



Descriptive Report and Test Results

MASTER CONTRACT: 211066

REPORT: 2661531

PROJECT: 70052480

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PRODUCTS

CLASS 2871-02 –HEATERS-Miscellaneous

CLASS 2871-82 – HEATERS-Miscellaneous - Certified to US Standard

Oil immersion, flange type, aluminum sheathed type heaters ALIM-0001HD to ALIM-0012HD series models rated 480V and ALIM-0001HD-575 to ALIM-0012HD-575 series models 575V, 60Hz, 3ph 16kW max.

Oil immersion, flange type, aluminum sheathed type heaters 3FL-ALIM-0001 to 1-0012, 3FLS-ALIM-0001 to -0012, 6FL-ALIM-0001 to -0012, 6FLS-ALIM-0001 to -0012 (8-32 (kW)), 8FL-ALIM-0001 to -0012, 8FLS-ALIM-0001 to -0012, 16-64 (kW), 10FL-ALIM-0001 to -0012, 10FLS-ALIM-0001 to -0012, 24-96 (kW) series models rated 480V and 600V, 60Hz, 3ph 96kW max.

Note: The ALIM models are equipped with electrical connection box 4 and 12 type enclosure.

Oil immersion, flange type, aluminum sheathed type heaters 3FL-SSS-0001 TO -0012, 4 TO 16 (KW), 3FL (3PSI)-0001 TO -0012, 4 TO 16 (KW), 6FL-SSS-0001 TO -0012, 8-32 (KW) , 6FLS (3PSI)-SSS-0001 TO -0012, 8 TO 32(KW), 8FL-SSS-0001 TO 0012, 16 TO 64 (KW) , 8FL(3PSI)-SSS-0001 TO 0012 (KW), 10FL-SSS-0001 TO 0012, 24 TO 96 (KW), 10FL(3PSI)-0001 TO -0012, 24-96KW series models rated 480V and 600V, 60Hz, 3ph 96kW max.

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865 Ellingham Avenue, Pointe-Claire, Quebec, Canada H9R 5E8
Telephone: 514.694.8110 1.800.463.6727 Fax: 514.694.5001 www.csagroup.org

Note: The SSS models are equipped with electrical connection box 4X and 12 type enclosure.

1. The max temperature of oil as condition of operation for the immersed heaters 480V, 575V&600V, 60HZ, 3ph, 96 k W max will be 260°F;
2. This oil immersion aluminum sheathed type heaters are certified only for use in equipment where the acceptability of the combination is determined by CSA-International.

APPLICABLE REQUIREMENTS

CAN/CSA-C22.2 No. 72-10 – Heating and Heater Elements (Replacement Types)

UL 499 14TH Ed – Electric Heating Appliances

MARKINGS

The manufacturer is required to apply the following markings:

- Products shall be marked with the markings specified by the particular product standard.
- Products certified for Canada shall have all Caution and Warning markings in both English and French.

Additional bilingual markings not covered by the product standard(s) may be required by the Authorities Having Jurisdiction. It is the responsibility of the manufacturer to provide and apply these additional markings, where applicable, in accordance with the requirements of those authorities.

The products listed are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US' for Canada and US (indicating that products have been manufactured to the requirements of both Canadian and U.S. Standards) or with adjacent indicator 'US' for US only or without either indicator for Canada only.

Note:

The product shall be legibly marked “**For supply connections use wires suitable for at least 90°C (221°F)**”

This wording shall be located at or near the point where the supply connections are to be made and shall be clearly visible during installation and examination of the supply-wiring connections.

Nameplate adhesive label material approval information:

Self-adhesive labels employed shall be manufactured under the 7921 class.

Each component shall be marked in a permanent manner with the following:

- a) The submitter's name or trademark or Master contract number “**211066**” adjacent to the CSA Mark
- b) The CSA monogram and the indicators ‘c’ and ‘us’.
- c) electrical rating in volts and watts .
- d) The catalogue, style, model or other type designation;
- e) Date code

Note:

1. The product may bear one of the following CSA Markings: CSA, or CSA us or c CSA us.
2. Bilingual Markings for products with CSA Mark or c CSA us Mark.

ALTERATIONS

1. The units are marked as noted under “Markings” above.
2. The bonding inside of the electrical box from grounding terminal to the bottom flange (2 inch (50.8 mm) thick) of the electrical box (enclosure) (see cold side of the heater element). The bonding wire will have a min. size of 6AWG and the screw used will be mi. size 8.

Note: The grounding of the power supply is connected with the grounding terminal in the time of installation.

FACTORY TESTS

Dielectric Strength Test

The equipment at the conclusion of manufacture, before shipment, shall withstand for one min, without breakdown

b) 1000V ac + 2 x rated voltage for units rated 480Vac, 575Vac and 600V, between live parts and exposed non-current-carrying metal parts

As an alternative, a potential 20 percent higher may be applied for one second.

WARNING: The factory test(s) described herein may present a hazard of injury to personnel and/or property and should only be performed by persons knowledgeable of such hazards and under conditions designed to minimize the possibility of injury.

SPECIAL INSTRUCTIONS FOR FIELD SERVICES

1. Component descriptions marked with either the “(INT)” or “(INT*)” identifiers may be substituted with other components providing the requirements specified under the notes in the “Description” are complied with.

COMPONENT SPECIAL PICKUP

Not applicable.

DESCRIPTION

Notes:

1. Component Substitution
 - a) Critical components (those identified by mfr name, cat no), which are NOT identified with either "INT" or "INT*" are not eligible for substitution without evaluation and report updating
 - b) The term "INT" means a "Certified" and/or "Listed" (or a "Recognized" and/or "Accepted") component may be replaced by one "Certified" and/or "Listed" by another certification organization accredited by the appropriate accreditation body or scheme requirements to the correct standard, for the same application; providing the applicable country identifiers are included and requirements in item "d" below are complied with.
 - c) The Term "INT*" means a "Recognized" and/or "Accepted" component may be replaced by one "Recognized" and/or "Accepted" by another certification organization accredited by the appropriate accreditation body or scheme requirements to the correct standard, for the same application, providing the applicable country identifiers are included, the component is **also** CSA Certified, the requirements in item "d" below are complied with and any "conditions of suitability" for the component (as recorded in this descriptive report) are complied with.
 - d) Components which have been substituted, must be of an equivalent rating, configuration (size, orientation, mounting) and the applicable minimum creepage and clearance distances are to be maintained from live parts to bonded metal parts and secondary parts.
 - e) Substitution of a "Certified" and/or "Listed" component with a component that is "Recognized" or "Accepted" is not permitted without evaluation and report updating.
 - f) A component description marked with "UR Recognized" or "cUR Recognized" or "cURus Recognized" indicates that a component is UL Recognized and accepted for use in the end product described in this report based on UL Conditions of Acceptability. Conditions of Acceptability of UR Recognized components are based mainly on flammability ratings, electrical ratings, temperature, and number of cycles.

Part A

The oil immersion, aluminum sheathed type heaters ALIM-0001 to ALIM-0012 series rated 480V & 575V, 60Hz, 3ph max 16kW models are described below:

Nomenclature:

A typical product name is: **ALIM-0012HD-575**

	<u>ALIM</u>	<u>xxxx</u>	<u>yy</u>	<u>zz</u>
Position	1	2	3	4

Position 1: Four digits denoting material of the sheet material used (see AL=Aluminum) followed by the type of the heater (see IM=immersion) of product.

Position 2: Model number (0001, 0002, 0003, 0004, 0005, 0006, 0007, 0008, 0009, 0010, 0011 and 0012) related with specific construction (total length (A), Immersed length (B), Fined (C) , Smut area (D) & x Cold End area (E)) and corresponding power characteristic in (kW) (4, 6, 7.5, 9, 12 and 16)

Position 3: Two digits denoting construction type (HD)

Position 4: Additional suffix numbers denoting power supply voltage when different from the standard model
575 – for 575V ac

General: The subject models are similar except as noted below.

The ALIM Series models for 480V specific characteristics are shown in the table below and the reference dimensions are shown in Att2 Illustration 5:

Part Number	Model Type	Power (kW)	Voltage	Phase	Length (A)	Immersed (B)	Finned (C)	(D)	Cold End (E)
ALIM-0001HD	Immersion	4	480	3	34	30	25	5	8.813
ALIM-0002HD	Immersion	6	480	3	40	36	31	5	8.813
ALIM-0003HD	Immersion	7.5	480	3	45	41	36	5	8.813
ALIM-0004HD	Immersion	9	480	3	58	54	49	5	8.813
ALIM-0005HD	Immersion	12	480	3	69	66	61	5	7.813
ALIM-0006HD	Immersion	16	480	3	73	70.5	65	5.5	7.813
ALIM-0007HD	Immersion	4	480	3	36	32	28	4	7.813
ALIM-0008HD	Immersion	6	480	3	38	34	30	4	7.813
ALIM-0009HD	Immersion	7.5	480	3	42	38	34	4	7.813
ALIM-0010HD	Immersion	9	480	3	48	44	40	4	7.813
ALIM-0011HD	Immersion	12	480	3	52	48	44	4	7.813
ALIM-0012HD	Immersion	16	480	3	56	52	48	4	7.813

The ALIM Series models for 575V specific characteristics are shown in the table below and the reference dimensions are shown in Att2 Illustration 5:

Part Number	Model Type	Power (kW)	Voltage	Phase	Length (A)	Immersed (B)	Finned (C)	(D)	Cold End (E)
ALIM-0001HD-575	Immersion	4	575	3	34	30	25	5	8.813
ALIM-0002HD-575	Immersion	6	575	3	40	36	31	5	8.813
ALIM-0003HD-575	Immersion	7.5	575	3	45	41	36	5	8.813
ALIM-0004HD-575	Immersion	9	575	3	58	54	49	5	8.813
ALIM-0005HD-575	Immersion	12	575	3	69	66	61	5	7.813
ALIM-0006HD-575	Immersion	16	575	3	73	70.5	65	5.5	7.813
ALIM-0007HD-575	Immersion	4	575	3	36	32	28	4	7.813
ALIM-0008HD-575	Immersion	6	575	3	38	34	30	4	7.813
ALIM-0009HD-575	Immersion	7.5	575	3	42	38	34	4	7.813
ALIM-0010HD-575	Immersion	9	575	3	48	44	40	4	7.813
ALIM-0011HD-575	Immersion	12	575	3	52	48	44	4	7.813
ALIM-0012HD-575	Immersion	16	575	3	56	52	48	4	7.813

Note: All the dimensions are in inch.

1. Body

- Accepted for application
- Manufacturer: METRA ALLUMINUM Inc.
- Designation: 9899886
- Material: 6360 Aluminum
- Dimensions: Fined Cylinder, ID=1.7 inch, outside max dim (over-fin) =2.840in.
- (Details are shown in Att2 Illustration 4 and Att2 Illustration 5)

2. Heating elements
Accepted for application
Manufacturer: Hyndman industrial Products Inc.
Number provided: 6
Material: Alloy NIK-80
Detailed spec for of material are shown in Att2 Illustration 1
Note: Connections are Y type for 480V models and Delta for 575V models (details are shown in Att3 Schematics)
Note: Number of coil used in ALIM-0007HD to ALIM-0012HD models is identical with the one used on ALIM-0001HD to ALIM-0006HD models for the same power (see k W).

3. Leads (Buss Bar)
Accepted for application
Manufacturer: Trivolt Industries
Designation: 5/16-18 buss bar
Material: Steel
Dimensions: L=8.2inch, 5/16-18, 2.35 inch (outside of the front heating element)
Each of the three leads were insulated with mica tube: L=5.86 inch, OD=0.587 inch, ID=0.515 inch.

4. Insulation
Accepted for application
Manufacturer: UCM Magnesia
Designation: 33 LST
Material: Mg O
Min. thickness: 0.036 inch (0.914mm)
(Details are shown in Att2 Illustration 2 and 3)

5. Cordierite Insulator
Accepted in application
Manufacturer: DU-CO CERAMICS CO.
Material: 65E
Drawing: E-1874
Note: 8xCeramics/assembly are used and L=48 inch.
Note: Drawings were supplied by Trivolts Industries as supporting documents.

Note: Terminal Box having a cover box, gasket (VBNB) , 5/16 steel washer, 5/16 -18 steel nuts , mica washer and epoxy ring, can be provided as optional. Ref. Att4 Illustration 5.

Part B

Oil immersion, flange type, aluminum sheathed type heaters 3FL-ALIM-0001 to 1-0012, 3FLS-ALIM-0001 to -0012, 6FL-ALIM-0001 to -0012, 6FLS-ALIM-0001 to -0012 (8-32 (kW) , 8FL-ALIM-0001 to -0012, 8FLS-ALIM-0001 to -0012, 16-64 (kW), 10FL-ALIM-0001 to -0012, 10FLS-ALIM-0001 to -0012, 24-96 (kW) series models rated 480V and 600V series models 60Hz, 3ph 96kW max.

Note: The ALIM models are equipped with electrical connection box 4 and 12 type enclosure.

Oil immersion, flange type, aluminum sheathed type heaters 3FL-SSS-0001 TO -0012, 4 TO 16 (KW), 3FL (3PSI)-0001 TO -0012, 4 TO 16 (KW), 6FL-SSS-0001 TO -0012, 8-32 (KW) , 6FLS (3PSI)-SSS-0001 TO -0012, 8 TO 32(KW),

8FL-SSS-0001 TO 0012, 16 TO 64 (KW) , 8FL(3PSI)-SSS-0001 TO 0012 (KW), 10FL-SSS-0001 TO 0012, 24 TO 96 (KW), 10FL(3PSI)-0001 TO -0012, 24-96KW.

Note: The SSS models are equipped with electrical connection box 4X and 12 type enclosure

Nomenclature new series using different junction boxes (4 to 12 type when manufactured on aluminum) and 4X and 12 when manufactured on SS):

A typical product name is: **3FL-ALIM-0012-J-N1**

Position	<u>3FL (3)</u> 0	<u>ALIM</u> 1	<u>xxxx</u> 2	<u>y</u> J	<u>zz</u> N4
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Position 0: Two digits denoting flange Type (size): 3 FL (for 3 inch), 6FL (for 6 inch), 8 FL (for 8 inch), 10 FL (for 10 inch).

Not followed by (3) – indicate blind flange 150 lbs.

- 7.5 in O.D. for 3” flange
- 11 in O.D. for 6” flange
- 13.5 in O.D. for 8” flange
- 16 in O.D. for 10” flange

Followed by (3) – indicate Blind Flange 300 lbs

- 8.25 in O.D. for 3” flange
- 12.5 in O.D. for 6” flange
- 15 in O.D. for 8” flange
- 17.5 in O.D. for 10” flange

Position 1: Four digits denoting material of the sheet material used (see AL=Aluminum) or (see SSS=Stainless Steel) followed by the type of the heater (see IM=immersion) of product.

Position 2: Model number (0001, 0002, 0003, 0004, 0005, 0006, 0007, 0008, 0009, 0010, 0011 and 0012) (related with specific construction (Immersed length (A), Fined (B), Cold End area (C)) and corresponding power characteristic in (kW):

- (4, 6, 7.5, 9, 12 and 16) for 3FL flange models;
- (8, 12, 15, 18, 24 and 32) for 6FL flange models;
- (16, 24, 30, 36, 48 and 64) for 8FL flange models
- (24, 36, 45, 54 and 96).

Note: Model number (0001, 0002, 0003, 0004, 0005, 0006, 0007, 0008, 0010, 0011, 0012) for 10FL and 10FLS models

Position 3: One digit denoting the voltage (see table below);

Position 4: Two digits denoting junction box type (N1, N4);

		Prefix		
A =208V	3 PHASE		K =208V	1 PHASE
AA= 220V	3 PHASE		KK=220V	1 PHASE
B=240V	3 PHASE		L=240V	1 PHASE
C=300V	3 PHASE		M=300V	1 PHASE
D=315V	3 PHASE		N=315V	1 PHASE
E=380V	3 PHASE		O=380V	1 PHASE
F=400V	3 PHASE		P=400V	1 PHASE
G=415V	3 PHASE		Q=415V	1 PHASE
H=440V	3 PHASE		R=440V	1 PHASE
I =460V	3 PHASE		S=460V	1 PHASE
J=480V	3 PHASE		T=480V	1 PHASE
X=600	3 PHASE		xx=600	1 PHASE

6. Heating elements

As described on the Edition 1 of this report (see Item 1 to 5).
 Different configuration are available:

3" FL. ALUMINIUM

One aluminum sheathed heating element located in the center of a 3 inch flange (see 3 FL).

Also available with 4 or 5 (inch) flange

Detailed construction and dimensions are shown on:

Att2 Illustrations 6 for 150 psi models

Att2 Illustrations 7 for 300 psi models

6" FL. ALUMINIUM

Two aluminum sheathed heating element located in the center line of a 6 inch flange (see 6 FL).

Detailed construction and dimensions are shown on:

Att2 Illustrations 8 for 150 psi models

Att2 Illustrations 9 for 300 psi models

8" FL. ALUMINIUM

4 aluminum sheathed heating element located in the center line of an 8 inch flange (see 8 FL).

Detailed construction and dimensions are shown on:

Att2 Illustrations 10 for 150 psi models

Att2 Illustrations 11 for 300 psi models

10" FL. ALUMINIUM

4 aluminum sheathed heating element located in the center line of an 8 inch flange (see 10 FL).

Detailed construction and dimensions are shown on:

Att2 Illustrations 12 for 150 psi models

Att2 Illustrations 13 for 300 psi models

Note: The models having the junction box manufactured on Stainless Steel have a similar construction and dimensions, only the material is different.

7. Junction Box (Enclosure)

Note: Represent the cold-side of the oil immersion, flange type, aluminum sheathed type heaters

Material: Aluminum Alloy 6061-T6 (for all 3", 6", 8" and 10" models).

Accepted by test for this application as: 4 and 12 type enclosures.

And SS 304 (alternative to aluminum for all the 3", 6", 8" and 10" models).
Accepted by test for this application as: 4X and 12 type enclosures.
Details and dimensions are shown on Att2 Illustrations 6 to 13.

8. Terminal block

CSA (221942), UR and c UR (E220514)

Manufacturer: CONNECTWELL INDUSTRIES PVT LTD, INDIA

Designation: CTS6U (Part#: 710.060) for 50A max models

Rated: (UR & c UR) 8-22 Str AWG, Cu, TQ 14.0 Lb In (1.6 N m), 600V, 50A, C, 2 (105), 4

CSA 22-8 AWG, 50A, 600V, Spacing Group: CSA (B, C, D), UL (BC)

End Plate: 710.002, DIN Rail: 111.013, End Stop: 710.097

Designation: CTS25U (Part#: 710.250) for 115A max models

Rated: (UR & c UR) 2-14 AWG, Str, Cu, TQ 35 Lb in (3.9 N-m), 600V, 115A, C, 2 (105)

CSA 2-12 AWG, 115A, 600V, Electrical Spacing: CSA and UL (B, C, D)

End Plate: 710.003, DIN Rail: TS35x7.5 (111.013), End Stop: 710.097

Designation: CTS50U (Part#: 710.450) for 150A max models

Rated: (UR & c UR) 2/0-6 AWG, Str, Cu, TQ 60 Lb in (6.8 N m), 600V, 150A, B, C, 2 (105), 4

CSA 6-2/0 AWG, 150A, 600V, Electrical Spacing: CSA and UL (B, C, D)

DIN Rail: TS35x7.5 (111.013), End Stop: 710.097

Note: This are DIN Rail Mount Terminal Blocks with Screw Terminals.

Ref. Att3 Schematics 2 to 5

9. Internal wirings

0-50A

MGT 450°C/ 600V

CSA (LR 13427),

Manufacturer: Wire Holdings LLC d/b/a Radix Wire

UR and c UR (E22244)

Manufacturer: RADIX WIRE CO, USA

Designation: UR (Style 5107), c UR (AWM Class I, Group A/B, FT1)

Part #: BFT10C105 (-L1, -L2, -L3) for 3FL, 6FL, 8FL and 10FL models

Rated: 450°C, 600V, 10 AWG,

51-115A

MGT 450°C/ 600V

CSA (LR 13427),

Manufacturer: Wire Holdings LLC d/b/a Radix Wire

UR and c UR (E22244)

Manufacturer: RADIX WIRE CO, USA

Designation: UR (Style 5107), c UR (AWM Class I, Group A/B, FT1)

Part #: BFT08C133 (-L1, -L2, -L3) for 3FL, 6FL, 8FL and 10FL models or

BFT06C133 (-L1, -L2, -L3) for 3FL, 6FL, 8FL and 10FL models

Rated: 450°C, 600V, 6-8 AWG,

115-150A

MGT 450°C/ 600V

CSA (LR 13427),

Manufacturer: Wire Holdings LLC d/b/a Radix Wire
UR and c UR (E22244)
Manufacturer: RADIX WIRE CO, USA
Designation: UR (Style 5107), c UR (AWM Class I, Group A/B, FT1)
Part #: BFT02C133 (-L1, -L2, -L3) for 3FL, 6FL, 8FL and 10FL models or
Rated: 450°C, 600V, 2 AWG,
Ref. Att3 Schematics 2 to 5

10. Grounding and Bonding

a. **GROUND TERMINAL BLOCK**
3", 6", 8" and 10" Flange Type

0-50A models

CSA (221942), UR and c UR (E220514)
Designation: CGMT4 (Part#: 710.202)
Manufacturer: CONNECTWELL INDUSTRIES PVT LTD, INDIA
Rating: (UR & c UR) 22-10 AWG, Cu, FW 2, 7 LB-in (0.8 N m), B, C, 2 (105), 4
CSA 22-10 AWG, Spacing Group: CSA PCTB
DIN Rail: TS15x5, End Stop: 710.098

51-115A models

CSA (221942), UR and c UR (E220514)
Designation: CGT10U (Part#: 710.210)
Manufacturer: CONNECTWELL INDUSTRIES PVT LTD, INDIA
Rating: (UR & c UR) 16-8 AWG, Cu, FW 2, 14 LB-in (1.6 N m), B, C, 2 (105), 4
CSA 22-6 AWG, Spacing Group: CSA PCTB
DIN Rail: TS35x7.5, End Stop: 710.097

115-150A models

CSA (221942), UR and c UR (E220514)
Designation: CGT35U (Part#: 710.235)
Manufacturer: CONNECTWELL INDUSTRIES PVT LTD, INDIA
Rating: (UR & c UR) 8-2 AWG, Cu, FW 2, 25 LB-in (2.8 N m), B, C, 2 (105)#
CSA 8-2 AWG, Spacing Group: CSA PCTB
DIN Rail: TS35x7.5, End Stop: 710.097

b. Insured by a suitable factory-installed stud, screw, or bolt, together with the necessary nuts and washers.

A minimum screw size having a head diameter of not less than that specified for pan head screws in ASME B18.6.3;
The bonding conductor connecting the grounding terminal block to the bonding screw installed on the bottom 2 inch (50.8 mm) thick bottom blind flange is min. 10AWG copper conductor for models having max. 8AWG max size of larger ungrounded conductor.
The bonding conductor connecting the grounding terminal block to the bonding screw installed on the bottom 2 inch (50.8 mm) thick bottom blind flange is min. 6AWG copper conductor for models having max. 2/0 AWG max size of larger ungrounded conductor.

The following attachments and their content are shown below:

Edition 1

Photos 1 to 5 Model: ALIM-0001HD to ALIM-0012HD Rated: 480V & 575V, 60Hz, 3ph, 16kW max.	Att1 Photos 1 to 5
Heating elements spec and spacing's	Att2 Illustrations 1
Electrical MgO Product Specification	Att2 Illustrations 2
Typical heating Element longitudinal cross section	Att2 Illustrations 3
Typical heating Element transversal cross section	Att2 Illustrations 4
ALIM-0001 to 0012 Assembly drawing, ratings and main dimensions.	Att2 Illustrations 5
Resistance value in (Ω) and connections (Y) for 480V, 3 phase and (Δ) for 575V, 3 phase.	Att3 Schematics 1
ALIM User Manual	Att4 Manual 1

Edition 2

Photos 6 to 20 Model: Oil immersed Heater ALUM Model: 10 FL (3)-ALIM-0012-J-72kW-N7	Att1 Photos 1 to 5
HAZ-LOCATION ALUM 3FL-150-REV A	Att2 Illustrations 6
HAZ-LOCATION ALUM 3FL-300-REV-A	Att2 Illustrations 7
HAZ-LOCATION ALUM 6FL-150-REV A	Att2 Illustrations 8
HAZ-LOCATION ALUM 6FL-300-REV A	Att2 Illustrations 9
HAZ-LOCATION ALUM 8FL-150-REV A	Att2 Illustrations 10
HAZ-LOCK ALUM 8 FL -300-REV A	Att2 Illustrations 11
HAZ-LOCATION ALUM 10FL-150-REV A	Att2 Illustrations 12
HAZ-LOCATION ALUM 10FL-300-REV A	Att2 Illustrations 13
3FL-ALIM 1 TO 12 with 3-10 inch flange-ALIM Series Models-with N4 junction box	Att2 Illustrations 14
3FL-SSS 1 TO 12 with 3-10 inch flange-SSS Series Models-with N1 junction box	Att2 Illustrations 15
ALIM 1 TO 12 with 3-10 inch flange-ALIM Series Models-with N1 junction box	Att2 Illustrations 16
3FL- DIAGRAM OF WIRING	Att3 Schematics 2
6FL DIAGRAM OF WIRING	Att3 Schematics 3
8FL DIAGRAM OF WIRING	Att3 Schematics 4
10FL-DIAGRAM OF WIRING	Att3 Schematics 5

Note: The maximum power ratings evaluated in PART B was 96kW.

TEST HISTORY

Edition 1 - Project 2661531

The following test were performed at Trivolt Industries, 9422 Blvd St-Leonard, H1R 3B5, Québec, on models : ALIM-0012HD (rated 480V, 60Hz, 3ph, 16k W) and ALIM-0012HD-575 (rated 575V, 60Hz, 3ph, 16k W). The tests were performed to the requirements of CAN/CSA-C22.2 No 72-10 and UL 499 Thirteenth Edition.

C22.2 No. 72-10	6.2	Rating , 6.2.1, 6.2.2
	6.3	Test voltage
	6.4	Dielectric Strength 6.4.1, 6.4.3
UL 499 Thirteenth Edition	33	Normal Temperature Test, 33.1.1 to 33.1.3, 33.1.8, 33.1.9, 33.1.10, 33.1.11, 33.1.12 to 33.1.14, 33.1.16,
	35	Dielectric Voltage-Withstand Test, 35.4

The applicability of the tests according with C22.2 No. 72-10 is shown below.

Clause	Requirement-Test	Rational	Verdict
6.2	Rating		P
6.4	Dielectric strength		P
6.5	Flame retardance	Aluminum sheathed heater element	N/A
6.6	Aging of special heater elements	Aluminum sheathed heater element	N/A
6.7	Ground contact millivolt drop	Not a grounded plug-in-type heater elements	N/A
6.8	Additional tests for VR/T heater elements	Not a VR/T heater elements	N/A
6.9	Insulating liner investigation	Aluminum sheathed heater element	N/A
6.10	Moisture absorption resistance	Not other component than aluminum sheathed body are immersed in oil.	N/A
6.11	Leakage current 6.11.1 to 6.11.6	Heater elements intended for permanently connected equipment.	N/A

P=Performed

N/A = Not Applicable

The applicability of the tests according with UL 499 is shown below.

Clause	Requirement-Test	Rational	Verdict
30	General		
31	Power Input Test		P
32	Leakage Current	Not a cord-connected product	N/A
33	Normal Temperature Test . 33.1		P
	Normal Temperature Test. 33.2 to 33.12	This a permanently connected immersed oil heater	N/A
34	Test of Insulation Resistance and Leakage Current as a Result of Moisture	Not material part of this product are likely to be adversely affected by moisture under condition of intended use	N/A
35	Dielectric Voltage-Withstand Test		P
36	Mechanical Endurance Test	The intended operation of a heating appliance don't causes movement of the internal wiring	N/A
37	Resistance to Impact	Not reservoir part of this product	N/A
38	Overflow Test	This is a immerse heater	N/A
39	Abnormal Operation Test .	This is an permanently connected Immersion heater. The conditions of normal operation are representative for this type of product and specific models evaluated.	N/A
40	Testing of Component Switches and Control Devices	This product don't incorporate any switches or Control Devices. The control and the switches if applicable will be installed in the end use application.	N/A
41	Strain Relief Test	Not a cord connected product. Strain relief component is not part of this 3ph, permanently connected heater.	N/A
42	Push-Back Relief Test	Not a cord connected product. Strain relief	N/A

		component is not part of this 3ph, permanently connected heater.	
43	Test for Permanence of Cord Tag for Outdoor-Use Heating Appliances with Power-Supply Cords Less than 6 Feet (1.8 m)	Not a cord connected product	N/A

P=Performed
N/A = Not Applicable

The test results are kept on main electronic file.

Edition 2 - Project 70058480

Addition of new oil immersion series models, flange type 3", 6", 8" and 10", rated 600V, 60Hz, 3ph, 96kW max having the junction box manufactured on aluminum alloy or in Stainless Steel. Update to report.

Note: Both aluminum and SS models includes combination of 1, 2, 4 and 6 heating elements interconnected inside of the specific junction box.

Evaluation of the junction boxes as 4X and 12 type enclosures according with the applicable standards.

Note: The junction box represent the cold-side of the heating elements.

The followings tests were successfully performed on model Oil immersed Heater ALUM Model: 10 FL (3)-ALIM-0012-J-72Kw-N7, to the requirements of CAN/CSA-C22.2 No. 72-10 (R2014) and UL 499 14TH Edition. The test were performed at Trivolt Industries, 9422 Blvd., Viau St. Leonard, H1R 3B5, Québec, Canada, under the CSA TMPC certification program.

C22.2 No. 72-10 (R2014)	6.2	Rating, 6.2.1, 6.2.2./33 Power Input Test
	6.3	Test Voltage
	6.4	Dielectric strength, 6.4.1 and 6.4.3
UL 499 14TH Edition	36	Normal Temperature Test
	38	Dielectric Voltage-Withstand Test (at 1000V+480V*2=1960V ac)

Note: The tests performed on 480V, 60Hz, 72kW model was considered acceptable for entire series.

The followings sample enclosures 3" and 10" flange type, were tested on the conditions required for 4X and 12 type at CSA Toronto lab, under the requirements of CAN/CSA-C22.2 No. 94.2-15 and UL 50E.

ALIM-3-VOLTAGE-WATT-3-1-52.5-62.5-7-4-C FOR 3 INCH FLANGE.

ALIM-10-VOLTAGE-WATT-3-1-52.5-62.5-7-4-C FOR 10 INCH FLANGE.

The followings tests were performed on with acceptable results on the enclosures 3" and 10" flange type:

8.6 Hosedown test

Note: The torque used for the installation of the screw was 75 lbs.-in.

8.15 Misalignment, was Waived, due to the specific construction of the hub, giving access to the power supply and grounding terminal of this permanently connected heating elements.

The followings tests were performed on with acceptable results on the gasket sample manufactured on PB 70 (see Buna N, Nitrile material) employed and all immersed heating elements object of this report:

8.13 Gasket Test,
8.13.2 Tensile strength and elongation tests
8.13.4 Oil immersion test

The followings tests failing on the enclosures 3” and 10” flange type:

8.9 Additional corrosion test

Note: Due to this failing the electrical box (enclosure) manufactured on aluminum alloy 6061-T6 are not accepted as 4X type enclosure.

Only the electrical box (enclosure) manufactured on Type 304 stainless steel Stainless Steel are accepted for this application as 4X Type enclosure.

The test results are kept on main electronic file.

No other tests deemed necessary.

---End of Report---