



## SEK-01 Secondary Protection Relay Over Current Protection

- 16 pcs memory
- LCD display
- Control by touch key
- 24Vdc
- 110Vdc/ac
- 230Vac/dc power supply option

### General

Secondary protection relay is designed to protect high voltage engines, transformers, generators, power transmission lines against short circuit between 2 phase or phase to earth and against case of any short circuit to earth. It has 3 phase and earth control. It can be connected to protect only 3 phases or 2 phases and earth according to usage preference. It can be set in various time modes (definite or inverse). Easy to monitor of instantaneous secondary current of 3 phases and earth at the same time on LCD display. Also date and time can be monitored at the right bottom of the LCD display rotatively. Memory unit indicates the phase which one has Dropout, dropout current value, time/date when dropout happened of last 16 datas.

**RUNNING:** When power put on, if currents within normal range, phase normal and earth normal LED light comes on. Data of secondary current drawn of each phases and date / time are shown on display. In case of current is over than normal range (lower than sudden dropout value) indicator led light "normal" keep flashing during selected period. In case of current's value return to normal values before the selected time is up, then "normal" led light comes on back and came it out of fault mode. In case of current is over than normal range until time is up, "normal" led light came off and "fault" led light comes on and related relay's (phase or earth) contact get on and off for 0,5 sec (time-delay turn on mode). In case of current is over than sudden dropout value then "normal" led light indicator turns off and "fault" led comes on and related relay's (phase or earth) contact get on and off for 0,5 sec (sudden turn on). Relay shows "fault" mode until to press "reset" button when break circuit happen. Protection begin when current over than 1,1 times set value.

**SYSTEM SCREEN:** when operating normally, LCD screen shows secondary current of 3 phases and earth at the same time. Also date and time can be monitored at the right bottom of the LCD display rotatively.

IR	IS	IT
03,2	03,1	03,1
00,0	01 / 01 / 2003	
GROUND	DATE - TIME	

IR	IS	IT
03,2	03,1	03,1
00,0	12:00	
GROUND	DATE - TIME	

**RESET:** "RESET" button must be pushed to activate device again after any dropout or test operation. Device reset itself automatically in case of circuit breaker's cut off without any pushing to "RESET" button. In case of any dropout, if system still consume power (if circuit breaker has a mechanical problem) it warn user writing "circuit breaker problem" on the screen. In this case device must reset via pushing "RESET" button after problem is fixed with circuit breaker.

RESET DONE

CİRCUIT BREAKER PROBLEM

**TEST:** In case of pushing "Test" button accidentally, "Test başlasın mı?" is indicated on the display so that prevent any unwanted dropout. If it want to be tested, pushed the "TEST" button one more time and then time of sudden dropout factor and dropout's time curve what phase and earth set began count down. Respectively which ever reach the "zero" value (phase, earth) then the "Fault" led comes on and related relay's contact get on and off for 0,5 sec. Fault comes out of test mode when "RESET" button is pushed after test operation done and device get active 3 sec. Later.



### DROPOUT :

When dropout occur, these informations appear on the screen (see on the right) continues to appear until reset.

01/01/2003	12:00
IR=25,0 A	Sudden

01/01/2003	12:00
IR=18,3 A	Delayed

**IMPORTANT :** While program is on, current measuring and dropout operation stay continuously. When dropout happen, if there is any operation running with the program, it comes out of the program and informations about dropout is indicated on the display. In this case updates with program may not be saved.

### Parameters

#### TIME MODE SELECTION:

Push 'PROG' button to set parameters. Parameter selection will appear on the screen (see on the right). 'TERS ZAMANLI (INVERSE TIME)' or 'SABİT ZAMANLI (DEFINITE TIME)' is selected by ▲ and ▼ buttons. In case of do not push any button for 20 sec. last status is saved and program is out. If 'PROG' button is pushed before 20 sec. Is up data is saved and next parameter come up. In case of selecting 'TERS ZAMANLI' mode, one of 3 kind of curve mode should be selected with next parameter. If 'SABİT ZAMANLI' is selected, curve mode selection is skipped. ESC button is pushed to come out of the program.

INVERSE - TIME (DEPENDENT)  
DEFINITE - TIME (FREE)

#### CURVE MODE SELECTION:

Curve mode selection is done using ▲ and ▼ buttons. One of 'normal ters, çok ters, aşırı ters' modes is selected. Each mode has 10 different time curve. One of these curves would be choosed later. ESC button is pushed to come out of program.

INVERSE - TIME NORMAL INVERSE  
INVERSE - TIME NORMAL INVERSE  
INVERSE - TIME NORMAL INVERSE

#### PHASE DROPOUT CURRENT SET:

Dropout current set is done using ▲ and ▼ buttons. It can be set range 2,5 Amp. and 10 Amp. If 'PROG' button is pushed when desired dropout current value is selected, data is saved and next parameter comes up. When current of system is over than 1,1 times of dropout current value, related curve time or fixed time begin running. ESC button is pushed to come out of program.

I > (A) = 4,8 AMP max Phase Current

#### PHASE SUDDEN DROPOUT SET:

Phase Sudden Dropout Set is done using ▲ and ▼ buttons. It can be set range 2 x In and 10 x In. If 'PROG' button is pushed when desired Phase Sudden Dropout value is selected, the data is saved and next parameter comes up. The moment when current of system is over than cross of dropout current value and selected sudden dropout value; dropout happen directly without counting. ESC button is pushed to come out of program. Sudden Dropout = System Current > (dropout current value) x (phase sudden dropout value)

I >>= kxI > 3 PHASE Sudden Dropout Factor

#### PHASE DELAY TIME OR CURVE:

Selection is done ▲ and ▼ buttons. In case of Opposit Time is selected , there are 10 different curve option range 0,1 and 1,0. In case of Fixed Time is selected, there is time option range 1 sec. and 10 sec. Each curve mode of 3 has different formula. Factor value at formula of selected curve mode is described by set curve value. So that 10 different time curve occur. Towards from closest of center to farrest of center, set current / delay time curve must be selected biggest through smallest. ESC button is pushed to come out of program.

t = 0,4 curve PHASE Dropout Time  
In case of Inverse Time  
t = 4 sec PHASE Dropout Time  
In case of Definite Time

#### GROUND TIME MODE SELECTION:

Selection of Opposit time or Fixed time of earth also done independent of phase time mode using ▲ and ▼ buttons.

GND. INV. TIME ↑  
GND. DFNT. TIME ↓

#### GROUND DROPOUT CURRENT SET:

Dropout Current selection is done using ▲ and ▼ buttons. It can be set from 0,6 Amp. To 3 Amp. If 'PROG' button is pushed when desired Earth Dropout Current value is selected, information is saved and next parameter comes up. When earth short circuit current value is over than 1,1 times of earth dropout current value, related curve time and fixed time begin running. ESC button is pushed to come out of program.

I > (A) = 1,0 AMP max Ground Current

#### GROUND SUDDEN DROPOUT SET:

Earth Sudden Dropout selection is done using ▲ and ▼ buttons. It can be set range 2 x In and 10 x In. If 'PROG' button is pushed When desired Earth Sudden Dropout value is selected, the data is saved and next parameter comes up. The moment when earth short circuit current value is over than cross of earth dropout current value; dropout happen directly without counting. Sudden dropout = Earth short circuit current > (Earth dropout current value) x (Earth sudden dropout value)

I >>= kxI > 3 TOPR. Sudden Dropout Factor

**GROUND DELAY TIME OR CURVE:**

Selection is done ▲ and ▼ buttons. In case of Opposit Time is selected, there are 10 different curve option range 0,1 and 1,0. In case of Fixed Time is selected, there is time option range 1 sec. and 10 sec. Each curve mode of 3 has different formula. Factor value at formula of selected curve mode is described by set curve value. So that 10 different time curve occur. Towards from closest of center to farrest of center, set current / delay time curve must be selected biggest through smallest. ESC button is pushed to come out of program.

t=0,4.curve GND. Dropout Time  
In case of Inverse Time  
t = 4 sec GND Dropout Time  
In case of Definite Time

**DATE and TIME SET:**

Day, month, year, hour and minute come up sequently by each next pushing to 'ESC' button. ▲ and ▼ buttons are used for setting. Then push 'PROG' button to save all datas and then come out of program. In case of 'ESC' button is pushed, menu comes out of program without saving.

HOURLY-DATE SET  
01/01/2003 12:00

**MEMORY**

Push 'ESC' button to input memory. First memory informations are indicated on the display for 3 sec. and then first saved data(m00) comes up. Using ▲ and ▼ buttons, last 16 datas(m00-m16) saved to memory can be seen in date sequently. ESC button is pushed again to come out of memory.

MEMORY  
Dropout Information  
01/01/2003 12:00  
IR=12,4 Amp m00

**CURVE MODES and CURVE SELECTIONS:**

3 different of curve mode can be selected. These are "normal ters(Inverse)", "çok ters(Very Inverse)", "aşırı ters(Extremely Inverse)" modes. Function formula of each one and the table of times depend curve numbers as below. Desired current / time curve is selected via this table.

Inverse	I/Is	t = $\frac{0,14}{0,02} \times T_p(s) - 1$																
		1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0	7,5	8,0	8,5	9,0	9,5
Tp = 0,1 için t (sn)	1,71	1,00	0,75	0,63	0,55	0,49	0,45	0,42	0,40	0,38	0,36	0,35	0,34	0,33	0,32	0,31	0,30	0,29
Tp = 0,2 için t (sn)	3,42	2,00	1,50	1,26	1,10	0,98	0,90	0,84	0,80	0,76	0,72	0,70	0,68	0,66	0,64	0,62	0,60	0,58
Tp = 0,3 için t (sn)	5,13	3,00	2,25	1,89	1,65	1,47	1,35	1,26	1,20	1,14	1,08	1,05	1,02	0,99	0,96	0,93	0,90	0,87
Tp = 0,4 için t (sn)	6,84	4,00	3,00	2,52	2,20	1,96	1,80	1,68	1,60	1,52	1,44	1,40	1,36	1,32	1,28	1,24	1,20	1,16
Tp = 0,5 için t (sn)	8,55	5,00	3,75	3,15	2,75	2,45	2,25	2,10	2,00	1,90	1,80	1,75	1,70	1,65	1,60	1,55	1,50	1,45
Tp = 0,6 için t (sn)	10,26	6,00	4,50	3,78	3,30	2,94	2,70	2,52	2,40	2,28	2,16	2,10	2,04	1,98	1,92	1,86	1,80	1,74
Tp = 0,7 için t (sn)	11,97	7,00	5,25	4,41	3,85	3,43	3,15	2,94	2,80	2,66	2,52	2,45	2,38	2,31	2,24	2,17	2,10	2,03
Tp = 0,8 için t (sn)	13,68	8,00	6,00	5,04	4,40	3,92	3,60	3,36	3,20	3,04	2,88	2,80	2,72	2,64	2,56	2,48	2,40	2,32
Tp = 0,9 için t (sn)	15,39	9,00	6,75	5,67	4,95	4,41	4,05	3,78	3,60	3,42	3,24	3,15	3,06	2,97	2,88	2,79	2,70	2,61
Tp = 1,0 için t (sn)	17,10	10,00	7,50	6,30	5,50	4,90	4,50	4,20	4,00	3,80	3,60	3,50	3,40	3,30	3,20	3,10	3,00	2,90

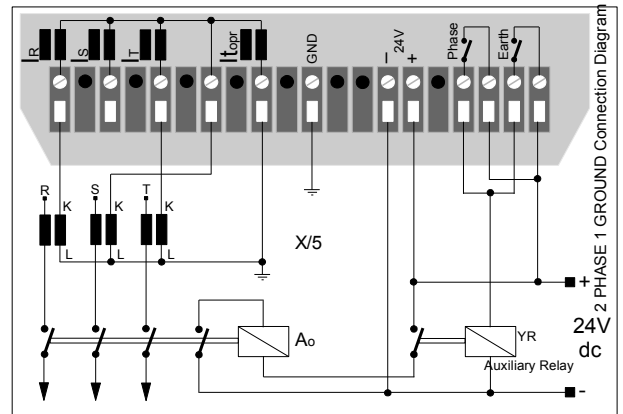
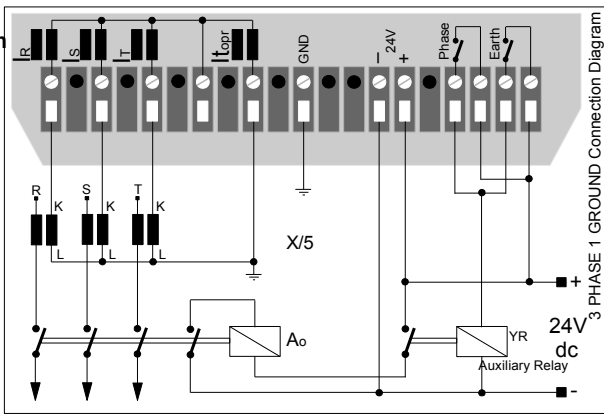
  

Very Inverse	I/Is	t = $\frac{13,5}{(I/Is) - 1} \times T_p(s)$																
		1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0	7,5	8,0	8,5	9,0	9,5
Tp = 0,1 için t (sn)	2,70	1,35	0,90	0,67	0,54	0,45	0,38	0,33	0,30	0,27	0,24	0,22	0,20	0,19	0,18	0,17	0,16	0,15
Tp = 0,2 için t (sn)	5,40	2,70	1,80	1,34	1,08	0,90	0,76	0,66	0,60	0,54	0,48	0,44	0,40	0,38	0,36	0,34	0,32	0,30
Tp = 0,3 için t (sn)	8,10	4,05	2,70	2,01	1,62	1,35	1,14	0,99	0,90	0,81	0,72	0,66	0,60	0,57	0,54	0,51	0,48	0,45
Tp = 0,4 için t (sn)	10,80	5,40	3,60	2,68	2,16	1,80	1,52	1,32	1,20	1,08	0,96	0,88	0,80	0,76	0,72	0,68	0,64	0,60
Tp = 0,5 için t (sn)	13,50	6,75	4,50	3,35	2,70	2,25	1,90	1,65	1,50	1,35	1,20	1,10	1,00	0,95	0,90	0,85	0,80	0,75
Tp = 0,6 için t (sn)	16,20	8,10	5,40	4,02	3,24	2,70	2,28	1,98	1,80	1,62	1,44	1,32	1,20	1,14	1,08	1,02	0,96	0,90
Tp = 0,7 için t (sn)	18,90	9,45	6,30	4,69	3,78	3,15	2,66	2,31	2,10	1,89	1,68	1,54	1,40	1,33	1,26	1,19	1,12	1,05
Tp = 0,8 için t (sn)	21,60	10,80	7,20	5,36	4,32	3,60	3,04	2,64	2,40	2,16	1,92	1,76	1,60	1,52	1,44	1,36	1,28	1,20
Tp = 0,9 için t (sn)	24,30	12,15	8,10	6,03	4,86	4,05	3,42	2,97	2,70	2,43	2,16	1,98	1,80	1,71	1,62	1,53	1,44	1,35
Tp = 1,0 için t (sn)	27,00	13,50	9,00	6,70	5,40	4,50	3,80	3,30	3,00	2,70	2,40	2,20	2,00	1,90	1,80	1,70	1,60	1,50

Extremely Inverse	I/Is	t = $\frac{80}{(I/Is)^2} \times T_p(s)$																
		1,5	2,0	2,5	3,0	3,5	4,0	4,5	5,0	5,5	6,0	6,5	7,0	7,5	8,0	8,5	9,0	9,5
Tp = 0,1 için t (sn)	6,40	2,67	1,52	1,00	0,71	0,53	0,41	0,33	0,27	0,23	0,19	0,17	0,14	0,13	0,11	0,10	0,09	0,08
Tp = 0,2 için t (sn)	12,80	5,34	3,04	2,00	1,42	1,06	0,82	0,66	0,54	0,46	0,38	0,34	0,28	0,26	0,22	0,20	0,18	0,16
Tp = 0,3 için t (sn)	19,20	8,01	4,56	3,00	2,13	1,59	1,23	0,99	0,81	0,69	0,57	0,51	0,42	0,39	0,33	0,30	0,27	0,24
Tp = 0,4 için t (sn)	25,60	10,68	6,08	4,00	2,84	2,12	1,64	1,32	1,08	0,92	0,76	0,68	0,56	0,52	0,44	0,40	0,36	0,32
Tp = 0,5 için t (sn)	32,00	13,35	7,60	5,00	3,55	2,65	2,05	1,65	1,35	1,15	0,95	0,85	0,70	0,65	0,55	0,50	0,45	0,40
Tp = 0,6 için t (sn)	38,40	16,02	9,12	6,00	4,26	3,18	2,46	1,98	1,62	1,38	1,14	1,02	0,84	0,78	0,66	0,60	0,54	0,48
Tp = 0,7 için t (sn)	44,80	18,69	10,64	7,00	4,97	3,71	2,87	2,31	1,89	1,61	1,33	1,19	0,98	0,91	0,77	0,70	0,63	0,56
Tp = 0,8 için t (sn)	51,20	21,36	12,16	8,00	5,68	4,24	3,28	2,64	2,16	1,84	1,52	1,36	1,12	1,04	0,88	0,80	0,72	0,64
Tp = 0,9 için t (sn)	57,60	24,03	13,68	9,00	6,39	4,77	3,69	2,97	2,43	2,07	1,71	1,53	1,26	1,17	0,99	0,90	0,81	0,72
Tp = 1,0 için t (sn)	64,00	26,70	15,20	10,00	7,10	5,30	4,10	3,30	2,70	2,30	1,90	1,70	1,40	1,30	1,10	1,00	0,90	0,80

**Control Connection**



**Technical Information**

- Operational Voltage : 24 Vdc
- Operating Range : (0,8 - 1,2)x Un (Un nominal voltage)
- Operational Current (In) : 5A Phase , 1A Earth
- Contact Current : 10A / 24Vdc
- Current Set of Phase Dropout : 2,5 - 10 A
- Phase Sudden Dropout Factor : 2 - 10 x In
- Phase Delay Time : Fixed Time 1 - 10 sn  
Opposit Time 0,1 - 1,0 curves
- Current Set of Ground Dropout : 0,6 - 3 A
- Ground Sudden Dropout Factor : 2 - 10 x In
- Ground Delay Time : Fixed Time 1 - 10 sec  
Opposit Time 0,1 - 1,0 curves
- Sudden Dropout Time : < 200msec
- Set Failure : %7
- Dropout Memory Number : 16
- Protection Degree : IP20
- Connection Diagram : To front panel of Switchbox
- Dimensions : 144\*144\*140 mm

