CSI SPECS

ReliaGear® Low Voltage Dry Type Transformers

Specification

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1. General

1.1. Scope

The requirements of the contract, Division [1][01] and Division [16][26] apply to work in this section.

1.2. Section Includes

A. This specification covers single phase and three phase general purpose individually mounted dry type transformers, 208 to 600 V maximum, for general power and lighting applications.
B. For the purposes of this document, the term “equipment” refers exclusively to dry type transformers

1.3. Related Sections

1.4. References

The equipment in this specification is designed and manufactured according to latest revision of the following standards (unless otherwise noted).

A. ANSI/IEEE C57.96, distribution and power transformers, guide for loading dry type appendix to ANSI C57.12 standards.

B. ANSI/NFPA 70, National Electrical Code.

C. IEEE C57.12.91, general requirements for dry type distribution and power transformers including those with Solid Cast and/or resin-encapsulated windings

D. IEEE C57.12.91, test code for dry type distribution and power transformers

E. NEMA ST 20, dry type transformers for general applications

F. UL 1561, dry type general purpose power transformer

G. Efficiency level DOE 2016 by 10 CFR PART 431

1.5. Definitions

1.6. System Description

1.7. Submittals

A. Manufacturer shall provide copies of the following documents to owner for review and evaluation in accordance with general requirements of Division [1][01] and Division [16][26].

    a. Product data on specified product documenting the following:

        i. Dimensions

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ii. Weight

iii. kVA

iv. Voltage

v. Taps

vi. Insulation class

vii. Sound level

b. Wiring diagram

c. Installation instructions are available per request

1.8. Project Record Documents

A. Maintain an up-to-date set of contract documents. Make note of all revisions and deviations that are made during the project.

B. Provide final typical outline drawing.

1.9. Operation & Maintenance Data

A. Manufacturer shall provide a copy of installation, operation and maintenance procedures to owner in accordance with general requirements of Division [1] [01] and Division [16] [26].

B. Submit operation and maintenance data based on factory and field testing, operation and maintenance of specified product.

1.10. Quality Assurance

A. The manufacturer of the transformer as indicated by the label on the transformer shall be the manufacturer of the major components within the transformer.

B. The manufacturer shall provide seismic tested equipment as follows (verify below):

a. The testing was performed according to both the requirements of ICC-ES AC156 and demonstrated that the equipment satisfied testing requirements for I_p=1.5, a_p=1.0, R_p=2.5, and Z/h = 1.0. In accordance with ASCE 7-10, which contains the seismic provisions of the 2021 International Building Code [IBC], AC156 is an acceptable test procedure for determining the seismic certification of equipment. ASCE 7-10, Section 13.2.1.2.b allows for testing alone to be used to satisfy IBC seismic design requirements for electrical equipment.

b. Using AC156 procedures, factory engineering determined that the test results demonstrate the adequacy of the ABB low voltage transformers up to the peak ground seismicity (SDS) in the table below. Therefore, factory engineering concludes that the test data demonstrates that the ABB low voltage transformers are certified for installation in accordance with the seismic provisions of the IBC-20201 / CBC-2022 for any site with a site-specific SDS equal or less than the attached SDS table and at any location within a building.

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Enclosure Type & Product Names	Material Winding	Mounting Type	kVA	Width (in)	Depth (in)	Height (in)	Weight (lbs)	S_{DS} (g) at z/h=1	S_{DS} (g) at z/h=0
QL, QF Transformers	Aluminum	Floor Mounted	9 - 750	18.0 - 61.0	16.0 - 48.8	27.0 -76.2	200 - 4479	1.18	1.89
QL, QF Transformers	Copper	Floor Mounted	11 - 1000	18.7 - 47.5	16.9 - 40.0	27.3 - 65.7	230 - 4290	1.18	1.89
QL, QF Transformers	Aluminum	Wall Mounted	9 - 225	18.7 - 32.0	16.9 - 28.0	27.3 - 40.0	230 - 756	1.20	1.92
QL, QF Transformers	Copper	Wall Mounted	11 - 225	18.7 - 32.0	16.9 - 24.0	27.3 - 40.0	230 - 1018	1.16	1.86
Encapsulated and enclosed servicenter transformer with exterior junction box	Aluminum	Floor Mounted	3 - 30	10.5 - 35.0	11.0 - 35.0	14.4 - 44.8	103 - 440	2.25	2.5
Encapsulated and enclosed servicenter transformer with exterior junction box	Copper	Floor Mounted	0.05 - 30	5.0 - 34.5	3.1 - 24.0	6.2 - 34.7	6 - 462	2.25	2.5
Encapsulated and enclosed servicenter transformer with exterior junction box	Aluminum	Wall Mounted	5 - 30	10.5 - 35.0	11.0 - 35.0	14.4 - 44.8	103 - 468	2.50	NA
Encapsulated and enclosed servicenter transformer with exterior junction box	Copper	Wall Mounted	0.05 - 30	5.0 - 34.5	3.13 - 24.0	6.2 - 32.2	6 - 500	2.50	NA
IP	Copper	Floor Mounted	0.05 - 3	3.0 - 6.8	3.0 - 9.0	2.7 - 9.5	2.4 - 51.5	2.25	2.5
IP	Copper	Wall Mounted	0.05 - 3	3.0 - 9.0	3.3 - 9.0	2.7 - 9.5	2.5 - 50	1.81	2.5

1.11. Delivery, Storage, & Handling

A. Deliver, store, protect, and handle products in accordance with the manufacturer's recommendations.
B. Dry type transformers shall be located in well-ventilated areas, free from excess humidity, dust and dirt and away from hazardous materials. Indoor locations shall be protected to prevent moisture from entering enclosure.
C. Equipment shall be shipped with edge and top protection that is adequate to protect the transformer enclosure from common dents and scratches.

1.12. Project Conditions (Site Environmental Conditions)

A. Follow standards, local codes and installation guide for service conditions before, during and after transformer installation.

1.13. Warranty

A. Manufacturer warrants equipment to be free from defects in materials and workmanship for 10 years from date of installation. To qualify for the ten (10) year warranty, the transformer must be energized within eighteen (18) months from date of shipment.

2. Products

2.1. General Requirements

A. Dry type general purpose transformers shall be rated as indicated in the drawings.

B. Comply with NEMA ST 20, and list and label as complying with UL 1561.

C. Cores: one leg per phase.

D. Enclosure: Ventilated, NEMA 250, type 2 for indoor locations, type 3R for outdoor locations. Enclosures shall meet UL 506 requirements for the following characteristics:

   a. Ventilation openings

   b. Corrosion resistance

   c. Cable bending space

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d. Surface temperature rise

e. Wiring compartment temperature rise

f. Terminations

E. Transformers supplied to this specification shall be able to operate continuously at 100% nameplate rating at ambient temperature not exceeding 40°C.

F. Insulation Class: 220°C, UL recognized insulation system with a maximum of [150 (standard)] [115] [80] °C rise above 40°C ambient temperature. Temperature rise ratings shall be in accordance with UL 1561.

G. Transformer shall have self-cooled sound levels [equal to or (standard)] [-3dB] [-5dB] lower than those established by ANSI/IEEE.

Equivalent Winding KVA range	**Average Maximum Sound Level (dB)**	
	K-Factor 1 K-Factor 4 K-Factor 9	**K- Factor 13 K-Factor 20**
9.00 and below	40	40
9.01 to 50.00	45	48
50.01 to 150.00	50	53
150.01 to 300.00	55	58
300.01 to 500.00	60	63
500.01 to 700.00	62	65
700.01 to 1000.00	64	67

H. Transformer shall be sound tested in the factory prior to shipment. A record of the sound testing can be obtained from the manufacturer upon request (additional cost applies).

I. Transformers shall meet the energy efficiency requirements of 10 CFR PART 431 2016.

Single-phase	
kVA	**Efficiency (%)**
15	97.70
25	98.00
37.5	98.20
50	98.30
kVA	**Efficiency (%)**
75	98.50
100	98.60
167	98.70
250	98.80
333	98.90

Three-phase	
kVA	**Efficiency (%)**
15	97.89
30	98.23

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45	98.40
75	98.60
112.5	98.74
150	98.83
225	98.94
300	99.02
500	99.14
750	99.23
1000	99.28

J. Transformers shall carry the fully rated load continuously when the surrounding air does not exceed 30°C/86°F, 40°C/140°F maximum and adjacent structures do not prohibit the free movement of cooling air according to installation manual.

K. Transformers 5kVA and above shall be able to meet ANSI/IEEE C57.96 daily overload requirements listed in drawings. Transformers loaded in accordance with this paragraph shall be capable of long service life under thermal conditions specified. There shall be no need for derating.

L. Transformer construction

   a. Transformer core shall be constructed of high-grade, non-aging silicon steel with high magnetic permeability and low hysteresis and eddy current losses. Magnetic flux densities shall be kept well below core saturation point. Transformer core shall be clamped by bolts through the core laminations to provide consistent pressure throughout the core length. Completed core and coil shall be bolted to enclosure base and isolated from base by rubber vibration-absorbing mounts.

   b. Enclosure shall be constructed of heavy gauge steel.

   c. Coils shall be [aluminum] [copper].

2.2. Special Requirements

A. Where indicated on drawings, transformers shall be GUARD I™ type that provide common mode noise attenuation and transverse m ode noise attenuation by using a copper electrostatic shield.

B. Where indicated on drawings, transformers shall be GUARD II™ type that provide common mode noise attenuation plus as enhanced level of transverse mode noise attenuation for increased protection of sensitive electronic equipment and transient overvoltage protection. A copper electrostatic shield is included.

C. Where indicated on drawings, transformers shall be GUARD III™ type that help to eliminate harmonic currents. In addition, by cancelling harmonic currents, they reduce energy losses. A copper electrostatic shield is included.

   a. Zero degree phase shift

   b. Thirty degree phase shift

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D. Where indicated on drawings, K-Factor transformers shall withstand the harmonics content of a system, K-Factor transformers are rated for 600 volts and below and shall include a copper electrostatic field.

   a. K-4

   b. K-13

   c. K-20

E. Where indicated on drawings, low noise transformers shall reduce vibrations within the magnetic steel core, thus lowering the humming of the transformer to 3dB to 5dB less than NEMA/ANSI standards. Available in aluminum or copper windings, they feature a 220°C insulation system with a 150°C, 115°C or 80°C rise.

F. Where indicated on drawings, the Servicenter™ mini-unit substation shall contain three products: transformer, distribution panel and circuit breakers.

G. Where indicated on drawings, drive isolation transformers shall be designed to specifically handle the mechanical stresses, voltage distortions and harmonics associated with SCR applications.

H. Where indicated on drawings, transformer shall be totally enclosed, non-ventilated (TENV). Totally enclosed non-ventilated transformers must be housed in an enclosure NEMA 3R (IP32) non-ventilated compartment and provide protection against dust, dirt, or lint. The available capacities are 15-75 kVA.

I. Stainless steel transformers NEMA 2 rated enclosure and shall be made of 316 stainless steel. The available capacities are 15-150 kVA.

2.3. Accessories

A. Accessories for 15 kVA to 750 kVA are available as spare parts or as additional feature:

   a. [Rain shield kits]

   b. Front kit

   c. Side kit

   d. Cover kit

   e. [Lug kits]

   f. Enclosure kit

   g. Bottom pan kit

B. Accessories included in transformers from 15 kVA to 150 kVA (except for stainless steel or special transformers):

   a. Lug kits

   b. Ground kits

C. Accessories for transformers from 15 kVA to 112.5 kVA should be available as additional options:

   a. [Wall mounting brackets]

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D. Accessories pre-installed on transformer from 15 kVA to 750 kVA should be available as additional options (not available for separate sale as a kit)

   a. [IR windows]

2.4. Primary Voltage Taps

A. Transformers shall have the following high voltage tap arrangements unless noted otherwise in plans:

   a. Taps for transformers smaller than 3kVA – no taps

   b. Taps for transformers 3 through 25 kVA – [no taps] [2, 5% taps, both below nominal voltage] [4, 2-1/2% taps, 2 above, 2 below nominal voltage]

   c. Taps for transformers 25 kVA to 300 kVA – two 2.5% taps above and four 2.5% below normal full capacity

   d. Taps for transformer 500 kVA – two 2.5% taps above, 2 below nominal voltage

   e. Taps for 750 kVA – one tap above and one tap below at 5% of the nominal voltage

2.5. Testing

A. Transformers furnished with this specification shall receive the following production tests:

   a. Applied potential

   b. Induced potential

   c. No load losses

   d. Voltage ratio

   e. Polarity

   f. Continuity

B. Manufacturer shall perform the following additional tests on units identical to the design type being supplied to this specification. Manufacturer shall provide test data sheets on request to prove performance of these tests.

   a. Sound levels

   b. Temperature rise tests

   c. Full load losses

   d. Regulation

   e. Impedance

2.6. Finish

A. Paint color shall be ANSI 61 gray, using manufacturer approved processes.

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3. Execution

3.1. Examination

A. Verify that dry type transformers are ready to install

B. Very field measurements are as instructed by manufacturer

C. Electrical contractor to verify that required utilities are available

D. Electrical contractor has obtained all necessary data to install the unit

3.2. Location

A. Electrical contractor to verify proper location for the unit

B. The transformer shall be installed in a location where the sides with ventilated openings are a minimum distance of six inches from noncombustible structures or equipment to ensure adequate air circulation

3.3. Installation

NOTE TO SPECIFIER: *ADDITIONAL PROVISIONS AND EDITING MAY BE REQUIRED FOR THIS PART*

A. Install per manufacturer's instructions

B. Install required safety labels

C. In accordance with NEC Section 450-9, allow at least six inches clearance for ventilation

3.4. Field Quality Control

A. Inspect installed dry type transformers for anchoring, alignment, grounding, and physical damage

B. Check tightness of all accessible mechanical and electrical connections with calibrated torque wrench. Minimum acceptable values are specified in manufacturer’s instructions.

3.5. Cleaning

A. Repaint scratched or marred exterior surfaces to match original finish

END OF SECTION

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