

Aerospace series — Connectors, electrical, circular, coupled by threaded ring, fire-resistant or non fire-resistant, operating temperatures –65 °C to 175 °C continuous, 200 °C continuous, 260 °C peak —

Part 001: Technical specification

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National foreword

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A list of organizations represented on ACE/6/-/3 can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Série aérospatiale - Connecteurs électriques circulaires à accouplement par bague fileté, résistant au feu ou non, températures d'utilisation - 65 °C à 175 °C continu, 200 °C continu, 260 °C en pointe - Partie 001 : Spécification technique

Luft- und Raumfahrt - Elektrische Rundsteckverbinder mit Schraubkupplung, feuerbeständig oder nicht feuerbeständig, Betriebstemperaturen - 65 °C bis 175 °C konstant, 200 °C konstant, 260 °C Spitze - Teil 001: Technische Lieferbedingungen

This European Standard was approved by CEN on 24 June 2006.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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Foreword

This document (EN 2997-001:2006) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2007, and conflicting national standards shall be withdrawn at the latest by April 2007.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 2997-1:1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

This family of connectors is derived from MIL-DTL-83723F series III, type T with which it is intermateable. It is particularly suitable for use on aircraft engines and in zones of severe environmental conditions on board aircraft, applying EN 2282.

These connectors are distinguishable from MIL-DTL-83723F by:

- the mechanical stop for coupling being achieved manually;
- the coupling system having a self-locking nut that features a greater resistance to decoupling;
- the variety of the functional classes and models.

1 Scope

This standard specifies the general characteristics, the conditions for qualification acceptance and quality assurance, and the test programs and groups for threaded ring coupling circular connectors, fire-resistant or non fire-resistant, intended for use in a temperature range from -65°C to 175°C continuous, 200°C continuous or 260°C peak according to the classes and models.

2 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 263, *ISO Inch screw threads — General plan and selection for screws, bolts and nuts — Diameter range 0,06 to 6 in.*

ISO 4524-1, *Metallic coatings — Test methods for electrodeposited gold and gold alloy coatings — Part 1: Determination of coating thickness.*

EN 2267-002, *Aerospace series — Cables, electrical, for general purpose — Operating temperatures between -55°C and 260°C — Part 002: General.*

EN 2282, *Aerospace series — Characteristics of aircraft electrical supplies.*

EN 2346-003, *Aerospace series — Cable, electrical, fire resistant — Operating temperatures between -65°C and 260°C — Part 003: DL family, single core — Product standard.*

EN 2591-100*, *Aerospace series — Elements of electrical and optical connection — Test methods — Part 100: General.*

* And all parts quoted in this standard.

EN 2997-002, *Aerospace series — Connectors, electrical, circular, coupled by threaded ring, fire-resistant or non fire-resistant, operating temperatures 175 °C continuous, 200 °C continuous, 260 °C peak — Part 002: Specification of performance and contact arrangements.*

EN 3155-001, *Aerospace series — Electrical contacts used in elements of connection — Part 001: Technical specification.* ¹⁾

EN 3197, *Aerospace series — Installation of aircraft electrical and optical interconnection systems.* ¹⁾

EN 3660-003, *Aerospace series — Cable outlet accessories for circular and rectangular electrical and optical connectors — Part 003: Grommet nut, style A for EN 2997 and EN 4067 — Product standard.*

EN 3660-004, *Aerospace series — Cable outlet accessories for circular and rectangular electrical and optical connectors — Part 004: Cable outlet, style A, straight, unsealed with clamp strain relief for EN 2997 and EN 4067 — Product standard.*

EN 3909, *Aerospace series — Test fluids for electric components and sub-assemblies.*

EN 9133, *Aerospace series — Quality management systems — Qualification Procedure for aerospace standard parts.*

MIL-DTL-83723F, *Connectors, electrical, (circular, environment resisting), receptacles and plugs, general specification for.* ²⁾

MIL-PRF-7808L, *Lubricating oil, aircraft turbine engine, synthetic base, NATO code number O-148.* ²⁾

MIL-PRF-7870C, *Lubricating oil: general purpose, low temperature, NATO code number O-142.* ²⁾

MIL-PRF-23699F, *Lubricating oil, aircraft turbine engine, synthetic base, NATO code number O-156.* ²⁾

MIL-PRF-87937D, *Cleaning compound, aerospace equipment.* ²⁾

MIL-HDBK-454A, *General guidelines for electronic equipment.* ²⁾

QPL-5606-31, *Hydraulic fluid, petroleum base; aircraft; missile and ordnance.* ²⁾

AS1241C, *Fire resistant phosphate ester hydraulic fluid for aircraft.* ³⁾

AMS1424D, *Fluid, Deicing/Anti-Icing, Aircraft, SAE Type I.* ³⁾

3 Terms and definitions

For the purposes of this standard, the terms and definitions given in EN 2591-100 apply.

1) Published as AECMA Pre-standard at the date of publication of this standard.

2) Published by: Department of Defense (DOD), The Pentagon, Washington D.C. 20301, USA.

3) Published by Society of Automotive Engineers Inc. (SAE) 400 Commonwealth Drive, Warrendale, PA 15096-001, USA.

4 Description

4.1 General

Different variants of materials, housings and contact arrangements are provided according to the model and class.

These connectors use crimp or solder contacts of sizes 20, 16 and 12.

The receptacles and plugs contain either male contacts or female contacts.

The contacts fitted in the classes Y and YE receptacles are exclusively of the male non-removable solder type.

The connectors are polarized by means of keyways and keys; polarization shall be obtained before the male contacts enter the insert of the female contacts and before the coupling ring is engaged. The position of the keying arrangement is given in Table 5. Masking of the blue colour band on the receptacle provides visual indication of full coupling.

4.2 Receptacle

The receptacle may be attached by:

- square flange;
- the jam-nut with O-ring sealing; for spare parts, see EN 2997-002;
- round flange for attachment by soldering/brazing/welding, classes Y and YE only.

The receptacle contains five keyways into which the keys of the plug engage. The main keyway is fixed and is wider than the others. Polarization is ensured by different positions of the secondary keyways. The position of the insert is fixed relative to the main keyway.

4.3 Plug

The plug contains five keys, which engage in the keyways of the receptacle. The main key is wider than the others. Polarization is ensured by different positions of the secondary keys. The position of the insert is fixed relative to the main key.

The coupling ring permanently fitted on the plug enables the connectors to be coupled and uncoupled. The coupling torque shall be at least 50 % lower than the uncoupling torque. The internal thread of the coupling ring may be treated during manufacture with a suitable lubricant compatible with the performance required in this standard.

The plug of classes S, SE, RS and WS is fitted with a grounding spring device ensuring electrical continuity between the coupled connector housings.

4.4 Materials and surface treatment

4.4.1 General

When dissimilar metals are in close contact, adequate protection against corrosion shall be used for the electromotive force of the cell not to exceed 0,25 V (see EN 3197).

4.4.2 Housings

The material of the housing for the connectors and for the fittings may either be passivated stainless steel or aluminium alloy protected against corrosion by nickel or cadmium plating (see EN 2997-002).

4.4.3 Contacts

Unless otherwise specified, the contacts shall be in ferrous alloy for classes Y and YE and in copper alloy for the other models.

The contacts for classes Y and YE shall be gold-plated on an appropriate undercoat (silver undercoat shall not be used). Selective protection is authorized provided that it is sufficient to ensure that performance is not affected.

Measurement of the thickness of the protective treatment shall be effected in accordance with EN 2591-508.

For removable contacts, see EN 2997-002.

4.4.4 Non-metallic materials

The materials used for insert, seals and grommets shall have hardness and mechanical and electrical characteristics consistent with the required use.

5 Design

5.1 Housings

The connector housings shall be in one unit. They shall contain teeth at the rear over the entire periphery and shall accommodate the cable outlet accessory and other fittings. The receptacle shall furthermore be fitted with an O-ring seal for sealing the coupled housings.

Receptacles for attachment by nut shall contain an O-ring seal. The nut shall have holes for the passage of locking wire.

The threads shall conform to ISO 263.

The coupling ring shall be designed so that the male and female contacts engage when it is rotated clockwise and disengage when it is rotated anti clockwise. The coupling ring shall be knurled to aid gripping by hand.

On completion of tightening of the coupling ring, mechanical metal to metal contact shall exist between the receptacle and the plug mating faces, indicated by masking of the blue colour band (see Figure 1).

The cable outlet accessories shall compress the grommet of the connectors without twisting it.

A blue colour band indicating that the crimp contacts of the connectors are intended for rear removal shall be provided:

- behind the flange of the receptacles with square flange;
- on the flange of receptacles for nut attachment;
- on the coupling ring of the plugs.

The position of the blue colour bands shall be such that at least one of them is visible at all times on the coupling ring of the plug.

5.2 Inserts

The insert carrying the male and female contacts shall be in hard material and have a cross section and radii such that no cracks, flaking or breaks can occur in normal operation.

The insert for contacts shall be non-removable; it shall be mechanically held in the housing. Sealing shall be provided between the housing and insert.

The front face of the insert shall be such that sealing is ensured when the connectors are coupled. The interfacial seal of the insert of the male contacts shall be bonded on the hard insert.

The grommet shall permit sealing for all cable diameters indicated in EN 2997-002 and shall not be removable.

The mechanical contacts retention system shall be integrated in the hard insert.

The design of non-hermetic connectors shall permit individual installation of the contacts without removal of the insert or grommet. Insertion and removal of the contacts shall be from the rear with the tools specified in the product standards.

6 Definition drawings and masses

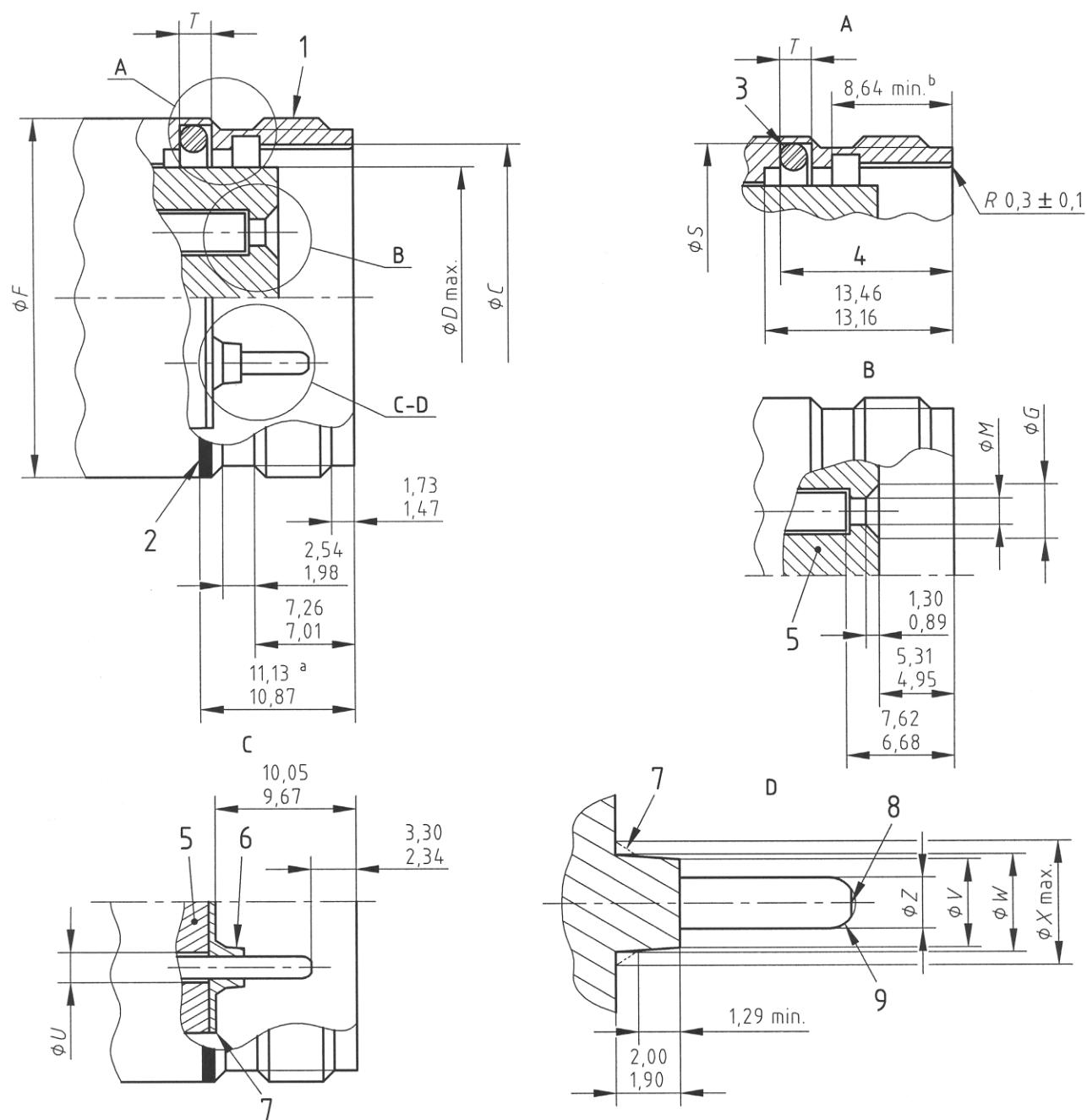
6.1 General

The general dimensions and the masses of receptacles, plugs and protective covers are given in the product standards.

6.2 Receptacle mating dimensions

The mating dimensions of receptacles are shown in Figure 1 including details A, B, C and D as well as in Tables 1 and 2.

Dimensions and tolerances are in millimetres.



Key

- | | |
|---|-------------------------------------|
| 1 Thread | 5 Hard insert |
| 2 Blue coloured band minimum width 0,64 | 6 Interfacial seal |
| 3 Seal diameter housing size 08 : $1,42 \pm 0,08$
housing sizes 10 to 28 : $1,78 \pm 0,08$ | 7 Optional shape |
| 4 Housing 08 : 12,37
12,12 | 8 Flat ϕN |
| Other housings : 12,57
12,32 | 9 Blend radius |
| | ^a To rear of colour band |
| | ^b Depth of keyways |

Figure 1

Table 1

Housing size	Thread, class 2A ^a	<i>C</i>	<i>D</i> max.	<i>S</i>	<i>T</i>	<i>F</i> max.
08	0.5625 - 24 UNEF	10,62 10,49	7,37	12,58 12,45	1,93 1,80	14,27
10	0.6875 - 24 UNEF	13,59 13,46	9,86	16,28 16,15	2,26 2,13	17,67
12	0.8750 - 20 UNEF	17,91 17,78	14,17	20,60 20,47		22,22
14	0.9375 - 20 UNEF	19,66 19,53	15,93	22,35 22,22		23,77
16	1.0625 - 18 UNEF	22,89 22,76	19,61	25,58 25,45		26,97
18	1.1875 - 18 UNEF	25,58 25,45	21,84	28,27 28,14		30,15
20	1.3125 - 18 UNEF	28,75 28,63	25,02	31,45 31,32		33,32
22	1.4375 - 18 UNEF	31,93 31,80	28,19	34,62 34,49		36,49
24	1.5625 - 18 UNEF	35,10 34,98	31,37	37,80 37,67		39,67
28	1.8125 - 16 UN	41,45 41,32	37,52	44,15 44,02		46,02
^a ISO 263.						

Table 2

Contact size	<i>G</i> ^a	<i>M</i>	<i>U</i> ^b	<i>V</i>	<i>W</i>	<i>X</i> ^a max.	<i>Z</i>	<i>N</i>
20	3,00 2,90	1,50 1,24	1,17 1,07	2,28 2,14	2,38 2,28	3,00	1,04 0,99	0,51 0,13
16	3,81 3,71	2,06 1,80	1,75 1,65	2,88 2,73	2,98 2,88	3,81	1,61 1,56	0,81 0,43
12	5,33 5,22	2,84 2,54	2,57 2,46	3,85 3,68	3,95 3,85	5,33	2,41 2,36	1,57 1,19
^a For contact arrangements 08-03 and 10-06, $G = \frac{2,44}{2,34}$, X max. = 2,44. ^b Dimension <i>U</i> does not apply to hermetic receptacles.								

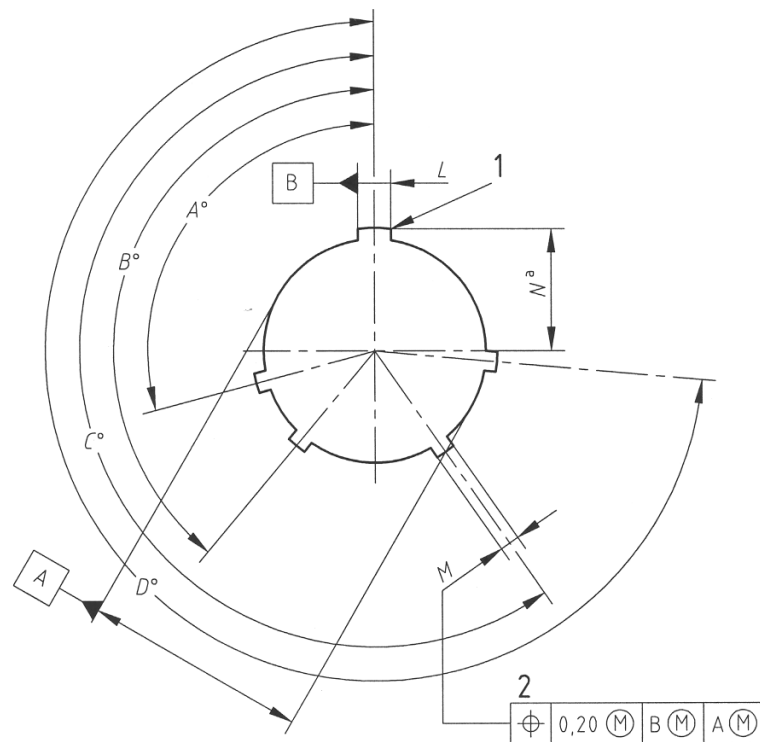
Table 3

Housing size	Thread, class 2B ^a	<i>B</i> max.	<i>H</i> min.	<i>J</i>	<i>K</i> min.
08	0.5625 - 24 UNEF	7,37	7,47	10,29 10,16	14,61
10	0.6875 - 24 UNEF	9,86	10,87	13,36 13,23	17,96
12	0.8750 - 20 UNEF	14,17	15,19	17,68 17,55	22,73
14	0.9375 - 20 UNEF	15,93	16,94	19,43 19,30	24,31
16	1.0625 - 18 UNEF	19,61	20,17	22,66 22,53	27,53
18	1.1875 - 18 UNEF	21,84	22,86	25,35 25,22	30,71
20	1.3125 - 18 UNEF	25,02	26,04	28,52 28,40	33,88
22	1.4375 - 18 UNEF	28,19	29,21	31,70 31,57	37,06
24	1.5625 - 18 UNEF	31,37	32,38	34,87 34,75	40,23
28	1.8125 - 16 UN	37,52	38,73	41,22 41,09	46,58
^a ISO 263					

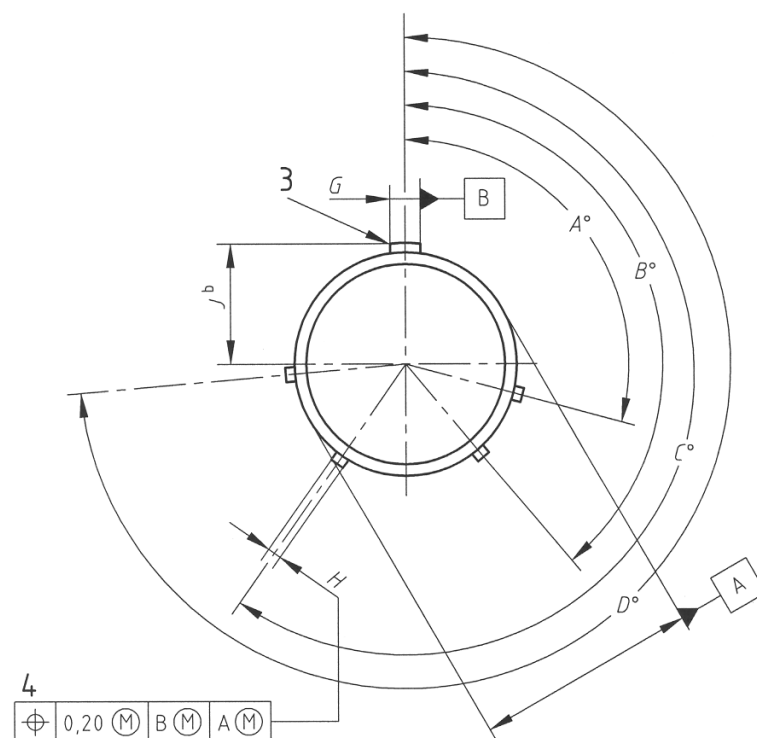
6.4 Receptacle and plug polarization

See Figure 3 and Tables 4 and 5.

Dimensions and tolerances are in millimetres.



Receptacle



Plug

Key

- 1 Keyway for main key
- 2 4 secondary keyways
- 3 Main key

- 4 4 secondary keys
a 5 keyways
b 5 keys

Figure 3

Table 4 — Position of the keys and keyways

Position	Housing sizes - Values in degrees											
	08				10				12 to 28			
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>
N	105	140	215	265	105	140	215	265	105	140	215	265
6	102	132	248	320	102	132	248	320	18	149	192	259
7	80	118	230	312	80	118	230	312	92	152	222	342
8	35	140	205	275	35	140	205	275	84	152	204	334
9	64	155	234	304	64	155	234	304	24	135	199	240
Y	—	—	—	—	25	115	220	270	98	152	268	338

Table 5

Housing size	<i>G</i>	<i>H</i>	<i>J</i>	<i>L</i>	<i>M</i>	<i>N</i>
08	2,21 2,05	1,40 1,24	5,72 5,64	2,47 2,31	1,96 1,83	5,92 5,79
10			7,24 7,16			7,45 7,32
12			9,40 9,32			9,60 9,47
14			10,29 10,21			10,49 10,36
16	3,00 2,84		11,89 11,81	3,26 3,10		12,09 11,96
18			13,23 13,15			13,44 13,31
20			14,81 14,73			15,01 14,58
22			16,41 16,33			16,61 16,48
24			17,98 17,90			18,19 18,06
28			21,16 21,08			21,42 21,29

6.5 Dimensions of the rear accessory interface

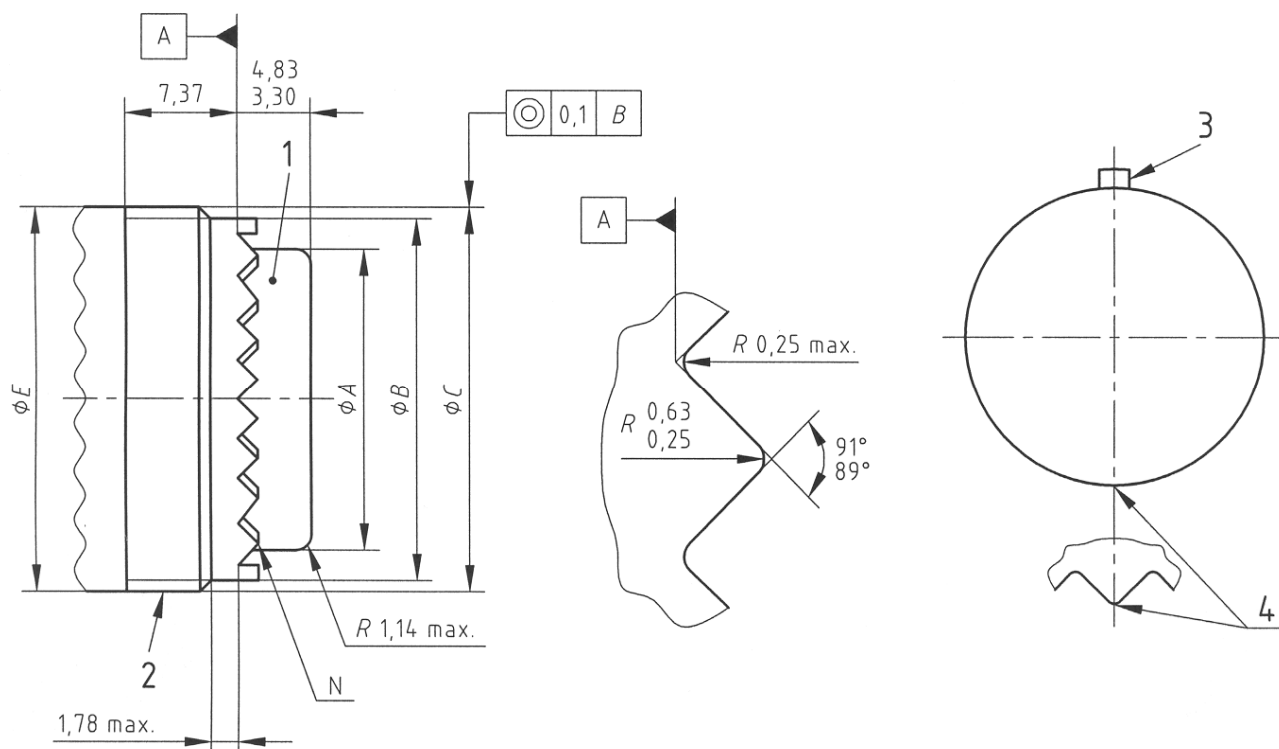
The rear dimensions of receptacles and plugs with threads for mounting cable outlet accessories are shown in Figure 4 and in Table 7.

Accessory teeth shall be aligned with the centre line of the main key/keyway as shown in Figure 4 within the tolerances shown in Table 6.

Table 6

Housing size	Alignment tolerance of axis
8 to 12	$\pm 3^\circ$
14 to 18	$\pm 2^\circ$
20 and greater	$\pm 1^\circ$

Dimensions are in millimetres.



Key

- 1 Grommet
- 2 Thread
- 3 Master key
- 4 Crest of tooth

Figure 4

Table 7

Housing size	<i>A</i> max.	<i>B</i> min.	<i>C</i> max.	Thread class 2A ^a	<i>E</i> max.	N Number of teeth
08	7,75	9,40	11,10	0.5000 - 20 UNEF	12,70	12
10	10,29	12,62	14,53	0.6250 - 24 UNEF	15,88	15
12	13,49	15,57	17,45	0.7500 - 20 UNEF	19,05	21
14	16,89	18,75	20,62	0.8750 - 20 UNEF	22,23	24
16	20,07	21,92	23,80	1.0000 - 20 UNEF	25,40	30
18	22,07	23,34	25,20	1.0625 - 18 UNEF	26,97	33
20	25,25	26,52	28,37	1.1875 - 18 UNEF	30,18	36
22	28,42	29,69	31,55	1.3125 - 18 UNEF	33,32	39
24	31,60	32,87	34,72	1.4375 - 18 UNEF	36,53	42
28	37,90	39,22	42,67	1.7500 - 18 UN	44,45	54
^a ISO 263						

6.6 Contact arrangements

The contact arrangements in the inserts are specified by Figures 5 to 36, which show the front face of the female inserts.

The following tolerances apply to the inserts fitted in the housings (A and B reference Figure 3):

• centre of each hole: $\oplus \quad \varnothing 0,36 \quad \mathbf{A} \quad \mathbf{B}$

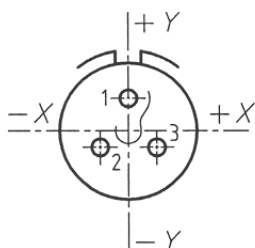
• centre of each contact end: $\oplus \quad \varnothing 0,61 \quad \mathbf{A} \quad \mathbf{B}$

Identification of the contact position shall be permanently applied in contrasting colour on the front face of the insert or interfacial seal and on the rear face of the wire sealing grommet. Identification shall not be recessed or raised on the sealing surfaces.

Symbols for contact sizes are given in EN 3155-001.

Housing sizes and contact arrangements (see Figures 5 to 36).

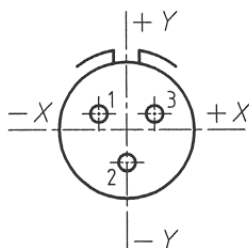
08-03
3 contacts size 20



Contact	X mm	Y mm
1	0	+ 1,91
2	- 1,65	- 0,97
3	+ 1,65	- 0,97

Figure 5

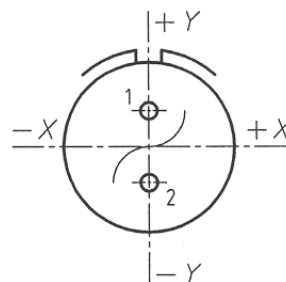
08-98
3 contacts size 20



Contact	X mm	Y mm
1	- 1,65	+ 0,94
2	0	- 1,91
3	+ 1,65	+ 0,94

Figure 6

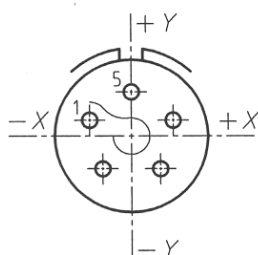
10-02
2 contacts size 20



Contact	X mm	Y mm
1	0	+ 2,11
2	0	- 2,11

Figure 7

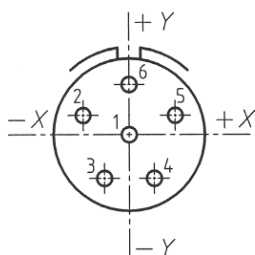
10-05
5 contacts size 20



Contact	X mm	Y mm
1	- 2,72	+ 1,04
2	- 1,88	- 2,16
3	+ 1,88	- 2,16
4	+ 2,72	+ 1,04
5	0	+ 2,90

Figure 8

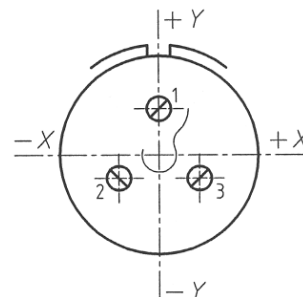
10-06
6 contacts size 20



Contact	X mm	Y mm
1	0	0
2	- 3,05	+ 1,27
3	- 1,65	- 2,87
4	+ 1,65	- 2,87
5	+ 3,05	+ 1,27
6	0	+ 3,30

Figure 9

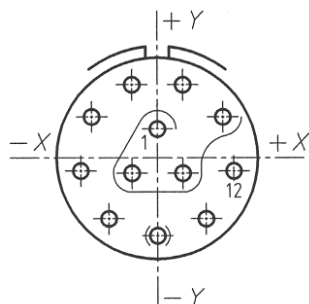
12-03
3 contacts size 16



Contact	X mm	Y mm
1	0	+ 3,05
2	- 2,64	- 1,52
3	+ 2,64	- 1,52

Figure 10

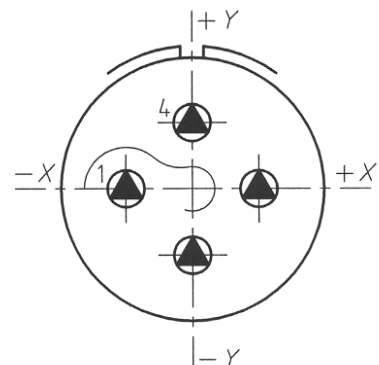
12-12
12 contacts size 20



Contact	X mm	Y mm	Contact	X mm	Y mm
1	0	+ 1,88	7	- 4,24	+ 2,67
2	- 1,65	- 0,99	8	- 4,95	- 0,84
3	+ 1,65	- 0,99	9	- 3,15	- 3,91
4	+ 4,24	+ 2,67	10	0	- 5,00
5	+ 1,65	+ 4,75	11	+ 3,15	- 3,91
6	- 1,65	+ 4,75	12	+ 4,95	- 0,84

Figure 11

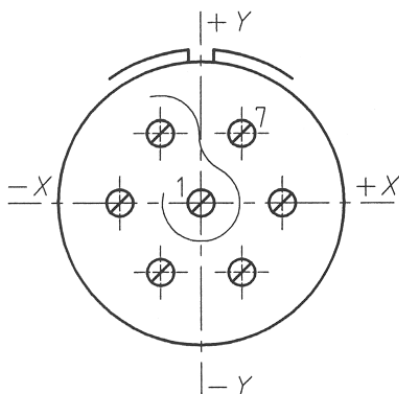
14-04
4 contacts size 12



Contact	X mm	Y mm
1	- 4,29	0
2	0	- 4,29
3	+ 4,29	0
4	0	+ 4,29

Figure 12

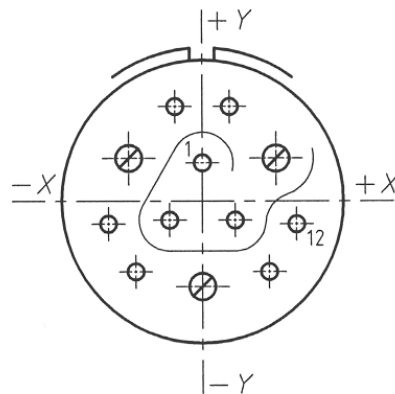
14-07
7 contacts size 16



Contact	X mm	Y mm
1	0	0
2	- 2,41	+ 4,17
3	- 4,83	0
4	- 2,41	- 4,17
5	+ 2,41	- 4,17
6	+ 4,83	0
7	+ 2,41	+ 4,17

Figure 13

14-12
9 contacts size 20
3 contacts size 16



Contact	X mm	Y mm	Contact	X mm	Y mm
1	0	+ 2,29	7	- 4,45	+ 2,57
2	- 1,98	- 1,14	8	- 5,69	- 1,37
3	+ 1,98	- 1,14	9	- 4,04	- 4,24
4	+ 4,45	+ 2,57	10	0	- 5,13
5	+ 1,65	+ 5,61	11	+ 4,04	- 4,24
6	- 1,65	+ 5,61	12	+ 5,69	- 1,37

Figure 14