BS EN 4165-002:2015

BSI Standards Publication

Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous

Part 002: Specification of performance and contact arrangements

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National foreword

This British Standard is the UK implementation of EN 4165-002:2015. It supersedes BS EN 4165-002:2007 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ACE/6, Aerospace avionic electrical and fibre optic technology.

A list of organizations represented on this committee 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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European foreword

This document (EN 4165-002:2015) 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of an identical text or by endorsement, at the latest by January 2016, and conflicting national standards shall be withdrawn at the latest by January 2016.

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 4165-002:2007.

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1 Scope

This European standard defines a number of conditions common to rectangular electrical modular connectors for receptacles, plugs and rack and panel, with interchangeable modules and continuous operating temperature 175 °C.

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.

EN 2591-209, *Aerospace series — Elements of electrical and optical connection — Test methods — Part 209: Current temperature derating*

EN 3155-002, *Aerospace series — Electrical contacts used in elements of connection — Part 002: List and utilization of contacts*

EN 3155-082, *Aerospace series — Electrical contacts used in elements of connection — Part 082: Contacts, electrical, female, type A, crimp, class S — Product standard*

EN 3197, *Aerospace series — Design and installation of aircraft electrical and optical interconnection systems*

EN 4165-001, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 001: Technical specification*

EN 4165-003, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 003: Modules series 2 and series 3 — Product standard*

EN 4165-004, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 004: Stackable mounting receptacle 2 and 4 modules, series 2 — Product standard*

EN 4165-005, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 005: Stackable mounting receptacle 2 and 4 modules, series 3 — Product standard*

EN 4165-006, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 006: Plug for 2 and 4 modules, series 2 — Product standard*

EN 4165-007, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 007: Plug for 2 and 4 modules, series 3 — Product standard*

EN 4165-008, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 008: Rack and panel plug for 2 and 4 modules, series 2 — Product standard*

EN 4165-009, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 009: Rack and panel plug for 2 and 4 modules, series 3 — Product standard*

EN 4165-010, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 010: Rack and panel rear mounted plug 2 and 4 modules, series 2 — Product standard*

EN 4165-011, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 011: Flange mounting receptacle 2 and 4 modules, series 2 — Product standard*

EN 4165-012, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 012: Flange mounting receptacle 2 and 4 modules, series 3 — Product standard*

EN 4165-013, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 013: Cable clamp 2 and 4 modules for connectors, series 2 and series 3 — Product standard*

EN 4165-014, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 014: Shielded accessory body, 2 and 4 modules for connectors, series 2 and series 3 — Product standard*

EN 4165-015, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 015: Round chimney for accessory (1 per module cavity) — Product standard*

EN 4165-016, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 016: Double oval chimney for accessory (1 per 2 modules) — Product standard*

EN 4165-017, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 017: Blank chimney for accessory (1 per module cavity) — Product standard*

EN 4165-018, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 018: Protective cover for receptacle 2 and 4 modules, series 2 and series 3 — Product standard*

EN 4165-024, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 024: Single module plug — Product standard*

EN 4165-025, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 025: Module receptacle — Product norm*

EN 4165-026, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 026: Accessories for single modules — Product norm*

EN 4165-027, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 027: Rack and panel rear mounted plug for 2 and 4 modules, series 3 — Product standard* [1)]

EN 4529-002, *Aerospace series — Elements of electrical and optical connection — Sealing plugs — Part 002: Index of products standards*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 4165-001 apply.

4 Synoptic

For intermountabilities between plugs and receptacles, modules series 2 and series 3, male and female, see Annex A (informative) and Annex B (informative).

1) Published as ASD-STAN Prestandard at the date of publication of this European standard (http://www.asd-stan.org/).

5 Description and codification of shell classes

See Table 1.

Table 1 — Material and class

Classes	Description
Connectors	
C	Plug and receptacle with housing (shell), composite material unplated, 500 h resistance to salt mist, maximum operating temperature: 175 °C continuous.
W	Plug and receptacle with housing (shell) olive drab cadmium plated, aluminium alloy, 500 h resistance to salt mist, maximum operating temperature: 175 °C continuous.
F	Plug and receptacle with housing (shell) black nickel plated aluminium alloy, 96 h resistance to salt mist, maximum operating temperature: 175 °C continuous.
J	Plug and receptacle with housing (shell) olive drab cadmium plated, composite material, 500 h resistance to salt mist, maximum operating temperature: 175 °C continuous.
M	Plug and receptacle with housing (shell) nickel plated composite material, 500 h resistance to salt mist, maximum operating temperature: 175 °C continuous.
Protective cover	
W	Protective cover for plug and receptacle olive drab cadmium plated, aluminium alloy, 500 h resistance to salt spray, maximum operating temperature: 175 °C continuous.
F	Protective cover for plug and receptacle black nickel plated aluminium alloy, 96 h resistance to salt spray, maximum operating temperature: 175 °C continuous.
M	Protective cover for single module receptacle, nickel plated composite shell, 500 h resistance to salt spray, maximum operating temperature: 175 °C continuous.
Accessories	
C	Cable clamp composite material unplated, 500 h resistance to salt mist, maximum operating temperature: 175 °C continuous
W	Cable clamp in olive drab cadmium plated, aluminium alloy, 500 h resistance to salt spray, maximum operating temperature: 175 °C continuous.
F	Cable clamp in black nickel plated, aluminium alloy, 96 h resistance to salt spray, maximum operating temperature: 175 °C continuous.
W	Accessory with housing (shell) olive drab cadmium plated, aluminium alloy, 500 h resistance to salt mist, maximum operating temperature 175 °C continuous.
F	Accessory with housing (shell) black nickel plated, aluminium alloy, 96 h resistance to salt mist, maximum operating temperature 175 °C continuous
J	Accessory in olive drab cadmium plated, composite shell, 500 h resistance to salt spy, maximum operating temperature: 175 °C continuous.
M	Accessory nickel plated composite shell, 500 h resistance to salt spray, maximum operating temperature: 175 °C continuous.
Chimney for rear accessories	
W	Blank, round, or double oval chimney, olive drab cadmium plated aluminium alloy, 500 h resistance to salt spray, maximum operating temperature: 175 °C continuous.
F	Blank, round, or double oval chimney, black nickel plated, aluminium alloy, 96 h resistance to salt spray, maximum operating temperature: 175 °C continuous.
B	Blank, round, or double oval chimney, nickel plated, aluminium alloy, 48 h resistance to salt spray, maximum operating temperature: 175 °C continuous.

6 Operating conditions

6.1 Combinations of plugs and receptacles

See Annex A (informative) and Annex B (informative).

Table 2 shows the recommended combinations (marked by X) which achieve the characteristics specified for each housing.

The characteristics of the pair of connectors are those of the components with the lowest performance.

Other combinations may be used subject to the approval of the design authority.

Table 2 — Plugs / Receptacles combinations

Plug class	Receptacle class				
	W	F	J	M	C
W	X	–	X	–	X
F	–	X	–	X	X
J	X	–	X	–	X
M	–	X	–	X	X
C	X	X	X	X	X

6.2 Combinations of protective covers and connectors

See Table 3.

Table 3 — Protective covers / Connectors combinations

Protective cover class	Receptacle class				
	W	F	J	M	C
W	X	–	X	–	X
F	–	X	–	X	X
M	–	X	–	X	X

6.3 Combinations of accessories and connectors

See Annex A (informative) and Annex B (informative).

See Table 4.

Table 4 — Accessories / Connectors combinations

Accessories class	Plug and receptacle class				
	W	**F**	**J**	**M**	**C**
W	X	–	X	–	–
F	–	X	–	X	–
J	X	–	X	–	–
M	–	X	–	X	–
C	X	X	X	X	X

6.4 Combinations of chimneys and accessories

See Table 5.

Table 5 — Chimneys / Accessories combinations

Chimneys and blank chimney class	Accessory class				
	W	**F**	**J**	**M**	**C**
W	X	–	X	–	–
F	–	X	–	X	–
B	–	X	–	X	–

Not applicable for EN 4165-024, EN 4165-025 and EN 4165-026.

6.5 Permissible cables and maximum permissible current

The sealing performance of these connectors is achieved with the cables of dimensions given in Table 6 and using the accessories and wiring tools specified.

The heating caused by the passage of the current shall not cause the exceeding of the maximum temperature. Test EN 2591-209 shall be taken into account.

Table 6 — Cables and maximum current

Size		Size of conductors standard cables		Outer diameter of cables mm		Current A per contact
Contact	**Barrel**	**ASD code**	**AWG** [a]	min.	max.	
22	22	004	22	0,71	1,37	5
		002	24			3
		001	26			2
20	20	006	20	0,85	2,11	7,5
		004	22			5
		002	24			3
20	18	010	18	0,85	2,11	7,5
		006	20			7,5
		004	22			5
		002	24			3
16	16	012	16	1,31	2,62	13
		010	18			10
		006	20			7,5
16	14	020	14	1,63	2,62	13
		012	16			13
		010	18			10
		006	20			7,5
12	12	030	12	1,90	3,70	23
		020	14			13
12	10	Under standardization				
8	8 [b]	–	–	–	–	–

NOTE The use of cables exceeding the maximum diameter indicated is prohibited. Cables smaller than the minimum diameter may be used, subject to a concession, provided that the requirements of EN 3197 are observed.

[a] Closest American Wire Gauge

[b] The cable for size 8 contacts are specified in the contact product standard (see EN 3155-002).

7 Operating characteristics

7.1 Electrical conditions

— Heating: See EN 2591-209

— Rated current: according to standard for contacts

— Insulation resistance at ambient temperature: 5 000 MΩ

— Withstanding voltage at sea level: 1 300 V r.m.s.

— Withstanding voltage from 15 000 m to 33 000 m: 600 V r.m.s.

7.2 Climatic conditions

— Minimum temperature: −55 °C

— Maximum temperature: 175 °C continuous. Furthermore, the connector operating temperature shall be limited to the maximum operating temperature indicated in the product standard for contacts.

— Corrosion resistance and fluid resistance: See EN 4165-001.

7.3 Mechanical conditions

Mechanical endurance: 500 mating and unmating cycles.

8 Models types

See Table 7.

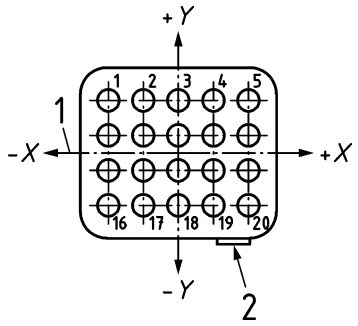
Table 7 — Models types

Type	Classes	Product standard	Series	Description
Connectors				
0	C – W – F – J – M	EN 4165-004	2	Rectangular stackable mounting receptacle, 2 or 4 modules
	M	EN 4165-025	2	Push-pull latching mechanism short receptacle, 1 module
	W	EN 4165-005	3	Rectangular stackable mounting receptacle, 2 or 4 modules
6	C – W – F	EN 4165-006	2	Plug 2 or 4 modules
		EN 4165-007	3	
	J – M	EN 4165-006	2	Plug 2 or 4 modules
	M	EN 4165-024	2	Push-pull latching mechanism plug, 1 module
	J – M	EN 4165-007	3	Plug 2 or 4 modules
9	W – F	EN 4165-008	2	Rectangular rack and panel plug, 2 or 4 modules
		EN 4165-009	3	
	W – F	EN 4165-010	2	Rectangular rack and panel plug rear mounted, 2 or 4 modules
		EN 4165-027	3	
7	C – J – M – W – F	EN 4165-011	2	Rectangular flange mounting receptacle, 2 or 4 modules
	M	EN 4165-025	2	Push-pull latching mechanism receptacle, 1 module
	W	EN 4165-012	3	Rectangular flange mounting receptacle, 2 or 4 modules
Modules				
A	For all classes	EN 4165-003	2	Male and female modules, rear release contacts
B	For all classes	EN 4165-003	3	Female module, rear release contacts
Protective cover				
3	W – F – M	EN 4165-018	2	Protective cover for receptacle, single, 2 or 4 modules
Rear accessories				
13	C – W – F	EN 4165-013	2 3	Cable clamp, 2 or 4 modules shells
14	W – F – J – M	EN 4165-014	2 3	Accessory 2 or 4 modules round chimney
15	W – F– B	EN 4165-015	2 3	Round chimney for accessories 2 or 4 modules (1 for each cavity)
16	W – F– B	EN 4165-016	2 3	Double oval chimney for accessories 4 modules (1 for 2 cavities)
17	W – F– B	EN 4165-017	2 3	Round blank chimney for accessories (1 for each cavity)
-	M - C	EN 4165-026	2	Accessory for push-pull latching mechanism

9 Modules contact arrangements – Series 2 and series 3

Front view of male modules, see Figures 1 to 10.

20-22
20A22

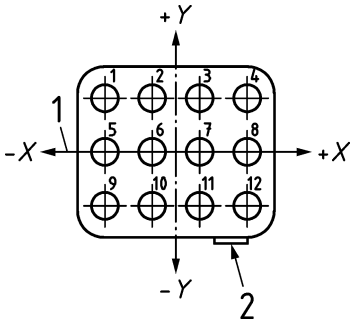


Key

1 Centre line
2 Coding location

Figure 1

12-20

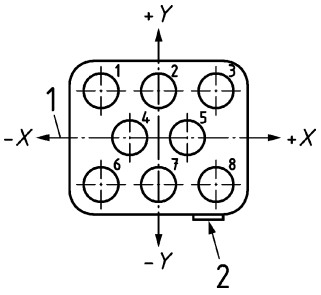


Key

1 Centre line
2 Coding location

Figure 2

08-16
08G16

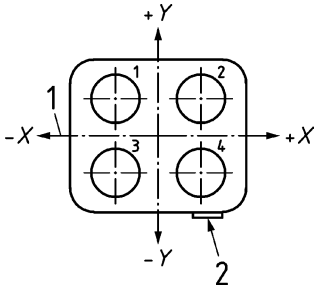


Key

1 Centre line
2 Coding location

Figure 3

04-12
04G12

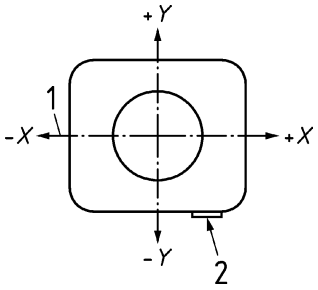


Key

1 Centre line
2 Coding location

Figure 4

01-08
01G08

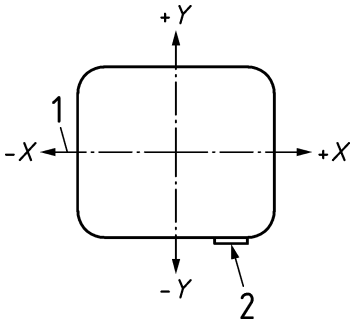


Key

1 Centre line
2 Coding location

Figure 5

N and NL

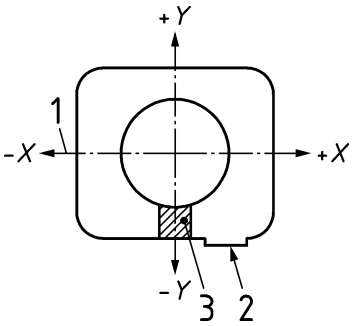


Key

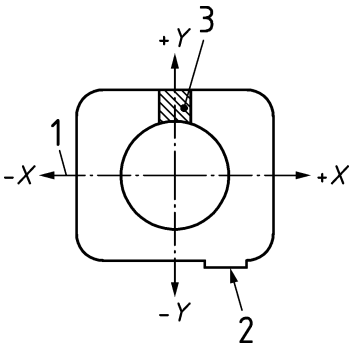
1 Centre line
2 Coding location

Figure 6

01Q18
01L18



01Q28
01L28

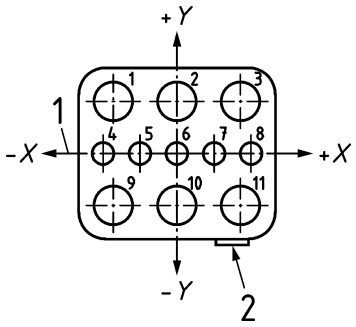


Key

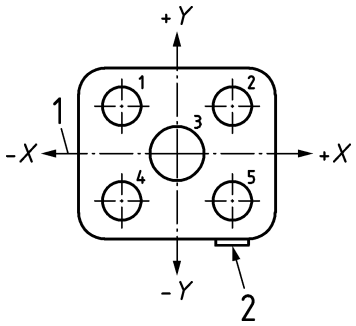
1 Centre line
2 Coding location
3 Contact key

Figure 7

99-01
99A01



99-10

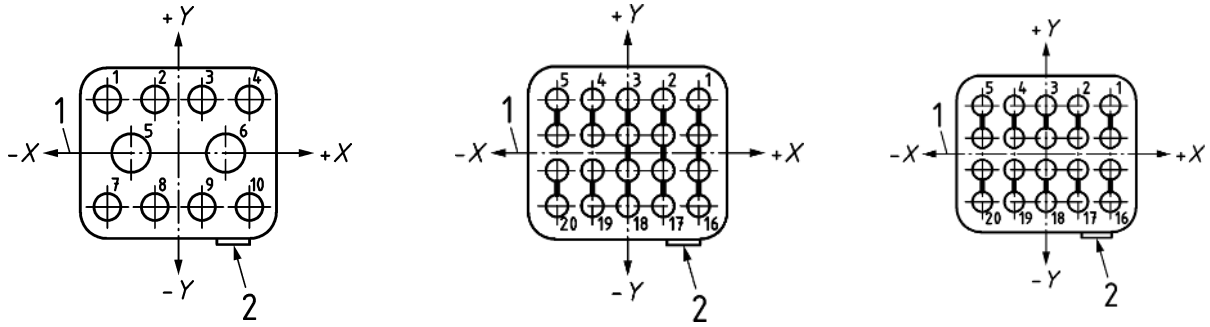


Key

1 Centre line
2 Coding location

Figure 8

20Y22 **2AY22** **2BY22**



Key

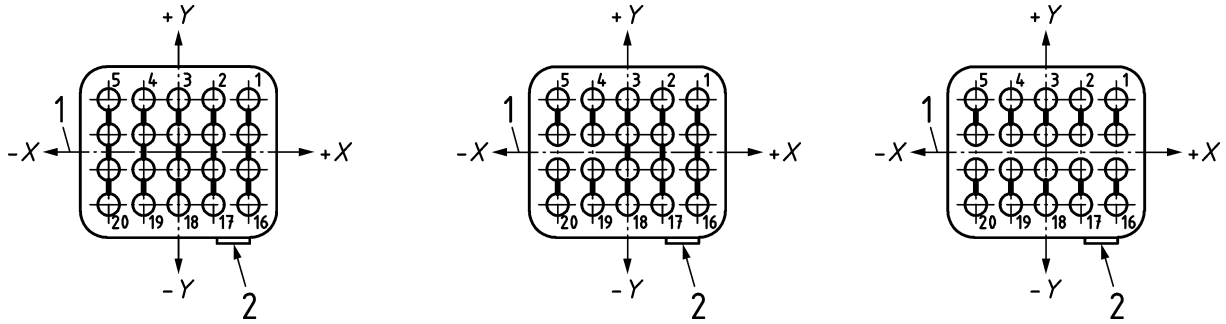
1 Centre line

2 Coding location

Arrangement shall be used with contact EN 3155-082 only.

Figure 9

20Z22 **2AZ22** **2BZ22**



Key

1 Centre line

2 Coding location

Shall not be used with gold-selective plated contacts.

Figure 10

10 Contacts

The maximum operating temperature of the connector shall be limited to that specified in the contact product standard.

Removable contacts, which can be used are indicated in EN 3155-002.

11 Sealing plugs

Sealing plugs are defined in EN 4529-002 shall be used in the grommet cavities, which correspond to unwired contacts.

12 Rear accessories

The rear accessories are defined in EN 4165-002.

13 Tooling contacts

The tooling for crimping, installing and extracting removable contacts is indicated in the standards for contacts EN 3155-002.

14 Tooling accessories for modules

See product standard.

15 Assembly and wiring instructions

See EN 3197.

Annex A
(informative)

Synoptic

A.1 Synoptic connectors series II and III, classes F and classes W, 2 and 4 modules

See Figure A.1.

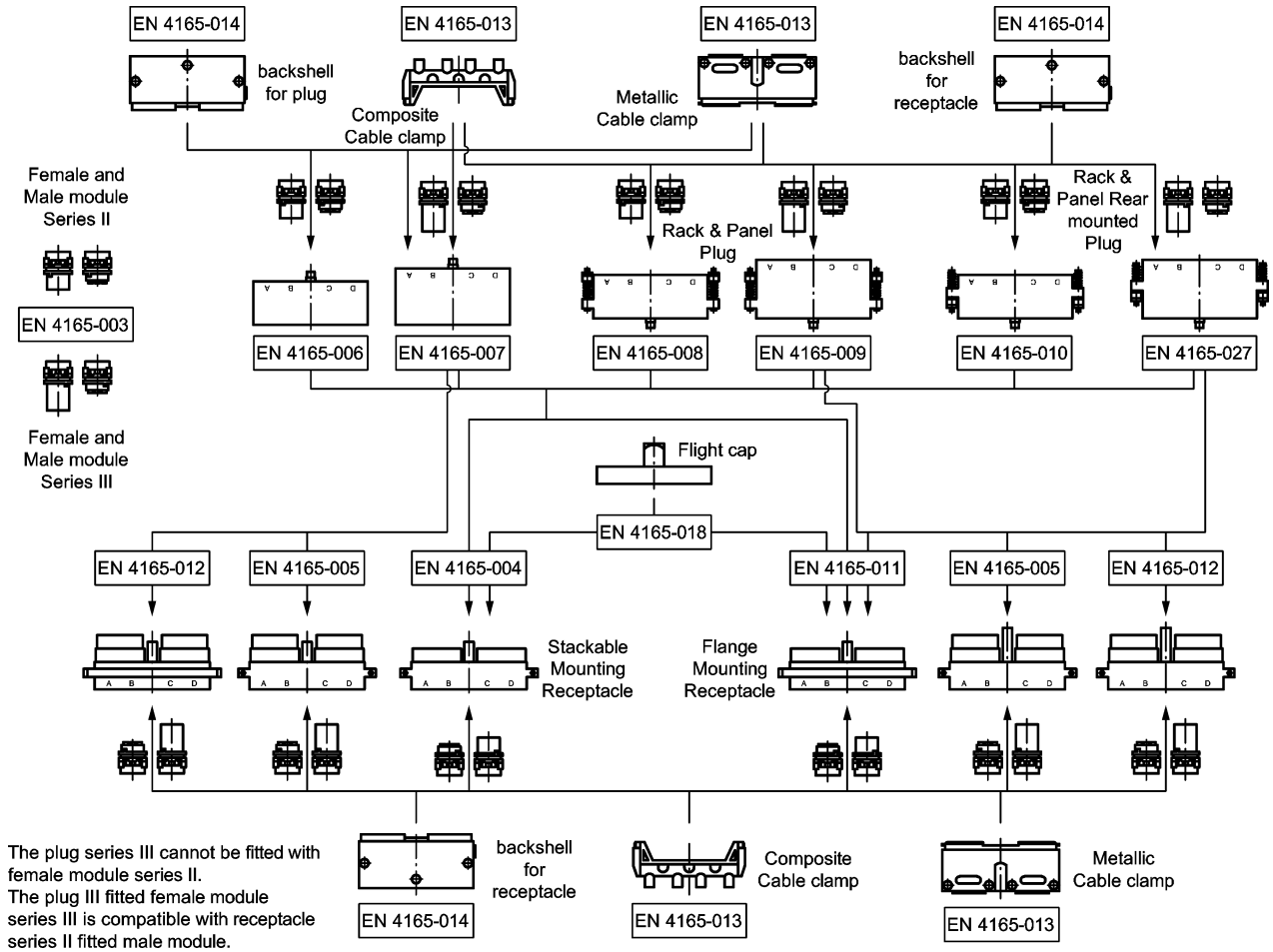


Figure A.1

Synoptic connectors series II, classes J, M and C, 2 and 4 modules

See Figure A.2.

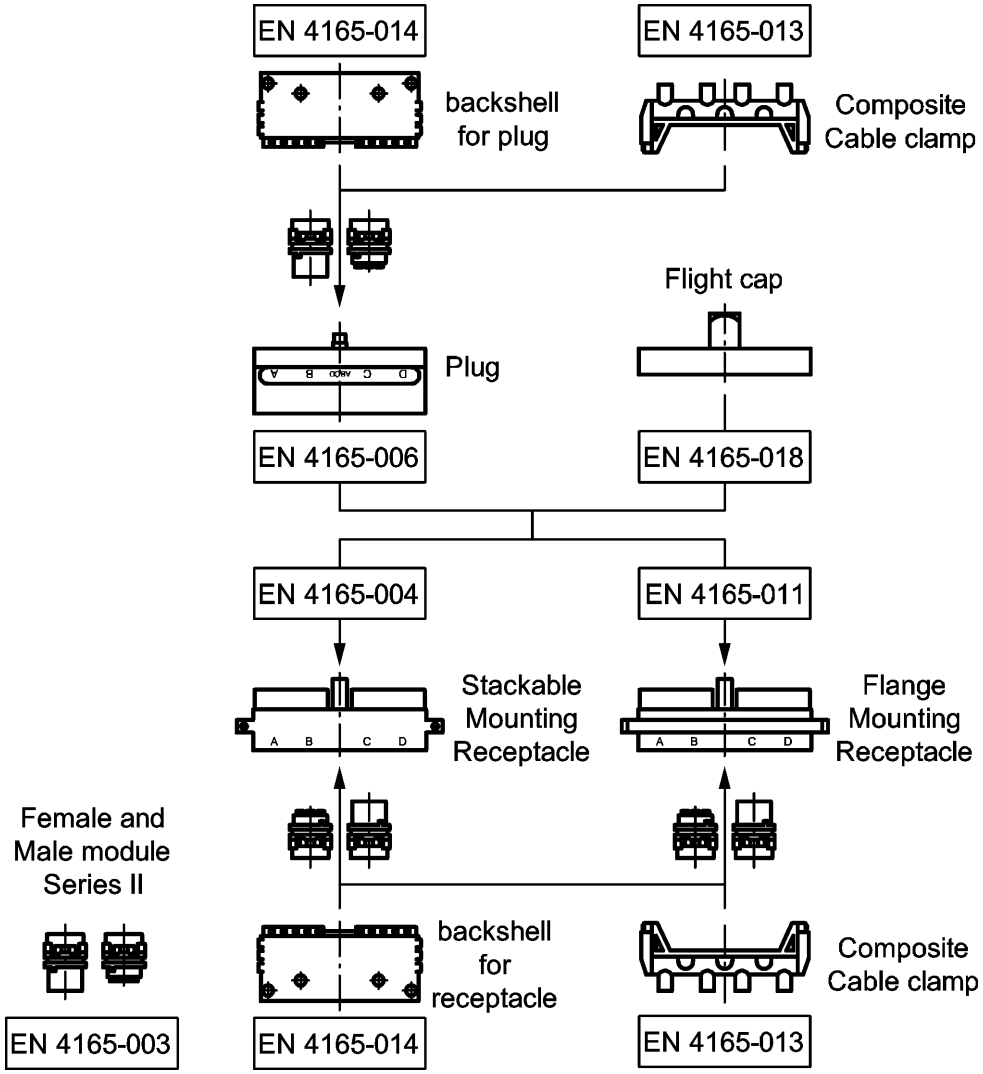


Figure A.2

Annex B
(informative)

Synoptic, single module series II, classes M

See Figure B.1.

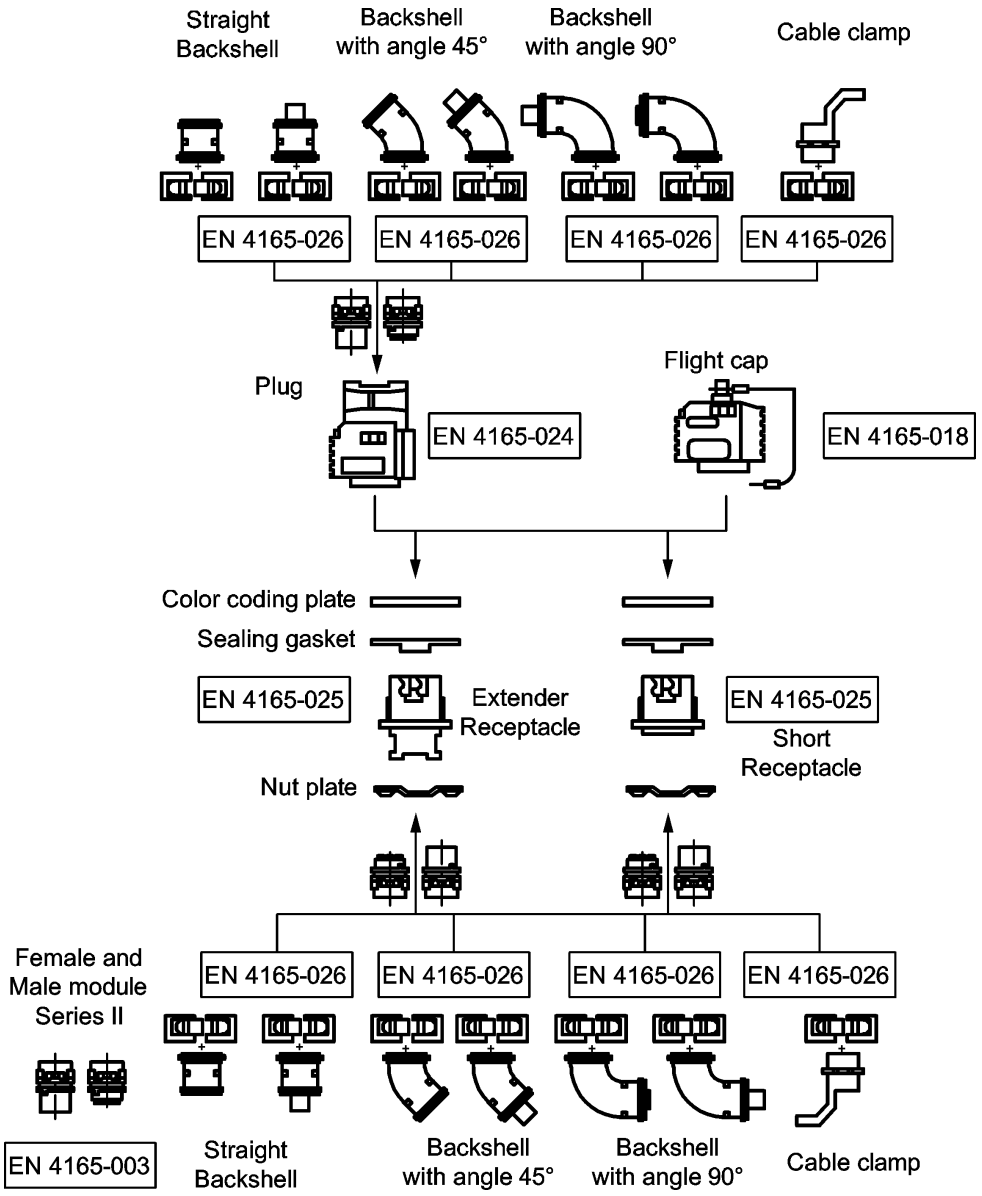


Figure B.1

Bibliography

EN 4165-021, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 021: Coupling system keyway for plug — Product standard*

EN 4165-022, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 022: Insertion/extraction tool for removal of modules — Product standard*

EN 4165-023, *Aerospace series — Connectors, electrical, rectangular, modular — Operating temperature 175 °C continuous — Part 023: Tooling for assembly of receptacle coding component — Product standard*

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