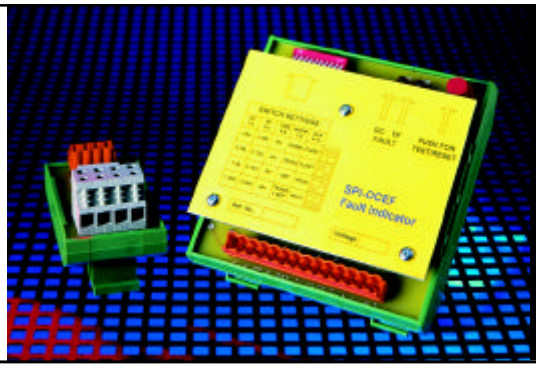
SPi-OCEF PROGRAMMABLE

Programmable Over Current and Earth Fault Indicator



Application

The SPi-OCEF programmable detects and indicates the passage of phase fault, earth fault and SEF currents. Designed for use with remotely controlled and automated HV/MV switchgear it is connected to 3 phase CTs and can be used on both overhead and underground cable networks.

Operation

The unit constantly measures the output from 3 phase mounted CTs (often in the switchgear) and compares the output against the user set thresholds for fault current.

Measurement of current is made every 1mSec. When current above the threshold setting of the indicator is measured a fault calculation is initiated. The algorithm used for fault measurement allows the indicator to grade with the minimum settings likely to be used by the source protection relays and at the same time avoid possible mis-measurement due to capacitive charge currents.

When a fault condition is established the unit indicates using a flashing LED and electrical output contacts.

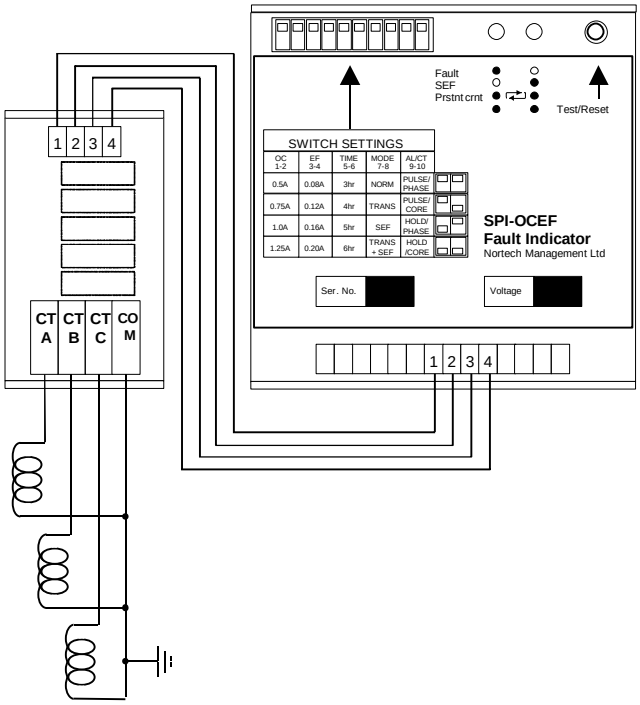
The device comprised two sections, one for CT terminations and the other the fault indicator. This arrangement allows the fault indicator to be removed, replaced or installed at a later date without the need for CT shorting.

DIL switch functions

The 10 way on board DIL switches provide user selectable settings and operation of the SPi indicator:

Switch	Function	
1-2	Overcurrent setting range (CT secondary) nominal +/- 15% 0.5A, 0.75A, 1.0A, 1.25A	
3-4	Earth-fault setting range (CT secondary) nominal +/- 15% 0.08A, 0.12A, 0.16A, 0.2A SEF level if set is approximately 0.025A for all EF settings	
5-6	Indicating time for permanent fault indications 3hr, 4hr, 5hr, 6hr	
7-8	Normal	Permanent fault indication only No Sensitive earth-fault monitor
	Transient	Transient fault indications
	SEF	Sensitive earth-fault monitor
	Trans/SEF	Transient indications AND Sensitive EF
9	Pulsed alarm (2 seconds) or Permanent alarm (closed until supply restored or to end of indicating period)	
10	Selection for CT arrangement - 3 phase mounted CT's - 2 phase mounted and 1 core balance CT	

CT and inter-board connections



Mounting

The device is available as either a din-rail mounting for use inside control cabinets or as a potted version inside an weatherproof enclosure for mounting outside switchgear.

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SPECIFICATION

Power Supply	Standard: 14-30V dc (24V nominal) Optional: 9 – 20V dc (12V nominal)
Power Drain	Quiescent current 30mA Maximum 100mA when indicating
Mains Sensing	40V ac to 240V ac (used in fault logic)
Reset	1. manual using push button 2. dc signal from telemetry (9 – 48V dc) 3. on completion of selected time period
CT requirements *(User selectable)*	Option A: [1 x core balanced 60/1] AND [2 x phase CTs] Option B: 3 x phase CTs Option C: any CT can be used, for example 3x1000/1 or 3x500/1
Over Current Threshold	4 switchable settings based on the output of the CT secondary: 0.5A, 0.75A, 1.0A, 1.25A (+/- 15%) (= 250A, 375A, 500A, 625A primary current when using 500/1 CTs)
Earth Fault Threshold *When using 3 x phase CTs*	4 switchable settings based on the output of the CT secondary: 0.08A, 0.12A, 0.16A, 0.2A (+/- 15%) (= 40A, 60A, 80A, 100A primary current when using 500/1 CTs)
Earth Fault Threshold *When using core balanced CT*	Single fixed threshold of 0.833(P/S); where P=number primary turns, S=number secondary turns. When using a single 60/1 core balanced CT = 50A sensitivity
SEF Threshold *When using 3 x phase CTs*	0.025A (+/- 20%) secondary for 5 seconds continuous. For a 500/1 CT this is equivalent to 12 A primary fault current.
SEF Threshold *When using core balanced CT*	0.012A (+/- 20%) secondary for 5 seconds continuous. For a 500/1 CT this is equivalent to 7A primary fault current.
Fault (OC & EF) indication	RED flashing LED1 at 1 second intervals
Fault (SEF) indication	RED flashing LED2 at 1 second intervals
High Current indication	Persistent high current (above threshold for 30 s), LED flash alternately until high current ceases.
Test indication	Both LEDs flash at 1 second intervals then steady on
Confirmation Time	Following a fault detection the indicator will not sense a further fault for a period of 3 minutes.
Auxiliary Alarm 1	operates for Faults Option A: Fleeting, normally open volt free contacts (2 sec) Option B: Latched, normally open
Auxiliary Alarm 2	operates for persistent high current Option A: Fleeting, normally open volt free contacts (2 sec) Option B: Latched, normally open
Auxiliary Alarm Contact Rating	2A at 30Vdc or 0.5A at 120Vac

MECHANICAL

CT resistor block	45mm(W) x 78mm(H) x 50mm(D) DIN rail mounting
DIN Rail SPi indicator	112mm(W) x 112mm(H) x 42mm(D)
Potted Enclosure SPI indicator	120mm(W) x 120mm(H) x 105mm(D)
Temperature range	-25 'C to +70 'C ambient
Maintenance	The unit does not require maintenance, the button on the front of the unit is used for manual reset and routine operational checks

TESTING

Insulation: Between any terminal and earth	2kV RMS for 1 minute
Insulation: Between independent circuits	2kV RMS for 1 minute
Insulation: Across normally open contacts	1kV RMS for 1 minute
High Hz Disturbance: 2.5kV Common mode (longitudinal)	No mal-operation
High Hz Disturbance: 1kV Series mode (transverse)	No mal-operation
Electrostatic Discharge: 8kV contact	No mal-operation
Fast Transient: 2kV 5/50nSec. 2.5kHz repetitive	No mal-operation, steady state, operated or during fault measurement
EMC: Susceptibility	100kHz to 1gHz, 3V/ metre on all planes, no mal-operation
EMC: Emissions	No significant emissions
Current Injection Tests	50A threshold +/- 10% up to at least 20,000A primary current for 3 Sec. through 60/1 current transformer