

# Transformer Protection Features Overview

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(✓ = Standard, ◦ = Option)

Protection functions	ANSI	MCDTV4-2	MRDT4-2	XD1-T
Overexcitation V/Hz	24	✓		
Synchro check	25	✓		
Undervoltage	27	✓		
Power protection: P, Q, Qr, S, Pr	32F, 37F, 32Q, 37Q, 37QR, 32S, 37S, 37R	✓		
QU protection (undervoltage- directional reactive power protection)	27&32Q<	✓		
Negative sequence elements (current/DEFT/INV)	46	✓	✓	
Negative/positive sequence elements (voltage)	47	✓		
Overload protection with thermal replica	49	✓	✓	
Circuit breaker failure protection	50BF / 62BF	✓	✓	
Phase current elements (non-directional)	50/51		✓	
Phase current elements (non-directional and directional)	67	✓		
Earth current elements (non-directional)	50N / 51N		✓	
Earth current elements (non-directional and directional)	67N	✓		
Inrush detection IH2 (2nd harmonic)		✓	✓	
Voltage controlled current protection	51C	✓		
Voltage restraint current protection	51V	✓		
Negative sequence elements (current/IEC/ANSI curves)	51Q	✓		
Power factor cos (φ)	55	✓		
Overvoltage	59	✓		
Residual voltage elements	59N	✓		
Voltage transformer supervision	60FL	✓		
Current transformer supervision	60L	✓	✓	
Trip circuit supervision	74TC	✓	✓	
Vector surge	78	✓		
Underfrequency / Overfrequency	81 O/U	✓		
Frequency gradient (ROCOF)	81R	✓		
Lockout function	86	✓	✓	
Generator differential protection	87G	✓	✓	
Transformer differential protection	87T	✓	✓	✓
Restricted earth fault elements	87N (64REF)	✓	✓	
Breaker Wear Monitor	BKM	✓	✓	
Protection parameter sets		4	4	
Reverse interlocking		✓	✓	
Event, failure and disturbance recorder		✓	✓	
Trend recording		✓	✓	
<b>Control</b>				
Control function for 1 / up to 6 switchgear(s)		6	1	
Logic (up to 80 equations)		✓	✓	
<b>Measuring functions</b>				
Currents		✓	✓	
Thermal overload θ		✓	✓	
Voltages		✓		
Frequency		✓		
<b>Hardware</b>				
Number of binary output relays (depends on type of device)		11/11	7/13	2
Number of digital inputs (depends on type of device)		16/8	8/16	
Number of analog inputs and outputs (depends on type of device)		0/2+2		
<b>Communication</b>				
IEC61850 (RJ45 or fiber optic [FO] LC)		◦	◦	
MODBUS RTU (via fiber optic [FO] ST or RS485)		◦	◦	
Modbus TCP (RJ45 or fiber optic [FO] LC)		◦	◦	
IEC60870-5-103 (via fiber optic [FO] ST or RS485)		◦	◦	
Profibus DP (via fiber optic [FO] ST or RS485)		◦	◦	
DNP3.0 RTU (via fiber optic [FO] ST or RS485)		◦	◦	
DNP3.0 TCP (RJ45 or fiber optic [FO] LC)		◦	◦	
IRIG-B interface (time synchronization)		✓	✓	