

# TenarisHydril BlueDock® AARK2 Connector

## Scope

These guidelines apply specifically to the use of TenarisHydril BlueDock® Connector with AARK2 option, as part of the BlueDock® connector family.

This document is part of the TenarisHydril Running Manual, and provides an overview of best practices for these specific products. It should be used in conjunction with the rest of the sections within the TenarisHydril Running Manual.

Tenaris Field Service Representatives can modify these guidelines when circumstances dictate. Implementation will only occur if the Representative deems the modification to be non-detrimental to product integrity. All modifications need to be clearly explained and agreed with the client representative prior to implementation and fully documented in the Running Service Report and Service Ticket.

## References

- FTD29356 - Premium Connection Approved Thread Compounds.
- GDL31457 - Recommended guidelines for the field inspection of TenarisHydril connections.
- GDL23349 - Pre-Running Preparation
- GDL53330 – Visual Inspection of Dopeless® technology for Weld-on Connectors

## Equipment, Material & Documents

1. Verify the appropriate thread compound is available. Refer to document FTD29356 for a list of compounds approved by Tenaris.
2. Latest version of the specific Product Data Sheet can be obtained from Tenaris web site. In case this is unavailable, request it from the local Technical Sales Representative.
3. There are two designs of BlueDock® AARK2: Metal to Metal (MTM) and Elastomeric (ELS) seal variants. Both MTM and ELS seal designs can also be supplied with a sea water exclusion seal (SWS).
4. Connectors can also be supplied with the weld cord prepared for fatigue resistance (FF).
5. Additionally, BlueDock® AARK2 has two designations of each variant: High Range (HR) and Low Range (LR). These designations are dependent on wall thickness (WT).
6. Verify the compatibility of the BlueDock® AARK2 connector with accessories such as pup joints, shoe track, wellhead housing, etc., and ensure that their material grade is compatible with the main string.
7. Ensure the following are available on the rig prior to operation commencement: spare O-rings (ELS and/or SWS), AARK2 spares and installation / removal tools.
8. Specific tools required for successful running or pulling BlueDock® AARK2 connector include:
  - Feeler gauges from 0.05 mm to 1 mm.
  - Socket wrench: 10 mm (preferably magnetized), maximum wrench length 20 cm.
  - M8 T-bolt. The length is not a requirement, but a minimum length of 10 cm is recommended to aid removal of the AARK2 box bolts.

- Spare AARK2 for PIN and BOX side.
- Spare class 10.9 M6 x 1 mm x 10 mm length with 10 mm hexagonal bolts.



10 MM SOCKET WRENCH



M8 T-BOLT

## Pre-Running

1. Ensure TRS crew verifies that the elevators can pass over the weld cord and seats against the bearing load face of the connector.
2. The following connector information will be hard stamped on the connector OD:
  - Seal Type
  - Range: Low Range (LR) or High Range (HR)
  - OD
  - Connector SMYS
  - Manufacturing Facility
  - Manufacturing Quarter
  - Traceability Numbers

## Connector Color Coding

| RANGE | SEAL    | GRADE  | COLOUR |
|-------|---------|--------|--------|
| HR    | MTM     | 70 Ksi | Blue   |
| HR    | MTM     | 90 Ksi | Grey   |
| HR    | ELS     | 70 Ksi | Yellow |
| HR    | ELS     | 90 Ksi | Brown  |
| HR    | MTM SWS | 70 Ksi | Green  |
| HR    | MTM SWS | 90 Ksi | Purple |
| HR    | ELS SWS | 70 Ksi | Silver |
| HR    | ELS SWS | 90 Ksi | Red    |
| LR    | MTM     | 70 Ksi | Orange |

|    |         |         |              |
|----|---------|---------|--------------|
| LR | MTM     | 90 Ksi  | Pink         |
| LR | ELS     | 70 Ksi  | Violet       |
| LR | ELS     | 90 Ksi  | Black        |
| LR | MTM SWS | 70 Ksi  | Sky-Blue     |
| LR | MTM SWS | 110 Ksi | Green Beige  |
| LR | MTM SWS | 90 Ksi  | White        |
| LR | ELS SWS | 70 Ksi  | Magenta      |
| LR | ELS SWS | 90 Ksi  | Bright Green |

3. One 50 mm wide band painted round the connector indicating Range, Seal Type and Connector Grade.

4. Products prepared for fatigue resistance (FF) will have an additional silver band on the pipe OD beside the girth weld.

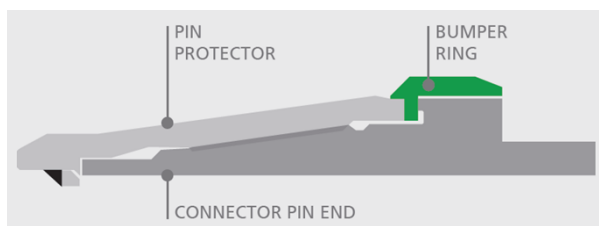
5. Alternatively / additionally if requested by customer a color code may be painted in the pipe OD.

| GRADE | COLOUR |
|-------|--------|
| X46   | Black  |
| X52   | Green  |
| X56   | Blue   |
| X60   | Red    |
| X65   | White  |
| X70   | Purple |
| X80   | Yellow |

6. Make note of the connector and pipe grade. The connector's material strength should be higher than the pipe SMYS, except for 110 Ksi connector and P110 pipe.

7. Remove thread protectors.

8. BlueDock® AARK2 protectors are in two parts: the thread / seal protector and the bumper ring. When handling and / or storing pipe both parts must be correctly installed to pin and box to prevent damage to the connector, AARK2 and their housing.



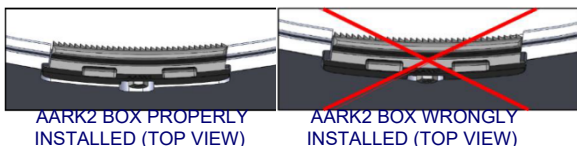
9. Check that three AARK2 are correctly installed in the pin and box. Refer to Inspection section 9 for details.
10. Check if Pin side AARK2 bolts are tight. If loose, tighten the bolts with a 10 mm socket wrench. Do not apply excessive force.
11. Check if Box side AARK2 bolts are tight. If loose, tighten the bolts with a 10 mm socket wrench. Do not apply excessive force.
12. Ensure the connectors are clean and free of all debris and / or contaminants. Cleaning methods should conform to GDL23349.
13. Visually inspect threads, shoulders, retainers and seal areas prior to running in accordance with field inspection guideline GDL31457. Ensure no damage is evident.
14. Pipe should arrive with the O-ring and AARK2 installed. If not, verify that compatible O-rings and AARK2 are available.
15. Check the condition and fit of the O-ring (Elastomeric and SWS variants).
16. Ensure spare O-rings and AARK2 are available.

17. Clean, dry then re-install protectors, ensuring they are tight and are not cross-threaded.
18. Never move or handle pipe without the correct thread protectors securely in place.
19. Verify the material grade of all accessories are compatible with the main string.
20. BlueDock® AARK2 connector metal to metal and elastomeric seal variants are not interchangeable.
21. Low Range (LR) and High Range (HR) connectors of the same diameter are not interchangeable.
22. BlueDock® AARK2 connectors are NOT interchangeable with standard BlueDock® or BlueDock® AARK connectors.
23. BlueDock® AARK2 connectors with different wall thicknesses of the same variant are interchangeable within the same LR or HR versions.

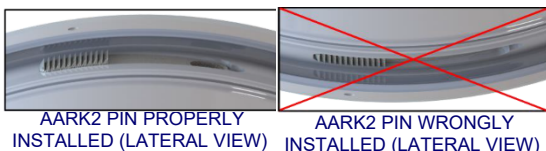
## Inspection

1. Check box and pin connectors for meshes or out-of-round condition. Large OD connectors can be susceptible to handling damage such as meshes, dents or ovality.
2. Visually inspect all connectors in accordance with GDL31457.
3. For inspection of Dopeless® connections, refer to GDL53330.
4. Ensure the pin, box shoulders and retainers are free of dents, tears or raised material that could potentially interfere with correct assembly.

5. Ensure the alignment guide areas are free of gouges or raised material. Refer to GDL31457.
6. Pay particular attention to MTM seal areas. Any damage witnessed is cause for rejection.
7. Ensure the O-ring groove is free of dents, mashes or gouges that could prevent correct installation.
8. Ensure the O-ring is free from abrasions, cuts or tears. If any are found, replace it with a new ring and ensure it is correctly seated.
9. Ensure the AARK2 is installed in the box end at the correct position, with the teeth properly aligned over the alignment guide of the box, as illustrated in the images below.



10. Check that the AARK2 installed in the pin has its teeth positioned above the alignment guide and can move inward freely.



11. Debris on the AARK2 should be cleaned. Small plastic debris from thread protectors can be accepted provided it does not interfere with normal AARK2 function or connector make-up.

12. Debris and contaminants on the protectors should be cleaned and dried. Re-install protectors, ensuring they are tight.

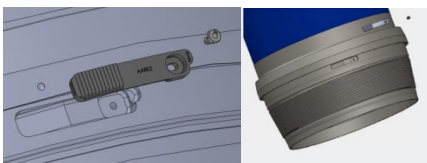
13. Apply anti-corrosion spray on the AARK2 to prevent seizure during storage.

14. Alternatively, storage compound such as Kendex may be applied.

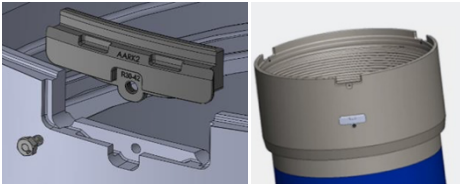
15. Verify the material grade of any pups or accessories is compatible with main string. Pay particular attention to the type of connector on each item and note any differences.



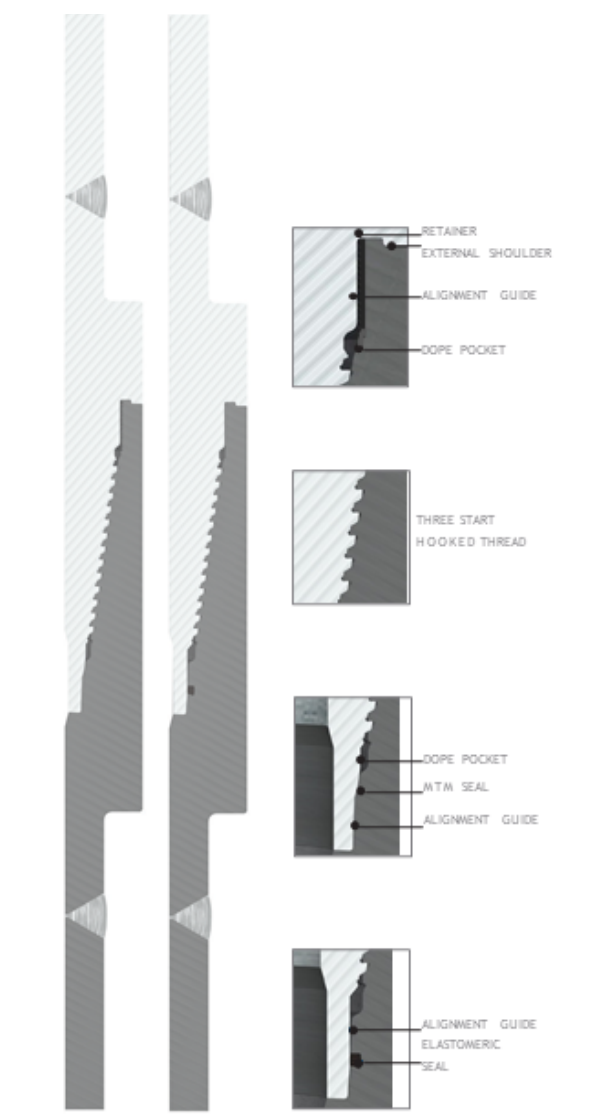
## TenarisHydril BlueDock® AARK2 Configuration



TENARISHYDRIL BLUEDOCK® AARK2 PIN SIDE

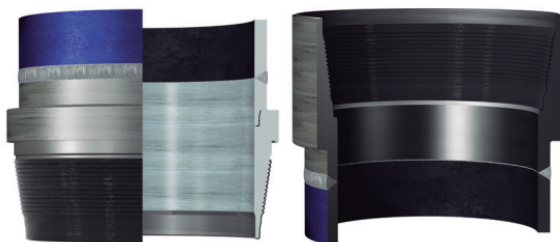


TENARISHYDRIL BLUEDOCK® AARK2 BOX SIDE



## Thread Compound Application

### Doped version



1. Ensure all connector surfaces are free of all contamination / debris and completely dry prior to doping. Ensure any previously applied storage compound is completely removed.
2. Do not use solvents on Elastomeric or Sea Water Exclusion Seals as they may degrade the O-ring.
3. For Tenaris approved thread compounds, refer to document FTD29356.
4. Always use a new unopened pail of running compound, ensuring it is completely homogenized prior to use.
5. **PIN END:** Apply a thin, even coat of running compound, covering the full thread area, seal surfaces (MTM, ELS and / or SWS), pin nose and torque shoulder. The thread form should be clearly visible.
6. Do not apply dope on the dope pocket nor external alignment guide.
7. **BOX END:** Apply an even coat of running compound covering the full thread area, seal surfaces (MTM, ELS and / or SWS) and torque shoulder. The thread form should be clearly visible.

8. Do not fill dope pockets or stress relief groove at box shoulder.
9. Do not pack the O-ring causing dope to encroach under the ring (Elastomeric and SWS variants).
10. For Tenaris approved thread compounds, apply the friction factor indicated in FTD29356. For thread compounds other than those listed, apply the thread compound manufacturer's indicated friction factor.

## Dopeless® version

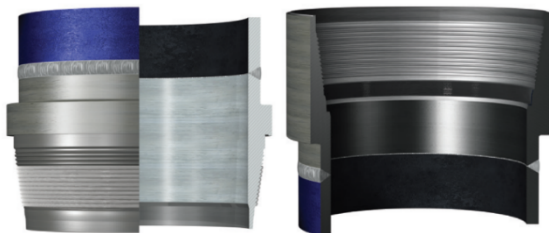
Dopeless® Connections *do not require thread compound for make-up*, except in the case of mixed assemblies as explained in the following section.

### **FOR MIXED ASSEMBLIES (COMBINATION OF THE DOPED WITH DOPELESS VERSIONS)**

1. Remove any storage compound and apply a very thin layer of an approved thread compound on the thread and seal of the non-Dopeless® connection.
2. If a Tenaris approved running thread compound was used as storage compound, remove the excess, leaving only a very thin layer on the thread and seal area of the non-Dopeless® connection. Do not apply thread compound on the Dopeless® connection side.

## Thread Lock Application

### Doped version



1. Ensure the connectors are completely clean and dry prior to applying thread lock.
2. Apply thread lock to 50% of the threads behind the pin seal.
3. Do not apply thread lock onto the seal.
4. Apply thread compound to the SWS area.
5. Apply an even coat of running compound to the box torque shoulder and seal surface.
6. Do not fill dope pockets or stress relief groove at box shoulder.
7. Apply the thread lock manufacturer's indicated friction factor.

### Dopeless® version

1. Remove the coating from the threads on the pin connection where the thread lock is to be applied.
2. Use a hand or rotary brass wire wheel to remove the coating from the threads, ensuring no contact is made

with the seal.

3. Leave the coating on the pin seal, torque shoulder and threads where no thread lock is to be applied.

4. Apply thread lock to 50% of the threads behind the pin seal.

5. Do not apply thread lock on the seal.

6. When assembling Dopeless® Technology connections with thread lock utilize the torque obtained from the tool available at [https://dcp.tenaris.com/Mixed\\_Assemblies](https://dcp.tenaris.com/Mixed_Assemblies).

## Torque Application

1. The use of computer make-up analysis equipment is recommended when assembling BlueDock® AARK2 MTM connectors.

2. Shoulder window for BlueDock® AARK2 connectors can be found in the product data sheets.

3. A BlueDock® AARK2 connector assembles within  $\frac{3}{4}$  of a turn from stabbing to power tight make-up.

4. The presence of the AARK2 does not affect the make-up chart. No disturbance should be seen in the graph. A characteristic noise can be heard during make-up as the AARK2 on the pin pass by the AARK2 on the box; this is normal behavior.

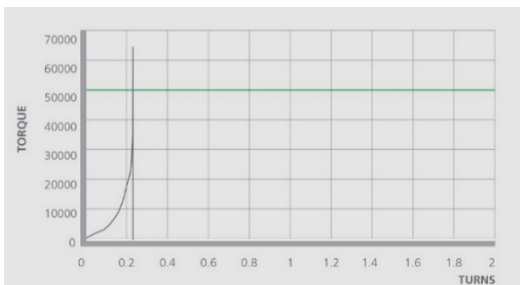
5. For accurate graph definition it is important to set the horizontal scale (turns) to 1 or below.

6. Reference torque should be set at zero.

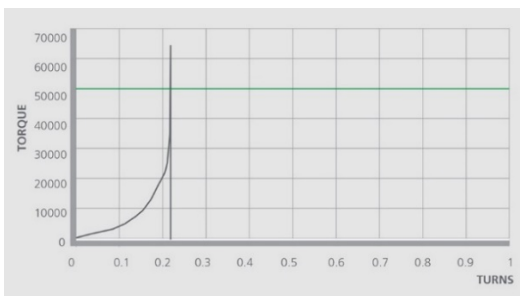
7. Set the dump valve at the optimum make-up torque. Verify its operation on the pipe body prior to first make-up

torque to ensure over-torque protection and achievement of the required torque

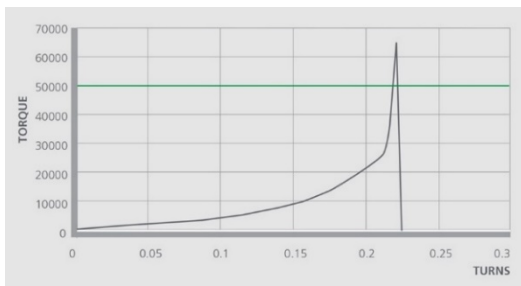
8. The graphs below correspond to the make-up operation of the same connector displayed with three different turn spans. Different profiles can be obtained by changing the turn span of the graph. The second and third graphs provide improved clarity.



Graph window set at 2 turns.



Graph window set at 1 turn.





Graph window set at 0.3 turn.

9. In case the preferred method of computer make-up analysis is not available, use the external shoulder as a visual guide of correct assembly. Verify the gap between pin and box face with feeler gauges, ensuring that:

- A 0.35 mm feeler gauge **does not fit** in any position.
- A 0.30 mm feeler gauge **does not fit** in at least one position.

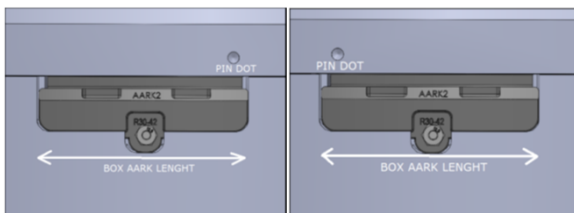
If either of these two requirements are not met, the assembly cannot be accepted.

10. To overcome the torque dissipation caused by combined weight of the extension joint and wellhead housing, it may be necessary to apply maximum torque or slightly beyond when assembling to the string.

## Running

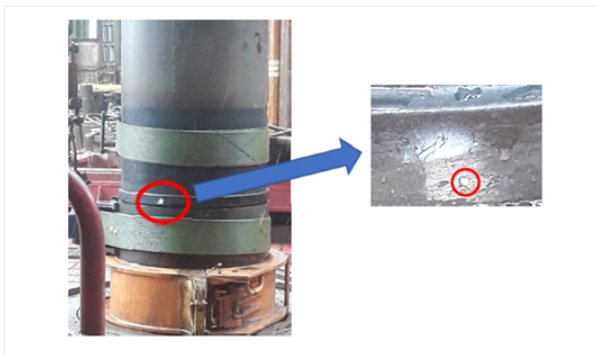
1. Alignment is critical for all pipe running operations, particularly for large OD. Ensure travelling block / top drive is aligned with the rotary.
2. A misalignment of 20% of the connector OD is excessive and should be corrected before proceeding.
3. A stabbing guide is highly recommended to allow controlled, safe stabbing.
4. The use of a weight compensator is recommended.
5. Ensure pipe is stabilized during stabbing and make-up, this is especially important in windy conditions and/or if running on a floating installation.

6. Stab pipe in a smooth controlled fashion, ensuring elevator is slackened off from the connector.
7. Once stabbed and stabilized the make-up should be conducted in a single continuous operation without starts and stops until optimum torque is attained. Never rotate the pin end counterclockwise with AARK2 installed.
8. Apply Low gear and make-up below 5 RPM but no slower than 2 RPM.
9. Apply the torque indicated in the appropriate data sheet ensuring an acceptable make-up is attained as previously described.
10. Check correct alignment of pin and box AARK2. The "drilled" dot on the pin should fall within the box AARK2 length. White spray paint may be used to make the dot position more visible.



**PIN DOT MINIMUM  
ACCEPTABLE POSITION**

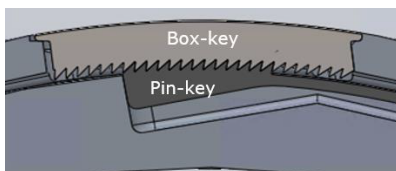
**PIN DOT MAXIMUM  
ACCEPTABLE POSITION**



11. Once assembled scribe a longitudinal line across both connectors as a visual reference.
12. If a situation arises where an O-ring and / or AARK2 require replacement, do so away from the well bore.
13. When using spider type elevator check bottom guide ID to ensure free pass of connector box side.

## Activation of Automatic Anti Rotational Key (AARK2)

Automatic Anti-Rotational Keys (AARK2) activate automatically during the make-up **without human intervention** by self-engaging the pin-key teeth with box-key teeth.

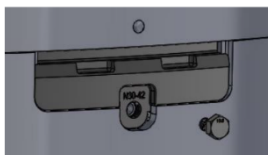


AARK2 ENGAGED AFTER MAKE-UP

If an AARK2 is damaged, it should be replaced with a new one.

## De-Activation of Automatic Anti Rotational Key (AARK2)

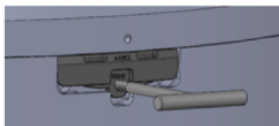
1. To de-activate the AARK2, use a 10 mm socket wrench to loosen the bolt in the box-side AARK2.



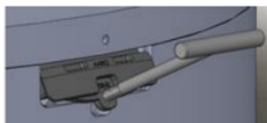
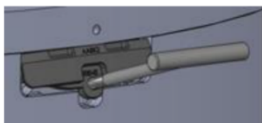
2. Remove the bolt and move the AARK2 upwards to release it from the pocket in the box housing. If after removing the bolt, the AARK2 does not move freely upwards, position a chisel in the AARK2 slot and apply controlled force to move it upwards.



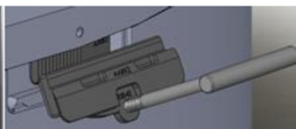
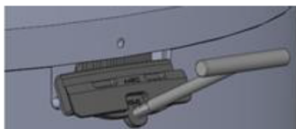
3. If the AARK2 still doesn't come out, use the M8 T-bolt (or M8 bolt) to remove the AARK2 as illustrated in the following images:



**SCREW THE T-BOLT INTO THE AARK2 FEMALE M-8 THREAD**



**TURN THE T-BOLT UPWARDS**



**USING THE T-BOLT, PULL THE AARK2 DOWNWARD AND OUTWARD TO REMOVE IT FROM THE HOUSING.**

4. Repeat the same sequence for the remaining two AARK2, removing all of them

5. If the AARK2 is engaged, it shall be released by applying a bump torque in the make-up direction. The recommended bump torque is the optimum torque.
6. If the AARK2 is not released on the first attempt, the torque value may be increased until relative movement between the pin and box is observed. Do not exceed the maximum make-up torque.

## Pulling

1. Alignment is equally as critical for pulling as it is for running pipe.
2. Ensure travelling block / top drive is aligned with the hole, 20% misalignment is excessive and should be rectified before breaking out the connection.
3. The use of a weight compensator is recommended.
4. Ensure all AARK2 are deactivated.
5. Remove the three AARK2 in the box only.
6. Do not attempt to break out the connection with AARK2 installed as this will require very high torque and will very likely result in damage to both thread and/or AARK2.
7. Back up tong, if used, should be placed on the pipe body.
8. Break and spin out speed should be below 5 RPM.
9. Ensure vertical stabilization of the pipe when breaking and spinning out.
10. When rotating out, use the previously scribed alignment marks as reference to prevent connector bumping.

11. Stop rotation when marks are aligned.
12. Do not over-rotate or allow the pipe to spin on the last engaged thread, as this may cause thread damage.
13. A stabbing guide is recommended to guide the pin out from the box when picked up.
14. Stabilize and control pipe movement while lifting the pin out of the box.
15. If the pipe is to be stored, completely cover the AARK2 and their slots with storage compound to prevent corrosion.
16. Apply storage / thread compound to pin and box connectors to prevent corrosion, including any rejects.
17. Re-install clean, dry thread protectors securely.

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