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What is AS/NZS 61439?

AS/NZS 61439 is the Australian and New Zealand standard for Low-voltage Switchgear and Control gear assemblies which was published in May 2016. The standard was adapted and modified from the original IEC 61439 standard. This new standard superseded the previous standard AS/NZS 3439 which was introduced in 2002, and this transition had a 5-year grace period. The main difference between these two standards is that the Type-Tested Switchgear and Assemblies (TTA) and Partially-Type-Tested Switchgear and Assemblies (PTTA) have been replaced by the Design Verifications techniques.

Who is the Original manufacturer, Assembly manufacturer and User?

The Original manufacturer is the organization that has carried out the original design and the associated verification of an Assembly in accordance with the relevant Assembly standard. The Assembly manufacturer is the organization taking the responsibility for the completed Assembly. If anyone is making modifications to an assembly, they will also be considered as an Assembly manufacturer. User is the party who will specify, purchase, use and/or operate the Assembly, or someone acting on their behalf. Therefore, the switchboard manufacturer will be considered as the Assembly manufacturer while the Electrical contractor will act as the User.

Who is responsible for compliance of an Assembly?

The Original manufacturer should Design and Test an assembly be complied with corresponding standard, but it is the Assembly manufactures responsibility to ensure all requirements and recommendations are fulfilled as per the original manufacturer's instructions for compliance.

How to verify an assembly?

As per AS/NZS 61439 an assembly needs to be verified to be used within an electrical installation of defined characteristics. This verification comes in two parts,

➤ Design Verification

Design verification is intended to verify compliance of the design of an assembly with the requirements of the relevant assembly standard in the AS/NZS 61439 series. Usually design verification is carried out on typical arrangements within a standard product range, and at the time the product is developed by the Original manufacturer. Then the Assembly manufacturer must verify that their design is similar or superior to the Original manufacturer verified design. If an assembly has been varied from the original specifications, the Assembly manufacturer must redo the design verification as required.

There are three main design verifications techniques in AS/NZS 61439.

- ✓ Verification by Testing
 - Mechanical and Electrical tests as per requirements.
- ✓ Verification by Comparison with a tested reference design
 - Derivation from similar variants of tested designs. This needs to demonstrate that the new design has the same or better characteristics than the tested design.
- ✓ Verification by Assessment
 - Assessments via calculations and design rules, including use of appropriate safety margins.

Table D.1 in Annex D of the AS/NZS 61439.1 provides a list of design verifications to be performed for compliance.

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➤ Routine Verification

Routine verification is carried out on every assembly that is manufactured, normally prior to it being dispatched from the manufacturer's works. It is intended to detect faults in materials and workmanship and to confirm correct and proper functioning of the manufactured assembly. The assembly manufacturer determines if routine verification is carried out during and/or after manufacture.

What Part of the standard does a Switchboard need to comply in AS/NZS 61439?

The AS/NZS 61439 consists of 8 parts,

- 1) AS/NZS 61439.0: Guide to specifying assemblies.
- 2) AS/NZS 61439.1: General Rules.
- 3) AS/NZS 61439.2: Power switchgear and controlgear assemblies.
- 4) AS/NZS 61439.3: Distribution boards intended to be operated by ordinary persons (DBO).
- 5) AS/NZS 61439.4: Particular requirements for assemblies for construction sites (ACS).
- 6) AS/NZS 61439.5: Assemblies for power distribution in public networks.
- 7) AS/NZS 61439.6: Busbar trunking systems (busways).
- 8) AS/NZS 61439.7: Assemblies for specific applications such as marinas, camping sites, market squares, electrical vehicles charging stations.

AS/NZS 61439.1 which is the General Rules, applies to any type of Low-voltage Switchgear and Control gear assembly. Depending on the characteristics of the assembly it needs to comply with one of the Parts from AS/NZS 61439.2 to AS/NZS 61439.7. For Low-voltage Switchboards it will be either AS/NZS 61439.2 or AS/NZS 61439.3. Assembly manufacturer should choose the required part of the standard during the design.

What is difference between AS/NZS 61439.2 and AS/NZS 61439.3?

AS/NZS 61439.2 covers Power switchgear and controlgear assemblies used to distribute and control power to all types of loads, intended for industrial, commercial, and similar applications where operation by ordinary persons is not intended. Any switchboard does not meet the requirements of AS/NZS 61439.3 will need to be manufactured as per AS/NZS 61439.2.

AS/NZS 61439.3 covers Distribution Boards intended to be operated by Ordinary Persons (DBO). As per AS/NZS 61439.3, if the Rated Current (I_n) of a Distribution board that does not increase above 250A and any outgoing circuit current rating (I_{nc}) does not exceed 125A, it will be considered as a DBO, and need to be manufactured as per AS/NZS 61439.3.

What is User information template (Annex C)?

Annex C is a Table intended to use as a template for the identification of items necessary for the Assembly manufacturer which is to be provided by the User. Depending on which Part of the AS/NZS 61439 is applied this will act as an agreement between Assembly manufacturer and User.

If the assembly being designed to,

- ✓ AS/NZS 61439.2 User Agreement should be as per Annex BB on AS/NZS 61439.2.
- ✓ AS/NZS 61439.3 User Agreement should be as per Annex AA on AS/NZS 61439.3.

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What is Design Verification (Annex D)?

Annex D of the AS/NZS 61439.1 illustrates the Table D.1, which is the List of design verifications to be performed in an assembly. It is a summary table made out from all Design Verifications on Clause 10 of the AS/NZS 61439.1. Below Table is derived from Table D.1 in Annex D to indicate what verification are required by each party.

| No. | Characteristic to be verified | Clauses or subclauses to 61439.1 | Verification by Original manufacturer | Verification by Assembly manufacturer |
|-----|---|--|--|--|
| 1 | Strength of material and parts: Resistance to corrosion Properties of insulating materials: Thermal stability Resistance to abnormal heat and fire due to internal electric effects Resistance to Ultra-Violet (UV) radiation Lifting Mechanical impact Marking | 10.2 10.2.2 10.2.3 10.2.3.1 10.2.3.2 10.2.4 10.2.5 10.2.6 10.2.7 | Verification by Test Verification by Test Verification by Test Verification by Test N/A Verification by Test | Verification by Test |
| 2 | Degree of protection of enclosures | 10.3 | Verification by Test | During Routine Verification |
| 3 | Clearances | 10.4 | Verification by Test | During Routine Verification |
| 4 | Creepage distances | 10.4 | Verification by Test | During Routine Verification |
| 5 | Protection against electric shock and integrity of protective circuits: Effective earth continuity between the exposed conductive parts of the ASSEMBLY and the protective circuit Short-circuit withstand strength of the protective circuit | 10.5 10.5.2 10.5.3 | Verification by Test Verification by Test or Comparison with a reference tested design. No need of testing for assemblies under 10kA. | During Routine Verification Verification by comparison with a reference design. No need of verification on assemblies under 10kA. |
| 6 | Incorporation of switching devices and components | 10.6 | Verification by Assessment | Verification by Assessment and Routine Verification |
| 7 | Internal electrical circuits and connections | 10.7 | Verification by Assessment | Verification by Assessment and Routine Verification |
| 8 | Terminals for external conductors | 10.8 | Verification by Assessment | Verification by Assessment and Routine Verification |
| 9 | Dielectric properties: Power-frequency withstand voltage Impulse withstand voltage | 10.9 10.9.2 10.9.3 | Verification by Test | During Routine Verification Verification by Assessment and Routine Verification |

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| | | | | |
|----|-------------------------------------|-------|---|---|
| 10 | Temperature-rise limits | 10.10 | Verification by Test, or comparison with a reference design or calculation using AS 60890 (only up to rated current of 1600A) | Verification by comparison with a reference design Or Verification by calculation using AS 60890 |
| 11 | Short-circuit withstand strength | 10.11 | Verification by Test or Comparison with a reference tested design. No need of testing for assemblies under 10kA. | Verification by comparison with a reference design. No need of verification on assemblies under 10kA. |
| 12 | Electromagnetic compatibility (EMC) | 10.12 | Verification by Test or Assessment | Verification by Assessment |
| 13 | Mechanical Operation | 10.13 | Verification by Test | During Routine Test |

As per the above Table, the Assembly manufacturer must make sure all the required verifications on the last column have been done on a completed assembly. Most of them are done during the Routine verification. Routine Verification sample document can be used to follow the required tests. Below guidance can be used for others which are not covered in Routine Verification.

Marking (10.2.7)

The ASSEMBLY manufacturer must provide each ASSEMBLY with one or more labels, marked in a durable manner, and located in a place which is visible and legible when the ASSEMBLY is installed and in operation.

The following information regarding the ASSEMBLY must be provided on the designation label(s):

- ✓ ASSEMBLY manufacturer's name or trademark.
- ✓ Type designation or identification number or any other means of identification, making it possible to obtain relevant information from the ASSEMBLY manufacturer.
- ✓ Means of identifying date of manufacture.
- ✓ AS/NZS 61439-X (the specific part "X" must be 2 for Power switchgear and control gear assemblies or 3 for Distribution boards intended to be operated by ordinary persons).
- ✓ Rated Current of the Assembly (I_{nA}).
- ✓ Degree of Protection

Below is a sample of a Main Label used by NAW Controls,

| | |
|----------------------------|--------------|
| DB-1 | |
| MANUFACTURER: | NAW CONTROLS |
| DRAWING NO: | 15947-5001 |
| MANUFACTURE DATE: | 05/2021 |
| RATED CURRENT, I_{nA} : | 195A |
| DEGREE OF PROTECTION: | IP42 |
| COMPLIES TO AS/NZS 61439.3 | |

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Marking made by moulding, pressing, engraving or similar, including labels with a laminated plastic covering, does not need to be tested.

Otherwise, the labels need to be tested as below.

- ✓ By rubbing the marking by hand for 15 s with a piece of cloth soaked in water and then for 15 seconds with a piece of cloth soaked with petroleum spirit. (NOTE: The petroleum spirit is defined as a solvent hexane with a content of aromatics of maximum 0,1 % in volume, a kauri butanol value of 29, an initial boiling point of 65 °C, a final boiling point of 69 °C and a density of approximately 0,68 g/cm³)
- ✓ After the test, the marking shall be legible to normal or corrected vision without additional magnification.

Temperature-rise limits (10.10)

Eureka standard MDB type constructions have been tested for the Temperature-rise limits inside the enclosure for maximum Rated Current (I_{nA}) of 200A (EUR-3-250 as Main switch) or 220A (TS250DSU250 as Main switch).

Any assembly that deviates from the standard construction, the Temperature-rise limits need to be verified by calculation. For Partially Type Tested assemblies up to 1600A, Temperature-rise limits can be verified using calculation methods given in AS 60890. Please contact NAW Controls for support on this calculation.

Short-circuit withstand strength (10.11)

No need of verification on assemblies under 10kA. If the assembly is above 10kA Designs Verification need to be done by comparison with a reference design. Please contact NAW Controls for support on this Designs Verification.

Routine Verification (11)

For Routine Verification please refer to the 'Routine Verification' document provided. This need to be filled out for each assembly. Depending on the part of the AS/NZS 61439 standard, compliance statement at the bottom needs to be changed. (Amend the unwanted part) Dielectric Test is only required for assemblies that need to comply with AS/NZS 61439.2. For AS/NZS 61439.3 just add 'N/A' in front of the test findings.

Having passed all these tests and verification, the Assembly manufacturer can state that the assembly is comply to AS/NZS 61439.2 or AS/NZS 61439.3.

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