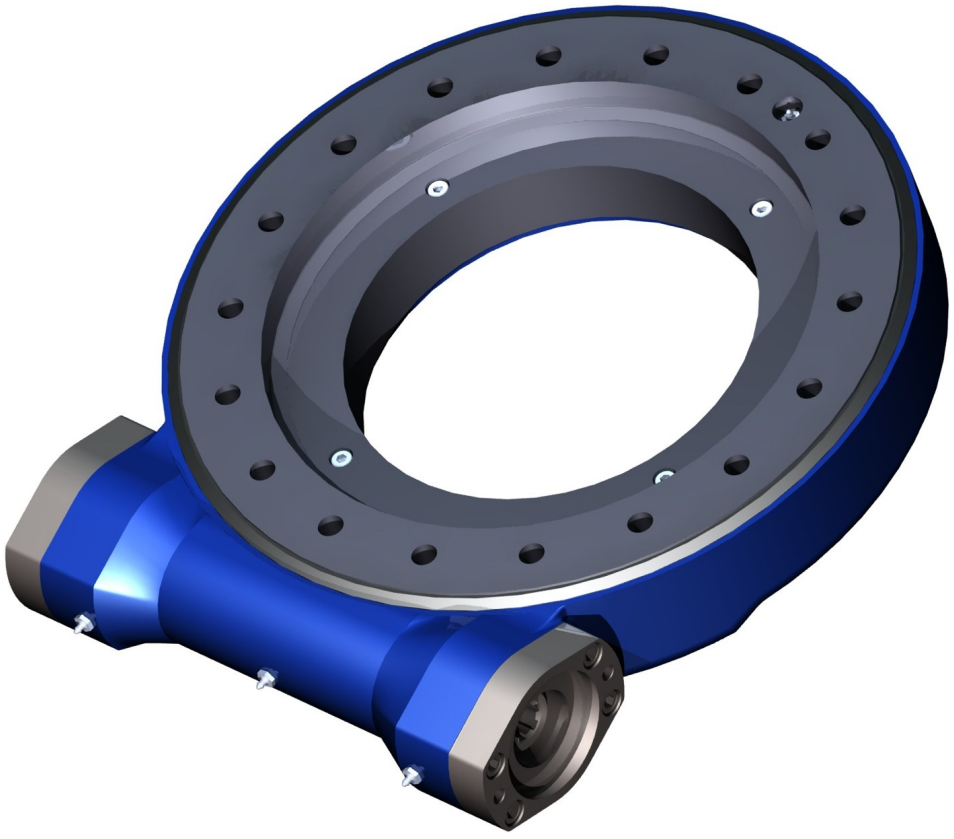
SLEWPRO
SLEWING BEARINGS

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P&C-SER-SPE-24-001 Rev C

FIELD GUIDE

Slewing Drive Installation and Maintenance

Handling, mounting, bolting, lubrication, motors and encoders, inspection, and what to do when a drive fails. A practical guide from the SlewPro engineering team.



Keep this guide with the machine.

Your drive drawing and the instructions supplied with it always take priority over this guide.

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The checklist

Tick each step as you go. The sections that follow explain why each one matters.

Before installation

- ☐ Drive kept in its packaging and its shipped position, in a dry room
- ☐ In storage more than five months? Corrosion protection renewed before use
- ☐ Unpacked without cutting or nicking the seals
- ☐ Lifted with eye bolts in the threaded holes of the rings, on rated gear
- ☐ Checked for damage and turned by hand
- ☐ Mounting surfaces machined, clean, free of weld spatter, galvanizing, burrs and paint
- ☐ Cleaned with a cold solvent that will not attack the seals; never steam or a pressure washer
- ☐ Mounting surface within the perpendicularity and flatness limits in section 2
- ☐ New fasteners of the grade, size and number on the drive drawing (Class 10.9 unless it says otherwise); hardened flat washers only
- ☐ Thread engagement 2 to 10 times the bolt diameter

Installation

- ☐ Drive mounted UNLOADED
- ☐ SHIPPING bolts removed; SHOULDER bolts left in place
- ☐ Thread lock applied; every mounting hole filled or sealed
- ☐ One ring at a time, crosswise: 30%, 50%, then 100% of the drawing torque
- ☐ Each bolt head marked against the structure at final torque
- ☐ Drive turned through its full travel: no tight spots

Before first use

- ☐ Every grease point charged (figure 4), turning the drive while greasing
- ☐ Oil and drain ports on a hydraulic motor left alone: they are not grease points
- ☐ Motor rotation confirmed under no load before the rated load is applied
- ☐ Paint damage from installation made good

In service

- ☐ Bolt torque rechecked within the first 100 operating hours, then once a year
- ☐ Relubrication on schedule with a grease from section 5, the right grade at each point
- ☐ Seals inspected at least once a year
- ☐ Noise, heat, torque change or metal in purged grease investigated, not greased over
- ☐ Idle equipment greased at least every six months
- ☐ Complete refill with new grease every three years

Your drawing takes priority. Where the drive drawing or the instructions supplied with the drive give a value - bolt grade, tightening torque, grease, relubrication interval - use theirs. Every SlewPro quote includes a 3D model and drawing, so the mounting dimensions, bolt pattern and grease points are in hand before the structure is built. All work in this guide is for suitably qualified personnel wearing appropriate protective equipment.

What is in a slewing drive

A slewing drive is a slewing bearing, a worm and a housing in one sealed unit. It carries axial, radial and tilting-moment load at the same time as it transmits torque, so it has to be mounted, bolted and greased as carefully as a bearing and a gearbox together. Figure 1 names the parts used in this guide; the numbered parts are the grease points, described in section 5.

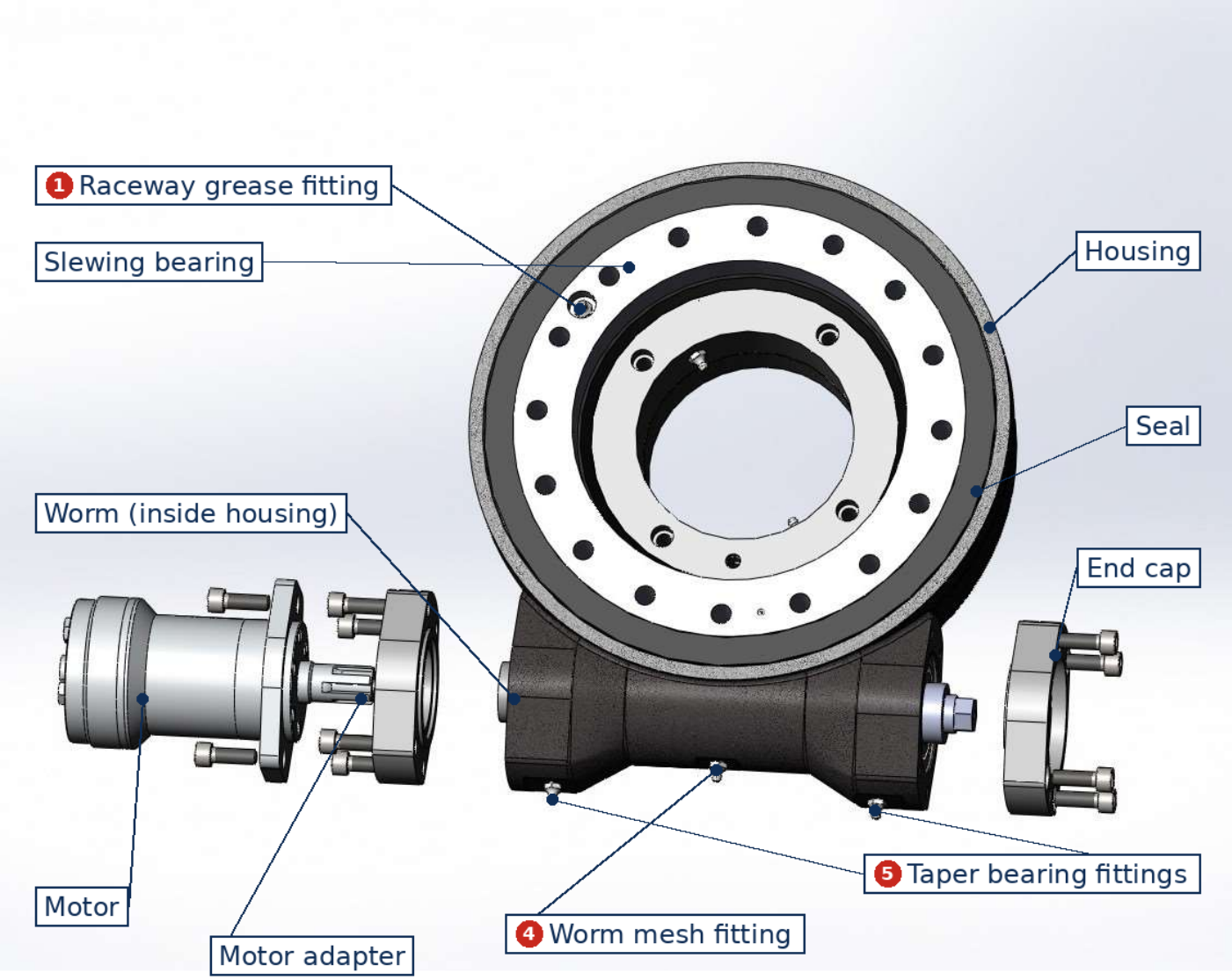


Figure 1. A worm-type slewing drive shown exploded. Grease points: 1 raceway, 4 worm and gear mesh, 5 taper roller bearings at each end of the worm. Point 2 is on the inner ring and point 3 is the filler plug; both are shown in figure 4.

1. Receiving, handling and storage

- **Wear appropriate protective equipment** whenever the drive is handled or unpacked.
- **Keep it in its shipped position** and avoid collisions with containers, equipment and other parts while unloading.
- **Lift it properly.** Fit eye bolts to the threaded holes in the rings and lift on rated gear at several points. Never lift by the motor or the worm housing alone.
- **Store it dry,** in its packaging and its shipped position, in a dry room away from moisture.

- **Watch the storage time.** The surface corrosion protection lasts about five months in closed packaging. Beyond that the drive needs extra protection, and the protection should be renewed before it goes into service.
- **Unpack it carefully.** Cut the wrapping away from the seals: a nicked seal lets water and grit in from day one. Check for damage and turn the drive by hand before you start.

2. Prepare the mounting structure

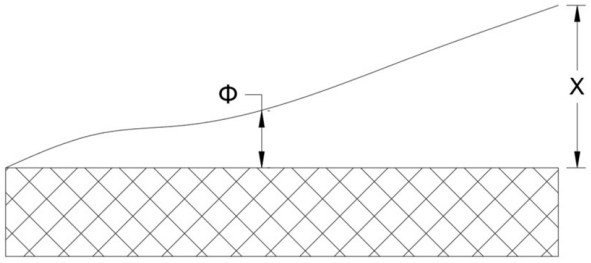
The structure the drive bolts to matters as much as the drive. Local deflection changes how load is shared around the ring, so part of the bearing sees far more than the design load and the worm can bind.

- **Remove everything that stands proud.** Weld spatter, galvanizing residue, dirt, burrs and paint all distort the ring.
- **Clean with a cold solvent** that will not damage the rubber seals, and follow the solvent maker's handling instructions. Never use a steam jet or a high-pressure cleaner.
- **Mount the drive unloaded.**

Permissible mounting-surface deviation

Horizontally installed drive. Values in inches, with millimetres in [ ].

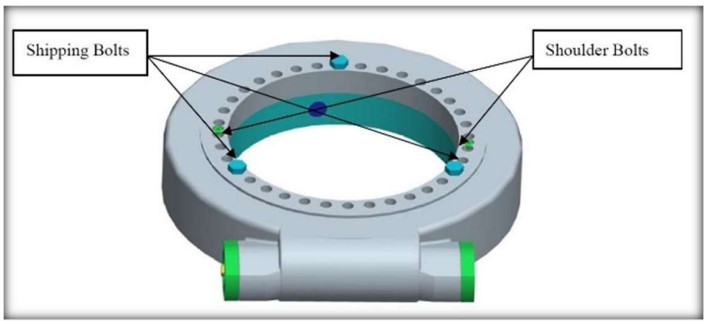
Drive size	3" [76]	5" [127]	7" [178]	9" [229]	12" [305]	14" [356]	17" [432]	21" [533]	25" [635]
Perpendicularity, in length	.0028 [0.07]	.0035 [0.09]	.0043 [0.11]	.0063 [0.16]	.0091 [0.23]	.0102 [0.26]	.0126 [0.32]	.0165 [0.42]	.0193 [0.49]
Perpendicularity, in angle	0.09°	0.09°	0.09°	0.09°	0.09°	0.09°	0.09°	0.09°	0.09°
Flatness	.0016 [0.04]	.0039 [0.10]	.0039 [0.10]	.0047 [0.12]	.0059 [0.15]	.0059 [0.15]	.0059 [0.15]	.0079 [0.20]	.0079 [0.20]



Any deviation must rise and fall gradually, like a sine curve - never a step. **For a drive between the sizes listed, or larger than 25 in.,** use the values on the drive drawing, or ask us before the structure is machined.

3. Position and bolt the drive

Shoulder bolts and shipping bolts are not the same thing



When mounting the drive, REMOVE the shipping bolts and LEAVE the shoulder bolts in place.

Shipping bolts hold the rings together in transit; left in, they lock the drive. Shoulder bolts are part of the assembly; taken out, they let it come apart.

Choosing the fasteners

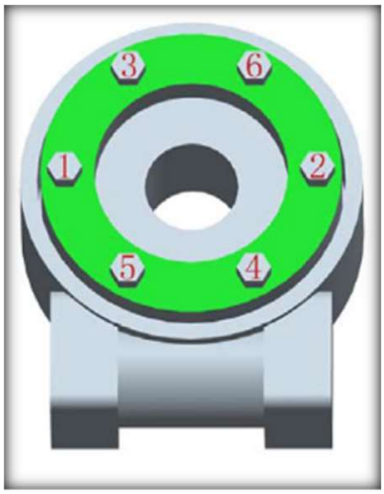
- **The grade, size and number on the drive drawing.** Class 10.9 or better unless the drawing says otherwise.
- **Hardened flat washers only.** No spring washers and no standard flat washers.
- **Thread engagement 2 to 10 times the bolt diameter.** Outside that range the joint, the service life and the seal are all affected.
- **Never let a bolt run out through a tapped hole** - it will reach the internals and damage the drive.
- **Use a high-strength gasket** where the allowable contact stress of the mounting surface would otherwise be exceeded.
- **New fasteners, every time.** The mounting fasteners are supplied by the machine builder.

Guide tightening torques

Values in lb-ft, with N·m in [ ]. **The torque on your drive drawing takes priority.** For bolts larger than M20, use the drawing torque.

Metric bolt	Class 8.8	Class 10.9	Class 12.9
M8	19 ± 3 [26 ± 4]	24 ± 2 [33 ± 3]	33 ± 4 [45 ± 6]
M10	38 ± 5 [52 ± 7]	53 ± 4 [72 ± 6]	66 ± 7 [90 ± 10]
M12	66 ± 9 [90 ± 12]	89 ± 7 [120 ± 10]	111 ± 15 [150 ± 20]
M16	166 ± 26 [225 ± 35]	225 ± 18 [305 ± 25]	280 ± 37 [380 ± 50]
M18	229 ± 33 [310 ± 45]	306 ± 26 [415 ± 35]	384 ± 52 [521 ± 70]
M20	302 ± 37 [410 ± 50]	443 ± 37 [600 ± 50]	553 ± 74 [750 ± 100]

Tightening sequence



1. Apply thread lock to the threads.
2. Fill every mounting hole. If a bolt cannot be fitted because of the structure, confirm the remaining bolts are strong enough and seal the open hole against water and dust.
3. Work on one ring at a time - inner or outer, either first. Torque crosswise, in the pattern shown, to 30%, then 50%, then 100% of final torque.
4. Finish that ring, then do the other ring the same way.
5. Mark each bolt head against the stationary structure at final torque. The mark tells an inspector later whether a bolt has moved.
6. Turn the drive through its full travel. A tight spot that appears as you torque points to a flatness or distortion problem: stop and find it.

Mounting direction

Horizontal and vertical mounting are both normal; the direction follows the application. Figure 2 shows the four orientations the motor and worm can take. **On solar trackers,** mount the drive upside down on the azimuth axis, with the worm housing below the ring, so water cannot stand on the seals (figure 3).

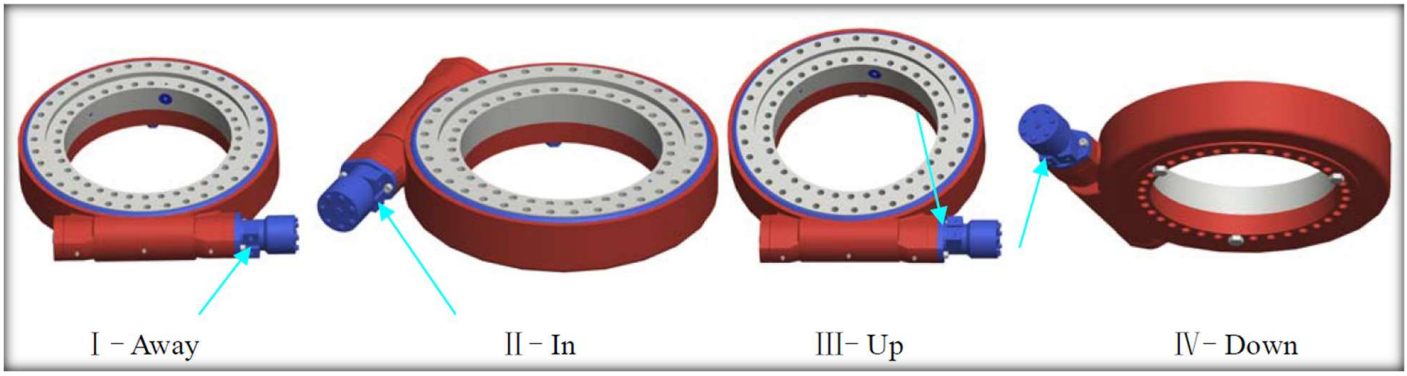


Figure 2. Worm housing orientations: I away, II in, III up, IV down.

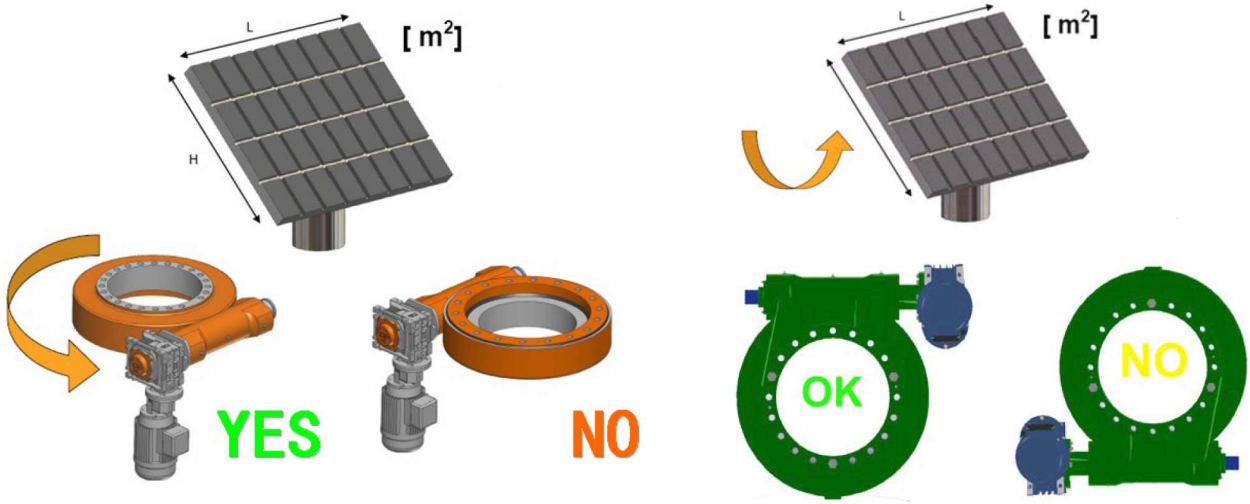


Figure 3. Solar tracker mounting: azimuth drive upside down (left), worm housing below the ring on the elevation axis (right).

Paint repair

Installation chips paint. Once the drive is mounted, inspect it and make good any damaged surface, or the corrosion protection is lost where it is needed most.

4. Check it before it goes into service, and keep checking

- **Turn the drive through its full travel.** Smooth, no binding, no abnormal noise.
- **Confirm motor rotation under no load** before the rated load is applied (section 6).
- **Recheck bolt torque** after the first period of operation. Settling loosens bolts, and the marks made at installation show which have moved.

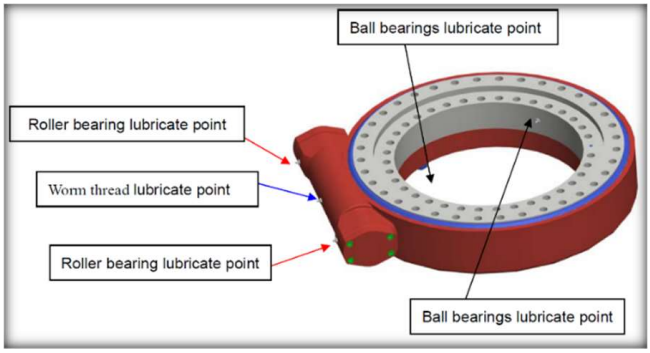
Bolt and seal inspection schedule

When	What to do
Within the first 100 operating hours	Retighten every mounting bolt to the drawing torque, with no external load on the bolted joint.
Once a year	Repeat the bolt check. Inspect the seals for tears, cracks and damage and replace any that are damaged.
If any bolt is found loose	Replace all bolts and washers with new ones. Never re-use a fastener that has worked loose.
Severe service	Check more often: heavy shock, vibration, or a structure that is still settling.

5. Lubrication

A slewing drive runs under high load at low speed, the ideal condition for metal-to-metal wear once the grease film breaks down. **Insufficient lubrication is the most frequent cause of slewing drive failure.** The drive arrives fully greased; grease every point again once it is mounted.

Three things need grease, and each has its own fittings



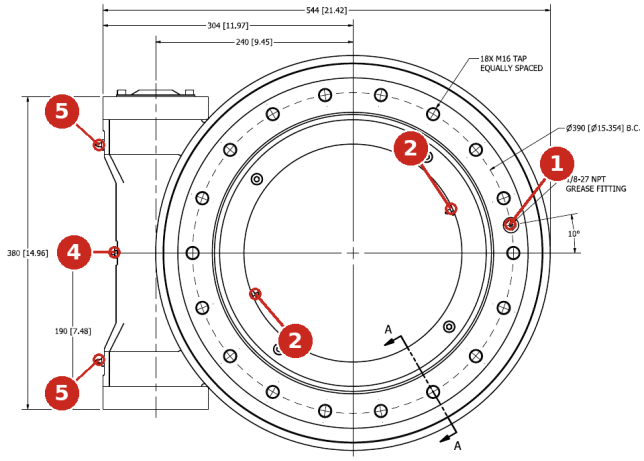
Grease point	What it is
Slewing bearing raceway	the ball or roller path in the ring
Worm and gear mesh	where the worm drives the ring gear
Taper roller bearings	the worm shaft bearings, one at each end

Left: the grease points on a typical worm drive - ball bearing (raceway) points on the ring, roller bearing (taper bearing) points at each end of the worm, and the worm thread (mesh) point between them.

Finding each fitting on your drawing

Every SlewPro drive drawing shows the grease fittings and the filler plug and gives their thread size, usually 1/8-27 NPT. Figure 4 is our FWA14 drawing with each one numbered; the same numbers are used in figure 1 and in the table below. Positions differ between models, so use the same method on your own drawing.

FRONT FACE



BACK FACE

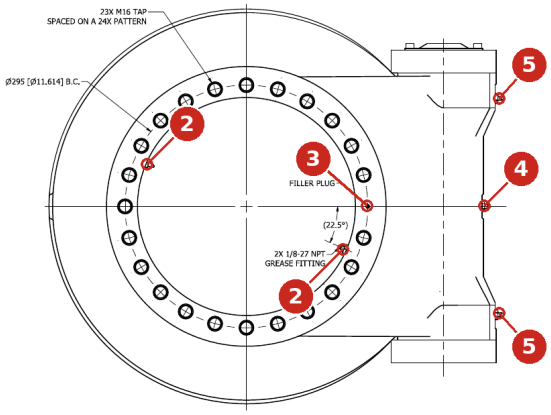


Figure 4. FWA14 slewing drive drawing, front and back faces, with each grease point numbered. The inner-ring fittings (2) can be seen in both views.

No.	Where on the drive	Fitting	What it feeds	Quantity (table below)
1	Front face of the ring, beside the bolt circle (at 10° on the FWA14)	1/8-27 NPT grease fitting	Slewing bearing raceway	Ring raceway
2	Inner ring, two fittings 180° apart (at 22.5° on the FWA14)	2 x 1/8-27 NPT grease fitting	Slewing bearing raceway, inner side	Ring raceway, shared between them
3	Back face of the inner ring	Filler plug	Not a routine grease point: remove it only for the three-year complete refill	-
4	Worm housing, middle	Grease fitting	Worm and gear mesh	Worm gear thread
5	Worm housing, each end next to the end caps	2 x grease fitting	Taper roller bearings	Taper bearing, each

Oil ports are not grease points. A hydraulic motor has two 7/8-14 UNF oil ports (A and B) and a 7/16-20 UNF case drain port (figure 5). Never put grease in them, and never connect a grease line to them.

Choosing the grease: two grades, both sold in North America

The raceway and the worm need different consistencies. The raceway takes a standard **NLGI 2** extreme-pressure grease. The worm mesh and the taper roller bearings take a softer **NLGI 1** EP grease that flows back into the mesh as the worm turns. Use extreme-pressure (EP) and anti-wear additives in both. Any product below meets its specification and can be bought from a local distributor.

Brand	Raceway (points 1, 2): NLGI 2 EP	Thickener
Mobil	Mobilux EP 2	Lithium
Mobil	Mobilgrease XHP 222	Lithium complex
Shell	Gadus S2 V220 2	Lithium
Chevron	Ultra-Duty Grease EP 2	Lithium
Chevron	Starplex EP 2	Lithium complex
Castrol	Spheerol EPL 2	Lithium
Phillips 66	Unoba EP 2	Lithium
Petro-Canada	Precision XL EP2	Lithium complex
Klüber	Centoplex 2 EP	Lithium

Brand	Worm and taper bearings (points 4, 5): NLGI 1 EP	Thickener
Mobil	Mobilux EP 1	Lithium
Mobil	Mobilgrease XHP 221	Lithium complex
Shell	Gadus S2 V220 1	Lithium
Chevron	Starplex EP 1	Lithium complex
Petro-Canada	Precision XL EP1	Lithium complex

- **Pick one product for each grade and stay with it.** Never mix thickener types in the same cavity: two incompatible greases can both stop working.
- **If your drawing or order acknowledgement names a grease, use that one.** Earlier drive drawings list Molykote 44, Mobiltemp SHC 100 or SHC 32, and Unitemp 550; if one of those is already in the drive, keep using it, or purge the old grease completely before changing.
- **Temperature.** These greases suit the conditions the intervals below assume, -22 °F to 140 °F. For a drive running hotter or colder than that, ask us for a grease rated for it.

How much grease

Quantities for one routine relubrication, in lb, with grams in [ ]. They are top-up amounts, not the amount needed to fill an empty cavity; for a complete refill, fill until fresh grease shows at the seals. For a drive between the sizes listed or larger than 25 in., use the quantities on the drive drawing or ask us.

Drive size	Ring raceway (1, 2)	Worm gear thread (4)	Taper bearing (5), each
3" [76]	N/A	.154-.198 [70-90]	.022 ± .001 [10 ± 0.5]
5" [127]	.022-.033 [10-15]	.220-.331 [100-150]	.022 ± .001 [10 ± 0.5]
7" [178]	.033-.044 [15-20]	.441-.551 [200-250]	.022 ± .001 [10 ± 0.5]
9" [229]	.066-.077 [30-35]	.772-.882 [350-400]	.033 ± .001 [15 ± 0.5]
12" [305]	.099-.110 [45-50]	.882-.992 [400-450]	.033 ± .001 [15 ± 0.5]
14" [356]	.121-.132 [55-60]	1.102-1.213 [500-550]	.033 ± .001 [15 ± 0.5]
17" [432]	.154-.165 [70-75]	1.213-1.323 [550-600]	.033 ± .001 [15 ± 0.5]
21" [533]	.265-.287 [120-130]	1.764-2.205 [800-1000]	.033 ± .001 [15 ± 0.5]
25" [635]	.309-.331 [140-150]	2.205-2.646 [1000-1200]	.033 ± .001 [15 ± 0.5]

How often to relubricate

The right interval depends on the working conditions and can only be fixed by experience on the actual machine. Where there is nothing else to go on, start here.

Situation	Typical starting point
After installation	Grease every point once the drive is mounted, even though it arrived greased.
Dry, clean workshop: positioners, turntables, robots	Every 500 operating hours, or once a year.
Outdoors or difficult: cranes, construction machines, wind, solar, man lifts	Every 6 months.
Aggressive: sea, desert, arctic, very dirty, or more than 70 operating hours a week	Every 150 operating hours, or every 4 months.
Extreme: tunnelling machines, steel mills, oil field	Every 50 operating hours, or every 2 months, whichever comes first.
Idle equipment and storage	At least every six months, to prevent corrosion.
Complete refill	Every 3 years, filling each cavity completely with new grease.

These intervals assume -22 °F to 140 °F at the drive and an output speed below 1.5 rpm.

How to apply it

- **Clean each fitting** before the grease gun goes on it.
- **Turn the drive while you grease,** so the grease reaches the whole circumference and pushes old grease and dirt out.
- **Charge each fitting in turn,** with the right grade at each point: NLGI 2 at 1 and 2, NLGI 1 at 4 and 5.

Four mistakes to avoid

- **Greasing once a year.** Far too infrequent for most applications.
- **Mixing greases.** Use the same grease, or one confirmed compatible.
- **Greasing until it overflows.** Grease forced past the seals raises temperature and pressure inside the drive and can push a seal out.
- **Greasing a noisy drive and carrying on.** Noise can mean internal damage; extra grease only hides it for a while.

6. Motors and encoders

Hydraulic motor

- **Match the motor rotation** to the worm rotation needed to turn the ring the way the application requires.
- **Check the motor mounting bolt torque,** then connect the hydraulic lines to ports A and B.
- **Turn it under no load first.** If it does not turn smoothly, check the hydraulic circuit, the coupling, the drive and the worm, and check there is enough grease. Apply the rated load only once the no-load test passes.
- **Direction:** viewed on the output shaft, flow in at A and out at B turns clockwise; in at B and out at A turns counter-clockwise.

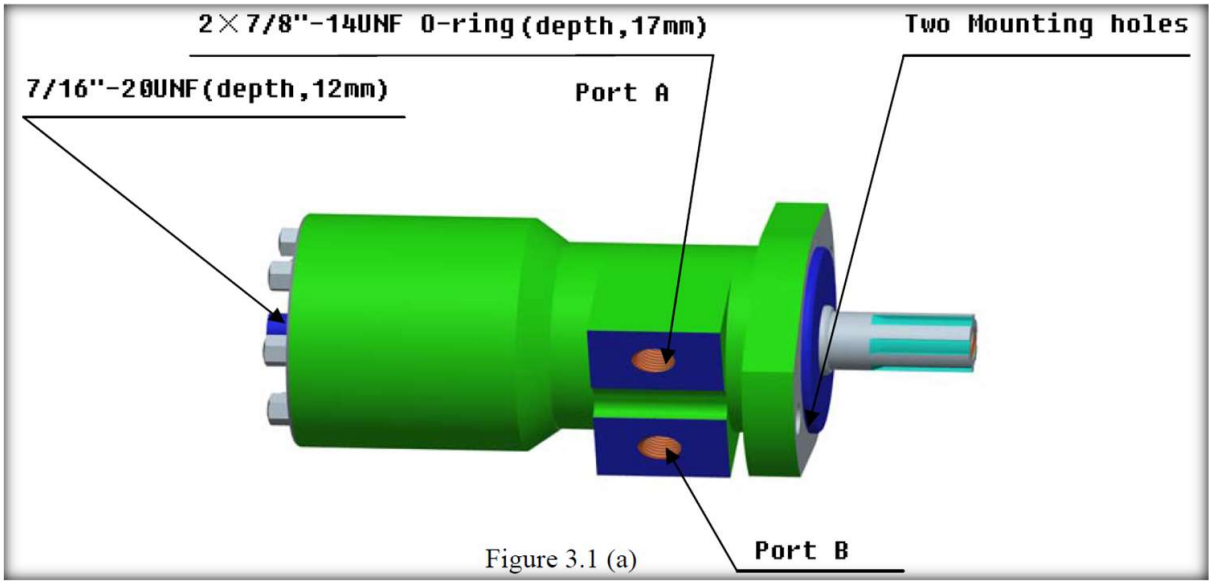
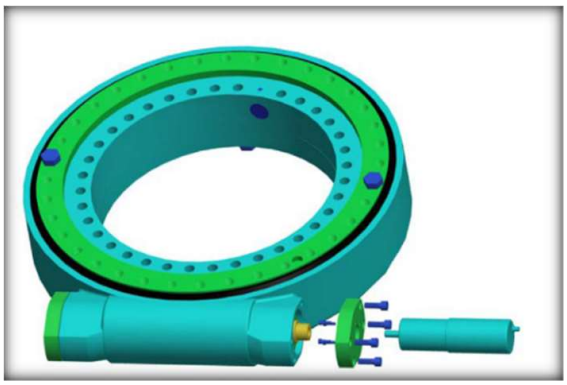


Figure 5. Hydraulic motor: 2 x 7/8-14 UNF O-ring oil ports (A, B) and a 7/16-20 UNF case drain. None of these is a grease point.

Electric motor, standard 24 VDC

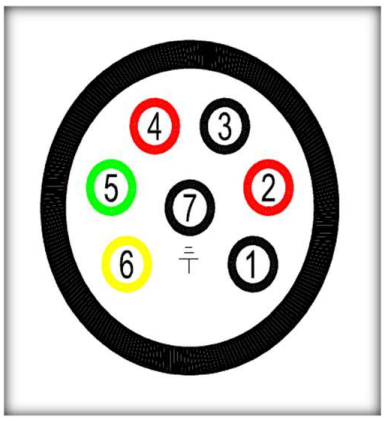


1. Clean the mounting surface.
2. Join the adapter and tighten its screws to the motor.
3. Fit the motor and tighten its screws to the drive.
4. Connect the DC supply and check rotation. If it turns the wrong way, swap LINE (L) and NEUTRAL (N).
5. Turn it under no load. If it does not turn smoothly, check the supply, the coupling, the drive and the worm, and the grease.
6. Apply the rated load and check again.

For any other motor - 110 VDC, brushless DC or AC - follow the specification supplied with that motor.

Encoder, M2 series (Hall sensor)

	M2-V	M2-N
Output type	Voltage output	Open collector NPN
Pull-up resistor	Yes	No
Output signal	2 square waves, phase quadrature	2 square waves, phase quadrature
Channels	A and B	A and B
Operating voltage	12 VDC (5-24)	12 VDC (5-24)
Operating current	Max 12 mA at 12 V	Max 12 mA at 12 V
Pulse width deviation	Max 15°	Max 15°
Phase shift deviation	Max 15°	Max 15°
Output voltage (low)	Max 0.4 VDC at 20 mA	Max 0.4 VDC at 20 mA
Operating temperature	-40 °F to 185 °F (-40 °C to 85 °C)	-40 °F to 185 °F (-40 °C to 85 °C)



Pin	Function
1	Motor 0 V (motor input) - black, thick
2	Motor +24 V (motor input) - red, thick
3	Hall 0 V (Hall input) - black, thin
4	Hall +12 V (5-24) (Hall input) - red, thin
5	Hall signal A (square wave) - green, thin
6	Hall signal B (square wave) - yellow, thin
7	Ground (G)

Hall sensor

- With 5-24 VDC applied, working current should be no more than 50 mA.
- **Never reverse the poles.** Connecting +24 V and 0 V the wrong way round destroys the sensor.
- **Never apply the motor supply to the Hall sensor.**
- Take anti-static precautions, and route the sensor cable away from power cables to avoid interference.

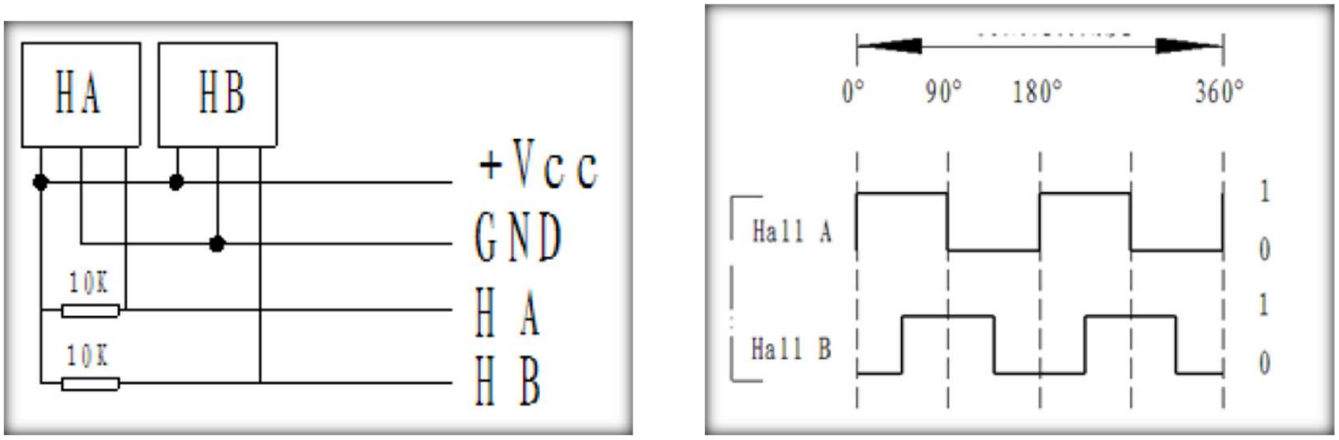
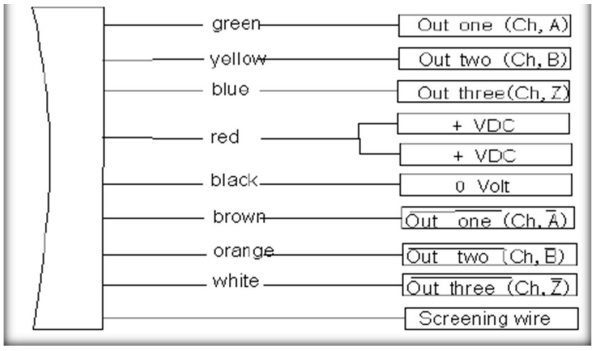


Figure 6. Hall sensor circuit (left) and output waveforms against mechanical rotation angle (right).

Photoelectric encoder (incremental)



Resolution	100 / 360 / 500 / 600 / 1000 / 1024
Output signal	3 channels (A, B, Z)
Operating voltage	5-28 VDC
Output	Push-pull / NPN open collector / line driver
Frequency	115 kHz
Maximum speed	6,000 rpm
Protection	IP54
Cable	6.5 ft (2 m), radial
Housing	Plastic
Shaft	Stainless steel, .236 x .591 in. (6 x 15 mm)
Operating temperature	14 °F to 158 °F (-10 °C to 70 °C)
Bearings	2 x 626 ZZ
Polarity protection	Yes

7. Warning signs and what they usually mean

Most drive failures start with lubrication, mounting, overload or water - and almost all of them give warning first.

Warning sign	Often caused by	What to do
Noise or vibration that is not normal	Dry raceway or worm, contamination, internal damage, overload	Investigate before regreasing; check purged grease and the load.
Rising temperature or hot spots	Not enough grease, wrong grade, over-tight bolts, overload	Check the grease at each point, bolt torque and the load.
Motor working harder, or uneven rotation	Mounting distortion, worm wear, dry mesh, debris	Check flatness and bolts; grease the worm (point 4); inspect.
Increasing backlash at the output	Worm and gear wear	Measure and record it; contact us with the trend.
Metal in purged grease	Raceway, worm or gear wear	Take it seriously: plan an inspection and a replacement.
Grease leaking, or damaged seals	Seal wear, over-greasing, impact	Replace seals; keep water and dirt out.
Rust or water in the grease	Damaged seal, washdown, standing water, upright solar mounting	Purge with fresh grease; review the seals and the mounting direction.
Loose bolts at inspection	Settling, under-torque, vibration	Replace all bolts and washers with new ones (section 4).

Stay inside the ratings

Every drive has limits for output torque, tilting moment, axial and radial load and speed on its drawing. Repeated loading beyond them starts fatigue in the raceway and wear in the worm that can end in sudden failure. If the application has changed since the drive was selected, have the selection checked. Typical rated output torque for standard worm drives:

Drive size	3"	5"	7"	9"	12"	14"	17"	21"	25"
Rated torque, lb-ft	148	221	738	5,900	6,638	8,113	10,326	12,539	14,751
[kN·m]	[0.20]	[0.30]	[1.00]	[8.00]	[9.00]	[11.00]	[14.00]	[17.00]	[20.00]

Your drive drawing gives the ratings for your model, and they take priority over this table.

8. Replacing a drive

If a drive has failed and the machine is down, speed matters. Send us whatever you have:

- **the part number,** from the nameplate or the drawing, from any manufacturer;
- **the drawing**; or
- **photos and the main dimensions:** outside diameter, height, bolt circles and hole counts, motor type and ratio.

Talk to our engineers. Send it to **info@slewpro.com** or call **330-633-7735**, and we will identify the replacement and tell you what, if anything, differs from the original. More guides at **slewpro.com/blog**.

P&C-SER-SPE-24-001; Rev C, Edition 10 / 2026. Supersedes Revision B. Potesta & Company accepts no liability for failure to pass this guide to anyone installing or maintaining the drive, or for installation and maintenance that does not follow it.