# *TEST REPORT*

## UL50

## Enclosures for Electrical Equipment

## Special Purpose Enclosures - Industrial Products

| | |
|---|---|
| Report reference No. ..... : | **0036043-01** |
| Compiled by (+ signature)..... : | Razmik Mansourian |
| Approved by (+ signature) ..... : | Niklas Johansson |
| Date of issue ..... : | 2000-12-18 |
| Content..... : | 13 pages |

| | |
|---|---|
| Applicant ..... : | MCT BRATTEBERG |
| Address ..... : | Lyckeåborg<br>371 92 Karlskrona |

| | |
|---|---|
| Standard..... : | **Applicable parts of UL50, 11th Edition: 1995** |
| Specified NEMA TYPE-code. ..... : | **Tested for NEMA Type 3R & 4X & 12 Enclosure** |
| TRF date. ..... : | DEW/990104 |

| | |
|---|---|
| Type of test object..... : | Gasket mounted in an enclosure box |
| Trademark..... : | MCT BRATTEBERG |
| Model/type reference ..... : | ALF- 150 |
| Manufacturer..... : | MCT BRATTEBERG |
| Rating..... : | Type 3R & 4X & 12 Enclosure |

| |
|---|
| Measures approx.: 253 x 119 mm. |
| Possible test case verdicts:<br>- test case does not apply to the test object: N(.A.)<br>- test object does meet the requirement: P(ass)<br>- test object does not meet the requirement: F(ail)<br>- the requirement has not been checked: N/C |
| General remarks:<br>"(see remark #)" refers to a remark appended to the report.<br>"(see appended table)" refers to a table appended to the report.<br>Throughout this report a point is used as the decimal separator.<br>The test results presented in this report relate only to the object tested.<br>This report shall not be reproduced except in full without the written approval of the testing laboratory. |

Note: Equipment used during test:

Cabinet ID: N.N. (prototype)

| Table 6.1<br>ENCLOSURE TYPES according to UL 50 11th Ed. and CAN/CSA-C22.2 No. 94-M91 | | | |
|---|---|---|---|
| **Type** | **Intended use and description / Requirements or qualification tests, paragraph or section number** | **Comments** | **Verdict** |
| **3** | *Outdoor use primarily to provide a degree of protection against rain, sleet, wind blown dust and damage from external ice formation.* | | — |
| | Rain – Section 30 | | — |
| | Outdoor Dust or Hose – Section 32 or 35 | | — |
| | Icing – Section 34 | | — |
| | Protective Coating – Section 15 | | — |
| | Gaskets – Section 14 | | — |
| | Gasket Tests – Section 43 | | — |
| **3R** | *Outdoor use primarily to provide a degree of protection against rain, sleets and damage from external ice formation.* | | P |
| | Rain – Section 30 | Rain Test has been performed | P |
| | Icing – Section 34 | A Icing Test has been performed. | P |
| | Protective Coating – Section 15 | Polymeric Enclosure | N |
| | Gaskets – Section 14 | A Gasket Test has been performed. | P |
| | Gasket Tests – Section 43 | A Gasket Test has been performed. | P |
| **3S** | *Outdoor use primarily to provide a degree of protection against rain, sleet, wind blown dust and to provide for operation of external mechanisms when ice laden.* | | — |
| | Rain – Section 30 | | — |
| | Outdoor Dust or Hose – Section 32 or 35 | | — |
| | Icing – Section 34 | | — |
| | Protective Coating – Section 15 | | — |
| | Gaskets – Section 14 | | — |
| | Gasket Tests – Section 43 | | — |
| **4** | *Indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, hose-directed water and damage from external ice formation.* | | — |
| | Hosedown – Section 35 | | — |
| | Protective Coating – Section 15 | | — |
| | Icing – Section 34 | | — |
| | Gaskets – Section 14 | | — |
| | Gasket Tests – Section 43 | | — |

| | | | |
|---|---|---|---|
| **4X** | *Indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, hose-directed water and damage from external ice formation.* | | **P** |
| | Hosedown – Section 35 | | P |
| | Protective Coating – Section 15 | | N |
| | Corrosion Resistance – Section 39 | | N |
| | Icing – Section 34 | | P |
| | Gaskets – Section 14 | | P |
| | Gasket Tests – Section 43 | | P |
| **12,12K** | *Indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping noncorrosive liquids.* | | **P** |
| | Corroision Protection – 5.3 | | N |
| | Rust Resistance – Section 38 | | N |
| | Drip – Section 31 | Hosedown test conducted | P |
| | Indoor Circulating Airbome Dust or Atomized Water Method A – Section 32 or 33 | | P |
| | Gaskets – Section 14 | | P |
| | Gasket Tests – Section 43 | | P |

## Table 6.2
## Environmental related constructional features for enclosure types

| Type / Requirements – Paragraph or section number | Comments | Verdict |
|---|---|---|
| **3** | | — |
| Polymeric Enclosures/Parts – 7.1.2 | | — |
| Equipment Openings – 8.2.1 | | — |
| Mounting Openings – 8.4.1, 8.4.3 | | — |
| Conduit knockouts and Conduit openings – 8.5.1 | | — |
| Covers and doors – 16.4 | | — |
| Markings – 49.2, 49.6 and 49.7 | | — |
| **3R** | In accordance with the standard. | **P** |
| Polymeric Enclosures/Parts – 7.1.2 | V-0 enclosure | P |
| Equipment Openings – 8.2.1 | | N |
| Drainage Openings – 8.3.1 | | N |
| Mounting Openings – 8.4.1, 8.4.2 | | P |
| Conduit knockouts and Conduit openings – 8.5.1 | | N |
| Additional Openings – 8.6.2 | | N |
| Covers and doors – 16.4 | | P |
| Markings – 49.2, 49.3, 49.4, 49.5, 49.6 and 49.7 | See Remark # 4 | N/C |
| **3S** | | — |
| Polymeric Enclosures/Parts – 7.1.2 | | — |
| Equipment Openings – 8.2.1 | | — |
| Mounting Openings – 8.4.1, 8.4.3 | | — |
| Conduit knockouts and Conduit openings – 8.5.1 | | — |
| Covers and doors – 16.4 | | — |
| Markings – 49.2, 49.6 and 49.7 | | — |

| 4 | | — |
|---|---|---|
| Polymeric Enclosures/Parts – 7.1.2 | | — |
| Equipment Openings – 8.2.1 | | — |
| Mounting Openings – 8.4.1, 8.4.3 | | — |
| Conduit knockouts and Conduit openings – 8.5.1 | | — |
| Markings – 49.2, 49.7 | | — |

| 4X | | P |
|---|---|---|
| Polymeric Enclosures/Parts – 7.1.2 | V – 0 Enclosure | P |
| Equipment Openings – 8.2.1 | | N |
| Mounting Openings – 8.4.1, 8.4.3 | | P |
| Conduit knockouts and Conduit openings – 8.5.1 | | N |
| Markings – 49.2, 49.7 | See Remark #4 | N/C |

| 12 | | P |
|---|---|---|
| Equipment Openings – 8.2.1 | | N |
| Mounting Openings – 8. 4.1 and 8. 4. 4 | | P |
| Conduit Knockouts and Conduit Openings – 8.5.2 | | N |
| Markings – 49.2 and 49.7 | See Remark #4 | N/C |

| Clause | Requirement / Test | Result / Comment | Verdict |
|---|---|---|---|
| | **GENERAL** | | |
| **5** | **General** | | **P** |
| | **ENCLOSURES** | | |
| **6** | **General** | Tested in acceptance of an Type 3R Enclosure, (See table 6.1 and 6.2 in this test report). | **P** |
| **7** | **Polymeric Enclosures/Parts** | Metal enclosure | N |
| **8.** | **Openings in enclosure** | | **P** |
| 8.3 | Drainage openings | | N |
| 8.4 | Mounting openings | At the rear cover plate are 4 openings for mounting purpose. | P |
| 8.5 | Conduit knockouts and conduit openings | | N |
| 8.6 | Additional openings | | N |
| **9** | **Observation Windows** | | N |
| **10** | **Thickness of Cast-Metal Enclosures** | | N |
| **11** | **Thickness of Sheet-Metal Enclosures** | | N |
| **12** | **Joints and Fastenings** | | P |
| **13** | **Notches** | | N |
| **14** | **Gaskets** | | **P** |
| 14.1 | Test performed | See Remark # 3 | P |
| 14.4 | Gasket adhesive or mechanical means | By"adhesive" and by mechanical means. | P |
| CAN 4.4 | Gaskets shall comply with clause "CAN 6.2.5" | See UL50 clause 43 | N |

| Clause | Requirement / Test | Result / Comment | Verdict |
|---|---|---|---|
| | **PROTECTION AGAINST CORROSION** | | |
| **15** | **Outdoor Enclosures** | | **P** |
| 15.1 | Hinges | | P |
| 15.2-15.10 | Material in enclosure | Polymeric enclosure | P |
| (CAN 4.8) | Material in enclosure | | P |
| | **COVERS AND DOORS** | | |
| **16** | **General** | The cover is screwed into position. | P |
| **17** | **Thickness** | | N |
| **18** | **Fastenings** | See above | P |
| **19 & 20 & 21** | **Flanges** | | N |
| | **HINGES** | | |
| **22** | **Butt Hinges** | | N |
| **23** | **Piano Hinges** | | N |
| **24** | **Ear-Type Hinges** | | N |
| **25** | **Formed Hinges** | | N |
| | **LATCHES AND HANDLES** | | |
| **26** | **Details** | | N |

| Clause | Requirement / Test | Result / Comment | Verdict |
|---|---|---|---|
| | **CONNECTION FOR WIRING SYSTEMS** | | |
| **27** | **Details** | | **N** |
| 27.1 | Knockouts | No knockouts. | N |
| 27.4 | Threaded hole | | N |
| 27.8 | Conduit hub | | N |
| | **PERFORMANCE** | | |
| **28** | **Compression Test** | | N |
| **29** | **Deflection Test** | | N |
| **30 (CAN 6.4)** | **Rain Test** | A rain test was conducted. | P |
| 30.1.a. | Type 3R *(no significant acc. of water)* | See Remark # 1 | P |
| 30.1.b. | Type 3 or 3S *(no water)* | | N |
| 30.2 | Type 3R comply with 49.5 | | N |
| **31** | **Drip Test** | Hosedown test conducted | P |
| **32** | **Dust Test** | Hosedown test conducted | P |
| **33** | **Atomized Water Test** | | N |
| **34** | **Icing Test** | | **P** |
| 34.1 | Type 3S, opening of enclosure with ice still not melted | | N |
| 34.2 | Type 3, 3R, 4, 4X, 6, 6P, undamaged after ice melted | See Remark # 2 | P |

| Clause | Requirement / Test | Result / Comment | Verdict |
|---|---|---|---|
| **35 (CAN 6.8)** | **Hose and Hosedown Tests** | | **P** |
| 35.1.1 | Type 3, 3S, 4, 4X, 6, 6P *(no water)* | | N |
| 35.2 | Hosedown Test (Type 4, 4X, 6 or 6P), *(246L)* | See remark #5 | P |
| 35.3 | Hose Test (Type 3 or 3S) *(170L)* | | N |
| **36** | **Submersion Test** | | N |
| **37** | **Oil Test** | | N |
| **38** | **Rust Resistance Test** | | N |
| **39** | **Corrosion Resistance Test** | | N |
| **40** | **Air Pressure Test** | | N |
| **41** | **Polymeric Enclosure Rigid Metallic Conduit Connection Tests** | | N |
| **42** | **Polymeric Enclosure Bonding Test** | | N |
| **43** | **Gasket Tests** | A gasket test performed. | **P** |
| 43.1 | Gasket test | See Remark # 3 | P |
| (CAN 6.2.5) | Gasket Tests | | N |
| (CAN 6.2.5.1) | Deformation at room temperature | | N |
| (CAN 6.2.5.2) | Deformation after ageing in an air oven | | N |
| (CAN 6.2.5.3) | Impact and Deformation | | N |
| **44** | **Metallic Coating Thickness Test** | | N |
| **45** | **Metallic Enclosure Conduit Hub Test** | | N |
| **46** | **Metallic Enclosure Threaded Opening Test** | | N |
| **47** | **Permanence of Marking** | See Remark # 4 | N/C |

| Clause | Requirement / Test | Result / Comment | Verdict |
|---|---|---|---|
| | **MARKING** | | |
| **48** | **General** | | P |
| **49** | **Environmental Related Markings** | See Remark # 4 | N/C |
| **50** | **Non-environmental Enclosure Ratings** | | N |
| **51** | **Cautionary Markings** | | N |
| | **SPECIFIC ENCLOSURE** | | |
| **52** | **Cabinets and Cutout Boxes** | | N |
| **53** | **Junction and Pull Boxes** | | N |

Remarks

## Summary of Encapsulation tests according to UL 50 and CAN/CSA-C22.2 No. 94-M91

Remark 1 (Clause 30 Rain Test: **Type 3R Enclosure**):

a. Test Conditions:
The equipment was placed on a table, in its normal direction. It was placed in the focal area of the spray heads to ensure that maximum / equal amount of water would expose the cabinet. It was "water-sprayed" with a test-apparatus according to figure 30.1 in this standard.

Water pressure: 5 pounds/inch$^2$ (34.5kPa) Duration: 1 hour.

b. Inspection description:

No water was found inside the equipment.

c. Result:
**The result is in compliance with the acceptance conditions for Type 3R Enclosure of this standard.**

Remark 2 (Clause 34.2 Icing Test: **Type 3R Enclosure**):

An icing test was made according to clause 34 in the UL50-standard.

After obtaining a 3/4inch (19mm) of ice on the testprobe (next to the equipment), the test was succeded and the ice was then melted.

Result: No damage was observed on the equipment.

**The result is in compliance with the acceptance conditions for Type 3R Enclosure of this standard.**

Remarks

## Summary of Encapsulation tests according to UL 50 and CAN/CSA-C22.2 No. 94-M91

Remark 3 (Clause 43.1 Gasket Test: **Type 3R Enclosure**):

a. Test Conditions:
- 3 samples of gaskets were tested; ALF- 150.
- After "ageing in an air oven" , at +70C for 168 hours, a tensile strength was conducted on all 3 samples, plus 1 "unaged" sample.

b. Inspection description:
The thickness of the gasket was compared with the initial thickness of the specimen, (measured approx. 100%).
No visible deterioration, deformation, melting or cracking or hardening of the material was determined.
The strength test of the test samples showed almost 100% comparing the aged to the unaged sample. (Req. tensile strength better than 70% and elongation not less than 60%)

c. Result:
**The result is in compliance with the acceptance conditions for a Type 3R Enclosure of this standard.**

Remark 4 (Clause 47 and 49 Markings):

The enclosure shall be marked with a type number, for example, ***Type 3R Enclosure*** or ***Type 4X Enclosure*** or***Type 12 Enclosure*** in a permanently secured manner in accordance to this standard.

Encosures marked with a type may also be marked as follows:

a. Type **4X** may be marked "raintight & watertight"

b. Type **3R** may be marked "rainproof"

c. Type **12** may be marked "driptight"

Remark 5 (Clause 35.2 Hosedown test:**Type 4X** )

a. Test Conditions:

The enclosure and its external mechanisms was to be sprayed by water from a hose having a 1-inch (25,4-mm) inside dimeter nozzle that delivers at least 65 gallons (246 L) of water per minute.The water stream was to be directed at the joints of the enclosure from a distance of 10-12 feet (3,0 – 3,7m) and was to be moved along the joints or surface at a minimun rate of 4 seconds per linear inch (1,6 s/cm).

b. Inspection description:

No water was found inside the equipment.

c. Result:
**The result is in compliance with the acceptance conditions for a Type 4X Enclosure of this Standard.**