# Blue® Series and Legacy Series Make up Acceptance

1. Computer graph interpretation is exactly as described, 'interpretation' which means it is not an exact science. Many things should be taken into account before accepting a graph; condition of pipe, weather, alignment, thread compound, pipe or rig movement, temperature and most importantly the behaviour exhibited by the graphs of the connections previously made up during the run. There are however some basic rules and tenets which if understood along with specific connection mechanics, allow the area of interpretation to remain within anticipated parameters. The following examples are indicative and are only for guidance as to the acceptance of any given connection assembly. Many variables can produce graphs which differ to the ones depicted, which with the correct understanding and knowledge can still be acceptable make up profiles.

2. The accuracy of any make up graph is only as good as the accuracy of the equipment used and the data input. Therefore it is imperative all equipment used is well maintained, calibrated, set up and operated correctly. Data input should be cross checked to ensure accuracy and saved.

3. A computer graph for a shouldered connection can essentially be broken down into four component parts:

- Thread and seal interference build slope.
- Shoulder point.
- Linear delta torque build.
- Delta turns.

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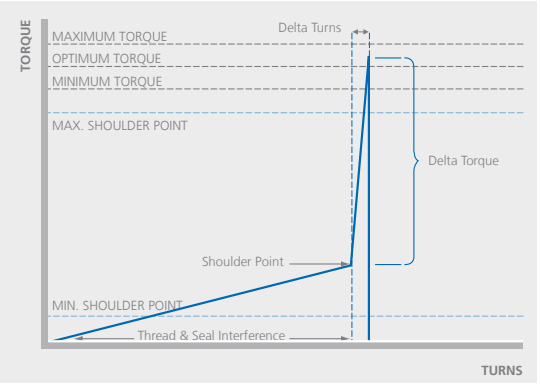
**4.** Individually and collectively the above four components are analyzed within known characteristics for the given connection design in order for the make up graph to be interpreted accurately.




**TYPICAL GRAPH PROFILE**

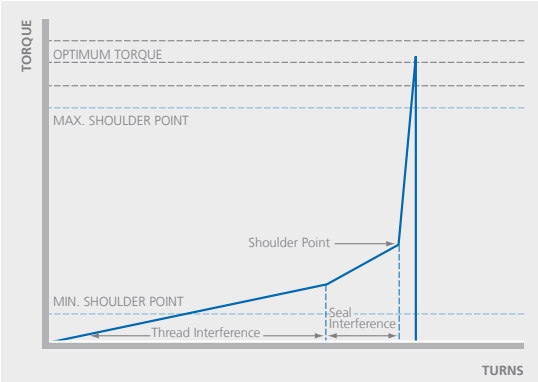
**5.** The four basic component parts of a graph should exhibit the following characteristics:

- Smooth, continuous thread and seal interference build exhibiting no unusual discontinuities.
- A distinct, identifiable shoulder point within set shoulder parameters.
- An exponential delta torque build after shoulder point exhibiting no discontinuities.
- Delta turns within acceptable parameters.

**6.** Encountering high torque at the commencement of rotation or soon after can indicate cross threading of the connections. Immediately stop rotation, back out and inspect the connections for damage.

**7.** Best practice is to spin the connection in without the back up tong gripping the pipe.

**8.** Occasionally some connections can exhibit a change in angle during seal engagement this is perfectly acceptable. This profile may be evident on every make up of a particular string or may occur sporadically throughout the run.




**9.** Although a shouldered connection will exhibit the four component parts described previously the configuration of each make up can vary considerably. Many factors influence the profile of a computer graph; weather, rig movement, pipe sway, travelling block alignment or sway, pipe bend, tong slip, rotation speed, snub line whip, elevator or other equipment contact on the pipe, material grade, temperature, accuracy of the make up equipment, dope type, dope temperature, dope consistency, dope application, dope contamination, dope friction factor and quantity of dope applied. Any and all of which can be a contributing factor to graph profile outcome.

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**10.** It is imperative data is accurately input to the computer and stored correctly. Shoulder points should be accurately pinpointed whether automatically or manually in order to accurately determine delta turns.

**11.** There are many reasons for not accepting a make up graph and therefore breaking out the connection, priority among these is doubt with the integrity of the assembly leading to the connections leaking down hole. Unacceptable graphs require the connections to be fully disassembled with both pin and box connections cleaned and inspected for damage. Only when this process has been completed and no damage found, can the connections then be re-assembled. Partial break out is inadvisable. All graphs should be kept for post job analysis including unacceptable make up graphs.

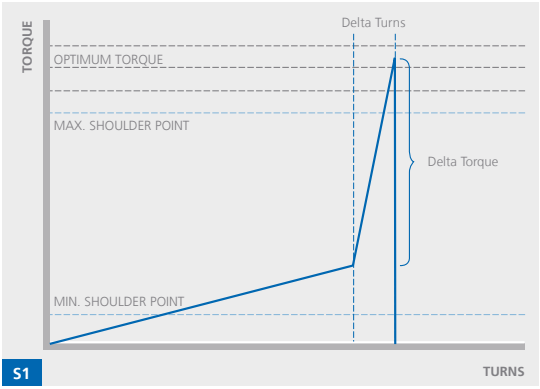
**12.** The following series of graphs, which are by no means exhaustive, are indicative of the many different profiles witnessed, both acceptable and unacceptable. In certain circumstances an anomalous graph profile can be accepted after investigation by a qualified Tenaris Field Service Representative but only within the context of the particular run of pipe it is encountered. This would only be the case if the cause has been identified and is deemed by the representative as non-detrimental to connection integrity. If no remedy can be effected further graphs of a similar type can be accepted during that particular run.

**13.** These graphs are applicable to Blue® Series and Legacy Series shouldered connections. The only difference being; SLX®, MACII™, PH6™, PH4™ and CS® shouldered connections have no defined shoulder point criteria.

**14.** All graph examples indicated are applicable to all variants of Blue® Series and Legacy Series shouldered connections, doped and Dopeless® connections.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES

For Blue® Series and Legacy Series threaded and coupled connections there is a maximum allowable delta turn criteria.




**ACCEPTABLE**

The criteria for maximum allowable delta turn of Blue® Series or Legacy Series threaded and coupled connections is as follows:

- A final torque above minimum and below maximum.
- The maximum delta turn can be no more than:
  - 0.12 turns for sizes 5 1/2" and below
  - 0.10 turns for sizes above 5 1/2"
- Loss of linearity is allowed within the acceptable maximum delta turn.
- For any delta above the defined limit value reject both connections.

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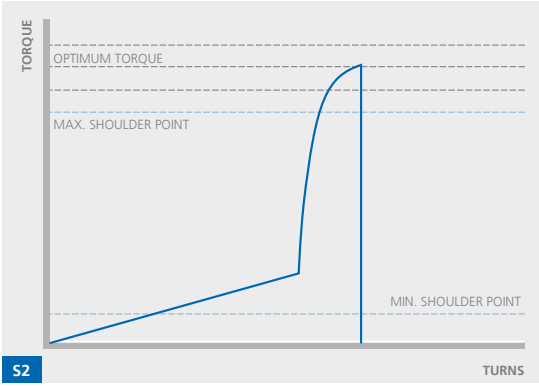
## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES

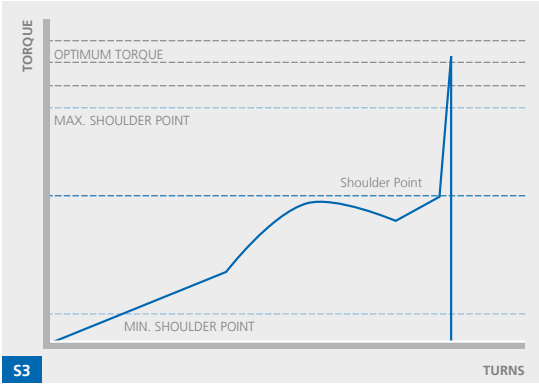



**ACCEPTABLE**

If a graph with a larger than normal delta turn is displayed, with or without loss of linearity, the process to follow is:

- A final torque above minimum and below maximum.
- Expand the graph and ensure the shoulder point is accurately indicated, adjust if necessary.
- If the delta turn limit value is exceeded reject both connections.
- If the delta turn limit value is not exceeded accept the make up.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




### ACCEPTABLE

Thread and seal build profile with smooth hump effect not exceeding shoulder point.

#### Possible Causes

- Excessive running compound
- High friction factor running compound
- Slight misalignment
- Pipe sway
- Rig movement
- Pipe bend
- Contact on pipe by other equipment

#### Recommendations

If no obvious reason is evident break out the first make up and inspect both connections for damage, if no damage found continue to accept similar graph profiles.

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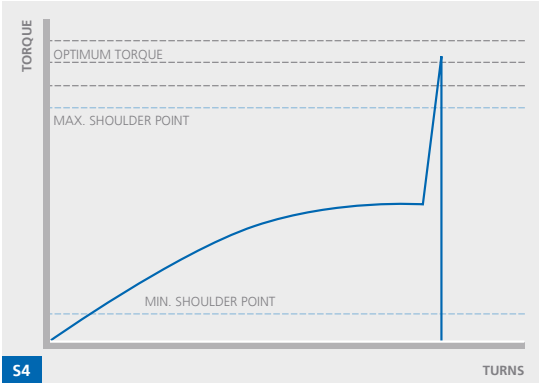
## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**ACCEPTABLE**

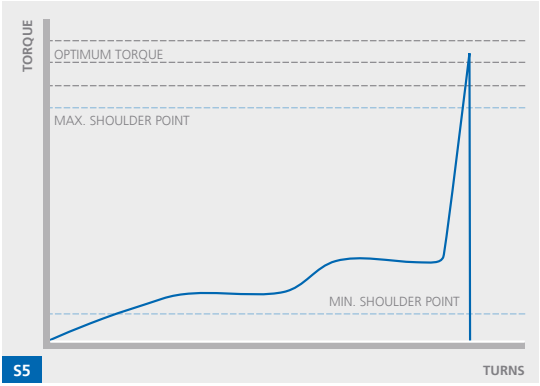
Curved thread and seal interference build with smooth profile.

Possible Causes

- Excess thread compound
- High friction factor thread compound
- Low temperature thread compound
- Pipe sway
- Rig movement
- Pipe bend
- Contact on pipe by other equipment

If compound is thought to be the cause ensure it is fully stirred and warm if possible. Eradicate any contact by other equipment during make up.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




### ACCEPTABLE

Minor, smooth oscillations during thread and seal interference build profile.

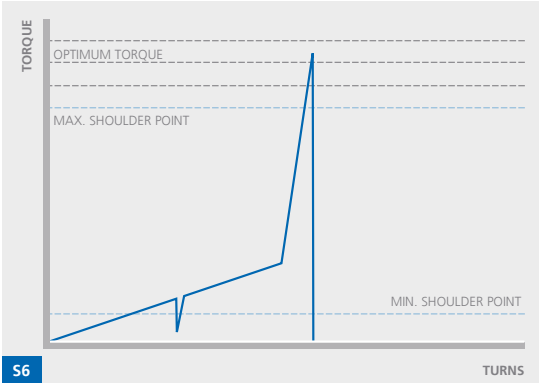
#### Possible Causes

- Pipe sway
- Pipe bend
- Rig movement
- Contact on pipe by other equipment
- Excessive spin in speed

#### Recommendations

Reduce rotation speed if pipe sway, rig movement or pipe bend is the reason.
Stabilize pipe during make up.
Eradicate any contact by other equipment.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**ACCEPTABLE**

Single tong slip during thread and seal build.

### Possible Causes

- Clogged tong dies
- Worn tong dies
- Incorrect dies or tong jaws
- Tong not level
- Snub line movement
- Wet or oil covered pipe OD

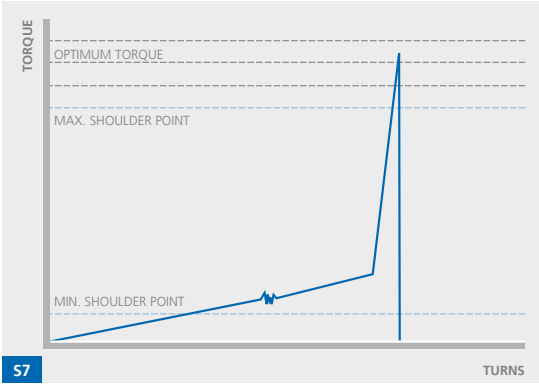
### Recommendations

Accept if the tong slip is momentary and the torque build returns to previous build slope.

### Take action to prevent reoccurrence

- Clean or replace tong dies.
- Ensure tong and back up is level and dies contact pipe OD evenly.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**ACCEPTABLE**

Minor interference during thread interference build.

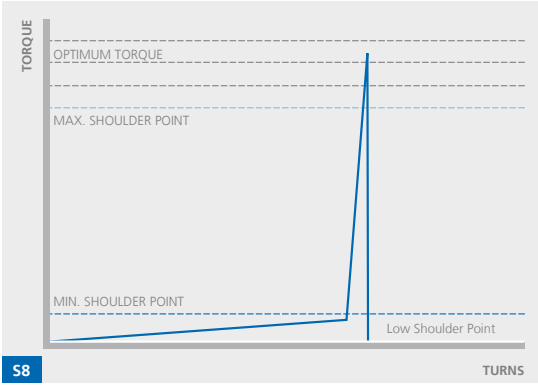
### Possible Causes

- Electrical interference
- Momentary contact on pipe, elevators, etc.

### Recommendations

Identify cause and eradicate if possible.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

Low shoulder point.

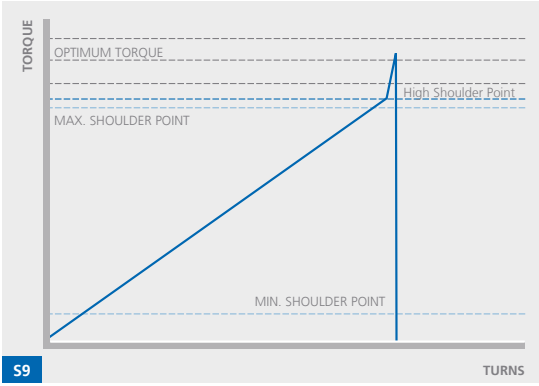
### Possible Causes

- Incorrect torque applied
- Incorrect thread compound friction factor
- Contaminated thread compound
- Substance contamination of connections
- Storage compound not cleaned off prior to application of thread compound
- Other friction reducer
- Incorrect load cell / data reading
- Low thread interference

### Recommendations

- Break out, clean and inspect both connections for damage.
- Ensure connections are cleaned using methods recommended in cleaning section of this document.
- Ensure connections are dry if possible.
- If no damage found decrease amount of thread compound applied, respecting recommended distribution then re-make up connection.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

High shoulder point.

### Possible Causes

- Incorrect torque
- Incorrect running compound
- Contaminated or lack of running compound
- High thread interference
- Incorrect friction factor
- Load cell problem
- Misalignment

### Recommendations

- Break out, clean and inspect both connections for damage.
- If no damage found re-apply thread compound increasing the amount applied respecting the recommended distribution then re-make up connection.

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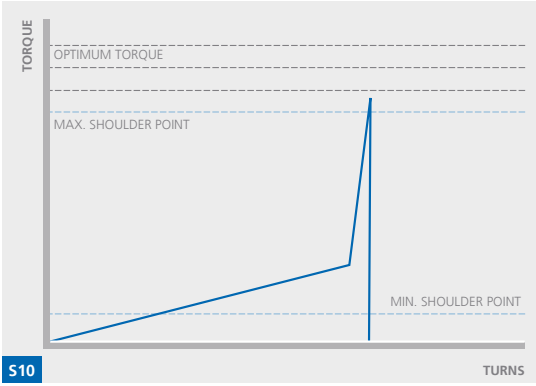
## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

Low final torque.

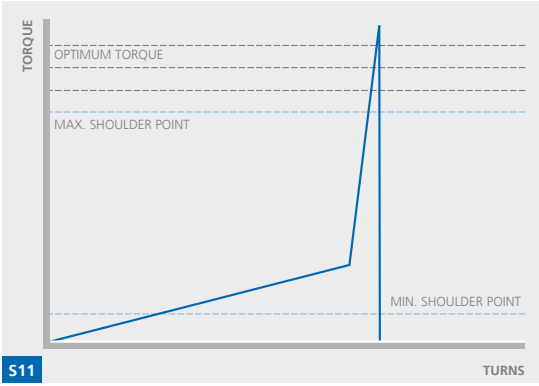
### Possible Causes

- Incorrect torque input
- Incorrect dump valve function
- Load cell error
- Operator error

### Recommendations

- Break out clean and inspect both connections for damage.
- If no damage found re-apply thread compound then re-make up connection.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

High final torque.

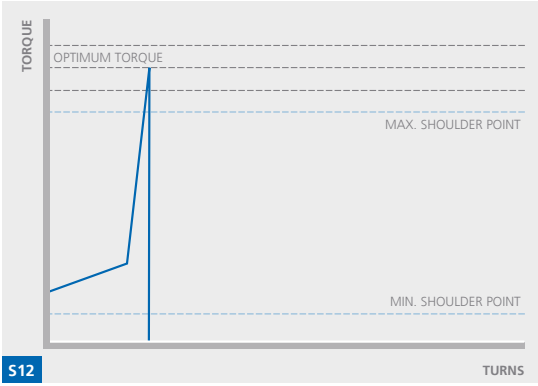
### Possible Causes

- Incorrect torque
- Incorrect dump valve function
- Load cell error
- Operator error
- High momentum

### Recommendations

- Break out clean and inspect both connections for damage.
- If no damage found re-apply thread compound then re-make up connection.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

Short / incomplete graph.

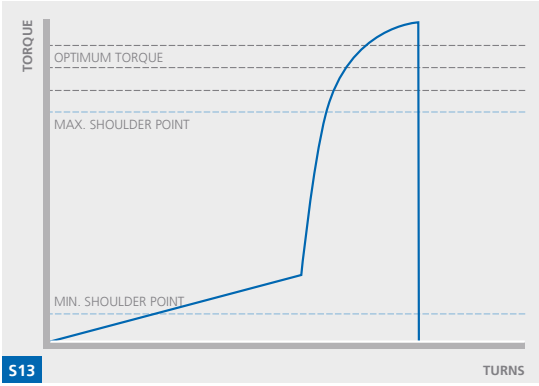
### Possible Causes

- Reference torque set too high
- Late gear change
- High initial interference

### Recommendations

- Break out clean and inspect both connections for damage.
- If no damage found re-apply thread compound then re-make up connection.
- Lower reference torque.
- Stabilize pipe during stabbing and make up.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

Over torque with yield.

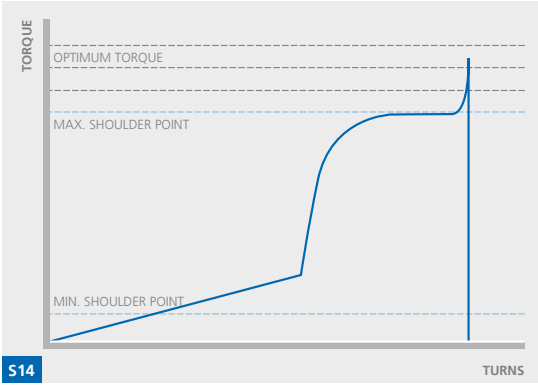
### Possible Causes

- Incorrect torque
- Incorrect thread compound
- Contaminated thread compound
- Storage compound not cleaned off correctly
- Incorrect friction factor
- Disparity of connection grade / weight
- Load cell error
- Equipment malfunction
- Incorrect tong arm length
- Operator error

### Recommendations

Reject both pin and box connections.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

Yielded connection.

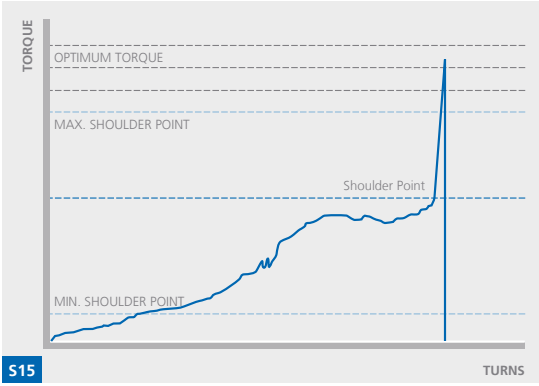
### Possible Causes

- Incorrect torque
- Incorrect thread compound
- Contaminated thread compound
- Storage compound not cleaned off correctly
- Incorrect friction factor
- Disparity of connection grade / weight
- Load cell error
- Equipment malfunction
- Incorrect tong arm length
- Operator error

### Recommendations

Reject both pin and box connections.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

Erratic thread and seal build, indications of galling.

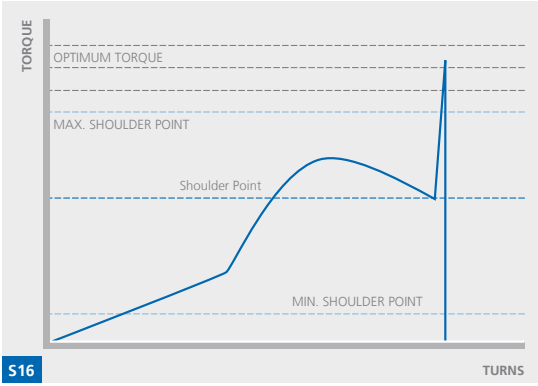
### Possible Causes

- Incorrect thread compound
- Contaminated thread compound
- Misalignment
- High rotation speed
- Pipe movement during spin in
- Damaged threads
- Debris on connections

### Recommendations

- Break out, clean and inspect both connections for damage.
- If no damage found re-apply thread compound then re-make up connection.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

Hump effect exceeding final shoulder.

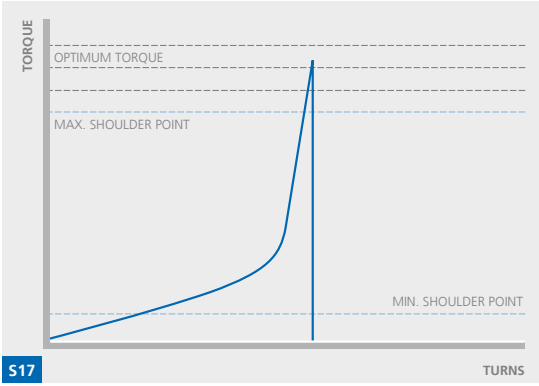
### Possible Causes

- Excessive thread compound application
- Contaminated thread compound
- Debris on connections
- High friction factor thread compound
- Pipe movement during spin in
- External contact on pipe from other equipment
- Misalignment

### Recommendations

- Break out connections exhibiting this profile, clean and inspect both connections for damage.
- If no damage found re-apply thread compound, reducing quantity then re-make up connection.
- Eradicate any other external influence causing this effect.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

Non defined shoulder point.

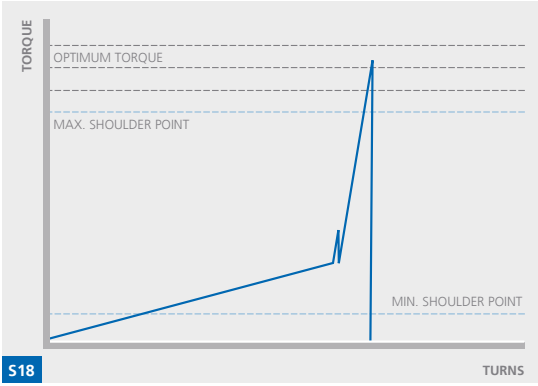
### Possible Causes

- Incorrect torque
- Misalignment
- Pipe movement during spin in
- Debris on threads
- High friction factor thread compound
- Excessive thread compound application
- Slow final rotation speed
- False shoulder encountered

### Recommendations

- Break out, clean and inspect both connections for damage.
- If no damage found re-apply thread compound then re-make up connection.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

Sharp spike or interference prior to shoulder point.

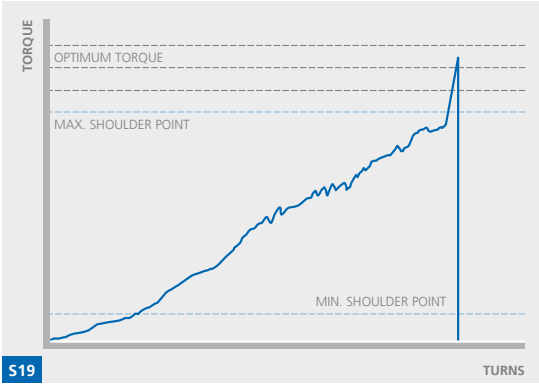
### Possible Causes

- Galling of threads or seal
- Contaminated thread compound
- Debris on threads / seals
- Sudden pipe movement prior to shoulder
- Contact on pipe from external equipment
- Misalignment

### Recommendations

- Break out, clean and inspect both connections for damage.
- If no damage found re-apply thread compound then re-make up connection.
- Eradicate any external equipment contact on pipe.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

High and erratic thread interference.

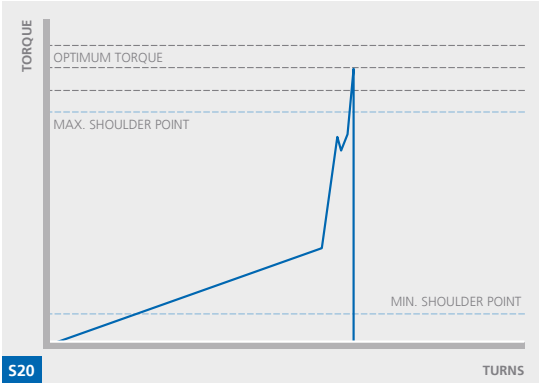
### Possible Causes

- Galled threads
- Contaminated thread compound
- Incorrect thread compound
- Debris on threads
- Damaged threads
- Misalignment
- Crossed threads
- High spin in speed
- Pipe movement during spin in

### Recommendations

- Break out, clean and inspect both connections for damage.
- If no damage found re-apply thread compound then re-make up connection.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

Discontinuous delta torque build.

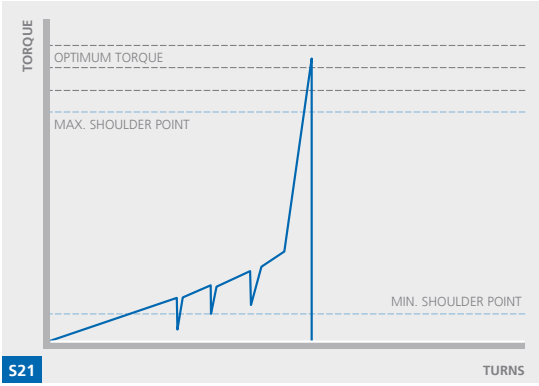
### Possible Causes

- Galled threads
- Damaged threads
- Misalignment
- Crossed threads
- Tong slip

### Recommendations

- Break out, clean and inspect both connections for damage.
- If no damage found re-apply thread compound then re-make up connection.
- If tong slip is the cause clean or replace dies.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

Multiple tong slip.

### Possible Causes

- Clogged tong dies
- Worn tong dies
- Incorrect dies or tong jaws
- Tong not level
- Snub line movement
- Wet or oil covered pipe OD

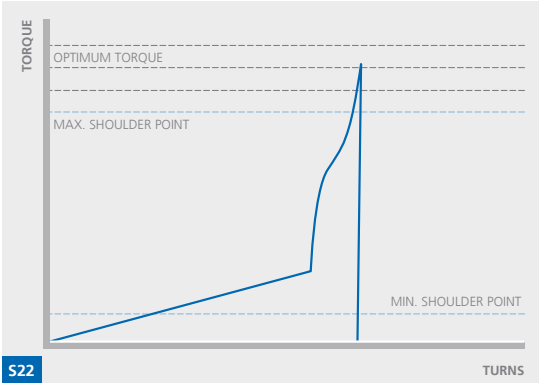
### Recommendations

- Break out clean and inspect both connections for damage.
- If no damage found re-apply thread compound then re-make up connection.

### Take action to prevent reoccurrence

- Clean or replace tong dies.
- Ensure tong and back up is level and dies contact pipe OD evenly.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

Discontinuous delta torque build.

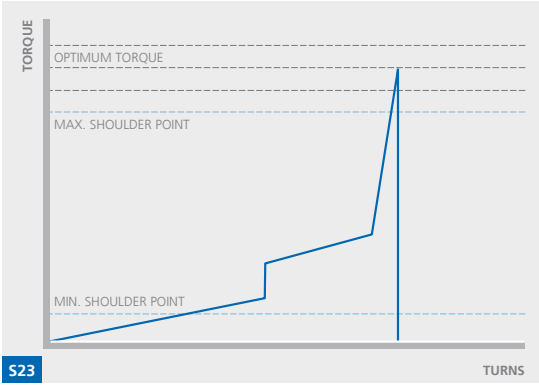
### Possible Causes

- Coupling turn
- Minor yield
- External contact on pipe from other equipment

### Recommendations

- Break out, clean and inspect both connections for damage.
- If no damage found re-apply thread compound then re-make up connection.
- Eradicate any contact from external equipment.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES

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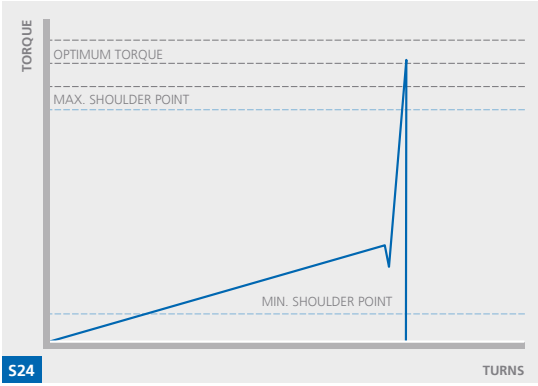
**UNACCEPTABLE**

Turns counter malfunction.

Recommendations

- Break out, clean and inspect both connections for damage.
- If no damage found re-apply thread compound then re-make up connection.
- Remedy turns counter malfunction.

## COMPUTER GRAPH BLUE® SERIES AND LEGACY SERIES




**UNACCEPTABLE**

Dip Prior to Shoulder

Possible Causes

- Minor back up tong movement just prior to shoulder
- Back up tong not completely level

Recommendations:

- Break out clean and inspect both connections for damage.
- If no damage found re-make connections.
- Adjust back up tong to prevent reoccurrence.