Section 5

5-2

5-2

5-2

5-3

5-3

5-4

5-4

5-5

5-5

5-6

5-7

5-8

5-8

5-9

5-10

5-11

5-12

5-13

5-14

5-15

5-16

5-16

5-16

5-18

5-18

5-20

5-21

5-22

5-23

5-24

5-25

5-26

5-27



5-33

5-33

5-33

5-34

© 2019 Schneider Electric All Rights Reserved





Introduction — Schneider Electric Energy Automation Solutions

Schneider Electric has proven solutions for the protection, monitoring and control of any critical infrastructure power system, whether large or small. Starting with a full range of Protective Relays for Medium or Low voltage distribution systems that provide dependability and reliability, Schneider Electric fits the bill. Sepam, MiCOM and ECOFIT are the front line of protection. Add the V125 for Arc Flash protection and you have a robust system for equipment protection. Let Schneider Electric's Energy Automation Solutions provide the Protection, Monitoring, and Control you need!

Schneider Electric's ranges for Remote Terminal Units (RTU) includes SAGE and T300. SAGE is a rack mount solution offering IED integration, NERC CIP security, IEC 61131-based logic functions, communications protocols, and a custom applications library.

T300 is a modular form factor feeder RTU for Medium Voltage and Low Voltage public distribution network management.

System Protection Solutions

Schneider Electric's family of protective relays have been protecting power systems world wide for over 100 years. From electric utilities to commercial buildings and data centers, customers know that Schneider Electric has the right relay solution for them. Today's modern relays are much more than simple overcurrent devices. They provide power system protection as well as arc flash protection in one device all while communicating to SCADA or DCS systems seamlessly. Whether it is a new installation or a retrofit opportunity, Schneider Electric has the answer.

V125 Arc Flash Module

Arc flash incidents are very real and very dangerous. The Schneider Electric V125 arc flash module provides detection in as low as 2 milliseconds to help mitigate equipment damage. Up to four (4) point sensors are brought into the V125 from different compartments in switchgear, such as the cable, breaker and bus compartments. The module is set with simple DIP switches and can be set up to deliver zones of arc flash protection. Installation is easy with a DIN rail or a door mount option.

ECOFIT 50/51

The ECOFIT 50/51 Plug and Protect numerical relay is a direct replacement for many GE IAC and IFC relays that are still in service today. No re-wiring is required. Remove the old relay and install the ECOFIT 50/51 and its cover. The relay has 31 different overcurrent curves built in and features an instantaneous element that can trip in as little as 1.5 cycles. Gain the benefits of waveform capture, sequence of events and metering that were not possible with the older electromechanical relays.



ECOFIT 50/51

V125 Arc Flash Module

Sepam Digital Relays



MiCOM Relays

Sepam™ Digital Relays

Sepam relays feature outstanding modularity and are ideal for a myriad of applications, including industrial and commercial feeder, motor, transformer, generator, busbar, and capacitor applications. Built-in breaker control, automatic throwover, and zone selective interlocking logic makes Sepam easy to configure and test. The family consists of three (3) ranges, Series 20, Series 40 and Series 80, allowing customers to purchase the right amount of relay for their particular application.

MiCOM Relays

MiCOM relays provide utility grade protection with deep cyber security features. Large or small power systems; simple or complex applications are all covered in the MiCOM line of products.

G

© 2019 Schneider Electric All Rights Reserved 11/20/2019







V125 Arc Flash Protection Unit

V125 Arc Flash Protection Solutions

Critical infrastructure depends heavily on an uninterrupted supply of electric power. Arc flash protection devices help accomplish this and are used to improve safety and mitigate equipment damage. Schneider Electric is the pioneer in the field of arc flash protection with close to 50,000 arc flash systems and 600,000 sensors in service worldwide. The V125 arc flash protection module can detect an arc flash event in as little as 2 milliseconds and send a control command to an interrupting device. It can accommodate up to four (4) point sensors and has a wide range 24 to 240 volt ac or dc power supply. It can be DIN rail mounted or door mounted and is easily set via DIP switches.







V125 Arc Flash Protection Unit with Optional REL52901 Door Mount Bracket



REL52901 Door Mount Bracket

Table 5.1: V125 Arc Flash Protect	ion Units		
Description	Cortec Type	Note	Catalog Number
Arc flash protection unit	V125		REL52900
Arc Sensor	VA 1 DA-6	Cable length 19.69 ft	REL52804
Arc Sensor	VA 1 DA-20	Cable length 65.62 ft	REL52801
Arc Sensor (Pipe type)	VA 1 EH-6	Cable length 19.69 ft	REL52809
Arc Sensor (Pipe type)	VA 1 EH-20	Cable length 65.62 ft	REL52807
Arc Sensor (Pipe type, IP65)	VA 1 EH-6-IP	Cable length 19.69 ft	
Arc Sensor (Pipe type, IP65)	VA 1 EH-20-IP	Cable length 65.62 ft	
Arc Sensor, shielded (metal pipe)	VA 2 DV-15	Cable length 49.22 ft	
Arc Sensor, shielded (metal pipe)	VA 2 DV-20	Cable length 65.62 ft	
Door mount bracket		For V125	REL52901
Surface Mounting Plate for Sensors	VYX001	Z-shaped	REL52828
Surface Mounting Plate for Sensors	VYX002	L-shaped	REL52829
Surface Mounting Plate for VA 1 DV Sensor	VYX628	U-shaped	
I/O unit 3 phase current 1 trip contact, ring lug connections	VAM4CSE-RL		





Arc Flash point sensor Type VA 1D





-

VYX 002

S

^{11/20/2019} Courtesy of Steven Engineering, Inc - (800) 258-9200 - sales@steveneng.com - www.stevenengineering.com

ECOFIT CT Powered Protection Relays



ECOFIT 50/51 Retrofit Relays

The Schneider Electric ECOFIT 50/51 single phase or ground time overcurrent relays are direct plug and protect replacements for many GE IAC or GE IFC electromechanical, GE DIAC and Basler BE1-50/51B replacements for GE IAC relays. The relays are self-powered from 50 or 60 Hz systems and are designed to be one to one replacements for existing electromechanical or digital relays. The relays are equipped with 31 built-in protection curves. ECOFIT 50/51 provides information that was not available in the E/M relays: (1) Twenty (20) overcurrent fault records time-tagged to the millisecond; (2) 200 events records time stamped to the millisecond; (3) Ten (10) Disturbance records up to 4 seconds per record at a sample rate of 32 samples per cycle. Plug and Protect reduces costs in installation time because it saves existing wiring and reduces engineering costs over other options. A 10-year warranty is standard.

Also refer to ECOFIT 50/51 on the www.schneider-electric.us website.

Catalog Number Configuration







The Schneider Electric ECOFIT 50/51 is a direct replacement for many GE IAC relays.



The Schneider Electric ECOFIT 50/51 is a direct replacement for many GE IFC relays.



© 2019 Schneider Electric All Rights Reserved

11/20/2019

G





The Sepam[™] Range

Sepam protection relays are time-tested, high-performance devices that ensure dependability. This range of products was designed with a simple idea in mind: All users should be able to find a solution corresponding exactly to their needs with the right balance between performance, simplicity and cost. With Series 20, 40 and 80, the Sepam range does just this. This family of relays offers a solution for every application need, specifically targeting industrial installations. These multi-functional protection devices allow an easy and hassle-free startup with simple-to-use programming software. Sepam relays also comply with the latest communication protocols on the market, including IEC61850, DNP3 and Modbus. In addition, all relays within this range come with a standard 10-year warranty and conformal coating for protection against harsh environments.

Features and Benefits

- Compact devices with clearly defined connection terminals for easy installation
- Predefined control logic for circuit breaker control or contactor control
- Predefined control logic for Zone Selective Interlocking applications
- Predefined control logic for Automatic Transfer applications
- User-friendly software (SFT2841) with built-in manuals for every relay
- Support for offline programming
- Application-specific design ensuring appropriate protection for any given application
- Low power CT options for the use of relays on new installations where the load is low
- Field-upgradable technology to stay up-to-date on the latest hardware and software

Sepam Series 20

The Series 20 consists of high-performing solutions suited for standard applications requiring current or voltage protection.

Applications Covered:

- Substation (feeder)
- Transformer
- Motor
- Busbar

Sepam Series 40

The Series 40 family of protection relays are designed for demanding applications requiring current, voltage and/or frequency protection.

- · Substation (feeder)
- Transformer
- Motor
- Generator

Sepam Series 80

The Series 80 relays are for custom applications requiring enhanced protection of electrical distribution networks.

Applications Covered:

- Substation (feeder)
- Transformer
- Motor
- Generator
- Busbar
- Capacitor



Sepam Series 20 and 40

Sepam Series 80

S



Sepam Protection Configurations

Three relay series with increasing protection capabilities for six types of applications to provide all possible protection configurations

Table 5.2: Sepam 20, 40 and 80 Protection Functions

ANSI Device	Description	Sepam 20/40 Relay Models				Sepam 80 Relay Models												
Number	Description	S24	M20	B22	S40	T40	T42	M41	G40	S84	M87	M88	T87	G87	G88	C86	B80	B83
12/14	Speed Switch		•					•			•	•		•	•			
21B	Underimpedance													•	•			
24	Volts/Hertz												•	٠	٠			
25	Synch Check									•			•	٠	•		•	٠
26	Thermostat					•	•				•	٠	•		٠			
27	Phase-to-phase Undervoltage			•	•	•	•	•	٠	•	٠	٠	•	٠	•	•	•	٠
27D	Positive sequence Undervoltage			•				•		•	•	•	•	•	•	•	•	•
27R	Remnant Undervoltage			•				•		•	•	•	•	•	•	•	•	•
27S	Phase-to-neutral Undervoltage			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
27TN	Third Harmonic Neutral Undervoltage			-		-		-	-	-		-	-		•			
32P	Directional Power							•	•	•		•		-				
320/40/55	Directional Reactive Power								•		•		•		•			
37	Phase Undercurrent		•					•	-	•	•	•		-	-			
38	Bearing Temperature		•			•	•	•	•		•	•	•	•	•	•		
40	Loss of Excitation							•	•		•	•		•	٠			
46	Negative Sequence Current/Unbalance	•	•		٠	•	•	•	•	•	•	•	•	•	•	•	•	•
47	Negative Sequence Undervoltage			•	•	٠	•	•	•	•	•	•	•	•	٠	٠	•	•
48	Excessive Starting Time		•					•			•	•						
49	Thermal Overload		•			•	•	•	•	•	•	•	•	•	•	•		
49T	RTD Monitoring		•			•	•	•	•		•	•	•	•	•	•		
50BF	Breaker Failure	•	-		•	•	•	•	•	•	•	•	•	•	•	•	•	•
50/27	Inadvertent Energization													•	•			
50	Instantaneous Phase Overcurrent	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•
50G	Instantaneous Ground Overcurrent (Measured)		•		•	•	•		•		•	•			•	•	•	
50N	Instantaneous Ground Overcurrent (Calculated)	•													•			
501/	Voltage Restrained Instantaneous Overcurrent	-	-		-	-	-	-	-	-	-	-				-		-
51	Time Phase Overcurrent	-								•							-	
510	Capacitor Bank Unbalance	-			•	•	-	-	-		-	-		-				-
510	Time Ground Overcurrent (Measured)						-	-	-		-			-				-
510	Time Ground Overcurrent (Calculated)	_	•								•				•			-
51IN		•	•		•	•	•	•	•	•	•	•	•	•	•	•	••	•
51LR	Voltage Restrained Instantaneous Overcurrent		•					•	-		•	•						
500	Voltage Restrained Time Oversument								•								<u> </u>	
510	Phase to phase Queryeltage	_							•					•	•			l
59	Phase-to-phase Overvoltage			•	•	•	•	•	•	•	•	•	•	•	•	•	_	•
59N	Neutral Voltage Displacement			•	•	•	•	•	•	•	•	•	•	•	•	•	_	•
640	100% Stater Cround Fault					•	•						•	-	-			
64DEE	Restricted Ground Fault													•	•		<u> </u>	
66	Starts per hour							-			-		•					
67	Directional Phase Overcurrent		•					•		•	•	•			•		<u> </u>	<u> </u>
67N	Directional Ground Overcurrent										•	•	•					
78	Pole Slip	-													•			1
79	Reclosing	1.									<u>⊢</u>			<u>⊢</u>			r	1
81H	Overfrequency	+-						-			-			-				-
011		+		•	•	•	•			•		•	•		•	•		-
01L	Pate of Change of Frequency	+		•	•	•	•	•	•	•	•	•	•	•	•	•	-	•
01K	Machine Differential			•						•	<u> </u>			<u> </u>			<u> </u>	<u> </u>
0/ IVI 07T	2 Winding Transformer Differential	+									•			•				<u> </u>
0/1		1						1	1		1	•	•	1	•		L	L

G

PROTECTION, CONTROL, AND ENERGY AUTOMATION



Sepam[™] 20/40/80 Characteristics

Table 5.3: Protection Configurations

Characteristics	Series 20	Series 40	Series 80			
Logic inputs	0-10	0-10	0-42			
Logic outputs	4-8	4-8	5-23			
Temperature sensors	0-8	0-16	0-16			
	Current 3I + I0	Current 3I + I0	Current 2 x 3I + 2 x I0			
Channels	Voltage 3V + V0	Voltage 3V + V0	Voltage 2 x 3V + V0			
	LPCT [1]	LPCT [1]	LPCT [1]			
	1-2	1-2	2-4			
	ModBus, IEC 103, DNP3, IEC 61850	ModBus, IEC 103, DNP3, IEC 61850	ModBus, IEC 103, DNP3, IEC 61850			
Communication Ports	_	Redundancy	Redundancy			
	_	_	Goose Messaging			
	Matrix [2]	Matrix [2]	Matrix [2]			
Control	iviauliX [2]	Logic equation editor	Logic equation editor			
	-	-	Logipam [3]			
Other a	-	_	Front memory cartridge with settings			
Other	_	Backup 48 hours (capacitor)	Backup lithium battery [4]			

Table 5.4: Metering Measurements (Basic - Sepam Series 20)

Metering	Measurement Range	Accuracy
Phase Current / Residual Current (Calculated)	0.1 to 40 ln	±1%
Residual Current (Measured)	0.1 to 20 In0	±1%
Demand Current / Peak Demand Current	0.1 to 40 ln	±1%
Phase-to-Phase Voltage / Phase-to-Neutral Voltage	0.05 to 1.2 Vnp	±1%
Residual Voltage	0.015 to 3 Vnp	±1%
Positive Sequence Voltage	0.05 to 1.2 Vnp	±5%
Frequency	50 ± 5 Hz or 60 ± 5 Hz	±0.05 Hz
Temperature	-22 to +392 °F (-30 to +200 °C)	±1 °C from -20 to +140 °C

Table 5.5: Metering Measurements (Standard — Sepam Series 40)

Metering	Measurement Range	Accuracy
Phase Current / Residual Current (Calculated)	0.1 to 40 In	±0.5%
Residual Current (Measured)	0.1 to 20 In0	±1%
Demand Current / Peak Demand Current	0.1 to 40 In	±0.5%
Phase-to-Phase Voltage / Phase-to-Neutral Voltage	0.06 to 1.2 Vnp	±0.5%
Residual Voltage	0.04 to 3 Vnp	±1%
Positive Sequence Voltage / Negative Sequence Voltage	0.05 to 1.2 Vnp	±2%
Frequency	25 to 65 Hz	±0.02 Hz
Active Power	0.015 Sn to 999 MW	±1%
Reactive Power	0.015 Sn to 999 MVar	±1%
Apparent Power	0.015 Sn to 999 MVA	±1%
Peak Demand Active Power	0.015 Sn to 999 MW	±1%
Peak Demand Reactive Power	0.015 Sn to 999 MVar	±1%
Power Factor	-1 to +1 (CAP/IND)	±1%
Calculated Active Energy	0 to 2.1x108 MWH	±1% ±1 digit
Calculated Reactive Energy	0 to 2.1x108 MVARH	±1% ±1 digit
Temperature	-22 to +392 °F (-30 to +200 °C	±1 °C from -20 to +140 °C

Table 5.6: Metering Measurements (Advanced — Sepam Series 80)

Metering	Measurement Range	Accuracy
Phase Current	0.02 to 40 ln	±0.5%
Residual Current (Calculated)	0.005 to 40 In	±1%
Residual Current (Measured)	0.005 to 20 In0	±1%
Demand Current / Peak Demand Current	0.02 to 40 ln	±0.5%
Phase-to-Phase Voltage / Phase-to-Neutral Voltage	0.05 to 1.2 Vnp	±0.5%
Residual Voltage / Neutral Point Voltage	0.015 to 3 Vnp	±1%
Positive Sequence Voltage / Negative Sequence Voltage	0.05 to 1.2 Vnp	±2%
Frequency	50 ± 5 Hz or 60 ± 5 Hz	±0.01 Hz
Active Power	0.008 Sn to 999 MW	±1%
Reactive Power	0.008 Sn to 999 MVar	±1%
Apparent Power	0.008 Sn to 999 MVA	±1%
Peak Demand Active Power	0.008 Sn to 999 MW	±1%
Peak Demand Reactive Power	0.008 Sn to 999 MVar	±1%
Power Factor	-1 to +1 (CAP/IND)	±1%
Calculated Active Energy	0 to 2.1x108 MWH	±1% ±1 digit
Calculated Reactive Energy	0 to 2.1x108 MVARH	±1% ±1 digit
Temperature	-22 to +392 °F (-30 to +200 °C)	±1 °C from -20 to +140 °C
Rotation Speed	0 to 7200 RPM	±1 RPM

LPCT: low-power current transducer complying with standard IEC 60044-8. Control matrix for simple assignment of information from the protection, control and monitoring functions. [1]

[2] [3] [4] Logipam ladder language (PC programming environment) to make full use of Sepam series 80 functions. Standard lithium battery 1/2 AA format 3.6 V front face exchangeable.

© 2019 Schneider Electric All Rights Reserved

^{11/20/2019} Courtesy of Steven Engineering, Inc - (800) 258-9200 - sales@steveneng.com - www.stevenengineering.com

S



Sepam™ 20 Configuration

Table 5.7: Sepam Series 20 Configuration

Model	Description	Relay Base Model	-	_	_	_	_	_	-	_
S24	S24 — Substation Relay	SQ1S24								
B22	B22 — Busbar Relay	SQ1B22	Diaplay		-		DTD	Analog	Loginom	Synch
M20	M20 — Motor Relay	SQ1M20	Display	Current	Coms	1/0	RIDS	Out	Logipani	Check
T24	T24 — Transformer Relay	SQ1T24								
	Advanced Display	·	A							
DSM303	Remote Advanced Display		R							
	Voltage Inputs Only (Required for Busbar Relays			0						
CCA634	1A/5A CT inputs			1						
CCA630	Alt. 1A/5A CT inputs (requires CSH120, 200 or 30)			2						
CCA670	Low Power CT (LPCT) 3									
MES114	10In/4Out, 24–48Vdc/120–250Vac				А					
MES114E	10ln/4Out, 110–125Vdc/110Vac B									
MES114F	10In/4Out, 220–250Vdc/220–220Vac				С					
ACE959	1 x RS485					1				
ACE969TP2	2 x RS485					2				
ACE969FO2	1 x RS485/ 1 x Fiber Optic					3				
	without (not available on Substation or Busbar relays)						А			
MET1482	8 Temp sensor inputs						В			
	without 0									
MSA141	1 x Analog 0–1mA, 0–10mA, 0–20mA, 4–20mA output 1									
	Without (80 Series Only) A									
	Without (80 Series Only)									0

Table 5.8: Sepam Series 20 Typical Catalog Numbers

Catalog Numbers	Description
SQ1S24A1B1A0A0	Series 20 - Substation/Feeder Protection S24 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), RS485
SQ1M20A1B1B0A0	Series 20 - Motor Protection M20 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), 8 RTD's, RS485
SQ1T24A1B1A0A0	Series 20 - Transformer Protection T24 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), RS485
SQ1B22A0B1A0A0	Series 20 - Voltage Protection B22 (24-250Vdc & 120-240Vac), Voltage Inputs ONLY, 10In/8Out (110-125 Vdc, 110Vac), RS485

Also refer to Sepam Series 20 on www.schneider-electric.us.

Sepam 40 Configuration

Table 5.9: Sepam Series 40 Configuration

Model	Description	Relay Base Model	_	-	-	_	-	-	_	_
S42	S42 - Substation Relay	SQ1S42								
G40	G40 - Generator Relay	SQ1G40	Display	0	0	1/0	DTD	Analog	Loginom	Svnch
M41	M41 - Motor Relay	SQ1M41	Display	Current	Coms	1/0	RIDS	Out	Logipam	Check
T42	T42 - Transformer Relay	SQ1T42								
	Advanced Display		A							
DSM303	Remote Advanced Display		R							
CCA634	1A/5A CT inputs			1						
CCA630	Alt. 1A/5A CT inputs (requires CSH120, 200 or 30)			2						
CCA670	Low Power CT (LPCT)			3						
MES114	10ln/4Out, 24-48Vdc/120-250Vac A									
MES114E	10ln/4Out, 110-125Vdc/110Vac* B									
MES114F	10In/4Out, 220-250Vdc/220-240Vac				С					
ACE959	1 x RS485 1									
ACE969TP2	2 x RS485					2				
ACE969FO2	1 x RS485/ 1 x Fiber Optic					3				
ACE850TP	2 x Ethernet Ports (Copper, IEC61850/ModbusTCP)					5				
ACE850FO	2 x Ethernet Ports (Fiber, IEC61850/ModbusTCP)					6				
	without						A			
MET1482	8 Temp sensor inputs (One Module)						В			
2 x MET1482	16 Temp sensor inputs (Two Modules)						С			
	without							0		
MSA141	1 x Analog 0-1mA, 0-10mA, 0-20mA, 4-20mA output							1		
	without (80 Series Only)								А	
	without (80 Series Only)									0

Table 5.10: Sepam Series 40 Typical Catalog Numbers

Catalog Numbers	Description
SQ1S42A1B1A0A0	Series 40 Substation/Feeder Protection S42 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), RS485
SQ1S42A1B5A0A0	Series 40 Substation/Feeder Protection S42 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), 2 x RJ-45 Ethernet - Modbus/IEC61850
SQ1M41A1B1B0A0	Series 40 Motor Protection M41 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), 8 RTD's, RS485
SQ1T42A1B1A0A0	Series 40 Transformer Protection T42 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), RS485
SQ1G40A1B1A0A0	Series 40 Generator Protection G40 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), RS485
	Ales refer to Concre Corise 10 an unity achine idea alestric up

Also refer to Sepam Series 40 on www.schneider-electric.us.

G

PROTECTION, CONTROL, AND ENERGY AUTOMATION



Sepam 80 Configuration

Table 5.11: Sepam Series 40 Configuration

Model	Description	Relay Base Model	_	_	_		_	_	_	_
S84	S84 - Substation Relay	SQ1S84								
B80	B80 - Busbar Relay	SQ1B80								
B83	B83 - Busbar Relay	SQ1B83								
G87	G87 - Generator Relay	SQ1G87								
G88	G88 - Generator Relay	SQ1G88	Display	Current	Coms	I/O	RTD's	Analog	Logipam	Synch
M87	M87 - Motor Relay	SQ1M87						Out		CHECK
M88	M88 - Motor Relay	SQ1M88	-							
T87	T87 - Transformer Relay	SQ1T87								
C86	C86 - Capacitor Bank Relay	SQ1C86	-							
	Advanced Display		A							
MimicBus	MimicBus Display		P							
DSM303	Remote Advanced Display		с							
CCA634	1A/5A CT inputs			1						
CCA630	Alt. 1A/5A CT inputs (requires CSH120, 200 or 30)			2						
CCA671(80)	Low Power CT (LPCT)			3						
MES120	14In/6Out, 24-48Vdc				D					
2 x MES120	28In/12Out, 24-48Vdc				E					
3 x MES120	42In/18Out, 24-48Vdc				F					
MES120G	14In/6Out, 220-250Vdc				G					
2 x MES120G	28In/12Out, 220-250Vdc				н					
3 x MES120G	42In/18Out, 220-250Vdc				<u> </u>					
MES120H	14In/6Out, 110-125Vdc				J					
2 x MES120H	28In/12Out, 110-125Vdc				ĸ					
3 x MES120H	42In/18Out, 110-125Vdc				L					
ACE959	1 x RS485					1				
ACE9691P2	2 X RS485					2				
ACE909F02	2 x Ethernet Ports (Conner, IEC61850/ModbusTCP)					5				
ACE050TP	2 x Ethernet Ports (Eiber JEC61850/ModbusTCP)					5				
AGE050FU	without					0	_ ^			
MET1482	8 Temp sensor inputs (One Module)						. A			
2 x MFT1482	16 Temp sensor inputs (Two Modules)						. Č			
2 / 11/21 1402	without						5	0		
MSA141	1 x Analog 0-1mA, 0-10mA, 0-20mA, 4-20mA output							1		
	without								А	
SFT080	Logipam Firmware								В	
	without									0
MCS025	Sync-Check Module (required for ANSI-25)									1

Table 5.12: Sepam Series 80 Typical Catalog Numbers

Catalog Numbers	Description
SQ1S84P1J5A0B0	Series 80 - Substation/Feeder Protection S84 (24-250Vdc), mimicBus Graphical Display, 1/5A CT inputs, 14In/11Out Digital Module (110-125Vdc/mid p.u.), 2 x RJ-45 ports (Modbus or IEC61850 with GOOSE), ladder logic firmware (PLC base).
SQ1B83P1J5A0B1	Series 80 - Busbar Protection B83 (24-250Vdc), mimicBus Graphical Display, 1/5A CT inputs, 14In/11Out Digital Module (110-125Vdc/mid p.u.), 2 x RJ-45 ports (Modbus or IEC61850 with GOOSE), ladder logic firmware (PLC base), Synchro-check
SQ1G87P1J5A0B0	Series 80 - Generator Differential Protection G87 (24-250Vdc), mimicBus Graphical Display, 1/5A CT inputs, 14In/11Out Digital Module (110-125Vdc/mid p. u.), 2 x RJ-45 ports (Modbus or IEC61850 with GOOSE), ladder logic firmware (PLC base).
SQ1M87P1J5B0B0	Series 80 - Motor Differential Protection M87 (24-250Vdc), mimicBus Graphical Display, 1/5A CT inputs, 14In/11Out Digital Module (110-125Vdc/mid p.u.), 8 RTD's, 2 x RJ-45 ports (Modbus or IEC61850 with GOOSE), ladder logic firmware (PLC base).
SQ1T87P1J5A0B0	Series 80 - Transformer Differential Protection T87 (24-250Vdc), mimicBus Graphical Display, 1/5A CT inputs, 14In/11Out Digital Module (110-125Vdc/mid p. u.), 2 x RJ-45 ports (Modbus or IEC61850 with GOOSE), ladder logic firmware (PLC base).
	Alex refer to Sonem Series 90 on yuury schneider electric up

Also refer to Sepam Series 80 on www.schneider-electric.us.

S

Substation/Feeder protection is broken into three sections Basic, Standard, and Advanced. The Basic protection is covered with our Sepam S24 protection relay and handles overcurrent (50/51) and ground faults (50G/51G or 50N/51N). The Standard protection is covered with the Sepam S42 protection relay and covers a host of current, voltage, and frequency protection elements. The Advanced protection is covered with the Sepam S84 and covers current, voltage, frequency, and synchro check protection

Sepam Substation / Feeder Applications





S24/S42



S84

Typical Catalog Number: **SQ1S24A1B1A0A0** Series 20 Substation/Feeder Protection S24 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), RS485 Standard Protection Relay S42

Basic Protection Relay S24

functions.

Typical Catalog Number: **SQ1S42A1B1A0A0** Series 40 - Substation/Feeder Protection S42 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), RS485

Advanced Protection Relay S84

Typical Catalog Number: SQ1S84P1J5A0B0 Series 80 - Substation/Feeder Protection 584 (24-250Vdc), mimicBus Graphical Display, 1/5A CT inputs, 14In/11Out Digital Module (110-125Vdc/mid p.u.), 2 x RJ-45 ports (Modbus or IEC61850 with GOOSE), ladder logic firmware (PLC base).

Table 5.13: Features

Feature		Basic Protection Relay S24 Sepam 20 Series	Standard Protection Relay S42 Sepam 40 Series	Advanced Protection Relay S84 Sepam 80 Series
Current Protection		•	•	•
Built in CB Control		•	•	•
Native Zone Selective Interlocking		•	•	•
Waveform Captures		•	•	•
Event Records		•	•	•
Voltage Protection			•	•
Frequency Protection			•	•
Field Expandable Communications			•	•
Synchro-check Protection (optional)				•
Native Automatic Throw over Scheme				•
Field expandable I/O				•
Ladder Logic PLC custom programming	l (optional)			•
Mimic-bus graphical display (optional)				•
Onboard data logging				•
	Modbus RTU	•	•	•
	DPN	•	•	•
Communications options	Modbus TCP/IP		•	•
	IEC61850–MMS		•	•
	IEC61850–MMS + GOOSE			•

Z

Table 5.14: I	Functions			
ANSI Device Number	Description	Basic Protection Relay S24 Sepam 20 Series	Standard Protection Relay S42 Sepam 40 Series	Advanced Protection Relay S84 Sepam 80 Series
25	Synch Check			•
27	Phase-to-phase undervoltage		•	•
27D	Positive sequence undervoltage			•
27R	Remnant undervoltage			•
27S	Phase-to-neutral undervoltage		•	•
32P	Directional Power		•	•
37	Phase Undercurrent			•
46	Negative Sequence Current/Unbalance	•	•	•
47	Negative Sequence undervoltage		•	•
49	Thermal Overload			•
50	Instantaneous Phase Overcurrent	•	•	•
50BF	Breaker Failure	•	•	•
50G	Instantaneous Ground Overcurrent (Measured)		•	•
50N	Instantaneous Ground Overcurrent (Calculated)	•	•	•
51	Time Phase Overcurrent	•	•	•
51G	Time Ground Overcurrent(Measured)		•	•
51N	Time Ground Overcurrent(Calculated)	•	•	•
59	Phase-to-phase overvoltage		•	•
59N	Neutral Voltage Displacement		•	•
67	Directional Phase Overcurrent		•	•
67N	Directional Ground Overcurrent		•	•
79	Reclosing	•	•	•
81H	Overfrequency		•	•
81L	Underfrequency		•	•
81R	Rate of Change of Frequency			•

© 2019 Schneider Electric All Rights Reserved





M20/M41



M87/M88

Sepam Motor Applications

Motor protection is broken into three sections Basic, Standard, and Advanced. The Basic protection is covered with our Sepam M20 protection relay and handles overcurrent (50/ 51) and ground faults (50G/51G or 50N/51N). The Standard protection is covered with protection elements. The Advanced protection is covered with the Sepam M87/M88 and covers current, voltage, frequency, and differential protection functions.

Basic Protection Relay (M20 - Sepam 20 Series)

Typical Part Number: SQ1M20A1B1A0A0 Series 20 - Motor Protection M20 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), RS485

Standard Protection Relay (M41 - Sepam 40 Series)

Typical Part Number: SQ1M41A1B1A0A0 Series 40 - Motor Protection M41 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), RS485

Advanced Protection Relay (M87/M88 - Sepam 80 Series)

Typical Part Number: **SQ1M87P1J5A0B0** Series 80 - Motor Protection S84 (24-250Vdc), mimicBus Graphical Display, 1/5A CT inputs, 14In/11Out Digital Module (110-125Vdc/ mid p.u.), 2 x RJ-45 ports (Modbus or IEC61850 with GOOSE), ladder logic firmware (PLC base).

Table 5.15: Features

Feature		M20	M41	M87/M88
Current Protection		•	•	•
Built in CB Control		•	•	•
Native Zone Selective Interlocking		•	•	•
Waveform Captures		•	•	•
Event Records		•	•	•
Voltage Protection			•	•
Frequency Protection			•	•
Field Expandable Communications			•	•
Synchro-check Protection (optional)				•
Native Automatic Throw over Scheme				•
Field expandable I/O				•
Ladder Logic PLC custom programming (optional)				•
Mimic-bus graphical display (optional)				•
Onboard data logging				•
Native Load Shedding and Motor Restart				•
Ability to incorporate a transformer into th	e same zone of protection (M88 only)			•
Built in Motor start and trending reports				•
	Modbus RTU	•	•	•
	DPN	•	•	•
Communications options	Modbus TCP/IP		•	•
	IEC61850–MMS		•	•
	IEC61850–MMS + GOOSE			•

Table 5 16: Eunctions

Table 5.10.1 unclio					
ANSI Device Number	Description	M20	M41	M87	M88
12/14	Speed Switch	•	•	•	•
26	Thermostat			•	•
27	Phase-to-phase undervoltage		•	•	•
27D	Positive sequence undervoltage		•	•	•
27R	Remnant Undervoltage		•	•	•
27S	Phase-to-neutral undervoltage		•	•	•
32P	Directional Power		•	•	•
32Q/40/55	Directional Reactive Power		•	•	•
37	Phase Undercurrent	•	•	•	•
38	Bearing Temperature	•	•	•	•
40	Loss of Excitation		•	•	•
46	Negative Sequence Current/Unbalance	•	•	•	•
47	Negative Sequence undervoltage		•	•	•
48	Excessive Starting Time	•	•	•	•
49	Thermal Overload	•	•	•	•
49T	RTD Monitoring	•	•	•	•
50BF	Breaker Failure		•	•	•
50	Instantaneous Phase Overcurrent	•	•	•	•
50G	Instantaneous Ground Overcurrent(Measured)	•	•	•	•
50N	Instantaneous Ground Overcurrent(Calculated)	•	•	•	•
51	Time Phase Overcurrent	•	•	•	•
51G	Time Ground Overcurrent(Measured)	•	•	•	•
51N	Time Ground Overcurrent(Calculated)	•	•	•	•
51LR	Locked Rotor	•	•	•	•
59	Phase-to-phase overvoltage		•	•	•
59N	Neutral Voltage Displacement		•	•	•
66	Starts per hour	•	•	•	•
67N	Directional Ground Overcurrent			•	•
78	Pole Slip			•	•
81H	Overfrequency		•	•	•
81L	Underfrequency		•	•	•
87M	Machine Differential			•	
87T	2 Winding Transformer Differential				•

S

© 2019 Schneider Electric All Rights Reserved

^{11/20/2019} Courtesy of Steven Engineering, Inc - (800) 258-9200 - sales@steveneng.com - www.stevenengineering.com

Transformer protection is broken into three sections Basic, Standard, and Advanced. The Basic protection is covered with our Sepam T24 protection relay and handles overcurrent (50/51) and ground faults (50G/51G or 50N/51N). The Standard protection is covered with the Sepam T42 protection relay and covers a host of current, voltage, and frequency protection elements. The Advanced protection is covered with the Sepam T87 and covers current, voltage, frequency, differential, and synchro check protection





T24/T42



T87

functions.

Typical Part Number: SQ1T24A1B1A0A0 Series 20 - Transformer Protection T24 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), RS485

Standard Protection Relay (T42 - Sepam 40 Series)

Basic Protection Relay (T24 - Sepam 20 Series)

Sepam Transformer Applications

Typical Part Number: **SQ1T42A1B1A0A0** Series 40 - Transformer Protection T42 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), RS485

Advanced Protection Relay (T87 - Sepam 80 Series)

Typical Part Number: **SQ1T87P1J5A0B0** Series 80 - Transformer Protection S84 (24-250Vdc), mimicBus Graphical Display, 1/5A CT inputs, 14In/11Out Digital Module (110-125Vdc/mid p.u.), 2 x RJ-45 ports (Modbus or IEC61850 with GOOSE), ladder logic firmware (PLC base).

Table 5.17: Features

Feature		T24	T42	T87
Current Protection		•	•	•
Built in CB Control		•	•	•
Native Zone Selective Interlocking		•	•	•
Waveform Captures		•	•	•
Event Records		•	•	•
Voltage Protection			•	•
Frequency Protection			•	•
Field Expandable Communications			•	•
Synchro-check Protection (optional)				•
Native Automatic Throw over Scheme				•
Field expandable I/O				•
Ladder Logic PLC custom programming (optional)				•
Mimic-bus graphical display (optional)				•
Onboard data logging				•
	Modbus RTU	•	•	•
	DPN	•	•	•
Communications options	Modbus TCP/IP		•	•
	IEC61850–MMS		•	•
	IEC61850–MMS + GOOSE			•

ble 5.18: Functions	
---------------------	--

ANSI Device Number	Description	T24	T42	T87
24	Volts/Hertz			•
25	Synch Check			•
26	Thermostat	•	•	•
27	Phase-to-phase undervoltage		•	•
27D	Positive sequence undervoltage			•
27R	Remnant Undervoltage			•
27S	Phase-to-neutral undervoltage		•	•
32P	Directional Power			•
38	Bearing Temperature	•	•	•
46	Negative Sequence Current/Unbalance	•	•	•
47	Negative Sequence undervoltage		•	•
49	Thermal Overload	•	•	•
49T	RTD Monitoring	•	•	•
50BF	Breaker Failure	•	•	•
50	Instantaneous Phase Overcurrent	•	•	•
50G	Instantaneous Ground Overcurrent (Measured)	•	•	•
50N	Instantaneous Ground Overcurrent (Calculated)	•	•	•
50V	Voltage Restrained Instantaneous overcurrent			•
51	Time Phase Overcurrent	•	•	•
51G	Time Ground Overcurrent (Measured)	•	•	•
51N	Time Ground Overcurrent (Calculated)	•	•	•
59	Phase-to-phase overvoltage		•	•
59N	Neutral Voltage Displacement		•	•
63	Buchholz Pressure	•	•	•
64REF	Restricted Ground Fault			•
67N	Directional Ground Overcurrent		•	
67	Directional Phase Overcurrent		•	•
81H	Overfrequency		•	•
81L	Underfrequency		•	•
87T	2 Winding Transformer Differential			•









G87/G88

G40

Sepam Generator Applications

Generator protection is broken into two sections Standard and Advanced. The Standard protection is covered with the Sepam G40 protection relay and covers a host of current, voltage, and frequency protection elements. The Advanced protection is covered with the Sepam G87/G88 and covers current, voltage, frequency, differential, and synchro check protection functions.

Standard Protection Relay (G40 - Sepam 40 Series)

Typical Part Number: **SQ1G40A1B1A0A0** Series 40 - Generator Protection G40 (24-250Vdc & 120-240Vac), 1/5A CT inputs, 10In/8Out (110-125 Vdc, 110Vac), RS485

Advanced Protection Relay (G87/G88 - Sepam 80 Series)

Typical Part Number: **SQ1687P1J5A0B0** Series 80 – Generator Protection G87 (24-250Vdc), mimicBus Graphical Display, 1/5A CT inputs, 14In/11Out Digital Module (110-125Vdc/mid p.u.), 2 x RJ-45 ports (Modbus or IEC61850 with GOOSE), ladder logic firmware (PLC base).

Table 5.19: Features

Feature		G40	G87	G88
Current Protection		•	•	•
Built in CB Control		•	•	•
Native Zone Selective Interlocking		•	•	•
Waveform Captures		•	•	•
Event Records		•	•	•
Voltage Protection		•	•	•
Frequency Protection		•	•	•
Field Expandable Communications		•	•	•
Synchro-check Protection (optional)			•	•
Native Automatic Throw over Scheme			•	•
Field expandable I/O			•	•
Ladder Logic PLC custom programming (optional)			•	•
Mimic-bus graphical display (optional)			•	•
Onboard data logging			•	•
Native Load Shedding and Motor Resta	art		•	•
Ability to incorporate a transformer into	the same zone of protection (M88 only)		•	•
Built in Motor start and trending reports			•	•
	Modbus RTU	•	•	•
	DPN	•	•	•
Communications options	Modbus TCP/IP	•	•	•
	IEC61850–MMS	•	•	•
	IEC61850-MMS + GOOSE	1	•	•

Table 5.20: Functions	
-----------------------	--

ANSI Device Number	Description	G40	687	688
12/14	Speed Switch	040	607	000
218				
210	Volte/Hertz			•
24	Synch Check			
23		-	•	•
27		•	•	•
270	Positive sequence undervoltage		•	•
27R	Remnant Undervoltage		•	•
27S	Phase-to-neutral undervoltage	•	•	•
27TN	Third Harmonic Neutral Undervoltage		•	•
32P	Directional Power	•	•	•
32Q/40/55	Directional Reactive Power	•	•	•
38	Bearing Temperature	•	•	•
40	Loss of Excitation	•	•	•
46	Negative Sequence Current/Unbalance	•	•	•
47	Negative Sequence undervoltage	•	•	•
49	Thermal Overload	•	•	•
49T	RTD Monitoring	•	•	•
50/27	Inadvertent energization		•	•
50BF	Breaker Failure	•	•	•
50	Instantaneous Phase Overcurrent	•	•	•
50G	Instantaneous Ground Overcurrent(Measured)	•	•	•
50N	Instantaneous Ground Overcurrent(Calculated)	•	•	•
50V	Voltage Restrained Instantaneous overcurrent	•	•	•
51	Time Phase Overcurrent	•	•	•
51G	Time Ground Overcurrent(Measured)	•	•	•
51N	Time Ground Overcurrent(Calculated)	•	•	•
51V	Voltage Restrained Time Overcurrent	•	•	•
59	Phase-to-phase overvoltage	•	•	•
59N	Neutral Voltage Displacement	•	•	•
66	Starts per hour	•		
64G	100% Stator Ground Fault		•	•
67	Directional Phase Overcurrent		•	•
67N	Directional Ground Overcurrent		•	•
78	Pole Slip		•	•
81H	Overfrequency	•	•	•
81L	Underfrequency	•	•	•
87M	Machine Differential		•	
87T	2 Winding Transformer Differential			•

© 2019 Schneider Electric All Rights Reserved

PROTECTION, CONTROL, AND ENERGY AUTOMATION

S



Sepam Busbar Applications



B80/B83

Busbar protection is broken into two sections Basic and Advanced. The Basic protection is covered with our Sepam B22 protection relay and handles voltage and frequency protectoin. The Advanced protection is covered with the Sepam B80/B83 and covers current, voltage, frequency, and synchro check protection functions.

Basic Protection Relay (B22 - Sepam 20 Series)

Typical Part Number: **SQ1G40A1B1A0A0** Series 20 - Busbar Protection B22 (24-250Vdc & 120-240Vac), VT inputs, 10In/8Out (110-125 Vdc, 110Vac), RS485

Advanced Protection Relay (B80/B83 - Sepam 80 Series)

Typical Part Number: **SQ1B83P1J5A0B0** Series 80 - Busbar Protection S84 (24-250Vdc), mimicBus Graphical Display, 1/5A CT inputs, 14In/11Out Digital Module (110-125Vdc/mid p. u.), 2 x RJ-45 ports (Modbus or IEC61850 with GOOSE), ladder logic firmware (PLC base).

B22

Table 5.21: Features				
Feature		B22	B80	B83
Current Protection			•	•
Built in CB Control		•	•	•
Native Zone Selective Interlocking		•	•	•
Waveform Captures		•	•	•
Event Records		•	•	•
Voltage Protection (2 sets of VTs or	n B83)	•	•	•
Frequency Protection		•	•	•
Field Expandable Communications			•	•
Synchro-check Protection (optional)		•	•
Native Automatic Throw over Scheme			•	•
Field expandable I/O			•	•
Ladder Logic PLC custom program	ming (optional)		•	•
Mimic-bus graphical display (option	al)		•	•
Onboard data logging			•	•
	Modbus RTU	•	•	•
Communications options	DPN	•	•	•
Communications options	Modbus TCP/IP		•	•
	IEC61850–MMS + GOOSE		•	•

Table 5.22: Functions

ANSI Device NumberDescriptionB22B80B8325Synch Check <td< th=""><th>Table J.22. Tunci</th><th>10113</th><th></th><th></th><th></th></td<>	Table J.22. Tunci	10113			
25Synch Check•••27Phase-to-phase undervoltage••••27DPositive sequence undervoltage••••27RRemnant Undervoltage••••27SPhase-to-neutral undervoltage••••46Negative Sequence Current/Unbalance••••47Negative Sequence undervoltage••••50BFBreaker Failure•••••50GInstantaneous Phase Overcurrent•••••50NInstantaneous Ground Overcurrent(Measured)•••<	ANSI Device Number	Description	B22	B80	B83
27Phase-to-phase undervoltage••27DPositive sequence undervoltage•••27RRemnant Undervoltage•••27SPhase-to-neutral undervoltage•••46Negative Sequence Current/Unbalance•••47Negative Sequence undervoltage•••50BFBreaker Failure•••500Instantaneous Ground Overcurrent•••503Instantaneous Ground Overcurrent(Measured)•••504Time Phase Overcurrent•••505Instantaneous Ground Overcurrent(Calculated)•••510Time Ground Overcurrent(Calculated)•••511Time Ground Overcurrent(Calculated)•••513Time Ground Overcurrent(Calculated)•••59Phase-to-phase overvoltage•••59NNeutral Voltage Displacement•••61HOverfrequency••••81ILUnderfrequency••••81RRate of Change of Frequency••••81RRate of Change of Frequency••••81RRate of Change of Frequency••••81RRate of Change of Frequency••••81RRate of Change of Frequency <td>25</td> <td>Synch Check</td> <td></td> <td>•</td> <td>•</td>	25	Synch Check		•	•
27DPositive sequence undervoltage•••27RRennant Undervoltage••••27SPhase-to-neutral undervoltage••••46Negative Sequence Current/Unbalance••••47Negative Sequence undervoltage••••50BFBreaker Failure•••••50Instantaneous Phase Overcurrent••••••50GInstantaneous Ground Overcurrent(Measured)••• <td< td=""><td>27</td><td>Phase-to-phase undervoltage</td><td>•</td><td>•</td><td>•</td></td<>	27	Phase-to-phase undervoltage	•	•	•
27RRemnant Undervoltage•••27SPhase-to-neutral undervoltage••••46Negative Sequence Current/Unbalance••••47Negative Sequence undervoltage••••50BFBreaker Failure•••••50Instantaneous Phase Overcurrent•••	27D	Positive sequence undervoltage	•	•	•
27SPhase-to-neutral undervoltage•••46Negative Sequence Current/Unbalance•••47Negative Sequence undervoltage•••47Negative Sequence undervoltage•••50BFBreaker Failure•••50Instantaneous Phase Overcurrent•••50GInstantaneous Ground Overcurrent(Measured)•••50NInstantaneous Ground Overcurrent(Calculated)•••51Time Phase Overcurrent•••51GTime Ground Overcurrent(Measured)•••51NTime Ground Overcurrent(Measured)•••59Phase-to-phase overvoltage•••59NNeutral Voltage Displacement•••81HOverfrequency••••81LUnderfrequency••••81RRate of Change of Frequency••••	27R	Remnant Undervoltage	•	•	•
46Negative Sequence Current/Unbalance••47Negative Sequence undervoltage•••50BFBreaker Failure•••50Instantaneous Phase Overcurrent•••506Instantaneous Ground Overcurrent(Measured)•••507Instantaneous Ground Overcurrent(Calculated)•••510Instantaneous Ground Overcurrent(Calculated)•••511Time Phase Overcurrent•••513Time Ground Overcurrent(Measured)•••514Time Ground Overcurrent(Calculated)•••515Time Ground Overcurrent(Calculated)•••518Neutral Voltage Displacement•••59NNeutral Voltage Displacement•••61HOverfrequency••••81RRate of Change of Frequency••••81RRate of Change of Frequency••••	27S	Phase-to-neutral undervoltage	•	•	•
47Negative Sequence undervoltage•••50BFBreaker Failure••••50Instantaneous Phase Overcurrent••••50GInstantaneous Ground Overcurrent(Measured)••••50NInstantaneous Ground Overcurrent(Calculated)•••••51Time Phase Overcurrent••<	46	Negative Sequence Current/Unbalance		•	•
50BFBreaker Failure••50Instantaneous Phase Overcurrent•••50GInstantaneous Ground Overcurrent(Measured)•••50NInstantaneous Ground Overcurrent(Calculated)•••51Time Phase Overcurrent•••51GTime Ground Overcurrent(Measured)•••51NTime Ground Overcurrent(Calculated)•••59Phase-to-phase overoltage•••59NNeutral Voltage Displacement•••81HOverfrequency•••81LUnderfrequency•••81RRate of Change of Frequency•••	47	Negative Sequence undervoltage	•	•	•
50Instantaneous Phase Overcurrent••50GInstantaneous Ground Overcurrent(Measured)••50NInstantaneous Ground Overcurrent(Calculated)••51Time Phase Overcurrent••51GTime Ground Overcurrent(Measured)••51NTime Ground Overcurrent(Calculated)••59Phase-to-phase overvoltage••59NNeutral Voltage Displacement••81HOverfrequency•••81LUnderfrequency•••81RRate of Change of Frequency•••	50BF	Breaker Failure		•	•
50GInstantaneous Ground Overcurrent(Measured)•••50NInstantaneous Ground Overcurrent(Calculated)•••51Time Phase Overcurrent•••51GTime Ground Overcurrent(Measured)•••51NTime Ground Overcurrent(Calculated)•••59NPhase-to-phase overvoltage•••59NNeutral Voltage Displacement•••81HOverfrequency•••81LUnderfrequency•••81RRate of Change of Frequency•••	50	Instantaneous Phase Overcurrent		•	•
50NInstantaneous Ground Overcurrent(Calculated)••51Time Phase Overcurrent•••51GTime Ground Overcurrent(Measured)•••51NTime Ground Overcurrent(Calculated)•••59Phase-to-phase overvoltage•••59NNeutral Voltage Displacement•••81HOverfrequency•••81LUnderfrequency•••81RRate of Change of Frequency•••	50G	Instantaneous Ground Overcurrent(Measured)		•	•
51Time Phase Overcurrent•••51GTime Ground Overcurrent(Measured)••••51NTime Ground Overcurrent(Calculated)••••59Phase-to-phase overvoltage••••59NNeutral Voltage Displacement••••81HOverfrequency•••••81LUnderfrequency•••••81RRate of Change of Frequency•••••	50N	Instantaneous Ground Overcurrent(Calculated)		•	•
51GTime Ground Overcurrent(Measured)●●51NTime Ground Overcurrent(Calculated)●●59Phase-to-phase overvoltage●●59NNeutral Voltage Displacement●●59NOverfrequency●●81LUnderfrequency●●81RRate of Change of Frequency●●	51	Time Phase Overcurrent		•	•
51NTime Ground Overcurrent(Calculated)●●59Phase-to-phase overvoltage●●●59NNeutral Voltage Displacement●●●81HOverfrequency●●●81LUnderfrequency●●●81RRate of Change of Frequency●●●	51G	Time Ground Overcurrent(Measured)		•	•
59Phase-to-phase overvoltage●●59NNeutral Voltage Displacement●●81HOverfrequency●●81LUnderfrequency●●81RRate of Change of Frequency●●	51N	Time Ground Overcurrent(Calculated)		•	•
59N Neutral Voltage Displacement ● ● 81H Overfrequency ● ● 81L Underfrequency ● ● 81R Rate of Change of Frequency ● ●	59	Phase-to-phase overvoltage	•	•	•
81H Overfrequency ● ● 81L Underfrequency ● ● 81R Rate of Change of Frequency ● ●	59N	Neutral Voltage Displacement	•	•	•
81L Underfrequency • • 81R Rate of Change of Frequency • •	81H	Overfrequency	•	•	•
81R Rate of Change of Frequency	81L	Underfrequency	•	•	•
	81R	Rate of Change of Frequency	•		

G





Sepam Capacitor Applications

Busbar protection is broken into two sections Basic and Advanced. The Basic protection is covered with our Sepam B22 protection relay and handles voltage and frequency protectoin. The Advanced protection is covered with the Sepam B80/B83 and covers current, voltage, frequency, and synchro check protection functions.

Advanced Protection Relay (C86 - Sepam 80 Series)

Typical Part Number: **SQ1C86P1J5A0B0** Series 80 - Transformer Protection S84 (24-250Vdc), mimicBus Graphical Display, 1/5A CT inputs, 14In/11Out Digital Module (110-125Vdc/mid p.u.), 2 x RJ-45 ports (Modbus or IEC61850 with GOOSE), ladder logic firmware (PLC base).

C86

Table 5.23: Features

Feature		C86						
Current Protection		•						
Built in CB Control		•						
Built in protection and control for Capac	citors, up to 4 steps	•						
Native Zone Selective Interlocking		•						
Waveform Captures		•						
Event Records		•						
Voltage Protection		•						
Frequency Protection		•						
Field Expandable Communications		•						
Native Automatic Throw over Scheme		•						
Field expandable I/O		•						
Ladder Logic PLC custom programming	g (optional)	•						
Mimic-bus graphical display (optional)		•						
Onboard data logging		•						
	Modbus RTU	•						
Communications options	DPN	•						
	Modbus TCP/IP	•						
IEC61850-MMS + GOOSE •								
ANSI Dovico Numbor	Description	C 26						
27	Descentration							
,,								
27D	Positive sequence undervoltage	<u>.</u>						
27D 27P	Positive sequence undervoltage Remont Lindervoltage	•						
27D 27R 27S	Positive sequence undervoltage Remnant Undervoltage	•						
27D 27R 27S 20	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage	•						
27D 27R 27S 38	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Bearing Temperature Neutral Concernent Undervoltage	• • • •						
27D 27R 27S 38 46	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Bearing Temperature Negative Sequence Current/Unbalance	• • • • •						
27D 27R 27S 38 46 47	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Bearing Temperature Negative Sequence Current/Unbalance Negative Sequence undervoltage	• • • • • •						
27D 27R 27S 38 46 47 49	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Bearing Temperature Negative Sequence Current/Unbalance Negative Sequence undervoltage Thermal Overload	• • • • • • •						
27D 27R 27S 38 46 47 49 497	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Bearing Temperature Negative Sequence Current/Unbalance Negative Sequence undervoltage Thermal Overload RTD Monitoring Deveload RTD Monitoring	• • • • • • • • • • • •						
27D 27R 27S 38 46 47 49 49 49T 50BF	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Bearing Temperature Negative Sequence Current/Unbalance Negative Sequence undervoltage Thermal Overload RTD Monitoring Breaker Failure Interval	• • • • • • • • • • • • •						
27D 27R 27S 38 46 47 49 497 50BF 50 500 50	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Bearing Temperature Negative Sequence Current/Unbalance Negative Sequence undervoltage Thermal Overload RTD Monitoring Breaker Failure Instantaneous Phase Overcurrent Instantaneous Course Overcurrent Instantaneous							
27D 27R 27S 38 46 47 49 49 49T 50BF 50 50G 50G	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Bearing Temperature Negative Sequence Current/Unbalance Negative Sequence undervoltage Thermal Overload RTD Monitoring Breaker Failure Instantaneous Phase Overcurrent Instantaneous Cround Overcurrent (Measured) Instantaneous Cond Overcurrent (Calculated)							
27D 27R 27S 38 46 47 49 49 49T 50BF 50 50G 50G 50N	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Bearing Temperature Negative Sequence Current/Unbalance Negative Sequence Current/Unbalance Negative Sequence Current/Unbalance Thermal Overload RTD Monitoring Breaker Failure Instantaneous Phase Overcurrent (Measured) Instantaneous Ground Overcurrent (Calculated) Therma Overload Thermat Overload Thermat Overload Thermat Overload Thermat Overcurrent (Calculated) Thermat Overload T							
27D 27R 27S 38 46 47 49 49 49T 50BF 50 50G 50G 50N 51C	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Phase-to-neutral undervoltage Bearing Temperature Negative Sequence Current/Unbalance Negative Sequence undervoltage Thermal Overload RTD Monitoring Breaker Failure Instantaneous Phase Overcurrent Instantaneous Ground Overcurrent (Measured) Instantaneous Ground Overcurrent (Calculated) Time Phase Overcurrent Canceling Back Inbalance							
27D 27R 27S 38 46 47 49 49 49T 50BF 50 50G 50G 50G 50N 51 51C 51C	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Phase-to-neutral undervoltage Bearing Temperature Negative Sequence Current/Unbalance Negative Sequence undervoltage Thermal Overload RTD Monitoring Breaker Failure Instantaneous Phase Overcurrent Instantaneous Ground Overcurrent (Measured) Instantaneous Ground Overcurrent (Calculated) Time Phase Overcurrent Capacitor Bank Unbalance Time Overcurent							
27D 27R 27S 38 46 47 49 49 49T 50BF 50BF 50G 50G 50G 50N 51 51C 51C 51G 51M	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Bearing Temperature Negative Sequence Current/Unbalance Negative Sequence undervoltage Thermal Overload RTD Monitoring Breaker Failure Instantaneous Phase Overcurrent Instantaneous Ground Overcurrent (Measured) Instantaneous Ground Overcurrent (Calculated) Time Phase Overcurrent Capacitor Bank Unbalance Time Ground Overcurrent (Measured)							
27D 27R 27R 38 46 47 49 49 49T 50BF 50 50G 50G 50G 50G 510 511 51C 51G 51N 51N 510	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Bearing Temperature Negative Sequence Current/Unbalance Negative Sequence undervoltage Thermal Overload RTD Monitoring Breaker Failure Instantaneous Phase Overcurrent Instantaneous Ground Overcurrent (Measured) Instantaneous Ground Overcurrent (Calculated) Time Phase Overcurrent Capacitor Bank Unbalance Time Ground Overcurrent (Measured) Dereve the shore overcurrent (Measured) Dereve the shore overcurrent (Calculated) Dereve the shore overcurrent							
27D 27R 27R 27S 38 46 47 49 49 49T 50BF 50 50G 50G 50G 50N 51 51C 51C 51G 51N 59 50	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Bearing Temperature Negative Sequence Current/Unbalance Negative Sequence undervoltage Thermal Overload RTD Monitoring Breaker Failure Instantaneous Ground Overcurrent (Measured) Instantaneous Ground Overcurrent (Calculated) Time Phase Overcurrent Capacitor Bank Unbalance Time Ground Overcurrent (Measured) Time Ground Overcurrent (Calculated) Phase-to-phase overvoltage							
27D 27R 27S 38 46 47 49 49 50BF 50 50G 50G 50G 50N 511 51C 51G 51G 51G 51S 59 59N	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Bearing Temperature Negative Sequence Current/Unbalance Negative Sequence Current/Unbalance Thermal Overload RTD Monitoring Breaker Failure Instantaneous Ground Overcurrent (Measured) Instantaneous Ground Overcurrent (Calculated) Time Phase Overcurrent Capacitor Bank Unbalance Time Ground Overcurrent (Calculated) Time Ground Overcurrent (Calculated) Phase-to-phase overvoltage Neutral Voltage Displacement							
27D 27R 27S 38 46 47 49 49 49T 50BF 50 50G 50G 50G 50N 51 51C 51C 51C 51C 51C 51R 59 59 59N 81H	Positive sequence undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Remnant Undervoltage Phase-to-neutral undervoltage Remaing Temperature Negative Sequence Current/Unbalance Negative Sequence undervoltage Thermal Overload RTD Monitoring Breaker Failure Instantaneous Phase Overcurrent Instantaneous Ground Overcurrent (Measured) Instantaneous Ground Overcurrent (Calculated) Time Phase Overcurrent (Measured) Time Ground Overcurrent (Measured) Time Ground Overcurrent (Calculated) Time Ground Overcurrent (Calculated) Phase-to-phase overvoltage Neutral Voltage Displacement Overfrequency							

S

© 2019 Schneider Electric All Rights Reserved



The MiCOM Range

The MiCOM protection relay range provides capability for a wide variety of protection, control, measurement, monitoring, and communication. MiCOM protection relays offer scalable levels of functionality and hardware options to best suit your protection requirements and allows you to choose the most cost-effective solution for your application. The versatile hardware and common relay management software (Easergy Studio) allows simple configuration and installation in different applications.

Features and Benefits

- Advanced communications capabilities including IEC61850 with PRP and HSR
- Self-powered options on the MiCOM 10 series
- Native cyber security including IEEE 1686 and NERC-CIP
- Wide range of frequency protections including 16.5, 16.67, 25, 50, and 60Hz
- User-friendly programmable scheme logic for custom programming
- Application-specific design ensuring appropriate protection for any given application

MiCOM Characteristics

Table 5.24: MiCOM Series Characteristics MICOM 10 Ser MICOM 20 Serie MICOM 30 Se MICOM 40 Serie Corio The MiCOM 30 series provides for a full range of protection features and is focused on Utility and Railway The MiCOM 40 series fulfils the protection requirements for a wide The MiCOM 10 series provides for The MiCOM 20 series provides for Description self-powered protection basic current based protections range of Utility and industrial applications cations app Applications Covered Substation (Feeder) Motor . . Transformer . . Distance Line Differential • • Railway . Busbar . Mesh breaker arrangements . Generator Characteristics Frequency 50/60 Hz Logic inputs max 8 max 12 max 82 max 64 Opto inputs max 82 max 64 Output contacts max 48 max 60 Logic outputs max 8 max 8 max 48 max 60 Continuous carry 5A/8A/10A 10 A Short duration current 30 A for 0.5 (3s) 30 A for 3s LED indication 23 (19) 22 (18) (programmable) Settings groups 4 4 High break contacts NA NA max 16 max 8 Function keys / hot keys NA NA 10/2 6 Fault records 15 20 25 8 250 1000 250-512 Event records 200 16.4s (max 8 rec.) 75s (max 10, s/rec.) Disturbance records 5 5 Programmable logic Flexible Logic Fully programmable Graphical / Fully programmable NA IRIG-B NA Optional Optional Optional LCD display Alphanumeric / Graphical Alphanumeric EIA(RS) 232 EIA(RS) 232 Front port Rear port Yes / Optional Yes / Optional EIA(RS)485 or fiber K-Bus / EIA(RS)485 or fiber Counter EIA(RS)485 or fiber EIA(RS)485 or fiber Modbus EIA(RS)485 or fiber EIA(RS)485 or fiber IEC 60870-5-103 IEC 60870-5-101 EIA(RS)485 or fiber EIA(RS)485 or fiber EIA(RS)485 or fiber EIA(RS)485 or Ethernet (RJ45, fiber) DNP3.0 IEC 61850 Wire RJ45 or fiber Wire RJ45 or fiber Pin or Ring Terminals Ring Analog I/O 4/4 NA 1/2max 0/2 Temperature sensors NA max 10 max 10 max 10 1-4 1-4 ModBus, IEC 103, DNP3 ModBus, IEC 103, DNP3 ModBus, IEC 103, DNP3, IEC 61850 ModBus, IEC 103, DNP3, IEC 61850 Communication Ports Redundancy Redundancy Goose Messaging Goose Messaging

G

MiCOM Series Characteristics

www.se.com/us

Schneider

Electric

Table 5.25: Feeder Management and Overcurrent Relays

Easergy MiCOM series		10		20				30		40						
model	P111	P115	P116	P120	P121	P122	P123	P125	P126	P127	P132	P139	P141	P142	P143	P145
Case size				20TE	20TE	20TE	20TE	30TE	30TE	30TE	24, 40 or 84TE	40 or 84TE	40TE	40TE	60 or 80TE	60TE
CT Inputs	4	4	4	1	4	4	4	1	4	4	4	4	5	5	5	5
VT Inputs								1	1	3	4 or 5	4 or 5	3	3	3 or 4	3 or 4
Opto Inputs (max)	8	2	6	2	2	3	5	4	7	12	70	70	8	16	32	32
Output Contacts (max)	8	4	7	4	4	6	8	6	8	8	32	28	8	15	30	32
High Break Contacts (max)											16	16		4	8	8
RTDs (max)											10	10				
Analogue Input / Output (max)											1/2	1/2				
Function Keys / Hotkeys											•	٠	٠	•	•	•
Bay Control and Monitoring											Mimic	Graphical				
Interlocking Logic											•	٠				

Table 5.26: Transformer Protection Relays

Easergy MiCOM series / model	30 / P631	30 / P632	30 / P633	30 / P634	40 / P642	40 / P643	40 / P645
Case size	24 or 40TE	40 or 84TE	40 or 84TE	40 or 84TE	40TE	60TE	80TE
CT Inputs	6	8	12	15	8	12	18
VT Inputs		1	1	1	1 or 2	1 or 4	1 or 4
Opto Inputs (max)	4	34	40	34	12	24	24
Output Contacts (max)	14	22	30	22	12	24	24
Analogue Input / Output (max)		1/2	1/2	1/2	4/4	4/4	4/4
High Break Contacts	4	4	4	4	4	4	8
RTDs (option)		1	1	1	10	10	10
Function keys / Hotkeys	•	•	•	•		•	•
Bay Control & Monitoring		Mimic	Mimic				
Interlocking Logic		•	•				

Table 5.27: Generator Management Relays

Easergy MiCOM series / model	40 / P342	40 / P343	40 / P344	40 / P345
Case size	40 or 60TE	60 or 80TE	80TE	80TE
CT Inputs	5	8	8	9
VT Inputs	4	4	5	6
Opto Inputs (max) / Output Contacts (max)	24	32	32	32
High Break Contacts	4	8	8	8
RTDs (option)	10	10	10	10
Analogue Input / Output (max)	4/4	4/4	4/4	4/4
Function keys / Hotkeys	•	•	•	•
Interlocking Logic	•	•	•	•

Table 5.28: Busbar Protection Relays

Easergy MiCOM series / model	40 / P741* (CU)	40 / P742* (PU)	40 / P743* (PU)	40 / P746
Case size	80TE	40TE	60TE	80TE
CT Inputs		4	4	18/21
VT Inputs				3/0
Opto Inputs (max)	8	16	24	40
Output Contacts (max)	8	8	21	32
Eunction keys / Hotkeys	•		•	•

Table 5.29: Rail Protection Relays

Easergy MiCOM series / model	30 / P138	30 / P436	30 / P438	30 / P638
Case size	40 or 84TE	40 or 84TE	40 or 84TE	84TE
CT Inputs	2	3	3	5
VT Inputs	1	2	2	1
Opto Inputs (max)	22	34	28	38
Output Contacts (max)	48	46	46	64
RTDs (option)	1	1	1	1
Analogue Input / Output (max)	1/2	1/2	1/2	1/2
Function keys / Hotkeys	•	•	•	•

S

MiCOM Self-Powered Applications





MiCOM 10 Series f-Powered or Dual Powered P115 and P116 P11x Self-

MiCOM Self-Powered Applications

Self-powered applications are special and require specific hardware to handle the necessary protection of equipment. Schneider Electric offers the MiCOM P116 relay for this application. The P116 provides a number of advantages including dual power options, communications, withdrawable case, and electromagnetic flag indicators.

- Current Protection
- · Electromagnetic flag indicators
- Withdrawable case
 - Waveform captures
- Event records
- Communications options:
 - Modbus RTU
 - Event records

Table 5 30: Functions

Tuble 0.00. T ul								
ANSI Device Number	Description	P116						
37	Undercurrent	•						
46	legative Sequence Current/Unbalance							
46BC	Broken conductor detection	•						
50BF	Breaker Failure	•						
50	Instantaneous Phase Overcurrent	•						
50N	Instantaneous Ground Overcurrent(Calculated)	•						
51	Time Phase Overcurrent	•						
51N	Time Ground Overcurrent(Calculated)	•						
50HS	Switch on to fault	•						
79	Reclosing	•						

Table 5.31: Typical Catalog Number

Catalog Number	Description
P116A1N6N25115111W	Series 10 - Substation/Feeder Protection, Dual powered P116 (CT powered and 60-250Vdc & 60-240Vac), 5A CT inputs, 6In/7Out (24-250 Vdc, 24- 240Vac), RS485, 5 electromagnetic flags, withdrawable case

MiCOM Substation / Feeder Applications

The MiCOM range of relays offers varying levels of functionality and hardware options to best suit the protection requirements and allows the customer to choose the most cost effective solution for their application.

The versatile hardware allows for application in many installations and a common relay management software (MiCOM S1 Studio) makes for easy configuration and application.

Basic Feeder Protection Relays - MiCOM 10 and 20 Series

The 10 and 20 series hardware platforms are the building blocks of the MiCOM protection relay range providing the capability for a wide variety of protection, control, measurement, monitoring and communication functions.

The MiCOM P11x relays are suitable for all the applications where overcurrent and/or ground fault protection are required. P11x can be applied to medium and low voltage electrical systems as an optimized and cost-efficient solution tailored to user's needs.

MiCOM P120, P121, P122 and P123 relays provide comprehensive overcurrent phase and ground fault protection for utilities networks, industrial plants and networks as well as for other applications where overcurrent protection is required. The ground fault protection is sensitive enough to be applied in electrical networks where the ground fault current is low.

Standard and Advanced Feeder Protection Relays - MiCOM 30 and 40 Series

- Easergy MiCOM P132 offers a flexible and powerful feeder management device housed in a 4U case in 24TE, 40TE or 84TE widths. Easergy MiCOM P132 offers bay control for up to 3 devices and a library of 80 pre-engineered templates to reduce engineering time.
- Easergy MiCOM P139 one-box solution is the most advanced in the range. It's available in 40TE or 84TE width, 4U case sizes. It offers bay control for up to 10 devices. It uses a pre-engineered library of up to 300 templates for efficient engineering and commissioning.
- Easergy MiCOM P14x Feeder Management and Overcurrent Protective Relays are especially suitable where a complete or advanced power system protection scheme solution is required.

G





© 2019 Schneider Electric All Rights Reserved



The following models are available:

- Easergy MiCOM P141 Feeder management relay
- Easergy MiCOM P142 Feeder management with integrated Autoreclose
- Easergy MiCOM P143 Feeder management, integrated Autoreclose and Check Synchronism ٠
- z sergy MiCOM P145 Feeder management, Autoreclose, Check Synchronism and Enhanced operator control functions ٠

Table 5.32: Functions of Feeder Management Relays

25 Check synchronizing Image: specific sp	ANSI	Protection Function	P111	P115	P116	P120	P121	P122	P123	P125	P126	P127	P132	P139	P141	P142	P143	P145
32 Directional power Image: Sequence device Image: Sequence device <td>25</td> <td>Check synchronizing</td> <td></td> <td>•</td> <td>•</td> <td></td> <td></td> <td>•</td> <td>•</td>	25	Check synchronizing											•	•			•	•
32V Voltage controlled direct. reactive power Image: controlled direct. reactive power Image: controlled direct. reactive power 34 Master sequence device Image: controlled direct. reactive power Image: controlled direct. reactive power 37 Undercurrent Image: controlled direct. reactive power Image: controlled direct. reactive power 46 Negative sequence overcurrent Image: controlled direct. reactive power Image: controlled direct. reactive power 47 Negative sequence over voltage Image: controlled direct. reactive power Image: controlled direct. reactive power 48 Incomplete sequence relay Image: controlled direct. reactive power Image: controlled direct. reactive power 49 Thermal overload Image: controlled direct. reactive power Image: controlled direct. reactive power Image: controlled direct. reactive power 50/51P 3 Phase overcurrent Image: controlled overcurrent Image: controlled overcurrent Image: controlled overcurrent 50BF Circuit breaker failure Image: controlled overcurrent Image: controlled overcurrent Image: controlled overcurrent 51LR Motor Image: controlled overcurrent Image: controlled overcurrent Image: controlled dint Image: contrelid direct. reactive p	32	Directional power										•	•	•	•	•	•	•
34 Master sequence device • <td>32V</td> <td>Voltage controlled direct. reactive power</td> <td></td> <td>•</td> <td>•</td> <td></td> <td></td> <td></td> <td></td>	32V	Voltage controlled direct. reactive power											•	•				
37 Undercurrent • <	34	Master sequence device												•				
46 Negative sequence overcurrent • <	37	Undercurrent			•			•	•		•	•	•	•	•	•	•	•
46BC Broken conductor •	46	Negative sequence overcurrent			•			•	•		•	•	•	•	•	•	•	•
47 Negative sequence over voltage •	46BC	Broken conductor			•			٠	•		•	٠	•	•	•	٠	٠	٠
48 Incomplete sequence relay •	47	Negative sequence over voltage										•	٠	٠	•	•	•	٠
49 Thermal overload •	48	Incomplete sequence relay											•	•				
50/51N Ground fault •	49	Thermal overload	•		•			٠	•		٠	•	•	•	•	•	•	•
50/51P 3 Phase overcurrent • </td <td>50/51N</td> <td>Ground fault</td> <td>•</td> <td>•</td> <td>•</td> <td></td> <td>•</td> <td>٠</td> <td>•</td> <td>•</td> <td>٠</td> <td>•</td> <td>•</td> <td>•</td> <td>•</td> <td>•</td> <td>•</td> <td>•</td>	50/51N	Ground fault	•	•	•		•	٠	•	•	٠	•	•	•	•	•	•	•
50/51P/N 1 Phase or ground overcurrent •	50/51P	3 Phase overcurrent	•	•	•		٠	٠	•		٠	•	•	•	•	•	•	•
50BF Circuit breaker failure •	50/51P/N	1 Phase or ground overcurrent				•				•			•	•				
51LR Motor Image: Controlled overcurrent Image: Contrent Image: C	50BF	Circuit breaker failure	•	•	•			•	•		•	•	•	•	•	•	•	•
51/v Voltage controlled overcurrent •<	51LR	Motor											•	•				
59/27 Over / Under voltage • <td>51V</td> <td>Voltage controlled overcurrent</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>•</td> <td>•</td> <td>•</td> <td>•</td> <td>•</td> <td>•</td> <td>•</td>	51V	Voltage controlled overcurrent										•	•	•	•	•	•	•
59N Residual over voltage 64 Restricted ground fault	59/27	Over / Under voltage										•	•	•	•	•	•	•
64 Restricted ground fault	59N	Residual over voltage								•	•	•	٠	٠	•	•	•	٠
	64	Restricted ground fault				•	•	•	•	•	•	•	•	•	•	•	•	•
66 Startup monitoring	66	Startup monitoring											•	•				
67N Ground fault directional	67N	Ground fault directional								•	•	•	٠	•	•	•	•	•
67N Transient ground fault detection	67N	Transient ground fault detection											•	•				
67N Sensitive directional ground fault	67N	Sensitive directional ground fault											•	•	•	•	•	•
67P Phase directional	67P	Phase directional										•	•	•	•	•	•	•
67W Wattmetric ground fault	67W	Wattmetric ground fault								•	•	•	•	•	•	•	•	•
79 Autoreclose • • • • • • • • • • •	79	Autoreclose			•				•		•	٠	٠	•		٠	٠	•
81 Under / Over frequency • • • • • • • •	81	Under / Over frequency										•	•	•	•	•	•	•
81P Under frequency load shedding	81P	Under frequency load shedding											•	•				
81R Rate of change of frequency	81R	Rate of change of frequency										•	•	•	•	•	•	•
85 Protective signaling	85	Protective signaling											•	•				
	86	Lock-out	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
CTS Current transformer supervision	CTS	Current transformer supervision					-	-			-	•	•	•	•	•	•	•
SOTE Switch on to fault	SOTE	Switch on to fault	•		•				•		•	•	•	•	•		•	•
	TCS	Trip circuit supervision	•		•			•	•		•	•	•	•	•	•	•	•
VTS Voltage transformer supervision	VTS	Voltage transformer supervision	-		-			-	-		-		•		•	•	•	•
YN Neutral admittance	YN	Neutral admittance										•	•	•	•		•	•
	•	Circuit breaker monitoring	•	1	•	1		•	•	1	•	•	•	•	•	•	•	•
		Cold load pick-up	•		•	<u> </u>		•	•	<u> </u>	•	•	•	•	•	•	•	
		Inrush blocking									-	-				-		
		InterMiCOM			-													-
		Limit value monitoring				<u> </u>				<u> </u>			•	•	-	-	-	

Table 5.33: Typical Catalog Numbers

	Catalog Numbers	Description					
Basic	P123A00Z412EC0	Series 20 - Substation/Feeder Protection, P123 (24-250Vdc & 48-240Vac), 1/5A CT inputs, 5In/8Out (24-250 Vdc, 24-240Vac), RS485, DNP3					
Standard	P14121RABM0B48L	Series 40 - Substation/Feeder Protection, P141 (48-110Vdc), 1/5A CT inputs, 8In/ 7Out (user configurable voltage thresholds), 3xRJ-45, IEC61850, DNP3					
Advanced	P14521RHBM0B48M	Series 40 - Substation/Feeder Protection, P141 (48-110Vdc), 1/5A CT inputs, 16In/ 20Out (user configurable voltage thresholds), 4 high break outputs, 3xRJ-45, IEC61850, DNP3					

MiCOM Motor Applications







MiCOM Motor Applications

The MiCOM 10, 20, 30 and 40 series protection relays are designed for various motor protection applications.

Basic Motor Protection Relay (MiCOM P 10 and 20 Series Relays)

The MiCOM P211 and P22x protection relay range are particularly adapted to oil refinery, chemical plant, metallurgy, glass and cement manufacturing, paper mills, electrical and mechanical engineering, food production, mining etc. It is also suitable for water treatment and in pumping stations as well as in steam power plants.

MiCOM P22x range of protection relays is designed for motor protection applications and includes a complete set of protection functions. Models available: MiCOM P220 MiCOM P225

A complete set of protection functions is performed on the measurement of current, voltage and temperature.

In addition to above basic functions, the relay carries out a large number of other functions that enable it to protect and run the motor more effectively.

Advanced Motor Protection Relay (MiCOM P 30 and 40 Series Relays)

Easergy™ MiCOM P24x relays offer advanced protection, control and monitoring of motors and rotating machines. Models available: MiCOM P241, MiCOM P242, MiCOM P243

Easergy™ MiCOM P24x comprehensive protection package includes 87 differential protection and optimization of thermal image monitoring for machines.

These relays not only improve monitoring conditions, but they also facilitate machine maintenance and save on wiring costs.

Table 5.34: Functions available for the different models of the Motor protection MiCOM range of relays

ANSI	Protection Function	P211	P220	P225	P130C	P132	P139	P241	P242	P243
14	Speed switch input	•		•		•	•	•	•	•
25	Check synchronizing					•	•			
27LV	Reacceleration		•	•	•	•	•	•	•	•
30/46/86	Unbalance / Lock out		•	•	•	•	•	•	•	•
32L/O/R	Directional power				•	•	•			
32R	Reverse power				•	•	•	•	•	•
37	Loss of load	•	•	•	•	•	•	•	•	•
37	Undercurrent		•	•	•	•	•	•	•	•
38/49	Thermal overload	•	•	•	•	•	•	•	•	•
40	Loss of field							•	•	•
46	negative sequence overcurrent	•		•	•	•	•	•	•	•
47	Negative sequence over voltage				•	•	•	•	•	•
47N	Neutral over voltage				•	•	•			
50/51P	Phase overcurrent	•	•	•	•	•	•	•	•	•
50BF	Circuit breaker failure			•	•	•	•	•	•	•
50N/51N	Ground fault	•	•	•	•	•	•	•	•	•
50S/51LR/51S	Locked rotor	•	•	•	•	•	•	•	•	•
55	Out of step							•	•	•
59/27	Under / Over voltage			•	•	•	•	•	•	•
59N	Residual over voltage				•	•	•	•	•	•
64N/32N	Wattmetric ground fault				•	•	•	•	•	•
66/48/51	Startup monitoring	•	•	•	•	•	•	•	•	•
67N	Ground fault directional				•	•	•			
67N	Sensitive directional ground fault				•	•	•	•	•	•
67P	Phase directional				•	•	•			
810	Over frequency				•	•	•			
81U	Under frequency				•	•	•	•	•	•
81R	Rate of change frequency				•	•	٠			
87M	Motor differential									•
CTS	Current transformer supervision		•	•	•	•	•	•	•	•
TCS	Trip current supervision		•	•	•	٠	•	•	•	٠
VTS	Voltage transformer supervision				•	•	•	•	•	•
	anti backspin			•				•	•	•
	Circuit breaker monitoring		•	•		•	•	•	•	•

Table 5.35: Typical Catalog Numbers

	Catalog Number	Description						
Basic	P225CA0Z112A0CB	Series 20 - Motor Protection, P225 (24-250Vdc & 48-240Vac), 1/5A CT inputs, 6In/5Out (24-250 Vdc, 24- 240Vac), 10 RTD's, RS485, Modbus						
Standard	P24121RB6M0D18L	Series 40 - Motor Protection, P241 (48-110Vdc), 1/5A CT inputs, 8In/7Out (user configurable voltage thresholds), 10 RTD's, 3xRJ-45, IEC61850						
Advanced	P24321RB6M0D08M	Series 40 - Differential Motor Protection, P243 (48-110Vdc), 1/5A CT inputs, 16In/16Out (user configurable voltage thresholds), 10 RTD's, 3xRJ-45, IEC61850						

AND

G

© 2019 Schneider Electric All Rights Reserved 11/20/2019



P631 / P632 / P633 / P634 / P642 / P643 / P645

MiCOM Transformer Applications

Easergy™ MiCOM P63x and P64x Transformer Differential Protection and Control Devices are designed for fast, selective, short-circuit protection of transformers, motors, generators and other installations.

Models available:

- Easergy MiCOM P631
- Easergy MiCOM P632
- Easergy MiCOM P633
- Easergy MiCOM P634
- Easergy MiCOM P642
- Easergy MiCOM P643
- Easergy MiCOM P645

These devices also incorporate many supplementary protective backup functions.

Table 5.36: Functions available for the different models of the Transformer protection MiCOM range of relays

ANSI	Protection Function	P631	P632	P633	P634	P642	P643	P645
24	Overexcitation		•	•	•	•	•	•
46	Negative sequence overcurrent	•	•	•	•	•	•	•
47	Negative sequence over voltage					•	•	•
49	Thermal overload	•	•	•	•	•	•	•
50/51N	Ground fault	•	•	•	•	•	•	•
50/51P	Phase overcurrent	•	•	•	•	•	•	•
50BF	Circuit breaker failure	•	•	•	•	•	•	•
59/27	Under / Over voltage		•	•	•	•	•	•
67N	Ground fault directional					•	•	•
67P	Phase directional					•	•	•
81	Under / over frequency		•	•	•	•	•	•
87G/64	Restricted ground fault		2	3	3	2	3	3
87T	Transformer differential (windings)	2	2	3	4	2	3	3
CTS	Current transformer (CT) supervision	•	•	•	•	•	•	•
TCS	Trip current supervision	•	•	•	•	•	•	•
VTS	Voltage Transformer (VT) supervision					•	•	•
	2nd harmonic restraint	•	•	•	•	•	•	•
	Overfluxing / 5th harmonic	•	•	•	•	•	•	•

Table 5.37: Typical Catalog Numbers

	Catalog Number	Description
Basic	P64221RABM0B48L	Series 40 - Transformer differential (2 sets of CT's) Protection, P642 (48-110Vdc), 1/5A CT inputs, 8ln/8Out (user configurable voltage thresholds), 3xRJ-45, IEC61850, DNP3
Standard	P64321RABM0B48M	Series 40 - Transformer differential (3 sets of CT's) Protection, P643 (48-110Vdc), 1/5A CT inputs, 16In/16Out (user configurable voltage thresholds), 3xRJ-45, IEC61850, DNP3
Advanced	P64521RABM0B48M	Series 40 - Transformer differential (5 sets of CT's) Protection, P645 (48-110Vdc), 1/5A CT inputs, 16In/16Out (user configurable voltage thresholds), 3xRJ-45, IEC61850, DNP3

S

© 2019 Schneider Electric All Rights Reserved

MiCOM Generator Applications



MiCOM Generator Applications

The Easergy™ MiCOM P34x generator protection relays provide flexible and reliable integration of protection, control, monitoring and measurement functions for small, medium and large generators. Models available:

- MiCOM P342
- MiCOM P343
- MiCOM P344
- MiCOM P345



P342 / P343 / P344 / P345

P34x range covers small generators with all necessary industry standard protection and increasing through larger or more important generators with 100% stator ground fault protection via a 3rd harmonic measuring technique, pole slipping and unintentional energization at standstill protection.

Advanced models in the range offer leading techniques for large generators including second neutral voltage inputs for ground fault/inter-turn protection and 100% stator ground fault protection via a low frequency injection technique.

Table 5.38: Functions available for the different models of the Generator protection MiCOM range of relays

ANSI	Protection Function	P342	P343	P344	P345
21	Under-impedance	•	•	•	•
24	Overexcitation		•	•	•
25	Check synchronizing	•	•	•	•
27TN/59TN	100% stator ground fault (3rd)	•	•	•	•
32L/O/R	Directional power	•	•	•	•
37N/37P	Sensitive phase and ground fault undercurrent	•	•	•	•
38/49	Thermal overload	•	•	•	•
40	Loss of field	•	•	•	•
460C	Negative sequence overcurrent	•	•	•	•
46T	Negative sequence thermal	•	•	•	•
47	Negative sequence over voltage	•	•	•	•
49T	Thermal overload	•	•	•	•
50/27	Unintentional energization		•	•	•
50/51P	Phase overcurrent	•	•	•	•
50BF	Circuit breaker failure	•	•	•	•
50N/51N	Ground fault	•	•	•	•
50DT	Interturn / split phase		•	•	•
51V	Voltage dependent O/C	•	•	•	•
59/27	Under / over voltage	•	•	•	•
59N	Residual over voltage	•	•	•	•
64	Restricted ground fault	•	•	•	•
64N/32N	Wattmetric ground fault	•	•	•	•
64R	Rotor ground fault (MiCOM P391 option)	•	•	•	•
64S	100% stator ground fault (low frequency)				•
67N	Sensitive directional ground fault	•	•	•	•
67P	Phase directional	•	•	•	•
67W	Wattmetric sensitive ground fault	•	•	•	•
78	Pole slipping		•	•	•
81AB	Turbine abnormal frequency	•	•	•	•
81	Under / over frequency	•	•	•	•
87G/87GT	Generator differential		•	•	•
CTS	Current transformer supervision	•	•	•	•
TCS	Trip circuit supervision	•	•	•	•
VTS	Voltage transformer supervision	•	•	•	٠
	Circuit breaker monitoring	•	•	•	•

Table 5.39: Typical Catalog Numbers

Cata	log Number	Description
Basic	P34221RBBM0B38L	Series 40 - Generator Protection, P342 (48-110Vdc), 1/5A CT inputs, 8In/7Out (user configurable voltage thresholds), 10 RTD's, 3xRJ-45, IEC61850, DNP3
Standard	P34321RBBM0B38M	Series 40 - Generator Protection, P342 (48-110Vdc), 1/5A CT inputs, 16In/14Out (user configurable voltage thresholds), 10 RTD's, 3xRJ-45, IEC61850, DNP3
Advanced	P34521RBBM0B38M	Series 40 - Generator Protection, P345 (48-110Vdc), 1/5A CT inputs, 24In/24Out (user configurable voltage thresholds), 10 RTD's, 3xRJ-45, IEC61850, DNP3

AND

G

© 2019 Schneider Electric All Rights Reserved 11/20/2019







P721 / P723

P741 / P742 / P743 / P746

MiCOM Busbar Differential Applications High Impedance Differential Protection Relays

MiCOM P72x high impedance differential protection series provides high impedance differential protection for generators, reactors, motor and busbar applications. Models available:

- MiCOM P721
- MiCOM P723

MiCOM P72x apart from offering the same application benefits as traditional high impedance electromechanical protection schemes, it combines the added benefits of numerical technology to provide advanced communications, event records, fault records, disturbance records and ancillary protection features.

Combined with the MiCOM P79x, a standalone metrosil and resistor unit, it provides simplified scheme engineering for single or three-phase differential applications.

Numerical Busbar Protection Relay Scheme (Centralized)

Easergy™ MiCOM P746 numerical busbar protection provides centralized complete protection for all voltages level up to extra high voltage busbar configurations.

- Models available:
- MiCOM P746

Simple configuration for centralized architecture. The Easergy MiCOM P746 differential busbar protection provides a centralized one box or three boxes architecture and is very simple to use

It does not need to be deeply engineered and supports easy operation and maintenance of the busbar

Numerical Busbar Protection Relay Scheme (Distributed)

The Easergy MiCOM P740 numerical busbar protection scheme provides scalable and complete protection for all voltage levels, from low to extra or ultra high-voltage busbar configurations.

Models available:

- MiCOM 741
- MiCOM 742
- MiCOM 743

Easergy MiCOM P740 is one of the fastest and complete in its class, providing secure and sensitive protection for all types of voltage busbar configurations. It is easily adapted to any configuration and can operate with different types of CT.

Table 5.40: Functions available for the different models of the Busbar protection MiCOM range of relays

ANSI	Protection Function	P741	P742	P743	P746
50N/51N	Ground fault		•	•	•
50/51P	Phase overcurrent		•	•	•
50BF	Circuit breaker failure	•	•	•	•
87BB	Busbar	•	•	•	•
87CZ	Check Zones	•			•
87P	Phase segregated differential	8 zones			4 zones
87P	Sensitive ground fault differential	8 zones			
CTS	Current transformer supervision	•	٠	•	•
TCS	Trip circuit supervision	•	٠	•	•
VTS	Voltage transformer supervision		٠	•	•
	Phase comparison				•
	CT saturation detection		•	•	
	CT supervision		•	•	•

Table 5.41: Typical Catalog Numbers

Catalog Numbe	r	Description			
Standard — High Impedance Busbar Differential	P723000Z112CB0	Series 20 - High Impedance bus differential Protection, P723 (24-250Vdc & 48-240Vac), 1/5A CT inputs, 5In/8Out (24-250 Vdc, 24-240Vac), RS485, Modbus			
P723 with external stabilizing resistor P793	P793CF0E2	External stabilizing resistor, 20kJ			
Advanced — Low impedance Busbar Differential (1 or 3 box mode)	P74622RABM0C48M	Series 40 - Low Impedance bus differential (7 sets of CT's) Protection, P746 (48-110Vdc), 1/5A CT inputs, 16In/16Out (user configurable voltage thresholds), 3xRJ-45, IEC61850, DNP3			

MiCOM Protection Relays





P433 / P435 / P437 / P439 / P430C

P441 / P442 / P443 / P444 / P445 / P446



Easergy™ MiCOM P43x distance protection and One-Box devices

Applied for selective short circuit, ground fault and overload protection in all kinds of medium, high and extra-high voltage systems.

Easergy MiCOM P43x offers a comprehensive range of protection functions as standard with optional hardware and software features available to satisfy customer needs.

Easergy MiCOM P439 One-Box solution includes Bay Control up to 10 devices, including a library of more than 300 pre-engineered bay templates, to reduce engineering time.

Table 5.42: Easergy[™] MiCOM P43x Models Available:

Easergy MiCOM P433	MiCOM P439
Easergy MiCOM P435	MiCOM P430C
Easergy MiCOM P437	

Easergy MiCOM P44x - High Performance Relay Distance Protection

Easergy MiCOM P44x provides high speed and high performance distance protection for all overhead lines and cable applications and offers a comprehensive range of protection functions as standard.

Easergy MiCOM P44x is complemented by various serial and Ethernet communication protocols including IEC61850. Protection is further enhanced by the use of Programmable Scheme Logic within the device.

The range offers quadrilateral (polygon) or mho characteristics with a long history of high performance, load blinding areas, comprehensive range of teleprotection schemes, Power swing alarm and blocking and Multishot autoreclosure with check synchronism.

Table 5.43: Easergy MiCOM P44x Models Available:

MiCOM P441	MICOM P444
MICOM P442	MICOM P445
MICOM P443	MICOM P446

Table 5.44: Functions available for the different models of the Distance protection MiCOM range of relays

00

ANSI	Protection Function	P433	P435	P437	P439	P441	P442	P443	P444	P445	P446
21/21N	Distance	•	•	•	•	•	•	•	•	•	•
25	Check synchronising	•	•	•	•	•	•	•	•	•	•
32	Directional power	•	•	•	•						
32V	Voltage controlled directional reactive power	•	•		•						
46	Negative sequence overcurrent	•	•	•	•	•	•	•	•	•	•
46/67	Directional negative sequence			•		•	•	•	•	٠	٠
46BC	Broken conductor	•	•	•	•	•	•	•	•	•	•
49	Thermal overload	•	•	•	•	•	•	•	•	•	•
50/27	Switch on-to fault	•	•	•	•	•	•	•	•	•	•
50/51N	Ground fault	•	•	•	•	•	•	•	•	•	•
50/51P	Phase overcurrent	•	•	•	•	•	•	•	•	•	•
50ST	Stub bus protection	•	•	•	•	•	•	•	•	•	•
59/27	Over / under voltage	•	•	•	•	•	٠	•	•	•	•
59N	Residual over voltage	•	•	•	•	•	•	•	•	•	•
62/50BF	Circuit breaker failure	•	•	•	•	•	•	•	•	•	•
67N	Ground fault directional	•	•	•	•	•	•	•	•	•	•
67N	Transient ground fault detection	•	•		•						
67P	Phase directional					•	•	•	•	•	•
67W	Wattmetric ground fault	•	•		•						
68	Out of step tripping	•	•	•	•			•			•
78	Power swing blocking	•	•	•	•	•	٠	•	•	•	٠
79	Auto-reclose	3 pole	1/3 p	1/3 p	3 pole	3 pole	1/3 p	1/3 p	1/3 p	3 pole	1/3 p
81	Over / under frequency	•	•	•	•	•	•	•	•	•	•
81R	Rate of change of frequency	•	•	•	•			•		٠	٠
81P	Under-frequency load shedding	•	•		•						
85	Channel aided scheme logic	•	•	•	•	•	•	•	•	•	•
CVTS	Capacitive voltage transformer supervision					•	•		•		
TCS	Trip circuit supervision	•	•	•	•	•	•	•	•	•	•
VTS/CTS	Voltage / current transformer supervision	•	•	•	•	•	٠	•	•	٠	٠
ΔΙ/ΔV	Delta directional comparison							•			•
YN	Neutral admittance	•	•		•						
	Process Bus interface for SV						•	•		•	•
	Mutual compensation			•		•	•	•	•		•

Table 5.45: Typical Catalog Numbers

Catalog Numbers		Description				
Standard Version	P44321RMBM0H98M	Series 40 - Distance Protection, P443 (48-110Vdc), 1/5A CT inputs, 16In/24Out (user configurable voltage thresholds), 1300nm single- mode dual channel, 3xRJ-45, IEC61850, DNP3				
Advanced Version	P44521ROBM0J98L	Series 40 - Distance Protection, P445 (48-110Vdc), 1/5A CT inputs, 16In/16Out (user configurable voltage thresholds), 1300nm single- mode dual channel, 3xRJ-45, IEC61850, DNP3				

G





P251 / P532

P541 / P542 / P543 / P544 / P545 / P546



MiCOM Line Differential Applications MiCOM P521 - Feeder Differential Protection Relays

MiCOM P521 provides high speed, two ended current differential unit protection of overhead lines and underground cables in applications such as ring mains and parallel feeders.

Models available: MiCOM P521

MiCOM P521 relay provides fast, efficient current differential protection. It is very flexible and can be applied to a wide range of power systems. Offering a variety of communications interface options, MiCOM P521 provides valuable local and remote back-up protection

Easergy™ MiCOM P532 - Line Differential Protection and Bay Control Device

Easergy MiCOM P532 provides a two-ended line differential protection function with all of the necessary protection communication interfaces.

Easergy MiCOM P532 is an inexpensive line differential protection device that features optional control functions for rapid and selective short-circuit and overload protection of cables and power lines.

It provides a rapid three-stage differential protection system using a tripping characteristic with multiple knee points amongst the numerous supplementary functions. The optional control functions enable Easergy MiCOM P532 to control up to six switchgear units fitted to a bay panel, and to monitor their contact positions.

Easergy MiCOM P54x - Line Differential Protection Relays

Easergy MiCOM P54x is designed for high performance overhead line and cable applications, it interfaces readily with the longitudinal (end to end) communications channels and has optional distance backup protection.

Models available:

MiCOM P541, P542, P543, P544, P545, P546

Easergy MiCOM P541-P546 series provides high-speed current differential unit protection. The P54x is designed for all overhead line and cable applications, as it interfaces readily with the longitudinal (end to end) communications channel between line terminals.

A full range of back-up protection is integrated. This enhances the dependability of the protection, as hot-standby elements (such as distance zones and overcurrent) can be brought into service whenever a signaling channel outage may occur.

Table 5.46: Functions available for the different models of the Line Differential protection MiCOM range of relays

ANSI	Protection Function	P521	P530C	P532	P541	P542	P543	P544	P545	P546	P547
21	Distance						•	•	•	•	•
25	Check synchronizing			٠			•	•	•	•	•
37	Loss of load / undercurrent										
46	Negative sequence overcurrent	•		•			•	•	•	•	•
49	Thermal overload	•	•	٠	•	•	•	•	•	•	•
50/51N	Ground fault	•	•	•	•	•	•	•	•	•	•
50/51P	Phase overcurrent	•	•	•	•	•	•	•	•	•	•
50BF	Circuit breaker failure	•	•	•	•	•	•	•	•	•	•
59/27	Over / under voltage		•	•			•	•	•	•	•
64W	Wattmetric ground fault		•	•			•	•	•	•	•
67N	Ground fault directional		•	•			•	•	•	•	•
67N	Sensitive directional ground fault			•			•	•	•	•	•
67P	Phase directional		•	•			•	•	•	•	•
78	Power swing blocking						•	•	•	•	•
79	Auto-reclose	3 pole	3 pole	3 pole		3 pole	1/3 pole				
81	Under / over frequency			•			•	•	•	•	•
87L	Line differential (terminal)	2	2	2	2/3	2/3	2/3	2/3	2/3	2/3	
87L	Phase comparison										•
CTS	CT supervision	•					•	•	•	•	•
TCS	Trip circuit supervision	•	•	•	•	•	•	•	•	•	•
	2 breaker configuration							•		•	
	2nd harmonic restraint	•	•	•	•	•	•	•	•	•	
	Copper wire signaling	•	•	•							
	Direct / permissive inter tripping	•	•	•	•	•	•	•	•	•	
	FO signaling	•	•	•	•	•	•	•	•	•	
	In Zone transformer	•			•	•	•	•	•	•	
	PLC signaling										•
	SDH / Sonet networks						•	•	•	•	
	Vector compensation	•			•	•	•	•	•	•	

Table 5.47: Typical Catalog Numbers

Catalo	g Number	Description
Basic Version	P521A0GZ412DG0	Series 20 - Line differential Protection, P521 (24-250Vdc & 48-240Vac), 1/5A CT inputs, 5In/8Out (24-250 Vdc, 24-240Vac), 1300nm single-mode single channel, RS485, DNP
Standard Version	P54321RCBM0H98M	Series 40 - Line differential Protection, P543 (48-110Vdc), 1/5A CT inputs, 16In/14Out (user configurable voltage thresholds), 1300nm single-mode dual channel, 3xRJ-45, IEC61850, DNP3
Advanced Version	P54521RCBM0H98M	Series 40 - Line differential Protection, P545 (48-110Vdc), 1/5A CT inputs, 24In/32Out (user configurable voltage thresholds), 1300nm single-mode dual channel, 3xRJ-45, IEC61850, DNP3

11/20/2019

Courtesy of Steven Engineering, Inc - (800) 258-9200 - sales@steveneng.com - www.stevenengineering.com





P138 / P436 / P438

MiCOM Railway Applications

Easergy™ MiCOM P138 - Overcurrent Protection Device for Rail Applications

The Easergy MiCOM 30 series rail devices are dedicated to railway catenary protection. The Easergy MiCOM P138 specifically provides directional overcurrent protection for rail applications

The Easergy MiCOM P138 enables a wide range of applications to protect supplies and catenaries in classic and autotransformer-fed (AT) systems. With easy connection to virtually all substation and catenary network management systems, it is enhanced by a complete range of backup protection and automation functions

Easergy MiCOM P638 - Transformer Protection Device for Rail Applications

Easergy MiCOM Px30 rail devices are dedicated to railway catenary protection. The Easergy MiCOM P638 provides transformer differential protection

Easergy MiCOM P638 enables a wide range of applications to protect supplies and catenaries in classic and autotransformer-fed (AT) systems. With easy connection to virtually all substation and catenary network management systems, Easergy MiCOM P638 is enhanced by a complete range of backup protection and automation functions

Easergy MiCOM P436 and P438 - Distance Protection Devices for Rail Applications

Easergy MiCOM 30 series rail devices are dedicated to railway catenary protection. The Easergy MiCOM P436 provides catenary protection for classic and two-phase AT feeders.

Easergy MiCOM P436 and Easergy MiCOM P438 enable a wide range of applications to protect supplies and catenaries in classic and autotransformer-fed (AT) systems. With easy connection to virtually all substation and catenary network management systems, the two models are enhanced by a complete range of backup protection and automation functions.

Table 5.48: Functions available for the different models of the Railway protection MiCOM range of relays

ANSI	Protection Function	P138	P436	P438	P638
21/21N	Distance		•	•	
27/59	Over / under voltage	•	•	•	•
49	Thermal overload	•	•	•	•
50/27	Switch on-to fault	•	•	•	
50H	High current supervision	•	•	•	
50/51N	High current ground fault (tank protection)	•			•
50/51P	Phase overcurrent	•	•	•	•
62/50BF	Circuit breaker failure	•	•	•	•
67P	Phase directional	•	•	•	•
81	Under / over frequency	•	•	•	•
86	Lock-out	•	•	•	•
87T	Transformer differential (windings)				2
di/dt,dv/dt, dΦ /dt	Train startup detection		•	•	
Hz	Rail catenary protection		16 2/3	25/50/60	
TCS	Trip circuit supervision	•	•	•	•
CTS	Current transformer supervision		•	•	
VTS	Voltage transformer supervision	•	•	•	
	2nd harmonic restraint	•	•	•	•
	3rd, 5th, 7th harmonic blocking	•	•	•	
	Defrost protection	•	•	•	
	High impedance fault detection	•	•	•	
	InterMiCOM	•	•	•	

Table 5.49: Typical Catalog Numbers

Catalog Numbers	Descriptions
P138849011M0303409612947	Series 30, Feeder relay, 60-250 Vdc/100-230 Vac with 4 high break contact plus 10 inputs and 16 outputs , 61850
P438849020M0308417616947	Series 30, Distance relay, 60-250 Vdc/100-230 Vac with 4 high break contact plus 10 inputs and 16 outputs , 61850
P638849011M0303406612947	Series 30, Transformer Relay, 60-250 Vdc/100-230 Vac with 4 high break contact plus 10 inputs and 16 outputs , 61850

G

The SAGE RTU Range



SAGE RTUs — Introduction

A variety of SAGE RTU models allow you to choose the right solution for your application. You can deploy the hardware that meets the requirements of each installation. Important distinctions such as physical size, physical I/O quantities, and communications port medium allow you to choose the RTU meeting each application's requirements — no more and no less. Each SAGE RTU provides the same browser-based user interface for easy configuration and setup. Each offers IED integration, NERC CIP security, IEC 61131-based logic functions, communications protocols, and a custom applications library. Each RTU uses the same CPU, firmware, and configuration files, which simplifies spare parts stocking and engineering effort, saving time and money.

Schneider Electric has many years of experience offering custom designed retrofit solutions that provide improved functionality over obsolete RTUs while minimizing the field installation and commissioning time required for the change out of equipment. Each retrofit RTU is specifically designed to make use of as much of the existing equipment as possible. Special interface cards are delivered to connect to the existing termination boards. Terminations are left in place, eliminating the need for field personnel to buzz-out field wiring. Retrofits for Westinghouse Redac, GE GEtac, CDC 44-500, CDC 44-550, Harris 5000, L&G 8000/9000, and Tasnet are already available [1]

Features and Benefits

- Time Saving
- Easy Upgrade
- Scalable I/O
- Excellent Support
- Made in America
- Cyber-Secure
- Intuitive Configuration
- All Protocols & Apps Included

• Extensive Protocol Suite

- Math and Logic Apps
- Alarming & Annunciation
- SEL Relay Integration
- Grid Automation Apps
- Custom Retrofit Solutions
- Common CPU and Firmware

Table	5.50:	SAGE	Product	Matrix

Model	2400	4400	3030M	1410	1430	1450
	2400	4400	3030M	1410	1430	1450
Applications Covered	ſ		ſ			
Substation Data Concentrator		•	•	•		
Substation RTU	Large Substation	Large Substation	•			
Automation Controller	•	•	•	•	•	•
Protocol Converter	•	•	•	•	•	•
Gateway	•	•	•			
Sectionalizer	•					•
Cap Bank Controller	•					•
Feeder RTU					Built in Status and Control	Built in AC Analog Inputs
Flexible Communications Interfaces				•	•	
Characteristics				-		
Physical Size	12" x 15"	19" x 7" x 10.5"	19" x 5.25" x 10.5"	8" x 5"	12" x 8"	11" x 11"
RS-232	4 / 12	16	16	2 / 10	2 / 10	4 / 12
Serial Fiber	0	0	0	1	0	0
RS-485	0	0	0	1	2	0
Ethernet	2/6	2/5	2/5	2/6	2/6	2/6
Digital Input	16 / 240	224	224	0	16	8
Analog Input	8 / 232	256	0 / 256	0	0 / 256	6 (AC)
Digital Output	128	128 SBO / 256 DO	64	0	4	4
1 ms SOE	0 / 512	256 / 512	0/512	0/512	0/512	0
Analog Output	12	0	0	0	0	0
Mount	Panel	Rack	Rack	Panel / Din	Panel	Panel

• First # indicates built-in capacity, second # indicates maximum expansion capacity

• All units have the same software functionality (Protocols, Applications, User Interface)

• SAGE 1450 Analogs are AC Input type and allow 3 Current and 3 Voltage Inputs. All other models represent milliamp transducer DC Analog Input

• SAGE 4400 has capacity for 128 SBO type Trip / Close pairs and up to 256 Digital Output Points, all on scalable XT Boards

• All Inputs and Outputs in this table are Hardware wired points. Does not include points from IED's.

5-27

PROTECTION, CONTROL, AND ENERGY AUTOMATION

10





SAGE 2400

SAGE 2400 RTU

In the SAGE RTU family, the SAGE 2400 RTU offers the most comprehensive physical I/ O capabilities and versatile application. Designed for traditional RTU applications, it can accommodate hundreds of analog, digital, and control I/Os along with the easy configuration, protocols, and applications from all SAGE RTUs.

Each SAGE RTU provides the same browser-based user interface for easy configuration and setup. Each RTU offers IED integration, NERC CIP security, IEC 61131-based logic functions, communications protocols, and a custom applications library. [2]

Applications		
Large Substation RTU	Protocol Converter	
Automation Controller	 NERC CIP Cybersecure IED Gateway 	
Features Onboard		
 Size: 12 x 15 Inches AMD LX-800 500 MHz CPU with 1 GB flash memory (Common to all SAGE RTU) 4x RS232 Serial Ports: Options up to 8 additional RS-232 Serial Ports [3] (12 total serial ports) 	 -40 C to +85 C operating temperature range for reliability in the harshest environments. All field connections designed to pass: ANSI C37.90.1979 (R1982) ANSI C37.90.1-1989 	
 2x 10/100 Fast Ethernet: Optional 4 Port Switch Available [3] 	 IEEE 4/2-19/4 Remember 1/2 to make a laboration of the state 	
 10-33 VDC Power Input 	Removable I/O terminal blocks Eull three year warranty standard	
 LEDs for visual indications of communications, digital ins & outs, and other functions 		
Baseboard I/O		
 16 Digital Input / Accumulator Points 	 4x SBO or 8x DO Control points 	
 8 DC Analog Inputs (±5 VDC, 0-5 VDC, 1-5 VDC, ±1 mA, 0-1 mA, 4-20 mA, 10-50 mA) 	2x Alarm Contact points	
I/O Expansion Capabilities		
 Up to 240 Digital Input Points (5 ms) Up to 232 DC Analog Input Points (Several Variances Available) Up to 128 SBO Trip Close Pairs / 256 Digital Output Points Up to 512 1ms SOF Digital Input Points /3/ 	 A combination of Special Function Bus Cards ACI [4] IMS SOE [4] Digital Output 	
Up to 12 Analog Output Points [4]	• IRIG-B [3]	
	• GPS [3]	
Same Firmware Capabilities in all SAGE RTUs		
 Intuitive config@WEB Browser Based User Interface: No proprietary Software Required 	 SEL IED Management (AutoConfig, EVE File Storing, Config Change Management) 	
 Extensive Protocol Suite included with every unit 	 Detailed Comm Diagnostics and Counters: 	
 Configurable Math, Logic, and Automation Applications IEC 61131 Compliant IsaGRAF Programming Interface NERC CIP Cybersecurity Advanced Logging with Syslog Client Force Point Data 	 Secure Ethernet Protocols IPSec / IKE HTTPS SSL / SSH SFTP 	
. croc . c Data	 Embedded Firewall 	

[2] See our website for a full catalog of I/O Expansion Options.

[3] On PC/104 Expansion Cards[4] On Discontinued Cards

5-28





SAGE 3030

Designed for Substation Gateway applications, the SAGE 3030 Magnum can accommodate many vendor agnostic IED's via Serial and Ethernet communications. The SAGE 3030M RTU offers the most communications ports while allowing traditional hardwire I/O options from other SAGE models.

Each SAGE RTU provides the same browser-based user interface for easy configuration and setup. Each RTU offers IED integration, NERC CIP security, IEC 61131-based logic functions, communications protocols, and a custom applications library. [5]



SAGE 4400

The SAGE 4400 combines the best features of the SAGE 3030M and the SAGE 2400. The 4400 is a rack mounted RTU with all the communications capabilities of the 3030M and the I/O flexibility of the SAGE 2400. The 4400 uses the same I/O cards as the other SAGE products for maximum retrofit capability and is designed for applications that require a significant capability for discrete I/O. It includes enough processor power for integration of many IED's as well as intelligent embedded applications and logic functions.

Each SAGE RTU provides the same browser-based user interface for easy configuration and setup. Each RTU offers IED integration, NERC CIP security, IEC 61131-based logic functions, communications protocols, and a custom applications library. [5]

SAGE 3030 Magnum RTU

Applications	
Substation Data Concentrator	Protocol Converter
Substation RTU	 NERC CIP Cybersecure IED Gateway
Automation Controller	
Features Onboard	
• Size: 19 x 5.25 x 10.5 Inches	2x Alarm Contacts
Serial Ports: 16 x RS-232	 Wide range Power Input Options
• 40 to +80 C Operating temperature	 85-254 VAC, 85-350 VDC
 Ethernet Ports: 2 x 10/100 Mbps (Optional 3 port Ethernet switch) 	Designed for Electric Utility applications
AMD LX-800 500 MHz CPU with 1 GB flash memory (Common	 Meet IEEE 472, ANSI C37.90 SWC
to all SAGE RTU)	Meet C37.90.1 standards Full 2 Vacuation Memory to Other should
 Non Windows® OS (VxWorks) 	Full 3 Year Warranty Standard
PC/104™ bus architecture	 Rugged relay-style metal enclosure for easy rack mounting
 Continuous IRIG-B output with built-in bus to all communication ports for IRIG-B In, GPS, RTC, or protocol time synchronization GPS [6] Protocols Arbiter 	 Over 100 LEDs for positive visual Indications Serial Communications (TX, RX, DCD/ +5V, CTS, RTS) x 18 Power, Run, Reset, Local, Time Source Fail, IED Failed, User Logged In, Config Changed, RLL Running, Ethernet Lik, and Alarm 1 & 2
Hardware I/O Options	
Up to 224 Status / Acc Inputs (5 ms)	Up to 256 DC Analog Input points [6]
 Up to 64 SBO Trip Close Pairs (momentary and latching) 	 Up to 512 1ms SOE Status inputs [6]
Same Firmware Capabilities in all SAGE RTUs	
 Intuitive config@WEB Browser Based User Interface 	Force Point Data
No proprietary Software Required	Detailed Comm Diagnostics and Counters
 Extensive Protocol Suite included with every unit 	 PCAP, Protocol Captures
Configurable Math, Logic, and Automation Applications	Secure Ethernet Protocols
IEC 61131 Compliant IsaGRAF Programming Interface	IPSec / IKE HTTPS
NERC CIP Cybersecurity	– SSL/SSH
Advanced Logging with Syslog Client	– SFTP
 SEL IED Management (AutoConfig, EVE File Storing, Config Change Management) 	 Embedded Firewall

SAGE	4400	RTU

ſ

1

ſ

Applications	
Substation Data ConcentratorLarge Substation RTU	Protocol ConverterNERC CIP Cybersecure IED Gateway
Automation Controller	
Features Onboard	
 Size: 19 x 7 x 10.5 Inches -40° to +80° C Operating Temperature AMD LX-800 500 MHz CPU with 1 GB flash memory (Common to all SAGE RTU) Serial Ports: 16 x RS232 with Comm Status LED's on Front Panel RTU status LED's on Front Panel SVDC available on each port (up to 5W total) 300-115,000 bps available 	 Remote/Local Switch with available Dry Contacts Time Synching IRIG-B In -> Distributed to all 16 Serial ports GPS [6] Protocols Arbiter Power Input Options 10-33 VDC
 Ethernet Ports: 2 x 10/100 Mbps (Optional 3 port switch [6]) 	 With Input Fusing and power switch
2x Alarm Contacts Onboard	 Grounding Bar
Hardware I/O Options	
 Options with more user friendly cable interface (See attached brochure for I/O details) Up to 224 Status Inputs (5 ms) Up to 256 - 1 ms SOE Status Inputs 	 Up to 128 SBO Trip Close Pairs Up to 256 DC Analog Input points Up to 256 DO Digital Output Points
Same Firmware Capabilities in all SAGE RTUs	
Intuitive config@WEB Browser Based User Interface. No proprietary Software Required Extensive Protocol Suite included with every unit	Force Point Data Detailed Comm Diagnostics and Counters PCAP Protocol Contures
 Configurable Math, Logic, and Automation Applications IEC 61131 Compliant IsaGRAF Programming Interface NERC CIP Cybersecurity Advanced Logging with Syslog Client 	 Secure Ethernet Protocols IPSec / IKE HTTPS SSL / SSH SFTP
 SEL IED Management (AutoConfig, EVE File Storing, Config Change Management) 	 Embedded Firewall

[5] See our website for a full catalog of I/O Expansion Options.

[6] Available with PC/104 Expansion Cards

© 2019 Schneider Electric All Rights Reserved OTECTION, CONTROL, / ENERGY AUTOMATION

10

SAGE 1410 RTUs

Force Point Data

PCAP, Protocol Captures

Secure Ethernet Protocols

Embedded Firewall

IPSec / IKE

SSL/SSH

HTTPS

SETP

Detailed Comm Diagnostics and Counters





SAGE 1410

Smart and compact data concentrator / protocol converter / gateway solution.

Each SAGE RTU provides the same browser-based user interface for easy configuration and setup. Each RTU offers IED integration, NERC CIP security, IEC 61131-based logic functions, communications protocols, and a custom applications library.



SAGE 1430

Compact status and control module with powerful IED integration capabilities.

Each SAGE RTU provides the same browser-based user interface for easy configuration and setup. Each RTU offers IED integration, NERC CIP security, IEC 61131-based logic functions communications protocols and a custom

functions, communications protocols, and a custom applications library.

SAGE 1410 RTU

Applications Substation Data Concentrator Protocol Converter Automation Controller Flexible Communications Interfaces Features Separate PPP port for serial dial-up Compact Footprint 8 x 5 x 2 (W x L x H) Inches ٠ 40° to +85° C Operating Temperature Non-Windows® OS (VxWorks) Two — Built-in 10/100 Mbps Ethernet® ports (independent IPs) : Optional four port Ethernet switch [7] Designed for Electric Utility applications Meet IEEE 472, ANSI C37.90 SWC Meet C37.90.1 standards Two RS232 w/LEDs for DCD, RX, RTS, CTS and TX (Expands to 10 [7]) Optional on board GPS Receiver One RS485 w/LEDs for RX and TX (2 wire operation) Optional IRIG-B Input/Output One Fiber Optic communications w/LEDs for RX and TX On board LEDs show operational status: Power / Full Comm Status indications AMD LX-800 500 MHz CPU with 1 GB flash memory (Common to all SAGE RTU) . Full three Year Warranty Standard PC/104[™] bus architecture for easy future upgrades Accepts 12-33VDC Input Power directly .

- Optional 125 VDC/20-60 VDC/120 VAC power supply
- Same Firmware Capabilities in all SAGE RTUs
- Intuitive config@WEB Browser Based User Interface. No proprietary Software Required
- Extensive Protocol Suite included with every unit
- Configurable Math, Logic, and Automation Applications
- IEC 61131 Compliant IsaGRAF Programming Interface
- NERC CIP Cybersecurity
- Advanced Logging with Syslog Client
- Advanced Logging with systog Ulent

 SEL IED Management (AutoConfig, EVE File Storing, Config ______
 Change Management)
- SAGE 1430 RTU

Ap	oplications
	Feeder RTI I with built

 Feeder RTU with built in Status and Control 	 Protocol Converter 		
Automation Controller	 Flexible Communications Interfaces 		
Features			
 Compact Footprint: 8 x 12.5 x 4 (W x L x H) Inches 40° to +85° C. Operating Temperature 	 2 RS485 w/LEDs for RX and TX (2 wire operation) 		
 2 - Built-in 10/100 Mbps Ethernet® ports (independent IPs) 	 Separate PPP port for serial dial-up 		
Optional – 4 port Ethernet switch	 AMD LX-800 500 MHz CPU with 1 GB flash memory (Common to all SAGE RTU) 		
 2 RS232 w/LEDs for DCD, RX, RTS, CTS and TX (Expandable to 10) 	 Non Windows® OS (VxWorks) 		
10 10)	 PC/104[™] bus architecture 		
Hardware I/O			
 16 Digital Inputs (Status/Accumulator/SOE) 	 Optional on board GPS Receiver 		
 4 T/C Momentary Controls (8 relays) 	 Optional IRIG-B Input/Output 		
 Easy to connect removable Phoenix® type terminal blocks 	 Optional DC Analog Input Module 		
 Designed for Electric Utility applications Meet IEEE 472, ANSI C37.90 SWC 	 On board LEDs show operational status (Power / Full Comm Status indications) 		
 Meet C37.90.1 standards 	 Full 3 Year Warranty Standard 		
	 Built-in 125 VDC/20-60 VDC/120 VAC power supply 		
Same Firmware Capabilities in all SAGE RTUs			
 Intuitive config@WEB Browser Based User Interface. No proprietary Software Required 	 SEL IED Management (AutoConfig, EVE File Storing, Config Change Management) 		
Extensive Protocol Suite included with every unit	Detailed Comm Diagnostics and Counters		
Configurable Math, Logic, and Automation Applications	 PCAP, Protocol Captures 		
 IEC 61131 Compliant IsaGRAF Programming Interface 	Secure Ethernet Protocols		
NERC CIP Cybersecurity	- IPSec / IKE		
Advanced Logging with Syslog Client	- HTTPS - SSL/SSH		
Force Point Data	_ SETP		

[7] With PC/104 Expansion Cards5-30

82

Embedded Firewall





SAGE 1450

SAGE 1450 RTU

A powerful pole-top distribution automation platform with all the functionality of a gateway. AC Input (ACI) option provides an advanced transducer-less AC analog input capability. The SAGE 1450 can be used for interfacing to conventional PTs and CTs as well as standard current/voltage linepost sensors such as the Square D LSCV Line Post Sensors or Lindsey CVMI linepost sensors. These terminations include custom instrument-grade transformers, designed for high linearity and ultra low phase shift, which provide the high impedance inputs required for the linepost sensor resistor divider voltage outputs.

Each SAGE RTU provides the same browser-based user interface for easy configuration and setup. Each RTU offers IED integration, NERC CIP security, IEC 61131-based logic functions, communications protocols, and a custom applications library.

Applications	
Feeder RTU with built in AC Analog Inputs Automation Controller Protocol Converter	SectionalizerCap Bank Controller
Features	
 Compact Footprint: 11 x 11 x 4 Inches 40° to +85° C Operating Temperature Two Built-in independent Ethernet Ports Optional 4 Port Ethernet switch [8] Four Built-in serial ports (expands to 12 [8]) Separate PPP port for serial dial-up AMD LX800 500 Mhz CPU w/ 1 GB Flash Memory Built-in Battery Charger w/low voltage disconnect On Board I/O with removable terminal blocks a Digital Inputs (Sts/Accum/SOE) 4 T/C Mom Pairs (8 relays - 2A@30VDC) 6 Transducerless Als (3 current & 3 voltage) 2 DC Analog Inputs (Input Voltage and Battery Voltage) 	 On board LEDs show operational status Power, status, control indications Full Comm Status indications Accepts 9-33 VDC Input Power directly Optional 125 VDC/20-60 VDC/120 VAC onboard power supply Designed for Electric Utility applications Meet IEEE 472, ANSI C37.90 SWC Meet C37.90.1 standards Optional On-Board GPS Receiver [8] Optional IRIG-B Input/Output [8] Full 3 Year Warranty Standard
Same Firmware Canabilities in all SAGE RTUS	
Initiative config@WEB Browser Based User Interface. No proprietary Software Required Extensive Protocol Suite included with every unit	 Force Point Data Detailed Comm Diagnostics and Counters PCAP, Protocol Captures
 Configurable Math, Logic, and Automation Applications IEC 61131 Compliant IsaGRAF Programming Interface NERC CIP Cybersecurity Advanced Logging with Syslog Client 	Secure Ethernet Protocols IPSec / IKE HTTPS SSL / SSH SFTP
 SEL IED Management (AutoConfig, EVE File Storing, Config Change Management) 	 Embedded Firewall

SAGE Sales and Support

New RTU Sales	
Email:	USUtilityQuotes@schneider-electric.com
Tips:	Tips: Power Input Requirements, Hard wired I/O Requirements, Communications Ports Needed, Mounting, Other options needed will expedite the quotation process.
Spares and Upgra	ades
Phone:	(713) 920-6897
Email:	USUtilityQuotes@schneider-electric.com
Tips:	Having the Part Number from the Baseboard or CPU will help choose the right spare for your application.
Technical Suppor	t
Phone:	(713) 920-6832
Email:	sagertu_support@schneider-electric.com
Tips:	Generally a copy of the configuration, data traps, and the firmware version will help us diagnose any problems.
Repairs	
Email:	USUtilityQuotes@schneider-electric.com
Tips:	Have the Tag numbers from the affected products, and the Serial Number. Remove known good parts to minimize any repair costs.

S

[8] With PC/104 Expansion Cards

© 2019 Schneider Electric All Rights Reserved

^{11/20/2019} Courtesy of Steven Engineering, Inc - (800) 258-9200 - sales@steveneng.com - www.stevenengineering.com



Easergy™ T300 RTUs — Introduction

The Easergy T300 is a single, powerful feeder RTU designed to prepare your business for the future. It helps you evolve with the grid, improve downtime tolerance, and manage increasing energy demand. It also helps you meet increased quality and performance requirements, optimize costs, and improve the efficiency of your electrical distribution network. Easergy T300 Remote Terminal Unit (RTU) is a modular platform of hardware and firmware, and an application building block for Medium Voltage and Low Voltage public distribution network management. It offers a single solution for control and monitoring from a simple pole-top device to a large MV/MV or MV/LV substation. [1]

Features and Benefits

New!)

- Reduce MV and LV outage durations (SAIDI)
- Centralized and decentralized MV and LV distribution network management: fault location, isolation, and service restoration
- Private network management (MV loops): Self-healing network management Automatic Transfer Switch
- Volt/VAR optimization support for distributed generation integration
- MV and LV power and quality measurement according to standard EN 50160
- Synchronize voltage measurements on the feeder in order to facilitate distributed generation integration
- Asset management efficiency. Reduce CAPEX with a single, multi-application, modular offer
- Strong Cybersecurity Management

Table 5.51: Easergy T300 RTUs - Overview

HU250 Head Unit and Communication Gateway	SC150 MV Switchgear Controller	LV150 Transformer an LV Switchboard Monitoring
HU250	SC150	LV150
Applications covered:	Applications covered:	Applications covered:
 Communication Gateway Automation Controller Sectionalizer Cap Bank Controller & Volt Var Optimization Distributed energy resources control and monitoring Cybersecurity Gateway Compliant with IEC 62351 and IEEE P1686 SCADA communication security (IEC 62351-5) Local and remote access security based on RBAC (IEC 62351-8) Connection security for maintenance (local and remote): HTTPS, SSH Protocol security for file transfer: SFTP Authentication by centralized Radius client 	 MV Network Management. Modular up to 24 Load Break Switches Non-Directional and Directional Fault Detection Sectionalizer and Auto Transfer Source Automation Power measurement (IEC 61557-12) Power Quality (IEC 61000-4- 30 Class S) Underground MV/MV and MV/ LV substation control and monitoring Overhead load break switch (LBS) control 	 LV network distribution monitoring LV Power measurement according to IEC 61557-12 LV Power quality according IEC 61000-4-30 Class S Pad-mounted and Overhead Transformer temperature monitoring LV Broken conductor detection (fuse detection)

Table 5.52: Easergy T300 Power Supplies



[1] Refer to catalog (document number NRJED314621EN) or the Easergy T300 product range for more information.

G

PROTECTION, CONTROL, A ENERGY AUTOMATION

AND



Easergy[™] HU250 Communication Gateway



HU250



SC150

LV150



Easergy TM HU250 is a powerful and flexible communication gateway for all Easergy T300 configurations. [2]

Easergy™ T300 RTUs (Remote Terminal

Units)

- Easergy HU250 can also be used as a standalone gateway for third-party IEDs
- Open to any communication system and protocol
- · Compliant with cyber security standards
- Advanced configuration tools
- Open to IEC 61131 applications
- · Web server for easy commissioning and maintenance
- Easy remote and local firmware updates
- Secure Wi-Fi connectivity

Table 5.53: Easergy HU250

Description	Catalog Number
Easergy HU250: head unit communication gateway with cyber security management	EMS59000

Easergy SC150 Medium Voltage Switch Controller

All advanced functions for MV line and switchgear management in a compact box. [2]

- · Switchgear control and monitor
- Advanced fault detection
- Power measurement
- Power quality
- Sectionalizer automation
- Embedded operator HMI
- Automation systems
 - Automatic Transfer Source (ATS), self healing, etc., are hosted in HU250 and are designed in a IEC 61131-3 PLC workbench.
 - The sectionalizer automation (SEC) concerning one switchgear is managed by the SC150 module. This automation is factory predefined but configurable on site. This automation provides the autonomous ability to open the MV switch following detection of a number of fault currents.

Table 5.54: Easergy SC150

Description	Catalog Number
SC150 Medium Voltage Switch Controller CT-LPVT/VT, 1/5 A - LPVT/VT sensors	EMS59201
SC150 Medium Voltage Switch Controller CT-CAPA, 1/5 A - VPIS/VDS/PPACS sensors	EMS59202

Easergy LV150 Low Voltage Transformer Monitor

The Easergy LV150 is an unmatched low voltage monitoring module designed for the public MV/LV substation. It combines accurate 3-phase energy and power measurements with data logging, power quality analysis, alarming and temperature capabilities not typically available in such a compact RTU. The Easergy LV150 is compliant with stringent international standards that enhance its metering accuracy and power quality measurements, as specified by the safety standard requirement for the MV/LV substation. Easergy LV150 gives you the energy intelligence and control needed to track performance, stay informed in real time of critical conditions and empower you to make strategic decisions. It will help you increase reliability, maximize the use of resources and improve service. [2]

Applications

- Transformer temperature monitoring
- LV incomer power monitoring
- LV incomer power quality monitoring
- LV network voltage fault detection (loss of neutral at transformer level)

Table 5.55: Easergy LV150

Description	Catalog Number
Low Voltage Transformer Monitor	EMS59300



DTECTION, CONTROL, A ENERGY AUTOMATION

[2] Refer to catalog (document number NRJED314621EN) or the Easergy T300 product range for more information.





PS50



PS25

Easergy PS50 and PS25 Backup Power Supplies

The Easergy T300 PS50 and PS25 backup power supplies are designed for long power supply interruption and to maintain control and monitoring of the entire MV substation during outages. Designed to supply all components in the substation including switchgear mechanics and motors. The Easergy PS50 is ideal for isolated sites that are regularly struck by lightning. [3]

- 10 kV insulation and 20 kV surge
- · Protected against neutral cutout
- High temperature range: -40° C to 70° C and easy maintenance
- Only a unique battery (PS50 and PS25-12) for easy maintenance and robust lifespan (> 10 years)
- Battery end-of-life monitoring for preventive maintenance

Applications

- Designed for severe environments with a high level of insulation
- Designed for very long outage times
- · Easy maintenance with only one battery

Table 5.56: Easergy T300 PS50 and PS25 Backup Power Supplies

Description	Catalog Numbers
Easergy PS25-12V: Power supply and battery charger single 12V 48W output	EMS58585
Easergy PS25-24V: Power supply and battery charger single 24V 48W output	EMS58586
Easergy PS50-24V: Power supply and battery charger 12V and 24V outputs	EMS58587
Easergy PS50-48V: Power supply and battery charger 12V and 48V outputs	EMS58588

G

5-34