GE
Digital Energy

Advanced Transformer Protection

8 Series Mini Paper

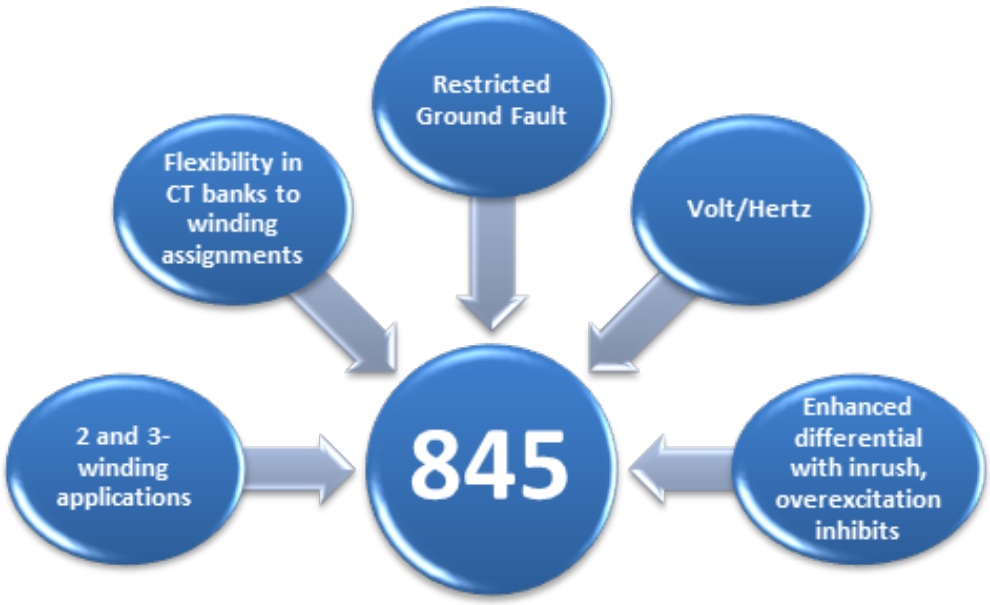
imagination at work

Comprehensive Asset Protection for 2 and 3-Winding Transformers

Part of the Multilin 8 Series of modern Protection & Control devices, GE's Multilin 845 Transformer Management Relay offers advanced protection, control, asset health monitoring, with advanced communications for Medium and Large 2- and 3-winding power transformers. As part of this advanced platform the Multilin 845 is built from common hardware, firmware, and utilizes the same simplified device setup software as the other Multilin 8 Series devices reducing training, setup and commissioning time and effort, and maintenance requirements.

Other relays in this platform include the Multilin 850 Feeder Protection System and Multilin 869 Motor Management System.

The Multilin 845 raises the standard for performance and reliability with advanced transformer protection features including:



..\Transformer\Percent Differential

Item Name	Value	Unit
Function	Disabled	
Pickup	0.20	x CT
Slope 1	25	%
Break 1	1.50	x CT
Break 2	4.00	x CT
Slope 2	95	%
Inrush Inhibit Function	Disabled	
Inrush Inhibit Level	20.0	%
Inrush Inhibit Mode	Per Phase	
Overexcitation Inhibit	Disabled	
Overexcitation Level	10.0	%
Pickup Delay	0.000	s
Block	Off	
Output Relays	Do Not Operate	

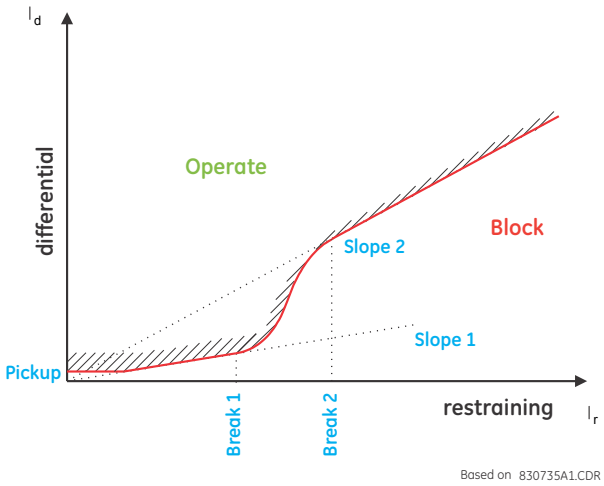
Transformer Differential

Differential protection may be considered as the first line of protection for internal transformer phase to phase or phase to ground faults.

GE's Multilin 845 differential element offers the following critical features to effectively manage power transformers including:

- Sensitivity to phase to phase and phase to ground faults
- High speed fault detection
- Flexible 2nd harmonic transformer inrush inhibit and 5th harmonic overexcitation inhibit
  - For greater application flexibility, the 2nd harmonic inhibit element can be further enhanced with settings for Per Phase, Average, 2-out-of-3, and 1-out-of-3.

- Biased, dual slope characteristic to prevent a missoperation caused by spurious differential current during external faults under possible CT saturation.
- Instantaneous unbiased differential for fast tripping under high current level internal faults



Transformer Setup & Configuration Flexibility

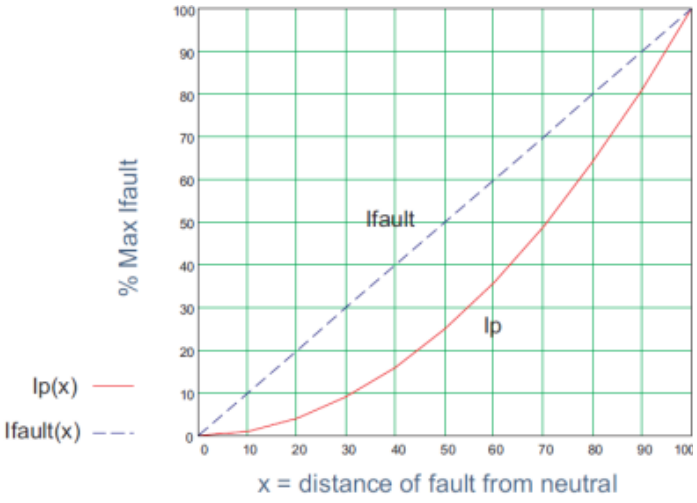
The Multilin 845 relay allows full flexibility in assigning CT banks to specific transformer windings. This simplifies engineering efforts and offers greater flexibility to meet specific application requirements. The CT bank name is user programmable and is retained in the setting file for all element assignments and metering purposes for each winding. Neutral grounding for each wye winding of the protected transformer is provided internally, through firmware compensation.

..\Transformer\Winding 1		
Item Name	Value	Unit
Signal Input	CT Bank 1 -J1	
Rated MVA	5.000	MVA
Nominal Ph-Ph Voltage	13.800	kV
Connection	Wye	
Grounding	Not Within Zone	
Wndg Resistance (3-ph)	10.0001	Ohms

All transformer metered quantities, including differential and restraint currents, 2nd and 5th harmonic currents, and load currents are available over supported communication protocols, in oscillography, data logger and through Flexelements for user specific applications.

Restricted Ground Fault

Up to 3 Restricted Ground Fault (RGF) elements are available in Multilin 845 relay. This element provides ground fault detection for low-magnitude ground fault currents, which occur primarily when ground faults occur close to the neutral point of the wye connected transformer winding.



Ground fault detection is especially important for impedance grounded wye windings where an internal ground fault will produce a low magnitude ground fault current, depending on the position of the fault with respect to the winding neutral point. Percent differential protection may not detect such faults. With constant monitoring of the ground current, the RGF function has been enhanced with adaptive restraint based on the I2, I1 and I0 to provide more security against external phase-to-phase faults with CT saturation, which otherwise may create operating conditions.

Volt/Hertz

Volts per Hertz (V/Hz) can be used as a first line or backup protection for over-excitation or over-fluxing conditions of the transformer core.

The Multilin 845's Volts per Hertz elements have the following features:

- Two identical Volts per Hertz elements in each setting group in order to achieve a two-level of protection
- Configuration of the input voltage signal(s) is made flexible by providing the selection between three-phase voltage inputs or the auxiliary voltage channel.
- Phase-to-phase or phase-to-ground voltage mode can be selected to define per-unit base
- Various curve types such as Definite Time, Inverse time and Flexcurve characteristics in order to define required operation of the element are also offered
- Linear reset characteristic is provided with reset time settings in order to match the cooling characteristics of the protected equipment

..\Voltage\Volts per Hertz 1

Item Name	Value	Unit
Function	Disabled	
Signal Input	Ph VT Bnk1-J2	
Voltage Mode	Phase-ground	
Pickup	0.80	V/Hz
Curve	Definite Time	
TD Multiplier	1.00	
T Reset	1.00	
Block	Off	
Output Relays	Do Not Operate	