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Aerospace — Drives, internal, TORX® PARALOBE® driver bit — Geometrical definition, gaging and technical requirements

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Aerospace — Drives, internal, TORX® PARALOBE® driver bit — Geometrical definition, gaging and technical requirements

Aéronautique et espace — Empreintes, TORX® PARALOBE® embout d'entraînement — Définition géométrique, calibrage et exigences techniques

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Foreword

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This document was prepared by Technical Committee ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 4, *Aerospace fastener systems*.

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Introduction

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INTERNATIONAL STANDARD ISO 4580:2021(E)

Aerospace — Drives, internal, TORX® PARALOBE® driver bit — Geometrical definition, gaging and technical requirements

1 Scope

This document specifies basic dimensions, characteristics and engineering requirements for TORX® PARALOBE®[1)] driver bits used with aerospace fasteners.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 4579, *Aerospace — Drives, internal, TORX® PARALOBE® drive — Geometrical definition, gaging and technical requirements*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
driver bit
tool to induce a torque into a fastener's *recess* (3.2)

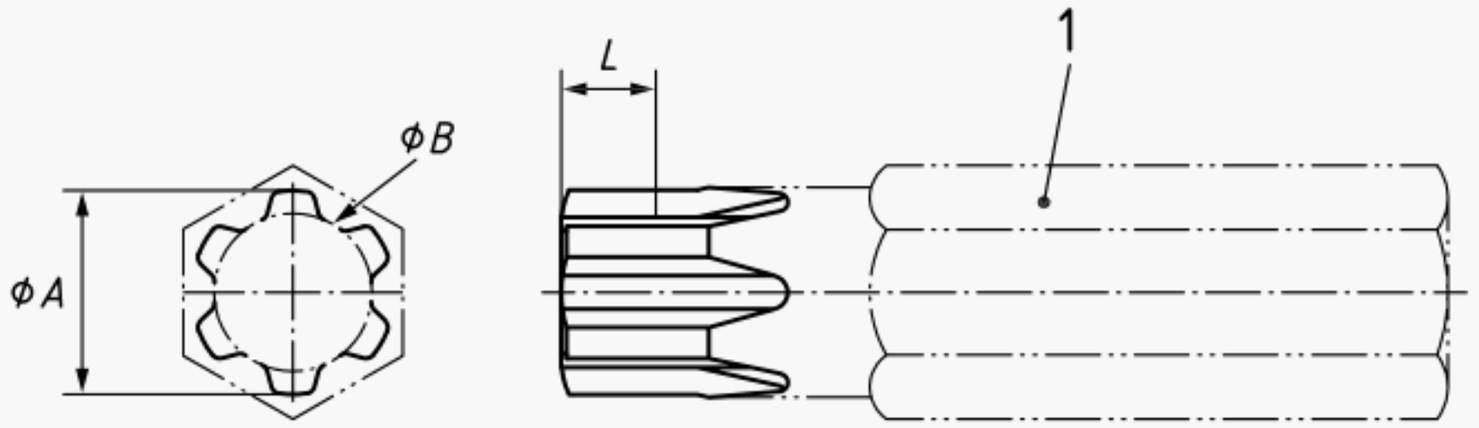
3.2
recess
geometry in a fastener that allows attaching a tool in order to induce a torque to enable tightening and untightening of a fastener

4 Basic driver bit configuration

4.1 General

The basic driver bit configuration shall be in accordance with Figure 1. Driver bits according to this document shall be used in conjunction with fasteners having an internal TORX® PARALOBE® drive according to ISO 4579.

1) TORX PARALOBE is the trademark of a product supplied by Acument Intellectual Properties, LLC, 6125 Eighteen Mile Road, Sterling Heights, MI 48314, USA. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of the products named. Equivalent products may be used if they can be shown to lead to the same results.



Key

⌀*A* configuration diameter (see Tables 1 and 2)

⌀*B* configuration inscribed diameter (see Tables 1 and 2)

L configuration length (see Tables 1 and 2)

1 driver bit marking

Figure 1 — Basic driver bit configuration

The drive size descriptor shall appear on surface of driver bit. The manufacturer's symbol shall also appear on the surface of driver bit.

EXAMPLE:

PARALOBE 25SI

4.2 Basic driver bit configuration dimensions — metric

Table 1 — Driver bit dimensions — metric

Drive code	Drive size descriptor	⌀*A* Configuration diameter mm	⌀*B* Configuration inscribed diameter mm	*L* Configuration length min. mm	Configuration torque min. N · m
001	1SI	0,89	0,64	0,38	0,175
002	2SI	1,02	0,71	0,46	0,256
003	3SI	1,21	0,84	0,53	0,424
004	4SI	1,37	0,99	0,61	0,662
005	5SI	1,50	1,10	0,64	0,891
006	6SI	1,80	1,38	0,76	1,65
007	7SI	2,10	1,59	0,91	2,51
008	8SI	2,44	1,85	1,07	4,01
009	9SI	2,64	2,01	1,12	5,11
010	10SI	2,90	2,18	1,22	6,69
015	15SI	3,45	2,64	1,47	11,6
020	20SI	4,08	3,15	1,70	19,5
025	25SI	4,69	3,56	1,96	28,9
027	27SI	5,27	4,08	2,18	42,4
030	30SI	5,84	4,51	2,44	57,6
040	40SI	7,02	5,41	2,95	99,9
045	45SI	8,27	6,48	3,48	167
050	50SI	9,35	7,21	3,99	237

Table 1 *(continued)*

Drive code	Drive size descriptor	⌀*A* Configuration diameter mm	⌀*B* Configuration inscribed diameter mm	*L* Configuration length min. mm	Configuration torque min. N · m
055	55SI	11,86	9,42	5,08	504
060	60SI	14,02	10,92	6,10	810
070	70SI	16,45	12,93	7,19	1 320
080	80SI	18,59	14,43	8,18	1 890
090	90SI	21,12	16,60	9,32	2 810
100	100SI	23,46	18,45	10,36	3 850
110	110SI	25,36	19,38	11,28	4 700

4.3 Basic driver bit configuration dimensions — inch

Table 2 — Driver bit dimensions — inch[a]

Drive code	Drive size descriptor	⌀*A* Configuration diameter inch	⌀*B* Configuration inscribed diameter inch	*L* Configuration length min. inch	Configuration torque min. lbf · in
001	1SI	0.035	0.025	0.015	1.55
002	2SI	0.040	0.028	0.018	2.27
003	3SI	0.048	0.033	0.021	3.75
004	4SI	0.054	0.039	0.024	5.86
005	5SI	0.059	0.044	0.025	7.89
006	6SI	0.071	0.055	0.030	14.6
007	7SI	0.083	0.063	0.036	22.2
008	8SI	0.096	0.073	0.042	35.5
009	9SI	0.104	0.079	0.044	45.2
010	10SI	0.114	0.086	0.048	59.2
015	15SI	0.136	0.104	0.058	103
020	20SI	0.161	0.124	0.067	173
025	25SI	0.185	0.140	0.077	256
027	27SI	0.208	0.161	0.086	375
030	30SI	0.230	0.178	0.096	510
040	40SI	0.277	0.213	0.116	884
045	45SI	0.326	0.255	0.137	1 480
050	50SI	0.368	0.284	0.157	2 100
055	55SI	0.467	0.371	0.200	4 460
060	60SI	0.552	0.430	0.240	7 170
070	70SI	0.648	0.509	0.283	11 700
080	80SI	0.732	0.568	0.322	16 700
090	90SI	0.832	0.654	0.367	24 900

[a] The dimensions in this table are rounded. Therefore the general formula for converting inches into mm cannot be used.

Table 2 *(continued)*

Drive code	Drive size descriptor	⌀*A* Configuration diameter inch	⌀*B* Configuration inscribed diameter inch	*L* Configuration length min. inch	Configuration torque min. lbf · in
100	100SI	0.924	0.727	0.408	34 100
110	110SI	0.999	0.763	0.444	41 600

[a] The dimensions in this table are rounded. Therefore the general formula for converting inches into mm cannot be used.

4.4 Driver bit designation

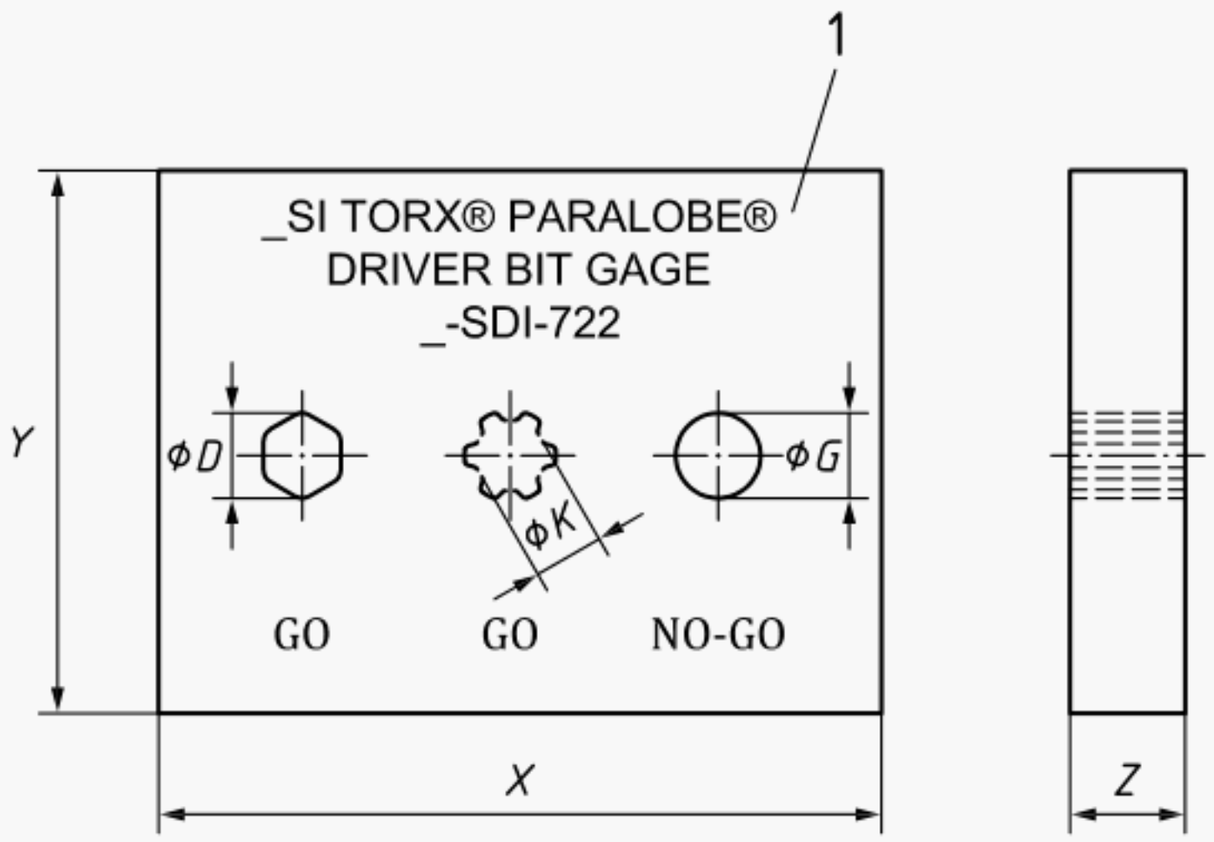
The driver bit designation shall be as shown in the following example:

ISO 4580-025

- 025 — Drive code as listed in Tables 1 and 2
- ISO 4580 — Drive standard

5 Driver bit inspection

5.1 Driver bit gaging equipment



Key

X gage body length (see Tables 3 and 4)
Y gage body width (see Tables 3 and 4)
Z gage body thickness (see Tables 3 and 4)
⌀*D* configuration circumscribed diameter go gage (see Tables 3 and 4)
⌀*K* configuration inscribed diameter go gage (see Tables 3 and 4)
⌀*G* configuration circumscribed diameter no-go gage (see Tables 3 and 4)
1 gage identification marking

Figure 2 — Driver bit inspection gage

The driver bit inspection gage identification markings shall appear on surface of gage along with drive size descriptor and gage series number.

EXAMPLE:

25SI TORX® PARALOBE®

Driver bit gage

25-SDI-722

5.2 Driver bit gaging procedure

The driver bit configuration dimensions shall be inspected with the go, no-go gages specified in Figure 2. The driver bit body dimensions shall be appropriate for the application as defined in the applicable military standards, industry standards or manufacturer's data. Unless otherwise specified, the driver bit shall be in accordance with the requirements of industry standards.

Driver bit inspection gage dimensions are listed in Tables 3 and 4.

The driver bit configuration length (L) shall be measured with a calliper or other appropriate method.

5.3 Driver bit inspection gage dimensions — metric

Table 3 — Driver bit inspection gage dimensions — metric

Drive size descriptor	Gage series number	$\varnothing D$ mm	$\varnothing K$ mm	$\varnothing G$ mm	X mm	Y mm	Z mm
1SI	01-SDI-722	0,92	0,67	0,86	50,80	38,10	6,35
2SI	02-SDI-722	1,05	0,74	0,99	50,80	38,10	6,35
3SI	03-SDI-722	1,25	0,87	1,19	50,80	38,10	6,35
4SI	04-SDI-722	1,40	1,02	1,34	50,80	38,10	6,35
5SI	05-SDI-722	1,53	1,15	1,47	50,80	38,10	6,35
6SI	06-SDI-722	1,83	1,43	1,77	50,80	38,10	6,35
7SI	07-SDI-722	2,14	1,63	2,08	50,80	38,10	6,35
8SI	08-SDI-722	2,47	1,88	2,41	50,80	38,10	6,35
9SI	09-SDI-722	2,67	2,04	2,61	50,80	38,10	6,35
10SI	10-SDI-722	2,93	2,21	2,87	50,80	38,10	7,92
15SI	15-SDI-722	3,48	2,67	3,42	50,80	38,10	7,92
20SI	20-SDI-722	4,12	3,18	4,06	50,80	38,10	7,92
25SI	25-SDI-722	4,75	3,61	4,65	50,80	38,10	7,92
27SI	27-SDI-722	5,33	4,14	5,23	50,80	38,10	7,92
30SI	30-SDI-722	5,89	4,57	5,79	50,80	38,10	7,92
40SI	40-SDI-722	7,09	5,46	6,99	63,50	38,10	9,53
45SI	45-SDI-722	8,33	6,53	8,23	63,50	38,10	9,53
50SI	50-SDI-722	9,40	7,26	9,30	63,50	38,10	9,53
55SI	55-SDI-722	11,94	9,50	11,78	63,50	38,10	9,53
60SI	60-SDI-722	14,10	11,00	13,94	88,90	50,80	12,70
70SI	70-SDI-722	16,54	13,01	16,38	88,90	50,80	12,70
80SI	80-SDI-722	18,67	14,51	18,51	88,90	50,80	12,70
90SI	90-SDI-722	21,21	16,69	21,05	88,90	50,80	12,70
100SI	100-SDI-722	23,55	18,55	23,39	101,60	50,80	12,70

Table 3 *(continued)*

Drive size descriptor	Gage series number	⌀D mm	⌀K mm	⌀G mm	X mm	Y mm	Z mm
110SI	110-SDI-722	25,45	19,46	25,29	101,60	50,80	12,70

5.4 Driver bit inspection gage dimensions — inch

Table 4 — Driver bit inspection gage dimensions — inch[a]

Drive size descriptor	Gage series number	⌀D inch	⌀K inch	⌀G inch	X inch	Y inch	Z inch
1SI	01-SDI-722	0.036	0.026	0.034	2.000	1.500	0.250
2SI	02-SDI-722	0.041	0.029	0.039	2.000	1.500	0.250
3SI	03-SDI-722	0.049	0.034	0.047	2.000	1.500	0.250
4SI	04-SDI-722	0.055	0.040	0.053	2.000	1.500	0.250
5SI	05-SDI-722	0.060	0.045	0.058	2.000	1.500	0.250
6SI	06-SDI-722	0.072	0.056	0.070	2.000	1.500	0.250
7SI	07-SDI-722	0.084	0.064	0.082	2.000	1.500	0.250
8SI	08-SDI-722	0.097	0.074	0.095	2.000	1.500	0.250
9SI	09-SDI-722	0.105	0.080	0.103	2.000	1.500	0.250
10SI	10-SDI-722	0.115	0.087	0.113	2.000	1.500	0.312
15SI	15-SDI-722	0.137	0.105	0.135	2.000	1.500	0.312
20SI	20-SDI-722	0.162	0.125	0.160	2.000	1.500	0.312
25SI	25-SDI-722	0.187	0.142	0.183	2.000	1.500	0.312
27SI	27-SDI-722	0.210	0.163	0.206	2.000	1.500	0.312
30SI	30-SDI-722	0.232	0.180	0.228	2.000	1.500	0.312
40SI	40-SDI-722	0.279	0.215	0.275	2.500	1.500	0.375
45SI	45-SDI-722	0.328	0.257	0.324	2.500	1.500	0.375
50SI	50-SDI-722	0.370	0.286	0.366	2.500	1.500	0.375
55SI	55-SDI-722	0.470	0.374	0.464	2.500	1.500	0.375
60SI	60-SDI-722	0.555	0.433	0.549	3.500	2.000	0.500
70SI	70-SDI-722	0.651	0.512	0.645	3.500	2.000	0.500
80SI	80-SDI-722	0.735	0.571	0.729	3.500	2.000	0.500
90SI	90-SDI-722	0.835	0.657	0.829	3.500	2.000	0.500
100SI	100-SDI-722	0.927	0.730	0.921	4.000	2.000	0.500
110SI	110-SDI-722	1.002	0.766	0.996	4.000	2.000	0.500

[a] The dimensions in this table are rounded. Therefore the general formula for converting inches into mm cannot be used.

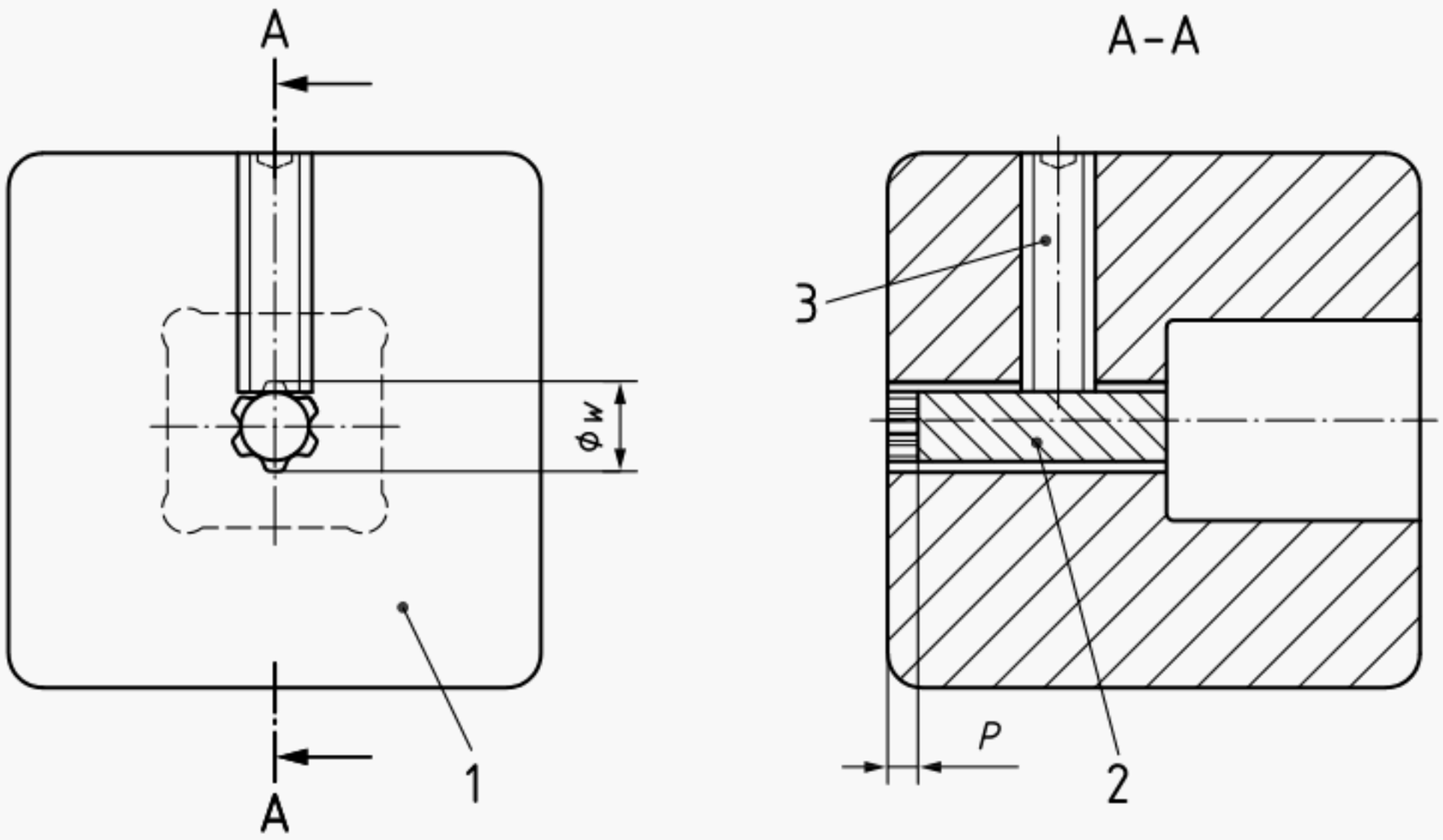
6 Driver bit torque test

6.1 Driver bit torque test apparatus

The torque test apparatus shall be capable of maintaining alignment of the driver bit axis and torque test fixture configuration axis, ensuring non-rotation of the torque test fixture, applying a specified end load and apply torque only, and avoiding applying a bending moment on the driver bit. The apparatus shall not resist any tendency of the driver bit to cam out of the torque test fixture configuration during the test.

6.2 Torque test fixture

The driver bit shall be tested in a torque test fixture (Figure 3) having in its centre the correct drive size, configuration and pin to set configuration depth (*P*), to values shown in Table 5. The configuration in the test fixture shall have a hardness of 58 HRC to 61 HRC.



Key

⌀*W* torque test fixture configuration diameter (see Table 5)
P configuration depth (see Table 5)
1 fixture identification marking
2 pin
3 set screw

Figure 3 — Driver bit torque test fixture — typical

The driver bit torque test fixture identification marking shall appear on surface of fixture.

EXAMPLE:

25-SDI-727

Table 5 — Driver bit torque test fixture configuration dimensions — metric and inch[a]

Drive size descriptor	Torque fixture series number	⌀*W* Configuration diameter mm	*P* Configuration depth mm	⌀*W* Configuration diameter inch	*P* Configuration depth inch
1SI	01-SDI-727	0,95	0,43	0.037	0.017
2SI	02-SDI-727	1,07	0,50	0.042	0.020
3SI	03-SDI-727	1,29	0,60	0.051	0.024
4SI	04-SDI-727	1,45	0,67	0.057	0.027
5SI	05-SDI-727	1,58	0,71	0.062	0.028
6SI	06-SDI-727	1,89	0,84	0.074	0.033
7SI	07-SDI-727	2,22	1,00	0.087	0.040
8SI	08-SDI-727	2,56	1,17	0.101	0.046

[a] The dimensions in this table are rounded. Therefore the general formula for converting inches into mm cannot be used.

Table 5 *(continued)*

Drive size descriptor	Torque fixture series number	⌀*W* Configuration diameter mm	*P* Configuration depth mm	⌀*W* Configuration diameter inch	*P* Configuration depth inch
9SI	09-SDI-727	2,76	1,24	0.109	0.049
10SI	10-SDI-727	3,02	1,36	0.119	0.054
15SI	15-SDI-727	3,58	1,63	0.141	0.064
20SI	20-SDI-727	4,20	1,88	0.165	0.074
25SI	25-SDI-727	4,82	2,17	0.190	0.086
27SI	27-SDI-727	5,40	2,43	0.213	0.096
30SI	30-SDI-727	5,98	2,69	0.235	0.106
40SI	40-SDI-727	7,19	3,24	0.283	0.128
45SI	45-SDI-727	8,44	3,80	0.332	0.150
50SI	50-SDI-727	9,52	4,31	0.375	0.170
55SI	55-SDI-727	12,07	5,40	0.475	0.213
60SI	60-SDI-727	14,28	6,41	0.562	0.253
70SI	70-SDI-727	16,71	7,51	0.658	0.296
80SI	80-SDI-727	18,87	8,50	0.743	0.335
90SI	90-SDI-727	21,44	9,64	0.844	0.380
100SI	100-SDI-727	23,78	10,68	0.936	0.421
110SI	110-SDI-727	25,69	11,60	1.011	0.457

[a] The dimensions in this table are rounded. Therefore the general formula for converting inches into mm cannot be used.

6.3 Torque wrench/torsion machine

Hand torque wrench shall conform to applicable requirements.

Torsion machines or other power tools shall conform to applicable requirements.

7 Driver bit torque test procedure

The minimum driver bit torque values are listed in Table 1 and Table 2 when tested in accordance with the procedure below. These values should not be mistaken as assembly torque values nor fastener recess torque.

a) Set the torque test fixture configuration depth *P* for correct drive size as listed in Table 5.

b) Place driver bit in a suitable torque test apparatus.

c) Mate the driver bit within the configuration of the torque test fixture, ensuring that the bit is free to move in or out of the configuration but that the bit axis is constrained within 1° of angular alignment with the torque test fixture configuration axis.

d) Apply an end load as specified in the fastener standard or other applicable document. The total end load shall be effective at bit/torque test fixture configuration juncture.

e) With the bit mated to the torque test fixture configuration and the end load applied (but no torque applied), zero the torque measuring device.

f) Apply the torque slowly in the installation direction at a smooth, continuous rate until driver bit torsional fracture occurs.

g) Record the applied torque and mode of failure.

h) Disengage the driver bit and torque test fixture configuration.

i) If required, repeat steps a) to h), applying torque in the removal direction, using a new driver bit.

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