ABB Power T&D Company Inc.
Relay Division
Coral Springs, FL
Allentown, PA

January, 1991
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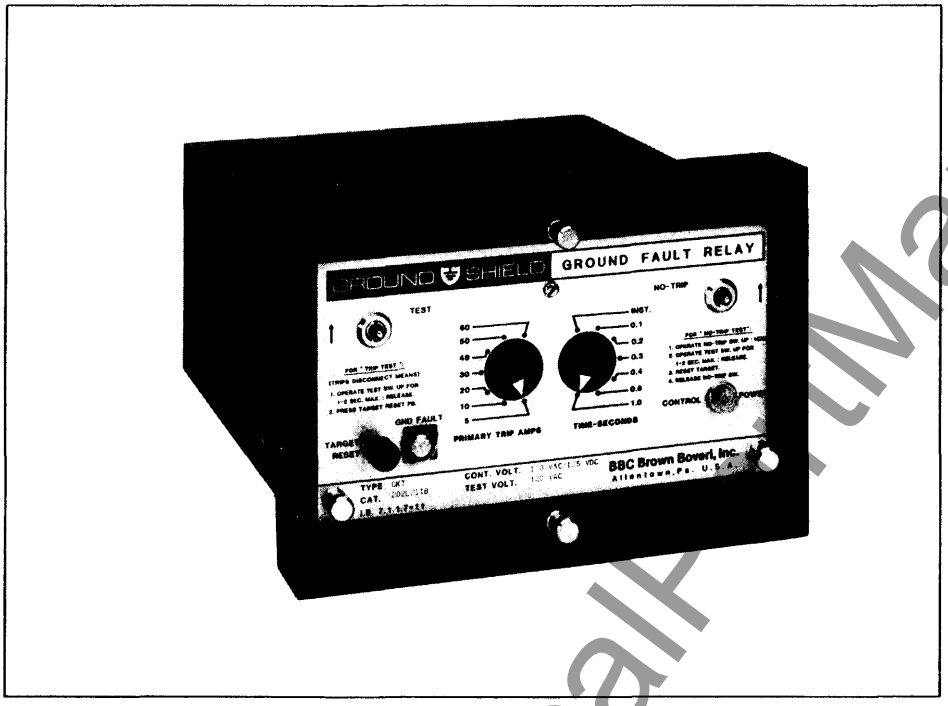
pages 1-4, dated October, 1988
Mailed to: E, D, C/41-100B

Device Number: 50GS, 51GS

GROUND SHIELD®

Types GKC, GKT Ground Fault Relay Systems



Features

- Fast, sensitive protection
- Adjustable pickup and time delay
- Wide choice of sensors and control voltages
- Contact output
- Operation Indicator
- Relay/Sensor test, trip or no trip
- Control power light
- Self-reset or seal-in
- Memory Operation
- Seismic capability to 6g ZPA
- Transient immunity
- Drawout construction
- UL listed
- 2 year warranty

Application

The GKC and GKT GROUND SHIELD Systems offer fast, sensitive protection against ground-faults including destructive, low magnitude, arcing ground faults in solid and resistance grounded distribution systems. They consist of a special-design, core-balancing current transformer (sensor) and a low-burden, solid-state ground relay.

Type GS ground sensors are available with small or large-window configurations designed to enclose all phase and neutral or ground-return bus or cable conductors.

Pickup or sensitivity of GKC/GKT relay family spans from 2A to 1200A and is available in (4) ranges.

All relay calibrations are in primary amperes.

Lower pickup ranges are normally used for protection of individual loads such as motors, transformers or branches in solidly grounded systems. They are also employed for protection of high or medium resistance systems where coordination depends mostly on time setting.

Medium and high pickup ranges find applications for main, feeder, and circuit protection in low-resistance or solidly grounded systems.

Ungrounded (3-wire) power systems require an artificial neutral and should be converted to a high-resistance type for proper application.

The GKC/GKT system provides seven time-current curves of definite time shape, figure 2. All relay calibrations are in primary amperes. Tripping of the desired breaker (coordination) is obtained by applying relays with successively faster curves progressing from source to load circuits.

Application of these GROUND-SHIELD Systems is simple and direct. One sensor and one relay are used with any type of circuit. The sensor is selected by physical size; the relay by sensitivity range and speed of operation. A minimum pick-up setting on the relay offers maximum system protection but at a possible sacrifice in selectivity depending on the downstream equipment characteristics.

The GKT provides a built-in test for both the relay and sensor; the GKC test is for the relay only. The test can be run with or without tripping the disconnected device.

Two output contacts and control power light are provided.

The relay includes a target indicator which retains its indication even with loss of control power.

An interlock is available for use in double-ended substations or tie applications.

Relay self-reset or seal-in (latch) operation can be selected.

Standard relays have memory type operation for intermittent faults. Relays with fast reset are available.

Control power drain at standby is very low.

Figure 1. Wiring Diagrams for Drawout Style Ground Relays Types GKC, GKT

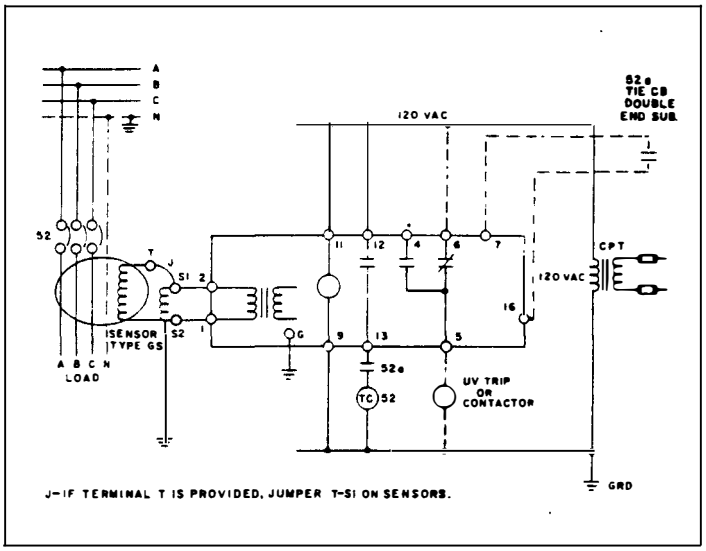


Figure 1a. Type GKC with A.C. control power

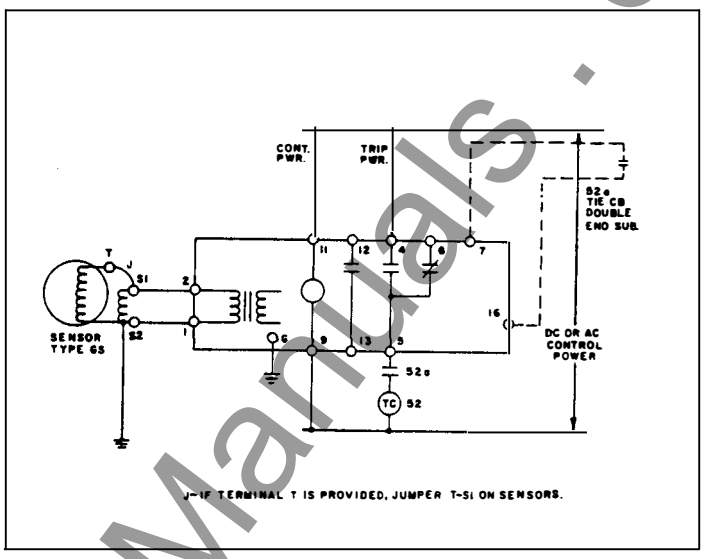


Figure 1b. Type GKC with D.C. control power

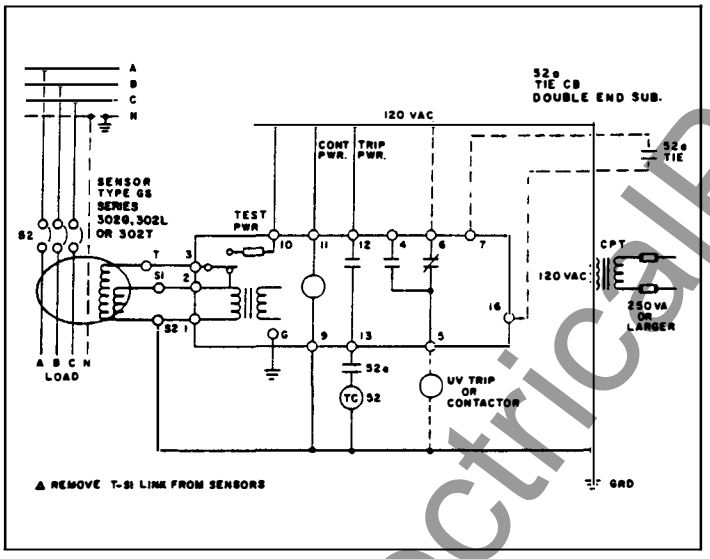


Figure 1c. Type GKT with 120 VAC Test and control power

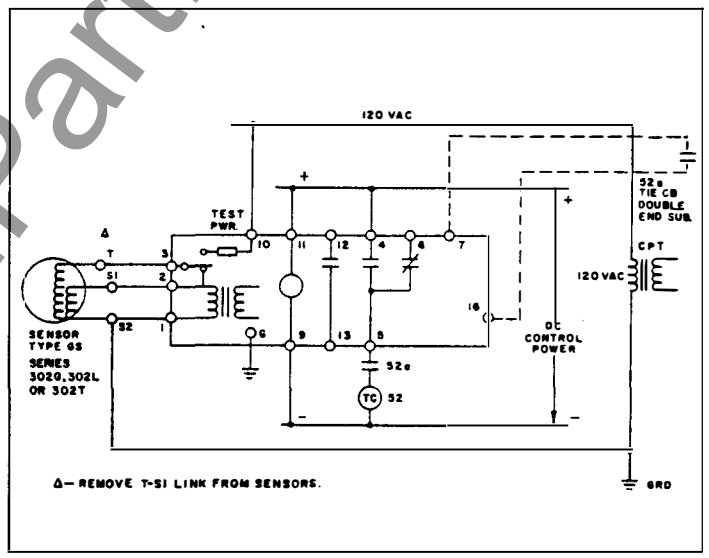


Figure 1d. Type GKT with 120 VAC Test power and D.C. control power

Notes:

1. System "neutral to ground" connection must be on source side of ground sensor. DO NOT ground neutral anywhere downstream from sensor location.

2. Control power source should have sufficient capacity to accommodate trip coil inrush current and to avoid excessive voltage collapse during operation. Type GKT requires 120 VAC control power to supply 0.5-5A for sensor testing. Control transformer (if used) must be connected line-to-line in a power circuit.

3. Special precautions must be taken when applying ground fault relaying on a 4-wire multi-source or double ended substations. The relays will accept a NO-TRIP contact input for interlocking. Refer to factory for additional information.

4. Sensors provided with the T terminal, a shorting link is required between terminals T and S1 (except if used with type GKT relays.)

Application (continued)

The Type GKC and GKT Relays are drawout construction for ease of maintenance. Standard features include: 1) A CONTROL POWER LAMP to indicate the presence of control power to the relay system. 2) A ground fault OPERATION INDICATOR which maintains indication even on loss of control power. 3) A TEST SWITCH for performing an operational test on the relay system. 4) A NO-TRIP switch to prevent the disconnect from tripping when the operational test is performed, if continuity of service must be maintained. 5) A RESET pushbutton to reset the target from orange to black.

Built-In Test Features

The GKC relay includes a built-in test feature that allows testing of the relay and disconnect device operation. Any of the type GS Ground Sensors may be used in this system. If the sensor includes the "T" terminal it must be jumpered to the S1 terminal.

The GKT relay is provided with test circuits and current limiting resistors to inject a test current into the sensor test winding (3-5 amperes maximum). Thus the test power transformer should be sized accordingly to supply the test current at 120 VAC for 1-2 seconds. A minimum rating of 250 VA is recommended. Note that the control power and test power circuits are isolated, hence could be connected to different sources. However, the relay terminal 10 should be connected to the ungrounded end of the 120 VAC test source and terminal 1 (or terminal S2 of the sensor) should be wired to the grounded end of the source.

Type GKT relays are designed for use with type GS sensors that have provisions for testing (terminal T). The test circuit requires that the T-S1 jumper supplied on the sensor be removed.

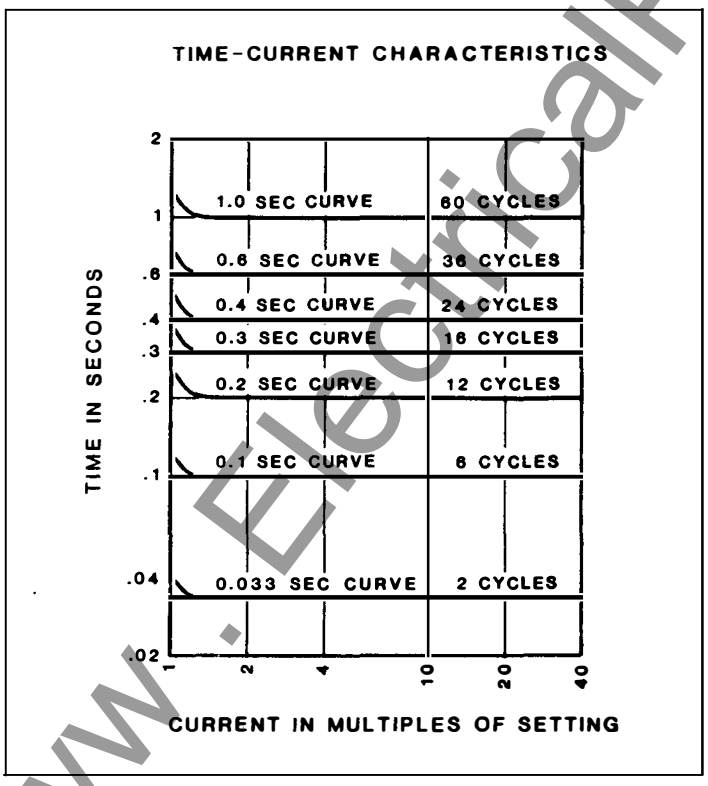


Figure 2 — Time-Current Curves for Types GKC, GKT.

Specifications

Input Signal:	Current from a secondary winding of a type GS sensor.
Primary Trip Amperes: (25/50/60 Hz)	Switch selected 2,4,8,12,16,20,24A 5,10,20,30,40,50,60A 20,40,80,120,160,200,240A 100,200,400,600,800,1000,1200A
Time Delay:	Definite Time as shown in figure 2. Switch selected: Inst. (0.033), 0.1,0.2,0.3,0.4,0.6,1.0 sec.
Input Withstand:	Sensor primary current
0.033 sec.:	200,000A RMS (all ranges)
0.5 sec.:	65,000A RMS (all ranges)
continuous:	3000A RMS (20-240A, 100-1200A) 300A RMS (2-24A, 5-60A)
Output Contacts:	1 form C (SPDT) 1 form A (N.O.) rated at 125 VDC 40A for 0.033 sec. (trip duty) 30A for 0.25 sec. 8A continuous 1A break (resistive) 0.3A break (inductive)
Control Power:	Models available 24,32,48,125,175VDC; 120VAC Max. operating voltage — Nominal +10% Min. operating voltage — 55% of nominal (AC) 80% of nominal (DC)
Sensor Test Source:	(Type GKT only) 120 VAC (+10, −20%)
Control Source Drain:	Approx. 3-5 ma. standby, 30-40 ma operate
Operating Temperature:	Minus 20°C to plus 70°C
Seismic Capability:	More than 6g's ZPA either axis biaxial broadband multifrequency without damage or malfunction (ANSI/IEEE C37.98)
Transient Immunity:	More than 2500V, 1MHz bursts at 400 Hz repetitive rate continuous (ANSI C37.90A SWC); Fast transient test; EMI test.

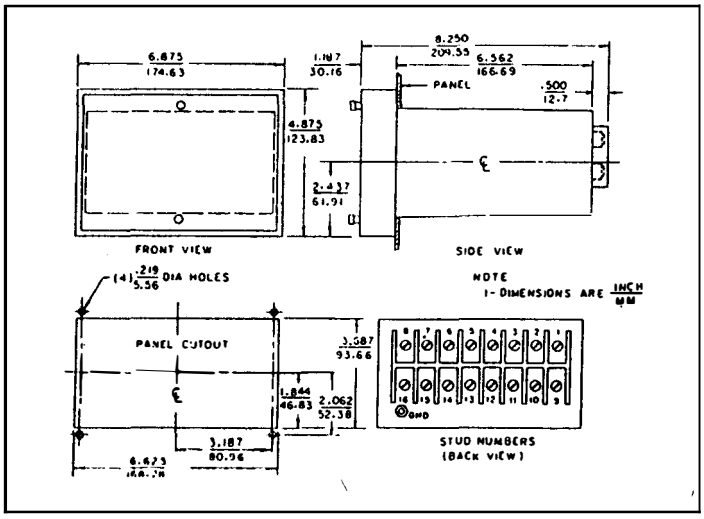


Figure 3 — Relay Outline and Drilling.

Type GS Ground Sensors

The current sensor consists of a wound core of small cross section with a uniformly distributed secondary winding. Solid core units have the entire assembly cast in epoxy. Split core units are separable for easy installation over existing cables or bus.

Size & Shape		Catalog Numbers
Type GS - Ground Sensors - Solid Core		
2" round	(Note 5)	302B0200UL
3" round	(Note 5)	302B0300UL
5" round	(Note 4)	302G0500UL
8" round	(Note 4)	302G0800UL
7" x 21" rect.	(Note 4)	302L0721UL
7" x 25" rect.	(Note 4)	302L0725UL
7" x 27" rect.	(Note 4)	302L0727UL
7" x 31" rect.	(Note 4)	302L0731UL
7" x 37" rect.	(Note 4)	302L0737UL
10" x 13" rect.	(Note 5)	302B1013UL
10" x 17" rect.	(Note 5)	302B1017UL
10" x 24" rect.	(Note 5)	302B1024UL
16" x 20" rect.	(Note 5)	302B1620UL
Type GS - Ground Sensors - Split Core		
8" round	(Note 5)	302D0800UL
7" x 7" rect.	(Note 4)	302T0707UL
7" x 10" rect.	(Note 4)	302T0710UL
7" x 17" rect.	(Note 4)	302T0717UL
7" x 24" rect.	(Note 4)	302T0724UL
7" x 30" rect.	(Note 4)	302T0730UL
7" x 37" rect.	(Note 4)	302T0737UL
10" x 10" rect.	(Note 4)	302T1010UL
10" x 17" rect.	(Note 4)	302T1017UL
10" x 24" rect.	(Note 4)	302T1024UL
10" x 30" rect.	(Note 4)	302T1030UL

Notes:
1. Sensors are 600V class devices. Follow air and surface clearance requirements of electrical designs.
2. For sensor dimensions see Section 7.10.0.2.
3. For complete and additional ordering information for both ground fault relays and sensors, refer to pages 5 and 6.
4. Suitable for use with either GKT or GKC Relay. Sensors are provided with T terminal (test winding).
5. Suitable for use with GKC relays (does not include test winding).

How To Specify

Ground fault protection shall be Asea Brown Boveri Type GKC/GKT system or approved equal, consisting of (1) Type GKC/GKT relay and (1) Type GS current sensor. Sensitivity and operating time shall be adjustable on the front panel. Relay shall be capable of withstanding up to 6g seismic stress without damage or malfunction at minimum settings. Built-in means shall be provided to allow operational test of the relay or relay sensor with or without tripping. The relay shall be operable in a self-reset or seal-in mode. An operation indicator and control power light shall be provided.

How To Order

For each circuit to be protected order (1) Type GKC/GKT relay and (1) Type GS current sensor. Select 2-24 or 5-60A range relay for single motors, transformers, and high-resistance grounded systems. Select 20-240 or 100-1200A range relay for main, tie, feeder, and branch circuits. Also select the relay based on the control voltage source.

Refer to page 5 for Cat. No.'s and UL or CSA listed devices.

Select a Type GS current sensor from the tables on this page. Select a size which will encircle all phase conductors (including the neutral in a 4 wire system). Select a solid core or split core type. Split core sensors allow easier installation of ground fault protection to existing systems, since disconnecting bus work or cables is not necessary.

Further Information

List Prices: PL 41-020
Technical Data: TD 41-025
Instruction Book: IB 7.1.1.7-11①
Ground Fault Protection Guide: 18.1-5A①
Field Test Instruction (NEC): 7.1.1.7-9.1①
Other Protective Relays:
Application Selector Guide, TD 41-016

① Available upon request, only from Allentown Plant.

UL — Listed Underwriters' Laboratories, Inc. and by Canadian Standards Association.

January, 1991
Supersedes Section 7.1.0.3,
Types GKC, GKT on pages 2, 4 and 5,
dated September 1, 1990
Mailed to: E, D, C/41-100B

Drawout Case, Semi-Flush Mounting
Definite Time Characteristic
Time Curve: 0.033-1.0 sec.
Self-Reset or Seal-In Operation
Memory Function
Double-End (no-trip) Interlock

GROUNDSHIELD®

Types GKC, GKT Ground Fault Relay Systems

Type	(Primary Bus) Pickup Range	Output	Internal Connections	(See Note 1) Catalog Number
GKC	2-24A	1 form C	16D202VC	202R26x8UL
	5-60A	& 1 N.O.	16D202VC	202R21x8UL
	20-240A		16D202VC	202R27x8UL
	100-1200A		16D202VC	202R23x8UL
GKT with Sensor Test Feature (See Note 2)	2-24A	1 form C	16D202VT	202L26x8UL
	5-60A	& 1 N.O.	16D202VT	202L21x8UL
	20-240A		16D202VT	202L27x8UL
	100-1200A		16D202VT	202L23x8UL

Notes:
1. Each of the listed catalog numbers contains an "x" for the control voltage designation. To complete the catalog number, replace the "x" with the proper control voltage digit:
   - 24/32 Vdc 0
   - 125 Vdc, 120 Vac. 1
   - 48 Vdc 3
   - 175 Vdc . . . . . 7 (Capacitor Trip)

   UL - Listed by Underwriters' Laboratories, Inc., and by Canadian Standards Association.
2. For models with "Fast Reset", consult factory.
3. For use with (1) Type GS test winding sensor, series 302L, 302T or 302G.

Ground Fault Relays – Use with 1-Type GS Sensor from Tables A and B, on page 6.

Internal Connection Diagrams

Ground-Fault Relays, Drawout Case
Type GKC

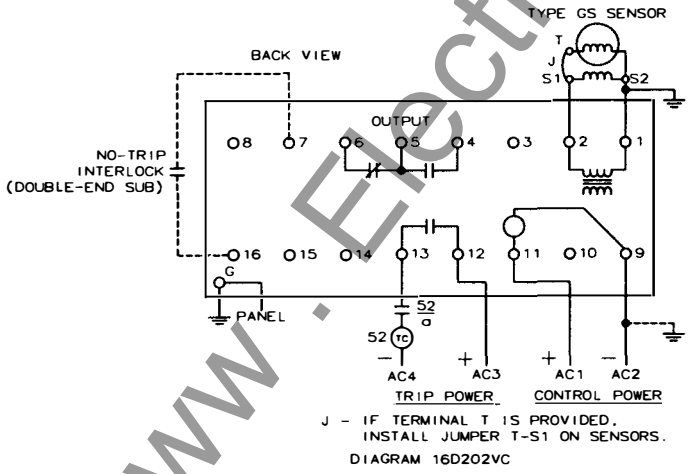


DIAGRAM 16D202VC

Ground-Fault Relays, Drawout Case
Type GKT

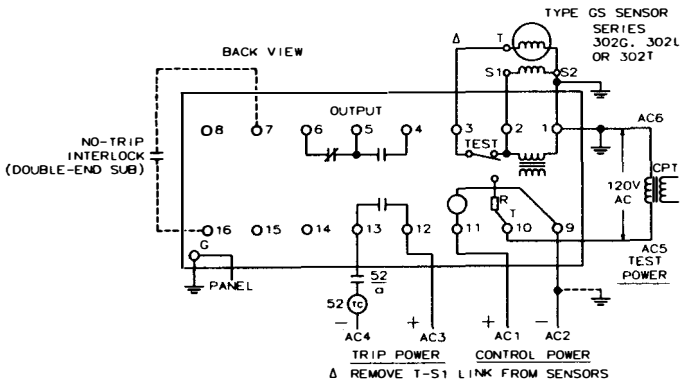


DIAGRAM 16D202VT

Table A – Type GS Ground Fault Sensors – Solid Core

Size & Shape	Catalog Number	
2" round	302B0200UL	
3" round	302B0300UL	
5" round	302G0500UL	See Note 1
8" round	302G0800UL	See Note 1
7" x 21" rectangular	302L0721UL	See Note 1
7" x 25" rectangular	302L0725UL	See Note 1
7" x 27" rectangular	302L0727UL	See Note 1
7" x 31" rectangular	302L0731UL	See Note 1
7" x 37" rectangular	302L0737UL	See Note 1
10" x 13" rectangular	302B1013UL	
10" x 17" rectangular	302B1017UL	
10" x 24" rectangular	302B1024UL	
16" x 20" rectangular	302B1620UL	See Note 2

Table B – Type GS Ground Fault Sensors – Split Core

Size & Shape	Catalog Number	
8" round	302D0800UL	
7" x 7" rectangular	302T0707UL	See Note 1
7" x 10" rectangular	302T0710UL	See Note 1
7" x 17" rectangular	302T0717UL	See Note 1
7" x 24" rectangular	302T0724UL	See Note 1
7" x 30" rectangular	302T0730UL	See Note 1
7" x 37" rectangular	302T0737UL	See Note 1
10" x 10" rectangular	302T1010UL	See Note 1
10" x 17" rectangular	302T1017UL	See Note 1
10" x 24" rectangular	302T1024UL	See Note 1
10" x 30" rectangular	302T1030UL	See Note 1
10" x 37" rectangular	302T1037UL	See Note 1

Notes:
1. Sensor includes test winding for relay/sensor testing.
2. For use with ground fault relays with 100-1200A range.

UL – Listed by Underwriters Laboratories, Inc., and by Canadian Standards Association.

Sensors and Relay Test Cable, 19 Turns Per Loop, Catalog Number 202W1219

For Sensors Other Than Listed Here, Consult Factory.

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