



## POWER-LOCK FAQ

*We answer your important POWER-LOCK questions!*

**Tsubaki Emerson Co.**

### Selection, Installation, Work environment

- \* Can the POWER-LOCK be used with a shaft that already has a finished keyway?
- \* What would happen if I assembled the POWER-LOCK without using a torque wrench?
- \* When assembling the POWER-LOCK, will the oil coating cause it to slip?

We have collected these frequently asked questions and others like it to make this FAQ.

With this pamphlet we hope to resolve common questions, and at the same time deepen your knowledge of our POWER-LOCKS.

### Design

**Q1. Can the POWER-LOCK be used with a shaft that already has a finished keyway?**

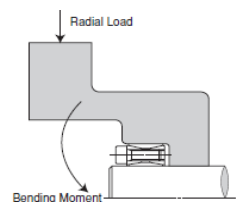
**Answer:**

Transmissible torque and thrust will decrease by 10% of the catalog value, but it is possible to use it. However, the EL series cannot be used with a shaft that has a finished keyway because it would become impossible to remove EL units due to deformation.

**Q2. Can the POWER-LOCK receive a bending moment?**

**Answer:**

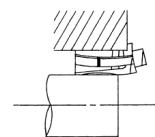
Generally, POWER-LOCKS cannot receive a bending moment. If the POWER-LOCK you use will have bending moments like that of the diagram on the right, please contact TEM for more information.



**Q3. Can I use the POWER-LOCK if it is a little longer than the length of the shaft?**

**Answer:**

If the shaft length is shorter than the width of the POWER-LOCK, the force to the inner ring becomes unequal, and it is impossible to use the POWER-LOCK due to the resulting deformation. Because of deformation, the accuracy of the centering will also decrease.



**Q4. What are the allowable limits of surface roughness of the shaft and hub portions that make contact with the POWER-LOCK?**

**Answer:**

The values written below from the catalog are the allowable limits. Rough finishing values greater than this are not acceptable. When the contact pressure is generated on the surface of the shaft or hub, the surfaces' undulation becomes crushed due to the contact pressure, and the plastic deformation of the shaft and hub occurs. Consequently, the shaft outer diameter will become smaller while the hub's inner diameter will grow larger along with the amount of surface roughness, and eventually the transmissible torque will decrease. Due to age deterioration there is a possibility of further plastic deformation.

**< Allowable surface roughness limits by series >**

AS	AD-N	AE	EL	EF	TF	ML	SL	RE	KE
12S	12S	12S	6S	12S	12S	12S	12S	12S	12S

**Q5. I'm thinking of using a POWER-LOCK with a hollow shaft. Will this cause any problems?**

**Answer:**

For a hollow shaft it is necessary to confirm whether the shaft material and hollow shaft diameter has the strength to withstand the pressure from the shaft due to the locking of the POWER-LOCK. The calculation formulas and related details are listed in our catalog. Please visit TEM's website to request your own catalog.

**Q6. In the catalog there is a hub diameter chart, but in the notes section it says, "safety factor is not included." What degree of safety factor should be calculated?**

**Answer:**

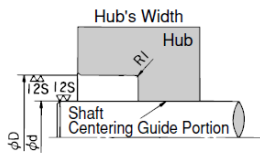
When tightening the bolt using the specified torque ( $M_A$ ), the minimum hub outer diameter that can withstand the hub contact pressure that occurs on the inner diameter of hub, is listed in the catalog. Generated contact pressure varies by the bolts' tightening torque, so if a standard torque wrench has a tolerance of  $\pm 5\%$ , the safety factor should include at least 10%.

**Q7. Is it possible to use the POWER-LOCK if the hub width is shorter than the POWER-LOCK width?**

**Answer:**

It is possible for the ML Series; however, because the generated hub contact pressure becomes large, it is necessary to confirm that the hub material strength and required hub outer diameter are acceptable by calculating hub contact pressure  $P'_k$  by using the following formula:  $P'_k = P \times l / B$

**Q8. If I use a POWER-LOCK series with no centering function and a hub with no guide portion, how does this affect centering accuracy?**



**Answer:**

It cannot be used because extremely large run-out will certainly occur, and its amount cannot be predicted. Make sure to always have the guide portion for centering the hub.

If the length of the guide portion for centering is at least half that of the shaft diameter ( $d/2$ ), you can obtain practical centering accuracy. In addition, decide the tolerance of the guide portion according to necessary precision.

**Q9. One POWER-LOCK won't be enough for my needs, so I want to use a number of them in a series. In this case, what will happen to transmissible torque?**

**Answer:**

Transmissible torque will increase, but the magnification differs depending on the series.

Please note that depending on the series, using multiple POWER-LOCKS may not be possible.

< Series scale chart for multi POWER-LOCK use >

Number of POWER-LOCKS used	1	2	3	4
AS	1	2	3	4
AD-N	1	2	Unusable	Unusable
TF KE	1	2	Unusable	Unusable
ML	1	1.2	Unusable	Unusable
EL	1	1.55	1.85	2
Others	1	Unusable	Unusable	Unusable

**Q10. Is it possible to use POWER-LOCKS with applications that have large impact loads like press machines and construction equipment?**

**Answer:**

Even when impact load is repeated, you must adequately consider the safety factor. If bolt-tightening torque is done sufficiently, it is possible to use POWER-LOCK. In regard to impact load torque, the safety factor of **S.F. = 5** is standard.

$$\text{S.F.} = (\text{POWER-LOCK transmissible torque}) / (\text{Impact load torque}) \geq 5$$

**Q11. Can I use the TF Series without a spacer?**

**Answer:**

Due to the following reasons, the TF Series cannot be used without a spacer:

- 1) The inner ring will warp.
- 2) The locking bolt will interfere with the hub.
- 3) The hub will not settle in its assembled position.
- 4) The hub will move during assembly.

**Assembly/disassembly**

**Q12. What would happen if I didn't use a torque wrench to install a POWER-LOCK?**

**Answer:**

The transmissible torque and thrust described in the catalog are the value when the locking bolts are tightened correctly. If the torque wrench is not used, the prescribed axial force will not be achieved, causing the POWER-LOCK to slip, and damaging the bolts or deforming the POWER-LOCK due to excessive tightening of the locking bolts. Make sure to use a torque wrench and tighten it according to the stipulated torque amount.

**Q13. What would happen if I tighten the bolt at a torque level less than the prescribed amount?**

**Answer:**

The tightening torque and the POWER-LOCK transmissible torque have a proportional relationship. Therefore, if bolt tightening torque is reduced, transmissible torque will also be reduced accordingly, but we cannot recommend this because reducing tightening torque will cause the locking bolt to loosen.

**Q14. When installing the POWER-LOCK, which portion do I have to apply oil/grease to?**

**Answer:**

It is necessary to apply oil/grease to the shaft and hub contact surfaces, as well as the mutual contact areas of the taper ring, inner and outer rings, and the bolt's bearing surface and the bolt screw surface. It is sometimes misunderstood that when applying oil to the taper's surface it can cause slip, but the lubricating effect is essential for smooth movement on the taper's surface during assembly. However, do not use oil or grease that includes molybdenum with anti-friction composites. Also, do not use any oil or grease that contains extreme pressure additives. If oil/grease containing these additives are used, the friction coefficient will significantly decrease, possibly damaging the tightening bolt.

**Q15. When assembling the series that requires an oil/grease coating on the tightening bolt, what would happen if I assembled without applying any oil/grease?**

**Answer:**

If the POWER-LOCK is assembled without applying oil/grease, transmissible torque can decrease by at least 20%. As well, there is a possibility that vibration will cause the locking bolts to loosen. The transmissible torque in the catalog is calculated on the basis of axial force when the locking bolt is in a lubricated condition. Therefore, do not remove any oil/grease from the POWER-LOCK. However, for ML and SL Series and the stainless steel and electroless nickel-plated Series, because the locking bolts have a special lubricated coating, no oil/grease coating is necessary for assembly.

**Q16. Up to how many times can I reinstall a POWER-LOCK?**

**Answer:**

About 10 times is possible for series other than the AD-N Series. However, it must be a POWER-LOCK that has not slipped and has no deformations or scratches. The structure of the AD-N Series can deform easily, so it is limited to approximately 2 times. When reusing, set the POWER-LOCK as stipulated. The POWER-LOCK's transmissible torque will not change. In addition, change the lubrication coated locking bolts for a new one if its condition warrants it. (Please order through our distributors.)

**Q17. Can I reuse a slipped Power Lock?**

**Answer:**

Once the POWER-LOCK has been completely disassembled, and no deformations or scratches have been discovered on any of its parts, by following the procedures for reassembly in the manual, it is possible to reuse it. The AD-N Series cannot be disassembled, so carefully inspect the appearance of the POWER-LOCK. The deterioration of the surface roughness can be a problem, so reuse the AD-N Series at the most 1 to 2 times.

**Q18. Do the POWER-LOCK bolts ever come loose?**

**Answer:**

Because the frictional torque is larger than the natural loosening torque, if the locking bolts have been tightened properly according to the prescribed tightening torque ( $M_A$ ), the bolt will not loosen. Additionally:

- 1) In order to secure the frictional force to prevent the bolts from loosening, a constant high locking force is used.
- 2) The part that makes contact with the bearing surface of the locking bolts is heat treated, so surface depressions are minimized.

Because of the reasons listed above, you can use TEM POWER-LOCKS without having to worry about bolts loosening.

**Q19. Is it OK if I use a locking washer with the locking bolt?**

**Answer:**

Under normal assembly circumstances there is no concern that the POWER-LOCK locking bolt will become loose. When spring washers, which generate reaction force are used, locking force decreases. Due to the decrease in the resulting axial force, and because of the decrease in transmissible torque, it cannot be used.

**Q20. When installing the AD-N Series, are there any particular points I should be aware of?**

**Answer:**

Compared with other POWER-LOCK series, the AD-N Series has a small taper angle to take a larger transmissible torque. Quickly tightening the locking bolts will create flaws in the locking bolts and screw holes, so when installing and removing, the locking bolts tightening procedure should be done little by little and evenly. (The tightening angle is  $30^\circ$  per tightening.) When disassembling the POWER-LOCK, make sure to use all of the tap holes for removal and follow the procedures listed in the instruction manual.

**Q21. I assembled the POWER-LOCK in a place of normal ambient temperature, but after that it was moved to a place with temperatures as high as  $180^\circ$  C.**

**Will this large temperature change lower the transmissible torque of the POWER-LOCK?**

**Answer:**

If the shaft and hub materials are the same or equivalent of that of the POWER-LOCK, it should be no problem because the shaft, hub and the POWER-LOCK will expand as one. If the shaft and hub are made of different materials such as stainless steel or aluminum, consult with TEM because it will be necessary to examine the possibility of their use. The use of POWER-LOCKS at temperatures in the range of  $-30^\circ$  C to  $200^\circ$  C is acceptable.

**Q22. Is it possible to use the stainless steel POWER-LOCK in the ocean?**

**Answer:**

If you don't mind a little rust then it is possible. Even when using in water, because the contact surfaces have high surface pressure, almost no water penetrates the POWER-LOCK, meaning no decrease in performance. However, if no rust is acceptable, it should not be used in water.

**Q23. I want to treat the POWER-LOCK with Raydent. (clean room use)**

**Answer:**

Using Raydent will cause the tapered surface to become rough due to peel-off and decrease transmissible torque. Please consider the use of electroless nickel plated types (AS-KP, KE-KP, TF-KP) and stainless steel types (AS-SS, KE-SS, RE-SS).

**We are proud to introduce our expansive POWER-LOCK lineup.**

**AS Series (multipurpose type)**



- 1)Applicable shaft diameter  $\phi 19 \text{ --- } \phi 300$
- 2)Easy handling and multi-purpose.
- 3)With less locking bolts than competitor's equivalent products, you can realize significant man-hour savings when assembling the AS Series.
- 4)Available in stainless steel and electroless nickel-plated finish.

**AE Series (flange type)**



- 1)Applicable shaft diameter  $\phi 19 \text{ --- } \phi 150$
- 2)It is not necessary to machine the guide portion in the hub because this series has a self-centering function.
- 3)The AE and AS Series have identical inner and outer diameters.
- 4)Simply constructed units with only an inner and an outer ring with locking bolts.

**TF Series (small diameter hub type)**



- 1)Applicable shaft diameter  $\phi 6 \text{ --- } \phi 90$
- 2)The small difference between the inner and outer diameters reduces contact pressure and makes mounting to small hubs possible.
- 3)It is possible to examine even relatively weak hubs such as aluminum pulleys.
- 4)Electroless nickel-plated finish is available.

### ML Series (quick installation with single nut type)



- 1)Applicable shaft diameter  $\phi 5 \text{ --- } \phi 75$
- 2)Simple installation just by the tightening of a nut.
- 3)Can be used even the hub width is shorter than the POWER-LOCK width.
- 4)Self centering function included.

### EL Series (element type)



- 1)Applicable shaft diameter  $\phi 10 \text{ --- } \phi 150$
- 2)There is no requirement on the size and number of locking bolts to be tightened or even the number of ELs to be installed. Optimum design is possible depending on the required transmissible torque.
- 3)Lightweight and compact; minimum installation space is required.

### AD-N Series (large capacity type)



- 1)Applicable shaft diameter  $\phi 19 \text{ --- } \phi 300$
- 2)Capable of transmitting 1.5 to 3 times the rated torque of the AS Series. Designed with the same inner and outer diameters as an AS Series.
- 3)Self centering function included.
- 4)We have a range of AD-N Series with applicable shaft diameters that start from  $\phi 19$ .
- 5)The built-in taper rings with inner and outer rings provide tight-fit around shafts and offer easy handling.

### KE Series (wide range of tolerances type)



- 1)Applicable shaft diameter  $\phi 5 \text{ --- } \phi 100$
- 2)Suitable for shafts with a wide range of tolerances;  
(m6, k6, js6, h6---h10).  
**<Electroless nickel-plated models specifically require h8 tolerance shafts.>**
- 3)From small to large, a wide selection of shaft sizes is available.
- 4)Available in stainless steel and electroless nickel-plated finish.



### **SL Series (external locking type)**



- 1)Applicable outer hub diameter  $\phi 24 \text{ --- } \phi 300$
- 2)External locking devices installed over outer hub diameters.
- 3)Excellent for locking the hollow shaft or thin hub wall design.
- 4)Can be installed or removed by tightening or loosening the locking bolts.  
No need to bother with adjusting keyways and thermal fittings.

### **RE-SS Series (environmental resistance type)**



- 1)Applicable shaft diameter  $\phi 5 \text{ --- } \phi 50$
- 2)All are stainless steel products, which makes for high anti-corrosive capabilities.
- 3)For the installation and removal of the snap ring, there are two types of installation you can choose from: flange and straight.
- 4)It is not necessary to apply any lubrication to the locking bolts for installation due to special grease coated bolts.

### **EF Series (All-in-one pressure flange type)**



- 1)Applicable shaft diameter  $\phi 10 \text{ --- } \phi 120$
- 2)EL Series Power Lock and pressure flange all-in-one type.
- 3)Has the same inner and outer diameter as the EL Series and has 2-3 times as much transmissible torque capacity.
- 4)Centering function included.

For further information, please contact our Overseas Sales Department at the numbers provided below.

TEL: +81(75) 956-8476

FAX: +81(75) 957-3122

**Tsubaki Emerson Co.**

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