

## GRID SOLUTIONS

# MULTILIN AGILE MOTOR PROTECTION

## P24N, P24D Motor Management Series

Motors are key assets used in various industrial environments and critical to ensure process continuity. The cause of motor failure could be electrical or mechanical or both. It is important to effectively protect and monitor operating parameters & health to take informed decisions and avoid costly downtime.

Multilin Agile platform offers dedicated motor protection relay with basic to advanced features to choose based on the motor size and application. The relay supports GE Vernova's proven Thermal model for reliable motor protection along with various independent stages of functions to protect against electrical & mechanical faults including Overcurrent/overvoltage/Power & frequency protection.

The relay supports extensive monitoring & recording functions including alarms, events, disturbance records, motor start records etc. along with motor health report for maintenance team to review, spot trends and take preventive action.

The relay supports LCD / large graphical screen option which facilitates effective monitoring & visualization of operational parameters. Advanced cybersecurity option complying to NERC-CIP / IEC62351 standards ensures safety against malicious cyber-attacks.

### Key Benefits

- GE Vernova's proven Thermal model for reliable motor protection
- Motor health report with operating and diagnostic information
- Smaller footprint for easy retrofitting of aging infrastructure
- Intuitive graphical display for effective monitoring, communications & troubleshooting
- Easy testing & commissioning with virtual injection & testing feature
- Draw-out design for simplified testing, commissioning & maintenance
- Cost savings on engineering time & wiring due to traditional hardwired control scheme replacement

### Applications

- Protection and control of small to medium sized motors (typically up to 1MW)
- Protection of pumps, conveyors, fans, compressors, and others in process or manufacturing industries
- Applications requiring redundant communications
- Motor health monitoring
- High reliability in coastal, industrial and polluted environments due to harsh environmental coating of PCBs (printed circuit boards) as the standard



### Advanced Protection & Control

- Fast protection execution, scan rate 8 times / cycle
- Enhanced Thermal modeling and start supervision
- Anti-backspin and Emergency Restart
- Customization with FlexElements & FlexCurves

### Advanced Monitoring & Metering

- Metering - current, voltage, power, energy, frequency, power factor, THD, Motor Run Hours
- Oscillography (up to 128 s/c), Motor Start Records, Event Recorder, Fault Recorder, Last Trip Data & Datalogger
- Advanced Motor Health report

### Advanced Communications

- Supports IEC 61850 Ed. 2, IEC 62439 (PRP/ HSR), Modbus RTU/ TCP, IEC 60870- 5-103, DNP 3.0 serial/ethernet protocols
- IEEE 1588 (PTP), IRIG-B and SNTP time synchronization

### Ease of Use

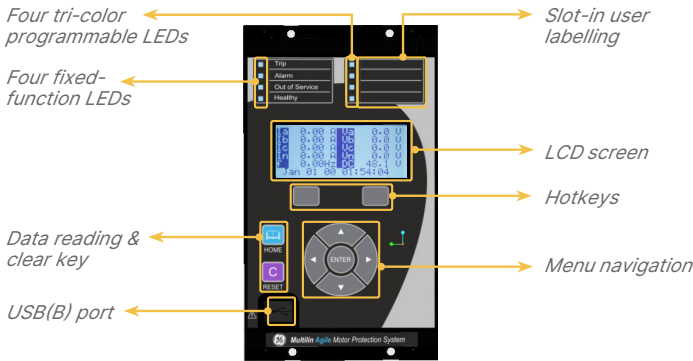
- Compact and withdrawable design with 4" and 6" case size options
- Configurable SLD for bay monitoring & control, push buttons and function keys for connected switchgear
- Single configuration software across Multilin devices
- Single Setting file for relay configuration



GE VERNOVA

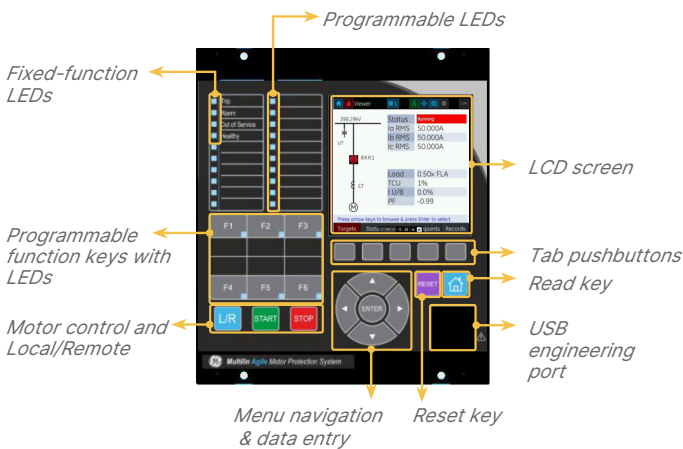
## Intuitive User Interface

The 20TE (4") front HMI hosts a multi-line text display which allows direct device interaction. Smart dependencies within the menu ensure that settings for unused elements are hidden. Four tricolor LED lamps are available, freely configurable, in addition to four fixed-function LEDs which provide a cost-effective solution for annunciation.



Front Panel interface 20TE (4")

The 30TE (6") version front HMI hosts a fully graphical color screen that supports start, stop, local/remote and direct function key access facilitating the control of connected motor. Sixteen tricolor LED lamps are available, and freely configurable, in addition to four fixed-function LEDs.



Front panel interface 30TE (6") - ANSI version

Both 20TE & 30TE version support multiple languages with easy switching between English and an additional language on the local display without uploading new firmware. A USB front port offers ready access by field personnel laptops.

## Environmental Responsibility

The relays are manufactured in a lead-free soldering process using lead-free components. Power dissipation is very low as it minimizes the burden on station batteries. Even the product weight (including packaging) is optimized to lessen the transit carbon footprint. Such actions boost the eco-responsibility demonstrated in the Product Environment Profile (PEP). The product does not require any resident battery.

The PEP shows claims for raw material, energy and water depletion, global warming potential, ozone depletion, photochemical ozone creation, air acidification, and hazardous waste production.

## Quality Built-in

Quality Built-In methodology is applied throughout the development and manufacturing processes. The product is designed with an IEC62443-4-1:2018 certified secure development lifecycle process. Parts stress analysis in R&D, rigorous component supplier selection and a shipping carton compliant with ISTA protection requirements are examples of the best practice to maximize long-life reliability. All circuit boards have harsh environmental coating to resist moisture, salt, corrosive atmosphere and industrial ambient pollution as standard. Circuit board production uses in-circuit tests, boundary scanning, built-in self-test, automated optical inspection, and X-ray scanning to achieve 100% test coverage.

Manufacturing of the product is at an ISMS 27001 certified plant.

## Retrofitting

In addition to new-build, Multilin Agile can be used to refurbish legacy protection schemes. Having lower depth than most 4U relays or electromechanical disk relays in the installed base makes retrofitting within the existing footprint and AC/DC schematic an easy task.

## Multilin Agile Offers:

- Space-saving 4U height (177 mm) and 20TE (4") / 30TE (6") width case size
- Terminals with IP20 protection, safer within the panel
- A front USB port and rear RS485 and RJ45 ports
- Power-up diagnostics and continuous self-monitoring
- Freely programmable opto-isolated binary I/O relays
- Watchdog health contact
- Field upgradeable via firmware upgrade to change relay model avoiding costly hardware change



## Motor Protection

### Motor Thermal Overload

Multilin Agile supports advanced thermal model to avoid motor failures that are caused by extensive heating of the different parts of motor involved in electromechanical operation. RMS and negative sequence current elements are taken into account so that any unbalanced condition can be detected, and any abnormal heating can be avoided.

Standard overload thermal curve with different time constants according to the machine cycles (heating, cooling or start-up) are supported to provide optimal protection.

A user-programmable curve feature gives the user additional flexibility if a standard thermal overload curve is not suitable for the application.

Applications such as induction fan drives and high inertia rotors/loads in which the motor stator and rotor thermal limits differ significantly can take advantage of this feature for optimal grading.

Inhibition of the function in case of extreme starting conditions (very long start, very high start current) supported and inhibition of a new start until the machine has cooled down, immediately after a trip.

### Two-Speed Thermal Model

The two-speed motor protection feature allows for the protection of motors that can operate at two different speeds. The algorithm integrates the heating at each speed into one thermal model.

### Protection of Motors with High-Inertia Loads

The voltage dependent overload curve feature is tailored to protect motors which are used in high inertia load applications. Voltage is continually monitored when the motor is started and during acceleration. The thermal limit curve is then adjusted accordingly. This enables the Multilin Agile to distinguish between a locked rotor condition, an accelerating condition and a running condition.

### Phase and Ground Fault Overcurrent

Multiple independent stages are available for each phase overcurrent element. Additional to the definite time and predefined IDMT curve selection, programmable curves for customized operation and resetting are available.

The earth fault current, which will appear during a stator ground fault, can be detected by two independent protection elements using either earth current measured from a sensitive current input, or earth current internally derived from the three phase currents. Both methods can be used simultaneously.

### Current Unbalance

Unbalance current, also known as negative sequence current or  $I_2$ , results in disproportionate rotor heating. The current unbalance protection can detect when the motor's thermal capacity is exhausted and alarm and /or trip before the motor has heated substantially. For the Multilin Agile relay, unbalance is defined as the ratio of negative sequence to positive-sequence current.

### Undercurrent Protection

The undercurrent protection element provides the ability to trip the motor due to external conditions that can cause the load being driven by the motor to drop below a pre-set level. This function is used to protect pumps from loss of suction, fans from loss of airflow due to a closed damper or a conveyor system due to a broken belt.

### Underpower Protection

The Underpower element is based on the three-phase real power (kW) measured from the phase currents and voltages. Underpower may be used to detect loss of load conditions. This may be used for more sensitive detection of load loss or pump cavitation or detecting process related issues.

### Reverse Power

This element is based on the active power measurement to detect power flow from the machine to the system when a loss of mains occurs.

### Phase Reversal

Both input voltage phase rotation and magnitude are monitored to ensure they are correct before allowing the machine to start.

### Motor Start Supervision

Motor start supervision consists of the following features: Time-Between Starts, Start-per-Hour, Restart Time and Start Inhibit. These elements are intended to guard the motor against excessive starting duty, which is normally defined by the motor manufacturer in addition to the thermal damage curves. The Emergency Restart enables the user to reset the Motor start supervisions in case of process needs. The start inhibit function prevents the starting of a motor when the motor is too hot and does not have a sufficient amount of thermal capacity available to allow a start without being tripped offline. In case of emergency, the thermal capacity used and motor start supervision timers can be reset to allow a hot motor to start.

### Mechanical Jam and Acceleration Time

These two elements are used to prevent motor damage during abnormal operational conditions such as excessively long acceleration time or stalled rotors. The mechanical jam element senses increased loading associated with process or load related faults such as an overloaded conveyor.

### Voltage and Frequency Protection

The voltage and frequency protection functions detect abnormal system conditions like over/under voltage, over/under frequency and/or phase reversal that are potentially hazardous to the motor.

## Advanced Logic and Control Capabilities

Multilin Agile incorporates advanced automation capabilities that reduce the need for additional programmable controllers or discrete control relays by including programmable logic, communication, and HV bay / MV cell monitoring, there by reducing equipment and engineering cost. Advanced automation also enables seamless integration into other protection or process systems (SCADA or DCS).

### FlexElements™

FlexElement™ is a universal comparator that can be programmed to respond either to a signal level or to a rate-of-change (delta) over a pre-defined period. FlexElements™ can be used to generate special protection or monitoring functions. The relay supports up to 8 FlexElements™.

### Digital Counters

Multilin Agile provides sixteen identical digital counters. A digital counter counts the number of state transitions from logic 0 to logic 1. The counters are generally used to count operations such as pickups of an element, changes of state of an external contact (e.g., breaker auxiliary switch), or pulses from a watt-hour meter.

### FlexLogic™

FlexLogic™ is the powerful programming logic engine that provides the ability to create customized protection and control schemes logic for feeder control interlocking schemes with adjacent protection and dynamic setting group changes, minimizing the need for and the associated costs of auxiliary components and wiring.

### Switchgear Control and Configurable SLD

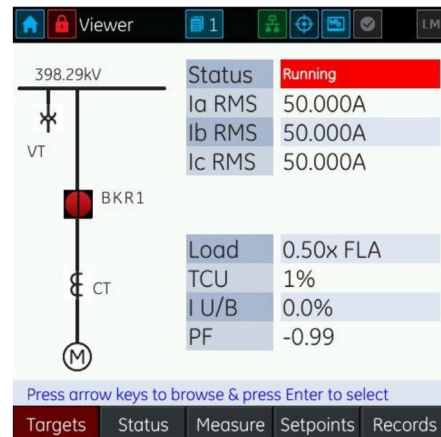
Multilin Agile offers comprehensive switchgear control aided by a configurable SLD & breaker control. A total of 8 switchgear elements can be controlled. Circuit Breaker control is available through dedicated Open/Close push buttons, graphical HMI interface, optically isolated inputs and remotely via the substation communication.

Up to six (6) pages of configurable SLD are supported which can be configured to show breakers, switches, metering, and status items. The device allows double point status and control over the IEC 61850 protocols for various types of switches and disconnectors.

## Supervisory and Condition Monitoring Functions

Depending on the hardware base, two stage circuit breaker failure protection, CT/VT supervision, circuit breaker condition monitoring and trip circuit supervision are available.

The optically isolated inputs and programmable scheme logic enable supervision of the trip circuit in both open and closed states. Multilin Agile claims full compliance with the benchmark H7 supervision scheme.



Enhanced Bay visualization & control aided by single line diagram display-30TE (6") version

## Breaker Health Monitoring

The breaker is monitored by the relay not only for detection of breaker failure, but also for the overall "breaker health" which includes:

- Breaker close and breaker open times
- Trip circuit monitoring
- Spring charging time
- Per-phase arcing current
- Trip counters

## DC Supply Monitoring

Multilin Agile measures the DC auxiliary supply infeed to the device, to determine whether the supply is within acceptable operational limits. Three DC supply monitoring zones are available, for under and overvoltage alarming. The DC auxiliary supply value can be displayed on the front panel LCD. This measurement also assists in auto configuration of binary input pickup thresholds to provide accurate pickup and drop-off.

## Active Impedance Binary Inputs

Multilin Agile binary inputs comply to the ESI 48-4 EB2 standard and are immune to inductive fields created in substations where wiring runs for hundreds of meters in the yard and neighboring wires, busbars and power conductors create strong fields. The inputs support programmable pickup and drop-off and no spurious pickup during battery ground faults or capacitive discharges, thereby making them perfect for plant status monitoring.



Binary inputs immunity to inductive fields

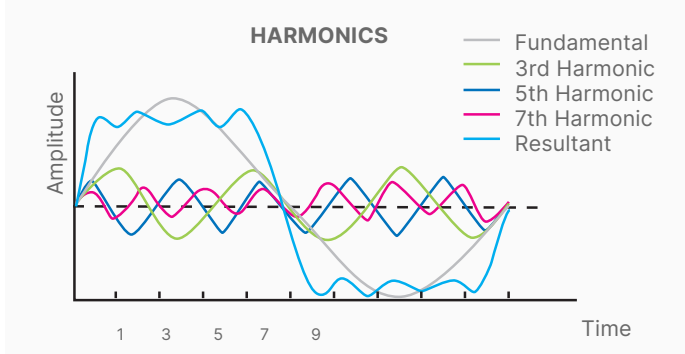
## Measurement, Recording and Post-Fault Analysis

Multilin Agile offers unmatched power system analytics through the advanced features and monitoring and recording tools.

Up to 2048 time-tagged event records are stored in non-volatile memory and can be extracted using the communication ports or viewed on the front panel display. Records of the last 25 faults are stored, and fault data is also available via the IEC 61850 protocol.

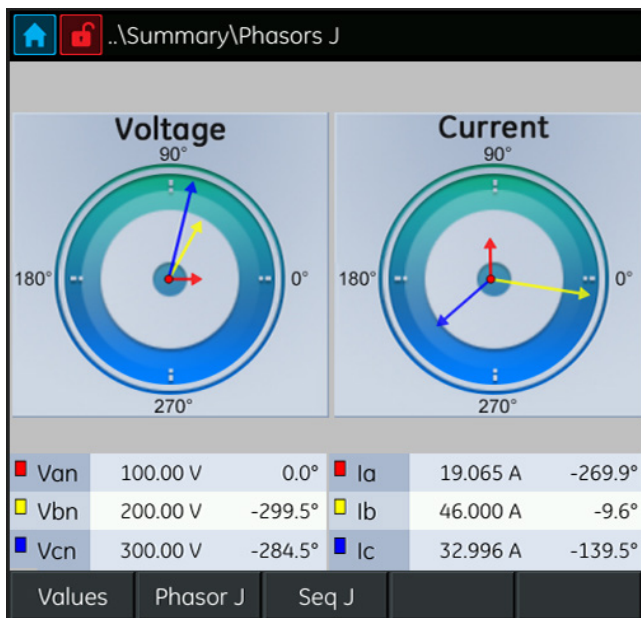
The internal disturbance recorder has up to 16 analog oscillograph channels and 64 digital channels, with a 30 second capacity.

The relay offers comprehensive Power Quality metering by measuring up to the 21st harmonic for both currents and voltages including total harmonic distortion (THD).



Power Quality Monitoring & Custom Schemes

Multilin Agile provides a comprehensive datalogging facility where the average values of analog metering can be recorded at a user selectable interval. The datalogger can store information from up to 16 analog channels, selected from any analog values calculated by the relay.



Phasor view for effective monitoring, commissioning & troubleshooting – 30TE (6”) version

## Advanced Motor Health Report

The Multilin Agile health report provides a quick snapshot of the motor operating and diagnostic information in an easy way to allow users to make decisions about health of the motor. Based on the graphical representation and trend values of the motor historical data gathered by the Multilin Agile, users can quickly identify process issues and maintenance requirements before damage occurs and costly repairs are required.

The motor health report quickly provides a motor operation summary with detailed information in the following categories.

- Device Overview
- Status Overview
- Trip Summary
- Motor Operating History
- Motor Starting Learned Data
- Motor Start Records
- Motor Stopping/Tripping

### P24D Motor Operational Report

OVERVIEW	
Requested Period	Jun 18, 2024 12:00 AM - Jun 18, 2024 10:59 AM
Report Created By	Admin
Motor Name	Relay 1
Protection Device	P24DB1DJ3C0080E
Firmware Version	08A
Motor FLA	100 A
Rated Voltage	600 V
Phase Rotation	ABC
System Frequency	50 Hz
Motor Running Time	1 days 7 hours
Generated At:	Jun 18, 2024 10:00 AM

#### Status Overview

Available Time Range: Jun 18, 2024 - Jun 18, 2024

Status	Parameter	% Change	Oldest Record (Jun 18, 2024)	Latest Record (Jun 18, 2024)
▲	Acceleration Time	Increased	0.0 s	19.0 s
▼	Starting Current	Increased	0.0 xFLA	4.0 xFLA
▲	Starting Capacity	Increased	0 %	91 %
▲	Average Motor Load	Decreased 49.5 %	1.01 xFLA	0.51 xFLA
▲	Run Time After Start	Decreased 100.0 %	0 days 5 min	0 days 0 min
▲	Average kW	Decreased 71.4 %	33.80 kW	9.60 kW
▲	Average kVar	Decreased 100.0 %	-0.10 kVar	0.00 kVar
▲	Average PF		-0.99	-0.99

#### Trip Summary

Available Time Range: Jun 18, 2024 12:00 AM - Jun 18, 2024 10:59 AM

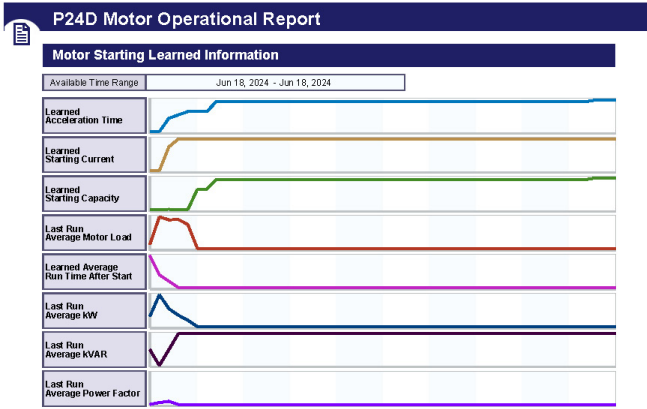
Overload / Thermal	Current	Voltage / Frequency / Power	Miscellaneous
3			

#### Motor Operating History

Available Time Range: Jun 18, 2024 09:57 PM - Jun 18, 2024 10:17 PM

Total Number of Events	
Motor Starting / Running	56
Manual Stop Commands	0
Trip Commands	3
Lockouts	0
Alarm Conditions	0
Emergency Restarts	56

Motor Operation Report snapshot from Multilin Agile Motor protection device



Motor Starting Learned Information extracted from Multilin Agile Motor device

## Local and Remote Communication

Multilin Agile provides advanced communication technologies for remote data and engineering access, making it easy and flexible to use and integrate into new and existing networks. Providing several Ethernet and serial port formats and supporting a wide range of industry standard protocols, the relay can be integrated directly into DCS and SCADA systems.

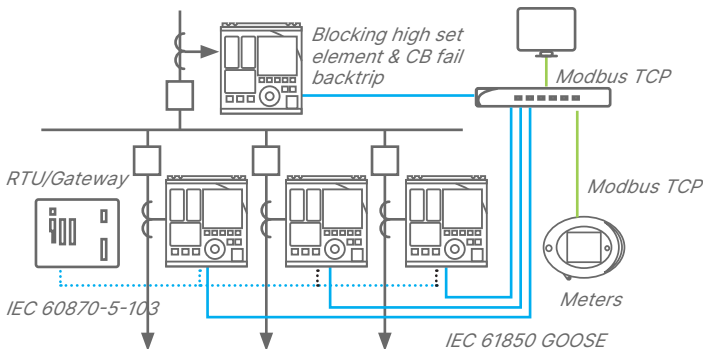
The following protocols are supported:

- Modbus (RS485 serial and Ethernet)
- IEC 61850 Ed. 2
- IEC 60870-5-103 serial
- DNP3.0 (RS485 serial and Ethernet)
- IEC62439 (PRP/HSR) redundancy protocol
- IEEE 1588 (PTP) for time synchronization

All serial protocols - Modbus, IEC 60870-5-103 and DNP 3.0 - are switchable in settings and site- selectable for customer use. Similarly, all the Ethernet protocols (Modbus TCP, IEC 61850 and DNP 3.0) are available for selection once ordered.

The concurrent Ethernet protocol feature allows customers to futureproof their investment for applications requiring support of multiple Ethernet protocols in a single device. Similarly, ordering the Ethernet option in a device initially connected with a serial protocol can provision for a future communications upgrade to Ethernet.

Multilin Agile offers 256 virtual inputs, and superior GOOSE performance.

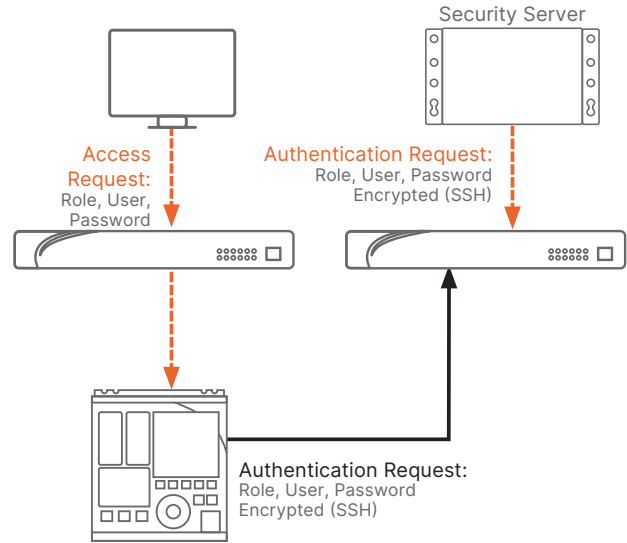


Mixed Communication Protocols: Application Example

## Advanced Cybersecurity

Multilin Agile helps prevent unauthorized access and malware by delivering host of cybersecurity features compliant with NIS and NERC CIP guidelines, or other security regulations.

- Authentication/authorization/accounting server support (AAA-Radius)
- Role Based Access Control (RBAC)
- Non-erasable cyber event recorder (Syslog for SEM)
- Product level security
- Achilles Level 1 certified for Cyber Security penetration tests



Cybersecurity with Radius Authentication

## Testing and Simulation

Multilin Agile offers the capability for simulating current and voltage inputs. Other test operations are also possible such as the LED lamp test for each color, contact input states and testing of output relays.

The simulation feature tests the response to programmed conditions, without the need of external AC voltage and current inputs. First time users will find this to be a valuable training tool. System parameters such as currents, voltages and phase angles are entered as setpoints.

When placed in simulation mode, the relay suspends reading actual AC inputs, generates samples to represent the programmed phasors, and loads these samples into the memory to be processed by the relay. Normal (pre-fault), fault and post-fault conditions can be simulated to exercise a variety of relay features.

## Model Variants and Intended Application

MODEL	HARDWARE BASE	INTENDED APPLICATION	CASE SIZE
P24NB	P24N	Motor Protection (current elements only)	20TE / 30TE
P24DB	P24D	Motor Protection (current, voltage & power elements)	20TE / 30TE

## Hardware Overview

FUNCTION	NON-DIRECTIONAL	DIRECTIONAL
	P24N	P24D
CT (AC current) inputs : 1 and 5 A software selectable	3Ph +N	3Ph +N
VT (AC voltage) inputs : 100/120 V		4
Digital inputs min./max. hardware option		
20TE(4") case	5 to 14	
30TE(6") case	11 to 30	
Output relays min./max. hardware option		
20TE(4") case	5 to 11	
30TE(6") case	9 to 25	
Rear communication port (software selectable to convert into demodulated IRIG-B)		RS485
2nd Rear communication port options	Additional RS485 serial (20TE only), 0 to 3 RJ45 Ethernet, 0 to 3 fiber Ethernet*	
Communication Protocols	IEC 103, Modbus, DNP3.0, Modbus TCP, DNP3 Ethernet, IEC 61850, IEC62439 (PRP/HSR) *	
Trip circuit supervision (H7 scheme)	Yes	

*\*Refer to order code for possible combinations. Please refer to the wiring diagram*

## Protection & Control Functions

ANSI CODE	FUNCTION	NON-DIRECTIONAL	DIRECTIONAL
		P24NB	P24DB
50	Definite time overcurrent protection (short circuit)	•	•
50N/G	Neutral / Ground definite time overcurrent protection (Derived and Measured)	•	•
51	IDMT overcurrent	•	•
51N/G	Neutral / Ground IDMT overcurrent protection	•	•
50/51SEF	Sensitive ground fault	•	•
68	Inrush blocking	•	•
46	Current unbalance	•	•
55	Power factor		•
	Programmable curves	•	•
67P	Directional phase overcurrent		•
67N/G	Directional neutral/ground overcurrent		•
37	Undercurrent detection (loss of load)	•	•
37P	Underpower detection		•
32	Phase directional power		•
32R	Reverse power protection		•
49	Thermal overload (current replica)	•	•
48/50LR	Start / Stalled protection (Mechanical jam)	•	•
66	Number of starts limitation (Start supervision)	•	•
87RGF	Restricted ground fault (REF)	•	•
14	Speed switch input	•	•
	Emergency restart	•	•
50BF	CB failure	•	•
27P / 59P	Phase undervoltage/overvoltage		•
27_1 / 59_1	Positive sequence undervoltage/overvoltage		•
59_2	Negative sequence overvoltage		•
	Reduced voltage start		•
59N	Residual overvoltage		•
47	Phase reversal		•
81O	Overfrequency		•
81U	Underfrequency		•
81V	Undervoltage blocking of frequency protection		•
ABS	Anti-backspin (Timer based)	•	•
	FlexLogic	•	•
	Blocking scheme	•	•
86	Latching output contacts (Lockout) / Start inhibit	•	•
	Switch status control	•	•
VTS	VT supervision		•
CTS	CT supervision	•	•
	DC supply supervision	•	•
	CB condition monitoring	•	•
	Setting groups	6	6



Wiring Diagram – 20TE (4”) version

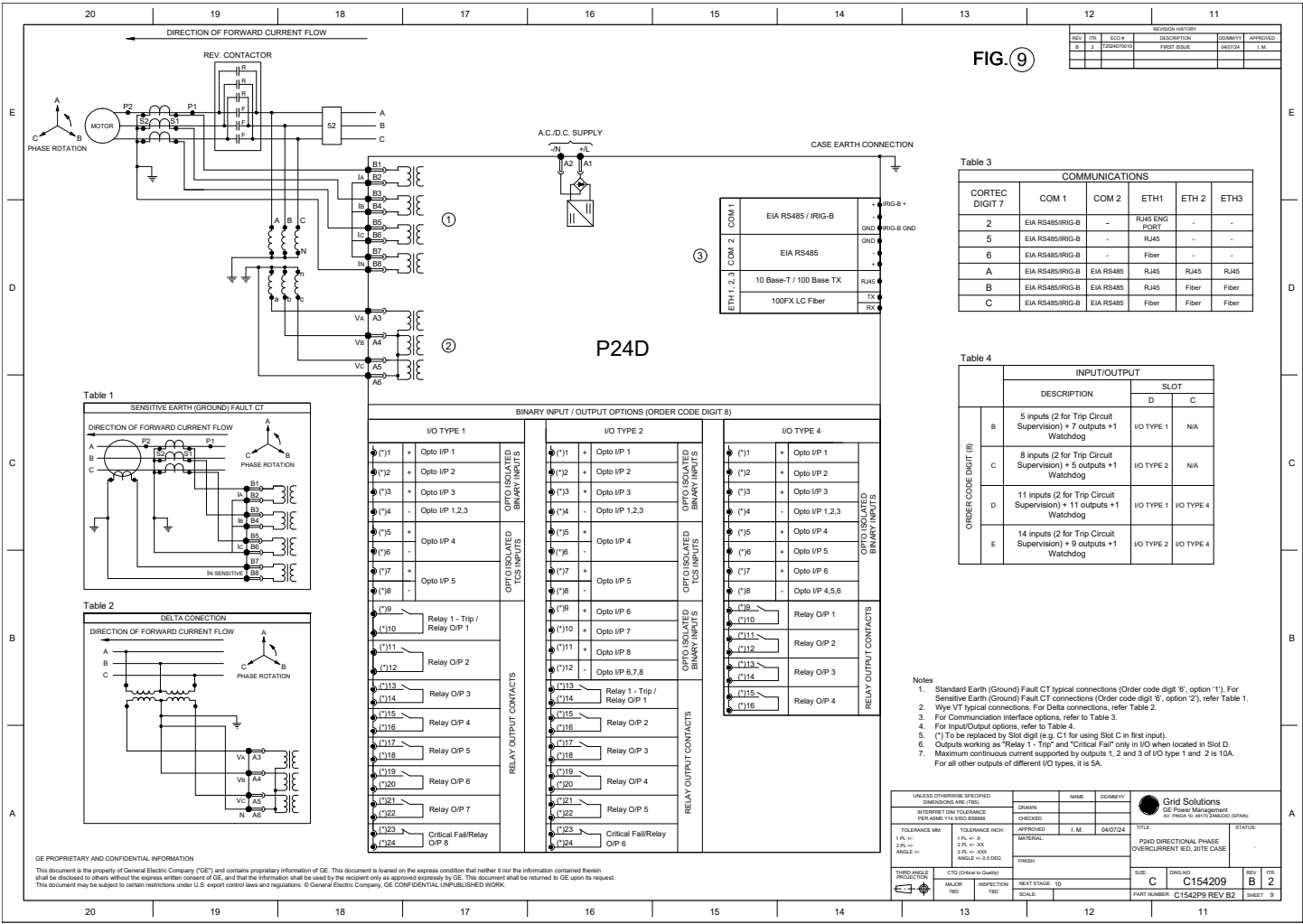
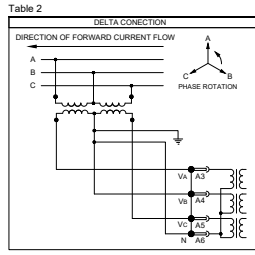
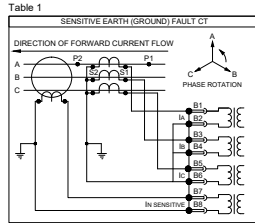


FIG. 9

REVISION HISTORY				
REV.	DATE	DESCRIPTION	DESIGNED BY	APPROVED BY
B	2	2024/07/01	FIRST ISSUE	040324 L.M.

Table 3 COMMUNICATIONS

CORTEC DIGIT 7	COM 1	COM 2	ETH1	ETH 2	ETH3
2	EIA RS485/IRIG-B	-	RJ45 ENG. POINT	-	-
5	EIA RS485/IRIG-B	-	RJ45	-	-
6	EIA RS485/IRIG-B	-	Fiber	-	-
A	EIA RS485/IRIG-B	EIA RS485	RJ45	RJ45	RJ45
B	EIA RS485/IRIG-B	EIA RS485	RJ45	Fiber	Fiber
C	EIA RS485/IRIG-B	EIA RS485	Fiber	Fiber	Fiber



BINARY INPUT / OUTPUT OPTIONS (ORDER CODE DIGIT 8)

I/O TYPE 1		I/O TYPE 2		I/O TYPE 4	
(*)1	+ Opto I/P 1	(*)1	+ Opto I/P 1	(*)1	+ Opto I/P 1
(*)2	+ Opto I/P 2	(*)2	+ Opto I/P 2	(*)2	+ Opto I/P 2
(*)3	+ Opto I/P 3	(*)3	+ Opto I/P 3	(*)3	+ Opto I/P 3
(*)4	- Opto I/P 1,2,3	(*)4	- Opto I/P 1,2,3	(*)4	- Opto I/P 1,2,3
(*)5	+ Opto I/P 4	(*)5	+ Opto I/P 4	(*)5	+ Opto I/P 4
(*)6	-	(*)6	- Opto I/P 5	(*)6	+ Opto I/P 5
(*)7	+ Opto I/P 5	(*)7	+ Opto I/P 5	(*)7	+ Opto I/P 6
(*)8	-	(*)8	-	(*)8	- Opto I/P 4,5,6
(*)9	Relay I - Trip / Relay O/P 1	(*)9	+ Opto I/P 6	(*)9	Relay O/P 1
(*)10	Relay O/P 2	(*)10	+ Opto I/P 7	(*)10	Relay O/P 2
(*)11	Relay O/P 3	(*)11	+ Opto I/P 8	(*)11	Relay O/P 3
(*)12	Relay O/P 4	(*)12	- Opto I/P 6,7,8	(*)12	Relay O/P 4
(*)13	Relay O/P 5	(*)13	Relay I - Trip / Relay O/P 1	(*)13	Relay O/P 5
(*)14	Relay O/P 6	(*)14	Relay O/P 2	(*)14	Relay O/P 6
(*)15	Relay O/P 7	(*)15	Relay O/P 3	(*)15	Relay O/P 7
(*)16	Relay O/P 8	(*)16	Relay O/P 4	(*)16	Critical Fail/Relay O/P 8
(*)17	Critical Fail/Relay O/P 8	(*)17	Relay O/P 5	(*)17	Critical Fail/Relay O/P 8
(*)18	-	(*)18	Critical Fail/Relay O/P 6	(*)18	-

Table 4 INPUT/OUTPUT

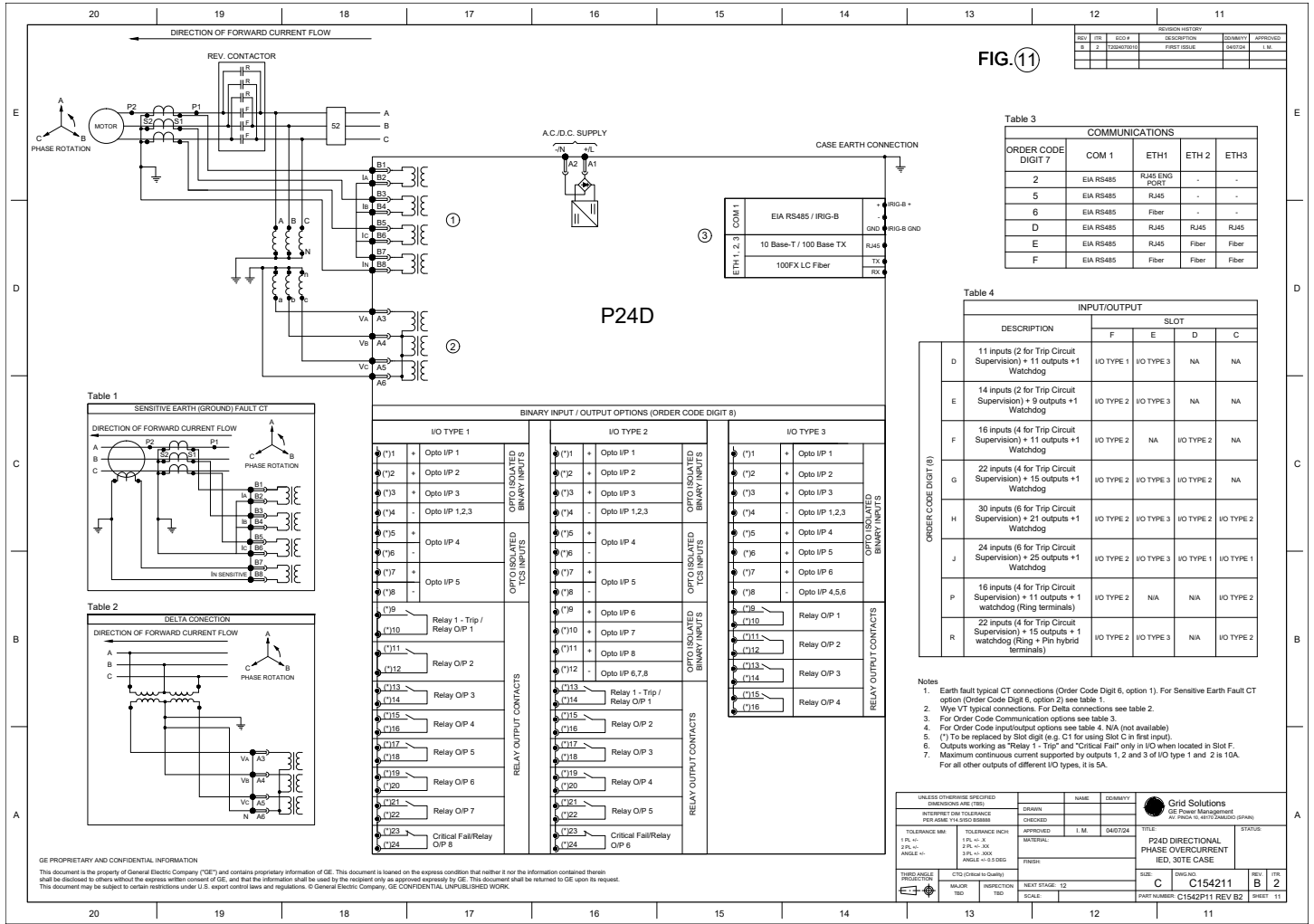
ORDER CODE DIGIT (8)	DESCRIPTION	SLOT	
		D	C
B	5 Inputs (2 for Trip Circuit Supervision) + 7 outputs +1 Watchdog	VO TYPE 1	N/A
C	8 Inputs (2 for Trip Circuit Supervision) + 5 outputs +1 Watchdog	VO TYPE 2	N/A
D	11 Inputs (2 for Trip Circuit Supervision) + 11 outputs +1 Watchdog	VO TYPE 1	VO TYPE 4
E	14 Inputs (2 for Trip Circuit Supervision) + 9 outputs +1 Watchdog	VO TYPE 2	VO TYPE 4

- Notes
- Standard Earth (Ground) Fault CT typical connections (Order code digit '8', option '1'). For Sensitive Earth (Ground) Fault CT connections (Order code digit '8', option '2'), refer Table 1.
  - Wye YT typical connections. For Delta connections, refer Table 2.
  - For Communication interface options, refer to Table 3.
  - For Input/Output options, refer to Table 4.
  - (\*) To be replaced by Slot digit (e.g. C1 for using Slot C in first input).
  - Outputs working as 'Relay I - Trip' and 'Critical Fail' only in IO when located in Slot D.
  - Maximum continuous current supported by outputs 1, 2 and 3 of I/O type 1 and 2 is 10A. For all other outputs of different I/O types, it is 5A.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN mm		NAME	DOBNEY	Grid Solutions	
INTERPRET DIM TOLERANCE PER ASME Y14.5 2018	CHECKED			GE Power Management	
TOLERANCE mm	TOLERANCE INCH	APPROVED	L.M.	040324	TITLE
1 PL. +/-	1 PL. +/-			P24D DIRECTIONAL PHASE OVERCURRENT REL. 20TE CASE	
2 PL. +/-	2 PL. +/-			STATUS	
ANGLE +/-	ANGLE +/-			FINISH	
THIRD ANGLE PREFERRED		C/D (Circle to Query)		SIZE	DWG NO.
MAJOR	INSPECTION	NEXT STAGE: 10	SCALE:	C	C154209
TRD	TRD			PART NUMBER:	C1542P9 REV B2

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## Wiring Diagram – 30TE (6") version



Order Code Information

VARIANTS	ORDER NUMBER										
	1-4	5	6	7	8	9	10	11	12-13	14	15
<b>Multilin Agile Application</b>											
Motor Protection Relay- Non directional	P24N										
Motor Protection Relay- Directional	P24D										
<b>Application Package Options</b>											
Base		B									
<b>Current / Voltage Inputs</b>											
Standard Earth (Ground) CT	P24D/N		1								
Sensitive Earth (Ground) Fault CT	P24D/N		2								
<b>Hardware Options</b>											
EIA RS485 serial comms – with RJ45 Engineering Port (only)	20TE/30TE			2							
EIA RS485 serial comms and station bus Ethernet - Single channel RJ45 copper	20TE/30TE			5							
EIA RS485 serial comms and station bus Ethernet - Single channel fiber	20TE/30TE			6							
2x EIA RS485 serial, 2x RJ45 Ethernet (configurable PRP/HSR/LLA) and 1x RJ45	20TE			A							
2x EIA RS485 serial, 2x fiber Ethernet (configurable PRP/HSR/LLA) and 1x RJ45	20TE			B							
2x EIA RS485 serial, 2x fiber Ethernet (configurable PRP/HSR/LLA) and 1x fiber	20TE			C							
1x EIA RS485 serial, 2x RJ45 Ethernet (configurable PRP/HSR/LLA) and 1x RJ45	30TE			D							
1x EIA RS485 serial, 2x fiber Ethernet (configurable PRP/HSR/LLA) and 1x RJ45	30TE			E							
1x EIA RS485 serial, 2x fiber Ethernet (configurable PRP/HSR/LLA) and 1x fiber	30TE			F							
<b>Binary Input / Output Options</b>	<b>Case</b>										
5 inputs (2 for Trip Circuit Supervision) + 7 outputs + 1 watchdog	20TE				B						
8 inputs (2 for Trip Circuit Supervision) + 5 outputs + 1 watchdog	20TE				C						
11 inputs (2 for Trip Circuit Supervision) + 11 outputs + 1 watchdog	20TE/30TE				D						
14 inputs (2 for Trip Circuit Supervision) + 9 outputs + 1 watchdog	20TE/30TE				E						
16 inputs (4 for Trip Circuit Supervision) + 11 outputs + 1 watchdog	30TE				F						
22 inputs (4 for Trip Circuit Supervision) + 15 outputs + 1 watchdog	30TE				G						
30 inputs (6 for Trip Circuit Supervision) + 21 outputs + 1 watchdog	30TE				H						
24 inputs (6 for Trip Circuit Supervision) + 25 outputs + 1 watchdog	30TE				J						
16 inputs (4 for Trip Circuit Supervision) + 11 outputs + 1 watchdog (Ring terminals)**	30TE				P						
22 inputs (4 for Trip Circuit Supervision) + 15 outputs + 1 watchdog (Ring + Pin hybrid terminals)**	30TE				R						
<b>Communication protocols / Cybersecurity</b>											
DNP3.0 / Modbus / IEC 60870-5-103						2					
IEC 61850 / DNP3.0 / Modbus / IEC 60870-5-103						3					
IEC 61850 / DNP3.0 / Modbus / IEC 60870-5-103 + advanced cyber Level 2						4					
<b>Case</b>											
20TE Flush (4 inch width) with text display							B				
30TE Flush (6"), 6 function keys, 16 programmable LEDs and Color Graphical HMI (IEC version)*							C				
30TE Flush (6"), 6 function keys, 16 programmable LEDs, Color Graphical HMI (ANSI version)							E				
30TE Flush (6"), 6 function keys, 16 programmable LEDs, Color Graphical HMI & Bay Control (IEC version*)							G				
30TE Flush (6"), 6 function keys, 16 programmable LEDs, Color Graphical HMI & Bay Control (ANSI version)							N				
Software upgrade only (via After Sales)							0				
<b>Language</b>											
English (UK) / English (US) / French / Spanish / Russian / Turkish								0			
English (UK) / English (US) / Polish / German								1			
<b>Software Version</b>											
Unless specified, the latest version of software will be delivered									**		
<b>Customization / Regionalization</b>											
Regular (IEC standards and 50Hz/1 amp based default settings)											0
IEEE market default configuration - US English, 60Hz and 5 amp preconfiguration											6
Customer specific											A
<b>Hardware design suffix</b>											
Enhanced model											E

Note

\* Offers a single line diagram for control, but with a basic, fixed bay template only.

G and N options are required for a configurable mimic diagram.

\* Check availability

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