

DGF7 Display

reference manual



Ground Fault Systems bv

Ground Fault Systems B.V.
Rigtersbleek-Aalten 4B15
7521 RB Enschede
The Netherlands

www.groundfaultsystems.com
info@groundfaultsystems.com
Tel: +31 53 4318628
CofC: 55400914

1. GENERAL DESCRIPTION	3
2. FUNCTIONALITY	4
2.1 Pushbuttons	4
2.1.1 G/F current display	4
2.1.2 G/F Trip Level display	4
2.1.3 Trip code display	4
2.1.4 Trip code display during power down situations	5
2.1.5 Reset function	5
2.1.6 Relay test	5
2.1.7 LCD test	6
2.1.8 Alarm code display	6
2.2 Datalink error code	6
3. PARAMETER SETTING	7
3.1 Display Settings	7
3.2 Display setup procedure	7
4. CONNECTIONS AND PRECAUTIONS	8
5. TECHNICAL SPECIFICATIONS	9
5.1 Serial datalink circuit	9
5.2 Terminals	9
5.3 Environment	9
5.4 Mechanical properties	9
6. APPLICABLE STANDARDS	10
7. TABLES AND FIGURES	11
7.1 Table 1 - DGF7-3 dipswitch settings	11
7.2 Table 2 - DGF7 Display settings versus current read-out	12
7.3 Table 3 - Trip codes	13
7.4 Figure 1 - Typical Field Connection using DGF7-3 with built-in core balance, remote reset and DGF7 Display.	14
7.5 Figure 2 - Dimensions DGF7 Display	15

1. GENERAL DESCRIPTION

The DGF7 Display is a door mounted self powered operator interface to be used in conjunction with the DGF7-3 Ground Fault (G/F) protection system. It has a four digit LCD panel that normally shows the magnitude of residual current flowing to ground as it is measured by the DGF7-3. If a trip occurred and the ground fault current has been removed, the display will show, in flashing mode, the measured current just prior to the trip. The two integrated pushbuttons also allow for other data to be accessed, such as trip codes, the G/F Trip Level as it is set by means of dipswitches on the DGF7-3, and various parameters inside the display itself that modify its behaviour.

The DGF7 Display has settable parameters to enable the user to tailor the DGF7 Display to their needs, Relay Test on/ off, G/F Current Display Mode ('%', 'A' and 'kA') and CS Configuration.

The G/F Current Display Mode is a 'real world', auto-ranging, readout in relative or absolute mode for different current sensors.

When the DGF7-3 G/F protection system loses control voltage, the DGF7 Display memorises the actual trip state, which remains accessible to the operator by pressing the 'SHOW TRIP' button. This feature is especially useful when pulse tripping a breaker that also supplies control voltage to the DGF7-3 G/F protection system.

The pushbuttons can also be used to test the segments of the LCD and to invoke a relay test on the DGF7-3.

The display is connected to the DGF7-3 base unit using a single twisted pair of wires. No separate power supply is needed.

2. FUNCTIONALITY

2.1 Pushbuttons

The DGF7 Display has two pushbuttons, marked 'SHOW TRIP' and 'RESET'. With these two buttons a variety of reading and setting options can be performed.

2.1.1 G/F current display

When left untouched (except while in parameter set-up mode, see [section 3](#)), the DGF7 Display will always return to showing the current flowing to ground, commonly referred to as 'G/F current'. The user has two options for showing this current:

- Relative format: as a percentage of the G/F Trip Level. The G/F Trip Level is set by means of dials 1, 2 and 3 on the DGF7-3 base unit. It is the intention that the user checks the '%' box on the DGF7 Display's front panel with a marker.
- Absolute format, i.e. in engineering units: A or kA. In this mode the DGF7 Display uses the P4 parameter (see [section 3](#)), specifying the CS configuration, to calculate absolute from relative current. It is the intention that the user checks the 'A' or 'kA' box on the DGF7 Display's front panel with a marker, as is appropriate for the selected configuration. Absolute format is the factory default setting.

Normally the system shows the G/F current's actual value, refreshing it every 0,5 seconds. When the DGF7-3 base unit is in a tripped state, with the fault current removed, the value flashes and refers to the situation just prior to trip. If the fault current is still active, the actual value will be displayed.

When the G/F current exceeds the system's measuring range, the display shows Out, meaning 'Out of range'. Depending on various internal variables, the maximum value that can be represented (whether in relative or absolute format) before resorting to the 'Out of range' indication varies from around 400 to 800 % of the G/F Trip Level.

[Back to Table 2.](#)

2.1.2 G/F Trip Level display

The DGF7 Display is able to show the G/F Trip Level Setting (by holding the 'SHOW TRIP' button longer than 2 seconds). All supported configurations are shown in [table 1](#). For the configurations the user needs to set internal parameter P4 as is detailed in [section 3](#).

2.1.3 Trip code display

Pushing the 'SHOW TRIP' button when the G/F current is shown, calls forward the trip code display. If no trip condition is present, the display shows as tr:--. Further operator action lacking, the display will return to G/F current after 2 seconds. If, on the other hand, a trip condition is present, the format becomes tr:xx in which *xx* is the trip code, indicating the cause of the trip. The *xx* codes are explained on the front panel of the DGF7 Display. A complete list with more extensive explanations is available in [section 7.3](#). Further operator action lacking, the display will return to G/F current after 10 seconds.

Pushing the 'SHOW TRIP' button again while the *tr:xx* trip code is on the display makes the display return to G/F current instantaneously.

Pressing the 'RESET' button while the tr:xx trip code is on the display, is interpreted as a request to reset the trip. Both the trip relay and the trip registration will be reset IF possible. During reset action the display will show a moving dot, then show the tr:-- format of the trip code and return to G/F current

2 seconds later. Note however, that if at the time of reset a different trip was already lurking, the old trip registration will clear giving way to the new one, and the trip relay will remain activated without glitches. Resetting a trip will be refused if the cause of the trip has not cleared yet. In that case the display will show a 1,5 seconds message '---', then return to the trip code. Of course one should first clear the fault in the field that caused the current increase in the first place before resetting, or else the DGF7-3 will reset its relay and trip out immediately again.

Resetting of the trip relay is meaningless if dipswitches 7 and 8 on the DGF7-3 base unit are set for Pulsed Relay Operating Mode. However, the registration of the trip behaves as described above in conjunction with the 'RESET' pushbutton.

2.1.4 Trip code display during power down situations

When the DGF7-3 base unit loses control voltage, it sends out trip status information on its datalink before shutting down. The DGF7 Display receives this information, stores it in memory and then shuts down itself, which shows by the LCD panel blanking.

Thanks to a built-in backup power source the trip information can be retrieved for at least ten hours after loss of control voltage. Pressing the 'SHOW TRIP' button will bring forward the trip code display as it was described above, revealing whether or not the system was tripped at the loss of control voltage, and if so, what was the cause of the trip-out. The information remains visible until the pushbutton is released or backup power is exhausted.

This feature is useful when pulse tripping a breaker that also supplies control voltage to the G/F protection system. Especially when several systems control one single breaker (with their relay contacts in parallel), which prevents the user from having to figure out which of them caused a given trip without having live systems anymore.

For as long as control voltage remains absent, no other functionality than the one described here is available.

The memorised trip information will reset automatically when control voltage is restored. If the DGF7-3 is still in a tripped state, the Display will first show $tr:xx$, then $---$ and finally $0,000$ or the actual G/F current value. The previous trip value is lost.

2.1.5 Reset function

The DGF7 Display can be used to reset the DGF7-3 after a trip occurred. A reset will only be granted if the cause of the trip is not present anymore.

To reset the DGF7-3:

- Press the 'SHOW TRIP' button to read the trip cause.
- Press the 'RESET' button to reset the indicated trip, the LCD shows a moving dot, followed by $tr:--$, then goes back to normal current read-out.

If the cause of the trip is cleared but another one is lurking, then pressing the 'RESET' button will reset the trip indication on the LCD and the new trip code is shown. The relay of the DGF7-3 however will remain in the trip state, without glitches.

2.1.6 Relay test

Keeping the 'SHOW TRIP' button pressed and then pressing the 'RESET' button invokes a test, which switches an AC voltage onto the CS sensor input of the DGF7-3 base unit's built-in processor. The voltage is scaled to simulate a residual current of 1,5 – 3 times the G/F Trip Level setpoint. The base unit will trip on G/F after the delay defined on its dipswitches (plus 0,4 s).

The trip code $tr:00$ is called forward by pressing the 'SHOW TRIP' button. The 'RESET' button can then be pushed to reset the trip. You cannot reset without first pressing the 'SHOW TRIP' button.

By means of parameter P2 the relay test feature can be switched off, so as not to allow for personnel to cause inadvertent trips from a door mounted operator interface.

Tests can still be started from the DGF7-3 base unit.

If one tries to start a test while the feature is switched off, the display will show a 1,5 seconds message 'OFF'. If one tries to start a test while the system is already tripped, the display will show a 1,5 seconds message '---'. See [chapter 3](#) for the parameter settings.

2.1.7 LCD test

The LCD panel can be tested at all times by keeping the 'RESET' button pressed longer than 2 seconds. All segments of the LCD panel will turn on, displaying 8.8:8.8 until the pushbutton is released.

2.1.8 Alarm code display

The current version of the DGF7-3 has no alarm functions.

The display will show AL:-- if the 'SHOW ALARM'/'RESET' button is pressed.

2.2 Datalink error code

At the moment only one error code is used: E:04.

The DGF7 Display does not receive data via the datalink. This code may be seen for a few seconds when the base unit is powered down.

3. PARAMETER SETTING

3.1 Display Settings

Five settable parameters stored in non-volatile memory enable the user to tailor the DGF7 Display to their needs. However, to discourage unauthorised manipulation, parameters can only be changed by going through the procedure outlined in [section 3.2](#).

Param.	Description		Values
P1	Alarm Reset Style	◆	0 Standard style; pressing 'RESET' resets the alarm relay and registration only if the alarm is manually resettable and the cause has cleared 1 Not used in this configuration
P2	Start Relay Test Control	◆	0 Start test capability (from the DGF7 Display) is switched on 1 Start test capability is switched off;
P3	G/F Current Display Mode	◆	0 Relative mode: G/F Current is displayed as a percentage of the G/F Trip Level that is set on the DGF7-3 dipswitches; please check the '%' box on the front panel ¹ 1 Absolute mode: G/F Current is displayed in A or kA, as is applicable. If a 5000:5 interposing CT is used, check the 'kA' box on the front panel ¹
P4	CS Configuration See table 2	◆	0 Internal/External 500:1 CS or Interposing 5000:5 CT 1 External 1000:1 CS 2 External 2000:1 CS 3 External 10.000:1 CS 4 Interposing 500:5 CT
P5	Alarm annunciation status of this display	◆	0 This display is not regarded as an alarm annunciating output. 1 Not used in this configuration
◆ Factory settings			

¹ Use a waterproof marker.

3.2 Display setup procedure

Five settable parameters stored in non-volatile memory enable the user to tailor the DGF7 Display to their needs. However, to discourage unauthorised manipulation, parameters can only be changed by going through a procedure.

Contact us at [info\(@\)groundfaultsystems.com](mailto:info(@)groundfaultsystems.com) for the procedure or look in the paper manual included with the unit.

[Back to Functionality.](#)

[Back to G/F Trip Level Display.](#)

[Back to Relay Test.](#)

4. CONNECTIONS AND PRECAUTIONS

Please consult the following checklist when applying the DGF7 Display.

1. Place the DGF7 Display on the door or front panel of the clean dry enclosure that accommodates the DGF7-3 G/F Protection Unit it is connected to. The panel cut-out is a rectangle measuring 85 mm vertically, and 70 mm horizontally. Use the U-shaped mounting bracket coming with the unit to clamp it onto the panel.
2. The two connections to the DGF7 Display are by means of screw clamp pull-apart terminals. Terminals will accept 0,5-2,5 mm², 20-14 AWG solid or stranded conductors. The user may want to identify the following terminals as indicated on the display's product label:
 - S1 for connecting the datalink from the DGF7-3 (Signal plus 5V)
 - C for connecting the datalink from the DGF7-3 (Common)
3. For good EMC behaviour it is important (as in any installation) to run all wiring, especially if unshielded, close along the chassis or in metal ducts, avoiding excess lengths.
4. If the distance between the Display and the DGF7-3 exceeds 1 m, shielded cable is recommended. The shield must be connected to chassis ground by means of a clamp, at the DGF7-3 side, where the FB terminal is bonded to chassis ground. From the clamp to the DGF7-3 terminals the wires can be left unshielded.

5. TECHNICAL SPECIFICATIONS

5.1 Serial datalink circuit

Datalink voltage	Max. 5 V DC
Maximum total length	Max. 5 m, within one enclosure. Use shielded cable for over 1 m.

5.2 Terminals

Type	Pull-apart
UL/CSA rating	300 V AC, 10 A
VDE rating	250 V AC, 12 A, pollution degree 3, over-voltage category III
Insulation stripping length	7 mm
Torque	0,4 – 0,6 Nm
Field wiring	0,5 – 2,5 mm ² (VDE) 20 - 14 AWG (UL/CSA), Cu, solid or stranded

5.3 Environment

Operating temperature	-20 °C to +60 °C
Storage temperature	-25 °C to +80 °C
Humidity	85% max (no condensation)
Ingress protection	IP55

5.4 Mechanical properties

Height	95 mm
Width	81 mm
Depth	38 mm (excluding bracket and screws)
Panel cut-out	85 x 70 mm (H x W)
Mounting bracket	2 pieces M5 x 16 plus rings and bracket supplied
Weight (open)	0,16 kg
Weight (packaged)	0,19 kg

6. APPLICABLE STANDARDS

EN 61000-6-3	Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments (=lowest levels) 30-230 MHz 30 dB μ V at 10 m distance 230-1000 MHz 37 dB μ V at 10 m distance
EN 61000-6-2	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments (=highest levels) 80-1000 MHz with 80% AM modulation up to 10 V/m at 3 m distance from source
EN 61000-4-2	Electromagnetic compatibility (EMC) for industrial-process measurement and control equipment – Part 4-2: Electrostatic discharge (ESD) immunity
EN 61000-4-3	Electromagnetic compatibility (EMC) for industrial-process measurement and control equipment – Part 4-3: Radiated electromagnetic field immunity
EN 61000-4-4	Electromagnetic compatibility (EMC) for industrial-process measurement and control equipment – Part 4-4: Electrical fast transient/burst immunity
EN 61000-4-5	Electromagnetic compatibility (EMC) for industrial-process measurement and control equipment – Part 4-5: Surge immunity
EN 61000-4-6	Electromagnetic compatibility (EMC) for industrial-process measurement and control equipment – Part 4-6: Conducted radio frequency field immunity
EN 61000-4-11	Electromagnetic compatibility (EMC) for industrial-process measurement and control equipment – Part 4-11: Voltage dips/drops/variations immunity
EN 60947-5-1	Low-voltage switchgear and controlgear – Part 5-1: Control circuit devices and switching elements – Electromechanical control circuit devices
IEC 60755	General requirements for residual current operated protective devices
UL	UL 1053 Ground-Fault Sensing and Relaying Equipment, Class 1
CSA	C22.2 No. 144-M91 Ground Fault Circuit Interrupters
CE	CE mark – Declaration of Conformity

7. TABLES AND FIGURES

7.1 Table 1 - DGF7-3 dipswitch settings

'R' denotes right and 'L' denotes left.

Values are primary currents for a 500:1 ratio internal or external Current Sensor.

For other ratio's see [Table 2](#).

Switch no.	Parameter	Set to	Meaning
1 2 3	Ground Fault Trip level	L L L ♦ L L R L R L L R R R L L R L R R R L R R R	0,030 A 0,100 A 0,250 A 0,37 A 0,50 A 1,00 A 3,00 A 0,060 A
4 5 6	Ground Fault Trip Delay time and Trip Inhibit	L L L ♦ L L R L R L L R R R L L R L R R R L R R R	20 ms without Trip Inhibit 20 ms with Trip Inhibit 100 ms without Trip Inhibit 100 ms with Trip Inhibit 300 ms without Trip Inhibit 300 ms with Trip Inhibit 1 s without Trip Inhibit 3 s without Trip Inhibit
7 8	Operating Mode	L L ♦ L R R L R R	Continuous Non-Failsafe operation Continuous Failsafe operation Pulsed Non-Failsafe operation Pulsed Failsafe operation
♦ Factory settings			

[Back to G/F Trip Level display.](#)

7.2 Table 2 - DGF7 Display settings versus current read-out

Values are primary currents.

No.	0 (a)	0 (b)	1	2	3	4
DGF7-3 setting	Internal/ external 500:1	Interposing 5000:5	External 1000:1	External 2000:1	External 10.000:1	Interposing 500:5
0,030 A	0,030 A	0,030 kA	0,060 A	0,120 A	0,60 A	3,00 A
0,100 A	0,100 A	0,100 kA	0,200 A	0,40 A	2,00 A	10,0 A
0,250 A	0,250 A	0,250 kA	0,50 A	1,00 A	5,0 A	25,0 A
0,37 A	0,37 A	0,37 kA	0,74 A	1,48 A	7,4 A	37 A
0,50 A	0,50 A	0,50 kA	1,00 A	2,00 A	10,0 A	50 A
1,00 A	1,00 A	1,00 kA	2,00 A	4,0 A	20,0 A	100 A
3,00 A	3,00 A	3,00 kA	6,0 A	12,0 A	60 A	300 A
0,060 A	0,060 A	0,060 kA	12,0 A	24,0 A	120 A	600 A

Note: When using a 5000:5 interposing CT, the user needs to remember that displayed currents are in kA; (see [section 2.3](#)), the 'kA' box can be checked with a marker on the display's front panel, making this obvious.

The G/F Trip Level can be called forward by keeping the 'SHOW TRIP' pushbutton pressed longer than 2 seconds. The information remains visible until the pushbutton is released.

[Back to G/F Trip Level display.](#)

[Back to Display Settings.](#)

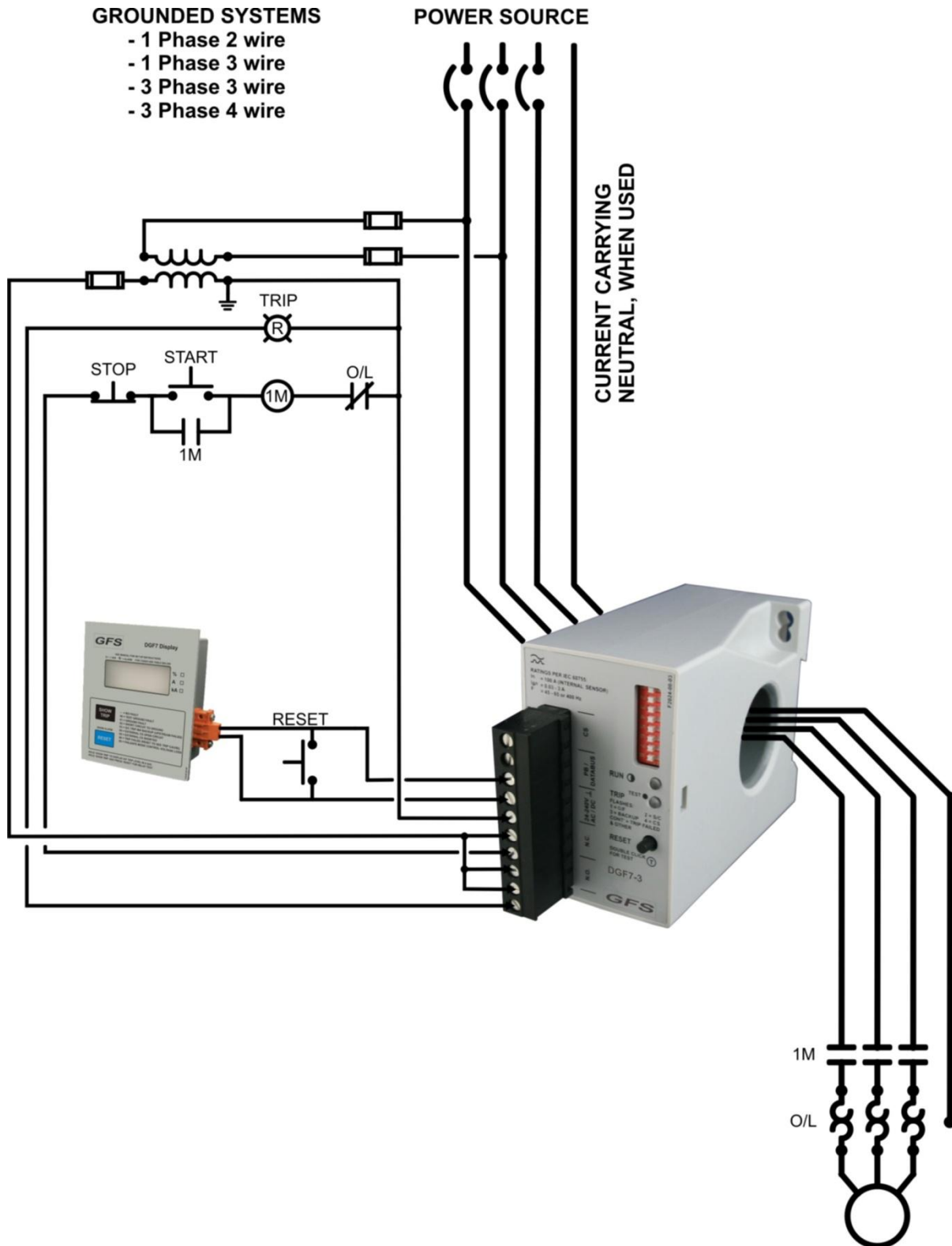
[Back to Table 1.](#)

7.3 Table 3 - Trip codes

Code	Description
00	TEST GROUND FAULT The user started a test and as a result of that the system tripped.
01	GROUND FAULT Residual current exceeded the G/F Trip Level during the G/F Trip Delay, but never exceeded the H/C Trip Level.
02	SHORT CIRCUIT TO GROUND Residual current exceeded the S/C Trip Level; system response was instantaneous. In case Type 2 Co-ordination is used, the upstream device tripped correctly, and after the current went to zero as a result, the DGF7-3 activated its trip relay to isolate the faulty circuitry.
03	BACKUP TRIP (UPSTREAM FAILED) This trip can only occur when the Trip Inhibit function is used. Residual current exceeded the H/C Trip Level, but the upstream device failed to trip. The DGF7-3 then tripped as a last resort. The contactor should be inspected, since its contacts may well be damaged.
04	EXTERNAL CS OPEN CIRCUIT The connection to an external CS was detected to be open for approximately 2 seconds. This error is latched, so intermittent failures are captured.
05	EXTERNAL CS SHORTED The connection to an external CS was detected to be shorted for approximately 2 seconds. This error is latched, so intermittent failures are captured.
06	TRIP FAILED A trip state on top of one of the possible trips described above. Residual current remained high after a trip. Pressing reset clears this trip, but not yet the trip state, such that the LCD display now shows the original trip code and the red LED on the DGF7-3 will now show the original trip's flashing code.
08	FAILSAFE LOSS OF CONTROL VOLTAGE The DGF7-3 base unit is used in one of the failsafe trip relay modes, and it lost control voltage while not being tripped.

[Back to Trip code display.](#)

7.4 Figure 1 - Typical Field Connection using DGF7-3 with built-in core balance, remote reset and DGF7 Display.



7.5 Figure 2 - Dimensions DGF7 Display

