

PowerLogic™ T300 substation controller

SC160

Switchgear control, protection unit

Installation Guide



Part number	Designation
EMS59210	PowerLogic SC160 CT- LPVT/VT

NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

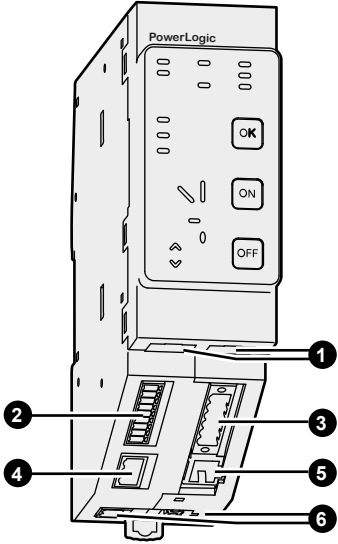
A qualified person is one who has skills and knowledge related to the construction, installation, and operation of electrical equipment and has received safety training to recognize and avoid the hazards involved.



Description

The SC160 module of the PowerLogic™ T300 range is the interface for control of the MV cubicle equipment.

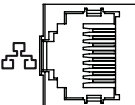
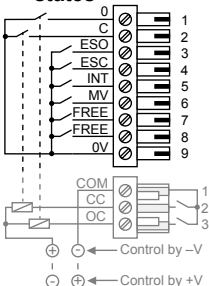
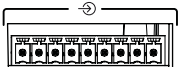
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NOTICE

- HAZARD OF INCORRECT VOLTAGE AND CURRENT MEASUREMENTS**
- Do not expose the device to conditions exceeding the electrical values specified in this document.
 - The product must be connected to the ground (DIN rail) to help ensure compliance with electromagnetic compatibility (EMC) limits.
 - Standby protection should be provided in accordance with national and international cabling regulations.
 - An appropriate electrical disconnecting device must be installed in the building in question.
 - Use only the type of connector supplied as an accessory for the SC160 module (product reference: EMS59220).
 - Check that the connections correspond to the recommended cables before powering up the equipment.
 - Use appropriate tools to perform cabling on the connectors (suitable screwdriver, crimped end-pieces, etc.).
 - Strip the wires appropriately (not excessively) before connecting them to the connectors (see the recommendations in this document).
 - The connection of voltage and current sensors must be checked in the commissioning and maintenance phases.
- Failure to follow these instructions can result in equipment damage.**

The SC160 is formed of the following components:

Port	Characteristics	Description																				
1 Double Ethernet ports LAN 1 and 2 	10/100 Base-T RJ45 connector	Double ports dedicated to internal communication between PowerLogic T300 modules or for connection to a PC. Isolation: 2 kVac 10 Ethernet jumpers (Ref: EMS59528) provided as accessories allow the internal Ethernet connection between the modules HU250, SC150, SC160 and LV150 modules. See <i>NOTICE</i> below.																				
2 Switch or breaker states 	9-pin plug-in screw connectors: <table><thead><tr><th colspan="2">Switch or breaker states</th></tr></thead><tbody><tr><td>1</td><td>DI1-Switch or breaker open</td></tr><tr><td>2</td><td>DI2-Switch or breaker closed</td></tr><tr><td>3</td><td>DI3-Earthling switch open</td></tr><tr><td>4</td><td>DI4-Earthling switch closed</td></tr><tr><td>5</td><td>DI5-Switch interlock</td></tr><tr><td>6</td><td>DI6-MV voltage presence</td></tr><tr><td>7</td><td>DI7-Free or Module L/R input</td></tr><tr><td>8</td><td>DI8-Unassigned digital input</td></tr><tr><td>9</td><td>Common (0V)</td></tr></tbody></table> 	Switch or breaker states		1	DI1-Switch or breaker open	2	DI2-Switch or breaker closed	3	DI3-Earthling switch open	4	DI4-Earthling switch closed	5	DI5-Switch interlock	6	DI6-MV voltage presence	7	DI7-Free or Module L/R input	8	DI8-Unassigned digital input	9	Common (0V)	8 digital inputs ■ 7 inputs allocated to information and states coming from the switch or circuit breaker. ■ 1 unassigned input customizable by configuration (via the advanced configuration tool Easergy Builder). Note: DI 3 to 7 can be configured for other purposes. Refer to the T300 user manual for more information.
Switch or breaker states																						
1	DI1-Switch or breaker open																					
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7	DI7-Free or Module L/R input																					
8	DI8-Unassigned digital input																					
9	Common (0V)																					

NOTICE

- HAZARD OF WRONG CONNECTION**
- Do not connect any digital input to a source of voltage.
 - Do not use the double LAN port 1 and 2 for connection to an external switch or router.
- Failure to follow these instructions can result in equipment damage.**

Port	Characteristics	Description																		
3 Current inputs	6-pin plug-in screw connector: <table><tr><th colspan="2">CTs inputs</th></tr><tr><td>1</td><td>Phase current 1</td></tr><tr><td>2</td><td>Phase current 2</td></tr><tr><td>3</td><td>Phase current 3</td></tr><tr><td>4</td><td>Phase current common</td></tr><tr><td>5</td><td>Residual current common</td></tr><tr><td>6</td><td>Residual current</td></tr></table>	CTs inputs		1	Phase current 1	2	Phase current 2	3	Phase current 3	4	Phase current common	5	Residual current common	6	Residual current	4 inputs for connecting CTs: ■ 3 phase CTs, ■ 1 core balanced CT. Allows the following types of setup: ■ Type A setup: 3 phase CTs ■ Type B setup: 2 phase CTs + 1 core balanced CT ■ Type C setup: 1 core balanced CT ■ Type D setup: 3 phase CTs + 1 core balanced CT Note: Wire S2 of the CT (blue wire) is connected internally to the CT grounding wire.				
CTs inputs																				
1	Phase current 1																			
2	Phase current 2																			
3	Phase current 3																			
4	Phase current common																			
5	Residual current common																			
6	Residual current																			
4 Switch or breaker controls	3-pin plug-in screw connector: <table><tr><th colspan="2">Switch or breaker controls</th></tr><tr><td>1</td><td>DO1-Motor pack power supply common</td></tr><tr><td>2</td><td>DO2-Closing control or breaker close</td></tr><tr><td>3</td><td>DO3-Opening control or breaker tripping</td></tr></table>	Switch or breaker controls		1	DO1-Motor pack power supply common	2	DO2-Closing control or breaker close	3	DO3-Opening control or breaker tripping	The control polarity of the motor pack (common) is customizable via output DO1. This can be done by +V or -V (0V), and the polarization voltage (V) must comply with the following values: ■ 12 Vdc < V < 127 Vdc, ■ 90 Vac < V < 220 Vac. Max. permissible current: ■ 15 A peak; ■ 8 A permanent (48 Vdc); ■ 5 A permanent (60 Vdc); ■ 2 A permanent (90 Vdc); ■ 1 A permanent (110 Vdc).										
Switch or breaker controls																				
1	DO1-Motor pack power supply common																			
2	DO2-Closing control or breaker close																			
3	DO3-Opening control or breaker tripping																			
5 Voltage inputs	Connecting cable with the voltage sensor including an RJ45 connector on the SC160 side. <table><tr><th colspan="2">Voltage inputs</th></tr><tr><td>1</td><td>Ph2 voltage (-)</td></tr><tr><td>2</td><td>Ph2 voltage (+)</td></tr><tr><td>3</td><td>Not used</td></tr><tr><td>4</td><td>Ph1 voltage (-)</td></tr><tr><td>5</td><td>Ph1 voltage (+)</td></tr><tr><td>6</td><td>Not used</td></tr><tr><td>7</td><td>Ph3 voltage (+)</td></tr><tr><td>8</td><td>Ph3 voltage (-)</td></tr></table>	Voltage inputs		1	Ph2 voltage (-)	2	Ph2 voltage (+)	3	Not used	4	Ph1 voltage (-)	5	Ph1 voltage (+)	6	Not used	7	Ph3 voltage (+)	8	Ph3 voltage (-)	Connecting cable SC160 - Voltage sensor adapter can be supplied as an accessory. The wiring of the RJ45 connector on the SC160 side is given solely for information's sake. This connecting cable is supplied for the following adapters (see drawings opposite): ■ LPVT adapter (ref EMS59573) ■ SC150/160-VT adapter - 2 KV/1 mn insulation (ref EMS59572). Refer to the Installation Guide of each adapter (if available) to have more information about the installation and connection of the adapter.
Voltage inputs																				
1	Ph2 voltage (-)																			
2	Ph2 voltage (+)																			
3	Not used																			
4	Ph1 voltage (-)																			
5	Ph1 voltage (+)																			
6	Not used																			
7	Ph3 voltage (+)																			
8	Ph3 voltage (-)																			
6 Power supply	Plug-in screw connectors: <table><tr><th colspan="2">Power supply</th></tr><tr><td>+</td><td>+Vdc (+12 V to +48 V)</td></tr><tr><td>-</td><td>0V</td></tr></table>	Power supply		+	+Vdc (+12 V to +48 V)	-	0V	2 power supply connectors connected internally, facilitating serial connections and allowing looping of power supplies between the T300 modules. (see Power Supply section).												
Power supply																				
+	+Vdc (+12 V to +48 V)																			
-	0V																			

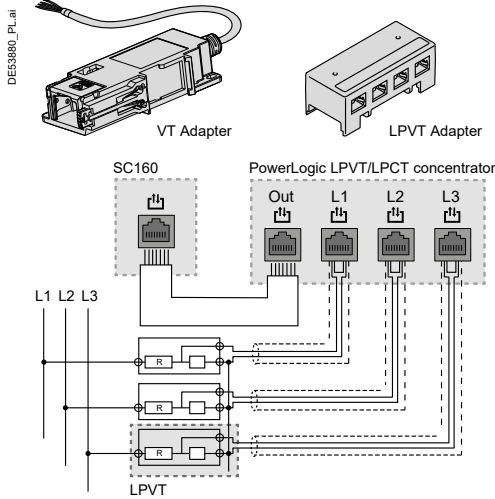
NOTICE

- HAZARD OF TERMINAL DAMAGE OR INCORRECT POWER SUPPLY**
- Use appropriate tightening torques for tightening connector screws (tightening torque values provided in this document).
 - The SC160 module must be powered by a power supply of the SELV/PELV type (e.g. the PS50 is of the SELV/ PELV type).
 - The supply voltage of the SC160 module must not exceed 57.6 Vdc.
- Failure to follow these instructions can result in equipment damage.**

⚠ ⚠ DANGER

- HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH**
- Do not connect items of equipment with different earth potentials with an RJ45 cable.
 - Do not use RJ45 cable longer than 10 meters (32.8 feet).
- Failure to follow these instructions will result in death or serious injury.**

Various models of voltage sensor adapter



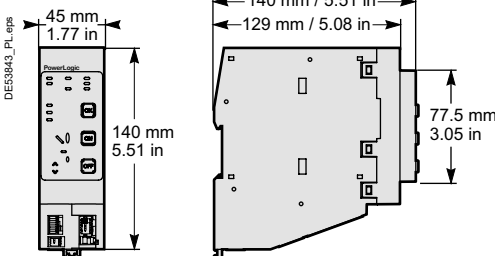
Wire size recommendations (cable length should be less than 2 meters):

				
2		7 mm 0.276 in	0.5 mm² 20 AWG	0.22-0.25 N.m 1.9-2.2 lb-in
4			1 mm² 17 AWG	
3			0.2-2.5 mm² 24-13 AWG	0.5-0.6 N.m 4.4-5.3 lb-in
6	 12-48 V		1-2.5 mm² 17 AWG	0.5-0.6 N.m 4.4-5.3 lb-in

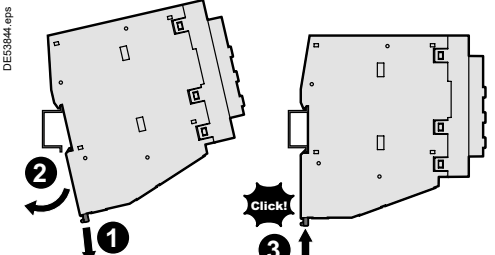
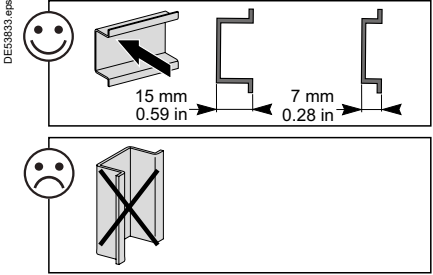
Installation

Installing the enclosure

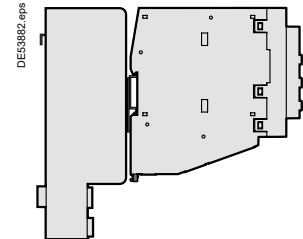
The SC160 module is fastened to a DIN rail. No tool is needed for mounting. Simply clip it in order to fasten it as shown below.



External dimensions of the SC160 enclosure



Installing the SC160 module on DIN rail



Installing the SC160 module on a PS50 enclosure

Installing and connecting split-core CTs in the cubicle

Depending on the type of kit supplied, the setup will concern:

- Type A setup: 3 split-core phase CTs
- Type B setup: 2 split-core phase CTs + 1 core balance CT
- Type C setup: 1 core balance CT
- Type D setup: 3 split-core phase CTs + 1 core balance CT

The setup remains the same irrespective of the type of kit used. The CTs are of the split-core type and have an automatic retaining system for cables of dia. 30 to 45 mm (1.18 to 1.77).

NOTICE

HAZARD OF INCORRECT WIRING

- When fitting the CTs on the cables, it is essential to comply with the direction of positioning: HAUT/TOP marking facing upward, wire exit downward (see illustration below).
- The shielding of each MV cable must be re-inserted inside the corresponding CT before being connected to ground (see diagram below).
- The blue wire on the CT secondary (S2) is connected internally to the blue wire (blue wire including a round terminal at the end).
- The blue wire including the round terminal must be connected to the same frame ground as the cubicle.

Failure to follow these instructions can result in equipment damage.

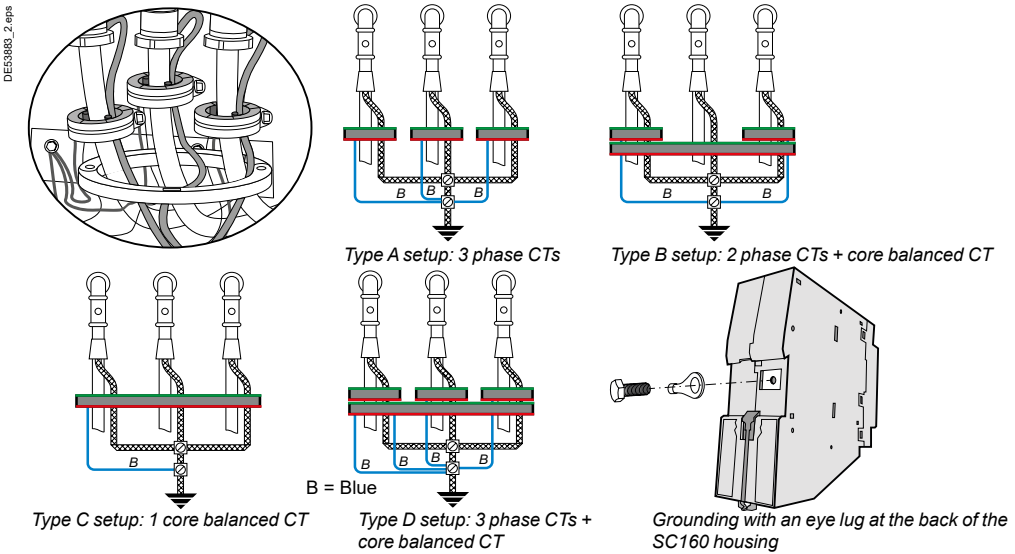
Not following wiring instructions can lead to equipment damage and incorrect current measurements.

⚠ ⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- The current sensors used for measuring must be 1 A (for Protection or FPI) or 5 A (only for FPI) secondary with security factor limiting the current to 100 A secondary -1 s (according to standard 61869-2).
- The toroids must be short-circuited at the secondary when they are disconnected from the SC160 (eg during a maintenance operation). To do this, use a shorting block.
- Always use grounded external CTs for current inputs.
- The CTs should not remain disconnected, while being installed and power on. If a disconnection is to be made, for any reason whatsoever, a short circuit is required at the secondary part of the CTs. CT connectors are IP2X.
- Cables of voltage rating greater than 1000 V must have a shield connected to ground.
- The low-voltage insulation of the PowerLogic CTs means they can only be used on insulated cables.
- Ensure that all electrical power on MV network is removed before working on or installing CTs on the MV cable and making CT connections.

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



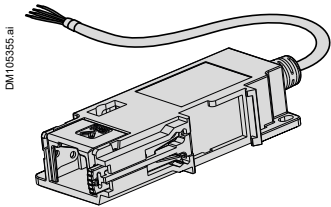
Operation

Once the SC160 has been powered up, some indicator lamps on the front panel may be lit to indicate certain operating states. The buttons allow the user to perform actions. These indications and actions are summarized in the table below:

Part	Description of indications and actions
1 1.1 1.2	SC160 states: 1.1 SC160 operating, communication status with the HU250 1.2 Equipment status (potential software error, potential hardware fault, potential configuration error).
2 2.1 2.2	Local/Remote 2.1 Remote mode: Local controls via the front panel (or the WI-FI) of the SC160 module are locked. Orders are possible from the control center. 2.2 Local mode: Controls via the front panel (or the WI-FI) are possible. Orders coming from the control center are locked. Note: The Local/Remote position displayed on the SC160 is a duplication of the display managed on the HU250 module.
3 3.1 3.2 3.3	Automatic control states and checks 3.1 Automatic control enabled 3.2 Automatic control disabled 3.3 Automatic control locked Note: The automatic control enabled and disabled states on SC160 modules are copied from the HU250 module. The automation locked state on an SC160 module reflects the state of the SC160 module and is copied to the HU250 module.
4 4.1 4.2 4.3	Special function LEDs Default assignment: 4.1 Tripping mode (green = enabled, unlit = disabled) 4.2 Tripping indication (orange flashing quickly = fault pick up/tripping imminent, red flashing slowly = trip latched) 4.3 Unassigned
5 5.1 5.2 5.3	Local control on switch or breaker and trip acknowledgment Local control on the switch or the breaker is possible only if the local mode is enabled 5.1 Trip acknowledgment button: this button must be pressed during 3s for resetting trip indication. Control enabling button: this button must be pressed simultaneously with the change-of-state button (ON or OFF) for control to be accepted. 5.2 Button for placing the switch in closed state (ON). 5.3 Button for placing the switch in open state (OFF).
6 6.1 6.2	Switch or breaker state Switch or breaker position symbolized by an illustration in two colors: 6.1 Vertical/red: closed position 6.2 Oblique/green: open position
7 7.1	Earthing/Grounding switch state Earthing/Grounding switch position symbolized by two states and one color: 7.1 Extinguished: Earthing/Grounding switch in open position Green: Earthing/Grounding switch in closed position
8 8.1	Voltage presence If DI6 used: 8.1 Red: power on (DI enabled) Extinguished: power off (DI disabled). If voltage sensor used: 8.1 Red: power on 3 phases, or invalid measure Extinguished: power off on 3 phases Orange: power on or off on at least one of the phases
9 9.1 9.2	Fault current detection and tripping Fault current detection or tripping is symbolized by two arrows that can indicate the direction of the fault current (for directional fault current type only): 9.1 Arrow pointing backward, flashing orange means fault detection in progress, flashing green means permanent earth fault or tripped on earth fault, steady green means permanent phase fault or tripped on phase fault, flowing in the direction indicated by the arrow (toward the busbar). 9.2 Arrow pointing forward, flashing orange means fault detection in progress, flashing red means permanent earth fault or tripped on earth fault, steady red means permanent phase fault or tripped on phase fault, flowing in the direction indicated by the arrow (toward the network). Also serves to indicate the presence of an ammetric type fault current.

VT adapter for SC160

SC150/160-VT adapter is the interface between the Medium Voltage sensors and the SC160.
An Ethernet RJ45 cable connecting the VT adapter and the SC160 can be supplied as accessory.



Refer to the **SC150/160-VT adapter Installation Guide** (ref: NT00394-xx) to have more information about the installation and connection of the SC150/160-VT adapter.

⚠ ⚠ DANGER

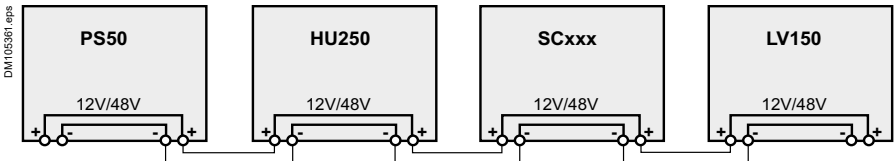
HAZARD OF ELECTRIC SHOCK, EXPLOSION OR ARC FLASH

- Wear your personal protective equipment (PPE) and comply with the safe electrical work practices. See NFPA 70E in the USA or applicable local standards.
- Only qualified personnel should install this equipment. Such work should be performed only after reading all documentations associated with this product. Refer to the PowerLogic T300 User Manual (reference NT00378-EN).
- Remove all electrical power from the SC160 and from all the devices to which the SC160 is connected before performing any work on the SC160.
- Always use a properly rated voltage sensing device to confirm that all power is off.
- Do not connect VT adapter directly to the MV sensors. Always use fuse and disconnect switch (maximum voltage allowable on the VT adapter inputs : 600 Vac).
- Never short the secondary of a Voltage Transformer (VT).

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

Power supply

The SC160 includes two connectors to connect the power supply. These two connectors are connected together internally in the SC160. Having two power supply connections can facilitate connection between the modules. No strapping is necessary.
Connect the SC160 as shown in the following diagram.



Parameters setup

Installation of the SC160 module requires no parameters setup. This is performed during the commissioning/configuration stages.
Refer to the User manual and the T300 Quick start for any further information.

Identification

The serial number of the SC160 is formed as follows: Year - Week - Work order, e.g. 15340265 (265th product manufactured, week 34 of the year 2015)

Grounding

The SC160 module must be connected to the ground:

- Either via the mounting DIN rail. The DIN rail helps ensure electrical continuity (preferably use a DIN rail in 304L stainless steel to withstand the climatic conditions).
- Either by means of an eye lug and a M4 screw (max. Length 10 mm), screwed in the threaded hole at the back of the SC160 housing (see diagram opposite). Use a green/yellow wire of length 300 mm maximum (11.81 in) and 4 mm² section (11 AWG) for the connection between the eye lug and the ground.

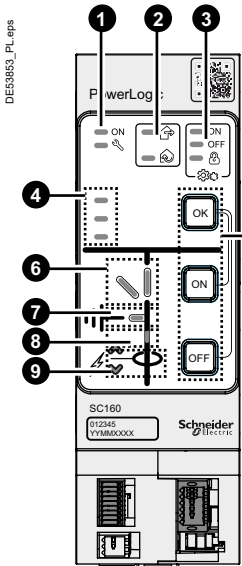
NOTICE

HAZARD OF INCORRECT GROUNDING

- The DIN rail on which the SC160 is installed must be grounded and of metallic type and must comply with electrical continuity in all climatic conditions.
- If the SC160 is installed on a PS50 power supply module, the grounding of the module is done via the PS50's DIN rail, which must be grounded via a dedicated terminal near the PS50 power input connector. Refer to the Installation Guide of the PS50 power supply.

Failure to follow these instructions can result in equipment damage.

Not following wiring instructions can lead to equipment damage and incorrect current measurements.



SC160

Note: The indications in bold letters correspond to normal operation (first power up without existence of a potential issue indication). The switchgear or circuit breaker and voltage presence states cannot be determined for normal operation, because that depends on the state of the network and the position of the switchgear or circuit breaker.

Meaning of indicator colors and states

Indicator state		Flashing			Steady			Unlit
		Red	Green	Orange	Red	Green	Orange	
1 1.1 1.2	1.1	Start-up	-	-	Fault	OK	Com OFF	-
	1.2	Module is going to restart	-	-	Major fault	-	Minor or transient fault or not yet configured	OK
2 2.1 2.2	2.1	-	-	-	-	Remote	-	Local
	2.2	-	-	-	Local	-	-	Remote
3 3.1 3.2 3.3	3.1	-	-	-	-	ON	-	OFF
	3.2	-	-	-	OFF	-	-	ON
	3.3	-	-	-	-	-	Locked	Unlocked
4 (1) 4.1 4.2 4.3	4.1	-	-	-	-	Tripping mode enabled	-	Tripping mode disabled
	4.2	Trip latched	-	Tripping imminent	-	-	-	No fault
	4.3	-	-	-	-	-	-	-
6 (2) 6.1 6.2	6.1	Invalid	-	Interm. state or earth switch closed	Closed	-	-	Open
	6.2	Invalid	-	Interm. state	-	Open	-	Closed
7 (2) 7.1	7.1	Invalid	-	Interm. state	-	Closed	-	Open
8 8.1	8.1	-	-	-	ON (3 phases or DI6) or invalid	-	ON (1 or 2 phases)	OFF (3 phases or DI6)
9 9.1 9.2	9.1	-	Earth fault toward busbar	Fault det. in progress	-	Phase fault toward busbar	-	No fault
	9.2	Earth fault toward network or ammetric fault	-	Fault det. in progress	Phase fault toward network or ammetric fault	-	-	No fault

(1) Indicators customizable by configuration. Only default values shown.
(2) Description of Main switch & Earth switch leds (6 & 7) is for case when setting «wiring input = open and closed». If «wiring input = open or closed», there is no intermediate state.

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Publication: Schneider Electric
Production: Schneider Electric
Printing: Schneider Electric

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