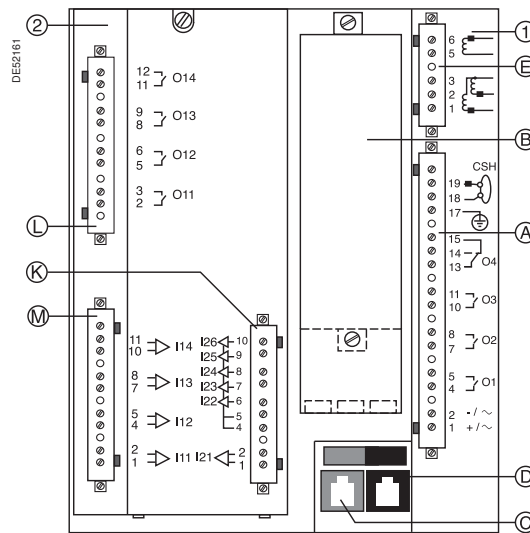


Sepam components

- base unit ①
 - ① base unit connector:
 - power supply
 - output relay
 - CSH30, 120, 200 or ACE990 input.
 - Screw-type connector shown (CCA620), or ring lug connector (CCA622)
 - ② 1/5 CT A current input connector (CCA630 or CCA634) or LPCT current input connector (CCA670)
 - ③ communication module link connection (white)
 - ④ remote inter-module link connection (black)
 - ⑤ voltage input connection, screw-type connector shown (CCA626) or ring lug connector (CCA627)
- optional input/output module ② (MES114)
 - ⑥ ⑦ MES114 module connectors
 - ⑧ MES114 module connector.



Connection of the base unit

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

CAUTION

LOSS OF PROTECTION OR RISK OF NUISANCE TRIPPING

If the Sepam is no longer supplied with power or is in fail-safe position, the protection functions are no longer active and all the Sepam output relays are dropped out. Check that this operating mode and the watchdog relay wiring are compatible with your installation.

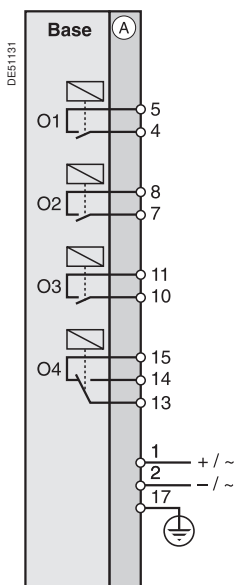
Failure to follow these instructions can result in equipment damage and unwanted shutdown of the electrical installation.

⚠ DANGER

HAZARD OF ELECTRIC SHOCK, ELECTRIC ARC OR BURNS

- Only qualified personnel 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 it. Consider all sources of power, including the possibility of backfeeding.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Start by connecting the device to the protective ground and to the functional ground.
- Screw tight all terminals, even those not in use.

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



Wiring of connectors CCA620 and CCA626:

- Without fitting:
 - 1 wire with maximum cross-section of 0.2 to 2.5 mm² (≥ AWG 24-12) or 2 wires with maximum cross-section of 0.2 to 1 mm² (≥ AWG 24-16)
 - Stripped length: 8 to 10 mm (0.31 to 0.39 in)
- With fitting:
 - Recommended wiring with Telemecanique fitting:
 - DZ5CE015D for 1 wire 1.5 mm² (AWG 16)
 - DZ5CE025D for 1 wire 2.5 mm² (AWG 12)
 - AZ5DE010D for 2 wires 1 mm² (AWG 18)
 - Tube length: 8.2 mm (0.32 in)
 - Stripped length: 8 mm (0.31 in)

Wiring of connectors CCA622 and CCA627:

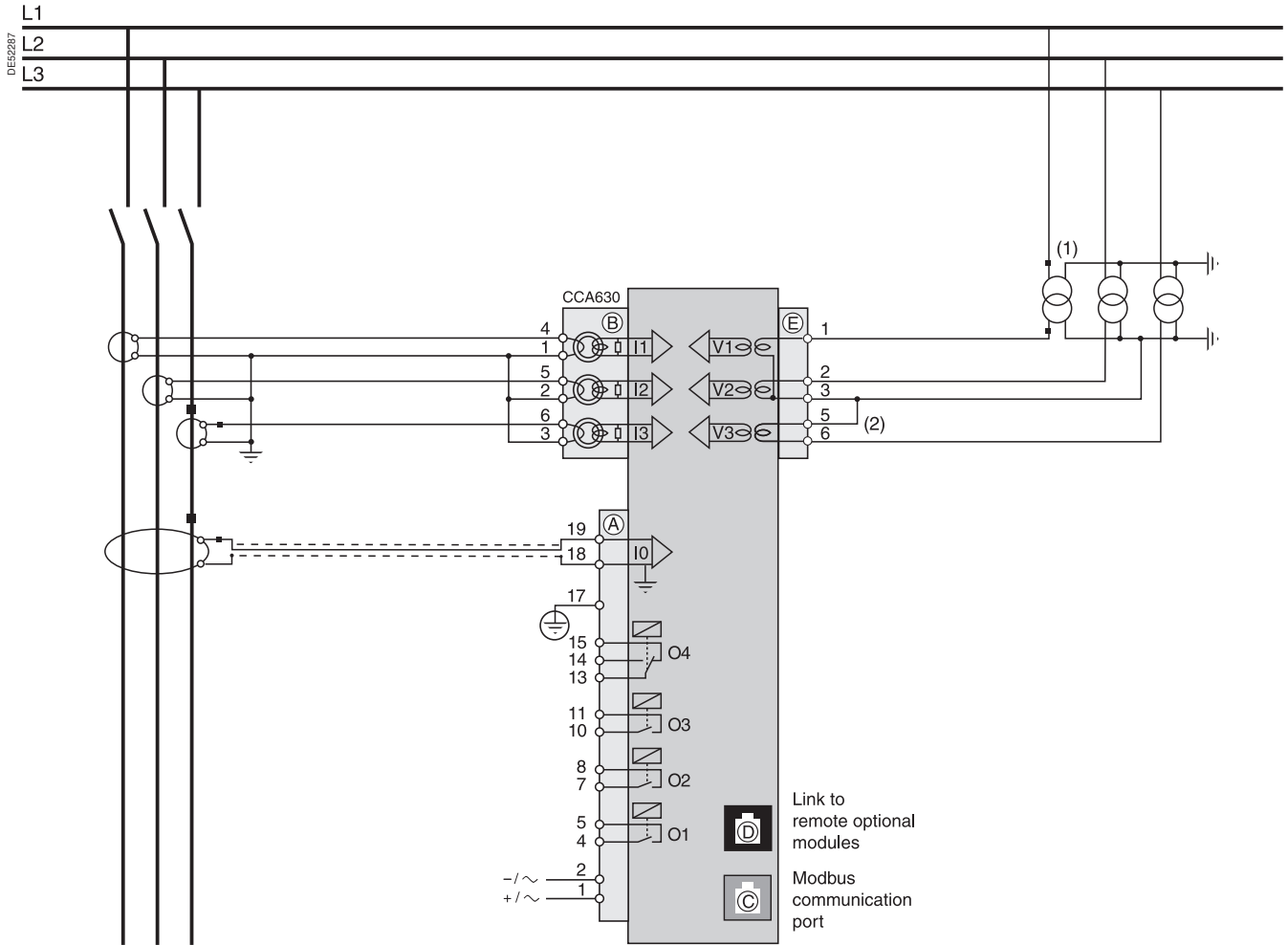
- Ring or spade lug: 6.35 mm (1/4")
- Wire with maximum cross-section 0.2 to 2.5 mm² (AWG 24-12)
- Stripped length: 6 mm (0.236 in)
- Use an appropriate tool to crimp the lugs onto the wires
- 2 ring or spade lugs maximum per terminal
- Tightening torque: 0.7 to 1 N·m (6 to 9 lb-in).

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 is a non assigned control output.
- O4 is a non assigned indication output. It can be assigned to the watchdog function.

Base unit

Connection of current input



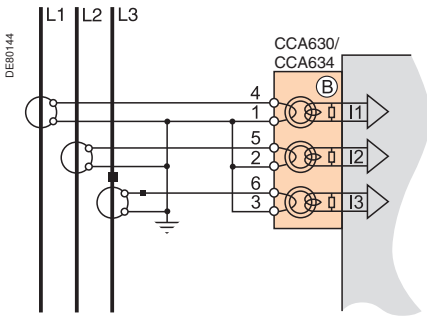
- (1) This type of connection allows the calculation of residual voltage.
 (2) Accessory for bridging terminals 3 and 5 supplied with CCA626 connector.

6

Base unit

Other phase current input connection schemes

Variant 1: phase current measurements by 3 x 1 A or 5 A CTs (standard connection)



Description

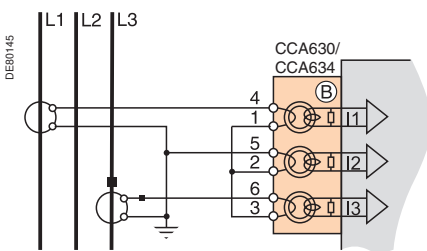
Connection of 3 x 1 A or 5 A sensors to the CCA630 or CCA634 connector.

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

Parameters

Sensor type	5 A CT or 1 A CT
Number of CTs	I1, I2, I3
Rated current (In)	1 A to 6250 A

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



Description

Connection of 2 x 1 A or 5 A sensors to the CCA630 or CCA634 connector.

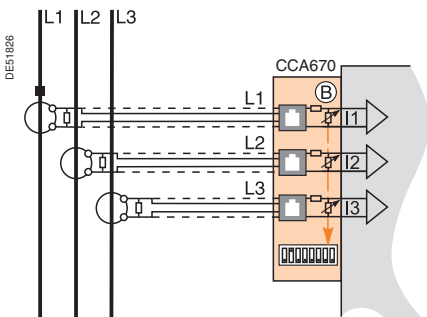
The measurement of phase currents 1 and 3 is sufficient to ensure all the phase current-based protection functions. The phase current I2 is only assessed for metering functions, assuming that $I_0 = 0$.

This arrangement does not allow the calculation of residual current.

Parameters

Sensor type	5 A CT or 1 A CT
Number of CTs	I1, I3
Rated current (In)	1 A to 6250 A

Variant 3: phase current measurement by 3 LPCT type sensors



Description

Connection of 3 Low Power Current Transducer (LPCT) type sensors to the CCA670 connector. The connection of only one or two LPCT sensors is not allowed and causes Sepam to go into fail-safe position.

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

Parameters

Sensor type	LPCT
Number of CTs	I1, I2, I3
Rated current (In)	25, 50, 100, 125, 133, 200, 250, 320, 400, 500, 630, 666, 1000, 1600, 2000 or 3150 A

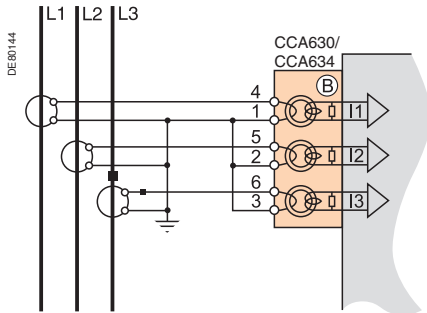
Note: Parameter In must be set 2 twice:

- Software parameter setting using the advanced UMI or the SFT2841 software tool
- Hardware parameter setting using microswitches on the CCA670 connector

Base unit

Other residual current input connection schemes

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



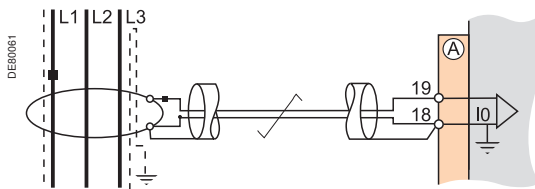
Description

Residual current is calculated by the vector sum of the 3 phase currents I1, I2 and I3, measured by 3 x 1 A or 5 A CTs or by 3 LPCT type sensors. See current input connection diagrams, page 211.

Parameters

Residual current	Rated residual current	Measuring range
None	$I_{n0} = I_n$, CT primary current	0.1 to 40 I_{n0}

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



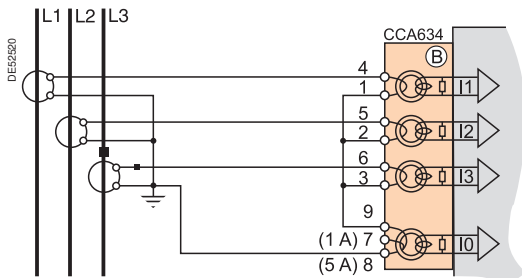
Description

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

Parameters

Residual current	Rated residual current	Measuring range
2 A rating CSH	$I_{n0} = 2$ A	0.2 to 40 A
5 A rating CSH	$I_{n0} = 5$ A	0.5 to 100 A
20 A rating CSH	$I_{n0} = 20$ A	2 to 400 A

Variant 3: residual current measurement by 1 A or 5 A CTs and CCA634



Description

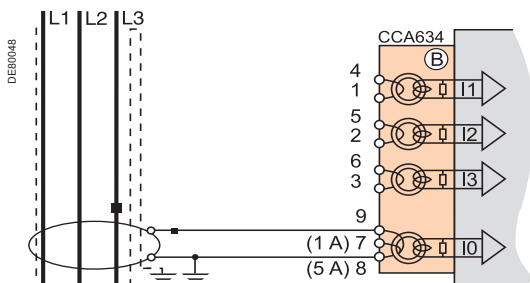
Residual current measurement by 1 A or 5 A CTs.

- Terminal 7: 1 A CT
- Terminal 8: 5 A CT

The sensitivity can be multiplied by 10 using the "sensitive" parameter setting with $I_{n0} = I_n/10$.

Parameters

Residual current	Rated residual current	Measuring range
1 A CT	$I_{n0} = I_n$, CT primary current	0.1 to 20 I_{n0}
Sensitive 1 A CT	$I_{n0} = I_n/10$	0.1 to 20 I_{n0}
5 A CT	$I_{n0} = I_n$, CT primary current	0.1 to 20 I_{n0}
Sensitive 5 A CT	$I_{n0} = I_n/10$	0.1 to 20 I_{n0}

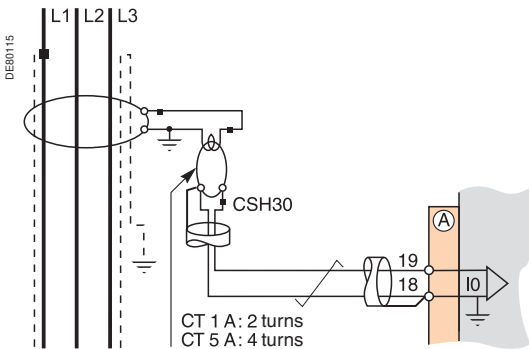


6

Base unit

Other residual current input connection schemes

Variant 4: residual current measurement by 1 A or 5 A CTs and CSH30 interposing ring CT



Description

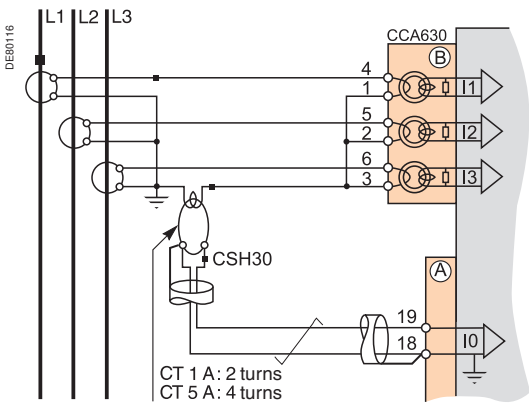
The CSH30 interposing ring CT is used to connect 1 A or 5 A CTs to Sepam to measure residual current:

- Connection of CSH30 interposing ring CT to 1 A CT: make 2 turns through CSH primary
- Connection of CSH30 interposing ring CT to 5 A CT: make 4 turns through CSH primary.

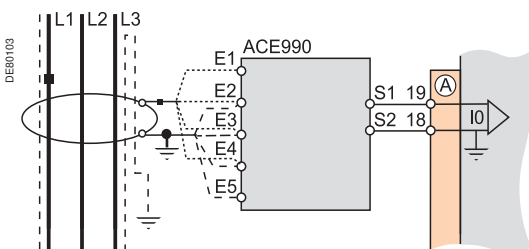
The sensitivity can be multiplied by 10 using the "sensitive" parameter setting with $In0 = In/10$.

Parameters

Residual current	Rated residual current	Measuring range
1 A CT	$In0 = In$, CT primary current	0.1 to 20 $In0$
Sensitive 1 A CT	$In0 = In/10$	0.1 to 20 $In0$
5 A CT	$In0 = In$, CT primary current	0.1 to 20 $In0$
Sensitive 5 A CT	$In0 = In/10$	0.1 to 20 $In0$



Variant 5: residual current measurement by core balance CT with ratio of 1/n (n between 50 and 1500)



Description

The ACE990 is used as an interface between an MV core balance CT with a ratio of 1/n

($50 < n < 1500$) and the Sepam residual current input.

This arrangement allows the continued use of existing core balance CTs on the installation.

Parameters

Residual current	Rated residual current	Measuring range
ACE990 - range 1	$In0 = Ik.n^{(1)}$	0.1 to 20 $In0$
(0.00578 ≤ k ≤ 0.04)		
ACE990 - range 2	$In0 = Ik.n^{(1)}$	0.1 to 20 $In0$
(0.0578 ≤ k ≤ 0.26316)		

(1) n = number of core balance CT turns

k = factor to be determined according to ACE990 wiring and setting range used by Sepam

Base unit

Connection of low voltage residual current inputs

Variant 1: residual current measurement by CTs on the neutral earthing link (with or without CSH30 interposing ring CT)

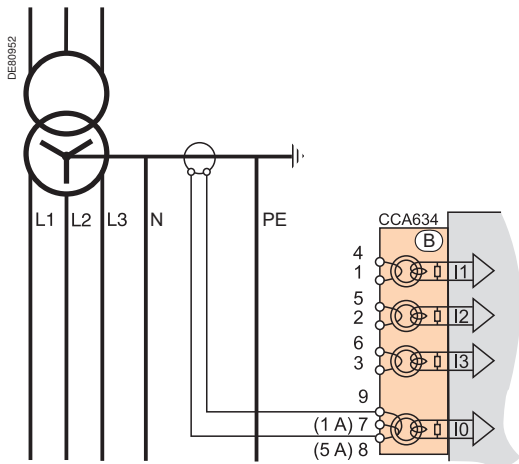
DE80103

Description

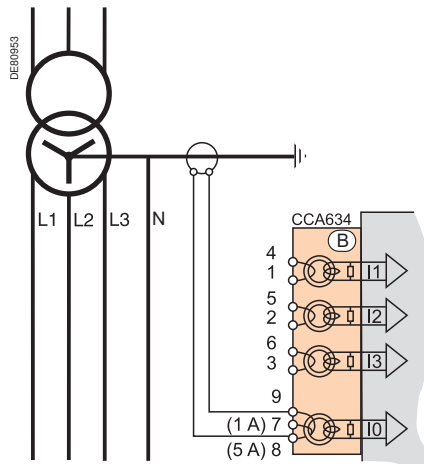
Residual current is measured with a 1 A or 5 A CT on the neutral point.

Parameters

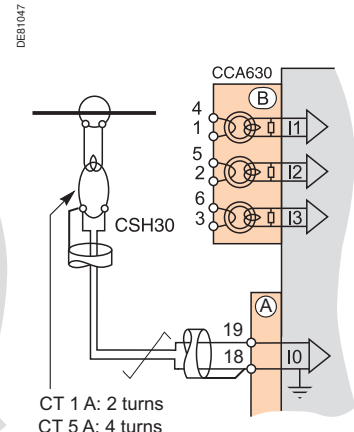
Residual current	Rated residual current	Measuring range
1 A CT	$I_{n0} = \text{neutral point CT In}$	0.1 to 20 I_{n0}
5 A CT	$I_{n0} = \text{neutral point CT In}$	0.1 to 20 I_{n0}



Connection on TN-S network.



Connection on TT network.



CT 1 A: 2 turns
CT 5 A: 4 turns
Connection with CSH30.

Variant 2: residual current measurement by CSH120 or CSH200 core balance CT on the neutral earthing link

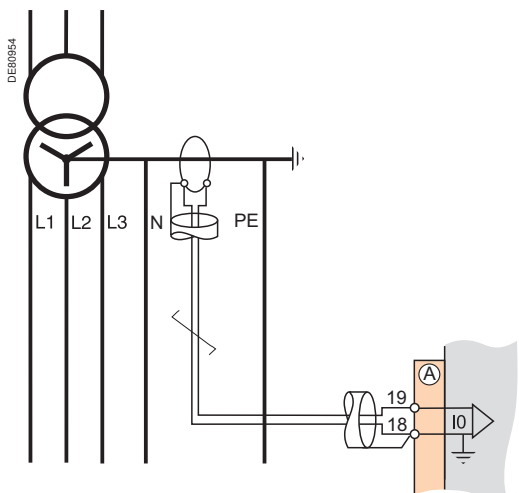
DE80103

Description

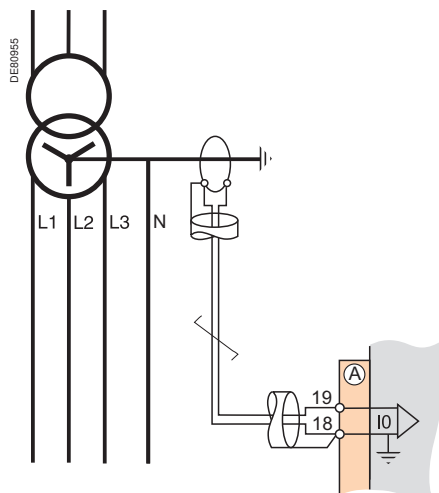
Residual current is measured with a core balance CT on the neutral point. Core balance CTs are recommended for measuring very low fault currents provided that the earth fault current remains below 2 kA. Above this value it is advisable to use the standard variant 1.

Parameters

Residual current	Rated residual current	Measuring range
2 A rating CSH	$I_{n0} = 2 \text{ A}$	0.1 to 20 I_{n0}
5 A rating CSH	$I_{n0} = 5 \text{ A}$	0.1 to 20 I_{n0}
20 A rating CSH	$I_{n0} = 20 \text{ A}$	0.1 to 20 I_{n0}



Connection on TN-S network.



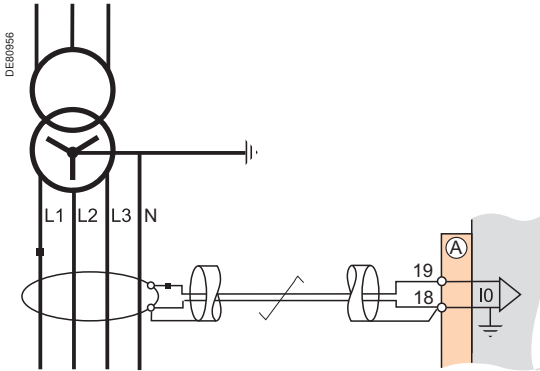
Connection on TT network.

6

Base unit

Connection of low voltage residual current inputs

Variant 3: residual current measurement by sum of 3 phase currents and neutral current measurement by CSH120 or CSH200 core balance CT



Connection on TN-S and TT networks.

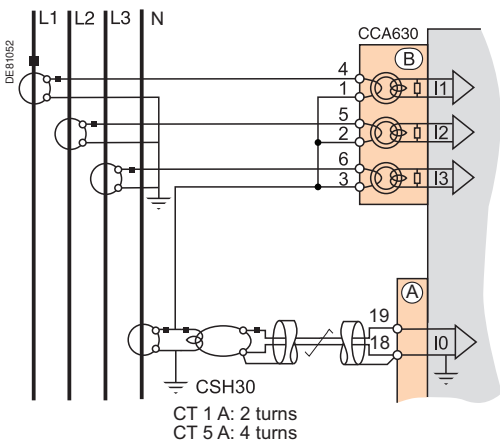
Description

Measurement by core balance CT is recommended for measuring very low fault currents.

Parameters

Residual current	Rated residual current	Measuring range
2 A rating CSH	$I_{n0} = 2 \text{ A}$	0.1 to 20 I_{n0}
5 A rating CSH	$I_{n0} = 5 \text{ A}$	0.1 to 20 I_{n0}
20 A rating CSH	$I_{n0} = 20 \text{ A}$	0.1 to 20 I_{n0}

Variant 4: residual current measurement by sum of 3 phase currents and neutral current measurement by 1 A or 5 A CTs and CSH30 interposing ring CT



Connection on TN-S and TT networks.

Description

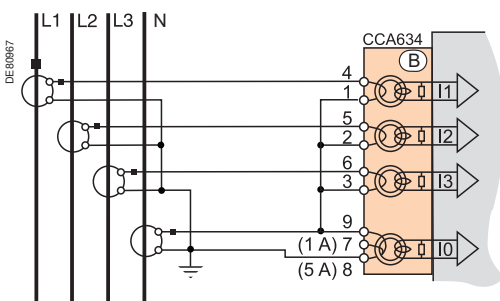
The phase and neutral CTs should have the same primary and secondary currents. The CSH30 interposing ring CT is used to connect 1 A or 5 A CTs to Sepam to measure residual current:

- Connection of CSH30 interposing ring CT to 1 A CT: make 2 turns through CSH primary
- Connection of CSH30 interposing ring CT to 5 A CT: make 4 turns through CSH primary.

Parameters

Residual current	Rated residual current	Measuring range
1 A CT	$I_{n0} = \text{phase CT primary current } I_n$	0.1 to 20 I_{n0}
5 A CT	$I_{n0} = \text{phase CT primary current } I_n$	0.1 to 20 I_{n0}

Variant 5: residual current measurement by sum of 3 phase currents and neutral current measurement by 1 A or 5 A CTs and CCA634 connector



Connection on TN-S and TT networks.

Description

The phase and neutral CTs should have the same primary and secondary currents. Residual current measurement by 1 A or 5 A CTs.

- Terminal 7: 1 A CT
- Terminal 8: 5 A CT

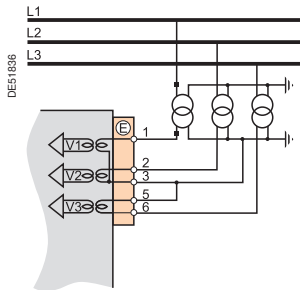
Parameters

Residual current	Rated residual current	Measuring range
1 A CT	$I_{n0} = \text{phase CT primary current } I_n$	0.1 to 20 I_{n0}
5 A CT	$I_{n0} = \text{phase CT primary current } I_n$	0.1 to 20 I_{n0}

The phase and residual voltage transformer secondary circuits are connected directly to the connector, item (E).

The 3 impedance matching and isolation transformers are integrated in the base unit of Sepam series 40.

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



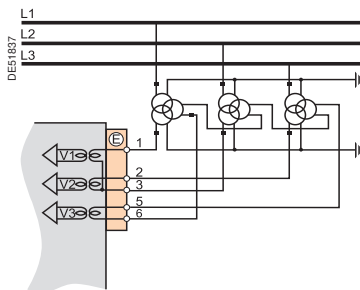
Parameters

Voltages measured by VTs	V1, V2, V3
Residual voltage	None

Functions available

Voltages measured	V1, V2, V3
Values calculated	U21, U32, U13, V0, Vd, Vi, f
Measurements available	All
Protection functions available (according to type of Sepam)	All

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



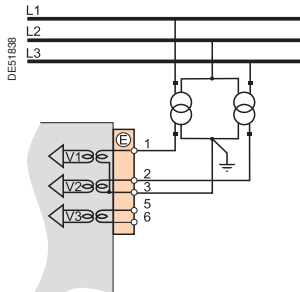
Parameters

Voltages measured by VTs	U21, U32
Residual voltage	External VT

Functions available

Voltages measured	U21, U32, V0
Values calculated	U13, V1, V2, V3, Vd, Vi, f
Measurements available	All
Protection functions available (according to type of Sepam)	All

Variant 3: measurement of 2 phase-to-phase voltages



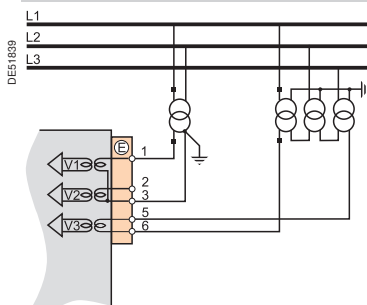
Parameters

Voltages measured by VTs	U21, U32
Residual voltage	None

Functions available

Voltages measured	U21, U32
Values calculated	U13, Vd, Vi, f
Measurements available	U21, U32, U13, Vd, Vi, f
Protection functions available (according to type of Sepam)	All except 67N/67NC, 59N

Variant 4: measurement of 1 phase-to-phase voltage and residual voltage



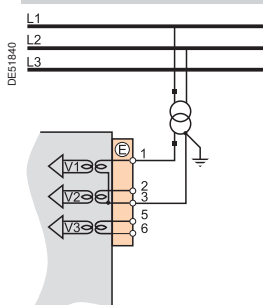
Parameters

Voltages measured by VTs	U21 or V1
Residual voltage	External VT

Functions available

Voltages measured	U21, V0
Values calculated	f
Measurements available	U21, V0, f
Protection functions available (according to type of Sepam)	All except 67, 47, 27D, 32P, 32Q/40, 27S

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



Parameters

Voltages measured by VTs	U21 or V1
Residual voltage	None

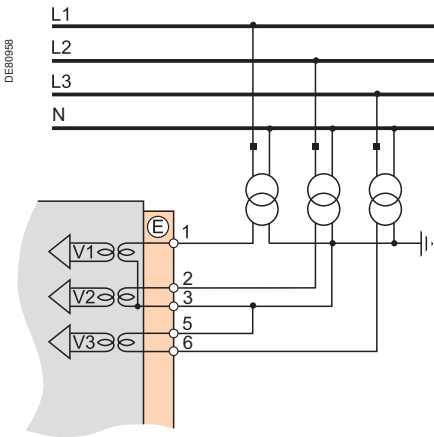
Functions available

Voltages measured	U21 or V1
Values calculated	f
Measurements available	U21 or V1, f
Protection functions available (according to type of Sepam)	All except 67, 47, 27D, 32P, 32Q/40, 67N/67NC, 59N, 27S

Base unit

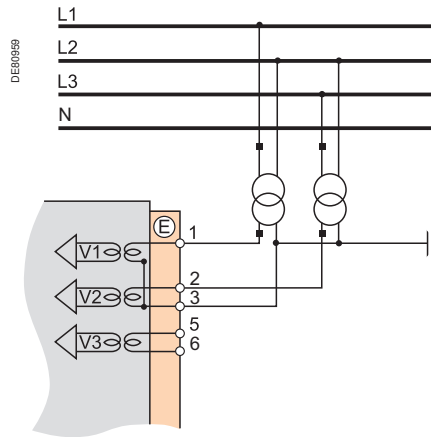
Connection of low voltage phase voltage inputs

Variant 1: TN-S and TN-C networks



When a ground fault occurs on a TN-S or TN-C network, the neutral potential is not affected: the neutral can act as a reference for the VTs.

Variant 2: TT and IT networks



When a ground fault occurs on a TT or IT network, the neutral potential is affected: the neutral cannot act as a reference for the VTs, phase-to-phase voltages must be used on both phases.