

SRA RESISTOR (2250/6, 1000/6) ARS-01 (04) RESISTOR CONTROLLER DATASHEET



ELA T150.8 en (11/2020)

SRA Resistor specification

The SRA 2250/6 and SRA 1000/6 Resistors are intended to increase the active component of residual current passing through the point of a ground fault. The device is designed for connection to the secondary winding of an arc-suppression coil. The system of the resistor's automatic control makes it possible to fit the resistance of the device to the character of the earth fault and thus enhance reliability – sensitivity of ground-fault protection relays. Resistor enables damping function for unbalanced networks in steady state without earth fault.

The ARS-01 and ARS-04 Controllers are designed to control the SRA Resistors, namely to connect it to / disconnect from the power auxiliary winding of the arc-suppression coil while the network is experiencing the ground fault. The controller matches the resistance of the device to the character of the earth fault and monitors thermal loading of the resistor. When used together with the ARS Controller, the SRA Resistor offers the optimal value of resistance being connected and improves the reliability – sensitivity of ground-fault protection relays also to high-ohmic faults. The controller enables to control damping function of the resistor in unbalance networks.

Description of the resistor

The SRA 2250/6 (1000/6, 540/6) Resistor has a cabinet consisting of two parts: (1) an IP 23 enclosure housing the resistors themselves and (2) an IP 54 control unit. The resistor enclosure contains air-cooled resistive elements while the control unit houses the input terminal block; contactors; heating resistor; thermostat and the controller. Both the resistor enclosure and the control unit casing are made of a stainless-steel sheet.

ARS Controllers

ARS controller controls SRA. It switches on the resistors in case of an earth fault and it reacts according to the setting. The ARS-01 and ARS-04 controllers can operate in two modes offering different functions, where a specific mode is selected parametrically.

Mode of SRA resistors control: The proper resistance to be connected is determined in accordance with the voltages measured across the auxiliary power winding of the arc-suppression coil (0 to 500 V) and the loading current passing through

the winding when the testing resistor is connected to the coil while the ground fault is being experienced. The resistance is built by a suitable series-parallel combination of the resistive elements of the SRA Resistor connected to the power winding of the arc-suppression coil. In case the ground-fault protections fail to extend signals proving they tripped as expected, the resistance adjusted as described above can be connected repeatedly. In that way the active component of the fault current will be increased to the optimal level, without causing inadvertent drop in voltage below the level required to trip the protections - consequently, the system will provide greater reliability in detecting even the high-resistance faults.

In unbalance networks the U_0 voltage can grow unacceptably even without an earth fault occurs. Such a network can be damped by using of additional conductivity added to the arc suppression coil. U_0 voltage is reduced by switching of the resistor to its auxiliary power winding. This function of SRA resistor can be also controlled by the ARS Controller. The damping resistor must be switched off automatically after the earth fault occurs not to increase the residual fault current and not to overload the resistor elements.

With the thermal capacity of the resistor used up to the full, the controller will prevent the resistor from being connected, or it will even disconnect the resistor when already connected. The resistor will remain safely disconnected until its temperature drops to approx. 80 % of its overall thermal capacity.

The automated diagnostics system will measure the current passing through the resistor and the U_0 voltage developed across the device whenever the resistor is connected.

Mode of SR resistors control: Responding to a ground fault experienced by the system, the controller will connect the resistor with the fix resistivity value to the auxiliary power winding of the arc-suppression coil so that the active component of the coil current is increased and the performance of the ground-fault protections is improved. The U_0 voltage (NVD – Neutral Voltage Displacement) will be monitored all the time, and with the ground-fault setpoint of the voltage exceeded, the device will first wait for the preset "time of R connection delay" and then connect the resistor to the auxiliary power winding of the coil for the preset "time of R connection". Provided the "number of connection cycles repeated" is set at a figure different from zero, the device will first wait for the "time of repeated R connection delay" and then it will connect the R resistor once again.

Technical parameters of SRA

Type	SRA 1000/6	SRA 2250/6
Rated resistance [Ω]	from 0.5 to 14	from 0.22 to 6
Rated voltage [V]	500	500
Rated current [A]	1000	2250
Loading time [s]	6	6
Weight [kg]	85	100
Cross-section of connecting cable [mm ² , Cu]	50	70
Control voltage of contactors	230 V / 50 Hz	230 V / 50 Hz

Available resistance values

Serial-parallel connection of individual resistance elements allows resistance values from the following table and the corresponding maximum residual current increase in 20 kV network in case of solid earth-fault (PAW ratio of ASC 12,1/0,5 kV):

Type	SRA 1000/6		SRA 2250/6	
	R [Ω]	dI [A] max. (20 kV)	R [Ω]	dI [A] max. (20 kV)
1	14	1,5	6	3,4
2	10	2,1	4	5,2
3	6	3,4	3	6,9
4	4	5,2	2	10,3
5	2,7	7,7	1,20	17,2
6	2,0	10,3	1,00	20,7
7	1,7	12,4	0,80	25,8
8	1,5	13,8	0,67	31,0
9	1,33	15,5	0,55	37,9
10	1,14	18,1	0,50	41,3
11	1,00	20,7	0,44	46,5
12	0,91	22,7	0,40	51,7
13	0,80	25,8	0,33	62,0
14	0,67	30,8	0,29	72,2
15	0,50	41,3	0,22	93,1

Technical parameters of ARS-01 (04)

Power supply

Power voltage	85 to 264 V AC, 110 to 375 V DC, optionally 24 to 100 V DC
Network frequency	50/60 Hz
Power consumption:	6 W
Internal fuse type:	T1A / 250 V
Insulation level:	3 kV

Current measuring inputs

Number of channels	1
Rated current range	0 – 1 A or 0 – 5 A
Overloading capacity of the inputs	1.2 I _n - permanently
Sampling frequency	2.4 kHz
Measurement accuracy	> 99.5 %, 12 bit ADC
Galvanic isolation level	4 kV
Input resistance	< 0.001 Ω

Voltage measuring inputs

Number of channels	1
Rated voltage range	0 – 500 A
Overloading capacity of the inputs	1.2 U _n
Sampling frequency	2.4 kHz
Measurement accuracy	> 99.5 %, 12 bit ADC
Galvanic isolation level	4 kV
Input resistance	100 kΩ

Binary outputs

Number of channels	5 + 3
Relay contact	single pole NO contact
Max. switching voltage	250 V AC / 8 A
Switching current	6 A AC, 0.3 A DC
Insulation level	5 kV

Binary inputs

Number of channels	4
Logical "1"	230 V AC, optionally 24 / 60 / 110 / 220 V DC
Logical "0"	< 30% out of the logical "1"
Internal consumption per channel	typical 2 mA, maximum 4 mA
Insulation level	4 kV
Time verification	10 ms to 10 s for DC; 60 ms to 10 s for AC

Analog outputs

Number of channels	2 current outputs 0/4 to 20 mA DC
Input resistance	500 Ω
Measurement accuracy	< 0.025 %
Resolution capability	5 μA
Galvanic isolation level	4 kV

Analog inputs

Number of channels	2 parameterized as current/voltage inputs
Input quality	Current input: 0/4 to 20 mA DC, voltage input: 0 to 10 V DC
Input resistance	500 Ω
Measurement accuracy	< 0.025 %
Resolution capability	5 μA / 2.5 mV
Galvanic isolation level	4 kV

Ambient conditions

Ambient temperature (operation)	-25...+70 °C
Ambient temperature (storage)	-45...+100 °C
Relative humidity	< 95 % non-condensing

Design

Case	Aluminum galvanized profile
Mounting	To the DIN rail or alternatively onto a panel

Total dimensions (H x W x L)	70 x 105 x 220 mm
Weight	1 kg
Mounting	panel mounting
Connectors	detachable, fixed with screws

Communication

The ARS-04 Controller is equipped with a RS-485 communication interface which enables to connect it to the remote control system using MODBUS (RTU) protocol. This option is not available for ARS-01.

Metering

The input circuits are used to measure, within three automatically set ranges, the voltage across the

auxiliary power winding of the arc-suppression coil (U) , and the current flowing through the power winding with the resistor connected (I). After being treated in the relevant current or voltage transformers of the instrument type, the signals are amplified, filtered, and fed into the inputs of the processor's analog-digital converter to be there subject to more processing. The signals being digitally processed are sampled at the frequency of 2.4 kHz.

SRA Resistors - Dimensioned Drawing

