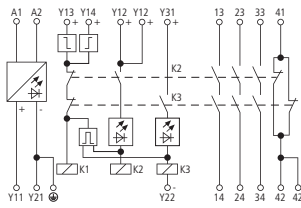


Circuit and Flow Chart Diagrams

Safety Relays ESR

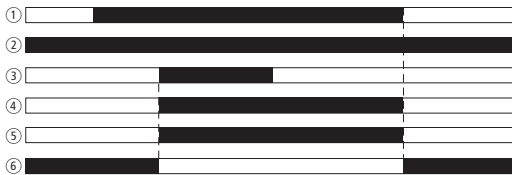
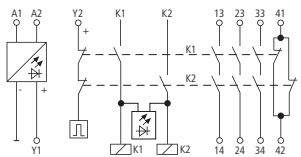
Safety relay for Emergency-Off and guard door monitoring

ESR3-NO-31



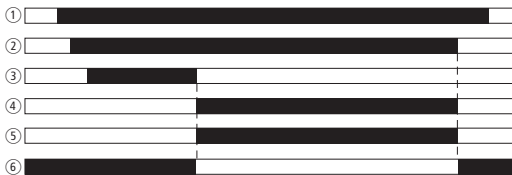
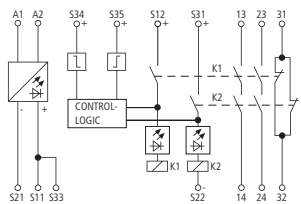
- ① A1/A2 supply voltage, LED power
- ② Y12, Y13 Emergency-Off
- ③ Y13 Reset (with reset button monitoring)
- ④ K2, K3, 13/14, 23/24, 33/34, LED K2, LED K3
- ⑤ 41/42

ESR4-NO-31



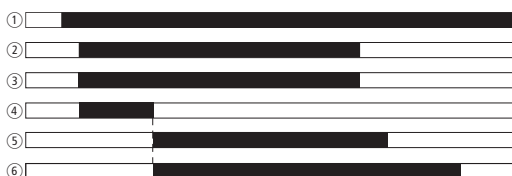
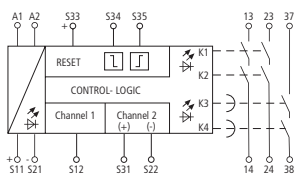
- ① A1/A2 supply voltage, LED power
- ② A2 supply voltage
- ③ Y2 Reset
- ④ K1, K2, LED K1/K2
- ⑤ 13/14, 23/24, 33/34
- ⑥ 41/42

ESR4-NO-21



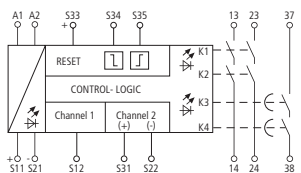
- ① A1/A2 supply voltage, LED power
- ② S21/S22 Emergency-Off
- ③ S34 Reset (with reset button monitoring)
- ④ K1, LED K1
- ⑤ K2, LED K2, 13/14, 23/24
- ⑥ 31/32

ESR4-NV3(30)-30



- ① A1/A2 supply voltage, LED power
- ② S12 Emergency-Off (Channel 1)
- ③ S31/S22 Emergency-Off (Channel 2)
- ④ S34 Reset (with reset button monitoring)
- ⑤ 13/14, 23/24, LED K1/K2
- ⑥ 37/38, LED K3/K4

ESR4-NT30-30



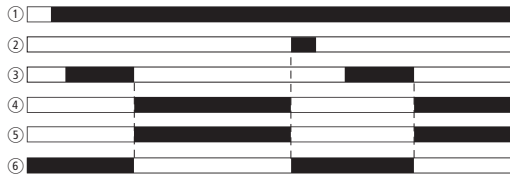
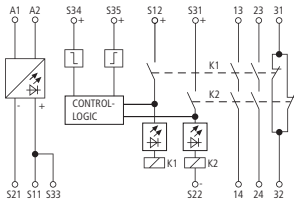
- ① A1/A2 supply voltage, LED power
- ② S12 Emergency-Off (Channel 1)
- ③ S31/S22 NOT-AUS (Channel 2)
- ④ S34 Reset (with reset button monitoring)
- ⑤ 13/14, 23/24, LED K1/K2
- ⑥ 37/38, LED K3/K4

Circuit and Flow Chart Diagrams

Safety Relays ESR

Safety relay for safety mat monitoring

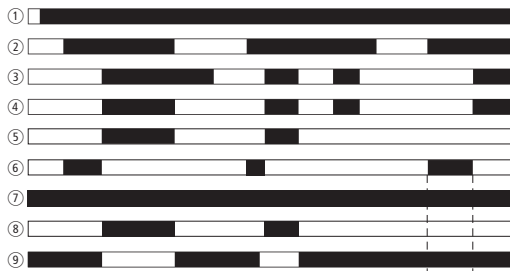
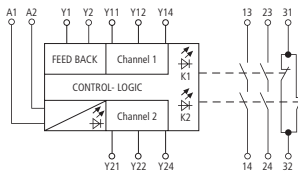
ESR4-NM-21



- ① A1/A2 voltage supply, LED power
- ② S11/S21, S12/S22 contact mat
- ③ S34 Reset (with reset button monitoring)
- ④ K1, LED K1
- ⑤ K2, LED K2, 13/14, 23/24
- ⑥ 31/32

Two-hand control relay

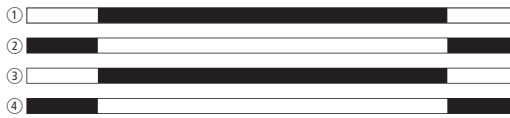
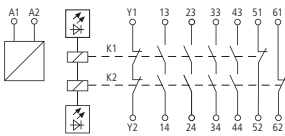
ESR4-NZ-21



- ① A1/A2 voltage supply, LED Power
- ② Positioning piece S1
- ③ Positioning piece S2
- ④ K1, LED K1
- ⑤ K2, LED K2
- ⑥ < 0.5 s monitoring
- ⑦ Y1/Y2 Feed Back
- ⑧ 13/14, 23/24
- ⑨ 31/32

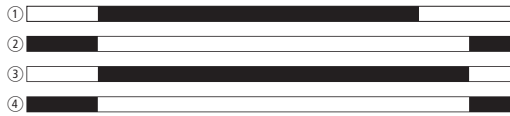
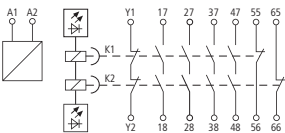
Contact expansions

ESR4-NE-42



- ① A1/A2 voltage supply
- ② Y1, Y2 feedback loop
- ③ 13/14, 23/24, 33/34, 43/44, LED K1, LED K2
- ④ 51/52, 61/62

ESR4-VE3-42

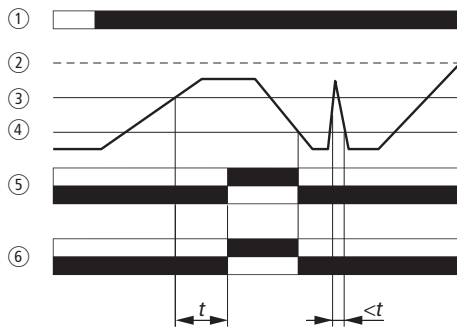


- ① A1/A2 voltage supply
- ② Y1, Y2 feedback loop
- ③ 17/18, 27/28, 37/38, 47/48, LED K1, LED K2
- ④ 55/56, 65/66

Flow Chart Diagrams

EMR4 measuring and monitoring relays

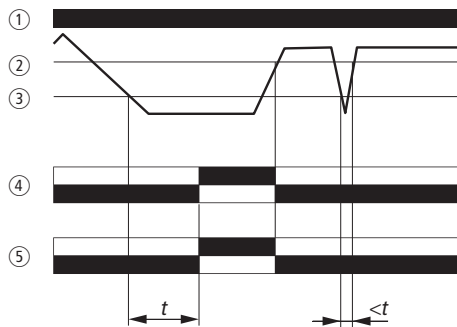
EMR4-I... current monitoring relays



Function at over-current OC

- ① supply voltage A1-A2
- ② Hysteresis (release value) under-current UC
- ③ measured current
- ④ Hysteresis (release value) over-current OC
- ⑤ make contact 1: 15-18, 15-16
- ⑥ make contact 2: 25-28, 25-26

measuring cycle = 80 ms
 $t = (0,05 - 1 \text{ s}; 1,5 - 30 \text{ s})$
 pick-up delay

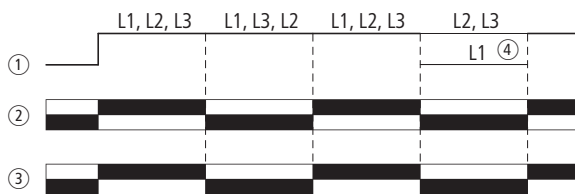


Function at under-current UC

- ① voltage supply A1-A2
- ② Hysteresis (release value) under-current UC
- ③ pick-up value measured current
- ④ make contact 1: 15-18, 15-16
- ⑤ make contact 2: 25-28, 25-26

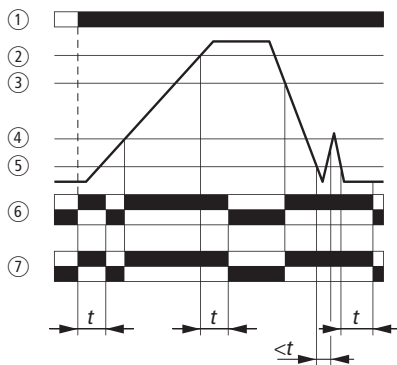
measuring cycle = 80 ms
 $t = (0,05 - 1 \text{ s}; 1,5 - 30 \text{ s})$
 pick-up delay

EMR4-F... phase sequence relay



- ① measured voltage, 3 phase AC supply L1, L2, L3
- ② make contact 1: 11-14, 11-12
- ③ make contact 2: 21-24, 21-22
- ④ phase failure 100 %

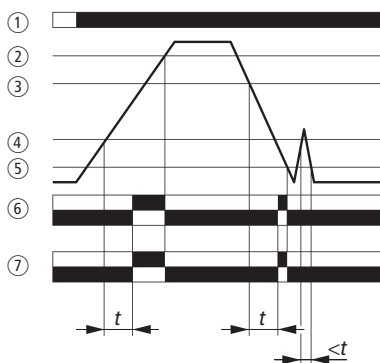
EMR4-W... phase monitoring relay



Pick-up delayed fault indication

- ① voltage supply A1-A2
- ② U_{max}
- ③ Hysteresis - 5 %
- ④ Hysteresis + 5 %
- ⑤ U_{min}
- ⑥ make contact 1: 15-18, 15-16
- ⑦ make contact 2: 25-28, 25-26

$t =$ Pick-up delay time only valid for monitoring over/under voltage



Return-delayed fault indication: function

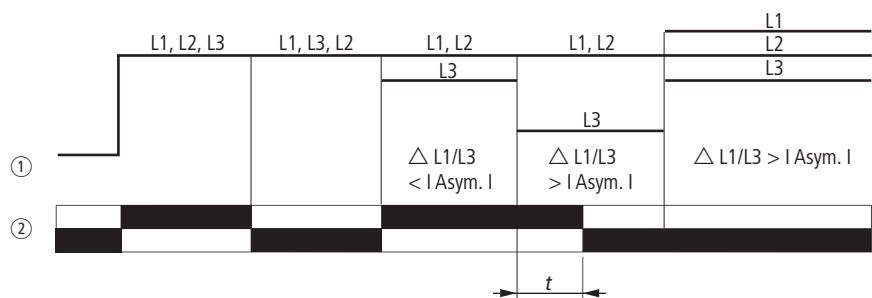
- ① voltage supply A1-A2
- ② U_{max}
- ③ Hysteresis - 5 %
- ④ Hysteresis + 5 %
- ⑤ U_{min}
- ⑥ make contact 1: 15-18, 15-16
- ⑦ make contact 2: 25-28, 25-26

$t =$ Pick-up delay time only valid for monitoring over/under voltage

Flow Chart Diagrams

EMR4 measuring and monitoring relays

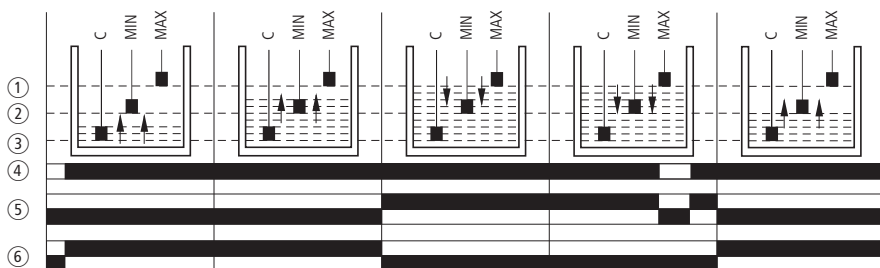
EMR4-A... phase imbalance monitoring relay



- ① level L1, L2, L3
- ② make contact 1: 15-18, 15-16

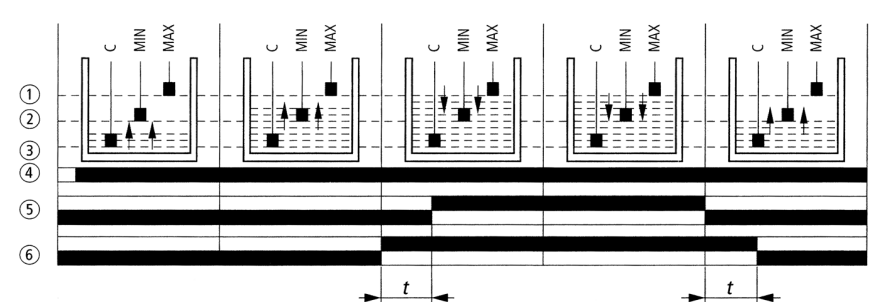
t = Pick-up delay time only actuated during assymetry, preset at 500 ms

EMR4-N100... level monitoring relay



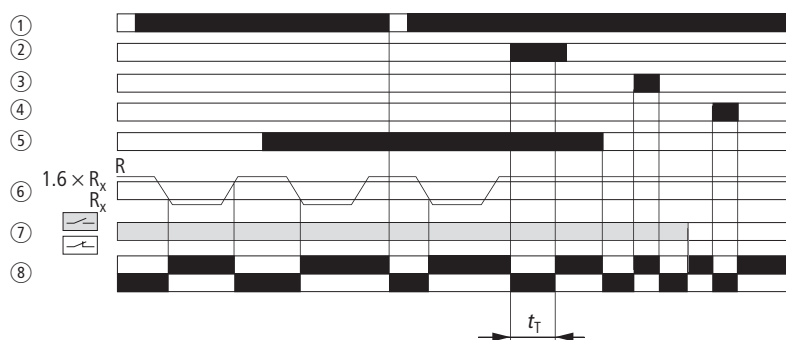
- ① max. level
- ② min. level
- ③ reference electrode C
- ④ supply voltage A1-A2
- ⑤ function dry run protection „DOWN“: 11-14, 11-12
- ⑥ function overflow protection „UP“: 11-14, 11-12

EMR4-N500... level monitoring relay



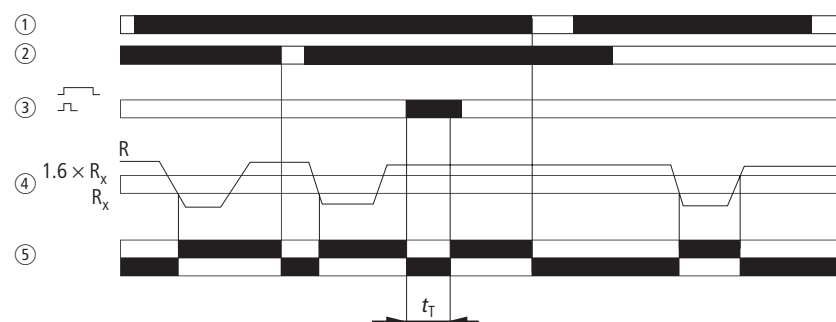
- ① max. level
- ② min. level
- ③ reference electrode C
- ④ supply voltage A1-A2
- ⑤ function pick-up delay 15-18, 25-28, 15-16, 25-26
- ⑥ function drop-out delay 15-18, 25-28, 15-16, 25-26

EMR4-RDC... insulation monitoring relay



- ① supply voltage A1-A2
 - ② front button: reset L+ and L-/test L+
 - ③ front button: test L- remote connection S3-S4: test L-
 - ④ remote connection S3-S1: test L+
 - ⑤ remote connection S3-S2: reset,
 - ⑥ insulation resistance R of the circuit, set response value R_x
 - ⑦ front switch : load current, : no load current
 - ⑧ Make contact: 15-18, 15-16
- t_T = Test time approx. 1 s

EMR4-RAC... insulation monitoring relay



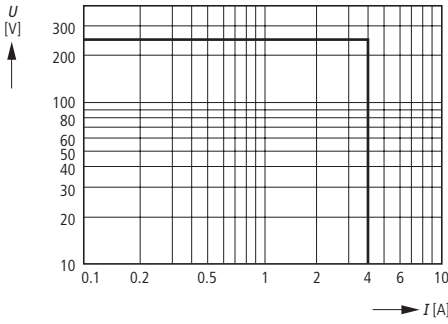
- ① supply voltage A1-A2
 - ② remote connection S1-S2: storing, reset,
 - ③ front button: reset, test remote connection S1-±: reset, test
 - ④ insulation resistance of the circuit set response value R_x
 - ⑤ make contact: 15-18, 15-16
- t_T = test time > approx. 300 ms

Tripping Characteristics

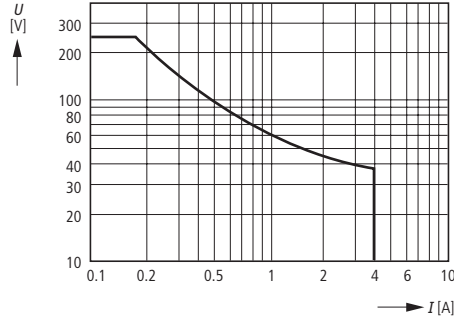
EMR4 measuring and monitoring relays

Load limit curves, module size 22,5 mm

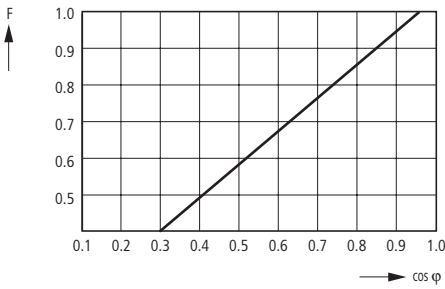
AC load (resistive)



DC load (resistive)

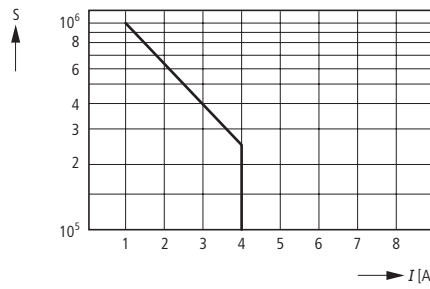


Reduction factor at inductive AC load



reduction factor F
at inductive load

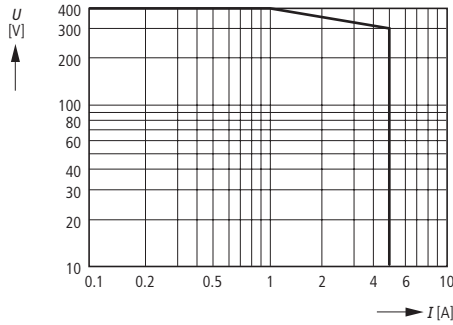
Contact lifespan



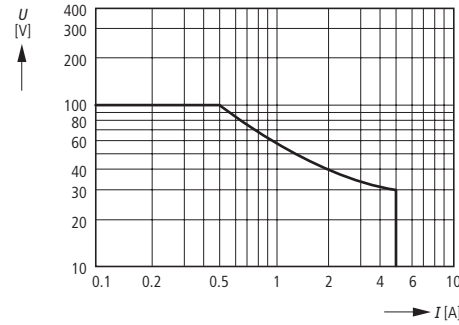
contact lifespan
operations S
220 V 50 Hz AC-1
360 operations/h

Load limit curves: module size 45 mm

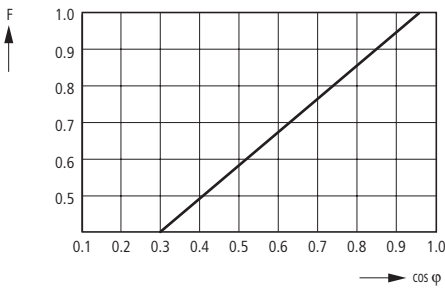
AC load (resistive)



DC load (resistive)

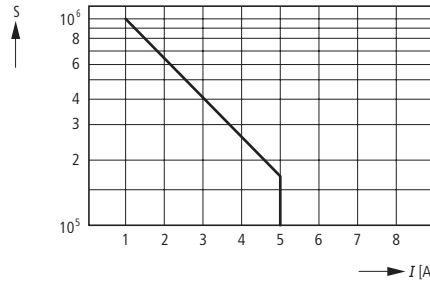


Reduction factor at inductive AC load



reduction factor F
at inductive load

Contact lifespan



contact lifespan
operations S
220 V 50 Hz AC-1
360 operations/h

Overload capability of EMR4-I...

	Current measuring range	Input resistance R_i	Terminal assignment/ measurement input	Continuous over- load capability	Overload capability for $t < 1$ s
EMR4-I1...	3...30 mA 10...100 mA 0,1...1 A	33 Ω 10 Ω 1 Ω	B1-C B2-C B3-C	50 mA 150 mA 1,5 A	300 mA 1 A 10 A
EMR4-I15...	0,3...1,5 A 1...5 A 3...15 A	0,06 Ω 0,018 Ω 0,006 Ω	B1-C B2-C B3-C	2 A 7 A 20 A	15 A 50 A 100 A