



SLOVENSKI STANDARD
SIST EN 4165-002:2023

01-september-2023

Aeronavtika - Konektorji, električni, pravokotni, modularni - Stalna delovna temperatura 175 °C - 002. del: Specifikacija lastnosti in razporeditev kontaktov

Aerospace series - Connectors, electrical, rectangular, modular - Operating temperature 175 °C continuous - Part 002: Specification of performance and contact arrangements

Luft- und Raumfahrt - Elektrischer Rechtecksteckverbinder in modularer Bauweise - Betriebstemperatur 175 °C constant - Teil 002: Leistungsdaten und Kontaktanordnungen

Série aérospatiale - Connecteurs modulaires - Température d'utilisation 175 °C continu - Partie 002: Spécification de performances et arrangement de contacts

Ta slovenski standard je istoveten z: EN 4165-002:2023

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| 49.060 | Letalska in vesoljska električna oprema in sistemi | Aerospace electric equipment and systems |

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Aerospace series - Connectors, electrical, rectangular,
modular - Operating temperature 175 °C continuous - Part
002: Specification of performance and contact
arrangements

Série aérospatiale - Connecteurs modulaires -
Température d'utilisation 175 °C continu - Partie 002:
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Luft- und Raumfahrt - Elektrischer
Rechtecksteckverbinder in modularer Bauweise -
Betriebstemperatur 175 °C constant - Teil 002:
Leistungsdaten und Kontaktanordnungen

This European Standard was approved by CEN on 24 July 2022.

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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 CEN-CENELEC Management Centre has the same status as the official versions.

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COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 4165-002:2023) 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 document has received the approval of the National Associations and the Official Services of the member countries of ASD STAN, 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 2024, and conflicting national standards shall be withdrawn at the latest by January 2024.

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

This document supersedes EN 4165-002:2015 and EN 4165-002:2015/AC:2016.

EN 4165-002:2023 includes the following significant technical changes with respect to EN 4165-002:2015:

- normative references updated;
- Clause 5 Description and codification of shell classes updated;
- Table 5 Chimneys/Accessories combinations: contacts size 23R added;
- 7.1 Electrical conditions updated;
- Non-developed layouts withdrawn (Clause 9);
- Clause 10 Contacts updated;
- Clause 12 Rear accessories updated;
- Clause 13 Tooling contacts updated;
- editorial revision of the document.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

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

EN 4165-002:2023(E)**1 Scope**

This document specifies 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 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.

EN 2591-207, *Aerospace series — Elements of electrical and optical connection — Test methods — Part 207: Voltage proof test*

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

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*¹

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*

¹ Published as ASD-STAN Standard at the date of publication of this document by AeroSpace and Defence industries Association of Europe — Standardization (ASD-STAN), <https://www.asd-stan.org/>.

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), 2 and 4 modules — 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 all receptacles series 2 — 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: Single module receptacle — Product standard

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

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

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

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3 Terms and definitions

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

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

4 Synoptic

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

5 Description and codification of shell classes

According to Table 1.

Table 1 — Material 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 mist, maximum operating temperature: 175 °C continuous. |
| F | Protective cover for plug and receptacle black nickel-plated aluminium alloy, 96 h resistance to salt mist, maximum operating temperature: 175 °C continuous. |
| M | Protective cover for single module receptacle, nickel plated composite shell, 500 h resistance to salt mist, maximum operating temperature: 175 °C continuous. |
| Accessories | |
| C | Accessory composite material unplated, 500 h resistance to salt mist, 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. |

| Classes | Description |
|-------------------------------------|---|
| 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 mist, maximum operating temperature: 175 °C continuous. |
| M | Accessory nickel-plated composite shell, 500 h resistance to salt mist, 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 mist, maximum operating temperature: 175 °C continuous. |
| F | Blank, round, or double oval chimney, black nickel plated, aluminium alloy, 96 h resistance to salt mist, maximum operating temperature: 175 °C continuous. |
| B | Blank, round, or double oval chimney, nickel plated, aluminium alloy, 48 h resistance to salt mist, 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

According to Table 3.

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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).

According to 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

According to 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 4165-026.

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 considered.

Table 6 — Cables and maximum current

| Size | | Size of conductors standard cables | | Outer diameter of cables | | Current per contact A |
|----------|----------------|------------------------------------|------------------|--------------------------|------|--------------------------|
| Contact | Barrel | ASD code | AWG ^a | mm | | |
| | | | | min. | max. | |
| 22 & 23R | 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 cables for size 8 contacts are specified in the contact product standard (see EN 3155-002).