

Load tap changers

Parts, service, and training

Siemens Energy offers a comprehensive portfolio of load tap changer (LTC) parts solutions and services supported by factory trained service engineers and original manufacturer engineering departments who understand your equipment design. From generation and transmission to distribution, transformers play a critical role in allowing power to be delivered efficiently and reliably. As an asset class, transformers constitute one of the largest investments in a utility's system. The current environment of higher loading on aging transformers, deferred capital expenditures, and increased service reliability requirements suggests that utilities should more closely manage transformer assets. A preventative LTC maintenance program will help utilities avoid unplanned failures, lower maintenance costs, and extend transformer service life.

We provide LTC testing, field maintenance troubleshooting, and project management services. Project engineers strictly follow OEM recommended procedures to minimize downtime and maximize transformer reliability and performance.

Customer benefits include:

- Extended transformer service life
- Reduced ongoing maintenance costs
- Improved employee and environmental safety
- Improved outage planning and support.

LTC maintenance training

When combined with a scheduled maintenance outage, LTC field service and onsite training provides the following hands-on experience for maintenance crews:

- Maintenance and repair sequencing
- Factory adjustment procedures and tolerances
- Part identification
- Troubleshooting, failure analysis.

LTC retrofit kit

The Siemens Energy LTC retrofit kit enhances transformer reliability at a fraction of the cost of a new transformer. A new vacuum-arcing style LTC increases transformer life, reduces maintenance costs, and minimizes installation downtime. **Typical work scope includes:**

- Drain oil from transformer, LTC
- Disconnect and cut away old LTC
- Engineer and construct transition cubical
- Test and commission.

LTC maintenance program (example TLH-21):

- Test oil dielectric strength
- Drain LTC tank oil
- Flush tank with insulating oil
- Check mechanism tightness
- Examine reversing switch fingers and stationary contacts
- Examine main fingers, blades (replace if necessary)
- Examine ring, ring fingers, hub, and hub fingers
- Examine cables, bolted connections
- Lubricate thoroughly and run LTC
- Check contact alignment at all positions in both directions
- Verify reversing switch operates smoothly, correct sequence
- Verify position indicator properly tracks LTC position
- Verify hold-in switch operates properly
- Verify electrical limit switches correctly stop LTC at both end positions.

Supported brands and models

Brand	Siemens / Allis-Chalmers	Ferranti Packard	ABB	Federal Pacific	Waukesha	Reinhausen	Westinghouse	GE
Model	TLB, TLF, TLC, TLH-20, TLH-21	25/34/6 9 RT32	UZE, UZF	TC 525, TC 546	UZDRT	RMVT(UTTB), RMV-A, RMV-II	UTT, UTT-B, UTS-A, URT, URT-ATS, UVT, UVW-A, UTH, URS, UNR	LR31, LR45 selector, LR59 contactor, LRT 48, LRT 68, LRT 72, LRT 65, LRT 83, LR 200, LR200 SERIES, LR300, LR 400, LR 500

Renewal parts

Siemens Energy provides comprehensive LTC and transformer parts solutions for Siemens Energy, Trafo-Union, Allis-Chalmers, Ferranti-Packard, Elin/EBG, VA TECH, and Peebles transformers. Should renewal parts be required during maintenance, Siemens Energy maintains a multi-million-dollar inventory for rapid supply of many key components.

Customer benefits include:

- Experienced in-house renewal parts specialists
- Access to OEM engineering departments
- Parts manufactured and tested to OEM specifications, including the latest design and material improvements
- 24 / 7 / 365 parts availability
- Verify electrical limit switches correctly stop LTC at both end positions.

- Motors
- Oil gauges
- Winding temp gauges.

Life-extension kits

- **In-line oil pump**
Replace out-of-production in-line oil pump with modern centrifugal design.
- **Bushings**
Replace out-of-production bushings with modern design kit including gaskets, mounting flange adapter, internal terminal adapter, and top terminal adapter as needed.
- **Electrical components**
Siemens Energy can provide replacement components for most out-of-production contactors, starters, motors, relays, switches, coils, and heaters.

Upgrade kits

- **TLH-20 isolated and standard reversing switch upgrade**
Convert to TLH-21 isolated and standard style reversing switch for improved conductivity and reduced reversing switch heating.
- **TLH-20 hub replacement upgrade**
Convert to TLH-21 style hub for longer hub life and improved main-finger positioning.
- **TLS quick break mechanism upgrade**
Upgrade to new design for better wear and longer mechanical life.
- **TLS reversing switch upgrade**
New materials provide better electrical conductivity and reduced contact heating.
- **TLB-2 upgrade**
Convert to TLB-3 for longer arcing contact life and improved reliability.
- **TLB-2 mechanism bell-crank upgrade**
Eliminate over-stressing of critical weld in operating mechanism with new design.

Maintenance kits

To reduce outage downtime, many customers order Siemens Energy LTC maintenance kits to have on hand in the event that parts are required during maintenance.

Parts solutions include:

- Main finger assembly
- Stationary contacts
- Gasket kits
- Bushings
- Coolers

Maintenance Tips

The following tips apply to the TLH-20/TLH-21 LTCs and are useful during long-term maintenance planning and troubleshooting.

The TLH-20 and TLH-21 are built to withstand severe operating conditions with a minimum amount of maintenance. LTC contacts are designed to be operated frequently. Infrequent operations tend to allow chemical films to form on the contact surfaces. Semi-monthly contact operation is necessary to prevent chemical film buildup, especially on the reversing switches, and should include movement of several tap positions to make the reversing switch move off and on its stationary contacts. This can be done while the transformer is under load. Additionally, the contacts should be moved several times over the full range once a year, preferably while the transformer is de-energized.

Routine inspection

Drain oil and open side inspection door. Flush compartment with insulating oil to rinse away carbon residue. Wipe-down as necessary. Examine tightness of nuts and bolts on mechanism.

Examine reversing switch contacts for signs of arcing, which would indicate that the drive mechanism is out of adjustment. Test dielectric strength of insulating oil; oil that tests >22kV per ASTM A-877 should be reprocessed or replaced.

If main and reversing switch moving contacts are positioned properly, the mechanism is tight, and the contacts show no appreciable wear, next inspection can take place in two to three years. However, an annual check is recommended. Insulating oil should be checked every six months.

Almost any condition that might lead to serious trouble will produce a noticeable change in sound when the equipment operates. Normally, snap action should have a uniformly solid sound at all positions. Delayed action clicks following a snap or sluggish motion may indicate that binding action is taking place. If this condition occurs, operate the mechanism in both the "raise" and "lower" directions. The change in sound pattern may indicate the need for a visual inspection.

Erosion of arcing contacts

Only the main contacts are exposed to arcing. The reversing switch, hub and ring contacts are subject only to mechanical wear and should not require replacement. For the main contacts, there is no set number of operations for replacing the contacts except to check the rate of contact deterioration and replace contacts accordingly. Deterioration rate varies widely with the voltage and current rating, actual loading conditions and frequency of LTC operations. Typical values of arcing contact life range from 100,000 - 1,000,000 LTC operations.

The main moving contacts are solid copper tungsten, and the main stationary contact blades have copper tungsten arcing tips. The main moving contacts should be replaced before the width of the remaining flat contact surface reaches 1/8 of an inch. The main stationary contact blades should be replaced before four-fifths of the copper tungsten edge has eroded.

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