



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 2024* 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 occurrence of:*

CEC 2024 Requirements

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



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

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



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.

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



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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CEC 2024, 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).



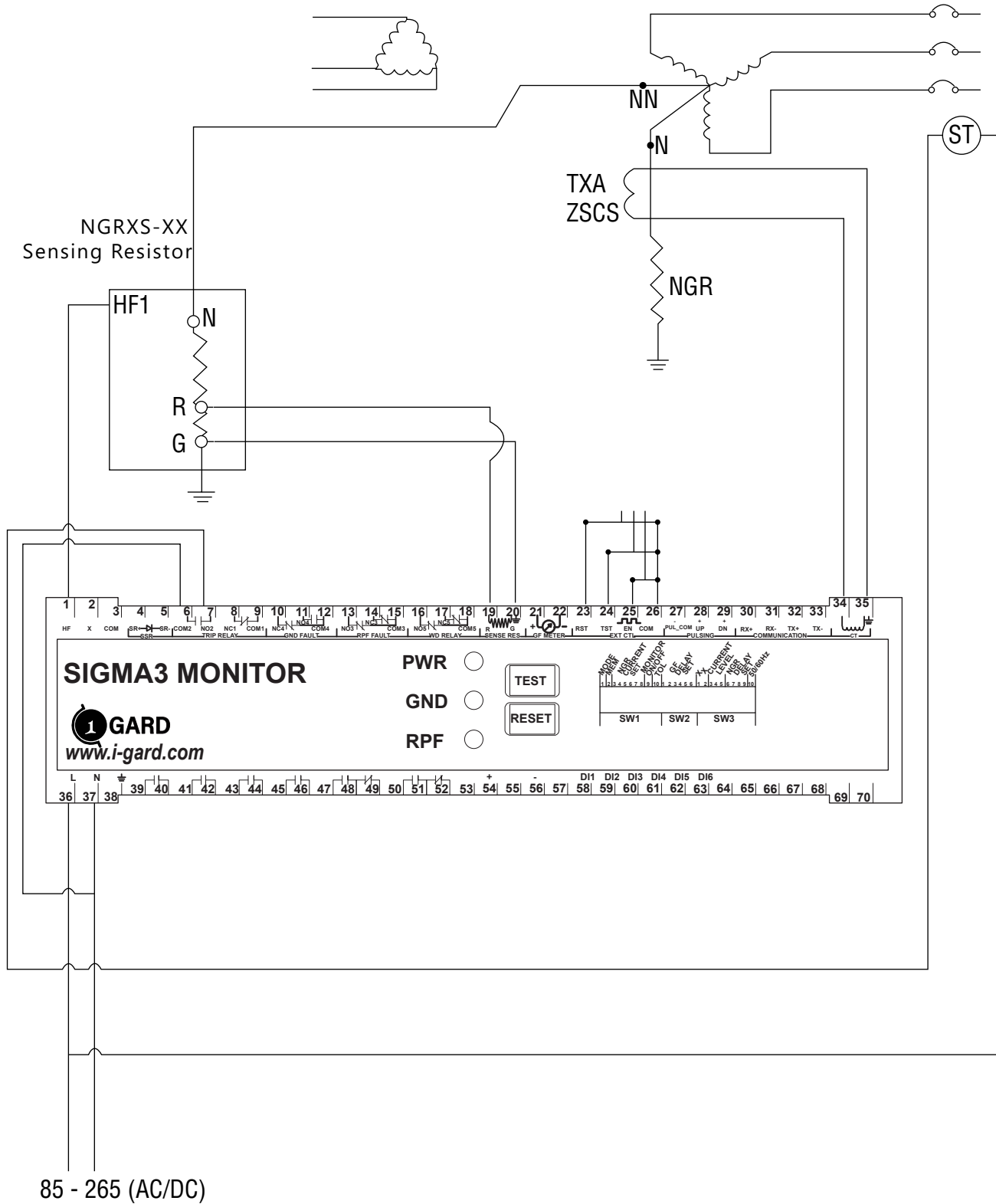
While the SIGMA3-C meets the requirements of CEC 2024 10.302 a), i-Gard strongly recommends against employing a 3 phase 4 wire HRG system where neutral loads can be served due to the inherent safety risk of this system. *I-Gard strongly recommends that all HRG systems be 3 phase 3 wire only.*

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.

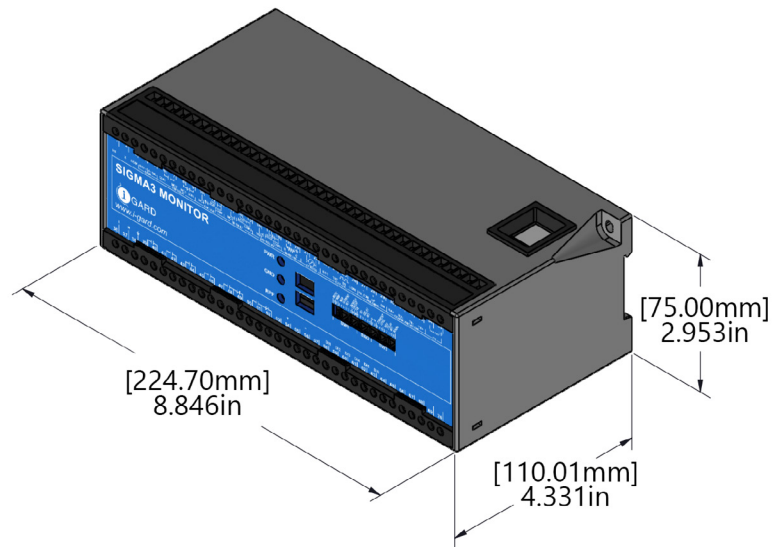


SIGMA3-C-TDM PHOTO

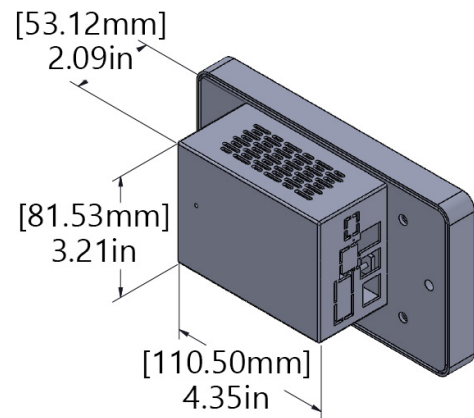
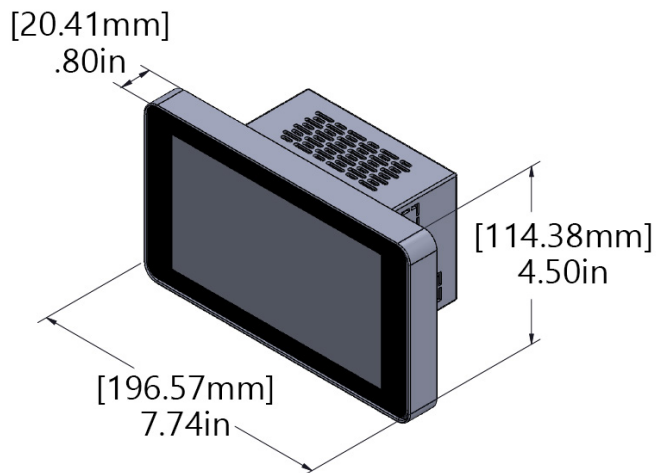


SIGMA3-C Typical System Diagram

DIMENSIONS



SIGMA3-C Dimensional Drawings



SIGMA3-C-TDM Dimensional Drawings

TECHNICAL SPECIFICATIONS

General Data	Description			
Power supply	Rated supply voltage	110-240 VAC/DC 50/60 Hz 36W Power supply ¹		
	Tolerance	-22.72% to +10% (85-264 AC/DC)		
Frequency range	50 / 60 Hz			
Temperature Range	Operating	-40°C to +60°C		
	Storage	-50°C to +70°C		
Electrical Tests	Surge test	3 kV		
	Dielectric test	2 kV for 1 minute		
NGR Let-Through Current Settings	1-1000A			
Output Relay Contacts	Trip Relay	Type	Form Z (NO and NC pair)	
		Rating	8 A, 250 VAC	
	Ground Fault	Type	1 Form C (NO/ NC)	
		Rating	8 A, 250 VAC/ 24 VDC	
	RP Fault	Type	1 Form C (NO/ NC)	
		Rating	8 A, 250 VAC/ 24 VDC	
	Watchdog Relay (Default is DC)	DC	Type	1 Form A (NO), Fail-safe Mode DC
			Rating	1 A @ 120 VDC Relay
AC ²		Type	1 Form C (NO/ NC)	
		Rating	8 A, 250 VAC/ 24 VDC	
Meter Output	0-1 mA DC (0-100% of Let through Current Setting)			
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 ³			
	Trip Memory On / Trip Memory Off			

Table 2.4.1 SIGMA3-C Technical Specifications

¹ 24V DC and 48V DC control supply is also available upon customer request

² Available upon customer request

³ In Shunt Trip mode, the Trip relay is normally closed (NC) and changes to the normally open (NO) state when tripped. In Failsafe mode, the relay operates in reverse, remaining normally open (NO) and changing to normally closed (NC) when tripped.



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