GARD

Unparalleled Protection

SIGMA3-C

i-Gard's SIGMA3-C relay is a combination ground fault and monitoring relay with pulsing capability, that fully complies with the requirements of the *Canadian Electrical Code 2021* section 10.302 *without exception* or rating restrictions.

The SIGMA3-C is designed for application in High Resistance Grounding systems (systems typically below 5 kV where the fault current is limited to 10 A or less) and the complete range of Low Resistance Grounding systems (systems between 5 kV and 69 kV where the NGR is time rated).

The SIGMA3-C has been specially designed to ensure effective monitoring of the NGR circuit, even when de-energized.

10-302 SUBRULE 2 USE REQUIREMENTS: *The integrity of an impedance grounded system shall be monitored, and the system shall have an audible or visual alarm that corresponds to the occurance of:*

CEC 2021 Requirements

a) A ground fault on current-carrying conductors, including the neutral conductor where line-to-neutral loads are served

b) A ground fault on the conductor connecting the impedance grounding device to the source; and

c) A loss of continuity of the impedance grounding circuit from the system source through the impedance grounding device to the grounded non-current-carrying conductive parts of the electrical system

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The SIGMA3-C relay is a also a ground fault relay, therefore any ground fault on any current-carrying conductors will be detected and alarmed.

The SIGMA3-C measures the impedance value of the ground path from the source neutral to ground. During a short condition, the equivalent impedance of the parallel circuit formed by the NGR and the short, will be very low. The SIGMA3-C will detect this abnormal condition and alarm.

During an open circuit, the SIGMA3-C will automatically switch to *injection mode,* injecting a high frequency signal to the NGRXS (sensing resistor) circuit. There will be no return of the signal due to the open circuit. This condition will be alarmed.

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ISO 9001:2015

SIGMA3-C

CEC 2021, Table 17. Summary of conditions (a), (b) and (c):

Configuration	A Ground Fault on the current carrying conductors (a)	A Ground Fault on the conductor from the source to the resistor (b)	Loss of Continuity from the source through the resistor to ground (c)
Distributed Neutral	Alarm and de-energize immediately	Alarm and de-energize immediately	Alarm and de-energize immediately
≤ 5 kV and ≤ 10 A	Alarm and de-energize within the time rating of NGR	Alarm and de-energize within 48 hours	Alarm
> 5 kV or >10 A	Alarm and de-energize within the time rating of NGR	Alarm and de-energize within 48 hours	Alarm

10-302 Use Requirements

1) Ungrounded conductors of an impedance grounded system shall be insulated to the nominal line-to-line voltage of the system.

2) The integrity of an impedance grounded system shall be monitored and controlled, as required by Table 17.

3) Alarms required by Table 17 shall

a) Be clearly labelled as to their purpose;

b) Clearly annunciate the status of the system to persons monitoring it; and

c) Continue signalling until the condition is corrected

Finally, the SIGMA3-C is fully compatible with all power-circuit elements, including those that intentionally connect the power system to the ground (single-phase grounding transformers, grounded-wye-primary potential transformers, and grounded-wye-primary power transformers).

While the SIGMA3-C meets the requirements of CEC 2021 10.302 a), i-Gard strongly recommends against employing a 3 phase 4 wire HRG system where neutral loads can be served due to the inherent safety risk of this system. *I-Gard strongly recommends that all HRG systems be 3 phase 3 wire only.*

The SIGMA3-C can be used with a touchscreen HMI called the SIGMA 3-C-TDM.
The SIGMA 3-C-TDM touchscreen HMI provides for: display of the status and readings of the SIGMA3-C; configuration and operation of pulse contactor settings; viewing of logging and trending data; remote reset of the SIGMA3-C; as well as providing TCP/IP communication.

SIGMA3-C-TDM PHOTO

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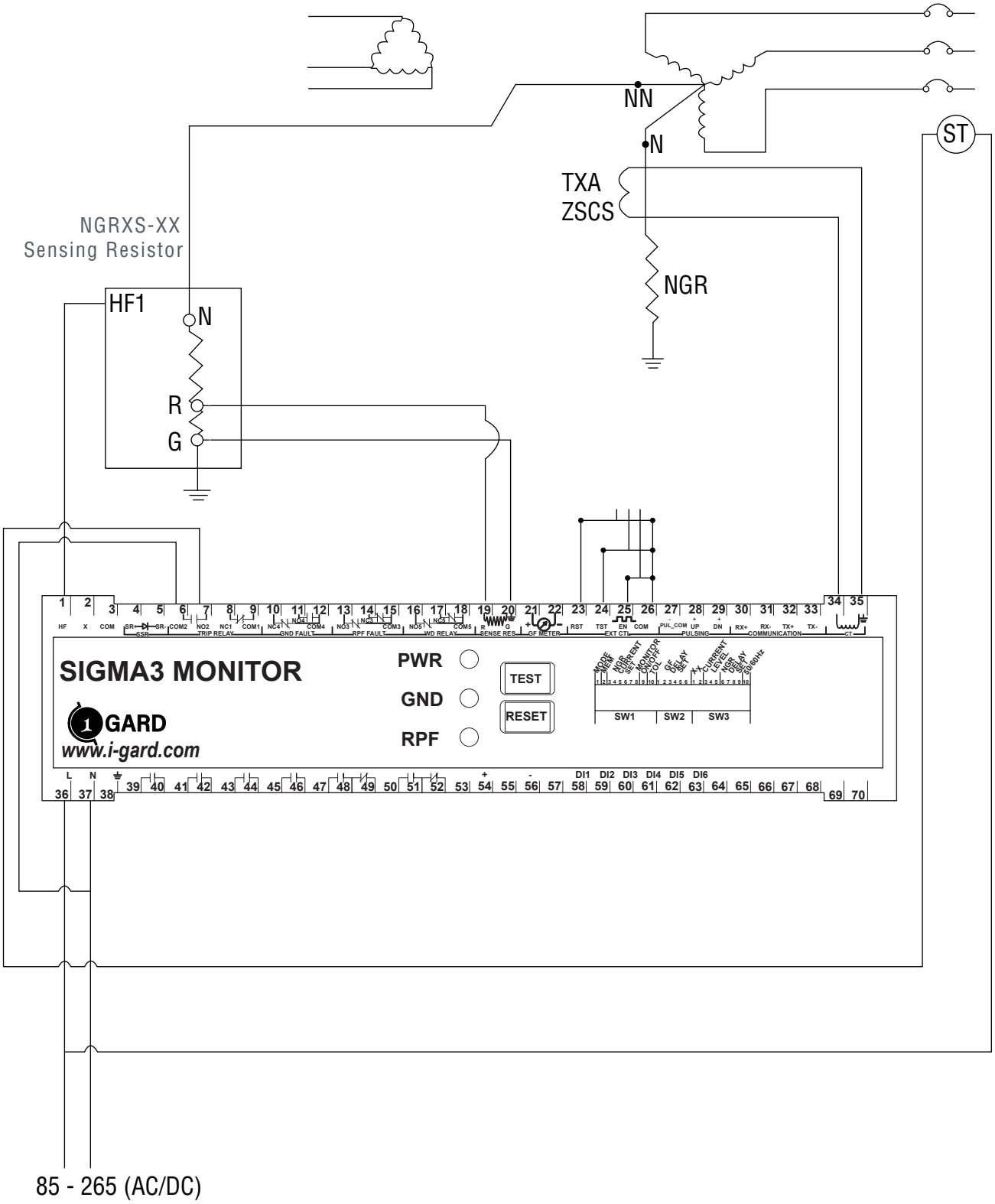

SIGMA3-C Typical System Diagram

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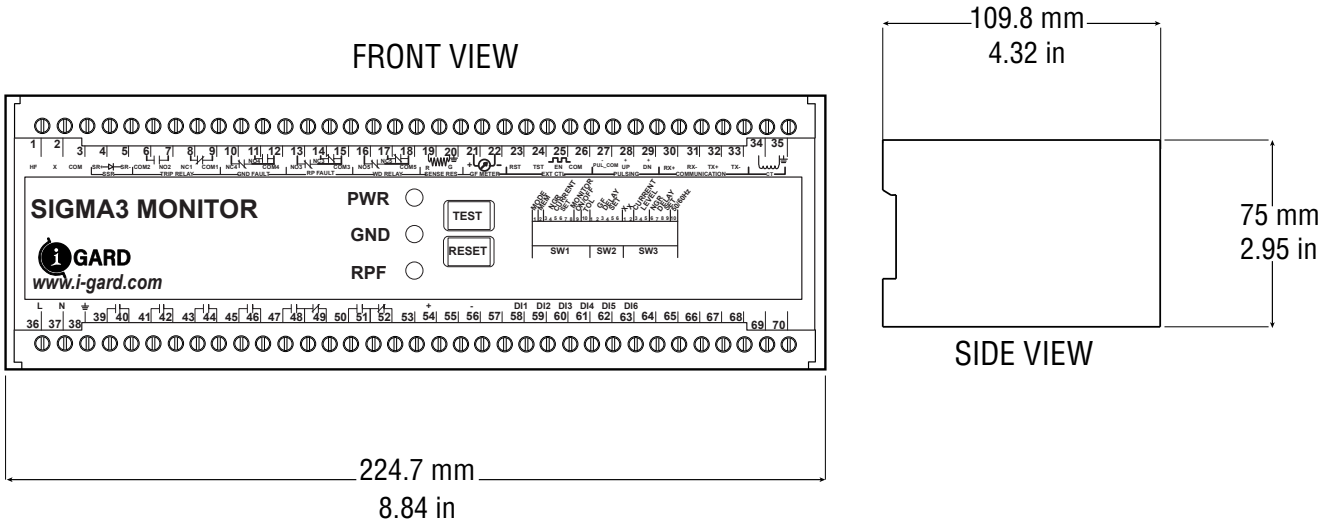
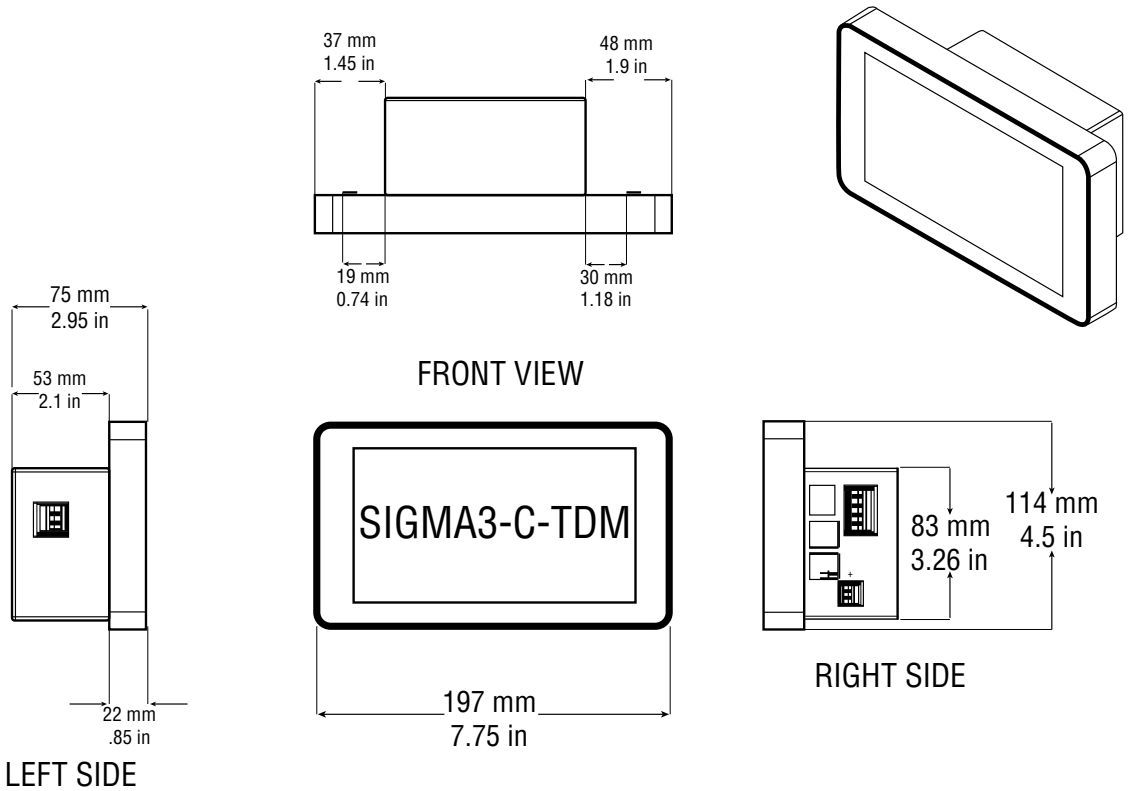
DIMENSIONS



SIGMA3-C Dimensional Drawings



SIGMA3-C-TDM Dimensional Drawings

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TECHNICAL SPECIFICATIONS

Electrical Ratings	Control Power:	110-240 VAC/DC 50/60 Hz 36W Power suply	
	Maximum:	-22.72% to +10% (85-264 AC/DC)	
Output Relay Contacts	Main Trip Relay:	Type:	Form Z (NO and NC pair)
		Rating:	10 A@240 VAC, 10 A@30 VDC, 1/2 HP@240 VAC
	Pulsing RPF Fault Relay:	Type:	1 Form C (NO/NC)
		Output:	Max: 1 A @ 12 VDC
SIGMA3-C Watchdog relays	DC	Type:	1 Form A (NO), Fail-safe Mode DC
		Rating:	1 A @ 120 VDC Relay
	AC	Type:	1 Form C (NO/NC)
		Raiting:	10 A@240 VAC, 8A@24 VDC, 1/2 HP@240VAC
Meter Output	0-1 mA DC (0-100% of Let-through Current Setting)	DC or AC Relay	
Electrical Tests	Surge test: @ 3 kV Dielectric test: @ 2 kV for 1 minute		
NGR Let-Through Current Settings	1-1000A		
Output Relay Contacts	Auxiliarity NGR Fault Relay	Type:	1 Form C (NO/NC)
		Rating:	10 A@240 VAC, 8A@24 VDC, 1/2 HP@240 VAC
Ground Fault Trip Settings	Trip Level	5%, 10%, 15%, 20%, 25%, 30%, 40%, 50%	
	Trip Time	60 - 9300 ms	
Operating Modes	* Fail-safe (Under-voltage Trip) / Shunt-trip		
	Trip Memory On / Trip Memory Off		
Frequency	50 / 60 Hz		
Temperature Range	Operating: -40°C to +60°C Storage: -50°C to +70°C		

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