MiCOM P54x

Differential Protection

With comprehensive distance and aided DEF protection.

Design evolution K

Schneider Electric announces a major evolution, with the P54x line differential protection now incorporating the proven technology of the sub-cycle distance MiCOM P443, merged as one single Intelligent Electronic Device (IED).

The new P54x evolution combines current differential, five zone sub-cycle distance protection and a phase segregated aided directional earth fault protection, providing the complete solution for any type of fault on the power system.

This relay becomes the standard in all HV, EHV and UHV line protection applications, duplicated where dual redundant main protection is demanded.

The enhanced functionality and versatility of working in either a two or three ended scheme, combined with the ease of adaptation as the power and communication systems expand and change in complexity, make the P54x a truly future-proof relay.

Customer Benefits

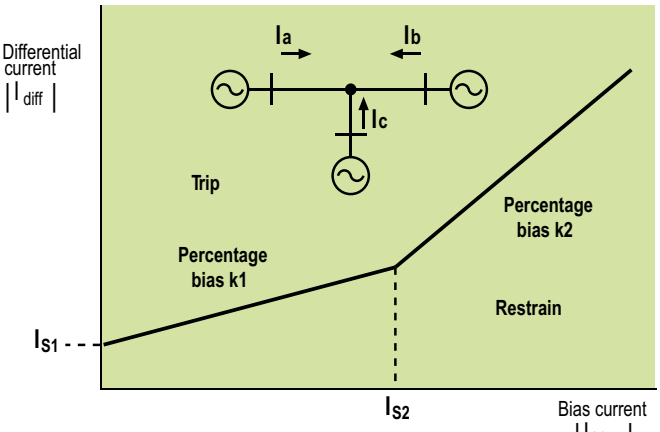
- Reduced spares holding
- Harmonized scheme drawings and panels wiring
- Minimum training requirements
- Reduced time to commission

The P54x is the ideal cost-benefit choice to protect HV, EHV and UHV lines or cables.

Schneider Electric

New features

- The evolution of P54x relays provides an excellent cost-effective solution for line protection. The optional five zones of sub-cycle distance protection can work as independent parallel protection to the differential. Alternatively, each zone can be set to work as backup in case of communication failure.
- Phase segregated aided directional earth fault DEF (67N) can also be configured as main protection to provide high resistance ground fault detection. The innovative “Virtual Current Polarizing” feature even ensures correct operation when the fault generates negligible zero or negative sequence voltages.
- The relay provides two independent tele-protection schemes each using a separate communication channel. The distance and DEF functions are therefore flexible in configuration, to operate in shared channel logic or in discrete modes. If differential protection is not used, ON-OFF teleprotection can be enhanced by using InterMiCOM64 digital signaling.
- Differential current transformer supervision provides stability of the differential protection in case of failure on any CT wire in the differential zone. The relay will detect which one of the local or remote current transformers has failed, making it easy for the user to identify the affected CT circuit.
- GPS synchronizing caters for differences between the transmit and receive path message routing, as typically found in SONET (synchronous digital hierarchy) multiplexed applications. The proven“ping-pong” time alignment method, and optional GPS synchronism using the P594 for the common time base, are carried forward into all new P543-P546 models.
- The new P54x relays deliver a comprehensive implementation of IEC61850, the international standard for Ethernet-based communication in substations. IEC61850 enables integration of all protection, control, measurement and monitoring functions within a substation. The IEC61850 implementation in MiCOM relays allows interoperability with other vendors’ IEDs and systems, and easy integration with the PACiS substation control systems.
- P543 and P545 now facilitate in-zone transformer feeder applications
- All models support ABC and ACB phase rotation
- A new easy to use Human Machine Interface (HMI) includes ten Programmable User Function Keys with associated Tri-Color LEDs. Typical control, maintenance, and commissioning options are initiated from simple key presses, rather than the need to navigate a menu.



$$|I_{diff}| = |I_a + I_b + I_c|$$

$$|I_{bias}| = 0.5\ (|I_a| + |I_b| + |I_c|)$$

The relay operates when

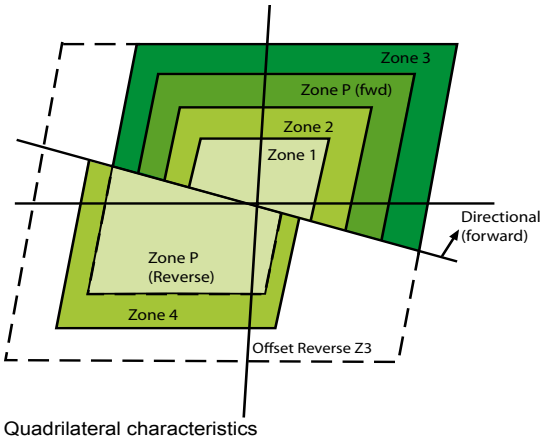
(1) For $|I_{bias}| < I_{S2}$

$$|I_{diff}| > k_1 |I_{bias}| + I_{S1}$$

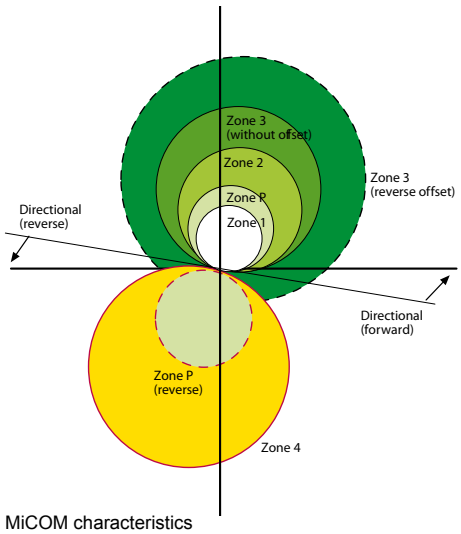
(2) For $|I_{bias}| > I_{S2}$

$$|I_{diff}| > k_2 |I_{bias}| - (k2 - k1) I_{S2} + I_{S1}$$

Biased current differential protection



Quadrilateral characteristics



MiCOM characteristics

LINE DIFFERENTIAL, TRANSFORMER AND BUSBAR PROTECTION RELAYS

	Device		P541	P542	P543	P544	P545	P546	P547
CT Inputs			4	4	5	9	5	9	4
VT inputs			-	-	4	3	4	3	-
Opto Inputs(max) [1]			8	16	16	16	24	24	8
Output Contacts(max) [1]			7	14	14	14	32	32	8
Analogue I/O (option)			-	-	-	-	-	-	-
RTDs (option)			-	-	-	-	-	-	-
Function Keys/Hotkeys			X	X	X	X	X	X	X
Interlocking Logic			X	X	X	X	X	X	X
Protection									
Line Differential	87P		X	X	X	X	X	X	-
2 terminal			-	-	-	-	-	-	-
2/3 terminal			X	X	X	X	X	X	-
FO signalling			X	X	X	X	X	X	-
Metallic signalling			-	-	-	-	-	-	-
SDH/Sonet ne tworks			-	-	X	X	X	X	-
In -Zone transformer			X	X	X	-	X	-	-
2nd harmonic restraint			X	X	X	-	X	-	-
Vector Compensation			X	X	X	-	X	-	-
Transient Bias (CT saturation)			-	-	-	-	-	-	-
2 breaker configuration			-	-	-	X	-	X	-
Direct/Permissive Intertripping			X	X	X	X	X	X	-
Phase Comparison	87PC		-	-	-	-	-	-	X
PLC signalling			-	-	-	-	-	-	X
Transformer Differential	87P		-	-	-	-	-	-	-
windings			-	-	-	-	-	-	-
Restricted earth fault	87G/ 64		-	-	-	-	-	-	-
overfluxing/ 5th harmonic			-	-	-	-	-	-	-
overexcitation	24		-	-	-	-	-	-	-
2nd harmonic restraint			-	-	-	-	-	-	-
Busbar Protection	87BB		-	-	-	-	-	-	-
Central unit (Nbr of Feeders)			-	-	-	-	-	-	-
Peripheral units - 8 zones			-	-	-	-	-	-	-
Phase segregated differential	87P		-	-	-	-	-	-	-
Sensitive earth fault differential 6 zones	87N		-	-	-	-	-	-	-
Check Zones	87CZ		-	-	-	-	-	-	-
CT supervision	CTS		-	-	-	-	-	-	-
CT Saturation Detection			-	-	-	-	-	-	-
Fibre optic signalling			-	-	-	-	-	-	
Ancillary Functions									
Phase overcurrent	50/51P		X	X	X	X	X	X	X
Phase directional	67P		-	-	X	X	X	X	-
Ground fault	50/51N		X	X	X	X	X	X	X
Ground Fault directional	67N		-	-	X	X	X	X	-
CT supervision	CTS		-	-	X	X	X	X	-
Sensitive directional earthfault	67N		-	-	X	X	X	X	-
Wattmetric earth fault	64W		-	-	X	X	X	X	-
Distance Protection	21		-	-	X	X	X	X	-
Power Swing Blocking	78		-	-	X	X	X	X	-
Check Sync	25		-	-	X	-	X	-	-
Negative sequence overcurrent	46		-	-	X	X	X	X	X
Thermal overload	49		X	X	X	X	X	X	X
Loss of load/Undercurrent	37		-	-	-	-	-	-	-
Under/Over frequency	81U/O		-	-	-	-	-	-	-
Circuit breaker failure	50BF		X	X	X	X	X	X	X
Autoreclose	79		-	3 pole	1/3 pole	-	1/3 pole	-	-
Over/Under voltage	27/59		-	-	X	X	X	X	-
Trip Circuit Supervision	TCS		X	X	X	X	X	X	X

Please note that some relays may have a limit on max. I/O when used as a combination.