>Module</th>
<th>m (mm)</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of teeth, wheel</td>
<td>z2</td>
<td>-</td>
</tr>
<tr>
<td>Number of teeth, pinion</td>
<td>z1</td>
<td>-</td>
</tr>
<tr>
<td>Overall gear ratio</td>
<td>i</td>
<td>-</td>
</tr>
<tr>
<td>Maximum torque</td>
<td>Mmax (Nm)</td>
<td>1117.2</td>
</tr>
<tr>
<td>Nom. torque</td>
<td>Mnom (Nm)</td>
<td>830.5</td>
</tr>
<tr>
<td>Maximum holding torque*</td>
<td>Ms</td>
<td>(Nm)</td>
</tr>
<tr>
<td>Static load rating, radial</td>
<td>Crad</td>
<td>(kN)</td>
</tr>
<tr>
<td>Static load rating, axial</td>
<td>Car</td>
<td>(kN)</td>
</tr>
<tr>
<td>Dynamic load rating, radial</td>
<td>Crd</td>
<td>(kN)</td>
</tr>
<tr>
<td>Dynamic load rating, axial</td>
<td>Car</td>
<td>(kN)</td>
</tr>
<tr>
<td>Weight, incl. 12 kg for hydraulic motor RE300</td>
<td>(kg)</td>
<td>132</td>
</tr>
</tbody>
</table>

*Optional with brake

The selection of the hydraulic / electric motor depends on actual customer requirements and specifications. Selection example: performance data with hydraulic motor RE300

| Number of teeth, wheel | z2 | - | 294 |
| Number of teeth, pinion | z1 | - | 15 |
| Overall gear ratio | i | - | 19.6 |
| Maximum torque | Mmax (Nm) | 1117.2 |
| Nom. torque | Mnom (Nm) | 830.5 |
| Maximum holding torque* | Ms | (Nm) | 1117.2 |
| Static load rating, radial | Crad | (kN) | 731 |
| Static load rating, axial | Car | (kN) | 1957 |
| Dynamic load rating, radial | Crd | (kN) | 375 |
| Dynamic load rating, axial | Car | (kN) | 321 |
| Weight, incl. 12 kg for hydraulic motor RE300 | (kg) | 132 |

*Optional with brake

Pressure differential | dp (bar) | 150 |

Oil flow | Q (l/min) | 25 |

Output speed | n (min⁻¹) | 5 |

Maximum achievable torque | Mmax (Nm) | 1117.2 |

Equivalent tilting moment [kNm]

Limiting load diagram for “compressive” load

If in doubt, please contact IMO!
Series Overview

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

Limiting load diagrams of individual sizes for "compressive" load

Verifying tooth base fatigue strength:

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

$M_d$: Operation torque [Nm]

$M_{d\text{,nom}}$: Nominal torque [Nm] for $S_F = 1$ 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:

$$M_d \leq M_{d\text{,nom}}$$

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

$$G_w \geq B_n \cdot ED_{179}$$

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]

$B_n$: Operation time [h]

$ED_{179}$: Duty [%]

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 ø14, 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 ø308, minimum

![Diagram of Size 0311](image)

### Size 0411

**Mounting holes**
- \( Y = 20 \) Holes M12-20 deep, equally spaced
- \( Z = 24 \) Holes ø14, 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 ø405, minimum

![Diagram of Size 0411](image)
### Size 0541

**Mounting holes**
- Y = 20 Holes M12-20 deep, equally spaced
- Z = 32 Holes ø14, 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 ø537, minimum

---

### Size 0641

**Mounting holes**
- Y = 32 Holes M12-20 deep, equally spaced
- Z = 36 Holes ø14, 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
SP-M Series

### Size 0741

- **Mounting holes:**
  - Y = 36 Holes M12-20 deep, equally spaced
  - Z = 40 Holes ø14, 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 ø739, minimum.

### Size 0841

- **Mounting holes:**
  - Y = 36 Holes M12-20 deep, equally spaced
  - Z = 40 Holes ø14, 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 ø841, minimum.

---

**Drawing reference number SP-M 0741/2-05894**

- **Module:** m [mm] 6
- **Number of teeth, wheel:** zi [-] 138
- **Number of teeth, pinion:** zi [-] 15
- **Overall gear ratio:** i [-] 9.19
- **Maximum torque:** Mmax [Nm] 17700
- **Nom. torque:** Tn [Nm] 17494
- **Maximum holding torque:** Th [Nm] 17700
- **Static load rating, radial:** Cre [kN] 456
- **Static load rating, axial:** Cae [kN] 1066
- **Dynamic load rating, radial:** Cdr [kN] 194
- **Dynamic load rating, axial:** Cad [kN] 195
- **Weight, incl. 10 kg for hydraulic motor 2-200:** [kg] 140

*Optional with brake*

---

**Drawing reference number SP-M 0841/2-05895**

- **Module:** m [mm] 6
- **Number of teeth, wheel:** zi [-] 156
- **Number of teeth, pinion:** zi [-] 15
- **Overall gear ratio:** i [-] 10.19
- **Maximum torque:** Mmax [Nm] 20077
- **Nom. torque:** Tn [Nm] 19594
- **Maximum holding torque:** Th [Nm] 20077
- **Static load rating, radial:** Cre [kN] 518
- **Static load rating, axial:** Cae [kN] 1210
- **Dynamic load rating, radial:** Cdr [kN] 204
- **Dynamic load rating, axial:** Cad [kN] 206
- **Weight, incl. 10 kg for hydraulic motor 2-200:** [kg] 155

*Optional with brake*

---

If in doubt, please contact IMO!
**SP-M Series**

### Size 0941

- **Mounting holes**
  - 40 Holes M12-20, deep, equally spaced
  - 44 Holes ø14, equally spaced

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

### Size 1091

- **Mounting holes**
  - 44 Holes M12-20, deep, equally spaced
  - 48 Holes ø14, equally spaced

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

---

**Drawing reference number SP-M 0941/2-05896**

- **Modulo**
  - m (mm): 6

- **Number of teeth, wheel**
  - z2: 172

- **Number of teeth, pinion**
  - z1: 88

- **Overall gear ratio**
  - i: 1.98

- **Maximum torque**
  - M_m = 960 Nm

- **Nominal torque for i = 1 + 5 rpm**
  - M_m = 960 Nm

- **Maximum holding torque**
  - M_h = 211 Nm

- **Static load rating, radial**
  - C_R = 579 kN

- **Static load rating, axial**
  - C_A = 1354 kN

- **Dynamic load rating, radial**
  - C_R = 212 kN

- **Dynamic load rating, axial**
  - C_A = 214 kN

- **Weight, incl. 10 kg for hydraulic motor 2-200**
  - M_s = 170 kg

*Optional with brake

---

**Drawing reference number SP-M 1091/2-05887**

- **Modulo**
  - m (mm): 6

- **Number of teeth, wheel**
  - z2: 198

- **Number of teeth, pinion**
  - z1: 88

- **Overall gear ratio**
  - i: 2.26

- **Maximum torque**
  - M_m = 180 Nm

- **Nominal torque for i = 1 + 5 rpm**
  - M_m = 180 Nm

- **Maximum holding torque**
  - M_h = 420 Nm

- **Static load rating, radial**
  - C_R = 672 kN

- **Static load rating, axial**
  - C_A = 1570 kN

- **Dynamic load rating, radial**
  - C_R = 224 kN

- **Dynamic load rating, axial**
  - C_A = 226 kN

- **Weight, incl. 10 kg for hydraulic motor 2-200**
  - M_s = 200 kg

*Optional with brake

---

If in doubt, please contact IMO!
Series Overview

Maximum torque $M_d \text{ max}$ of individual sizes

Verifying tooth base fatigue strength:

Valid for the following conditions:
- Output speed: $n = 3.0 \text{ rpm}$
- Repeated load
- Ambient temperature of $20^\circ C$

$M_d \text{ max}$: Operation torque [Nm]

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

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

$$M_d \text{ B} \leq M_d \text{ nom}$$

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):

$$G_w \geq B_u \cdot \frac{EDS}{100}$$

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

Gw: Limit value from diagram [h]

$B_u$: Operation time [h]

EDS: Duty [%]

Verification of the pitting and wear safety of tooth flanks must be done by the IMO Engineering Department!
**SP-H Series**

### Size 0455

- **Mounting holes**
  - \( Y = 18 \) Holes M20-40 deep, equally spaced
  - \( Z = 18 \) 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

### Size 0555

- **Mounting holes**
  - \( Y = 20 \) Holes M20-40 deep, equally spaced
  - \( Z = 20 \) 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

---

**Drawing reference number SP-H 0455/2-05910**

- **Module** \( m \) [mm]: 8
- **Number of teeth, wheel** \( z_2 \) [-]: 72
- **Number of teeth, pinion** \( z_1 \) [-]: 15
- **Overall gear ration** \( i \) [-]: 102.54
- **Maximum torque** \( M_{max} \) [Nm]: 32670
- **Nom. torque \( x = 1 \) at \( \pm \) 2 [Nm]: 21550
- **Maximum holding torque** \( M_h \) [Nm]: 27673
- **Static load rating, radial** \( C_{rad} \) [kN]: 1628
- **Static load rating, axial** \( C_{ax} \) [kN]: 372
- **Dynamic load rating, radial** \( C_{rad} \) [kN]: 267
- **Dynamic load rating, axial** \( C_{ax} \) [kN]: 312
- **Weight incl. 10 kg for hydraulic motor 2-132** [kg]: 215

*Optional with brake

---

**Limiting load diagram for “compressive” load**

---

**Drawing reference number SP-H 0555/2-05911**

- **Module** \( m \) [mm]: 8
- **Number of teeth, wheel** \( z_2 \) [-]: 85
- **Number of teeth, pinion** \( z_1 \) [-]: 15
- **Overall gear ration** \( i \) [-]: 102.54
- **Maximum torque** \( M_{max} \) [Nm]: 32670
- **Nom. torque \( x = 1 \) at \( \pm \) 2 [Nm]: 21550
- **Maximum holding torque** \( M_h \) [Nm]: 27673
- **Static load rating, radial** \( C_{rad} \) [kN]: 1628
- **Static load rating, axial** \( C_{ax} \) [kN]: 372
- **Dynamic load rating, radial** \( C_{rad} \) [kN]: 267
- **Dynamic load rating, axial** \( C_{ax} \) [kN]: 312
- **Weight incl. 10 kg for hydraulic motor 2-132** [kg]: 215

*Optional with brake

---

**Limiting load diagram for “compressive” load**

---

**If in doubt, please contact IMO!**
**SP-H Series**

**Size 0655**

- **Mounting holes**: 24 holes M20-40 deep, equally spaced
- **Mounting face against upper surface**: ø655, minimum
- **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

**Size 0755**

- **Mounting holes**: 24 holes M20-40 deep, equally spaced
- **Mounting face against upper surface**: ø755, minimum
- **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

*If in doubt, please contact IMO!*

---

**Limiting load diagram for “compressive” load**

- **Module**
  - \( m \) [mm]: 8
  - \( z_2 \) [-]: 58
  - \( z_1 \) [-]: 15
  - \( i \) [-]: 119.26
  - \( M_{\text{max}} \) [Nm]: 37667
  - \( M_{\text{nom}} \) [Nm]: 25048
  - \( M_{\text{h}} \) [Nm]: 301
  - \( C_{\text{rad}} \) [kN]: 770
  - \( C_{\text{ax}} \) [kN]: 2561
  - \( C_{\text{h}} \) [kN]: 331
  - Weight, incl. 10 kg for hydraulic motor 2-132 [kg]: 245

*Optional with brake*

---

**Limiting load diagram for “compressive” load**

- **Module**
  - \( m \) [mm]: 8
  - \( z_2 \) [-]: 110
  - \( z_1 \) [-]: 15
  - \( i \) [-]: 132.73
  - \( M_{\text{max}} \) [Nm]: 42279
  - \( M_{\text{nom}} \) [Nm]: 28204
  - \( M_{\text{h}} \) [Nm]: 132
  - \( C_{\text{rad}} \) [kN]: 888
  - \( C_{\text{ax}} \) [kN]: 2376
  - \( C_{\text{h}} \) [kN]: 349
  - Weight, incl. 10 kg for hydraulic motor 2-132 [kg]: 265

*Optional with brake*
Size 0855

Mounting holes
Y = 20 Holes 020-40 deep, equally spaced
Z = 20 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 ø855, minimum.

Size 0955

Mounting holes
Y = 30 Holes 020-40 deep, equally spaced
Z = 30 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 ø955, minimum.

If in doubt, please contact IMO!

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

Selection example: performance data with hydraulic motor 2-132

<table>
<thead>
<tr>
<th>Module</th>
<th>Number of teeth, wheel</th>
<th>Number of teeth, pinion</th>
<th>Overall gear ratio</th>
<th>Maximum torque</th>
<th>Nom. torque ( M_{\text{nom}} ) [Nm]</th>
<th>Maximum holding torque* ( M_h ) [Nm]</th>
<th>Static load rating, radial ( C_{rad} ) [kN]</th>
<th>Static load rating, axial ( C_{ax} ) [kN]</th>
<th>Dynamic load rating, radial ( C_{rad} ) [kN]</th>
<th>Dynamic load rating, axial ( C_{ax} ) [kN]</th>
<th>Weight, incl. 10 kg for hydraulic motor 2-132 [kg]</th>
<th>Pressure differential ( p ) [bar]</th>
<th>Oil flow ( Q ) [l/min]</th>
<th>Output speed ( n ) [min⁻¹]</th>
<th>Maximum achievable torque ( M_d ) [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( z_2 ) [( - )]</td>
<td>( z_1 ) [( - )]</td>
<td>( i ) [( - )]</td>
<td>( M_d ) max</td>
<td>( M_d ) nom</td>
<td>( M_h )</td>
<td>( C_{rad} ) [kN]</td>
<td>( C_{ax} ) [kN]</td>
<td>( C_{rad} ) [kN]</td>
<td>( C_{ax} ) [kN]</td>
<td>( M_d ) [Nm]</td>
<td>( p ) [bar]</td>
<td>( Q ) [l/min]</td>
<td>( n ) [min⁻¹]</td>
<td>( M_d ) [Nm]</td>
</tr>
<tr>
<td></td>
<td>122</td>
<td>15</td>
<td>161.69</td>
<td>51888</td>
<td>51888</td>
<td>36342</td>
<td>1123</td>
<td>3066</td>
<td>328</td>
<td>383</td>
<td>320</td>
<td>195</td>
<td>70</td>
<td>3</td>
<td>51888</td>
</tr>
</tbody>
</table>

*Optional with brake

Equivalent tilting moment [kNm]

Raceway curve
Bolt curve \( R_p \) 0.2
Bolt quality class 10.9

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

Limiting load diagram for "compressive" load

Drawing reference number SP-H 0855/2-05914

Drawing reference number SP-H 0955/2-05915

Limiting load diagram for "compressive" load

If in doubt, please contact IMO!
# Application Data Sheet - Slew Drives

Please fill in the form and send to:
IMO Antriebseinheit GmbH & Co. KG - Gewerbepark 16 - 91350 Gremsdorf, Germany - Fax: +49 9193 6395-2140

## 1. Contact

<table>
<thead>
<tr>
<th>Customer:</th>
<th>Company:</th>
<th>Contact person: Email:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Street: Tel.:</th>
<th>Email:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country: Fax:</th>
<th>ZIP code/city:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Company:**

**Contact person:**

**Email:**

**Street:**

**Tel.:**

**Country:**

**Fax:**

**ZIP code/city:**

---

## 2. Application

**Application description (sketch, if required):**

Does a solution already exist? **No** | **Yes**

If yes, which one:

Should limited sizes and interface dimensions be considered? **No** | **Yes**

If yes, what should be considered:

**Position of rotation axis:**

- Vertical
- Horizontal
- Changing to Degrees

**Load direction:**

- Compressive load
- Suspension load

**Operation/ambient temperature:**

- Minimum °C
- Normal °C
- Maximum °C

**Do shocks or vibrations occur?** **No** | **Yes**

**Self-locking/brake required?** **No** | **Yes**

**Special axis required?** **No** | **Yes**

---

## 3. Load

<table>
<thead>
<tr>
<th>Load case nr.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real load</td>
<td>$F_{xa}$ N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Roller load</td>
<td>$F_{rg}$ N</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tilting moment</td>
<td>$M_{a}$ Nm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating torque</td>
<td>$T_{oa}$ Nm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holding torque</td>
<td>$T_{oh}$ Nm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional accelerating torque</td>
<td>$T_{ax}$ Nm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating speed</td>
<td>$n_{pm}$ rpm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slewing angle</td>
<td>$\delta$, Grad</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration of load case (Total=100%)</td>
<td>%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. slewing time per minute</td>
<td>$\delta_{pm}$, %/min</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Are safety factors included in the load calculations a) to f)? **No** | **Yes**

Should additional load increasing factors be included in the load calculations a) to f)? **No** | **Yes**

Continuous operation **No** | **Yes**

Slewing direction **one direction only** | **alternating directions**

**Description of load case:**

Load case 1:

<table>
<thead>
<tr>
<th>Load case 2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load case 3:</td>
</tr>
<tr>
<td>Load case 4:</td>
</tr>
<tr>
<td>Load case 5:</td>
</tr>
<tr>
<td>Load case 6:</td>
</tr>
</tbody>
</table>

---

If in doubt, please contact IMO!
### Application Data Sheet - Slew Drives

#### 4. Drive concept

<table>
<thead>
<tr>
<th>with hydraulic motor</th>
<th>max. available pressure difference</th>
<th>bar</th>
<th>Q</th>
<th>l/min</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>max. available oil flow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>etc.</td>
<td>with electric motor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>rated voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>mains frequency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>etc.</td>
<td>without motor</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### 5. Additional customer requirements

Do additional customer requirements exist (e.g., standards and specifications, special approval criteria, inspection certificates, special packaging, quality assurance agreements) which have to be considered?  

- [ ] No  
- [ ] Yes

If yes, which:

- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]

#### 6. Commercial data

<table>
<thead>
<tr>
<th>Expected yearly usage</th>
<th>pieces per year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned call-off quantity (lot size)</td>
<td>pieces</td>
</tr>
<tr>
<td>Project duration</td>
<td>years</td>
</tr>
<tr>
<td>Required date for Slew Drive sample</td>
<td></td>
</tr>
<tr>
<td>Planned production start</td>
<td></td>
</tr>
<tr>
<td>Required offer date</td>
<td></td>
</tr>
<tr>
<td>Target price range Euro/piece</td>
<td>Euro/piece</td>
</tr>
</tbody>
</table>

#### 7. Further information

Further information for choosing the best design solution for the application  
(e.g., description of application and cycle, drawings, pictures etc.)

- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]

#### 8. Customer confirmation

Hereewith, we confirm that the data mentioned above can be used for the design and offer proposal.

Customer name/signature

---

If in doubt, please contact IMO!
For custom configurations, we also supply material certificates according to DIN EN 10204. 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).
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 DIN EN ISO 9001 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 Group of Companies

Plant I, Gremsdorf, Germany

Plant II, Gremsdorf, Germany

Plant III, Summerville, SC, USA

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