# Multilin™ **O**Plus

AUTOMATION CONTROL SYSTEM

## **KEY BENEFITS**

- Powerful automation controller eliminates the need for separate substation programmable logic controller
- High-end load shedding with multiple stages of frequency and voltage retains system stability after disturbances
- Fast optimal load shedding executed within 20ms minimizes process outages and costs associated with system downtime
- Intelligently sheds loads to maintain system/process integrity
- Highly customizable and scalable, integrating easily into most industrial plants with new or existing EMS/SCADA
- Customizable annunciator panel capable of handling up to 288 alarms eliminates the need for a separate panel
- High-end fault and disturbance recording eliminates the need for digital fault or disturbance recorders
- Synchronized phasor information according to IEEE® C37.118 standard for detection of system instability
- Increase network availability by reducing failover time to zero through IEC<sup>®</sup> 62439-3 "PRP" support
- HMI with pre-configured and customizable displays including real-time bay control, metering, fast load shed reports, equipment status, fault and event recording

## **APPLICATIONS**

- Advanced bay control/monitoring (6 breakers and 30 disconnects)
- Fast, power-balance load shed
- Frequency and voltage load shed

- Substation alarm concentrator, annunciator, and controller
- Advanced automation schemes such as bus transfer
- Stand-alone breaker protection and monitoring

## **FEATURES**

#### **Bay Protection & Control**

- Dedicated automation controller with 4000 lines of logic
- Powerful math, control and boolean operators
- 10 stages of under/over frequency protection for load shedding
- 4 stages of rate-of-change-of frequency for load shedding
- 6 stages of undervoltage elements for load shedding
- Dedicated protection logic at 1 msec execution rate
- Dedicated HMI for breaker and disconnect control
- Multi-breaker synchrocheck with single/three pole autoreclosing
- Dual breaker failure protection
- Direct and tele-protection elements using inter-relay communications

#### **Bay Monitoring and Metering**

- CT and VT monitoring
- Metering: current, voltage, frequency, power, energy and phasors as per IEEE C37.118
- Fault recorder: 256 samples/cycle, 30 sec of storage capacity
- Disturbance recorder: 1 sample/cycle, 5 min of storage capacity
- Event recorder: 8000 time-tagged events, with 0.5 ms scan of digital inputs
- Comprehensive display of metering, phasors, maintenance and fault information in the front panel

#### Fast Load Shed

- Fast optimal load shedding executed within 20ms
- Intelligently sheds only necessary loads per customized priorities
- Highly customizable and scalable, integrating easily into most industrial plants with new or existing EMS/SCADA
- Optional stand-alone system with local HMI for viewing dedicated system status and reports
- Suitable for small or large industrial systems without re-design
- Easy-to-use system where settings and priorities can be configured within seconds

#### Communications

- IEC61850, DNP3, Modbus® RTU, Modbus TCP/IP, IEC 60870-5-104, PRP
- Three independently configurable IP's with failover features
- Inter-relay communication based on standard protocols
- Front USB for maintenance and downloading of records and events

#### Ease-of-Use and Security

- Graphical protection and automation logic programming
- Real-time logic monitoring to simplify commissioning and troubleshooting
- EnerVista™ Launchpad service and update notification toolset keeps documents and software up-to-date
- EnerVista Integrator providing easy integration of data (SCADA or DCS) into new or existing systems



## Advanced Bay Control

The C90<sup>Plus</sup> bay control or monitoring functionality is intended for high-end bay control applications typically used in transmission installations, where a larger quantity of I/O, advanced protection and control functionality and an advanced HMI is desired.

#### Bay Control Protection Functions

#### Overcurrent

The C90<sup>Plus</sup> provides multiple stages of overcurrent functions for phase, neutral and ground. Overcurrent functions include:

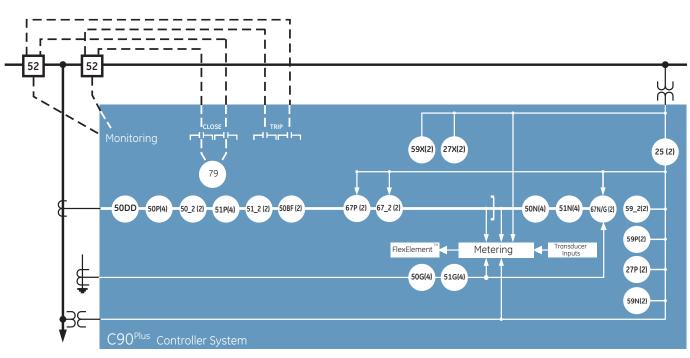
- Instantaneous and timed overcurrent elements for phase, neutral, ground and negative sequence protection
- Directional supervision is available for phase neutral and negative sequence elements
- Time O/C elements can individually be set to use IEEE, IEC or custom FlexCurves™

#### Over and Under Voltage Protection

Long lines under lightly loaded conditions or no-load or sudden loss of power may experience voltages exceeding the rated per unit voltage level of the line. Use the phase overvoltage element of the C90<sup>Plus</sup> to initiate a local trip as well as a remote trip using direct transfer trip. The C90<sup>Plus</sup> also provides additional voltage functions including neutral overvoltage, negative sequence overvoltage and phase undervoltage. The phase undervoltage can be programmed as definite time or inverse time.

#### **Over and Under Frequency Protection**

The multiple stages of under and over frequency elements can be used to initiate load shedding or remedial action schemes or frequency-based load restoration schemes during lack of generation in the network or due to sudden load drops. Combined with the advanced automation capabilities of the C90<sup>Plus</sup>, flexible, special protection schemes, advanced load shedding and load restoration schemes can be built.



#### Functional Block Diagram

#### ANSI® Device Numbers & Functions

Device Number	Function
25	Synchronism Check
27P	Phase Undervoltage
27X	Auxiliary Undervoltage
50BF	Breaker Failure
50DD	Current Disturbance Detector
50G	Ground Instantaneous Overcurrent
50N	Neutral Instantaneous Overcurrent
50P	Phase Instantaneous Overcurrent

Device Number	Function
50_2	Negative Sequence Instantaneous Overcurrent
51G	Ground Time Overcurrent
51N	Neutral Time Overcurrent
51P	Phase Time Overcurrent
51_2	Negative Sequence Time Overcurrent
52	AC Circuit Breaker
59N	Neutral Overvoltage

Device Number	Function
59P	Phase Overvoltage
59X	Auxiliary Overvoltage
59_2	Negative Sequence Overvoltage
67N	Neutral Directional Overcurrent
67P	Phase Directional Overcurrent
67_2	Negative Sequence Directional Overcurrent
79	Automatic Recloser
81 U/O	Under and Over Frequency

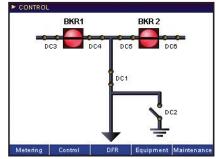
#### Small Signal Oscillation Functionality

A new protection element called the small signal oscillation detection is added to the product. Modern power systems are becoming increasingly interconnected to each other for the benefits of increased reliability, reduced operation cost, improved power quality and reduced necessary spinning reserve. With the increasingly large interconnected power systems some technical challenges also become apparent. One of these challenges is the inter-area low frequency oscillations that are a major threat to reliable operations of large-scale power systems. Inter-area oscillations not only limit the amount of power transfer, but also threaten the system security and equilibrium, as they may lead to system instability and cascading outages.

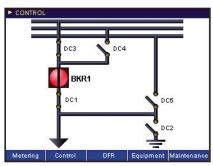
Therefore, it is essential to identify the characteristics of the inter-area oscillations, including oscillation frequency and damping ratio, so that proper actions can be taken based on the results. This is required to improve the system damping and maintain stability in the power system. The C90<sup>Plus</sup> can detect these inter-area oscillations and provide an alarm or even a trip signal to prevent a large-scale system disturbance.

#### **Bay Configurations**

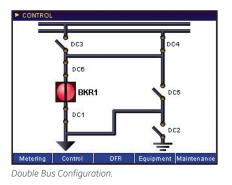
The C90<sup>Plus</sup> has 12 pre-configured bay single line diagrams and corresponding controls for each of the bay equipment. Users can also program their own single line diagrams using the ANSI/IEC library symbols provided in the EnerVista setup program.





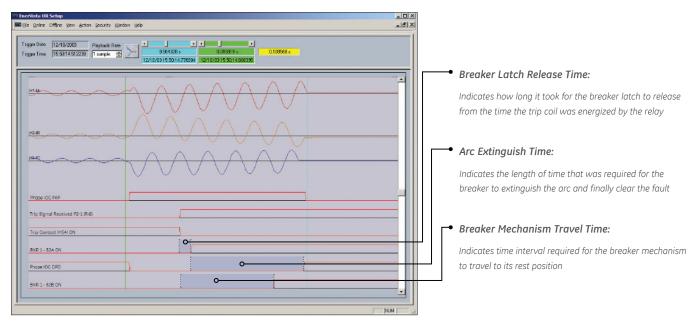


Two-Main and Transfer Bus Configuration.



## Power System Troubleshooting

The C90<sup>Plus</sup> contains tools that allow for the early detection of impending breaker problems and allow for maintenance to be performed before serious damage occurs.



Triggering a waveform on each breaker operation can identify changes in the length of time each part or mechanism in the breaker takes to perform its function.

## Fast Load Shed

### Why Fast Load Shed?

Conventional frequency and voltage load shedding schemes operate typically in 250 ms to seconds.

Contingency based load shedding schemes are typically faster at 160 – 400 ms depending on both system architecture and communications employed.

Both these scheme types are too slow for industrial cogeneration applications, such as oil and gas or manufacturing, where very fast load shedding is required to ensure power system and critical processes integrity.

#### What is Fast Load Shed?

Fast load shed is a system consisting of one or more C90<sup>Plus</sup>, IEC 61850-Ethernet network, UR, UR<sup>Plus</sup> or IEC 61850-8-1 capable end devices that provides fast load shedding, to re-establish power balance when source/ loads balance is disrupted. End devices are of UR, URPlus, SR or IED's with IEC 61850-8-1 support (other vendor IED interoperability not proven/tested). It is possible to use existing devices which do not support IEC 61850. In those cases the D25 RTU can be used to communicate between those existing devices and the fast load shed controller (FLSC), however this will slow the scheme down. The C90<sup>Plus</sup> FLSC checks if generation lost exceeds remaining generation reserve per:

#### $\Delta$ (Pgen) + Preserve $\geq 0$

In case of generation loss or power unbalance GOOSE messages are sent to shed enough load per pre-defined priorities above available generation reserve (Adaptive Mode). Load priorities can be changed/updated via HMI within a second. Alternatively, a pre-defined shedding scenario can be executed upon each defined contingency (Static Mode).

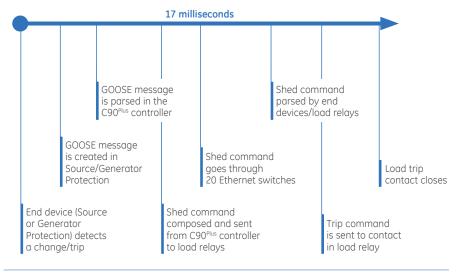
Up to 16 automatic reports are generated for any scheme operation containing Fast Load Shed Controller (FLSC) relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last changed date.

#### Speed of Fast Load Shed Scheme:

The speed of Fast Load Shedding including internal processing is as follows:

Origin	UR end device detects trip/breaker operation
3000 µs	UR GOOSE message with change of online state
200 µs	Message passed through multiple LAN switches
3000 µs	FLSC processing and calculations
1000 µs	Shed command GOOSE message composed
500 µs	FLSC GOOSE message is sent through LAN switches
3000 µs	Shed command GOOSE message parsed by load URs
4000 µs	UR end device calculations and processing
2000 µs	Trip contact output closes
16.7 ms	Total

#### End-to-end execution made under 20 ms



#### C90<sup>Plus</sup> Load Shed Scheme Devices

#### C90<sup>Plus</sup> Fast Load Shed Controller (FLSC)

The controller is the main decision point of the system where all the calculations and intelligent commands are sent. It is a substation hardened device with a real-time operating system that is highly reliable and accurate. It is also equipped with a local annunciator panel and HMI screen (optional) for ease-of-use for maintenance and operation. The controller receives source data from end devices, load data from end devices or aggregators via analog GOOSE. It handles up to 64 loads or infeeds as well as 6 local infeeds, and makes the final decision to shed load. The load shed commands are issued via GOOSE to end devices.

# C90<sup>Plus</sup> Fast Load Shed Aggregator (FLSA)

This is an extension of the system allowing for aggregation of load data and is a load shed data concentrator, combining load data from end devices and sending as analog GOOSE to the FLSC. It does not make load shed decisions. It allows the controller to handle more than 64 loads. By connecting the aggregators in a tree-like matrix, the number of loads controlled with this scheme can reach over 2500.

#### Load Shed Controller Design

The FLSC can interface or aggregate measurements into 32 sources/infeeds and 32 loads/load groups (many loads/group).

User-defined shed priorities of the load groups are fixed or user-selectable through

an HMI. Loads can be taken out of scan if it is determined that shedding is not required. The FLSC has an auto-compute solution option (Adaptive Mode) where loads to be shed are calculated based on priorities, generation lost and generation reserve, and a manual scenario execution option (Static Mode) where load shedding is pre-determined for each power loss contingency.

#### Scalability of the Fast Load Shed Scheme

The controller can handle up to 64 infeeds/ loads or aggregators plus 6 local devices (infeeds or loads).

Adding another  $\text{C90}^{\text{Plus}}$  as an aggregator extends the system by an additional 70 loads. With 12 infeeds, 18 loads & 40 aggregators

(64 loads each), the system can support 12 infeeds and 2578 sheddable loads. Minimal re-configuration is required in the case of system expansion.

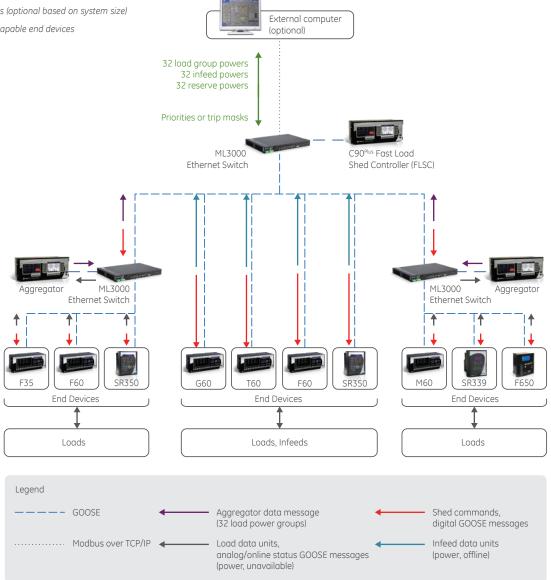
#### Interoperability

All communications are based on GOOSE and IEC 61850-8-1.

#### The System Overview and Architecture

Below is a typical Fast Load Shed scheme, consisting of:

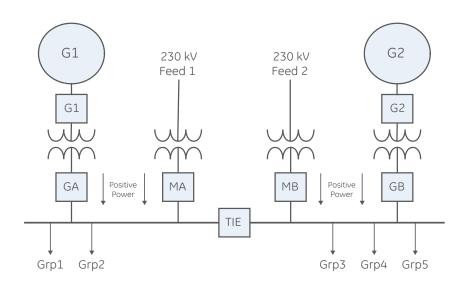
- 1 x C90<sup>Plus</sup> FLSC
- IEC 61850-Ethernet network
- 2 x C90<sup>Plus</sup> FLSA's (optional based on system size)
- IEC 61850-8-1 capable end devices



The above system architecture can be expanded to cater for non-IEC 61850 end devices by adding a D25 Substation Controller.

#### Simplified Source-Load Example

Below is a simplified system illustrating the load shed priorities and how shedding is determined:



The Total System Load = PGrp1 + PGrp2 + PGrp3 + PGrp4 + PGrp5 Total Source/Generation = PG1 + PG2 + PMA + PMB

The C90<sup>Plus</sup> calculates:  $\Delta$ (Pgen)+ Preserve  $\geq 0$ 

LOAD PRIORITIZATION: (AS SET	BY END-USER)	
Asset	Value	Priority/Status (User set)
Group 1	10MW	5
Group 2	10 MW	0 (Don't Shed)
Group 3	5 MW	1
Group 4	20MW	4
Group 5	5 MW	2

Example: For a loss of 9MW of Generation with no generation reserve, the scheme will trip Load Groups 3 and 5 for a total of 10MW.

#### Actual Load Shed Performance Results (System Islanded)

Below are some test results from a C90<sup>Plus</sup> fast load shed scheme operation in conjunction with backup df/dt and under frequency load shedding, illustrating operating speed of each system at a petrochemical facility that got islanded as a 4.5MW underpowered island. In this case the scheme operated in 13 ms, including trip command to shedding load breakers.

TIME(MS)	EVENT
0	Breaker MB Opened Manually
8	Breaker Open De-bounced Island Detected Priorities 1, 2 and, 3 Load Shed Sent
10	Shed Message Received at Load Relays
13	Trip Coils Energized
50	Shed Breaker Open – Load Shed
64	ROCOF(df/dt) Trigger
106	Under Frequency Load Shed Trigger

## C90<sup>Plus</sup> Automation Control System

The C90<sup>Plus</sup> is a powerful logic controller and protection product designed for the requirements of industrial and utility power systems. Its unparalleled list of features make the C90<sup>Plus</sup> one of the most agile and advanced products, allowing it to perform several functions and be used in many scenarios based on the needs of each customer. The C90<sup>Plus</sup> provides unmatched logic processing ability combined with a powerful math engine with deterministic execution of logic equations, regardless of the configuration of the number of lines of logic.

The C90<sup>plus</sup> provides the tools and functionality necessary for creating customized automation and control schemes that include:

- Advanced bay control and interlocking
- Breaker monitoring and control
- Automatic bus transfer schemes
- Load shedding and load restoration schemes
- Ultra fast load shedding in industrial plants

#### **Automation Logic**

The C90<sup>Plus</sup> incorporates advanced automation features including powerful FlexLogic™ (user programmable logic) for its protection and advanced automation schemes. Combined with the communication capabilities, C90<sup>Plus</sup> automation features far surpass what is found in average relays with programmable logic. The C90<sup>Plus</sup> integrates seamlessly with UR and UR<sup>Plus</sup> relays for complete system protection, including interlocking and special protection schemes.

#### FlexLogic

FlexLogic is the powerful user programmable logic engine that provides the ability to create customized protection and control schemes thereby minimizing the need, and the associated costs, of auxiliary components and wiring. The independent automation FlexLogic features math, Boolean and control functions, which can be used for advanced load shedding, load restoration and dynamic Volt/VAR control schemes. More than 4000 lines of logic are provided with a deterministic execution rate of 50 msec, irrespective of the number of lines of logic. Automation FlexLogic operators include:

- Math: EXP, ACOS, ATAN2, ATAN, ASIN, FLOOR, CEIL, LOG, LOG10, POW, SIN, COS, TAN, NEG, ABS, SQRT, ADD, SUB, MUL, DIV, CONSTANT
- Boolean: AND, NAND, NOR, NOT, OR, XOR
- Control: =, <=, !=, >=, <, >, Latch, Positive/ Negative/Dual one shot, Timers, Counters

#### **Deterministic Automation**

A power system is a real-time system in which time and accuracy of every control should be considered critical. The C90<sup>Plus</sup> operating system ensures that every action and control is scheduled properly and beforehand to guarantee that nothing is missed nor delayed. This intelligence inside the C90<sup>Plus</sup> handles both protection trip commands as well as any other logic written for execution as per its programmed timeline. No more delays or missed timelines when it comes to control because the processor is 'busy' or otherwise.

#### Communications

The C90<sup>plus</sup> supports the most popular industry standard protocols enabling easy, direct integration into DCS and SCADA systems including:

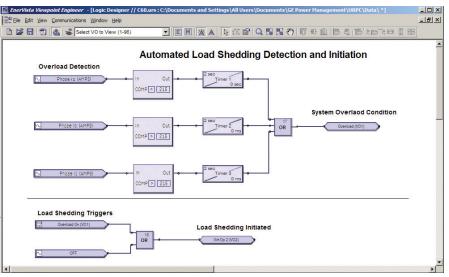
- IEC 61850
- DNP3
- Ethernet Global Data (EGD)
- IEC 60870-5-104
- Modbus RTU, Modbus TCP/IP
- PRP as per IEC 62439-3
- Three independently configurable IP's with failover features
- Inter-relay communication card to enable implementation of pilot schemes based on standard communication protocols
- Front USB for maintenance and downloading records and events

# Interoperability with Embedded IEC 61850

Use the C90<sup>Plus</sup> with integrated IEC 61850 to lower costs associated with protection, control and automation. GE Multilin's leadership in IEC 61850 comes from thousands of installed devices and follows on many years of development and operational experience with UCA 2.0.

• Replace expensive copper wiring between devices with direct transfer of data using GOOSE messaging

#### Custom Programmable Logic Designer



The C90% supports an advanced automation logic engine that supports Boolean operators, analog comparisons, and advanced mathematical operations.

- Configure systems based on IEC 61850 and also monitor and troubleshoot them in realtime with EnerVista Viewpoint Engineer
- Integrate GE Multilin IEDs and generic IEC 61850-compliant devices seamlessly in EnerVista Viewpoint Monitoring

#### **Extreme Communication**

- High reliable communication card with automatic failover and extremely fast redundant schemes
- Inter-relay communication card to enable implementation of pilot schemes that are based on standard communication protocols, and both "Direct" and "Tele-Protection" input and output elements available

Ease-of-use, security ease-of-use and quick setups are considered throughout every application and configuration parameter requiring virtually no training for those working in the power industry. The EnerVista suite is an industry-leading set of software programs that simplifies every aspect of using the C90Plus relay. The EnerVista suite provides all the tools to monitor the status of the protected asset, maintain the relay, and integrate information measured by the C90<sup>Plus</sup> into DCS or SCADA monitoring systems. Convenient COMTRADE and Sequence of Events viewers are an integral part of the UR<sup>Plus</sup> Setup software included with every UR<sup>Plus</sup> relay, to carry out postmortem event analysis to ensure proper protection system operation.

#### Security and NERC<sup>®</sup> CIP

- Audit Trail
- Password protection and authentication
- Support for alphanumeric passwords
- Role-based access control to manage multiple personnel rights as per ANSI INCITS 359-2004

#### LAN Redundancy

Substation LAN redundancy has been traditionally accomplished by reconfiguring the active network topology in case of failure. Regardless of the type of LAN architecture (tree, mesh, etc), reconfiguring the active LAN requires time to switchover, during which the LAN is unavailable. UR devices deliver redundancy as specified by PRP-IEC 62439-3, which eliminates the dependency on LAN reconfiguration and the associated switchover time. The UR becomes a dual attached node that transmits data packets over both main and redundant networks simultaneously, so in case of failure, one of the data packets will reach the receiving device with no time delay.

#### EnerVista Launchpad

EnerVista Launchpad is a powerful software package that provides users with all of the setup and support tools needed for configuring and maintaining GE's Multilin products. The setup software within Launchpad allows for the configuration of devices in real-time by communicating using serial, Ethernet, or modem connections, or offline by creating setting files to be sent to devices at a later time. Included in Launchpad is a document archiving and management system that ensures critical documentation is up-to-date and available when needed. Documents made available include:

- Manuals
- Application Notes
- Guideform Specifications
- Brochures
- Wiring Diagrams
- FAQ's
- Service Bulletins

#### **Viewpoint Engineer**

Viewpoint Engineer is a set of powerful tools that will allow you to configure and test your relays at a system level in an easy-touse, graphical drag-and-drop environment. Viewpoint Engineer provides the following configuration and commissioning utilities:

- Graphical Logic Designer
- Graphical System Designer
- Graphical Logic Monitor
- Graphical System Monitor

#### User Interface and HMI

The C90<sup>Plus</sup> provides extensive local HMI capability through two dedicated display panels. One serves as a digital annunciator and the other optional HMI is for display and control functions.

#### Annunciator

Enhanced HMI and Annouciator panels on the front of the C90<sup>Plus</sup> make it one of the most powerful human machine interfaces on local units. The C90<sup>Plus</sup> provides an embedded, configurable color LCD annunciator on the front panel of the device, eliminating the need for LED labels and separate annunciators in the relay panel.

- Any contact/direct/remote input or internally generated FlexLogic operand can be assigned to be displayed on the annunciator.
- Up to 288 targets may be assigned. The display can be configured for 12/24/48 alarms per page to a maximum of 24 pages using a 16-color pallet for better

visualization and customization.

- A separate self-test message page on the annunciator panel shows clear error messages about the device health, greatly assisting in identifying, and correcting device related issues.
- For easy maintenance and asset management, product information, such as IP addresses and serial numbers of each module, are also accessible without the need to connect to the unit.

Phase TOC1 Operate	Phase TOC2 Operate	CB Fail Opera		С	B1 Open
CB2 Open	DC1 Open	Earth Sv Oper		D	C3 Open
DC4 Open	Reclosing Enabled	Load Sh Enabl			d Shed II inabled
ALAEMS: 96 SELET	EST C PAGE LOF 4	Reset	Next A	Jann	Next Page

12 to 48 user-configurable alarms per page eliminate the need for a separate annunciator.

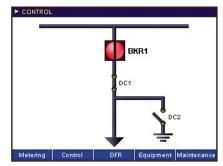
HMI

• Comprehensive data visualization.

METERING - S	SUMN	ARY'				
Phase A	١В	Phas	e BC	Ph	ase CA	
400.1		39	9.4	3	400.2	kV
Phase	A	Pha	se B	P	hase C	
368.1		36	0.4	8	366.2	Α
255		2	54		255	MW
4.2		4	.1		4.2	MVAr
0.96		0.	95		0.96	PF
Summary	E	nergy	Phase	ors	Sequence	

Easy-to-read large display of metering values.

 User-programmable single line diagram supported by ANSI/IEC symbols. Preprogrammed single line diagrams for bay monitoring and control for common bus configurations, including ring-bus, double breaker and breaker-and-half configurations.



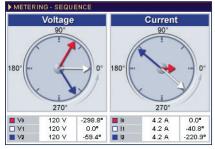
Single Bus Configuration.

- Multiple programmable control pushbuttons, ten pushbuttons per page with multiple levels of control.
- Local/remote control.

Delta O	days 00:00:00:0138	91	Event 427	& 426
Event#	Date/Time		Cause	
431	Mar 05 2007 12:2	3:23:637727	Cont lp 8 Or	1
430	Mar 05 2007 12:2	3:23:637727	Cont lp 7 Or	1
429	Mar 05 2007 12:2	3:23:637727	Cont lp 6 Or	١
428	Mar 05 2007 12:2	3:23:637727	Cont lp 5 Or	1
427	Mar 05 2007 12:2	3:20:735543	Dist Z1 OP	
426	Mar 05 2007 12:2	3:20:721634	Dist Z1 PKP	
125	Mar 05 2007 12:2	3:20:721634	Dist Z2 PKP	
424	Mar 05 2007 12:2	3:20:721634	Dist Z3 PKP	
423	Mar 05 2007 12:2	3:20:721634	OSC Trigger	

Sequence of event records provide the ability to view the time difference between two events for troubleshooting and analysis.

- Pre-programmed comprehensive displays for:
  - Metering
  - Bay Control
  - Fault Reports
  - Sequence of Event Reports
  - Fault Records
  - Device Diagnostics
  - Equipment Manager
  - Fast Load Shed Status and Reports
  - Real-Time Phasor Displays of Voltage, Current and Sequence Components



Phasor display of sequence components showing the standing unbalance in the line.

#### Front Panel USB

The front panel of the C90<sup>Plus</sup> provides a USB 2.0 host for field laptop connections for highspeed data transfers, making downloading and uploading faster than a conventional RS232 connection.

## C90<sup>Plus</sup> Automation Control System

#### **Digital Alarm Annunciator**

- 288 customizable alarms in multiple pages using a pallet of 16 colors
- Eliminates the need for separate annunciator
- Descriptive self-test messages



- User-configurable single line diagrams using IEC/ANSI library symbols
- Local control and status indication of breakers & disconnect switches, 20 userprogrammable pushbuttons
- Local/remote control
- Fault, event, disturbance and transient reports

#### **Bay Protection**

- Overcurrent, over/under voltage, over/ under frequency
- Breaker failure, autoreclose, synch check
  512 lines of Protection FlexLogic
- @ 1 msec execution



#### **Automation Controller**

- Built-in industry hardened logic controller
- 4096 lines of independent userprogrammable logic, 50 msec execution rate
- Advanced math, Boolean and control operations

#### **Communication Capabilities**

- Up to three independent Ethernet ports with redundant fast-over
- IEC 61850, DNP3, MODBUS TCP/IP, IEC 60870-5-104 protocols
- Front USB port for high speed data transfer

#### \_ Recorders

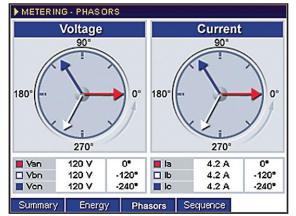
- Eliminates the need for stand-alone disturbance recorders
- Configurable and up to 256 samples/cycle, 1 min duration recorder
- Dedicated disturbance recorder for recording long term events
- Synchrophasors over Ethernet

# Disturbance Recorder Eliminates Stand-Alone DFR and Phasor Measurement Unit

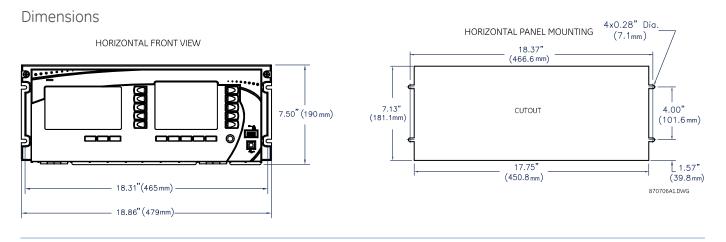
	Ready to Capture		Мет	ory Available
Fault Report	9			0
Transient Recorder				0
Disturbance Recorder	•			0
Records	Latest		Total	
Events	Mar 05 2007 12:23:23	637727	431	
Faults	Mar 05 2007 12:23:20	):735543	1	
Transients	Mar 05 2007 12:23:20	):721634	1	
Disturbances	Mar 04 2007 02:47:12	2:346789	3	
Summary SC	E Fault Reports	Transi	ient	Disturbance

Digital fault recorder summary with the latest information on events, faults, transients and disturbances.

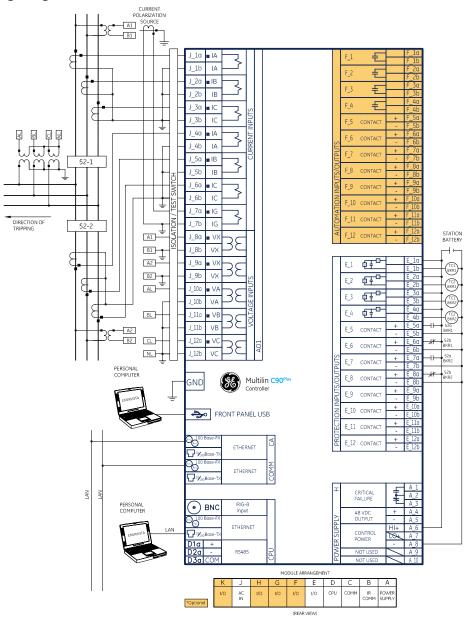
# Real-Time Phasor Information of Fundamental and Sequence Components



Real-time display of the fundamental phasors of voltage and current in the front panel HMI.



Typical Wiring Diagram



## Technical Specifications

reennears	
AUTORECLOSURE	
Applications:	two breakers
Tripping schemes:	single-pole and three-pole
Reclose attempts: Reclosing mode:	up to 4 before lockout selectable
Breaker sequence:	selectable
AUXILIARY OVERVOLT	AGE
Pickup level:	0.000 to 1.100 pu in steps of 0.001
Dropout level:	<98% of pickup
Level accuracy:	±0.5% of reading from 10 to 208 V
Pickup delay: Reset delay:	0.00 to 600.00 seconds in steps of 0.01 0.00 to 600.00 seconds in steps of 0.01
Timing accuracy:	±3% of operate time or ±4 ms
	(whichever is greater)
Operate time:	<2 cycles at 1.10 × pickup at 60 Hz
AUXILIARY UNDERVO	
Pickup level: Dropout level:	0.000 to 1.100 pu in steps of 0.001 >102% of pickup
Level accuracy:	±0.5% of reading from 10 to 208 V
Curve shapes:	GE IAV inverse, definite time
Curve multiplier:	0.00 to 600.00 in steps of 0.01
Timing accuracy:	±3% of operate time or ±4 ms (whichever is greater)
	(whenever is greater)
BREAKER FAILURE Mode:	single pole three pole
Current supervision:	single-pole, three-pole phase current, neutral current
Supervision pickup:	0.001 to 30.000 pu in steps of 0.001
Supervision dropout:	<98% of pickup
Supervision accuracy at	: 0.1 to 2.0 × CT: ±2% of rated
Supervision accuracy at	: >2.0 × CT:
	±2.5% of reading
Time accuracy:	±3% or 4 ms (whichever is greater)
BREAKER FLASHOVER	
Operating quantity:	phase current, voltage, and voltage difference
Pickup level voltage:	0.000 to 1.500 pu in steps of 0.001
Dropout level voltage:	97 to 98% of pickup
Pickup level current:	0.000 to 1.500 pu in steps of 0.001
Dropout level current: Level accuracy:	97 to 98% of pickup ±0.5% or ±0.1% of rated
Level accuracy.	(whichever is greater)
Pickup delay:	0.000 to 65.535 seconds in steps of
Time geourges	0.001
Time accuracy:	±3% or ±42 ms (whichever is greater)
Dime accuracy: Operate time:	±3% or ±42 ms (whichever is greater) <42 ms at 1.10 × pickup at 60 Hz
	(whichever is greater)
Operate time:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum
Operate time: CONTACT INPUTS	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V
Operate time: CONTACT INPUTS Input rating: On threshold:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater)
Operate time: CONTACT INPUTS Input rating:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V
Operate time: CONTACT INPUTS Input rating: On threshold:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater)
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold:	(whichever is greater) <42 ma at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 80% of nominal voltage setting 130% of nominal voltage setting 130% of nominal voltage setting 130% of nominal voltage setting or 285 V maximum
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting 130% of nominal voltage setting 130% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady-
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage:	(whichever is greater) <42 ma at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 80% of nominal voltage setting 130% of nominal voltage setting 130% of nominal voltage setting 130% of nominal voltage setting or 285 V maximum
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominol voltage: Input impedance:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting 130% of nominal voltage setting 230% of nominal voltage setting 130% of nominal voltage setting 130% of nominal voltage setting 230% of nominal voltage se
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance: Recognition time:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <1 ms
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominol voltage: Input impedance:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 80% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting 130% of nominal voltage setting 130% of nominal voltage setting 130% of nominal voltage setting 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance: Recognition time: Debounce timer:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 80% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting 130% of nominal voltage setting 130% of nominal voltage setting 130% of nominal voltage setting 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance: Recognition time: Debounce timer: Chatter detection timer: Chatter detection timer:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting 130% of nominal voltage setting 130% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25 1 to 100
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance: Recognition time: Debounce timer: Chatter detection timer:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting 130% of nominal voltage setting 130% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25 1 to 100
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance: Recognition time: Debounce timer: Chatter detection timer: Chatter detection timer: Chatter detection timer: Chatter state changes: DISTURBANCE DETECT	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting 130% of nominal voltage setting 130% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25 1 to 100 <b>TOR (50DD)</b> sensitive current disturbance detector 0.004 to 0.04 pu (twice the current cut-
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance: Recognition time: Debounce timer: Chatter detection timer: Disturbance Detection Type: Range:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 80% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting 130% of nominal voltage setting 30% of nominal
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Recognition time: Debounce timer: Chatter detection timer: Chatter detection timer: Chatter detection timer: Chatter state changes: DISTURBANCE DETECT Type: Range: FLEXCURVES	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting 130% of nominal voltage setting 130% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <4 ms 1.50 to 16.00 ms in steps of 0.25 1 to 100 seconds 10 to 100 <b>TOR (50DD)</b> sensitive current disturbance detector 0.04 to 0.04 pu (twice the current cut- off level threshold)
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Recognition time: Debounce timer: Chatter detection timer: Chatter detection timer: Chatter tate changes: DISTURBANCE DETECT Type: Range: FLEXCURVES Number:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting 07 20 V (whichever i
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance: Recognition time: Debounce timer: Chatter detection timer: PLEXCURVES Number: Reset points:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25 1 to 100 <b>TOR (50DD)</b> sensitive current disturbance detector 0.004 to 0.04 pu (twice the current cut- off level threshold) <b>4</b> (A through D) 40 (0 through 1 of pickup)
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Recognition time: Debounce timer: Chatter detection timer: Chatter detection timer: Chatter tate changes: DISTURBANCE DETECT Type: Range: FLEXCURVES Number:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting 07 20 V (whichever i
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Recognition time: Debounce timer: Chatter detection time: Debounce timer: Chatter detection time: DESTURBANCE DETECT Type: Range: FLEXCURVES Number: Reset points: Operate points: Time delay:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25 1 to 100 <b>TOR (SODD)</b> sensitive current disturbance detector 0.004 to 0.04 pu (twice the current cut- off level threshold) 4 (A through D) 40 (0 through 1 of pickup) 80 (1 through 20 of pickup)
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance: Recognition time: Debounce timer: Chatter detection timer: Debounce timer:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25 1 to 100 <b>TOR (SODD)</b> sensitive current disturbance detector 0.004 to 0.04 pu (twice the current cut- off level threshold) 4 (A through D) 40 (0 through 1 of pickup) 80 (1 through 20 of pickup)
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominol voltage: Input impedance: Recognition time: Debounce timer: Chatter detection timer: Chatter detection timer: Chatter detection timer: Chatter detection timer: Chatter tate changes: DISTURBANCE DETEC Type: Range: FLEXCURVES Number: Reset points: Operate points: Time delay: FLEXELEMENTS	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25 1 to 100 seconds 10 to 100 <b>TOR (50DD)</b> sensitive current disturbance detector 0.004 to 0.04 pu (twice the current cut- off level threshold) 40 (0 through 1 of pickup) 80 (1 through 20 of pickup) 0 to 65535 ms in steps of 1 8 any analog actual value, or two values
Operate time: CONTACT INPUTS Input rating: On threshold: Bounce threshold: AZ threshold: AZ threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Recognition time: Debounce timer: Chatter detection timer: Chatter detection timer: Chatter detection timer: Chatter detection timer: Chatter detection timer: Chatter state changes: DISTURBANCE DETEC Type: Range: FLEXCURVES Number: Reset points: Operate points: Operate points: Time delay: Elements: Operating signal:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active 24 to 250 V active 24 to 250 V active 24 to 16.00 ms in steps of 0.25 1 to 10.0 <b>TOR (SODD)</b> sensitive current disturbance detector 0.004 to 0.04 pu (twice the current cut- off level threshold) 4 (A through D) 40 (0 through 1 of pickup) 8 01 through 20 of pickup 0 to 65535 ms in steps of 1 8 any analog actual value, or two values in differential mode
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance: Recognition time: Debounce timer: Chatter detection timer: Detection timer: Reset points: Operate points: Time delay: Elements: Operating signal mode:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting or 20 V (whichever is greater) 10% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25 1 to 100 <b>TOR (50DD)</b> sensitive current disturbance detector 0.004 to 0.04 pu (twice the current cut- off level threshold) 4 (A through D) 40 (0 through 1 of pickup) 80 (1 through 20 of pickup) 0 to 65355 ms in steps of 1 8 any analog actual volue, or two values in differential mode signed or absolute volue
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance: Recognition time: Debounce timer: Chatter detection timer: Chatter state changes: DISTURBANCE DETEC Type: Range: FLEXCURVES Number: Reset points: Operate points: Operate points: Time delay: FLEXELEMENTS Elements: Operating signal: Operating signal: Operating mode: Comparator detection:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active 24 to 250 V active 24 to 250 V active 24 to 16.00 ms in steps of 0.25 1 to 100 <b>TOR (50DD)</b> sensitive current disturbance detector 0.004 to 0.04 pu (twice the current cut- off level threshold) 4 (A through D) 40 (0 through 1 of pickup) 80 (1 through 20 of pickup) 0 to 65535 ms in steps of 1 <b>8</b> any analog actual value, or two values in differential mode signed or absolute value level, detta over, under
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance: Recognition time: Debounce timer: Chatter detection timer: Detection timer: Chatter detection timer: Detection timer: Operating signal mode: Operating signal mode: Operating signal mode: Operating level: Sickup level:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting or 28 V waximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25 1 to 100 <b>TOR (SODD)</b> sensitive current disturbance detector 0.004 to 0.04 µu (twice the current cut- off level threshold) 4 (A through D) 4 (0 through 1 of pickup) 8 (1 through 20 of pickup) 0 to 65335 ms in steps of 1 8 any analog actual value, or two values in differential mode signed or absolute value level, detta over, under -90.000 to 90.000 pu in steps of 0.001
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance: Recognition time: Debounce timer: Chatter detection timer: Debounce timer: Chatter detection timer: Debounce timer: Chatter detection time: Debounce timer: Comparator detection: Pickup level: Comparator detection: Pickup level: Set the time time time time time time: Comparator detection: Pickup level: Set time time: Debounce time: Deb	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25 1 to 100 seconds 10 to 100 <b>TOR (SODD)</b> sensitive current disturbance detector 0.004 to 0.04 pu (twice the current cut- off level threshold) 40 (0 through 1 of pickup) 80 (1 through 20 of pickup) 0 to 65535 ms in steps of 1 8 any analog actual value, or two values in differential mode signed or absolute value level, detta over, under -90.000 to 90.000 pu in steps of 0.001 0.1 to 50.0% in steps of 0.1
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance: Recognition time: Debounce timer: Chatter detection timer: Detection timer: Chatter detection timer: Detection timer: Operating signal mode: Operating signal mode: Operating signal mode: Operating level: Sickup level:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 80% of nominal voltage setting or 28 V waximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25 1 to 100 <b>TOR (SODD)</b> sensitive current disturbance detector 0.004 to 0.04 µu (twice the current cut- off level threshold) 4 (A through D) 4 (0 through 1 of pickup) 8 (1 through 20 of pickup) 0 to 65335 ms in steps of 1 8 any analog actual value, or two values in differential mode signed or absolute value level, detta over, under -90.000 to 90.000 pu in steps of 0.001
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance; Recognition time: Debounce timer: Chatter detection timer; Chatter state changes: DISTURBANCE DETEC Type: Range: FLEXCURVES Number; Reset points: Operate points: Operate points: Time delay: FLEXELEMENTS Elements: Operating signal: Operating mode: Coperating mode: Coperating mode: Coperating mode: Coperating node: Coperating node: Coperating node: Coperating node: Compared the	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 285 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25 1 to 100 seconds 10 to 100 <b>TOR (SODD)</b> sensitive current disturbance detector 0.004 to 0.04 pu (twice the current cut- off level threshold) 40 (0 through 1 of pickup) 80 (1 through 20 of pickup) 0 to 65535 ms in steps of 1 8 any analog actual value, or two values in differential mode signed or absolute value level, delta over, under -90.000 to 90.000 pu in steps of 0.001 0.1 to 5.00% in steps of 0.1 20 ms to 60 days 0.001
Operate time: CONTACT INPUTS Input rating: On threshold: Off threshold: Bounce threshold: AZ threshold: Overvoltage threshold: Maximum current: Nominal voltage: Input impedance: Recognition time: Debounce timer: Chatter state changes: DISTURBANCE DETEC Type: Reset points: Operate points: Operate points: Operating signal: Operating signal: Operating signal: Operating signal: Operating signal: Operating mode: Comparator detection: Pickey level: Hysteresis: Deta dt:	(whichever is greater) <42 ms at 1.10 × pickup at 60 Hz 300 V DC maximum 70% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 15 V (whichever is greater) 50% of nominal voltage setting or 20 V (whichever is greater) 30% of nominal voltage setting or 28 V maximum 10 mA during turn on, 0.5 mA steady- state 24 to 250 V active <1 ms 1.50 to 16.00 ms in steps of 0.25 1 to 100 <b>TOR (SODD)</b> sensitive current disturbance detector 0.004 to 0.04 µu (twice the current cut- off level threshold) 4 (A through D) 40 (0 through 1 of pickup) 80 (1 through 20 of pickup) 0 to 65335 ms in steps of 1 8 any analog actual value, or two values in differential mode signed or absolute value level, detta over, under -90.000 to 50.000 µu in steps of 0.001 0.1 to 50.0% in steps of 0.1 20 ms to 60 days 0.000 to 65.535 seconds in steps of

FLEXMATRIX	
Principle:	aggregates and conditions signals for
Tipping goourgou	tripping and auxiliary functions
Timing accuracy:	±1 ms
FLEX STATES	up to 256 la significación la servición de
Number:	up to 256 logical variables grouped under 16 Modbus addresses
Programmability:	any logical variable, contact, or virtual input
GROUND INSTANTAN	NEOUS OVERCURRENT
Pickup level:	0.000 to 30.000 pu in steps of 0.001
Dropout level: Level accuracy at 0.1 to	<98% of pickup
	±0.5% of reading or ±1% of rated (whichever is greater)
Level accuracy at >2.0	× CT: ±1.5% of reading
Overreach:	<2%
Pickup delay:	0.00 to 600.00 seconds in steps of 0.01
Reset delay: Operate time:	0.00 to 600.00 seconds in steps of 0.01 <16 ms at 3 × pickup at 60 Hz
	peration at 1.5 × pickup:
	±3% or ±4 ms (whichever is greater)
GROUND TIME OVER	
Current:	phasor or RMS
Pickup level: Dropout level:	0.000 to 30.000 pu in steps of 0.001 <98% of pickup
Level accuracy at 0.1 to	
	±0.5% of reading or ±1% of rated
Level accuracy at >2.0	(whichever is greater) × CT:
	±1.5% of reading
Curve shapes:	IEEE Moderately Inverse, IEEE Very Inverse, IEEE Extremely Inverse, IEC
	(BS) A, IEC (BS) B, IEC (BS) C, IEC Short
	Inverse, IAC Inverse, IAC Short Inverse, IAC Very Inverse, IAC Extremely Inverse,
	I2t, FlexCurves™ (programmable),
C	definite time (0.01second base curve)
Curve multiplier: Reset type:	0.01 to 600.00 in steps of 0.01 instantaneous/timed (per IEEE)
neber type.	Timing accuracy for 1.03 to 20 × pickup:
	±3.5% of operating time or ±1 cycle (whichever is greater)
	(whichever is greater)
	(whichever is greater) E DIRECTIONAL OVERCURRENT
NEGATIVE-SEQUENC Directionality: Polarizing:	(whichever is greater) E DIRECTIONAL OVERCURRENT co-existing forward and reverse voltage
Directionality: Polarizing: Polarizing voltage:	(whichever is greater) E DIRECTIONAL OVERCURRENT co-existing forward and reverse voltage V_2
Directionality: Polarizing: Polarizing voltage: Operating current:	(whichever is greater) E DIRECTIONAL OVERCURRENT co-existing forward and reverse voltage V_2 L_2
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing (zero-sec	(whichever is greater) <b>E DIRECTIONAL OVERCURRENT</b> co-existing forward and reverse voltage V_2 I_2 [uence]: $\ -0\  - K \times \ -1\ $
Directionality: Polarizing: Polarizing voltage: Operating current:	(whichever is greater) E DIRECTIONAL OVERCURRENT co-existing forward and reverse voltage V_2 L_2 l_2 uencel:  L_0  - K ×  L_1] -sequencel:
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing (zero-sec	(whichever is greater) <b>E DIRECTIONAL OVERCURRENT</b> co-existing forward and reverse voltage V_2 I_2 uence): $ I_0  - K \times  I_1 $ i-sequence): $ I_2  - K \times  I_1 $
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing (zero-sea Level sensing (negative Restraint, K: Characteristic angle:	(whichever is greater)           E DIRECTIONAL OVERCURRENT           co-existing forward and reverse           voltage           \_2           \_2           yuence):             _0  - K ×   _1            >sequence):             _2  - K ×   _2            0.000 to 0.500 in steps of 0.001           0 to 90° in steps of 1
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing (zero-sec Level sensing (negative Restraint, K:	(whichever is greater) <b>E DIRECTIONAL OVERCURRENT</b> co-existing forward and reverse voltage V_2 I_2 uence): $ [.0] - K \times  [.1]$ .sequence): $ [.2] - K \times  [.1]$ 0.000 to 0.500 in steps of 0.001 0 to 90° in steps of 1 40 to 90° in steps of 1, independent for
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing (zero-sea Level sensing (negative Restraint, K: Characteristic angle: Limit angle: Angle accuracy:	(whichever is greater)           E DIRECTIONAL OVERCURRENT           co-existing forward and reverse           voltage           \_2           \_2           yuence):             _0  - K ×   _1            >sequence):             _2  - K ×   _2            0.000 to 0.500 in steps of 0.001           0 to 90° in steps of 1
Directionality: Polarizing: Operating voltage: Operating current: Level sensing lzero-sec Level sensing (negative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance:	(whichever is greater) <b>E DIRECTIONAL OVERCURRENT</b> co-existing forward and reverse voltage V_2 I_2 uence): $ L_0  - K \times  L_1 $ -sequence): $ L_0  - K \times  L_1 $ 0.000 to 0.500 in steps of 0.001 0 to 90° in steps of 1 40 to 90° in steps of 0.001 forward and reverse $\pm 2^{\circ}$ 0.00 to 250.00 ohms in steps of 0.01
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing lzero-sec Level sensing (negative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level:	(whichever is greater) <b>E DIRECTIONAL OVERCURRENT</b> co-existing forward and reverse voltage V_2 $\lfloor_2$ [uence]: $\Vert _0 \vert - K \times \Vert _1 \rfloor$ -sequence]: $\Vert _2 \vert - K \times \Vert _1 \rfloor$ ( $\lfloor _2 \vert - K \times \Vert _1 \rfloor$ 0.000 to 0.500 in steps of 0.001 0 to 90° in steps of 1 40 to 90° in steps of 1, independent for forward and reverse $\pm 2°$ 0.00 to 250.00 ohms in steps of 0.01 0.05 to 30.00 pu in steps of 0.01
Directionality: Polarizing: Operating voltage: Operating current: Level sensing lzero-sec Level sensing (negative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance:	(whichever is greater) <b>E DIRECTIONAL OVERCURRENT</b> co-existing forward and reverse voltage V_2 I_2 uence): $ L_0  - K \times  L_1 $ -sequence): $ L_0  - K \times  L_1 $ 0.000 to 0.500 in steps of 0.001 0 to 90° in steps of 1 40 to 90° in steps of 0.001 forward and reverse $\pm 2^{\circ}$ 0.00 to 250.00 ohms in steps of 0.01
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing lzero-sea Level sensing Inegative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Operation time:	(whichever is greater) <b>E DIRECTIONAL OVERCURRENT</b> co-existing forward and reverse voltage $V_2$ $L_2$ [uence]: $  \_0  - K \times   \_1 $ >-sequence]: $  \_2  - K \times   \_1 $ 0.000 to 0.500 in steps of 0.001 0 to 90° in steps of 1. 40 to 90° in steps of 1. 40 to 90° in steps of 1. forward and reverse $\pm 2^{\circ}$ 0.00 to 250.00 ohms in steps of 0.01 0.05 to 30.00 pu in steps of 0.01 <pre></pre>
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing lzero-sea Level sensing Inegative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Operation time:	(whichever is greater)           E DIRECTIONAL OVERCURRENT           co-existing forward and reverse           voltage           V_2 $ _2$ uence): $  _0  - K \times   _1 $ >sequence): $  _2  - K \times   _1 $ 0.000 to 0.500 in steps of 0.001           0 to 90° in steps of 1           40 to 90° in steps of 1, independent for forward and reverse $\pm 2^{\circ}$ 0.00 to 250.00 ohms in steps of 0.01           0.05 to 30.00 pu in steps of 0.01 $<98\%$ $<16$ ms at 3 x pickup at 60 Hz           EINSTANTANEOUS OVERCURRENT           0.000 to 30.000 pu in steps of 0.001
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing (zero-sec Level sensing (negative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Dropout level: Dropout level: Dropout level: Dropout level: Dropout level:	(whichever is greater)           EDRECTIONAL OVERCURRENT           co-existing forward and reverse           voltage           L2           luence):             _0  - K ×   _1            >sequence):             _2  - K ×   _1            >o00 to 0.500 in steps of 0.001           0 to 90° in steps of 1           40 to 90° in steps of 1           000 to 250.00 ohms in steps of 0.01           0.05 to 30.00 pu in steps of 0.01           <98%
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing lægative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dopout level: Operation time: <b>NEGATIVE-SEQUENC</b> Pickup level:	(whichever is greater) <b>E DIRECTIONAL OVERCURRENT</b> co-existing forward and reverse voltage V_2 $\lfloor_2 \rfloor$ uencel: $\lfloor U_0 - K \times \Vert L_1 \rfloor$ $\lfloor U_0 - K \times \Vert L_1 \Vert$ $\lfloor U_0 - K \times \Vert L_1 \Vert$ $\Vert U_0 - K \times \Vert U_0 \Vert$ $\Vert U_0 - K \sqcup U_0 - K \sqcup U_0 \Vert$ $\Vert U_0 - K \sqcup U_0 - K \sqcup$ $\Vert U_0 - K \sqcup U_0 - K \sqcup$ $\Vert U_0$
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing lzero-sec Level sensing (negative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Operation time: <b>NEGATIVE-SEQUENC</b> Pickup level: Dropout level: Dropout level: Dropout level: Dropout level: Dropout level: Dropout level: Level accuracy at 0.1 to	(whichever is greater) <b>E DIRECTIONAL OVERCURRENT</b> co-existing forward and reverse voltage V_2 L_2 upencel: $  \_0  - K \times   \_1 $ besquencel: $ \_0  - K \times   \_1 $ 0.000 to 0.500 in steps of 0.001 0 to 90° in steps of 1 40 to 90° in steps of 1 40 to 90° in steps of 1 40 to 90° in steps of 0.001 0.05 to 30.00 puin in steps of 0.01 0.05 to 30.00 puin in steps of 0.01 ey88% <16 ms at 3 x pickup at 60 Hz <b>E INSTANTANEOUS OVERCURRENT</b> 0.000 to 30.000 puin steps of 0.001 ey88% of pickup 0 2.0 x CT: ±0.5% of reading or ±1% of rated (whichever is greater)
Directionality: Polarizing: Polarizing: Operating current: Level sensing læro-sec Level sensing lnegative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Dropout level: Dropout level: Dropout level: Dropout level: Dropout level:	(whichever is greater) E DIRECTIONAL OVERCURRENT co-existing forward and reverse voltage V_2 I_2 uence): $ [.0] - K \times  [.1]$ .5-equence): $ [.2] - K \times  [.1]$ 0.000 to 0.500 in steps of 0.001 0 to 90° in steps of 1 40 to 90° in steps of 1 40 to 90° in steps of 1 40 to 90° in steps of 0.01 0 to 50 30.00 pu in steps of 0.01 .05 to 30.00 pu in steps of 0.01 .98% 416 ms at 3 x pickup at 60 Hz E INSTANTANEOUS OVERCURRENT 0.000 to 30.000 pu in steps of 0.001 .98% of pickup 0.2 0 x CT: ±0.5% of reading or ±1% of rated (whichever is greater) x CT:
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing lzero-sec Level sensing (negative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Operation time: <b>NEGATIVE-SEQUENC</b> Pickup level: Dropout level: Dropout level: Dropout level: Dropout level: Dropout level: Dropout level: Level accuracy at 0.1 to	(whichever is greater) <b>E DIRECTIONAL OVERCURRENT</b> co-existing forward and reverse voltage V_2 l_2 uencel: $    - K \times   1 $ besequencel: $    - K \times   1 $ 0.000 to 0.500 in steps of 0.001 0 to 90° in steps of 1 40 to 90° in steps of 1 40 to 90° in steps of 1.1 40 to 90° in steps of 0.01 0.05 to 30.00 pu in steps of 0.01 0.05 to 30.00 pu in steps of 0.01 0.05 to 30.00 pu in steps of 0.01 event is at 3 x pickup at 60 Hz <b>E INSTANTANEOUS OVERCURRENT</b> 0.000 to 30.000 pu in steps of 0.001 event is greater) 2.0 x CT: ±0.5% of reading or ±1% of rated (whichever is greater) x CT: ±1.5% of reading <2%
Directionality: Polarizing: Polarizing: Operating current: Level sensing logative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Doport level: Dropout level: Dropout level: Dropout level: Level accuracy at >2.0 Overreach: Pickup delay:	(whichever is greater)           E DIRECTIONAL OVERCURRENT           co-existing forward and reverse           voltage           V_2           L_2           uencel: $ [.0] - K \times  [.1]$ -sequencel: $ [.2] - K \times  [.1]$ 0.000 to 0.500 in steps of 0.001           0 to 90° in steps of 1           40 to 90° in steps of 1, independent for           forward and reverse $\pm 2^{\circ}$ 0.00 to 250.00 ohms in steps of 0.01           0.05 to 30.00 pu in steps of 0.01           .98%           .16 ms at 3 × pickup at 60 Hz           E INSTANTANEOUS OVERCURRENT           0.000 to 30.000 pu in steps of 0.001           .98% of pickup           .0.20 x CT:           ±0.5% of reading or ±1% of rated           (whichever is greater)           x CT:           ±1.5% of reading           .2%           .0.00 to 600.00 seconds in steps of 0.01
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing læro-sed Level sensing læro-sed Level sensing læro-sed Level sensing læro-sed Level sensing læro-sed Level sensing læro- Offset impedance: Pickup lævel: Dropout level: Dropout level: Dropout level: Dropout level: Level accuracy at 0.1 to Level accuracy at >2.0 Overreach: Pickup delay: Reset delay:	(whichever is greater)           EDRECTIONAL OVERCURRENT           co-existing forward and reverse           voltage           V_2           L_2           uencel: $ L_0  - K \times   L_1 $ >sequencel: $ L_2  - K \times   L_1 $ 0.000 to 0.500 in steps of 0.001           0 to 90° in steps of 1           40 to 90° in steps of 1           0.00 to 250.00 ohms in steps of 0.01           0.05 to 30.00 pu in steps of 0.01           0.98%           <16 ms at 3 x pickup at 60 Hz
Directionality: Polarizing: Polarizing: Operating current: Level sensing logative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Doport level: Dropout level: Dropout level: Dropout level: Level accuracy at >2.0 Overreach: Pickup delay:	(whichever is greater)           E DIRECTIONAL OVERCURRENT           co-existing forward and reverse           voltage $L_2$ $L_2$ $L_2$ uencel: $\   - K \times \ 1 $ b-sequencel: $\   - K \times \ 1 $ 0.000 to 0.500 in steps of 0.001           0 to 90° in steps of 1           40 to 90° in steps of 1           0.00 to 250.00 ohms in steps of 0.01           0.05 to 30.00 pu in steps of 0.01           0.05 to 30.00 pu in steps of 0.01           •28%           <16 ms at 3 × pickup at 60 Hz
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing læro-sec Level sensing lnegative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Operation time: <b>NEGATIVE-SEQUENC</b> Pickup level: Dropout level: Level accuracy at >2.0 Overreach: Pickup delay: Reset delay: Operatione:	(whichever is greater)           E DIRECTIONAL OVERCURRENT           co-existing forward and reverse           voltage $L_2$ $L_2$ $L_2$ uencel: $\   - K \times \ 1 $ b-sequencel: $\   - K \times \ 1 $ 0.000 to 0.500 in steps of 0.001           0 to 90° in steps of 1           40 to 90° in steps of 1           0.00 to 250.00 ohms in steps of 0.01           0.05 to 30.00 pu in steps of 0.01           0.05 to 30.00 pu in steps of 0.01           •28%           <16 ms at 3 × pickup at 60 Hz
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing læro-sec Level sensing læro-sec Level sensing (negative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Dropout level: Dropout level: Dropout level: Level accuracy at >2.0 Overreach: Pickup delay: Reset delay: Operatione:	(whichever is greater) <b>E DIRECTIONAL OVERCURRENT</b> co-existing forward and reverse voltage V_2 L_2 upencel: $  \_0  - K \times   \_1 $ >esequencel: $  \_2  - K \times   \_1 $ 0.000 to 0.500 in steps of 0.001 0 to 90° in steps of 1 40 to 90° in steps of 1 40 to 90° in steps of 1 40 to 90° in steps of 1 0 to 90° in steps of 1 0 to 90° in steps of 0.001 0.05 to 30.000 pu in steps of 0.01 0.05 to 30.000 pu in steps of 0.01 ey88% <16 ms at 3 x pickup at 60 Hz <b>E INSTANTANEOUS OVERCURRENT</b> 0.000 to 30.000 pu in steps of 0.001 $< 20 \times CT:$ $\pm 0.5\%$ of reading or $\pm 1\%$ of rated (whichever is greater) x CT: $\pm 1.5\%$ of reading <2% 0.00 to 600.00 seconds in steps of 0.01 .00 to 50.00 seconds in steps of 0.01 .20 ms at 3 x pickup at 60 Hz beration at 1.5 x pickup: $\pm 3\%$ or $\pm 4$ ms (whichever is greater) E <b>OVERVOLTAGE</b>
Directionality: Polarizing: Polarizing: Operating current: Level sensing logative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Dropout level: Dropout level: Dropout level: Dropout level: Dropout level: Dropout level: Dropout level: Level accuracy at >2.0 Overreach: Pickup delay: Reset delay: Operate time: Timing accuracy for op: NEGATIVE-SEQUENC Pickup level:	(whichever is greater) <b>E DIRECTIONAL OVERCURRENT</b> co-existing forward and reverse voltage V_2 $\lfloor_2 \rfloor$ uencel: $\Vert . D - K \times \Vert . 1 \rfloor$ besequencel: $\Vert . D - K \times \Vert . 1 \rfloor$ $L > - K \times \Vert . 1 \rfloor$ 0.000 to 0.500 in steps of 0.001 $0 to 90^{\circ}$ in steps of 1 $40 to 90^{\circ}$ in steps of 1 $40 to 90^{\circ}$ in steps of 1 $40 to 90^{\circ}$ in steps of 0.01 0.05 to 30.00 pu in steps of 0.01 0.05 to 50.00 to for 40 Hz <b>E INSTANTANEOUS OVERCURRENT</b> 0.000 to 50.000 seconds in steps of 0.01 0.05 to 600.00 seconds in steps of 0.01 0.00 to 600.00 seconds in steps of 0.01 0.00 to 600.00 seconds in steps of 0.01 0.00 to 5.250 pu in steps of 0.01
Directionality: Polarizing: Polarizing voltage: Operating voltage: Operating current: Level sensing logative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Doport level: Dropout level: Dropout level: Level accuracy at >2.0 Overreach: Pickup delay: Reset delay: Operate time: Timing accuracy for op <b>NEGATIVE-SEQUENC</b> Pickup level: Dropout level: Dropout level: Dropout level: Dropout level: Directime: Timing accuracy for op	(whichever is greater)           EDRECTIONAL OVERCURRENT           co-existing forward and reverse           voltage $V_2$ $L_2$ (uence): $  _0  - K \times   _1 $ >sequence): $  _2  - K \times   _2 $ 0.000 to 0.500 in steps of 0.001           0 to 90° in steps of 1           40 to 90° in steps of 1, independent for forward and reverse $\pm 2^{\circ}$ 0.00 to 250.00 ohms in steps of 0.01           .005 to 30.00 pu in steps of 0.01           .98%           <16 ms at 3 × pickup at 60 Hz
Directionality: Polarizing: Polarizing: Operating voltage: Operating current: Level sensing læro-sec Level sensing (negative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Dropout level: Dropout level: Dropout level: Level accuracy at 0.1 to Level accuracy at >2.0 Overreach: Pickup delay: Reset delay: Operate time: Timing accuracy for op NEGATIVE-SEQUENC Pickup level:	(whichever is greater) <b>E DIRECTIONAL OVERCURRENT</b> co-existing forward and reverse voltage V_2 $\lfloor_2 \rfloor$ uencel: $\Vert . D - K \times \Vert . 1 \rfloor$ besequencel: $\Vert . D - K \times \Vert . 1 \rfloor$ $L > - K \times \Vert . 1 \rfloor$ 0.000 to 0.500 in steps of 0.001 $0 to 90^{\circ}$ in steps of 1 $40 to 90^{\circ}$ in steps of 1 $40 to 90^{\circ}$ in steps of 1 $40 to 90^{\circ}$ in steps of 0.01 0.05 to 30.00 pu in steps of 0.01 0.05 to 50.00 to for 40 Hz <b>E INSTANTANEOUS OVERCURRENT</b> 0.000 to 30.000 pu in steps of 0.01 $0.05 w of reading or ±1% of rated (whichever is greater) \times CT:\pm 1.5\% of reading<2%0.00 to 600.00 seconds in steps of 0.010.00 to 600.00 seconds in steps of 0.010.00 to 50.00 seconds in steps of 0.01c20 m at 3 x pickup at 60 HzE OVERVOLTAGE0.000 to 1.250 pu in steps of 0.01$
Directionality: Polarizing: Polarizing voltage: Operating current: Level sensing longative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Dopout level: Dropout level: Level accuracy at >2.0 Overreach: Pickup delay: Reset delay: Operate time: Timing accuracy for op <b>NEGATIVE-SEQUENC</b> Pickup level: Diropout level: Level accuracy at >2.0 Overreach: Pickup delay: Reset delay: Dirapout level: Level accuracy for op	(whichever is greater)           EDRECTIONAL OVERCURRENT           co-existing forward and reverse           voltage $V_2$ $L_2$ puence): $  _0  - K \times   _1 $ >sequence): $  _2  - K \times   _2  $ 0.000 to 0.500 in steps of 0.001           0 to 90° in steps of 1           40 to 90° in steps of 1, independent for           forward and reverse           ±2°           0.00 to 250.00 ohms in steps of 0.01           .098%           <16 ms at 3 × pickup at 60 Hz
Directionality: Polarizing: Polarizing: Operating voltage: Operating current: Level sensing logative Restraint, K: Characteristic angle: Limit angle: Angle accuracy: Offset impedance: Pickup level: Dropout level: Dropout level: Dropout level: Dropout level: Level accuracy at >2.0 Overreach: Pickup aleve: Timing accuracy for op <b>NEGATIVE-SEQUENC</b> Pickup alevel: Dirapout level: Level accuracy of 0.1 to Level accuracy of op <b>NEGATIVE-SEQUENC</b> Pickup aleve: Dropout level: Derapout level: Level accuracy for op <b>NEGATIVE-SEQUENC</b> Pickup alevel: Dropout level: Dropout level: D	[whichever is greater] E DIRECTIONAL OVERCURRENT co-existing forward and reverse voltage V_2 $\lfloor_2 \rfloor$ Lesquence: $\Vert \rbrack - K \times \Vert \rrbracket$ esequence: $\Vert \rbrack - K \times \Vert \rrbracket$ $L \ge - K \longrightarrow L \ge - K \to \Vert \rrbracket$ $L \ge - K \longrightarrow L \ge - K \to \Vert \rrbracket$ $L \supseteq - K \to L \ge - K \to \Vert \rrbracket$ $L \supseteq - K \to L \ge - K \to L \to$

	TIME OVERCURRENT
Pickup level:	0.000 to 30.000 pu in steps of 0.001
Dropout level:	<98% of pickup
Level accuracy at 0.1 to	±0.5% of reading or ±1% of rated
	(whichever is greater)
Level accuracy at >2.0 >	
Curve shapes:	±1.5% of reading IEEE Moderately Inverse, IEEE Very
carre shapes.	Inverse, IEEE Extremely Inverse, IEC
	(BS) A, IEC (BS) B, IEC (BS) C, IEC Short
	Inverse, IAC Inverse, IAC Short Inverse
	IAC Very Inverse, IAC Extremely Invers I2t, FlexCurves™ (programmable),
	definite time (0.01 second base curve
Curve multiplier:	0.01 to 600.00 in steps of 0.01
Reset type:	instantaneous/timed (per IEEE) and
T : 6 4 6	linear
Timing accuracy for 1.0.	
	±3.5% of operating time or ±1 cycle (whichever is greater)
NEUTRAL DIRECTION	
Directionality: Polarizina:	co-existing forward and reverse
Polarizing: Polarizing voltage:	voltage, current, dual V_0 or VX
Polarizing current:	IG
Operating current:	I_0
Level sensing:	$3 \times ( I_0  - K \times  I_1 )$ , IG; independent for
-	forward and reverse
Restraint (K):	0.000 to 0.500 in steps of 0.001
Characteristic angle:	-90 to 90° in steps of 1
Limit angle:	40 to 90° in steps of 1, independent for
Angle accuracy:	forward and reverse ±2°
Offset impedance:	0.00 to 250.00 ohms in steps of 0.01
Pickup level:	0.002 to 30.000 pu in steps of 0.01
Dropout level:	<98%
Operation time:	<16 ms at 3 × pickup at 60 Hz
NEUTRAL INSTANTAN	EOUS OVERCURRENT
Pickup level:	0.000 to 30.000 pu in steps of 0.001
Dropout level:	<98% of pickup
Level accuracy at 0.1 to	
	±0.5% of reading or ±1% of rated
Level accuracy at >2.0 >	(whichever is greater)
Level accuracy at >2.0 >	±1.5% of reading
Overreach:	<2%
Pickup delay:	0.00 to 600.00 seconds in steps of 0.0
Reset delay:	0.00 to 600.00 seconds in steps of 0.0
	<20 ms at 3 × pickup at 60 Hz
	<20 ms at 3 × pickup at 60 Hz eration at 1.5 × pickup:
Timing accuracy for ope	<20 ms at 3 × pickup at 60 Hz eration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater)
NEUTRAL OVERVOLTA	<20 ms at 3 × pickup at 60 Hz eration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) AGE
Timing accuracy for ope NEUTRAL OVERVOLTA Pickup level:	<20 ms at 3 × pickup at 60 Hz ration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>GE</b> 0.000 to 1.250 pu in steps of 0.001
NEUTRAL OVERVOLTA Pickup level: Dropout level:	<20 ms at 3 × pickup at 60 Hz ration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>KGE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup
Timing accuracy for ope <b>NEUTRAL OVERVOLTA</b> Pickup level: Dropout level: Level accuracy:	<20 ms at 3 × pickup at 60 Hz eration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>XGE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V
Timing accuracy for ope <b>NEUTRAL OVERVOLTA</b> Pickup level: Dropout level: Level accuracy:	<20 ms at 3 × pickup at 60 Hz eration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>XGE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V
Timing accuracy for ope <b>NEUTRAL OVERVOLTA</b> Pickup level: Dropout level: Level accuracy: Pickup delay:	<20 ms at 3 × pickup at 60 Hz ration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) AGE 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve
Timing accuracy for open <b>NEUTRAL OVERVOLTA</b> Pickup level: Dropout level: Level accuracy: Pickup delay: Timing accuracy: Timing accuracy:	<20 ms at 3 × pickup at 60 Hz ration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>GE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater)
Timing accuracy for open <b>NEUTRAL OVERVOLTA</b> Pickup level: Dropout level: Level accuracy: Pickup delay: Timing accuracy: Timing accuracy:	<20 ms at 3 × pickup at 60 Hz eration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>KGE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0
Timing accuracy for open <b>NEUTRAL OVERVOLTA</b> Pickup level: Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy:	<20 ms at 3 × pickup at 60 Hz ration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) GE 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup
Timing accuracy for open <b>NEUTRAL OVERVOLTA</b> Pickup level: Dropout level: Level accuracy: Pickup delay: Timing accuracy: Operate time: <b>NEUTRAL TIME OVER</b>	<20 ms at 3 × pickup at 60 Hz ration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) GE 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup
Timing accuracy for open NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy: Operate time: NEUTRAL TIME OVER( Current:	<20 ms at 3 × pickup at 60 Hz ration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>GE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup <b>CURRENT</b>
Timing accuracy for open NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy: Operate time: NEUTRAL TIME OVERG Current: Pickup level: Dropout level:	<20 ms at 3 × pickup at 60 Hz ration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>KGE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup <b>CURRENT</b> phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <98% of pickup
Timing accuracy for open NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy: Operate time: NEUTRAL TIME OVERG Current: Pickup level: Dropout level:	<20 ms at 3 × pickup at 60 Hz ration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>XGE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup <b>CURRENT</b> phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <98% of pickup 2.0 × CT:
Timing accuracy for open NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy: Operate time: NEUTRAL TIME OVERG Current: Pickup level: Dropout level:	<20 ms at 3 × pickup at 60 Hz ration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>XGE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup <b>CURENT</b> phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <98% of pickup 2.0 × CT: ±0.5% of reading or ±1% of rated
Timing accuracy for open NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy: Operate time: NEUTRAL TIME OVERC Current: Pickup level: Dropout level: Level accuracy at 0.1 to	<20 ms at 3 × pickup at 60 Hz eration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>XGE</b> 0.000 to 1.250 pu in steps of 0.001 +0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup <b>CURRENT</b> phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <98% of pickup 2.0 × CT: ±0.5% of reading or ±1% of rated (whichever is greater)
Timing accuracy for open NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy: Operate time: NEUTRAL TIME OVERC Current: Pickup level: Dropout level: Level accuracy at 0.1 to	<20 ms at 3 × pickup at 60 Hz ration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>XGE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup <b>CURRENT</b> phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <98% of pickup 2.0 × CT: ±0.5% of reading or ±1% of rated (whichever is greater) <ct:< td=""></ct:<>
Timing accuracy for open NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Timing accuracy: Operate time: NEUTRAL TIME OVER( Current: Pickup level: Dropout level: Level accuracy at >2.0 >	<20 ms at 3 × pickup at 60 Hz eration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>XGE</b> 0.000 to 1.250 pu in steps of 0.001 +0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup <b>CURRENT</b> phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <98% of pickup 2.0 × CT: ±0.5% of reading or ±1% of rated (whichever is greater)
Timing accuracy for open NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Timing accuracy: Operate time: NEUTRAL TIME OVER( Current: Pickup level: Dropout level: Level accuracy at >2.0 >	<20 ms at 3 × pickup at 60 Hz ration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>XGE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup <b>CURENT</b> phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <98% of pickup 2.0 × CT: ±1.5% of reading or ±1% of rated (whichever is greater) <ct: ±1.5% of reading IEEE Moderately Inverse, IEEE Very Inverse, IEEE Extremely Inverse, IEC</ct: 
Timing accuracy for open NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Timing accuracy: Operate time: NEUTRAL TIME OVER( Current: Pickup level: Dropout level: Level accuracy at >2.0 >	<20 ms at 3 × pickup at 60 Hz eration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) // SE 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve (definite time) or user-defined curve 3 cycles at 1.10 × pickup 2.0 × CT phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <98% of pickup 2.0 × CT: ±0.5% of reading or ±1% of rated (whichever is greater) < CT: ±1.5% of reading IEEE Moderately Inverse, IEEE Very Inverse, IEEE Extremely Inverse, IEC (BS) A, IEC (BS) B, IEC (BS) C, IEC Short (BS) A, IEC (BS) B, IEC (BS) C, IEC Short
Timing accuracy for open NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Timing accuracy: Operate time: NEUTRAL TIME OVER( Current: Pickup level: Dropout level: Level accuracy at >2.0 >	<20 ms at 3 × pickup at 60 Hz eration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) (SE 0.000 to 1.250 pu in steps of 0.001 ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve (definite time) or user-defined curve 3 cycles at 1.10 × pickup 2.0 × CT Phasor or RMS 0.000 to 30.000 pu in steps of 0.001 ≤98% of pickup 2.0 × CT: ±0.5% of reading or ±1% of rated (whichever is greater) < CT: ±1.5% of reading 1EEE Moderately Inverse, IEEE Very Inverse, IEEE Extremely Inverse, IEC (BS) A, IEC (BS) B, IEC (BS) C, IEC Short ISD A, IEC (BS) B, IEC (BS) C, IEC Short
Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy: Operate time: NEUTRAL TIME OVER( Current: Pickup level:	<pre>&lt;20 ms at 3 × pickup at 60 Hz eration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater)  <b>XGE</b> 0.000 to 1.250 pu in steps of 0.001 <math>&lt; 98\%</math> of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) &lt;3 cycles at 1.10 × pickup <b>CURRENT</b> phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <math>&lt; 39\%</math> of pickup 2.0 × CT: ±0.5% of reading or ±1% of rated (whichever is greater) <ct: a,="" b,="" c,="" extremely="" i<="" iac="" iec="" ieee="" iesi="" inverse="" inverse,="" moderately="" of="" reading="" short="" td="" very="" ±1.5%=""></ct:></pre>
Timing accuracy for open NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Timing accuracy: Operate time: NEUTRAL TIME OVER( Current: Pickup level: Dropout level: Level accuracy at >2.0 >	<20 ms at 3 × pickup at 60 Hz rration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>XGE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup <b>CURRENT</b> phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <98% of pickup 2.0 × CT: ±0.5% of reading r ±1% of rated (whichever is greater) <ct: ±1.5% of reading IEEE Moderately Inverse, IEEE Very Inverse, IECE Extremely Inverse, IEC (SIS) A, IEC (BS) B, IEC (BS) C, IEC Short INVERSE, IAC Extremely Inverse, IAC Very Inverse, IAC Extremely Inverse IAC Very Inverse Mc programmable),</ct: 
Timing accuracy for open NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Timing accuracy: Operate time: NEUTRAL TIME OVER Current: Pickup level: Dropout level: Level accuracy at >2.0 > Curve shapes:	<20 ms at 3 × pickup at 60 Hz rration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>XGE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup <b>CURRENT</b> phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <98% of pickup 2.0 × CT: ±0.5% of reading r ±1% of rated (whichever is greater) <ct: ±1.5% of reading IEEE Moderately Inverse, IEEE Very Inverse, IECE Extremely Inverse, IEC (SIS) A, IEC (BS) B, IEC (BS) C, IEC Short INVERSE, IAC Extremely Inverse, IAC Very Inverse, IAC Extremely Inverse IAC Very Inverse Mc programmable),</ct: 
Timing accuracy for ope NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy: Operate time: NEUTRAL TIME OVER( Current: Pickup level: Dropout level: Level accuracy at >2.0 > Curve shapes: Curve multiplier: Reset type:	<pre>&lt;20 ms at 3 × pickup at 60 Hz rration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater)  KGE 0.000 to 1.250 pu in steps of 0.001 &lt;98% of pickup 1.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 tdefinite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) &lt;3 cycles at 1.10 × pickup CURRENT phasor or RMS 0.000 to 30.000 pu in steps of 0.001 &lt;98% of pickup 2.0 × CT: ±0.5% of reading r teleE Moderately Inverse, IEEE Very Inverse, IEEE Extremely Inverse, IEC (BS) A, IEC (BS) B, IEC (BS) C, IEC Short Inverse, IAC Inverse, IAC Extremely Inverse IAC Very Inverse I</pre>
Timing accuracy for ope NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy: Operate time: NEUTRAL TIME OVER( Current: Pickup level: Dropout level: Level accuracy at >2.0 > Curve shapes: Curve multiplier: Reset type:	<20 ms at 3 × pickup at 60 Hz ration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>KGE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup <b>CURENT</b> phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <98% of pickup 2.0 × CT: ±0.5% of reading or ±1% of rated (whichever is greater) <ct: ±1.5% of reading IEEE Moderately Inverse, IEC EVery Inverse, IEC INVERS, IEC (BS) C, IEC Short Inverse, IAC Inverse, IAC Extremely Inverse IAC Very Inverse, IAC Extremely Inver</ct: 
Timing accuracy for ope NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy: Operate time: NEUTRAL TIME OVER( Current: Pickup level: Dropout level: Level accuracy at >2.0 > Curve shapes: Curve multiplier: Reset type:	20 ms at 3 × pickup at 60 Hz eration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) 43% or ±4 ms (whichever is greater) 43% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 110 × pickup CURRENT phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <98% of pickup 20 × CT: ±0.5% of reading r ±1% of rated (whichever is greater) <ct: ±1.5% of reading IEEE Moderately Inverse, IEEE Very Inverse, IEEE Extremely Inverse, IEC (BS) A, IEC (BS) B, IEC (BS) C, IEC Short Inverse, IAC Inverse, IAC Short Inverse IAC Very Inverse, IAC Extremely Inverse IAC Very Inverse (AG Chort Inverse IAC Very Inverse, IAC Extremely Inverse IAC Very Inverse IAC Very Inverse IAC Very Inverse IAC Ve</ct: 
Timing accuracy for open NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy: Operate time: NEUTRAL TIME OVERC Ourrent Pickup level: Dropout level: Level accuracy at >2.0 > Curve shapes: Curve shapes: Curve multiplier: Reset type: Timing accuracy at 1.03	<20 ms at 3 × pickup at 60 Hz ration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) <b>XGE</b> 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup <b>CURRENT</b> phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <98% of pickup 2.0 × CT: ±0.5% of reading or ±1% of rated (whichever is greater) <ct: ±1.5% of reading IEEE Moderately Inverse, IEEE Very Inverse, IECE Extremely Inverse, IEC (SIS) A, IEC (BS) B, IEC (BS) C, IEC Short ISO (SIS) B, IEC (BS) B, IPC (SIS), Inverse IAC Very Inverse, IAC Extremely Inverse IAC Very Inverse, IAC Extremely Inverse IAC Very Inverse, IAC Extremely Inverse IAC Very Inverse, IAC Short Inverse IAC Very Inverse, IAC Extremely Inverse IAC Very Inverse, IAC Short Inverse IAC Very Inverse in greater)</ct: 
Timing accuracy for ope NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy: Operate time: NEUTRAL TIME OVER( Current: Pickup level: Dropout level: Level accuracy at 0.1 to Level accuracy at >2.0 × Curve shapes: Curve shapes: Curve multiplier: Reset type: Timing accuracy at 1.03 NON-VOLATILE LATCH	<pre>&lt;20 ms at 3 × pickup at 60 Hz rration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater)  KGE 0.000 to 1.250 pu in steps of 0.001 &lt;98% of pickup 1.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 tdefinite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) &lt;3 cycles at 1.10 × pickup CURRENT phasor or RMS 0.000 to 30.000 pu in steps of 0.001 &lt;98% of pickup 2.0 × CT: ±0.5% of reading EEE Moderately Inverse, IEEE Very Inverse, IEEE Extremely Inverse, IEC (BS) A, IEC (BS) B, IEC (BS) C, IEC Short Inverse, IECE Extremely Inverse, IEC ISS) A, IEC (BS) B, IEC (BS) C, IEC Short Inverse, IAC Inverse, IAC Extremely Inverse IAC Very Inverse IAC Very Inverse, IAC Extremely Inverse IAC Very Inv</pre>
Timing accuracy for open NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Timing accuracy: Operate time: NEUTRAL TIME OVER Current: Pickup level: Dropout level: Level accuracy at >2.0 > Curve shapes: Curve shapes: Curve shapes: Curve shapes: Curve multiplier: Reset type: Timing accuracy at 1.03 NON-VOLATILE LATCH Type:	<pre>&lt;20 ms at 3 × pickup at 60 Hz pration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater)  KGE 0.000 to 1.250 pu in steps of 0.001 &lt;98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) 43 cycles at 1.10 × pickup  Phasor or RMS 0.000 to 30.000 pu in steps of 0.001 &lt;98% of pickup 2.0 × CT: ±0.5% of reading or ±1% of rated (whichever is greater) <ct: extremely="" ieee="" inverse,="" krem<="" kremely="" moderately="" of="" reading="" td="" very="" ±1.5%=""></ct:></pre>
Timing accuracy for ope NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy: Operate time: NEUTRAL TIME OVER( Current Pickup level: Dropout level: Level accuracy at 0.1 to Level accuracy at >2.0 > Curve shapes: Curve shapes: Curve shapes: Curve multiplier: Reset type: Timing accuracy at 1.03 NON-VOLATILE LATCH Type: Number:	<20 ms at 3 × pickup at 60 Hz eration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater) (SE 0.000 to 1.250 pu in steps of 0.001 <98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ±3% or ±20 ms (whichever is greater) <3 cycles at 1.10 × pickup 2.0 × CC (CURRENT Phasor or RMS 0.000 to 30.000 pu in steps of 0.001 <98% of pickup 2.0 × CC ±0.5% of reading or ±1% of rated (whichever is greater) c CT: ±1.5% of reading IEEE Moderately Inverse, IEEE Very Inverse, IEEE Extremely Inverse, IEC (BS) A, IEC (BS) B, IEC (BS) C, IEC Short Inverse, IAC Inverse, IAC Short Inverse IAC Very Inverse, IAC Sho
Timing accuracy for ope NEUTRAL OVERVOLTA Pickup level: Dropout level: Level accuracy: Pickup delay: Reset delay: Timing accuracy: Operate time: NEUTRAL TIME OVER( Current: Pickup level: Dropout level: Level accuracy at 0.1 to Level accuracy at >2.0 × Curve shapes: Curve shapes: Curve multiplier: Reset type: Timing accuracy at 1.03 NON-VOLATILE LATCH	<pre>&lt;20 ms at 3 × pickup at 60 Hz pration at 1.5 × pickup: ±3% or ±4 ms (whichever is greater)  KGE 0.000 to 1.250 pu in steps of 0.001 &lt;98% of pickup ±0.5% of reading from 10 to 208 V 0.00 to 600.00 seconds in steps of 0.0 (definite time) or user-defined curve 0.00 to 600.00 seconds in steps of 0.0 ta3% or ±20 ms (whichever is greater) 3 cycles at 1.10 × pickup  Phasor or RMS 0.000 to 30.000 pu in steps of 0.001 &lt;98% of pickup 2.0 × CT: ±0.5% of reading or ±1% of rated (whichever is greater) scT: ±1.5% of reading IEEE Moderately Inverse, IEEE Very Inverse, IEEE Extremely Inverse, IEEE Very Inverse, IEEE Stremely Inverse, IEEE Very Inverse, IEEE Extremely Inverse, IEEE Very Inverse, IEEE Extremely Inverse, IEEE Very Inverse, IEEE Extremely Inverse, IEEE Very Inverse, IEEE Very Inverse, IEEE Very Inverse, IEEE Very Inverse, IAC Very Inverse, IAC Short Inverse IAC Very Inverse, IAC Very Inverse, IAC Short Inverse, IAC Very Inve</pre>

## Technical Specifications (cont'd)

PHASE DIRECTIONAL	
Relay connection: Quadrature voltage:	90° (quadrature) phase A (VBC), phase B (VCA), phase C (VAB) for ABC phase sequence; phase A (VCB), phase B (VAC), phase C (VBA) for ACB phase sequence
Polarizing voltage thres	
Current sensitivity thres	
Characteristic angle: Angle accuracy:	0 to 359° in steps of 1 ±2°
	: <12 ms, typically (reverse load, forward fault) :: <8 ms, typically (forward load, reverse
	fault)
PHASE INSTANTANEC	
Pickup level: Dropout level:	0.000 to 30.000 pu in steps of 0.001 <98% of pickup
Level accuracy at 0.1 to	
Level accuracy at >2.0 :	< CT: ±1.5% of reading
Overreach: Pickup delay:	<2% 0.00 to 600.00 seconds in steps of 0.01
Reset delay:	0.00 to 600.00 seconds in steps of 0.01
Operate time:	<16 ms at 3 × pickup at 60 Hz
Timing accuracy for ope	±3% or ±4 ms (whichever is greater)
PHASE OVERVOLTAGE	
Voltage:	phasor only
Pickup level:	0.000 to 3.000 pu in steps of 0.001
Dropout level: Level accuracy:	<98% of pickup ±0.5% of reading from 10 to 208 V
Pickup delay:	0.00 to 600.00 seconds in steps of 0.01
Operate time:	<3 cycles at 1.10 × pickup
Timing accuracy:	±3% or ±4 ms (whichever is greater)
PHASE TIME OVERCU	
Current: Pickup level:	phasor or RMS 0.000 to 30.000 pu in steps of 0.001
Dropout level:	<98% of pickup
Level accuracy at 0.1 to	
Level accuracy at >2.0 ;	±0.5% of reading or ±1% of rated (whichever is greater)
Curve shapes:	±1.5% of reading IEEE Moderately Inverse, IEEE Very Inverse, IEEE Extremely Inverse, IEC (BS) A, IEC (BS) B, IEC (BS) C, IEC Short Inverse, IAC Inverse, IAC Short Inverse, IAC Very Inverse, IAC Extremely Inverse, I2t, FlexCurves™ (programmable), definite time (0.01 second base curve)
Curve multiplier: Reset type:	0.01 to 600.00 in steps of 0.01 instantaneous/timed (per IEEE)
Timing accuracy at 1.03	
	±3.5% of operating time or ±1 cycle (whichever is greater)
PHASE UNDERVOLTA	
Pickup level:	0.000 to 1.100 pu in steps of 0.001
Dropout level: Level accuracy: Curve shapes:	>102% of pickup ±0.5% of reading from 10 to 208 V GE IAV Inverse; Definite Time (0.1
Curve multiplier:	second base curve) 0.00 to 600.00 in steps of 0.01
	eration at <0.90 × pickup:
	±3.5% of operate time or ±4 ms (whichever is greater)
PROTECTION FLEXLO	
Programming:	Reverse Polish Notation with graphical
	visualization (keypad programmable)
Lines of code: Internal variables:	512 64
Supported operations:	NOT, XOR, OR (2 to 16 inputs), AND (2 to 16 inputs), NOR (2 to 16 inputs), NAND (2 to 16 inputs), latch (reset-dominant), edge detectors, timers
Inputs:	any logical variable, contact, or virtual input
Number of timers: Pickup delay:	32 0 to 60000 (ms, seconds, or minutes) in
	steps of 1
Dropout delay:	0 to 60000 (ms, seconds, or minutes) in steps of 1
PROTECTION VIRTUA	
Input points: Programmability:	64 self-reset or latched
ogi ar in domity.	

PROTECTION VIRTUA	L OUTPUTS
Output points: Programmability:	96 output of a protection FlexLogic equation or input to a protection FlexLogic equation
REMOTE INPUTS (IEC	61850 GSSE/GOOSE)
Input points: Remote devices: Default states on loss c Remote double-points :	on, off, latest/off, latest/on
	EC 61850 GSSE/GOOSE)
Standard output points User output points:	: 32 32
SENSITIVE DIRECTION	NAL POWER
Meosured power: Stages: Characteristic angle: Calibration angle: Minimum power: Pickup level accuracy: Hysteresis: Pickup delay: Time accuracy: Operate time:	three-phase, true RMS 2 0 to 359° in steps of 1 0.00 to 0.95° in steps of 0.05 -1.200 to 1.200 pu in steps of 0.001 ±1% or ±0.001 pu (whichever is greater) 2% or 0.001 pu (whichever is greater) 0.00 to 600.00 seconds in steps of 0.01 ±3% or ±4 ms (whichever is greater) 50 ms
SMALL SIGNAL OSCIL	
Measured value: Elements: Inputs: Minimum pickup: Pickup level accuracy: Pickup delay: Time accuracy: Operate time:	any analog value 2 6 0.02 to 10.00 pu in steps of 0.01 for alarm; 0.05 to 10.00 pu in steps of 0.01 for trip ±5% or ±0.1 pu (whichever is greater) definite time, 0.00 to 600.00 seconds in steps of 0.01 ±3% or ± 20 ms (whichever is greater) 3 / (4 × fs) to 1 / fs, where fs is the signal frequency
VT FUSE FAILURE SU	1 2
Elements:	1 per source

Monitored parameters: V\_2, V\_1, I\_1

#### Automation

AUTOMATION LOGIC	
Number of lines of logic	4096
Number of blocks:	1
Edit and view capability	Ves
Logic type:	cyclic
Programming language	
Execution rate:	50 ms
Variable types: Boolean operations:	Boolean, IEEE floating point NOT, XOR, OR, AND, NOR, NAND, any contact input, any direct input, any teleprotection input, any remote input, any virtual input, any automation logic
Arithmetic operations:	operand add, subtract, multiply, divide, negation, absolute value, square root, exponent, logarithm, sine, cosine, tangent, arcsine, arccosine, arctangent, natural logarithm, base 10 algorithm, modulo, ceiling, floor
Control operations:	latch, timer, comparator, absolute timer functions
Boolean inputs:	any contact input, direct input, teleprotection input, remote input, virtual input, or automation logic operand
Analog inputs:	any FlexAnalog™ quantity
Virtual inputs:	128
Virtual outputs:	255
Remote inputs:	64
Remote outputs:	64
Remote devices:	32
AUTOMATION VIRTUA	L INPUTS
Input points:	128
Programmability:	self-reset or latched
AUTOMATION VIRTUA	L OUTPUTS
Output points:	255
Programmability:	output of an automation logic equation or input to an automation logic equation
BREAKER CONTROL	
Mode:	single-pole, three-pole
Control:	open/close, local/SCADA
Control seal-in:	0 to 2000 ms in steps of 1
BREAKER INTERLOCK	ING
Interlocking inputs:	6

DISCONNECT CONTR Mode:	single-pole, three-pole
Control:	open/close, local/SCADA
Control seal-in:	0 to 2000 ms in steps of 1
DISCONNECT INTERL	
Interlocking inputs:	3
FAST LOAD SHEDDIN	
Elements: Algorithm:	1 adaptive (using priorities) or static
Algorium.	(using trip masks)
Static mode scenarios:	up to 32
Adaptive mode priorities	
Total of infeeds, loads, o	and aggregators monitored per C90 <sup>Plus</sup>
	up to 64 via communications plus 6 local infeeds or loads
Infeeds:	up to 32
Loads per end device:	up to 6 per GOOSE data message
Loads per C90Plus:	up to 70 (up to 64 from end device, p up to 6 from local contact input/outp
	cards)
Load groups:	up to 32
Operate time:	1/8 power system cycle (exclusive of
Dower merceurement w	communications and end device del
Power measurement up	250 ms
Elements:	CHANGE LOAD SHEDDING
Minimum voltage:	4 0.10 to 1.25 pu in steps of 0.01
Pickup level:	0.10 to 15.00 Hz/s in steps of 0.01
Dropout level:	pickup – 0.02 Hz/s
Pickup delay:	0.00 to 99.99 seconds in steps of 0.00
Dropout delay:	0.00 to 99.99 seconds in steps of 0.0
Level accuracy: Time accuracy:	30 mHz/s or 3.5% (whichever is greater) ±3% or ±4 ms (whichever is greater)
95% settling time for df	
-	<24 cycles
Operate time (typical):	6 cycles at 2 × pickup; 5 cycles at 3 ×
	pickup; 4 cycles at 5 × pickup
LOAD SHEDDING SO	
Minimum voltage picku	
Minimum voltage dropo	but: pickup + 0.20 pu
Minimum voltage dropo	out: pickup + 0.20 pu juence voltage pickup:
Minimum voltage dropo Maximum negative-sec	ut: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout:
Minimum voltage dropo Maximum negative-sec	ut: pickup + 0.20 pu uence voltage pickup: 0.00 to 1.25 pu in steps of 0.01
Minimum voltage dropo Maximum negative-sec	ut: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout:
Minimum voltage dropa Maximum negative-sea Maximum negative-sea SELECTOR SWITCH	ut: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropput: pickup - 0.20 pu 1 to 7 in steps of 1
Minimum voltage dropo Maximum negative-seo Maximum negative-seo SELECTOR SWITCH Upper position limit: Selecting mode:	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge
Minimum voltage dropa Maximum negative-sea Maximum negative-sea SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer:	ut: pickup + 0.20 pu uence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 uence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs:	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropput: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit
Minimum voltage dropa Maximum negative-sea Maximum negative-sea SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer:	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs:	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropput: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs:	ut: pickup + 0.20 pu uence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 uence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode:	ut: pickup + 0.20 pu uence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 uence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK	ut: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage diffe	put: pickup + 0.20 pu uence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 uence voltage dropput: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 rence: 0 to 100000 volts in steps of 1
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage diffe	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 rence: 0 to 100000 volts in steps of 1 nce:
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differ Maximum angle differe	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropput: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 rence: 0 to 100000 volts in steps of 1 nce: 0 to 100° in steps of 1
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differe Maximum angle differe Maximum frequency di	<ul> <li>pickup + 0.20 pu juence voltage pickup:</li> <li>0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu</li> <li>1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize/restore mode</li> <li>2 rence: 0 to 100000 volts in steps of 1 nce: 0 to 100° in steps of 1 fference: 0.00 to 2.00 Hz in steps of 0.01</li> </ul>
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differe Maximum angle differe Maximum frequency di	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropput: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 2 rence: 0 to 100000 volts in steps of 1 frerence: 0 to 10000 in steps of 1 fference: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference:
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differe Maximum angle differe Maximum frequency di Hysteresis for maximum	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 rence: 0 to 100000 volts in steps of 1 nce: 0 to 100° in steps of 1 freence: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference: 0.00 to 0.10 Hz in steps of 0.01
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differe Maximum angle differe Maximum frequency di Hysteresis for maximum	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropput: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize/restore mode 2 rence: 0 to 100000 volts in steps of 1 nce: 0 to 10000 volts in steps of 1 fference: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference: 0.00 to 2.00 Hz in steps of 0.01 none, UH & DV2, DV1 & UV2, DV1 or
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differe Maximum angle differe Maximum frequency di Hysteresis for maximum	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropput: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize/restore mode 2 rence: 0 to 100000 volts in steps of 1 nce: 0 to 10000 volts in steps of 1 fference: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference: 0.00 to 2.00 Hz in steps of 0.01 none, UH & DV2, DV1 & UV2, DV1 or
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differe Maximum angle differe Maximum frequency di Hysteresis for maximur Dead source function:	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 2 rence: 0 to 100000 volts in steps of 1 fierence: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference: 0.00 to 0.10 Hz in steps of 0.01 none, LV1 & DV2, DV1 & LV2, DV1 or DV2, DV1 xor DV2, DV1 & DV2 (L = liw DV2, DV1 xor DV2, DV1 & DV2 (L = liw D = dead)
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differe Maximum frequency di Hysteresis for maximur Dead source function: UNDERFREQUENCY I	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 2 rence: 0 to 100000 volts in steps of 1 fierence: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference: 0.00 to 0.10 Hz in steps of 0.01 none, LV1 & DV2, DV1 & LV2, DV1 or DV2, DV1 xor DV2, DV1 & DV2 (L = liw DV2, DV1 xor DV2, DV1 & DV2 (L = liw D = dead)
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differe Maximum frequency di Hysteresis for maximur Dead source function: UNDERFREQUENCY L Elements: Pickup level:	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 rence: 0 to 100000 volts in steps of 1 nce: 0 to 10000 volts in steps of 0.01 n frequency difference: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference: 0.00 to 1.01 Hz in steps of 0.01 none, IV1 & DV2, DV1 so TV2, DV1 or DV2, DV1 xor DV2, DV1 & DV2 (L = liw DV2, DV1 xor DV2, DV1 & DV2 (L = liw DV2, DV1 xor DV2, DV1 & DV2 (L = liw DCAD SHEDDING
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum frequency di Hysteresis for maximur Dead source function: UNDERFREQUENCY I Elements: Pickup level: Dropout level:	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize/restore mode 2 rence: 0 to 100000 volts in steps of 1 free: 0 to 1000° in steps of 1 freence: 0 to 100° in steps of 0.01 n frequency difference: 0.00 to 0.200 Hz in steps of 0.01 none, LVI & DV2, DVI & LV2, DVI or DV2, DVI xor DV2, DVI & DV2 (L = liw D = devd) 0AD SHEDDING 10 45.00 to 65.00 Hz in steps of 0.01 pickup level + 0.03 Hz
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differ Maximum ongle differe Maximum frequency di Hysteresis for maximur Dead source function: UNDERFREQUENCY L Elements: Pickup level: Dropout level: Pickup delay:	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropput: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize/restore mode 2 rence: 0 to 100000 volts in steps of 1 nce: 0 to 10000 volts in steps of 1 ference: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference: 0.00 to 2.00 Hz in steps of 0.01 none, UX1 & DV2, DV1 & UV2, DV1 or DV2, DV1 xor DV2, DV1 & DV2 (L = liw D = dead) CAD SHEDDING 10 45.00 to 55.00 Hz in steps of 0.01 pickup level + 0.03 Hz 0.00 to 9.99 seconds in steps of 0.01
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differe Maximum angle differe Maximum frequency di Hysteresis for maximur Dead source function: UNDERFREQUENCY L Elements: Pickup level: Dropout level: Pickup delay: Dropout delay:	put: pickup + 0.20 pu uence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 uence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 2 rence: 0 to 100000 volts in steps of 1 fference: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference: 0.00 to 100 Hz in steps of 0.01 none, LV1 & DV2, DV1 & LV2, DV1 or DV2, DV1 xor DV2, DV1 & LV2, LL = liv DV2, DV1 xor DV2, DV1 & LV2, LL = liv D = 100 45.00 to 65.00 Hz in steps of 0.01 pickup level + 0.03 Hz 0.00 to 99.99 seconds in steps of 0.0 0.00 to 99.99 seconds in steps of 0.0
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differ Maximum angle differe Maximum frequency di Hysteresis for maximur Dead source function: UNDERFREQUENCY I Elements: Pickup level: Dropout level: Dropout level: Dropout delay: Level accuracy:	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize/restore mode 2 rence: 0 to 100000 volts in steps of 1 nce: 0 to 1000° in steps of 1 ference: 0.00 to 0.200 Hz in steps of 0.01 n frequency difference: 0.00 to 0.100 Hz in steps of 0.01 n rougency DV1 & DV2 (L = liw D = dead) <b>OAD SHEDDING</b> 10 45.00 to 65.00 Hz in steps of 0.01 pickup level + 0.03 Hz 0.00 to 99.99 seconds in steps of 0.0 0.00 to 99.99 seconds in steps of 0.0 0.00 to 99.99 seconds in steps of 0.0
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differ Maximum ongle differe Maximum frequency di Hysteresis for maximur Dead source function: UNDERFREQUENCY L Elements: Pickup level: Dropout level: Pickup delay: Dropout delay: Level accuracy: Time accuracy:	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropput: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 rence: 0 to 100000 volts in steps of 1 nce: 0 to 1000 volts in steps of 0.01 in frequency difference: 0.00 to 2.00 Hz in steps of 0.01 in frequency difference: 0.00 to 0.10 Hz in steps of 0.01 in frequency difference: 0.00 to 2.00 Hz in steps of 0.01 in cone, UVI & DV2, DVI & DV2 (L = liw D = dead) CAD SHEDDING 10 45.00 to 55.00 Hz in steps of 0.01 pickup level + 0.03 Hz 0.00 to 99.99 seconds in steps of 0.0 ±0.01 Hz ±3% or 4 ms (whichever is greater)
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differ Maximum angle differe Maximum frequency di Hysteresis for maximur Dead source function: UNDERFREQUENCY I Elements: Pickup level: Dropout level: Dropout level: Dropout delay: Level accuracy:	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 6.00 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 2 conce: 0 to 100000 volts in steps of 1 nce: 0 to 10000 volts in steps of 1 nce: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference: 0.00 to 1.00 Hz in steps of 0.01 none, LVI & DV2, DVI & LV2, DVI or DV2, DVI xor DV2, DVI & LV2, UVI or DV2, DVI xor DV2, DVI & DV2 (L = liw D = dead) 0.00 to 99.99 seconds in steps of 0.01 pickup level + 0.03 Hz 0.00 to 99.99 seconds in steps of 0.02 0.00 to 99.99 seconds in steps of 0.03 0.00 to 99.99 seconds in steps of 0.02 0.00 to 99.99 seconds in steps of 0.03 0.00 to 90.99 secon
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differ Maximum ongle differe Maximum frequency di Hysteresis for maximur Dead source function: UNDERFREQUENCY L Elements: Pickup level: Dropout level: Pickup delay: Dropout delay: Level accuracy: Time accuracy:	put: pickup + 0.20 pu uence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 uence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 2 rence: 0 to 100000 volts in steps of 1 fference: 0.00 to 2.00 Hz in steps of 0.01 none, LV1 & DV2, DV1 & LV2, DV1 or DV2, DV1 xor DV2, DV1 & LV2, L = liw D = dead) 10 45.00 to 65.00 Hz in steps of 0.01 pickup level + 0.03 Hz 0.00 to 99.99 seconds in steps of 0.0 ±0.01 Hz ±3% or 4 ms (whichever is greater) 4 cycles at -0.1 Hz/s change; 35. cyc
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differ Maximum ongle differe Maximum frequency di Hysteresis for maximur Dead source function: UNDERFREQUENCY L Elements: Pickup level: Dropout level: Pickup delay: Dropout delay: Level accuracy: Time accuracy:	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropput: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 rence: 0 to 100000 volts in steps of 1 nce: 0 to 100000 volts in steps of 1 ference: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference: 0.00 to 2.00 Hz in steps of 0.01 none, IUX & DV2, DV1 & DV2 (L = liw D = dead) OAD SHEDDING 10 45.00 to 55.00 Hz in steps of 0.01 pickup level + 0.03 HZ ±3% or 4 ms (whichever is greater) 4 cycles at -0.1 Hz/s change; 3 cycles at -0.5 Hz/s change
Minimum voltaĝe dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differe Maximum angle differe Maximum frequency di Hysteresis for maximur Dead source function: UNDERFREQUENCY L Elements: Pickup level: Dropout level: Pickup delay: Level accuracy: Operate time (typical): UNDERVOLTAGE LOA Elements:	put: pickup + 0.20 pu uence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 uence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 2 7 0 to 100000 volts in steps of 1 fference: 0 to 100000 volts in steps of 1 fference: 0 to 1000 in steps of 1 fference: 0.00 to 2.00 Hz in steps of 0.01 none, LV1 & DV2, DV1 & LV2, DV1 or DV2, DV1 xor DV2, DV1 & LV2, DV1 & LV2, DV1 or DV2, DV1 xor DV2, DV1 & LV2, DV1 & LV2, DV1 or DV2, DV1 xor DV2, DV1 & LV2, DV1
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differ Maximum onlage differe Maximum onlage differe Maximum requency di Hysteresis for maximur Dead source function: UNDERFREQUENCY I Elements: Pickup level: Dropout delay: Level accuracy: Operate time (typical): UNDERVOLTAGE LOA Elements: Pickup level:	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 6.00 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 2 conce: 0 to 100000 volts in steps of 1 nece: 0 to 1000° in steps of 1 fference: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference: 0.00 to 2.00 Hz in steps of 0.01 none, LVI & DV2, DVI & LV2, DVI or DV2, DVI xor DV2, DVI & LV2, UVI or DV2, DVI ar DV2, DVI & DV2 (L = liw D = dead) 0.00 to 99.99 seconds in steps of 0.01 pickup level + 0.03 Hz 0.00 to 99.99 seconds in steps of 0.02 0.00 to 99.99 seconds in steps of 0.03 0.00 to 99.99 seconds in steps of 0.03 0.00 to 99.99 seconds in steps of 0.04 4 cycles at -0.1 Hz/s change; 3 cycles at -0.5 Hz/s change 6 0.10 to 1.25 pu in steps of 0.01
Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differe Maximum onltage differe Maximum ongle differe Maximum frequency di Hysteresis for maximur Dead source function: UNDERFREQUENCY L Elements: Pickup delay: Dropout level: Dropout delay: Level accuracy: Operate time (typical): UNDERVOLTAGE LOA Elements: Pickup level: Dropout level: Dropout level: Dropout level: Dropout level: Dropout level:	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 rence: 0 to 100000 volts in steps of 1 freence: 0 to 100° in steps of 1 freence: 0 to 100° in steps of 0.01 ner (UL) (UL) (UL) (UL) (UL) (UL) 10 0 to 100° in steps of 0.01 none, UL & DV2, DV1 & UV2 (UL = liv) D = dead 0.00 to 9.99 seconds in steps of 0.01 pickup level + 0.03 Hz 0.00 to 9.99 seconds in steps of 0.01 pickup level + 0.03 Hz 0.00 to 9.9.99 seconds in steps of 0.01 ±3% or 4 ms (whichever is greater) 4 cycles at -0.1 Hz/s change; 3.5 cyc at -0.3 Hz/s change; 3 cycles at -0.5 Hz/s change D SHEDDING 6 0.10 to 1.25 pu in steps of 0.01 pickup level + 0.20 pu
Minimum voltaĝe dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differe Maximum angle differe Maximum frequency di Hysteresis for maximur Dead source function: UNDERFREQUENCY L Elements: Pickup level: Dropout level: Pickup delay: Level accuracy: Operate time (typical): UNDERVOLTAGE LOA Elements: Pickup level: Dropout level: Dropo	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 60.0 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize/restore mode 2 rence: 0 to 100000 volts in steps of 1 freernce: 0 to 100° in steps of 1 freernce: 0 to 100° in steps of 0.01 n frequency difference: 0.00 to 0.20 Hz in steps of 0.01 none, LVI & DV2, DVI & DV2 (L = liw D = dead) OAD SHEDDING 10 45.00 to 65.00 Hz in steps of 0.01 pickup level + 0.03 Hz 0.00 to 0.31 Hz + 3% or 4 ms (whichever is greater) 4 cycles at -0.1 Hz/s change, 3 cycles at -0.5 Hz/s change D SHEDDING 6 0.01 to 1.25 pu in steps of 0.01 pickup level + 0.20 pu 0.00 to 99.99 seconds in steps of 0.01 pickup level + 0.20 pu 0.01 to 1.25 pu in steps of 0.01 pickup level + 0.20 pu 0.00 to 99.99 seconds in steps of 0.01 pickup level + 0.20 pu 0.01 to 1.25 pu in steps of 0.01 pickup level + 0.20 pu 0.00 to 99.99 seconds in steps of 0.01 pickup level + 0.20 pu 0.00 to 99.99 seconds in steps of 0.01 pickup level + 0.20 pu 0.00 to 99.99 seconds in steps of 0.01 pickup level + 0.20 pu 0.00 to 99.99 seconds in steps of 0.01 pickup level + 0.20 pu
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Minimum voltage dropo Maximum negative-sec Maximum negative-sec SELECTOR SWITCH Upper position limit: Selecting mode: Time-out timer: Control inputs: Power-up mode: SYNCHROCHECK Elements: Maximum voltage differ Maximum ongle differe Maximum frequency di Hysteresis for maximur Dead source function: UNDERFREQUENCY I Elements: Pickup level: Dropout tevel: Pickup delay: Level cevel: Pickup delay: Dropout delay: Level accuracy: Operate time (typical):	put: pickup + 0.20 pu juence voltage pickup: 0.00 to 1.25 pu in steps of 0.01 juence voltage dropout: pickup - 0.20 pu 1 to 7 in steps of 1 time-out or acknowledge 3.0 to 6.00 seconds in steps of 0.1 step-up and three-bit restore from non-volatile memory or synchronize to a three bit control inp or synchronize/restore mode 2 2 conce: 0 to 100000 volts in steps of 1 nece: 0 to 1000° in steps of 1 fference: 0.00 to 2.00 Hz in steps of 0.01 n frequency difference: 0.00 to 2.00 Hz in steps of 0.01 none, LVI & DV2, DVI & LV2, DVI or DV2, DVI xor DV2, DVI & LV2, UVI or DV2, DVI ar DV2, DVI & DV2 (L = liw D = dead) 0.00 to 99.99 seconds in steps of 0.01 pickup level + 0.03 Hz 0.00 to 99.99 seconds in steps of 0.02 0.00 to 99.99 seconds in steps of 0.03 0.00 to 99.99 seconds in steps of 0.03 0.00 to 99.99 seconds in steps of 0.04 4 cycles at -0.1 Hz/s change; 3 cycles at -0.5 Hz/s change 6 0.10 to 1.25 pu in steps of 0.01

## Equipment Manager

BATTERY MONITOR	
Principle: alarms	monitors battery voltage and auxiliary
Hysteresis:	5%
Timing accuracy:	1 cycle
BREAKER ARCING	CURRENT
Elements:	1 per breaker (to a maximum of 2)
Principle:	accumulates contact wear (Ixt), measures fault magnitude and duration
Auxiliary contact com	pensation:
	0 to 50 ms in steps of 1
Alarm threshold:	0 to 50000 kA2-cycle in steps of 1 cy: 0.25 of power cycle

## Metering

CURRENT METERING	
Type:	phase and ground RMS current
Accuracy at 0.1 to 2.0 ×	CT: ±0.25% of reading or ±0.1% of rated (whichever is greater) at 50/60 Hz nominal frequency
Accuracy at >2.0 × CT:	±1.0% of reading, at 50/60 Hz nominal frequency
DATA LOGGER	
Channels:	1 to 16
Parameters: Statistics:	any FlexAnalog value maximum and time of maximum,
Statistics.	minimum and time of minimum, average
Alarms:	high, high-high, low, low-low
ENERGY METERING	
Type:	positive and negative watt-hours and var-hours
Accuracy:	±2.0% of reading
Range:	–2.0 × 109 to 2.0 × 109 MWh/Mvarh
Parameters: Update rate:	three-phase only 50 ms
FREQUENCY METERIN	
Accuracy at V = 0.8 to 1	
-	±0.001 Hz (when voltage signal is used for frequency measurement)
Accuracy at I = 0.1 to 0.	25 pu: ±0.05 Hz (when current signal is used for frequency measurement)
Accuracy at I > 0.25 pu:	±0.001 Hz (when current signal is used for frequency measurement)
PHASOR MEASUREM	
PHASOR MEASUREME Output format: Channels:	per IEEE C37.118 standard 14 synchrophasors, 8 analogs, 16
Output format:	per IEEE C37.118 standard
Output format: Channels:	per IEEE C37.118 standard 14 synchrophasors, 8 analogs, 16 digitals <1% frequency, voltage, current, power, rate
Output format: Channels: TVE (total vector error):	per IEEE C37.118 standard 14 synchrophasors, 8 analogs, 16 digitals <1% frequency, voltage, current, power, rate of change of frequency, user-defined 1, 2, 5, 10, 12, 15, 20, 25, 30, 50, or 60
Output format: Channels: TVE (total vector error): Triggering:	per IEEE C37.118 standard 14 synchrophasors, 8 analogs, 16 digitals <1% frequency, voltage, current, power, rate of change of frequency, user-defined
Output format: Channels: TVE (total vector error): Triggering: Reporting rate:	per IEEE C37.118 standard 14 synchrophasors, 8 analogs, 16 digitals <1% frequency, voltage, current, power, rate of change of frequency, user-defined 1, 2, 5, 10, 12, 15, 20, 25, 30, 50, or 60 times per second One over TCP/IP port, two over UDP/IP
Output format: Channels: TVE (total vector error): Triggering: Reporting rate: Number of clients:	per IEEE C37.118 standard 14 synchrophasors, 8 analogs, 16 digitals <1% frequency, voltage, current, power, rate of change of frequency, user-defined 1, 2, 5, 10, 12, 15, 20, 25, 30, 50, or 60 times per second One over TCP/IP port, two over UDP/IP ports as indicated in appropriate specifications sections at: 16-bit integer or 32-bit IEEE floating
Output format: Channels: TVE (total vector error): Triggering: Reporting rate: Number of clients: AC ranges: Network reporting form	per IEEE C37.118 standard 14 synchrophasors, 8 analogs, 16 digitals <1% frequency, voltage, current, power, rate of change of frequency, user-defined 1, 2, 5, 10, 12, 15, 20, 25, 30, 50, or 60 times per second One over TCP/IP port, two over UDP/IP ports as indicated in appropriate specifications sections at: 16-bit integer or 32-bit IEEE floating point numbers rectongular (real and imaginary) or polar (magnitude and angle)
Output format: Channels: TVE (total vector error): Triggering: Reporting rate: Number of clients: AC ranges: Network reporting form	per IEEE C37.118 standard 14 synchrophasors, 8 analogs, 16 digitals <1% frequency, voltage, current, power, rate of change of frequency, user-defined 1, 2, 5, 10, 12, 15, 20, 25, 30, 50, or 60 times per second One over TCP/IP port, two over UDP/IP ports as indicated in appropriate specifications sections at: 16-bit integer or 32-bit IEEE floating point numbers rectangular (real and imaginary)
Output format: Channels: TVE (total vector error): Triggering: Reporting rate: Number of clients: AC ranges: Network reporting form Network reporting style: Post-filtering: Calibration:	per IEEE C37.118 standard 14 synchrophasors, 8 analogs, 16 digitals <1% frequency, voltage, current, power, rate of change of frequency, user-defined 1, 2, 5, 10, 12, 15, 20, 25, 30, 50, or 60 times per second One over TCP/IP port, two over UDP/IP ports as indicated in appropriate specifications sections at: 16-bit integer or 32-bit IEEE floating point numbers rectangulor (real and imaginary) or polar (magnitude and angle) coordinates none, 3-point, 5-point, 7-point
Output format: Channels: TVE (total vector error): Triggering: Reporting rate: Number of clients: AC ranges: Network reporting form Network reporting style: Post-filtering:	per IEEE C37.118 standard 14 synchrophasors, 8 analogs, 16 digitals <1% frequency, voltage, current, power, rate of change of frequency, user-defined 1, 2, 5, 10, 12, 15, 20, 25, 30, 50, or 60 times per second One over TCP/IP port, two over UDP/IP ports as indicated in appropriate specifications sections at: 16-bit integer or 32-bit IEEE floating point numbers rectangulor (real and imaginary) or polar (magnitude and angle) coordinates none, 3-point, 5-point, 7-point
Output format: Channels: TVE (total vector error): Triggering: Reporting rate: Number of clients: AC ranges: Network reporting form Network reporting style: Post-filtering: Calibration: POWER METERING Real power accuracy: Reactive power accuracy	per IEEE C37.118 standard 14 synchrophasors, 8 analogs, 16 digitals <1% frequency, voltage, current, power, rate of change of frequency, user-defined 1, 2, 5, 10, 12, 15, 20, 25, 30, 50, or 60 times per second One over TCP/IP port, two over UDP/IP ports as indicated in appropriate specifications sections at: 16-bit integer or 32-bit IEEE floating point numbers rectangular (real and imaginary) or polar (magnitude and angle) coordinates none, 3-point, 5-point, 7-point $\pm 5^{\circ}$ $\pm 1.0\%$ of reading at $-1.0 \le PF < 0.8$ and $0.8 < PF \le 1.0$ 21:
Output format: Channels: TVE (total vector error): Triggering: Reporting rate: Number of clients: AC ranges: Network reporting form Network reporting style: Post-filtering: Calibration: POWER METERING Real power accuracy:	per IEEE C37.118 standard 14 synchrophasors, 8 analogs, 16 digitals <1% frequency, voltage, current, power, rate of change of frequency, user-defined 1, 2, 5, 10, 12, 15, 20, 25, 30, 50, or 60 times per second One over TCP/IP port, two over UDP/IP ports as indicated in appropriate specifications sections at: 16-bit integer or 32-bit IEEE floating point numbers rectangular (real and imaginary) or polar (magnitude and angle) coordinates none, 3-point, 5-point, 7-point $\pm 5^{\circ}$ $\pm 1.0\%$ of reading at $-1.0 \le PF < 0.8$ and $0.8 < PF \le 1.0$ 21:
Output format: Channels: TVE (total vector error): Triggering: Reporting rate: Number of clients: AC ranges: Network reporting form Network reporting style: Post-filtering: Calibration: POWER METERING Real power accuracy: Reactive power accuracy	per IEEE C37.118 standard 14 synchrophasors, 8 analogs, 16 digitals <1% frequency, voltage, current, power, rate of change of frequency, user-defined 1, 2, 5, 10, 12, 15, 20, 25, 30, 50, or 60 times per second One over TCP/IP port, two over UDP/IP ports as indicated in appropriate specifications sections at: 16-bit integer or 32-bit IEEE floating point numbers rectangular (real and imaginary) or polar (magnitude and angle) coordinates none, 3-point, 5-point, 7-point $\pm 5^{\circ}$ $\pm 1.0\%$ of reading at $-1.0 \le PF < 0.8$ and $0.8 < PF \le 1.0$ 2Y: $\pm 1.0\%$ of reading at $-0.2 \le PF \le 0.2$ CY:
Output format: Channels: TVE (total vector error): Triggering: Reporting rate: Number of clients: AC ranges: Network reporting form Network reporting style: Post-filtering: Calibration: POWER METERING Real power accuracy: Reactive power accuracy	per IEEE C37.118 standard 14 synchrophasors, 8 analogs, 16 digitals <1% frequency, voltage, current, power, rate of change of frequency, user-defined 1, 2, 5, 10, 12, 15, 20, 25, 30, 50, or 60 times per second One over TCP/IP port, two over UDP/IP ports as indicated in appropriate specifications sections at: 16-bit integer or 32-bit IEEE floating point numbers rectangular (real and imaginary) or polar (magnitude and angle) coordinates none, 3-point, 5-point, 7-point $\pm 5^{\circ}$ $\pm 1.0\%$ of reading at $-1.0 \le PF < 0.8$ and $0.8 < PF \le 1.0$ 2Y: $\pm 1.0\%$ of reading at $-0.2 \le PF \le 0.2$ CY:

## Digital Fault Recorder

Storage capacity:       one record with all available channels at 60 samples per second for 40 seconds         Maximum records:       64         Sampling accuracy:       41 ms per second of recording         Analog channel date:       any FlexAnalog™ quantity         Digital channel date:       any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand         Triggers:       any digital change of state (user-programmable), undervoltage, directurent, overcurrent, underfrequency, overvoltage, undercurrent, overcurrent, underfrequency, overvoltage, undervoltage, directurent, overcurrent, underfrequency, overvoltage, undervoltage, directure, to event         Storage modes:       time window from rising edge of trigger, continuous recording as long as trigger is active         Pre-trigger window:       0 to 100%         Data storage:       non-volatile memory <b>EVENT RECONDER</b> Storage copacity:         Storage copacity:       8192 events         Time tag:       to 1 ms         Triggers:       any contact input, direct input, remote input, virtual input, logic operand, or self-test event         Data storage:       non-volatile memory <b>FAULT REPORT</b> Records:         Records:       5         Data       single-ended         Accuracy:       2% of line length         Units:       miles o	DISTURBANCE RECO	RDER
at 60 samples per second for 40       Maximum records:     64       Sampling accuracy:     1 sample per cycle       Analog channels:     64       Analog channels:     64       Analog channels:     32       Digital channel data:     any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand       Triggers:     any contact input, automation logic operand, or FlexLogic operand       Triggerigers:     any contact input, automation logic operand, or FlexLogic operand       Triggeriger modes:     automatic overwrite, programmable lingger, 1 lock       Storage modes:     automatic overwrite, protected       Triggeriger window:     0 to 100%       Data storage:     non-volatile memory <b>EVENT RECORDER</b> Storage capacity:       Storage capacity:     8192 events       Time tag:     to 1 ms       Triggers:     any contact input, direct input, remote input, virtual input, logic operand, or self-test event       Data storage:     non-volatile memory <b>FAULT REPORT</b> Storage capacity:       Records:     5       Data     strain and circuit 1D, date and time of trigger, irrimware revision       Triggers:     strain and circuit 1D, date and time of trigger, irrimware revision       Triggers:     strain and circuit 1D, date and time of trigger, irrimware revision		one record with all available channels
Maximum records:64Sampling accuracy: Analog channels:1 sample per cycleAnalog channels:64Analog channels:32Digital channels:32Digital channels:any FlexAnalog <sup>™</sup> quantityDigital channels:any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operandTriggers:any dijtal change of state luser- programmable lundervoltage, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, 1 user- programmable trigger, 1 lockStorage modes:automatic overwrite, protectedTriggering modes:time window from rising edge of trigger, continuous recording as long as trigger is activePre-trigger window:0 to 100%Data storage:non-volatile memoryFUENT RECORDERStorage capacity:Storage capacity:8192 eventsTime tag:to 1 msTriggers:any contact input, direct input, remote input, virtual input, logic operand, or self-test eventData storage:non-volatile memoryFAULT REPORTIt current and voltage phosors 12 cycles before 50DD associated with fuilt report sourcel, form fault report torager, from fault current and voltage phosors 12 cycles before 50DD associated with fuilt report sourcel, form fault report torage, firmware revisionTriggers:user-selected operandData storage:non-volatile memoryFAULT REPORTFSC relay name, firmware revision, contingency date/time and duration, scend-ystate power flows, infeed lost, scenaros <td< td=""><td>5 111.01</td><td>at 60 samples per second for 40</td></td<>	5 111.01	at 60 samples per second for 40
Sampling rate:1 sample per cycleSampling accuracy:<1 ms per second of recording	Mandani and I	
Sampling accuracy:At ms per second of recording Analog channels:64Analog channel data:any FlexAnalog <sup>M</sup> quantityDigital channels:32Digital channel data:any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLagic operandTriggers:any digital change of state luser- programmable, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency. Juser- programmable trigger, 1 lockStorage modes:utme window from rising edge of trigger, continuous recording as long as trigger is activePre-trigger window:0 to 100%Data storage:non-volatile memory <b>EVENT RECORDER</b> EventsStorage capocity:8192 eventsTime tag:to 1 msTriggers:stotion and circuit ID, date and time of trigger, frager, fra		
Analog channels:64Analog channel data:any FlexAnalog™ quantityDigital channel data:any contact input, direct input, remateinput, virtual input, automation logicoperand, or FlexLogic operandTriggers:any digital change of state luser- programmablel, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, 1 user- programmable trigger, 1 lockStorage modes:automatic overwrite, protectedTriggering modes:time window from rising edge of trigger, to to 100%Pre-trigger window:0 to 100%Data storage:non-volatile memory <b>EVENT RECORDER</b> Storage capacity:Storage capacity:8192 eventsTime tag:to 1 msTriggers:any contact input, direct input, remote input, virtual input, logic operand, or self-test eventData storage:non-volatile memory <b>FAULT REPORT</b> Station and circuit ID, date and time of trig, firmware revisionTriggers:user-selected operandData:single-endedAccuracy:2% of line lengthUnits:miles or kilometersTrigger:for fund line memory <b>FAULT LOCATOR</b> Method:single-endedAccuracy:2% of line lengthData storage:non-volatile memory <b>FAULT LOCATOR</b> Method:single-endedAccuracy:2% of line lengthData storage:non-volatile memory <b>FAULT REPORT</b> Records:16Data:FLSC r		
Analog channel data:       any FlexAnalog™ quantity         Digital channels:       32         Digital channel data:       any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand         Triggers:       any digital change of state (user-programmable), undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, 1 user-programmable trigger, 1 lock         Storage modes:       automatic overwrite, protected         Triggering modes:       time window from rising edge of trigger, continuous recording as long as trigger is active         Pre-trigger window:       0 to 100%         Data storage:       non-volatile memory <b>EVENT RECORDER</b> Storage copacity:         Storage capacity:       8192 events         Time tag:       to 1 ms         Triggers:       ony contact input, direct input, remote input, virtual input, logic operand, or self-test event         Data storage:       non-volatile memory <b>FAULT REPORT</b> Taule and voltage phasors (2 cycles before 50DD associated with foult report source), foult current and voltage phasors (2 cycles before 50DD associated with foult report source), foult current and voltage phasors (2 cycles thefore 50DD associated with foult report source), foult current and voltage phasors (1 cycle for 1 minute scenarios encountered, load groups shed, settings ency of the scenarios encountered, load groups shed, settings ency of the scenarios, contingency date/time and duration, steady-state power flow		
Digital channels:32Digital channel data:any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operandTriggers:any digital change of state luser- programmablel, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of strequency, luser- programmable trigger, lockStorage modes:automatic overwrite, protectedTriggering modes:time window from rising edge of trigger, continuous recording as long as trigger is activePre-trigger window:0 to 100% Data storage: non-volatile memoryEVENT RECORDERStorage capacity: 8192 events Time tag: to 1 msTriggers:any contact input, direct input, remote input, virtual input, digic operand, or self-test eventData storage:non-volatile memoryFAULT REPORTRecords:Records:5Data:station and circuit ID, date and time of trigger, firmware revision trigger:Triggers:user-selected operand on-volatile memoryFAULT LOCATORsingle-ended Accuracy:Records:16Data:FLSC relay name, firmware revision, contingeroy date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date stat 25 samples per cycle for 1 minuteNumber of records:1 to 64Data storage:non-volatile memoryFAULT LOCATORmemoryRecords:16DataTLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenari		
Digital channel data:       ony contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand         Triggers:       any digital change of state luser-programmable, undervoltage, undercurrent, overcurrent, underfrequency, overfrequency, overfrequency, rate of change of frequency, 1 user-programmable trigger, 1 lock         Storage modes:       automatic overwrite, protected         Triggering modes:       time window from rising edge of trigger, continuous recording as long as trigger is active         Pre-trigger window:       0 to 100%         Data storage:       non-volatile memory <b>EVENT RECORDER</b> Storage capacity:         Storage capacity:       8192 events         Tringers:       ony contact input, direct input, remote input, virtual input, logic operand, or self-test event         Data storage:       non-volatile memory         FALLT REPORT       Records:         Records:       5         Data:       station and circuit ID, date and time of trigger, firmware revision         Triggers:       user-selected operand         Data storage:       non-volatile memory         FALLT LOCATOR       Fuestores         Method:       single-ended         Accuracy:       2% of line length         Units:       miles or kilometers         Triggers:       non-volatile memory </td <td></td> <td></td>		
input, virtual input, automation logic operand, or FlexLogic operand any digital change of state (user- programmabile), undervoltage, overvoltage, undercurrent, underfrequency, under trade of change of frequency, 1 user- programmable trigger, 1 lockStorage modes:automatic overwrite, protectedTriggering modes:automatic overwrite, protectedTriggering modes:non-volatile memoryEVENT RECORDERStorage capacity:Storage capacity:8192 eventsTime tag:to 1 msTriggers:any contact input, direct input, remote input, virtual input, logic operand, or self-test eventData storage:non-volatile memoryFALLT REPORTRecords:5Data:station and circuit ID, date and time of trip, fault type, active setting group at time of trigger, pre-fault current and voltage phasors I2 cycles before 5DD associated with fault report source), fault current and voltage phasors 11 cycle after trigger, invare revisionTriggers:user-selected operand bata storage:Data storage:non-volatile memoryFAULT LOCATORMethod:single-ended Accuracy:Accuracy:2% of line length units:Units:miles or kilometersTriggers:any FLS contingency and voltatie power flows, infeeds lost, scenarios encountered, load groups shed, settings lost change dateTriggers:any FLS contingency antice data storage:Triggers:any FLS contingency and voltatie power flows, infeeds lost, scenarios encountered, load groups shed, settings lost change dateTriggers:any FL		any contact input, direct input, remote
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Triggering modes:       time window from rising edge of trigger, continuous recording as long as trigger is active         Pre-trigger window:       0 to 100%         Data storage:       non-volatile memory         EVENT RECORDER       Storage capacity:         Storage capacity:       8192 events         Time tag:       to 1 ms         Triggers:       any contact input, direct input, remate input, virtual input, logic operand, or self-test event         Data storage:       non-volatile memory         FAULT REPORT       Records:         Records:       5         Data:       station and circuit ID, date and time of trigger, pre-fault current and voltage phasors (2 cycles before 50DD associated with foul trigger, firmware revision         Trigger:       user-selected operand         Data storage:       non-volatile memory         FAULT LOCATOR       Wethod:         Method:       single-ended         Accuracy:       2% of line length         Units:       miles or kilometers         Trigger:       for four furger, infeeds lost, scenarios encountered, load groups shed, settings lost change date         Trigger:       non-volatile memory         FALL LOCATOR       Storage capacity:         Pata storage:       non-volatile memory         FAST LOAD SHED REPORT		programmable), undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, 1 user- programmable trigger, 1 lock
Data storage:       non-volatile memory         EVENT RECORDER       Storage capacity:       8192 events         Time tag:       to 1 ms         Triggers:       ony contact input, direct input, remote input, virtual input, logic operand, or self-test event         Data storage:       non-volatile memory         FAULT REPORT       Execords:         Records:       5         Data:       station and circuit ID, date and time of trigger, pre-fault current and voltage phosors (2 cycles before 50DD associated with fault report source), fault current and voltage phosors (1 cycle after trigger), protection elements operated at time of trigger; imware revision         Triggers:       user-selected operand         Data storage:       non-volatile memory         FAULT LOCATOR       Execures:         Method:       single-ended         Accuracy:       2% of line length         Units:       miles or kilometers         Trigger:       from fault report         Data storage:       non-volatile memory         FASE LOAD SHED REPORT       Execords:         Records:       16         Data:       fLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, lineeds lost, scenarios encountered, load groups shed, settings lost change date         Triggers:       ony FLS contingency	5	time window from rising edge of trigger, continuous recording as long as trigger is active
EVENT RECORDER           Storage capacity:         8192 events           Time tag:         to 1 ms           Triggers:         up contact input, direct input, remote input, virtual input, logic operand, or self-test event           Data storage:         non-volatile memory           FAULT REPORT         Records:           Records:         5           Data:         station and circuit ID, date and time of trigger, firmware revision           Triggers:         user-selected operand Data storage:           Data torage:         non-volatile memory           FAULT LOCATOR         Method:           Method:         single-ended           Accuracy:         2% of line length Units:           Units:         miles or kilometers           Trigger:         from fault report           Data storage:         non-volatile memory           FAST LOAD SHED REPORT         Records:           Records:         16           Data:         FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, lineeds lost, scenarios encountered, load groups shed, settings last change date           Triggers:         on record with all available channels at 32 samplies per cycle for 1 minute           Triggers:         on record with all available channels at 32 samples per cycle for 1 minute     <	Pre-trigger window:	0 to 100%
Storage capacity:       8192 events         Time tag:       to 1 ms         Triggers:       uny contact input, direct input, remote input, virtual input, logic operand, or self-test event         Data storage:       non-volatile memory         FAULT REPORT       Records:         Records:       5         Data:       station and circuit ID, date and time of trigger, pre-fault current and voltage phasors (2 cycles before 50DD associated with foult report source), fault current and voltage phasors (1 cycle after trigger), protection elements operated at time of trigger; firmware revision         Triggers:       user-selected operand         Data storage:       non-volatile memory         FAULT LOCATOR       Method:         Nethod:       single-ended         Accuracy:       2% of line length         Units:       miles or kilometers         Trigger:       fom fault report         Data storage:       non-volatile memory         FAST LOAD SHED REPORT       Records:         Records:       16         Data:       FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings lost change date         Triggers:       any FLS contingency         Data:       FLSC relay name, firmware revision, contingency <t< td=""><td>Data storage:</td><td>non-volatile memory</td></t<>	Data storage:	non-volatile memory
Storage capacity:       8192 events         Time tag:       to 1 ms         Triggers:       uny contact input, direct input, remote input, virtual input, logic operand, or self-test event         Data storage:       non-volatile memory         FAULT REPORT       Records:         Records:       5         Data:       station and circuit ID, date and time of trigger, pre-fault current and voltage phasors (2 cycles before 50DD associated with foult report source), fault current and voltage phasors (1 cycle after trigger), protection elements operated at time of trigger; firmware revision         Triggers:       user-selected operand         Data storage:       non-volatile memory         FAULT LOCATOR       Method:         Nethod:       single-ended         Accuracy:       2% of line length         Units:       miles or kilometers         Trigger:       fom fault report         Data storage:       non-volatile memory         FAST LOAD SHED REPORT       Records:         Records:       16         Data:       FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings lost change date         Triggers:       any FLS contingency         Data:       FLSC relay name, firmware revision, contingency <t< td=""><td>EVENT RECORDER</td><td></td></t<>	EVENT RECORDER	
Time tag:       to 1 ms         Triggers:       any contact input, direct input, remote input, virtual input, logic operand, or self-test event         Data storage:       non-volatile memory         FAULT REPORT       Execurds:         Records:       5         Data:       station and circuit ID, date and time of trigger, pre-fault current and voltage phasors (2 cycles before 50DD associated with fault report source), fault current and voltage phasors (1 cycle after trigger), protection elements operated at time of trigger, firmware revision         Triggers:       user-selected operand         Data storage:       non-volatile memory         FAULT LOCATOR       Method:         Method:       single-ended         Accuracy:       2% of line length         Units:       miles or kilometers         Trigger:       from fault report         Data storage:       non-volatile memory         FAST LOAD SHED REPORT       Records:         Records:       16         Data:       FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date         Triggers:       any FLS contingency         Data storage:       non-volatile memory         TRANSIENT RECORDEX       Storage capacity:         Storage c		8192 events
Triggers:       ony contact input, direct input, remote input, virtual input, logic operand, or self-test event         Data storage:       non-volatile memory         FAULT REPORT       Execords:         Records:       5         Data:       station and circuit ID, date and time of trip, fault type, active setting group at time of trigger, pre-fault current and voltage phosors (2 cycles before 50D bassociated with fault report source), fault current and voltage phosors (1 cycle after trigger, initware revision         Triggers:       user-selected operand         Data storage:       non-volatile memory         FAULT LOCATOR       Method:         Single-ended       Accuracy:         Accuracy:       2% of line length         Units:       miles or kilometers         Trigger:       from fault report         Data storage:       non-volatile memory         FAST LOAD SHED REPORT       Records:         Records:       16         Data:       FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, lineteds lost, scenarios encountered, load groups shed, settings lost change date         Triggers:       one record with all available channels         Triggers:       one record with all available channels         Storage capacity:       one record with all available channels         Storage capacity: </td <td></td> <td></td>		
Data storage:       non-volatile memory         FAULT REPORT       station and circuit ID, date and time of trig. foult type, active setting group at time of trig. foult type, active setting group at time of trig. foult trig. for trig. for the social factor of trig. for the social factor of		any contact input, direct input, remote input, virtual input, logic operand, or
FAULT REPORT         Records:       5         Data:       station and circuit ID, date and time of tringer, pre-fault current and voltage phasors (2 cycles before 50DD associated with foult report source), fault current and voltage phasors (1 cycle after trigger), protection elements operated at time of trigger, firmware revision         Triggers:       user-selected operand         Data storage:       non-volatile memory         FAULT LOCATOR       Method:         Method:       single-ended         Accuracy:       2% of line length         Units:       miles or kilometers         Trigger:       from fault report         Data storage:       non-volatile memory         FAST LOAD SHED REPORT       Records:         Records:       16         Data:       FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date         Triggers:       any FLS contingency         Data storage:       non-volatile memory         TRANSIENT RECORDER       Storage capacity:         Storage capacity:       one record with all available channels at 32 samples per cycle for 1 minute         Number of records:       16 to 256 samples per power cycle         Sampling rate:       16 to 256 samples per power cycle	Data storag	
Records:     5       Data:     station and circuit ID, date and time of trigger, pre-fault current and voltage phasors (2 cycles before 50DD associated with fault report source), fault current and voltage phasors (1 cycle after trigger), protection elements operated at time of trigger, firmware revision       Trigger;     user-selected operand       Data storage:     non-volatile memory       FAULT LOCATOR     Method:       Method:     single-ended       Accuracy:     2% of line length       Units:     miles or kilometers       Trigger:     from fault report       Data storage:     non-volatile memory       FAST LOAD SHED REPORT     Records:       Records:     16       Data:     FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date       Triggers:     any FLS contingency       Data storage:     non-volatile memory       TRANSIENT RECORDER     Storage capacity:       Storage capacity:     one record with all available channels at 32 samples per cycle for 1 minute       Number of records:     16 to 256 samples per power cycle       Timestamp accuracy:     any FlexAnalog quantity       Digital channel data:     any FlexAnalog quantity       Digital channel data:     any FlexAnalog quantity       Digital channel data:     any fe	5	non-volatile memory
Data:       station and circuit ID, date and time of trip, foult type, active setting group at time of trigger, pre-fault current and voltage phasors (2 cycles before 50D bassociated with fault report source), fault current and voltage phasors (1 cycle after trigger, pre-trigger), pre-tected operand         Data storage:       non-volatile memory         FAULT LOCATOR       Ime of trigger, pre-fault current and voltage phasors (1 cycle after trigger, pre-trigger,	FAULT REPORT	
trip, foult type, active setting group at time of trigger, pre-fault cycle after trigger, protection elements operated at time of trigger, firmware revision Triggers: user-selected operand Data storage: non-volatile memory FAULT LOCATOR Method: single-ended Accuracy: 2% of line length Units: miles or kilometers Triggers: non-volatile memory FAULT LOCATOR Method: single-ended Accuracy: 2% of line length Units: miles or kilometers Trigger: from fault report Data storage: non-volatile memory FAULT LOCATOR Method: single-ended Accuracy: 2% of line length Units: miles or kilometers Triggers: non-volatile memory FASE LOAD SHED REPORT Records: 16 Data: FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows; infeeds lost, scenarios encountered, load groups shed, settings last change date Triggers: ony FLS contingency Data storage: non-volatile memory TRANSIENT RECORDER Storage capacity: one record with all available channels at 32 samples per cycle for 1 minute Number of records: 1 to 64 Sampling channels: up to 128 Digital channel data: ony FLEs contingency duantity Digital channel data: ony FLEs contingency experiments and cycle annels: up to 128 Storage channels: up to 128 Sampled channel data: ony contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand Sampled channels: up to 24 Sampled channel data: 16-bit, unprocessed sampled channels Triggers: any digital channel change of state, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, one userprogrammable, one block Storage modes: automatic overvrite, protected Triggering modes: to to 100%	Records:	5
current and voltage phasors (2 cycles before 50DD associated with foult report source), fault current and voltage phasors (1 cycle after trigger), protection elements operated at time of trigger, firmware revision Triggers: user-selected operand Data storage: non-volatile memory FAULT LOCATOR Method: single-ended Accuracy: 2% of line length Units: miles or kilometers Triggers: from fault report Data storage: non-volatile memory FAST LOAD SHED REPORT Records: 16 Data: FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings lost change date Triggers: any FLS contingency Data storage: non-volatile memory TRANSIENT RECORDER Storage capacity: one record with all available channels at 32 samples per cycle for 1 minute Number of records: 1 to 64 Sampling rate: 16 to 256 samples per power cycle Timestamp accuracy: <10 µs per second frecording Anolog channel data: any FlexAnolog quantity Digital channel data: any contact input, direct input, remote input, virtual input, duranton logic operand, or flexLogic operand Sampled channels up to 128 Sampled channel data: 16-bit, unprocessed AC input channels (Lobannels any GlexAnolog quantity Digital channel data: 16-bit, unprocessed scenarios Sampled channel data: 16-bit, unprocessed scenarios Storage modes: automatic overwrite, protected Triggers: any digital channel change of state, undervoltage, overvlatage, undercurrent, vercurrent, underfrequency, overfrequency, rate of change of frequency, one userprogrammable, one block storage modes: time window from rising edge of trigger is active Pre-trigger window: 0 to 100%		station and circuit ID, date and time of
with foult report source), fault current and voltage phasors (1 cycle after trigger, protection elements operated at time of triggers: user-selected operand Data storage: non-volatile memory FAULT LOCATOR Method: single-ended Accuracy: 2% of line length Units: miles or kilometers Trigger: from fault report Data storage: non-volatile memory FAST LOAD SHED REPORT Records: 16 Data: FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings lost change date Triggers: any FLS contingency TRANSIENT RECORDER Storage capacity: one record with all available channels Sumpling rate: 16 to 256 samples per over cycle Timestamp accuracy: <10 µs per second of recording Analog channel data: any FlexAnalog quantity Digital channel data: 16-bit, unprocessed, AC imput, virtual input, direct input, remote input, virtual input, direct input, remote input, virtual input, direct input, remote input, virtual input, durect input, remote input, virtual input, outomation logic operand, or flexLogic operand Sampled channels: up to 24 Sampled channels: automatic overvrite, protected Triggering modes: time window from rising edge of trigger vis active Pre-trigger window: 0 to 100%		
cycle offer trigger, protection elements operated at time of trigger, firmware revision Triggers: user-selected operand Data storage: non-volatile memory FAUL LOCATOR Method: single-ended Accuracy: 2% of line length Units: miles or kilometers Trigger: from fault report Data storage: non-volatile memory FAST LOAD SHED REPORT Records: 16 Data: ELSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date Triggers: any FLS contingency Data storage: non-volatile memory TRANSIENT RECORDER Storage capacity: one record with all available channels at 32 samples per cycle for 1 minute Number of records: 16 to 256 samples per power cycle Timestamp accuracy: <10 µs per second frecording Analog channels: up to 12% Digital channels: up to 12% Sampled channels: up to 24 Sampled channels: up to 24 Storage modes: automatic overwrite, protected Triggers: ary digital channel change of state, undervitage, overvitage, underreguency, overfrequency, rate of change of frequency, one userprogrammable, one block storing modes: time window from rising dego of tigger is active Pre-trigger window: 0 to 100%	with fault report source	) fault current and voltage phasors (1
trigger, firmware revision Triggers: user-selected operand Data storage: non-volatile memory FAULT LOCATOR Method: single-ended Accuracy: 2% of line length Units: miles or kilometers Trigger: from fault report Data storage: non-volatile memory FAST LOAD SHED REPORT Records: 16 Data: FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings lost change date Triggers: any FLS contingency Data storage: non-volatile memory TRANSIENT RECORDER Storage capacity: one record with all available channels at 32 samples per cycle for 1 minute Number of records: 1 to 64 Sampling rate: 16 to 256 samples per power cycle Timestamp accuracy: 410 µs per second frecording Analog channel data: any FlexAnalog quantity Digital channel data: any fielxAnalog quantity Digital channel data: 16-bit, upprocessed, AC input channels Digital channel data: 16-bit, upprocessed sampled channels Triggers: any digital channel change of state, undervoltage, overvoltage, undercurrent, vercurrent, underfrequency, over Storage modes: at to fold Sampled channel data: 16-bit, upprocessed sampled channels State, undervoltage, overvoltage, undercurrent, vercurrent, underfrequency, over state, undervoltage, overvoltage, undercurrent, vercurrent, underfrequency, over Storage modes: attore Triggering modes: attore Storage modes: attore Trigger window: 0 to 100%		
Data storage:       non-volatile memory         FAULT LOCATOR       single-ended         Method:       single-ended         Accuracy:       2% of line length         Units:       miles or kilometers         Trigger:       from fault report         Data storage:       non-volatile memory         FAST LOAD SHED REPORT       Records:         Records:       16         Data:       FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date         Triggers:       any FLS contingency         Data storage:       non-volatile memory         TRANSIENT RECORDER       Storage capacity:         Storage capacity:       one record with all available channels at 32 samples per cycle for 1 minute         Number of records:       16 to 256 samples per power cycle         Storage channels:       up to twelve L6-bit, uprocessed, AC input channels         analog channel data:       any FlexAnalog quantity         Digital channel data:       any GetAnnel data:         Digital channel data:       any digital channel chanels         Sampled channels       up to 24         Sampled channel data:       16-bit, unprocessed sampled channels         Triggers:	trigger firmware revisie	-
FAULT LOCATOR           Method:         single-ended           Accuracy:         2% of line length           Units:         miles or kilometers           Trigger:         from fault report           Data storage:         non-volatile memory           FAST LOAD SHED REPORT         Records:           Records:         16           Data:         FLSC relay name, firmware revision, contingency date/firme and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings lost change date           Triggers:         any FLS contingency           Data storage:         non-volatile memory           TRANSIENT RECORDER         Storage capacity:           Storage capacity:         one record with all available channels           Number of records:         1 to 64           Sampling rate:         16 to 255 samples per power cycle           Timestamp accuracy:         <10 µs per second of recording	ungger, minimule revisio	
Method:       single-ended         Accuracy:       2% of line length         Units:       miles or kilometers         Trigger:       from fault report         Data storage:       non-volatile memory         FAST LOAD SHED REPORT         Records:       16         Data:       FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infreeds lost, scenarios encountered, load groups shed, settings lost change date         Triggers:       any FLS contingency         Data storage:       one record with all available channels         Number of records:       1 to 64         Sampling rate:       16 to 256 samples per power cycle         Timput channels:       up to twelve 16-bit, upprocessed, AC input, channels         Analog channel data:       any FlexAnalog quantity         Digital channel data:       any digital channel change of state, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, oret of change of frequency, oret of change of frequency, oret of change of frequency, rate of change of frequency, rate of change of frequency, one userprogrammable, one block         Sorage modes:       any digital channel change of state, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, oret requency, rate of change of frequency, ret of change of frequency, rate	Triggers:	user-selected operand
Method:       single-ended         Accuracy:       2% of line length         Units:       miles or kilometers         Trigger:       from fault report         Data storage:       non-volatile memory         FAST LOAD SHED REPORT         Records:       16         Data:       FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infreeds lost, scenarios encountered, load groups shed, settings lost change date         Triggers:       any FLS contingency         Data storage:       one record with all available channels         Number of records:       1 to 64         Sampling rate:       16 to 256 samples per power cycle         Timput channels:       up to twelve 16-bit, upprocessed, AC input, channels         Analog channel data:       any FlexAnalog quantity         Digital channel data:       any digital channel change of state, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, oret of change of frequency, oret of change of frequency, oret of change of frequency, rate of change of frequency, rate of change of frequency, one userprogrammable, one block         Sorage modes:       any digital channel change of state, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, oret requency, rate of change of frequency, ret of change of frequency, rate	Triggers:	user-selected operand
Accuracy:       2% of line length         Units:       miles or kilometers         Trigger:       from fault report         Data storage:       non-volatile memory         FAST LOAD SHED REPORT         Records:       16         Data:       FLSC relay name, firmware revision, contingency date/time and duration, scenarios encountered, load groups shed, settings last change date         Triggers:       any FLS contingency         Data storage:       non-volatile memory         TRASUSENT RECORDER       Storage capacity:         Storage capacity:       one record with all available channels at 32 samplies per cycle for 1 minute         Storage capacity:       one record with all available channels at 32 samplies per cycle for 1 minute         Storage capacity:       one record with all available channels         Sampling rate:       16 to 256 samples per power cycle         Timestamp accuracy:       <10 µs per second of recording	Triggers: Data storage:	user-selected operand
Trigger:       from fault report non-volatile memory         FAST LOAD SHED REPORT         Records:       16         Data:       FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infreeds lost, scenarios encountered, load groups shed, settings lost change date         Triggers:       any FLS contingency non-volatile memory         TRANSIENT RECORDER         Storage capacity:       one record with all available channels         Number of records:       1 to 64         Sampling rate:       16 to 256 samples per power cycle Timestamp accuracy:         Analog channels:       up to twelve 16-bit, uprocessed, AC input channels         Digital channels:       up to 128         Orgerand data:       any flexAnolog quantity         Digital channel data:       16-bit, uprocessed sampled channels         Sampled channels:       up to 24         Sampled channels:       up to 24         Sampled channels:       any digital channel change of state, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, one userprogrammable, one block         Storage modes:       automatic overvwrite, protected         Triggering modes:       the window from rising edge of trigger is active         Pre-trigger window:       to to 10%	Triggers: Data storage: FAULT LOCATOR	user-selected operand non-volatile memory
Data storage:         non-volatile memory           FAST LOAD SHED REPORT           Records:         16           Data:         FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings lost change date           Triggers:         any FLS contingency           TRANSIENT RECORDER         Storage capacity:           Storage capacity:         one record with all available channels at 32 samples per cycle for 1 minute           Timestamp accuracy:         10 is per second of recording up to twelve 16-bit, uprocessed, AC input channels           Analog channel data:         any FlexAnalog quantity           Digital channel data:         any Contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand           Sampled channels:         up to 24           Sampled channels:         up to 24           Sampled channels:         up digital channel adate:           ringers:         aud wigital channel of the bick, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, one userprogrammable, one block           Storage modes:         automatic overwrite, protected           Triggering modes:         time window from rising edge of trigger is active	Triggers: Data storage: FAULT LOCATOR Method:	user-selected operand non-volatile memory single-ended 2% of line length
FAST LOAD SHED REPORT         Records:       16         Data:       FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings lost change date any FLS contingency         Data storage:       non FLSC contingency         Data storage:       non volatile memory         TRANSIENT RECORDER       Storage capacity:         Storage capacity:       one record with all available channels at 32 samples per cycle for 1 minute         Number of records:       1 to 64         Sampling rate:       16 to 256 samples per power cycle         Timestamp accuracy:       -10 µs per second of recording         Analog channels:       up to twelve 16-bit, uprocessed, AC         Digital channel data:       any centact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand         Sampled channels:       up to 128         Sampled channels       up to 24         Sampled channels data:       16-bit, unprocessed sampled channels         Triggers:       any digital channel change of state, undervoltage, overvlatage, undercurrent, underfrequency, ore teording of state, undervoltage, overvlatage, undercurrent, overcurrent, underfrequency, ore teording of frequency, one userprogrammable, one block         Storage modes:       automatic overwrite, protected         Triggering modes: <t< td=""><td>Triggers: Data storage: FAULT LOCATOR Method: Accuracy:</td><td>user-selected operand non-volatile memory single-ended 2% of line length</td></t<>	Triggers: Data storage: FAULT LOCATOR Method: Accuracy:	user-selected operand non-volatile memory single-ended 2% of line length
Records:       16         Data:       FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date         Triggers:       any FLS contingency         Data storage:       non-volatile memory <b>TRANSIENT RECORDER</b> Storage capacity:         Storage capacity:       one record with all available channels at 32 samples per cycle for 1 minute         Number of records:       16 to 256 samples per power cycle         Timestamp accuracy:       -10 µs per second of recording         Analog channels:       up to twelve 16-bit, uprocessed, AC input, channels         Digital channels:       any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand         Sampled channel data:       any digital channel change of state, undervoltage, overvlottage, undercurrent, underfrequency, over trequency, rate of change of frequency, one userprogrammable, one block         Storage modes:       automatic overvrite, protected         Triggers:       automatic overvrite, protected         Triggering modes:       time window from rising edge of trigger         Storage modes:       automatic overvrite, protected         Triggering modes:       automatic overvrite, protected <t< td=""><td>Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger:</td><td>user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report</td></t<>	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report
Data:       FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings lost change date         Triggers:       any FLS contingency         Data:       one record with all available channels         Translemt RECORDER       one record with all available channels         Storage capacity:       one record with all available channels         Number of records:       1 to 64         Sampling rate:       16 to 255 samples per power cycle         Analog channel data:       any FlexAnalog quantity         Digital channels:       up to twelve 16-bit, uprocessed, AC input channels         Digital channel data:       any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand         Sampled channels:       up to 24         Sampled channels:       up to 24         Sampled channels       any digital channel change of state, undervoltage, overvlotage, undercurrent, overcurrent, underforquency, over tre of change of frequency, one userprogrammable, one block         Storage modes:       automatic overvrite, protected triggering modes:         Triggering modes:       the window from rising edge of trigger is active         Pre-trigger window:       to to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report
contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date memory FLS contingency Data storage: non-volatile memory TRANSIENT RECORDER Storage capacity: one record with all available channels at 32 samples per cycle for 1 minute Sampling rate: 16 to 256 samples per power cycle Timestamp accuracy: <10 µs per second of recording Analog channel data: any FlexAnalog quantity Digital channels: up to 128 Digital channel data: any contact input, direct input, remote input, virtual input, automation logic operand, or FlexAnalog quantity Digital channels: up to 24 Sampled channels: up to 24 Storage modes: automatic overwrite, protected Triggering modes: time window from rising edge of trigger is active Pre-trigger window: 0 to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory
Data storage:         non-volatile memory           TRANSIENT RECORDER         one record with all available channels at 32 samples per cycle for 1 minute           Number of records:         1 to 64           Sampling rate:         16 to 256 samples per power cycle           Timestamp accuracy:         -210 µs per second of recording           Analog channels:         up to twelve 16-bit, unprocessed, AC input channels           Digital channel         any contact input, direct input, remote input, virtual input, automation logic operand, or FlexAnalog operand           Sampled channel         up to 24           Sampled channel data:         10+bit, unprocessed sampled channels           Triggers:         any digital channel change of state, undervoltage, overvoltage, undercurrent, vercurrent, underfrequency, over userprogrammable, one block           Storage modes:         automatic overwrite, protected           Triggering modes:         the window from rising edge of trigger is active           Pre-trigger window:         0 to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REE	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory PORT
TRANSIENT RECORDER         Storage capacity:       one record with all available channels at 32 samples per cycle for 1 minute         Number of records:       16 to 256 samples per power cycle         Timestamp accuracy:       <10 µs per second of recording	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REF Records: Data:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory PORT 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date
Storage capacity:       one record with all available channels at 32 samples per cycle for 1 minute         Number of records:       1 to 64         Sampling rate:       16 to 256 samples per power cycle         Timestamp accuracy:       <10 µs per second of recording	Triggers: Data storage: FAUL LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REI Records: Data: Triggers:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from foult report non-volatile memory PORT 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings lost change date any FLS contingency
at 32 samples per cycle for 1 minute Sampling rate: 16 to 256 samples per power cycle Timestamp accuracy: Analog channels: Digital channels: Sampled channels: Digital channel data: Sampled channels: Sampled channe	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REF Records: Data: Triggers: Data storage:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory <b>CPT</b> 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory
Number of records:       1 to 64         Sampling rate:       16 to 256 samples per power cycle         Timestamp accuracy:       10 µs per second of recording         Analog channels:       up to twelve 16-bit, unprocessed, AC         Digital channel data:       ony FlexAnalog quantity         Digital channel data:       ony FlexAnalog quantity         Sampled channels:       up to 24         Sampled channel data:       ony contact input, direct input, remote input, virtual input, outmotion logic operand, or FlexLogic operand         Triggers:       any digital channels data:         Triggers:       any digital channel of frequency, vareurent, underGrequency, vervoltage, undercurrent, overcurrent, underGrequency, rate of change of frequency, rate of change of frequency, core userprogrammable, one block         Storage modes:       automatic overwrite, protected         Triggering modes:       the window from rising edge of trigger, continuous recording as long as trigger is active         Pre-trigger window:       0 to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REI Records: Data: Triggers: Data storage: TRANSIENT RECORDI	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory PORT 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory R
Sampling rate:     16 to 256 samples per power cycle       Timestamp accuracy:     <10 µs per second of recording	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REI Records: Data: Triggers: Data storage: TRANSIENT RECORDI	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory CORT 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory ER one record with all available channels
Timestamp accuracy:       <10 µs per second of recording up to twelve 16-bit, unprocessed, AC input channels         Analog channel data:       any FlexAnalog quantity up to 128         Digital channels:       any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand         Sampled channels:       up to 24         Sampled channels:       any digital channel channel channel sampled channel data:         Triggers:       any digital channel change of state, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, over frequency, one block         Storage modes:       automatic overwrite, protected triggering modes:         Trigger window:       to to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REF Records: Data: Triggers: Data storage: TRANSIENT RECORDI Storage capacity:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory <b>CORT</b> 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings lost change date any FLS contingency non-volatile memory <b>ER</b> one record with all available channels at 32 samples per cycle for 1 minute
Analog channels:       up to twelve 16-bit, unprocessed, AC input channels         Analog channel data:       nay FlexAnalog quantity         Digital channels:       up to 128         Digital channel data:       any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand         Sampled channels:       up to 24         Sampled channel data:       16-bit, unprocessed sampled channels         Triggers:       any digital channel change of state, undercurrent, overcurrent, underfrequency, oret of change of frequency, one userprogrammable, one block         Storage modes:       automatic overwrite, protected         Triggering modes:       time window from rising edge of trigger, continuous recording as long as trigger is active         Pre-trigger window:       0 to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REG Records: Data: Triggers: Data storage: TRANSIENT RECORDI Storage capacity: Number of records:	user-selected operand non-volatile memory Single-ended 2% of line length miles or kilometers from fault report non-volatile memory CORT 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory CR one record with all available channels at 32 samples per cycle for 1 minute 1 to 64
input channels Analog channel data: Digital channels Up to 128 Digital channel data: Digital channel data: Digital channel data: Sampled channels: Triggers: Triggers: Storage modes: Digital channel channel change of state, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, ore userprogrammable, one block Storage modes: Triggeris: Digital channel change of trigger stative Pre-trigger window: O to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REF Records: Data storage: Triggers: Data storage: TRANSIENT RECORD Storage capacity: Number of records: Sampling rate:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory CORT 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory con record with all available channels at 32 samples per cycle for 1 minute 1 to 64
Analog channel data:     any FlexAnalog quantity       Digital channels:     up to 128       Digital channel data:     any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand       Sampled channels:     up to 24       Sampled channel data:     16-bit, unprocessed sampled channels any digital channel change of state, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, ore userprogrammable, one block       Storage modes:     automatic overwrite, protected       Triggering modes:     time window from rising edge of trigger is active       Pre-trigger window:     0 to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REF Records: Data: Triggers: Data storage: TRANSIENT RECORDI Storage capacity: Number of records: Sampling rate: Timestamp accuracy:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory CORT 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings lost change date any FLS contingency non-volatile memory EN one record with all available channels 1 to 64 16 to 256 samples per power cycle <10 µs per second of recording
Digital channels: up to 128 any contact input, direct input, remote any contact input, direct input, remote any contact input, direct input, remote any contact input, automation logic operand, or FlexLogic operand Sampled channel data: 16-bit, unprocessed sampled channels Triggers: any digital channel change of state, undercurrent, overcurrent, underfrequency, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, one userprogrammable, one block Storage modes: automatic overwrite, protected Triggering modes: time window from rising edge of trigger is active Pre-trigger window: 0 to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REF Records: Data: Triggers: Data storage: TRANSIENT RECORDI Storage capacity: Number of records: Sampling rate: Timestamp accuracy:	user-selected operand non-volatile memory Single-ended 2% of line length miles or kilometers from fault report non-volatile memory CORT 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory CR on record with all available channels at 32 samples per cycle for 1 minute 1 to 64 16 to 256 samples per power cycle <10 µs per second of recording µp to twelve 16-bit, unprocessed, AC
input, virtual input, automation logic operand, or FlexLogic operand Sampled channels: Triggers: any digital channel change of state, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, one userprogrammable, one block Storage modes: automatic overwrite, protected Triggering modes: time window from rising edge of trigger is active Pre-trigger window: 0 to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REF Records: Data storage: Triggers: Data storage: TRANSIENT RECORD Storage capacity: Number of records: Sampling rate: Timestamp accuracy: Analog channels:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory CORT 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory CR one record with all available channels at 32 samples per cycle for 1 minute 1 to 64 1 to 256 samples per power cycle <10 µs per second of recording µp to twelve 16-bit, unprocessed, AC input channels
operand, or FlexLogic operand Sampled channels: Up to 24 Sampled channel data: Triggers: State, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, ore userprogrammable, one block Storage modes: Triggering modes: Triggering modes: Ot 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REG Records: Data: Triggers: Data storage: TRANSIENT RECORDI Storage capacity: Number of records: Sompling rate: Timestamp accuracy: Analog channels: Analog channel data: Digital channels:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory <b>CORT</b> 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory <b>ER</b> one record with all available channels at 32 samples per cycle for 1 minute 1 to 64 16 to 256 samples per power cycle <10 µs per second of recording up to twelve 16-bit, unprocessed, AC input channels any FlexAnalog quantity up to 128
Sampled channels:     up to 24       Sampled channel data:     16-bit, unprocessed sampled channels       Triggers:     any digital channel change of state, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, one userprogrammable, one block       Storage modes:     automatic overwrite, protected       Triggering modes:     time window from rising egge of trigger is active       Pre-trigger window:     0 to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REG Records: Data: Triggers: Data storage: TRANSIENT RECORDI Storage capacity: Number of records: Sompling rate: Timestamp accuracy: Analog channels: Analog channel data: Digital channels:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory <b>CORT</b> 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory <b>ER</b> one record with all available channels as 25 samples per cycle for 1 minute 1 to 64 16 to 256 samples per power cycle <10 µs per second of recording µp to twelve 16-bit, unprocessed, AC input channels any FlexAnalog quantity µp to 128 any contact input, direct input, remote
Sampled channel data:       16-bit, unprocessed sampled channels         Triggers:       any digital channel change of state, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, one userprogrammable, one block         Storage modes:       automatic overwrite, protected         Triggering modes:       time window from rising edge of trigger, continuous recording as long as trigger is active         Pre-trigger window:       0 to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REG Records: Data: Triggers: Data storage: TRANSIENT RECORDI Storage capacity: Number of records: Sompling rate: Timestamp accuracy: Analog channels: Analog channel data: Digital channels:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory <b>PORT</b> 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, contingency date/time and duration, steady-state power flows, infeeds lost, contingency date/time and duration, steady-state power flows, infeeds lost, contingency date/time and duration steady-state power flows, infeeds lost, contingency contingency non-volatile memory <b>R</b> one record with all available channels at 32 samples per cycle for 1 minute 1 to 64 16 to 256 samples per power cycle <10 µs per second of recording up to twelve 16-bit, unprocessed, AC input channels any FlexAnolog quantity up to 128 any contact input, direct input, remote input, virtual input, automation logic
undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, one userprogrammable, one block Storage modes: Triggering modes: time window from rising edge of trigger, continuous recording as long as trigger is active Pre-trigger window: 0 to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REF Records: Data: Triggers: Data storage: TRANSIENT RECORDI Storage capacity: Number of records: Sampling rate: Timestamp accuracy: Analog channels: Digital channel data: Digital channel data:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from foult report non-volatile memory <b>PORT</b> 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory <b>FR</b> one record with all available channels at 32 samples per cycle for 1 minute 1 to 64 16 to 256 samples per power cycle <10 µs per second of recording up to twelve 16-bit, unprocessed, AC input channels any FlexAnalog quantity up to 128 ony contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand
Storage modes:         automatic overwrite, protected           Triggering modes:         time window from rising edge of trigger, continuous recording as long as trigger is active           Pre-trigger window:         0 to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REG Records: Data: Triggers: Data storage: TRANSIENT RECORDI Storage capacity: Number of records: Sampling rate: Timestamp accuracy: Analog channel data: Digital channel data: Digital channel data: Sampled channel: Sampled channel data:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory <b>PORT</b> 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory <b>EP</b> one record with all available channels as amples per cycle for 1 minute 1 to 64 16 to 256 samples per power cycle <10 µs per second of recording µp to twelve 16-bit, unprocessed, AC input channels any FlexAnolog quantity µp to 128 any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand µp to 24 16-bit, unprocessed sampled channels any digital channel change of
Triggering modes: time window from rising edge of trigger, continuous recording as long as trigger is active Pre-trigger window: 0 to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REG Records: Data: Triggers: Data storage: TRANSIENT RECORDI Storage capacity: Number of records: Sampling rate: Timestamp accuracy: Analog channel data: Digital channel data: Digital channel data: Sampled channel: Sampled channel data:	user-selected operand non-volatile memory Single-ended 2% of line length miles or kilometers from fault report non-volatile memory CORT 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory CR on record with all available channels at 32 samples per cycle for 1 minute 1 to 64 16 to 256 samples per power cycle <10 µs per second of recording up to twelve 16-bit, unprocessed, AC input channels any FlexAnolog quantity up to 128 any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand up to 24 16-bit, unprocessed sampled channels any digital channel change of state, undervoltage, overvoltage, undercurrent, overcurrent, underfrequency, overfrequency, rate of change of frequency, and
Pre-trigger window: 0 to 100%	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REF Records: Data: Triggers: Data storage: TRANSIENT RECORDI Storage capacity: Number of records: Sampling rate: Timestamp accuracy: Analog channels: Digital channels: Digital channels: Sampled channels: Sampled channel data: Triggers:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory <b>PORT</b> 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory <b>EP</b> one record with all available channels at 32 samples per cycle for 1 minute 1 to 64 16 to 256 samples per power cycle <10 µs per second of recording µp to twelve 16-bit, unprocessed, AC input channels any FlexAnolog quantity µp to 128 any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand up to 24 16-bit, unprocessed sampled channels any digital channel change of state, undervoltage, overvoltage, undercurrent, underfrequency, overfrequency, one userprogrammable, one block
	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REF Records: Data: Triggers: Data storage: TRANSIENT RECORDI Storage capacity: Number of records: Sampling rate: Timestamp accuracy: Analog channel data: Digital channels: Digital channel data: Sampled channels: Sampled channel data: Triggers:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory <b>PORT</b> 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory <b>POR</b> one record with all available channels at 32 samples per cycle for 1 minute 1 to 64 16 to 256 samples per power cycle <10 µs per second of recording µp to twelve 16-bit, unprocessed, AC input channels any FlexAnalog quantity µp to 128 any cated loannel change of state, undervoltage, overvoltage, undervoltage, overcurent, underfrequency, overfrequency, rate of change of frequency, one userprogrammable, one block automatic overwrite, protected time window froge long a bing as trigger
	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REI Records: Data: Triggers: Data storage: TRANSIENT RECORDI Storage capacity: Number of records: Sampling rate: Timestamp accuracy: Analog channel data: Digital channels: Digital channel data: Sigital channel data: Sampled channels: Sampled channel data: Triggers: Storage modes: Triggering modes:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory <b>PORT</b> 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory <b>R</b> one record with all available channels at 32 samples per cycle for 1 minute 1 to 64 16 to 256 samples per power cycle <10 µs per second of recording up to twelve 16-bit, unprocessed, AC input channels any FlexAnolog quantity up to 128 any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand up to 24 16-bit, unprocessed sampled channels any digital channel change of state, undervoltage, overvoltage, underfurequency, overfequency, rate of change of frequency, one userprogrammable, one block automatic overwrite, protected time window from rising edge of trigger, continuous recording as long as trigger is active
	Triggers: Data storage: FAULT LOCATOR Method: Accuracy: Units: Trigger: Data storage: FAST LOAD SHED REI Records: Data: Triggers: Data storage: TRANSIENT RECORDI Storage capacity: Number of records: Sampling rate: Timestamp accuracy: Analog channel data: Digital channels: Digital channel data: Sigital channel data: Sampled channels: Sampled channel data: Triggers: Storage modes: Triggering modes:	user-selected operand non-volatile memory single-ended 2% of line length miles or kilometers from fault report non-volatile memory <b>PORT</b> 16 FLSC relay name, firmware revision, contingency date/time and duration, steady-state power flows, infeeds lost, scenarios encountered, load groups shed, settings last change date any FLS contingency non-volatile memory <b>R</b> one record with all available channels at 32 samples per cycle for 1 minute 1 to 64 16 to 256 samples per power cycle <10 µs per second of recording up to twelve 16-bit, unprocessed, AC input channels any FlexAnolog quantity up to 128 any contact input, direct input, remote input, virtual input, automation logic operand, or FlexLogic operand up to 24 16-bit, unprocessed sampled channels any digital channel change of state, undervoltage, overvoltage, underfrequency, overfequency, rate of change of frequency, one userprogrammable, one block automatic overwrite, protected time window from rising edge of trigger, continuous recording as long as trigger

## Front Panel Interface

ANNUNCIATOR

la a cita	
Inputs:	288
Windows per page:	12 to 48
Pages: Sequence:	up to 24 manual reset, locking
Off indication:	alarm inactive and reset
Flashing indication:	alarm active and not acknowledged,
On indication:	alarm inactive and not acknowledged alarm active and acknowledged, alarn
Priority:	inactive and not reset by active window and page number
Data storage:	non-volatile memory
CONTROL DISPLAY	
Devices:	status and control of up to 8 power
	system devices
Pushbuttons:	30 dedicated user-programmable pushbuttons
Functionality:	supports select-before-operate functionality
DIGITAL FAULT RECO	
Sequence of events:	displays the stored sequence of events
sequence of events.	record
Fault reports:	display and retrieval of the critical metrics of a stored fault report
Transient records:	retrieval of a stored transient record
Disturbance records:	retrieval of a stored disturbance record
Fast load shedding (FLS	
	retrieval of a stored FLS record
EQUIPMENT MANAGE	R DISPLAY
Battery monitoring:	displays the current battery voltage ar alarm states
	didiffi states
METERING DISPLAY	displays present values of veltage
Summary:	displays present values of voltage, current, real power, reactive power,
	power factor, and frequency on a per-
-1	phase and total basis
Phasors:	digital and graphical display of presen
	voltage and current magnitudes and angles
Sequence components:	displays present magnitudes and
	angles of current and voltage sequence
<b>F</b>	components
	four-quadrant display of accumulated
Energy:	
	energy
Demand:	energy present and peak demand values for current and real, reactive, and apparent
	energy present and peak demand values for
Demand:	energy present and peak demand values for current and real, reactive, and apparen power AY
Demand:	energy present and peak demand values for current and real, reactive, and apparer power AY clisplays the current status of all
Demand: MAINTENANCE DISPL Input and output status contact inputs and outp	energy present and peak demand values for current and real, reactive, and apparen power AY clisplays the current status of all
Demand: MAINTENANCE DISPL Input and output status	energy present and peak demand values for current and real, reactive, and apparen power AY clisplays the current status of all
Demand: MAINTENANCE DISPL Input and output status contact inputs and outp	energy present and peak demand values for current and real, reactive, and apparen power AY clisplays the current status of all
Demand: MAINTENANCE DISPL input and output status contact inputs and outp Hardware Ac current CT rated primary:	energy present and peak demand values for current and real, reactive, and apparen power AY displays the current status of all uts 1 to 50000 A
Demand: MAINTENANCE DISPL Input and output status contact inputs and outp Hardware Ac current CT rated primary: CT rated secondary:	energy present and peak demand values for current and real, reactive, and apparent power AY displays the current status of all uts 1 to 50000 A 1 A or 5 A
Demand: MAINTENANCE DISPL Input and output status contact inputs and output Hardware Ac current CT rated primary: CT rated secondary: Nominal frequency:	energy present and peak demand values for current and real, reactive, and apparent power AY t displays the current status of all uts 1 to 50000 A 1 A or 5 A 50 or 60 Hz
Demand: MAINTENANCE DISPL Input and output status contact inputs and output Hardware Accurrent CT rated primary: CT rated secondary: Nominal frequency: Relay burden:	energy present and peak demand values for current and real, reactive, and apparent power AY displays the current status of all uts 1 to 50000 A 1 A or 5 A 50 or 60 Hz <0.2 VA secondary
Demand: MAINTENANCE DISPL Input and output status contact inputs and outp Hardware Ac current CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range:	energy present and peak demand values for current and real, reactive, and apparent power AY displays the current status of all suts 1 to 50000 A 1 A or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrics
Demand: MAINTENANCE DISPL Input and output status contact inputs and output Hardware Accurrent CT rated primary: CT rated secondary: Nominal frequency: Relay burden:	energy present and peak demand values for current and real, reactive, and apparent power AY displays the current status of all suts 1 to 50000 A 1 A or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrics
Demand: Input and output status contact inputs and output Hardware Accurrent CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range: Current withstand:	energy present and peak demand values for current and real, reactive, and apparent power AY to stappay the current status of all uts 1 to 50000 A 1 k or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrics 20 ms at 250 × rated, 1 second at 100
Demand: MAINTENANCE DISPL Input and output status contact inputs and output Hardware Accurrent CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range: Current withstand: Ac VOLTAGE	energy present and peak demand values for current and real, reactive, and apparent power AY displays the current status of all uts 1 to 50000 A 1 A or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrice 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated
Demand: Input and output status contact inputs and output Hardware Accurrent CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range: Current withstand:	energy present and peak demand values for current and real, reactive, and apparent power AY to stappay the current status of all uts 1 to 50000 A 1 k or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrics 20 ms at 250 × rated, 1 second at 100
Demand: MAINTENANCE DISPL Input and output status contact inputs and outp Hardware Ac current CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Current withstand: AC VOLTAGE VT rated secondary:	energy present and peak demand values for current and real, reactive, and apparent power AY clisplays the current status of all uts 1 to 50000 A 1 A or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetricc 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V
Demand: MAINTENANCE DISPL Input and output status contact inputs and outp Hardware Ac CURRENT CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Ac VOLTAGE VT ratio: Nominal frequency: Relay burden:	energy present and peak demand values for current and real, reactive, and apparent power AY (isplays the current status of all uts) 1 to 50000 A 1 A or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrice 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 2400.0 V 1.00 to 2400.0 V 50 or 60 Hz <0.25 VA at 120 V
Demand: MAINTENANCE DISPL Input and output status contact inputs and output ACCURRENT CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range: Current withstand: AC VOLTAGE VT rated secondary: VT rated secondary: VT rated secondary: VT rated secondary: Nominal frequency: Relay burden: Conversion range:	energy present and peak demand values for current and real, reactive, and apparent power AY tidisplays the current status of all uts 1 to 50000 A 1 A or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrics 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 24000.0 50 or 60 Hz <0.25 VA at 120 V 1 to 275 V
Demand: MAINTENANCE DISPL Input and output status contact inputs and outp Hardware Ac CURRENT CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Ac VOLTAGE VT ratio: Nominal frequency: Relay burden:	energy present and peak demand values for current and real, reactive, and apparent power AY displays the current status of all uts 1 to 50000 A 1 A or 5 A 50 or 60 Hz 0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrics 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 2400.0 V 1.00 to 2400.0 S 50 or 60 Hz <0.25 VA at 120 V 1 to 275 V continuous at 260 V to neutral, 1
Demand: MAINTENANCE DISPL Input and output status contact inputs and outp Hardware AC CURRENT CT rated primary: CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range: VT ratio: Nominal frequency: Relay burden: Conversion range: Voltage withstand:	energy present and peak demand values for current and real, reactive, and apparent power AY tidisplays the current status of all uts 1 to 50000 A 1 A or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrics 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 24000.0 50 or 60 Hz <0.25 VA at 120 V 1 to 275 V
Demand: MAINTENANCE DISPL Input and output statuss contact inputs and outp Hardware Ac CURRENT CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range: Current withstand: Motion frequency: Relay burden: Nominal frequency: Relay burden: Conversion range: VT ratio: Nominal frequency: Relay burden: Conversion range: Voltage withstand: CONTACT INPUTS	energy present and peak demand values for current and real, reactive, and apparent power AY displays the current status of all uts 1 to 50000 A 1 A or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrice 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 24000.0 50 or 60 Hz <0.25 VA at 120 V 1 to 275 V continuous at 260 V to neutral, 1 minute per hour at 420 V neutral
Demand: MAINTENANCE DISPL Input and output status contact inputs and output ACCURRENT CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range: Current withstand: MC VOLTAGE VT rated secondary: VT rated secondary: VT ratio: Nominal frequency: Relay burden: Conversion range: Voltage withstand: CONTACT INPUTS Input rating:	energy present and peak demand values for current and real, reactive, and apparent power AY clasplays the current status of all uts 1 to 50000 A 1 k or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrics 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 24000.0 50 or 60 Hz <0.25 VA at 120 V 1 to 275 V continuous at 260 V to neutral, 1 minute per hour at 420 V neutral 300 V DC maximum
Demand: MAINTENANCE DISPL Input and output status contact inputs and outp Hardware Ac CURRENT CT rated primary: CT rated secondary: Nominal frequency: Relay burden: COVENTAGE VT rated secondary: VT ratio: Nominal frequency: Relay burden: Conversion range: Voltage withstand: Conversion range: Voltage withstand: CONTACT INPUTS Input rating: Selectable thresholds:	energy present and peak demand values for current and real, reactive, and apparent power AY displays the current status of all suts 1 to 50000 A 1 A or 5 A 50 or 60 Hz 0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrics 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 2400.0 50 or 60 Hz <0.25 VA at 120 V 1 to 275 V continuous at 260 V to neutral, 1 minute per hour at 420 V neutral 300 V DC maximum 24 to 250 V
Demand: MAINTENANCE DISPL Input and output status contact inputs and output ACCURRENT CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range: Current withstand: MC VOLTAGE VT rated secondary: VT rated secondary: VT ratio: Nominal frequency: Relay burden: Conversion range: Voltage withstand: CONTACT INPUTS Input rating:	energy present and peak demand values for current and real, reactive, and apparent power AY clasplays the current status of all uts 1 to 50000 A 1 k or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrics 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 24000.0 50 or 60 Hz <0.25 VA at 120 V 1 to 275 V continuous at 260 V to neutral, 1 minute per hour at 420 V neutral 300 V DC maximum
Demand: MAINTENANCE DISPL Input and output status contact inputs and outp AC CURRENT CT rated primary: CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range: Current withstand: AC VOLTAGE VT ratic secondary: VT ratic secondary: VT ratic secondary: VT ratic secondary: VT ratic secondary: VT ratic secondary: Conversion range: Voltage withstand: CONTACT INPUTS Input rating: Selectable thresholds: Maximum current: Recognition time:	energy present and peak demand values for current and real, reactive, and apparent power AY displays the current status of all suts 1 to 50000 A 1 A or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrics 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 24000.0 50 or 60 Hz <0.25 VA at 120 V 1 to 275 V continuous at 250 V to neutral, 1 minute per hour at 420 V neutral 300 V DC maximum 24 to 250 V 10 mA during turn on, 0.5 mA steady- state <1 ms
Demand: Input and output status contact inputs and output Contact inputs and output CT rated primary: CT rated pecondary: Nominal frequency: Relay burden: Conversion range: Current withstand: AC VOLTAGE VT rated secondary: VT ratio: Nominal frequency: Relay burden: Conversion range: Voltage withstand: CONTACT INPUTS Input rating: Selectable thresholds: Maximum current:	energy present and peak demand values for current and real, reactive, and apparent power AY AY displays the current status of all uts 1 to 50000 A 1 k or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrics 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 2400.0 50 or 60 Hz <0.25 VA at 120 V 1 to 275 V continuous at 260 V to neutral, 1 minute per hour at 420 V neutral 300 V DC maximum 24 to 250 V 10 mA during turn on, 0.5 mA steady- state
Demand: MAINTENANCE DISPL Input and output statuss contact inputs and outp AC CURRENT CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range: Current withstand: AC VOLTAGE VT ratio: Nominal frequency: Relay burden: Conversion range: Voltage withstand: CONTACT INPUTS Input rating: Selectable thresholds: Maximum current: Recognition time: Debounce timer:	energy present and peak demand values for current and real, reactive, and apparent power AY displays the current status of all suts 1 to 50000 A 1 A or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrics 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 24000.0 50 or 60 Hz <0.25 VA at 120 V 1 to 275 V continuous at 250 V to neutral, 1 minute per hour at 420 V neutral 300 V DC maximum 24 to 250 V 10 mA during turn on, 0.5 mA steady- state <1 ms
Demand: MAINTENANCE DISPL Input and output statuss contact inputs and outp AC CURRENT CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range: Current withstand: AC VOLTAGE VT ratio: Nominal frequency: Relay burden: Conversion range: Voltage withstand: CONTACT INPUTS Input rating: Selectable thresholds: Maximum current: Recognition time: Debounce timer:	energy present and peak demand values for current and real, reactive, and apparent power AY AY tidisplays the current status of all uts 1 to 50000 A 1 to 75 A 50 or 60 Hz 40.2 VA secondary 0.2 to 46 × CT rating RMS symmetrics 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 24000.0 50 or 60 Hz 40.25 VA at 120 V 1 to 275 V continuous at 260 V to neutral, 1 minute per hour at 420 V neutral 300 V DC maximum 24 to 250 V 10 mA during turn on, 0.5 mA steady- state 4 I ms 1.50 to 16.00 ms in steps of 0.25 <b>CINTICAL FAILURE RELAY</b>
Demand: MAINTENANCE DISPL Input and output status contact inputs and outp AC CURRENT CT rated primary: CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range: Current withstand: AC VOLTAGE VT ratic secondary: VT ratic secondary: Conversion range: Voltage withstand: CONTACT INPUTS Selectable thresholds: Maximum current: Recognition time: Debounce timer: CONTACT OUTPUTS: C	energy present and peak demand values for current and real, reactive, and apparent power AY (isplays the current status of all suts) 1 to 50000 A 1 A or 5 A 50 or 60 Hz <0.2 VA secondary. 0.02 to 46 × CT rating RMS symmetrics 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 24000.0 50 or 60 Hz <0.25 VA at 120 V 1 to 275 V continuous at 250 V to neutral, 1 minute per hour at 420 V neutral 300 V DC maximum 24 to 250 V 10 mA during turn on, 0.5 mA steady- state 1.50 to 16.00 ms in steps of 0.25 CRITICAL FAILURE RELAY
Demand: MAINTENANCE DISPL Input and output status contact inputs and outp AC CURRENT CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range: Current withstand: AC VOLTAGE VT ratic secondary: YT ratic secondary: YT ratic secondary: Nominal frequency: Relay burden: Conversion range: Voltage withstand: CONTACT INPUTS Input rating: Selectable thresholds: Maximum current: Recognition time: Debounce timer: CONTACT OUTPUTS: C Make and carry for 0.2 s Continuous carry:	energy present and peak demand values for current and real, reactive, and apparent power AY (displays the current status of all uts) 1 to 50000 A 1 A or 5 A 50 or 60 Hz <0.2 VA secondary 0.02 to 46 × CT rating RMS symmetrice 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 24000.0 50 or 60 Hz <0.25 VA at 120 V 1 to 275 V continuous at 260 V to neutral, 1 minute per hour at 420 V neutral 300 V DC maximum 24 to 250 V 0 mA during turn on, 0.5 mA steady- state <1 ms 1.50 to 16.00 ms in steps of 0.25 CRITICAL FAILURE RELAY
Demand: MAINTENANCE DISPL Input and output status contact inputs and outp AC CURRENT CT rated primary: CT rated primary: CT rated secondary: Nominal frequency: Relay burden: Conversion range: Current withstand: AC VOLTAGE VT ratic secondary: VT ratic secondary: Conversion range: Voltage withstand: CONTACT INPUTS Selectable thresholds: Maximum current: Recognition time: Debounce timer: CONTACT OUTPUTS: C	energy present and peak demand values for current and real, reactive, and apparent power AY (isplays the current status of all suts) 1 to 50000 A 1 A or 5 A 50 or 60 Hz <0.2 VA secondary. 0.02 to 46 × CT rating RMS symmetrics 20 ms at 250 × rated, 1 second at 100 rated, continuous at 3 × rated 50.0 to 240.0 V 1.00 to 24000.0 50 or 60 Hz <0.25 VA at 120 V 1 to 275 V continuous at 250 V to neutral, 1 minute per hour at 420 V neutral 300 V DC maximum 24 to 250 V 10 mA during turn on, 0.5 mA steady- state 1.50 to 16.00 ms in steps of 0.25 CRITICAL FAILURE RELAY

## Hardware (cont'd)

FORM-A RELAY	
Make and carry for 0.2	30 A per ANSI C37.90
Carry continuous: Break at L/R of 40 ms:	6A 0.250 A DC at 125 V DC; 0.125 A DC at 250 V DC
Operate time: Contact material:	<4 ms silver alloy
CONTACT OUTPUTS:	
Make and carry for 0.2	s: 30 A as per ANSI C37.90
Continuous carry: Break at L/R of 40 ms:	6:00 AM 10 A at 250 V DC
Operate time:	<100 µs
Contact material:	silver alloy
CONTROL POWER EX Capacity:	100 mA DC at 48 V DC
Isolation:	2 kV
CRITICAL FAILURE RE	
Make and carry for 0.2	s: 30 A as per ANSI C37.90
Carry continuous:	6:00 AM
Break at L/R of 40 ms:	0.250 A DC at 125 V DC; 0.125 A DC at 250 V DC; 0.10 A DC maximum at 125 V
Operate time: Contact material:	<8 ms silver alloy
ETHERNET PORTS	Silver alloy
Standard:	1 port supporting Modbus TCP
Optional:	2 ports supporting DNP 3.0, IEC 60870-5-104, or IEC 61850 located on communications module
100Base-FX media type	e: 1300 nm, multi-mode, half/full-duplex, fiber optic with ST connector
10/100Base-TX media t	
Power budget: Maximum optical input	10 dB
Receiver sensitivity:	-30 dBm
Typical distance: SNTP clock synchroniza	2.0 km tion:
	<10 ms typical
IRIG-B INPUT Amplitude modulation:	1 to 10 V pk-pk
DC shift:	TTL
Input impedance: Isolation:	50 kΩ 2 kV
POWER SUPPLY	
Nominal DC voltage:	125 to 250 V
Minimum DC voltage: Maximum DC voltage:	80 V 300 V
Nominal AC voltage:	100 to 240 V at 50/60 Hz 80 V at 48 to 62 Hz
Minimum AC voltage: Maximum AC voltage:	275 V at 48 to 62 Hz
Voltage withstand: Voltage loss hold-up:	2 × highest nominal voltage for 10 ms 200 ms duration at nominal
Power consumption:	30 VA typical, 65 VA maximum
RS485 PORT	
Baud rates:	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
Protocol:	Modbus RTU and DNP 3.0
Distance: Isolation:	1200 m 2 kV
SOLID-STATE RELAY	
Make and carry for 0.2	
Carry continuous:	30 A as per ANSI C37.90 6A
Break at L/R of 40 ms:	10.0 A DC at 250 V DC
Operate time: USB PORT	< 100 µs
Standard:	type B USB connector for EnerVista
	software

## Communications

DIRECT INPUTS	
Input points: Remote devices: Default states on loss o	96 per channel 16 of communications: On, Off, Latest/On, Latest/Off
Ring configuration: Data rate: CRC: CRC alarm:	yes, no 64 or 128 kbps 32-bit responding to rate of messages failing
CRC alarm monitoring r	the CRC message count: 10 to 10000 in steps of 1 1 to 1000 in steps of 1
Unreturned messages of	
Unreturned messages of Unreturned messages of	alarm monitoring message count: 10 to 10000 in steps of 1 alarm threshold: 1 to 1000 in steps of 1
DIRECT OUTPUTS	
Output points:	96 per channel
(IEC 61850 GOOSE)	IG (FLS) END DEVICE DATA UNITS
Number:	64
MODBUS USER MAP Number: Programmability:	up to 256 Modbus addresses any setting or actual value in decimal
REMOTE INPUTS (IEC	61850 GSSE/GOOSE)
Input points: Remote devices: Default states on loss c Remote double-point st	On, Off, Latest/Off, Latest/On
	EC 61850 GSSE/GOOSE)
Standard output points User output points:	: 12A 32
TELEPROTECTION	
Input points: Remote devices: Default states on loss of Ring configuration: Data rate:	16 per channel 3 a of communications: On, Off, Latest/On, Latest/Off No 64 or 128 kbps
CRC:	32-bit

## Inter-Relay Communications

R5422 interface: G.703 interface: 850 nm laser (multimod NOTE:	2.0 km (50/125 µm cable with ST connector) 2.9 km (62.5/125 µm cable with ST connector) 2.9 km (62.5/125 µm cable with ST connector) The typical distances shown are based on the assumptions for system loss shown below. As actual losses vary from one installation to another, the distance covered by your system may system may system may actual losses with the distance covered by your system
LINK LOSSES (850 NM	vary. I LASER, MULTIMODE MODULE)
ST connector losses:	2 dB (total of both ends)
50/125 µm fiber loss:	2.5 dB/km
62.5/125 µm fiber loss:	3.0 dB/km
Splice loss:	one splice every 2 km, at 0.05 dB loss
	per splice
System margin:	3 dB of additional loss was added to calculations to compensate for all othe losses, including age and temperature
LINK POWER BUDGE (850 NM LASER, MUL	
Maximum optical input	
riaximani optical inpat	–9 dBm
Minimum transmit powe	er:
	–22 dBm (into 50 µm fiber), –18 dBm (into 62.5 µm fiber)
Maximum receiver sens	-32 dBm
	-32 dBm
Power budget:	– 32 αΒΠ 10 dBm (for 50 μm fiber), 14 dBm (for 62.5 μm fiber)

#### Tests

PRODUCTION TESTS	
Thermal:	products go through a 12 hour burn-in
inermai:	products go through a 12 hour burn-in process at 60°C
TYPE TESTS	
Vibration:	IEC 60255-21-1, 1G (class Bm)
Shock / bump:	IEC 60255-21-2, 10G (class Bm)
Seismic (single axis):	IEC 60255-21-3, 1G / 3.5 mm (class 1)
Make and carry (30 A):	IEEE C37.90
Conducted immunity:	IEC 61000-4-6 / IEC 60255-22-6, class 3 (10 V RMS)
Surge:	IEC 61000-4-5 or IEC 60225-22-5, 1.2/50 test up to level 4 (4 kV)
Burst disturbance (1 MH	
	IEC 60255-22-1 up to 2.5 kV at 1 MHz damped
Fast transients:	ANSI/IEEE C37.90.1, EC61000-4-4 class
	4, (2 kV, 5 kHz / 4 kV, 2.5 kHz, 2 kV on
	data control ports and inputs/outputs), IEC 60255-22-4
Radiated immunity:	IEC 61000-4-3 / IEC 60255-22-3 class 3
naalatea minanty.	(10 V/m) or IEEE C37.90.2 radiated RFI
	(35 V/m)
Power frequency distur	
	IEC 61000-4-8 (30 A/m) class 4
Radiated/conducted en	nissions: IEC 60255-25 / CISPR 11/22 class A
Insulation resistance:	IEC 60255-5
Dielectric strength:	IEC 60255-5, ANSI/IEEE C37.90
Dielectric across relay o	iontacts: IEEE C37.90 (1.6 kV)
Electrostatic discharge:	EN 61000-4-2, IEC 60255-22-2 8 kV C, 15 kV A, L4
Voltage dips/interruptio	
	IEC 61000-4-11 (30% 1 cycle), IEC 60255-11
AC ripple:	IEC 61000-4-17 (standard)
Interruptions on DC pov	
	IEC 61000-4-29
Damped magnetic imm	unity: IEC 61000-4-10 (level 5, 100A/m)
Impulse voltage withsto	
	EN/IEC 60255-5 (5 kV)
Humidity cyclic:	IEC 60068-2-30, 6 days 55°C, 95%RH
	(variant 1)

## Environmental

OPERATING TEMPERATURE		
Cold:	IEC 60068-2-1, 16 hours at –40°C	
Dry heat:	IEC 60068-2-2, 16 hours at 80°C	
OTHER ENVIRONMENTAL SPECIFICATIONS		
Altitude:	up to 2000 m	
Installation category:	II	
IP rating:	IP30 for front, IP10 for back	

## Approvals and Certification

APPROVALS	
UL508 17th edition an	d C22.2 No.14-05: UL listed for the USA and Canada
CERTIFICATION	
CE LVD 2006/95/EC: CE EMC 89/336/EEC:	EN/IEC 61010-1:2001 / EN60255-5:2000 EN 60255-26:2004-08

## Typical C90<sup>Plus</sup> Fast Load Shed Order Codes:

Controller	Aggregator
C90P-AE-PC03DSX-XHXACXXXX No HMI No AC M Protection FlexLogic No AC M Load Shed Controller B Inputs, 4 Form IEC 61850 No Metering	A Outputs Load Shed Agaregator 8 Inputs, 4 Form-A Outputs
Ordering	
C90P         •         E         *         *         *         *         X         H         *	* * * ** * Description Base Unit Annunciator Annunciator & HMI English None Basic Protection and Protection FlexLogic
O Automation S L L L L L L L L L L L L L L L L L L	Basic protection, protection FlexLogic, small-signal oscillation detection Breaker Control & Synchrocheck Breaker Control, Synchrocheck, & Automation Controller Breaker Control, Synchrocheck, Automation Controller, & Load Shedding Fast load shedding (controller) Fast load shedding (aggregator)
Communications 01 02 03 04 42 A3 A4 4	ModBus TCP/IP, DNP 3.0 Serial, and Serial Modbus ModBus TCP/IP, & IEC 61850 ModBus TCP/IP, IEC 61850, & DNP 3.0 TCP/IP ModBus TCP/IP, IEC 61850, & IEC 60870-5-104 ModBus TCP/IP, IEC 61850, DNP 3.0 TCP/IP & PRP ModBus TCP/IP, IEC 61850, IEC 60870-5-104 & PRP
Metering D S P L L U	No AC metering; data logger for non-metering data Basic Metering Basic Metering & Synchrophasors Basic Metering & Data Logger Basic Metering, Data Logger, & Synchrophasors
Digital Fault Recorder S D Equipment Manager X O	Fault Recorder & Sequence of Events Fault Recorder, Sequence of Events, & Disturbance Recorder No equipment manager features
S S Harsh Environment Coating X C	Circuit breaker, communications statistics, and battery monitor None (Standard)
C   H   Power Supply H   H   H   H   H   H   H   H   H   H	Harsh Environment Conformal Coating High (88-275VAC/80-300VDCI) Reserved G.703, 64/128 kbps, two channels R5422, 64/128 kbps, two channels, two clock inputs 850 nm, 64/128 kbps, ST multi-mode laser, two channels with DDMI
Communications Module X	None Dual ST fiber and copper module
A B C D E	A     A     A     B     Inputs, 4 Form-A Outputs with Voltage & Current Monitoring       B     B     B     Inputs, 4 Solid State Outputs with Voltage & Current Monitoring       C     C     C     B       D     D     D     4       Inputs, 8 Form-A Outputs     5       F     F     12       F     F     12
AC Module .	X         No AC module           01         5 VT & 7 CT (5 Amp current)           02         5 VT & 7 CT (1 Amp current)

#### Notes for Fast Load Shedding:

Front Panel: Can be either A or H (HMI is an option)

Automation: C or A for Controller or Aggregator

Communication Module: Only option A available

AC Module: X – none only option

#### Accessories for the C90<sup>Plus</sup> –

- MultiLink Ethernet Switch
- Viewpoint EngineerViewpoint MaintenanceVPM-1
- Viewpoint Monitoring IEC 61850 VP-1-61850
- 339 Motor Protection
- F35 Feeder Protection
- F35 Feeder Protection F60 Feeder Protection .
- F650 Bay Controller
- G30 Generator Protection
- G60 Generator Protection .

ML3K-F-HX-A-B-E-E-W-W-Y-Y-X-X-X • 350 Feeder Protection 350-E-P5-G5-H-E-S-N-M-3E-D-N 339-E-P5-G5-H-E-S-N-M-3E-D-N F35-N03-VKH-F8L-H6P-MXX-PXX F60-N03-VKH-F8L-H6P-MXX-PXX

F650-B-F-B-F-1-G-0-HI-6E

G30-N03-VKH-F8L-H6P-M8L-PXX

G60-N03-VKH-F8L-H6P-M8L-PXX

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