
**Metric series wires for measuring
screw threads**

Piges métriques pour mesurage des filetages



Reference number
ISO 16239:2013(E)

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Foreword

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/TC 1, *Screw threads*.

Metric series wires for measuring screw threads

1 Scope

This International Standard specifies the material, metric series nominal diameters, diameter tolerances, and designation for screw thread measuring wires.

This International Standard is applicable to the measurement of the pitch diameters of ISO general purpose metric screw threads (M), Unified screw threads (UN), Whitworth pipe threads (G, R), and ISO metric trapezoidal screw threads (Tr) with standard pitches. These wires are intended for use on screw threads with a small lead angle, less than 5°, and are mainly used to calibrate the pitch diameters of thread plug gauges.

2 Normative references

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

ISO 1, *Geometrical Product Specifications (GPS) — Standard reference temperature for geometrical product specification and verification*

ISO 5408, *Screw threads — Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO 5408 and the following apply.

3.1

best-size wire

wire that would touch an imaginary thread of zero lead angle at the pitch cylinder

Note 1 to entry: For symmetric threads, the diameter of a best-size wire is equal to $P/(2 \cos \alpha/2)$, where P is the pitch and $\alpha/2$ is the flank angle.

4 Reference temperature

In accordance with ISO 1, the dimension of the wire shall be related to the standard reference temperature of 20 °C.

5 Material, hardness, and surface finish

The wires shall be made from alloy tool steel that has been stabilized to ensure dimensional stability. The wires shall be free from cracks and other detrimental defects.

The hardness shall be (760 ± 50) HV5 over the measuring surface.

The roughness shall not exceed $0,4 \mu\text{m}$ R_z over the measuring surface.

6 Nominal diameters of best-size wires

6.1 Wires for ISO general purpose metric screw threads (M)

The nominal diameters of best-size wires and the allocation of pitches are given in [Table 1](#).

Table 1 — Nominal diameters of best-size wires and allocated pitches for M threads

Dimensions in millimetres

Nominal diameter of wires	Pitch P	Nominal diameter of wires	Pitch P
0,115	0,2	0,866	1,5
0,144	0,25	1,010	1,75
0,173	0,3	1,155	2
0,202	0,35	1,443	2,5
0,231	0,4	1,732	3
0,260	0,45	2,021	3,5
0,289	0,5	2,309	4
0,346	0,6	2,598	4,5
0,404	0,7	2,887	5
0,433	0,75	3,175	5,5
0,462	0,8	3,464	6
0,577	1	4,619	8
0,722	1,25	–	–

6.2 Wires for Unified screw threads (UN)

The nominal diameters of best-size wires and the allocation of number of threads per 25,4 mm are given in [Table 2](#).

6.3 Wires for Whitworth pipe threads (G, R)

The nominal diameters of best-size wires and the allocation of number of threads per 25,4 mm are given in [Table 3](#).

6.4 Wires for ISO metric trapezoidal screw threads (Tr)

The nominal diameters of best-size wires and the allocation of pitches are given in [Table 4](#).

Table 2 — Nominal diameters of best-size wires and allocated threads per 25,4 mm for UN threads

Nominal diameter of wires mm	Threads per 25,4 mm	Nominal diameter of wires mm	Threads per 25,4 mm
0,183	80	0,917	16
0,204	72	1,047	14 ^a
0,229	64	1,128	13
0,262	56	1,222	12
0,306	48	1,275	11,5 ^a
0,333	44	1,333	11
0,367	40	1,466	10
0,407	36	1,629	9
0,458	32	1,833	8 ^a
0,524	28	2,095	7
0,543	27 ^a	2,444	6
0,611	24	2,933	5
0,733	20	3,259	4,5
0,815	18 ^a	3,666	4

^a These wires may be used for USA pipe threads, such as NPT, NPSC, and NPTF threads.

Table 3 — Nominal diameters of best-size wires and allocated threads per 25,4 mm for G and R threads

Nominal diameter of wires mm	Threads per 25,4 mm	Nominal diameter of wires mm	Threads per 25,4 mm
0,511	28	1,023	14
0,754	19	1,302	11

Table 4 — Nominal diameters of best-size wires and allocated pitches for Tr threads

Dimensions in millimetres

Nominal diameter of wires	Pitch <i>P</i>	Nominal diameter of wires	Pitch <i>P</i>
0,776	1,5	7,247	14
1,035	2	8,282	16
1,553	3	9,317	18
2,071	4	10,353	20
2,588	5	11,388	22
3,106	6	12,423	24
3,623	7	14,494	28
4,141	8	16,564	32
4,659	9	18,635	36
5,176	10	20,706	40
6,212	12	22,776	44

7 Tolerances of wires

Two tolerance grades for the diameter are standardized. They should be chosen according to the measurement uncertainty required.

The diameter limit deviations and the maximum permissible differences of the actual diameters of the wires are given in [Table 5](#).

Table 5 — Diameter limit deviations and maximum permissible differences of the actual diameters of the wires

Tolerance item	Tolerance grade	Tolerance μm	Recommended measurement method
Limit deviations for the actual diameters of each wire to the nominal diameters specified	1	$\pm 0,5$	8.1
Maximum permissible difference of the actual diameters between the wires in a set		0,25	8.1
Maximum permissible difference of the actual diameters along the axis of a wire		0,25	8.1
Maximum permissible difference of the actual diameters around a wire		0,25	8.2
Limit deviations for the actual diameters of each wire to the nominal diameters specified	2	± 1	8.1
Maximum permissible difference of the actual diameters between the wires in a set		0,5	8.1
Maximum permissible difference of the actual diameters along the axis of a wire		0,5	8.1
Maximum permissible difference of the actual diameters around a wire		0,5	8.2

8 Measurement methods for wires

8.1 Measuring the actual diameters of each wire

The actual diameters of each wire should be measured in the three planes, E1, E2, and E3, perpendicular to the axis of the wire, and in each plane, two actual diameters should be measured in perpendicular directions (see [Figure 1](#)).

The direct measurement or comparison measurement (using gauge blocks) for the actual diameters of each wire should be chosen according to the measurement uncertainty required.

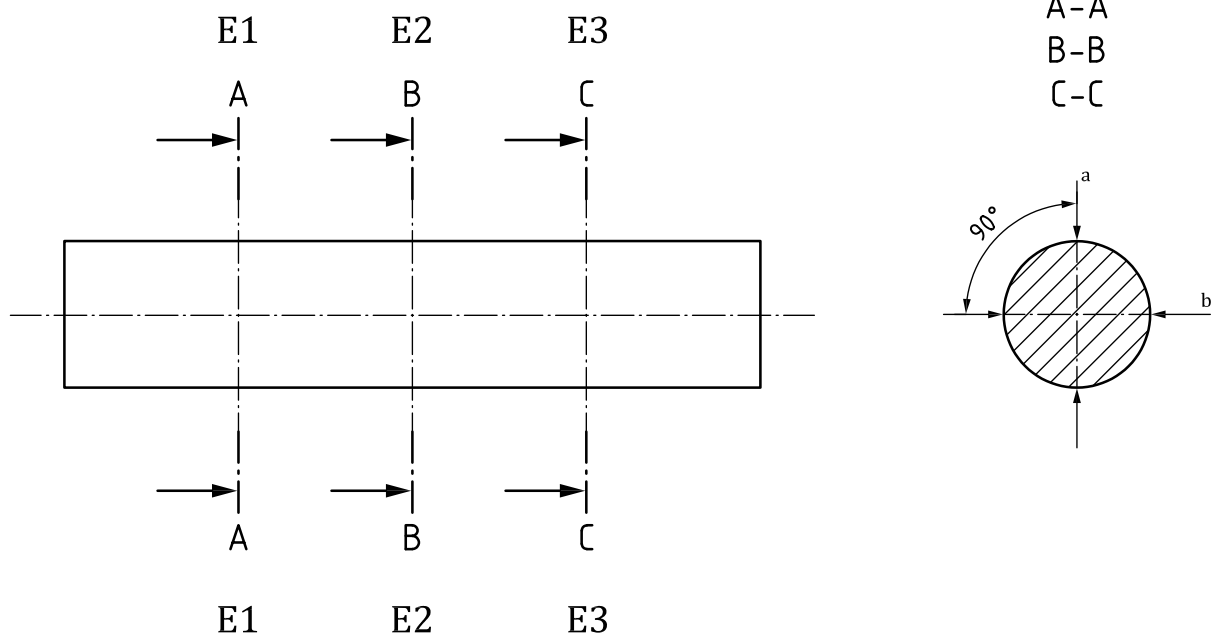
NOTE In some countries, the actual diameters of wires are measured in a deformed condition for the correction of the measuring force.

8.2 Determination of the difference of the actual diameters around a wire

The difference of actual diameters around a wire should be determined by measuring the highest and the lowest points in a 60° groove, e.g. a ground thread plug gauge under a suitable measuring head (see [Figure 2](#)).

The measuring positions of a wire are in the three planes, E1, E2, and E3 (see [Figure 1](#)).

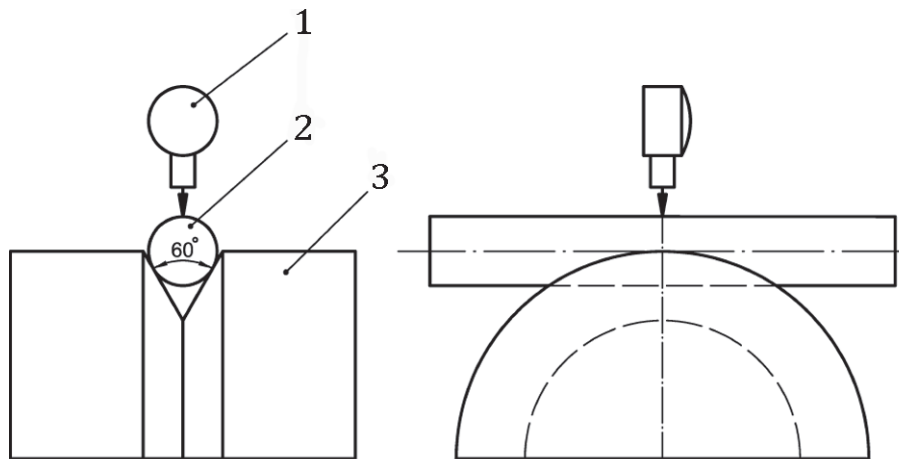
When rotating the wire in a 60° groove, the difference between the maximum and minimum readings on the measuring instrument shall be taken and divided by 1,5. The calculated result shall not exceed the value of the maximum permissible difference specified.



Key

- E1, E2, E3 section planes of measurement
The three planes (E1, E2, and E3) are distributed evenly over the measuring axial length.
- a, b Two local diameters in each section plane of measurement (E1, E2, or E3).

Figure 1 — Measuring positions



Key

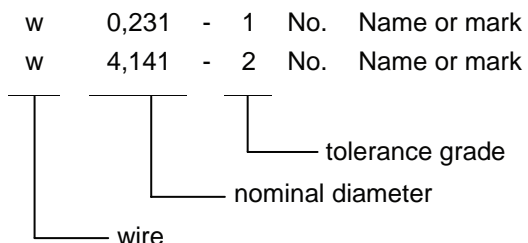
- 1 measuring instrument
- 2 wire
- 3 vee groove

Figure 2 — Determination of the difference of the actual diameters around a wire in a 60° groove

9 Designation

The complete designation for a thread wire comprises the letter, “w”, the value of the wire nominal diameter, the figure indicating the tolerance grade, the serial number of the wire, and the manufacturer’s name or mark. The nominal diameter and tolerance grade are separated by a dash.

EXAMPLE



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