



## UL Combination Classification Listing with FM Requirements

### Certification of Less-Flammable Liquid-Filled Transformers

The NEC 450-23 defines generally accepted guidelines for less-flammable liquid filled transformers. Underwriters Laboratory (UL) and Factory Mutual (FM) are common third-party organizations that certify transformer designs for use in areas that require less flammable insulation fluid.

### “UL Combination Classification Listing” vs. “Factory Mutual Approval”

FM and UL use slightly different methods for complying with NEC 450-23. FM has chosen to formulate a dedicated standard for transformers complying with NEC450-23. UL has combined a Listed transformer with a Classified fluid for complying with NEC 450-23 within the Classification of the fluid; therefore, UL has a Combination Classification/Listing.

### UL Combination Classification Listing

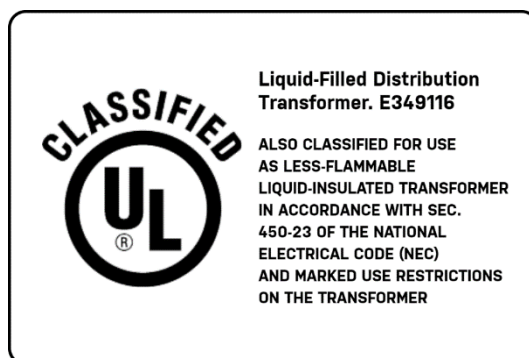
When required, VanTran can provide a UL Combination Classification listing for less flammable liquid-filled transformers. The UL Combination Classification Listed Transformer includes the following features:

- Transformer designed to requirements of IEEE C57.12.00
- Tank designed for minimum withstand of 12 psi before rupture
- Fluid fire point of at least 300°C
- Pressure relief device with a flow rate suitable for the transformer kVA rating (per Table 1)
- Transformer primary overcurrent protection (per Table 1)

### UL Combination with FM Requirements

FM Listed less-flammable liquid filled transformers include additional devices. While VanTran does not have FM Approval, VanTran can provide a UL Combination Classification with the following FM requirements.

- Tank designed for 7 psi pressure without permanent distortion
- Tank designed for minimum withstand of 15 psi before rupture
- Liquid level indicator
- Liquid temperature indicator
- Pressure-vacuum gage
- Pressure relief device with alarm contacts above 2500 kVA (outdoor)
- Pressure relief device with alarm contacts above 500 kVA (indoor)



Transformer 3-phase Transformer Rating kVA	Required Protection*		Required PRD Flow Rate SCFM
	Current Limiting Fusing Maximum I <sup>2</sup> t	Or Overcurrent Protection Maximum I <sup>2</sup> t	
45	500000	700000	35
75	500000	800000	35
112.5	550000	900000	35
150	600000	1000000	50
225	650000	1300000	100
300	750000	1400000	100
500	900000	1900000	350
750	1100000	2200000	350
1000	1250000	3400000	350
1500	1500000	4500000	700
2000	1750000	6000000	700
2500	2000000	7500000	5000
3000	2250000	9000000	5000
3750	2500000	11000000	5000
5000	3000000	14000000	5000
7500	3000000	14000000	5000
10000	3000000	14000000	5000

\*A power system coordination study must be conducted by others to ensure proper overcurrent protection of the transformer to limit the I<sup>2</sup>t let through current available in the system.

Table 1



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