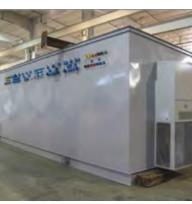




CONDENSED CATALOG





# PROTECTION RELAYS&CONTROLS

Ground-Fault Protection • Motor & Feeder Protection • NGR Monitoring Ground-Check Protection • Arc-Flash Protection • Generator Protection & Control Engine Control & Diagnostics • Alarm Monitoring • Custom Engineered Products

### We Are The **GLOBAL EXPERTS** in **Electrical Safety and Productivity**

### **Global Resources for A Global Market**

From mining installations in Chile to semiconductor fabrication plants in Taiwan, customers trust Littelfuse electrical safety products and services to keep systems running and workers protected.

Our innovation, proven technical expertise, broad portfolio of products and services and global resources enable us to provide objective, comprehensive solutions for each unique application.



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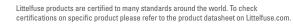










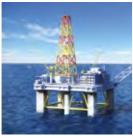














### We Improve Electrical Safety and Increase Productivity

For decades Littelfuse has been helping customers improve their electrical systems. In addition to well-designed products, our technical expertise brings years of experience and product design support to your application.

We can provide immediate access to specialized technical resources, online references or field application support. This catalog outlines the Littelfuse line of protection relays, custom products, generator and engine controls, and alarm monitors, plus the technical capabilities we offer for your application.



Shock Hazard **Injury to Personnel Arc-Flash Hazards Open-CT Hazards Failed Resistors** 



**Fault Damage Equipment Replacement Calibration Costs Compliance Citations Motor Rewinds** 



Replacement Time **Nuisance Tripping** Intermittent Faults **Unreliable Protection Calibration Time** 

### For All Harsh Environments

Mining

Petrochemical, Oil and Gas

Marine

**Power Generation** 

**Pipelines and Transportation** 

**Aggregate and Cement** 

Pulp and Paper

Water and Wastewater

**Shore-to-Ship Power** 

**Data Centers** 

Semiconductor Equipment

**Hospitals** 

Alternative Energy

### How to use this catalog

Choose your preferred product-selection method from the examples below.

MOTOR AND PUMP PROTECTION ➤ By Application.. .....Pq 4-7 ►By Feature Set ......Pg 8-9 (IEEE #) PGR-6100 PGR-6130 PGR-6150 Ground fault (50G/N, 51G/N) Overload (49, 51) Unbalance (current) (46) Phase loss (current) (46) → By Product Category & Common Questions: **Product Selection Guide**.............. Pg 10-15 MOTOR PROTECTION **ADVANCED** Comprehensive Protection for Medium-Voltage Motors

Voltage Protection and Starter Control

pg. 23

NO 4



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### 1 GROUND-FAULT PROTECTION



insulation resistance can be caused by moisture, vibration, chemicals and dust.

#### Ungrounded DC System

ongrounded bo dystem			
SE-601	DC Ground-Fault Monitor16		
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### TRAILING CABLE PROTECTION

T2800



Continuously monitor the integrity of the ground conductor to protect portable equipment from hazardous voltages caused by ground faults.

SE-105, SE-107	Ground-Fault Ground-Check Monitor18
SE-134C, SE-135	Ground-Fault Ground-Check Monitor18
SE-145	Ground-Fault Ground-Check Monitor20

### RESISTANCE GROUNDING/NGR MONITORING

Overcome many of the issues experienced with solidly-grounded and ungrounded electrical systems. High-resistance grounding eliminates the Arc-Flash hazard associated with the first ground fault, transient overvoltages, and allows for continuous operation during a ground fault.

SE-325	Neutral-Grounding-Resistor Monitor20
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NGR Series	Neutral-Grounding-Resistor Packages21
PGN Series	Pulsing High-Resistance-Grounding System 21

### MOTOR AND PUMP PROTECTION



Prevent damage to motors caused by overloads, jams, phase loss or unbalance, heat from non-electric sources, heavy start-ups and excessive operational cycles. Dynamic thermal curves, as well as integrated protection, metering, and data-logging functions extend motor life and maximize process efficiency.

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PGR-6800	Pump Protection Relay	24

### 5 FEEDER PROTECTION



Protect feeder circuits from overcurrents, earth faults, phase loss and other detrimental conditions in critical applications and processes. They provide essential data for predictive and preventive maintenance, extending the life of equipment, enhancing safety and maximizing efficiency.

FPU-32	Feeder Protection Unit24
FPS	Feeder Protection System24

### ARC-FLASH PROTECTION



Rapidly detects developing Arc-Flash incidents and sends a trip signal to interrupt power before significant damage occurs.

D0100, D0900	Arc-Flash Protection Relay25	
PGR-8800	Arc-Flash Protection Relay 25	

### PERSONNEL PROTECTION



The first product on the market to provide UL 943C, Class C and D shock protection for personnel in industrial facilities.

### **8** GENERATOR & SINGLE-FUNCTION PROTECTION





PGR-4300	Generator Ground-Fault Relay	26
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_	ENGINE CONTROL		Terminations & Adapters	
10	ENGINE CONTROL		Controls & Diagnostic Accessories	39
1	Control and protection for gen-sets, marine propulsion, pump and compressor engines. Communication interfaces for RS485 Modbus-RTU and CAN J1939 are available.  M2000 Engine Control	14	CUSTOM PRODUCTS/RELAY-RELATED ELEC. E  Our custom-built portable power centers, distribution panels and substations are products of choice for leading mining companies. Littelfuse Startco manufactures rugged products that are built to withstand the harshest conditions and are fully test to ensure they meet the most stringent mining requirements.  Portable Power Centers  Mining Machine Controls	red4141
	The EngineEye diagnostic unit helps improve the efficiency and		Soft Starters	
	performance of combustion engines by measuring and analyzing the		Power Take-Off Panels	41
	engine combustion process. It utilizes a handheld high-precision cylinder pressure indicator and a pressure sensor.		Electrical/Modular Buildings	41
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14	- ALIVINION TOTAL CONTROL CONT		NGR and CT Sizing Charts	
	Monitor a wide range of alarms in industrial, power generation,		Protection Relay Quick Reference Guide	
	petrochemical and marine applications. Both digital and analog signals can be monitored. External communication via RS485 Modbus-RTU is available.		Controls Quick Reference Guide	
	M1000 Alarm Monitor		Technical Resources	45
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ACCESSORIES-SOFTWARE



### TYPICAL APPLICATIONS

### Ground-Fault Protection Relays

APPLICATION	COMMON PROBLEMS	PRODUCT PROTECTION CATEGORY (PG NO.)
GENERATORS	Insulation breakdown due to vibration and corrosion	Ground Fault (pg 16) Resistance Grounding (pg 20) Arc-Flash (pg 25)
TRANSFORMERS	Overloading and overvoltage	Resistance Grounding (pg 20) Feeder (pg 24)
SWITCHGEAR & MCCs	Highest average downtime (IEEE 493-1997)	Ground Fault (pg 16) Motor (pg 22) Feeder (pg 24) Resistance Grounding (pg 20) Arc-Flash (pg 25)
SWITCHBOARDS & PANELBOARDS	Low-level leakage current undetected by typical OCPDs	Ground Fault (pg 16)
DRIVES	Switching frequencies cause nuisance tripping	Ground Fault (pg 16) Motor (pg 22) Arc-Flash (pg 25)
MOTORS & PUMPS	Winding faults due to overloading, water, dust and vibration	Ground Fault (pg 16) Motor (pg 22) Arc-Flash (pg 25)
FEEDER CIRCUITS	Temperature and mechanical stress lead to severe damage	Ground Fault (pg 16) Feeder (pg 24)
PORTABLE EQUIPMENT	Movement causing broken conductors and failed insulation	Ground Fault (pg 16) Feeder (pg 24) Arc-Flash (pg 25)
GROUNDING RESISTORS	Open-circuit resistors due to corrosion or loose connections	Resistance Grounding (pg 20)

### Motor & Feeder Protection Relays

APPLICATION	COMMON PROBLEMS	PRODUCT PROTECTION CATEGORY (PG NO.)
SWITCHGEAR & MCCs	Highest average downtime (IEEE 493-1997)	Ground- Fault (pg 16) Motor (pg 22) Feeder (pg 24), Resistance Grounding (pg 20) Arc-Flash (pg 25)
DRIVES	Switching frequencies cause nuisance tripping	Ground Fault (pg 16) Motor (pg 22) Arc-Flash (pg 25)
MOTORS & PUMPS	Winding faults due to overloading, water, dust and vibration	Ground Fault (pg 16) Motor (pg 22) Arc-Flash (pg 25)
FEEDER CIRCUITS	Temperature and mechanical stress lead to severe damage	Ground Fault (pg 16) Feeder (pg 24)
PORTABLE EQUIPMENT	Cable failure due to overloading	Motor (pg 22) Feeder (pg 24)



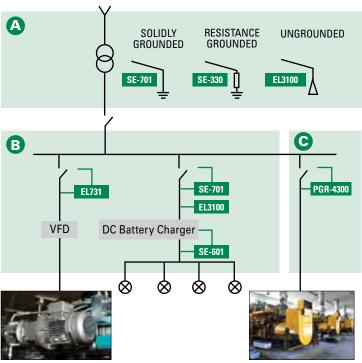
### TYPICAL PRODUCT APPLICATION

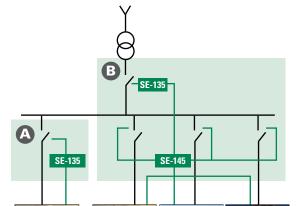




TRAILING CABLE PROTECTION

### **GROUND-FAULT PROTECTION**





A Single-Load Application

Ground-Check GF Relay B Multiple-Load Application SE-135 (pg 19)

Ground-Check GF Relay System

SE-145 (pg 20)

A Service Entrance

Solidly Grounded GF Relay SE-701 (pg 18) Resistance-Grounded GF Relay SE-330 (pg 20) Ungrounded GF Indicator EL3100 (pg 17)

**B** Loads

Variable Frequency GF Relay **EL731** (pg 16) SE-704 (pg 18) **GF Relay** Phase-Voltage Indicator EL3100 (pg 16) DC GF Relay SE-601 (pg 17)

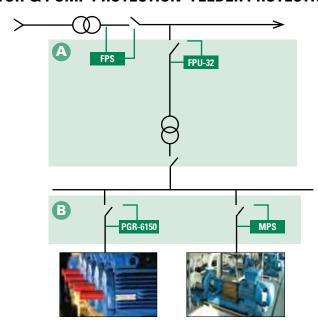
Generator Ground-Fault Protection

Generator GF Relay PGR-4300 (pg 16)





### **MOTOR & PUMP PROTECTION FEEDER PROTECTION**



A Feeder Protection

Feeder Protection Relay Feeder Protection Relay

Motor Protection

Standard Motor Protection Relay Advanced Motor Protection Relay FPS (pg 24) FPU-32 (pg 24)

PGR-6150 (pg 22) MPS (pg 23)

5



### TYPICAL APPLICATIONS

### Alarm Monitoring

Alarm panels for monitoring of critical processes in marine, off-shore and land-based applications. Analog or digital inputs for monitoring of current, temperature or pressure, etc. Indication of alarms. Logging of alarm and events.

APPLICATION	COMMON FUNCTIONS	PRODUCT CATEGORY (PG NO.)
MACHINERY ALARM SYSTEMS	Exhaust gas temperature monitoring on internal combustion engines, bearing temperature or coolant temperature monitoring.	
MARINE ALARM SYSTEMS	Water Ingress Detection; Ballast Water Monitoring	Alarm Monitoring (pg 37)
PROCESS AUTOMATION	Pump Control; Flow Control	
STORAGE FACILITY MONITORING	Ambient Condition Monitoring	

### **Engine Controls**

Equipment for starting, stopping, monitoring and protection of internal combustion engines.

APPLICATION	COMMON FUNCTIONS	PRODUCT CATEGORY (PG NO.)
MARINE PROPULSION ENGINES	Engine Control and Safety Systems	
MARINE AUXILIARY ENGINES	Engine Control and Safety Systems	Engine Control (pg 35)
GENSET ENGINES	Control and protection of generator sets	

### **Engine Diagnostics**

Monitoring of engine condition for preventive maintenance and optimization.

APPLICATION	COMMON FUNCTIONS	PRODUCT CATEGORY (PG NO.)
LARGE MARINE AND POWER STATION INTERNAL COMBUSTION ENGINES	Cylinder Pressure Analyzer, MIP	Engine Diagnostics (pg 36)

### Generator Controls

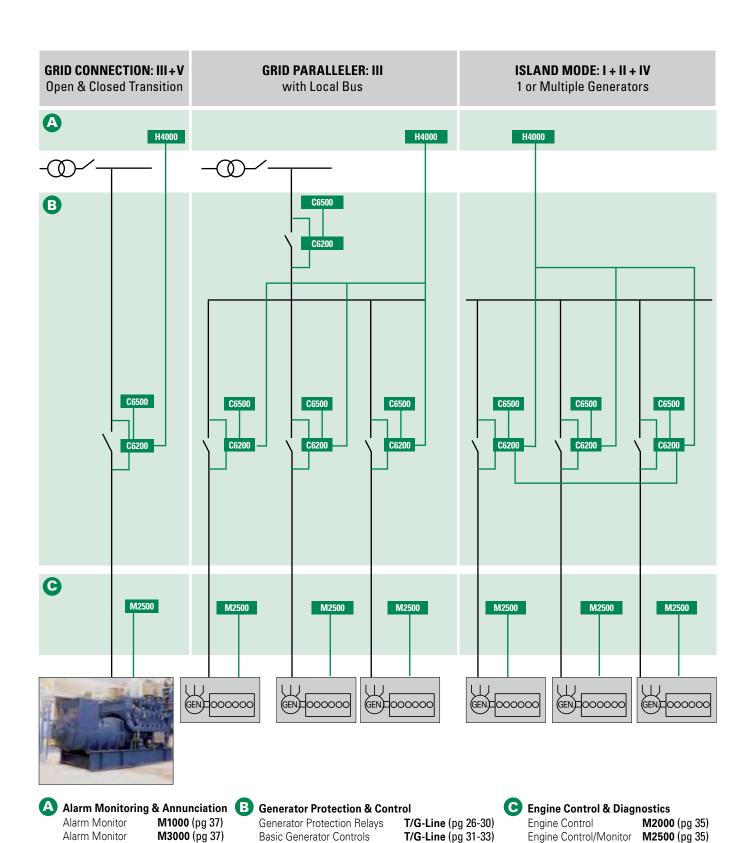
Equipment for synchronization of parallel running generators, load sharing and power management.

APPLICATION	COMMON FUNCTIONS	PRODUCT CATEGORY (PG NO.)
I. MARINE GENERATORS	Synchronizing, Load Sharing, Generator Protection, Speed/Voltage Control, Engine Control, Alarm and Safety Systems	
II. REMOTE POWER STATIONS	Synchronizing, Load Sharing, Generator Protection, Speed/Voltage Control, Engine Control Systems	Generator Protection (pg 26)
III. GRID PARALLEL GENERATORS	Synchronizing, Load Control, Power Factor Relation, Generator Protection, Speed/Voltage Control, Engine Control Systems	Generator Control (pg 31)  Engine Control (pg 35)  Engine Diagnostics (pg 36)
IV. CONTAINER GENSETS	Synchronizing, Load Sharing, Generator Protection, Speed/Voltage Control, Engine Control Systems	Alarm Monitoring (pg 37)
V. EMERGENCY GENERATORS	Generator Protection, Speed/Voltage Control, Engine Control Systems	

For single lines of applications I to V, see next page.



### TYPICAL PRODUCT APPLICATION



Alarm Monitor

M4200 (pg 37)

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C6200 (pg 34)

**S6000** (pg 34) **S6100** (pg 34)

Standard Generator Controls

Advanced Generator Controls

and (C6500 User Interface)
Advanced Generator Controls

**E5000** (pg 36)

**Engine Diagnostics** 



### FEATURE COMPARISONS

Use the feature tables below and the Product Selection Guide on pages 10-15 to choose the appropriate protection relay or monitor for your application.







FEATURE	SE-601	EL731	EL3100	PGR-3200	T3200	SE-701 SE-703 SE-704	T2800	SE-105 SE-107	SE-134C SE-135	SE-145	SE-325	SE-330 SE-330HV SE-330AU
Detects GF via voltage			V	~							V	<b>V</b>
Detects GF via current	V	V				<b>V</b>	V	<b>V</b>	<b>V</b>	V	V	<b>V</b>
Detects DC GF	V	V										
Adjustable GF pickup	V	V				<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	V	V	<b>V</b>
Adjustable time delay	V	V			V	<b>V</b>	<b>V</b>	<b>V</b>	<b>V</b>	V	V	<b>V</b>
Remote reset	V	V		V		<b>V</b>		V	<b>V</b>	V	V	<b>V</b>
Analog output	V	V		<b>V</b>	V	<b>V</b>						<b>V</b>
Fail-safe option	V	V				<b>V</b>		<b>V</b>	<b>V</b>	V	V	<b>V</b>
Harmonic filtering		V		<b>V</b>		<b>V</b>		V	<b>V</b>	V	V	<b>V</b>
CT-Loop monitoring		V				<b>V</b>			<b>V</b>	V		
Insulation monitoring				V	V							
Ground-check monitoring								<b>V</b>	V	V		
Grounding-resistor monitoring											V	<b>V</b>
PTC/RTD overtemperature		V										
Communications		V										<b>V</b>
Conformal coating	‡	V	V	‡	V	‡	V	V	V	V	V	<b>V</b>

### **Arc-Flash Relays**

FEATURE	D0100	D0900	PGR-8800
Current detection			V
Point sensors	<b>V</b>	<b>V</b>	<b>V</b>
Fiber optic sensors			<b>V</b>
Cable monitoring on sensor inputs			•
USB			V
DC supply	V		V
AC supply		<b>V</b>	<b>V</b>
Data logging			V





### 🌃 🤠 Motor & Feeder Protection Relays 🛮 🕕 Alarm Monitors



FEATURE (IFFE (I)	PGR	PGR	PGR	MP	<b>S</b>	PGR	FPL	B
FEATURE (IEEE#)	PGR-6100	PGR-6130	PGR-6150	MPU-32	MPS	PGR-6800	FPU-32	FPS
Ground fault (50G/N, 51G/N)	V		<b>V</b>	V	<b>V</b>		<b>&gt;</b>	<u></u>
Overload (49, 51)		<b>V</b>	V	V	>	V	V	V
Unbalance (current) (46)		V	V	V	<b>&gt;</b>	V	<b>V</b>	<b>V</b>
Phase loss (current) (46)		V	<b>V</b>	V	>	V	<b>&gt;</b>	V
Phase reverse (current) (46)		V	V	V	<b>&gt;</b>	V	<b>V</b>	<b>V</b>
PTC overtemperature (49)		_	<b>V</b>	V	>		<b>V</b>	
Undercurrent (37)			V	V	<b>&gt;</b>	V		
Jam			<b>V</b>	V	>			
Overcurrent (50, 51)			V	V	<b>V</b>		<b>V</b>	V
Failure to accelerate			<b>V</b>	V	>			
RTD temperature (38, 49)				V	<b>V</b>		<b>V</b>	V
Starts per hour (66)				V	>			
Differential (87)				V	<b>V</b>			
Reduced overcurrent setting				V	>			
Phase loss (voltage) (47)					<b>V</b>			<b>V</b>
Phase reverse (voltage) (47)					>			<b>V</b>
Unbalance (voltage) (47)					>			V
Overvoltage (59)					>		<b>&gt;</b>	V
Undervoltage (27)					>			V
Power factor (55)					>			V
Overfrequency (81)					>			V
Underfrequency (81)					>			V
Starter control					>			
Breaker control								V
Underspeed (14)					<b>&gt;</b>			
Integrated CTs		V	<b>V</b>			V		
Off-line insulation monitoring	V							
Metering and data logging			<b>V</b>	V	>		<b>&gt;</b>	V
Communications			V	V	V		<b>V</b>	V
Conformal coating	‡			V	>		<b>&gt;</b>	V
10-year warranty				V	V		<b>V</b>	<b>V</b>

FEATURE	M1000	M3000	M4200	M4500	M4600	M4700	M4780
Alarm panel	<	V	<				
Indicator panel	<b>V</b>	<b>V</b>	<b>V</b>	V	V	V	V
No. of inputs	10	24	8	6	8	20	20
Digital input	<b>V</b>	<b>*</b>	<b>V</b>	V	V	V	V
No. of open collector outputs	10	14	4				
Common alarm output <sup>†</sup>	1oc	1oc	2dryc			1dryc <sup>‡</sup>	1dryc <sup>‡</sup>
Siren output	1dryc	1oc	1dryc			1dryc <sup>‡</sup>	1dryc <sup>‡</sup>
LCD display		>					
Configure from PC	V	V	V				
Configure from DIP switches/ jumper	<b>&gt;</b>		<b>&gt;</b>			~	<b>V</b>
Configure from front panel		V					
MODBUS-RTU (RS485)	<b>V</b>	V					V
LED dimming	<b>V</b>	V	<b>V</b>				
LED synchronizing	<b>V</b>		<b>V</b>				
Panel linking	V						
Remote reset	<b>V</b>	<b>&gt;</b>	<b>V</b>				
Sensor monitoring	<b>V</b>	V	<b>V</b>				
Insulation monitoring of supply voltage	<b>&gt;</b>		<b>v</b>				
Monitoring of supply voltage	<b>&gt;</b>		<b>v</b>				

<sup>\*</sup>Both analog and digital input.

toc=open collector; dryc=dry contact

NOTE: Tables are for reference only and include standard and optional configurations. Please see the respective catalog page for exact product specifications. IEEE Device Numbers are shown in parenthesis after the applicable features.



### FEATURE COMPARISONS

Use the feature tables below and the Product Selection Guide on pages 10-15 to choose the appropriate control and protection for your generator or engine.

### Generator Protection & Single-Function Relays

FEATURE (IEEE #)	PGR-4300	G2000	G3000	G3300	T2000	T2100	T2200	T2300	T2400	T2500	T2700	T2900	T3000	T3100	T3300
Overload											<b>&gt;</b>				
Overcurrent							<b>V</b>		<b>&gt;</b>	V					
Undercurrent (37)															
Short circuit								V		V					
Reverse power (32)		V			>										
Overfrequency (81)			V										V		
Underfrequency (81)			V										V		
Overvoltage (59)				V										V	V
Undervoltage (27)				V										<b>&gt;</b>	<b>&gt;</b>
Excitation loss (40)						V									
Earth fault															
Differential current relay (87)												V			
Insulation monitoring relay															
Single phase measurement		V	V		<b>&gt;</b>	V					>		V	V	
3-phase measurement				V			V	V	V	V		V			V
Conformal coating						V	V	V	V	V	V	V	V	V	V

### **Engine Controls**

FEATURE (IEEE #)	M2000	M2500	M2600
Start/stop	~	V	
Digital sensor inputs	V	<b>V</b>	V
Analog sensor inputs		V	
Cable monitoring on fuel/ stop solenoid output		~	V
Graphical display		V	
CAN J1939		<b>V</b>	
USB		V	
SD card slot		V	
Pick-up input	<b>V</b>	V	V

### Generator Controls

FEATURE (IEEE #)	T2600	T4500	T4800	T4900	T5000	E7800	T7900	M8100	T8400	C6200	S6000	S6100	S6610
3 phase true RMS measurement	V	V	V	V	V			V		V	V	V	
Overcurrent										V	V		
Short circuit										>	V		
Overload										V	V		
Reverse power (32)			V							V	V		
Excitation loss (40)										>	V		
Overfrequency (81)										<b>&gt;</b>	V	V	
Underfrequency (81)										V	V	V	
Overvoltage (59)										<b>&gt;</b>	V	V	
Undervoltage (27)										V	V	V	
ROCOF (81)										>	V		
Vector shift										V			
Preferential load trip										<b>V</b>	V		
Synchronizing (25)		V								V		V	
Check synchronizer (25)					V			>		>		V	
Active load sharing [kW]			V							V		V	
Reactive load sharing [kVAR]				V						<b>&gt;</b>		V	
Power factor regulation				V						V		V	
Dead bus monitoring/ black out limiter								>		>		V	
Load depending start/stop (PM)	V									<b>V</b>			V
Large consumer control (PM)										V			V
Dynamic grid-parallel operation control										V		V	
MODBUS RTU (RS485 interface)										>	V	V	~
Motorized potentiometer						V							
Electronic potentiometer							V						
Dead bus closure									V				

NOTE: These tables are for reference only and include standard and optional configurations.

### **Engine Diagnostics**

FEATURES	BASIC E5000 & E5100	PROFESSIONAL E5000, E5100, E5200 & 5300		
USB	<b>V</b>	<b>~</b>		
Color LCD	<b>V</b>	<b>✓</b>		
PC software included	<b>V</b>	<b>V</b>		
Upgradable	<b>V</b>	<b>✓</b>		
Temperature compensation	<b>V</b>	<b>V</b>		
Calibration-check integration	<b>~</b>	<b>~</b>		
Connecting sensor ports	1	5		
Pressure graph	<b>V</b>	<b>✓</b>		
MIP mode		<b>~</b>		
Misfire analysis		<b>✓</b>		
p <sup>max</sup>		<b>V</b>		
p/time	V	<b>✓</b>		
p <sup>max</sup> bar graph		<b>~</b>		
p/alpha		<b>✓</b>		
dp/alpha		<b>V</b>		
p/V		<b>✓</b>		
Pressure sensor	V	<b>✓</b>		
Crank-angle sensor		<b>✓</b>		
Maximum engines (memory)	5	20		
Maximum cylinders/ engine (memory)	20	20		
Maximum number of strokes (memory)	30	30		



Select product category

Select the needed features in each category

This is the recommended product for your application

### PRODUCT SELECTION GUIDE



#### **GROUND-FAULT PROTECTION TRAILING CABLE PROTECTION GROUNDED UNGROUNDED GROUND-CONDUCTOR MONITORING** & GROUND-FAULT PROTECTION DC AC AC DC Detect Locate Ground **Ensure Ground-Conductor Continuity** Detect & Fault & Reduce for Portable Equipment and Low-level Limit Solid Resistance Transient **Ground-Fault** Submersible Pumps and Ground Overvoltage Currents **Detect Ground Faults Faults** N<sub>0</sub> **YES** Detect Reduce Potential Insulation for Arc Flash Breakdown Convert **YES** NO **YES** N<sub>0</sub> System to Resistance Grounding Phase-Voltage Cable Voltage Indication N0 YES <5 kV >5 kV Convert System to Resistance Grounding Off-line "De-energized" System **Insulation Monitor YES** N<sub>0</sub> **Detect Ground** Detect AC/DC Number of Fault by **Ground Fault in VFDs Trailing Cables** Phase-Voltage Measurement N0 Single **YES** Three cable trailing or dual cables termination **Ground-Fault Relay** Application Gen Wide 10 mA-Range 5 A

**Ground-Fault Protection Relays** 

pg. 16

EL3100 PGR-3200 T2800

pg. 17 PGR-4300

Trailing Cable Relays

SE-134C

SE-135

pg. 19

SE-145

pg. 20

SE-601

pg. 16

T3200

**PGR-3200** 

pg. 17

pg. 19, 26

SE-701 SE-704

pg. 18

pg. 18

**EL731** 

pg. 16

SE-105

**SE-107** 







**FEEDER** 

### **RESISTANCE GROUNDING/NGR MONITORING**

### **PROTECTION** RESISTANCE-GROUNDED AC **STANDARD ADVANCED Current Protection** Current & Voltage Implement Implement Protection & Neutral-Grounding Resistance (NGR) & Metering Low-Resistance High-Resistance IEEE/IEC Metering IEEE/IEC **Continuity Monitoring** Grounding Grounding Overcurrent Overcurrent Pulsing, Digital Filtering, Communications, or Software **YES** N0 Identify Faulted Feeder YES NO SE-330 & SE-701 **SE-330 SE-325 PGN-1000 PGN-3000** FPU-32 pg. 24

Resistance-Grounding Systems

pg. 20

Feeder Protection Relays

pg. 24

pg. 20

pg. 20 & 18

pg. 21



Select product category

### PRODUCT SELECTION GUIDE

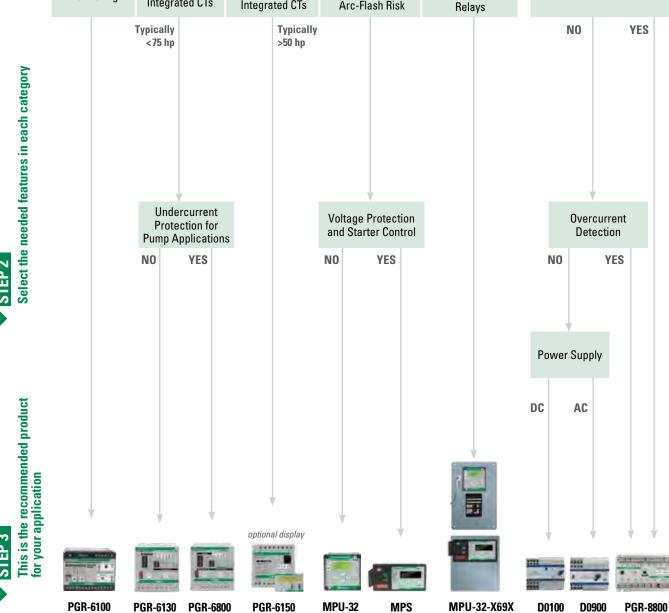


### **MOTOR & PUMP PROTECTION**

BASIC	STAN	NDARD	ADVANCED	RETROFITS
Ground- Fault Protection and Insulation Monitoring	Protection for Low-Voltage Motors (<1000 V), Integrated CTs	Multi-Function Protection for Low-Voltage Motors (<1000 V), Integrated CTs	Comprehensive Protection for Medium-Voltage Motors, Reduced Arc-Flash Risk	Pre-wired, Plug & Play Replacement for Obsolete Relays

**ARC-FLASH PROTECTION** ARC-FLASH DETECTION

Sensor Health Monitoring



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pg. 24

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pg. 25

MPS-469X









### **PERSONNEL PROTECTION**

THREE-PHASE (no neutral) & SINGLE-PHASE **GROUNDED SYSTEMS** 

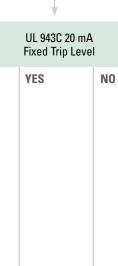
Detect & Interrupt Low-Level Leakage Current

### **GENERATOR & SINGLE-FUNCTION PROTECTION**

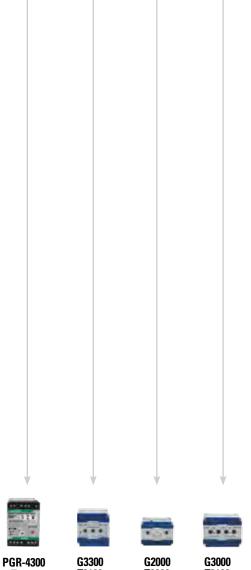
CURRENT	VOLTAGE	POWER	MISC.
Single & Dual	Under-	Forward	Frequency,
Channel	&	&	Excitation
Overcurrent,	Over-	Reverse	Loss,
Short-Circuit	Voltage	Power	Differential

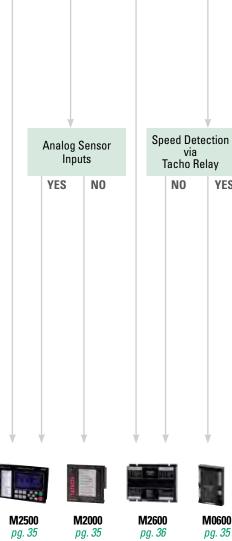
### **ENGINE CONTROL**

ð	START/STOP & MONITORING		ВА	CK-UP FOR MA SAFETY SYSTE	
	J1939 Communica	tion	S	peed Detection Pickup	via
	YES	NO		YES	NO













via

**YES** 

SB6100 GFCI pg. 25

**EGFPD** pg. 25

T2200 T2300 T2400 T2500 pg. 26, 28-29

T3100 T3300 pg. 27, 30

T2000 T2700 pg. 26, 29, 29

T2100 T2900 T3000

pg. 26-27, 29-30

pg. 35

M0600 pg. 35

Industrial Shock-Blocks

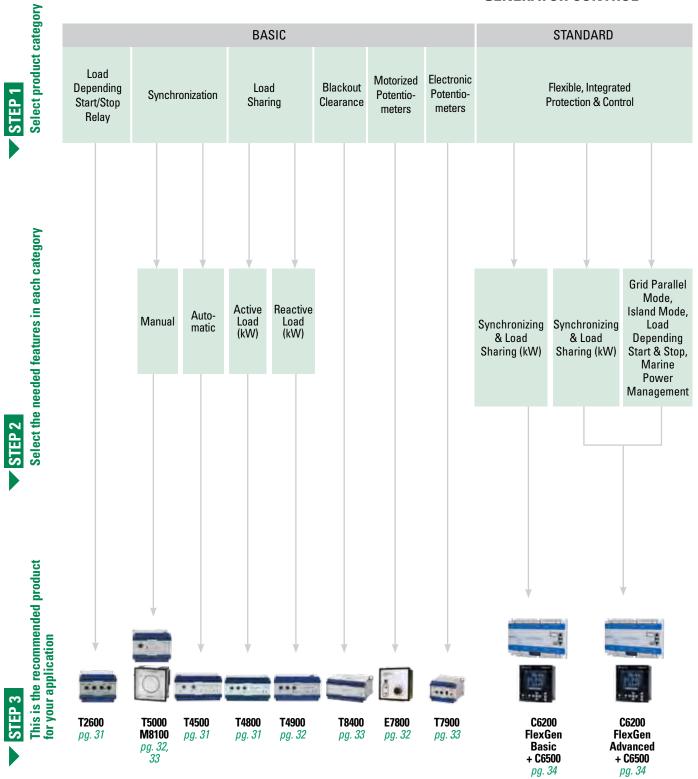
Generator & Single-Function Protection

**Engine Control** 





### **GENERATOR CONTROL**



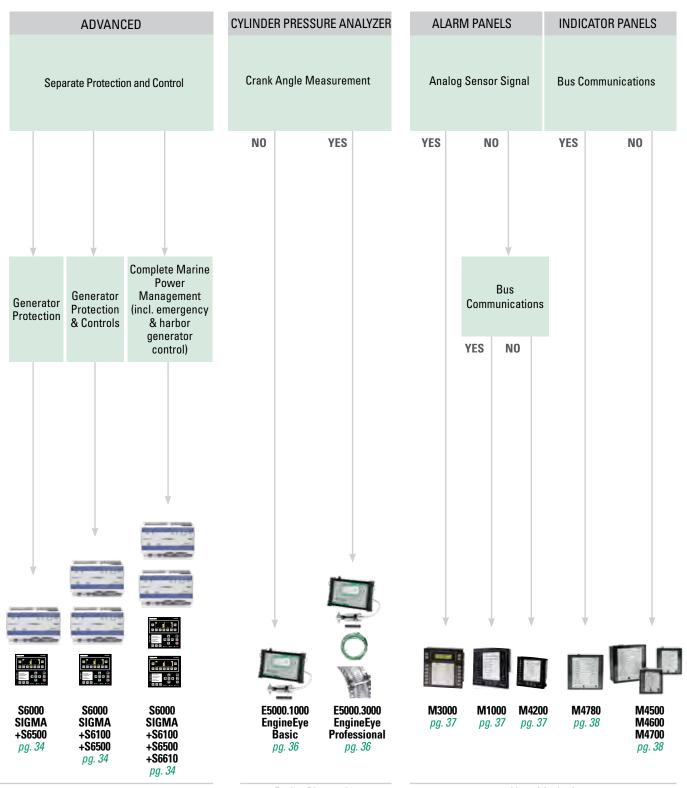






### **ENGINE DIAGNOSTICS**

### **ALARM MONITORING**



**Engine Diagnostics** 

Alarm Monitoring



### SE-601 (PGR-2601) DC Ground-Fault Relay

### For Ungrounded DC Systems



### Features/Benefits

- A microprocessor-based ground-fault relay for ungrounded dc systems
- Sensitive 1- to 20-mA trip settings
- 50-ms to 2.5-s time-delay settings
- Limits ground-fault current to 25 mA
- Form-A and Form-B trip contacts

### **Specifications**

**IEEE Device Number Dimensions** 

**H** 75 mm (3.0") **W** 55 mm (2.2") **D** 115 mm (4.5") Analog Output

76G

UL cSP us C € C

**Communications** Warranty

5 Years

### **Web Resources**

Littelfuse.com/se-601

ORDERING NUMBER	CONTROL POWER	ACCESSORIES
SE-601-0U	120/240 Vac/dc	
SE-601-0D	24 Vdc	SE-GRM Series Ground Reference Modules PGA-0500 Analog Current Meter
SE-601-0T	48 Vdc	Tart 5555 / maiog sumble Wibito

### **EL731** AC/DC Sensitive Earth-Leakage

### For Solidly-Grounded Systems



#### Features/Benefits

- Microprocessor-based relay that offers complete coverage from 0-15 kHz
- Adjustable trip settings provide wide-range protection and coordination
- Operate in both AC or DC mode and single or combined ranges
- LED indication for visual trip, alarm and CT
- LCD metering of earth-leakage current

### **Specifications**

**IEEE Device Numbers** 38, 49, 50G/N,

51G/N, 79G **H** 48 mm (1.9") **W** 96 mm (3.8") **D** 129 mm (5.0")

5 Years

(UL) c (Pus C

Warranty

**Dimensions** 

**Web Resources** Littelfuse.com/el731

ORDERING NUMBER	CONTROL POWER	COMMUNICATIONS
EL731-00-X0	120/240 Vac/Vdc	None
EL731-01-X0	120/240 Vac/Vdc	DeviceNet™
EL731-02-X0	120/240 Vac/Vdc	Profibus <sup>®</sup>
EL731-03-X0	120/240 Vac/Vdc	EtherNet/IP™
EL731-04-X0	120/240 Vac/Vdc	Modbus® TCP
EL731-10-X0	48 Vdc & 24 Vac	None
EL731-11-X0	48 Vdc & 24 Vac	DeviceNet™
EL731-12-X0	48 Vdc & 24 Vac	Profibus®
EL731-13-X0	48 Vdc & 24 Vac	EtherNet/IP™
EL731-14-X0	48 Vdc & 24 Vac	Modbus® TCP
EL731-20-X0	24 Vdc	None
EL731-21-X0	24 Vdc	DeviceNet™
EL731-22-X0	24 Vdc	Profibus®
EL731-23-X0	24 Vdc	EtherNet/IP <sup>TM</sup>
EL731-24-X0	24 Vdc	Modbus® TCP





### **EL3100** Ground-Fault & Phase-Voltage Indicator

For Grounded & Ungrounded AC Systems





#### Features/Benefits

- Meets NEC® Article 250.21 (B) and CEC code Part 1 requirements for ungrounded systems
- Low-voltage remote LEDs
- · Phase voltage indication
- Output relay for remote ground-fault indication

### **Specifications**

Input Voltage Input L: 208/240 Vac

Input H: 480/600 Vac

**Dimensions H** 87.0 mm (3.43")

**W** 112.5 mm (4.43") **D** 56.0 mm (2.2")

Warranty 5 Years

Web Resources

Littelfuse.com/el3100

ORDERING NUMBER	MOUNTING	ACCESSORIES
EL3100-00	DIN, Surface	RK-310X-0Y Remote LED

Note: X=R for red LED and G for green LED; Y=0 for no label and 1 for a ground-fault label

### **PGR-3200** Ground-Fault Protection System For Ungrounded AC Systems



#### Features/Benefits

- Meets NEC Article 250.21 (B)
- Continuously monitors the insulation integrity of ungrounded electrical systems for ground faults
- Provides 2 warnings and 1 alarm
- Analog output for insulation measurement

#### **Specifications**

IEEE Device Number 27, 64 Dimensions H 99.7

**mensions H** 99.7 mm (3.9") **W** 75 mm (4.3")

**W** 75 mm (4.3") **D** 110 mm (4.3")

**Communications** Analog Output

Warranty 5 Years

#### **Web Resources**

Littelfuse.com/pgr-3200

ORDERING NUMBER	CONTROL POWER	ACCESSORIES
PGR-3200	240 Vac	PGH family High Tension Couplers
PGR-3200-120	120 Vac	PGA-0510 Analog Insulation Meter

### **T3200** Double Insulation Monitoring Relay For Ungrounded Systems



### Features/Benefits

- Continuously monitors two systems galvanically separated from each other
- Ensures correct operation in spite of voltage supply fluctuations
- Visual indication of power pick-up, and output trip

### **Specifications**

### Web Resources

Littelfuse.com/t3200

ORDERING NUMBER	1-3 TERMINALS	2-3 TERMINALS	ACCESSORIES
T3200.0010	230 V		
T3200.0020	450 V	400 V	
T3200.0030	480 V	415 V	E2333 Megaohmmeter
T3200.0050	110 V	100 V	
T3200.0060	127 V	120 V	

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### SE-701 (PGR-5701) Ground-Fault Relay For Solidly and Resistance-Grounded Systems





#### Features/Benefits

- A microprocessor-based ground-fault relay for resistance-grounded and solidly grounded systems
- Choice of input CT gives wide setting range
- Digital DFT harmonic filter
- Non-volatile trip memory retains trip state
- Compatible with VFD applications
- Adjustable pick-up settings from 1% to 99% of CT primary rating, as low as 50 mA

12/24 Vdc

48 Vdc

24 Vac

Adjustable time-delay settings from 0.5 to 2.5 sec

### **Specifications**

**IEEE Device Numbers Dimensions** 

**H** 75 mm (3.0") W 55 mm (2.2") **D** 115 mm (4.5") Analog Output 5 Years

50G, 50N, 51G, 51N

**Communications** Warranty

**Web Resources** Littelfuse.com/se-701

### ORDERING NUMBER CONTROL POWER **ACCESSORIES** 120/240 Vac/Vdc **Ground Fault Current Transformers**

PGA-0500 Analog Current Meter

### SE-703 Earth Leakage Monitor For Solidly and Resistance-Grounded Systems







SF-701-0U

SE-701-0D

SE-701-0T

SE-701-03

- A microprocessor-based ground-fault relay for resistance-grounded and solidly earthed systems
- Provides sensitive ground-fault protection
- Digital DFT harmonic filter
- Non-volatile trip memory retains trip state
- Compatible with VFD applications
- Adjustable pick-up settings from 25 mA to 500 mA
- Adjustable time-delay settings from 50 to 500 ms

### **Specifications**

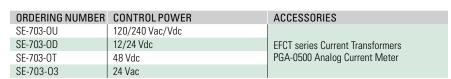
**IEEE Device Numbers Dimensions** 

**H** 75 mm (3.0") W 55 mm (2.2") **D** 115 mm (4.5") Analog Output 5 Years

50G, 50N, 51G, 51N

**Communications** Warranty

**Web Resources** Littelfuse.com/se-703



### SE-704 (PGR-4704) Earth Leakage Monitor For Solidly and Resistance-Grounded Systems









### Features/Benefits

- Microprocessor-based unit with DFT
- Provides very sensitive groundfault protection
- Non-volatile trip memory retains trip state
- Compatible with VFD applications
- Adjustable pick-up settings from 10 mA to 5 A
- Adjustable time-delay settings from

### 0.5 to 2.5 sec

ORDERING NUMBER	CONTROL POWER	ACCESSORIES
SE-704-0U	120/240 Vac/Vdc	
SE-704-0D	12/24 Vdc	SE-CS30 series Current Transformers
SE-704-0T	48 Vdc	PGA-0500 Analog Current Meter
SE-704-03	24 Vac	

### **Specifications**

**IEEE Device Numbers Dimensions** 

50G, 50N, 51G, 51N **H** 75 mm (3.0") W 55 mm (2.2") **D** 115 mm (4.5") Analog Output 5 Years

**Communications** Warranty

### **Web Resources**

Littelfuse.com/se-704



### **T2800** Earth-Fault Relay For Solidly and Resistance-Grounded Systems



### Features/Benefits

- Accepts high supply voltage variation
- Visual indication of power, pick-up and
- Direct line-line or line-neutral voltage supply
- Wide range of combined current and delay
- DIN-rail or Screw-mount

### **Specifications**

Trip Level  $0.02-0.2 \times I_{N}$  or  $0.2-2 \times I_{N}$ Delay 0.1-1 sec or 1-10 sec **Dimensions** H 70 mm (2.76")

W 100 mm (3.94") **D** 115 mm (4.52")

#### **Web Resources**

Littelfuse.com/t2800

ORDERING NUMBER	TERMINALS		1	
UNDENING NUMBER	1-3	2-3	I <sub>N</sub>	
T2800-00	230 V		5 A	
T2800-01	450 V	400 V	5 A	
T2800-02	127 V	120 V	5 A	
T2800-04	24 Vac/Vdc		5 A	
T2800-05	480 V	415 V	5 A	
T2800-08	230 V		1 A	

### TRAILING CABLE PROTECTION

### SE-105 • SE-107 Ground-Fault Ground-Check Monitor



#### Features/Benefits

- Adjustable pickup so unit can be used on a wide variety of trailing cable applications
- Adjustable time delay for quick protection and system coordination
- Harmonic filter prevents false operation

### **Specifications**

**IEEE Device Numbers Dimensions** 

3GC, 50G/N, 51G/N **H** 50 mm (5.9") **W** 109 mm (4.3") **D** 100 mm (4.0") 5 Years

(UL) c (Files C

Warranty

**Web Resources** 

Littelfuse.com/se-105 Littelfuse.com/se-107

ORDERING NUMBER	CONTROL POWER	ACCESSORIES
SE-105	120 Vac	
SE-105D	120 Vac/Vdc	CT200 Series Current Transformer
SE-105E	240 Vac	1N5339B Termination Assembly
SE-107	120 Vac	SE-TA6 Termination Assembly
SE-107D	120 Vac/Vdc	SE-TA6-SM Stud-Mount Termination Assembly
SE-107E	240 Vac	

### SE-134C (PGM-8134) • SE-135 Ground-Fault Ground-Check Monitor









### Features/Benefits

- Fail-safe ground check circuit
- Combination ground-wire monitor and ground-fault relay
- Zener-characteristic termination device
- High induced-ac rejection
- DFT (harmonic) filter

### **Specifications**

IEEE Device Numbers **Dimensions** 

3GC, 50G, 50N, 51G, 51N **H** 213 mm (8.4") **W** 99 mm (3.9") **D** 145 mm (5.7")

5 Years

Warranty

#### Web Resources

Littelfuse.com/se-134c Littelfuse.com/se-135

ORDERING NUMBER	CONTROL POWER	ACCESSORIES
SE-134C-00	120/240 Vac/Vdc	05.0040.0 4.5 4.0 4.7 4
SE-134C-10	24/48 Vac/Vdc	SE-CS10 Ground-Fault Current Transformer SE-TA6A Series Termination Assembly
SE-135-00	120/240 Vac/Vdc	SE-TA12A Series Termination Assembly
SE-135-10	24/48 Vac/Vdc	,



### TRAILING CABLE PROTECTION

#### SE-145 Ground-Fault Ground-Check Monitor



#### Features/Benefits

- Adjustable pick-up can be used on a wide variety of trailing-cable applications
- Adjustable time delay for quick protection and system coordination
- Separate annunciation of ground faults and ground-check faults

#### **Specifications**

**IEEE Device Number** 3GC, 50G, 50N, 51G, 51N **Dimensions** 

**H** 213 mm (8.4") W 192 mm (7.6") **D** 176 mm (7.0")

**Communications** EtherNet/IP™ Optional Warranty 5 Years

Web Resources

Littelfuse.com/se-145

ORDERING NUMBER	CONTROL POWER	COMMUNICATIONS	ACCESSORIES
SE-145-00-00	120/240 Vac; 110-250 Vdc	_	05 0040 0
SE-145-30-00	120/240 Vac; 110-250 Vdc	Modbus® TCP	SE-CS10 Series Ground-Fault CT
SE-145-30-00	24 Vdc Battery Back-up	_	SE-CS40 Series Ground-Fault CT SE-TA12A Series Termination Assembly
SE-145-33-00	24 Vdc Battery Back-up	Modbus® TCP	SE-TATZA Series Termination Assembly

### RESISTANCE GROUNDING AND NGR MONITORING

### SE-325 (PGM-8325) Neutral-Grounding-Resistor Monitor



#### **Description**

The SE-325 Neutral-Grounding-Resistor Monitor is used on resistance-grounded systems up to 25 kVac to monitor the integrity of the complete neutral-to-ground path for loose connection, resistor and ground faults.

### Features/Benefits

- Adjustable ground-fault detection
- Adjustable time-delay settings
- Selectable fail-safe mode
- Conformally coated circuit boards

### **Specifications**



59N, 86, 3

**H** 150 mm (5.9") **Dimensions** 

W 109 mm (4.3") **D** 100 mm (4.0")

Warranty 5 Years

**Web Resources** Littelfuse.com/se-325



### SE-330 (PGR-5330), SE-330HV Neutral-Grounding-Resistor Monitor



5 Years





(UL) c (Fus C



**Description** 

An advanced ground-fault and grounding-resistor monitoring relay. It measures neutral current, neutralto-ground voltage and neutral-to-ground resistance.

#### Features/Benefits

- · Continuous NGR monitoring
- Detect ground-fault anywhere on monitored system
- Adjustable pickup (2-100%)
- Adjustable time delay (0.1-10s)

### **Specifications**

**Communications** 

IEEE Device Numbers **Dimensions** 

50G/N, 51G/N, 59N, 3, 86 H 213 mm (8.4")

**W** 98 mm (3.9") **D** 132 mm (5.2") RS-232; DeviceNet™, Profibus®, EtherNet/IP™

Warranty

#### **Web Resources**

Littelfuse.com/se-330

See website for SE-330HV details and ordering information.

ORDERING NUMBER	COMMUNICATIONS	ACCESSORIES
SE-330-X0-XX	RS-232	
SE-330-X1-XX		ER Series Sensing Resistor EFCT Series Ground-Fault Current Transformer
SE-330-X2-XX	DC 222 9. Drofibuo®	SE-CS30 Series Ground-Fault Current Transformer
SE-330-X3-XX	RS-232 & EtherNet/IP™ & Modbus® TCP	





### RESISTANCE GROUNDING AND NGR MONITORING

### **SE-330AU** Neutral-Grounding-Resistor Monitor





#### **Description**

An advanced earth-fault and earth-resistor monitor for low- and medium-voltage transformers and generators. The SE-330AU complies with AS/NZS 2081.3:2002.

### Features/Benefits

- · Continuous NGR monitoring
- Detect ground-fault anywhere on monitored system
- Adjustable pickup settings
- Adjustable time delay settings

### **Specifications**

**Communications** 

**Dimensions** H 213 mm (8.4") **W** 98 mm (3.9")

**D** 132 mm (5.2") RS-232; DeviceNet™,

Profibus®, EtherNet/IP™ Warranty 5 Years

**Web Resources** Littelfuse.com/se-330au

ORDERING NUMBER	COMMUNICATIONS	ACCESSORIES
SE-330AU-X0-XX	RS-232	
SE-330AU-X1-XX	RS-232 & DeviceNet™	ER Series Sensing Resistor EFCT Series Ground-Fault Current Transformer
SE-330AU-X2-XX	RS-232 & Profibus®	SE-CS30 Series Ground-Fault Current Transformer
SE-330AU-X3-XX	RS-232 & EtherNet/IP™ & Modbus® TCP	

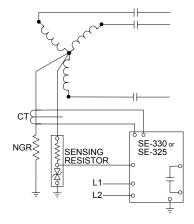
### **NGR Series Neutral-Grounding-Resistor Packages**



Neutral-Grounding Resistors (NGRs) are used to ground power systems by inserting a resistor between the system neutral and ground. This lowers the prospective ground-fault current to a predetermined value. Because the system is grounded, transient overvoltages do not occur and ground-fault current can flow, allowing it to be detected and measured.

#### **Web Resources**

For more information on Resistance Grounding Systems, visit Littelfuse.com/ngr



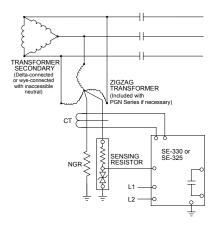
### **PGN Series Pulsing High-Resistance Grounding System**



The PGN Pulsing High-Resistance-Grounding Systems are used to ground power systems by inserting a resistor between the system neutral and ground to lower the ground-fault current to a predetermined value. A proper RG system solves the problem of transient overvoltages, and the difficulty of locating ground faults.

#### **Web Resources**

For more information on Resistance Grounding Systems, visit Littelfuse.com/pgn





### MOTOR PROTECTION

### PGR-6100 (GFR-4000) Motor Ground-Fault and Insulation Relay



### Features/Benefits

- Online monitoring to detect ground faults
- · Offline monitoring of insulation resistance
- Continuously monitors for predictive protection
- CT loop monitoring
- Individual alarm contacts (form C)
- Individual analog outputs to indicate insulation resistance and ground-fault current

### **Specifications**

**IEEE Device Numbers** 50G/N, 51G/N, 64, 74 **Dimensions H** 75 mm (3.0")

W 99.7 mm (3.9")
D 110 mm (4.3")

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**Communications** 2 Analog Outputs **Warranty** 5 years

### **Web Resources**

Littelfuse.com/pgr-6100

ORDERING NUMBER	CONTROL POWER	ACCESSORIES
PGR-6100-120	120 Vac	PGC-5000 Series Ground-Fault Transformers PGA-0500 Analog % Current Meter
PGR-6100-240	240 Vac	PGA-0510 Analog Ohm Meter PGH Family High Tension Couplers

### PGR-6130 Electronic Overload Relay



### Features/Benefits

- No external CT required for currents up to 90 A
- Cause-of-trip indication
- N.O. and N.C. alarm contacts
- · Adjustable overload trip-class setting
- Adjustable current pickup
- Over-temperature (PTC) protection
- Thermal overload protection

### **Specifications**

IEEE Device Numbers 46, 49, 51 Dimensions H 83 mm (3

**H** 83 mm (3.3") **W** 78 mm (3.1") **D** 99 mm (3.9")

Warranty 5 years

#### **Web Resources**

Littelfuse.com/pgr-6130

ORDERING NUMBER	CONTROL POWER	FULL-LOAD CURRENT	ACCESSORIES
PGR-6131-24	24 Vdc	4-16.7 A	
PGR-6131-120	120 Vac	4-16.7 A	
PGR-6131-240	240 Vac	4-16.7 A	
PGR-6132-24	24Vdc	15-40.5 A	DOD 0400 D
PGR-6132-120	120 Vac	15-40.5 A	PGB-6130 Remote Indication and Reset Assembly
PGR-6132-240	240 Vac	15-40.5 A	and neset Assembly
PGR-6133-24	24Vdc	40-91 A	
PGR-6133-120	120 Vac	40-91 A	
PGR-6133-240	240 Vac	40-91 A	

### **PGR-6150** Motor Protection System





### Features/Benefits

- 13 protective functions
- 2 relay outputs, 1 digital input
- No external CT required for currents up to 25 A
- Thermal protection through starting, running, overload and cooling cycles
- RS-485 interface with Modbus® RTU
- Optional PGR-6150-OPI Operator Interface

#### **Specifications**

IEEE Device Numbers 37, 46, 49, 50, 50G/N,

51, 51G/N, 66

Dimensions (Relay) H 83 mm (3.3")

**W** 78 mm (3.1") **D** 99 mm (3.95")

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**Dimensions (OPI) H** 56 mm (2.2") **W** 106 mm (4.2")

Communications D 23 mm (0.9")
RS-485 with Modbus® RTU
5 years

Web Resources
Littelfuse.com/pgr-6150

ORDERING NUMBER	CONTROL POWER	ACCESSORIES
PGR-6150-24 (Control Unit)	24/48 Vdc	
PGR-6150-120 (Control Unit)	120/240 Vac/Vdc	PGR-6150-OPI Operator Interface PGC-6000 Series Ground-Fault Transformer
PGR-6150-OPI (Operator Interface)	Powered by Control Unit	1 do 0000 oches diound rault fransionner





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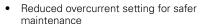
### MOTOR PROTECTION

### MPU-32 (PGR-6200) Motor Protection Unit

### Features/Benefits







- Dynamic thermal modeling
- Communications for various networks
- Optional RTD protection
- Optional differential protection
- Conformal coating

Modular system and compact design makes installation easy for new or retrofit applications

### **Specifications**

IEEE Device Numbers 37, 38, 46, 49, 50, 50G/N. 51, 51G/N, 66, 74, 86, 87

Dimensions **H** 96 mm (3.78")

W 96 mm (3.78") **D** 132 mm (5.2")

Communications RS-232 (Standard); RS-485, DeviceNet™

EtherNet/IP™ (Optional)

Warranty 10 years

Web Resources

Littelfuse.com/mpu-32

ORDERING NUMBER	COMMUNICATIONS	ACCESSORIES
MPU-32-00-00	TIA-232	Phase Current Transformers
MPU-32-01-00	TIA-232 & TIA-485	Ground-Fault Current Transformers
MPU-32-02-00	TIA-232 & DeviceNet™	MPS-RTD Temperature Input Module
MPU-32-04-00	TIA-232 & EtherNet/IP™ & Modbus® TCP	MPS-DIF Differential Current Module

### MPS (PGR-6300) Motor Protection System







### Features/Benefits

- Overcurrent reduction setting for safer maintenance
- Monitors voltage, current, and temperature
- 22 motor-protection functions
- Conformal coating
- Dynamic thermal modeling
- Starter control, Metering, and Data Logging
- Optional RTD protection with hazardouslocation certified RTD module
- Optional differential protection
- Modular design makes installation easy

### **Specifications**

**IEEE Device** 1, 2, 3, 5, 9, 14, 18, 19, 27, 34, **Numbers** 37, 38, 46, 47, 48, 49, 50, 50G,

> 50N, 51, 51G/N, 55, 59, 66, 74, 81, 86, 87, 94

Dimensions (OPI) **H** 98 mm (3.86")

W 192 mm (7.56")

**D** 0.42 mm (1.65") **Communications** Allen-Bradley® DF1 & Modbus®

RTU (Standard); DeviceNet™,

Profibus®, EtherNet/IP™ (Optional) 10 years

Warranty **Web Resources** Littelfuse.com/mps

COMMUNICATIONS ORDERING NUMBER MPS-CTU-01-00 RS-485 MPS-CTU-02-00 RS-485 & DeviceNet™ MPS-CTU-03-00 RS-485 & Profibus® RS-485 & EtherNet/IP™ & Modbus® TCP MPS-CTU-04-00 MPS-0PI-01-00 Operator Interface

**ACCESSORIES Phase Current Transformers Ground-Fault Current Transformers** MPS-RTD Temperature Input Module MPS-DIF Differential Current Module

### MPU-32-X69X (PGR-6210) & MPS-469X (PGR-6310) **Motor Protection Retrofit Kits**



### Features/Benefits

- Direct replacement for GE Multilin 169, 269, 369 and 469 relays
- Microprocessor-based protection
- Proven reliability
- Conformally coated circuit boards
- Pre-wired module allows minimal change-out time
- Ability to match existing overcurrent values

### **Ordering Information**

### **Ordering Information** MPS-469X

		MODULE CONFIGURATION	MPS COMMUNICATION	FUTURE OPTIONS
	-	X	Χ	000
×		0 = None	1 = RS485	
469)		1 = One MPS-RTD Module	2 = RS485 & DeviceNet	
MPS-469X		2 = Two MPS-RTD Modules	3 = RS485 & Profibus	
≥		3 = One MPS-DIF Module	4 = RS485 & EtherNet/IPTM	
		4 = One MPS-RTD Module & One MPS-DIF Module		



MPU-32-X69X		J-32-X69X		
WII O 02 70070				
		RTD INPUTS	MPU-32 COMMUNICATION	GROUND-FAULT CT
$\succeq$	-	X	X	X
X69X	$0 = 0$ ne Platinum 100 $\Omega$		0 = TIA232	0 = Wired for Ground-Fault CT (50 mA Secondary)
32-	$^{\prime}$ 1 = One Platinum 100 Ω & 8-input MPS-RTD Module		1 = TIA232 & TIA485	1 = Wired for 1- or 5-A Secondary Ground-Fault CT

2 = TIA232 & DeviceNet 4 = TIA232 & EtherNet/IPTM

**FUTURE OPTIONS** 00



### PUMP PROTECTION

### **PGR-6800** Pump Protection Relay





#### Features/Benefits

- No external CT required for currents up to 90 A
- Cause-of-trip indication
- N.O. and N.C. alarm contacts
- Adjustable overload trip class setting
- · Adjustable current pickup
- Undercurrent protection

#### **Specifications**

**IEEE Device Numbers** 37, 46, 49, 51

**Dimensions H** 83 mm (3.3"); **W** 78 mm (3.1")

**D** 99 mm (3.9")

Warranty 5 years

#### **Web Resources**

Littelfuse.com/pgr-6800

ORDERING NUMBER	CONTROL POWER	FULL-LOAD CURRENT	ACCESSORIES
PGR-6801-24	24 Vdc	7-19.6 A	
PGR-6801-120	120 Vac	7-19.6 A	
PGR-6801-240	240 Vac	7-19.6 A	
PGR-6802-24	24 Vdc	19-44.2 A	PGB-6800 - Remote Indication
PGR-6802-120	120 Vac	19-44.2 A	and Reset Assembly
PGR-6802-240	240 Vac	19-44.2 A	and neset Assembly
PGR-6803-24	24 Vdc	40-90.4 A	
PGR-6803-120	120 Vac	40-90.4 A	
PGR-6803-240	240 Vac	40-90.4 A	

### FEEDER PROTECTION

### FPU-32 (PGR-7200) Feeder Protection Unit



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### Features/Benefits

- Protection, metering, and data-logging functions
- Programmable using the operator interface, the TIA-232 port, or an optional communications network
- IEC & IEEE protection curves
- CT saturation compensation
- · Communications for different networks
- Two set-point groups

### **Specifications**

**IEEE Device Numbers** 26, 46, 49, 50, 50G/N,

51, 51G/N, 74, 86

**Dimensions H** 96 mm (3.78"); **W** 96 mm (3.78")

D 132 mm (5.2")

Communications

TIA-232, RS-485, DeviceNet™

Warranty 10 years

### **Web Resources**

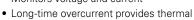
Littelfuse.com/fpu-32

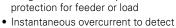
ORDERING NUMBER	COMMUNICATIONS	ACCESSORIES
FPU-32-00-00	TIA-232	
FPU-32-00-01-00	TIA-232 & TIA-485	Phase Current Transformers
FPU-32-00-02-00	TIA-232 & DeviceNet™	Ground-Fault Transformer
FPU-32-00-04-00	TIA-232 & Modbus® TCP	

### FPS (PGR-7300) Feeder Protection System









- catastrophic failure
- Coordination using IEEE and IEC
- Two setpoint groups
- Breaker control
- Conformal coating

### **Specifications**



**Dimensions (OPI) H** 98 mm (3.86"); **W** 192 mm

(7.56")

**D** 0.42 mm (1.65")

Communications Allen-Bradley® DF1 & Modbus® RTU (Standard); DeviceNet™,

Profibus®, EtherNet/IP™ (Optional)

10 years

### Web Resources Littelfuse.com/fps

Warranty

ORDERING NUMBER	COMMUNICATIONS	ACCESSORIES
FPS-CTU-01-00	RS-485	
FPS-CTU-02-00	RS-485 & DeviceNet™	Phase Current Transformers
FPS-CTU-03-00	RS-485 & Profibus®	Ground-Fault Current Transformer MPS-RTD Temperature Input Module
FPS-CTU-04-00	RS-485 & EtherNet/IP™ & Modbus® TCP	SE-IP65CVR-M Cover
FPS-0PI-01-00	Recommended	





Littelfuse.com/RelaysControls



**Specifications** 

Web Resources

**Specifications** 

**Dimensions** 

Interface

Warranty

**IEEE Device Numbers** 

**Web Resources** 

Littelfuse.com/ArcFlash

Littelfuse.com/d0900

**Dimensions** 

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**H** 90 mm (3.5") **W** 105 mm (4.1")

**D** 75 mm (3.0")

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**H** 130 mm (5.2")

**W** 200 mm (7.9") **D** 54 mm (2.2")

50, AFD

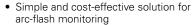
**USB 1.1** 

5 years

### **ARC-FLASH PROTECTION**

### D0100/D0900 Arc-Flash Protection Relay

#### Features/Benefits



- Compact module fits into a wide range of applications
- · Arc-flash trip time is less than 1 ms
- Single arc-flash relay can monitor 2 sensors

,		
ORDERING NUMBER	CONTROL POWER	ACCESSORIES
D0100.0010	48-220 Vdc	A0200 Light Sensor
D0100.0020	24 Vdc	A0300 Light Sensor
D0900 0010	220-250 Vac	D0400/D0500 Junction Box

### PGR-8800 (D1000) Arc-Flash Protection Relay

### Features/Benefits

- Microprocessor-based relay that limits arc-fault damage by detecting the light from an arc flash and rapidly tripping
- Sensors, inputs and connections are monitored to ensure fail-safe operation
- Arc-flash trip time is less than 1 ms
- Single module can monitor up to 6 sensors and up to 4 PGR-8800 units can be linked into one system
- Phase-CT inputs provide overcurrent protection and prevent nuisance trips
- LED indication provides at-a-glance status for module and I/O state on relay and sensors
- USB programming is fast and easy

OSB programming is last and easy					
ORDERING NUMBER	COMMUNICATIONS	ACCESSORIES			
PGR-8800-00 (UL, C-tick)	Multi-unit linking, Modbus® RTU	PGA-LS10 Point Sensor			
PGR-8800-01 (CE, C-tick)		PGA-LS20/PGA-LS25 Fiber-Optic Sensors PGA-1100 Diode Logic Unit Current Transformer			

### PERSONNEL PROTECTION

### **Industrial Shock-Block**



Open-Chassis Model

#### Features/Benefits

- The UL 943 inverse time curve reduces the probability of nuisance tripping.
- UL 943C Fixed Trip Level (GFCI Model) provides protection for systems with leakage current higher than the 6 mA trip level required by Class A GFCIs.
- Selectable Trip Levels (EGFPD Models) help reduce nuisance tripping by allowing users to adjust the trip level in systems that have leakage current higher than the standard 6 mA UL 943 Class A.
- UL 943C Ground Monitor/Interrupt insures continuity of the load ground.

- Undervoltage, brownout and chatter detection prolong the internal contactor lifetime.
- Overcurrent Protection is provided with 3 200-A Class T 600-V fuses

#### **Specifications**

Dimensions Enclosed: H 453 mm (17.8")

**W** 406 mm (16.0") **D** 223 mm (8.8"

Open: **H** 387 mm (15.2")

**W** 341 mm (13.4") **D** 161 mm (6.4")

Warranty 1 year

#### Web Resources

Littelfuse.com/IndustrialShockBlock

ORDERING NUMBER	NUMBER VOLTAGE (V) TRIP LEVEL (m.		UL CATEGORY/CLASS	ACCESSORIES
SB6100-00x-0	208		LIL 042C Class C	
SB6100-10x-0	240	20 (Fixed)	UL 943C Class C special-purpose GFCI	
SB6100-20x-0	480		special-purpose di ci	SB-OPI Operator Interface
SB6100-30x-0	600		UL 943C Class D special-purpose GFCI	
SB6100-01x-0	208	6, 10, 20, 30		1N5339B
SB6100-11x-0	240		6, 10, 20, 30	UL 943/UL 1053 Equipment ground-
SB6100-21x-0	480	(Selectable)	fault protective device (EGFPD)	
SB6100-31x-0	600			

Note: x=0 for open-chassis models and 1 for enclosed model





### **PGR-4300** Generator Ground-Fault Relay





### Features/Benefits

- No CTs required
- Provides a simple method for tripping a groundfault condition on generators
- Use with 3- or 4-pole transfer switches
- Monitors neutral-to-ground integrity
- Adjustable pick-up settings from 100 to 1200 A
- Adjustable time-delay settings from 0 to 1 sec

### **Specifications**

IEEE Device Numbers 50G/N, 51G/N Dimensions H 75 mm (3.0")

**W** 55 mm (2.2") **D** 115 mm (4.5") Analog Output

**Communications** Analog **Warranty** 5 Years

#### **Web Resources**

Littelfuse.com/pgr-4300

ORDERING NUMBER	CONTROL POWER	ACCESSORIES
PGR-4300-12	12 Vdc	
PGR-4300-24	24 Vdc	PGA-0500 Analog Current Meter
PGR-4300-120	120 Vac	

### **G2000** Power Relay





### Features/Benefits

- Detects power level for protection, control and monitoring
- PC configuration for forward-power or reversepower functionality
- User configured scales and setpoints suits a broad variety of applications
- 63 Vac to 690 Vac systems can be monitored by the same unit

### **Specifications**

 Supply
 8-36 Vdc/0.75 W at 24 Vdc

 Input Voltage
 63-690 Vac ± 30%

 Input Current
 5 A CT, max. 10 A

 Frequency
 35-75 Hz

 Dimensions
 H 73 mm (2.9")

**W** 75 mm (3.0") **D** 114 mm (4.5")

Web Resources Littelfuse.com/g2000

ORDERING NUMBER	CONTROL POWER	ACCESSORIES
G2000 0010	24 Vdc. 5 A	G0100 Programming Kit

### **G3000** Frequency Relay

CE



#### Features/Benefits

- Frequency monitoring for generators, bus bars or other distribution systems
- PC configuration for over- and under-frequency protection in one unit
- User-configured scales and setpoints suit a broad variety of applications
- 63 Vac to 690 Vac systems can be monitored by the same unit

### Specifications

Supply Input Voltage Input Current Frequency Dimensions 8-36 Vdc/0.75 W at 24 Vdc 63-690 Vac ± 30% 5 A CT, max. 10 A 35-75 Hz H 73 mm (2.9") W 75 mm (3.0") D 114 mm (4.5")

Web Resources Littelfuse.com/g3000

ORDERING NUMBER	CONTROL POWER	ACCESSORIES
G3000.0010	24 Vdc	G0100 Programming Kit



### **G3300** Voltage Relay

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#### Features/Benefits

- Monitors voltage on generators, bus bars or other distribution systems
- PC configuration for over- and under-voltage protection in one relay
- User-configured scales and setpoints suit a broad variety of applications
- Phase-symmetry monitor enables use in gridconnection applications
- 63 Vac to 690 Vac systems can be monitored by one unit

### **Specifications**

 Supply
 8-36 Vdc/0.75 W at 24 Vdc

 Input Voltage
 63-690 Vac ± 30%

 Frequency
 35-75 Hz

 Dimensions
 H 73 mm (2.9")

 W 75 mm (3.0")

**D** 114 mm (4.5")

### Web Resources

Littelfuse.com/g3300

ORDERING NUMBER	CONTROL POWER	ACCESSORIES
G3300.0010	24 Vdc	G0100 Programming Kit

### **T2000** Reverse Power Relay

### CE

#### Features/Benefits

- Protects the generator from being run as an electric motor
- Accepts high supply-voltage variation to ensure correct operation during voltage supply fluctuations
- Visual indication of power, pick-up and trip output provides quick and concise status information

#### **Specifications**

 Trip level
 2-20 % I<sub>N</sub>

 Delay
 2-20 sec.

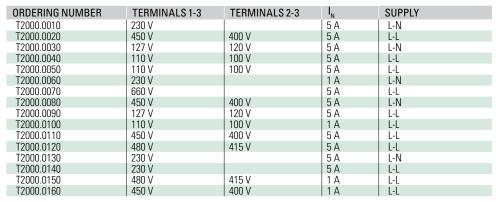
 Max. Voltage
 660 V

 Dimensions
 H 70 mm (2.8")

 W 100 mm (3.9")
 D 115 mm (4.5")

#### Web Resources Littelfuse.com/t2000





### **T2100** Excitation Loss Relay

### CE



- Protects against loss of excitation in a synchronous generator
- Accepts high supply-voltage variation to ensure correct operation during voltage supply fluctuations
- Visual indication of power, pick-up and trip output provides quick and concise status information

#### **Specifications**

 Trip level
 0.5-1.5 x I N

 Delay
 2-20 sec.

 Max. Voltage
 660 V

 Dimensions
 H 70 mm (2.8")

 W 100 mm (3.9")
 D 115 mm (4.5")

#### Web Resources Littelfuse.com/t2100



ORDERING NUMBER	TERMINALS 1-3	TERMINALS 2-3	I <sub>N</sub>	SUPPLY
T2100.0010	230 V		5 A	L-N
T2100.0020	480 V	415 V	5 A	L-L
T2100.0030	450 V	400 V	5 A	L-L
T2100.0040	110 V	100 V	1 A	L-L
T2100.0050	110 V	100 V	5 A	L-L
T2100.0060	110 V	100 V	5 A	L-L
T2100.0070	480 V	415 V	5 A	L-L
T2100.0080	110 V	100 V	5 A	L-L
12100.0000	110 V	100 V	I D A	L-L



### T2200 3-Phase Overcurrent Relay

#### Features/Benefits

- Designed for generator or feeder protection against overcurrent in each of the 3 phases
- Accepts high supply-voltage variation to ensure correct operation during voltage supply fluctuations
- Visual indication of power, pick-up and trip output provides guick and concise status information

ORDERING NUMBER	TERMINALS 1-3	TERMINALS 2-3	l <sub>N</sub>	
T2200.0010	450 V	400 V	5 A	
T2200.0020	450 V	400 V	5 A	
T2200.0030	230 V		5 A	
T2200.0040	230 V	110 V	5 A	ı
T2200.0050	230 V		1 A	
T2200.0060	450 V	400 V	5 A	
T2200.0070	110 V	100 V	5 A	
T2200.0080	480 V	415 V	5 A	ı
T2200.0090	24 Vdc		5 A	
T2200.0100	450 V	400 V	5 A	Ī
T2200.0110	450 V	400 V	1 A	

### **Specifications**

 Trip level
 0.5-1.4 x I N

 Delay
 3-30 sec.

 Max. Voltage
 660 V

 Dimensions
 H 70 mm (2.8")

 W 100 mm (3.9")
 D 115 mm (4.5")

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#### Web Resources Littelfuse.com/t2200

	FUNCTION
Α	Latching output, resetable
Α	Normally energized output, latching, resetable
A A	Latching output, resetable
Α	Latching output, resetable
Α	Latching output, resetable
A A A A	Normally energized output, latching, resetable
Α	Latching output, resetable
Α	Latching output, resetable
A A	Latching output, resetable
Α	Instantly extra output relay
Α	Instantly extra output relay

### T2300 3-Phase Short-Circuit Relay

### Features/Benefits

- Designed for short-circuit protection of generators, power transmissions and consumer's supply
- Accepts high supply-voltage variation to ensure correct operation during voltage supply fluctuations
- Visual indication of power, pick-up and trip output provides quick and concise status information

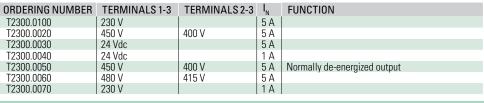
### Specifications

Trip level 1.0-4.0 x I<sub>N</sub>
Delay 0.1-1.0 sec.

Max. Voltage 660 V
Dimensions H 70 mm (2.8")
W 100 mm (3.9")
D 115 mm (4.5")

#### Web Resources Littelfuse.com/t2300





### **T2400** 3-Phase Dual Overcurrent Relay

#### Features/Benefits

- Includes two overcurrent relays combined to protect or monitor generators and power transmissions
- Accepts high supply-voltage variation to ensure correct operation during voltage supply fluctuations
- Combining two relays is a cost-effective and spacesaving solution for non-essential load tripping

### **Specifications**

 Trip level
 0.5-1.4 x l N

 Delay
 3-30 sec.

 Max. Voltage
 660 V

 Dimensions
 H 70 mm (2.8")

 W 100 mm (3.9")
 D 115 mm (4.5")

### Web Resources Littelfuse.com/t2400



ORDERING NUMBER	TERMINALS 1-3	TERMINALS 2-3	l <sub>N</sub>	FUNCTION
T2400.0010	230 V		5 A	
T2400.0020	450 V	400 V	5 A	
T2400.0030	110 V	100 V	5 A	
T2400.0040	450 V	400 V	5 A	Latching output on relay 1, 6-60 sec. delay on relay 1
T2400.0050	480 V	415 V	5 A	
T2400.0060	450 V	400 V	1 A	
T2400.0070	450 V	400 V	5 A	Latching output on relay 1, normally energized relay 1
T2400.0080	127 V	120 V	5 A	
T2400.0090	24 Vdc		5 A	
		120 V		

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### **GENERATOR & SINGLE-FUNCTION PROTECTION**

### **T2500** Overcurrent and Short-Circuit Relay

### Features/Benefits

- The short-circuit relay protects against faults causing high currents, while the overcurrent relay protects against thermal damage
- Accepts high supply-voltage variation to ensure correct operation during voltage supply fluctuations
- Combining two relays is a cost-effective and space-saving solution

#### **Specifications**

 Trip level
 0.5-1.4 x I<sub>N</sub>

 Delay
 3-30 sec.

 Max. Voltage
 660 V

 Dimensions
 H 70 mm (2.8")

 W 100 mm (3.9")
 D 115 mm (4.5")

### Web Resources

Littelfuse.com/t2500



ORDERING NUMBER	<b>TERMINALS 1-3</b>	<b>TERMINALS 2-3</b>	I <sub>N</sub>	FUNCTION
T2500.0010	450 V	400 V	5 A	Latching output, resetable
T2500.0020	230 V		5 A	Latching output, resetable
T2500.0030	480 V	415 V	5 A	Latching output, resetable
T2500.0040	450 V	400 V	1 A	Latching output, resetable
T2500.0050	24 Vdc		5 A	Latching output, resetable
T2500.0060	230 V		5 A	De-energized extra output relay
T2500.0070	450 V	400 V	5 A	De-energized extra output relay
T2500.0080	450 V	400 V	5 A	De-energized extra output relay, latching outputs
T2500.0090	480 V	415 V	5 A	De-energized extra output relay
T2500.0100	24 Vdc		1 A	De-energized extra output relay
T2500.0110	450 V	400 V	5 A	De-energized extra output relay, latching short circuit output
T2500.0120	24 Vdc		5 A	De-energized extra output relay, de-energized relay 1, no internal power backup

### T2700 Power Relay

### CE



### Features/Benefits

- Detects power levels for protection, control or monitoring and will protect against excessive active loads
- Accepts high supply-voltage variation to ensure correct operation during voltage supply fluctuations
- Visual indication of power, pick-up and trip output provides guick and concise status information

#### **Specifications**

 Trip level
 15-150 x I<sub>N</sub>

 Delay
 2-20 sec.

 Max. Voltage
 660 V

 Dimensions
 H 70 mm (2.8")

 W 100 mm (3.9")
 D 115 mm (4.5")

#### Web Resources Littelfuse.com/t2700

ORDERING NUMBER	TERMINALS 1-3	TERMINALS 2-3	I <sub>N</sub>	SUPPLY	FUNCTION
T2700.00	230 V		5 A	L-N	
T2700.02	450 V	400 V	5 A	L-L	
T2700.03	230 V	400 V	5 A	L-L	
T2700.04	110 V	100 V	5 A	L-L	Normally energized output
T2700-08	127 V	120 V	5 A	L-N	

### T2900 3-Phase Differential Relay





- Monitors current leakage in generators and measures the differential current of each of the 3 phases
- Accepts high supply-voltage variation to ensure correct operation during voltage supply fluctuations
- Visual indication of power, pick-up and trip output provides quick and concise status information

### **Specifications**

 Trip level
 0.04-0.4 x I<sub>N</sub>

 Delay
 1-10 sec.

 (0.1-1 sec. bridging terminals 18/19)

 Max. Voltage
 660 V

Dimensions H 70 mm (2.8") W 100 mm (3.9") D 115 mm (4.5")

Web Resources Littelfuse.com/t2900



ORDERING NUMBER	TERMINALS 1-3	TERMINALS 2-3	I <sub>N</sub>
T2900.0010	450 V	400 V	5 A
T2900.0020	230 V		5 A
T2900.0030	480 V	415 V	5 A
T2900.0040	110 V	100 V	5 A



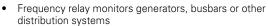
### T3000 Frequency Relay

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**D** 115 mm (4.5")

**D** 115 mm (4.5")





- Accepts high supply-voltage variation to ensure correct operation during voltage supply fluctuations
- Visual indication of power, pick-up and trip output provides guick and concise status information
- Combining 2 relays is a cost-effective and spacesaving solution for monitoring both underfrequency and overfrequency in one unit

 Overfrequency Level
 45-65 Hz

 Delay
 1-10 sec.

 Underfrequency Level
 45-65 Hz

 Delay
 1-10 sec.

 Max. Voltage
 660 V

 Dimensions
 H 70 mm (2.8")

 W 100 mm (3.9")

Web Resources

Littelfuse.com/t3000



### **Specifications**

ORDERING NUMBER	TERMINALS 1-3	TERMINALS 2-3
T3000.0010	230 V	
T3000.0020	450 V	400 V
T3000.0030	110 V	100 V
T3000.0040	480 V	415 V
T3000.0050	127 V	120 V

### **T3100** Voltage Relay

### CE



- Monitors voltage on generators, busbars or other distribution systems
- Signals when voltage is under or over its limits
- Consists of two relays, one for overvoltage and one for undervoltage monitoring
- Accepts high supply-voltage variation to ensure correct operation during voltage supply fluctuations

### **Specifications**

 Overvoltage level
 100-120%

 Delay
 1-10 sec.

 Undervoltage Level
 80-100%

 Max. Voltage
 660 V

 Dimensions
 H 70 mm (2.8")

 W 100 mm (3.9")

Web Resources Littelfuse.com/t3100



ORDERING NUMBER	TERMINALS 1-3	TERMINALS 2-3
T3100.0010	230 V	
T3100.0020	450 V	400 V
T3100.0030	110 V	100 V
T3100.0040	480 V	415 V
T3100.0060	127 V	120 V

### T3300 3-Phase Voltage Relay

### $c \in$



- Monitors voltage on generators, busbars or other distribution systems
- Signals when voltage is under or over its limits
- Consists of two relays, one for overvoltage and one for undervoltage monitoring
- Accepts high supply-voltage variation to ensure correct operation during voltage supply fluctuations

#### **Specifications**

 Overvoltage Level
 100-120%

 Delay
 1-10 sec.

 Undervoltage Level
 80-100%

 Max. Voltage
 660 V

 Dimensions
 H 70 mm (2.8")

 W 150 mm (5.9")
 D 115 mm (4.5")





ORDERING NUMBER	TERMINALS 17-19, 21-23, 25-27	TERMINALS 18-19, 22-23, 26-27
T3300.0010	230 V	
T3300.0020	450 V	400 V
T3300.0030	110 V	100 V
T3300.0040	480 V	415 V



 $C \in$ 

### **GENERATOR CONTROL**

### **T2600** Dual-Current Relay

### **Specifications**

 Start or stop the standby diesel generator depending on the load situation

Accepts high supply-voltage variation to ensure correct operation during voltage supply fluctuations

operation during voltage supply fluctuations

 Max. Voltage
 600 V

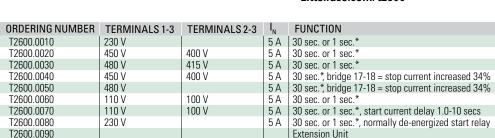
 Voltage Range
 70-110%

 Dimensions
 H 70 mm (2.8")

 W 150 mm (5.9")
 D 115 mm (4.5")

Visual indication of power, pick-up and trip output provides quick and concise status information

#### Web Resources Littelfuse.com/t2600



### **T4500** Auto Synchronizer for Conventional Governors

### CE



Features/Benefits

- Quickly provides automatic synchronization of a generator to a busbar via speed controller
- Inputs for disabling internal frequency control enables synchronization to external setpoint from other busbar sections, generators or the main grid
- Visual indication of signals provides quick and concise status information

#### **Specifications**

 Max. Voltage
 600 V

 Voltage Range
 70-110%

 Dimensions
 H 70 mm (2.8")

 W 100 mm (3.9")
 D 115 mm (4.5")

Web Resources Littelfuse.com/t4500



ORDERING NUMBER	TERMINALS 1-3, 5-7	TERMINALS 2-3, 6-7
T4500.0010	450 V	400 V
T4500.0020	230 V	
T4500.0030	480 V	415 V
T4500.0040	110 V	63 V
T4500.0050	127 V	120 V
T4500.0060	110 V	100 V
T4500.0070	600 V	

### **T4800** Load Sharer for Conventional Governors





- Provides automatic load-sharing and frequency control for parallel-running generators
- Inputs for disabling internal frequency control enables operation where system frequency is set externally such as in grid-parallel operation
- Visual indication of signals provides quick and concise status information

### **Specifications**

 Max. Voltage
 600 V

 Voltage Range
 70-110%

 Dimensions
 H 70 mm (2.8")

 W 150 mm (5.9")
 D 115 mm (4.5")

Web Resources Littelfuse.com/t4800



ORDERING NUMBER	TERMINALS 1-3	TERMINALS 2-3	I <sub>N</sub>
T4800.0010	450 V	400 V	5 A
T4800.0020	230 V		5 A
T4800.0030	480 V	415 V	5 A
T4800.0040	110 V	100 V	1 A
T4800.0050	450 V	400 V	1 A
T4800.0060	127 V	120 V	5 A
T4800.0070	110 V	100 V	5 A



### **GENERATOR CONTROL**

### **T4900 VAR Load Sharer**

### **Specifications**

 Provides automatic load-sharing of reactive power and voltage control for parallel-running generators Max. Voltage660 VVoltage Range110%DimensionsH 70 mm (2.8")

Inputs for disabling internal voltage control enables operation where system voltage is set externally such as in grid-parallel operation

**H** 70 mm (2.8") **W** 150 mm (5.9") **D** 115 mm (4.5")

Visual indication of voltage increase/decrease provides quick and concise status information

Web Resources Littelfuse.com/t4900



### **T5000** Paralleling Relay

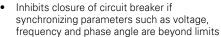
### CE

 $C \in$ 



to busbar

Features/Benefits



Prevents generator damage and disturbance

Visual indication of voltage and closing signal provides quick and concise status information

### **Specifications**

 Max. Voltage
 600 V

 Voltage Range
 70-110%

 Dimensions
 H 70 mm (2.8")

 W 100 mm (3.9")
 D 115 mm (4.5")

Web Resources Littelfuse.com/t5000



ORDERING NUMBER	TERMINALS 1-3	TERMINALS 2-3	FUNCTION
T5000.0010	450 V	400 V	
T5000.0020	230 V		
T5000.0030	480 V	415 V	
T5000.0040	110 V	100 V	
T5000.0050	127 V	120 V	
T5000.0060	480 V	415 V	Δφ=9-13.5°, ΔF=0.2-0.3 Hz
T5000.0070	450 V	400 V	$\Delta \dot{U}$ =15-20%, $\Delta \phi$ =9-13.5°, $\Delta F$ =0.2-0.3 Hz
T5000.0080	110 V	100 V	$\Delta U=15-20\%$ , $\Delta \dot{\phi}=9-13.5^{\circ}$ , $\Delta F=0.2-0.3$ n Hz
T5000.0090	450 V	400 V	Δφ=9-13.5°, ΔF=0.2-0.3 Hz
T5000.0100	660 V		·

### **E7800** Motorized Potentiometer





- Interface between increase/decrease contacts and a device requiring control/adjustments by an external potentiometer
- Can be used for speed trim of an electric speed governor in generator applications
- Wire wound for longer life than carbon potentiometers

### Specifications



**H** 96 mm (3.8") **W** 96 mm (3.8") **D** 80 mm (3.1")





ORDERING NUMBER	VOLTAGE	RPM	POTENTIOMETER
E7800.00.xx	230 V-240 Vac	1.0 (50 Hz)	5 kΩ-1 turn
E7800.01.xx	220 V-240 Vac	2.0 (50 Hz)	5 kΩ-10 turn
E7800.02.xx	100 V-110 Vac	1.0 (50 Hz)	5 kΩ-1 turn
E7800.03.xx	24 Vac	2.0 (50 Hz)	5 kΩ-10 turn
E7800.04.xx	100 V-110 Vac	2.0 (50 Hz)	5 kΩ-10 turn
E7800.05.xx	220 V-240 Vac	2.0 (50 Hz)	5 kΩ-1 turn
E7800.09.xx	24 Vac	1.0 (50 Hz)	5 kΩ-1 turn
E7800.23.xx	24 Vdc	0.8-6 Adj.	5 kΩ-1 turn
E7800.24.xx	24 Vdc	0.8-6 Adj.	5 kΩ-10 turn
E7800.90.00	24 Vdc	0.8-6 Adj.	DC output voltage, 0-1.0 V (0-100%)

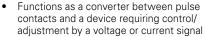


### GENERATOR CONTROL

### **T7900** Electronic Potentiometer

### CE





- Wide selection of output ranges including PWM which enables possible use with a broad variety of speed governors and voltage regulators
- Independent ramp-up and ramp-down time setting provides optimum controllability

### **Specifications**

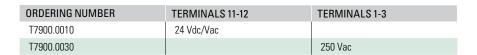
 Supply
 8-36 Vdc/Vac

 Consumption
 Max. 120 mA at 24 Vdc

 Dimensions
 H 70 mm (2.8")

 W 100 mm (3.9")
 D 115 mm (4.5")

Web Resources Littelfuse.com/t7900



### M8100 Synchroscope



#### Features/Benefits

- Provides illuminated indication of the phase and frequency difference between voltages on two separate AC systems
- High resolution visual indications with 38 LEDs
- Available with check-synchronizer relay enabling use as manual-synchronizing unit, or as auto-synchronizing back-up

#### **Specifications**

 Max. Voltage
 600 V

 Voltage Range
 70-110%

 Consumption
 2x3 VA max.

 Dimensions
 H 96 mm (3.8")

 W 96 mm (3.8")
 D 80 mm (3.1")

### Web Resources Littelfuse.com/m8100

ORDERING NUMBER	TERMINALS 1-1, 5-7	TERMINALS 1-3, 6-7	FUNCTION
M8100.0010	450 V	400 V	
M8100.0020	230 V		
M8100.0030	480 V	415 V	
M8100.0040	110 V	100 V	
M8100.0050	450 V	400 V	With check synchronizer relay
M8100.0060	230 V		With check synchronizer relay
M8100.0070	480 V	415 V	With check synchronizer relay
M8100.0080	110 V	100 V	With check synchronizer relay

### **T8400** Blackout Limiter

### $C \in$



- Enables fast clearing of a blackout
- Monitors up to four generators per unit (eight generators with two units)
- Independent 24-Vdc supply with wide tolerance operates regardless of system voltage failure

#### **Specifications**

 Supply Voltage
 24 Vdc 30%

 Max. Voltage
 660 Vac

 Frequency Range
 35-70 Hz

 Dimensions
 H 70 mm (2.7")

 W 150 mm (5.9")
 D 115 mm (4.5")

### Web Resources

Littelfuse.com/m8400

ORDERING NUMBER	TERMINALS 1-3, 8-10, 17-19, 24-26	FUNCTION
T8400.0010	400 V	1-1.5-2-2.5 sec.
T8400.0020	400 V	3-3.5-4-4.5 sec.
T8400.0030	230 V	1-1.5-2-2.5 sec.
T8400.0040	230 V	3-3.5-4-4.5 sec.
T8400.0050	415 V	1-1.5-2-2.5 sec.
T8400.0060	415 V	3-3.5-4-4.5 sec.





### **GENERATOR CONTROL**

### C6200 FlexGen Standard Generator Control

### $C \in$



FlexGen controllers are used to parallel generators with each other or with the grid. One FlexGen controller installed for each generator and handles all electrical control. Both Basic and Advanced versions include basic functions such as auto-synchronizing, frequency control, active load-sharing, deadbus monitoring and reverse power protection. In addition the FlexGen Advanced contains reactive load-sharing, voltage matching, power-factor control, grid-parallel operation control, and protection against excitation loss, RoCoF (df/dt), and vector shift.

#### Features/Benefits

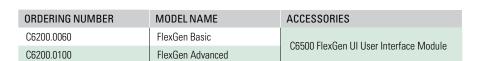
- 3-phase true RMS measurement is reliable and immune to high noise
- Analog outputs for speed and voltage control fit most electronic governors
- 10 programmable inputs and outputs for flexible configuration on a wide range of applications

#### **Specifications**

**Auxiliary Supply** 10 Vdc to 36 Vdc (24 Vdc-58%/+50%) **Generator Voltage** 63 V-690 V **Generator Rated Frequency** 50 Hz/60 Hz **C/T Secondary Current** 5 A 7 W Consumption **Ambient Temp Range** −20°C to +70°C **Dimensions H** 182 mm (7.2") **W** 282 mm (11.1")

**D** 50 mm (2.0")

Web Resources Littelfuse.com/c6200



### **S6000** Sigma Advanced Protection Module





#### **Description**

The SIGMA Generator Control and Protection System is available in a range of integrated modules for protection and control of marine and land-based generators. The modules are marine-approved and include all relevant functions, such as protection of generators, synchronizing and active/reactive load-sharing and power management.

#### IO/P Module S6000 Input/ Output and Protection Module

The SIGMA S6000 performs all measurements on the generator side (voltages, currents, frequency); performs generator protection, including a non-essential load trip in two steps; and includes three measurement transducers.

### S/LS Module S6100 Synchronizing and Load-Sharing Module

This module performs the control functions such as synchronizing, and active and reactive load sharing. It performs the measurements on the busbar side.

#### Features/Benefits

- 3-phase true RMS measurement is more reliable and immune to high noise
- Analog outputs for speed and voltage control fit most electronic governors and
- Large consumer request inputs with load feedback optimizes quantity of running generators and saves fuel

### **Specifications**

Primary Supply +24 Vdc (-30%/+30%) Isolated, 500 mA

Backup Supply +24 Vdc (-30%/+30%) Isolated, 500 mA

Environmental

Temp Range  $-15^{\circ}$ C to  $+70^{\circ}$ C Dimensions +145 mm (5.7")

**W** 190 mm (7.5") **D** 64 mm (2.5")

Web Resources Littelfuse.com/s6000

ORDERING NUMBER	DESCRIPTION
S6000.0010	Input/ Output and Protection Module— 5 A C/T
S6000.0020	Input/ Output and Protection Module— 1 A C/T
S6100.0010	Synchronization and Load Sharing Module

## ACCESSORIES S6500.0010 Power Manager Module S6610.0010 User Interface Module

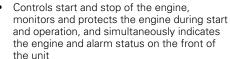


## **ENGINE CONTROL**

### **M2000** Engine Control

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- Eight inputs for monitoring e.g. oil pressure, coolant, temperature and engine speed
- Cable monitoring on sensor inputs for a fail safe system
- Can be combined with M0600 to build a complete control, alarm and safety system for marine engines

#### **Specifications**

Voltage Supply
Consumption
Dimensions

12-24 Vdc±30% (8-32 Vdc)
Max. 180 mA
H 144 mm (5.7")
W 144 mm (5.7")
D 35 mm (1.4")

Web Resources Littelfuse.com/m2000



#### M0600 Shutdown Unit





#### Features/Benefits

- · Back-up protection for marine engines
- With M2000, can be complete control, alarm and safety system
- Runs independently, as back-up for M2000
- Mounts on rear of M2000 or DIN-rail
   mountable

#### **Input Terminals**

1. OVS

	0.010b000
2. SPA	Spare
3. LOP	Low Oil Pressure
4. RUN	Running (Crank Disconnect)
5. STP	Stop (Engine Stop)
6. + 24 V	Supply Voltage (+)
7. –	Supply Voltage (-)
8 -	Supply Voltage (-)

Overspeed

#### **Web Resources**

Littelfuse.com/m0600

ORDERING NUMBER	DELAY FOR SPA	DELAY FOR LOP
M0600.0010	100 msec.	500 msec.
M0600.0020	1.5 sec.	1.5 sec.

## M2500 Engine Control and Monitoring Unit

CE



#### Features/Benefits

- Control and monitor engines in marine applications such as auxiliary generators, emergency generators and propulsion engines
- Allows manual (local) and automatic (remote) start of the engine and will monitor all engine parameters
- Nine digital alarm/shutdown inputs for monitoring e.g. oil pressure, coolant, temperature and engine speed
- Combine with M2600 to build a complete control, alarm and safety system for marine engines

#### **Specifications**

 Operating Temp.
 -15°C to +70°C

 Humidity
 95%

 Dimensions
 H 137 mm (6.2")

 W 209 mm (8.2")
 D 39 mm (1.5")

#### Web Resources Littelfuse.com/m2500

ORDERING NUMBER	CONTROL POWER	ACCESSORIES
M2500.0010	12-24 Vdc	M2600 Shutdown Unit K2502 SD Card K1025 USB A to B Cable



## ENGINE CONTROL

#### M2600 Shutdown Unit

## $C \in$



#### Features/Benefits

Ten digital shutdown inputs for e.g. low oil pressure, high coolant temperature, over speed etc.

- Cable monitoring on all shut down inputs
- Cable monitoring on fuel valve and stop solenoid output
- Speed detection via magnetic or inductive pick-up
- LEDs for status indication
- · Configuration by DIP switches

#### **Specifications**

Operating Temp. -15°C to +70°C Operating Temp. −15°C to +70°C Humidity 95%

Vibration DNV vibrations class B

**EMC** IEC 60945 **Enclosure** IP30

+24 Vdc (-30 %/+30 %) <3 W **Primary Supply Backup Supply** +24 Vdc (-30 %/+30 %) <3 W

Connection Screw terminals

Type Magnetic (2-wire), NPN and PNP (3wire)

25.0-25,000 Hz **Rated Frequency** 

9 Digital Sensor Inputs Normally open contacts to COM

(default) or normally closed contacts to COM. Optional cable monitoring.

**Web Resources** 

Littelfuse.com/m2600

ORDERING NUMBER	REQUIREMENT
M2600.0010	Optional

## **ENGINE DIAGNOSTICS**

## 



#### Features/Benefits

- Reliable robust tool for engine diagnostics, consisting of a cylinder pressure analyzer for collection of measurements, a pressure sensor, and an optional crank-angle sensor
- Detect problems before downtime occurs
- Tune and balance the engine during operation
- Follow step-by-step graphic instructions for difficult tasks
- Easily read self-guiding menus—even for new operators
- Analyze software data (incl. TDC & ISO correction) and e-mail readings to the
- View large color display with graphic charts in real time

#### **Specifications**

**Pressure Range Pressure Accuracy Temperature Range Dimensions** 

0-250 Bar

-50 to +400°C **H** 150 mm (5.9") **W** 260 mm (10.2") **D** 55 mm (2.2")

Web Resources

E5300.0010

Littelfuse.com/EngineEye

FEATURES	E5000 & E5100	E5000, E5100, E5200 & 5300
USB	•	•
Color LCD	•	•
PC software included	•	•
Upgradable	•	•
Temperature compensation	•	•
Calibration-check integration	•	•
Connecting sensor ports	1	5
Pressure graph	•	•
MIP mode		•
Misfire analysis	•	•
p <sup>max</sup>		•
p/time	•	•
p <sup>max</sup> diagram	•	•
p/alpha diagram		•
dp/alpha diagram		•
p/V diagram		•
Pressure sensor	•	•
Crank-angle sensor package		•
Maximum engines (memory)	5	8
Maximum cylinders/engine (memory)	20	20
Maximum number of strokes (memory)	30	30

ORDERING NUMBER	DESCRIPTION	
E5000.1000	EngineEye Basic (E5000.0010 + E5100.0010)	
E5000.3000	EngineEye Professional (E5000.0030 + E5100.0010 + E5300.0010)	
ACCESSORIES	DESCRIPTION	
E5100.0010	Separate Pressure Sensor with 1.5 m armored cable	
E5200 0010	Crank Angle Package includes:	

Crank Angle Sensor+ Crank Angle Band + Junction Box + Extension Cable

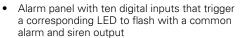
# Littelfuse® Expertise Applied | Answers Delivered

## ALARM MONITORING

#### M1000 Alarm Monitor







- Supports both normally-open and normallyclosed input contacts
- Multiple units can be connected as one system for a modular and scalable solution

#### **Specifications**

**Voltage Supply** 12-24 Vdc -30/+30% (8-32 Vdc)

48-110 Vdc -30/+40% (33-155 Vdc)

Siren Relay Contact
Communication

48-110 Vdc -30/+40% (33-155 Vdc)
220 Vac/2 A; 30 Vdc/2 A, 30 W
RS485 Interface

Dimensions H 144 mm (5.7") W 144 mm (5.7")

**D** 35 mm (1.4")

Web Resources

Littelfuse.com/m1000

ORDERING NUMBER	CONTROL POWER	FUNCTION
M1000.0040	48-110 Vdc	IP54 front
M1000.0080	12-24 Vdc	IP54 front
M1000.0220	12-24 Vdc	Internal siren, IP54 at front

#### M3000 Analog Alarm Annunciator





#### Features/Benefits

- 24 inputs can be configured individually for dry contact (normally-open or normallyclosed) inputs or analog inputs
- Programmable 10-character LCD text so each alarm is indicated clearly
- 24 inputs and 48 alarms allow for individual reference to any input and easy configuration of group and individual alarms

#### **Specifications**

 Voltage Supply
 24 Vdc ±30%

 Consumption
 Max. 400 mA

 Sensor Inputs
 24

 Alarms
 48

 LEDs
 24

 Communication
 RS485 Interface

 Dimensions
 H 144 mm (5.7")

 W 144 mm (5.7")
 D 70 mm (2.7")

Web Resources Littelfuse.com/m3000

ORDERING NUMBER	CONTROL POWER	ACCESSORIES
M3000.0010	24 Vdc	M1500 PT100 6-way Transmitter

#### M4200 Alarm Monitor





#### Features/Benefits

- Cost effective solution, with the possibility of monitoring eight individual sensors
- Supports both normally-open and normallyclosed input contacts
- Programmable LED color change allows flexible adjustment according to application
- Cable monitoring on sensor inputs indicates sensor health in case a sensor is lost

#### **Specifications**

Voltage Supply
Consumption
Relay Output
Dimensions

8.4-40 Vdc; 8.4-50 Vac
Max. 180 mA
Max. 250 Vac/6 A
H 96 mm (3.8")
W 96 mm (3.8")
D 20 mm (0.8")

Web Resources

Littelfuse.com/m4200

ORDERING NUMBER	CONTROL POWER
M4200.0010	24 Vdc



## ALARM MONITORING

### M4500, M4600 & M4700 Alarm Indicators

## $C \in$

#### Features/Benefits

The M4500, M4600 and M4700 Indicator Panels are intended for status indication of any process providing on/off outputs. The panels contain 6, 8 or 20 channels.

- Clamping fittings and plug-in terminal blocks allow for easy installation
- RS485 communication available for a remote display or PLCs

#### **Specifications**

**Voltage Supply** 24 Vdc ±25% **Dimensions** M4500: **H** 72 mm (2.8"); **W** 72 mm (2.8")

**D** 67 mm (2.6")

M4600: **H** 96 mm (3.8); **W** 96 mm (3.8") **D** 67 mm (2.6") M4700: **H** 144 mm (5.7"); **W** 144 mm (5.7")

**D** 67 mm (2.6")

#### **Web Resources**

Littelfuse.com/m4500 Littelfuse.com/m4600 Littelfuse.com/m4700



ORDERING NUMBER	CONTROL POWER	INPUT REFERENCE	ACCESSORIES
M4500.0010	24 Vdc/Vac	+24 Vdc	
M4500.0020	48 Vdc/Vac	+48 Vdc	
M4500.0030	12 Vdc/Vac	+12 Vdc	
M4500.0040	24 Vdc/Vac	0 Vdc	
M4500.0050	48 Vdc/Vac	0 Vdc	
M4500.0060	12 Vdc/Vac	0 Vdc	M0845.0010 Front cover for M4500
M4600.0010	24 Vdc/Vac	+24 Vdc	with handle IP54
M4600.0020	48 Vdc/Vac	+48 Vdc	
M4600.0030	12 Vdc/Vac	+12 Vdc	M0845.0020 Front cover for M4500
M4600.0040	110 Vdc	+110 Vdc	with key IP54
M4600.0050	24 Vdc/Vac	0 Vdc	,
M4600.0060	48 Vdc/Vac	0 Vdc	M0846.0010 Front cover for M4600
M4600.0070	12 Vdc/Vac	0 Vdc	with handle IP54
M4700.0010	24 Vdc/Vac	+24 Vdc	With Handic II 54
M4700.0020	48 Vdc/Vac	+48 Vdc	M0846.0020 Front cover for M4600
M4700.0030	12 Vdc/Vac	+12 Vdc	
M4700.0040	110 Vdc	+110 Vdc	with key IP54
M4700.0050	24 Vdc/Vac	0 Vdc	
M4700.0060	48 Vdc/Vac	0 Vdc	M0847.0010 Front cover for M4700/
M4700.0070	12 Vdc/Vac	0 Vdc	M4780 with handle IP54
M4700.0080	110 Vdc	0 Vdc	
M4700.0090	230 Vac	+24 Vdc	M0847.0020 Front cover for M4700/
M4700.0100	110 Vac	+24 Vdc	M4780 with key IP54
M4700.0110	230 Vac	0 Vdc	
M4700.0120*	24 Vdc	+24 Vdc	
M4700.0120*	24 Vdc	+24 Vdc	
M4700.0130 <sup>†</sup>	230 Vac	+24 Vdc	
M4780.0010 <sup>‡</sup>	24 Vdc	24 Vdc	

### **H4000 HMI Operator Panels**

## CE



#### Features/Benefits

The HMI Operator Panel is a touch-screen solution designed for applications such as engine control and supervision systems, power management systems and alarm systems. They can be integrated with products such as the M2500, Engine Controller, Generator Controllers and Alarm Panels.

Clear, high-resolution screen provides high level of details

#### **Specifications**

#### **Dimensions**

M4000: **H** 219 mm (8.6"); **W** 154 mm (6.0"); **D** 6 mm (0.2") M4100: **H** 301 mm (11.9"); **W** 228 mm (9.0"); **D** 6 mm (0.2") M4200: **H** 398 mm (15.7"); **W** 304 mm (12.0"); **D** 6 mm (0.2")

#### Web Resources

Littelfuse.com/h4000

ORDERING NUMBER	DESCRIPTION
H4000.0010	HMI Panel 6,5"
H4000.0020	HMI Panel 6,5", sun readable
H4100.0010	HMI Panel 10,4"
H4100.0020	HMI Panel 10,4" sun readable
H4200.0010	HMI Panel 15,1"
H4200.0020	HMI Panel 15,1" sun readable
H4900.0010	Programming Software

<sup>\*</sup>With common alarm relay, siren relay and built-in siren.

†Inverted reference. With common alarm relay, siren relay and built-in siren.

‡ Modbus TCP Indicator Panel, 20 channels, 24 Vdc, common alarm relay and built in siren.



## **SOFTWARE • PANEL MOUNT ADAPTERS • ACCESSORIES**

#### **Software**

Product	Software For
SE-COMM-RIS Relay Interface Software	MPU-32 MPS FPU-32 FPS
VMPU Virtual Motor Protection Relay	MPU-32
VMPS Virtual Motor Protection System	MPS
VFPU Virtual Feeder Protection Relay	FPU-32
PGW-6150 Relay Interface Software	PGR-6150

Product	t	Software For
SE-FLASH Firmware Update Utility		MPU-32 MPS FPU-32 FPS
SE-MON330 Relay Interface Software		SE-330 SE-330HV SE-330AU
MPU-32 Tutorial PGR-6200 Online Self-Training Tutorial		MPU-32
<b>H4900</b> Programming Software		H4000 H4100 H4200
PGW-8800 Relay Interface Software		PGR-8800

### **Panel Mount Adapters**



#### Features/Benefits

- Add communications capability to older switchgear and improve system performance
- Save cost by not calibrating older electromechanical devices
- Conformally-coated circuit boards
- Additional protective functions, including reduced overcurrent and dynamic thermal model
- Minimal change-out time by using existing CTs
- MPU-32 and MPS can use existing RTDs with an optional RTD module
- Ability to match existing overcurrent curves

### **Adapter Plates**

RELAY TO REPLACE	PANEL MOUNT	NEW RELAY
AB BULLETIN 1406	PMA-14	MPS
FPL-GFRM	PMA-6	SE-704
FPL-GFRM	PMA-6	SE-701
GE S1 GE S1	PMA-9	MPU-32
GE S1	PMA-9	FPU-32
GE LODTRAK III	PMA-10	MPU-32
	PMA-13	MPS
GE MULTILIN 169, 269, OR 369	PMA-16	MPU-32
	PMA-16	FPU-32
GE MULTILIN 469	PMA-24	MPS
GE MULTILIN P4A	PMA-15	MPU-32
GE MULTILIN P4A	PMA-15	FPU-32
GEC/MCGG	PMA-3	SE-704
GEC/MCGG	PMA-3	SE-701
GE & WESTINGHOUSE FT-11	PMA-12	MPU-32
P&B GOLDS	Contact Factory	FPU-32
WESTINGHOUSE CO9 & CO11	Contact Factory	FPU-32

### **Accessories**

Most protective relays require an accessory for operation. Visit Littelfuse.com/RelaysControls for a complete listing.







**DIN-Mount Adapters/Watertight Covers** 





## CT SELECTION GUIDE

		PRODUCT	GROUND-FAULT CT	GROUND-FAULT TRIP LEVEL (or insulation level)
		SE-601	No CTs required	1-20 mA
		EL3100	No CTs required	Indication only
NO ON		PGR-3200	No CTs required	Warnings at 30 k $\Omega$ & 50 k $\Omega$ , Alarm at 10 k $\Omega$
TECT (			CT-200 Series	10-198 A
GROU		SE-701/SE-703	EFCT Series	50 mA-4.95 A
			SE-CS30 Series	300 mA-29.7 A
		SE-704	SE-CS30 Series	10 mA-5 A
	L	EL731	EFCT Series	30-5,000 mA AC and DC
N BLE		SE-105/SE-107	CT200 Series	0.5-4 A
IG CAI ECTIO		SE-134C/SE-135	SE-CS10 Series	0.5-12.5 A
RAILIN PROT		SE-145	SE-CS10 Series	0.5-12.5 A
	L.	3L-143	SE-CS40 Series	2.0-50 A
NDIN			CT200 Series	12-200 A
GROU		SE-330	EFCT Series	100 mA-5 A
FEDER     MOTOR & PUMP     RESISTANCE GROUNDING/ TRAILING CABLE     GROUNDING/ TRAILING CABLE       PROTECTION     NGR MONITORING     PROTECTION       FROTE     PROTECTION			SE-CS30 Series	600 mA-30 A
	L.	SE-325	CT200 Series	0.5-4 A
_		PGR-6150	No phase CTs required <25 A, Optional SE-CS30 Series Ground-Fault CT	0.4-150 A
			CT200 Series	10-200 A
		MPU-32*	EFCT Series	50 mA-5 A
M N			SE-CS30 Series	300 mA-30 A
R & PU TECTIO			CT200	10-200 A
MOTO		MPS*	EFCT Series (5-A Primary)	50 mA-5 A
_			SE-CS30 Series (30-A Primary)	300 mA-30 A
		MPU-32-X69X-PMA16	Existing CTs can be used or same as MPU-32.	
		MPS-469X-PMA24	Existing CTs can be used or same as MPS.	
		PGR-6800	No CTs required <91 A	N/A†
			CT200 Series	10-200 A
		FPU-32*	EFCT Series	50 mA-5 A
H NO			SE-CS30 Series	300 mA-30 A
OTEC!	'		CT200	10-200 A
£		FPS*	EFCT Series (5-A Primary)	50 mA-5 A
_ Z		-	SE-CS30 Series (30-A Primary)	300 mA-30 A
ARC-FLASH PROTECTION		PGR-8800 <b></b>	CTs are optional	N/A

Note: See page 45 for CT sizing chart.

<sup>\*</sup>Phase CTs should be selected with a primary rating of 100-300% of rated current to maintain specified accuracy. CTs with a 1-A or 5-A secondary are accepted. †Trip levels are model specific, see ordering information on page 26.

<sup>‡</sup>Select a CT with a primary rating approximately equal to the system's rated current. CTs with 5-A secondary current are accepted.



## **CUSTOM ENGINEERED PRODUCTS**

#### **Electrical Modular Building/E-Houses**



Littelfuse Startco offers fully integrated electrical and automation systems. Our products include prefabricated, modular, skid-mounted enclosures for switchgear and auxiliary equipment. We deliver self-contained units, which are completely coordinated, assembled and tested in a controlled factory environment. The primary switchgear and control applications include low- and/or medium-voltage switchgear and motor control centre enclosures; relay panel enclosures; and RTU and SCADA enclosures.

### Skid-Mounted Substations (enclosed or open type)



Littelfuse Startco's skid-mounted substations feature NEMA 12 enclosures with portable, tub-type, flat bottoms. Stainless steel hardware is available for wet or humid environments.

### **Custom-Built Switchgear/Motor Control Centers**



Littelfuse Startco can go beyond pre-engineered solutions to offer custom-built gear for special applications. These products can meet customers' unique requirements beyond the scope of the preferred switchgear vendor's pre-engineered panels. Our custom-built gear is used in restricted space applications, outdoor applications (outdoor switchhouses), switchgear and ATS applications, pump controls, portable-duty MCCs and many others.

#### Trailer or Skid-Mounted Diesel Gen Sets



Custom engineered to meet the most rugged conditions with the required protection and control. skid or trailer mounted. A transformer can be added as part of the same package.

## **Power Monitoring and Control**



Littelfuse Startco builds very rugged and high-quality control consoles and PLC panels, including all required protection and control. These consoles typically include Littelfuse MPU-32 or MPS Motor Protection Relays, rugged industrial automation equipment, and custom Littelfuse Startco keypads.

#### Power Takeoff (PTO) Panels



Littelfuse Startco's power takeoff panels offer a convenient way to connect portable equipment to an electrical distribution system. The SEL-PTO is a custom product that typically incorporates the SE-105/SE-107 Ground-Fault Ground-Check Monitor, overload protection, breaker, motor starter, and door-mounted indication into a rugged wall-mount or free-standing enclosure.

### For More Information and to download our Custom **Engineered Products** Brochure, visit

Littelfuse.com/CustomProducts





## ADDITIONAL INFORMATION

#### **IEEE DEVICE NUMBERS**

- 1 Master Flement
- Time Delay Starting or Closing Relay
- 3 Checking or Interlocking Relay
- 4 -Master Contactor
- 5 Stopping Device
- Starting Circuit Breaker
- Rate of Change Relay
- Control Power Disconnecting Device
- Reversing Device
- 10 Unit Sequence Switch
- 11 Multi-function Device
- 12 Overspeed Device
- 13 Synchronous-speed Device
- 14 Underspeed Device 15 - Speed - or Frequency.
- Matching Device - Data Communications Device
- 17 - Shunting or Discharge Switch
- 18 Accelerating or Decelerating Device
- 19 Starting to Running Transition Contactor
- 20 Electrically Operated Valve
- 21 Distance Relay
- 22 Equalizer Circuit Breaker 23 - Temperature Control Device
- 24 Volts Per Hertz Relay
- Synchronizing or Synchronism-Check Device
- 26 Apparatus Thermal Device
- 27 Undervoltage Relay
- 28 Flame Detector - Isolating Contactor or
- Switch
- 30 Annunciator Relay
- 31 Separate Excitation Device 32 - Directional Power Relay
- 33 Position Switch
- 34 Master Sequence Device

- Short-Circuiting Device Polarity or Polarizing Voltage Devices
- Undercurrent or Underpower Relay
- 38 Bearing Protective Device
- Mechanical Condition Monitor
- Field (over/under excitation) Relay
- 41 Field Circuit Breaker
- 42 Running Circuit Breaker
- Manual Transfer or Selector Device
- 44 Unit Sequence Starting Relay
- 45 Abnormal Atmospheric Condition Monitor
- 46 Reverse-phase or Phase-Balance Current Relay
- Phase-Sequence or Phase-Balance Voltage Relay
- 48 Incomplete Sequence Relay 49 - Machine or Transformer, Thermal Relay
- 50 Instantaneous Overcurrent
- 51 AC Inverse Time Overcurrent
- Relay 52 - AC Circuit Breaker
- 53 Exciter or DC Generator Relay
- 54 Turning Gear Engaging Device
- 55 Power Factor Relay Field Application Relay
- Short-Circuiting or Grounding (Earthing) Device
- 58 Rectification Failure Relay
- 59 Overvoltage Relay
- 60 Voltage or Current Balance Relay
- 61 Density Switch or Sensor

- 35 Brush-Operating or Slip-Ring 62 Time-Delay Stopping or Opening Relay
  - 63 Pressure Switch Ground (Earth) Detector Relay
  - 65 Governor
  - 66 Notching or Jogging Device
  - 67 AC Directional Overcurrent
  - 68 Blocking or "Out-of-Step"
  - 69 Permissive Control Device
  - 70 Rheostat
  - 71 Liquid Level Switch
  - 72 DC Circuit Breaker
  - 73 Load-Resistor Contactor 74 - Alarm Relay
  - 75 Position Changing Mechanism
  - 76 DC Overcurrent Relay 77 - Telemetering Device
  - 78 Phase-Angle Measuring Relay
  - 79 AC Reclosing Relay
  - 80 Flow Switch
  - 81 Frequency Relay 82 - DC Reclosing Relay
  - 83 Automatic Selective Control
  - or Transfer Relay 84 - Operating Mechanism 85 - Communications, Carrier
  - or Pilot-Wire Relay
  - 86 Lockout Relay
  - 87 Differential Protective Relay
  - Auxiliary Motor or Motor Generator
  - 89 Line Switch
  - 90 Regulating Device
  - 91 Voltage Directional Relay 92 - Voltage and Power
  - Directional Relay
  - 93 Field Changing Contactor 94 - Tripping or Trip-Free Relay

## ANSI DEVICE NUMBERS

- AFD Arc Flash Detector
- CLK Clock or Timing Source **DDR** - Dynamic Disturbance Recorder
- DFR Digital Fault Recorder ENV - Environmental Data
  - High Impedance Fault Detector
- Human Machine Interface
- Historian LGC - Scheme Logic
- MET Substation Metering PDC - Phasor Data
- Concentrator PMU - Phasor Measurement
- PQM Power Quality Monitor
- RIO -Remote Input/Output Device
- RTU -Remote Terminal Unit/ Data Concentrator
- SFR. Sequence of Events Recorder
- TCM Trip Circuit Monitor SOTF - Switch On To Fault
- Unit

## TYPICAL SUFFIXES

- A Alarm/Auxiliary Power
- AC Alternating Current B - Battery/Blower/Bus
- BT Bus Tie Capacitor/Condenser/ Compensator/Carrier
- Current/Case/Compressor DC - Direct Current
- F Feeder/Field/Filament/ Filter/Fan
- Generator/Ground' М Motor/Metering
- N-Network/Neutral\* Pump/Phase Comparison
- Reactor/Rectifier/Room S-Synchronizing/Secondary/ Stainer/Sump/Suction
- T Transformer/Thyratron TH - Transformer
- (High-voltage Side) Transformer (Low-voltage Side)
- Transformer (Tertiary-voltage Side)
- Unit

Note: Descriptions per IEEE Std C37.2-1996

\*Suffix N is preferred when the device is connected in the residual of a polyphase circuit, is connected across broken delta, or is internally derived from the polyphase current or voltage quantities. The suffix G is preferred where the measured quantity is in the path of ground or, in the case of ground fault detectors, is the current flowing to ground.

## **NEUTRAL GROUNDING RESISTOR**

SIZING CHART

System Voltage (Line-to-line)	NGR Let-through Current and Resistance	Time Rating
208 V	5 A / 24 Ohms	Continuous
480 V	5 A / 55 Ohms	Continuous
600 V	5 A / 69 Ohms	Continuous
2,400 V 5 A / 277 Ohms or 10 A / 139 Ohms		Continuous or 10 sec
4,160 V 5 A / 480 Ohms or 10 A / 240 Ohms		Continuous or 10 sec
13,800 V 10 A/798 Ohms or 200 A/40 Ohms		10 seconds
25,000 V	25,000 V 200 A / 72 Ohms or 400 A / 36 Ohms	
34,500 V	200 A / 100 Ohms or 400 A / 50 Ohms	10 seconds

Note: The values shown are for any size transformer and are typical.

NOTE: The above table is for illustrative purposes only. Actual values may differ based on a variety of individual system considerations, such as capacitive charging current and coordination study results.

## **CURRENT TRANSFORMER**

SIZING CHART

Conductor	Minimum CT Window Size (Inner Diameter in mm)								
Size	Number of Conductors								
(AWG/kcmil)	1	3	4	6	8	12			
12	4	8	9	11	13	15			
10	6	10	11	14	16	19			
8	7	12	14	17	20	24			
6	9	15	18	22	25	31			
4	11	19	22	28	32	39			
3	13	22	25	31	36	44			
2	14	25	28	35	40	49			
1	16	28	32	39	45	55			
1/0	18	31	36	44	51	62			
2/0	20	35	40	49	57	69			
3/0	23	39	45	55	64	78			
4/0	25	44	51	62	72	88			
250	28	48	55	67	78	95			
350	33	56	65	80	92	113			
500	39	67	78	95	110	135			
750	48	82	95	117	135	165			
1000	55	95	110	135	156	191			

**Installation Instructions:** 

- When installing the PGC Family CTs, ensure the following: 1. Only the load carrying conductors pass through the center of the CT. This means L1 + N for
- 1-phase and L1+ L2 + L3 for 3-phase. 2. The power conductors pass through the center of the CT and are preferably bound together
- to keep the conductors uniformly spaced 3. The power conductors pass perpendicular to the CT and, where practical, continue

LRS Lloyd's Register of

- perpendicular to the CT on both sides of the CT for 3". 4. The power conductors should not be installed in a way that allows them to run along the
- side edges of the CT. 5. Where practical, locate the CT away from noise-generating devices such as transformers, frequency converters, etc.

## MARINE CERTIFICATIONS

Littelfuse Selco products are certified and in accordance with all the significant international standards. See page 47 for complete list of Marine Certified Products.



Shipping

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Royal Institution of Naval Architects RMRS Russian Maritime

Register of Shipping Russian River Register

KRS

## PROTECTION RELAYS QUICK REFERENCE GUIDE

		PRODUCT	TYPE	SYSTEM*	TYPICAL APPLICATIONS	NO CALIBRATION	VISUAL INDICATION	WARRANTY	COMM	CONFORMAL COATING	BENEFITS	PG#
		SE-601	GF Relay	UG DC	DC control systems, battery charging systems, transportation systems	•	•	5 years		О	Remembers trip status when power is cycled, safely run with Ground Fault	16
		EL731	Earth-Leakage Monitor	AC and/ or DC	Variable speed drives; AC, mixed frequency, & DC systems		•	5 years	О	•	Low-level broad-spectrum fault protection for drives on RG systems. Fault current metering	16
- G		EL3100	GF and Phase- voltage Indicator		Older (ungrounded) industrial facilities and phase-voltage indication	•	•	5 years		•	Meets NEC® Article 250.21(B)	17
GROUND-FAULT PROTECTION		PGR-3200	GF and Insulation Monitor		Older (ungrounded) industrial facilities and cable and motor insulation monitor		•	5 years		О	Meets NEC Article 250.21(B), provides 2 warnings	17
AULT		SE-701	GF Relay	SG AC or RG AC	Main, feeder, or load protection, motors, generators, pumps, heating cable, adjustable-speed drives	•	•	5 years		О	Wide setting range for any pickup level > 50 mA Harmonic filtering prevents nuisance trips	18
		SE-703	Earth-Leakage Monitor	RG AC	Australian mining HRE systems	•	•	5 years	О		Meet AS2081.3-2002 without false trips	18
	L	SE-704	Earth-Leakage Monitor Relay	SG AC or RG AC	Motors, generators, pumps, irrigation systems, heating cables, SCR-controlled heaters, semiconductor mfg. equipment	•	•	5 years		О	Detects low level arcing faults, detects CT wiring problems, up to 5 A, noise filtering	18
TRAILING CABLE PROTECTION	П	SE-105 SE-107	GF GC Monitor	RG AC	Portable power cables with integrated pilot conductor. Mining equipment, conveyors, cranes	•	•	5 years		•	Reliable ground-fault and ground-continuity detection for smaller systems	19
LING CA OTECTIO		SE-134C	GF GC Monitor	SG AC or RG AC	Shore-to-ship power, pumps, cranes, mining cables, material handling	•	•	5 years		•	Provides reliable ground continuity verification	19
NGF R		SE-145	GF GC Monitor	SG AC or RG AC	Three-way splitter boxes for mine trailing cables	•	•	5 years	О	•	Reduce amount of cable to supply up to three loads, with proper ground and ground-fault monitoring	20
E RESISTANCE GROUNDING/ NGR MONITORING		SE-325	NGR Monitor	RG AC	Resistance grounded systems	•	•	5 years		•	Detects resistor failure and ground faults	20
ANCE DING/ TORIN	L	SE-330	NGR Monitor	RG AC	Resistance grounded systems		•	5 years	•	•	Can be used on any system up to 72 kV and any resistor size	20
NG .	Γ.	PGR-6100	GF & Insulation Monitor	AC systems	Ground-fault protection and insulation monitoring for motors	•	•	5 years		O	Detects problems when motor is energized or de-energized, detects problems with CT wiring	22
		PGR-6130	Electronic Overload	AC systems	Small motors that need additional protection (typically <75 hp)	•	•	5 years			Integral CT and standard protection in compact design	22
MO		PGR-6150	Standard Motor Protection	AC systems	Premium protection for smaller and medium sized motors (typically >50 hp)	•	•	5 years	•		Integral CT, Operator Interface, and modular design	22
MOTOR PROTECTION		MPU-32	Advanced Motor Protection	AC systems	Smaller motors in critical applications and medium-sized motors in standard applications (typically >100 hp)	•	•	10 years	•	•	Thermal modeling for better accuracy, Arc-Flash hazard reduction, optional temp and differential monitoring	23
TECTION		MPS	Advanced Motor Protection	AC systems	Larger motors that need maximum protection (typically >500 hp)	•	•	10 years	•	•	Thermal modeling for better accuracy, Arc-Flash hazard reduction, opt. temp and voltage monitoring, can be used as starter control	23
_	ı	MPU-32-X69X	Retrofit Kit	Induction Motors	Replaces GE Multilin 169, 269 & 369	•	•	10 years	•	•	Plug and play installation, match existing curves	23
		MPS-469X	Retrofit Kit	Induction Motors	Replaces GE Multilin 469	•	•	10 years	•	•	Plug and play installation, match existing curves	23
	L	PGR-6800	Pump Protection	AC systems	Submersible and process pump motors	•	•	5 years			Integral CT and Undercurrent to detect low-level	24
PROTEC		FPU-32	Standard Feeder Protection	AC systems	Medium voltage distribution circuits	•	•	10 years	•	•	IEEE and IEC curves, Arc-Flash hazard reduction	24
ROTECTION	Ĺ	FPS	Advanced Feeder Protection	AC systems	Medium voltage distribution circuits with remote breaker control	•	•	10 years	•	•	IEEE and IEC curves, Arc-Flash hazard reduction, current and voltage protection	24
ARC-FLASH PROTECTION		D0900	Arc-Flash Relay	AC or DC	Switchgear in wind turbines, offshore oil rigs, marine, industrial, and power generation		•	1 year			Trip quickly and minimize hazard of an arc flash	25
HASH		PGR-8800	Arc-Flash Relay		Switchgear in wind turbines, offshore drill rigs, marine and power generation	•	•	5 years			Trip quickly and minimize hazard of an arc flash	25

\*LEGEND: UG=Ungrounded; SG=Solidly Grounded; RG=Resistance Grounded;

## **GENERATOR, ENGINE CONTROLS & PROTECTION QUICK REFERENCE GUIDE**

	PRODUCT	DESCRIPTION	TYPICAL APPLICATIONS	FEATURES	MARINE CERTIFICATIONS	PG#
Γ	PGR-4300	Generator Ground-Fault Relay (SG AC)	Manufacturers, rental companies and users of solidly grounded generators	No calibration, visual indication, 5-yr warranty . No CTs, can be used on 3- and 4-pole switches, alarms when generator becomes ungrounded	N/A	26
	G2000	Power Relay	Generator protection	User configurable scales and setpoints	N/A	26
	G3000	Frequency Relay	Generator protection	User configurable scales and setpoints	N/A	26
	G3300	Voltage Relay	Bus bar monitoring	User configurable scales and setpoints. Combined over- and undervoltage relay	N/A	27
	T2000	Reverse Power Relay	Generator protection	Works even if supply voltage drops to 50% of rated	ABS, BV, PRS, RMRS, RRR	27
	T2100	Excitation Loss Relay	Generator protection	Works even if supply voltage drops to 50% of rated	BV, RMRS, RRR	27
	T2200	Overcurrent Relay	Generator protection/trip on non essential loads	The non-essential trip function is used to reduce the chance of blackouts	BV, PRS, RMRS, RRR	28
	T2300	3-Phase Short-Circuit Relay	Generator protection	Accepts high supply voltage variations – 60 to 110%	BV, PRS, RMRS, RRR	28
	T2400	3-Phase Dual Overcurrent Relay	Generator Protection/trip on non essential loads	Combining two relays in same enclosure	BV, RMRS	28
	T2500	Overcurrent and Short-Circuit Relay	Generator protection	Combining two protection functions in same enclosure	BV, PRS, RMRS, RRR	29
	T2700	Power Relay	Generator protection	Accepts high-supply voltage variation, ensures correct operation in spite of voltage supply fluctuations (fulfills marine class requirement)	BV, RMRS, RRR	29
	T2800	Earth-Fault Relay	Generator protection	Protects generators against earth faults (Combined with T2200 overcurrent protection is also provided)	BV, RMRS, RRR	19
	T2900	3-Phase Differential Relay	Generator protection	Protection of generators, power transmission equipment and circuit breakers against differential currents	RRR	29
	T3000	Frequency Relay	Bus bar monitoring/non essential load trip	Combined over- and underfrequency relay	ABS, BV, KRS, PRS, RMRS, RRR	30
	T3100	Voltage Relay	Bus bar monitoring	Combined over- and undervoltage relay	ABS, BV, KRS, PRS, RMRS, RRR	30
	T3200	Double Insulation Monitoring Relay	Bus bar monitoring	Insulation monitoring of AC systems. One relay monitors two separate systems.	BV, PRS, RMRS, RRR	17
	T3300	Voltage Relay	Bus bar monitoring	Combining two relays in same enclosure	N/A	30
Г	T2600	Dual Current Relay	Load depending start and stop of generators	BV, DNV, KRS, RMRS	31	
	T4500	Auto Synchronizer	Synchronization of a generator to a busbar	Facilitates easy adjustment during installation and commissioning	ABS, BV, DNV, KRS, PRS, RMRS, RRR	31
	T4800	Load Sharer	Load sharing between generators or parallel operation of generators with the grid	Includes reverse power trip	ABS, BV, DNV, KRS, PRS, RMRS, RRR	31
	T4900	VAR Load Sharer	Reactive load sharing between generators or parallel operation of generators with the grid	Power factor regulation for grid parallel operation is included.	N/A	32
	T5000	Paralleling Relay	Paralleling of generators	Check synchronizer for enabling closure of circuit breakers	BV, PRS, RMRS	32
	E7800	Motorized Potentiometer	Interfacing of synchronizers and load sharers with governors and AVRs	Resistance range from 100 ohm to 10 K ohm	RRR	32
	T7900	Electronic Potentiometer	Interfacing of synchronizers and load sharers with governors and AVRs	Provides a wide selection of output ranges including PWM	N/A	33
	M8100	Synchroscope	Paralleing of generators	Versions with C/B close output and dead bus closure available.	BV, GL, RMRS, RRR	33
	T8400	Blackout Limiter	Paralleling of generators	N/A	33	
	C6200	FlexGen Generator Control	Generator control and protection device	Many operational modes are covered with the same unit	ABS, BV, CSS, KRS, RMRS, RRR	34
	\$6000, \$6100, \$6610	SIGMA Protection Module	Generator protection, control and full power management system	Covers all power management functions	ABS, BV, CCS, DNV, GL, KRS, LRS, NKK, RINA, RMRS, RRR	34
Ē	M2000	Engine Control	Engine control and monitoring	Possibility of changing between emergency generator mode and harbour generator mode via external switch.	BV, DNV, GL, LRS, NKK, PRS, RINA, RMRS, RRR	35
	M2500	Engine Control and Monitoring Unit	Engine control and monitoring	Digital and analog sensor inputs, J1939 communication. Configuration and log read-out via SD card	ABS, DNV, GL, LRS, RMRS, RRR	35
	E5000	Handheld EngineEye Unit	Engine diagnostics	MIP with large display and patented sensor, TDC and ISO correction	N/A	36
Г	M1000	Alarm Monitor	Monitoring of digital alarm signals	Voltage and insulation monitoring of supply voltage	ABS, BV, DNV, GL, KRS, LRS, NKK, PRS, RINA, RMRS, RRR	37
	M3000	Alarm Monitor Monitoring of digital and analog alarm signals Calculation of average value of input signals for exhaust gas monitoring		ABS, BV, DNV, GL, LRS, NKK, RINA, RMRS, RRR	37	
	M4200	Alarm Monitor	Monitoring of digital alarm signals	Programmable LED color, 8 channels	BV, DNV, LRS, RMRS, RRR	37
	M4500	Alarm Indicator			RRR	38
	M4600	Alarm Indicator	Remote alarm indication	8 channels	RRR	38
	M4700	Alarm Indicator	Remote alarm indication	20 channels. Versions with Modbus communication available.	RRR	38
1 .	H4000 Series	HMI Panels	Visualisation system with touch screen	DNV, GL, RINA	38	

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# Safe Electrical System

#### **White Papers & Technical Information**

An expanded Technical Application Guide, White Papers, and a library of technical information is available online at

#### Littelfuse.com/RelaysControls-Resources

Littelfuse can help you address application and circuit protection challenges while achieving regulatory compliance.



## Datasheets, User Manuals, WhitePapers and more, including:

- Introduction to Protection Relays and Applications
- Lowering the Limits for Ground-Fault Protection
- The Importance of Effective Motor and Motor Circuit Protection
- Ground-Fault Protection with VFDs
- Selecting an Arc Flash Relay
- Arc-Flash Incident Energy Reduction Workbook
- Why NGRs Need Monitoring
- Transformer Protection

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#### **Application Support**

Littelfuse's staff of professional engineers assists customers with the application of protection relays and generator controls. By working with the customer during the design phase, our engineers are able to help identify potential issues and provide product recommendations to resolve difficult problems. Since we are involved from the beginning, we are also able to provide recommendations for relay settings.

#### Field Support

Our experienced product and application engineers are available to provide assistance when investigating the cause of a relay trip, or assisting with product setup. As systems grow in terms of power and physical size, some products and settings may need to be adjusted. If so, our engineers are available to answer any questions that arise when modifying these applications.

#### **Online Tools and Relay Software**

Featuring easy to use navigation, search and selection tools as well as in-depth product details, Littelfuse.com/RelaysControls is a powerful resource for up-to-date technical information. In addition, our website features various software applications, such as relay-to-PC interface software, firmware, upgrade software, online demos and programming tutorials.

Littelfuse products and services enhance the safety and productivity of electrical systems. Along with protection relays, generator controls and alarm monitors, we offer current-limiting fuses to decrease Arc-Flash exposure, and fuse holders and fuse covers to reduce incidental contact and improve safety.

- **Protection Relays**
- Generator Control and Protection
- Alarm Annunciators and Indicators
- **Engine Control**
- **Engine Diagnostics**
- **Custom Power Centers**
- **■** Fuses and Fuse Holders



## 

For 85 years, Littelfuse electrical safety products have helped OEM engineers, consulting engineers and end-users select the right products to protect critical electrical equipment—all supported by our full line of product catalogs and reference materials.

**Arc-Flash Relay Brochure** 

Littelfuse offers one of the fastest Arc-Flash Protection relays on the market. The PGR-8800 can detect a developing arc flash extremely fast and send a trip signal before any significant damage occurs.

**Motor Protection Relay Brochure** 

Littelfuse provides a range of multi-function motor protection products that reliably protect small, medium and large motors.

Generator Controls and Alarm Panels Littelfuse Selco provides generator control, diagnostics

Littelfuse Selco provides generator control, diagnostics and protection products as well as alarm annunciation

and indication panels.

**Fuses and Fuse Holders Catalog** 

Littelfuse POWR-GARD® offers a complete circuit-protection portfolio, including time saving indication products for an instant visual blown fuse identification, even on de-energized systems.

To request catalogues for the entire Littelfuse portfolio of products, please contact your authorized Littelfuse sales representative or visit our website at **Littelfuse.com/Catalogs** 





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