

FAULT CURRENT LIMITER

First Commercial Fault Current Limiter for Distribution & Transmission Networks



- » **Protects the Grid by Suppressing Fault Currents**
- » **Cuts Capital and Operating Costs of the Grid**
- » **Instantaneous Response to Network Faults**
- » **Prolongs Useful Life of Network Plant**
- » **Immediate Recovery when Fault Clears**
- » **Enables Capacity Increase**
- » **Standard Transformer Technology (no Cryogenics)**
- » **Facilitates Interconnectivity & Smart Networks**
- » **Scalable up to Extra High Voltage Ratings**
- » **Enables Renewable Generation Connection**

GridON and Wilson Transformer Company are offering the first proven, fully tested commercial Fault Current Limiter (FCL); scalable to extra high voltage ratings. Unlike previous FCL technologies which have not reached commercial viability, our solution, utilizing standard transformer technology and manufacturing expertise, offers a robust product range, scalable from distribution to transmission networks.

GridON has partnered with Australian based Wilson Transformer Company – a shareholder and engineering and manufacturing partner – to bring its novel, world-class portfolio of FCL products to the market.

GridFeed FCLs enable the ever-increasing demand for capacity increase and connection of power generation from both conventional and renewable energy sources.

GridConnect FCLs facilitate network inter-connectivity and improve the quality and availability of the grid.

Designed using rudimentary electromagnetic principles, GridON's self-triggered FCL suppresses prospective fault currents on distribution and transmission grids. Using a unique and proprietary concept of magnetic-flux alteration (requiring no superconducting or cryogenic components), the FCL's impedance rises instantaneously upon fault condition. It limits the fault current for its entire duration and recovers to its normal condition immediately thereafter; guaranteeing protection from consecutive faults.

The Energy Technologies Institute (ETI) commissioned and invested in a US\$7m project to develop and demonstrate GridON's FCL system. The FCL has been fully tested by Testing & Certification Australia, an independent high power test lab, and will be put into service at a UK Power Networks substation in May 2013.

Topping thousands of other innovative technologies, GridON was the proud recipient of the coveted GE ecomagination Powering the Grid award. It has also won the prestigious European ACES Smart Grid award.

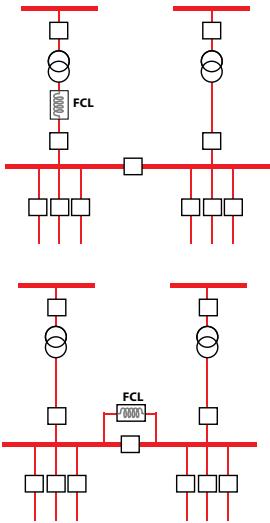
TECHNICAL DATA

GridFeed FCL in a transformer feeder location

Placing a GridFeed FCL in a transformer feeder location offers great flexibility in reducing substation fault levels to accommodate switchgear ratings. One or more FCLs may be installed, depending on the fault reduction required, with minimal changes to existing protection settings. The FCL may be included in the transformer protection zone, with no additional relays or CTs required. The FCL may also be used to improve loadbalancing between feeder transformers with different impedances and/or rated power. GridFeed FCLs enable capacity increase on existing grids.

GridConnect FCL in a bus-tie location

Placing a GridConnect FCL in a bus-tie location offers significant advantages in paralleling bus sections upon loss of one or more transformers in the substation. It also enables paralleling of bus sections in previously split substations, allowing interconnectivity, more flexible running arrangements and increased power quality. One or more FCLs may be installed, depending on the bus-bar topology and fault reduction required, with minimal changes to existing protection settings. The FCL may be paralleled with existing bus-tie circuit breakers, with no additional relays or CTs required.

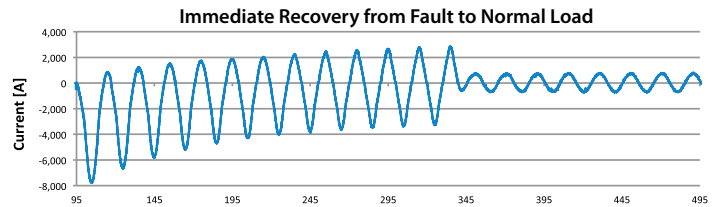
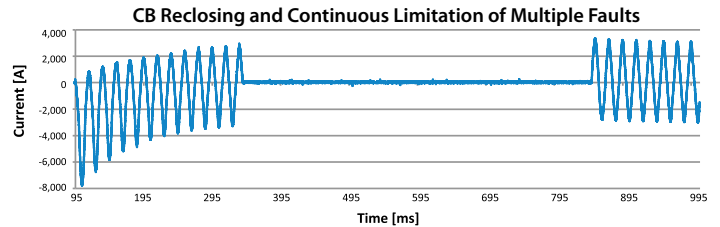
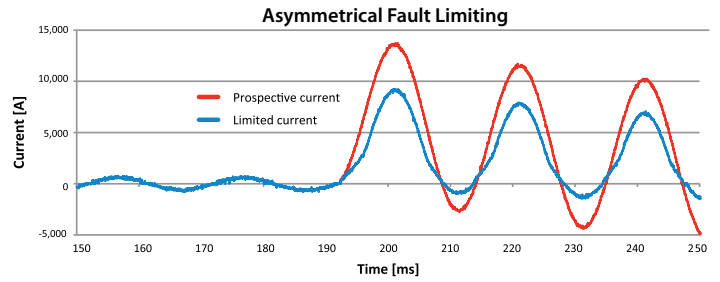


The FCL utilizes copper windings wound onto a DC biased, pre-saturated iron core, enabling it to present very low impedance during normal operation. When fault conditions occur, the iron core is self-driven instantaneously out of saturation, presenting much higher impedance to the grid, thereby limiting the fault current. Upon fault clearing, the FCL immediately (<1ms) resumes its low impedance normal condition, ready to protect against any subsequent network faults.

GridON's FCLs currently support all transmission and distribution voltage levels and offer fault current reduction flexibility to suit the specific application and customer requirements.

10MVA GridFeed FCL FOR UK Power Networks

Prior to installation, the FCL was fully tested under extreme network conditions by Testing & Certification Australia, a certified high power laboratory. Performance and withstand to fault current events have been demonstrated over 50 fault tests. Immunity to loss of DC bias has been verified both in nominal load and fault conditions. The device has been tested under circuit breaker reclosing and fault recovery conditions, demonstrating full fault limiting capability for repeated faults. Instantaneous recovery from fault back to nominal impedance has been demonstrated.



10MVA KEY PARAMETERS

Parameter	Value
Line Voltage	11kV, 50Hz, 3-ph
Nominal load current (power through)	525Arms (10MVA)
Prospective fault current	5.34kArms, 13.6kA peak
Limited fault current	2.22kArms, 9.13kA peak
Fault current reduction (clipping)	58% of steady state rms (33% of first peak)
Tested fault withstand duration	3 seconds
Recovery from fault to normal load	Instantaneous (less than 1msec)
CB reclosing	Fully tested with 500msec dead zone between faults
Voltage drop during normal operation	0.8-2%
Power frequency voltage withstand	28kV
Lightning impulse withstand	75kV

A comprehensive monitoring and control system is provided with the FCL to enable seamless integration with existing protection schemes and to provide a real-time view of the FCL operational parameters. GridON offers the DR-FCL monitoring system from Dynamic Ratings as part of its solution.

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