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# Petroleum and natural gas industries — Rotary drilling equipment —

## Part 2: Threading and gauging of rotary shouldered thread connections

*Industries du pétrole et du gaz naturel - Équipements de forage rotary —*

*Partie 2: Filetage et calibrage des connexions rotary filetées à épaulement*

ICS 75.180.10

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 10424-2 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 4, *Drilling and production equipment*.

ISO 10424 consists of the following parts, under the general title *Petroleum and natural gas industries — Rotary drilling equipment*:

- Part 1: *Rotary drill stem elements* [ISO/DIS 10424-2](https://standards.iteh.ai/catalog/standards/sist/bd66f4df-c7ce-435f-98f7-8516e446e1e0/iso-dis-10424-2)
- Part 2: *Threading and gauging of rotary shouldered thread connections*

## Introduction

This International Standard is based upon API Spec 7, *Specification for rotary drill stem elements*, 40<sup>th</sup> edition, December 2001. Users of this International Standard should be aware that further or differing requirements may be needed for individual applications. This International Standard is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the vendor should identify any variations from this International Standard and provide details.

This International Standard includes requirements of various natures. These are identified by the use of certain words or phrases:

- a) SHALL is used to indicate that a provision is MANDATORY;
- b) SHOULD is used to indicate that a provision is NON MANDATORY, but recommended as good practice;
- c) MAY is used to indicate that a provision is OPTIONAL.

In addition, in certain cases, this International Standard offers alternative requirements. These alternative requirements offer different options, and are listed as follows.

- d) At purchaser's option, in which case such option shall be mentioned on the purchase order. These cases are recognised by the use of words or phrases such as ALTERNATIVE or AT PURCHASER'S OPTION.
- e) At manufacturer's option, in which case such option shall be notified to the purchaser. Such cases are identified by the use of the phrase AT MANUFACTURER'S OPTION.

By agreement between purchaser and manufacturer. Such cases are recognised by the use of the phrase BY AGREEMENT BETWEEN INTERESTED PARTIES.

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# Petroleum and natural gas industries — Rotary drilling equipment —

## Part 2: Threading and gauging of rotary shouldered thread connections

### 1 Scope

This part of ISO 10424 specifies requirements on rotary shouldered connection for use in petroleum and natural gas industries: dimensional requirements on threads and thread gauges, stipulations on gauging practice, gauge specifications, as well as instruments and methods for inspection of thread connections. These connections are intended primarily for use in drill-string components, and are optimised for strength in tension, torsion and bending.

Other supplementary specifications may be agreed between interested parties for special tolerance requirements, qualification, testing, inspection, end finishing and certification.

This part of ISO 10424 is applicable to the following preferred rotary shouldered connection designs. These are traceable to an internationally supported system of gauges and calibration:

- a) number (NC) style;
  - b) regular (Reg) style;
  - c) full hole (FH) style.
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Reference information is included on several non-preferred rotary shouldered connection designs, which have been used historically or are used for special-purpose tools. These connections originated as proprietary or national standards, and are not supported by an international system of master gauges:

- H90 style;
- SL H90 style;
- PAC style;
- OH style;
- GOST style;
- IF style.

### 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/FDIS 10424-1:—<sup>1)</sup>, *Petroleum and natural gas industries — Rotary drilling equipment — Part 1: Rotary drill stem elements*

API 7, *Specification for rotary drill stem elements*

### 3 Terms and definitions, symbols and abbreviations

#### 3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

##### 3.1.1

###### **bevel diameter**

outside diameter of the contact face of the rotary shouldered connection

##### 3.1.2

###### **box connection or box end**

a threaded connection on oil country tubular goods with internal (female) threads

##### 3.1.3

###### **box thread**

internal (female) threads of a rotary shouldered connection

##### 3.1.4

###### **calibration system**

documented system of gauge calibration and control

##### 3.1.5

###### **cold working**

plastic deformation of the surface of the connection at a temperature low enough to insure or cause permanent changes to material properties

##### 3.1.6

###### **full depth thread**

thread in which the thread root lies on the minor cone of an external thread or lies on the major cone of an internal thread

##### 3.1.7

###### **gauge point**

imaginary plane, in the pin threads, perpendicular to the thread axis, in which the pitch diameter equals the value in Column 5 of Table 1

##### 3.1.8

###### **last engaged thread**

last thread of the pin near the make-up shoulder that is engaged with the box threads

##### 3.1.9

###### **lead**

distance parallel to the thread axis from a point on a thread turn and the nearest corresponding point on the same flank, i.e. the axial displacement of a point following the helix one turn around the thread axis

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1) To be published.

**3.1.10****length of box threads**

length of threads in the box measured from the makeup shoulder to the intersection of the non-pressure flank and crest of the last thread with full thread depth

**3.1.11****manufacturer**

firm, company or corporation that operates facilities capable of cutting the threads and is responsible for compliance with all the applicable provisions of this part of ISO 10424

**3.1.12****make-up shoulder**

sealing shoulder on a rotary shouldered connection

**3.1.13****non-pressure flank**

thread flank on which no axial load is induced from make-up of the connection or from tensile load on the drill stem member

NOTE On the pin, it is the thread flank farthest from the makeup shoulder. On the box, it is the thread flank closest to the makeup shoulder.

**3.1.14****pin connection or pin end**

a threaded connection on oil country tubular goods with external (male) threads

**3.1.15****pin thread**

external (male) threads of a rotary shouldered connection

**3.1.16****pitch cone**

imaginary cone running through points at which the distance across the threads is equal to the distance between the threads

**3.1.17****pitch diameter**

diameter of the pitch cone at the gauge point

**3.1.18****product**

drill string component with rotary shouldered connection in accordance with this part of ISO 10424

**3.1.19****product specification level (PSL)**

supplementary requirements as PSLs that are optional with the purchaser or that may be agreed between interested parties

NOTE These requirements apply only when stated on the purchase order.

**3.1.20****reference dimension**

dimension that is a result of two or more other dimensions

**3.1.21****rotary shouldered connection**

thread connection used on drill stem elements which has coarse, tapered threads and sealing shoulders

**3.1.22**

**stress-relief groove (feature) (SRG)**

modification performed on rotary shouldered connections which removes on a certain depth the unengaged threads of the pin or box

NOTE This process reduces the likelihood of fatigue cracking in the highly stressed area both for box and pin threads due to a reduction of a stress concentration.

**3.1.23**

**taper**

increase in the diameter of the pitch cone with length , in millimetres per millimetre of thread length

**3.1.24**

**thread form**

the thread profile in an axial plane for a length of one pitch

**3.1.25**

**tolerance**

amount of variation permitted

**3.1.26**

**working gauges**

gauges used for gauging rotary shouldered connections

**3.1.27**

**master gauges**

gauges used to calibrate working gauges

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NOTE These include Reference master, Regional master and Grand master gauges.

**3.2 Design types and definitions**

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Any style of rotary shouldered connection may be made in Right Hand or Left Hand versions. Right Hand is assumed unless otherwise designated as LH.

**3.2.1**

**number (NC) style**

type and size of the rotary shouldered connection, having the V-038R thread form; the number in the connection number is the pitch diameter of the pin thread at the gauge point rounded to units and tenths of inches

**3.2.2**

**regular (Reg) style**

type and size of the rotary shouldered connection, having thread forms of V-040, V-050 or V-055; the number relates to a historical drill-pipe size

**3.2.3**

**full hole (FH) style**

type and size of the rotary shouldered connection, having thread form of V-040 or V-050; the number relates to a historical drill-pipe size

**3.2.4**

**H90 style**

type and size of the rotary shouldered connection, having a 90° thread form ; the number relates to a historical drill-pipe size

**3.2.5****SL-H90 style**

type and size of the rotary shouldered connection, having a 90° thread form and heavy truncation ; the number relates to a historical drill-pipe size

**3.2.6****PAC style**

type and size of the rotary shouldered connection, having the V-076 thread form; the number relates to a historical drill-pipe size

**3.2.7****GOST Z style**

type and size of the rotary shouldered connection, covered by a Russian standard, having the V-038R, V-040 or V-050 thread form; the number designation is the pin-base diameter, rounded to units of millimetres

**3.2.8****IF Style**

type and size of the rotary shouldered connection, having the V-038R thread form; the number relates to a historical drill-pipe size

**3.3 Abbreviations and symbols****3.3.1 Abbreviations**

CW	Cold working	<b>iTeh STANDARD PREVIEW</b> <b>(standards.iteh.ai)</b>
IF	Internal flush (style)	
FH	Full hole (style)	
LH	Left hand	<a href="https://standards.iteh.ai/catalog/standards/sist/bd66f4df-c7ce-435f-98f7-85c16aa446ac/iso-dis-10424-2">ISO/DIS 10424-2</a> <a href="https://standards.iteh.ai/catalog/standards/sist/bd66f4df-c7ce-435f-98f7-85c16aa446ac/iso-dis-10424-2">https://standards.iteh.ai/catalog/standards/sist/bd66f4df-c7ce-435f-98f7-85c16aa446ac/iso-dis-10424-2</a>
LT	Low torque modification	
NC	Numbered connection (style)	
OD	Outside diameter	
PSL	Product specification level	
Reg	Regular (style)	
SRG	Stress relief groove	

**3.3.2 Symbols**

$C$	Pitch diameter of thread at gauge point
$D_{bg}$	Diameter of box member at groove
$D_{cb}$	Diameter of boreback stress relief groove cylinder
$D_{fg}$	Diameter of face groove and box counterbore in low-torque feature
$D_{fp}$	Diameter of plug fitting plate

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$D_l$	Large diameter of pin
$D_{lf}$	Diameter of flat on pin
$D_{srg}$	Diameter of pin stress relief groove
$D_{rg}$	Outside diameter of ring gauge
$D_s$	Small diameter of pin
$d_b$	Ball point diameter
$H$	Reference thread height not truncated
$h_g$	Reference gauge thread height truncated
$h$	Reference thread height truncated
$F_c$	Width of flat
$f_c$	Reference crest truncation
$f_r$	Reference root truncation
$L_{bt}$	Length of box threads (minimum)
$L_{bc}$	Depth of box
$L_{cb}$	Length of box bore-back
$L_{ct}$	Compensated thread length
$L_{ft}$	Distance from shoulder to first full pin thread
$L_{pg}$	Total length of plug gauge
$L_{rg}$	Total length of ring gauge
$L_{bg}$	Length, shoulder face to groove of box member
$L_{PC}$	Length of pin
$L_{Qc}$	Depth of box counterbore
$L_{srg}$	Length of relief groove on pin
$P$	Pitch of thread (used also for lead, since all threads referenced are single-start)
$Q$	Diameter of ring gauge counterbore
$Q_c$	Diameter of product box counterbore

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$r$	Radius at thread corners
$R$	Root radius
$S$	Mating stand-off
$S_1$	Stand-off of the working plug gauge
$S_2$	Stand-off of the working ring gauge
$T$	Taper, millimetres of diameter per millimetre of length
$\varphi$	Half of the included angle of taper cone
$\theta$	Half of the included angle of thread flanks

#### 4 Information to be supplied by purchaser

In placing orders for equipment to be manufactured with rotary shouldered connections in accordance with this part of ISO 10424, the purchaser shall specify the following on the purchase order:

- the number of this International Standard;
- thread style and size;
- if necessary, corresponding PSLs and other supplementary requirements as detailed in Clause 6 which are optional with the purchaser.

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#### 5 Threading

##### 5.1 Thread profile and dimensions

###### 5.1.1 Overall dimensions

Rotary shouldered connections shall be furnished in the sizes and styles shown in Table 1. Dimensions of rotary shouldered connections shall conform to Table 1 and Table 2, and Figure 1 and Figure 2. The dimensions shown in Table 1 and Table 2 that have no specified tolerance, and do not have tolerances defined below shall be considered reference dimensions. Deviations from these dimensions shall not be cause for rejection. The extent of the bevel of the small end of the pin is optional with the manufacturer. Right-hand threads shall be considered standard. Left-hand threads conforming to this part of ISO 10424 shall be acceptable.