

# **Raychem** GROUND-FAULT EQUIPMENT DEVICE SELECTION

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## OVERVIEW

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Raychem heating cables are reliable and easy to install and maintain. However, if the heating cable is improperly installed or physically damaged to the point that water contacts the bus wires, sustained arcing or fire could result. If arcing does occur, the fault current may be too low to trip conventional circuit breakers. To protect against the risk of fire, use ground-fault protection on each heating cable circuit.

Pentair Industrial Heat Tracing Solutions, approvals agencies, and national electrical codes require ground-fault protection of equipment for all heating cable installations. A grounded metallic covering is also required and is supplied as a braid or outer sheath.

## DESIGN OPTIONS

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A Ground-Fault Equipment Protection Device (GFEPD) typically has a trip level of 30 mA. These 30-mA devices, which are intended to protect equipment from damage due to overheating or fire, are not to be confused with 5-mA ground-fault circuit interrupters (GFCIs), which provide personnel protection from electrical shock but may cause nuisance tripping of the heat-tracing circuit. All Raychem single-phase, self-regulating heating cables and tank heating cables, and Raychem MI heating cables, require 30-mA GFEPDs. For all 3-phase heating cables, a 70-mA ground-fault device is recommended to minimize nuisance tripping due to long heating cable circuit lengths.

### Ground-Fault Protection Methods

Methods of providing ground-fault protection include:

- 30-mA ground-fault circuit breakers.
- Controllers with ground-fault protection built in, such as the Raychem 910, 920, NGC-30 and NGC-40.
- Neilsen-Kuljian or CR Magnetics sensors with a shunt-trip breaker, for use when current or voltage exceeds the ratings of traditional 30-mA ground-fault trip circuit breakers.
- Neilsen-Kuljian or CR Magnetics sensors to monitor and provide an alarm for a ground fault but not shut off the circuit, meeting the exception to the NEC requirement in Article 427-22.

### Ground-Fault Circuit Breakers

Manufacturers of 30-mA circuit breakers include Square D, Cutler Hammer (Westinghouse), General Electric, and Siemens. The breaker that is right for your application depends on the load current expected, the equipment voltage rating, and the panelboard in which the breaker is to be installed.

Table 1 lists some of the breakers available.

## GROUND-FAULT EQUIPMENT DEVICE SELECTION

**TABLE 1 GROUND-FAULT CIRCUIT BREAKER SELECTION TABLE**

<b>Bolt-On Style</b>						
<b>Manufacturer</b>	<b>Square D</b>			<b>Cutler Hammer (Westinghouse)</b>		
<b>Voltage</b>	<b>120</b>	<b>208/240<sup>1</sup></b>	<b>277</b>	<b>120</b>	<sup>2</sup>	<b>277</b>
15 Amps	QOB115EPD	QOB215EPD	EDB14015EPB	QBGFEP1015	QBGFEP2015	GBH1015
20 Amps	QOB120EPD	QOB220EPD	EDB14020EPB	QBGFEP1020	QBGFEP2020	GBH1020
30 Amps	QOB130EPD	QOB230EPD	EDB14030EPB	QBGFEP1030	QBGFEP2030	GBH1030
40 Amps	( <sup>3</sup> )	QOB240EPD	EDB14040EPB	NA	QBGFEP2040	GBH1040
50 Amps	( <sup>3</sup> )	QOB250EPD	EDB14050EPB	NA	QBGFEP2050	GBH1050
Panelboard	NQOD	NQOD	NA	POW-R-LINE 1	POW-R-LINE 1	NA
<b>Plug-In Style</b>						
<b>Manufacturer</b>	<b>Square D</b>			<b>Cutler Hammer (Westinghouse)</b>		
<b>Voltage</b>	<b>120</b>	<b>208/240<sup>1</sup></b>	<b>277</b>	<b>120</b>	<sup>1</sup>	<b>277</b>
15 Amps	QO115EPD	QO215EPD	NA	QPGFEP1015	QPGFEP2015	NA
20 Amps	QO120EPD	QO220EPD	NA	QPGFEP1020	QPGFEP2020	NA
30 Amps	QO130EPD	QO230EPD	NA	QPGFEP1030	QPGFEP2030	NA
40 Amps	( <sup>3</sup> )	QO240EPD	NA	NA	QPGFEP2040	NA
50 Amps	( <sup>3</sup> )	QO250EPD	NA	NA	QPGFEP2050	NA
Panelboard	QO Load Center	QO Load Center	NA	POW-R-LINE 1	POW-R-LINE 1	NA
Padlocks <sup>2</sup>	QO1PA	GF12PA	NA	QLPB123PL	QLPB123PL	NA

**Note:** Bell alarm contacts may be ordered through your local electrical distributor by adding a "2100" suffix to the Square D part number or a "W1" suffix to the Westinghouse part number (example: QOB120EPD2100 is a 20 A, 120 V breaker with bell alarm contacts).

1. Two-pole ground-fault breakers require 120 volts to power the internal electronics. 240-volt delta systems without a 120-volt neutral reference will require an additional transformer to provide the reference.
  2. Padlocks are required to comply with NEC article 427-55(a) if the circuit breaker is utilized as a disconnecting means.
  3. Use 208/240 V EPD for these amperages.
- NA—not available.

### External Ground-Fault Sensors

An external Neilsen-Kuljian or CR Magnetics ground-fault sensor may be used for ground-fault monitoring and alarm, high current or high voltage applications, and / or applications that require various ground-fault trip levels.

A Neilsen-Kuljian or CR Magnetics ground-fault sensor may be used for:

- Ground-fault monitoring and alarm, per the exception to NEC Article 427-22.
- Applications where current or voltage exceeds the ratings of available ground-fault circuit breakers.
- Applications that require a variety of ground-fault trip levels, such as 70 mA for VL heating cables.

Both of these ground-fault sensors have a ground-fault trip level adjustable from 1 to 100 mA and can be connected to an alarm light or to the shunt-trip of a breaker. These sensors also have an associated red light to indicate a fault and may have an additional light to indicate the presence of 120 V power. Both sensors can be supplied with a built-in TEST function, which simulates the fault and confirms that the unit is operational.



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