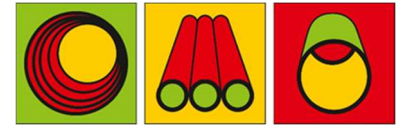


TPS Techniseal

Running Procedure

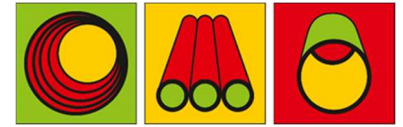
Pipe Preparation & Running Procedures
(all Types and Grades)





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1. Introduction

Running TPS Techniseal premium connections is characteristic of running several alternate premium connections that are common in the market.

1.1 General

1. Take care against damage (dropping, hit e. g.).
2. Use enough non-metal-timbers for storage under each layer of bundles/tubes.
3. Never place the timbers at the Connection Area => ensure distance from both ends.
4. Place timbers for each layer equally spaced and in the same position to avoid bending from weight.
5. If tubes are bundled without distance pieces => ensure that the distance from tube ends to the straps is enough to avoid bending, caused by different diameters.
6. Never place wrenches or tongs at PIN-End or BOX-End Areas to avoid deformation.

Note: Reference Appendix A, Pipe Storage and Bundling

2. Equipment & Pipe preparation

In order to ensure connection performance, it is extremely important to follow the guidelines recommended so as to apply the running and thread lock compound properly. Before applying the thread compound on the connections, ensure that the connections are thoroughly clean and dry.

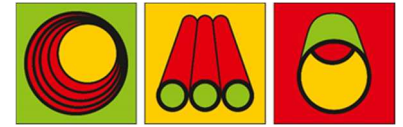
Note:

The thread, the sealing area and the torque shoulder on pin and coupling have to fulfill the geometrical requirements, be clean, without damage and free of burrs.

The coupling has to be phosphated or copper plated (depending on material grade).

Pipes with the dimension of $\geq 5"$ or >80 ksi have to be phosphated on the pin end.

Handling plugs should be installed at all times when the pipe is moved to or from the rig floor.



2.1 Alignment

1. Check the traveling block and rotary hole alignment.
2. Check centerlines of the suspended pin over the box, making adjustments if necessary.

Torque application

The recommended torque values for **TPS Techniseal** connections should always be used. Updated torque values can be found on our website: www.tpsd.de

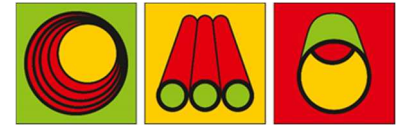
When combining different weights or different grades, use the lower of the two torque values.

2.2 Pre-running

1. Locate and inspect all necessary accessories and tools on location, such as: pup joints, crossovers, float equipment, stabbing guides, handling plugs, single – joint elevators, thread compound, etc.
2. Verify interchangeability with size, weight and connection type.

2.3 Drifting

1. Be careful not to damage connections during drifting operations.
2. Drifting should be done prior to cleaning or inspecting the connection.
3. Blow out the pipe ID from box to pin to completely remove loose mill scale and accumulated debris.
4. Ensure drift mandrels conform to API dimensional requirements or specified special drift requirements.
5. Drift from box to pin.
6. For drift testing internal plastic coated tubes use non-metallic-mandrels, only.



7. A non-ferrous drift is required for Chromium Steels.
8. Pipes that does not pass the drift test should be marked with a red paint band on either side where the drift is sticking and then laid aside for further investigation. „No drift“ should be marked on the pipe to avoid confusion with other types of damage.

2.4 Cleaning

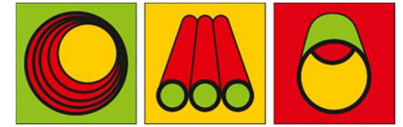
1. Thoroughly clean and dry the connections using one of the following methods:
 - A nonmetallic brush and cleaning solvent.
 - Steam clean with water and cleaning solvent.
 - A rotary bristle brush with jetted water and / or cleaning solvents

Note: Diesel is not recommended as a cleaning solvent.

2. Wipe or blow out solvents and / or water from the thread roots and from the bottom of the box. During freezing weather, be careful to ensure that no moisture remains on the connection. Ice may prevent proper seal and shoulder engagement during make – up.
3. Cleaning Operations must comply with the Environmental Regulations.

2.5 Inspection

1. Pipes should be situated so that the joints may be rolled 360 degrees to facilitate complete cleaning and inspection on a rack ca. 1 m high.
2. Inspect all connections for damage such as out-of-round, handling damage, dents, mashed areas, rust and scale. Seal areas must be free of longitudinal or transverse cuts, scratches, corrosion pitting, rust and scale.
Segregate and label properly all pipes with suspect connection damage. Further evaluation and hand repair must be performed by a TPS Field Service Specialist. Records should be kept on all repairs and rejects.

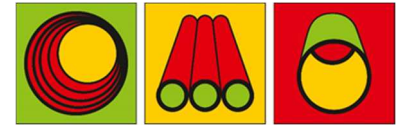


2.6 Connection preparation

1. Handle all pipes with thread protectors in place.
2. API modified thread running compound is recommended for **TPS Techniseal** connections.

Caution:

- the thread grease has to be stirred well prior to use (Oil-remains are not acceptable)
 - the thread grease and the brushes have to be clean
 - no foreign particles shall be applied
3. When the service temperature exceeds 120°C use a thermal grade running compound.
 4. In freezing temperature use an Arctic-grade running compound. The compound should be free of water and ice particles and kept warm in the dog house or with a warming device.
 5. When running "TR" (Teflon Ring) connections:
 - When running used tubing: Remove the used seal ring if damaged carefully, without using sharp edged tools, be careful that the internal coating and the seal are not damaged.
 - Use only new seal rings.
 - The seal ring groove on the BOX side must be clean.



3. Running

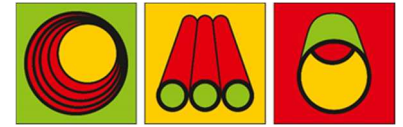
Collar-type elevators are recommended.

1. Bottleneck elevators are not recommended.
2. Single-joint elevators are recommended as they improve stabbing alignment and promote safer operations. When running the connections, ensure elevators are bored to the appropriate diameter and are used in conjunction with handling plug.
3. A modern single length weight compensator is highly recommended.
4. Check the traveling block and rotary hole alignment.
5. Power tongs are required for final torque application. Dies that are improperly mounted or poorly maintained can damage the pipe body. Torque measurement equipment must be calibrated.
6. The use of the torque turn monitoring system is absolutely necessary/rule. Verify the calibration dates on the torque turn equipment load cells.

3.1 Handling

Handle all pipes with thread protectors in place.

1. If pipes are to be left on the rack for an extended period of time prior to running, apply a suitable compound to the thread and seal areas. Place dry, clean and damage-free thread protectors on all connections.
2. Any accidental mishandling is cause for re-inspection of connections.
3. Before rolling or hoisting, install a handling plug (without seal elements) in the box end and ensure pin-end protectors are in place. Boxes that will not accept a handling plug should be set aside.



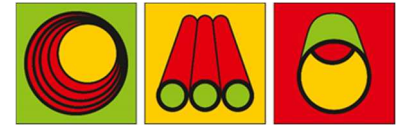
3.2 Stabbing

1. To prevent damage from accidental mishandling, the pin thread protector should not be removed until the joint is ready to stab.
2. While the pin is hanging in the derrick and the box is suspended in the rotary table, remove the pin protector and handling plug. Clean and re-inspect the connections if conditions warrant.
3. The tubes must be aligned with each other (elevator alignment) during stabbing and screwing, make adjustments if necessary.
4. Apply a light even coat of thread compound to the **TPS Techniseal** box and pin. Apply enough compound to evenly lubricate the threads and seals but do not allow large amounts to accumulate in the connection shoulders or fill more than 1/3 of the thread height. Do not apply any foreign matter, keep clean/protect the thread dope and the brushes used.
"As much as necessary, as little as possible!"

Note: The recommended thread compound quantity is mentioned on Appendix C

5. Ensure that stabbing guides are used and connections are carefully stabbed.
6. Very slowly, lower the joint hanging in the derrick. Carefully stab the pin into box and turn the pipe by hand or strap tong at least three (3) turns, to be sure that the thread section engaged.

Note: If no single length weight compensator is available, we recommend marking the outside surface of the PIN and BOX connections to show the start of the thread run in. These mark must line up whilst stabbing and must be visible while using the stabbing guide (this is to ensure a large bearing surface on the threads for the weight of the tube).

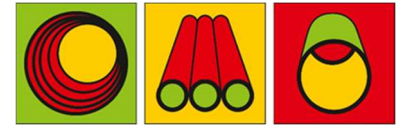


3.3 Make up

1. Power tongs are required to obtain final recommended torque values. The capability of the bucking unit (size- and torque range) should be suitable for the actual running operation. Torque values of Data Sheets may need to be adjusted by running compounds friction factor if it is different to 1.
2. Hand make-up at least three (3) turns is required. To extend the life of connection it is recommended to make up the pin into the box by hand or, if necessary, with a strap wrench with a smooth even motion.
3. Position the power tongs on the pipe so that the tongs and backups are sufficiently above and below the free connection end. The rotating speed has to be variable and shall not exceed 5 rpm until a short distance to the seal area. The final rotating speed (seal area up to torque shoulder) should be 2-3 rpm and should be made in low gear.
4. During make-up, the graphical torque turn diagram has to be observed. The connection-typical chart shows a slight increase during the thread make-up (see picture 11). As soon as the sealing areas come into touch, the graph will show a steeper climb (see picture 12) until the torque shoulders come into contact and a very steep rise of the graph up to the required shut-off-torque can be seen (see picture 13). The final torque varies with reference to the turning speed. The requirements of the make-up-process are fulfilled, if the DT. Torque-value is at least 50% of the required minimum torque and the flat portion (up to engage of shoulder contact) is at least 10% of the prescribed minimum torque.

Should a graph show an untypical course, the connection has to be unscrewed and the contact-areas of coupling and tube inspected for damages. The set-up of the machine has to be checked and, if necessary, corrected.

5. While making up, the upper end of the pipe must be held aligned. The power tong lead line must be 90° to the power tong for the working position (if applicable). The hanging line must be straight up in the working position → otherwise bending will negatively influence the connection as a result of the tong weight.
6. If the pipe has a tendency to wobble greatly during make up due to harmonics, wind, or rig motions, reduce the make up rotation speed to prevent damage.
7. Always check that make up acceptance criteria are met.



Note: When making up accessories, verify that both the power tong and back up tong have the correct diameter and grip properly. Incorrect tong dies or size can deform or damage the pipe body.

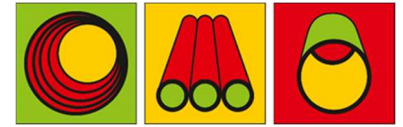
Note: Reference Appendix B for torque graph acceptance criteria.

4. Lowering

1. Pipe should be picked up and lowered carefully. Care should be exercised in setting floor slips to avoid shock-loading the string.
2. Ensure the elevator slips are set well below the connection area.
3. Keep the handling plug in the box connection until the joint is lowered and set in the floor slips. The plug will help keep drilling mud off the thread and seal areas if overflow occurs.
4. If fill-up is required during running, the handling plug should be left installed in the box to prevent the fill-up hose from damaging box threads and seals.
5. Do not hammer on the box to break the handling plug free. If necessary, hammer on the handling plug flang.

5. Pulling

1. The weight compensator should be used to avoid thread damage.
2. Use power tongs in low gear at no more than 5 RPM to break out connections.
3. Do not hammer on connections to assist breakout as this may damage the pipe or connections.
4. During breakout and spinout, the pipe must be vertical and allowed to spin freely, which may necessitate slacking off or unlatching elevators.



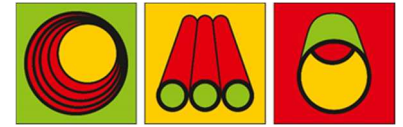
5. Excess torque during breakout or irregular rotation speed indicates poor alignment that may cause damage. Any rotational movement should be stopped until the cause is determined and corrected.
6. Take care not to over rotate during back-out so pin connection does not "drop" back into box.

Care should be exercised when lifting the pin out of the box. Maintaining breakout rotation and keeping the pin centered in the box when disengaging can prevent thread hang-up and damage

6. Storage

1. Handle all pipes with protectors in place.
2. Immediately after pulling the tubes out of the well, clean all pipes thoroughly to remove corrosive fluids from the outside and from the internal bore.
3. The disengaged connections should be cleaned to remove dope, mud and corrosive fluids, dried and preserved with standard anti-corrosion compound and protected against damage with clean, undamaged thread protectors.
4. Rejected connections must be properly marked.
5. Pipes which are EMI / Flux Leakage tested after use must be demagnetized.

Note: Damaged connections also require protection, after inspection, the damage may be field-repairable. Failure to apply protectors or storage compound may render the connections unsuitable for field-repair and they then need to be recut or scraped.



High Chrome Steel Tubular Handling and Storage Procedure

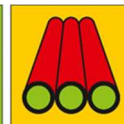
At high-alloy tubes (*chrome content 9%, 13% and higher, CRA = Corrosion Resistant Alloys*) the following additional requirements should be considered for handling, transport and storage (*suitable packaging material should be used*) to avoid contact corrosion.

Forklift forks	→ should be protected with plastic
Belt / sling	→ Nylon or protected by plastic
Storage separators	→ use of hardwood or aluminium
Impact protection	→ bumper rings (prevents clashing of tubes during rolling)
Inspection benches	→ plastic, aluminium or wood
Drift mandrel	→ plastic or aluminium
Paint marking	→ no fluorides permitted
Mousehole (mouse hole)	→ covered with plastic
"V Door"	→ protected with plastic or wood

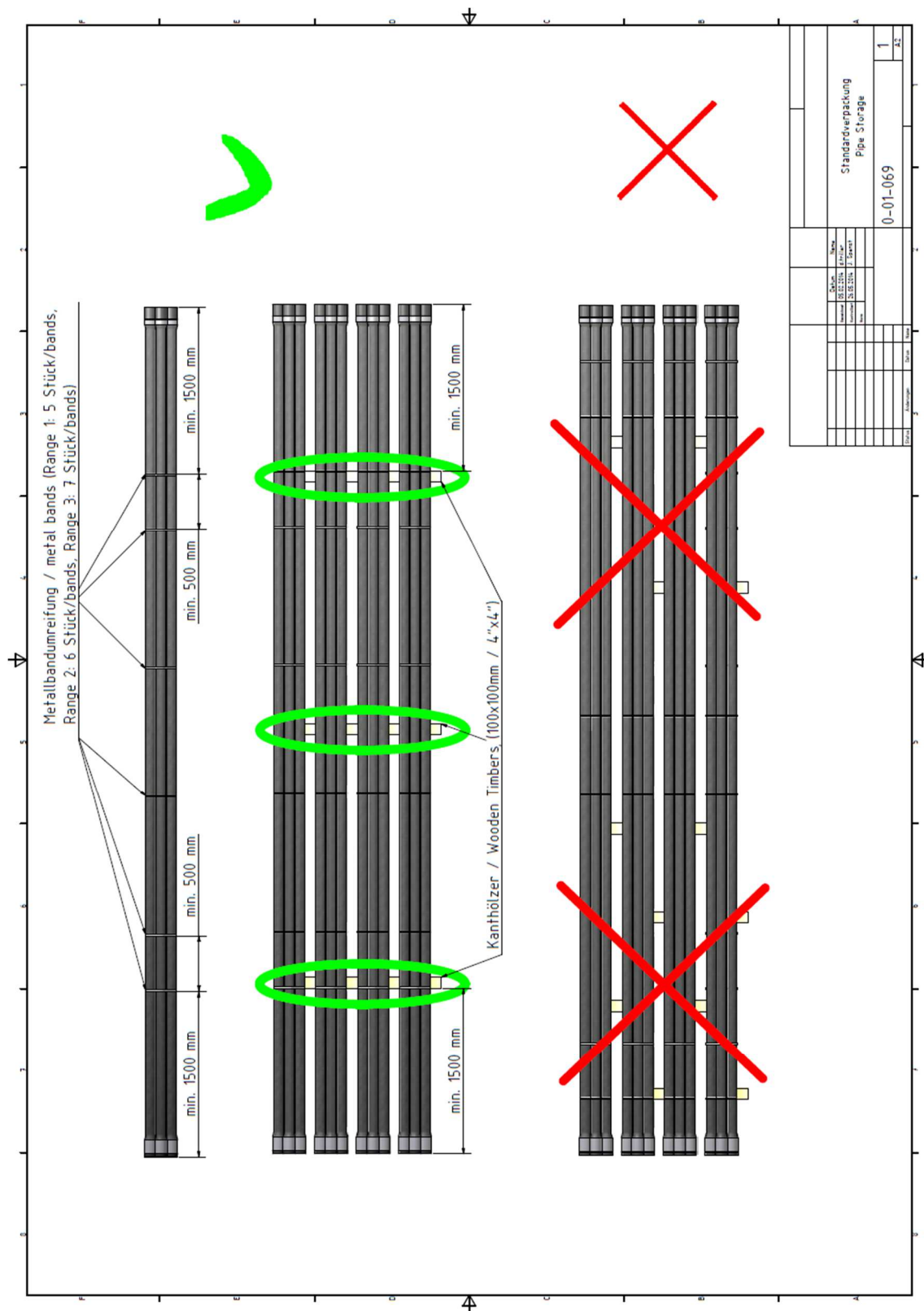
The additional equipment such as backup tong, power tong, tong jaws, Single Joint Weight Compensator etc. should be protected at all contact points and friction points to avoid any contact with carbon steel.

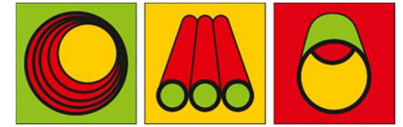
To avoid corrosion and cracks, tubes must be stored in Rap Systems or loose, each layer on top of non-metallic-timbers (three or more, depending on tube length), in dry and clean conditions.

No contact with ferrous metal is permitted.

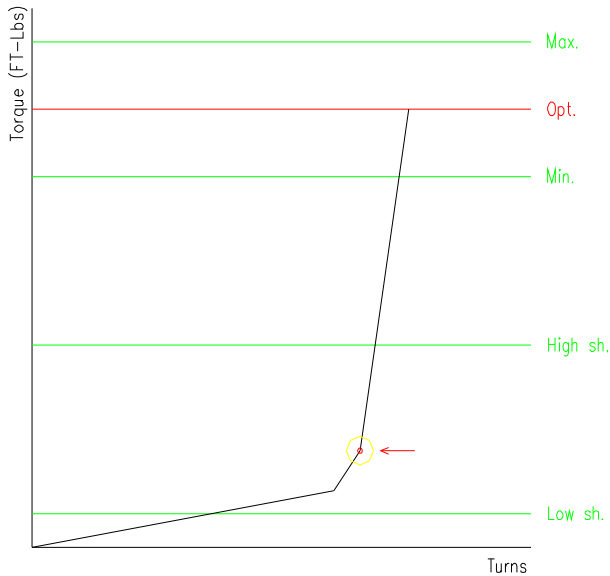


7. Appendix A „Storage“





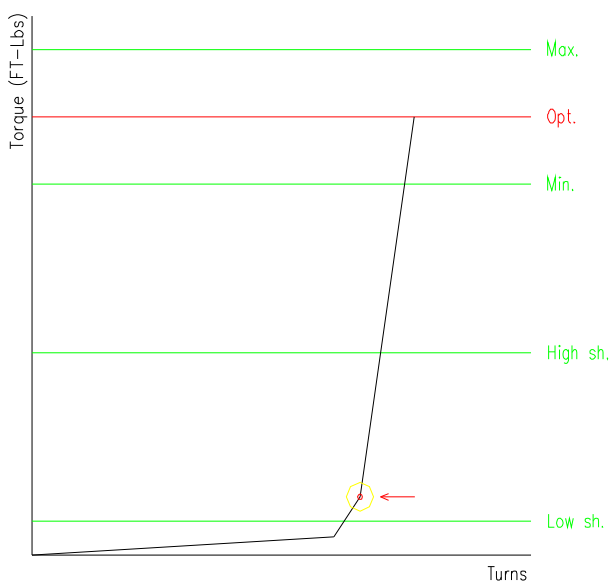
8. Appendix B „Evaluating TPS Techniseal Torque Graphs“



Picture 1.

Occurrence on the product:

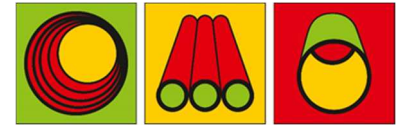
- the graphic shows an acceptable, objection-free make-up process



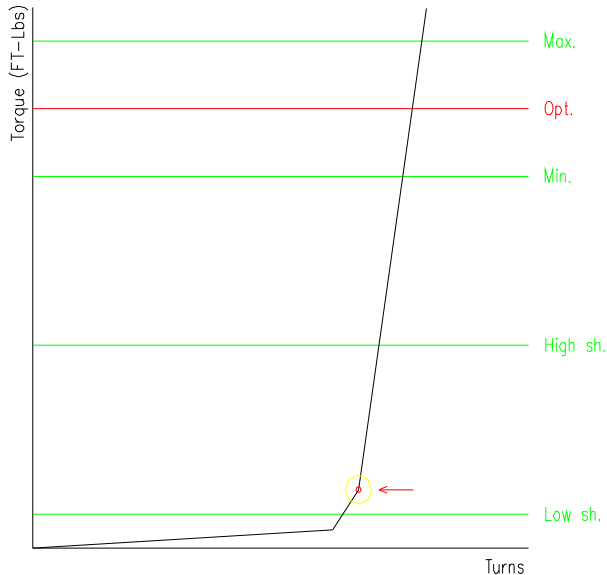
Picture 2.

Occurrence on the product:

- the graphic shows an acceptable, objection-free make-up process



Picture 3.



Occurrence on the product:

- Maximum torque exceeded
→ make-up not acceptable

Possible reasons:

- Dump Torque & Slow Down Torque set too high
- Calibration of load cell not ok
- make-up unit not correctly aligned
- turning-speed too high

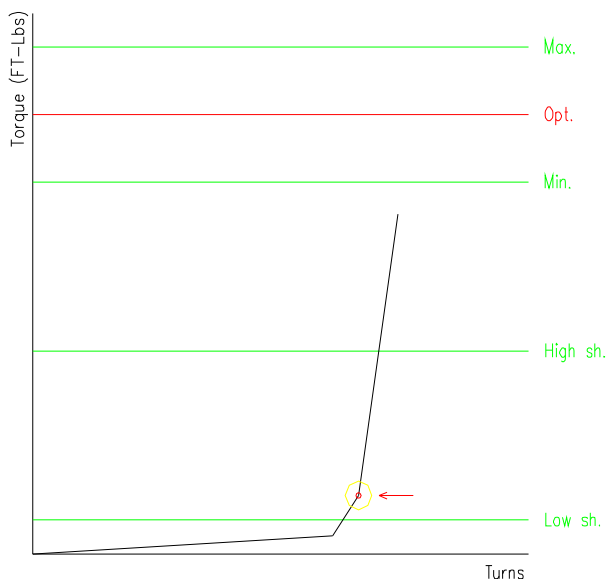
Possible consequence:

- Deformation of Pin & Box
- Sealing cannot be guaranteed
- Connection is not driftable

Corrective actions:

- Completely unscrew the connection
- Pin to be marked as not acceptable and, if possible, recutting
- Coupling to be marked as not acceptable and disposed

Picture 4.



Occurrence on the product:

- required torque not reached
→ make-up not acceptable

Possible reasons:

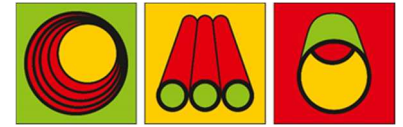
- Dump Torque & Slow Down Torque set too low
- Calibration of load cell not ok
- make-up unit not correctly aligned
- Operator has interrupted the process
- turning speed too low

Possible consequence:

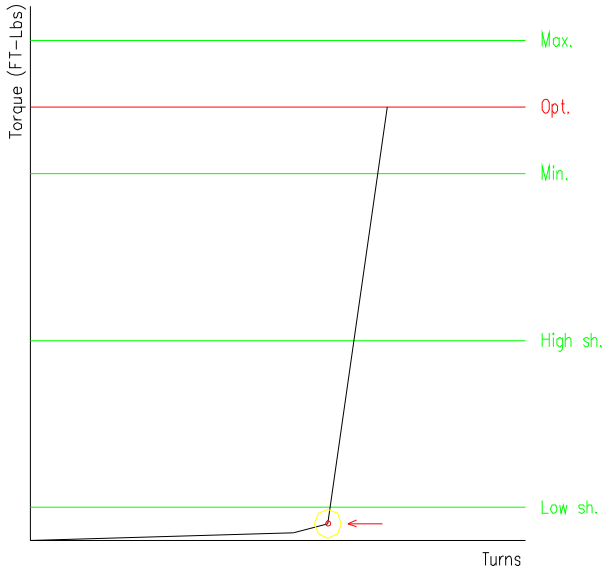
- Sealing cannot be guaranteed
- connection can loosen

Corrective actions:

- Unscrew connection completely
- clean pin & box completely
- visual inspection of pin & box
- if acceptable → re-make-up



Picture 5.



Occurrence on the product:

- Low Shoulder Torque not reached (*has to be $\geq 10\%$ of Min. Torque*)
- make-up not acceptable

Possible reasons:

- Set-up parameters not correct
- Calibration of load cell not ok
- make-up unit not correctly aligned
- thread grease not ok (polluted, not stirred, friction-coefficient < 1)
- turning speed too low

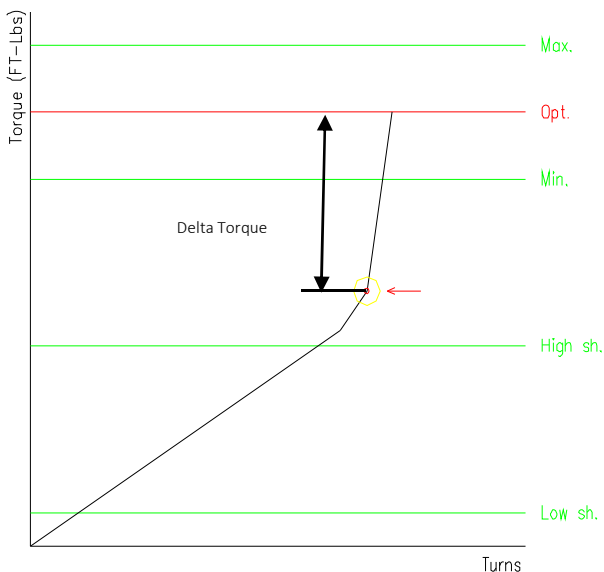
Possible consequence:

- Sealing cannot be guaranteed
- connection can loosen

Corrective actions:

- Unscrew connection completely
- clean pin & box completely
- visual inspection of pin & box
- if acceptable → re-make-up

Picture 6.



Occurrence on the product:

- High Shoulder Torque exceeded (*Delta Torque shall be $\geq 50\%$ of Min. Torque*)
- connection needs to be checked for acceptance

Possible reasons:

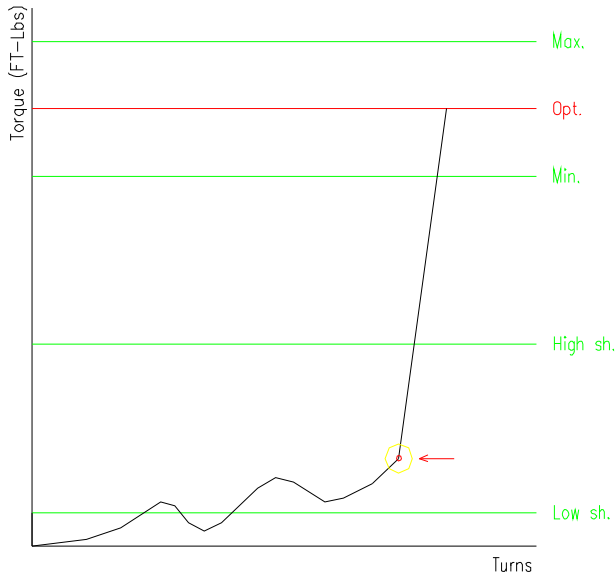
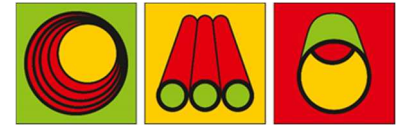
- Set-up parameters not correct
- Calibration of load cell not ok
- make-up unit not correctly aligned
- thread grease not ok (polluted, not stirred, friction-coefficient > 1)
- not enough thread grease

Possible consequence:

- Sealing cannot be guaranteed
- connection can loosen

Corrective actions:

- in case the Delta torque is not reached, the connection has to be unscrewed completely
- clean pin & box completely
- visual inspection of pin & box
- if acceptable → re-make-up



Picture 7.

Occurrence on the product:

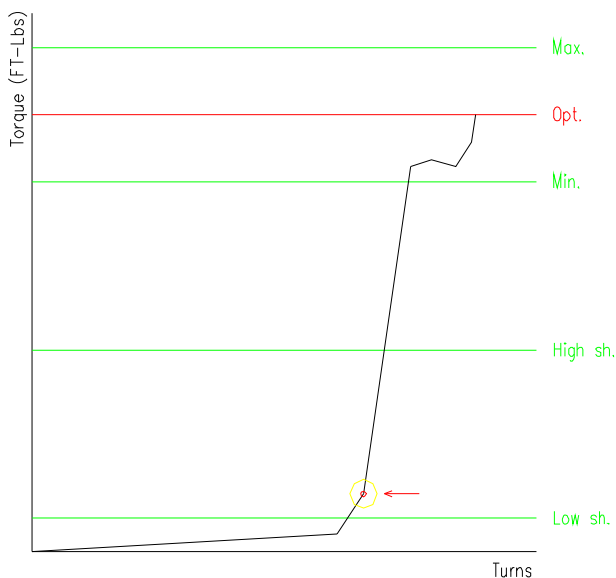
- Humping in the thread area
→ make-up acceptable

Possible reasons:

- make-up unit not correctly aligned
- thread grease not ok (polluted, not stirred)
- hand-tight make-up not carried out correctly
- clamping pressure too high
- wrong tension of the coupling

Corrective actions:

- re-align make-up unit
- for further make-ups consider an optimization of all factors



Picture 8.

Occurrence on the product:

- Humping in the torque shoulder area
→ make-up not acceptable

Possible reasons:

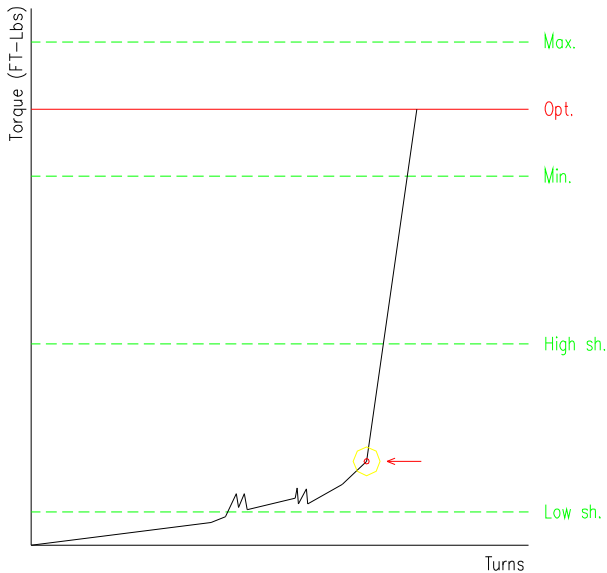
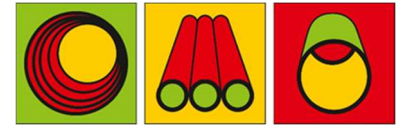
- make-up unit not correctly aligned
- wrong clamps
- clamping pressure too low
- Pipe or coupling has slipped through (Slip Stick)

Possible consequence:

- Sealing cannot be guaranteed
- connection can loosen
- plastical deformation on the torque shoulder

Corrective actions:

- Unscrew connection completely
- Pin to be marked as not acceptable and, if possible, recutting
- Coupling to be marked as not acceptable and disposed



Picture 9.

Occurrence on the product:

- Irregularities in the thread-overlap
→ make-up not acceptable

Possible reasons:

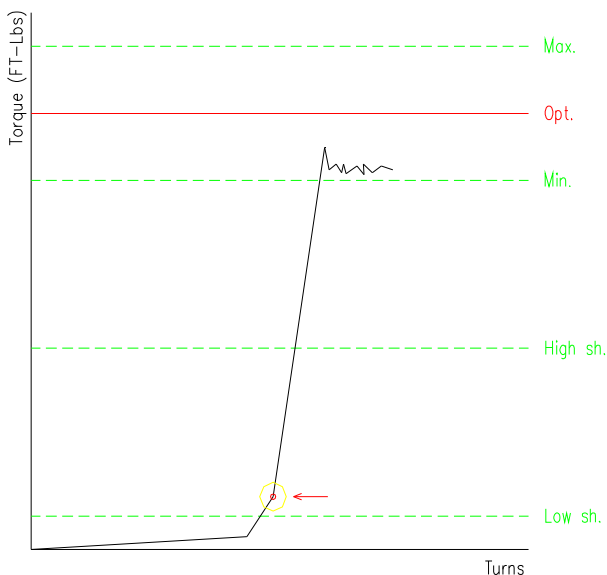
- make-up unit not correctly aligned
- wrong clamps
- hand-tight make-up not carried out correctly
- Pipe or coupling has slipped through (Slip Stick)

Possible consequence

- Sealing cannot be guaranteed
- Galling

Corrective actions:

- Unscrew connection completely
- clean pin & box completely
- visual inspection of pin & box
- if acceptable → re-make-up



Picture 10.

Occurrence on the product:

- Torque decrease
→ make-up not acceptable

Possible reasons:

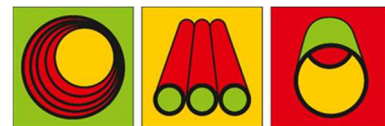
- make-up unit not correctly aligned
- wrong clamps
- Pipe or coupling has slipped through (Slip Stick)
- clamping pressure too low

Possible consequence

- Sealing cannot be guaranteed
- Damage of pipe & coupling

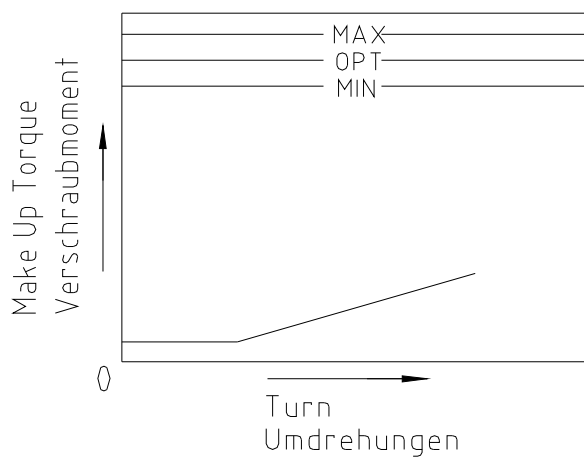
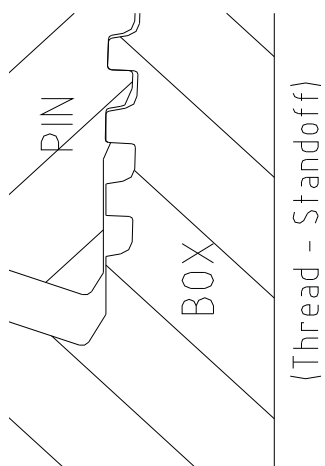
Corrective actions:

- Unscrew connection completely
- clean pin & box completely
- visual inspection of pin & box
- if acceptable → re-make-up

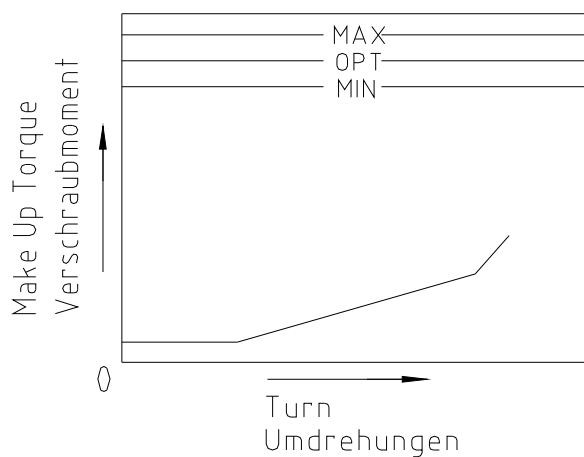
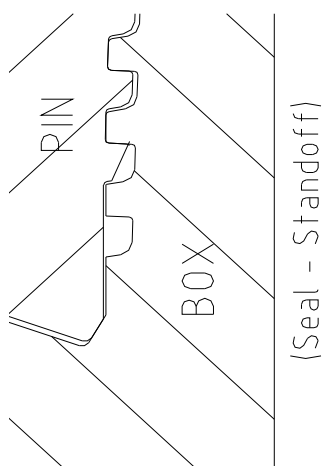


Step by step of the make-up process

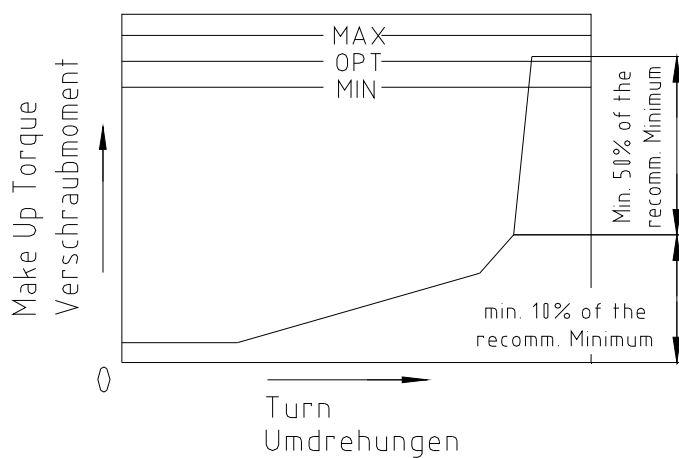
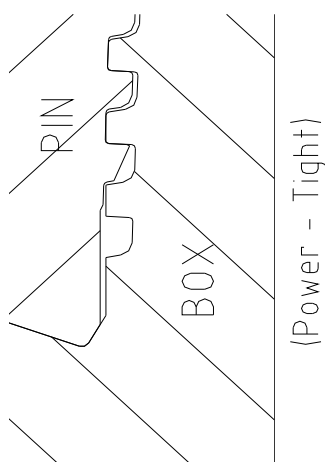
Picture 11

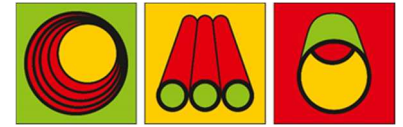


Picture 12



Picture 13





9. Appendix C „Thread Compound“

9.1 Recommended Thread Compound Quantity

Table 1: Recommended thread compound quantity (cm³)

Nom. OD	2 3/8	2 7/8	3 1/2	4	4 1/2	5	5 1/2	6 5/8	7	8 5/8	9 5/8
BOX	6	6	8	9	10	16	17	21	28	41	46
PIN	3	4	5	5	6	8	9	11	14	21	23