



**GrandBridge**  
ENERGY



**Single-Phase Mini Pad-Mounted Transformer**  
**Specification: GBE MPDL**  
**(Cambridge, North Dumfries, Brant County and Brantford Territories)**

**Issued by:** Engineering Department  
GrandBridge Energy  
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**Approved by:** Gurdeep Bansal, P.Eng. \_\_\_\_\_  
Approval is given in accordance with Ontario Regulation 22/04

**SPECIFICATION FOR**  
**LOW PROFILE SINGLE PHASE PAD-MOUNTED TRANSFORMERS**

**1. Scope**

This specification covers the requirements for standard low-profile single-phase pad-mounted 60 Hz, ONAN distribution transformers manufactured and tested in accordance with CSA C227.3.

Where conflict exists between this specification and CSA C227.3, this specification will govern.

Quantities, sizes, and voltage ratings shall be specified in the request for quotation. Bidders must detail any variations from this specification when submitting their quotes. Quotes containing unacceptable variations from the requirements of this specification shall be rejected.

**2. Reference Publications**

Reference to CSA C227.3 implies also latest revision.

In addition to all Publications listed in CSA C227.3, transformers shall meet the requirements of ISO 9001-00 Quality Management Systems.

Stainless steel shall meet the requirements of American Iron and steel Institute (AISI) Type 304L.

**3. Rated Voltages**

In addition to rated voltages listed in table 1 of CSA C227.3, dual voltage transformers may be specified. Designation of HV winding will be in the form of V x V1; example: 8320 GrdY/4800 x 27600 GrdY/16000 V.

**4. Electrical Characteristics**

**4.1 kVA Ratings**

The kVA ratings at rated voltages shall be 25, 50, 75, 100, and 167.

**4.2 Voltage Taps**

Transformers shall have  $\pm 2.5\%$  voltage taps, 2 full capacity above and 2 reduced capacity below normal voltage, as per CSA C227.3 Clause 4.4.2. Taps shall be labeled numerically on the nameplate as follows:

Numerical	1	2	3	4	5
% of High Voltage Winding	105	102.5	100	97.5	95

If required, high voltage taps for designated dual voltage transformers may be specified by the individual utility.

#### **4.3 Internal Fault Detector**

Transformers shall be equipped with internal fault detector (IFD) manufactured by IFD Corporation.

#### **4.4 Impedance**

Transformers will have guaranteed minimum impedance to limit short-circuit current at the service entrance equipment as follows:

- (a) Up to and including 50 kVA: 1.5%
- (b) 75 kVA: 2.0%
- (c) 100: 2.5%
- (d) 167 kVA: 4.25%

The above values are the default values unless the Purchaser specifies an alternate minimum impedance to accommodate a specific field or system condition.

### **5. Electrical Connection and Mechanical Features**

#### **5.1 Dimensions**

All transformers shall be low-profile and have dimensions as per CSA C227.3.

#### **5.2 Transformer Tank, Hood and Sill**

The Transformer tank, hood and sill shall be constructed from Stainless Steel Type 304L.

#### **5.3 Additional Features**

1. One drain plug and one filler plug shall be provided per CSA C227.3 Clause 11(b), and they shall be located in the cable entrance compartment.
2. 1 - 25mm diameter hole, covered with a removable stainless-steel plate, to be used for a remote fault indicator light – see CSA 227.3 Figure 10,
3. Load-break switch nameplate. To be part of the transformer nameplate depicting an electrical schematic of each switch position.

#### **5.4 Fusing**

Bayonet fuse assembly and warning labels shall conform to CSA C227.3 Clause 5.3, and

all sub clauses including 5.3.1 for dual voltage transformers. Transformers shall be protected by a removable “Bay-O-Net” expulsion fuse link, in series with a partial range current-limiting fuse.

### **5.5 Oil Level Sight Gauge**

All units shall be equipped with an oil level sight gauge complete with indicating float ball, located at the cold oil level as per CSA C227.3 Clause 11(o). It must be completely visible when cables and accessories are in place.

### **5.6 Exterior ID Labeling**

The exterior ID label shall be located on the secondary side of the transformer hood and is to include the following: serial number, percent impedance, date of manufacture and the manufacturers name and /or logo.

## **6. Bushings, Terminals, and Grounding**

### **6.1 High Voltage Bushings Inserts**

High voltage bushing inserts shall not be supplied.

### **6.2 Low-Voltage Bushings**

All low-voltage bushings shall conform to CSA C227.3 Clause 6.3, in addition transformers with ratings of 100kVA or less shall be equipped with a threaded stud complete with a jam nut, to allow tightening and setting the angle of orientation in accordance with Clause 6.3.1. A removable 7-hole secondary spade shall be provided for all transformer ratings.

## **7. Switches**

### **7.1 Load Break Switches**

Transformers with a primary voltage below 15kV shall be supplied with a single load break switch, the Transformer winding switch, SWT, in conformance with CSA C227.3 Clause 7.2 and Figure 3 unless otherwise specified.

For transformers with a primary voltage greater than 15kV, or where the purchaser requires, transformers shall be supplied with 3 load break switches, in accordance with CSA 227.3 Figure 3. Load break switches shall conform to CSA C227.3 Clause 7.2 and all sub clauses with clear nomenclature indicating open and closed positions. A load break switch nameplate detailing SWA, for H1A switch, SWB, for H1B switch, and SWT for the Transformer winding switch shall be included as per CSA C227.3 Clause 11(p).

## **8. Losses**

### 8.1 Loss Formula

For the purpose of tender comparison, the LDC shall use the following formula for the evaluation of transformer losses:

$$\text{Present value of losses} = 1.7 \times L + 22.4 \times N (\$) \quad \text{①}$$

Where:

L = Full load losses in Watts @ rated voltage and kVA, corrected to 85°C

N = No load losses in Watts @ 105% of rated voltage, corrected to 85°C

### 8.2 Total Owning cost

The present value of losses (see formula ①) shall be added to the tender price to arrive at the Total Owning Cost (TOC). Tender award not necessarily depend on the lowest TOC, but shall also include other considerations such as delivery, manufacturing quality, and historical quality of contract performance.

### 8.3 Guaranteed Losses

Losses shall be equal or less than those maximum values given in the latest version of the CSA Standard C802.1, "Minimum efficiency values for liquid-filled distribution transformers." The manufacturer shall provide the guaranteed values for no-load and full load losses. For dual voltage transformers, losses are to be specified for each voltage. A penalty will be imposed using the above equation if the no-load losses or the load losses exceed the guaranteed value. No credit will be given if the losses are lower than the guarantees.

In cases where the final average measured losses of identical units exceed the guaranteed values, the purchaser reserves the right to reject all of said units. If the purchaser should choose to accept these units, the manufacturer shall reimburse the purchaser for the additional cost of the transformer losses, which will be deducted from the manufacturer's invoice.

In order to assess the value of non-guarantee, the average value of the measured no load and full load losses, taken from all of the identical units or order, will be used as the basis for the losses calculation. In recognition of the inconsistent quality of the core steel, however, the cost of losses will be calculated as follows:

1. If the no load losses exceed the guarantee while the full load losses are within the guarantee, the calculation for the cost of losses will be based on the no load losses component of formula ②.
2. If the no load losses are within guarantee while the full load losses exceed the guarantee, the calculation for the additional cost of losses will be based on the full load losses component of formula ② only.

3. If both no load and full load losses exceed the guarantee, the calculation for the cost of losses will be based on formula ②.

$$\text{Loss Penalty} = (1.7 \times \Delta L + 22.4 \times \Delta N) \times (\# \text{ of Units in Order}) \quad \text{②}$$

Where:

$\Delta N = (\text{Average Actual No Load Losses in Watts}) - (\text{Guaranteed No Load Losses in Watts})$

$\Delta L = (\text{Average Actual Full Load Loss in Watts}) - (\text{Guaranteed Full Load Loss in Watts})$

## **9. Exterior Finish**

The exterior finish colour shall be Equipment Green Munsell 9GY1.5/2.6 as per CSA C227.3 Clause 9.2.

## **10. Drawings**

When tendering, 2 copies of the following drawings shall be submitted. One copy will be returned to the manufacturer with comments/approval. Drawing re-submission may be necessary if major changes are necessary. Final approved drawings must be secured before start of manufacturing.

- Outline and dimensions
- Name plate data as detailed in CSA C227.3

## **11. Tests and Inspection**

### **11.1 Type Tests**

Upon request, the manufacturer shall supply a record of type tests listed Clause 8.4.2 of CSA C227.3. Test data may be provided from tests performed on other unit's equivalent to those being purchased.

### **11.2 Routine Tests**

All routine tests listed in Clause 8.2 of CSA C227.3 shall be performed on each unit and a report shall be submitted to the LDC for approval prior to delivery of the transformers. The LDC reserves the right to reject any units that do not comply with the requirements stated herein.

### **11.3 Variations**

The purchaser has the right to reject any unit whose test results are outside the allowable tolerance limits stated in CSA C227.3.

### **11.4 Inspection**

Transformers may be inspected or test-witnessed by the LDC representative. The manufacturer shall advise the LDC of four production days prior to test dates.

### **11.5 Certified Test Reports**

The manufacturer shall submit two copies of a Certified Test Report reflecting all Routine and Type Test results as outlined in this specification. The reporting of the Routine Tests should be similar to Figure 1 – Sample Test Report.

## **12. Delivery and Shipping**

The manufacturer shall quote a guaranteed delivery date(s). Transformers shall be ready for shipment on time as noted on the P.O., but shipment will only be made when authorization is given by the LDC. Authorization may be dependent on review and approval of routine tests provided in 11.2. Any delay preventing the LDC from meeting customer's requirement will cause a penalty of maximum 10% of the price of delayed shipment.

The manufacturer shall take all necessary precautions to avoid, and will be responsible for, any damage to the unit, both internally and externally during shipment.

## **13. Guarantees**

Any transformer found damaged upon arrival, or malfunction under normal operating conditions for a period of one year from its in-service date or 24 months after delivery will be returned to the manufacturer for repair or replacement at the manufacturer expenses. Any claims against the transport company will be the responsibility of the manufacturer. Transformers returned under Warranty shall include a Certified Test Report and a report on the cause of the failure.

