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Lavergne, TN, USA

Instruction Bulletin

Sepam Series 20
Digital Relay
Installation Guide

Retain for future use.

Schneider Electric

NOTICE

Read these instructions carefully and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this bulletin or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of either symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, **can result in** death or serious injury.

⚠CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, **can result in** minor or moderate injury.

CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, **can result in** property damage.

NOTE: Provides additional information to clarify or simplify a procedure.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. This document is not intended as an instruction manual for untrained persons. No responsibility is assumed by Square D for any consequences arising out of the use of this manual.

Class A FCC Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designated to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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SECTION 1— INTRODUCTION

MAIN FUNCTIONS

The Sepam 1000+ Digital Relay is manufactured by Merlin Gerin in France. Merlin Gerin is a subsidiary of Schneider Electric, as is Square D. The Sepam 1000+ instruction materials shipped with your Sepam 1000+ contain all the information you will need to install and operate the Sepam 1000+.

The Sepam 1000+ features a modular design, Input/Output (I/O) and temperature options, and Modbus communications for easy integration into a POWERLOGIC Power Monitoring and Control System. Two types of displays are available: the basic User Machine Interface (UMI) and the Advanced UMI with LCD display.

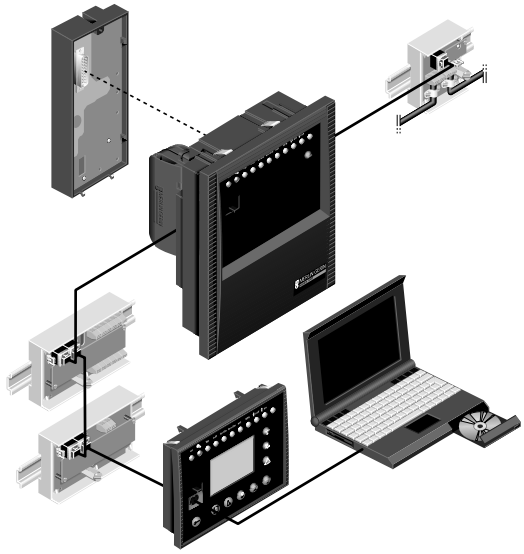


Figure 1: Sepam 1000+—A modular solution

Figure 2: Sepam 1000+ with basic UMI and with fixed advanced UMI

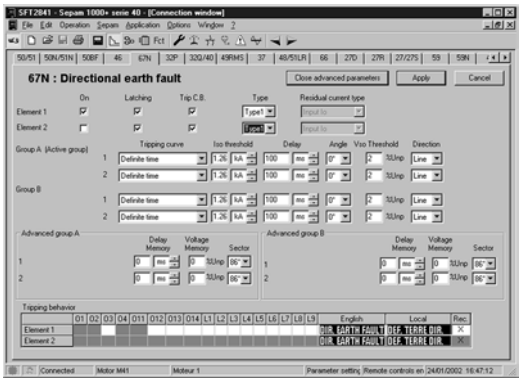


Figure 3: Example of an SFT2841 software screen (expert UMI)

The Sepam 1000+ series 20 family of protection and metering units is designed for the operation of machines and electrical distribution networks of industrial installations and utility substations for all levels of voltage.

The Sepam 1000+ series 20 family consists of simple, high-performing solutions, suited to demanding applications that call for current or voltage metering.

Table 1: Application Selector Guide

Selector	Criteria	Series 20			Series 40*		
AC Measurements		**I**	**V**	**V**	**I,V,P,E**	**I,V,P,E**	**I,V,P,E**
Specific Relay Functions				81R dF/dt (RoCoF)		67N,67NS Dir Grd O/C	67,67N,67NS Dir Grd O/C Dir Ph O/C
Application	Substation Long Feeder(High Ixc) Mains in Parallel Closed Loop	S20			S40	 S41	 S42 S42
	Transformer Mains in Parallel	T20			T40		 T42
	Motor Long Feeder (High Ixc)	M20				 M41	
	Generator				G40		
	Busbar (Voltage Mon) Gen/Utility in Parallel		B21	 B22			

*Not covered in this instruction bulletin.
Note: Ixc = Capacitive

Relay Logic

Substation Feeder and Main: S Type

- Detection of phase-to-phase and phase-to-ground short circuits
- Detection of unbalanced power source
- Recloser

Transformer: T Type

- Detection of internal faults and overloads
- Thermal overload protection suited to cooling modes

Motor: M Type

- Detection of internal faults, network related, and load faults
- Monitoring of motor starting conditions

Bus Voltage: B Type

- Monitoring of voltage and frequency abnormal operating conditions
- Rate of change of frequency protection for a fast and reliable disconnection

Measurement

All necessary electrical parameters:

- phase and residual currents
- average and peak demand currents
- phase-to-neutral, phase-to-phase, and residual voltages
- positive and negative sequence voltages
- frequency
- optional eight RTD inputs measure motor or transformer temperatures (two setpoints each)

Communication

Sepam series 20 is totally compatible with the **Modbus** communication standard.

All the data needed for centralized equipment management from a remote monitoring and control system are available via the Modbus communication port:

- reading: all measurements, alarms, protection settings,...
- writing: breaking device remote control orders,... .

Diagnosis

3 types of diagnosis data for improved operation:

- network and machine diagnosis: tripping current, context of the last 5 trips, unbalance ratio, disturbance recording
- switchgear diagnosis: cumulative breaking current, trip circuit supervision, operating time.
- diagnosis of the protection unit and additional modules: continuous self-testing, watchdog.

Control and monitoring

Circuit breaker program logic is ready to use, requiring no auxiliary relays or additional wiring.

Sepam Series 20 Selection Table

Functions		Type of Sepam				
		Substation	Transformer	Motor	Busbar	
Protections	**ANSI code**	**S20**	**T20**	**M20**	**B21 (4)**	**B22**
Phase overcurrent (1)	50/51	4	4	4		
Earth fault (or neutral) (1)	50N/51N 50G/51G	4	4	4		
Unbalance / negative sequence	46	1	1	1		
Thermal overload	49 RMS		2	2		
Phase undercurrent	37			1		
Excessive starting time, locked rotor	48/51LR			1		
Starts per hour	66			1		
Positive sequence undervoltage	27D/47				2	2
Remanent undervoltage	27R				1	1
Phase-to-phase undervoltage	27				2	2
Phase-to-neutral undervoltage	27S				1	1
Maximum de tension composée	59				2	2
Phase-to-phase overvoltage	59N				2	2
Underfrequency	81L				2	2
Overfrequency	81H				1	1
Rate of change of frequency	81R					1
Recloser (4 cycles)	79	□				
Thermostat / Buchholz			□			
Temperature monitoring (with MET148, 2 set points per sensor)	38/49T		□	□		
Metering						
Phase current I1,I2,I3 RMS		■	■	■		
Residual current Io		■	■	■		
Average current I1, I2, I3		■	■	■		
Peak demand phase current IM1,IM2,IM3		■	■	■		
Line voltage U21, U32, U13					■	■
Phase-to-neutral voltage V1, V2, V3					■	■
Residual voltage Vo					■	■
Positive sequence voltage / rotation direction					■	■
Frequency					■	■
Temperature measurement			□	□		
Network and machine diagnosis						
Tripping current I1,I2,I3, Io		■	■	■		
Unbalance ratio / negative sequence current Ii		■	■	■		
Running hours counter / operating time			■	■		
Thermal capacity used			■	■		
Remaining operating time before overload tripping			■	■		
Waiting time after overload tripping			■	■		
Starting current and time / overload				■		
Start inhibit time delay, number of starts before inhibition				■		
Disturbance recording		■	■	■	■	■
Switchgear diagnostic						
Cumulative breaking current^2		■	■	■		
Trip circuit supervision		□	□	□	□	□
Number of operations		□	□	□		
Operating time		□	□	□		
Charging time		□	□	□		
Self-diagnosis						
Watchdog		■	■	■	■	■

Output relay test (2)	□	□	□	□	□
Control and monitoring					
Circuit breaker / contactor control (3)	□	□	□	□	□
Logic discrimination	□	□	□		
4 addressable logic outputs	■	■	■	■	■
Additional modules					
MET148-2 module - 8 temperature sensor inputs		□	□		
MSA141 module - 1 low level analog output	□	□	□	□	□
MES114, MES114E, or MES114F module - (10I/4O)	□	□	□	□	□
ACE949-2 module - (2-wire) or ACE959 (4-wire) RS 485 interface	□	□	□	□	□

■ *standard,* □ *according to parameter setting and MES114 or MET148 input/output module options.*
(1) 4 relays with the exclusive possibility of logic discrimination or switching from one 2-relay group of settings to another 2-relay group (exclusive choice).
(2) with advanced UMI option only.
(3) for shunt trip unit or undervoltage release coil according to parameter setting.
(4) performs B20 type functions.

USER MACHINE INTERFACE

2 levels of User Machine Interface (UMI) are available depending on the user's needs:

- **basic UMI:**

  an economical solution for installations that do not require local operation (run via a remote monitoring and control system)

- **fixed or remote advanced UMI:**

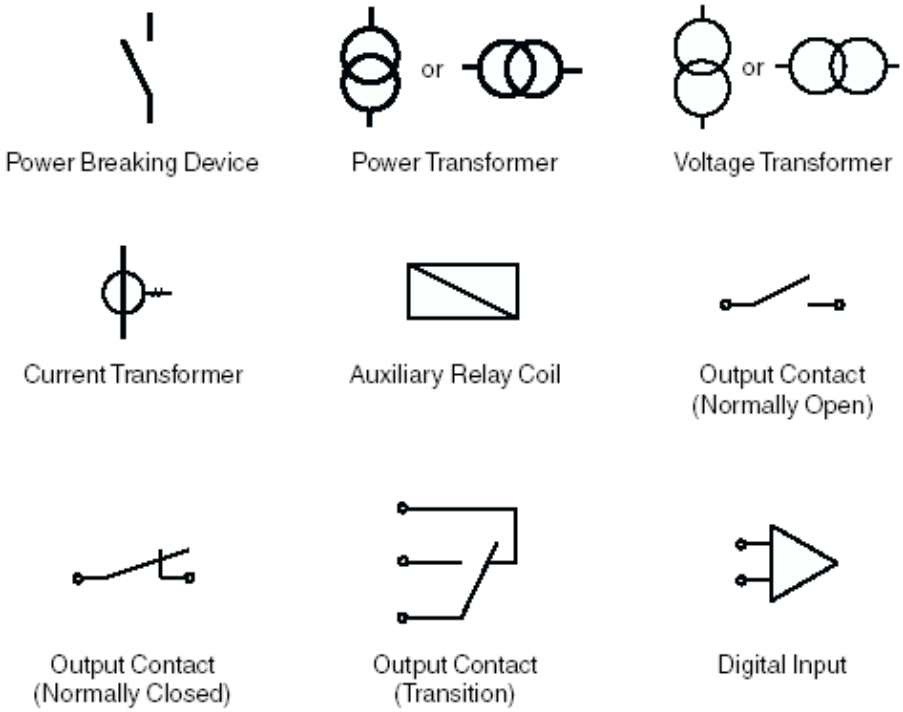
  a graphic LCD display and 9-key keypad are used to display the measurement and diagnosis values, alarm and operating messages and provide access to protection and parameter setting values, for installations that are operated locally.

EXPERT UMI SOFTWARE

The **SFT2841** PC software tool gives access to all the Sepam functions, with all the facilities and convenience provided by a Windows type environment.

SYMBOL KEY

Electrical symbols commonly used in Europe are found throughout this instruction bulletin. Those symbols, which may be unfamiliar to some users in North America, are explained below.



METRIC MEASUREMENTS/U.S. EQUIVALENTS

Some of the measurements provided in this instruction bulletin are metric. Users in the United States may find the following conversion chart helpful.

Table 2: Metric Conversions

Metric	equals	U.S. Equivalent
25.4 mm (millimeters)	=	1 inch
0.4536 kg (kilograms)	=	1 pound
° C (Centigrade) x 1.8 + 32	=	° F (Fahrenheit)

Table 3: Wire Size Conversions

Metric Area mm^2	equals	AWG Gauge
0.20	=	24
0.33	=	22
0.50	=	20
0.78	=	18
1.3	=	16
2.0	=	14
3.1	=	12
5.3	=	10

ELECTRICAL CHARACTERISTICS

Analog inputs			
Current transformer	input impedance	< 0.001 Ω	
1 A or 5 A CT (with CCA630)	consumption	< 0.001 VA at 1 A	
1 A to 6250 A ratings		< 0.025 VA at 5 A	
	rated thermal withstand	3 In	
	1-second overload	100 In	
Voltage transformer	input impedance	> 100 kΩ	
220 V to 250 kV ratings	input voltage	100 to 230/ $\sqrt{3}$ V	
	rated thermal withstand	230 V (1.7 Unp)	
	1-second overload	480 V (3.6 Unp)	

Temperature sensor input (MET148-2 module)	
Type of sensor	Pt 100 / Ni 100 / Ni 120
Isolation from earth	none
Current injected in sensor	4 mA

Logic inputs	**MES114**	**MES114E**		**MES114F**	
Voltage	24 to 250 V DC	110 to 125 V DC	110 V AC	220 to 250 V DC	220 to 240 V AC
Range	19.2 to 275 V DC	88 to 150 V DC	88 to 132 V AC	176 to 275 V DC	176 to 264 V AC
Frequency	-	-	47 to 63 Hz	-	47 to 63 Hz
Typical consumption	3 mA	3 mA	3 mA	3 mA	3 mA
Typical switching threshold	14 V DC	82 V DC	58 V AC	154 V DC	120 V AC

Control output relays (O1, O2, O11 contacts)					
Voltage	DC	24 / 48 V DC	127 V DC	220 V DC	
	AC (47.5 to 63 Hz)	-	-	-	100 to 240 V AC
Rated current		8 A	8 A	8 A	8 A
Breaking capacity	resistive load	8 / 4 A	0.7 A	0.3 A	
	L/R load < 20 ms	6 / 2 A	0.5 A	0.2 A	
	L/R load < 40 ms	4 / 1 A	0.2 A	0.1 A	
	resistive load	-	-	-	8 A
	p.f. load > 0.3	-	-	-	5 A
Making capacity		< 15 A for 200 ms			

Indication output relays (O3, O4, O12, O13, O14 contacts)					
Voltage	DC	24 / 48 V DC	127 V DC	220 V DC	
	AC (47.5 to 63 Hz)	-	-	-	100 to 240 V AC
Rated current		2 A	2 A	2 A	2 A
Breaking	L/R load < 20ms	2 / 1 A	0.5 A	0.15 A	
capacity	p.f. load > 0.3	-	-	-	1 A

Power supply				
	range	deactivated burden(1)	max. burden (1)	inrush current
24 / 250 V DC	-20% +10% (19.2–275 V DC)	3 to 6 W	7 to 11 W	< 10 A 10 ms
110 / 240 V AC	-20% +10% (88–264 V AC)	3 to 9 VA	9 to 15 VA	< 15 A 1/2 period
	47.5 to 63 Hz			
	ride throughtime	10 ms		

Analog output (MSA141 module)	
Current	4 - 20 mA, 0 - 20 mA, 0 - 10 mA
Load impedance	< 600 Ω (wiring included)
Accuracy	0.50%

(1) according to configuration.
(2) for higher values, please consult us.

ENVIRONMENTAL CHARACTERISTICS

Electromagnetic compatibility	**IEC / EN standard**	**Level / Class**	**Value**
Emission tests			
Disturbing field emission	EN 55022 / CISPR22	A	
Conducted disturbance emission	EN 55022 / CISPR22	B	
Immunity tests – Radiated disturbances			
Immunity to radiated fields	60255-22-3 / 61000-4-3	III	10 V/m
Electrostatic discharge	60255-22-2 / 61000-4-2	III	8 kV air 6 kV contact
Immunity tests – Conducted disturbances			
Immunity to conducted RF disturbances	61000-4-6	III	10 V
Fast transient bursts	60255-22-4 / 61000-4-4	IV	
1 MHz damped oscillating wave	60255-22-1	III	2.5 kV MC 1 kV MD
Impulse waves	61000-4-5	III	
Voltage interruptions	60255-11		100% 20 ms
Mechanical robustness	**IEC / EN standard**	**Level / Class**	**Value**
In operation			
Vibrations	60255-21-1	2	1 Gn
Shocks	60255-21-2	2	10 Gn / 11 ms
Earthquakes	60255-21-3	2	
De-energized			
Vibrations	60255-21-1	2 (1)	2 Gn
Shocks	60255-21-2	2 (1)	30 Gn / 11 ms
Jolts	60255-21-2	2 (1)	20 Gn / 16 ms
Climatic withstand	**IEC / EN standard**	**Level / Class**	**Value**
In operation			
Exposure to cold	60068.2.1	Ad	-25°C
Exposure to dry heat	60068.2.2	Bd	+70°C
Continuous exposure to damp heat	60068.2.3	Ca	93% HR; 40°C 10 days
Temperature variation with specified variation rate	60068.2.14	Nb	–25 °C to +70 °C 5°C/min
Salt mist	60068-2-52	Kb / 2	
Influence of corrosion	60654-4		Clean industrial air
In storage (4)			
Exposure to cold	60068.2.1	Ab	-25 °C
Exposure to dry heat	60068.2.2	Bb	+70 °C
Continuous exposure to damp heat	60068.2.3	Ca	93% RH; 40 °C 56 days
Standards	**IEC / EN standard**	**Level / Class**	**Value**
Enclosure tests			
Front panel tightness	60529	IP52	Other panels closed, except for rear panel IP20
	NEMA	Type 12 with gasket supplied	
Fire withstand	60695-2-11		650°C with glow wire
Electrical tests			
Ground continuity	61131-2		30 A
1.2/50 µs impulse wave	60255-5		5 kV (2)
Power frequency dielectric withstand	60255-5		2 kV 1 mn (3)
Certification			
CE	generic standard EN 50081-2	European directives 89/336/EEC Electromagnétic Compatibility (EMC) Directive 92/31/EEC Amendment 92/68/EEC Amendment 73/23/EEC Low Voltage Directive 93/68/EEC Amendment	
UL - c UL us	UL508 - CSA C22.2 n° 14-95		File E212533
CSA	CSA C22.2 n° 94-M91 / n° 0.17-00		File E210625

(1) Results given for intrinsic withstand, excluding support equipment
(2) Except for communication: 3 kV in common mode and 1kV in differential mode
(3) Except for communication: 1 kVrms
(4) Sepam must be stored in its original packing.

SECTION 2— SAFETY PRECAUTIONS

This chapter contains important safety precautions that must be followed before attempting to install, operate, service, or maintain electrical equipment. Carefully read and follow the safety precautions outlined below.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- Only qualified workers should install this equipment. Such work should be performed only after reading this entire set of instructions.
- NEVER work alone.
- Turn off all power supplying this equipment before working on or inside.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electric power. Assume that all circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Beware of potential hazards, wear personal protective equipment, carefully inspect the work area for tools and objects that may have been left inside the equipment.
- Use caution while removing or installing panels so that they do not extend into the energized bus; avoid handling the panels, which could cause personal injury.
- The successful operation of this equipment depends upon proper handling, installation, and operation. Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.
- Before performing Dielectric (Hi-Pot) or Megger testing on any equipment in which the relay is installed, disconnect all input and output wires to the relay. High voltage testing may damage electronic components contained in the relay.

Failure to follow these instructions will result in death or serious injury.

SECTION 3— INSTALLATION

INSTALLATION OF SEPAM

We recommend that you follow the instructions given in this document for quick and correct installation of your Sepam Series 20:

- equipment identification
- assembly and mounting
- connection of current inputs and voltage inputs
- connection of optional modules
- connection of power supply and ground
- checking prior to commissioning.

EQUIPMENT IDENTIFICATION

Sepam Model Identification

Using an advanced UMI, you can identify which Series 20 model you have by pressing the status key four times. See Figure 4. The model is identified as the "type."

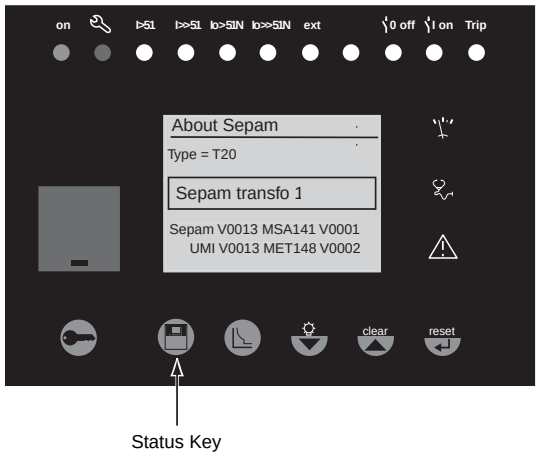
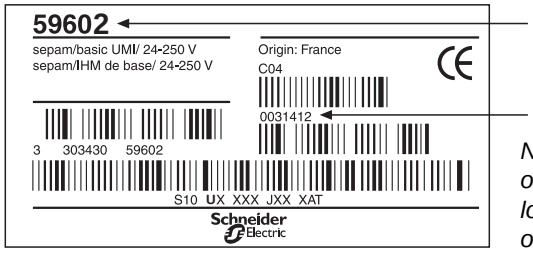


Figure 4: Sepam Model Identification

Identification Labels

To identify a Sepam, check the 2 labels on the right side panel of the base unit which describe the product's functional and hardware features.

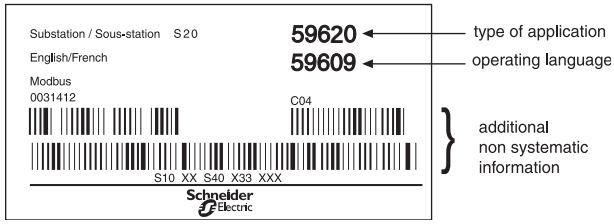
- hardware reference and designation label



NOTE: See Figure 5 on page 12 for the location of this label on the main unit.

- software reference and designation label

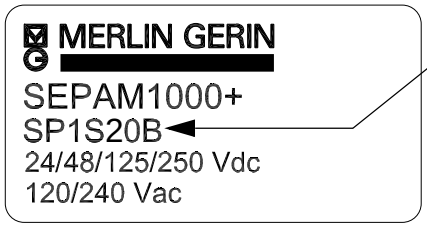
2



NOTE: See Figure 5 for the location of this label on the main unit.

- Label for units sold in the United States

3



NOTE: See Figure 5 for the location of this label on the main unit.

A 4-alpha suffix denotes a deviation from one or more of these standard features:

- Second language = French
- Connection for CT
- Terminal blocks for A for ring lugs

For example SP1M20A-USLS:

- for Spanish
- LPCT connector, and
- screw compression type TBs

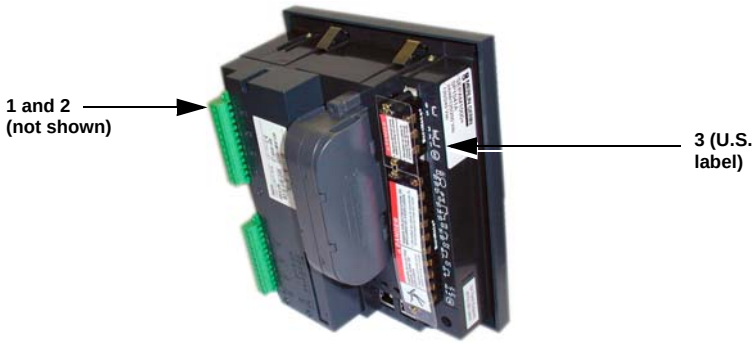


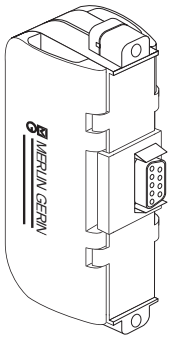
Figure 5: Equipment label locations

Package Labels

If the relay is still in its original package, you can identify it by comparing catalog number information similar to label 3 above with the description in “Sepam Models” on page 14.

Connectors

Each Sepam Series 20 main unit comes with one of the following unmounted connectors:



1. CCA 630* connector for connecting CTs to Sepam Series 20 (S20, T20, M20)

   * or CCA670 connector for LPCT sensors (See Figure 9 on page 39)

2. CCT640 voltage connector for VTs on Sepam Series 20 type B21, B22. See “Connection of voltage transformers” on page 45.

The other connectors come mounted and screw-locked on the modules.

⚠ CAUTION

LOSS OF PROTECTION

If ac control power is used, a backup power source is recommended to supply control power to the Sepam 1000+ during a power outage.

Failure to observe this precaution can cause the Sepam 1000+ to become inoperative if primary control power is lost.

Sepam Models

Catalog Number	Description
Digital Relay SEPAM Series 20 (Main Unit)	
SP1 S20 A	S20 (substa),adv UMI, 24-250 Vdc&120-240 Vac①
SP1 B21 A	B21 (bus/voltage),adv UMI, 24-250 Vdc&120-240 Vac①
SP1 B22 A	B22 (bus/voltage),adv UMI, 24-250 Vdc&120-240 Vac①
SP1 T20 A	T20 (transf),adv UMI, 24-250 Vdc&120-240 Vac①
SP1 M20 A	M20 (motor),adv UMI, 24-250 Vdc&120-240 Vac①
SP1 S20 B	S20 (substa),basic UMI, 24-250 Vdc&120-240 Vac①
SP1 B21 B	B21 (bus/voltage),basic UMI, 24-250 Vdc&120-240 Vac①
SP1 B22 B	B22 (bus/voltage),basic UMI, 24-250 Vdc&120-240 Vac①
SP1 T20 B	T20 (transf),basic UMI, 24-250 Vdc&120-240 Vac①
SP1 M20 B	M20 (motor),basic UMI, 24-250 Vdc&120-240 Vac①
Accessories For Digital Relay SEPAM Series 20	
MES114	10 input / 4 output module, 24–250 Vdc control power
MES114E	10 input / 4 output module, 125 Vdc/120 Vac control power
MES114F	10 input / 4 output module, 250 Vdc/240 Vac control power
MET1482	8 RTD resistance temperature detector input module②
MSA141	Analog output module②
DSM303	Remote advanced UMI (requires cable CCA77x see below)
ACE959	RS485 4-wire interface module ③(req. ext. 24 Vdc control power)
ACE949-2	RS485 2-wire interface module ③(req. ext. 24 Vdc control power)
ACE937	820 nM optical fiber interface module (control power supplied by Sepam main unit via CCA612 cable)
CCA770	2 ft cable from analog I/O daisy chain to main unit②
CCA772	2 m cable from analog I/O daisy chain to main unit②
CCA774	4 m cable from analog I/O daisy chain to main unit②
AMT840	Assembly plate for surface mounting of main unit
CSH30	Interposing window CT for residual current input④
CSH120	Ground sensor CT - 120 mm window
CSH200	Ground sensor CT - 200 mm window
ACE990	Aux. CT for ground sensor CT ratio adjustment (for retrofit)
ACE917	LPCT Injection Adaptor
CCA613	LPCT Test Plug
Tools For Digital Relay Sepam Series 20	
SFT2841 kit	Setting/operating software kit ⑤

①Ships with CCA630 CT connector (Figure 8 on page 34) [or CCA670 LPCT connector (see Figure 9 on page 39)] [or CCT640 VT connector (see “Connection of voltage transformers” on page 45)] and CCA622 terminal block (see Figure 7 on page 25).

②Analog I/O are DSM303, MET1482, MSA141. Maximum cable length from main unit to last device = 33 ft. (10 m).

③Includes CCA612 cable for module to relay connection.

④See 5A and 6A in “Ground Fault Current Measurement Method Summary without Neutral” on page 32 and 5B and 6B in “Ground Fault Current Measurement Method Summary with Neutral” on page 33.

⑤Includes SFT2826 waveform S/W+CCA783 cable for PC to relay connection.

Note: Contact Power Management Operation Technical Support for information on alternate control voltages, second language (other than French) on display, and special configuration. For technical support contact information, see “Getting Technical Support” on page 90.

Package Contents

Your Sepam 1000+ base unit is shipped in a single package with its connectors: a CCA630 for CTs (or CCA670 for LPCTs) (or CCT640 for VTs), and a 20 point ring lug type terminal block (CCA620, see page 24) for control power, ground sensor input, and 4 main unit outputs.

Instruction materials are also included (see “Instruction Materials” for details).

Optional accessories such as modules, current, and voltage input connector and cables come in separate packages.

NOTE: Sepam SFT 2841 software always ships in a separate package than the Sepam 1000+, even if ordered at the same time.

Instruction Materials

Your Sepam Series 20 is shipped with the following instruction documents:

- Sepam 1000+ Installation Guide (this instruction bulletin), number 63230-216-208
- Sepam 1000+ Quick Start Guide, number 03146790FE-D0
- Contact Sheet/Registration Card, number 63220-060-79

This installation guide, the Sepam Series 20 Reference Guide 63230-216-224, and other instruction bulletins are available online at www.powerlogic.com.

SHIPPING, HANDLING, AND STORAGE

Sepam in its Original Packaging

Transport:
Sepam may be shipped to any destination without taking any additional precautions by all usual means of transport.

Handling:
Sepam may be handled without any particular care and can even withstand being dropped by a person handling it (person standing on floor).

Storage:
Sepam may be stored in its original packaging, in an appropriate location for several years:
- temperature between -25 °C and +70 °C
- humidity ⩽ 90 %.

Periodic, yearly checking of the environment and the packaging condition is recommended.
Once Sepam has been unpacked, it should be energized as soon as possible.

Sepam Installed in a Cubicle

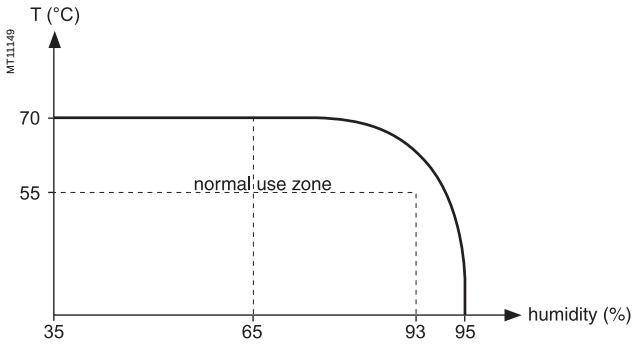
Transport:
Sepam may be transported by all usual means of transport in the customary conditions used for cubicles. Storage conditions should be taken into consideration for a long period of transport.

Handling:
Should the Sepam fall out of a cubicle, check its condition by visual inspection and energizing.

Storage:
Keep the cubicle protection packing for as long as possible. Sepam, like all electronic units, should not be stored in a damp environment for more than a month. Sepam should be energized as quickly as possible. If this is not possible, the cubicle reheating system should be activated.

OPERATING ENVIRONMENT

Operation in a damp environment
The temperature/relative humidity factors must compatible with the unit's environmental withstand characteristics.
If the use conditions are outside the normal zone, arrangements should be made before commissioning, such as providing air conditioning of the premises.



Operation in a polluted atmosphere
Sepam is designed to be used in a clean industrial environment as defined by IEC 60654-4 class 1. A contaminated industrial atmosphere components (such as the presence of chlorine, hydrofluoric acid, sulfur, solvents...) may cause corrosion of the electronic components, in which case environmental control arrangements should be made (such as closed, pressurized premises with filtered air, ...) before commissioning.

ASSEMBLY AND MOUNTING

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- Only qualified personnel should install this equipment. Such work should be performed only after reading this entire set of instructions.
- NEVER work alone.
- Before performing visual inspections, tests, or maintenance on this equipment, disconnect all sources of electrical power. Assume that all circuits are live until they have been completely de-energized, tested, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Turn off all power supplying the Sepam 1000+ and the equipment in which it is installed before installing and wiring the Sepam 1000+. Be aware that the Sepam 1000+ may be connected to a separate power source not derived from the equipment in which it is installed.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Beware of potential hazards, wear personal protective equipment, and carefully inspect the work areas for tools and objects that may have been left inside the equipment.

Failure to follow this instruction will result in death or serious injury.

- Main Unit

  The Sepam 1000+ main unit, whether equipped with basic or advanced UMI, flush mounts in a panel. Although an opening must be cut in the panel, no screws are necessary to mount the base unit. It is held in place by spring clips. For details, see “Flush-mounting in front panel” on page 19. Note: the maximum panel thickness is 0.135 inches (3.4 mm).

  If used in conjunction with a remote advanced display, the main unit with basic UMI can also be surface mounted at the back of a compartment using the AMT840 plate. This allows access to the connectors on the back of the Sepam 1000+. For details, see “Surface Mounting with AMT840 plate” on page 20.

- User Machine Interface (UMI). There are two types:
  - — Advanced UMI, with graphic LCD display alarm LEDs and keypad
  - — Basic UMI, with LEDs and reset

For installation of the remote Advanced UMI (DSM 303), see “Flush Mounting of the DSM303 module in the front panel” on page 21.

NOTE: A remote advanced UMI connects to a main unit equipped with a basic UMI (see “Sepam Series 20 Selection Table” on page 4), and cannot be used with a main unit equipped with a fixed Advanced UMI.

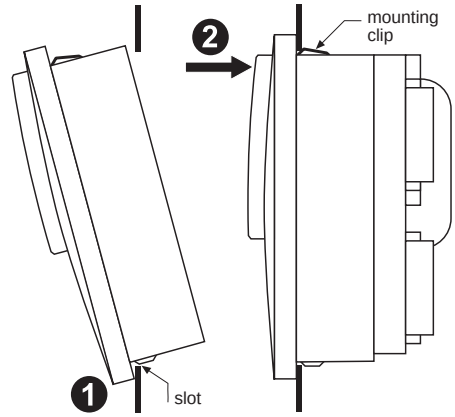
Each main unit associated with a remote advanced UMI must be configured to accept such a connection. Once configured, if the remote advanced UMI is disconnected, a self-test alarm issues and LEDs illuminate (see “Maintenance” on page 89).

- Input/Output Module MES114, MES114E, or MES114F (optional)

  For installation of these input/output modules on the back of the main unit, see page 24.

Mounting of the Sepam main unit

The Sepam is simply flush-mounted and clamped, without requiring any additional screw type fastening.



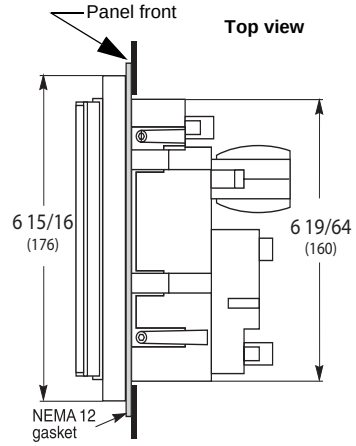
MT11164

1. Turn off all power supplying the Sepam 1000+ and the equipment in which it is installed before installing and wiring the Sepam 1000+. Be aware that the Sepam 1000+ may be connected to a separate power source not derived from the equipment in which it is installed.
2. Always use a properly rated voltage sensing device to confirm that all power is off.
3. Present the product as indicated, making sure the metal plate is correctly entered in the groove at the bottom.
4. Tilt the product and press on the top part to clamp it with the clips.

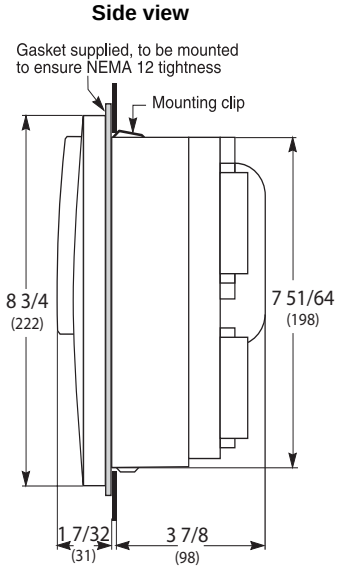
Flush-mounting in front panel

Assembly shown with advanced UMI and optional MES114 module.

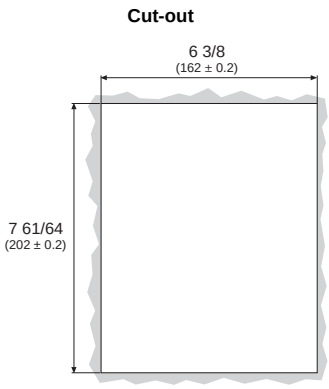
- Weight = env. 4.2 lb (1.9 kg) [with option]
- Weight = env. 3.3 lb (1.5 kg) [without option]



MT11150



MT11151



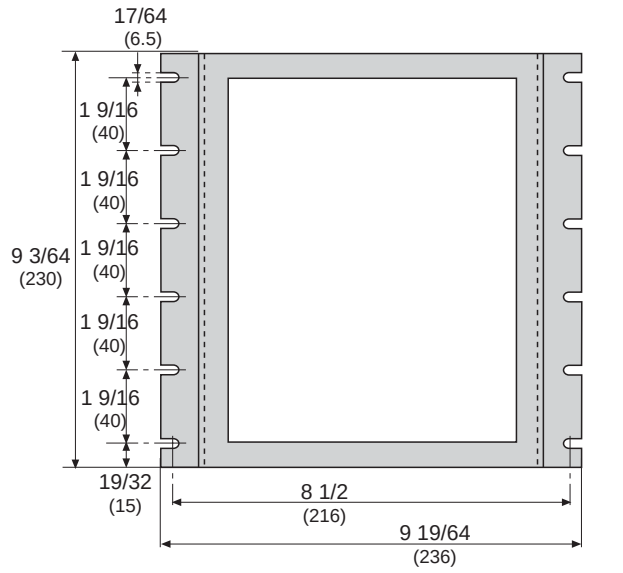
Mounting plate thickness < 0.135 in (3.4 mm).

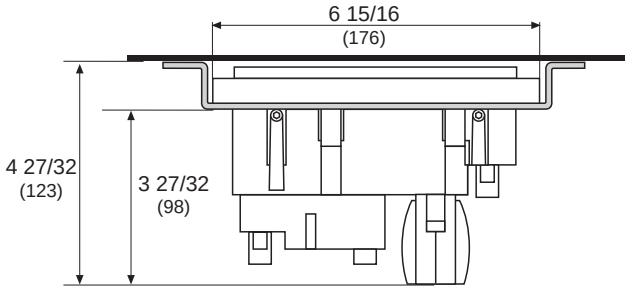
MT10461

Surface Mounting with AMT840 plate

- Used to mount Sepam with basic UMI at the back of the compartment with access to connectors on the rear panel.
- Assembly associated with the use of the remote advanced UMI (DSM303).

Front View



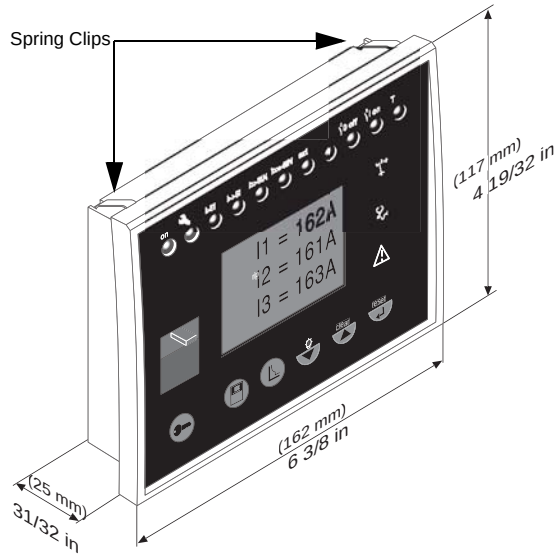


Top View

MT10332

Flush Mounting of the DSM303 module in the front panel

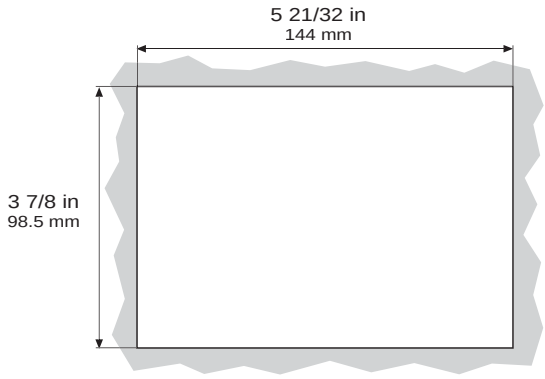
The module is simply flush-mounted and clamped, without requiring any additional screw type fastening.



Weight approximately 0.3 kg.
The depth with the connection cable is less than 1 3/16 in (30 mm).

MT10344

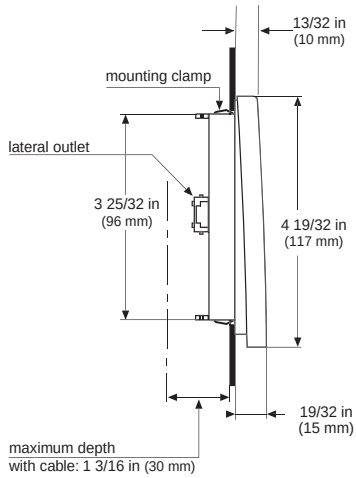
Cut-out



Cut-out dimensions for flush-mounting
(mounting plate thickness < .135 in [3.4 mm]).

MT10321

Side view



MT10463

CONNECTION

The Sepam connections are made to the removable connectors located on the rear surface. All the connectors are screw-lockable.

NOTE: All the terminals must be screwed tight, whether or not they are used.

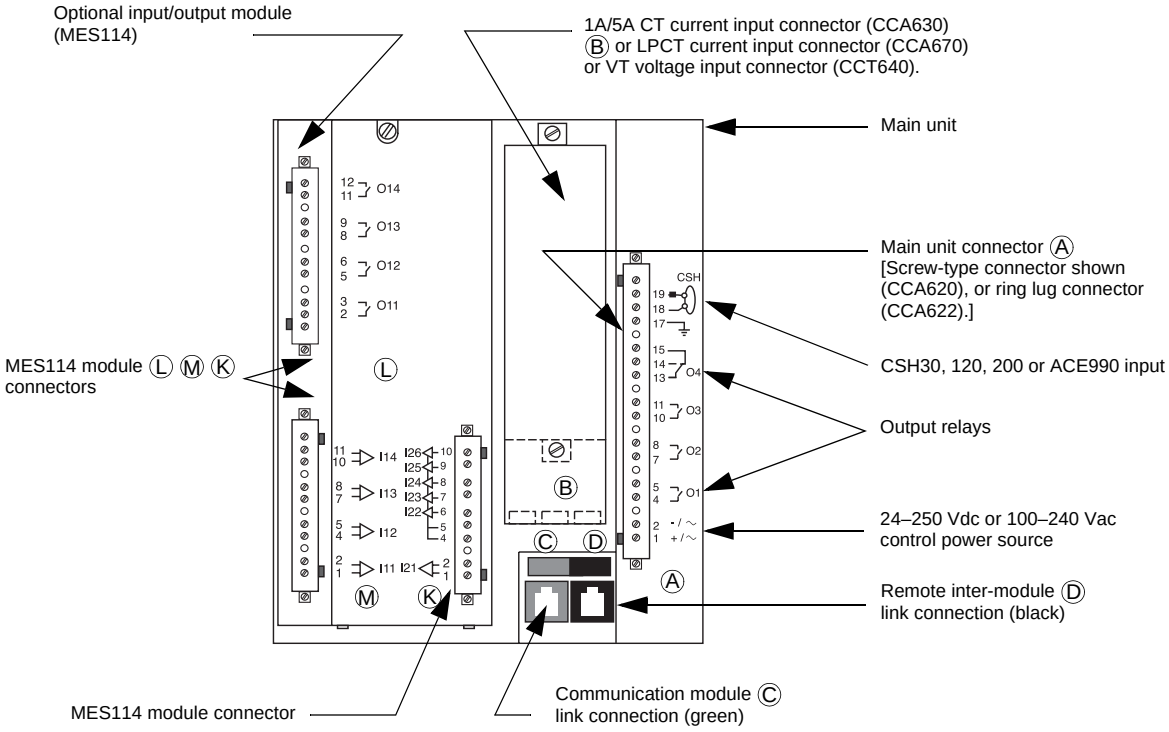
⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- Only qualified personnel should install this equipment. Such work should be performed only after reading this entire set of instructions.
- Turn off all power supplying the Sepam 1000+ and the equipment in which it is installed before installing and wiring the Sepam 1000+. Be aware that the Sepam 1000+ may be connected to a separate power source not derived from the equipment in which it is installed.
- Before wiring the main terminal block and installing the terminal guard shipped with the terminal block, turn off power to the Sepam 1000+ and any equipment wired to the terminal block.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- The successful operation of this equipment depends upon proper handling, installation, setup, and operation. Neglecting fundamental installation requirements may lead to personal injury as well as damage to electrical equipment or other property.

Failure to follow this instruction will result in death or serious injury.

Sepam Components



MT10305

Figure 6: Sepam Components

Installing Terminal Guard on Main Terminal Block Ⓐ (Ring Lug Terminals)

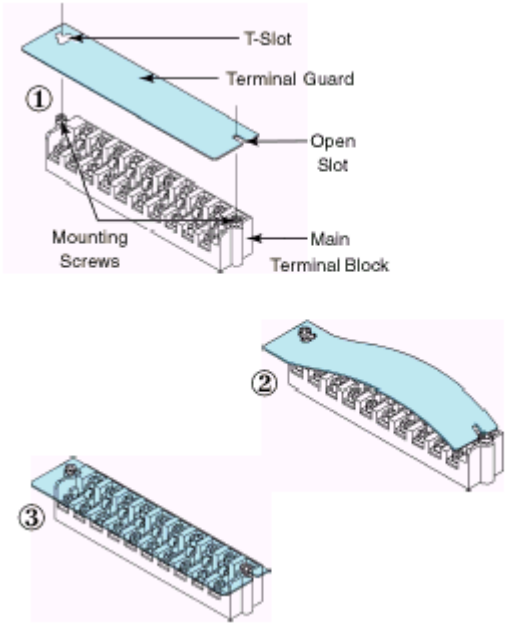
Terminal guards are shipped with each ring-lug type main terminal block. These guards must be installed after the terminal block is wired, but before the Sepam 1000+ and equipment wired to the module are energized. (See preceding DANGER notice.) These terminal guards are designed to prevent accidental contact with terminals once they are energized.

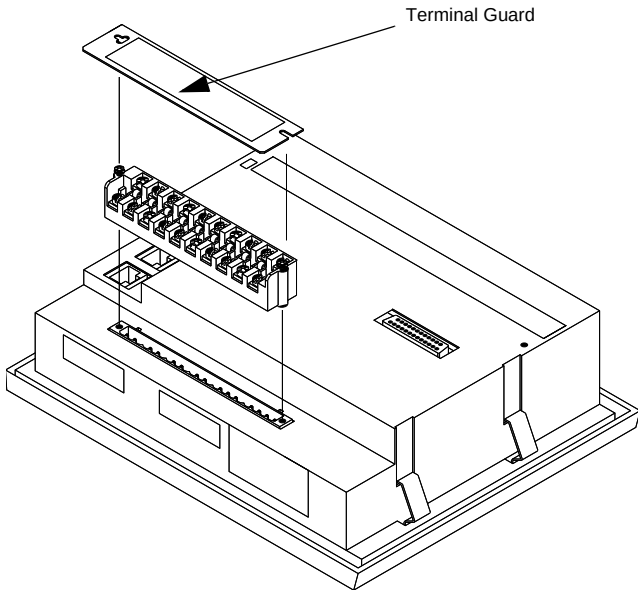
To install the terminal guard, follow these steps while referring to the illustrations below:

1. Slightly loosen the two module mounting screws on the ends of the block.
2. Place the T-slot in the terminal guard over one of the mounting screws and pull it toward the center of the module until the mounting screw is in the narrow portion of the T-slot. Tighten the mounting screw.

   Gently flex the terminal guard as shown and slide the open slot on the terminal guard under the head of the mounting screw so the screw secures it in place. Release the terminal guard so it lies flat over the terminals. Tighten the mounting screw.

   The terminal guards should now be firmly in place, preventing accidental contact with the terminals they cover.





Connection of the Main Unit

- Main Unit Ring Lug Connector CCA620 Ⓐ (control power, configurable output contacts, self-test alarm, ground sensor CT input [see “Connecting CTs” on page 34.])
- Digital Input/Output Modules with screw-type connection. See page 28.

Basic wiring components are shown in Figure 6. For specifics on wire gauge and fittings, refer to “Connection” on page 28. See typical AC schematic on page 29.

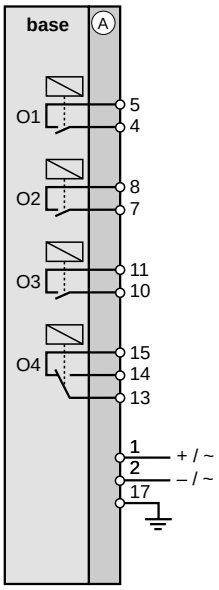


Figure 7: CCA622 Connector

The Sepam connections are made to the removable connectors located on the rear panel. All the connectors are screw-lockable.

NOTE: **All the terminals must be screwed tight, whether or not they are used.**

Wiring of the CCA620 (Main) Ⓐ connector:

■ without fitting:
□ 1 wire with maximum cross-section of 0.2 to 2.5 mm^2 (≥ AWG 24-12) or 2 wires with maximum cross-section of 0.2 to 1 mm^2 (≥ AWG 24-16)
□ stripped length: 8 to 10 mm
■ with fitting:
□ recommended wiring with Telemecanique fitting:
- DZ5CE015D for 1 wire 1.5 mm^2
- DZ5CE025D for 1 wire 2.5 mm^2
- AZ5DE010D for 2 wires 1 mm^2
□ tube length: 8.2 mm
□ stripped length: 8 mm.

Wiring of the CCA622 (Main) Ⓐ connectors:

■ ring lug connectors 6.35 mm (1/4").

Characteristics of the 4 base unit relay outputs O1, O2, O3, O4.

■ O1 and O2 are 2 control outputs, used by the breaking device control function for:
□ O1: breaking device tripping
□ O2: breaking device closing inhibition
■ O3 and O4 are indication outputs, only O4 may be activated by the watchdog function.

Connection of Optional Input Output
MES114 Module

Function

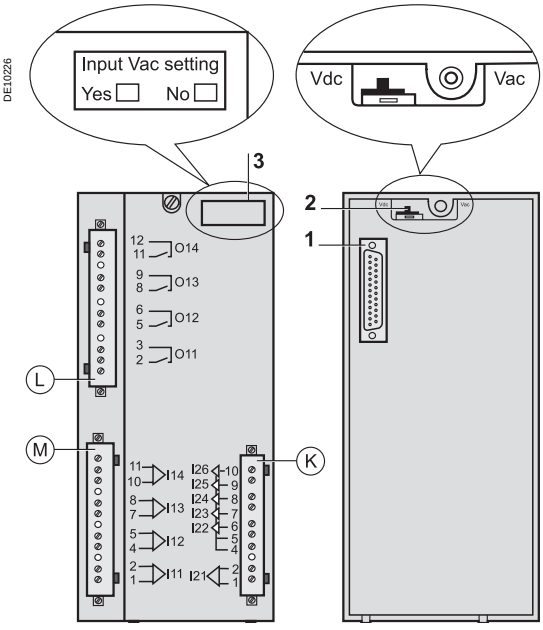
The 4 outputs included on the Sepam may be extended by adding an optional MES114 module with 10 inputs and 4 outputs, available in 3 versions:

- MES114: 10 DC inputs voltage from from 24 V DC to 250 V DC
- MES114E: 10 inputs, voltage 110-125 V AC or V DC
- MES114F: 10 inputs, voltage 220-250 V AC or V DC

The assignment of the inputs and outputs may be set up on the advanced UMI or using the SFT2841 software tool.

Characteristics

MES114 module					
Weight	0.28 kg				
Logical inputs	**MES114**	**MES114E**		**MES114F**	
Voltage	24 to 250 V DC	110 to 125 V DC	110 V AC	220 to 250 V DC	220 to 240 V AC
Range	19.2 to 275 V DC	88 to 150 VV DC	88 to 132 V AC	176 to 275 V DC	176 to 264 V AC
Frequency	/	/	47 to 63 Hz	/	47 to 63 Hz
Typical consumption	3 mA	3 mA	3 mA	3 mA	3 mA
Typical switching threshold	14 V DC	82 V DC	58 V AC	154 V DC	120 V AC
O11 control relay output					
Voltage	Dc	24 / 48 V DC	127 V DC	220 V DC	
	Ac (47.5 to 63 Hz)				100 to 240 V AC
Continuous current		8 A	8 A	8 A	8 A
Breaking capacity	Resistive load	8 / 4 A	0.7 A	0.3 A	8 A
	Load L/R < 20 ms	6 / 2 A	0.5 A	0.2 A	
	Load L/R < 40 ms	4 / 1 A	0.2 A	0.1 A	
	Load cos φ > 0.3				5 A
Making capacity		< 15 A for 200 ms			
O12 to O14 indication relay output					
Voltage	Dc	24 / 48 V DC	127 V DC	220 V DC	
	Ac (47.5 to 63 Hz)				100 to 240 V AC
Continuous current		2 A	2 A	2 A	2 A
Breaking capacity	Load L/R < 20 ms	2 / 1 A	0.5 A	0.15 A	
	Load cos φ > 0.3				1 A
Making capacity		< 15 A for 200 ms			



Description

Ⓛ, Ⓜ and Ⓚ: 3 removable, lockable screw-type connectors.

Ⓛ: connectors for 4 relay outputs:

- O11: 1 control relay output
- O12 to O14: 3 indication relay outputs.

Ⓜ: connectors for 4 independent logic inputs I11 to I14

Ⓚ: connectors for 6 logic inputs:

- I21: 1 independent logic input
- I22 to I26: 5 common point logic inputs.

1: 25-pin sub-D connector to connect the module to the base unit

2: voltage selector switche for MES114E and MES114F module inputs, to be set to:

□ V DC for 10 DC voltage inputs (default setting)

□ V AC for 10 AC voltage inputs.

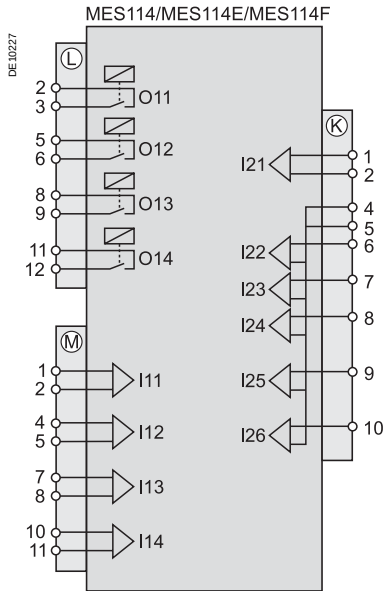
3 : label to be filled in to indicate the chosen parameter setting for MES114E and MES114F input voltages.

The parameter setting status may be accessed in the "Sepam Diagnosis" screen of the SFT2841 software tool.

Parameter setting of the inputs for AC voltage (V AC setting) inhibits the "operating time measurement" function.

Assembly

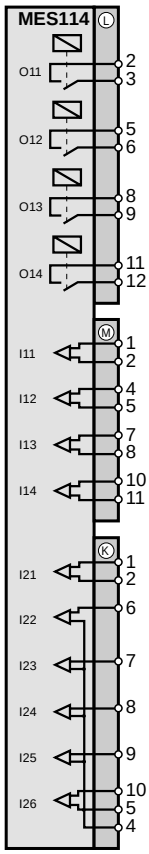
- insert the 2 pins on the MES module into the slots 1 on the base unit
- flatten the module up against the base unit to plug it into the connector 2
- tighten the 3 mounting screws.



Connection

For safety reasons (access to dangerous voltages), all terminals must be screwed tight, whether or not they are used.
The inputs are potential-free and the DC power supply source is external.

Wiring of connectors Ⓛ, Ⓜ and Ⓚ:
- wiring without fitting:
  - 1 wire with maximum cross-section 0.2 to 2.5 mm² (> AWG 24-12)
  - or 2 wires with maximum cross-section 0.2 to 1 mm² (> AWG 24-16)
  - stripped length: 8 to 10 mm
- wiring with fittings:
  - recommended wiring with Telemecanique fitting:
    - DZ5CE015D for one 1.5 mm² wire
    - DZ5CE025D for one 2.5 mm² wire
    - AZ5DE010D for two 1 mm² wires
  - tube length: 8.2 mm
  - stripped length: 8 mm.



Output characteristics

4 relay outputs O11, O12, O13, O14

- O11: control output, used to close the breaking device
- O12, O13, O14: indication outputs.

Input characteristics

4 or 10 potential-free inputs

- DC input voltage, from 24 V DC to 250 V DC
- external power supply source.

Connection

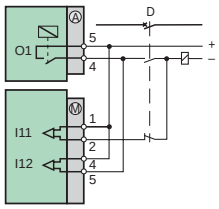
The optional input output modules are connected to screw type connectors. All the connectors are removable and may be locked by screw fastening. The inputs are potential-free and the DC power supply source is external.

NOTE: **All the terminals must be screwed tight, whether or not they are used.**

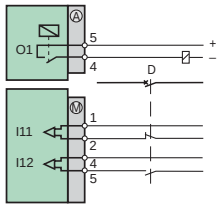
- wiring without fitting:
  - 1 wire with maximum cross-section of 0.2 to 2.5 mm^2 (≥ AWG 24-12) or 2 wires with maximum cross-section of 0.2 to 1 mm^2 (≥ AWG 24-16)
  - stripped length: 8 to 10 mm
- wiring with fitting:
  - recommended wiring with Telemecanique fitting:
    - DZ5CE015D for 1 wire 1.5 mm^2
    - DZ5CE025D for 1 wire 2.5 mm^2
    - AZ5DE010D for 2 wires 1 mm^2
  - tube length: 8.2 mm
  - stripped length: 8 mm.

Wiring of the Circuit Breaker/Contactor Trip Circuit

Wiring to be used when the "CB control" function is activated.



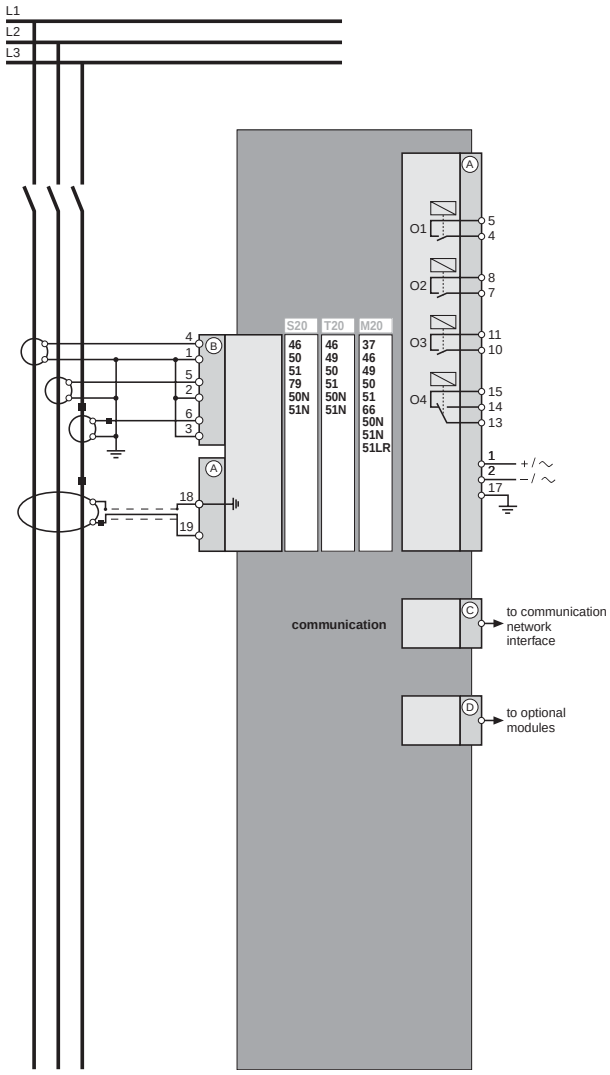
Wiring for shunt trip coil.
With monitoring of trip circuit and open/closed matching.



Wiring for undervoltage trip unit.
With monitoring of open / closed matching.

MT10146
MT10147

Connection of Current Inputs



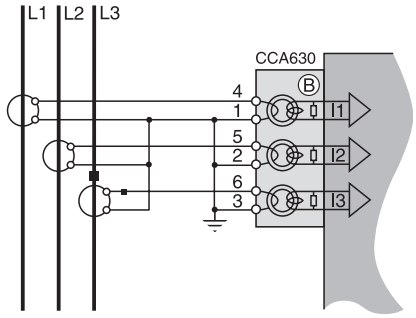
(1) This type of connection allows the calculation of residual voltage.
(2) See "Symbol Key" on page 6.

Table 4: Types S20 /T20 / M20

Connection to 1 A / 5 A current sensors			
Connector	**Type**	**Ref.**	**Cable**
A	Screw-type	CCA620	1 wire 0.2 to 2.5 mm^2 (≥ AWG 24-12) 2 wires 0.2 to 1 mm^2 (≥ AWG 24-16)
	Ring lug 6.35 mm	CCA622	
B	Ring lug 4 mm	CCA630	1.5 to 6 mm^2 (AWG 16 to AWG 10)
C	RJ45		CCA612
D	RJ45		CCA770: L = 0.6 m CCA772: L = 2 m CCA774: L = 4 m

Other Current Input Connection Schemes

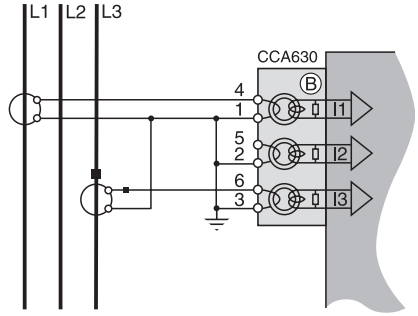
Variant 1: phase current measurement by three 1 A or 5 A CTs (standard connection)



Connection of three 1 A or 5 A CTs to the CCA630 connector.

The measurement of the 3 phase currents allows the calculation of residual current.

Variant 2: phase current measurement by two 1 A or 5 A CTs

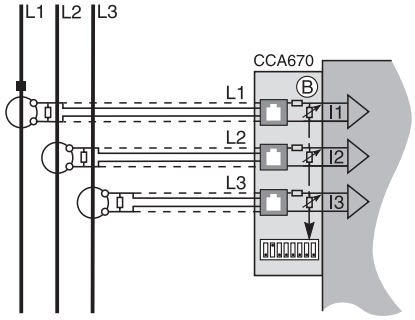


Connection of two 1 A or 5 A CTs to the CCA630 connector.

The measurement of phase currents 1 and 3 is sufficient to ensure all the current-based protection functions.

This arrangement does not allow the calculation of residual current.

Variant 3: phase current measurement by 3 LPCT type sensors



Connection of 3 Low Power Current Transducer (LPCT) type sensors to the CCA670 connector. The connection of just one or two sensors is not allowed.

The measurement of the 3 phase currents allows the calculation of residual current.

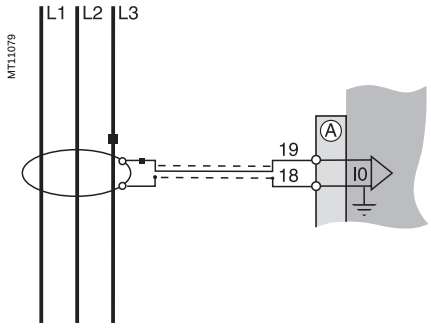
The In parameter, primary rated current measured by an LPCT, is to be chosen from the following values, in Amps: 25, 50, 100, 125, 133, 200, 250, 320, 400, 500, 630, 666, 1000, 1600, 2000, 3150.
Parameter to be set using the advanced UMI and the SFT2841 software tool, to be completed by hardware setting of the microswitches on the CCA670 connector.

Other residual current input connection schemes

Variant 1: residual current calculation by sum of 3 phase currents

The residual current is obtained by taking the vector sum of the 3 phase currents I1, I2 and I3, measured by three 1 A or 5 A CTs or by three LPCT type sensors.
See current input connection diagrams.

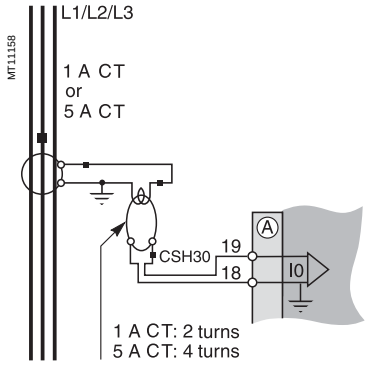
Variant 2: residual current measurement by CSH120 or CSH200 core balance CT (standard connection)



Arrangement recommended for the protection of isolated or compensated neutral systems in which very low fault currents need to be detected.

Setting range from 0.1 Ino to 15 Ino, with Ino = 2 A or 20 A according to parameter setting.

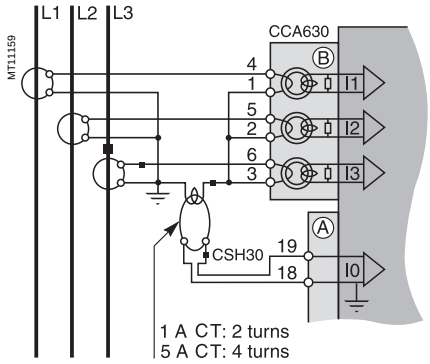
Variant 3: residual current measurement by 1 A or 5 A CT and CSH30 interposing ring CT



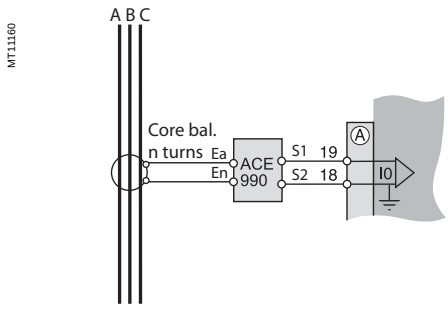
The CSH30 interposing ring CT is used to connect Sepam to 1 A or 5 A CTs to measure the residual current.

- connection of CSH30 interposing ring CT to 1 A CT: make 2 turns through the CSH primary winding
- connection of CSH30 interposing ring CT to 5 A CT: make 4 turns through the CSH primary winding

Setting range from 0.1 In to 15 In, with In = CT primary current.



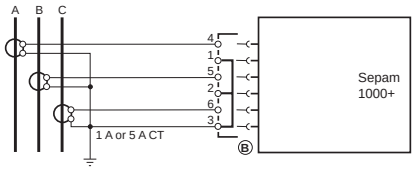
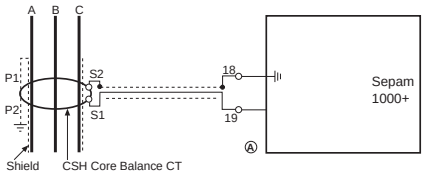
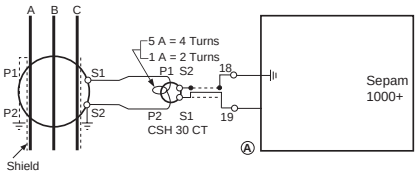
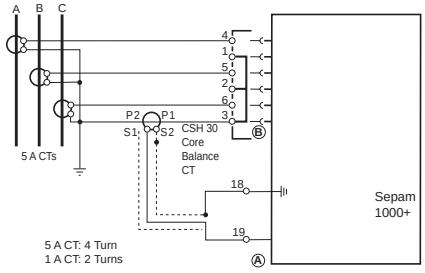
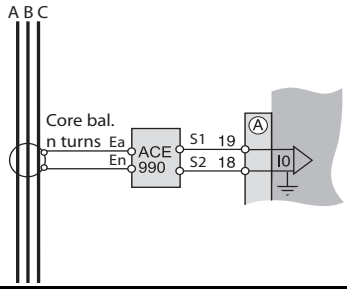
Variant 4: residual current measurement by core balance CT with ratio 1/n (n between 50 and 1500)



The ACE990 is used as an interface between a Medium Voltage core balance CT with ratio 1/n
(50 < n < 1500) and the Sepam 1000+ residual current input.
This arrangement makes it possible to keep the existing core balance CTs in the installation.

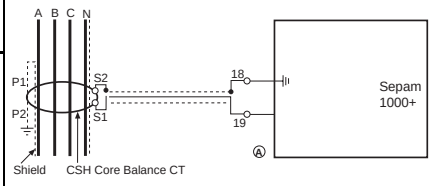
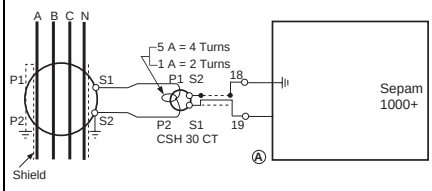
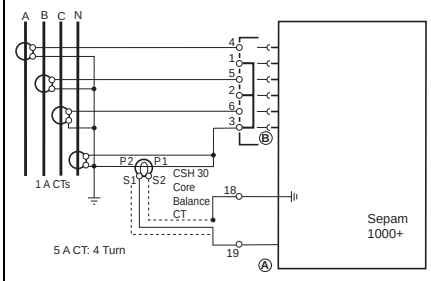
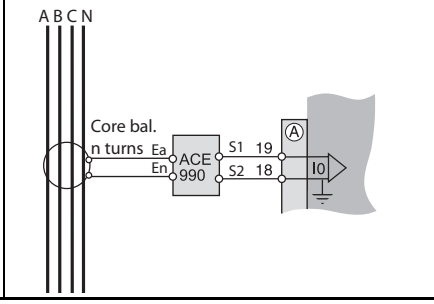
Setting range from 0.1 Ino to 15 Ino, with Ino = k x n,
with n = number of turns through core balance CT
and k = factor to be determined according to the wiring of the ACE990 and the parameter setting used by Sepam, among 20 discrete values from 0.00578 to 0.26316.

Ground Fault Current Measurement Method Summary without Neutral

Method Number	Measurement Method	Setting Range	Core Bal. CT	Connections	Residual Current Setting	Remark
1A (applies for LPCT also)	Internal Phase Current Summation	DT=0.1 Ino to 15 Ino IDMT=0.1 Ino to Ino	None		"3I Sum"	Sepam 1000+ Considers Ino=In
2A	Specific CSH Core Balance CT On 2 A Input Rating	DT=0.2 A to 30 A IDMT=0.2 A to 2 A	CSH 120 CSH 200		"2 A Rated CSH" (2 A Core Bal. CT)	Sepam 1000+ Considers Ino=2 A
4A	Specific CSH Core Balance CT On 20 A Input Rating	DT=2 A to 300 A IDMT=2 A to 20 A	CSH 120 CSH 200		"20 A Rated CSH (20 A Core Bal. CT)	Sepam 1000+ Considers Ino=20 A
5A*	Standard 1 A CT or 5 A CT	DT=0.1 Ino to 15 Ino IDMT=0.1 Ino to Ino	1 A/5 A CT Core Balance CT + CSH 30 Aux CT as interface		"1 A CT + CSH" or 5 ACT + CSH	Primary Rated Current: 1 A to 6.25 kA Ino=In
6A*	External Sum of Phase CT Secondaries (1 A or 5 A)	DT=0.1 Ino to 15 Ino IDMT=0.1 Ino to Ino	CSH 30 Core Balance CT as Interface		"1 A CT + CSH" or "5 A CT + CSH"	Set Sepam 1000+ For Ino=In (Primary Rated Current: 1 A to 6.25 kA)
7A	Standard 1 A CT or 5 A CT	DT=0.1 Ino to 15 Ino IDMT=0.1 Ino to Ino	1 A/5 A Core Balance CT + ACE 990		5 A CT + ACE 1 A CT + ACE	Ino=k x N N=CT turns .00578 ≤ K ≤26316 (See page 43.)

***See alternate CSH30 secondary connection on page 42.**

Ground Fault Current Measurement Method Summary with Neutral

Method Number	Measurement Method	Setting Range	Core Bal. CT	Connections	Residual Current Setting	Remark
2B	Specific CSH Core Balance CT On 2 A Input Rating	DT=0.2 A to 30 A IDMT=0.2 A to 2 A	CSH 120 CSH 200		"2 A Rated CSH" (2 A Core Bal. CT)	Sepam 1000+ Considers Ino=2 A
4B	Specific CSH Core Balance CT On 20 A Input Rating	DT=2 A to 300 A IDMT=2 A to 20 A	CSH 120 CSH 200		"20 A Rated CSH (20 A Core Bal. CT)	Sepam 1000+ Considers Ino=20 A
5B*	Standard 1 A CT or 5 A CT	DT=0.1 Ino to 15 Ino IDMT=0.1 Ino to Ino	1 A/5 A CT Core Balance CT + CSH 30 Aux CT as interface		"1 A CT + CSH" or 5 ACT + CSH	Primary Rated Current: 1 A to 6.25 kA Ino=In
6B*	External Sum of Phase CT Secondaries (1 A or 5 A)	DT=0.1 Ino to 15 Ino IDMT=0.1 Ino to Ino	CSH 30 Core Balance CT as Interface		"1 A CT + CSH" or "5 A CT + CSH"	Set Sepam 1000+ For Ino=In (Primary Rated Current: 1 A to 6.25 kA)
7B	Standard 1 A CT or 5 A CT	DT=0.1 Ino to 15 Ino IDMT=0.1 Ino to Ino	1 A/5 A Core Balance CT + ACE 990		5 A CT + ACE 1 A CT + ACE	Ino=k x N N=CT turns .00578 ≤ K ≤26316 (See page 43.)

***See alternate CSH30 secondary connection on page 42.**

Connecting CTs

Phase currents are measured by connecting two or three CTs via CCA630 (see “CCA630 wiring” on page 36).

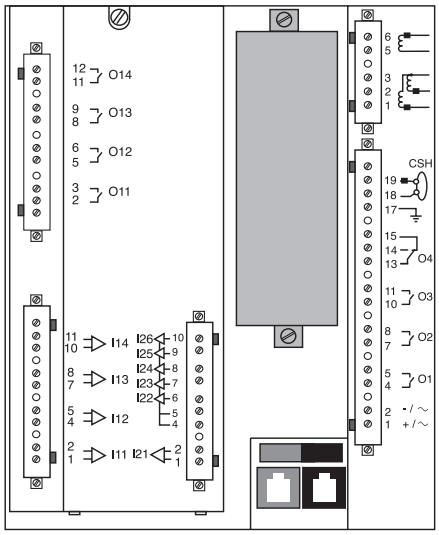
Ground fault currents can be measured externally by connecting a Current Transformer (CT). Four types of CTs are available:

- Interposing window CT for residual or standard ground sensor current input (CSH30)
- Ground Sensor CT—120 mm window (CSH120)
- Ground Sensor CT—200 mm window (CSH200)
- Auxiliary CT for Ground Sensor CT Ratio Adjustment (ACE990)—for retrofit applications (see “Connection of ACE990 interface” on page 43).

These ground fault CTs provide low-level input to the Sepam 1000+ to allow connector A (see Figure 6 on page 23) to be disconnected from the Sepam 1000+ without shorting.

Refer to the Ground Fault Current Measurement Method Summary on the next two pages for all CTs listed above except the ACE990.

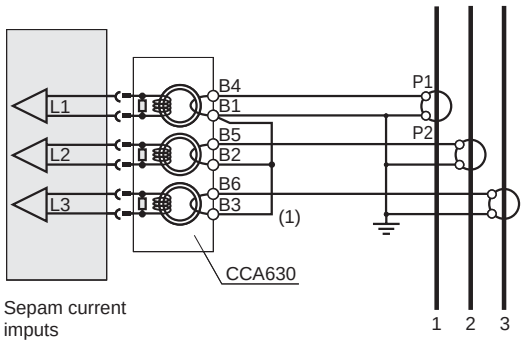
The current transformer (1 A or 5 A) secondary circuits are connected to the CCA630 connector, item Ⓑ.



MT10171
Figure 8: CCA630 CT Connector

The connector contains 3 interposing ring CTs with through primaries, which ensure impedance matching and isolation between the 1 A or 5 A circuits and Sepam.

The connector may be disconnected with the power on since disconnection does not open the CT secondary circuits.



1) bridging strap supplied with the CCA630.

MT10464

CCA630 wiring

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- If you want to remove current inputs to the Sepam Series 20, unplug connector CCA 630 without disconnecting wires from the connectors.
- You must short out the CT before disconnecting secondary leads.
- Follow proper procedures regarding CT secondary wiring. Never open-circuit the secondary of a CT.

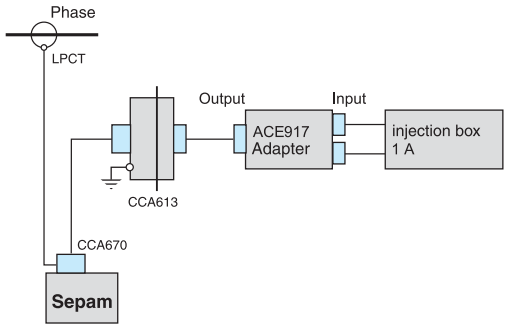
Failure to follow this instruction will result in death or serious injury.

1. Turn off all power supplying the Sepam 1000+ and the equipment in which it is installed before installing and wiring the Sepam 1000+. Be aware that the Sepam 1000+ may be connected to a separate power source not derived from the equipment in which it is installed.
2. Always use a properly rated voltage sensing device to confirm that all power is off.
3. Open the 2 side shields for access to the connection terminals. The shields may be removed, if necessary, to make wiring easier. If removed, they must be replaced after wiring.
4. Remove the bridging strap, if necessary. The strap links terminals 1, 2 and 3.
5. Connect the wires using 3 mm ring lugs. The connector accommodates wires with cross-sections of 1.5 to 6 mm^2 (AWG 16 to AWG 10).
6. Close the side shields
7. Plug the connector into the 9-pin inlet on the rear panel, item Ⓑ
8. Tighten the 2 CCA630 connector fastening screws on the rear panel of Sepam 1000+.

MT10318

Connecting LPCTs

CLP1 sensor.



Accessory connection principle.

CLP1 LPCT sensors

CLP1 sensors are voltage-output current sensors of the Low Power Current Transducer (LPCT) type, compliant with the IEC 60044-8 standard.
CLP1 sensors are designed to measure rated currents of between 100 and 1250 A, with a ratio of 100 A / 22.5 mV, and may be used on networks with a maximum of 17.5 kV.
The secondary winding of the CLP1 sensor is pre-equipped with a 5-m long shielded cable fitted with an RJ45 connector, which is connected to the 9-pin sub-D connector (B) on Sepam via a CCA670 interface connector, mounted on the rear panel of the Sepam 1000+ base unit.

Characteristics	
Rated primary current	100 A
Rated secondary voltage	22.5 mV
Rated primary extended current	1250 A
Measurement accuracy class	0.5
Protection accuracy class	5P
Rated accuracy limit primary current	40 kA
Accuracy burden	≥ 2 kΩ
Rated thermal short-circuit current	31.5 kA x 4 s - 40 kA x 3 s
Rated voltage (Um)	17.5 kV
Rated power frequency withstand voltage	38 kV - 42 kV
Rated lightning impulse withstand voltage (BIL)	95 kV
Weight	8 kg

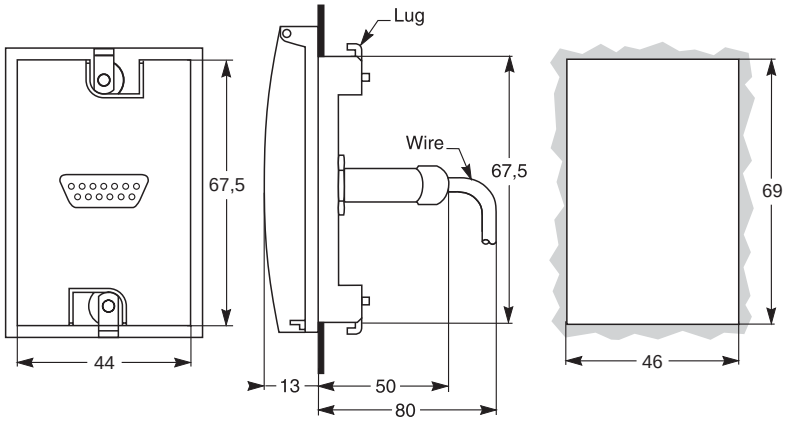
ACE917 injection adapter

The ACE917 adapter is used to test the circuit illustrated at left with a standard injection box, when Sepam 1000+ is connected to LPCT sensors.
The ACE917 adapter is inserted between:
- the standard injection box, which delivers a 1 A secondary current
- the LPCT test plug:
  - integrated in the Sepam 1000+ CCA670 connector
  - or transferred by means of the CCA613 accessory.

The following are supplied with the ACE917 injection adapter:
- 220 V AC power supply cord
- 3-meter ACE917 / LPCT test plug on CCA670 or CCA613 connection cord.

CCA613 remote test plug

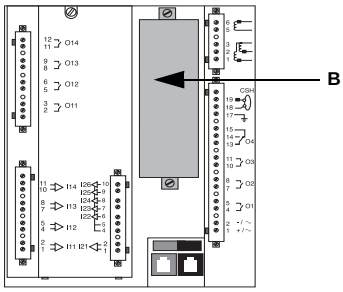
The CCA613 test plug, panel-mounted on the front of the cubicle and fitted with a 3-meter cord, is used to transfer data from the integrated test plug to the CCA670 interface connector on the rear panel of Sepam 1000+.



Front view with cover lifted. *Right side view.* *Cutout.*

LPCT sensor block and connection diagram

The LPCT current transformers (CVv 120 or CVv 200 sensors) are connected to the CCA 670 connector mounted on the rear of Sepam 1000+ item B .



Setting up the CCA670 connector

The CCA 670 connector should be calibrated when the Sepam 1000+ is commissioned according to the following instructions (see Variant 3 on page 30):

1. Turn off all power supplying the Sepam 1000+ and the equipment in which it is installed before installing and wiring the Sepam 1000+. Be aware that the Sepam 1000+ may be connected to a separate power source not derived from the equipment in which it is installed.
2. Always use a properly rated voltage sensing device to confirm that all power is off.
3. DIP switches must be set before attaching the CCA 670 phase current sensor module to the Sepam 1000+. Ensure the DIP switches are pushed completely UP or DOWN. Switches in in-between positions will result in random settings.
4. Use a screwdriver to remove the shield located in the “LPCT settings” zone; the shield protects 3 blocks of 8 microswitches marked L1, L2, L3,
5. On the L1 block, set the microswitch for the selected rated current to “1”,
   — The rated current must be same as the one set up in Sepam (“General characteristics” menu via SFT 2841 software, “Current sensors” screen via advanced UMI).
   — Leave the other 7 switches set to “0”.
6. Set the other 2 switch blocks L2 and L3 in the same position as the L1 block and close the shield again.
7. Install onto the Sepam unit.

⚠CAUTION

HAZARD OF UNINTENDED OPERATION

- DIP switches must be set before attaching the CCA 670 phase current sensor module to the Sepam 1000+.
- Ensure the DIP switches are pushed completely UP or DOWN. Switches in in-between positions will result in random settings.

Failure to correctly set DIP switches before attaching the phase current sensor module can result in unintended operation of the trip output contacts.

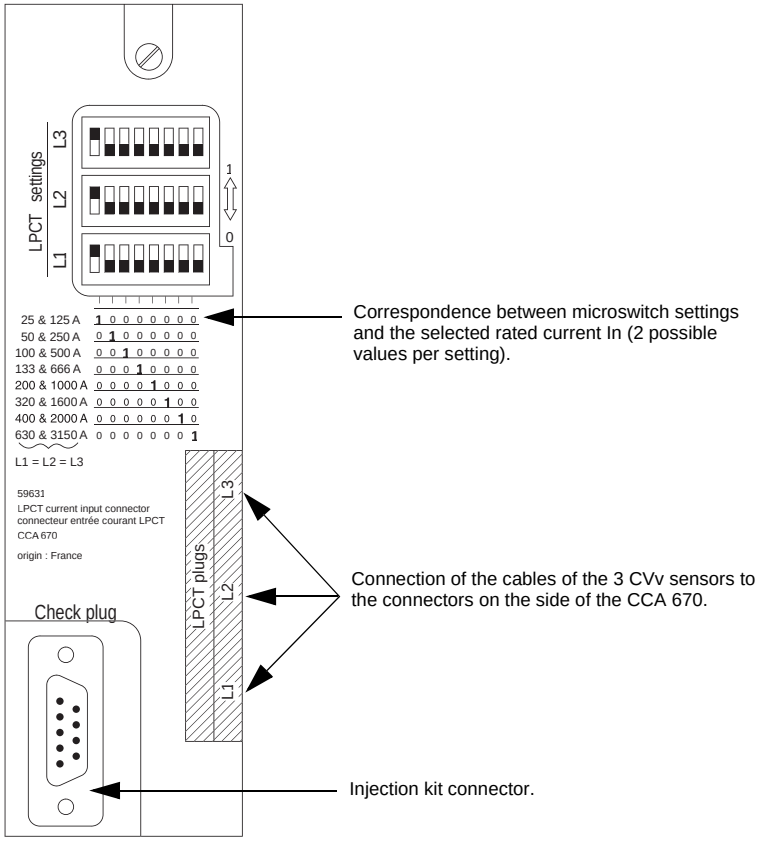
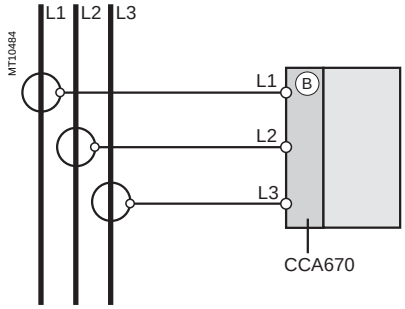


Figure 9: CCA670 LPCT Connector

This illustrates connection of three LPCT type current transfomers with CCA670 connector (the sensors are equipped with standard connection cords: length = 5 m).

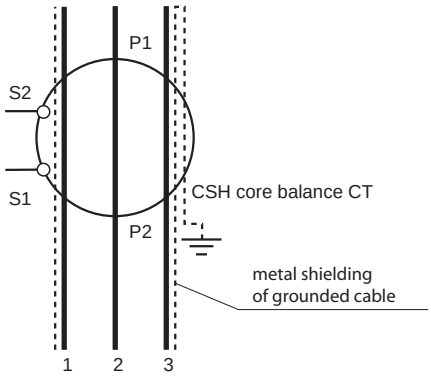


Connection of Ground Fault CTs

Use of CSH120 and CSH200 core balance CTs

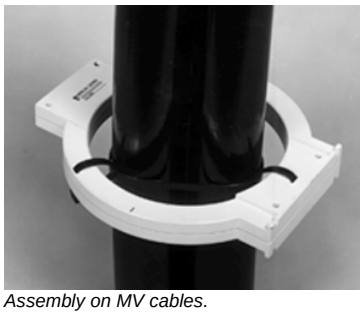
The only difference between the CSH120 and CSH200 core balance CTs is their inner diameter (120 mm and 200 mm).
Due to their low voltage isolation, they may only be used on cables fully insulated to system voltage.

CSH120 and CSH200 connection diagram

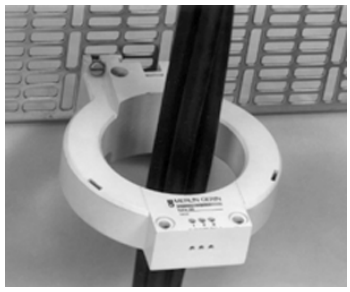


Cable shield grounding.

Assembly

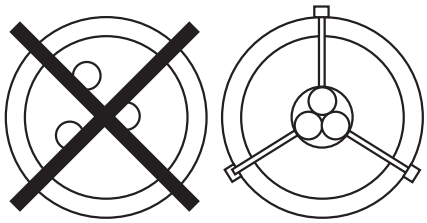


Assembly on MV cables.



Assembly on mounting plate.

Group the MV cable (or cables) in the middle of the core balance CT.
Use non-conductive binding to hold the cable.
Remember to insert the 3 medium voltage cable shielding grounding cables through the core balance CT.



Wiring

The CSH120 or CSH200 core balance CT is connected to Sepam's 20-pin connector (item Ⓐ).
Recommended cable:

- sheathed cable, shielded by tinned copper braid
- min. cable cross-section 0.93 mm^2 (AWG 18)
- resistance per unit length < 100 milli ohms/m
- min. dielectric strength: 1000 V.

Connect the connector cable shielding in the shortest manner possible to terminal 18 on Sepam.
Flatten the connection cable from the CT to the relay against the metal frames of the cubicle.
The connection cable shielding is grounded in Sepam. Do not ground the cable by any other means.

The maximum resistance of the Sepam connection wiring must not be more than 4 Ω.

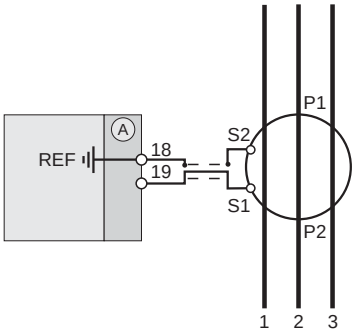
⚠ CAUTION

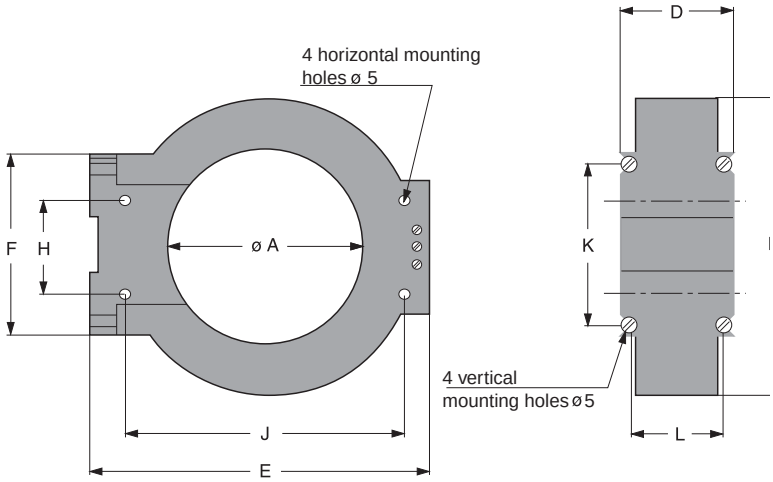
POTENTIAL OF INDUCED VOLTAGE

- Grounding the shield at any other point may create a ground loop, causing high currents on the shield.
- Before grounding the shield, insulate the ungrounded end.

Failure to follow these instructions will result in unintended operation.

Dimensions





⚠ CAUTION

POTENTIAL OF INDUCED VOLTAGE

- Grounding the shield at any other point may create a ground loop, causing high currents on the shield.
- Before grounding the shield, insulate the ungrounded end.

Failure to follow these instructions will result in unintended operation.

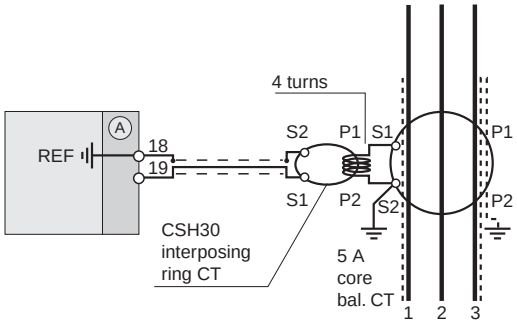
Dimensions in inches (mm)									**Weight**
CSH 120									0.6 kg (1.32 lb.)
A	**B**	**D**	**E**	**F**	**H**	**J**	**K**	**L**	
4 23/32 (120)	6 15/32 (164)	1 23/32 (44)	7 15/32 (190)	76	40	166	62	35	
CSH 200									1.4 kg (3.08 lb.)
7 7/8 (200)	10 3/32 (256)	1 13/16 (46)	10 25/32 (274)	120	60	257	104	37	

Use of CSH30 interposing ring CT

The CSH30 interposing ring CT should be used when residual current is measured by a current transformer with a secondary circuit (1 A or 5 A). It acts as an interface between the current transformer and the Sepam residual current input.
The CSH30 interposing ring CT is mounted on a symmetrical DIN rail. It may also be mounted on a plate by means of the mounting holes in its base.

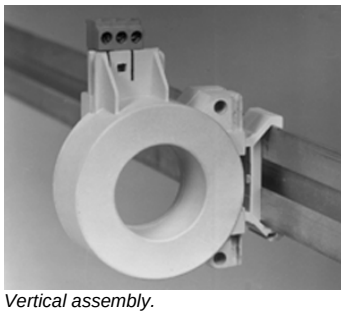
Connection diagram

The CSH30 is made to adapt to the type of 1 A or 5 A current transformer by the number of turns of the secondary wiring in the CSH30 interposing ring CT:
- 5 A rating - 4 turns
- 1 A rating - 2 turns.

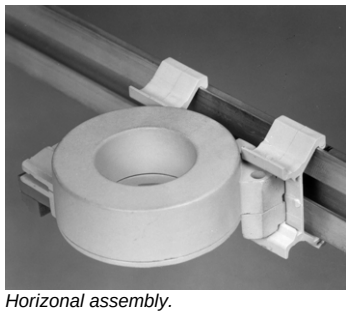


Example with 5 A CT.

Assembly



Vertical assembly.



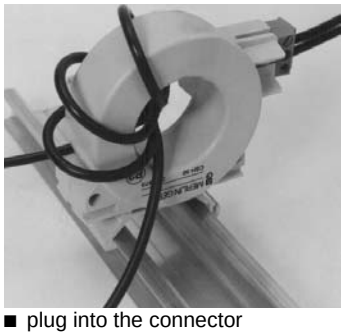
Horizonal assembly.

Wiring

The secondary winding of the CSH30 is connected to the connector, item Ⓐ.
Cable to be used:
- sheathed cable, shielded by tinned copper braid
- min. cable cross-section 0.93 mm^2 (AWG 18) (max. 2.5 mm^2)
- resistance per unit length < 100 mohm/m
- min. dielectric strength: 1000 V.

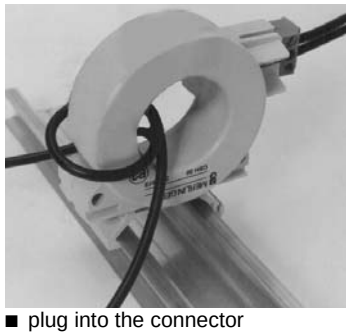
It is essential for the CSH30 interposing ring CT to be installed near Sepam (Sepam CSH30 link less than 2 m).
Flatten the cable against the metal frames of the cubicle.
The connection cable shielding is grounded in Sepam.
Do not ground the cable by any other means.

Connection to 5 A secondary circuit



- plug into the connector
- insert the transformer secondary wire through the CSH30 interposing ring CT 4 times.

Connection to 1 A secondary circuit



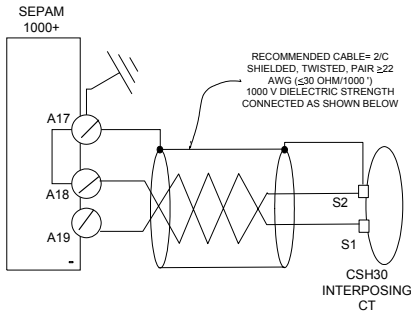
- plug into the connector
- insert the transformer secondary wire through the CSH30 interposing ring CT 2 times.

⚠ CAUTION

POTENTIAL OF INDUCED VOLTAGE

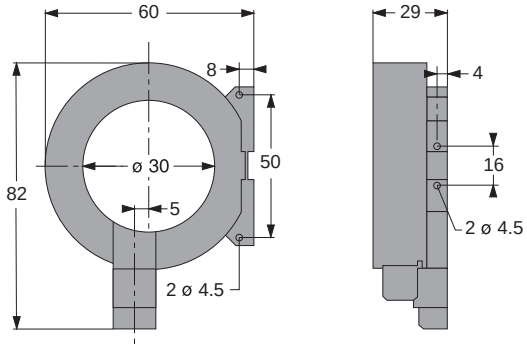
- Grounding the shield at any other point may create a ground loop, causing high currents on the shield.
- Before grounding the shield, insulate the ungrounded end.

Failure to follow these instructions will result in unintended operation.



Alternate CSH30 secondary connection

Dimensions



Weight: 0.12 kg.

Connection of ACE990 interface

The ACE990 is used to match the measurement of a MV core balance CT with ratio 1/n (50 ⩽ n ⩽ 1500) with that of the Sepam residual current input.
So as not to downgrade measurement accuracy, the MV core balance CT must be able to supply sufficient power. The value is given in the table opposite.

Use

To wire the ACE 990 interface correctly, it is necessary to know the following:

- ratio of the core balance CT (1/n)
- core balance CT power
- close approximation of the rated current Ino(1).

The table opposite may be used to determine the possible choices for the connection of the ACE990 interface primary circuit to the Sepam residual current input, as well as the rated residual current setting Ino.
The exact value of the rated current Ino(1) to be set is given by the following formula:
Ino = k x number of core balance CT turns
with k the factor defined in the table opposite.

Example:
The core balance CT used has a ratio of 1/400, 2 VA.
If the current being monitored is between 0.5 A and 60 A, a close approximation of the rated current Ino may be 5 A.
This value may be used to accurately measure from 0.5 A to 75 A.

Calculate the ratio : $\frac{\text{approx. Ino}}{\text{number of turns}}$

In the table opposite, find the closest value of k.
5/400 = 0.0125 close value k = 0.01136.
It correspoinds to core balance CTs with more than 0.1 VA of power.

The Ino value to be set is:
Ino = 0.01136 x 400 = 4.5 A

This Ino value may be used to monitor a current between 0.45 A and 67.5 A.

The secondary circuit of the MV core balance CT is wired to ACE990 terminals E2 and E4.

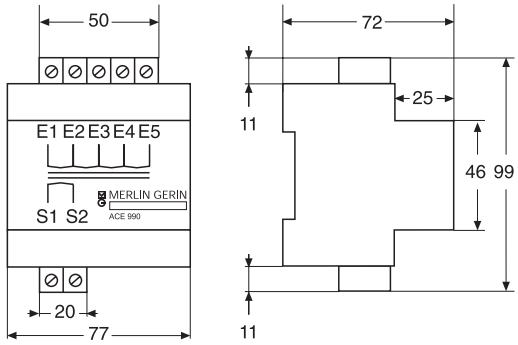
Characteristics

- accuracy:

amplitude: ±1%
phase: < 2°

- maximum permissible current: 20 kA 1 s (on primary of MV core balance CT with ratio 1/50 that does not saturate)
- operating temperature: -5°C +55°C
- storage temperature: -25°C +70°C.

(1) current value for which the required setting range extends to between 10% and 1500% of this value, at the most.
(2) parameter setting and adjustment of Ino current as a multiple of 0.1 A may be accessed from the SFT 2841 software tool or from the advanced UMI (general characteristics).



Mounted on symmetrical DIN rail, weight 640 g.

Value of k	ACE990 input	Choice of Sepam residual current(2)	Min. MV core bal. CT power
0.00578	E1 – E5	ACE990 - range 1	0.1 VA
0.00676	E2 – E5	ACE990 - range 1	0.1 VA
0.00885	E1 – E4	ACE990 - range 1	0.1 VA
0.00909	E3 – E5	ACE990 - range 1	0.1 VA
0.01136	**E2 – E4**	**ACE990 - range 1**	**0.1 VA**
0.01587	E1 – E3	ACE990 - range 1	0.1 VA
0.01667	E4 – E5	ACE990 - range 1	0.1 VA
0.02000	E3 – E4	ACE990 - range 1	0.1 VA
0.02632	E2 – E3	ACE990 - range 1	0.1 VA
0.04000	E1 – E2	ACE990 - range 1	0.2 VA
0.05780	E1 – E5	ACE990 - range 2	2.5 VA
0.06757	E2 – E5	ACE990 - range 2	2.5 VA
0.08850	E1 – E4	ACE990 - range 2	3.0 VA
0.09091	E3 – E5	ACE990 - range 2	3.0 VA
0.11364	E2 – E4	ACE990 - range 2	3.0 VA
0.15873	E1 – E3	ACE990 - range 2	4.5 VA
0.16667	E4 – E5	ACE990 - range 2	4.5 VA
0.20000	E3 – E4	ACE990 - range 2	5.5 VA
0.26316	E2 – E3	ACE990 - range 2	7.5 VA

Wiring

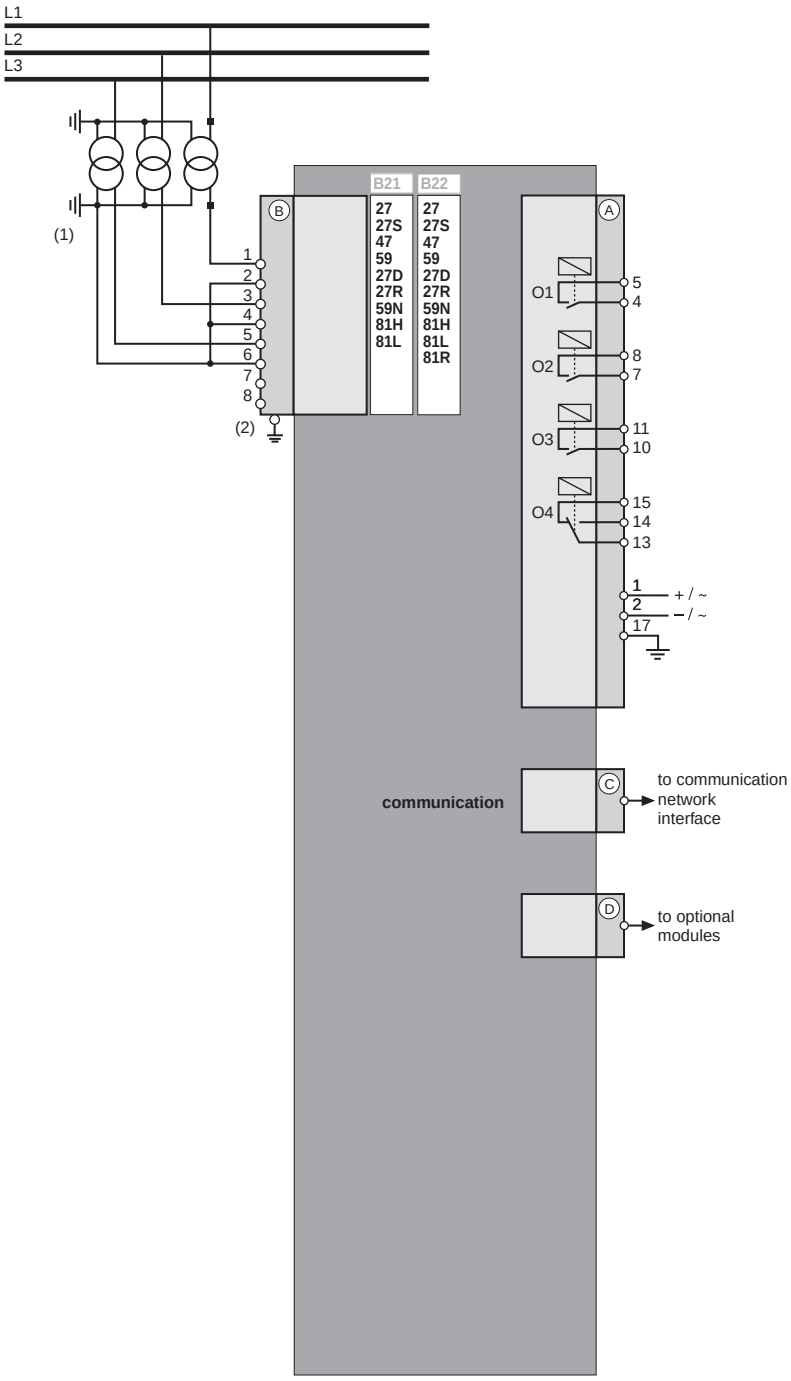
Only one core balance CT may be connected to the ACE990 interface.
The secondary circuit of the MV core balance CT is connected to 2 of the 5 ACE990 interface inputs. The core balance CT must be connected to the interface in the right direction for correct operation, in particular S1 on the MV core balance CT must be connected to the terminal with the lowest index (Ex). See Variant 4 on page 31.
Cables to be used:

- cable between the core balance CT and the ACE990: length less than 50 m
- sheathed cable, shielded by tined copper braid between the ACE990 and Sepam: maximum length 2 m
- cable cross-section between 0.93 mm^2 (AWG 18) and 2.5 mm^2 (AWG 13)
- resistance per unit length less than 100 mW/m
- minimum dielectric strength: 100 V.

Connect the ACE990 connection cable shielding in the shortest manner possible (maximum 2 cm) to pin 18 of the connector Ⓐ.
Flatten the cable from the CT to the relay against the metal frames of the cubicle. The connection cable shielding is grounded in Sepam.
Do not ground the cable by any other means.

Connection of voltage inputs

B21 and B22 types



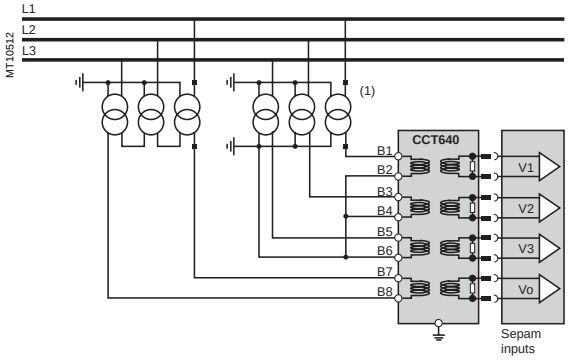
(1) This connection allows the residual voltage to be calculated.
(2) CCT640 connector earthing terminal.

Connection of voltage transformers

The phase and residual voltage transformer secondary circuits are connected to the CCT640 connector, item Ⓑ on B2X type Sepam units.

CCT640

The connector contains 4 transformers which provide impedance matching and isolation between the VTs and Sepam 1000+ input circuits.
Terminals B1 to B6 are intended for phase voltage measurement (1), and B7 and B8 for residual voltage measurement (case shown, not connected if obtained by the sum of the 3 phase voltages).



(1) 1, 2 or 3 VTs (case shown).

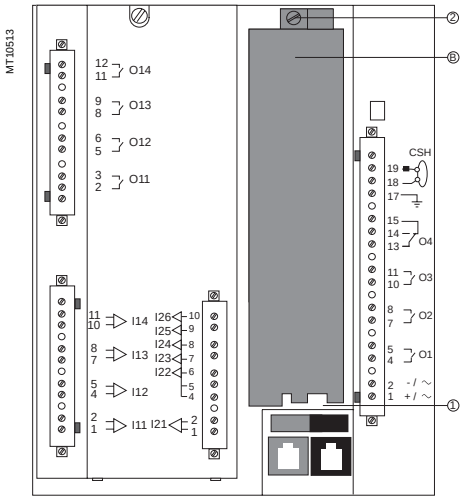
Installation of the CCT640 connector

■ insert the 2 connector pins into the slots ① on the base unit
■ flatten the connector against the unit to plug it into the 9-pin SUB-D connector (principle similar to that of the MES module)
■ tighten the mounting screw ②.

Connection

■ the connections are made to the screw type connectors that may be accessed on the rear of the CCT640 (item ③)
■ wiring without fitting:
□ 1 wire with maximum cross-section of 0.2 to 2.5 mm^2 (≥ AWG 24-12) or 2 wires with maximum cross-section of 0.2 to 1 mm^2 (≥ AWG 24-16)
□ stripped length: 8 to 10 mm
■ wiring with fitting:
□ recommended wiring with Telemecanique fitting:
- DZ5CE015D for 1 wire 1.5 mm^2
- DZ5CE025D for 1 wire 2.5 mm^2
- AZ5DE010D for 2 wires 1 mm^2

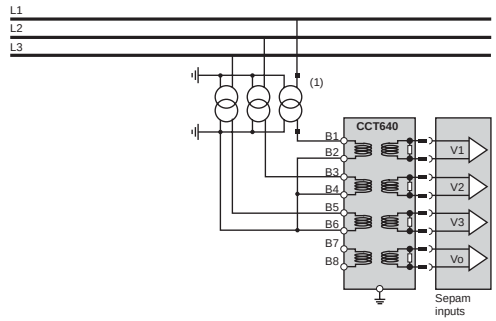
□ tube length: 8.2 mm
□ stripped length: 8 mm
■ the CCT640 must be earthed (by green/yellow wire + ring lug) on the screw ④ (safety in case the CCT640 become unplugged).



Voltage Transformer Connections

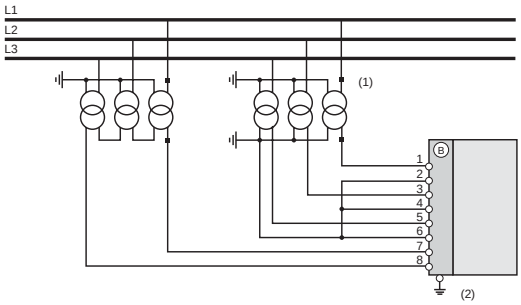
The phase and residual voltage transformer secondary circuits are connected to the CCT640 connector item Ⓑ on B21 or B22 type Sepam Series 20 units.

Variant 1: measurement of 3 phase-to-neutral voltages (standard connection)



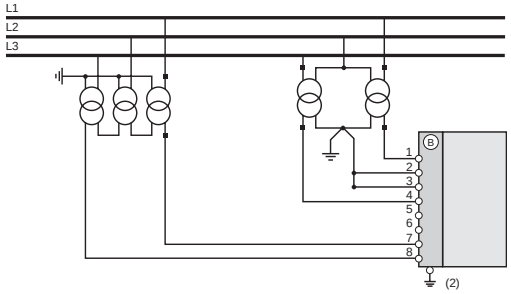
Phase voltage sensor parameter setting	3V
Residual voltage sensor parameter setting	3V sum
Voltages measured	V1, V2, V3
Values calculated	U21, U32, U13, Vo, Vd, Vi, f
Measurements available	All
Protection functions available (according to type of Sepam)	All

Variant 2: measurement of 3 phase-to-neutral voltages and residual voltage



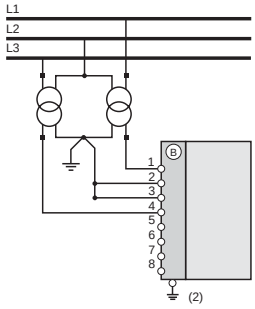
Phase voltage sensor parameter setting	3V
Residual voltage sensor parameter setting	External VT
Voltages measured	V1, V2, V3, Vo
Values calculated	U21, U32, U13, Vd, Vi, f
Measurements available	All
Protection functions available (according to type of Sepam)	All

Variant 3: measurement of 2 phase-to-phase voltages and residual voltage



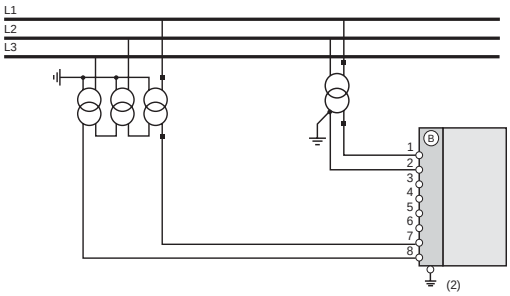
Phase voltage sensor parameter setting	U21, U32
Residual voltage sensor parameter setting	External VT
Voltages measured	U21, U32, Vo
Values calculated	U13, V1, V2, V3, Vd, Vi, f
Measurements available	All
Protection functions available (according to type of Sepam)	All

Variant 4: measurement of 2 phase-to-phase voltages



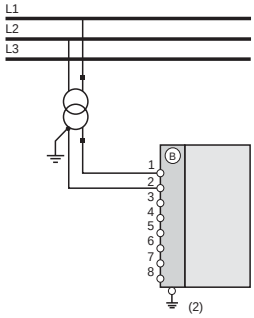
Phase voltage sensor parameter setting	U21, U32
Residual voltage sensor parameter setting	None
Voltages measured	U21, U32
Values calculated	U13, Vd, Vi, f
Measurements unavailable	V1, V2, V3, Vo
Protection functions unavailable (according to type of Sepam)	59N

Variant 5: measurement of 1 phase-to-phase voltage and residual voltage



Phase voltage sensor parameter setting	U21
Residual voltage sensor parameter setting	External VT
Voltages measured	U21, Vo
Values calculated	f
Measurements unavailable	U32, U13, V1, V2, V3, Vd, Vi
Protection functions unavailable (according to type of Sepam)	27D, 27S

Variant 6: measurement of 1 phase-to-phase voltage



Phase voltage sensor parameter setting	U21
Residual voltage sensor parameter setting	None
Voltages measured	U21
Values calculated	f
Measurements unavailable	U32, U13, V1, V2, V3, Vo, Vd, Vi
Protection functions unavailable (according to type of Sepam)	27D 59N, 27S

1) Measurement of phase voltages with 1, 2 or 3 VTs (case shown).
(2) CCT640 connector earthing terminal.

Connection of Optional Remote I/O Modules

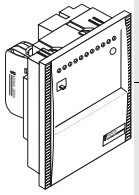
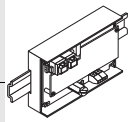
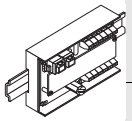
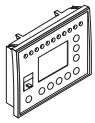
The optional MET148-2, MSA141 or DSM303 modules are connected to the base unit connector Ⓓ by a series of links using prefabricated cables which come in 3 different lengths with black fittings.

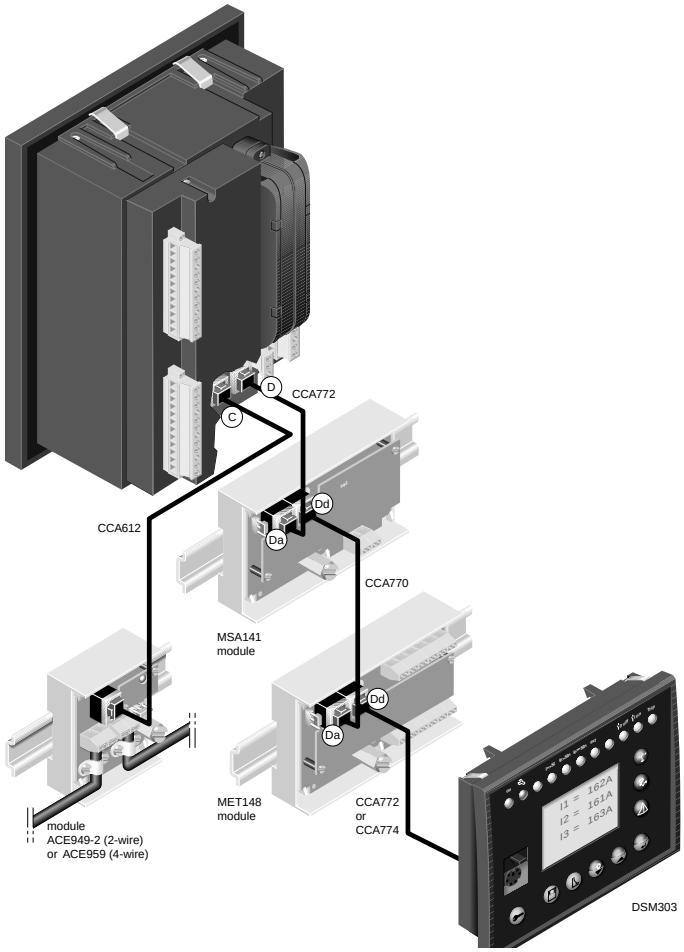
- CCA770 (L = 0.6 m)
- CCA772 (L = 2 m)
- CCA774 (L = 4 m).

The DSM303 module may only be connected at the end of the series.

Maximum configuration

A maximum of three modules may be connected to the base unit, in compliance with the module order and maximum connection lengths indicated in the table:

Base	Cable	Module 1	Cable	Module 2	Cable	Module 3
						
	CCA772 (2 m)	MSA141	CCA770 (0.6 m)	MET148-2	CCA774 (4 m)	DSM303



DSM303 remote advanced UMI module.

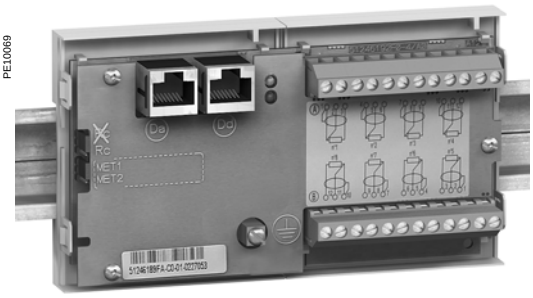
DSM303 remote advanced UMI module

The DSM303 module provides the same functional features as the fixed advanced UMI.

Associated with a Sepam 1000+ with a basic UMI, it may be installed on the front panel of the cubicle in the most suitable operating location.

- depth of 30 mm
- a single module for each Sepam 1000+ with a basic UMI, to be connected by one of the CCA772 (2 meter) or CCA774 (4 meter) prefabricated cables. This module may not be connected to Sepam 1000+ units with integrated advanced UMIs.

Temperature sensor modules MET148-2



MET148-2 temperature sensor module.

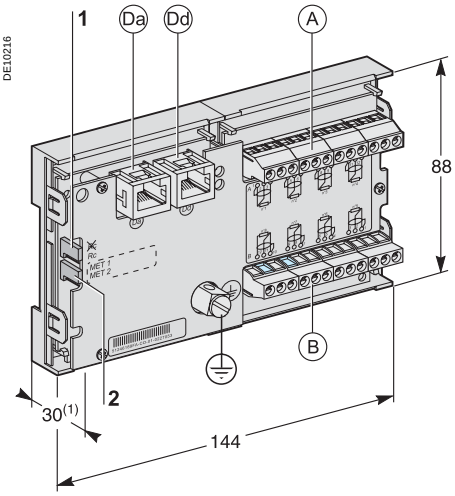
Function

The MET148-2 module may be used to connect 8 temperature sensors (RTDs) of the same type:
- Pt100, Ni100 or Ni120 type RTDs, according to parameter setting
- 3-wire temperature sensors
- a single module for each Sepam series 20 base unit, to be connected by one of the CCA770, CCA772 or CCA774 cords (0.6 or 2 or 4 meters))

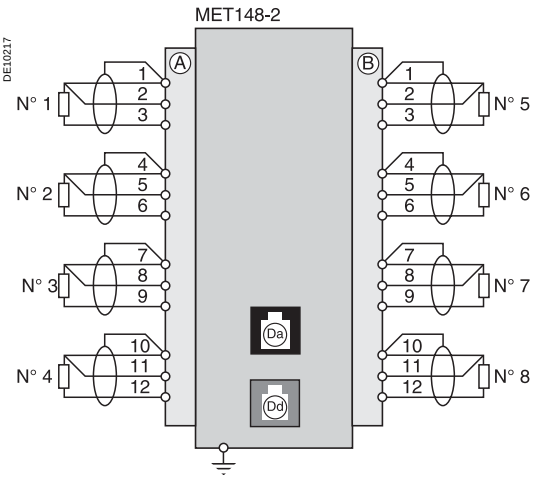
The temperature measurement (e.g. in a transformer or motor winding) is utilized by the following protection functions:
- thermal overload (to take ambient termperature into account)
- temperature monitoring.

Characteristics

MET148-2 module		
Weight	0.2 kg	
Assembly	On symmetrical DIN rail	
Operating temperature	-25 °C to +70 °C	
Environmental characteristics	Same characteristics as Sepam base units	
RTDs	**Pt100**	**Ni100 / Ni120**
Isolation from earth	None	None
Current injected in RTD	4 mA	4 mA



(1) *70 mm with CCA77x cable connected.*



Description and dimensions

(A) Terminal block for RTDs 1 to 4.

(B) Terminal block for RTDs 5 to 8.

(Da) RJ45 connector to connect the module to the base unit with a CCA77x cord.

(Dd) RJ45 connector to link up the next remote module with a CCA77x cord (according to application).

(⏚) Grounding/earthing terminal.

1 Jumper for impedance matching with load resistor (Rc), to be set to:
- Rc, if the module is not the last interlinked module (default position)
- Rc, if the module is the last interlinked module.

2 Jumper used to select module number, to be set to:
- MET1: 1st MET148-2 module, to measure temperatures T1 to T8 (default position).

Connection

Connection of the earthing terminal
By tinned copper braid or cable fitted with a 4 mm ring lug.

Connection of RTDs to screw-type connectors
- 1 wire with cross-section 0.2 to 2.5 mm² (≥ AWG 24-12)
- or 2 wires with cross-section 0.2 to 1 mm² (≥ AWG 24-16).

Recommended cross-sections according to distance:
- up to 100 m ≥ 1 mm², AWG 16
- up to 300 m ≥ 1.5 mm², AWG 14
- up to 1 km ≥ 2.5 mm², AWG 12.

Wriring precautions
- it is preferable to use shielded cables

The use of unshielded cables may cause measurement errors, which vary in degree on the level of surrounding electromagnetic disturbance
- only connect the shielding at the MET148-2 end, in the shortest manner possible, to the corresponding terminals of connectors (A) and (B)
- do not connect the shielding at the RTD end.

Accuracy derating according to wiring
The error Δt is proportional to the length of the cable and inversely proportional to the cable cross-section:

$$\Delta t(^{\circ}C) = 2 \times \frac{L(km)}{S(mm^2)}$$

- ±2.1 °C/km for 0.93 mm² cross-section
- ±1 °C/km for 1.92 mm² cross-section.

Analog output module MSA141

MSA141 analog output module.

Function

The MSA141 module converts one of the Sepam measurements into an analog signal:

- selection of the measurement to be converted by parameter setting
- 0-10 mA, 4-20 mA, 0-20 mA analog signal according to parameter setting
- scaling of the analog signal by setting minimum and maximum values of the converted measurement.

Example: the setting used to have phase current 1 as a 0-10 mA analog output with a dynamic range of 0 to 300 A is:

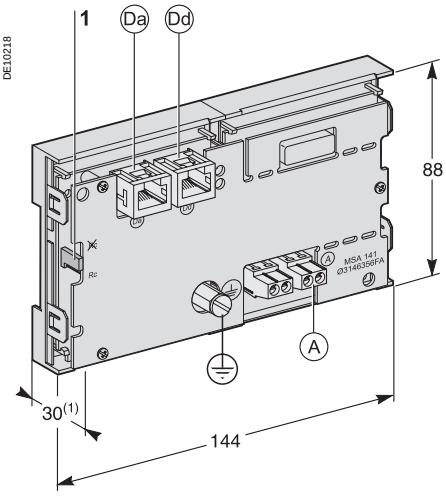
- minimum value = 0
- maximum value = 3000

- a single module for each Sepam base unit, to be connected by one of the CCA770, CCA772 or CCA774 cords (0.6 or 2 or 4 meters).

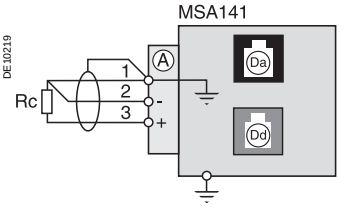
The analog output may also be remotely managed via the Modbus communication network.

Characteristics

MSA141 module		
Weight	0.2 kg	
Assembly	On symmetrical DIN rail	
Operating temperature	-25°C to +70°C	
Environmental characteristics	Same characteristics as Sepam base units	
Analog output		
Current	4-20 mA, 0-20 mA, 0-10 mA	
Scaling (no data input checking)	Minimum value	
	Maximum value	
Load impedance	< 600 Ω (wiring included)	
Accuracy	0.5 %	
Measurements available	**Unit**	**Series 20**
Phase and residual currents	0.1 A	■
Phase-to-neutral and phase-to-phase voltages	1 V	■
Frequency	0.01 Hz	■
Thermal capacity used	1%	■
Temperatures	1°C	■
Remote setting via communication link		■



***(1)** 70 mm with CCA77x cord connected.*



Description and dimensions

(A) Terminal block for analog output.

(Da) RJ45 connector to connect the module to the base unit with a CCA77x cord.

(Dd) RJ45 connector to link up the next remote module with a CCA77x cord (according to application).

(⏚) Grounding/earthing terminal.

1 Jumper for impedance matching with load resistor (Rc), to be set to:
- ■ ~~Rc~~, if the module is not the last interlinked module (default position)
- ■ Rc, if the module is the last interlinked module.

Connection

Earthing terminal connection

By tinned copper braid or cable fitted with a 4 mm ring lug.

Connection of analog output to screw-type connector

- 1 wire with cross-section 0.2 to 2.5 mm² (≥ AWG 24-12)
- or 2 wires with cross-section 0.2 to 1 mm² (≥ AWG 24-16).

Wiring precautions

- it is preferable to use shielded cables
- use tinned copper braid to connect the shielding at least at the MSA141 end.

Communication interface module

These modules are used for simple, dependable commissioning of the RS 485 link according to 2 connection topologies:

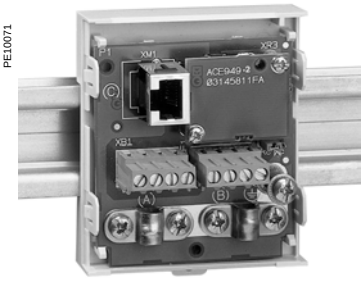
- 2-wire network with the ACE 949-2 module
- 4-wire network with the ACE 959 module

The RS 485 communication interfaces are supplied, via the network cable, by a single accessory that may be used to connect up to 25 units according to the chart below:

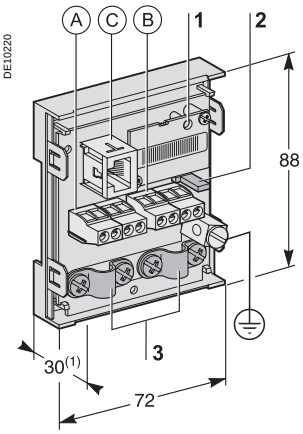
- These values are obtained with a standard AWG 24 2-pair cable with a resistance load per unit length of 78 1/2 Ω / km.
- Tolerance with distributed power supply: ± 10%.
- Values multiplied by 3 with a maximum of 1300 m with a specific cable; reference FILECA F2644-1; Schneider-approved.

For additional communications information, see “Communications Interface Wiring” on page 58. For information on the commissioning of the RS 485 network and the characteristics of the recommended cables, refer to “RS 485 Network Connection Guide“ PCRED399074EN.

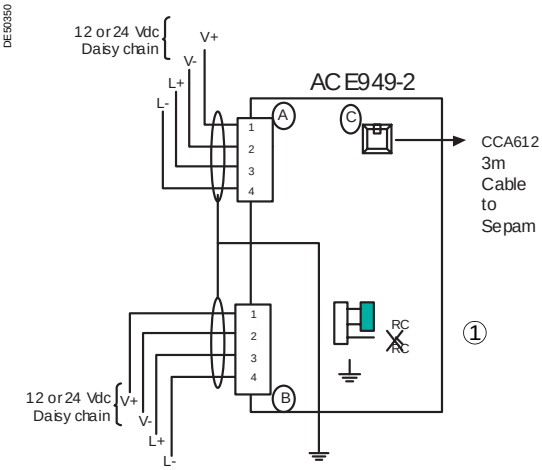
2-wire RS 485 network interface ACE949-2



ACE949-2 2-wire RS 485 network connection interface.



***(1)** 70 mm with CCA612 cord connected.*



NOTE: When modules are linked together, the jumper ① should be put in the RC (load resistance) position on the last module in the series. The modules are delivered in the position ~~RC~~.

Function

The ACE949-2 interface performs 2 functions:

- electrical interface between Sepam and a 2-wire RS 485 communication network
- main network cable branching box for the connection of a Sepam with a CCA612 cord.

Characteristics

ACE949-2 module	
Weight	0.1 kg
Assembly	On symmetrical DIN rail
Operating temperature	-25°C to +70°C
Environmental characteristics	Same characteristics as Sepam base units
2-wire RS 485 electrical interface	
Standard	EIA 2-wire RS 485 differential
Distributed power supply	External, 12 V DC or 24 V DC ±10 %
Consumption	16 mA in receiving mode
	40 mA maximum in sending mode

Maximum length of 2-wire RS 485 network with standard cable

Number of Sepam units	Maximum length with 12 V DC power supply	Maximum length with 24 V DC power supply
5	320 m	1000 m
10	180 m	750 m
20	160 m	450 m
25	125 m	375 m

***Note:** lengths multiplied by 3 with FILECA F2644-1 high-performance cable.*

Description and dimensions

(A) and (B) Terminal blocks for network cable.

(C) RJ45 plug to connect the interface to the base unit with a CCA612 cord.

(⏚) Grounding/earthing terminal.

1 Green LED, flashes when communication is active (sending or receiving in progress).

2 Jumper for RS 485 network line-end impedance matching with load resistor (Rc), to be set to:
- ~~RC~~, if the module is not at one end of the RS 485 network (default position)
- Rc, if the module is at one end of the RS 485 network.

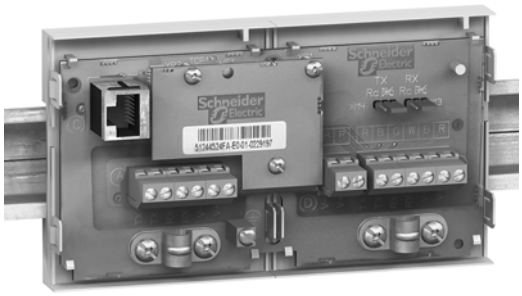
3 Network cable clamps (inner diameter of clamp = 6 mm).

Connection

- connection of network cable to screw-type terminal blocks (A) and (B)
- connection of earthing terminal by tinned copper braid or cable fitted with 4 mm ring lug
- the interfaces are fitted with clamps to hold the network cable and recover shielding at the incoming and outgoing points of the network cable:
  - ☐ the network cable must be stripped
  - ☐ the cable shielding braid must be around and in contact with the clamp
- the interface is to be connected to connector (C) on the base unit using a CCA612 cord (length = 3 m, green fittings)
- the interfaces are to be supplied with 12 V DC or 24 V DC
- refer to the "Sepam - RS 485 network connection guide " PCRED399074EN for all the details on how to implement a complete RS 485 network.

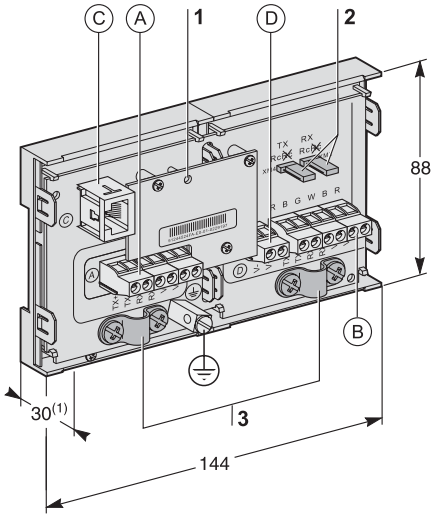
4-wire RS 485 network interface ACE959

PE10072



ACE959 4-wire RS 485 network connection interface.

DE10222



(1) *70 mm with CCA612 cord connected.*

DE50351

Function

The ACE959 interface performs 2 functions:

- electrical interface between Sepam and a 4-wire RS 485 communication network
- main network cable branching box for the connection of a Sepam with a CCA612 cord.

Characteristics

ACE959 module	
Weight	0.2 kg
Assembly	On symmetrical DIN rail
Operating temperature	-25°C to +70°C
Environmental characteristics	Same characteristics as Sepam base units
4-wire RS 485 electrical interface	
Standard	EIA 4-wire RS 485 differential
Distributed power supply	External, 12 V DC or 24 V DC ±10 %
Consumption	16 mA in receiving mode
	40 mA maximum in sending mode

Maximum length of 4-wire RS 485 network with standard cable		
Number of Sepam units	**Maximum length with 12 V DC power supply**	**Maximum length with 24 V DC power supply**
5	320 m	1000 m
10	180 m	750 m
20	160 m	450 m
25	125 m	375 m

Note: *lengths multiplied by 3 with FILECA F3644-1 high-performance cable.*

Description and dimensions

(A) and (B) Terminal blocks for network cable.

(C) RJ45 plug to connect the interface to the base unit with a CCA612 cord.

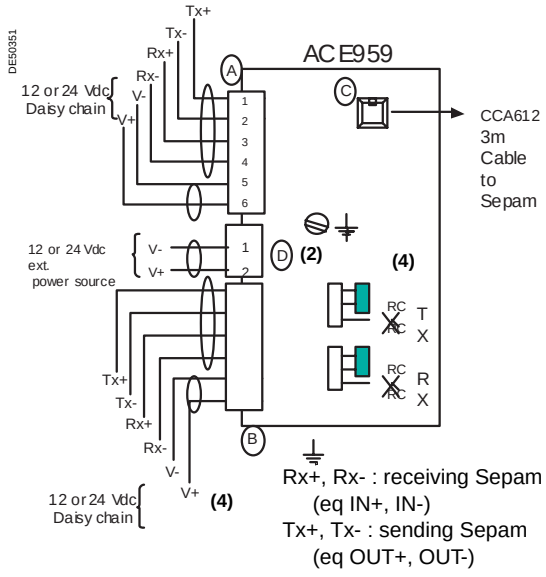
(D) Terminal block for a separate auxiliary power supply (12 V DC or 24 V DC).

(⏚) Grounding/earthing terminal.

1 Green LED, flashes when communication is active (sending or receiving in progress).

2 Jumper for RS 485 network line-end impedance matching with load resistor (Rc), to be set to:
- ~~Rc~~, if the module is not at one end of the RS 485 network (default position)
- Rc, if the module is at one end of the RS 485 network.

3 Network cable clamps (inner diameter of clamp = 6 mm).

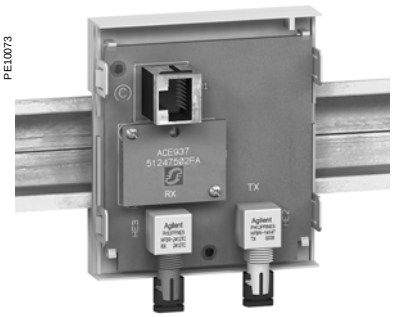


(1) Distributed power supply with separate wiring or included in the shielded cord (3 pairs).
(2) Terminal block for connection of the module that provides the distributed power supply.
(3) Use a braid or cable equipped with a 4 mm ring lug.
(4) When modules are linked together without DSM303, the jumper (4) should be put in the RC (load resistance) position on the last module in the series (MET148 or MSA141). The modules are delivered in the position ~~RC~~ *.*

Connection

■ connection of network cable to screw-type terminal blocks (A) and (B)
■ connection of earthing terminal by tinned copper braid or cable fitted with 4 mm ring lug
■ the interfaces are fitted with clamps to hold the network cable and recover shielding at the incoming and outgoing points of the network cable:
□ the network cable must be stripped
□ the cable shielding braid must be around and in contact with the clamp
■ the interface is to be connected to connector (C) on the base unit using a CCA612 cord (length = 3 m, green fittings)
■ the interfaces are to be supplied with 12 V DC or 24 V DC
■ the ACE959 can be connected to a separate distributed power supply (not included in shielded cable). Terminal block (D) is used to connect the distributed power supply module
■ refer to the "Sepam - RS 485 network connection guide" PCRED399074EN for all the details on how to implement a complete RS 485 network.

Fiber optic interface ACE937



ACE937 fiber optic connection interface.

Function

The ACE937 interface is used to connect Sepam to a fiber optic communication star system.
This remote module is connected to the Sepam base unit by a CCA612 cord.

Characteristics

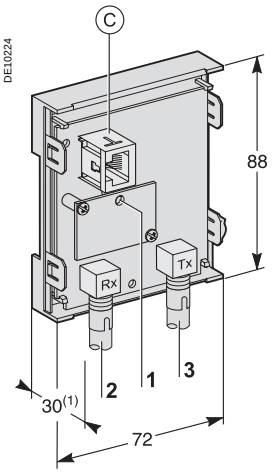
ACE937 module	
Weight	0.1 kg
Assembly	On symmetrical DIN rail
Power supply	Supplied by Sepam
Operating temperature	-25°C to +70°C
Environmental characteristics	Same characteristics as Sepam base units

Fiber optic interface	
Wavelength	820 nm (infra-red)
Type of connector	ST
Fiber type	Multimode glass

Fiber optic diameter (µm)	**Numerical aperture (NA)**	**Maximum attenuation (dBm/km)**	**Minimum optical power available (dBm)**	**Maximum length of fiber (m)**
50/125	0.2	2.7	5.6	700
62.5/125	0.275	3.2	9.4	1800
100/140	0.3	4	14.9	2800
200 (HCS)	0.37	6	19.2	2600

Maximum length calculated with:
- minimum optical power available
- maximum fiber attenuation
- losses in 2 ST connectors: 0.6 dBm
- optical power margin: 3 dBm (according to IEC60870 standard).

Example for a 62.5/125 µm fiber
Lmax = (9.4 - 3 -0.6) / 3.2 = 1.8 km.

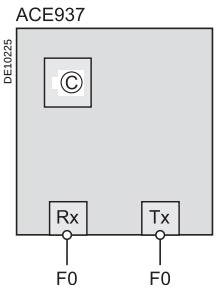


(1) *70 mm with CCA612 cord connected.*

Description and dimensions

(C) RJ 45 plug to connect the interface to the base unit with a CCA612 cord.

1 Green LED, flashes when communication is active (sending or receiving in progress)..
2 Rx, female ST type connector (Sepam receiving).
3 Tx, female ST type connector (Sepam sending).

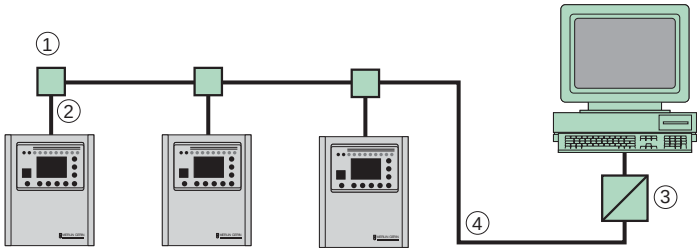


Connection

- the sending and receiving fiber optics fibers must be equipped with male ST type connectors
- fiber optics screw-locked to Rx and Tx connectors
- the interface is to be connected to connector (C) on the base unit using a CCA612 cord (length = 3 m, green fittings)

IMPLEMENTATION OF THE MODBUS NETWORK

A set of adapted accessories is used for fast, dependable implementation of the communication network from both the electrical and environmental (electromagnetic compatibility) viewpoints.



① Network connection interface, to be supplied by 12 V DC or 24 V DC distributed power supply
- ACE949-2 for 2-wire RS 485 networks
- or ACE959 for 4-wire RS 485 networks.

② CCA612 cable for connection of the interface to the C port of the Sepam base unit.
③ Interface for connection of the RS 485 network to the Modbus master, with distributed power supply to the ACE949-2 interfaces and polarization/termination of the communication link
- ACE909-2, 2-wire RS 485 / RS 232 converter
- or ACE919CA (110 V AC or 220 V AC) 2-wire RS 485/2-wire RS 485 interface
- or ACE919CC (24 V DC or 48 V DC) 2-wire RS 485/2-wire RS 485 interface.

④ Modbus network cable
- for 2-wire RS 485 network: two shielded twisted pairs (1 RS 485 pair, 1 pair for power suuply)
- for 4-wire RS 485 network: three shielded twisted pairs (2 RS 485 pairs, 1 pair for power supply)
- with tinned copper braiding shielding, coverage: > 65%
- characteristic impedance: 120 Ω
- gauge: AWG 24
- resistance per unit length: < 100 Ω/km
- capacitance between conductors: < 60 pF/m
- capacitance between conductor and shielding: < 100 pF/m
- maximum length: 1300 m.

Example of standard cable (for 2-wire RS 485 network):
- supplier: BELDEN reference: 9842 or 8723
- supplier: FILOTEX reference: FMA-2PS.

High-performance cable (for 2-wire RS 485 network):
- supplier: FILECA reference: F2644-1 (cable distributed by Schneider Electric in 60 m strands, reference CCR301).

For more information, refer to the "Sepam - RS 485 network connection guide" PCRED399074EN.

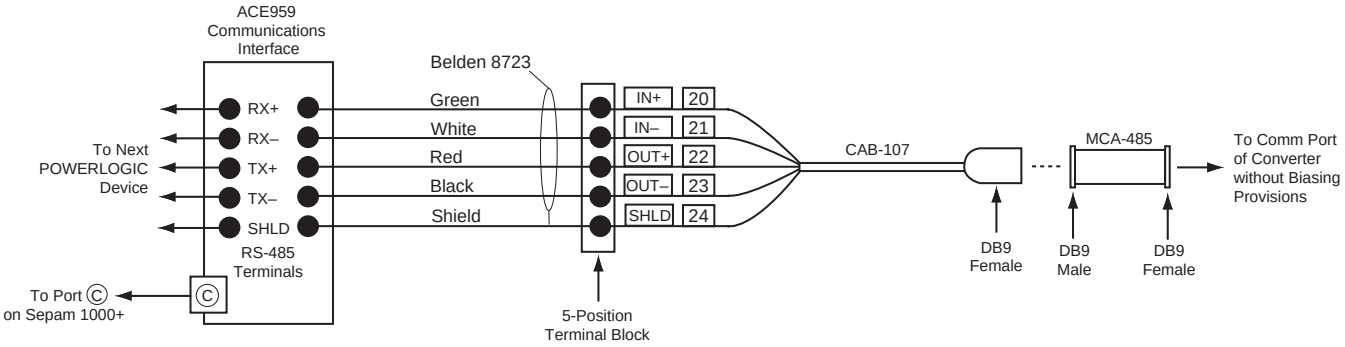
Communications Wiring

Biasing the Communications Link

To ensure reliable communications, you must bias the POWERLOGIC communications link (if biasing is not in the system master nor an interfacing RS232/485 converter). Use a Multipoint Communications Adapter (MCA-485) biasing device. Place the adapter between the first device on the link and the communications port of the PC. The illustration below shows installation of the adapter when the first device on the link is a Sepam 1000+ relay.

One set of biasing resistors is required per daisy chain. On the Black Box converter IC109A-R2, these can be activated by a switch. Other converters

should be checked for configurable biasing. Biasing is recommended at or near the system master.



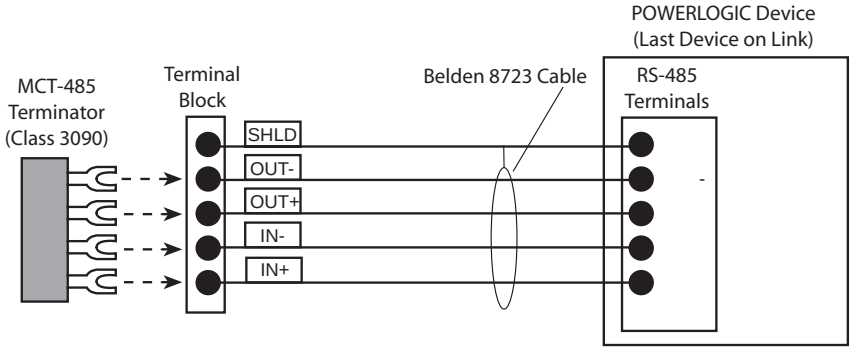
Connecting a Sepam 1000+ as the first device on a POWERLOGIC daisy chain using CAB107 cable, MCA-485, and terminal block

Terminating the Communications Link

To ensure reliable communications, terminate the last device on a POWERLOGIC communications link. The illustration below shows MCT-485 terminator placement when the final device on the link is a POWERLOGIC device. If the last device is a Sepam 1000+, see page 55 for termination instructions.

NOTE: If a communications link contains only a single device, it must be terminated. If a link contains multiple devices, as in the illustration on page 60, only the last device must be terminated.

One pair of terminating resistors is required at each end of an RS485 4-wire daisy chain. This can be accomplished by setting the movable jumpers on the ACE959 communications interface, the switches on Black Box converter IC109A-R2, or, for series 2000 circuit monitors, using a Multipoint Communication Adapter MCT-485. For series 4000 circuit monitors and series 600 power meters with screw-type terminals, use an MCTAS-485 (or an MCT-485 with a terminal block). Refer to the instruction bulletin for the specific device for more details.



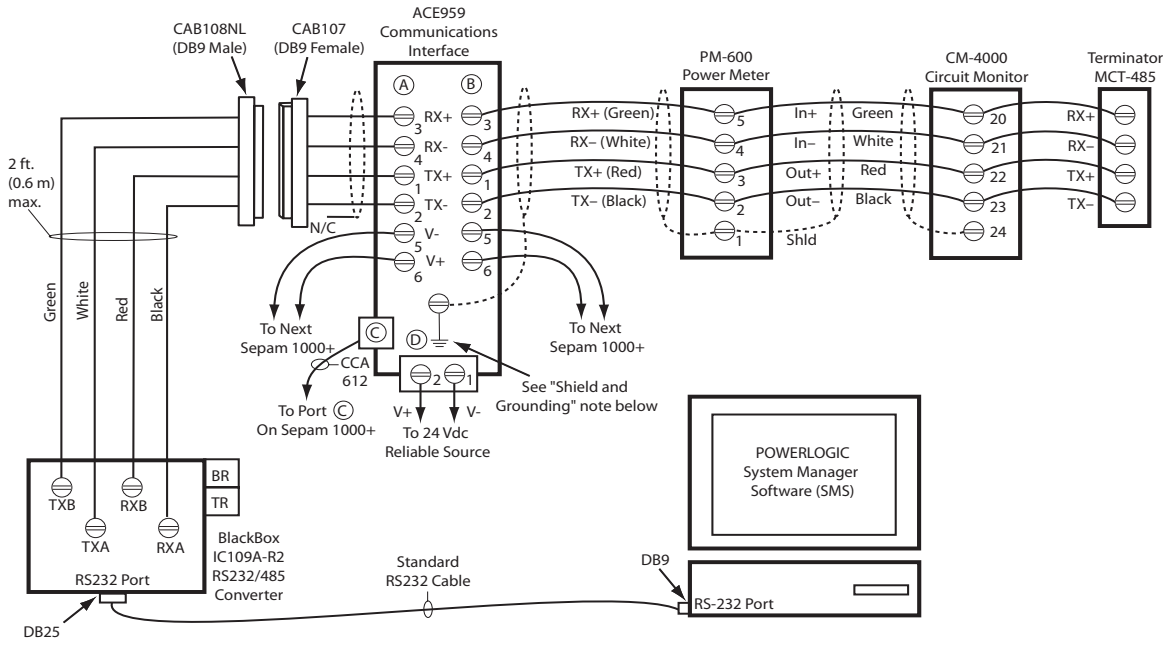
Terminating a device using an MCT-485 and a terminal block

Communications Interface Wiring

For information on Communications Wiring starting at Port C on the base unit, see page 48 and page 52. In North America, 4-wire communications wiring is recommended using the ACE959 communications interface.

This interface requires external 12/24 Vdc control power. See “Communication interface module” on page 52 for information on wiring the ACE959.

The illustrations on the following pages show typical communications network connections.



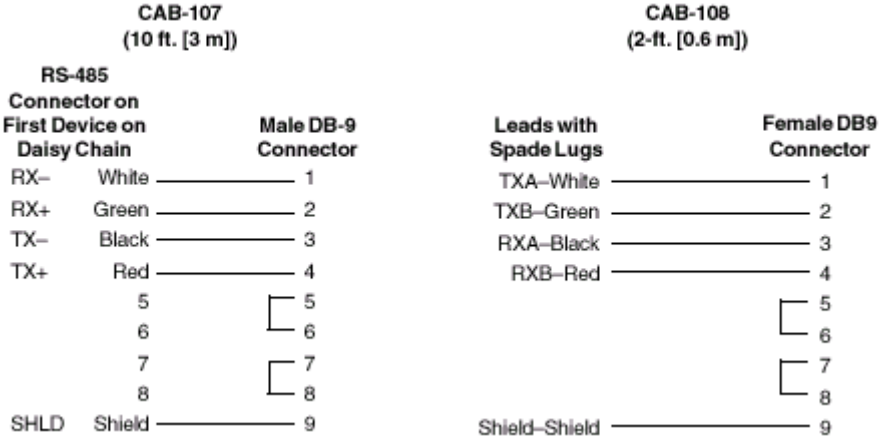
Notes:

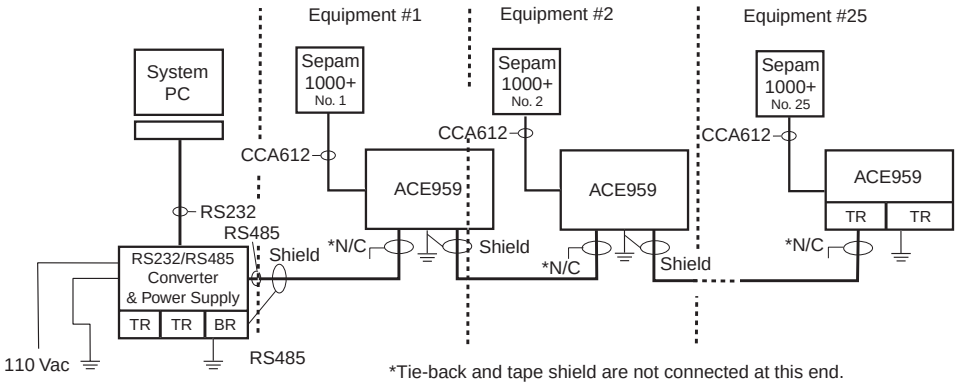
- Shield and Grounding— The shield is broken between two grounded shield termination points. Leave the shield intact from source until just before next shield ground. See Figure 11 on page 60 for more information.
- BR=Biasing Resistor. Also known as Polarizing Resistor (RP).
- TR= Terminating Resistor (also known as RC).
- Tie-back and tape shield are not connected at this end.

Figure 10: Typical Serial Communications Application

Cable Pinouts

Cable pinouts for CAB-107 and CAB-108 cables are shown below.





Notes:
■ RS485 cable is 4-wire plus shield. 2-wire power (24 Vdc) is also required. Recommended cable:
❑ Belden 9841 (1 pair-signal)
❑ Belden 9842 or 8723 (2 pair-signal)
❑ Belden 8760 (1 pair #18-power) or 8719 (1 pair #16-power)
❑ Fileca F3644-1 (2 pair signal/1 pair power)
■ Shield is broken between two grounded shield termination points (typical). Leave the shield intact from source until just before next shield ground.
■ Up to 25 Sepam 1000+ relays (maximum) on daisy chain.
■ TR=Terminating Resistor
■ Two TRs are required at each end of an RS485 4-wire diasy chain (can be accomplished by setting the movable jumpers on Sepam module ACE959, the switches on Black Box converter IC109A-R2, or, for series 2000 circuit monitors, using a Multipoint Communications Adapter MCT-485). For series 4000 circuit monitors and series 600 power meters with a screw-type terminal block, use an MCTAS-485 (or an MCT-485 with a terminal block). Refer to the device instruction bulletin for more details.
■ BR= Biasing Resistor
■ One BR set required per daisy chain (accomplish by setting switch on Black Box converter IC109A-R2; other converters should be checked for configurable biasing [recommended at or near system master]).
■ One recommended RS232/RS485 Converter is Black Box IC109A-R2 (power supply separate).

Figure 11: Network Daisy Chain Practices (including Shield Grounding)

Network Limits for POWERLOGIC Devices

Baud Rate	Maximum Distance feet (meters) 4-Wire RS-485 Daisy Chain	
	1–16 Devices	17-32 Devices
1200	10,000 (3,048)	10,000 (3,048)
2400	10,000 (3,048)	5,000 (1,524)
4800	10,000 (3,048)	5,000 (1,524)
9600	10,000 (3,048)	4,000 (1,219)①
19200	10,000 (3,048)	2,500 (762)
38400	5,000 (1,524)	2,000 (610)

① Lowering network baud rate to 9600 allows 7 POWERLOGIC devices and 25 Sepam 1000+s at 3,690 ft. (1,125 m).

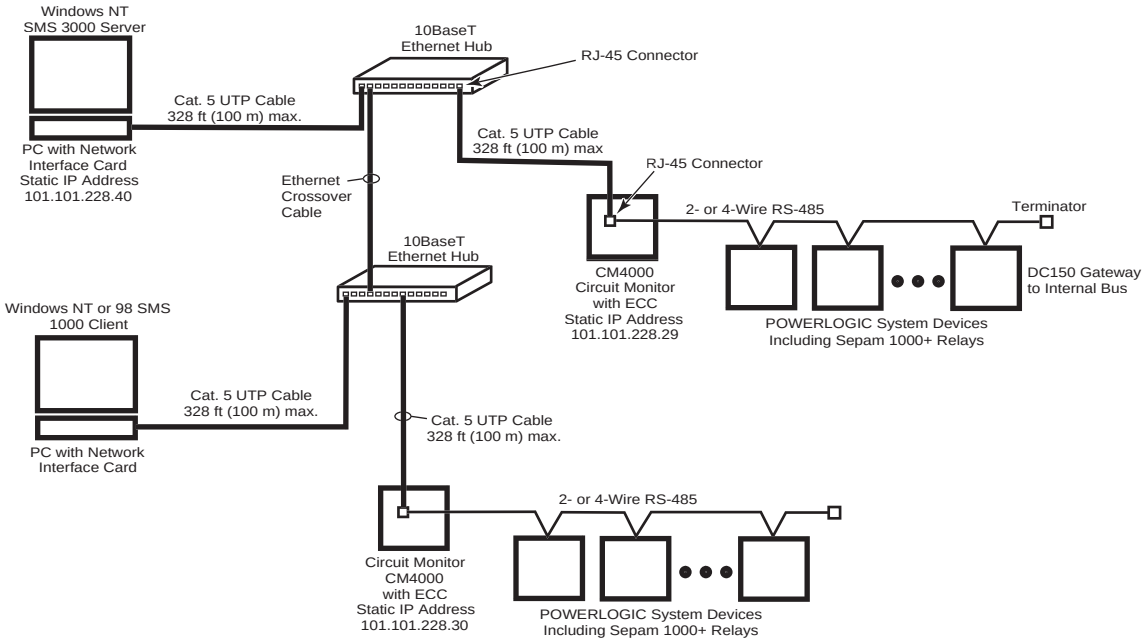
Network Limits for Sepam 1000+ Relays (at max. 38,400 baud rate)

Cable	Distributed Power	Maximum Distance feet (meters) of 4-Wire RS-485 Daisy Chain① Number of Sepam 1000+ Units Connected 5	10	20	25
"Standard"② AWG 24, 2-pair with resistance of 78.5 ohms/km	12 V	1,050 (320)	590 (180)	525 (160)	410 (125)
	24 V	3,281 (1,000)	2,460 (750)	1,476 (450)	1,230 (375)
Fileca F3644-1 specific cable	12 V	3,150 (960)	1,772 (540)	1,575 (480)	1,230 (375)
	24 V	4,265 (1,219)	4,265 (1,300)	4,265 (1,300)	3,690 (1,125)③

① With distributed power supply from one accessory.
② Belden 9841 (1 pair shielded); Belden 9842 or 8723 (2 pair shielded).
③ Lowering network baud rate to 9600 allows 7 POWERLOGIC devices and 25 Sepam 1000+s at 3,690 ft. (1,125 m).

Remote Operation via Ethernet LAN

The illustration below shows a typical POWERLOGIC Power Monitoring and Control System using Ethernet as the high-speed backbone to collect information from various devices and to allow the data to be shared by multiple users on different PCs.



10Base T Star Topology with Ethernet Communications Card (ECC) installed in Circuit Monitor Series 4000

Software

The setting/operation software kit (number SFT2841) includes parameter setting and operating software as well as fault waveform recovery software SFT2826. A cable for connecting a computer to a basic or an advanced UMI is also included.

In addition to the basic and advanced UMIs, you may see references in this document to an "expert UMI." The term "expert UMI" refers to a basic or an advanced UMI used in conjunction with SFT2841 software.

POWERLOGIC System Manager Software

POWERLOGIC System Manager Software can also be used with the Sepam Series 20. For information, refer to *Sepam 1000+ device type in a POWERLOGIC system*, document number 63230-218-200/A1.

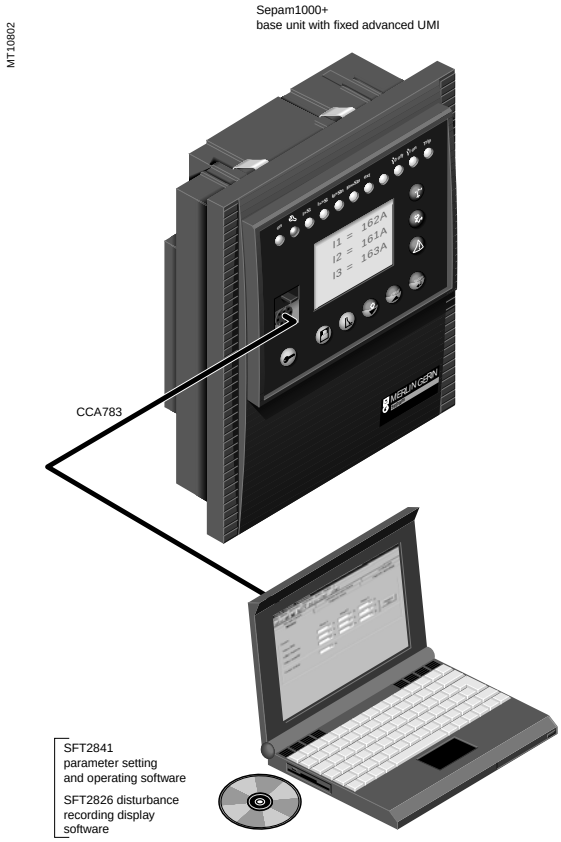
SECTION 4— OPERATION

USER MACHINE INTERFACES

Two different levels of user machine interface (UMI) are offered on the front panel of Sepam:
- basic UMI, with signal LEDs, for installations operated via a remote system with no need for local operation
- advanced UMI, with keypad and graphic LCD display, giving access to all the information necessary for local operation and Sepam parameter setting.

The UMI on the front panel of Sepam may be complemented by an expert UMI comprising the SFT2841 PC software tool, which may be used for all Sepam parameter setting, local operation and customization functions.

The expert UMI comes as a kit, the “SFT2841” kit, which includes:
- a CD-ROM, with
  - SFT2841 setting and operation software
  - SFT2826 fault recording file display software
- CCA783 cable, for connection between the PC and the serial port on the front panel of Sepam.



EXPERT UMI (SFT2841)

The expert UMI is available (as a complement to the basic or advanced UMI integrated in the product) on the screen of a PC equipped with the SFT2841 software tool and connected to the RS 232 port on the front panel of Sepam (run in a Windows ≥ V95 or NT environment).
All the data used for the same task are grouped together in the same screen to facilitate operation. Menus and icons are used for fast, direct access to the required information.

Current operation
- display of all metering and operation data
- display of alarm messages with the time of appearance (date, hour, mn, s, ms) [more than advanced UMI] (2)
- updating time and date when connected to relay (2)
- display of diagnosis data such as: tripping current, number of switchgear operations and cumulative breaking current
- display of all the protection and parameter settings
- display of the logic status of inputs, outputs and signal lamps.

This UMI is the solution suited to occasional local operation, for demanding personnel who require fast access to all the information.

Parameter and protection setting (1)
- display and setting of all the parameters of each protection function in the same page
- program logic parameter setting, parameter setting of general installation and Sepam data
- input data may be prepared ahead of time and transferred into the corresponding Sepam units in a single operation (downloading function). (2)

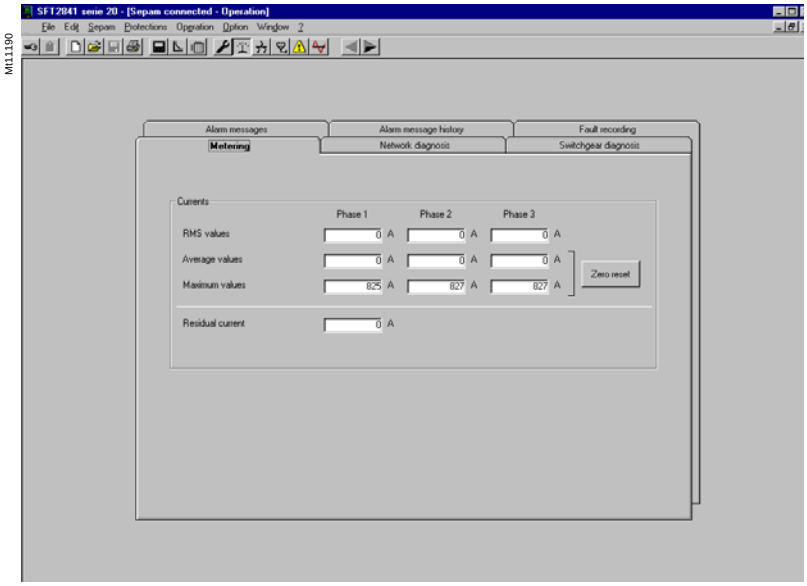
Main functions performed by SFT2841:
- changing of passwords (2)
- entry of general characteristics (ratings, integration period, …)
- entry of protection settings
- changing of program logic assignments (outputs and LEDs configuration)
- editing alarm LED labels (2)
- enabling/disabling of functions
- saving of files (2).

Saving
- protection and parameter setting data may be saved (2)
- printing of reports is possible as well. (2)

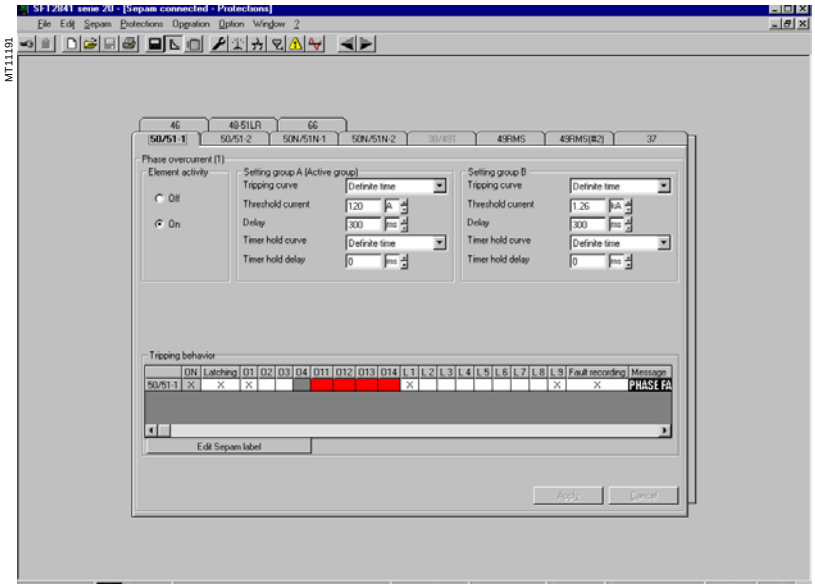
This UMI may also be used to recover fault recording files (2) and provide graphic display using the SFT2826 software tool.

Operating assistance
Access from all the screens to a help section which contains all the technical data required for Sepam installation and use.

(1) Modes accessed via 2 levels of passwords (protection setting level, parameter setting level).
(2) These features are beyond the scope of the advanced UMI.



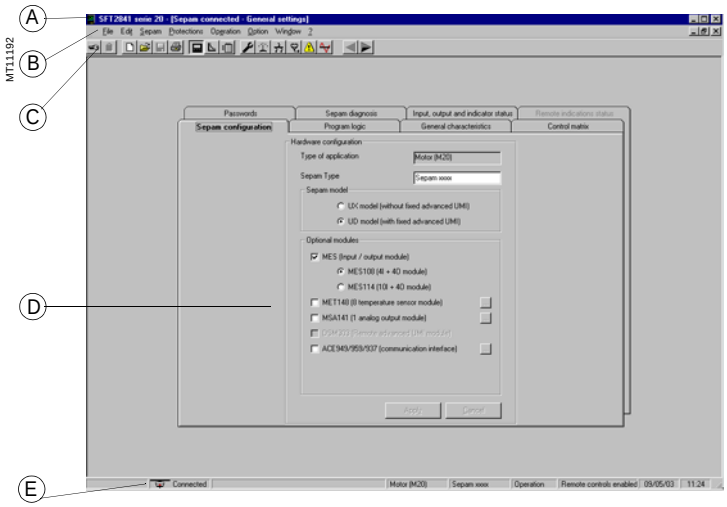
Example of a measurement display screen.



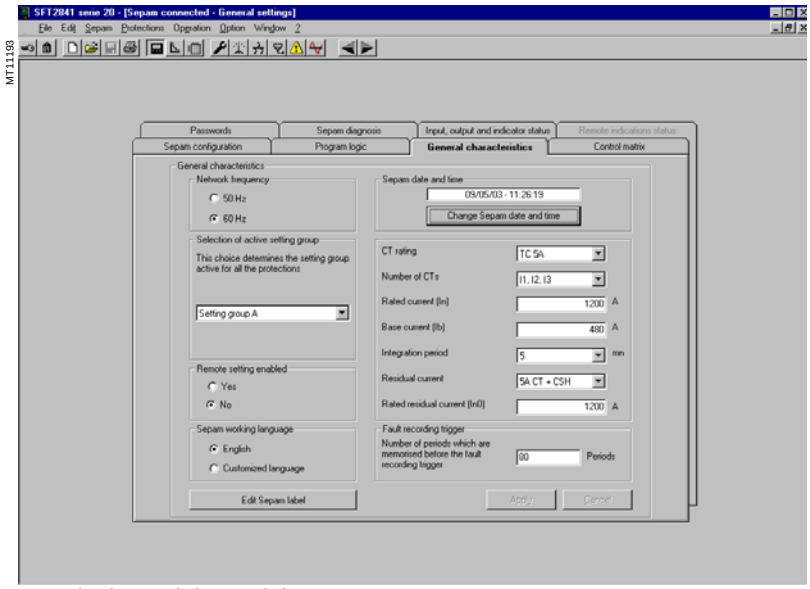
Example of a protection setting screen.

SFT2841 General screen organization

A Sepam document is displayed on the screen via a graphic interface that has the conventional Windows features.
All the SFT2841 software screens are set up in the same way, i.e.:
■ Ⓐ : title bar, with:
□ name of the application (SFT2841)
□ identification of the Sepam document displayed
□ window manipulation handles
■ Ⓑ : menu bar, to access all the SFT2841 software functions (unavailable functions are dimmed)
■ Ⓒ : toolbar, a group of contextual icons for quick access to the main functions (also accessed via the menu bar)
■ Ⓓ : work zone available to the user, presented in the form of tab boxes
■ Ⓔ : status bar, with the following information relating to the active document:
□ alarm on
□ identification of the connection window
□ SFT2841 operating mode, connected or not connected,
□ type of Sepam
□ Sepam editing identification
□ identification level
□ Sepam operating mode
□ PC date and time.



Example of Sepam configuration screen.



Example of general characteristics screen.

Guided navigation

A guided navigation mode is proposed to make it easier to enter all of the Sepam parameter and protection settings. It allows users to go through all the data input screens in the natural order.
The sequencing of the screens in guided mode is controlled by clicking on 2 icons in the toolbar Ⓒ:
■ ◀: to go back to the previous screen
■ ▶: to go to the next screen.

The screens are linked up in the following order:
1. Sepam hardware configuration
2. Program logic
3. General characteristics
4. Setting screens for the protection functions available, according to the type of Sepam
5. Various tabs of the control matrix

On-line help

The operator may look up on-line help at any time via the "?" command in the menu bar.
To use the on-line help, a browser such as Netscape Navigator or Internet Explorer MS is required.

SFT2841 Use of the software

"Not connected to Sepam" mode

Sepam parameter and protection setting

The parameter and protection setting of a Sepam using SFT2841 consists of preparing the Sepam file containing all the characteristics that are specific to the application, a file that is then downloaded into Sepam at the time of commissioning.

Operating mode:

■ create a Sepam file for the type of Sepam to be set up. (The newly created file contains the Sepam factory-set parameter and protection settings)

■ modify the Sepam general settings and protection function settings:

□ all the data relating to the same function are grouped together in the same screen

□ it is advisable to enter all the parameters and protection settings in the natural order of the screens proposed by the guided navigation mode. See preceding page.

Entry of parameter and protection settings:

■ the parameter and protection setting input fields are suited to the type of value:

□ choice buttons (for example, 50 Hz/60 Hz [See page 65.])

□ numerical value input fields

□ dialogue box (Combo box)

■ the user must "Apply" or "Cancel" the new values entered before going on to the following screen

■ the consistency of the new values applied is checked:

□ an explicit message identifies inconsistent values and specifies the authorized values

□ values that have become inconsistent following a parameter modification are replaced by "****" and must be corrected.

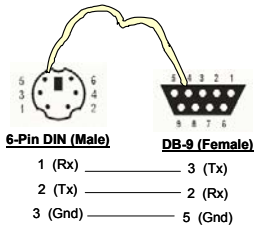
> **⚠ CAUTION**
>
> **HAZARD OF UNINTENDED OPERATION**
>
> A new setting is not applied to the Sepam 1000+ configuration until you press the *enter* button to store the new setting. If the "CHECK SETTINGS" message appears when you press *enter*, the new setting conflicts with other settings.
>
> **Failure to do so could result in unintended operation of the trip output contacts.**

"Connected to Sepam" mode

Precaution

When using a laptop, discharge to a grounded metal frame before physically connecting the CCA783 cable (supplied with the SFT2841 kit).

CCA783 Cable pinouts



Plugging into Sepam

■ plugging of the 9-pin connector (SUB-D type) into one of the PC communication ports. Configuration of the PC communication port via the "Communication port" function in the "Options" menu

■ plugging of the 6-pin connector into the connector (round minidin type) situated behind the blanking plate on the front panel of Sepam or the DSM303 module.

Connection to Sepam

2 possibilities for setting up the connection between SFT2841 and Sepam:

■ "Connection" function in the "File" menu

■ choice of "connect to the Sepam" at the start-up of SFT2841.

Once the connection with Sepam has been established, "Connected" appears in the status bar, and the Sepam connection window may be accessed in the work zone.

User identification

The window intended for the entry of the 4-digit password is activated:

■ via the "Passwords" tab

■ via the "Identification" function in the "Sepam" menu

■ via the "Identification" icon .

The "Return to Operating mode" function in the "Passwords" tab removes access rights to parameter and protection setting mode.

Downloading of parameters and protection settings

Parameter and protection setting files may only be downloaded in the connected Sepam in Parameter setting mode.

Once the connection has been established, the procedure for downloading a parameter and protection setting file is as follows:

■ activate the "Download Sepam" function in the "Sepam" menu

■ select the file(*.rpg) which contains the data to be downloaded.

Return to factory settings

This operation is only possible in Parameter setting mode, via the "Sepam" menu. All of the Sepam general characteristics, protection settings and the control matrix go back to the default values.

Uploading of parameter and protection settings

The connected Sepam parameter and protection setting file may only be uploaded in Operating mode.

Once the connection has been established, the procedure for uploading a parameter and protection setting file is as follows:

■ activate the "Upload Sepam" function in the "Sepam" menu

■ select the *.rpg file that is to contain the uploaded data

■ acknowledge the end of operation report.

Local operation of Sepam

Connected to Sepam, SFT2841 offers all the local operating functions available in the advanced UMI screen, plus the following functions:

■ setting of Sepam internal clock, via the "general characteristics" tab

■ implementation of the disturbance recording function, via the "Fault recording" menu "OPG": validation/inhibition of the function, recovery of Sepam files, start-up of SFT2826

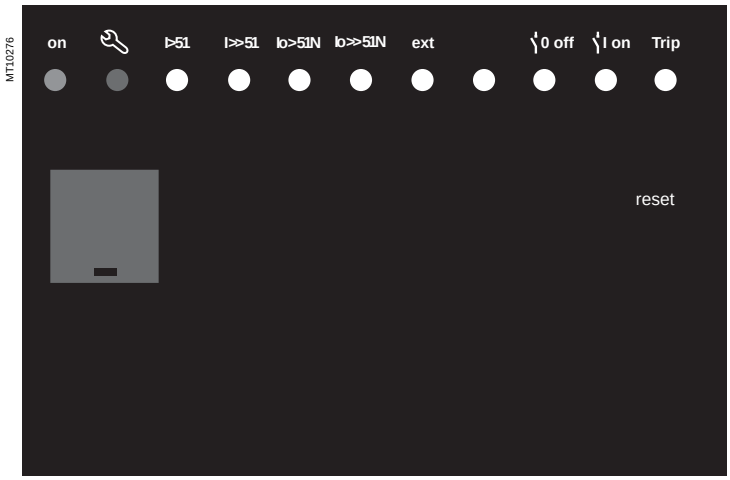
■ consultation of the history of the last 64 Sepam alarms, with time-tagging

■ access to Sepam diagnostic data, in the "Sepam" tab box, included in "Sepam diagnosis"

■ in Parameter setting mode, the switchgear diagnostic values may be modified: operation counter, cumulative breaking current to reset the values after a change of breaking device.

BASIC UMI ON RELAY

This UMI includes:
■ 2 signal lamps indicating Sepam operating status:
□ green "**on**" indicator: device on
□ red "**wrench**" indicator: device unavailable (initialization phase or equipment malfunction)
■ 9 parameterizable yellow signal lamps, fitted with a standard label (with SFT2841, a customized label can be printed on a laser printer)
■ "**reset**" button for clearing and resetting alarms and trips
■ 1 connection port for the RS 232 link with the PC (CCA783 cable), the connector is protected by a sliding cover (blanking cover). ⑩

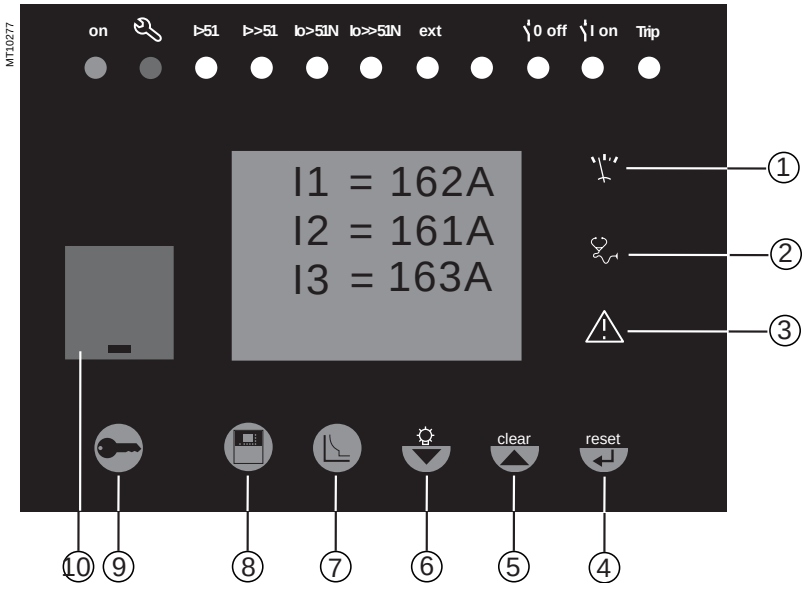


Advanced UMI on Relay or Remote

In addition to the basic UMI functions, this version provides:
■ **a "graphic" LCD display** for the display of measurements, parameter/protection settings and alarm and operating messages.
The number of lines, size of characters and symbols are in accordance with the screens and language versions.
The LCD display is back-lit when the user presses a key.
■ **a 9-key keypad with 2 operating modes:**

White keys for current operation:
① display of measurements,
② display of switchgear and network diagnosis data,
③ display of alarm messages,
④ resetting,
⑤ acknowledgment and clearing of alarms.

Blue keys activated in parameter and protection setting mode:
⑦ access to protection settings,
⑧ access to Sepam parameter setting,
⑨ used to enter the 2 passwords required to change protection and parameter settings.
The "↵, ▲, ▼ " (④, ⑤, ⑥) keys are used to browse through the menus and to scroll and accept the values displayed.
⑥ "**lamp test" key:**
switching on sequence of all the signal lamps.



ADVANCED UMI

Access Levels of Use

There are 3 levels of use:

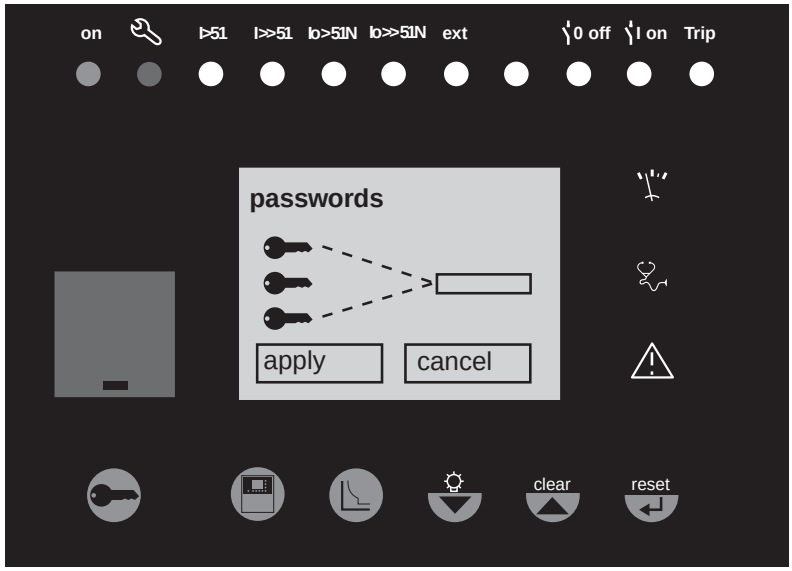
■ operator level: used to access all the screens in read mode and does not require any passwords

■ relay technician level: requires the entry of the first password (key), allows protection setting (key)

■ relay engineer level: requires the entry of the second password (key), allows modification of the general settings as well (key).

Only relay engineer level may modify the passwords.

The passwords have 4 digits.



Access to measured and calculated data (operator level)

The measurements and parameters may be accessed using the metering, diagnosis, status and protection keys. They are arranged in a series of screens as shown in the diagram opposite.

■ the data are split up by category in 4 menus, associated with the following 4 keys:

□ key: measurements

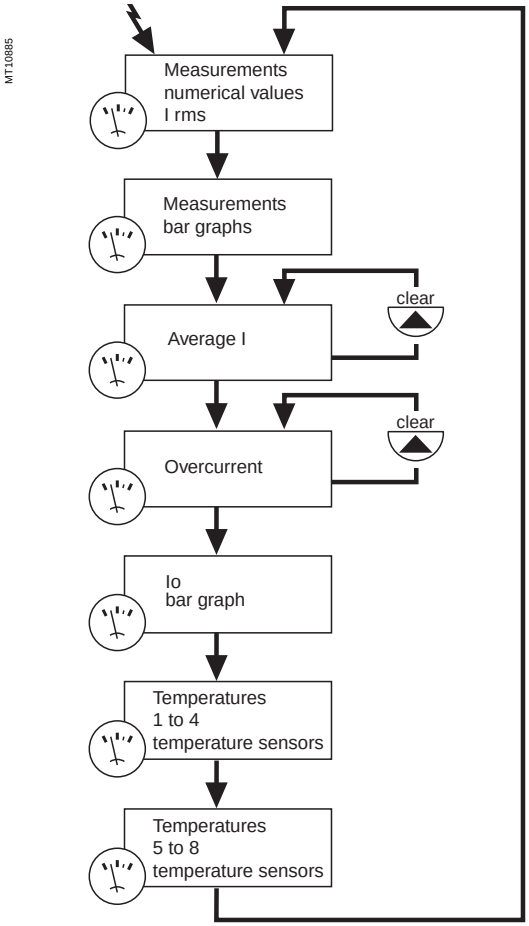
□ key: switchgear diagnosis and additional measurements

□ key: general settings

□ key: protection settings

□ when the user presses a key, the system moves on to the next screen in the loop. When a screen includes more than 4 lines, the user moves about in the screen via the cursor keys (▲,▼).

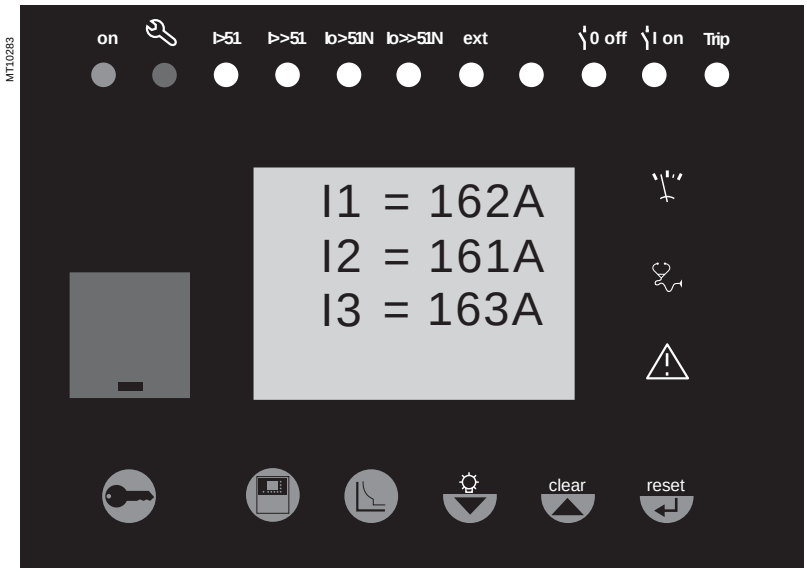
Example: measurement loop



White keys for current operation

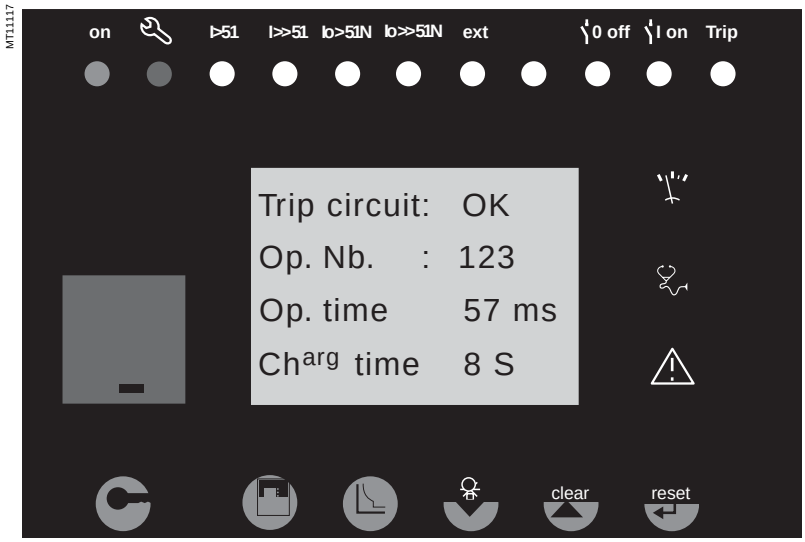
key

The "metering" key is used to display the variables measured by Sepam.



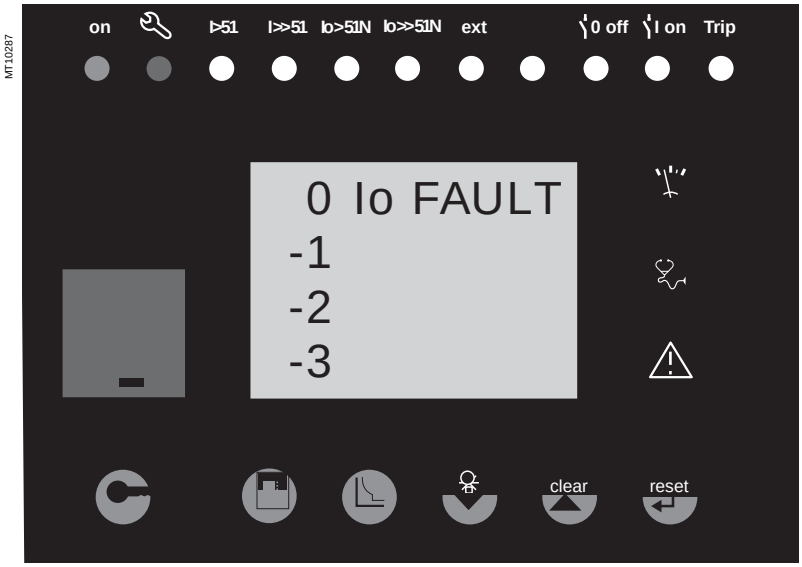
key

The “diagnosis” key provides access to diagnostic data on the circuit breaker or contactor and additional measurements, to facilitate fault analysis.



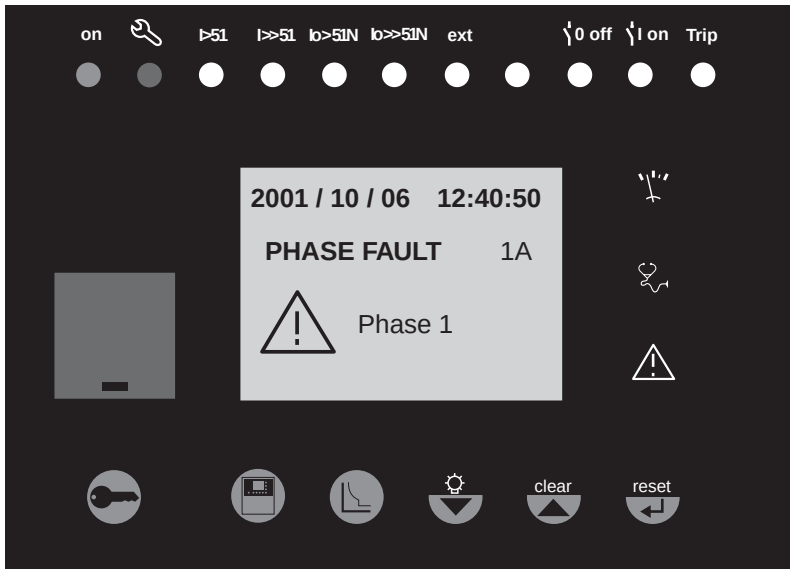
key

The “alarms” key is used to consult the 16 most recent alarms that have not yet been cleared.



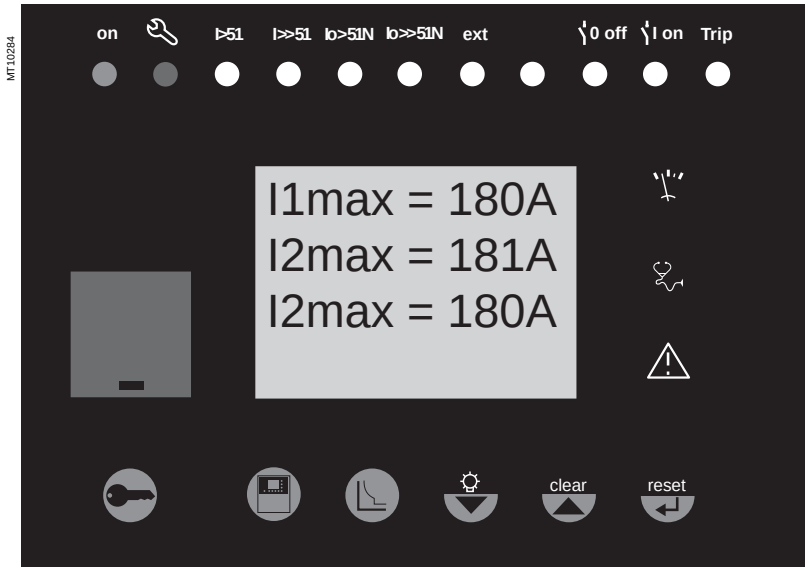
reset key

The “reset” key resets Sepam (extinction of signal lamps and resetting of protection units after the disappearance of faults).
The alarm messages are not erased.
Sepam resetting must be confirmed.



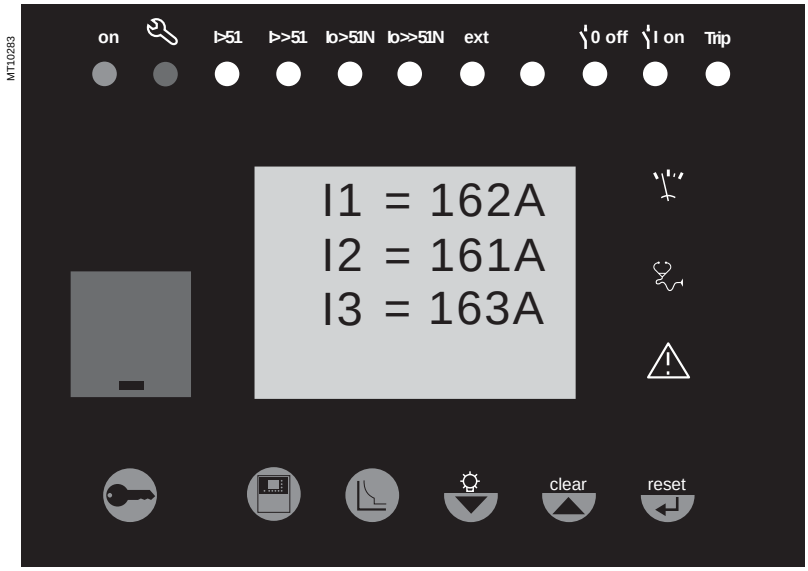
key

When an alarm is present on the Sepam display, the "clear" key is used to return to the screen that was present prior to the appearance of the alarm or to a less recent unacknowledged alarm. Sepam is not reset.
In the metering or diagnosis or alarm menus, the "clear" key may be used to reset the average currents, peak demand currents, running hours counter and alarm stack when they are shown on the display.



key

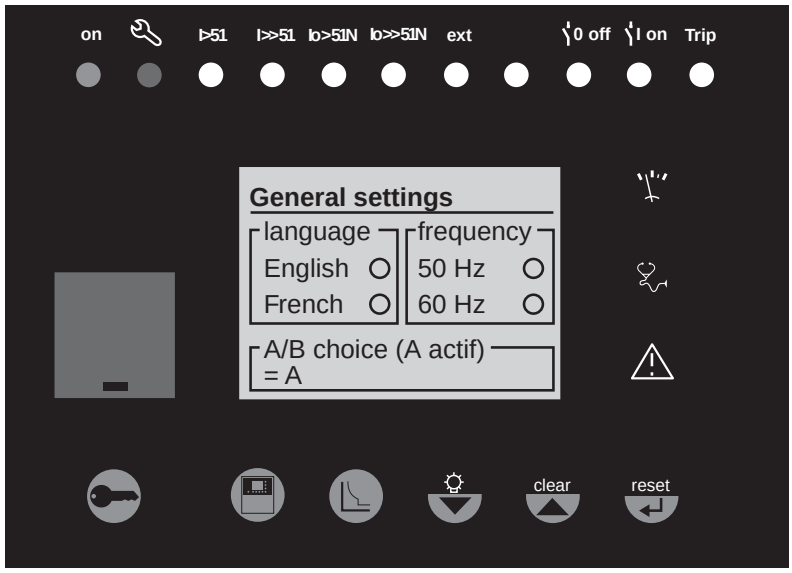
Press the "lamp test" key for 5 seconds to start up a LED and display test sequence.
When an alarm is present, the "lamp test" key is disabled.



Blue keys for parameter and protection setting

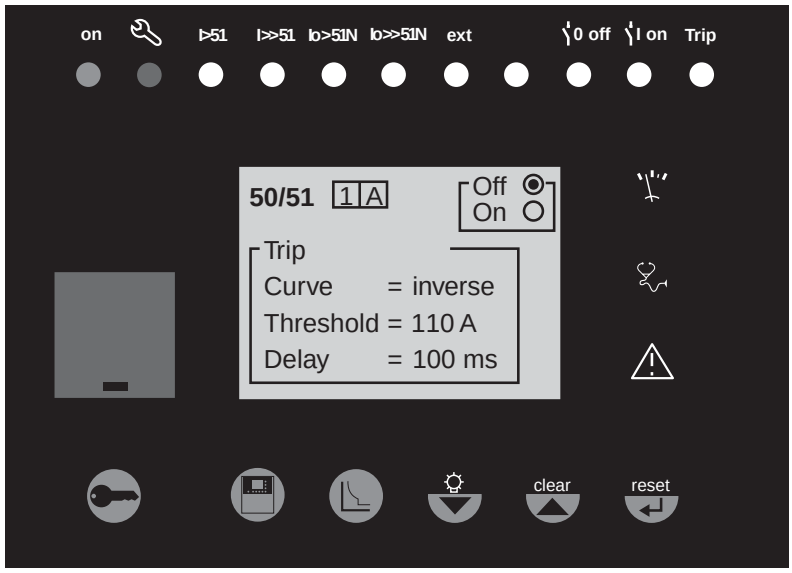
key

The “status” key is used to display and enter the Sepam general settings. They define the protected equipment characteristics and the different optional modules.



key

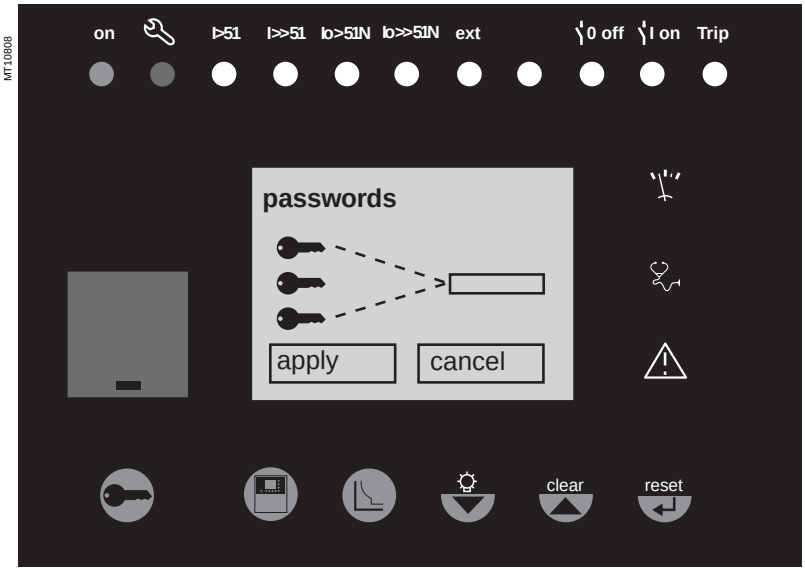
The “protection” key is used to display, set and enable or disable the protection units.



key

The access key is used to enter the passwords for access to the different modes:
- protection setting
- parameter setting.

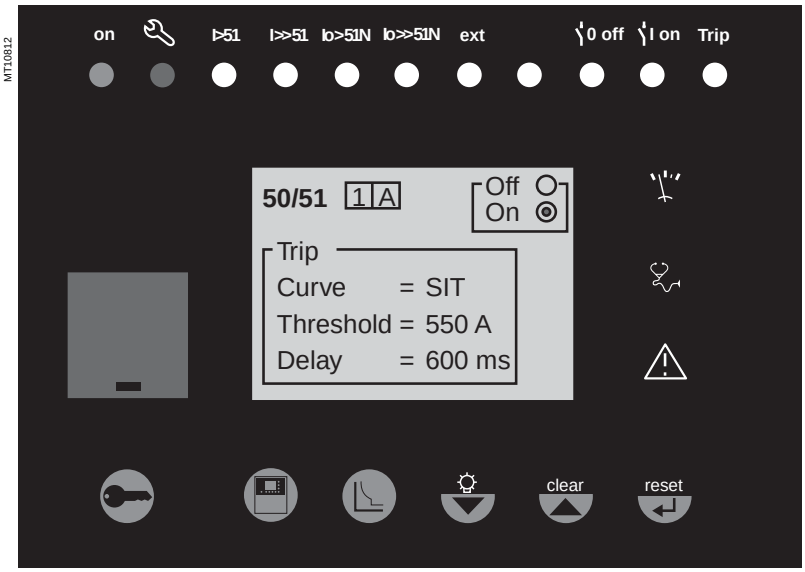
and return to "operating" mode (with no passwords).



Note: *for parameter setting of alarm LEDs and output relays, it is necessary to use the SFT2841 software, "program logic" menu.*

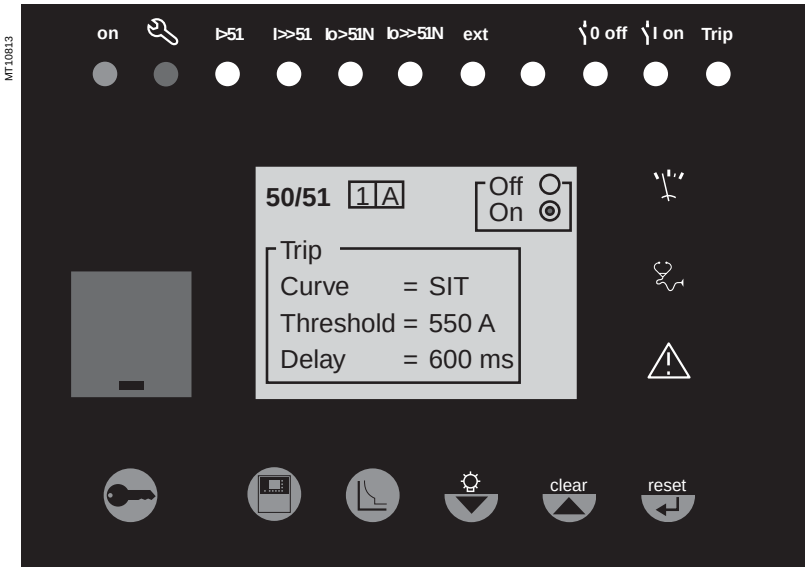
key

The ↵ key is used to confirm the protection settings, parameter settings and passwords.



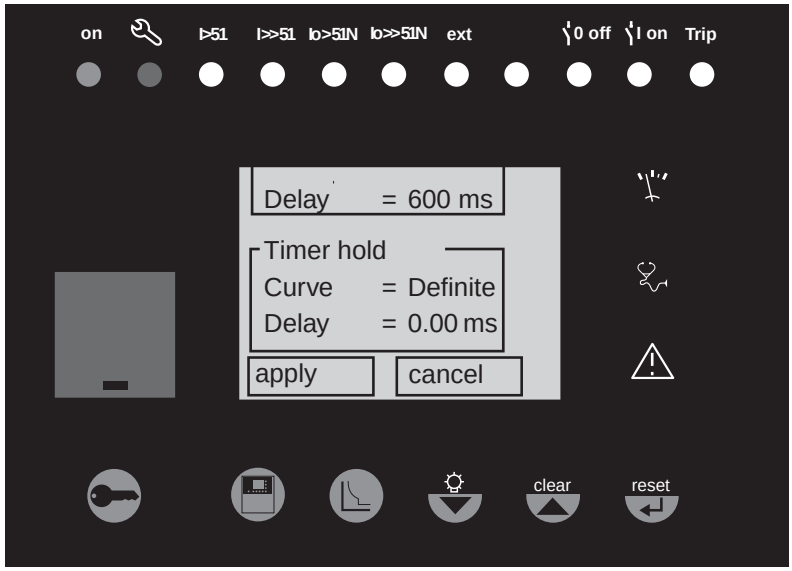
clear key

When there are no alarms on the Sepam display and the user is in the status, protection or alarm menu, the ▲ key is used to move the cursor upward.



key

When there are no alarms on the Sepam display and the user is in the status, protection or alarm menu, the ▼ key is used to move the cursor downward.



DATA ENTRY

Passwords

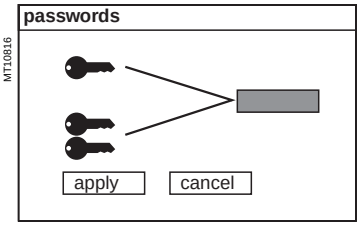
Sepam has two 4-digit passwords:

- the first password, symbolized by a key, is used to modify the protection settings
- the second password, symbolized by two keys, is used to modify the protection settings and all the general settings.

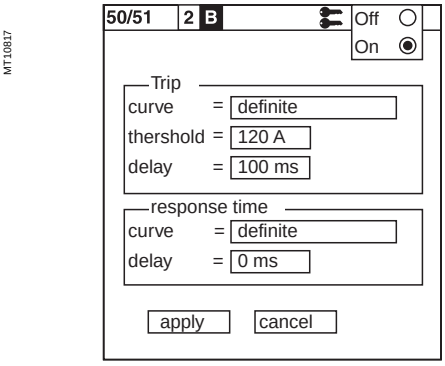
The 2 factory-set passwords are: 0000

Entry of passwords

Press the key to display the following screen:



Press the key to position the cursor on the first digit.
0 X X X
Scroll the digits using the cursor keys (▲, ▼), then confirm to go on to the next digit by pressing the key.
Do not use characters other than numbers 0 to 9 for each of the 4 digits.
When the password for your qualification level is entered, press the ▼ key to position the cursor on the apply box. Press the key again to confirm.
When Sepam is in protection setting mode, a key appears at the top of the display.
When Sepam is in parameter setting mode, two keys appear at the top of the display.



Access to the protection setting or parameter setting modes is disabled:

- by pressing the key
- automatically if no keys are activated for more than 5 minutes.

Modification of passwords

Only the parameter setting qualification level (2 keys) or the SFT2841 allow modification of the passwords. Passwords are modified in the general settings screen, key.

Loss of passwords

If the factory-set passwords have been modified and the latest passwords entered have been irretrievably lost by the user, please contact your local after-sales service representative.

General or Protection Settings Entry

Procedure for all Sepam screens

(example of phase overcurrent protection)

- enter the password
- access the corresponding screen by successively pressing the key
- move the cursor by pressing the ▼ key for access to the desired field (e.g. curve)
- press the key to confirm the choice, then select the type of curve by pressing the ▼ or ▲ key and confirm by pressing the key
- press the ▼ key to reach the following fields, up to the apply box. Press the key to confirm the setting.

Entry of numerical values

(e.g. current threshold value).

- position the cursor on the required field using the ▲ ▼ keys and confirm the choice by pressing the key
- select the first digit to be entered and set the value by pressing the ▲ ▼ keys (choice of ____. 0……9)
- press the key to confirm the choice and go on to the following digit.

The values are entered with 3 significant digits and a period.
The unit (e.g. A or kA) is chosen using the last digit.

- press the key to confirm the entry, then press the key for access to the following field
- all of the values entered are only effective after the user confirms by selecting the apply box at the bottom of the screen and presses the key.

DEFAULT PARAMETERS, ALL APPLICATIONS

The Sepam units are delivered with default parameter setting and protection setting according to the type of application.
These "factory" settings are also used with the SFT2841 software:
■ for the creation of new files in not connected mode
■ for a return to the "factory" settings in connected mode.

S20, T20 and M20 applications

Hardware configuration
■ identification: Sepam xxxx
■ model: UX
■ MES module: absent
■ MET module: absent
■ MSA module: absent
■ DSM module: present
■ ACE module: absent.

Output parameter setting
■ outputs used: O1 to O4
■ shunt trip units: O1, O3
■ undervoltage trip units: O2, O4
■ impulse mode: no (latched).

Program logic
■ circuit breaker control: no
■ logic discrimination: no
■ logic input assignment: not used.

General characteristics
■ network frequency: 50 Hz
■ group of settings: A
■ enable remote setting: no
■ working language: English
■ CT rating: 5 A
■ number of CTs: 3 (I1, I2, I3)
■ rated current In: 630 A
■ basic current Ib: 630 A
■ integration period: 5 mn
■ residual current: 3I sum
■ pre-trig for disturbance recording: 36 periods.

Protection functions
■ all the protections are "off"
■ the settings comprise values and choices that are informative and consistent with the general characteristics by default (in particular rated current In)
■ tripping behavior:
□ latching: yes
□ activation of output O1: yes
■ disturbance recording triggering: with.

Control matrix
Each Sepam 1000+ has program logic by default according to the type (S20, T20,…) as well as messages for the different signal lamps.
The functions are assigned according to the most frequent use of the unit. This parameter setting may be customized if required using the SFT2841 software package.
■ S20 application:
□ activation of output O2 upon protection tripping
□ activation of indicators according to front panel markings
□ watchdog on output O4
□ disturbance recording triggering upon signal pick-up.
■ complements for T20 application:
□ activation of O1 without latching upon tripping of temperature monitoring 1 to 7
□ activation of O1 and indicator L9 without latching upon thermal overload tripping.
■ complements for M20 application:
□ activation of outputs O1 and O2 and indicator L9 upon tripping of functions 37 phase undercurrent) and 51 LR (locked rotor)
□ activation of output O2 upon tripping of function 66 (starts per hour)
■ latching for function 51 LR.

B21(1) and B22 applications

Hardware configuration

- identification: Sepam xxxx
- model: UX
- MES module: absent
- MET module: absent
- MSA module: absent
- DMS module: present
- ACE module: absent.

Output parameter setting

- outputs used: O1 to O4
- shunt coils: O1 to O3
- undervoltage coils: O4
- impulse mode: no (latched).

Program logic

- circuit breaker control: no
- assignment of logic inputs: not used.

General characteristics

- network frequency: 50 Hz
- enable remote setting: no
- working language: English
- primary rated voltage (Unp): 20 kV
- secondary rated voltage (Uns): 100 V
- voltages measured by VTs: V1, V2, V3
- residual voltage: sum of 3Vs
- pre-trig for disturbance recording: 36 periods.

Protection functions

- all the protection functions are “off”
- the settings comprise values and choices that are informative and consistent with the general characteristics by default
- latching: no
- disturbance recording triggering: with.

Control matrix

- assignment of output relays and indicators according to chart:

Functions		Outputs				Indicators								
B21	B22	O1	O2	O3	O4	L1	L2	L3	L4	L5	L6	L7	L8	L9
27D-1	27D-1		■				■							
27D-2	27D-2	■					■							■
27R	27R			■				■						
27-1	27-1		■			■								
27-2	27-2	■				■								■
27S-1	27S-1	■				■								■
27S-2	27S-2	■				■								■
27S-3	27S-3	■				■								■
59-1	59-1		■						■					
59-2	59-2	■							■					■
59N-1	59N-1		■							■				
59N-2	59N-2	■								■				■
81H	81H	■									■			■
81L-1	81L-1		■									■		
81L-2	81L-2	■											■	■
	81R	■											■	■

- disturbance recording triggering upon signal pick-up
- watchdog on output O4.

Indicator marking

L1 : U < 27
L2 : U < 27D
L3 : U < 27R
L4 : U > 59
L5 : U > 59N
L6 : F > 81H
L7 : F < 81L
L8 : F << 81L
L9 : Trip

(1) Type B21 performs the same functions as cancelled type B20.

COMMISSIONING

Principles and Methods

Protection relay testing

Protection relays are tested prior to commissioning, with the dual aim of maximizing availability and minimizing the risk of malfunctioning of the assembly being commissioned. The problem consists of defining the consistency of the appropriate tests, keeping in mind that the relay is always involved as the main link in the protection chain.
Therefore, protection relays based on electromechanical and static technologies, must be systematically submitted to detailed testing, not only to qualify relay commissioning, but also to check that they actually are in good operating order and maintain the required level of performance.

The Sepam concept makes it possible to do away with such testing, since:

- the use of digital technology guarantees the reproducibility of the performances announced
- each of the Sepam functions has undergone full factory-qualification
- an internal self-testing system provides continuous information on the state of the electronic components and the integrity of the functions (e.g. automatic tests diagnose the level of component polarization voltages, the continuity of the analog value acquisition chain, non-alteration of RAM memory, absence of settings outside the tolerance range) and thereby guarantees a high level of availability

Sepam is therefore ready to operate without requiring any additional qualification testing that concerns it directly.

Sepam commissioning tests

The preliminary Sepam commissining tests may be limited to a commissioning check, i.e.:

- checking of compliance with BOMs and hardware installation diagrams and rules during a preliminary general check
- checking of the compliance of the general settings and protection settings entered with the setting sheets
- checking of current or voltage input connection by secondary injection tests
- checking of logic input and output connection by simulation of input data and forcing of output status
- validation of the complete protection chain (possible customized logical functions included)
- checking of the connection of the optional MET148-2 and MSA141 modules.

The various checks are described further on.

General principles

- **all the tests should be carried out with the MV cubicle completely isolated and the MV circuit breaker racked out (disconnected and open)**
- **all the tests are to be performed in the operating situation: no wiring or setting changes, even temporary changes to facilitate testing, are allowed.**
- the SFT2841 parameter setting and operating software is the basic tool for all Sepam users. It is especially useful during Sepam commissioning tests. The tests described in this document are systematically based on the use of that tool.

The commissioning tests may be performed without the SFT2841 software for Sepam units with advanced UMIs.

Method

For each Sepam:

- only carry out the checks suited to the hardware configuration and the functions activated

(A comprehensive description of all the tests is given further on)

- use the test sheet provided to record the results of the commissioning tests.

Checking of current or voltage input connections

The secondary injection tests to be carried out to check the connection of the current and voltage inputs are described according to:

- the type of current or voltage sensors connected to Sepam, in particular for residual current or voltage measurement
- the type of injection generator used for the tests: single-phase generator.

The different possible tests are described further on by:

- a detailed test procedure
- the connection diagram of the associated test generator.

The table below specifies the tests to be carried out according to the type of measurement sensors and type of generator used, and indicates the page on which each test is described.

Current sensors	**3 CTs**	**1 core balance CT**		
Voltage sensors			**3 VTs**	**1 residual VT**
Single-phase generator	See page 82.	See page 83.	See page 84.	See page 85.

Testing and metering equipment required

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, BURN, OR EXPLOSION

- This equipment must be installed and serviced only by qualified personnel.
- Qualified persons performing diagnostics or troubleshooting that require electrical conductors to be energized must comply with NFPA 70 E - Standard for Electrical Safety Requirements for Employee Workplaces and OSHA Standards - 29 CFR Part 1910 Subpart S - Electrical.
- Carefully inspect the work area for tools and objects that may have been left inside the equipment.
- Use caution while removing or installing panels so that they do not extend into the energized bus; avoid handling the panels, which could cause personal injury.

Failure to follow these instructions will result in death or serious injury.

Generators

■ dual sinusoidal AC current and voltage generator:
□ 50 or 60 Hz frequency (according to the country)
□ current adjustable 0–50A rms
□ adjustable voltage 0–150V
□ single-phase type
■ DC voltage generator:
□ adjustable from 48 to 250 V DC, for adaptation to the voltage level of the logic input being tested.

Accessories

■ plug with cord to match the "current" test terminal box installed
■ plug with cord to match the "voltage" test terminal box installed
■ electric cord with clamps, wire grip or touch probes.

Metering devices (built into the generator or separate)

■ 1 ammeter, 0 to 50 A rms
■ 1 voltmeter, 0 to 150 V rms

Computer equipment

■ PC with minimal configuration:
□ MicroSoft Windows 95 / 98 / NT 4.0 / XP / 2000
□ 133 MHz Pentium processor,
□ 64 MB of RAM (or 32 MB with Windows 95 / 98
□ 64 MB free on hard disk
□ CD-ROM drive
■ SFT2841 software
■ CCA783 serial connection cord between the PC and Sepam.

Documents

■ complete connection diagram of Sepam and additional modules, with:
□ phase current input connection to the corresponding CTs via the test terminal box
□ residual current input connection
□ phase voltage input connection to the corresponding VTs via the test terminal box
□ residual voltage input connection to the corresponding VTs via the test terminal box
□ logic input and output connection
□ temperature sensor connection
□ analog output connection
■ hardware BOMs and installation rules
■ group of Sepam parameter and protection settings, available in paper format.

Pre-test Equipment Check

Checking to be done prior to energizing

Apart from the mechanical state of the equipment, use the diagrams and BOMs provided by the contractor to check:
■ identification of Sepam and accessories determined by the contractor
■ correct grounding of Sepam (via terminal 17 of the 20-pin connector)
■ correct connection of auxiliary voltage (terminal 1: AC or positive polarity; terminal 2: AC or negative polarity)
■ presence of a residual current measurement core balance CT and/or additional modules connected to Sepam, when applicable
■ presence of test terminal boxes upstream from the current inputs and voltage inputs
■ conformity of connections between Sepam terminals and the test terminal boxes.

Connections

Check that the connections are tightened (with equipment non-energized).
The Sepam connectors must be correctly plugged in and locked.

Energizing

Switch on the auxiliary power supply.
Check that Sepam performs the following initialization sequence, which lasts approximately 6 seconds :
■ green ON and red indicators on
■ red indicator off
■ pick-up of "watchdog" contact.
The first screen displayed is the phase current measurement screen.

Implementation of the SFT2841 software for PC

■ start up the PC
■ connect the PC RS232 serial port to the communication port on the front panel of Sepam using the CCA783 cable
■ start up the SFT2841 software, by clicking on the related icon
■ choose to connect to the Sepam to be checked.

Identification of Sepam

■ note the Sepam serial number given on the label stuck to the right side plate of the base unit
■ note the Sepam type and software version using the SFT2841 software, "Sepam Diagnosis" screen
■ enter them in the test sheet. See page 88.

Pre-test Settings Check

Determination of parameter and protection settings

All of the Sepam parameter and protection settings are determined ahead of time by the design department in charge of the application, and should be approved by the customer.
It is presumed that the study has been carried out with all the attention necessary, or even consolidated by a network coordination study.
All of the Sepam parameter and protection settings should be available at the time of commissioning:
- in paper file format (with the SFT2841 software, the parameter and protection setting file for a Sepam may be printed directly or exported in a text file for editing)
- and, when applicable, in the format of a file to be downloaded into Sepam using the SFT2841 software.

Checking of parameters and protection settings

Verify that settings are study values instead of default settings.
The aim of this check is not to confirm the relevance of the parameter and protection settings.
- go through all the parameter and protection setting screens in the SFT2841 software, in the order proposed in guided mode
- for each screen, compare the values entered in the Sepam with the values recorded in the parameter and protection setting file
- correct any parameter and protection settings that have not been entered correctly, proceeding as indicated in the "Expert UMI" section of the Use chapter of this manual.

Conclusion

Once the checking has been done and proven to be conclusive, as of that phase, the parameter and protection settings should not be changed any further and are considered to be final.
In order to be conclusive, the tests which follow must be performed with these parameter and protection settings; no temporary modification of any of the values entered, with the aim of facilitating a test, is permissible.

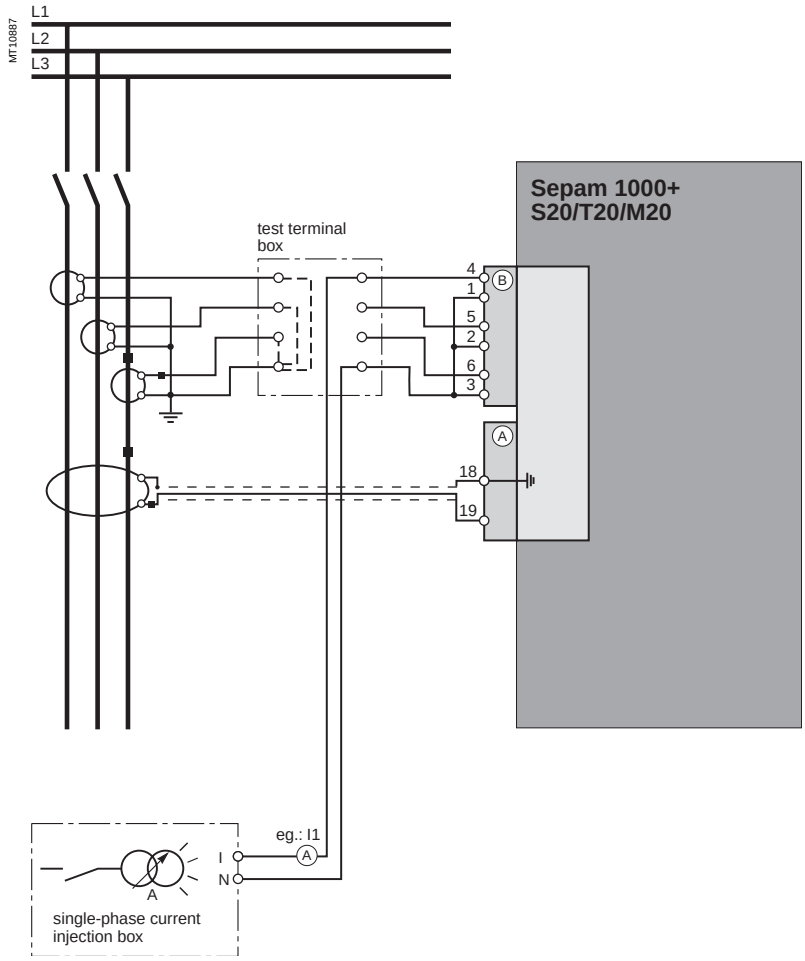
Checking of phase current input connection

Description:

Check to be carried out for Sepam 1000+ S20, T20 or M20.

Procedure:

■ to inject a current into the phase 1 input, connect the single-phase generator to the test terminal box using the plug provided, in accordance with the diagram below:



■ turn on the generator
■ inject the CT rated secondary current, i.e. 1 A or 5 A
■ use the SFT2841 software to check that the phase 1 current value is approximately equal to the CT rated primary current
■ if the residual current is calculated by taking the sum of the 3 phase currents, use the SFT2841 software to check that the residual current value is approximately equal to the CT rated primary current
■ if the residual current is measured via 3 phase CTs connected to a CSH30 interposing ring CT, use the SFT2841 software to check that the residual current value is approximately equal to the CT rated primary current
■ turn off the generator
■ proceed in the same way for the other 2 phase current inputs
■ at the end of the test, put the cover back on the test terminal box.

Checking of residual current input connection

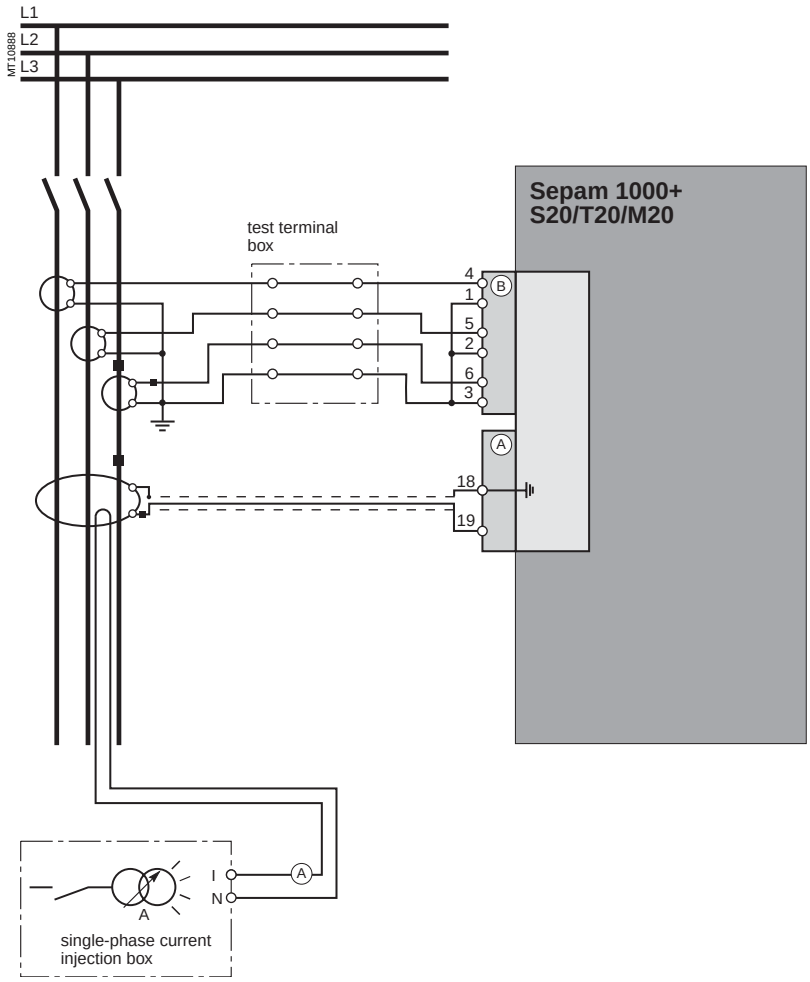
Description:

Check to be carried out for Sepam 1000+ S20, T20 or M20, when the residual current is measured by a specific sensor:

- CSH120 or CSH200 core balance CT
- another core balance CT connected to an ACE990 interface
- a single 1 A or 5 A CT encompassing the 3 phases, connected to a CSH30 interposing ring CT.

Procedure:

- connect the single-phase current generator to inject current into the primary circuit of the core balance CT or the CT, in accordance with the diagram below:



- turn on the generator
- inject a 5 A primary residual current
- use the SFT2841 software to check that the residual current value is approximately equal to 5 A
- turn the generator off.

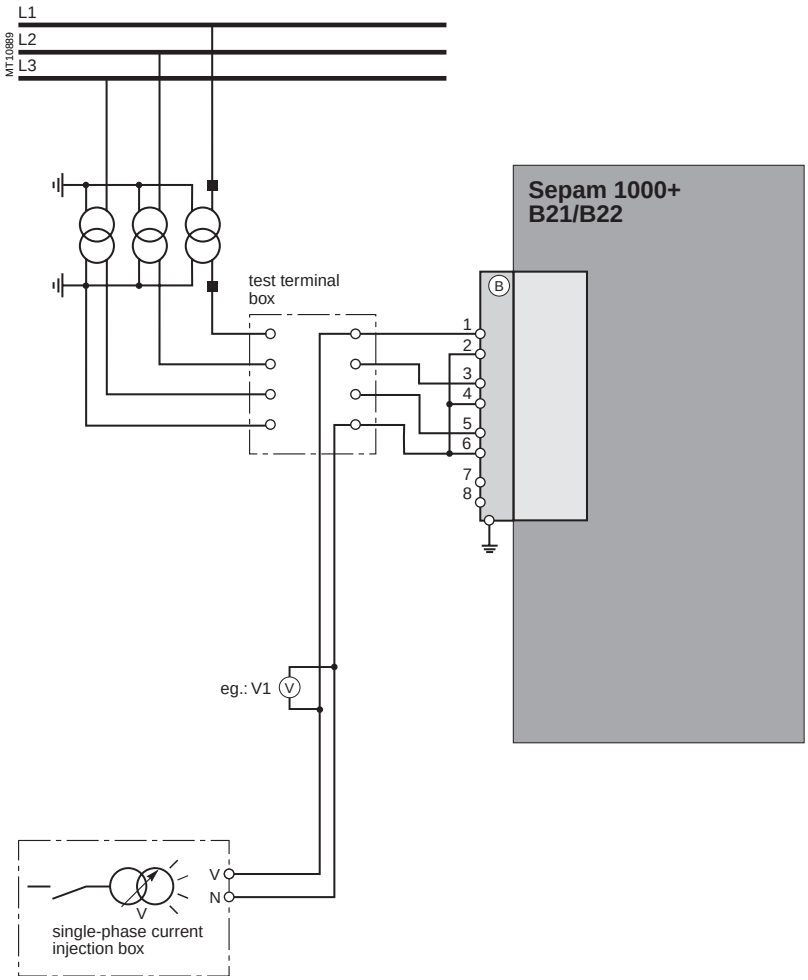
Checking phase voltage input connection

Description:

Check to be carried out for Sepam 1000+ B21 or B22.

Procedure:

■ to apply a phase-to-neutral voltage to the phase 1 voltage input, connect the single-phase voltage generator to the test terminal box using the plug provided, in ccordance with the diagram below:



■ turn the generator on
■ apply the VT rated secondary phase-to-neutral voltage (Uns/$\sqrt{3}$)
■ use the SFT2841 software to check that the phase-to-neutral voltage V1 value is equal to the VT rated primary phase-to-neutral voltage (Unp/$\sqrt{3}$)
■ if the residual voltage is calculated by the sum of the 3 voltages, use the SFT2841 software to check that the residual voltage is approximately equal to the VT rated primary phase-to-neutral voltage (Unp/$\sqrt{3}$)
■ turn the generator off
■ proceed in the same way for the other 2 phase voltage inputs
■ at the end of the test, put the cover back on the test terminal box.

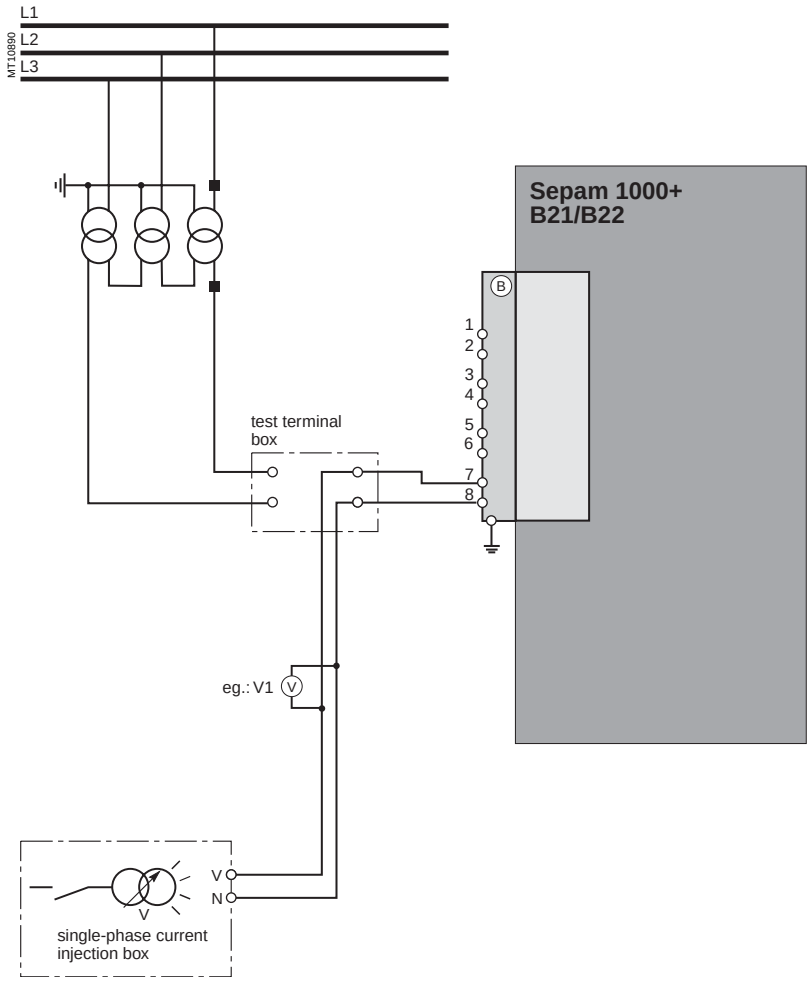
Checking of residual voltage input connection

Description:

Check to be carried out for Sepam 1000+ B21 or B22, when the residual voltage is measured by 3 VTs on the secondary circuits connected in an open delta arrangement.

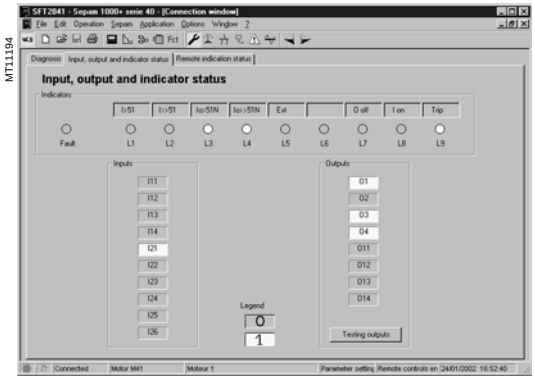
Procedure:

■ connect the single-phase voltage generator to the terminal test box using the plug provided, in accordance with the diagram below:



■ turn on the generator
■ apply the VT rated secondary phase-to-neutral voltage (Uns/$\sqrt{3}$)
■ use the SFT2841 software to check the residual voltag value Vo
■ Vo should be equal to the VT rated primary phase-to-neutral voltage (Unp/$\sqrt{3}$ or Vnp) if the VTs deliver Uns/$\sqrt{3}$ to the secondary circuit
■ Vo should be equal to the VT rated primary phase-to-phase voltage (Unp or $\sqrt{3}$ Vnp) if the VTs deliver Uns/3 to the secondary circuit
■ turn the generator off
■ put the cover back on the terminal test box.

Logic Input and Output

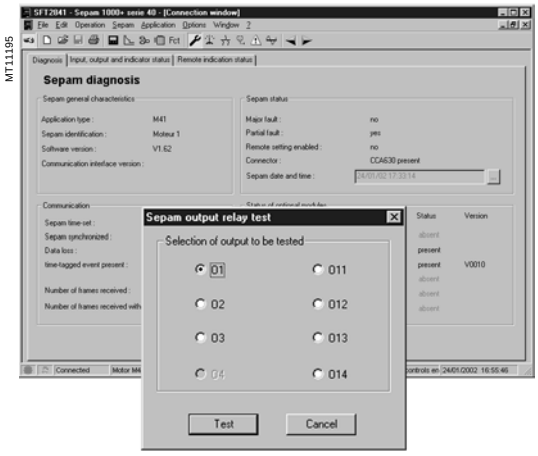


"Input, output, indicator status" screen.

Checking of logic input connection

Proceed as follows for each input:

- **if the input supply voltage is present,** use an electric cable to short-circuit the contact that delivers logic data to the input at 19.2–275 V dc
- **if the input supply voltage is not present,** apply a voltage supplied by the DC voltage generator to the terminal of the contact linked to the chosen input, being sure to comply with the suitable polarity and level
- **observe the change of status of the input** using the SFT2841 software, in the "Input, output, indicator status" screen
- at the end of the test, if necessary, press the SFT2841 Reset key to clear all messages and deactivate all outputs.



''Sepam diagnosis and output relay test'' screen.

Checking of logic output connection

Check carried out using the "Output relay test" function, activated via the SFT2841 software, in the "Sepam Diagnosis" screen.
Only output O4, when used for the watchdog, can be tested.
This function requires prior entry of the "Parameter setting" password.

- activate each output relay using the buttons in the SFT2841 software
- the activated output relay changes status over a period of 5 seconds
- observe the change of status of the output relay through the operation of the related switchgear (if it is ready to operate and is powered), or connect a voltmeter to the terminals of the output contact (the voltage cancels itself out when the contact closes)
- at the end of the test, press the SFT2841 Reset key to clear all messages and deactivate all outputs.

Validation of Protection Output and Custom Logic Functions

Principle

The complete protection chain is validated during the simulation of a fault that causes tripping of the breaking device by Sepam.

Procedure

- select one of the protection functions that triggers tripping of the breaking device
- according to the selected function or functions, inject a current and/or apply a voltage that corresponds to a fault
- observe the tripping of the breaking device

At the end of all the voltage or current application type checks, put the covers back on the test terminal boxes.

Optional Module Connection

Checking of RTD inputs to the MET148-2 module

The temperature monitoring function provided by Sepam T40, T42, M41 and G40 units checks the connection of each RTD that is configured.
An "RTD FAULT" alarm is generated whenever one of the RTDs is detected as being short-circuted or disconnected (absent).
To identify the faulty RTD or RTDs:

- display the temperature values measured by Sepam using the SFT2841 software
- check the consistency of the temperatures measured:
  - the temperature displayed is "****" if the RTD is short-circuited (T < -35°C)
  - the temperature displayed is "-****" if the RTD is disconnected (T > 205°C).

Checking of analog output connection to the MSA141 module

- identify the measurement associated by parameter setting to the analog output using the SFT2841 software
- simulate, if necessary, the measurement linked to the analog output by injection
- check the consistency between the value measured by Sepam and the indication given by the device connected to the analog output.

Test sheet Sepam series 40

Project: **Type of Sepam 1000+**

Switchboard: **Serial number**

Cubicle: **Software version** V

Overall checks

Check of the box ☐ when the check has been made and been conclusive

Type of check	
Preliminary general examination, prior to energizing	☐
Energizing	☐
Parameter and protection settings	☐
Logic input connection	☐
Logic output connection	☐
Validation of the complete protection chain	☐
Analog output connection to the MSA141 module	☐
Temperature sensor input connection to the MET148 module (for type T20 or M20)	☐

Checking of Sepam 1000+ S20, T20 or M20 current inputs

Type of check	Test performed	Result	Display	
Phase current input connection	Secondary injection of CT rated current, i.e. 1 A or 5 A	CT rated primary current	I1 = I2 = I3 =	☐
Residual current value obtained by 3 phase CTs	Secondary injection of CT rated current, i.e. 1 A or 5 A	CT rated primary current	Io =	☐
Residual current input connection to a specific sensor: ■ **CSH120 or CSH200** ■ **other core balance CT + ACE990** ■ **1 x 1 A or 5 A CT + CSH30**	Injection of 5 A into primary circuit of core balance CT or CT	Injected current value	Io =	☐

Checking of Sepam 1000+ B21 or B22 voltage inputs

Type of check	Test performed	Result	Display	
Phase voltage input connection	Secondary injection of VT rated phase-to-neutral voltage Uns/$\sqrt{3}$	VT rated primary phase-to-neutral voltage Unp/$\sqrt{3}$	V1 = V2 = V3 =	☐
Residual voltage value obtained by 3 phase VTs	Secondary injection of VT rated phase-to-neutral voltage Uns/$\sqrt{3}$	VT rated primary phase-to-neutral voltage Unp/$\sqrt{3}$	Vo =	☐
Connection of residual voltage input	Secondary injection of voltage Uns/$\sqrt{3}$	Residual voltage = Unp/$\sqrt{3}$ (if Uns/3 VT) = Unp (if Uns/3 VT)	Vo =	☐

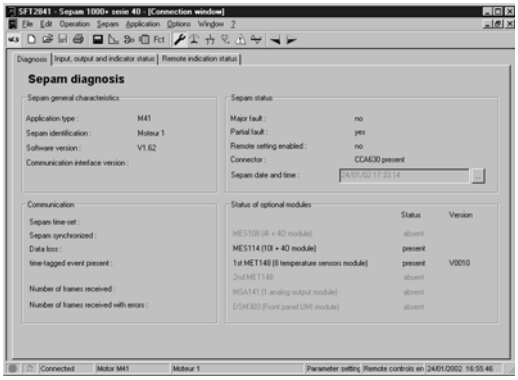
Tests performed on: **By:**	**Signatures**

Comments:

MAINTENANCE

Sepam has a large number of self-tests that are carried out in the base unit and additional modules. The purpose of the self-tests is:
- to verify that the system is functioning properly
- to put Sepam in an inhibit position if the relay could potentially malfunction
- to notify the operator that a maintenance operation is required.

The "Sepam diagnosis" screen of the SFT2841 software provides access to data on the status of the base unit and optional modules.



Sepam Diagnosis" screen.

⚠ CAUTION

HAZARD OF EQUIPMENT DAMAGE

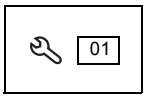
Never open the Sepam 1000+. Opening the Sepam voids the warranty.

Failure to follow this instruction can result in equipment damage.

Shutdown of the base unit if problems are identified

The base unit goes into the fail-safe position in the following conditions:
- the Sepam unit is at risk of malfunctioning
- sensor interface connector missing (CCA630 or CCA670)
- no connection of one of the 3 LPCT sensors to the CCA670 (connectors L1, L2 and L3)
- MES module configured but missing.

The Sepam unit will indicate shutdown by the following:
- ON indicator on
- 🔧 indicator on the base unit steadily on
- relay O4 "watchdog" in fault position
- output relays dropped out
- all protection units inhibited
- display showing fault message



- 🔧 indicator on DSM303 module (remote advanced UMI option) flashing.

Downgraded operation

The main unit is in working order (all the protection functions activated are operational) and indicates that one of the optional modules such as DSM303, MET148-2 or MSA141 is malfunctioning or else that a module is configured but not connected.

According to the model, this operating mode is conveyed by:
- Sepam with integrated advanced UMI (MD base):
  - ON indicator on
  - 🔧 indicator on the base unit flashing, including when the display is out of order (off)
  - 🔧 indicator on the MET or MSA module, steadily on.

The display shows a partial fault message and indicates the type of fault by a code:
- code 1: inter-module link fault
- code 3: MET module unavailable
- code 4: MSA module unavailable.

- Sepam with remote advanced UMI, MX base + DSM303:
  - ON indicator on
  - 🔧 indicator on the base unit flashing
  - 🔧 indicator on the MET or MSA module, steadily on
  - the display indicates the type of fault by a code (same as above).

Special case of faulty DSM303:
- ON indicator on
- 🔧 indicator on base unit flashing
- 🔧 indicator on DSM steadily on
- display off.

This Sepam operating mode is also transmitted via the communication link.

RTD fault

Each temperature monitoring function, when activated, detects whether the RTD associated with the MET148-2 module is short-circuited or disconnected.
When this is the case, the alarm message "RTD FAULT" is generated.
Since this alarm is common to the 8 functions, the identification of the malfunctioning RTD or RTDs is obtained by looking up the measured values:

- measurement displayed "****" if the sensor is short-circuited (T < -35°C)
- measurement displayed "-****" if the sensor is disconnected (or T > +205°C)

Other faults

Specific faults indicated by a screen:

- DSM303 version incompatible (if version < V0146).

Maintenance

The Sepam 1000+ does not require regular maintenance or calibration, nor does it contain any user-serviceable parts. If the Sepam 1000+ requires service, contact your local sales representative, or call the POWERLOGIC Technical Support Center for assistance.

Getting Technical Support

If you have questions about the Sepam 1000+ or other POWERLOGIC and POWERLINK products, contact the Power Management Operation Technical Support Center. The hours are Monday–Friday, 7:30 am–4:30 pm (Central time). Although the fax is available seven days a week, 24 hours a day, if you send your fax outside of these business hours, you will receive your response the next business day. Be sure to include your name and company, address, phone number, types of POWERLOGIC products, and a detailed description of the problem or question.
Support numbers are as follows:
Phone: (615) 287-3400
Fax: (615) 287-3404
Email: PMOSUPRT@SquareD.com
For technical publications, visit www.powerlogic.com.

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