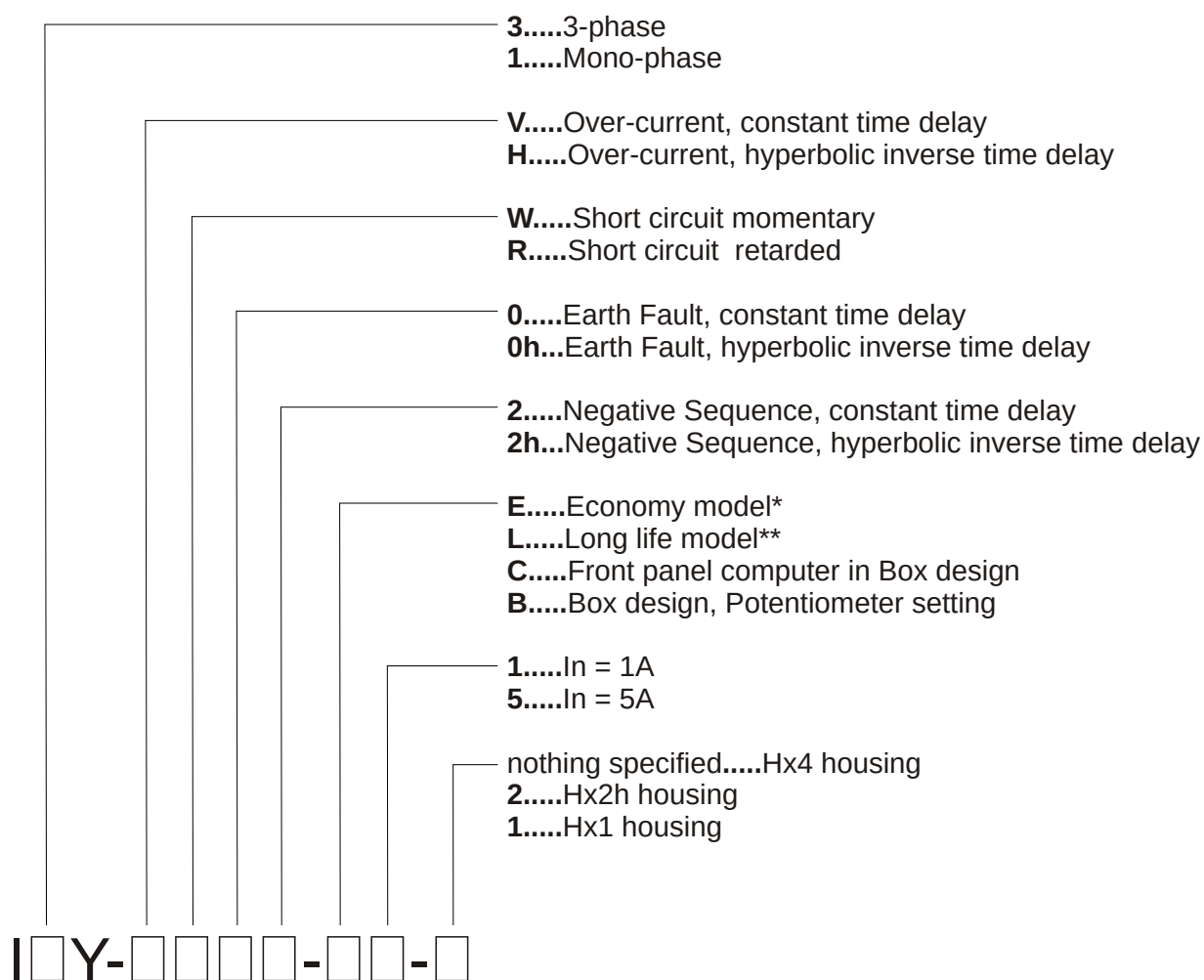


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*Economy model:
 Expected life time is 25 years at ambient temperature range +5° to 45°C.

**Long Life model:
 Expected life time is 50 years at ambient temperature range -20° to 55°C.

MONO-PHASE SELF-POWERED OVER-CURRENT RELAYS

I1Y

Features and properties

“Bridge current measuring transformer” enables:

- self-powering at very low input current ($0,5 I_n$);
- magnet power limiting enables very high input currents at relatively low thermal losses;
- accurate measurements of input currents, linearity is extended over several decades;

Design

SMD technology includes the application of modern micro-power linear operational amplifiers and references. The presented real time relay does not contain any vital parts with the life time less than 25 years for economy models, and 50 years for long life model. The spring intention of “I1Y-” relay’s design was, to serve as a top reliable back-up protection or to be used for basic protection on objects of high priority. The above mentioned strategy left no room for processor technology* or other functionally redundant or risque structures. The real time design ensures top reliability and the longest expected life time.

Functional features

- Self-powered from a single phase current as low as $0,5 I_n$;
- Permissible permanent overloading, in a case of unsuccessful fault disconnection is $8 \times I_n$ at 25°C ambient;
- Standard models: $I_n = 1 \text{ A}$ and 5 A ; $T_s = 10 \text{ s}$, independent time delay;
On request: $T_s = (2\text{s}; 5\text{s}; 20\text{s})$;
- Inverse time is available on request for long life models;
- Starter for alarming and external blockade are built-in for cooperation with superior control level.

Features and properties:

- Economic mono-phase, 2 seats housing;
- Very low power consumption;
- Very high stand by fault current;

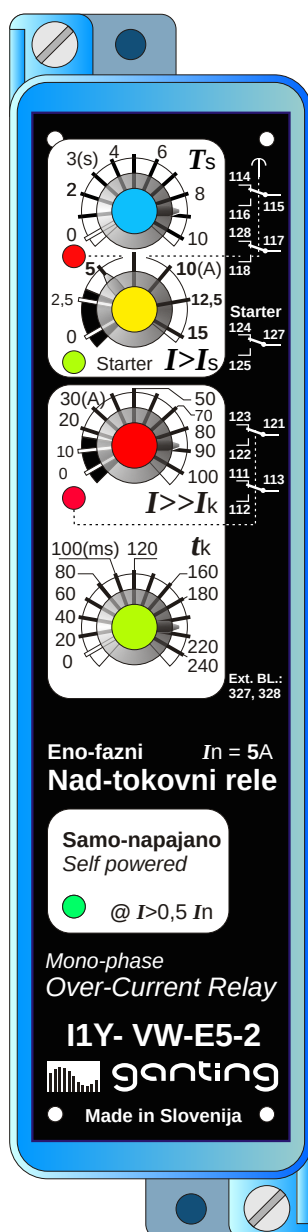
Design:

“Bridge current measuring transformer” enables

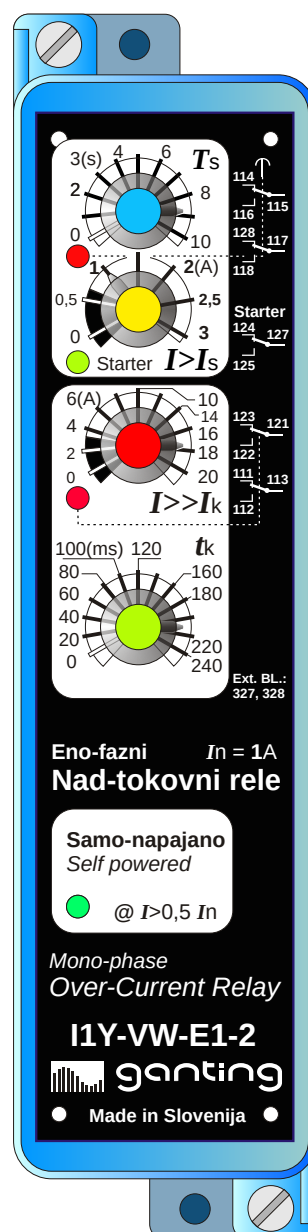
- self-powering at very low input current ($0,5 I_n$);
- magnet power limiting enables very high input currents at relatively low thermal losses;
- accurate measurements of input currents, linearity is extended over several decades;
- Compact single board design;
- New Combiflex pin terminals, extending directly from board;

Functional features:

- Delayed over-current relay;
- Constant time delay for economy model;
- Inverse time delay - on request;
- Momentary starter, for alarming to superior level;
- Retarded or momentary short circuit protection;
- External blocking, inhibits the tripping from remote superior level.



I1Y-VW-E5-2

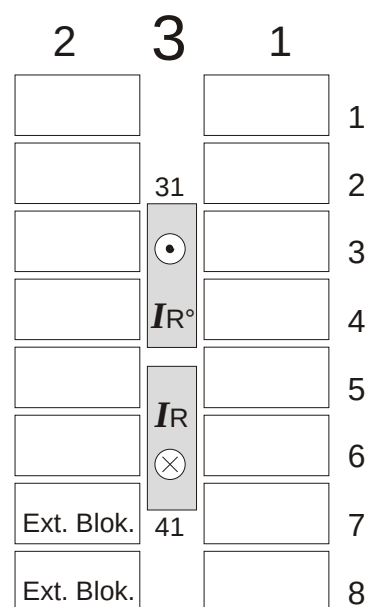
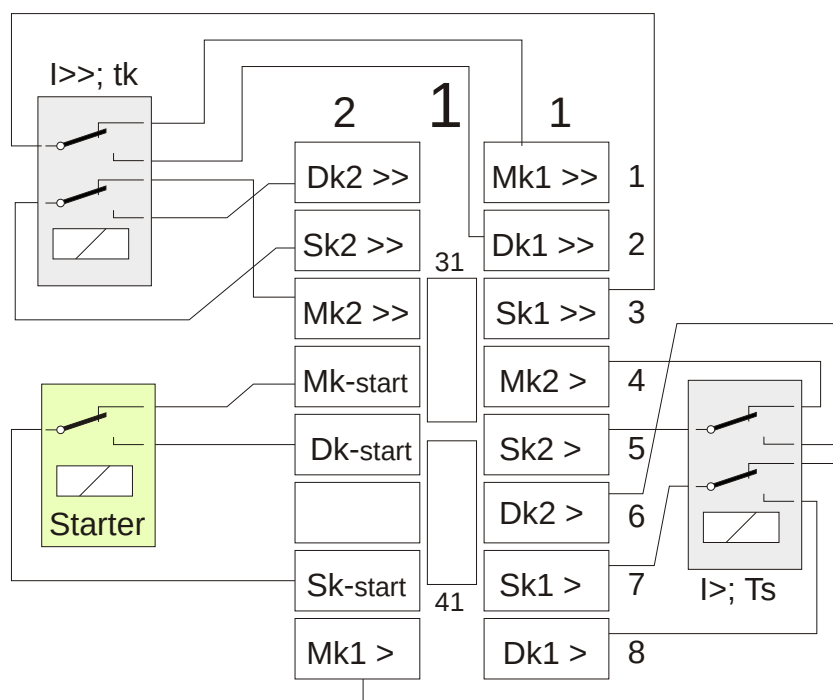


I1Y-VW-E1-2

TERMINAL DATA

I1Y-~-E-2

View to pin terminals of the Hx2h housing



Features and properties:

- Miniature mono-phase, single seat Combiflex housing Hx1;
- Very low power consumption;
- Very high stand by fault current;

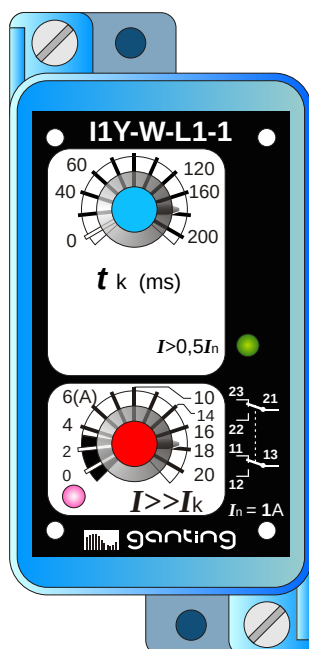
Design:

“Bridge current measuring transformer” enables

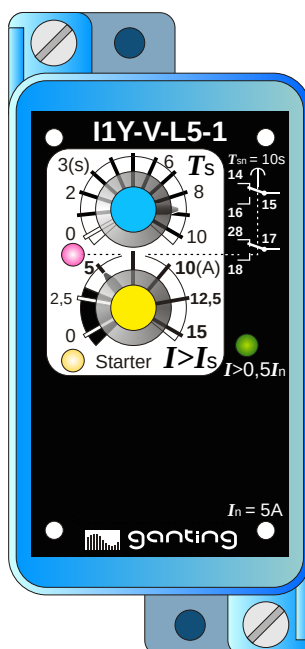
- self-powering at very low input current ($0,5 I_n$);
- magnet power limiting enables very high input currents at relatively low thermal losses;
- accurate measurements of input currents, linearity is extended over several decades;
- New Combiflex pin terminals, extending directly from board;

Functional features:

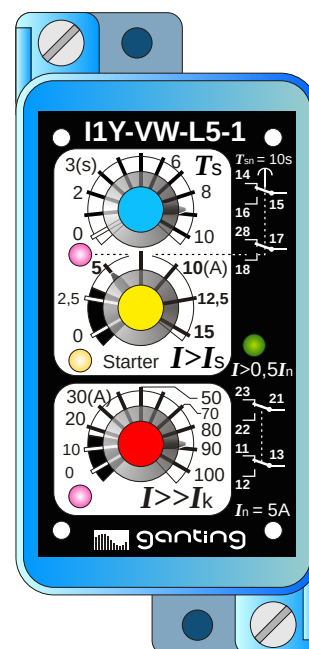
- Delayed over-current relay;
- Constant time delay;
- Retarded or momentary short circuit protection.



I1Y-W-L1-1
Retarded short circuit
current relay



I1Y-V-L5-1
Delayed
over-current relay
with starter

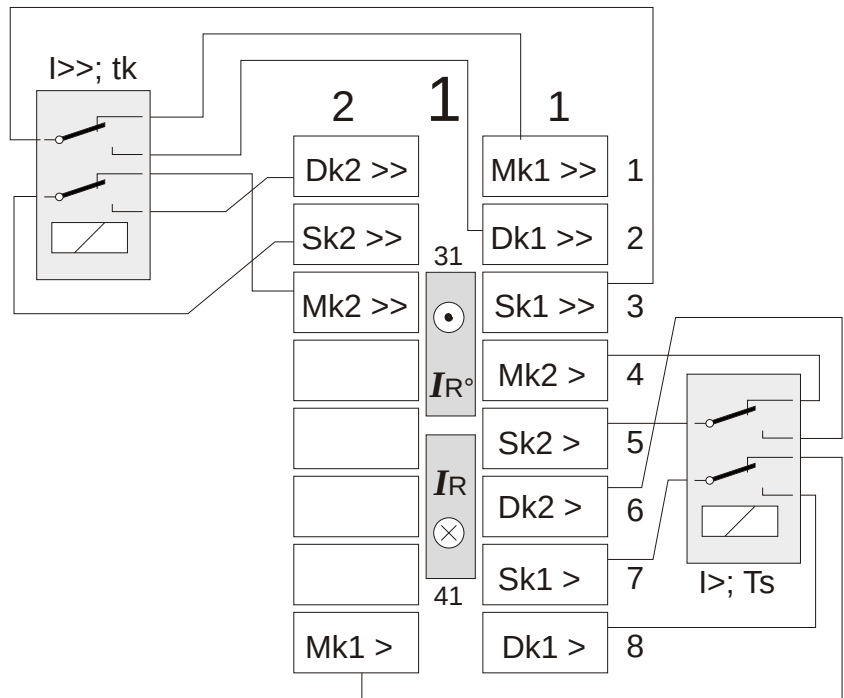


I1Y-VW-L5-1
Standard combination of the
delayed over-current relay
with alarming starter and the
short-circuit momentary Relay.

TERMINAL DATA

I1Y-~-L-1

View to pin terminals of the Hx1 housing



THREE-PHASE SELF-POWERED OVER-CURRENT RELAYS

I3Y

Features and properties

“Bridge current measuring transformer” enables:

- self-powering at very low input current ($0,5 I_n$), even from single phase ($0,6 I_n$);
- magnet power limiting enables very high input currents at relatively low thermal losses;
- accurate measurements of input currents, linearity is extended over several decades;
- All 3 phase currents contribute power to the central accumulation. United reference system enables minimum number of setting parts which results in economy and reliability.

For models I3Y-VW0-E, I3Y-VW0-L, I3Y-HW0-L:

- Earth fault current I_o is calculated in real time. Standard setting range is (0.1 to 0.5) I_n .

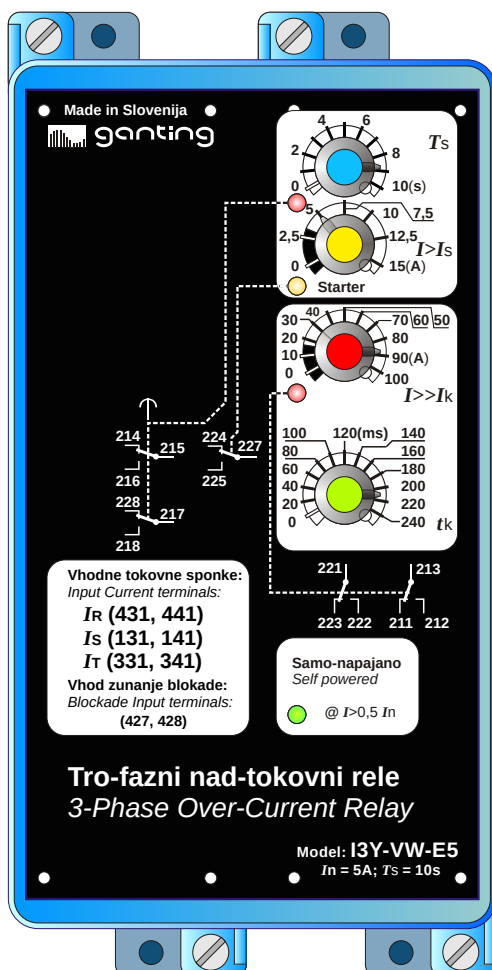
Design

SMD technology includes the application of modern micro-power linear operational amplifiers and references. The presented real time relay does not contain any vital parts with the life time less than 25 years for economy models, and 50 years for long life model.

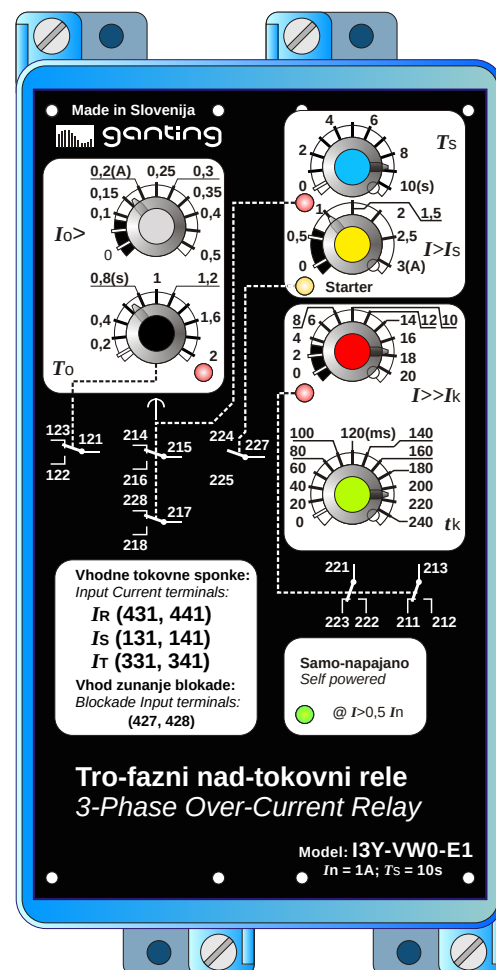
The spring intention of “I3Y-”relay’s design was, to serve as a top reliable back-up protection or to be used for basic protection on objects of high priority. The above mentioned strategy left no room for processor technology* or other functionally redundant or risque structures. The real time design ensures top reliability and the longest expected life time.

Functional features

- Self-powered from a single phase current as low as $0,6 I_n$ or from $0,5 I_n$ when all 3 phases contribute energy;
- Permissible permanent overloading, in a case of unsuccessful fault disconnection is $8 \times I_n$ at 25°C ambient;
- Standard model: $I_n = 1 \text{ A}$; $T_s = 10 \text{ s}$, independent timing; On request: $I_n = 5 \text{ A}$; $T_s = (2\text{s}; 5\text{s}; 20\text{s})$;
- Inverse time is available on request for long life models;
- Starter for alarming and external blockade are built-in for cooperation with superior control level.

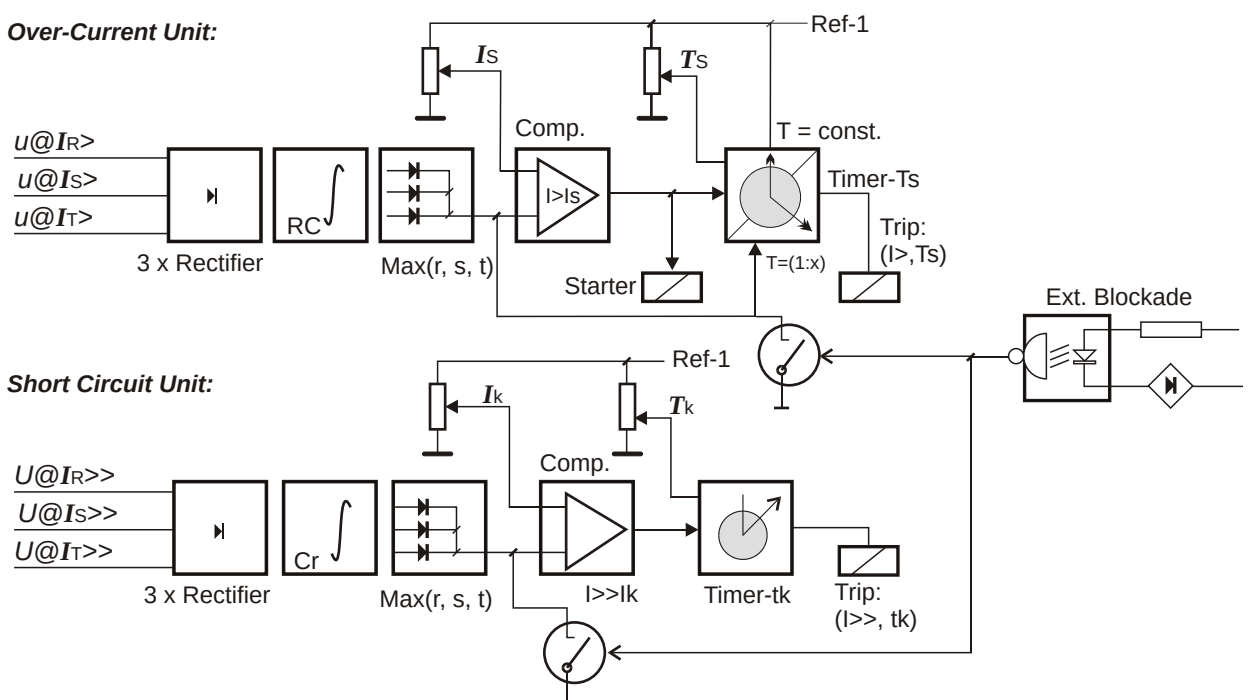
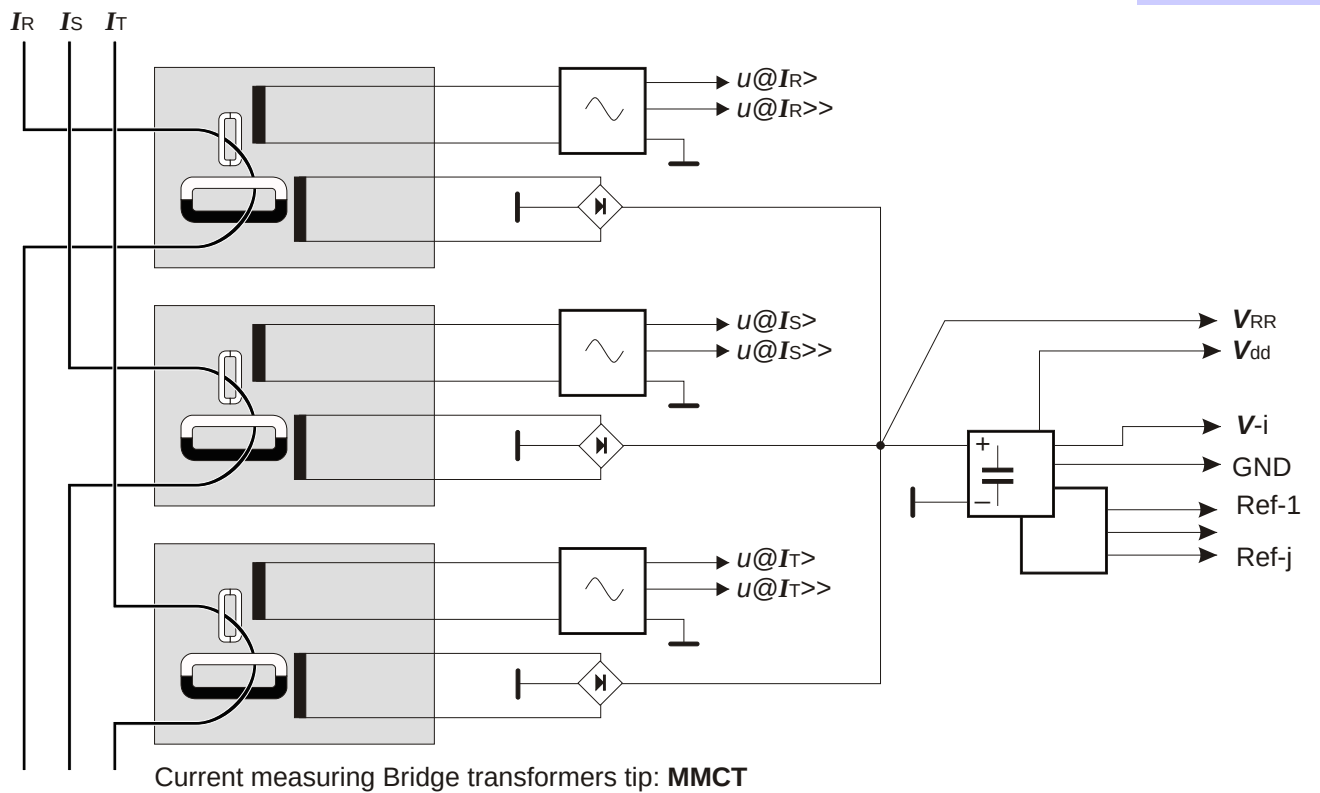


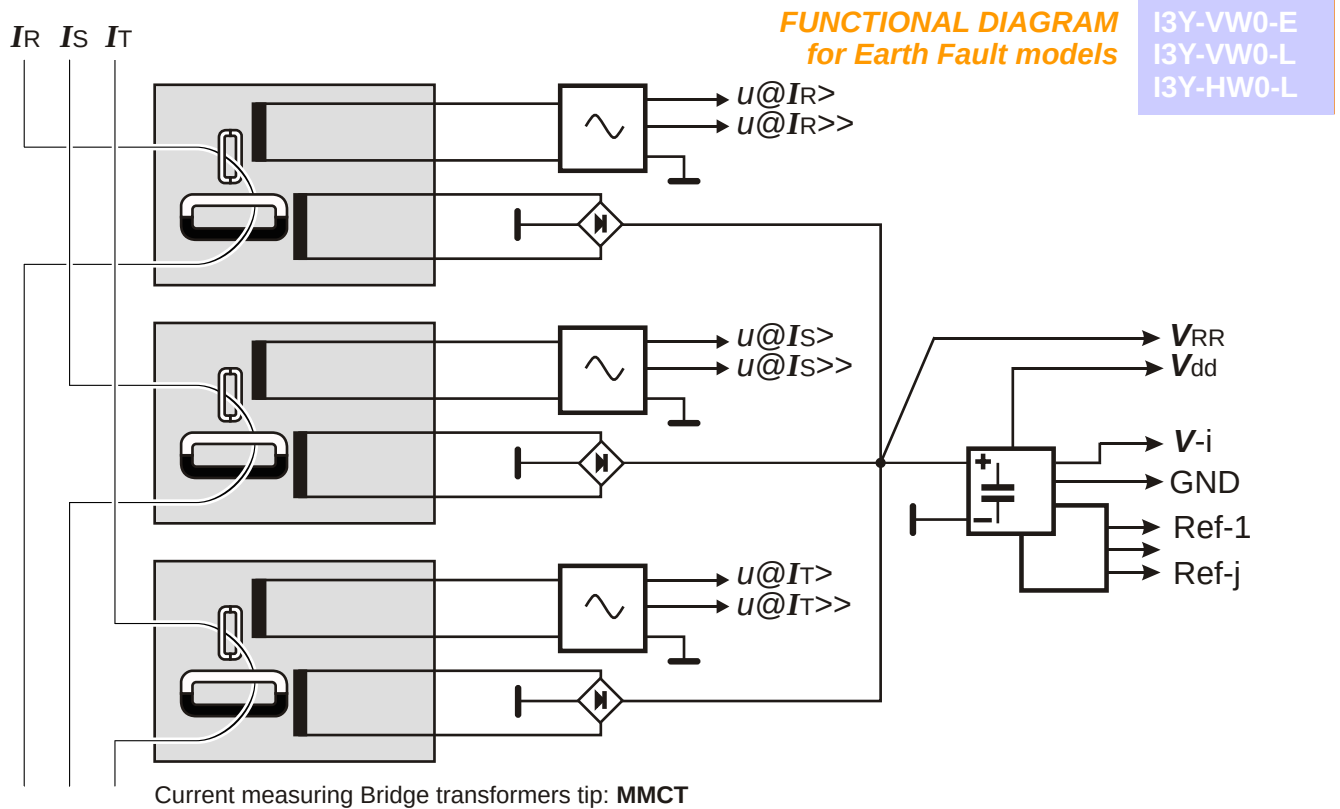
I3Y-vw-E5
Economy model



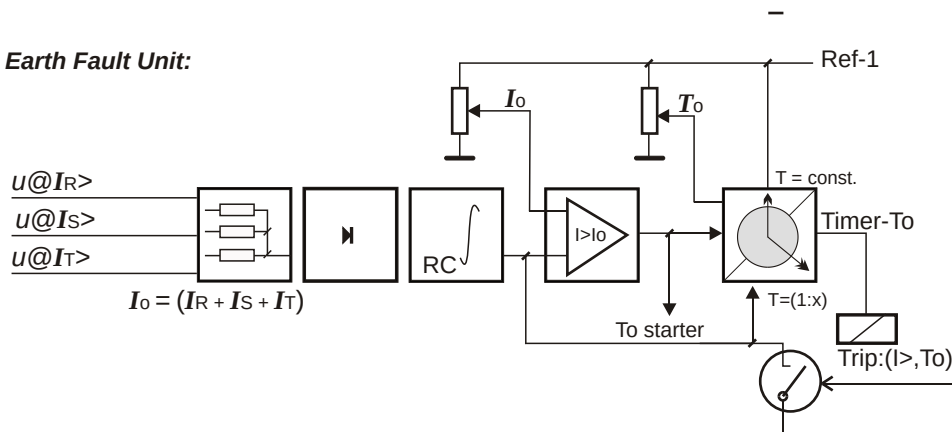
I3Y-VW0-E1
Model with delayed
Earth Fault Relay

FUNCTIONAL DIAGRAM for standard models

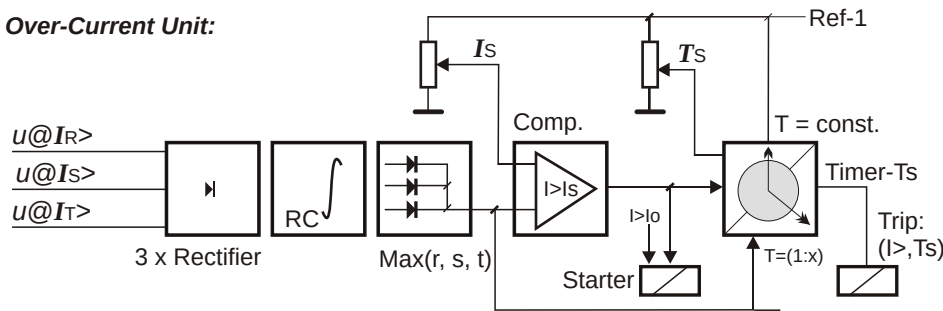




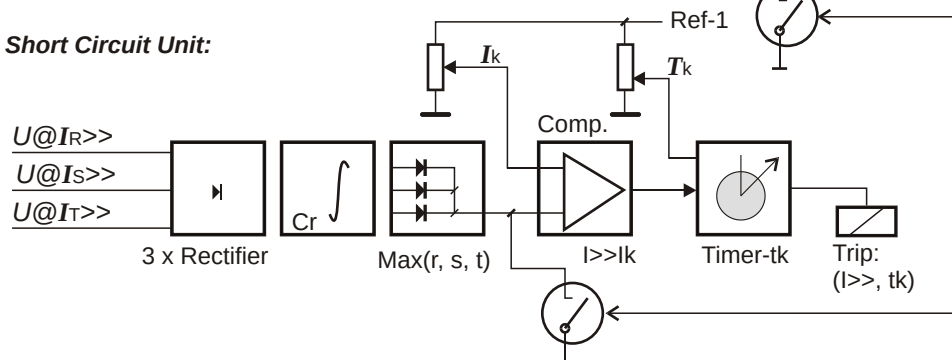
Earth Fault Unit:



Over-Current Unit:

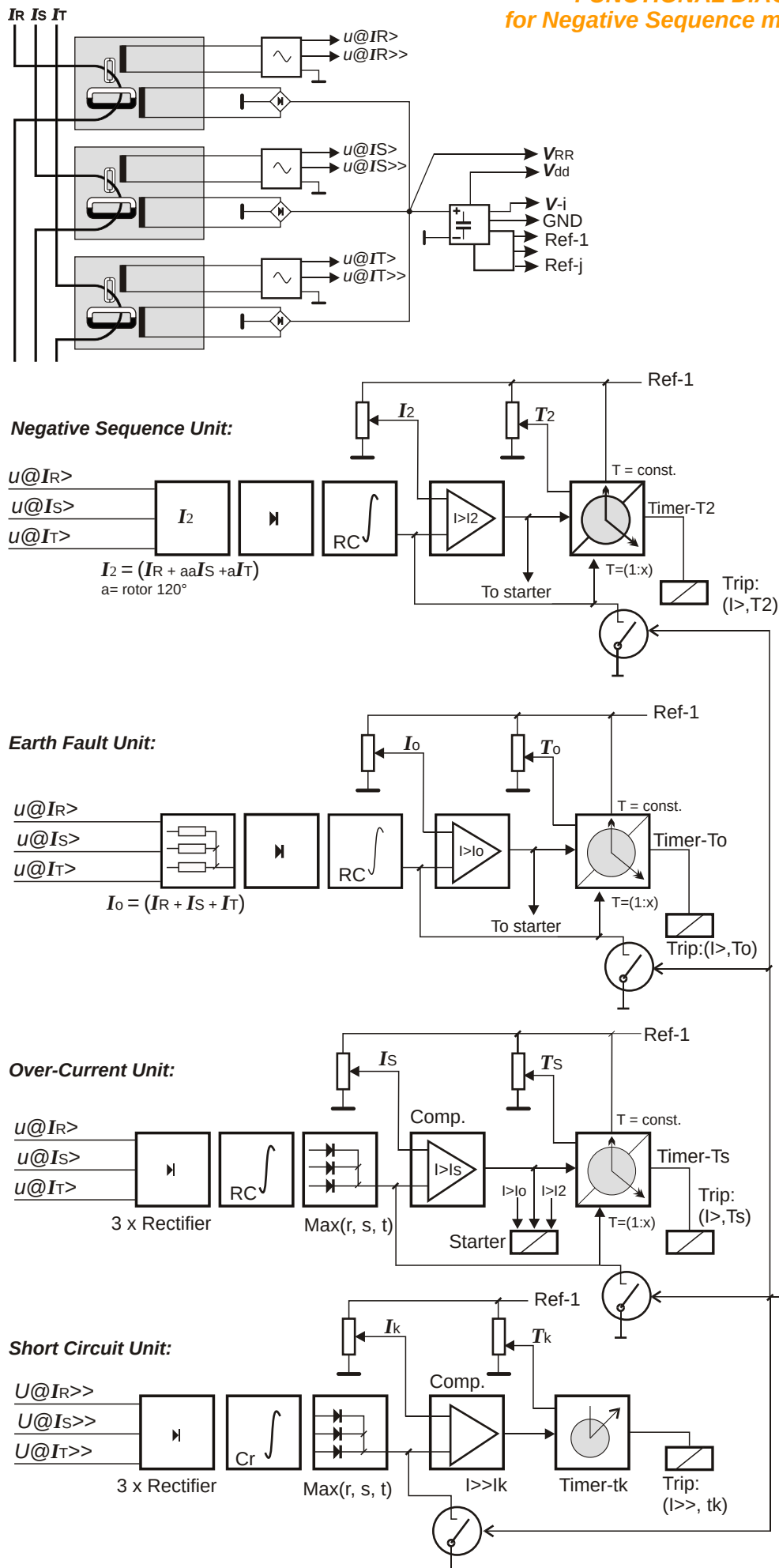


Short Circuit Unit:

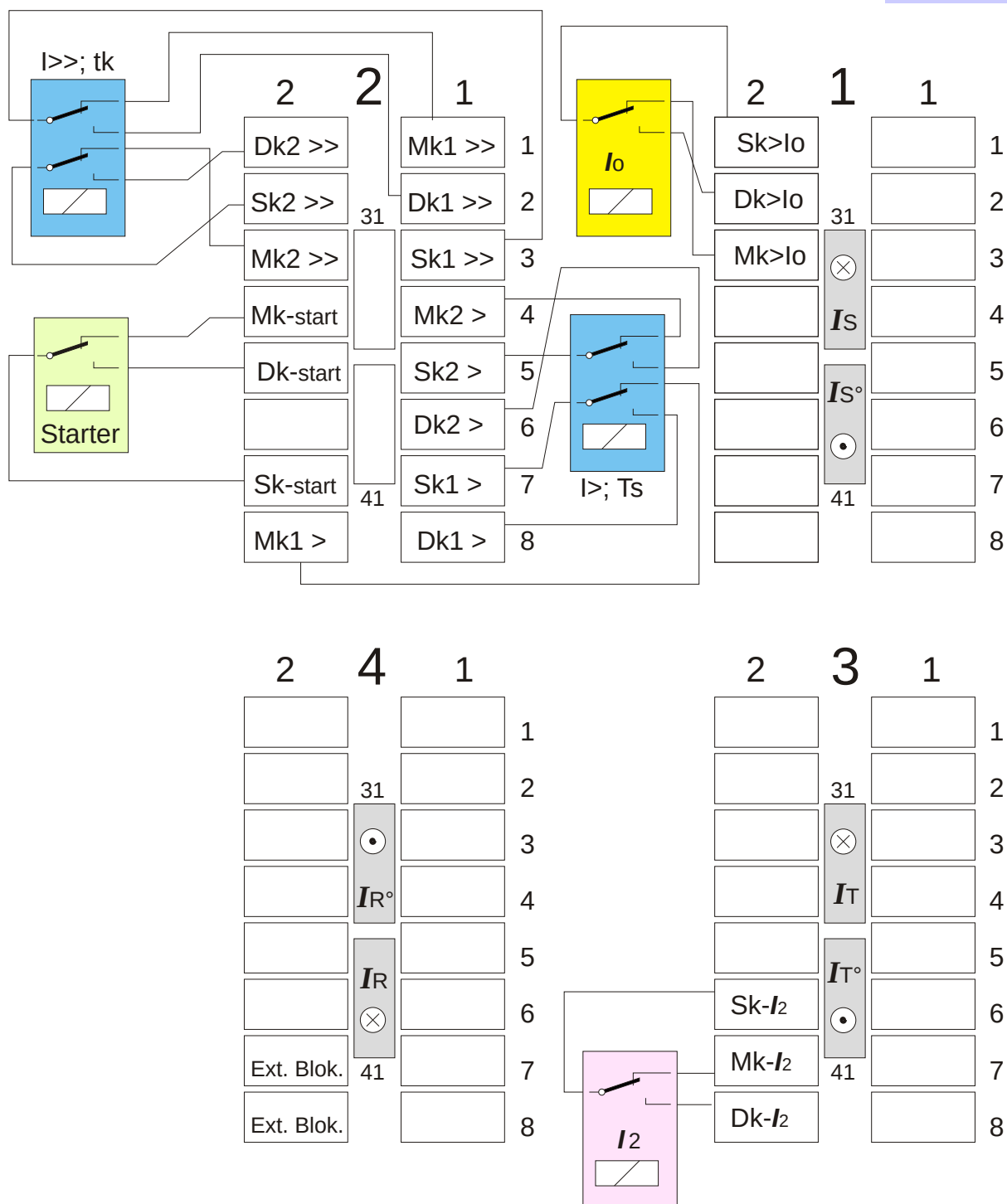


FUNCTIONAL DIAGRAM for Negative Sequence models

I3Y-VW02-E
I3Y-VW02-L
I3Y-HW02-L
I3Y-VW02-B



TERMINAL DATA
 View to pin terminals of the Hx4 housing

 I3Y-~-E
 I3Y-~-L


The table is showing output relays of various models:

note: "+" built-in relay;
 "-" not present terminals.

for models:

	I>; Ts	I>; tk	Starter	Io>; To	I2>; T2
I3Y-VW-L	+	+	+	-	-
I3Y-VW2-L	+	+	+	-	+
I3Y-VW-E	+	+	-	-	-
I3Y-VR0-L	+	+	+	+	-
I3Y-VW0-E	+	+	-	+	-
I3Y-VW02-L	+	+	+	+	+

REMOTE ADAPTIVE PROTECTION

I3Y-VW02-C

Functions:

- Over-current, delayed relay;
- Short circuit, retarded protection;
- Earth fault, delayed relay;
- Negative sequence, delayed relay;
- Starter, momentary alarming relay;
- Infra red serial, bidirectional gate;
- Blocking input, via opto insulator;

Local setting options:

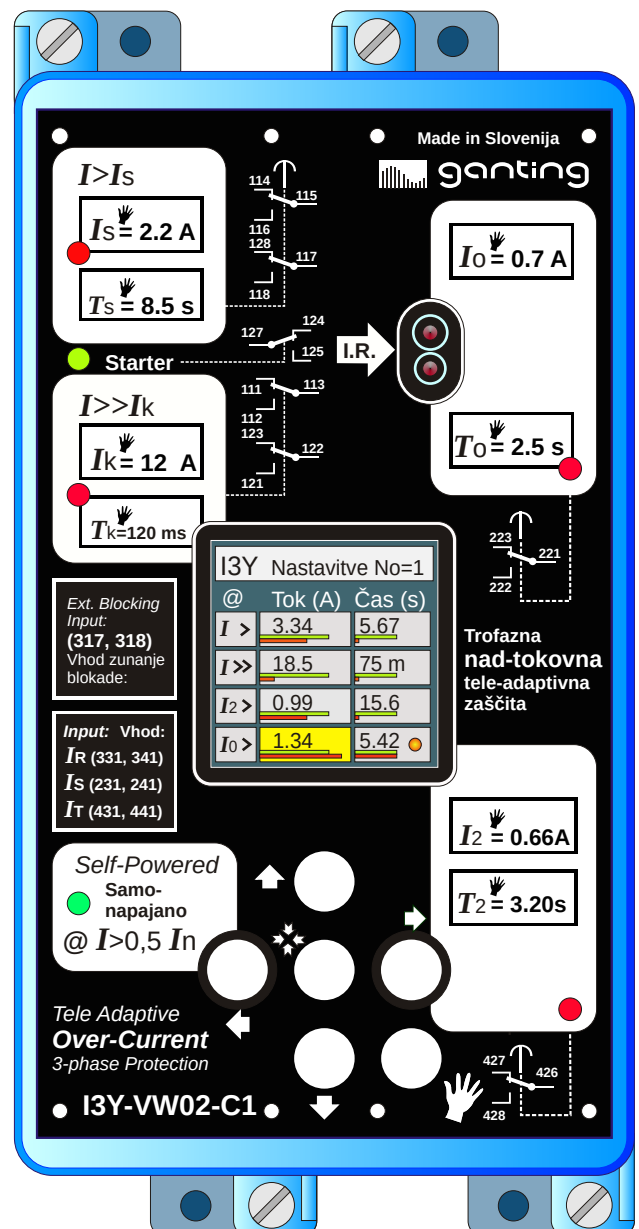
- By front panel keys and display;
- By mobile phone or by palm computer via IR link;
- By fibre connection to station computer;

Remote setting options:

- By mobile phone, permanently installed in relay room;
- By fibre connection to repeteur, linked to optical "high way ring".

Features:

- Self powered Real time relay, set by front panel computer;
- Minimized number of parts for setting;
- Build in front panel computer supervises communication and setting conformity;
- Detection of any compute's or communication fault, switches to manual settings;
- After disappearance of fault, the computer setting is restored automatically;
- During setting procedure, computer changes to manual set values;



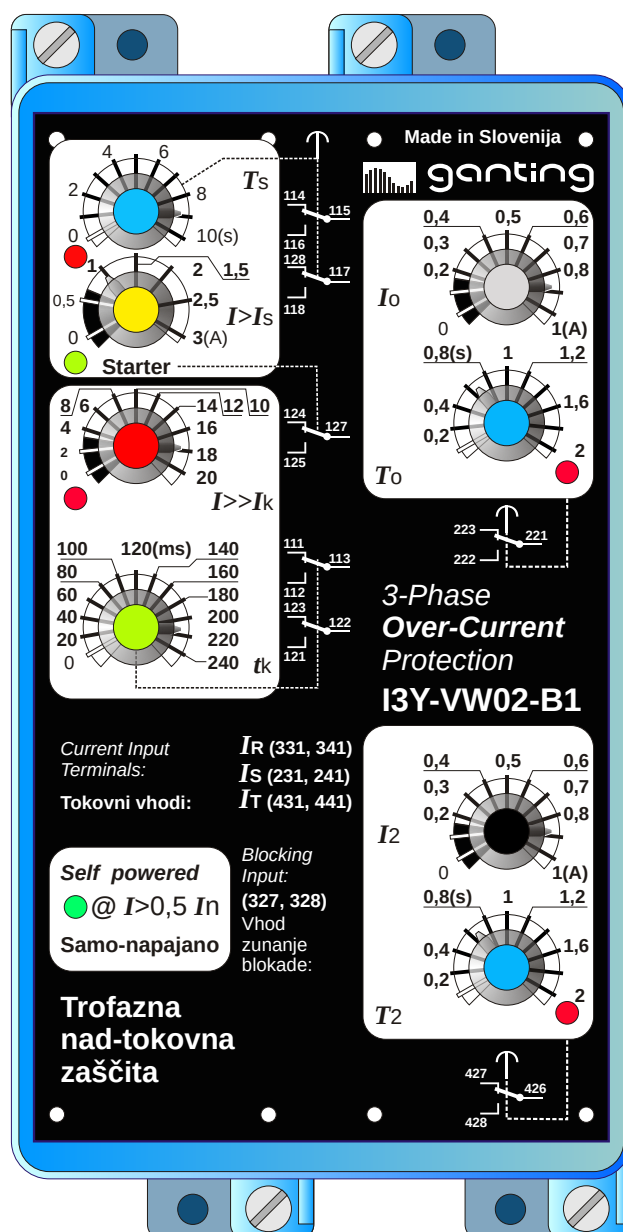
NEGATIVE SEQUENCE AND EARTH FAULT RELAY

Box design

I3Y-VW02-B

Functions:

- Over-current, delayed relay;
- Short circuit, retarded protection;
- Earth fault, delayed relay;
- Negative sequence, delayed relay;
- Starter, momentary alarming relay;
- Blocking input, via opto insulator;



TERMINAL DATA
View to pin terminals of the Hx4 housing

I3Y-VW02-C
I3Y-VW02-B

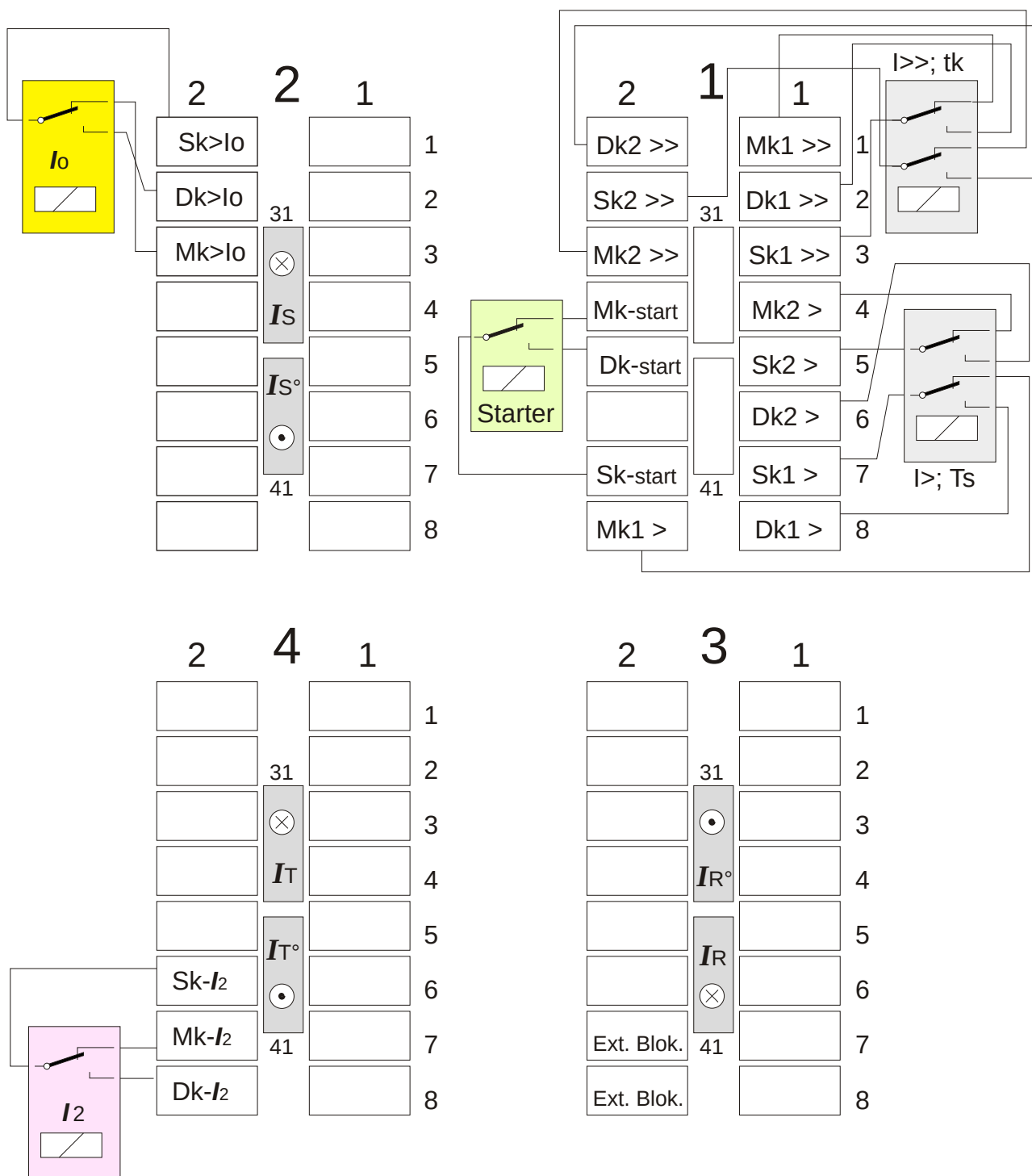
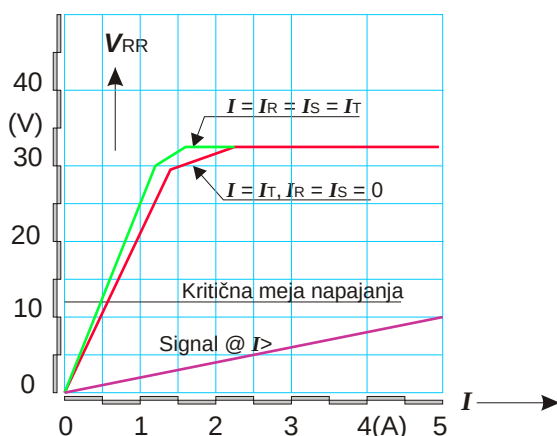


Table :

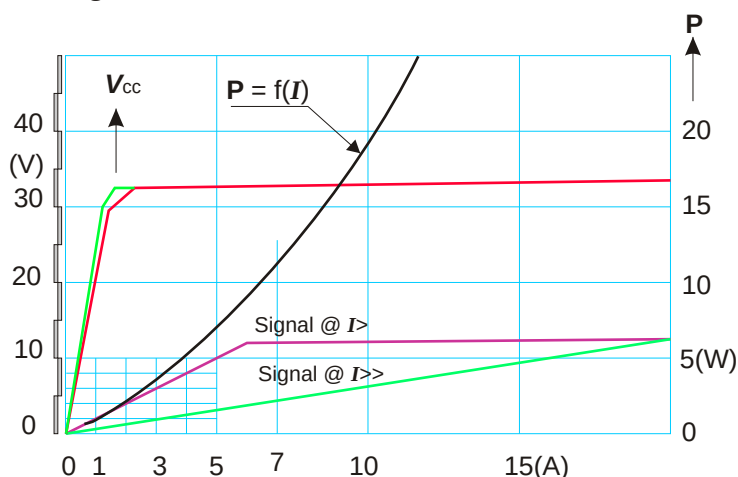
Parameter		Min.	Nom.	Max.	Unit	Conditions
Over-current relay						
Nominal Current	I_n		1 5		A A	Recommended on request
Setting range	I_s	0,5 0,6		3 3	I_n I_n	for 3 phase input for 1 phase input
Repetition accuracy			2		%	of scale range
Setting accuracy				5	%	of full scale
Reset Ratio (pick-up\drop-out)			95		%	of full scale
Time delay setting range	T_s	1		10	s	standard range 10s on request: (0,2 - 2)s, (0,5 - 5)s and (2 - 20)s.
Repetition accuracy			2		%	of scale range
Setting accuracy				5	%	of full scale
Reset Time		50	66	130	ms	Recovery done
Short circuit protection						
Setting range	I_k	4 18		20 75	A A	$I_n = 1A$ $I_n = 5A$
Inserted time delay setting range	t_k	0		240	ms	
Pick up time	t_p	20		35	ms	$I = 2 \times I_k$, at $t_k = 0$
Earth fault protection						
Setting range	I_o	0,2		0,5	I_n	of scale range
Repetition accuracy			5		%	of full scale
Setting accuracy				5	%	of full scale
Reset Ratio (pick-up\drop-out)			95		%	of full scale
Time delay setting range	T_o	0,2		2	s	standard range 2s on request: (1, 5, 10, 20)s
Repetition accuracy			5		%	of scale range
Setting accuracy				5	%	of full scale
Reset Time		50		100	ms	Recovery done
Power dissipation						
Nominal	P_n			0,5	W	per each Phase $I = I_n$
Dual				2	W	$I = 2 I_n$
Quard				5	W	$I = 4 I_n$
Continuous single phase fault line current	I_1			6,5	I_n	dissipation = 10W per housing; $T_{Amb} = 20^\circ C$
Continuous 3 phase fault line current	I_3			3,2	I_n	
Ambient Temperature	T_{Amb}	-10		+55	$^\circ C$	operating range
Storage Temperature		+5 -25		+45 +75	$^\circ C$ $^\circ C$	standard accuracy
Blocking input:						
Voltage range - Active		48	220	242	V	all timers and outputs momentarily disabled
- Not active		0		15	V	
Contact rating:						
Making capability				8	A	L/R < 20 ms; 100V d.c.
Breaking capacity - d.c.				0,05	A	
D.c. Breaking capacity via arc suppressor				5	A	L/R < 40 ms; 264V d.c.
Test Voltage (50Hz; 1min.)				2,5	kV _{rms}	between all d.c. Separated circuits

Figure 1:



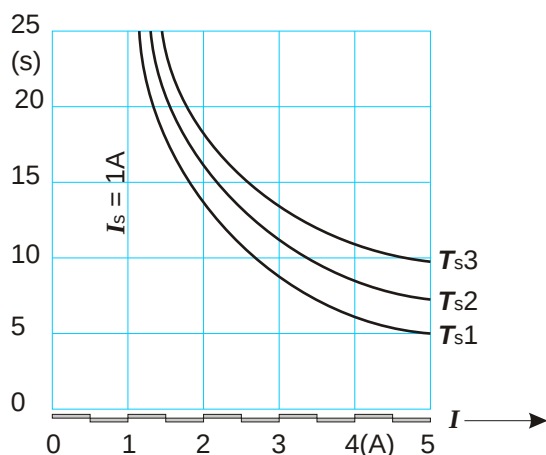
Relay Supply Voltage V_{RR} as a function of input current I . The upper curve for 3-phase and lower for single phase feed in. The lowest line is the phase input signal, scaled to match the over-current " $I>$ comparator".

Figure 2:



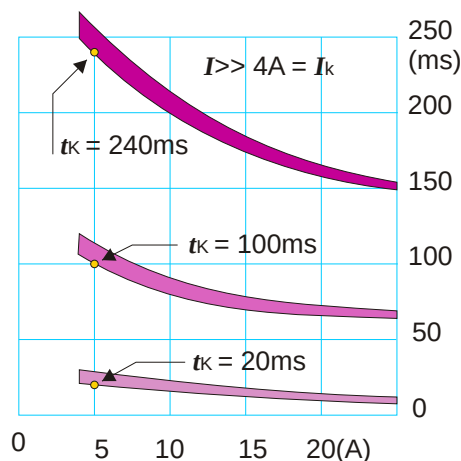
Increasing of thermal dissipation P by single phase feed-in current I . The bottom of the diagram shows the phase signal at the input of short circuit " $I>>$ comparator".

Figure 3:



Hyperbolic (1:x) time delay contraction at inverse delayed over-current protection, as a function of over-reach of set reference current set on the scale I_S , at the selected time on the delay T_s scale.

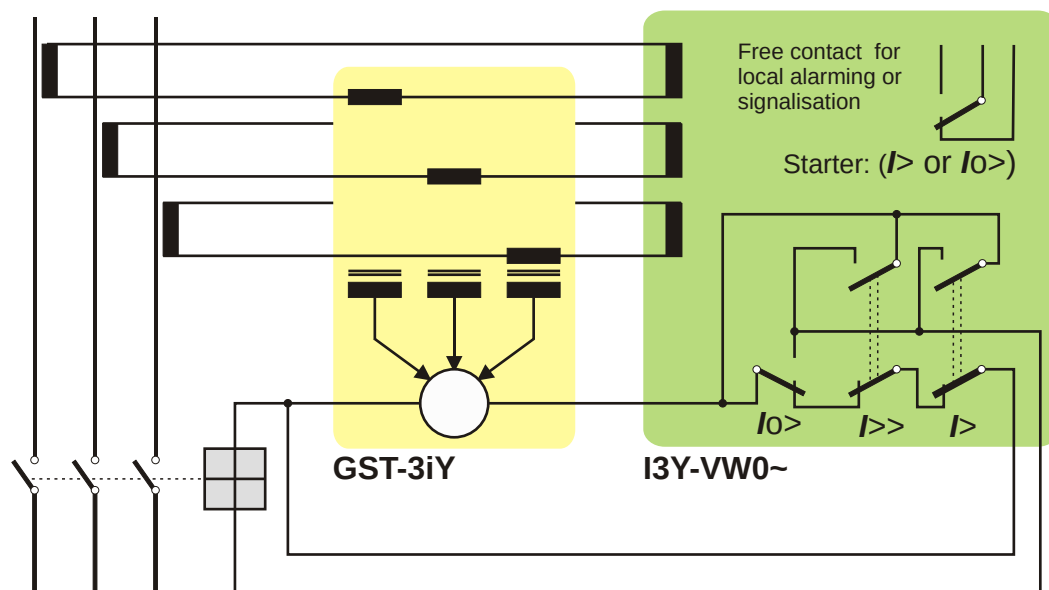
Figure 4:



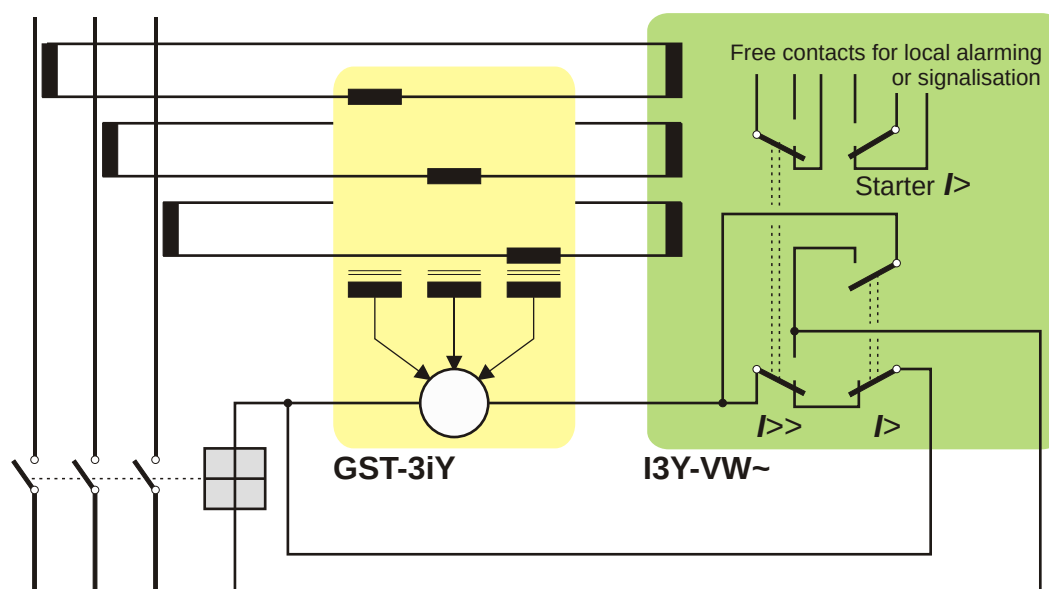
Short circuit relay switching times for 3 different time delay settings as a function of input current at minimum $I>>$ setting $I_k = 4A$.

APPLICATION
Inductive tripping unit

I3Y


Figure 1:

Connection of autonomy relay **I3Y~** containing delayed over-current, short circuit and delayed earth fault protection. Current transformers of magnet trigger unit **GST-I3Y** are in normal operating state bypassed by break contacts of individual stages. If any of the stages become active, the chain of break contacts is opened - trigger current transformers are "inserted" in tripping coil loop.


Figure 2:

Connection of autonomy relay **I3Y~** containing only delayed over-current and short circuit protection. Free contacts of **I3Y~** are at disposal either for alarming or for local automatisisation.

APPLICATION
Capacitive Tripping Unit type: GCN-3~

I3Y

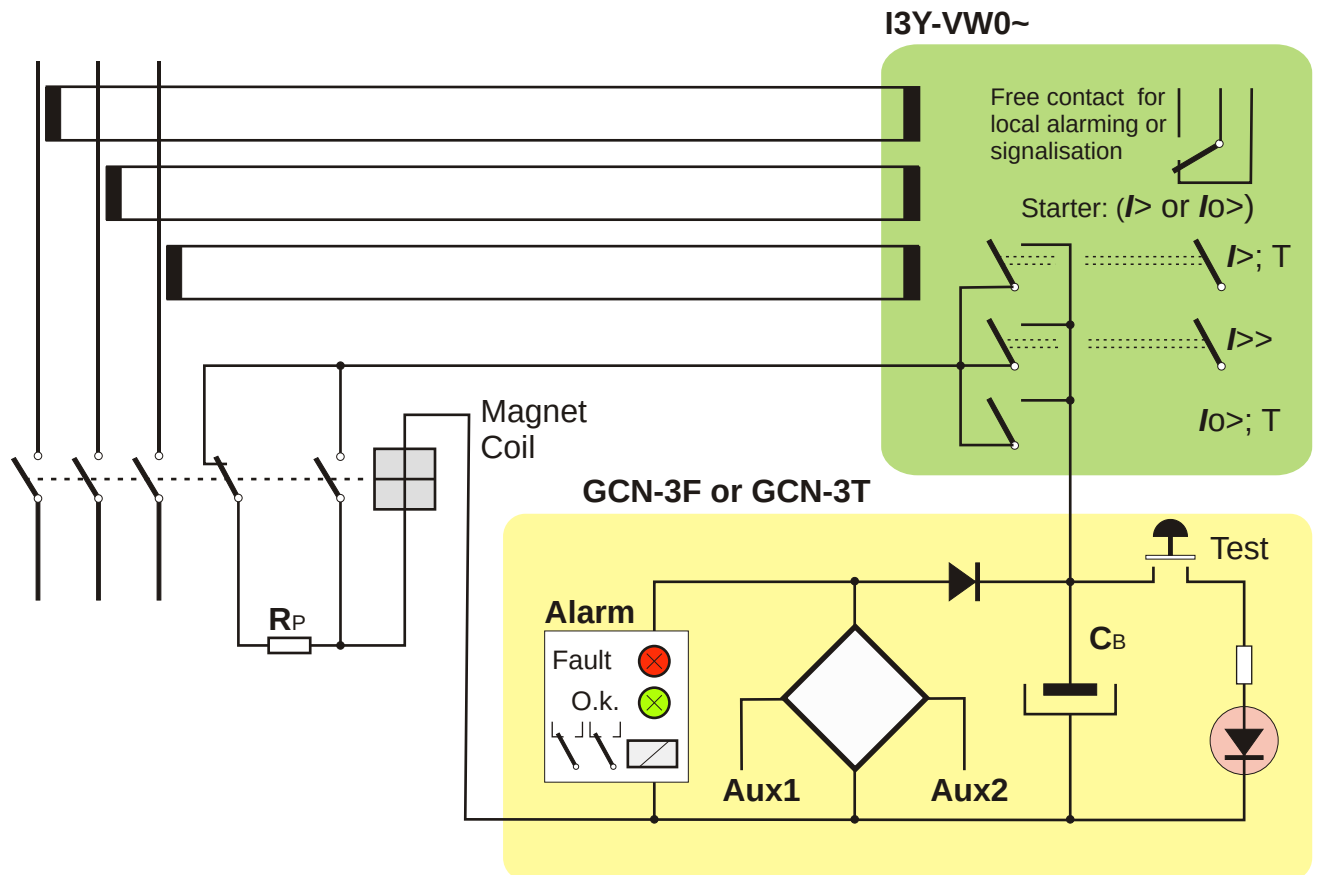


Figure 3:

is showing the basic connection for back up protection using self powered over-current relay type **I3Y~**, connected via the capacitive triggering unit type **GCN-3~** to trip high power tripping coil. Output contacts of all stages are wired parallel to enable either stage to trip and clear the fault out. Alarm relay employs 2 auxiliary contacts of the circuit breaker. N.c. Contact has a line resistor **R_P** in the loop, to supervise the off position of the circuit breaker. To guard the closed circuit breakers tripping loop there is the n.o. Auxiliary contact. Alarm relay's function is to announce too low voltage level on the buffer capacitor **C_B**. Energy stored in **C_B** is entering via terminals **Aux1** and **Aux2**. Auxiliary supply can be either d.c. battery or phase voltage.

APPLICATION

I3Y

Capacitive Tripping Unit type: GCN-3~
with Arc suppressor type: AS-250V/5A

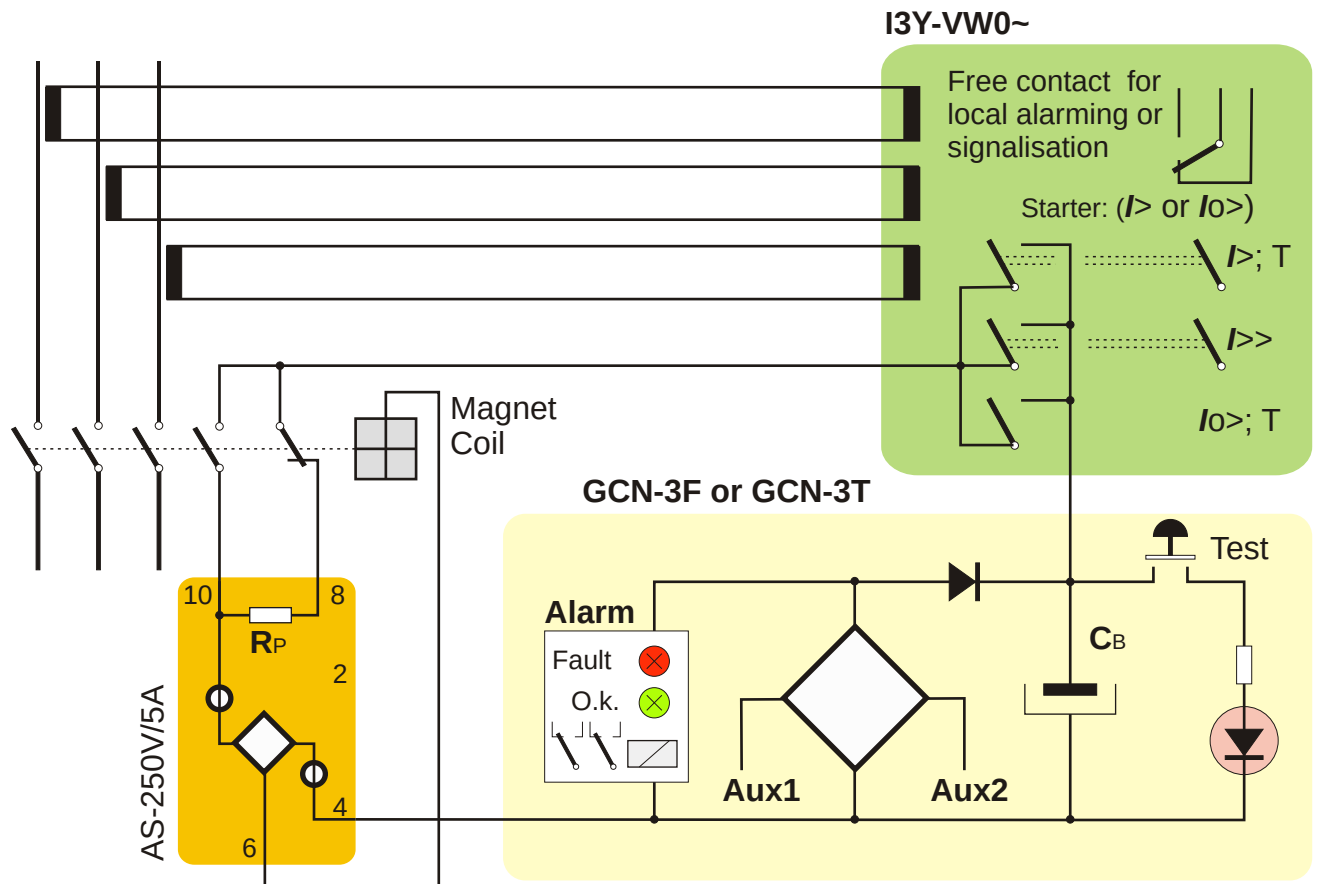


Figure 4:

displays similar autonomy o/c protection as previous figure, improved by arc suppressor type "AS-250V/5A". Main duty of arc suppressor is to inhibit the inductive energy of tripping coil to discharge through opening contact. Rectifier-bridge, parallel to the coil, does not prolong the tripping time. L/R time constant has an influence only at magnet releasing. Line resistor is included in mentioned arc suppressor and serves for "2-wire supervision" of disconnected position of circuit breaker. Recommended location for arc suppressor is close to magnet coil.