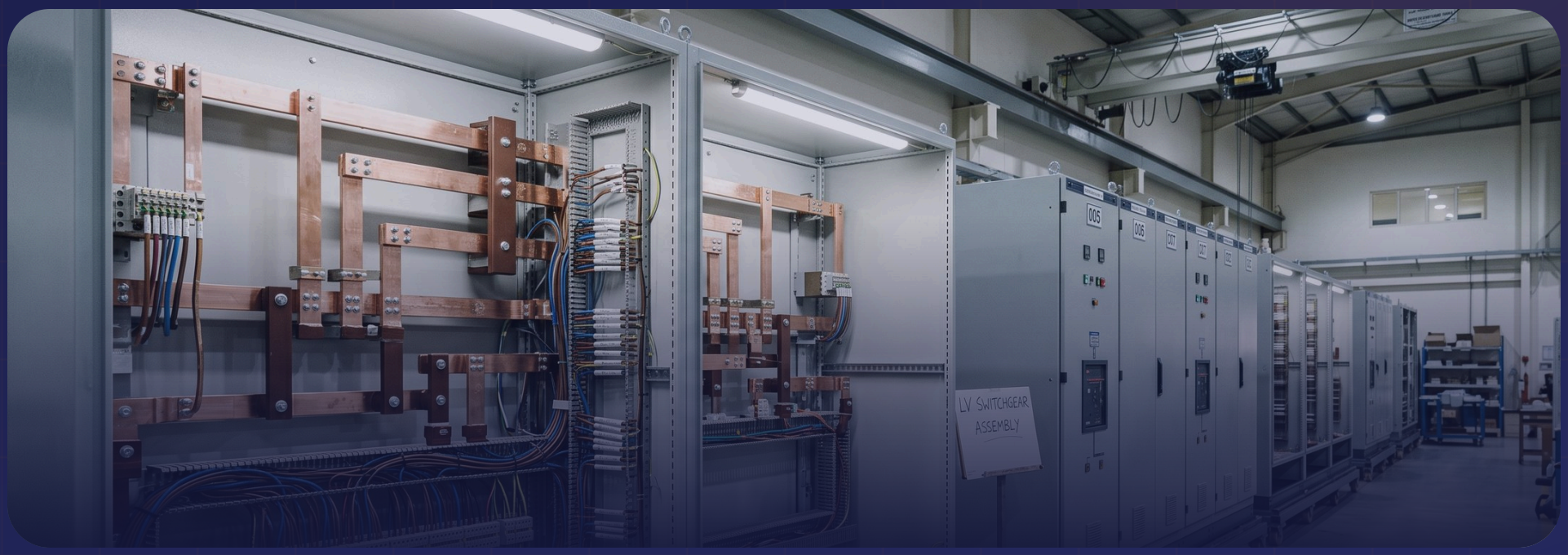


An LV assembly shop, sections open to their busbars.

NLC ACADEMY · EPISODE 34

TTA retired in 2009. Specify verification.

IEC 61439 replaced the TTA and PTTA terms with design verification. Older test reports still count where their results meet the current edition. Plus what Saudi rules say, and what 60 Hz and heat change.

START WITH THE WORD

TTA is the vocabulary of a withdrawn standard

- **1999** IEC 60439-1:1999
  type-tested and partially type-tested
- **2009** IEC 61439-1:2009
  TTA and PTTA replaced by verification
- **2011** IEC 61439-1:2011
  Edition 2.0, withdrawn in 2020
- **2014** BS EN 60439-1
  BSI withdraws the old standard
- **2020** IEC 61439-1:2020
  Edition 3.0, in force
- **2026** IEC TS 61641:2026
  internal arc moves to a TS

1 IEC's own abstract for IEC 61439-1:2009: the TTA and PTTA distinction "is eliminated by the verification approach", replaced by three equivalent routes. [1]

2 IEC 60439-1:1999 had "type-tested and partially type-tested assemblies" in its title. BSI withdrew BS EN 60439-1 on 30 November 2014, five years after IEC 61439 arrived. [1]

IEC 61439-1:2020, 10.1: earlier IEC 60439 test results need not be repeated if they meet the current edition. Specify design and routine verification to IEC 61439-2. [3][8]

THE SAUDI LAYER

Saudi rules already name IEC 61439, not TTA

SASO **EMC regulation lists** parts 1, 2, 3, 5 and 6	**SABER** **7 codes under 8537.10** non-regulated by code
GSO BD-142004-01 **Saudi Arabia: the only** 60 Hz grid in the table	**SEC 31-SDMS-07C** **cites IEC 61439-1, -6** 25 kA for 1 s
Project	**client terms may add tests**

1. SASO's 2023 EMC regulation lists SASO IEC 61439-1, -2, -3 and -5 and SASO GSO IEC 61439-6, undated. SEC 31-SDMS-07C Rev.0 cites IEC 61439-1 and -6. [4][7]
2. SABER's non-regulated list holds seven 12-digit codes under 8537.10, such as 853710000001, boards. For those: self-declaration and a shipment certificate. The declared code decides. [5]

In these documents we found no request for TTA, ASTA or KEMA. A project may add one; that is a contract term, not a regulation.

WHAT A SAUDI UTILITY WRITES

SEC's LV distribution panel, line by line

Short-circuit rating
Table 1 and 7.1.1: symmetrical r.m.s. for 1 s, on the 800, 1600 and 2500 A panels. [7]
25 kA 1 s

Temperature rise
7.1.2: tested to IEC 61439-1; rise at any point at most 60 K above the maximum ambient. SEC writes "60 °C": a rise, not an ambient. [7]
≤ 60 K

Sun on metal
4.1.4, surfaces in direct sun taken as 75 °C, plus the internal heating. [7]
75 °C

Enclosure
Outdoor, stainless steel, gasketed, with the panel at 400/231 V. [7]
IP54

Design evidence
7.1.4, certified design test reports on an identical unit at bid stage, and 7.2 routine tests on every unit. [7]
at bid

Two numbers: 60 K is the rise limit; 55 °C is SEC's maximum ambient (01-SDMS-01, as 56-SDMS-05 quotes it). Instruments keep their own limit (7.1.2 c). Rev.0, 10/2020; scope: this LV panel. [7]

TWO ROLES

Clause 10 and Clause 11 bind two roles

Clause 10 — **original manufacturer**
design verification, once per design

↓ **builds to the instructions, met in full**

Clause 11 — **assembly manufacturer**
routine verification, every panel

adds an arrangement the original never verified
and is deemed the original manufacturer for it
clause 10.1, IEC 61439-1:2020

1. The original manufacturer verifies the design; the assembly manufacturer builds and verifies every panel. These are roles: one company may hold both. [3][8]
2. Instructions met in full: the original design verification is not repeated; routine verification still is. An unverified addition makes the builder its original manufacturer. [3][8]

A breaker tested to its own standard is not the assembly's design verification. Clause 10.1 says so in one sentence. [3][8]

THREE ROUTES

Test, compare or assess: the menu differs by row

		test	compare	assess
10.2	strength of materials	●	●	○
10.3	degree of protection	●	·	●
10.4	clearances	●	·	·
10.4	creepage distances	●	·	·
10.5	shock protection	●	○	·
10.6	switching devices	·	·	●
10.7	internal circuits	·	·	●
10.8	external terminals	·	·	●
10.9	dielectric properties	●	·	○
10.10	temperature rise	●	●	●
10.11	short circuit	●	●	·
10.12	EMC	●	·	●

● open ○ some sub-items assessment only

1. 10.1: the routes are equivalent, the original manufacturer chooses, and a competent person does the work. No accredited laboratory is required. [3][8]

2. Rows 6 to 8 are verified by assessment only. Temperature rise accepts all three routes; short circuit, test or comparison. Table D.1, 2020. [3][9]

Want a test or an accredited laboratory? Specify it.

EDITION DRIFT

The 2020 edition moved the clauses you cite

	2011		2020
mechanical operation	10.13	→	10.2.8
Icw, short-time	5.3.4	→	5.3.5
Ipk, peak	5.3.3	→	5.3.4
Ing, group current	none	→	5.3.3
temperature guidance	Annex O	→	Annex L
busbar calculation	Annex P	→	Annex M
ambient adjustment	9.2 note	→	9.2.2

a 10.13 in a submittal names a withdrawn edition

1. Edition 3.0 runs design verification 10.2 to 10.12: 11, not 12, with mechanical operation folded into 10.2.8. Its Table D.1 has 12 rows, not 13. [3][9]
2. Ing arrived at 5.3.3 and temperature rise now centres on it, so Ipk moved to 5.3.4 and Icw to 5.3.5. Annex O became L, Annex P became M. [3]

"13 tests" was the row count of a withdrawn table, not a list of tests. Cite the edition beside every clause number.

EVERY PANEL

Nine routine checks, one always a test

11.2	degree of protection	inspection
11.3	clearances and creepage	inspection
11.4	protective circuits	inspection
11.5	built-in components	inspection
11.6	internal connections	inspection
11.7	external terminals	inspection
11.8	mechanical operation	functional check
11.9	**dielectric, 1 s**	instrument test
11.10	wiring and function	functional check

1 s
routine dielectric
not 60 s

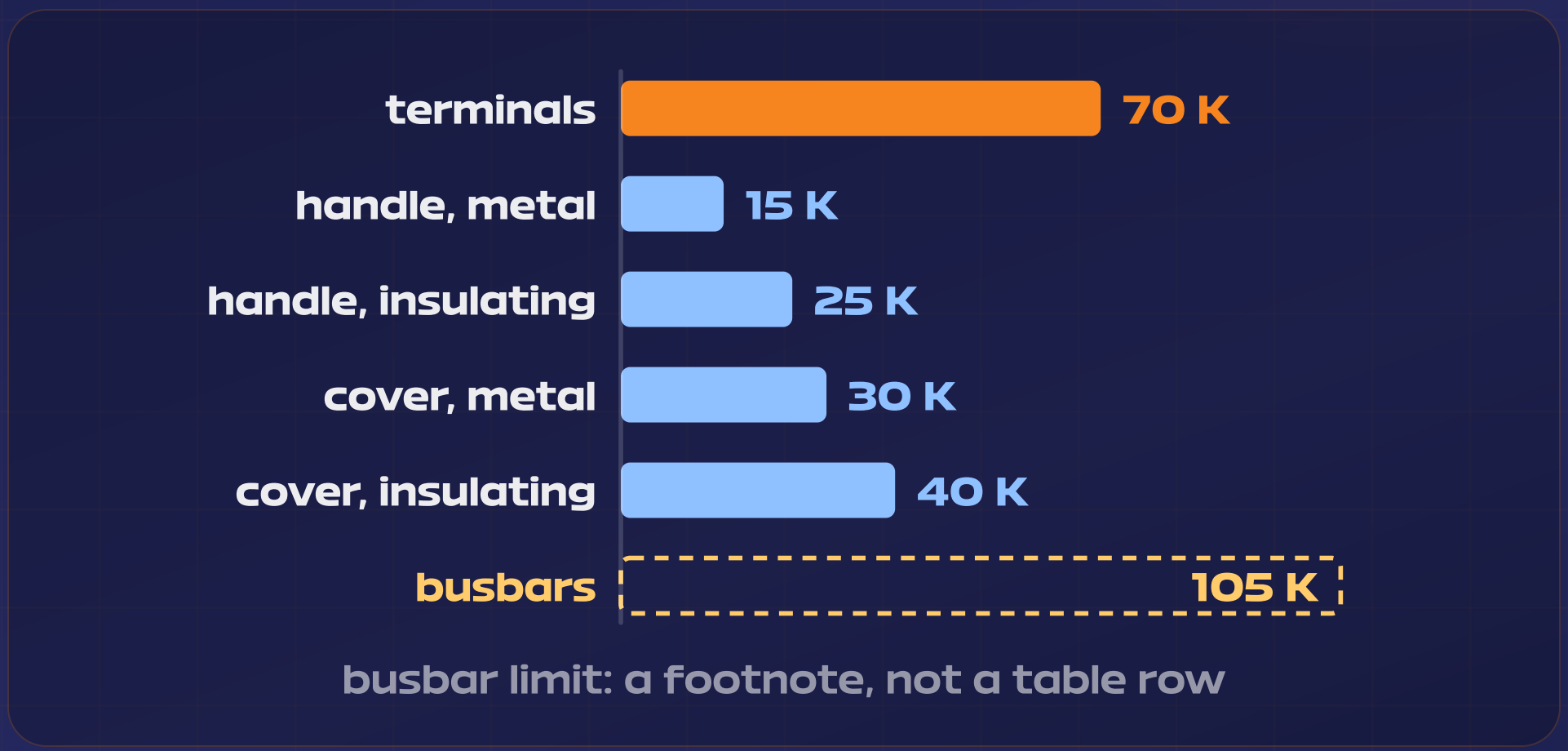
1 11.2 to 11.8 start with inspection; unclear clearances or earth continuity are measured or tested. 11.9, dielectric, is tested every time. [8]

2 Design: 60 s power-frequency; impulse by test, or clearances at 1.5 times Table 1. Routine: 1 s, trip at 3.5 mA or more; to 630 A and 500 V, 1 MΩ at 500 V DC may replace it. [8]

11.1: routine verification confirms the manufacturing instructions and 6.2.1 documents. 2011 capped the alternative at 250 A. [2][8]

THE LIMITS

Table 6 sets numbers, except for the busbars



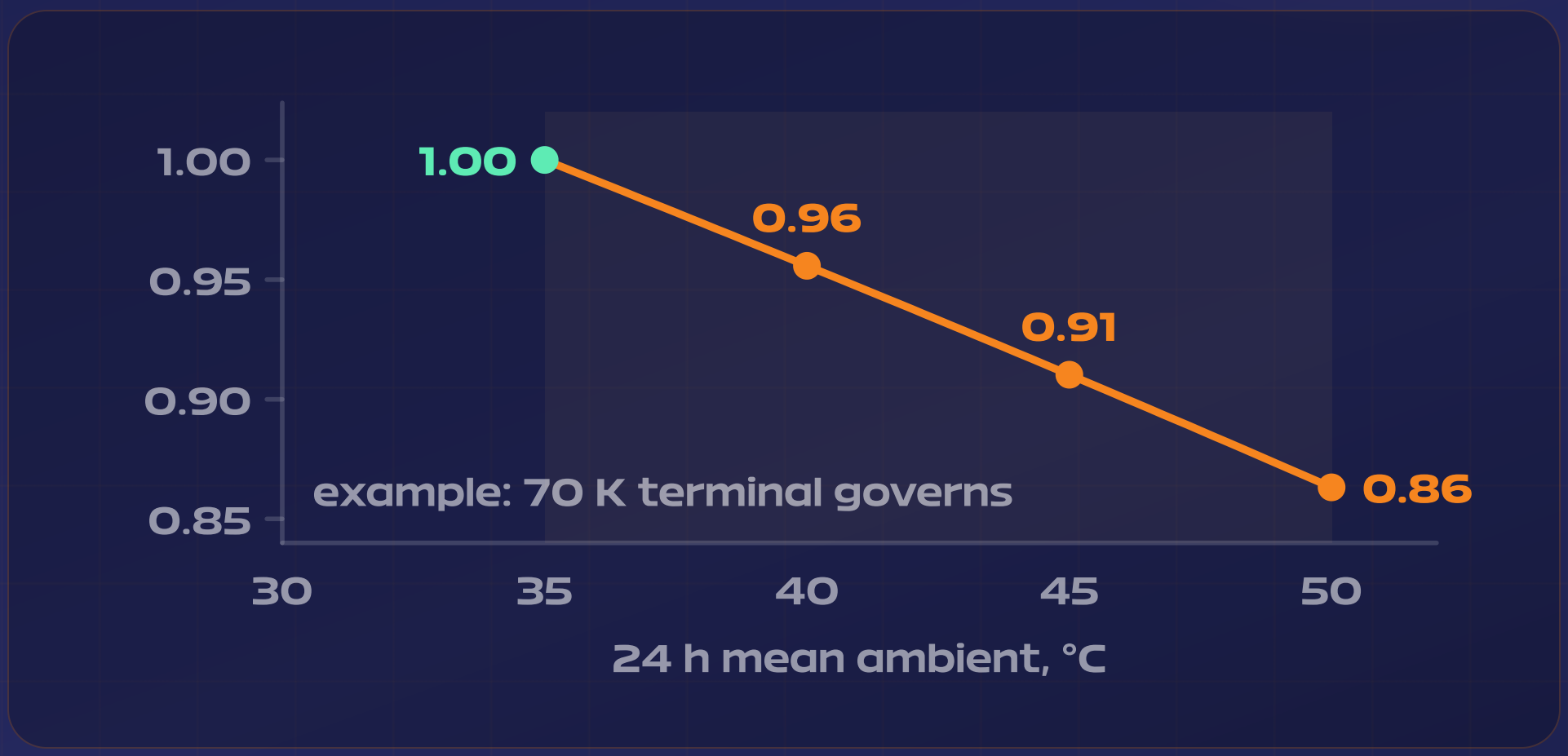
1. Terminals for external insulated conductors 70 K, or the component maker's lower limit. Handles 15 K metal, 25 K insulating. Covers 30 K metal, 40 K insulating. At a 35 °C daily mean. [8]

2. Busbars get no tabulated limit, only what they must not damage: a 105 K ceiling for copper, 55 K for bare aluminium unless the original manufacturer declares otherwise. [8]

A rise limit is kelvin above ambient. Above a 35 °C mean the current is adjusted (9.2.2); handles and covers may run hotter in absolute terms, with a W017 warning label. [8]

SAUDI HEAT

Above a 35 °C daily mean, the rating comes down



1. Normal service: 40 °C peak, 35 °C 24 h mean. 10.10.3.6 lets a rating tested at 35 °C be recalculated for 20 to 50 °C, by agreement, where losses go as I^2. [8][9]
2. Simplified example: a 70 K terminal governs and was tested at its limit. At a 50 °C mean, (55/70)^0.61 = 0.86 of the current. Other parts or cooling may govern. [8]

SEC is a separate layer: 60 K is the rise limit in 31-SDMS-07C; 55 °C is SEC's maximum ambient (01-SDMS-01 via 56-SDMS-05), a peak, not the 24 h mean plotted here. [7]

SAUDI GRID

60 Hz trims a 50 Hz rating above 800 A

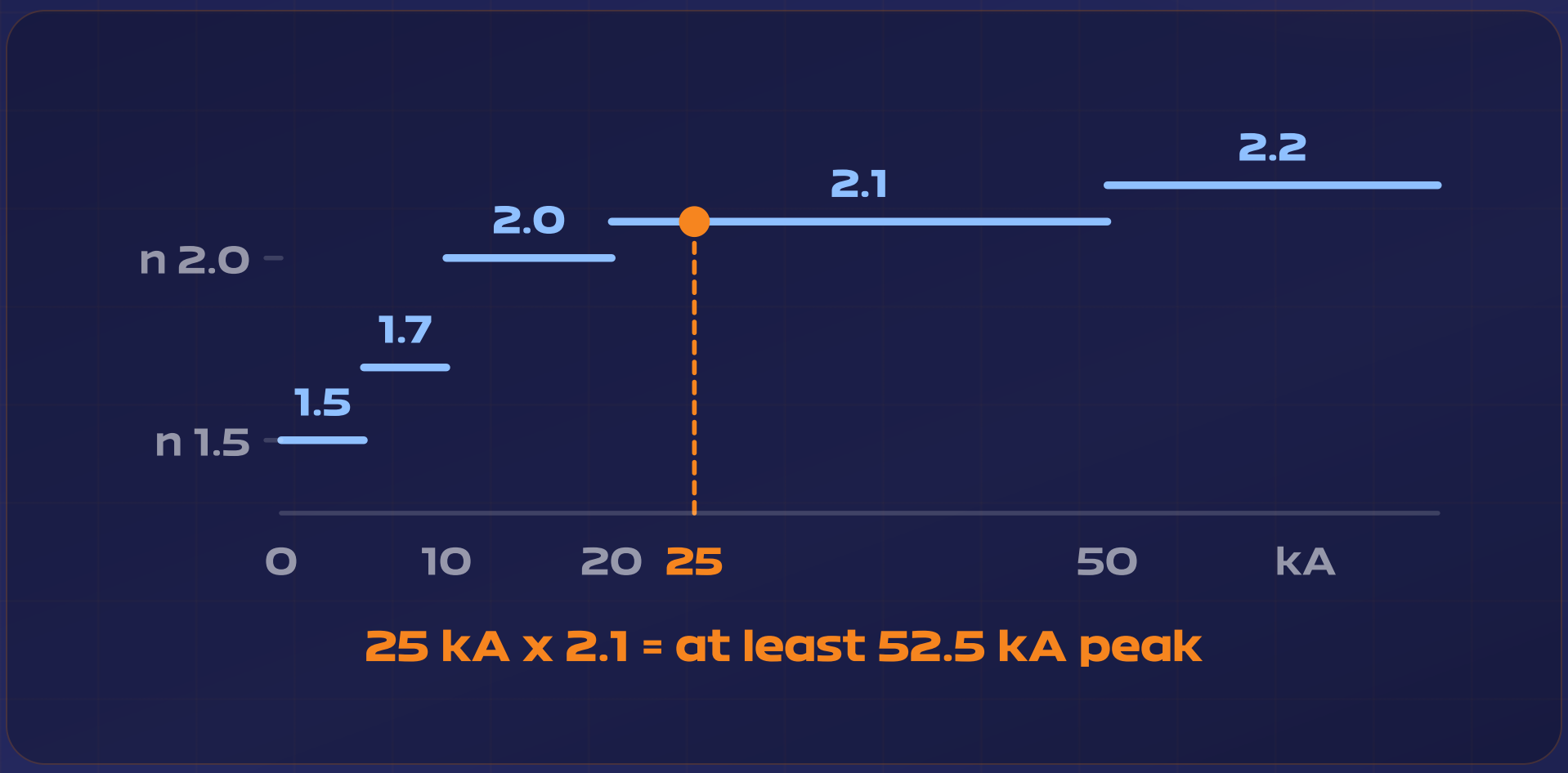


1. IEC 61439-1:2020, 10.10.3.1, unchanged from 2011: 50 Hz temperature-rise results hold at 60 Hz up to 800 A. Above it, 95%: 1600 A becomes 1520 A, 2500 A becomes 2375 A. [3][8]
2. No cut if the 50 Hz rise stayed within 90% of its limit. Saudi Arabia is the only 60 Hz grid in the GCC regulation's table. [6][8]

Rated frequency is a declared characteristic (5.5). Get the 60 Hz Ing or Inc in writing. [3]

SHORT CIRCUIT, PART ONE

Icw needs its duration, and Ipk its floor



25 kA x 2.1 = at least 52.5 kA peak

1. Icw (5.3.5) is declared in kA for a stated time; SEC asks 25 kA for 1 s. The peak it must survive is n times that, and Table 7 puts n at 2.1 for 25 kA. [7][8]
2. So 25 kA needs a declared Ipk of at least 52.5 kA. Makers often declare more: ABB lists 74 kA against a 25 kA Icw. [8][10]

Read a rating as a pair, Icw for the heat and Ipk for the force, and check both against the network's prospective current.

SHORT CIRCUIT, PART TWO

Same I²t is arithmetic, not a new rating



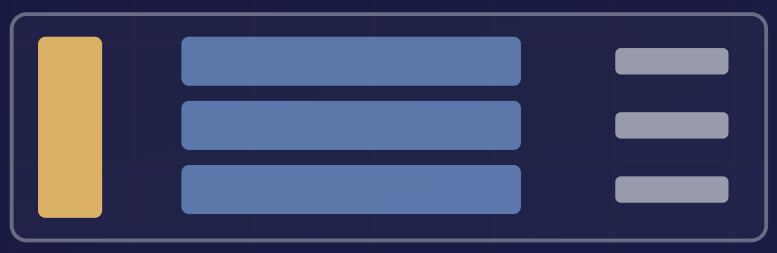
1. 25 kA for 1 s carries the I²t of 17.7 kA for 2 s or 14.4 kA for 3 s. 10.11.5.4 b) uses I²t = constant only to adjust a test period, with peak and 0.1 s conditions. [8]

2. Exempt from verification (10.11.2): Icw or Icc up to 10 kA; circuits behind current-limiting devices cutting off at 17 kA or less at the maximum prospective current; two further stated cases. [8]

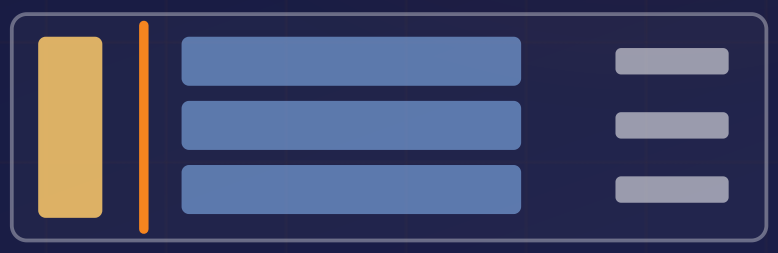
A different duration is a rating only when the original manufacturer declares and verifies it. Exempt circuits still need devices fit for the fault level. [8][9]

FORMS OF SEPARATION

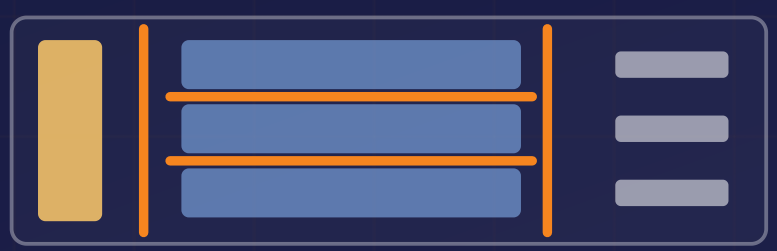
Form 4 is a barrier, not arc containment



Form 1
no internal separation



Form 2
busbars apart from units



Form 3
units apart, terminals not



Form 4
units and terminals apart

1. The original four, IEC 439-1 (1985) clause 7.7: separation limits "the probability of initiating arc faults". Initiating, not surviving. [12]

2. Forms now sit in IEC 61439-2:2020, 8.101 and Annex BB; its a and b sub-types are not reproduced here. The form is agreed between maker and user. [3][12]

Working on one unit with its neighbours live is a separate agreement (8.4.6.2.3, 2011 numbering); compartments are one of five listed measures. [2]

INTERNAL ARC

IEC 61439 conformity alone does not establish internal-arc performance



A verified design covers the line-up as built, and nothing added after.

0	TS 61641	PPE
hits for "internal arc" in the full 2011 text	**passive or active (IAMS)** since 19 August 2026	**maintenance and PPE** outside the TS scope

Specify against IEC TS 61641:2026: zones covered, permissible arc current and duration, and passive or active protection. A classification does not authorise live work; Icw is not an arc rating. [10][11]

THE CLAUSE TO WRITE

Five lines, and none says TTA

LOW-VOLTAGE ASSEMBLIES, SPECIFICATION

a. Assemblies to IEC 61439-2:2020 with IEC 61439-1:2020 (SASO adoption, edition confirmed with SASO); the label names the part.
b. Design verification report for the arrangement offered, route per Table D.1 row, Ing or Inc declared at 60 Hz; routine record per serial number.
c. Rated currents at the site's stated 24 h mean ambient, by test or 10.10.3.6, limiting component and method shown.
d. Icw in kA for a stated time with Ipk, or Icc with its named protective device, at or above the prospective current; any 10.11.2 exemption stated with its condition.
e. Form of separation and maintenance case agreed; any internal-arc requirement to IEC TS 61641:2026, naming zones, arc current, duration and protection type.

1. Each line names a document, a quantity or a record the supplier can be held to. IEC TR 61439-0 is the guide written for this job. [13]
2. IEC 61439 conformity alone does not establish internal-arc performance, and no arc classification authorises live work. [11]

SOURCES

Where every number in this deck comes from

[1] IEC 61439-1:2009 abstract; BS EN 60439-1:1999 record (BSI)
[2] IEC 61439-1:2011 Ed 2.0, as historical comparison
[3] IEC 61439-1:2020 Ed 3.0 and IEC 61439-2:2020 Ed 3.0
[4] SASO Technical Regulation for EMC (2023), Annex 1-a
[5] SABER non-regulated list, HS 853710
[6] GSO BD-142004-01, LV regulation, Annex 1 (non-official EN)
[7] SEC 31-SDMS-07C Rev.0 (10/2020); SEC 56-SDMS-05 Rev.0
[8] Ed 3.0 text via CEI EN IEC 61439-1:2022 extract (Certifico)
[9] BEAMA Guide to Verification, BS EN IEC 61439-2:2021
[10] ABB TAP No.11, Table 12.2; ABB, LV switchgear and IEC 61439
[11] IEC TS 61641:2026 abstract; IEC TR 61641:2014; IEC 62271-200
[12] IEC 439-1 (1985) clause 7.7, via IS 8623 (Part 1):1993
[13] IEC TR 61439-0:2022, guidance to specifying assemblies

Ratings at 60 Hz, ambient factors and I^2t values are computed from the cited clauses, with their assumptions stated. The full list is on the article page.

Practical electrical engineering

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https://nlc.com.sa/academy/tta-iec-61439.html

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