PREMIUM CONNECTION PERFORMANCE DATASHEETS MANUAL

TenarisHydril

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Premium Connection Performance Datasheets

INTRODUCTION

This manual has been prepared with the purpose of clarifying the concepts and terminology contained within the TenarisHydril Premium Connections Datasheets.

The application allows users to access to all relevant data pertaining our TenarisHydril pipe and premium connections, by application or dimension and in imperial or metric units.

1. APPLICATION FUNCTIONALITIES

New features of the Premium Connection Perfomance Datasheet application include:

I. Easily access the Premium Connection Performance Datasheets on a desktop, tablet or smartphone.

II. Choose how to find the appropriate TenarisHydril premium connection for your application; by geometry, application or drift.

III. Select up to five TenarisHydril premium connections for an in-depth comparison with the capability to print the comparison for later evaluation.

IV. Request further information directly through the data sheet: Tenaris representatives can discuss any specific technical queries.

V. Share a datasheet via email.

VI. Export documents in two different formats: PDF and Microsoft Excel.

VII. Print in US letter or A4 formats.

VIII. Navigate the datasheets in eight different languages: English, Spanish, Portuguese, Italian, Chinese, Arabic, Russian and Romanian.

IX. View the connection details directly from the datasheet including: blanking dimensions, the connection page on Tenaris.com and case studies.

2. TECHNICAL CONSIDERATIONS

I. Utilize the TenarisHydril Datasheets and this Manual in conjunction with the TenarisHydril Running Manual, which can be found online at http://www.tenaris.com/en/MediaAndPublications/BrochuresAndCatalogs/RunningManual.aspx.

Pipe Body Data

This section covers geometry and performance attributes of the pipe.

A. GEOMETRY

I. Nominal OD: The nominal Outside Diameter of the pipe.

II. Drift: The minimum internal diameter of both pipe and connection through which a drift (in accordance with API 5CT or with a special dimension) can pass.

III. Nominal ID: The nominal internal diameter of the pipe. Not to be confused with drift diameter.

IV. Wall Thickness: The nominal thickness of the pipe body. It is a precise way of identifying the pipe instead of the linear weight, in particular for non-standard products.

V. Plain End Weight: The nominal weight of the pipe before threading and without coupling. It is generally used for identification purposes of the original pipe.

VI. Nominal weight: The nominal weight by which the pipe is identified in the industry. This weight is only indicative and may be different from the plain end weight or the actual linear weight of the pipe.

VII. Minimum Wall Thickness: The minimum allowable wall thickness that may be found at any point along the pipe body, referenced to the nominal wall thickness (100%).

VIII. OD Tolerance: The allowable tolerance in the OD of the pipe.

B. PERFORMANCE

I. Body Yield Strength: This figure shows the upper limit of tensile strength the pipe can endure without experiencing plastic deformation. This is based on Specified Minimum Yield Strength (SMYS) and nominal dimensions (as per API 5C3 when applicable).

II. Internal Yield: This is the pipe burst pressure calculated in accordance with API 5C3 with the minimum wall thickness as the alternative selected (the default is 87.5%).

III. SMYS: SMYS indicates the upper limit of stress that can be applied to the material (in this case the steel with which the pipe is manufactured) without plastic deformation occurring.

IV. Collapse: This is the maximum external pressure the pipe will withstand without plastic deformation occurring.

V. Max. Allowable Bending: This property shows the maximum bending the pipe can endure without plastic deformation occurring. It can customarily be expressed in °/100 ft.

Connection Data

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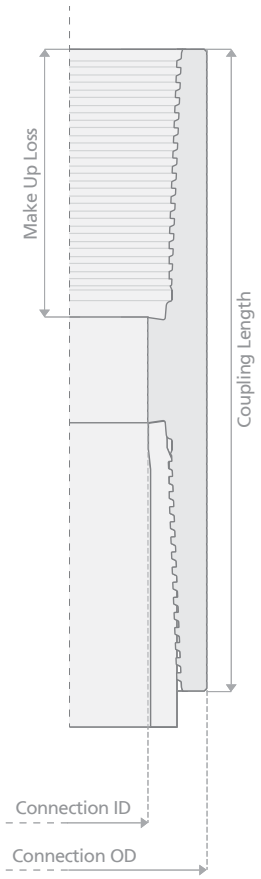
This section covers geometry and performance attributes of the connection.

A. GEOMETRY



I. Connection OD: The nominal outside diameter of the connection; it can be the same as the pipe or larger, depending on the connection design.

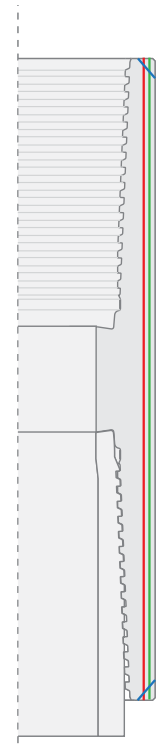
II. Coupling Length: The total length of the coupling from one face of the coupling to the other for Threaded & Coupled connections.

III. Connection ID: The nominal Inside Diameter of the connection. Always larger than the drift diameter of the joint but may be smaller than the pipe ID depending on each particular product design.

IV. Make-up Loss: The length of the pin that remains in the box when the connection is assembled to final position.

V. Threads per Inch (TPI): Indicates the number of full threads per inch of the connection. The larger the TPI, the larger the number of turns to full make up.

VI. Connection OD Options: There are several options that can be considered, with the *Regular* OD as a starting point from which all other options are designed:



- Regular Coupling
- Matched Strength (MS)
- Special Clearance (SC)
- Special Bevel (SB)

1. Matched Strength (MS): The coupling OD is adjusted to the minimum critical area capable of providing the same tensile efficiency as the pin end, allowing better clearance[1].

2. Special Clearance (SC): The coupling OD is reduced so as to obtain improved clearance, generally at the expense of tensile efficiency. The resulting tensile efficiency as a percentage is stated in the naming. E.g. SC85 indicates Special Clearance with approximately 85% tensile efficiency.

3. Regular API: For certain sizes of TenarisXP® Buttress, a coupling of matching OD to that of API Buttress is available.

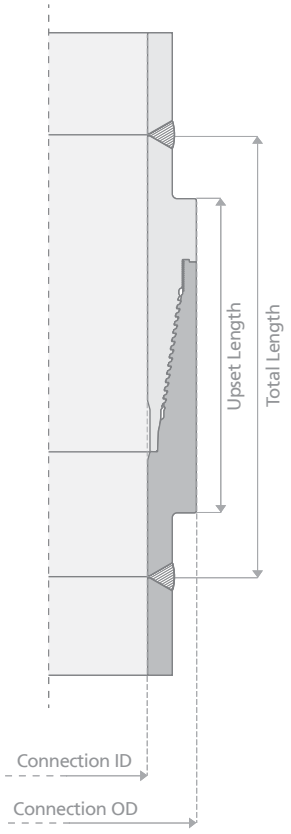
VII. Thread Starts: The number of thread start points of the connection.

For BlueDock® connectors:

VIII. Connection Weight: The combined weight of PIN and BOX.

IX. Upset OD Length: The distance of the upset measured from the connector elevator shoulder to connection face.

X. Total Length: The full distance between the two weld necks of assembled joints.



B. PERFORMANCE

All performance figures shown in the Datasheets are related to the structural capability of the connection.[2]

I. Tension Efficiency: The extent to which the connection matches the tensile capability of the pipe, as a percentage.

II. Joint Yield Strength: The upper limit of tensile strength the joint can endure without plastic deformation occurring.

1. This concept also applies for certain integral tubing connections (e.g. TSH CS).
2. For sealability-related performance information, contact your local Tenaris Representative.

III. Internal Pressure Capacity (Burst): The upper limit of internal pressure the joint can endure without plastic deformation occurring - calculated on nominal dimensions and material properties. When compared to that of the pipe, the *Internal Pressure Efficiency*, indicated as a percentage, is obtained.

IV. Compression Efficiency: The extent to which the connection matches the compression capability of the pipe, as a percentage.

V. Compression Yield Strength: The upper limit of compressive strength the joint can endure without plastic deformation occurring.

VI. Max. Allowable Bending: The maximum bending the product can endure without plastic deformation occurring – defined with pure bending and no pressure applied. It can customarily be expressed in °/100 ft or in kips-ft. When compared to that of the pipe itself, the corresponding *Efficiency*, indicated as a percentage, is obtained.

VII. External Pressure Capacity: The upper limit of external pressure the joint can endure without plastic deformation occurring. Compared to that of the pipe itself, the *External Pressure Efficiency*, indicated as a percentage, is obtained.

VIII. Coupling Face Load: The maximum load that can be applied to the coupling face of Threaded and Coupled connections for nominal sizes and material properties.

For BlueDock® connectors:

IX. SMYS: The SMYS of the material of the BlueDock® connector that is welded onto the pipe (connector material produced by rolling or forging with proprietary grade specifications).

Torques

A. MAKE-UP TORQUES[3]

I. Minimum Torque: The minimum required torque which shall be applied to the connection for correct assembly.

II. Optimum Torque: The recommended torque to be applied for correct assembly.

III. Maximum[4] Torque: The maximum torque which may be applied to the connection allowing correct assembly for optimum performance in terms of sealability and multiple make and breaks.

B. OPERATIONAL TORQUES

I. Operational Limit Torque: Indicates the maximum torque which can in certain circumstances be applied to the connection down hole. Please refer to TenarisHydril Running Manual for details.

II. Yield Torque: Indicates the torque at which damage will be inflicted to the connection and should never be approached.

3. These definitions apply for both connections with Dopeless® Technology and with dope, considered for the latter is API Modified thread compound with a friction factor of 1. For thread compound friction factor adjustment of other compounds, please refer to TenarisHydril Running Manual.

4. For BlueDock® Connectors, Maximum Make up Torque indicated is an estimated value to be considered as guidance. The actual Connector Yield Torque extensively exceeds the indicated value. If the Maximum torque needs to be increased, Tenaris shall be consulted.

C. SHOULDER TORQUES

Applicable to shouldered connections with a defined shoulder torque window:

I. Minimum Shoulder Torque: the minimum torque value where the contact of the pin and the box torque shoulder can be indicated on a Torque v. Turn graph for correct assembly.

II. Maximum Shoulder Torque: the maximum torque value where the contact of the pin and the box torque shoulder can be indicated on a Torque v. Turn graph for correct assembly.

D. BUCK-ON TORQUES

Specifically for the assembly of couplings, these are often higher than standard make up torques and are applied when making up couplings to pipe and accessories at a mill or machine shop. As in Make Up Torques, there will be a Minimum and a Maximum Value specified.

For BlueDock® connectors:

E. BREAK-OUT / MAKE-UP TORQUE RATIO

Indicates the level of torque (respective to the recommend Make up Torque values) to be applied to an assembled BlueDock® connector in order to break it out. This ratio is estimated based on average results of product Full Scale Testing.

I. Without ARK: Torque required when no Anti-Rotational Key is installed.

II. With one ARK: Torque required when only one Anti-Rotational Key is installed.

III. With two ARKs (default option): Torque required when two Anti-Rotational Keys are installed. Unless specified by the customer, this is the default option.

IV. With three ARKs: Torque required when three Anti-Rotational Keys are installed. This is the maximum number of Anti-Rotational Keys that can be simultaneously installed on a BlueDock® connector.

For additional information, please visit
www.tenaris.com