

Features

- Phase segregated output trip signals
- Down to 10 ms operating time for close-in faults.
- Very low overreach of the measuring elements.
- Optional residual current protection function
- Fast back-up earth fault protection for faults close to the line end
- Enables fast fault clearance for close in earth faults even if the distance protection or the directional residual current protection is blocked from the fuse supervision function

Application

Different system conditions, such as source impedance and the position of the faults on long transmission lines influence the fault currents to a great extent. An instantaneous phase overcurrent protection with short operate time and low transient overreach of the measuring elements can be used to clear close-in faults on long power lines, where short fault clearing time is extremely important to maintain system stability.

The instantaneous residual overcurrent protection can be used in a number of applications. Below some examples of applications are given.

- Earth fault protection for series compensated lines where the series capacitor is situated near the line end. Normally the earth fault current at a fault in the backwards direction is much smaller than the fault in the forward direction. Therefore the protections can be used even if the phase angle of the fault current will indicate a fault in the reverse direction.
- Fast back-up earth fault protection for faults close to the line end.
- Enables fast fault clearance for close in earth faults even if the distance protection or the directional residual current protection is blocked from the fuse supervision function

Functionality

The current measuring element continuously measures the current in all three phases and compares it to the set operate value IP_{set} . A filter ensures immunity to disturbances and dc components and minimizes the transient overreach. If any phase current is above the set value IP_{set} , the phase overcurrent trip signal TRP is activated. Separate trip signal for the actual phase(s) is also activated. The IOC current function block can also contain a residual current function. Both the phase overcurrent and the residual current function (if included) can activate the trip signal TRIP. The input signal BLOCK blocks all functions in the current function block.

As the instantaneous residual overcurrent function is integrated together with the instantaneous phase overcurrent function some signals are common: IOC--BLOCK which blocks both functions and IOC--TRIP which is a common trip from both functions. There is also a separate trip signal IOC--TRN which is a separate trip from the instantaneous residual overcurrent function.

If the residual current is detected to be larger than the setting value, an undelayed trip is activated, at the outsignals IOC--TRIP and IOC--TRN.

Function block

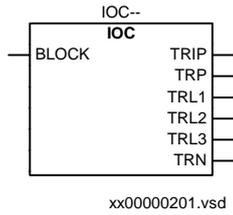


Figure 1: IOC function block including all options, ordering numbers 1MRK 001 457-AA, 1MRK 001 456-VA

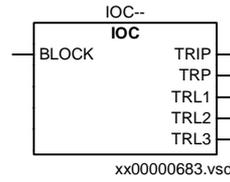


Figure 2: IOC function block phase overcurrent function, ordering number 1MRK 001 457-AA

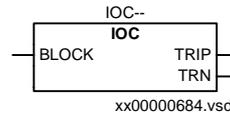


Figure 3: IOC function block residual overcurrent function, ordering number 1MRK 001 456-VA

Input and output signals

Table 1: Input signals for the IOC (IOC--) function block

Signal	Description
BLOCK	Block of the instantaneous overcurrent protection function. The signal also blocks the instantaneous residual current function, if it is included in the function block.

Table 2: Output signals for the IOC (IOC--) function block

Signal	Description
TRIP	Trip by instantaneous phase overcurrent. Trip also by instantaneous residual current function, if it is included in the IOC overcurrent protection.
TRP	Trip by instantaneous phase overcurrent
TRL1	Trip by instantaneous overcurrent, phase L1
TRL2	Trip by instantaneous overcurrent, phase L2
TRL3	Trip by instantaneous overcurrent, phase L3
TRN	Trip by the instantaneous residual overcurrent protection

Technical data

Table 3: IOC - Instantaneous overcurrent protection

Function		Setting range	Operate time	Accuracy
Operate current $I_{>>}$	Phase measuring elements	(50-2000)% of I_r In steps of 1%	-	+/- 2.5 % of I_r at $I \leq I_r$
				+/- 2.5 % of I at $I > I_r$
	Residual measuring elements	(50-2000)% of I_r In steps of 1%		+/- 2.5 % of I_r at $I \leq I_r$
				+/- 2.5 % of I at $I > I_r$
Operate time at $I > 10 \times I_{set}$			Max 15ms	-
Dynamic overreach at $\tau < 100$ ms			-	< 5%

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