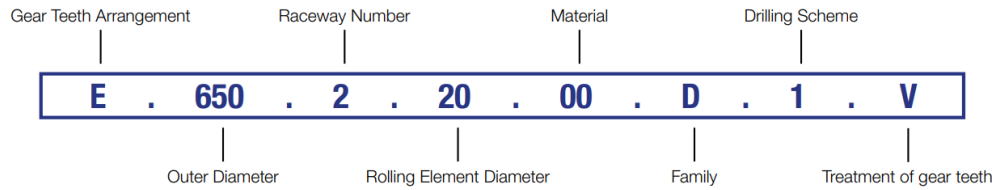




SLEWING RINGS

Installation and Maintenance Manual



**Gear Teeth Arrangement:**

SD = Without gear teeth
 E = External gear teeth
 I = Internal gear teeth

Raceway Number:

Shown when it's a double row slewing ring (2).

Material:

00 = C45 N
 10 = C45 N and 42CrMo4
 15 = 42CrMo4

Drilling Scheme:

Slewing rings have through holes or threaded holes for fixing screws.

Outer Diameter:

Shown in mm. Ranges from 200mm to 3500mm.

Rolling Elements:

Shown in mm.

Family:

A = Slewing ring with same diameter fixing holes in both inner and outer ring
 B = Standard version
 C = Light standard version
 D = Special version

Treatment of gear teeth:

V = gear hardened flank teeth
 W = gear hardened flank and bottom teeth

Warning

- The following text includes indications and procedures that must be considered during the installation and maintenance of the slewing rings.
- Read this manual carefully before carrying out any operation. Follow the instructions carefully to ensure the correct characteristics of our product.
- Qualified personnel Will oversee carrying out the maintenance, since each mentioned step is important.
- This manual must be kept near the slewing ring application and be available to personnel in case of doubt.
- The protection measures and the installation of all the equipment are the responsibility of the client.
- Please, for any question, contact our technical department at technical@tecmadrive.com
- The technical data of each slewing ring can be found in our catalogue.

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1. Transportation, handling and storage of stock

1.1. Transportation

TECMA DRIVE S.L. slewing drives are advisable to transport them only in a horizontal position and avoid any type of impact that they could receive. The slewing rings are protected with a double layer of plastic wrap, and they can be either palletized or placed inside a wooden box, in order to prevent rust and dust from entering.

1.2. Handling

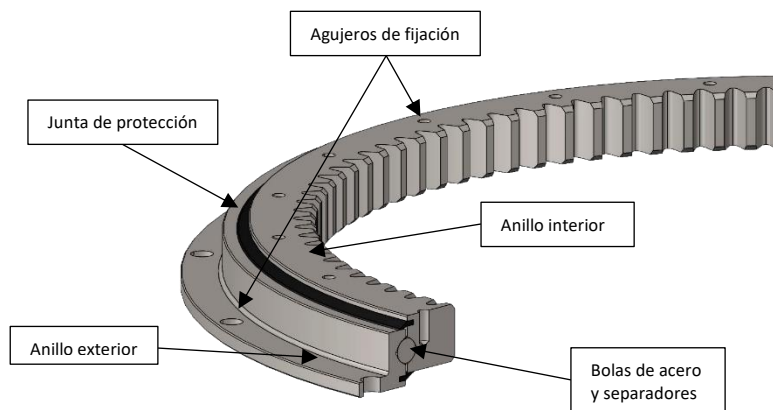
It is very important to handle the slewing rings carefully and use suitable PPE at all times (in this case, protective shoes). The slewing rings have threaded or through holes that facilitate safe handling by means of a lifting mechanism and fastened to screws.

1.3. Storage

The slewing rings stored are previously lubricated with a layer of oil and packed with two layers of plastic wrap (transparent and coloured), to protect them from any external agent that could damage the interior or exterior. Properly stored slewing rings can be kept for 12 months under proper conditions. Replace the lubricating Grease once every 18 months of the raceway and with the recommendation to change the protection every 12 months of the slewing rings stored.

2. Installation

TECMA DRIVE S.L. slewing rings have a compact structure and excellent performance, they can simultaneously withstand axial force, radial force and overturning moment, which are widely used in the industrial machinery industry, port machinery, metallurgical and environmental projects, among many others.



Label:

1. **Marking:** Locate don the outer ring or inner ring hole, indicating the slewing ring model, part number and manufacturer's name.
2. **Mark:**
 - The soft zone, marked with an "S", it will be found next to the slewing ring ball filling plug.
 - Green Paint marks the 3 most failing ring teeth where pinion flank clearance must be coordinated during the installation.

2.1. Previous checks

1. Check that the order received is consistent with the data in the purchase order.
2. Check that the slewing ring has not suffered any external damage caused by transport. Next, check the mobility of the bearing to see that the slewing ring rotates smoothly.
3. It is necessary to confirm that the slewing ring does not make any noise, if not, check that the lubrication is correct or that the flatness does not affect the assembly of the structure.
4. Check that the dimension and metric of the screws are correct.

2.2. Cleaning for set-up

1. Clean the support Surface of any external agent or dirt that could interfere with the contact.
2. Clean the external Surface of the slewing ring using a cold solvent that it will not damage the rubber seals.
3. **IMPORTANT!** Do not use a steam gun or pressure washer to clean the slewing ring.

2.3. Determination of the flatness deviation δp and the perpendicularity deviation δw of the mounting structure.

The contact surfaces of the slewing ring must meet certain specifications for deviations from flatness and perpendicularity.

The maximum flatness deviation value δp (waviness) around the circumference can only be reached once every 180°. The shape should resemble a sine curve that gradually rises and falls. The maximum deviation is calculated from the rolling diameter using the following formula:

$$\delta p = \frac{Dr + 500}{10.000}$$

The allowable perpendicular deviation δw (skew) it is based on the width of the flange and it must be measured in the cross direction. The maximum value that this value should reach is calculated using the following formula:

$$\delta w \leq 0.5 \times \delta p$$

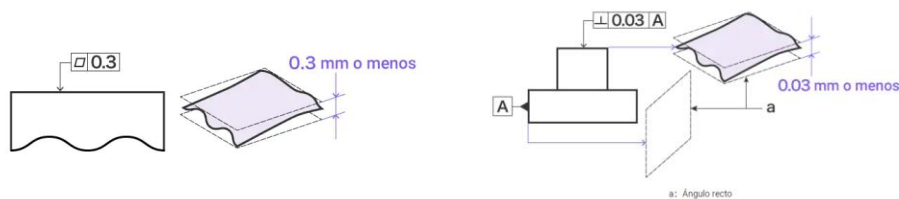


Image 1: Measurement of the deviation from flatness (left) and deviation from perpendicularity (right)

Raceway diameter (mm)	Allowable deviation of mounting surface flatness (mm)		
	Single row ball	Double row ball	Rollers
> 500	0.10	0.15	0.07
> 1000	0.15	0.20	0.10
> 1500	0.19	0.25	0.12
> 2000	0.22	0.30	0.15
> 2500	0.25	0.35	0.17
> 4000	0.30	0.40	0.20
> 6000	0.40	0.50	0.30

Table 1: Indicative table flatness of the slewing rings according to the type of ball

2.4. Lubricate the slewing ring or check the oil level

Slewing rings are supplied with a lightly lubricated raceway. It is recommended that the crowns be greased again before the first operation and subsequently lubricated adequately depending on the working conditions. Types of Grease suitable for standard working conditions are listed in the table below.

Company	Rolling	Tooth
BP	Energrease LS - EP2	Energrease LC 2
Mobilux	Mobilux EP2	Mobilgear OGL 461
SHELL	Alvania EPLF2	Malleus OGH
MOTUL/BECHEM	Rhus L 474/2	Berulit GA 400
ESSO	BEACON EP 2	Multi-Purpose Grease (Moly)
TOTAL FINA	Multis EP2 - Lical EP2	Ceran AD
ELF	Epexa 2 / Epexelf 2	Cardrexa DC1
CASTROL	Spheerol EPL 2	Castrol LMX
ARAL	Aralub HLP2	Aralub MKA-Z 1

Table 2: Table type of lubricants

Special attention must be paid to the grease used, as it must be compatible with the material of the gasket that seals the slewing ring to prevent its degradation.

Parts of the slewing ring that need lubrication	Serrated	Raceway
Amount of grease	Lightly cover all the teeth	10cc every 250mm rolling diameter

Table 3: Amount of Grease per part of the slewing ring

In case the slewing ring must withstand extreme loads and working conditions, or a shorter lubrication interval is required, optimal Grease can be used. The procedure used for lubrication is detailed in point 4.3.

2.5. Screws

The choice of the screws to fix our product is very important.

1. The size, number and quality of the screws marked by the manufacturer of the slewing ring must be used.
2. All holes in the slewing ring must be used to attach the slewing ring to the mounting structure.
3. The grip ratio must be met (thickness of the flange dividing the diameter of the screw). This value must be greater than 2 and less than 10.
4. The use of fully threaded screws is not recommended.
5. Correct operation of the slewing ring will affect the life and durability of the screw joint.
6. In the event the allowable surface pressure is exceeded, use washers of the proper size and strength.
7. Do not use screws, nuts and washers that have already been used, we also recommend replacing them after a while.
8. Retighten the bolts to the proper torque every 3 months.

Material	Max. Surface pressure in MPa
50Mn / C45N / 46Cr2N	420
42CrMo4 (Q+T)	700

Table 4: Table of admissible Surface pressures

2.6. Tightening torques

Under normal conditions, mounting bolts should be secured by proper preload. The use of split rings, Split washers, etc. is not permitted.

Screw specification (GB5782-86 GB5783-86)	Mounting holes diameter (mm)	Screw intensity grade (GB3098.1-82)		
		8.8	10.9	12.9
		Intensity limit of the screw material δ_{smin} (N/mm ²)		
		640	900	1080
		Tightening moment or torque μA (N·m)		
M10	11	44	62	75
M12	13.5	77.5	110	130
M14	15.5	120	170	210
M16	18	190	265	320
M18	20	260	365	435
M20	22	370	520	620
M22	24	500	700	840
M24	26	640	900	1080
M27	30	950	1350	1620
M30	33	1300	1800	2160
Strength $dFA(10^3N)$				
M33	36	293	421	495
M36	39	344	484	581
M39	42	414	581	698
M42	45	473	665	798
M45	48	553	777	932
M48	52	623	876	1050
M52	56	749	1054	1265
M56	62	863	1214	1457
M60	66	1008	1418	1621

MA=0.9Msp FA=0.9Fsp Mark: MA=0.9Msp (Clamp Torsion Available) FA=0.9Fsp (Clamp Force Available)

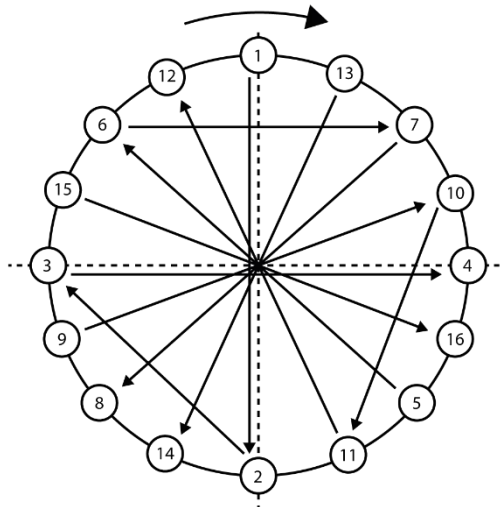
Table 5: Tightening torque for metric and imperial screws (non-lubricated thread)

2.7. Installation of the slewing ring

1. Delimit which will be the main loading area.
2. Use a feeler gauge to inspect the contact area between the slewing ring plane and the bracket installation surface, to check that they are fully in contact, if not, use shims to level to prevent the slewing ring from deforming after tightening the screws.
3. The soft zone is marked with an "S" and located next to the ball fill plug.
4. The slewing ring must be mounted without load.
5. Use a moment wrench during installation.
6. The screws fixed in the slewing ring must be used in their entirety, there can be no fastening points without screws. The screws must be tightened according to your design requirements.
7. If the slewing ring is exposed to unsuitable conditions, it is recommended to apply additional protection.

The procedure described below must be followed to avoid deviations between tightening forces of the screws.

1. It is recommended to apply thread locker to the screw thread (at least the last 3-5 threads) to ensure uniform friction resistance.
2. Preload the bolts including cross washers 3 steps: 30%, 80% and 100% of the tightening torque. The diagram below shows the order to follow when tightening the bolts.



3. Once the screw is tightened, make a mark on the Surface of the screw that continues to the Surface of the structure. This mark is useful when inspecting whether the screws have loosened.

3. Test run

Deviations in the mounting structure and the effect of unexpected loads can considerably affect the slewing ring, increasing its friction torque.

If the mounting bolts are tightened to the specified torque, then the slewing ring should rotate smoothly.

1. Repeatedly turn the assembled slewing ring.
2. Check that the slewing ring rotates smoothly and without noises.
3. Do another test with a full load.
4. After the test run, recheck the mounting screw tightening torques.

4. Maintenance

4.1. Checking the mounting screws

To avoid possible setting, it is necessary to retighten the bolts with the initially prescribed torque (This action Will be carried out after no tanner 100hours of operation and without external load applied to the bolt joint). It is recommended to inspect the bolts every year and adjust the tightening torque if necessary.

The frequency with which we will inspect the screws can be increased in case our bit is used for special operations or extreme environmental conditions. In case of loose screws, replace broken or worn screws, nuts and washers with new ones.

4.2. Lubrication maintenance

The most convenient lubricants to use as substitutes for the factory lubricant can be found in table 2, event so, the recommendations of each manufacturer on the handling oh the different lubricants must be considered.

Follow the procedure described below:

Raceway

1. Inject Grease into all the Grease nipples one by one while rotating the slewing ring until new drops of Grease appear on at least one of the lips of the joint.
2. Make sure the old Grease can Flow freely through the slewing ring.
3. It is recommended to rotate the slewing rings during greasing, following the appropriate precautions and accident prevention regulations.

Tooth

1. Remove excess old grease. Adhesive lubricants are considered very effective on gears exposed to the open air.
2. Apply grease to ring teeth with a clean brush. There is also the possibility of lubricating with a spry instead of using a brush or using a specific lubrication tool (greaser).

4.3. Lubrication intervals

Continuous lubrication is necessary to ensure the quality of the grease inside the gear. At TECMA DRIVE S.L. we recommend following our indications mentioned in the table below.

Working conditions	Lubrication intervals
Rotation speed <0.5rpm Non-extreme environmental conditions (Solar trackers)	Every 400 hours of operation or once every 12 months, whoever arrives first
Rotation speed >0.5rpm Non-extreme environmental conditions (Industrial applications, lifting platforms)	Every 200 hours of operation or once every 6 months, whoever arrives first
Extreme environmental conditions (Sea/desert/artic climate/dirty atmosphere) (Tunnel boring machines, steel mills)	Every 100 hours of operation or once every 3 months, whoever arrives first

Table 6: Lubrication intervals depending on working conditions

The specified values are valid for the following working conditions:

- Working temperature of the slewing ring $-30^{\circ}\text{C} < T < 80^{\circ}\text{C}$.
- Maximum circumferential speed of the slewing ring $< 4\text{m/s}$.
- Medium and low loads.

Table 6 can never replace the values established through experience. The most frequent cause of failure of a slewing ring is due to insufficient lubrication.

The slewing rings must be lubricated after each cleaning and after long periods of inactivity. Cranes and construction machinery during the Winter months would be clear examples.

The use of a stream gun or pressure washer to clean the slewing ring is not permitted.

5. Last indications

These instructions give you the necessary information to be able to correctly install and maintain a TECMA DRIVE S.L.

Please always check that you are working with the latest version of the manual.

These instructions must be sent to all new costumers. All work steps mentioned here must be carried out by qualified personnel.

Please, do not hesitate to contact our Technical Department for further information.

All information in this document has been rigorously tested and checked. However, we do not accept responsibility for omissions or errors.

TECMA DRIVE S.L. assumes no responsibility for:

1. Failure to follow installation and maintenance instructions.
2. Failures caused by passing the content to third parties.



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