INTERNATIONAL STANDARD

ISO 10424-2

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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

Reference number
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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*

— *Part 2: Threading and gauging of rotary shouldered thread connections*

Introduction

This International Standard is based on API Spec 7, *Specification for rotary drill stem elements*.

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.

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 connections for use in petroleum and natural gas industries, including 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.

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

This part of ISO 10424 is applicable to the following preferred rotary shouldered connection designs:

a) number (NC) style;

b) regular (REG) style;

c) full hole (FH) style.

These are traceable to an internationally supported system of gauges and calibration

2 Conformance — Units of measurement

In this part of ISO 10424, data are expressed in both the International System (SI) of units and the United States Customary (USC) system of units. Separate tables for data expressed in SI units and USC units are given in the body of this part of ISO 10424 and Annex A, respectively. Figures express data in both SI and USC units. For a specific order item, it is intended that only one system of units be used, without combining data expressed in the other system. Annex G provides the conversion between SI and USC units used in this part of ISO 10424.

Products manufactured to specifications expressed in either of these unit systems shall be considered equivalent and totally interchangeable. Consequently, compliance with the requirements of this part of ISO 10424 as expressed in one system provides compliance with requirements expressed in the other system. For data expressed in the SI system, a comma is used as the decimal separator and a space as the thousands separator. For data expressed in the USC system, a dot (on the line) is used as the decimal separator and a space as the thousands separator.

In the text, data in SI units are followed by data in USC units in brackets.

3 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 10424-1, *Petroleum and natural gas industries — Rotary drilling equipment — Part 1: Rotary drill stem elements*

ISO 11961[1)], *Petroleum and natural gas industries — Steel drill pipe*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

API Spec 7, *Specification for Rotary Drill Stem Elements*

4 Terms, abbreviated terms, definitions and symbols

4.1 Terms and definitions

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

4.1.1
bevel diameter
outside diameter of the contact face of the rotary shouldered connection

4.1.2
box connection
box end
threaded connection on oil country tubular goods with internal (female) threads

4.1.3
box thread
internal (female) threads of a rotary shouldered connection

4.1.4
break-in
procedure applied to newly manufactured threads to assure correct mating

4.1.5
calibration system
documented system of gauge calibration and control

4.1.6
cold working
plastic deformation of the surface of the connection at a temperature low enough to induce strain hardening

4.1.7
first perfect thread
thread furthest from the sealing face on a pin, or closest to the sealing face on a box, where both the crest and the root are fully formed

4.1.8
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

1) To be published. (Revision of ISO 11961:1996)

4.1.9
gauge point
imaginary plane, perpendicular to the thread axis of rotary shouldered connections at which the pitch diameter, C, at gauge point is measured

NOTE This plane is located 15,875 mm (0.625 0 in) from the make-up shoulder of the pin thread.

4.1.10
interchange stand-off
stand-off between each member of a gauge set and a corresponding gauge next higher in the ranking scheme: grand master or regional master, reference master, working gauge

4.1.11
lead
distance parallel to the thread axis from a point on a thread turn and the corresponding point on the next turn, i.e. the axial displacement of a point following the helix one turn around the thread axis

4.1.12
make-up shoulder
sealing shoulder on a rotary shouldered connection

4.1.13
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

4.1.14
master gauge
gauges used for calibration of other gauges

NOTE These include reference master, regional master and grand master gauges.

4.1.15
mating stand-off
stand-off between the plug and ring members of a gauge set

NOTE Interchange stand-off is the stand-off between each member and a gauge higher in the ranking scheme.

4.1.16
pin connection
pin end
threaded connection on oil country tubular goods with external (male) threads

4.1.17
pin thread
external (male) threads of a rotary shouldered connection

4.1.18
pitch
axial distance between successive threads, which, in a single start thread, is equivalent to lead

4.1.19
pitch cone
imaginary cone whose diameter at any point is equal to the pitch diameter of the thread at the same point

4.1.20
pitch diameter
diameter at which the distance across the threads is equal to the distance between the threads

4.1.21
product
drill string component with rotary shouldered connection in accordance with this part of ISO 10424

4.1.22
reference dimension
dimension that is a result of two or more other dimensions

4.1.23
rotary shouldered connection
thread connection used on drill stem elements which has coarse, tapered threads and sealing shoulders

4.1.24
stand-off
distance between faces of gauges, or gauge and product when mated

4.1.25
stress-relief groove
⟨feature⟩ modification performed on rotary shouldered connections that removes a certain length of 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 stress concentration.

4.1.26
taper
increase in the diameter of the pitch cone with length

NOTE The taper is expressed in millimetres per millimetre (inches per foot) of thread length.

4.1.27
thread form
thread profile in an axial plane for a length of one pitch

4.1.28
thread height
distance between the crest and root, normal to the axis of the thread

4.1.29
tolerance
amount of variation permitted

4.1.30
working gauges
gauges used for gauging rotary shouldered connections

4.2 Design types and definitions

NOTE Any style of rotary shouldered connection can be made in right-hand (RH) or left-hand (LH) versions. Right-hand is assumed unless otherwise designated as LH.

4.2.1
full-hole style
FH style
type and size of rotary shouldered connection having thread form of V-040 or V-050

NOTE The number relates to a historical drill-pipe size.

4.2.2
GOST Z style
type and size of the rotary shouldered connection, covered by a Russian standard and having the V-038R, V-040 or V-050 thread form

NOTE The number designation is the pin-base diameter, rounded to units of millimetres.

4.2.3
H90 style
type and size of rotary shouldered connection having a 90° thread form

NOTE The number relates to a historical drill-pipe size.

4.2.4
IF style
type and size of the rotary shouldered connection having the V-038R thread form

NOTE 1 The number relates to a historical drill-pipe size.

NOTE 2 The thread form was historically V-065.

4.2.5
number style
NC style
type and size of the rotary shouldered connection having the V-038R thread form

NOTE The number in the connection number is the first two digits of the pitch diameter of the pin thread at the gauge point, expressed in units of 2,54 mm (0,1 in).

4.2.6
open-hole style
OH style
type and size of rotary shouldered connection having the V-076 thread form

NOTE The number relates to a historical drill-pipe size.

4.2.7
PAC style
type and size of rotary shouldered connection having the V-076 thread form

NOTE The number relates to a historical drill-pipe size.

4.2.8
regular style
REG style
type and size of rotary shouldered connection having thread forms of V-040, V-050 or V-055

NOTE The number relates to a historical drill-pipe size.

4.2.9
SL H90 style
type and size of rotary shouldered connection having a 90° thread form and heavy truncation

NOTE The number relates to a historical drill-pipe size.

4.3 Abbreviations and symbols

4.3.1 Abbreviations

c/bore	Counterbore
CW	Cold working
dia.	Diameter
FF	Full face
FH	Full-hole (style)
ID	Inside diameter
IF	Internal-flush (style)
LH	Left-hand
LT	Low-torque modification
max.	Maximum
min.	Minimum
NC	Numbered-connection (style)
OD	Outside diameter
OH	Open-hole (style)
ref	Reference (dimension)
REG	Regular (style)
RH	Right-hand
SRG	Stress-relief groove
thds	Threads

4.3.2 Symbols

A	Depth of the pin stress-relief groove below the thread root at the gauge point
B	Depth of box stress-relief groove, measured from the pitch cone addendum
C_{GP}	Pitch diameter at working gauge point
C	Pitch diameter of thread at gauge point
d_b	Diameter of ball for lead and taper gauges
D_{BG}	Diameter of box member at stress-relief groove
d_{bh}	Diameter of ball for thread-height gauge
D_{CB}	Diameter of cylinder of boreback stress-relief contour
D_{FG}	Diameter of face groove and box counterbore in low-torque feature
D_{FP}	Diameter of plug fitting plate
D_L	Large diameter of pin

D_{LF}	Diameter of flat on pin
D_{MP}	Major diameter of plug gauge at gauge point
D_{MR}	Minor diameter of ring gauge at gauge point
D_{R}	Outside diameter of ring gauge
D_{S}	Small diameter of pin
D_{SRG}	Diameter of pin stress-relief groove
F_{c}	Width of crest flat, product thread
F_{r}	Width of root flat, product thread
f_{c}	Crest truncation, product thread
f_{cg}	Crest truncation, gauge thread
f_{r}	Root truncation, product thread
f_{rg}	Root truncation, gauge thread
H	Reference thread height not truncated
h	Product thread height truncated
h_{bg}	Depth of box stress-relief groove, measured normal to taper cone
h_{cn}	Height of product thread, compensated for taper
h_{g}	Reference gauge thread height truncated
L_{BC}	Depth of box
L_{BG}	Length, shoulder face to groove of box member
L_{BT}	Depth of box threads (minimum)
L_{ct}	Length of thread lead multiple, compensated for taper
L_{CB}	Boreback length
L_{CYL}	Depth of cylinder of boreback contour
L_{fp}	Thickness of gauge fitting plate
L_{ft}	Distance from shoulder to first full-depth pin thread
L_{GP}	Distance from shoulder to gauge point
L_{pg}	Total length of plug gauge
L_{rg}	Total length of ring gauge
L_{PC}	Length of pin
L_{Qc}	Depth of box counterbore
L_{SRG}	Length of relief groove on pin
L_{X}	Length from shoulder to last thread scratch on boreback cylinder
n	Number of threads in 25,4 mm (1.0 in)

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
r_c	Radius at corners of crest flat
r_r	Radius at corners of root flat
R	Root radius, product thread
R_{bg}	Radius at corners of box stress-relief groove
R_{FG}	Radius at corners of low-torque grooves
S	Mating stand-off of gauges
S_0	Stand-off of certified reference master gauges
S_1	Stand-off of the working plug gauge on a reference master gauge
S_2	Stand-off of the working ring gauge on a reference master gauge
T	Taper, expressed as millimetres of diameter per millimetre of length or inches of diameter per foot of length
T_{FP}	Thickness of gauge fitting plate
φ	Half of the included angle of the taper cone
θ	Angle between the thread flank and the normal to the thread axis

5 Information to be supplied by purchaser

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

— number of this part of ISO 10424;

— thread style and size;

— if necessary, supplementary requirements as detailed in Clause 6, which are optional with the purchaser.

6 Threading

6.1 Thread profile and dimensions

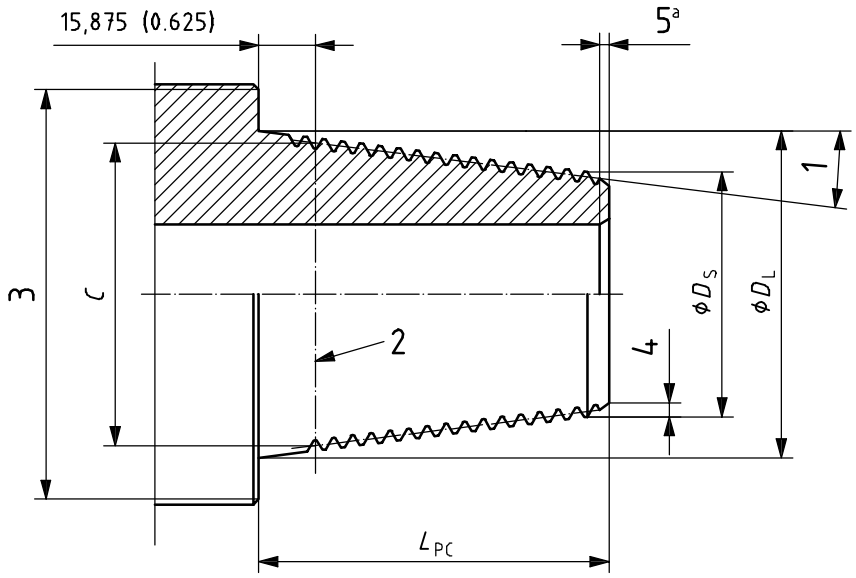
6.1.1 Overall dimensions

Rotary shouldered connections shall be furnished in the sizes and styles shown in Table 1. Dimensions of rotary shouldered connections shall conform to Tables 1 and 2, and Figures 1 and 2. The taper, T, in Tables 1 and 2, is related to the half-angle, φ, in Figures 1 and 2, by $T = 2 \tan\varphi$.

The dimensions shown in Tables 1 and 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, if certified reference master gauges exist for these threads.

Dimensions in millimetres (inches)

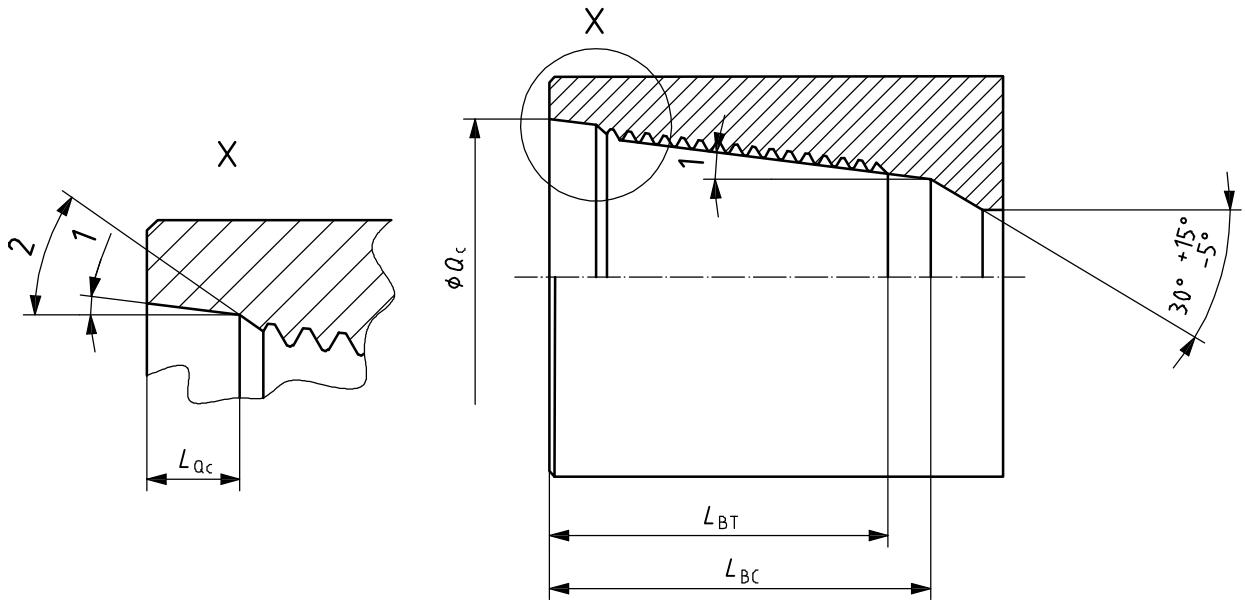


Key

1 taper half-angle, φ
2 plane of gauge point
3 connection bevel diameter; see 6.2
4 outside bevel, angle optional to manufacturer
5 optional inside bevel

[a] In accordance with ISO 11961 or product specification.

Figure 1 — Pin connection



Key

1 taper half-angle, φ
2 chamfer angle, typically 25° to 45°

Figure 2 — Box connection