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# International Standard



# 7994

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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## **Aerospace — Internal drive, offset cruciform recess (Torq-Set®) for rotary fastening devices — Metric series**

*Aéronautique et espace — Empreinte cruciforme déportée d'entraînement intérieur (Torq-Set®) pour dispositifs de fixation montés par rotation — Série métrique*

**First edition — 1985-11-15**

**ITeH STANDARD PREVIEW**  
**(standards.iteh.ai)**

[ISO 7994:1985](#)

<https://standards.iteh.ai/catalog/standards/sist/d2fa139b-9801-4cc7-9b7f-4c635dbed4ef/iso-7994-1985>

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**Ref. No. ISO 7994-1985 (E)**

**Descriptors :** aircraft industry, aircraft equipment, fasteners, dimensions, designation.

## 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7994 was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*.

Users should note that all International Standards undergo revision from time to time and that any reference made herein to any other International Standard implies its latest edition, unless otherwise stated.

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ISO 7994:1985  
<https://www.iso.org/obp/ui/#iso:code:35-9801-4cc7-9b7f-4c635dbed4ef/iso-7994-1985>

# Aerospace — Internal drive, offset cruciform recess (Torq-Set®) for rotary fastening devices — Metric series

## 0 Introduction

Users of this International Standard are advised that the internal drive recess specified in this International Standard is the Torq-Set® recess and that trademark and proprietary rights apply<sup>1)</sup>. Patent holders have agreed to negotiate licences on terms and conditions defined in statements that are available on request from the ISO Central Secretariat.

## 1 Scope

This International Standard specifies maximum and minimum dimensional requirements for an internal drive recess configuration for rotary fastening devices, and for the associated drivers and gauges, for metric design. The combinations suggested herein are provided for metric shank diameters.

## 2 Field of application

This configuration is intended primarily for use in aerospace applications and other critical areas where high assembly and removal torque capabilities are required.

## 3 References

ISO 128, *Technical drawings — General principles of presentation*.

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

## 4 Definitions

**4.1 internal drive recess:** A formed indentation in the centre of the head of the fastener, with a main axis extending along the longitudinal centreline of the part, the function of which is to accept a closely fitting driving tool for the transmission of rotary movement.

**4.2 driver:** A co-operating tool for use with a fastener the form of which matches the indentation in the head of the fastener to provide a coupling between a rotary driving force and the head of the fastener.

**4.3 offset cruciform recess:** An internal drive recess of an offset cruciform configuration having four equally spaced radial grooves, the sides of which are parallel to each other and parallel to the axis of the fastener.

The clockwise (driving) sides are arranged on 90° radial planes and taper from a maximum diameter at the head surface to a minimum diameter below the the head surface.

**4.4 anticamout rib (ACR®):** A projection of a small cross-section of material extending along a removal (counter-clockwise) recess wall and generally parallel to the recess axis. This rib is provided to allow preliminary indentation by the driver projections upon the application of a counter-clockwise torque and resist the tendency for the driver to ride up and out (self-eject) of the recess.

Drivers are also provided with projections along the removal walls which extend 90° to the axis in order to indent properly the recess projections upon application of a counter-clockwise torque.

1) Torq-Set® and ACR® are registered trademarks of the Phillips Screw Company.

## 5 Characteristics

5.1 The configuration, dimensions and tolerances shall conform as follows:

- recess: in accordance with figures 1, 2 and 3 and tables 1, 2 and 3;
- recess gauge configuration: in accordance with figure 4 and table 4;
- assembly of the recess gauge: in accordance with figure 5 and table 5;
- driver tip: in accordance with figure 6 and table 6.

5.2 The presentation of the figures conforms with ISO 128 and the symbols for tolerances of form and position are in accordance with ISO 1101.

5.3 Figure 4 and table 4 deal with the various gauges used to check the recess. These gauges are as follows:

— Type A GO gauge: used to measure the recess cavity at maximum material condition and to measure gauge penetration values as given in tables 2 and 3; this gauge can also be mounted in a holder and used with a dial indicator, as indicated in figure 5 and table 5.

— Type B GO gauge: used to limit interference between the recess rib and the driver; this gauge is used by hand, as it is, without a dial indicator.

— Type C NOT GO gauge: limits the minimum material condition of the recess; this gauge is used by hand, as it is, without a dial indicator.

## 6 Designation

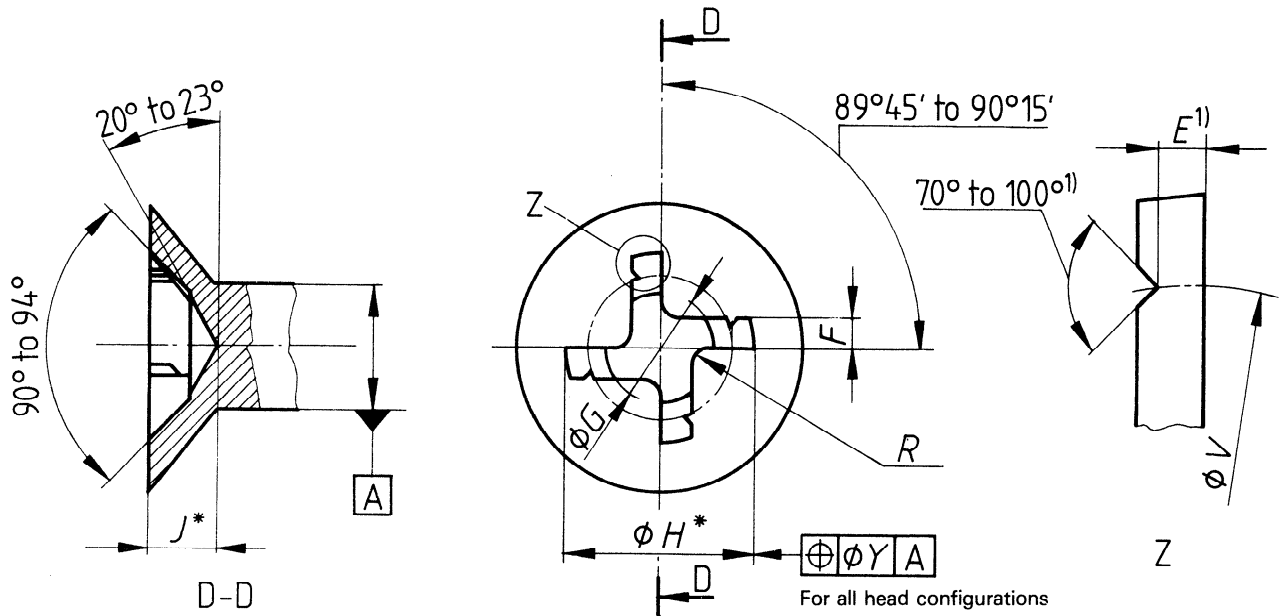
A driving recess complying with this International Standard shall be designated as follows:

**Driving recess ISO 7994 - R XX**

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\* See tables 2 and 3

**Figure 1 – Recess – Configuration**  
 (standards.itech.ai)

**Table 1 – General dimensions**

<https://standards.itech.ai/catalog/standards/sist/d2fa139b-9801-4cc7-9b7d-4c635dbed4ef/iso-7994-1985> Dimensions and tolerances in millimetres

Recess size and No.	$E^1$		$F$		$G$		$R$		$V$		$Y$	Inch recess size and No. <sup>2)</sup>		
	max.	min.	max.	min.	max.	min.	max.	min.	max.	min.				
R1,6					0,94	0,84					0,3	0		
R2			0,46	0,41	1,12	1,02	0,25	0,00				1		
R2,5			0,53	0,46	1,50	1,40						3		
R3			0,58	0,51	1,70	1,60	0,46	0,20			0,3	4		
R3,5	0,648	0,622	0,74	0,66	2,08	1,98			2,69	2,39		6		
R4	0,775	0,749	0,86	0,79	2,44	2,34			3,18	2,87		8		
R5	0,902	0,876	0,99	0,91	2,82	2,72	1,02	0,58	3,68	3,38	0,4	10		
R6	1,206	1,181	1,30	1,22	3,73	3,63			4,83	4,52		1/4		
R8	1,537	1,511	1,63	1,55	4,67	4,57	1,32	0,79	6,32	6,02		5/16		
R10			1,93	1,85	5,59	5,49					0,4	3/8		
R12			2,59	2,49	7,42	7,32	2,26	1,57				1/2		
R14			2,92	2,82	8,33	8,23						9/16		
R16			3,23	3,12	9,27	9,17	2,74	1,98			0,6	5/8		
R18			3,86	3,76	11,10	11,00								3/4
R22			4,50	4,39	12,95	12,85								7/8
R24			5,13	5,03	14,78	14,68	3,78	2,77				1,0		

1) Recess sizes R3,5 to R8 are to have ACR® ribs on the removal wall of each of the four wings. The rib is preferred to be generally triangular in shape; the crest of the triangle is defined by dimension  $E$ . The rib should, preferably, be within the envelope shown by the diameter  $V$ , max. and min., and be on at least the lower 75 % of the wall.

2) For information and comparison purposes only.

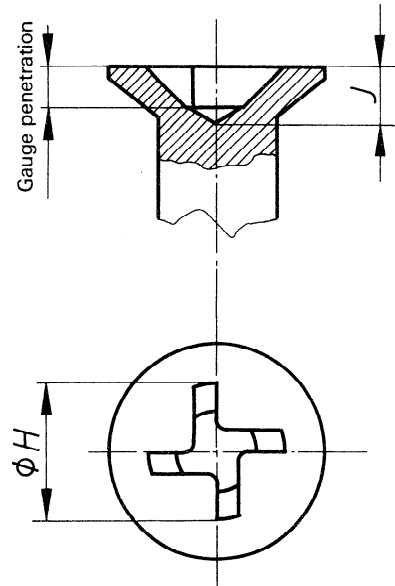


Figure 2 — Recess in 100° countersunk head  
 (standards.iteh.ai)

Table 2 — Recess dimensions applicable to 100° countersunk normal and reduced head

Dimensions in millimetres

Nominal shank or thread diameter	Recess and driver No.		Recess and driver No.	H		J		Gauge penetration	
	Normal head	Reduced head		max.	min.	max.	min.	max.	min.
M1,6	R1,6		R1,6	2,08	1,83	0,79	0,53	0,572	0,368
M2	R2		R2	2,49	2,24	0,94	0,69	0,686	0,470
M2,5	R2,5		R2,5	3,35	3,10	1,24	0,99	0,927	0,686
M3	R3		R3	3,76	3,51	1,40	1,14	1,029	0,775
M3,5	R3,5		R3,5	4,62	4,37	1,68	1,42	1,270	1,003
M4	R4		R4	5,46	5,21	1,98	1,73	1,511	1,219
M5	R5	R4	R5	6,30	6,05	2,29	2,03	1,740	1,422
M6	R6	R5	R6	8,26	8,00	3,00	2,74	2,261	1,905
M7	R6		R8	9,07	8,81	3,10	2,84	2,184	1,778
M8	R8		R10	10,85	10,59	3,68	3,43	2,616	2,159
M10	R10		R12	14,43	14,17	4,90	4,65	3,493	2,934
M12	R12		R14	16,21	15,95	5,51	5,26	3,924	3,315
M14	R14		R16	17,98	17,73	6,12	5,87	4,343	3,683
M16	R16		R18	21,56	21,31	7,32	7,06	5,232	4,470
M18	R18		R22	25,12	24,87	8,53	8,28	6,083	5,220
M20	R18		R24	28,70	28,45	9,73	9,47	6,960	5,994
M22	R22								
M24	R24								

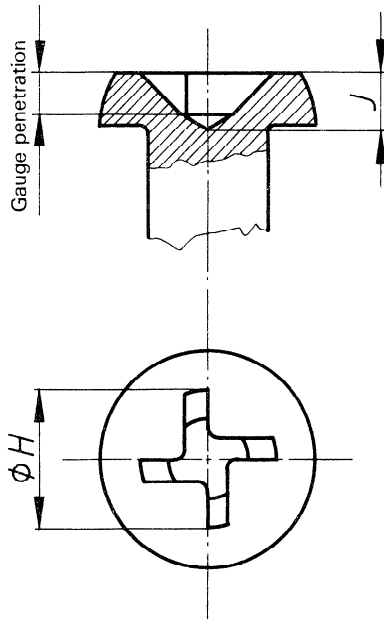


Figure 3 — Recess in normal flat top pan head  
 (standards.iteh.ai)

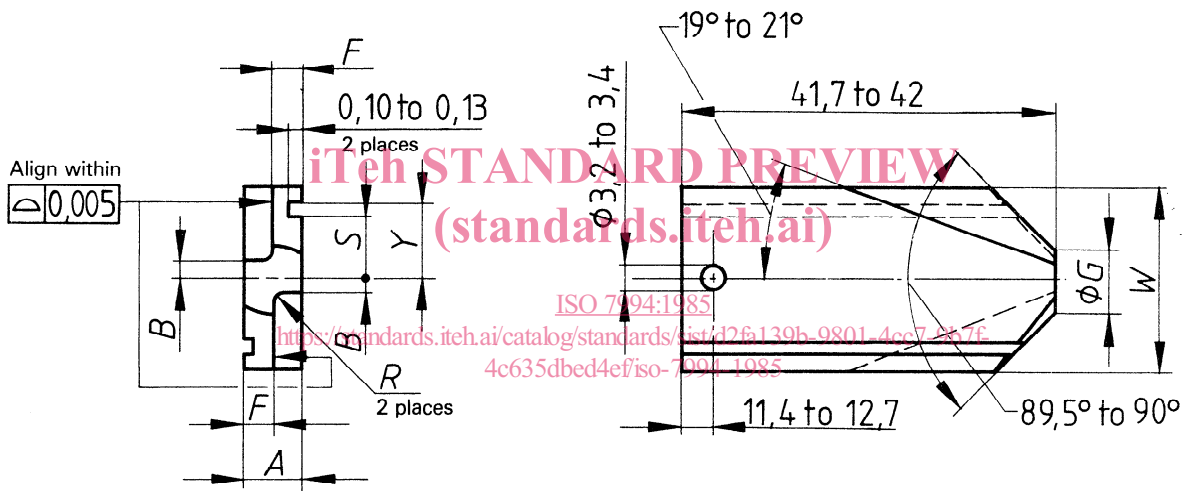
Table 3 — Recess dimensions applicable to normal flat top pan head

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Dimensions in millimetres

Nominal shank or thread diameter	Recess and driver No.	$H$		$J$		Gauge penetration	
		max.	min.	max.	min.	max.	min.
M1,6	R1,6	2,21	1,96	0,84	0,58	0,635	0,432
M2	R2	2,64	2,39	0,99	0,74	0,762	0,546
M2,5	R2,5	3,56	3,30	1,35	1,09	1,029	0,787
M3	R3	3,99	3,73	1,50	1,24	1,143	0,889
M3,5	R3,5	4,90	4,65	1,83	1,57	1,410	1,143
M4	R4	5,79	5,54	2,16	1,91	1,676	1,384
M5	R5	6,68	6,43	2,49	2,24	1,930	1,613
M6	R6	8,76	8,51	3,25	3,00	2,515	2,159
M7	R6	8,76	8,51	3,25	3,00	2,515	2,159
M8	R8	9,70	9,45	3,40	3,15	2,502	2,096
M10	R10	11,61	11,35	4,09	3,84	2,997	2,540
M12	R12	14,43	14,17	4,90	4,65	3,493	2,934
M14	R14	16,21	15,95	5,51	5,26	3,924	3,315
M16	R16	17,98	17,73	6,12	5,87	4,343	3,683
M18	R18	21,56	21,31	7,32	7,06	5,232	4,470
M20	R18	21,56	21,31	7,32	7,06	5,232	4,470
M22	R22	25,12	24,87	8,53	8,28	6,080	5,220
M24	R24	28,70	28,45	9,73	9,47	6,960	5,994

Dimensions and tolerance in millimetres



Material: Heat-treatable corrosion-resistant steel.  
 Heat treat: 58 to 62 HRC.

Figure 4 — Recess gauge — Configuration



Table 4 – Recess gauge – Dimensions

Dimensions and tolerances in millimetres

Recess gauge No. <sup>1)</sup>	Type of gauge <sup>1)</sup>	A ref.	B max.	F +0,003 0	G ±0,03	R max.	W ±0,25	S <sup>2)</sup> 0 -0,05	γ <sup>2)</sup> +0,05 0	Inch recess gauge No. <sup>3)</sup>						
R1,6A	GO	0,810	0,10	0,404	0,97	0,13	6,35			0A						
R1,6C	NO GO	0,917		0,457					0C							
R2A	GO	0,810		0,404				1,14	1A							
R2C	NO GO	0,917		0,457	1C											
R2,5A	GO	0,912		0,455	1,52			3A								
R2,5C	NO GO	1,069		0,533				3C								
R3A	GO	1,013	0,15	0,505	1,73	0,18			4A							
R3C	NO GO	1,171		0,584			4C									
R3,5A <sup>2)</sup>	GO	1,318		0,658	2,11		0,38		0,76	1,27	6A					
R3,5B <sup>2)</sup>	GO	1,245		0,622	2,11							6B				
R3,5C <sup>2)</sup>	NO GO	1,476		0,737	3,40			11,13	0,76	1,27	6C					
R4A <sup>2)</sup>	GO	1,572		0,35	0,785		2,46	0,56	6,35	1,02	1,52	8A				
R4B <sup>2)</sup>	GO	1,499	0,749		2,46						8B					
R4C <sup>2)</sup>	NO GO	1,730	0,864		3,99	11,13	1,02		1,52	8C						
R5A <sup>2)</sup>	GO	1,826	0,912		2,84	0,76	6,35		1,27	1,78	10A					
R5B <sup>2)</sup>	GO	1,753	0,876		2,84							10B				
R5C <sup>2)</sup>	NO GO	1,984	0,991		4,55		11,13		1,27	1,78	10C					
R6A <sup>2)</sup>	GO	2,436	0,50	1,217	3,76	0,76	22,22	1,78	2,29	1/4A						
R6B <sup>2)</sup>	GO	2,362		1,181	3,76							1/4B				
R6C <sup>2)</sup>	NO GO	2,593		1,295	5,74					1,78	2,29	1/4C				
R8A <sup>2)</sup>	GO	3,096		1,547	4,72			0,76	11,13	22,22	2,41	2,92	5/16A			
R8B <sup>2)</sup>	GO	3,023		1,511	4,72										5/16B	
R8C <sup>2)</sup>	NO GO	3,254		1,626	7,16								2,41	2,92	5/16C	
R10A	GO	3,706	0,50	1,852	5,64	1,02	19,05			3/8A						
R10C	NO GO	3,863		1,930					3/8C							
R12A	GO	4,976		2,487	7,47			0,76	11,13	22,22			1/2A			
R12C	NO GO	5,184		2,591											1/2C	
R14A	GO	5,636		2,817	8,38						1,02	25,40			9/16A	
R14C	NO GO	5,845		2,921											9/16C	
R16A	GO	6,246		3,122	9,32			1,02	38,10					5/8A		
R16C	NO GO	6,454		3,226												
R18A	GO	7,516		3,757	11,13					1,02			25,40			3/4A
R18C	NO GO	7,724		3,861												
R22A	GO	8,786		4,392	12,98						1,02	38,10				7/8A
R22C	NO GO	8,994		4,496												
R24A	GO	10,056	5,027	14,81	1,02	38,10			1.0A							
R24C	NO GO	10,264	5,131													1.0C

1) Mark gauge with International Standard number, recess gauge number and the type of gauge.  
 2) The removal wall of each of the two wings on types A and C recess gauge numbers R3,5 to R8 contains grooves as shown to clear ACR® rib.  
 3) For information and comparison purposes only.