

SIA-C

OC&EF
DUAL AND SELF-POWERED
PROTECTION RELAYS

Secondary Distribution Protection

RMUS, MRMUS, ALL TYPE OF MV SWITCHGEAR PANELS



Transformer



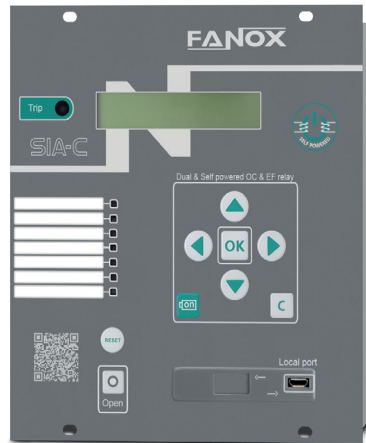
Wind Power



Solar Power



SELF-POWERED
TECHNOLOGY



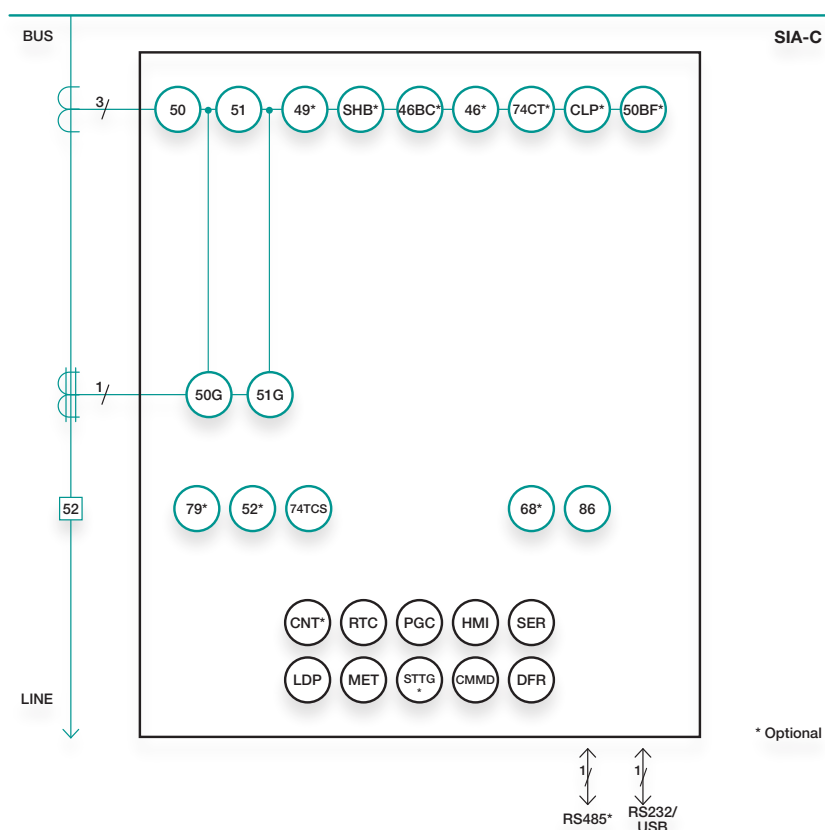
KEMA Labs

- The SIA-C is an OC&EF protection relay with self-powered and dual-powered (self-powering + auxiliary power) options.
- The relay is self-powered using the operating current through three /5 (5VA) or /1 (2.5VA). The relay is self-powered using the operating current through three /5 or /1 standard current transformers fitted on the lines. These transformers are also used to obtain current measurements. Besides, the SIA-C relay can be used with a universal auxiliary power supply of 24-230 Vac/dc (Vdc (±20%) / Vac (±15%)). The relay can also be supplied by a USB cable connected to the laptop or with a standard power bank.
- Internal Commissioning battery as optional. (Lithium battery: 20 years lifetime).
- Metallic box with high electromagnetic compatibility level (EMC) and wide operating temperature range.
- Really low start-up levels in self-powered mode: 0.075xIn in a three-phase system / 0.16xIn in a single-phase system
- Test menu allows the trip circuit to be tested before the transformation center is powered up.
- The front part of the SIA-C relays is provided with a navigation keypad made of 7 keys (including the RESET key) and a hot key to open the CB. Besides, there are up to 7 configurable LEDs and 1 bistable magnetic indicator (flag) which indicates the trip, maintaining their position even though the relay loses the supply.
- Self-diagnosis of the relay status (WATCHDOG) through the configurable LEDs and outputs.
- Low power consumption.
- To allow communication, relays are provided with a front Micro USB Port and with an optional remote communication RS485

port (Modbus RTU) and ethernet RJ45 port (Modbus TCP protocol) on the rear side.

- The SIA-C is provided with trip output for a low-power coil (24 Vdc – 135 mJ). Depending on the model, a single-phase trip or single/triple-phase trip is available by means of a switch.
- The SIA-C is provided with (depending on model):
 - » 2 outputs + 4 inputs
 - » 4 outputs + 4 inputs
 - » 7 outputs + 10 inputs
- The SIA-C is fitted with the demand of current (Load Data Profiling) with the following characteristics:
 - » Number of records: 168.
 - » Recording mode circular.
 - » Sampling rate (interval): configurable through communications 1-60 min.
- The SIA-C is provided with non-volatile RAM memory in order to store up to 1.024 events and disturbance fault recording (DFR-20 fault reports and 10 oscillographic records in COMTRADE format), maintaining date & time thanks to its internal RTC (Real Time Clock) even without power supply.
- The oscillography is downloaded by the communications port. The SICom communications program allows the oscillography record to be downloaded and saved in COMTRADE format (IEEE C37.111-1991).
- The installation and subsequent maintenance of external batteries are eliminated. The operating costs of the center are reduced.
- Withdrawable and non-withdrawable mechanics are available by model list to fulfil all our customers' needs and make the installation easier.

FUNCTIONS DIAGRAM SIA-C



ANSI CODE PROTECTIONS

50	Instantaneous phase overcurrent
51	Inverse time phase overcurrent
50G	Instantaneous measured neutral overcurrent
51G	Inverse time measured neutral overcurrent
SOTF	Switch on To Fault
SHB	Second Harmonic Blocking
49	Thermal overload
49T	External trip
CLP	Cold Load Pickup
37	Instantaneous phase undercurrent
46	Phase balance current protection
46BC	Broken Conductor Detection
52	Breaker wear monitoring
79	AC Reclosing device
60CTS	Phase CT supervision
74TVS	Trip voltage supervision
50BF	Circuit Breaker Failure
TB	Trip Block
PGC	Programmable logic control

ADDITIONAL FUNCTIONS

CNT	Counters
RTC	Real Time Clock
PGC	Programmable Logic Control
HMI	Human Machine Interface
SER	Sequential Event Recording
DFR	Disturbance Fault Recording
LDP	Load Data Profiling
MET	Metering
STTG	Settings Groups
CMMD	Commands

TECHNICAL PARAMETERS SIA-C

Function 50-1 Function 50-2 (*)	Function Enable: No/Alarm/Trip/SHB
	Current Tap: 0.05 to 30.00 xIn (step 0.01 xIn)
	Time Delay: 0.000 to 300.000 s (step 0.001 s)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation (phase reset time setting)
Function 50G-1 Function 50G-2 (*)	Timing accuracy: Without SHB permitted: ± 30 ms or $\pm 0.5\%$ (greater of both). With SHB permitted: ± 50 ms or $\pm 0.5\%$ (greater of both).
	Function Enable: No/Alarm/Trip/SHB
	Current Tap: 0.002 to 10.00 xIn (step 0.01 xIn)
	Time Delay: 0.000 to 300.000 s (step 0.001 s)
	Activation level: 100%
	Deactivation level: 95%
Function 51	Temporized deactivation (neutral reset time setting)
	Timing accuracy: Without SHB permitted: ± 30 ms or $\pm 0.5\%$ (greater of both). With SHB permitted: ± 50 ms or $\pm 0.5\%$ (greater of both).
	Function Enable: No/Alarm/Trip/SHB
	Curve Type: IEC 60255-151, IEEE and CO curves.
	IEC (Definite time, standard inverse, very inverse, extremely inverse, long time inverse, short time inverse) and IEEE (Moderately inverse, very inverse, extremely inverse) and CO (CO_P20, CO_P40, CO8).
	User defined curves (curve 1, curve 2, curve 3, curve 4)
	Time Delay: 0.000 to 300.000 s (step 0.001 s)
	Time Dial (TMS): 0.01 to 2 (step 0.01)
	Current Tap: 0.05 to 20.00 xIn (step 0.01 xIn)
	Curve, current activation level: 110%
	Curve, current deactivation level: 100%
	Defined time, current activation level: 100%
	Defined time, current deactivation level: 95%
	Temporized deactivation (phase reset time setting)
	Timing accuracy for IEC, IEEE and CO curve selection: Without SHB permitted: ± 30 ms or $\pm 5\%$ (greater of both). With SHB permitted: ± 50 ms or $\pm 5\%$ (greater of both).
	Timing accuracy for defined time selection: Without SHB permitted: ± 30 ms or $\pm 0.5\%$ (greater of both). With SHB permitted: ± 50 ms or $\pm 0.5\%$ (greater of both).

Function 51G	Function Enable: No/Alarm/Trip/SHB
	Curve Type: IEC 60255-151, IEEE and CO curves.
	IEC (Definite time, standard inverse, very inverse, extremely inverse, long time inverse, short time inverse) and IEEE (Moderately inverse, very inverse, extremely inverse) and CO (CO_P20, CO_P40, CO8).
	User defined curves (curve 1, curve 2, curve 3, curve 4)
	Time Delay: 0.000 to 300.000 s (step 0.001 s)
	Time Dial (TMS): 0.01 to 2 (step 0.01)
	Current Tap: 0.002 to 10.00 xIn (step 0.01 xIn)
	Curve, current activation level: 110%
	Curve, current deactivation level: 100%
	Defined time, current activation level: 100%
Function SHB	Defined time, current deactivation level: 95%
	Temporized deactivation (neutral reset time setting)
	Timing accuracy for IEC, IEEE and CO curve selection: Without SHB permitted: ± 30 ms or $\pm 5\%$ (greater of both). With SHB permitted: ± 50 ms or $\pm 5\%$ (greater of both).
	Timing accuracy for defined time selection: Without SHB permitted: ± 30 ms or $\pm 0.5\%$ (greater of both). With SHB permitted: ± 50 ms or $\pm 0.5\%$ (greater of both).
	Function enable: No/Yes
	Current Tap: 5 to 50% (step 1%)
Function SOTF	Reset Time: 0.000 to 300.000 (step 0.001 s)
	Block Threshold: 0.05 to 30.00 xIn (step 0.01 xIn)
	Activation level: 100%
	Deactivation level: 95%
Function 49T	Temporized deactivation
	Function Enable: No/Yes
	Current Tap: 0.05 to 30.00 xIn (step 0.01 xIn)
Function 49	Safe time: 0.001 to 5.000 (step 0.001 s)
	Activation level: 100%
	Deactivation level: 95%
	External trip by means of configurable inputs. Activated by short circuiting the terminals (without auxiliary voltage)
	Function enable: No/Yes
	Current tap: 0.10 to 2.40 In (step 0.01xIn)
	ζ heating: 3 to 600 min (step 1 min)
	ζ cooling: 1 to 6 x ζ heating (step 1)
Function 49T	Alarm: 20 to 99% (step 1%)
	Trip level: 100%
	Deactivation level: 95% of alarm level
	Timing accuracy: $\pm 5\%$ respect of theoretical value.

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Function CLP	Function Enable: No/Yes
	Settings groups: 1 to 4 (step 1)
	No load Time: 0.020 to 300.000 s (step 0.001 s)
	Cold load Time: 0.020 to 300.000 s (step 0.001 s)
	Open breaker activation 6% In and reset threshold: 8% In
Function 52	Maximum number of openings: 1 to 10.000 (step 1)
	Maximum accumulated amperes: 0 to 100.000 (M(A ²)) (step 1)
	Opening time: 0.001 to 5.000 s (step 0.001 s)
	Closing time: 0.001 to 5.000 s (step 0.001 s)
	Excessive repeated openings: 1 to 10.000 (step 1)
	Repetitive openings/Time: 1 to 300 min (step 1 min)
	Open breaker activation and reset threshold: 6% In
Function 79 (*)	Function Enable: No/Yes
	Hold Enable: No/Yes/No Time
	Number of recloses: 1 to 5 (step 1)
	Reclose time 1, 2, 3, 4, 5: 0.002 to 300.000 s (step 0.001 s)
	Hold time: 0.002 to 300.000 s (step 0.001 s)
	Reset time: 0.002 to 300.000 s (step 0.001 s)
	Safe time: 0.002 to 300.000 s (step 0.001 s)
	Locking possibilities: inputs, commands.
Function TB (*)	Function Enable: No/Yes
	Tap: 1.50 to 30.00 xIn (step 0.01 xIn)
Function 46 (*)	Function Enable: No/Alarm/Trip/SHB
	Curve Type: IEC 60255-151, IEEE and CO curves.
	IEC (Definite time, standard inverse, very inverse, extremely inverse, long time inverse, short time inverse), IEEE (Moderately inverse, very inverse, extremely inverse) and CO (CO_P20, CO_P40, CO8).
	User defined curves (curve 1, curve 2, curve 3, curve 4)
	Time Delay: 0.000 to 300.000 s (step 0.001 s)
	Time Dial (TMS): 0.01 to 2 (step 0.01)
	Current Tap: 0.05 to 20.00 xIn (step 0.01 xIn)
	Curve, current activation level: 110%
	Curve, current deactivation level: 100%
	Defined time, current activation level: 100%
	Defined time, current deactivation level: 95%
	Temporized deactivation (phase reset time setting)
	Timing accuracy for IEC, IEEE and CO curve selection:
	Without SHB permitted: ± 30 ms or $\pm 5\%$ (greater of both).
	With SHB permitted: ± 50 ms or $\pm 5\%$ (greater of both).
	Timing accuracy for defined time selection:
	Without SHB permitted: ± 30 ms or $\pm 0.5\%$ (greater of both).
	With SHB permitted: ± 50 ms or $\pm 0.5\%$ (greater of both).
Function 46BC (*)	Function enable: No/Yes
	Current Tap: 15 to 100 % (step 1%)
	Time delay: 0.030 to 300.000 s (step 0.001 s)
	Activation level: 100%
	Deactivation level: 95%
	Temporized deactivation (phase reset time setting)
Function 37 (*)	Function Enable: No/Alarm/Trip
	Current tap: 0.05 to 30.00 xIn (step 0.01 xIn)
	Minimum Level: 0.00 to 1.00 xIn (step 0.01 xIn)
	Time delay: 0.060 to 300.000 s (step 0.001 s)
	Activation level: 100%
	Deactivation level: 105%
	Temporized deactivation
	Timing accuracy: ± 30 ms or $\pm 0.5\%$ (greater of both)
Function 60CTS (*)	Function enable: No/Yes
	Time delay: 0.020 to 300.000 s (step 0.001 s)
	Open breaker activation 6% and reset threshold.8% In
	Detection of the loss of one phase CT
Function 50BF (*)	Function Enable: No/Yes
	Time Delay: 0.020 to 1.000 s (step 0.001 s)
	Open breaker activation and reset threshold: 6% In
Function 74TVS	Trip Voltage level: 12, 17, 22 or 24 Vdc
Programmable logic control (PGC)	OR4, OR4_LATCH, OR4_PULSES, OR4_TIMERUP, OR4_PULSE, NOR4, NOR4_TIMERUP, NOR4_PULSE, NOR4_PULSES, AND4, AND4_PULSES, AND4_TIMERUP, AND4_PULSE, AND4_LATCH, NAND4, NAND4_TIMERUP, NAND4_PULSE
Settings tables	4 settings groups
	Selectable by input or general setting.
SER	1024 events
Disturbance fault recording (DFR)	16 samples/cycle
	4 analog channels and 32 digital channels
	20 fault reports, 16 events in each.
	10 disturbance records in COMTRADE format (50 cycles each).
	COMTRADE IEEE C37.111-1991
Load Data Profiling (LDP)	Demand of current with the following characteristics:
	- Number of records: 168
	- Recording mode circular
	- Sampling rate (interval): configurable through communications (1-60 min)
Trip output	24 Vdc; 135 mJ (activation of the striker or low-powered coil)
	• Depending on the model, a single-phase trip or single/triple-phase trip is available by means of a switch.
Outputs (*)	Up to 7 configurable outputs:
	Up to 3 NO-NC outputs
	Up to 4 NO outputs
	250 Vac – 5 A 30 Vdc – 5 A

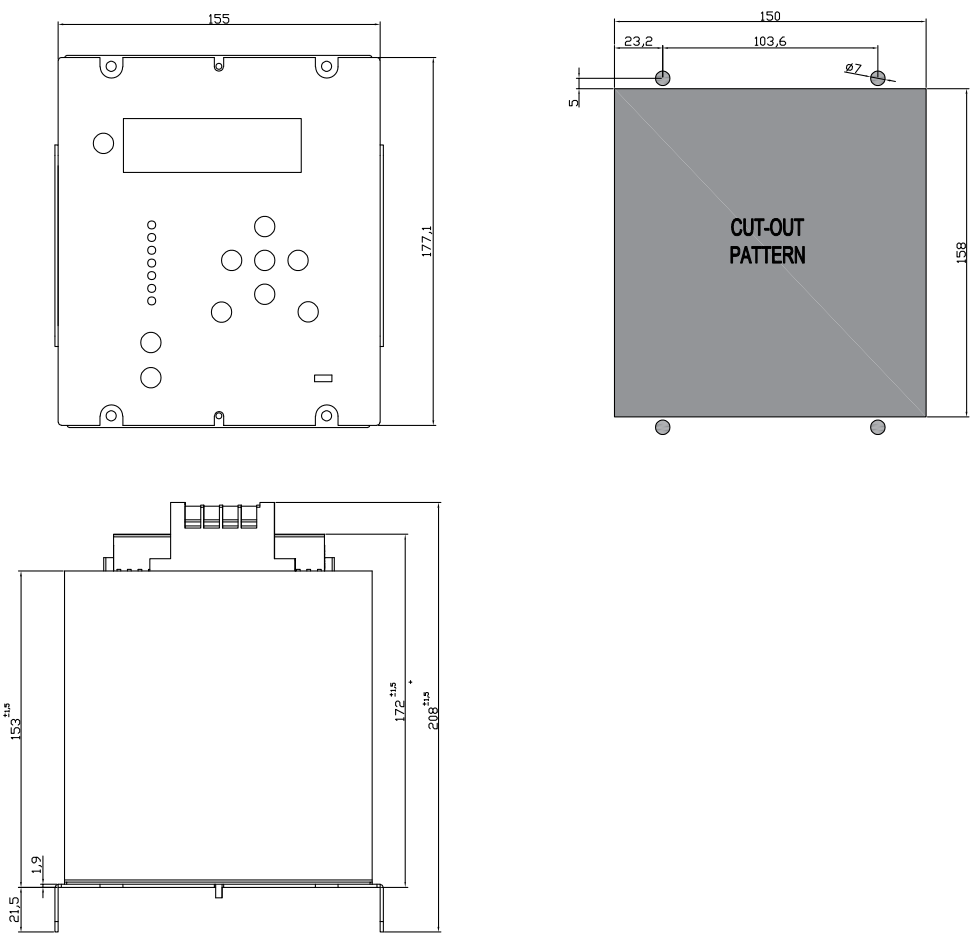
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Inputs (*)	Up to 10 configurable inputs: they are activated by short-circuiting the terminals without external supply. Any of them can be configured for the external trip.
Current measurements	Fundamental values (DFT)
	Sampling: 16 samples/cycle
	±2% in a band of ± 20% the nominal current and ±4% or ± 5 mA in the rest of the band. In case the current is between 0.002 to 0.0125 times the nominal current the accuracy will be 0.5mA.
	Phase measurement range: 0.02 to 30 times the nominal current
	Neutral measurement range: 0.002 to 16 times the nominal current
Communications	Local port (micro USB): Modbus RTU
	RS485 rear port: Modbus RTU (*)
	RS485 rear port: Modbus RTU, IEC60870-5-103 or DNP3.0 Serial (**)
	Ethernet (RJ45): Modbus TCP (*)
Self-powering from current	Three-phase self-powering level: $0.075 \times I_n$ CT /1 → > 75 mA CT/5 → > 375 mA
Power supply (*)	24-230 Vac/Vdc (Vdc (±20%) / Vac (±15%))
Battery Supply	Commissioning internal battery
Transformers	Power supply and measurement with standard CTs /1 or CTs /5
Energizing Quantities	Burden of current inputs: ≤2.5 VA (for 1 A and 5 A)
	Burden of power supply unit VDC: Max. 5 W VAC: Max. 10 VAs
	Operating temperature: -40 to 70°C
	Storage temperature: -40 to 80°C
Mechanical characteristics	Relative humidity: 95%
	Metallic box
	Panel mounted
	Non-withdrawable models: Vertical model: 177 x 155 x 171.22 (mm)
	Withdrawable model: 177 x 155 x 185.17 (mm)
	Weight: 3.5 kg
	IP-54 panel mounted (mechanics G and H) IP-40 panel mounted (mechanics F)

(*) Optional depending on the model

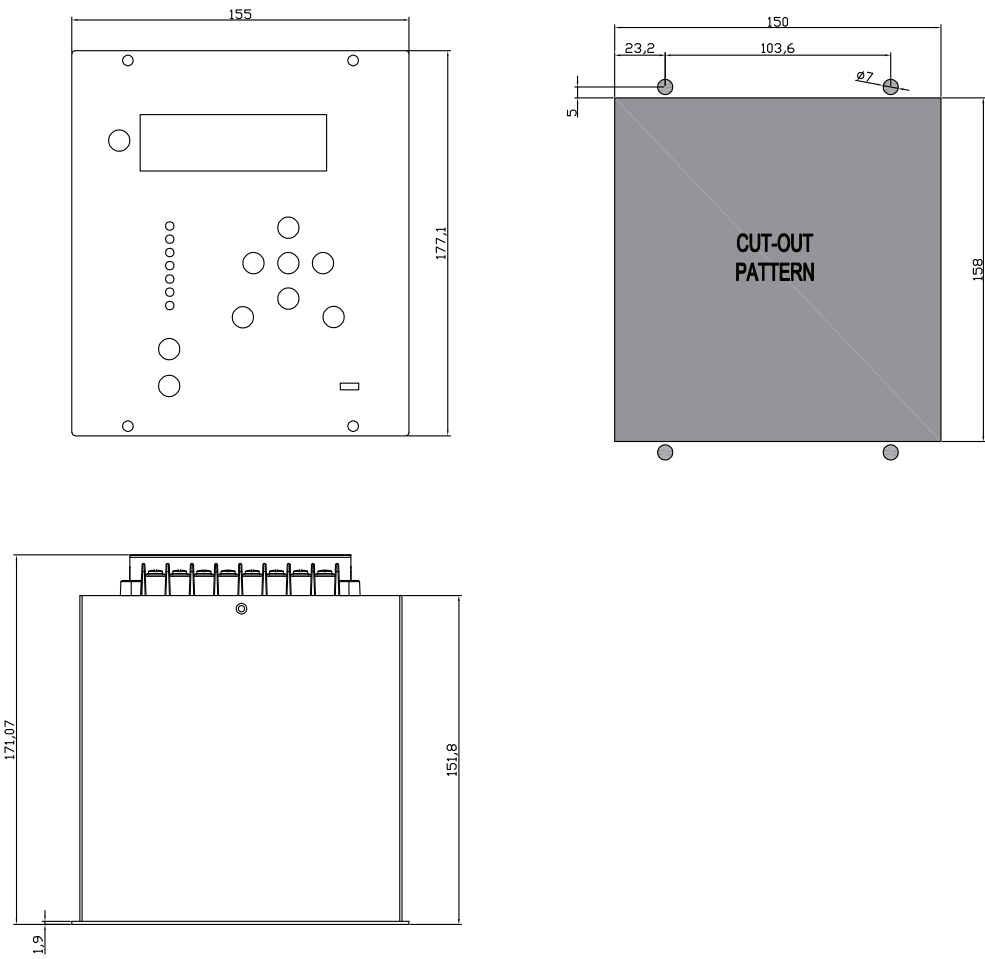
DIMENSIONS AND CUTOUT SIA-C

Withdrawable Mechanical:
F



DIMENSIONS AND CUTOUT SIA-C

Mechanical assembly:
G, H



KEMA STANDARDS SIA-C

TEST	TEST STANDARD	LEVEL
1. DIELECTRIC TESTS		
1.1. Impulse voltage	IEC60255-27 Clause 10.6.4.2	5 kV 1 kV
1.2. Dielectric voltage	IEC60255-27 Clause 10.6.4.3	2 kV 0,5 kV
1.3. Insulation resistance	IEC60255-27 Clause 10.6.4.4	500 VDC
2. ELECTROMAGNETIC COMPATIBILITY (EMC) tests		
2.1. EMISSION		
2.1.1. Radiated emission	IEC 60255-26 CISPR11 CISPR22	class A class A
2.1.2. Conducted emission	IEC 60255-26 CISPR22	class A
2.2. IMMUNITY		
2.2.1. Slow damped oscillatory wave (1 MHz)	IEC 60255-26 (IEC 61000-4-18) Clause 7.2.6	2,5 kV CM 1,0 kV DM 1 kV CM 0 kV DM
2.2.2. Electrostatic discharges	IEC 60255-26 (IEC 61000-4-2) Clause 7.2.3	6 kV cont. 8 kV air
2.2.3. Radiated radio frequency magnetic field	IEC 60255-26 (IEC 61000-4-3) Clause 7.2.4	80 - 1000 MHz 10 V/m 1,4 - 2,7 GHz 10 V/m 80, 160, 380, 450, 900, 1850, 2150 MHz 10 V/m
2.2.4. Fast transient/burst	IEC 60255-26 (IEC 61000-4-4) Clause 7.2.5	☒ Zone A 4 kV CM 2 kV CM ☐ Zone B 2 kV CM 1 kV CM
2.2.5. Surge	IEC 60255-26 (IEC 61000-4-5) Clause 7.2.7	☒ Zone A to 4 kV LE to 2 kV LL ☐ Zone B to 2 kV LE to 1 kV LL
2.2.6. Conducted disturbance induced by RF fields	IEC 60255-26 (IEC 61000-4-6) Clause 7.2.8	0,15 - 80 MHz 10 V 27, 68 MHz 10 V

2.2.7. Power frequency voltage (50 Hz)	IEC 60255-26 (IEC 61000-4-16) Clause 7.2.9	☒ Zone A 150 V DM 300 V CM ☐ Zone B 100 V DM 300 V CM
2.2.8. Power frequency H-field (50 Hz)	IEC 60255-26 (IEC 61000-4-8) Clause 7.2.10	30 A/m cont. 300 A/m 1-3 s
2.2.9. D.C. Voltage dips	IEC 60255-26 (IEC 61000-4-29) Clause 7.2.11	100%; 10-1000 ms 60%; 200 ms 30%; 500 ms
2.2.10. A.C. voltage dips	IEC 60255-26 (IEC 61000-4-11) Clause 7.2.11	100%; 0,5 - 25 c. 60%; 10/12 c. 30%; 25/30 c.
2.2.11. D.C. voltage interruptions	IEC 60255-26 (IEC 61000-4-29) Clause 7.2.11	100%; 5s
2.2.12. A.C. voltage interruptions	IEC 60255-26 (IEC 61000-4-11) Clause 7.2.11	100%; 250/300 c
2.2.13. D.C. Ripple	IEC 60255-26 (IEC 61000-4-17) Clause 7.2.12	15% Ut_dc 100/120 Hz
2.2.14. D.C gradual shut-down/start-up	IEC 60255-26 Clause 7.2.13	Shut-down ramp 60 s 5 min off Start-up ramp 60 s
2.2.15. Damped oscillatory magnetic field (100 kHz and 1 MHz)	IEC 61000-4-10	☒ Zone A 100 A/m (peak) ☐ Zone B 30 A/m (peak)
2.2.16. Pulse magnetic field	IEC 61000-4-9	1000 A/m
3. MECHANICAL ENVIRONMENTAL CONDITIONS		
3.1. Vibration response	IEC 60255-1 (IEC 60255-21-1) Clause 6.13.1	class 1
3.2. Vibration endurance	IEC 60255-1 (IEC 60255-21-1) Clause 6.13.1	class 1
3.3. Shock response	IEC 60255-1 (IEC 60255-21-2) Clause 6.13.2	class 1
3.4. Shock withstand	IEC 60255-1 (IEC 60255-21-2) Clause 6.13.2	class 1
3.5. Bump	IEC 60255-1 (IEC 60255-21-2) Clause 6.13.2	class 1

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3.6. Seismic (single axis sweep)	IEC 60255-1 (IEC 60255-21-3) Clause 6.13.3	class 1
4. CLIMATIC ENVIRONMENTAL CONDITIONS		
4.1. Dry heat operational	IEC 60255-1 (IEC 60068-2-2, test Bd) Clause 6.12.3.1	+70°C; 72h
4.2. Cold operational	IEC 60255-1 (IEC 60068-2-1, test Ad) Clause 6.12.3.2	-40°C; 72h
4.3. Dry heat storage	IEC 60255-1 (IEC 60068-2-2, test Bb) Clause 6.12.3.3	+80°C; 72h
4.4. Cold storage	IEC 60255-1 (IEC 60068-2-1, test Ab) Clause 6.12.3.4	-40°C; 72h
4.5. Change of temperature	IEC 60255-1 (IEC 60068-2-14, test Nb) Clause 6.12.3.5	-40°C; +70°C 3 hours 5 cycles
4.6. Damp heat, steady state	IEC 60255-1 (IEC 60068-2-78, test Cab) Clause 6.12.3.6	+40°C; 93% 10 days
4.7. Damp heat, cyclic	IEC 60255-1 (IEC 60068-2-30, test Db) Clause 6.12.3.7	+25°C; 40°C 97%; 93% 6 cycles



SELECTION & ORDERING DATA SIA-C

SIA-C

Overcurrent & Earth Fault Protection Relay – Dual & Self-powered

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