Stretch your distribution system investment with PEAK™ transformers

A new era in transformer design that optimizes overload capacity and reliability. Eaton introduces the Cooper Power™ series PEAK™ transformer technology for reliable electric power voltage transformation with capacity up to 122%

Eaton's Cooper Power series PEAK™ transformers are uniquely designed to provide additional capability for managing increased loads and temporary overloads without accelerating loss of insulation system life when compared to mineral oil-filled transformer alternatives. Two options are currently available for PEAK transformers, both utilizing an advanced high-temperature insulation system–comprised of thermally upgraded kraft paper, biodegradable Envirotemp™ FR3™ dielectric fluid, and an optimized core and coil design.

- For applications where additional overload capacity is most important–to manage increased loads or peak demand–a 65/75 °C (Average Winding Rise) AWR or 55/75 °C AWR PEAK transformer is recommended
- For applications where a smaller footprint and a lighter transformer–capable of the same ratings as a physically larger 65 °C AWR rated unit–are desired, a 75 °C AWR PEAK transformer is recommended

Increased overload capacity

- Customers are now able to operate PEAK single-phase transformers 9% beyond full rated base load, and three-phase transformers 12% beyond full rated base load with a 65/75 °C AWR slash-rating. Customers are able to operate PEAK three-phase transformers 22% beyond full-rated base load with a 55/75 °C AWR slash rating. These options allow customers to more precisely size transformers based on periods of peak demand–without accelerated reduction of insulation life.

- PEAK transformers can perform at higher kVA ratings than traditional mineral oil-filled units
- PEAK transformers can support more houses per transformer, versus traditional mineral oil-filled alternatives, potentially eliminating the need to increase to the next larger transformer size.
- Aging equipment can be replaced to add increased reliability to an existing system for long-term distribution planning

Powering Business Worldwide

Increased load capacity

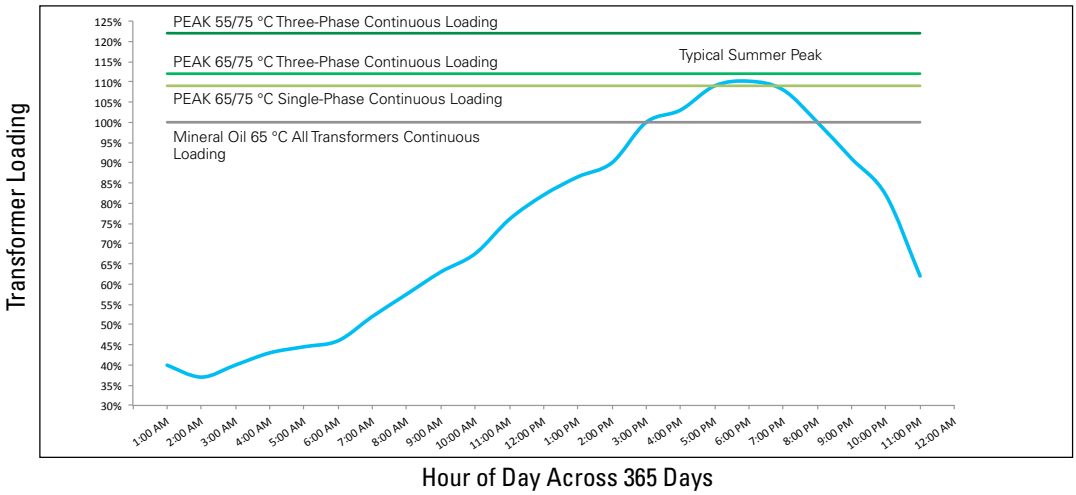
PEAK 65/75 °C AWR transformers are designed to accommodate heavier base loading for extended periods of time without accelerating loss of insulation system life. In fact, you can load PEAK single-phase transformers continuously 9% beyond full rated base load, and three-phase transformers 12% beyond full rated base load while maintaining IEEE Std C57.91™-2011 standard per unit life requirement. PEAK three-phase transformers can operate at 22% beyond full-rated base load with a 55/75 °C AWR slash rating.

Increased reliability

Moisture and thermal stress are the enemy of transformer insulation system life. PEAK transformer's superior moisture and thermal stress managing capabilities allow for extended insulation system life, which contributes to better overall system reliability by reducing the frequency of outages due to transformer failures.

- 75 °C AWR designs offer transformer insulation system life extension of up to 4 times that of the IEEE® 20.55 year life requirement
- 65/75 °C AWR designs offer transformer insulation system life extension of up to 8 times that of the IEEE® 20.55 year life requirement, when operated at the base kVA rating
- Soybean oil-based fluid creates barrier against water at the surface of the insulation, helping to protect the kraft paper in the windings from thermal degradation, resulting in insulation extended life
- Filled with a soybean oil-based dielectric fluid–recognized by UL® and FM Global® as a less flammable fluid–providing significantly enhanced fire safety
- More than 15 years of field experience with no reported fires in Envirotemp™ FR3™ fluid-filled transformers

Typical summer peak-load profile



Single-phase

Mineral oil-filled transformer full-load current in amperes at rated line voltage

PEAK transformer at 75 °C AWR equivalent full-load current in amperes at rated line voltage

Single-phase line currents			Single-phase line currents		
	Rated line voltage			Rated line voltage	
kVA rating	120	240	kVA rating	120	240
5	41.67	20.83	5.5	45.2	22.71
10	83.33	41.67	10.9	90.83	45.42
15	125.00	62.50	16.4	136.25	68.13
25	208.33	104.17	27.3	227.08	113.54
37.5	312.50	156.25	40.9	340.63	170.31
50	416.67	208.33	54.5	454.17	227.08
75	625.00	312.50	81.8	681.25	340.63
100	833.33	416.67	109	908.33	454.47

Full-load current in amperes at rated line voltage

The tables to the left show the capability to load a 65/75 °C PEAK transformer above the limit of traditional mineral oil-filled transformers. For example, a standard single-phase transformer with a 100 kVA rating can be operated at 109 kVA in a PEAK transformer design and deliver an additional 75 A of load for a 120 V secondary, relative to traditional mineral oil-filled transformers.

Three-phase

Mineral oil-filled transformer full-load current in amperes at rated line voltage

PEAK transformer at 75 °C AWR equivalent full-load current in amperes at rated line voltage

Three-phase line currents				Three-phase line currents			
	Rated line voltage				Rated line voltage		
kVA rating	120	208	240	kVA rating	120	208	240
30	144.34	83.27	72.17	33.6	161.66	93.26	80.83
45	216.51	124.91	108.25	50.4	242.49	139.90	121.24
75	360.84	208.18	180.42	84	404.15	233.16	202.07
112.5	541.27	312.27	270.63	126	606.22	349.74	303.11
150	721.69	416.36	360.63	168	808.29	466.32	404.15
225	1082.53	624.54	541.27	252	1212.44	699.48	606.22
300	1443.38	832.72	721.69	336	1616.58	932.64	808.29
500	2405.63	1387.86	1202.81	560	2694.30	1554.40	1347.15
750	3608.44	2081.79	1804.22	840	2331.61	2331.61	2020.73

The new PEAK™ transformer is available in both pole- and pad-mounted and substation designs.

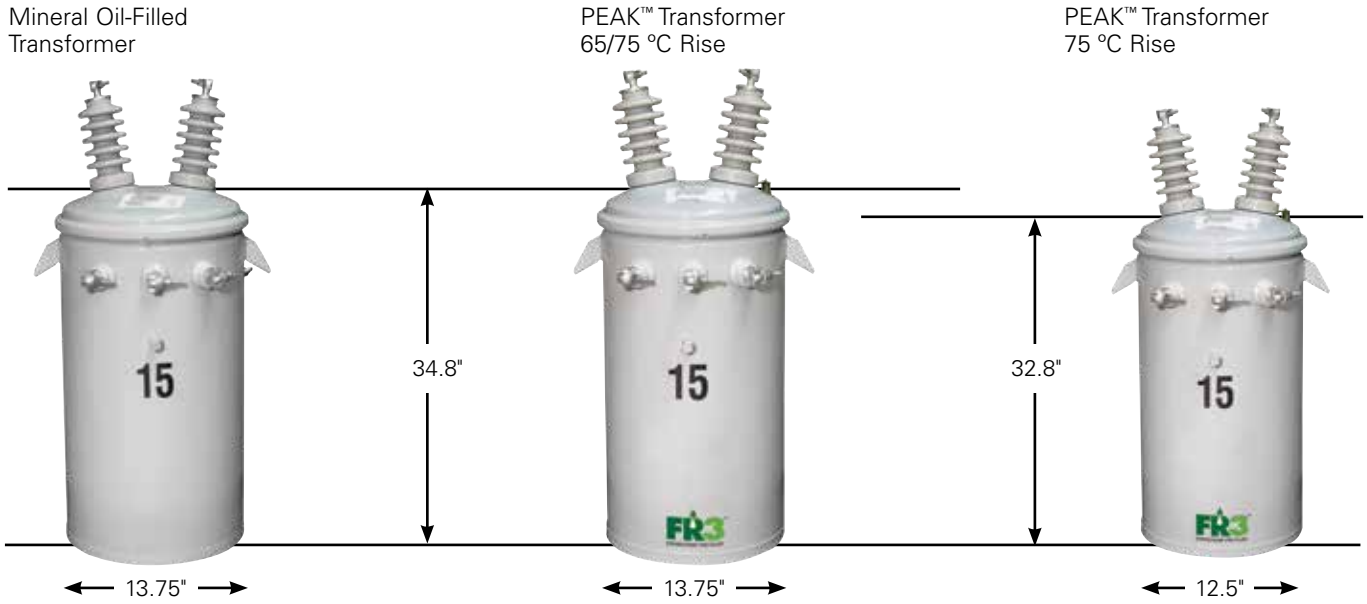
Smaller, lighter transformers

When compared to traditional 65 °C AWR transformers of the same kVA rating, 75 °C AWR PEAK transformers have the ability to be smaller and lighter. These units will typically use less material and fewer gallons of dielectric fluid resulting in better value, as well as lower handling and operating costs.

- Easier to handle and install
- Lower crane/hoisting costs
- Simplifies retrofitting efforts
- Eliminates need to upgrade utility poles
- Accommodates doorway and elevator constraints
- Eliminates need for larger concrete pad

Smaller and lighter than traditional transformers

The example below illustrates the potential footprint change in single-phase pole-mounted transformers.



The example below illustrates the potential footprint change in three-phase pad-mounted transformers.

A long history of innovation

New technology has historically driven changes in transformer design standards. With each revolution, the new transformer technology pushes the limits of previous design standards.

In 1956, Eaton's Cooper Power Systems Division was the first to design and sell the 65 °C AWR transformer. It wasn't until 1964 that 65 °C AWR became the NEMA® standard. Eaton is once again driving industry change with PEAK transformers.

The newly published IEEE Std C57.154™-2012 standard, titled "Standard for the Design, Testing and Application of Liquid-Immersed Distribution, Power and Regulating Transformers Using High-Temperature Insulation Systems and Operating at Elevated Temperatures," reflects new technology, allowing higher performance.

The acceptance of this new standard allows customers to deploy 75 °C AWR PEAK transformers with confidence.

Product scope

- 75 °C AWR (Average Winding Rise)
- 65/75 °C AWR
- 55/75 °C AWR, available 3-phase only
- 5-167 kVA single-phase pole-mount transformers
- 5-167 kVA single-phase pad-mount transformers
- 45-12,000 kVA three-phase pad-mount transformers
- 500-6,667 kVA single-phase substation transformers
- 300-12,000 kVA three-phase substation transformers

Transformer standard

The IEEE Std C57.154™-2012 standard, covering the design, testing, and applications of transformers operating at elevated temperatures, such as the PEAK transformer, was published October 30, 2012.

Test data

- PEAK transformers have been tested to ensure quality of the transformer and components
- Components have completed full testing at elevated temperatures:
  - Overcurrent protective devices
  - Switches
  - Bushings
  - Additional components
- Lockie accelerated aging testing

PEAK transformer comparison

	Mineral oil	PEAK 75 °C	PEAK 65/75 °C	PEAK 55/75 °C
Single-phase load capacity	IEEE Std C57.91™-2011 standard	IEEE Std C57.91™-2011 standard	+9% Continuous (above base kVA rating)	–
Three-phase load capacity	IEEE Std C57.91™-2011 standard	IEEE Std C57.91™-2011 standard	+12% Continuous (above base kVA rating)	+22% Continuous (above base kVA rating)
Life extension	1x	3-4x	8x (when operating at base kVA rating)	8x (when operating at base kVA rating)
Enhanced fire safety	–	✔	✔	✔
Environmentally preferred	–	✔	✔	✔
First price	lowest	lower	low	low
Lifetime cost of ownership	low	lower	lowest	lower
Bioremediation cost	high	moderate	moderate	moderate

*All values are design dependent

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