INTERNATIONAL STANDARD

ISO 9409-1

Second edition
1996-01-15

Manipulating industrial robots — Mechanical interfaces —

Part 1: Plates (form A)

Robots manipulateurs industriels — Interfaces mécaniques —
Partie 1: Interfaces à plateau (forme A)

Reference number
ISO 9409-1:1996(E)

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.

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.

International Standard ISO 9409-1 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC 2, *Robots for manufacturing environment*.

This second edition cancels and replaces the first edition (ISO 9409-1:1988) of which it constitutes a technical revision.

ISO 9409 consists of the following parts, under the general title *Manipulating industrial robots — Mechanical interfaces*:

— *Part 1: Plates (form A)*

— *Part 2: Shafts (form A)*

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Introduction

This part of ISO 9409 is one of a series of standards dealing with the requirements of manipulating industrial robots. Other documents cover such topics as terminology, general characteristics, coordinate systems, performance criteria and related test methods, safety, robot programming languages, and robot companion standard to MMS. It is noted that these standards are interrelated and also related to other International Standards.

Manipulating industrial robots are steadily growing in importance in industrial automation. Depending on the type of application, they may require removable end effectors such as grippers or tools which are attached to the mechanical interface.

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Manipulating industrial robots — Mechanical interfaces —

Part 1:
Plates (form A)

1 Scope

This part of ISO 9409 defines the main dimensions, designation and marking for a circular plate as mechanical interface (form A). It is intended to ensure the exchangeability and orientation of hand-mounted end effectors.

This part of ISO 9409 does not define other requirements of the end effector coupling device.

This part of ISO 9409 does not contain any correlation of load-carrying ranges.

The mechanical interface specified in this part of ISO 9409 will also find applications in simple handling systems which are not covered by the definition of manipulating industrial robots, such as pick and place or master-slave units.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 9409. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 9409 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 261:—[1], *ISO general-purpose metric screw threads — General plan.*

ISO 286-1:1988, *ISO system of limits and fits — Part 1: Bases of tolerances, deviations and fits.*

ISO 286-2:1988, *ISO system of limits and fits — Part 2: Tables of standard tolerance grades and limit deviations for holes and shafts.*

ISO 1101:—[2], *Technical drawings — Geometrical tolerancing — Tolerancing of form, orientation, location and run-out — Generalities, definitions, symbols, indications on drawings.*

ISO 8373:1994, *Manipulating industrial robots — Vocabulary.*

ISO 9787:1990, *Manipulating industrial robots — Coordinate systems and motions.*

3 Definitions

For the purposes of this part of ISO 9409, the definitions given in ISO 8373 apply.

4 Dimensions

4.1 General

Is it recommended that the dimensions for the mechanical interface be specified in accordance with table 1, series 1. The supplementary series 2 shall be used only in special cases where the graduation of series 1 is not sufficient for the intended use.

Only one centring diameter is required. d_3 is preferred. The use of d_2 is application dependent.

1) To be published. (Revision of ISO 261:1973)

2) To be published. (Revision of ISO 1101:1983)

The hole, d_5, is intended to have a location pin fitted, which is application dependent. The location pin may have different shapes, e.g. cylindrical or diamond. Any over-dimension shall be excluded by the selection of the location pin.

The location pin hole centre shall be aligned with the $+X_m$ axis vector of the mechanical interface coordinate system (see ISO 9787).

Detailed dimensions (e.g. undercuts), not stated here, are to be selected appropriately.

4.2 Tolerances

The mechanical interface dimensions shall be toleranced in accordance with ISO 286. Geometric tolerances shall be interpreted in accordance with ISO 1101. The counterbore diameter, d_3, and the guide pin hole, d_5, shall be datum references for all geometric tolerances, as shown in figure 1.

4.3 Thread form

Threaded holes shall be in accordance with ISO 261.

4.4 Provision for routing service lines

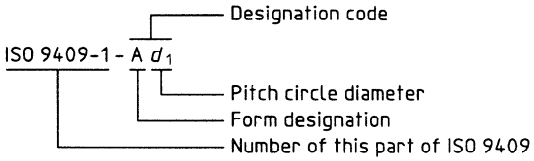
The flange may be constructed with a hollow centre. This centre hole shall have a diameter d_6 equal to or less than d_3.

4.5 End effector requirements

The dimensions and related tolerances of the mating surface of the end effector shall be compatible with the dimensions and tolerances specified in this part of ISO 9409.

5 Designation code

The designation of the mechanical interface whose dimensions are in accordance with this part of ISO 9409, shall be as follows:



EXAMPLE — A mechanical interface of a pitch circle diameter, d_1 = 40 mm, shall be designated as follows:

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6 Marking

When plate mechanical interface and related end effectors made in accordance with this part of ISO 9409 are marked, they shall be permanently stamped with the designation code (see clause 5).

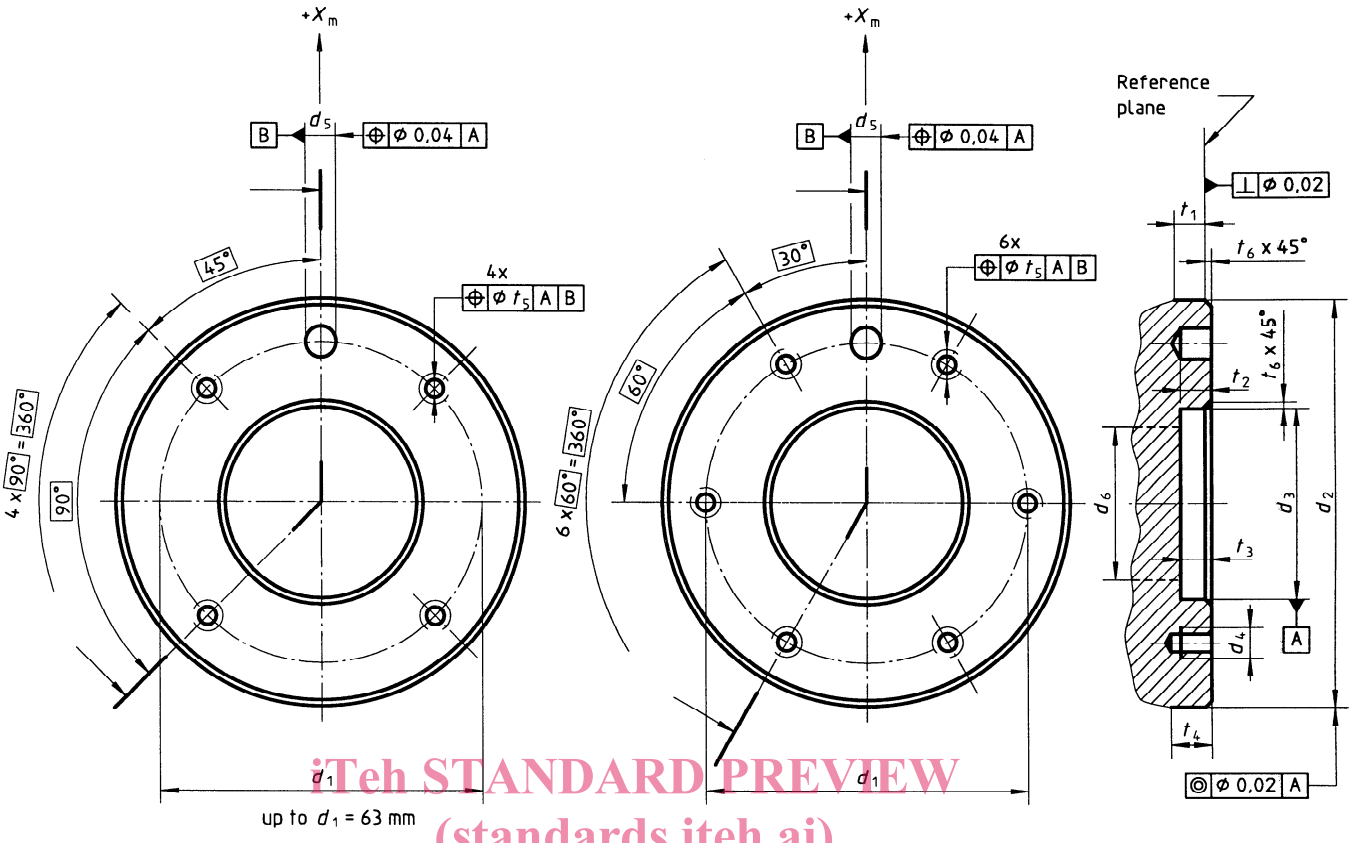

Figure 1 — Basic layout of the circular mechanical interface

Table 1 — Preferred series 1 and supplementary series 2 of the circular mechanical interface

Pitch circle diameter, d_1		d_2	d_3	d_4	d_5	t_1	t_2	t_3	t_4	t_5	t_6	Number of holes
Series 1	Series 2	h8	H7		H7	min.	min.	min.				
25		34	16	M4	4	6	4	4	See note 1	0,1	0,5	4
	31,5	40	20	M5	5		5					
40		50	25	M6	6		6	6			1 min.	
	50	63	31,5									
63		80	40									
	80	100	50	M8	8		8			0,15		6
100		125	63									
	125	160	80	M10	10	8	10	8				
160		200	100									
	200	250	125	M12	12		12			0,2		
250		315	160									

NOTES

1 The minimum depth of the threaded holes, t_4, is dependent on the material of the end effector coupling devices.

2 Parameter d_6: see 4.4.

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Descriptors: automation, automation engineering, manipulators, industrial robots, interfaces, plates, dimensions, designation, marking.

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