2.3 Ordering

2.3.1 Order Codes

The relay model number will be indicated on the side of the drawout unit. This identification label can be interpreted with the following order code.

	750	–	*	–	*	–	*	–	*	–	*	–	*	–	*	750 Feeder Management Relay
	760	–	*	–	*	–	*	–	*	–	*	–	*	–	*	760 Feeder Management Relay
Base Unit	750	|		|		|		|		|		|		|	750 relay
	760	|		|		|		|		|		|		|	760 relay with autoreclose
Phase Current Inputs	P1		|		|		|		|		|		|		1 A phase current inputs
	P5		|		|		|		|		|		|		5 A phase current inputs
Zero-Sequence Current Inputs		G1	|		|		|		|		|		|		1 A zero-sequence current inputs
		G5	|		|		|		|		|		|		5 A zero-sequence current inputs
Sensitive Ground or Polarizing Current Input			S1	|		|		|		|		|		1 A sensitive ground current input
			S5	|		|		|		|		|		5 A sensitive ground current input
			D1	|		|		|		|		|		1 A polarizing current input (MOD009)
			D5	|		|		|		|		|		5 A polarizing current input (MOD009)
Control Power					LO	|		|		|		|		20 to 60 V DC; 20 to 48 V AC at 48 to 62 Hz
					HI	|		|		|		|		88 to 300 V DC; 70 to 265 V AC at 48 to 62 Hz
Analog Outputs						A1	|		|		|		Eight (8) 0 to 1 mA analog outputs
						A5	|		|		|		Eight (8) 0 to 5 mA analog outputs
						A10	|		|		|		Eight (8) 0 to 10 mA analog outputs
						A20	|		|		|		Eight (8) 4 to 20 mA analog outputs
Breaker Closed LED							R	|		|		Red LED for Breaker Closed indicator
							G	|		|		Green LED for Breaker Closed indicator
Display/Ethernet								B	|		Basic display
								E	|		Enhanced display
								T	|		Enhanced display with Ethernet
Environmental Protection									H			Harsh (Chemical) Environment Conformal Coating

2.3.2 Example Order Codes

1. The 750-P1-G1-S1-LO-A10-R-B specifies a 750 Feeder Management Relay with 1 A phase, zero-sequence, and sensitive ground current Inputs, low control power, eight 0 to 10 mA analog outputs, a red LED for the Breaker Closed indicator, and a basic display.
2. The 760-P5-G5-S5-HI-A20-G-T specifies a 760 Feeder Management Relay with autoreclose, 5 A phase, zero-sequence, and sensitive ground current inputs, high control power, eight 4 to 20 mA analog outputs, a green LED for the Breaker Closed indicator, and enhanced display with Ethernet (10Base-T).

2.3.3 Accessories

- **DEMO:** Metal carry case in which the 750/760 can be mounted
- **SR19-1 or SR19-2 PANEL:** Single or double cutout 19-inch panels
- **RS-232/485:** RS232 to RS485 converter box for harsh industrial environments
- **1 A and 5 A PHASE CTs:** 50, 75, 100, 150, 200, 250, 300, 350, 400, 500, 600, 750, and 1000 CT ratios
- **SR $1\frac{3}{8}$-inch COLLAR:** For shallow switchgear, the collar reduces the depth of the relay by 1 3/8 inches
- **SR 3-inch COLLAR:** For shallow switchgear, the collar reduces the depth of the relay by 3 inches.

2.4 Specifications

2.4.1 Applicability

APPLICABILITY

Systems:	3 or 4 wire, 600 kV maximum 5000 A maximum
Frequency:	25 to 60 Hz nominal (frequency tracking allows operation from 16 to 65 Hz)

2.4.2 Inputs

CONTROL POWER

Options:	LO/HI (specify with order)
LO range:	20 to 60 V DC 20 to 48 V AC at 48 to 62 Hz
HI range:	88 to 300 V DC 70 to 265 V AC at 48 to 62 Hz
Power:	25 VA nominal, 35 VA max.

Total loss of voltage ride through time
(0% control power): 16.7 ms

PHASE CURRENT

Source CT:	1 to 50000 A primary, 1 or 5 A secondary
Relay input:	1 A or 5 A (specify with order)
Conversion range:	0.01 to 20 × CT (fundamental frequency only)
Accuracy:	at < 2 × CT: ±0.5% of 2 × CT at ≥ 2 × CT: ±1% of 20 × CT
Overload withstand:	1 second at 80 × rated current; continuous at 3 × rated current

Calculated neutral current errors:3 × phase inputs

GROUND CURRENT

Source CT:	1 to 50000 A primary, 1 or 5 A secondary
Relay input:	1 A or 5 A (specify with order)
Conversion range:	0.01 to 20 × CT (fundamental frequency only)
Accuracy:	at < 2 × CT: ±0.5% of 2 × CT at ≥ 2 × CT: ±1% of 20 × CT
Overload withstand:	1 second at 80 × rated current; continuous at 3 × rated current

CT Input	Current	Burden (typical)	
		VA	OHMS
1 A Phase & Ground	1 A 5 A 20 A	0.025 VA 0.60 VA 10 VA	0.02
5 A Phase & Ground	5 A 25 A 100 A	0.40 VA 10 VA 120 VA	0.02

SENSITIVE GROUND CURRENT

Source CT:	1 to 50000 A primary, 1 or 5 A secondary
Relay input:	1 A or 5 A (specify with order)
Burden:	< 0.2 VA at 1 or 5 A
Conversion range: Low end:	0.005 × CT
	Maximum: 500 A primary (fundamental frequency only)
Accuracy:	at < 0.1 × CT: ±0.2% of 1 × CT at ≥ 0.1 × CT: ±1% of 1 × CT
Overload withstand:	1 second at 80 × rated current; continuous at 3 × rated current

BUS AND LINE VOLTAGE

Source VT:	0.12 to 600 kV / 50 to 240 V
Source VT ratio:	1 to 5000 in steps of 0.1
Relay input:	50 to 240 V phase-neutral
Burden:	< 0.025 VA at 120 V or > 576 KW
Maximum continuous:	273 V phase-neutral (full-scale) at fundamental frequency only
Accuracy (0 to 40°C):	±0.25% of full scale (11 to 130 V); ±0.8% of full scale (130 to 273 V). For open delta, the calculated phase has errors 2 times those shown.

LOGIC INPUTS

Inputs:	14 contact and / or virtual inputs, 6 virtual only (functions assigned to logic inputs)
Dry contacts:	1000 Ω maximum ON resistance (32 V DC at 2 mA provided by relay)
Wet contacts:	30 to 300 V DC at 2.0 mA (external DC voltage only)

ANALOG INPUT

Current Input:	0 to 1 mA, 0 to 5 mA, 0 to 10 mA, 0 to 20 mA, or 4 to 20 mA (programmable)
Input impedance:	375 Ω ± 10%
Conversion range:	0 to 21 mA
Accuracy:	±1% of full scale

TRIP & CLOSE COIL MONITORING

Acceptable voltage range:	20 to 250 V DC
Trickle current:	2 to 5 mA

IRIG-B

Amplitude modulated:	2.5 to 6 Vpk-pk at 3:1 signal ratio
DC shift:	TTL
Input impedance:	20 kΩ ±10%
Error:	±1.0 ms

2.4.3 Measured Parameters



In the following specifications, accuracies are based on less than 2 × CT and 50 to 130 V inputs. The full-scale is defined as follows: Full Scale = 2 × CT at $1 \times VT_{Full\ Scale} \times \sqrt{3}$.

The harmonic components of current and voltage are removed from the input voltage and current parameters, so all relay measurements based on these quantities respond to the fundamental component only. To minimize errors, the A/D process utilizes a sampling rate

that is automatically adjusted to be 16 samples per power frequency cycle when a measurable voltage is available. To prevent overreaching of overcurrent elements, a digital filter removes the transient DC component of currents.

CURRENT

Phasors: Phase A RMS current
Phase B RMS current
Phase C RMS current

% of load-to-trip accuracy: ±0.5% of full-scale

VOLTAGE

Phasors: Phase A-N (A-B) voltage
Phase B-N (B-C) voltage
Phase C-N (C-A) voltage

Accuracy: ±0.25% of full scale

FREQUENCY

Measured: A-N (A-B) bus and line voltage
Range: 16 to 65 Hz
Accuracy: ±0.02 Hz

SYMMETRICAL COMPONENTS

Current level accuracy: ±1.5% of full scale
Voltage level accuracy: ±0.75% of full scale
Current and voltage angle accuracy: ±2°

3Φ POWER FACTOR

Range: 0.00 Lag to 1.00 to 0.00 Lead
Accuracy: ±0.02

3Φ REAL POWER

Range: –3000.0 to 3000.0 MW
Accuracy: ±1% of full scale

3Φ REACTIVE POWER

Range: –3000.0 to 3000.0 Mvar
Accuracy: ±1% of full scale
(see note above)

3Φ APPARENT POWER

Range: –3000.0 to 3000.0 MVA
Accuracy: ±1% of full scale (see note above)

WATT-HOURS

Range: -2.1×108 to 2.1×108 MWh
Accuracy: ±2% of full scale (see note above) per hour

VAR-HOURS

Range: -2.1×108 to 2.1×108 Mvarh
Accuracy: ±2% of full scale (see note above) per hour

DEMAND RANGE

Phase A/B/C current: 0 to 65535 A
3Φ real power: –3000.0 to 3000.0 MW
3Φ reactive power: –3000.0 to 3000.0 Mvar
3Φ apparent power: –3000.0 to 3000.0 MVA

DEMAND MEASUREMENT

Thermal exponential, 90% response time (programmed):
5, 10, 15, 20, 30, or 60 min.

Block interval / rolling demand, time interval (programmed):
5, 10, 15, 20, 30, or 60 min.

Accuracy:	±2% of full scale (see note above)

2.4.4 Protection Elements

PHASE / NEUTRAL / GROUND / NEGATIVE SEQUENCE TIME OVERCURRENT

Pickup level:	0.05 to 20.00 × CT in steps of 0.01
Dropout level:	97 to 98% of pickup level, or pickup level minus 2% of nominal current (0.02 x CT), whichever is less
Curves:	ANSI Extremely/Very/Moderately/Normally Inverse, Definite Time (0.1 s base curve), IEC Curve A/B/C and Short, FlexCurve™ A/B (programmable curves), IAC Extreme/Very/Inverse/Short
Curve multiplier:	0 to 100.00 in steps of 0.01
Reset type:	Instantaneous/Linear
Level accuracy:	per current input (I_2 is 3 × input error)
Timing accuracy:	±3% of trip time or ±40 ms (whichever is greater) at ≥ 1.03 × PU

SENSITIVE GROUND TIME OVERCURRENT

Pickup level:	0.005 to 1.000 × CT in steps of 0.001
Dropout level:	97 to 98% of pickup level, or pickup level minus 2% of nominal current (0.02 x CT), whichever is less
Curves:	ANSI Extremely/Very/Moderately/Normally Inverse, Definite Time (0.1 s base curve), IEC Curve A/B/C and Short, FlexCurve™ A/B (programmable curves), IAC Extreme/Very/Inverse/Short
Curve multiplier:	0 to 100.00 in steps of 0.01
Reset type:	Instantaneous/Linear
Level accuracy:	per sensitive ground current input
Timing accuracy:	±3% of trip time or ±40 ms (whichever is greater) at ≥ 1.03 × PU

VOLTAGE RESTRAINED PHASE TIME OVERCURRENT

Pickup adjustment:	Modifies pickup from 0.10 to 0.90 × VT nominal in a fixed line relationship

PHASE / GROUND INSTANTANEOUS OVERCURRENT

Pickup level:	0.05 to 20.00 × CT in steps of 0.01
Dropout level:	97 to 98% of pickup level, or pickup level minus 2% of nominal current (0.02 x CT), whichever is less
Time delay:	0 to 600.00 s in steps of 0.01
Level accuracy:	per phase / neutral / ground current input (I_2 is 3 × phase input error)
Operate time (Phase instantaneous, 0 ms time delay):	25 ms max. (output relay included), 1.5 x pickup @ 60 Hz, and 20 ms max. (solid state output included), 1.5 x pickup @ 60 Hz
Operate time (Ground instantaneous, 0 ms time delay):	50 ms max. (output relay included), 1.5 x pickup @ 60 Hz, and 45 ms max. (solid state output included), 1.5 x pickup @ 60 Hz
Timing accuracy:	±20 ms or ±0.1% of time delay setting (whichever is greater)
Phases:	Any one, any two, or all three (programmable) phases must operate for output (not for I_2)

NEUTRAL / NEGATIVE SEQUENCE INSTANTANEOUS OVERCURRENT

Pickup level:	0.05 to 20.00 × CT in steps of 0.01
Dropout level:	97 to 98% of pickup level, or pickup level minus 2% of nominal current (0.02 x CT), whichever is less
Time delay:	0 to 600.00 s in steps of 0.01

Level accuracy: per phase / neutral / ground current input (I_2 is 3 × phase input error)
Operate time (0 ms time delay): 50 ms max. (output relay included), 1.5 x pickup @ 60 Hz, and 45 ms max. (solid state output included), 1.5 x pickup @ 60 Hz
Timing accuracy: ±20 ms or ±0.1% of time delay setting (whichever is greater)
Phases: Any one, any two, or all three (programmable) phases must operate for output (not for I_2)

SENSITIVE GROUND INSTANTANEOUS OVERCURRENT

Pickup level: 0.005 to 1.000 × CT in steps of 0.001
Dropout level: 97 to 98% of pickup level, or pickup level minus 2% of nominal current (0.02 x CT), whichever is less
Time delay: 0 to 600.00 s in steps of 0.01
Level accuracy: per sensitive ground current input
Operate time (0 ms time delay): 50 ms max. (output relay included), 1.5 x pickup @ 60 Hz, and 45 ms max. (solid state output included), 1.5 x pickup @ 60 Hz
Timing accuracy: ±20 ms or ±0.1% of time delay setting (whichever is greater)

PHASE DIRECTIONAL

Relay Connection: 90° (quadrature)
Polarizing Voltage: Vbc (phase A); Vca (phase B); Vab (phase C)
MTA: 0 to 359° in steps of 1
Angle Accuracy: ±2°
Operation Delay: 25 to 40 ms

NEUTRAL DIRECTIONAL

NOTE

Polarized by voltage, current, or both voltage and current. For voltage element polarizing, the source VTs must be connected in Wye.

Polarizing voltage: –Vo
Polarizing current: Ig
MTA: 0 to 359° in steps of 1
Angle accuracy: ±2°
Operation delay: 25 to 40 ms

GROUND / SENSITIVE GROUND DIRECTIONAL

NOTE

Polarized by voltage, current, or both voltage and current. For voltage element polarizing, the source VTs must be connected in Wye.

Polarizing voltage: –Vo
Polarizing current: Ig
MTA: 0 to 359° in steps of 1
Angle accuracy: ±2°
Operation delay: 25 to 40 ms

BUS / LINE UNDERVOLTAGE

Minimum voltage: > programmable threshold from 0.00 to 1.25 × VT in steps of 0.01
Pickup level: 0 to 1.25 × VT in steps of 0.01
Dropout level: 102 to 103% of pickup
Curve: Definite Time or Inverse Time
Time delay: 0 to 6000.0 s in steps of 0.1

Phases:	Any one, any two, or all three (programmable) phases must operate for output (Bus Undervoltage only)
Level accuracy:	per voltage input
Timing accuracy:	±100 ms

OVERVOLTAGE

Pickup level:	0 to 1.25 × VT in steps of 0.01
Dropout level:	97 to 98% of pickup level
Time delay:	0.0 to 6000.0 s in steps of 0.1 (Definite Time)
Phases:	Any one, any two, or all three (programmable) phases must operate for output
Level accuracy:	per voltage input
Timing accuracy:	±100 ms

NEGATIVE SEQUENCE VOLTAGE

Pickup level:	0 to 1.25 × VT in steps of 0.01
Dropout level:	97 to 98% of pickup level
Time delay:	0 to 6000.0 s in steps of 0.1 (Definite Time / Inverse Time)
Level accuracy:	3 × voltage input error
Timing accuracy:	±100 ms

UNDERFREQUENCY

Minimum voltage:	0 to 1.25 × VT in steps of 0.01 in Phase A
Pickup level:	20 to 65 Hz in steps of 0.01
Dropout level:	Pickup + 0.03 Hz
Time delay:	0 to 600.00 s in steps of 0.01 (Definite Time)
Level accuracy:	±0.02 Hz
Timing accuracy:	±100 ms

BREAKER FAILURE

Pickup level:	0.05 to 20.0 × CT in steps of 0.01
Dropout level:	97 to 98% of pickup level
Time delay:	0.03 to 1.00 s in steps of 0.01
Timing accuracy:	±20 ms error
Level accuracy:	per CT input

NEUTRAL DISPLACEMENT

Pickup level:	0.00 to 1.25 × VT in steps of 0.01
Dropout level:	97 to 98% of pickup level
Curves:	ANSI Extremely/Very/Moderately/Normally Inverse, Definite Time (0.1 s base curve), IEC Curve A/B/C and Short, FlexCurve™ A/B (programmable curves), IAC Extreme/Very/Inverse/Short
Curve multiplier:	0 to 100.00 in steps of 0.01
Reset type:	Instantaneous/Linear
Level accuracy:	3 × voltage input error
Timing accuracy:	±50 ms

REVERSE POWER (IF ENABLED)

Pickup level:	0.015 to 0.600 × rated power
Dropout level:	94 to 95% of pickup
Reset time:	less than 100 ms
Level accuracy:	see 3Φ Real Power metering
Time delay:	0.0 to 6000.0 s in steps of 0.1
Timing accuracy:	±200 ms (includes Reverse Power pickup time)

2.4.5 Monitoring Elements

PHASE/NEUTRAL CURRENT

Pickup level:	0.05 to 20.00 × CT in steps of 0.01
Dropout level:	97 to 98% of pickup level
Time delay:	0 to 60000 s in steps of 1 (Definite Time)
Level accuracy:	per current input
Timing accuracy:	±100 ms

POWER FACTOR

Required voltage:	>30% of nominal in all phases
Pickup level:	0.50 lag to 0.50 lead in steps of 0.01
Dropout level:	0.50 lag to 0.50 lead in steps of 0.01
Time delay:	0 to 60000 s in steps of 1 (Definite Time)
Level accuracy:	±0.02
Timing accuracy:	±100 ms

ANALOG INPUT THRESHOLD

Pickup level:	0 to 65535 units in steps of 1
Dropout level:	2 to 20% of Pickup (programmable, under/over)
Time delay:	0 to 60000 s in steps of 1
Level accuracy:	±1%
Timing accuracy:	±100 ms

ANALOG INPUT RATE

Pickup level:	–1000 to 1000 units/hour in steps of 0.1
Dropout level:	97 to 98% of pickup level
Time delay:	0 to 60000.0 s in steps of 1
Level accuracy:	±1%
Timing accuracy:	±100 ms

OVERFREQUENCY

Required voltage:	>30% of nominal, phase A
Pickup level:	20.01 to 65.00 Hz in steps of 0.01
Dropout level:	Pickup – 0.03 Hz
Time delay:	0.0 to 6000.0 s in steps of 0.1
Level accuracy:	±0.02 Hz
Timing accuracy:	±100 ms

FAULT LOCATOR

Range:	–327 to 327 km (or miles) 0 to 65534 ohms
Memory:	stores 10 most recent faults

DATA LOGGER

Channels:	8 channels; same parameters as for analog outputs available
Sample rate:	per cycle / per second / per minute / every 5, 10, 15, 20, 30, or 60 minutes
Trigger source:	pickup/trip/dropout, control/alarm event, logic input, manual command, or continuous
Trigger position:	0 to 100%
Storage:	2 to 16 events with 2048 to 256 samples of data respectively (4096 if continuous)

TRIP COUNTERS

Accumulates all ground, sensitive ground, neutral, negative sequence, and phase overcurrent trips.

DEMAND

NOTE

Demand accuracies are based on less than 2 × CT and 50 to 130 V inputs.

Measured values: Phase A/B/C current (A), 3Φ real power (MW), 3Φ reactive power (Mvar), 3Φ apparent power (MVA)
Measurement type: Thermal Exponential, 90% response time (programmed): 5, 10, 15, 20, 30, or 60 min.
Block Interval / Rolling Demand, time interval (programmed): 5, 10, 15, 20, 30, or 60 min.
Block Interval with Start Demand Interval Logic Input pulses
- Amps pickup level: 10 to 10000 in steps of 1
- MW pkp level: 0.1 to 3000.0 in steps of 0.1
- Mvar pkp level: 0.1 to 3000.0 in steps of 0.1
- MVA pkp level: 0.1 to 3000.0 in steps of 0.1
- Level accuracy: ±2%

VT FAILURE
Programmable to inhibit dependent features.

BREAKER FAILURE TO OPERATE
Time delay: 30 to 1000 ms in steps of 10
Timing accuracy: 0 to 20 ms error

ACCUMULATED ARCING CURRENT
Pickup level: 1 to 50000 kA^2-cycles in steps of 1
Start delay: 0 to 100 ms in steps of 1

TRIP / CLOSE COIL MONITORS
Detect open trip and close circuits.

PULSED OUTPUT
Pulsed output is 1 second on time and one second off time after the programmed interval.

LAST TRIP DATA
Records cause of most recent trip, 4 RMS currents, and 3 RMS voltages with a 1 ms time stamp.

WAVEFORM CAPTURE
Channels: 4 currents, 3 voltages, 14 logic input states and 8 output relays
Sample rate: 16 per cycle
Trigger source: Element pickup/trip/dropout, control/alarm event, logic input or manual command
Trigger position: 0 to 100%
Storage: 2 to 16 events with 4096 to 512 samples of data respectively

EVENT RECORDER
Number of events: 512
Content: event cause, 3 phase current phasors, 1 ground current phasor, sensitive ground current phasors, 3 voltage phasors, system frequency, synchronizing voltage, synchronizing frequency, and analog input level with a 1 ms time stamp.

2.4.6 Control Elements

SYNCHROCHECK
Voltage difference: 0.01 to 100.00 kV in steps of 0.01
Phase difference: 0 to 100° in steps of 1
Frequency difference: 0.00 to 5.00 Hz in steps of 0.01

Operate time:	up to 140 ms for 60 Hz up to 160 ms for 50 Hz
Bypass permissives:	DB & DL (dead bus and dead line) LL & DB (live line and dead bus) DL & LB (dead line and live bus) DL | DB (dead line or dead bus) DL x DB (either dead line or dead bus)

SETPOINT GROUPS

Number of groups:	4
Accessibility:	Can be changed from logic input or through communications
Included features:	TOC Curves, Phase TOC and IOC, Neutral TOC and IOC, Ground TOC and IOC, Negative Sequence OC and Voltage, Phase Directional, Ground Directional, Overvoltage, Undervoltage, Underfrequency, Breaker Failure

UNDERVOLTAGE RESTORATION

Initiated by:	Trip from Undervoltage 1 to 4
Minimum voltage level:	0.00 to 1.25 × VT in steps of 0.01
Time delay:	0 to 10000 s in steps of 1
Incomplete seq. time:	1 to 10000 min. in steps of 1
Phases:	Any one, any two, or all three (programmable) phases must operate for output
Level accuracy:	per voltage input
Timing accuracy:	±100 ms

UNDERFREQUENCY RESTORATION

Initiated by:	Trip from Underfrequency 1/2
Minimum voltage level:	0.00 to 1.25 × VT in steps of 0.01
Minimum freq. level:	20.00 to 65.00 Hz in steps of 0.01
Time delay:	0 to 10000 s in steps of 1
Incomplete seq. time:	1 to 10000 min. in steps of 1
Level accuracy:	Per voltage and frequency input
Timing accuracy:	±100 ms

MANUAL CLOSE BLOCKING

Operated by:	manual close command.
Programmability:	Block IOC for a selected period. raise TOC pickup for a selected period.

COLD LOAD PICKUP BLOCKING

Operated by:	logic input command or automatically
Programmability:	Block IOC for a selected period; raise TOC pickup for a selected period.

TRANSFER SCHEME

Applicability:	Used for double-bus system with two normally-closed incoming and one normally-open bus tie circuit breaker.
Closing:	Automatic closing of the bus tie breaker after a loss of one source, with bus decayed voltage permissive.
Trip:	Trips a pre-selected breaker after the third breaker is manually closed (prevent parallel operation).

AUTORECLOSE (760 ONLY)

Reclose attempts:	Up to four (4) before lockout.
Blocking:	Each reclose shot can block IOC and raise TOC Pickup.
Adjustability:	Current supervision can adjust the maximum number of shots to be attempted.

2.4.7 Outputs

ANALOG OUTPUTS

Type:	Active
Outputs:	8 Channels; specify one of the following output ranges when ordering:
Ranges:	0 to 1 mA, 0 to 5 mA, 0 to 10 mA, 4 to 20 mA
Max. load:	12 kΩ for 0 to 1 mA output, 2.4 kΩ for 0 to 5 mA output, 1.2 kΩ for 0 to 10 mA output, 600 Ω for 4 to 20 mA output
Isolation:	Fully isolated
Accuracy:	±1% of full scale
Response:	100% indication in less than 6 power system cycles (100 ms at 60 Hz)

SOLID STATE TRIP

Make & carry:	15 A at 250 V DC for 500 ms

2.4.8 Output Relays

Relay contacts must be considered unsafe to touch when the 750/760 is energized! If the output relay contacts are required for low voltage accessible applications, it is the customer's responsibility to ensure proper insulation levels.

CONFIGURATION

Number:	8
Type:	Form A: Trip (1) and Close (2) Relays Form C: Auxiliary Relays 3 to 7 and Self-Test Warning Relay 8
Contacts:	silver alloy
Durability:	100 000 operations (at 1800 operations/hour) at rated load

TRIP CONTACT (FORM A) RATINGS

Applicability:	Trip and Close Relays (relays 1 and 2)
Make and carry:	30 A (per ANSI/IEEE C37.90)
Carry:	10 A @ 250 VAC (continuous)
Break:	0.4 A @ 250 VDC (L/R = 40 ms)

SERVICE CONTACT (FORM C) RATINGS

Applicability:	Auxiliary Relays (relays 3 to 7), and Self-Test Warning Relay (relay 8)
Make and Carry:	30 A (per ANSI/IEEE C37.90)
Carry:	5 A @ 250 VAC (continuous)
Break:	0.3 A @ 250 VDC (L/R = 40 ms) 3 A @ 240 VAC (P.F. = 0.4)

2.4.9 CPU

COMMUNICATIONS

Baud rate:	300 to 19200 baud
Parity:	programmable
Protocol:	Modbus RTU or DNP 3.0
Ethernet:	10Base-T RJ45 connector Modbus TCP/IP Version 2.0 / IEEE 802.3 Maximum 4 sessions

EEPROM
100000 program/erase cycles max.

CLOCK

Resolution:	1 ms
Accuracy with IRIG-B:	±1 ms
Accuracy without IRIG-B:	±5 minutes/month
Supercap backup life:	45 days when control power is off

2.4.10 Physical

TEMPERATURE

Operating range:	–40°C to +60°C
Ambient storage:	–40°C to +80°C
Ambient shipping:	–40°C to +80°C

NOTE

At temperatures below –20°C, the LCD contrast may become impaired.

ENVIRONMENTAL

Ambient operating temperature:	–40°C to +60°C
Ambient storage temperature:	–40°C to +80°C
Humidity:	up to 90% non-condensing
Pollution degree:	2
IP Rating:	40-X

LONG-TERM STORAGE

Environment:	In addition to the above environmental considerations, the relay should be stored in an environment that is dry, corrosive-free, and not in direct sunlight.
Correct storage:	Prevents premature component failures caused by environmental factors such as moisture or corrosive gases. Exposure to high humidity or corrosive environments will prematurely degrade the electronic components in any electronic device regardless of its use or manufacturer, unless specific precautions, such as those mentioned in the Environmental section above, are taken.

NOTE

It is recommended that all relays be powered up once per year, for one hour continuously, to avoid deterioration of electrolytic capacitors and subsequent relay failure.

CASE

Type:	Fully drawout unit (automatic CT shorts)
Approvals:	Meets CE drawout specifications
Seal:	Seal provision
Door:	Dust tight door
Mounting:	Panel or 19" rack mount
Weight:	7.9 kg (case and relay) 9.4 kg (shipping weight)

2.4.11 Testing

TYPE TESTING

The table below lists the 750/760 type tests:

Standard	Test Name	Level
EIA 485	RS485 Communications Test	32 units at 4000 ft.
IEC 60068-2-30	Relative Humidity Cyclic	55°C at 95% RH
IEC 60068-2-38	Composite Temperature/Humidity	65/–10°C at 93% RH
IEC 60255-5	Dielectric Strength	2300 V AC
IEC 60255-5	Insulation Resistance	>100 MΩ / 500 V AC / 10 s
IEC 60255-21-1	Sinusoidal Vibration	2 g
IEC 60255-21-2	Shock and Bump	5 g / 10 g / 15 g
IEC 60255-21-3	Seismic	6 g
IEC 60255-22-1	Damped Oscillatory Burst, 1 MHz	2.5 kV / 1 kV
IEC 60255-22-2	Electrostatic Discharge: Air / Direct	15 kV / 8 kV
IEC 60255-22-3	Radiated RF Immunity	10 V/m
IEC 60255-22-4	Electrical Fast Transient / Burst Immunity	4 kV
IEC 60255-22-5	Surge Immunity	4 kV / 2 kV
IEC 60255-22-6	Conducted RF Immunity, 150 kHz to 80 MHz	10 V/m
IEC 60255-25	Radiated RF Emission	Group 1 Class A
IEC 60255-25	Conducted RF Emission	Group 1 Class A
IEC 60529	Ingress of Solid Objects and Water (IP)	IP40 (front), IP20 (back)
IEC 61000-4-8	Power Frequency Magnetic Field Immunity	30 A/m
IEC 61000-4-9	Pulse Magnetic Field Immunity	1000 A/m
IEC 61000-4-11	Voltage Dip; Voltage Interruption	0%, 40%, 100%
IEEE C37.90.1	Fast Transient SWC	±4 kV
IEEE C37.90.1	Oscillatory Transient SWC	±2.5 kV
IEEE C37.90.3	Electrostatic Discharge: Air and Direct	±15 kV / ±8 kV

SIMULATION

Programmable pre-fault, fault, and post-fault parameters simulation modes. Simulation of circuit breaker and selection of whether or not to operate outputs relays.

PRODUCTION TESTS

Thermal cycling: Operational test at ambient, reducing to –40°C and then increasing to 60°C

Dielectric strength: 2000 VAC for 1 minute (as per UL & CE)



DO NOT CONNECT FILTER GROUND TO SAFETY GROUND DURING ANY PRODUCTION TESTS.

2.4.12 Approvals

APPROVALS

ACA:	Tick mark RF Emissions for Australia
CE:	Conforms to IEC 1010-1 / EN 50082-2
EN:	EN 50623 EMC - CE for Europe
FCC:	Part 15; RF Emissions for North America
IEC:	IEC 1010-1 LVD - CE for Europe
ISO:	GE Multilin's Quality Management System is registered to ISO9001:2000 QMI # 005094 UL #A3775
UL:	UL listed for the USA and Canada, E83849



Specifications subject to change without notice.