

Certificate uploading procedure:

To upload the certificates:

1. Configure the "Upload TFTP" parameter = Enabled (Ekip Connect page "Ekip Supply Evo Modbus TCP- General")
2. Configure an external Client TFTP with the following parameters:

Parameter	Configuration
Host IP Address	Use the IP address of the module being configured
Port	69

3. Specify the following parameters for each of the files to be transferred

Parameter	Configuration
Source File	Local file path
Destination File	Depending on the file being transferred, specify the following options one by one: 1. root_ca.crt.der, for the Root CA Certificate file 2. inter_ca.crt.der, for the Intermediate CA Certificate file 3. server.crt.der, for the Server Certificate file 4. server_key.der, for the Server private key file  NOTE: the Intermediate CA Certificate file need only be configured if the "Enable Intermediate CA" parameter has been enabled

4. Transfer from server to client after each Destination File has been programmed
5. Configure parameter "Upload TFTP" = Disabled once all the files have been transferred
6. Check or, if necessary, configure parameter Enable Secure Modbus = Secure Modbus (port 802)

Check certificate upload

The validity of the certificates can be checked by monitoring the Server Certificate, Root CA and Intermediate CA parameters on the Ekip Connect "Ekip Supply Evo Modbus TCP - General" page.

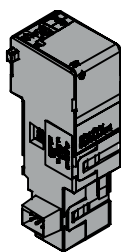
If one or more of the parameters is in the ERROR state, make sure that the files are correct, then repeat the Uploading and verification procedure.

Warnings

If Ekip Connect is without the Tunnel TLS automatic function, an intermediate TLS proxy must be configured between client and server to ensure protected communication.

Contact ABB for assistance.

4 - Ekip Com Modbus RTU



Ekip Com Modbus RTU is a communication accessory which allows Ekip Aware to be integrated into an RS-485 network with Modbus RTU communication protocol, remote supervision and monitoring functions, in two different modes, master and slave.

You can perform the following operations remotely:

- read Ekip Aware measurements and information
- manage certain controls, including opening and closing the circuit-breaker
- access information and parameters not available on the display
- If connected to a withdrawable version of the circuit-breaker, the allows the racked-in/racked-out status to be detected



IMPORTANT: the remote open and close commands of the circuit-breaker can only be executed if Ekip Aware is in the Remote configuration and the circuit-breaker is equipped with YO Sense and YC Sense coils.

Ekip Com Modbus RTU is always supplied with contacts Ekip AUP and Ekip RTC (page 333).

The System Interface document is available for mapping the module in its communication network. All the required communication and command details are listed in the document (page 237).

Models Two different modules compatible with the Modbus RTU protocol are available: *Ekip Com Modbus RTU* and *Ekip Com Modbus RTU Secure*.

The Secure version of the module contains security artifacts for identifying and exchanging data to and from Ekip Aware (this also in the Secure version), thereby enhancing the security level.



IMPORTANT:

- A Secure module connected to a standard Ekip Aware will function normally, without the additional safety functions
- each Ekip Aware can be connected to one single Ekip Com Modbus RTU (this means that an Ekip Com Modbus RTU and an Ekip Com Modbus RTU Secure cannot be connected at the same time)

Safety and cyber security



IMPORTANT: Consult chapter Cybersecurity guidelines on page 80

Connections Install the module in the first vacant slot of the terminal box after *Ekip Supply*, connected (Lite or Evo Modbus TCP), either on the circuit-breaker (fixed version) or on the fixed part (withdrawable version).

To connect the module to its communication network and for references about the terminals, please consult document [1SDM000056A1001](#).

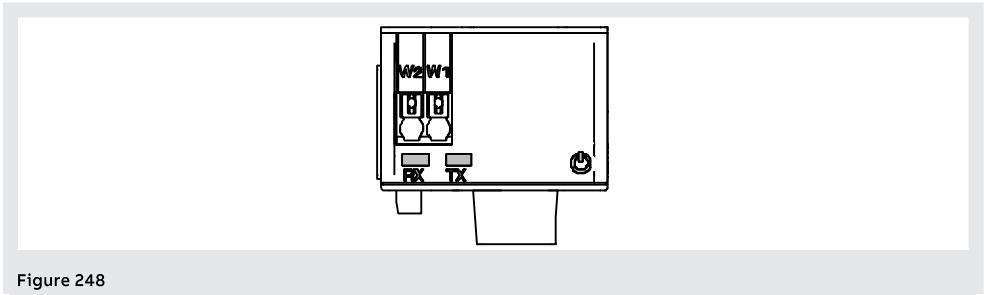
To connect the module to Ekip Aware, please consult document [1SDH002310A1512](#).

Power supply The module is supplied directly by the *Ekip Supply* to which it is connected.



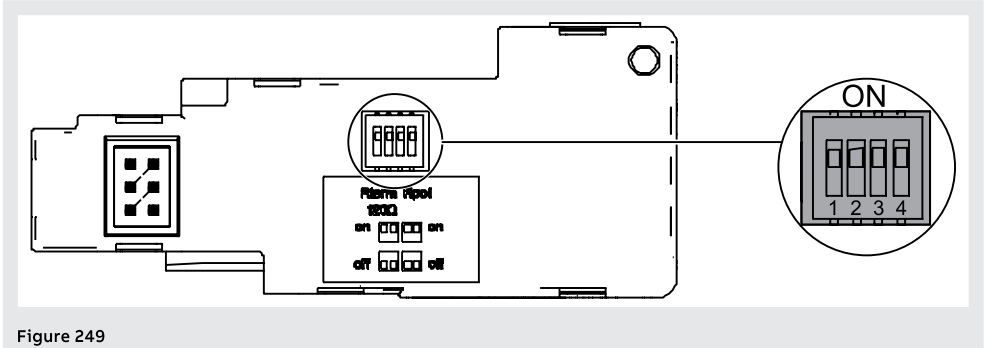
IMPORTANT: Communication between Ekip Aware and module and the communication system is interrupted in the absence of auxiliary power supply.

Interface the module has three signaling leds:



LED	Description
Power	Signals the on status and correct communication with Ekip Aware: • Off: module off • on and steady or with flashing synchronized with Power LED of Ekip Aware: module on and communication with protection release present • flashing not synchronized with the Power led of Ekip Aware (2 fast flashes per second): module on and communication with Trip unit absent.
Rx	Indicates the status of the incoming communication between network master and module (slave): • off: Modbus RTU communication not activated • on with fast flashes: Modbus RTU communication activated
Tx	Indicates the status of the outgoing communication between network master and module (slave): • off: Modbus RTU communication not activated • on with fast flashes: Modbus RTU communication activated

Configurations The dip switches at the side of the module allow the termination and polarization resistors of the RS-485 network to be enabled / disabled.



Resistor	Dip	Description	Default
Rterm	1 and 2	120 Ω termination resistor Move dip-switches 1 and 2 to the ON position to connect Rterm	Off
Rpol	3 and 4	536 Ω pull-up or pull-down resistor Move dip-switches 3 and 4 to the ON position to connect Rpol	Off



WARNING!

- **configure the dip-switches when the module is off, before connecting the module to the terminal block and communication network**
- **The terminating and biasing resistor must only be installed at the ends of each branch of the communication network (generally on the master and at the opposite end)**

Information in menu Local bus activation, which is essential for starting communication between Ekip Aware and module, is available in the *Settings* menu (page 75).

If the module is detected correctly by Ekip Aware, an info area is activated on the display (and becomes available in the menu at *Info - Modules - Ekip Com Modbus RTU*) giving the serial number and software version of the module.

Remote configurations The operating configuration can be changed from slave to master via USB-C port, via BLE and via system bus so as to integrate the module into an interactive data exchange network.

Parameter	Description	Default
<i>Serial address</i>	Module address; 1 to 247 range available  IMPORTANT: devices connected to the same network must have different addresses	247
<i>Baudrate</i>	Data transmission speed; 3 options are available: 9600 bit/s, 19200 bit/s, 38400 bit/s	19200 bit/s
<i>Physical protocol</i>	Defines the stop and parity bit; 4 options are available: • 8,E,1 = 8 data bits, 1 EVEN parity bit, 1 STOP bit • 8,O,1 = 8 data bits, 1 ODD parity bit, 1 STOP bit • 8,N,2 = 8 data bits, no parity bit, 2 STOP bits • 8,N,1 = 8 data bits, no parity bit, 1 STOP bit	8,E,1

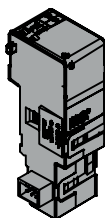


IMPORTANT:

- In the Master configuration, the module does not allow data exchange as in the normal Slave function
- the presence of several masters in the same network can cause faulty operation

Remote information Additional information, available via USB-C port, via BLE and via system bus, concerns the state and version of the module: CRC state (correctness of the software in the module), activated memory bank and security related status bits.

5 - Ekip Com Profibus DP



Ekip Com Profibus DP is a communication accessory which allows Ekip Aware to be integrated into an RS-485 network with Profibus communication protocol, with remote supervision and monitoring functions.

The module is configured as a Slave and remotely, you can:

- read Ekip Aware measurements and information
- manage certain controls, including opening and closing the circuit-breaker
- access information not available on the display
- If connected to a withdrawable version of the circuit-breaker, the allows the racked-in/racked-out status to be detected



IMPORTANT: the remote open and close commands of the circuit-breaker can only be executed if Ekip Aware is in the Remote configuration and the circuit-breaker is equipped with YO Sense and YC Sense coils.

Ekip Com Profibus DP is always supplied with contacts *Ekip AUP* and *Ekip RTC* (page 333).

The System Interface document is available for mapping the module in its communication network. All the required communication and command details are listed in the document (page 237).

Models Two different modules compatible with the Profibus protocol are available: *Ekip Com Profibus DP* and *Ekip Com Profibus DP Secure*.

The Secure version of the module contains security artifacts for identifying and exchanging data to and from Ekip Aware (this also in the Secure version), thereby enhancing the security level.



IMPORTANT:

- A Secure module connected to a standard Ekip Aware will function normally, without the additional safety functions
- each Ekip Aware can be connected to one single Ekip Com Profibus DP module (this means that an Ekip Com Profibus DP and an Ekip Com Profibus DP Secure cannot be connected at the same time)

Safety and cyber security



IMPORTANT: Consult chapter Cybersecurity guidelines on page 80

Connections Install the module in the first vacant slot of the terminal box after *Ekip Supply*, connected (Lite or Evo Modbus TCP), either on the circuit-breaker (fixed version) or on the fixed part (withdrawable version).

To connect the module to its communication network and for references about the terminals, please consult document [1SDM000056A1001](#).

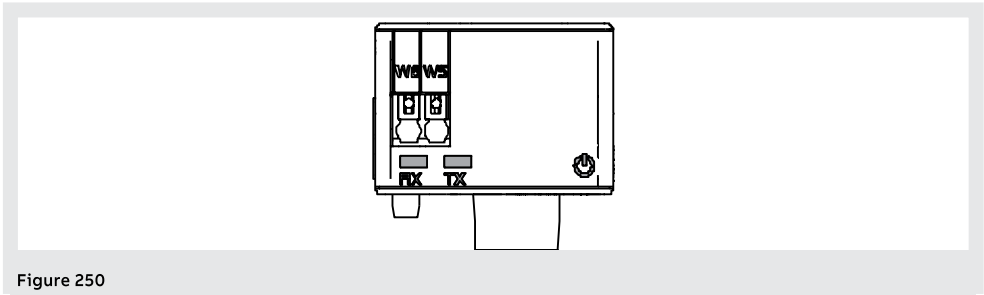
To connect the module to Ekip Aware, please consult document [1SDH002310A1512](#).

Power supply The module is supplied directly by the *Ekip Supply* to which it is connected.



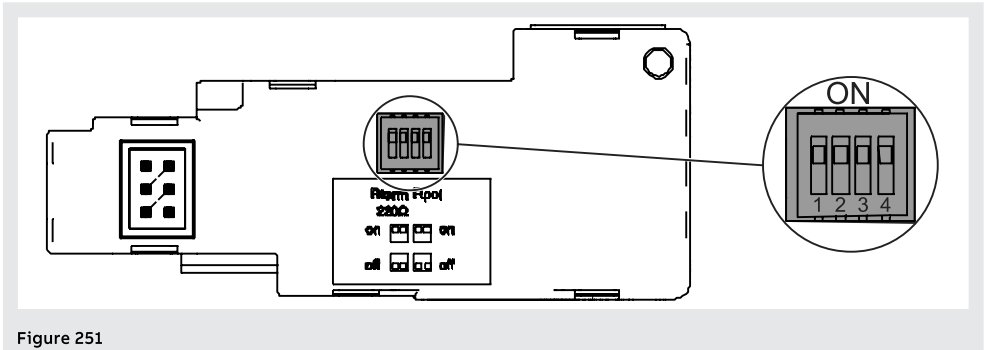
IMPORTANT: communication between Ekip Aware and the module is interrupted in the absence of auxiliary power supply

Interface the module has three signaling leds:



LED	Description
Power	Signals the on status and correct communication with Ekip Aware: - Off: module off - on and steady or with flashing synchronized with Power LED of Ekip Aware: module on and communication with protection release present - flashing not synchronized with the Power led of Ekip Aware (2 fast flashes per second): module on and communication with Trip unit absent.
Rx	Data Exchange LED, indicates the communication state between network master and module (slave): - off: Profibus DP communication not activated - on: Profibus DP communication activated
Tx	Indicates the communication state between Ekip Aware and module (slave): - off: communication between Ekip Aware and module not activated - on with fast flashes: communication between Ekip Aware and module activated

Configurations The dip switches at the side of the module allow the termination and polarization resistors of the RS-485 network to be enabled / disabled.



Resistor	Dip	Description	Default
Rterm	1 and 2	220 Ω termination resistor Move dip-switches 1 and 2 to the ON position to connect Rterm	Off
Rpol	3 and 4	390 Ω pull-up or pull-down resistor Move dip-switches 3 and 4 to the ON position to connect Rpol	Off



WARNING!

- **configure the dip-switches when the module is off, before connecting the module to the terminal block and communication network**
- **The terminating and biasing resistor must only be installed at the ends of each branch of the communication network (generally on the master and at the opposite end)**

Information in menu Local bus activation, which is essential for starting communication between Ekip Aware and module, is available in the *Settings* menu (page 75).

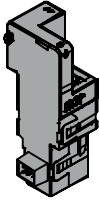
If the module is detected correctly by Ekip Aware, an info area is activated on the display (and becomes available in the menu at *Info - Modules - Ekip Com Profibus DP*) giving the serial number and software version of the module.

Remote configurations Additional parameters can be accessed via USB-C port, via BLE and via system bus:

Parameter	Description	Default
<i>Serial address</i>	Module address; 3 to 125 range available  IMPORTANT: devices connected to the same network must have different addresses	125
<i>Data access mode</i>	Defines Dataset (acyclic data) access mode • each individual acyclic register can be accessed in the Legacy mode using the Slot and Index fields (with variable Slot and Index, in accordance with the indications in the map) • only complete blocks can be accessed in the Dataset mode; with variable Slot and variable Index which defines the block reference See System Interface for details.	Legacy access
<i>Cyclic data endianness</i>	Establishes whether the register of the cyclic data item is configured in Big endian or Little endian.	Little endian
<i>Acyclic data endianness</i>	Establishes whether the register of the acyclic data item is configured in Big endian or Little endian.	Little endian

Remote information Additional information, available via USB-C port, via BLE and via system bus, concerns the state and version of the module: CRC state (correctness of the software in the module), activated memory bank and security related status bits.

6 - Ekip Com Profinet



Ekip Com Profinet is a communication accessory which allows Ekip Aware to be integrated into an Ethernet network with Profinet communication protocol, with remote supervision and monitoring functions.

The module is configured as a device and remotely, you can:

- read Ekip Aware measurements and information
- manage certain controls, including opening and closing the circuit-breaker
- access information not available on the display
- If connected to a withdrawable version of the circuit-breaker, the allows the racked-in/racked-out status to be detected



IMPORTANT: the remote open and close commands of the circuit-breaker can only be executed if Ekip Aware is in the Remote configuration and the circuit-breaker is equipped with YO Sense and YC Sense coils.

Ekip Com Profinet is always supplied with contacts *Ekip AUP* and *Ekip RTC* (page 333).

The System Interface document is available for mapping the module in its communication network. All the required communication and command details are listed in the document (page 237).

The ports used by the module are:

Ethertype	Port	Service	Notes
0x88CC	-	LLDP	Link Layer Discovery Protocol
0x8892 (Profinet)	-	Profinet IO	Specific for real time communications (RT)
0x0800	34964/udp	Profinet-cm (Context manager)	DCE/RPC

Safety and cyber security



IMPORTANT:

- Consult chapter Cybersecurity guidelines on page 80
- The module cannot be connected directly to the Internet. Only connect to dedicated Ethernet networks with Profinet communication protocol

Models Two different modules compatible with the Profinet protocol are available: *Ekip Com Profinet* and *Ekip Com Profinet Secure*.

The Secure version of the module contains security artifacts for identifying and exchanging data to and from Ekip Aware (this also in the Secure version), thereby enhancing the security level.



IMPORTANT:

- A Secure module connected to a standard Ekip Aware will function normally, without the additional safety functions
- each Ekip Aware can be connected to one single Ekip Com Profinet module (this means that an Ekip Com Profinet and an Ekip Com Profinet Secure cannot be connected at the same time)

Connections Install the module in the first vacant slot of the terminal box after *Ekip Supply Evo Modbus*, either on the circuit-breaker (fixed version) or on the fixed part (withdrawable version).

For references about the connection and terminals, please consult document [1SDM000056A1001](#); a cable of the Class 6 S/FTP type (Class 6 with double screening S/FTP) must be used for the communication bus.

To connect the module to Ekip Aware, please consult document [1SDH002310R0514](#).

Power supply The module is supplied directly by *Ekip Supply Modbus TCP* with terminal box.



IMPORTANT: communication between Ekip Aware and the module is interrupted in the absence of auxiliary power supply

Interface the module has three signaling leds:

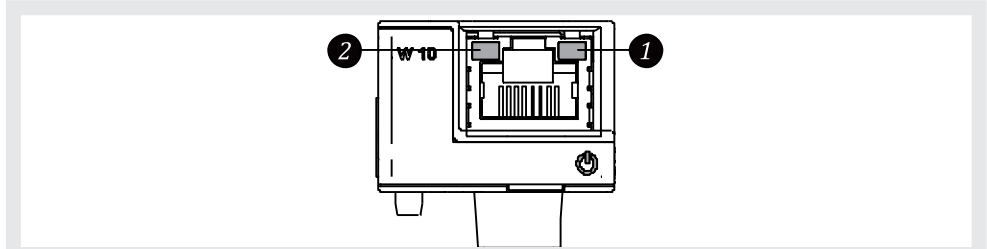


Figure 252

LED	Description
Power	Signals the on status and correct communication with Ekip Aware: • Off: module off • on and steady or with flashing synchronized with Power LED of Ekip Aware: module on and communication with protection release present • flashing not synchronized with the Power led of Ekip Aware (2 fast flashes per second): module on and communication with Trip unit absent.
Activity (1)	Indicates the communication state: • off: no activity on the line • flashing (activity on line present receiving and/or transmitting)
Link (2)	Indicates the communication state: • Off: incorrect connection, signal absent • on fixed: correct connection

Information in menu Local bus activation, which is essential for starting the communication between module and Ekip Aware, is available in the *Settings* menu (page 75).

If the module is detected correctly by Ekip Aware an info area is activated on the display (and becomes available in the menu at *Info - Modules - Ekip Com Profinet*), containing the following information:

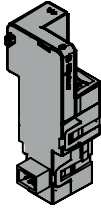
Information	Description
<i>SN and version</i>	Serial number and software version of module
<i>MAC address</i>	Address assigned by ABB, with OUI (Organizationally Unique Identifier) equal to ac:d3:64, which uniquely identifies the manufacturer of an Ethernet device

Remote configurations Additional parameters can be accessed via the service connector (via Ekip Connect) or via a system bus communication:

Parameter	Description	Default
<i>Data access mode</i>	Defines Dataset (acyclic data) access mode • each individual acyclic register can be accessed in the Legacy mode using the Slot, Subslot and Index fields (with Slot fixed at 3) • only complete blocks can be accessed in the Dataset mode; Slot is fixed at 0, Subslot at 1 and Index defines the block reference Consult the System Interface for details.	Legacy access
<i>Cyclic data endianness</i>	Establishes whether the register of the cyclic data item is configured in Big endian or Little endian.	Little endian
<i>Acyclic data endianness</i>	Establishes whether the register of the acyclic data item is configured in Big endian or Little endian.	Little endian

Remote information Additional information concerning the version and state of the module is available via the service connector, via Ekip Connect or by communication via system bus. This information includes: CRC state, indicating the correctness of the software in the module, memory bank activated, DCP Name, network settings such as the IP address, Network Mask, gateway address and security related status bits.

7 - Ekip Com EtherNet/IP™



Ekip Com EtherNet/IP™ is a communication accessory which allows Ekip Aware to be integrated into an Ethernet network with EtherNet/IP™ communication protocol, with remote supervision and monitoring functions.

The module is configured as Adapter or Target and remotely, you can:

- read Ekip Aware measurements and information
- manage certain controls, including opening and closing the circuit-breaker
- access information and parameters not available on the display
- If connected to a withdrawable version of the circuit-breaker, the allows the racked-in/racked-out status to be detected



IMPORTANT: the remote open and close commands of the circuit-breaker can only be executed if Ekip Aware is in the Remote configuration and the circuit-breaker is equipped with YO Sense and YC Sense coils.

Ekip Com EtherNet/IP™ is always supplied with contacts *Ekip AUP* and *Ekip RTC* (page 333).

The System Interface document is available for mapping the module in its communication network. All the required communication and command details are listed in the document (page 237).

Depending on the parameter settings, described in the next pages, the ports used by the module are:

Port	Protocol	Notes
44818	TCP	Encapsulation Protocol (example: ListIdentity, UCMM, CIP Transport Class 3)
44818	UDP	44818 UDP Encapsulation Protocol (example: ListIdentity)
2222	UDP	2222 UDP CIP Transport Class 0 or 1
68/udp	DHCP Client	DHCP client enabled alternatively as <i>Static address = On</i>

Safety and cyber security



IMPORTANT:

- Consult chapter Cybersecurity guidelines on page 80
- The module cannot be connected directly to the Internet. Only connect to dedicated Ethernet networks with EtherNet/IP™ communication protocol

Models Two different modules compatible with the EtherNet/IP™ protocol are available: *Ekip Com EtherNet/IP™* and *Ekip Com EtherNet/IP™ Secure*.

The Secure version of the module contains security artifacts for identifying and exchanging data to and from Ekip Aware (this also in the Secure version), thereby enhancing the security level.



IMPORTANT:

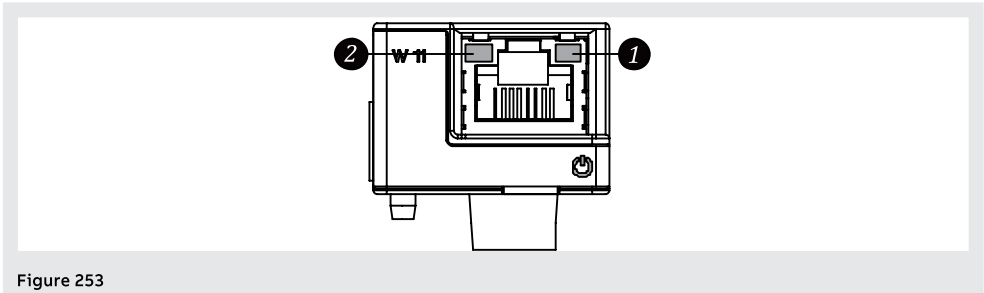
- A Secure module connected to a standard Ekip Aware will function normally, without the additional safety functions
- each Ekip Aware can be connected to one single Ekip Com EtherNet/IP™ module (this means that an Ekip Com EtherNet/IP™ module and an Ekip Com EtherNet/IP™ Secure module cannot be connected at the same time)

Connections The module must be assembled in the first vacant slot of the terminal block after *Ekip Supply*.
For references about the connection and terminals, please consult document [1SDM000056A1001](#); a cable of the Class 6 S/FTP type (Class 6 with double screening S/FTP) must be used for the communication bus.
To connect the module to Ekip Aware, please consult document [1SDH002310A1514](#).

Power supply The module is supplied directly by *Ekip Supply Modbus TCP* with terminal box.

! IMPORTANT: communication between Ekip Aware and the module is interrupted in the absence of auxiliary power supply

Interface the module has three signaling leds:



LED	Description
Power	Signals the on status and correct communication with Ekip Aware: • Off: module off • on and steady or with flashing synchronized with Power LED of Ekip Aware: module on and communication with protection release present • flashing not synchronized with the Power led of Ekip Aware (2 fast flashes per second): module on and communication with Trip unit absent.
Activity (1)	Indicates the communication state: • off: no activity on the line • flashing (activity on line present receiving and/or transmitting)
Link (2)	Indicates the communication state: • Off: incorrect connection, signal absent • on fixed: correct connection

Information in menu

Local bus activation, which is essential for starting communication between Ekip Aware and module, is available in the *Home - Settings - Connectivity* menu.

The following information will be available in the *Info - Modules* menu if Ekip Aware has detected the module correctly:

Information	Description
<i>SN and Version</i>	Serial number and software version of module
<i>IP address</i>	Address of the module, assigned to the module by a DHCP server at the time of connection to the network in the case of configuration with a dynamic IP or settable in the case of a static IP. i NOTE: without a DHCP server, the module automatically adopts a random IP address within the 169.254.xxx.xxx range
<i>Network Mask</i>	Subnet mask; identifies the method for recognizing the subnet to which the modules belong and enables modules to be searched for within a defined set of recipients.
<i>Gateway Address</i>	IP address of the node to which the module is connected, in the presence of several subnets
<i>MAC address</i>	Address assigned by ABB, with OUI (Organizationally Unique Identifier) equal to ac:d3:64, which uniquely identifies the manufacturer of an Ethernet device

Remote configurations

Additional parameters can be accessed via USB-C port, via BLE and via system bus:

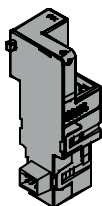
Parameter	Description	Default
<i>Force static IP Address</i>	Defines whether the module has the dynamic (OFF) or static (ON) IP address If = ON, all the associated parameters are enabled	OFF
<i>Static IP address</i>	Enables the static IP to be selected	0.0.0.0
<i>Static Network Mask</i>	Enables the subnet mask to be selected	0.0.0.0
<i>Static Gateway address</i>	When there are several subnets, enables the IP address of the node to which the module is connected to be selected	0.0.0.0

Remote information

Additional information can be accessed via USB-C port, via BLE and via system bus:

Information	Description
<i>Flash CRC status and result</i>	Information about the correctness of the SW in the module
<i>Security status</i>	Security related status bits

8 - Ekip Com IEC 61850



Ekip Com IEC 61850 is a communication accessory which allows Ekip Aware to be integrated into an Ethernet network with IEC 61850 communication protocol, with remote supervision and monitoring functions.

By means of the module, remotely you can:

- read Ekip Aware measurements and information
- manage certain controls, including opening and closing the circuit-breaker
- access information and parameters not available on the display
- transmit vertical communication (report) to superior supervision systems (SCADA), with statuses and measurements (re-transmitted whenever and only if they change with respect to the previous report)
- transmit horizontal communication (GOOSE) to other actuator devices (example: medium voltage circuit-breakers), with all the information about status and measurements normally shared by Ekip Com communication modules via bus.
- If connected to a withdrawable version of the circuit-breaker, the allows the racked-in/racked-out status to be detected



IMPORTANT: the remote open and close commands of the circuit-breaker can only be executed if Ekip Aware is in the Remote configuration and the circuit-breaker is equipped with YO Sense and YC Sense coils.

Ekip Com IEC 61850 is always supplied with contacts *Ekip AUP* and *Ekip RTC* (page 333).

The System Interface document is available for mapping the module in its communication network. All the required communication and command details are listed in the document (page 237).

The document also describes the configuration files for the IEC 61850 protocol and relative uploading procedure for assigning the Technical Name and enabling GOOSE messages if required (by setting the relative MAC Addresses)

Depending on the parameter settings, described in the next pages, the ports used by the module are:

Ethertype	Port	Protocol
0x0800-IP	102	ISO Transport Service on top of the TCP (RFC 1006)
0x88B8	-	GOOSE Messages
0x0800-IP	123 UDP	NTP - Network Time Protocol
0x0800-IP	69 UDP	TFTP - Trivial File Transfer Protocol

Safety and cyber security

The unit can only be connected to networks equipped with all the necessary security and prevention measures against unauthorized access (for example, the network of the control system of an installation).



IMPORTANT:

- Consult chapter Cybersecurity guidelines on page 80
- The module cannot be connected directly to the Internet. Only connect to dedicated Ethernet networks with IEC 61850 communication protocol

Models Two different modules compatible with the IEC 61850 protocol are available: *Ekip Com IEC 61850* and *Ekip Com IEC 61850 Secure*.

The Secure version of the module contains security artifacts for identifying and exchanging data to and from Ekip Aware (this also in the Secure version), thereby enhancing the security level.



IMPORTANT:

- A Secure module connected to a standard Ekip Aware will function normally, without the additional safety functions
- each Ekip Aware can be connected to one single Ekip Com IEC 61850 module (this means that an Ekip Com IEC 61850 and an Ekip Com IEC 61850 Secure cannot be connected at the same time)

Connections Install the module in the first vacant slot of the terminal box after *Ekip Supply Evo Modbus*, either on the circuit-breaker (fixed version) or on the fixed part (withdrawable version).

For references about the connection and terminals, please consult document [1SDM000056A1001](#); a cable of the Class 6 S/FTP type (Class 6 with double screening S/FTP) must be used for the communication bus.

To connect the module to Ekip Aware, please consult document [1SDH002310R0514](#).

Power supply The module is supplied directly by *Ekip Supply Modbus TCP* with terminal box.



IMPORTANT: communication between Ekip Aware and the module is interrupted in the absence of auxiliary power supply

Interface the module has three signaling leds:

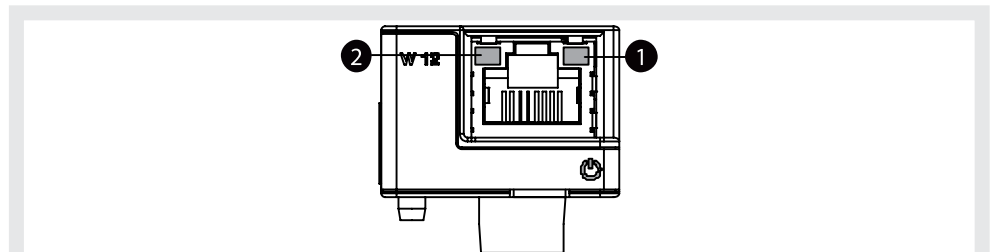


Figure 254

LED	Description
Power	Signals the on status and correct communication with Ekip Aware: • Off: module off • on and steady or with flashing synchronized with Power LED of Ekip Aware: module on and communication with protection release present • flashing not synchronized with the Power led of Ekip Aware (2 fast flashes per second): module on and communication with Trip unit absent.
Activity (1)	Indicates the communication state: • off: no activity on the line • flashing (activity on line present receiving and/or transmitting)
Link (2)	Indicates the communication state: • Off: incorrect connection, signal absent • on fixed: correct connection

Information in menu

The following information will be available in the *Info - Modules - Ekip Com IEC 61850* menu if Ekip Aware has detected the module correctly:

Information	Description
<i>SN and Version</i>	Serial number and software version of module
<i>IP address</i>	Address of the module, assigned to the module by a DHCP server at the time of connection to the network in the case of configuration with a dynamic IP or settable in the case of a static IP.  NOTE: without a DHCP server, the module automatically adopts a random IP address within the 169.254.xxx.xxx range
<i>Network Mask</i>	The subnet mask identifies the method for acknowledging the subnet to which the modules belong. Allows modules to be searched for within a certain group of addressees
<i>Gateway Address</i>	IP address of the node to which the module is connected, in the presence of several subnets
<i>MAC address</i>	Address assigned by ABB, with OUI (Organizationally Unique Identifier) equal to ac:d3:64, which uniquely identifies the manufacturer of an Ethernet device
<i>Cfg file</i>	Name of the configuration file uploaded to the modules
<i>Cfg file error</i>	Code of the error concerning the configuration file (0 = no error)

Remote configurations

Additional parameters can be accessed via the service connector (via Ekip Connect) or via a system bus communication:

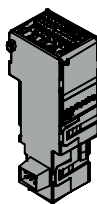
Parameter	Description	Default
<i>Preferred configuration file</i>	If several configuration files are present, allows file hierarchy between .cid and .iid to be defined	.cid
<i>Force static IP address</i>	Defines whether the module has the dynamic (OFF) or static (ON) IP address Se = On all the associated parameters are enabled	OFF
<i>Static IP address</i>	Enables the static IP to be selected	0.0.0.0
<i>Static Network Mask</i>	Enables the subnet mask to be selected	0.0.0.0
<i>Static Gateway address</i>	When there are several subnets, enables the IP address of the node to which the module is connected to be selected	0.0.0.0
<i>Configuration Session Security level</i>	Defines the write mode of the configuration file in the module via the TFTP port; two options are available: • Always ON: the TFTP port is always open and writing is always enabled • Enable required: The TFTP port remains closed by default and opens and closes by means of commands. The opening command enables writing for a limited time or for a limited number of data packages. Although not necessary, the closing command is available as a safety measure.	Always ON
<i>Start Configuration Session</i>	Writing enabling command on TFTP port in the Enabled required mode	---
<i>CB Open/CB Close command</i>	Defines the limitations to remote opening and closing command execution: • <i>Standard commands</i> = standard commands (unrestricted) activated • <i>CB Operate request</i> = standard commands not activated. Use programmable functions YC COMMAND and YO COMMAND, and Request breaker open (28) and Request breaker close (29) commands	Standard commands
<i>Remote Zone Selectivity Enable</i>	Analysis of selectivity input from IEC 61850 module can be enabled/disabled for each of protections S, S2, G, Gext, D, D(BW), D(FW)	Disabled (all)

Remote information

Additional information can be accessed via the service connector (via Ekip Connect) or via a system bus communication:

Information	Description
<i>Flash CRC status and result</i>	Information about the correctness of the SW in the module
<i>GOOSE Missing</i>	Signals that an expected GOOSE has not been received
<i>Configuration Mismatch</i>	A GOOSE received does not conform to the expected structure
<i>Decode Error</i>	
<i>Sequence number error</i>	
<i>Remote programmable statuses (from E to R)</i>	Condition (true/false) of the programmable states and information on selectivity arising from logic defined in the configuration files loaded in module IEC 61850
<i>Remote Zone Selectivity Inputs</i>	
<i>Security status</i>	Security related status bits

9 - Ekip Signalling 2K



Ekip Signalling 2K is an accessory signalling module allowing programmable inputs/outputs to be managed.

This module has:

- two contacts for output signals and relative status led
- two digital inputs and relative status led
- a Power led with the startup status of the module

Models Two different Signalling 2K modules are available: *Ekip Signalling 2K-1* and *Ekip Signalling 2K-2*.

The modules are identical in terms of characteristics and installation methods, except for: display menus, cabling and addresses for system communication, which are specific for each module.



NOTE: The information in this chapter is applicable to both models

The two modules can be connected at the same time to Ekip Aware so as to expand the potential of the system (example, to increase the number of control inputs and outputs).

The Secure version is available for each type of module (2K-1 and 2K-2).

The Secure version of the module employs devices able to enhance the security level in identifying and exchanging data from and to Ekip Aware (this also in the Secure version).



IMPORTANT: each Ekip Aware can be fitted with only one module per type. The configuration with two or three modules of the same model is not allowed (example: two Ekip Signalling 2K-1 modules)

- a Secure module connected to a standard Ekip Aware will function normally, without additional security functions
- each Ekip Aware can be connected to one single module per type; for example, two Ekip Signalling 2K-1 modules or an Ekip Signalling 2K-1 module and an Ekip Signalling 2K-1 Secure module cannot be connected at the same time

Safety and cyber security



IMPORTANT: Consult chapter Cybersecurity guidelines on page 80

Connections Install the module in the first vacant slot of the terminal box after *Ekip Supply* (Lite or Evo Modbus TCP), either on the circuit-breaker (fixed version) or on the fixed part (withdrawable version).

For references about the connection and terminals, please consult document [1SDM000056A1001](#); use AWG 22-16 cables with 1.4 mm maximum outer diameter for the external cabling.

To connect the module to Ekip Aware, please consult document [1SDH002310A1524](#).



IMPORTANT: The input is able to operate with a maximum input resistance of 25 Ohm. Wiring distance limitation have to be calculated from this value. As example: considering an AWG20 cable with 29.5 Ohm/km and a microswitch with a resistance of few milliohm (negligible for the calculation) the limitation is: $25 \text{ (Ohm)} / 29.5 \text{ (Ohm/km)} / 2 \text{ wires} = 0.423 \text{ km} = 423 \text{ mt}$

Power supply The module is supplied directly by Ekip Supply with terminal box.



IMPORTANT: communication between Ekip Aware and the module is interrupted in the absence of auxiliary power supply

Input Ekip Aware can be configured so that the status of the inputs corresponds to actions or signals, with different programming options.

The actions or signals corresponding to the state of the inputs can be programmed in a remotely accessible dedicated page (via USB-C port, via BLE or via system bus).

The state of each input (H11 or H12 for model 2K-1, H21 or H22 for model 2K-2) can be closed or open and is determined by connection (or non-connection) of the input to the common reference of the two inputs (HC1 for model 2K-1, HC2 for model 2K-2).

The corresponding ON or OFF logic state detected by Ekip Aware depends on the configuration of the input:

State of the input	Electrical condition with respect to the common reference	Configuration of input	Logic state detected by Ekip Aware
Open	Circuit open ⁽¹⁾	Active open	ON
		Active closed	OFF
Closed	Short-circuit ⁽²⁾	Active open	OFF
		Active closed	ON

⁽¹⁾ $R > 100\text{ k}\Omega$

⁽²⁾ $R (\text{wiring} + \text{short circuit contact}) < 25\text{ }\Omega$

Output Ekip Aware can be configured so that the output contacts of the module are closed or opened when one or more events occur, with different programming options.

Each output consists of a contact (K11-K12 o K13-K14 for model 2K-1; K21-K22 for model 2K-2) isolated from the module and from the other output.

Each contact has the following electrical characteristics:

Characteristics	Maximum limit ⁽¹⁾
Maximum switchable voltage	150 VDC / 250 VAC
Breaking capacity	2 A @ 30 VDC, 0,8 A @ 50 VDC, 0,2 A @ 150 VDC, 4 A @ 250 VAC
Dielectric strength between open contacts	1000 VAC (1 minutE @ 50 Hz)
Dielectric strength between each contact and coil	1000 VAC (1 minutE @ 50 Hz)

⁽¹⁾ Data relating to a resistive load

Interface the module has three signaling leds:

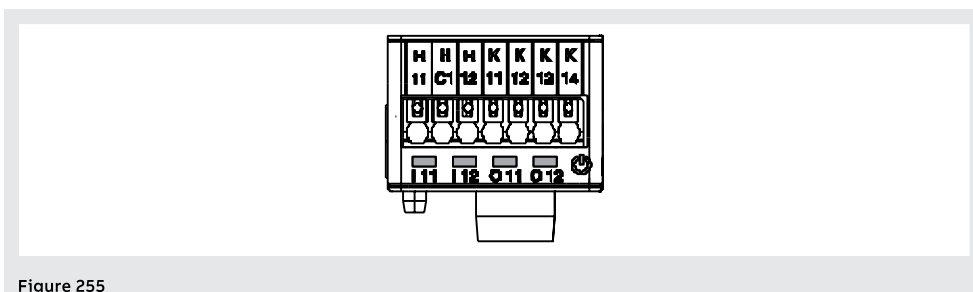


Figure 255

LED	Description
Power	Signals the on status and correct communication with Ekip Aware: - Off: module off - on and steady or with flashing synchronized with Power LED of Ekip Aware: module on and communication with protection release present - flashing not synchronized with the Power led of Ekip Aware (2 fast flashes per second): module on and communication with Trip unit absent.
I 11, I 12	Indicate the status of the contacts of each input: - off: circuit open - on: circuit closed
O 11, O 12	Indicate the status of the contacts of each output: - off: contact open - on: contact closed

Information in menu If the module is detected correctly by Ekip Aware, the display will visualize an info area available in the *Info - Modules - Ekip Signalling 2K* menu, in which the serial number of the module, the software version of the module, the logic state of the inputs and the state of the output contacts are given.

Input parameters The inputs can be remotely configured by means of the following parameters:

Parameter	Description	Default
<i>Polarity</i>	Defines the state of the input (circuit closed or open) that activates the logic state ON detected by Ekip Aware	Active Closed
<i>Delay</i>	Minimum activation time of the input before status change is recognized; the delay is given in seconds and can be set within range: 0 s to 100 s, in 0.01 s steps i NOTES: • if the input is deactivated before this time has elapsed the status change is not recognized • if delay = 0 s, minimum input activation must in any case exceed 300 μ S	0.1 s

Output parameters The outputs can be remotely configured by means of the following parameters:

Parameter	Description	Default
<i>Signal source</i>	Event which activates the output and switches the contacts. Different protection proposals, statuses and thresholds are available on the display; the Custom mode can be configured via Ekip Connect so as to extend the solutions and combine several events	None
<i>Delay</i>	Minimum duration of the presence of the source before the output is activated; the delay is given in seconds and can be set within range: 0 s to 100 s, in 0.01 s steps i NOTES: • the output will not be switched if the activation state deactivates before this time has elapsed • if delay = 0 s the source must still be present for longer than 300 μ S	0 s
<i>Contact Type</i>	Defines the rest status of the contact with source not present between: open (NO) and closed (NC)	NO
<i>Latched⁽¹⁾</i>	Allows the output (and relative status led) to be kept activated (On) or deactivated (Off) when the event disappears	OFF
<i>min Activation Time⁽²⁾</i>	Defines the minimum closing time of the contact following the rapid presence of sources: • Source duration < min. activation = contact is activated for the minimum activation time • Source duration $\geq$ min. activation = contact is activated for as long as the source persists Choose between: 0 ms, 100 ms, 200 ms	0 ms

⁽¹⁾ deactivate the latching of the outputs used if the module is used for the Power Controller function

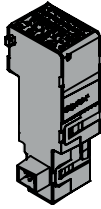
⁽²⁾ the Power Controller option will also be available if the module is used for the Power Controller function; if selected, the output remains activated for a set time that depends on the function, regardless of whether the event that activated it persists

Commands by remote control The following commands are available via USB-C port, via BLE and via system bus:

- Reset signals which, with latching activated and in the absence of the activation condition, switches any activated contacts to the rest state
- Sign Autotest, which executes the automatic output and input test sequence

Remote information Additional information, available via USB-C port, via BLE and via system bus, concerns the state and version of the module: CRC state (correctness of the software in the module), activated memory bank and security related status bits.

10 - Ekip RELT



Models

Ekip RELT is an accessory signalling module allowing programmable inputs/outputs to be managed.

This module has:

- two contacts for output signals and relative status led
- two digital inputs and relative status led
- a Power led with the startup status of the module

Two versions of Ekip RELT are available: *Ekip RELT* and *Ekip RELT Secure*.

The Secure version of the module contains security artifacts for identifying and exchanging data to and from Ekip Aware (this also in the Secure version), thereby enhancing the security level.



IMPORTANT:

- a Secure module connected to a standard Ekip Aware will function normally, without additional security functions
- each Ekip Aware can be connected to one single Ekip RELT module (this means that an Ekip RELT module and an Ekip RELT Secure module cannot be connected at the same time).

RELT Configuration

The local bus must be enabled in order to launch a communication between Ekip Aware and the module (page 75).

Once module presence has been detected, the Wizard RELT command becomes available on the display (in the RELT pages, accessible following paths *Home - Protections - Set A or Set B or Set C*).

The command automatically configures the RELT protection of Ekip Aware in the same way for the three configurations of protections A, B and C.

In addition, the command also configures one of the module inputs so that it activates the RELT protection, as well as the outputs of the module and the Local Activate function so that they are activated by the RELT protection.

The following parameters are configured by the module:

Parameter	Configuration from RELT Wizard command
Prot RELT	Status = Enabled; Threshold I31 = 1,5 In; Zone Selectivity status = Disabled; Zone Selectivity Type = Logic and Hardware; RELT Mode = Function Dependent; Function = Ekip RELT Input 1 (H31); Delay On = 100 ms
Ekip RELT - Input I31	Polarity = Active Closed; Delay = 0,1 s
Ekip RELT - Output O31 e O32	Contact Type = Normally Open; Latch = OFF; Signal Source = Second I Activated; Delay = 0 s; min Activation Time = 0 ms
Local activate function	Function = Second I Activated, Delay = 0 s

If the RELT mode is not enabled, the characteristics and functions of the module will be the standard ones described on the following pages.

Connections

Install the module in the first vacant slot of the terminal box after *Ekip Supply* (Lite or Evo Modbus TCP), either on the circuit-breaker (fixed version) or on the fixed part (withdrawable version).

For references about the connection and terminals, please consult document [1SDM000056A1001](#); use AWG 22-16 cables with 1.4 mm maximum outer diameter for the external cabling.

To connect the module to Ekip Aware, please consult document [1SDH002310A1524](#).



IMPORTANT: The input is able to operate with a maximum input resistance of 25 Ohm. Wiring distance limitation have to be calculated from this value. As example: considering an AWG20 cable with 29.5 Ohm/km and a microswitch with a resistance of few milliohm (negligible for the calculation) the limitation is: $25 \text{ (Ohm)} / 29.5 \text{ (Ohm/km)} / 2 \text{ wires} = 0.423 \text{ km} = 423 \text{ mt}$

Power supply The module is supplied directly by Ekip Supply with terminal box.



IMPORTANT: communication between Ekip Aware and the module is interrupted in the absence of auxiliary power supply

Input Ekip Aware can be configured so that the status of the inputs corresponds to actions or signals, with different programming options.

The actions or signals corresponding to the state of the inputs can be programmed in a remotely accessible dedicated page (via USB-C port, via BLE or via system bus).

The state of each input (H31 or H32) can be closed or open and is determined by connection (or non-connection) of the input to the common reference of the two inputs (HC3).

The corresponding ON or OFF logic state detected by Ekip Aware depends on the configuration of the input:

State of the input	Electrical condition with respect to the common reference	Configuration of input	Logic state detected by Ekip Aware
Open	Circuit open ⁽¹⁾	Active open	ON
		Active closed	OFF
Closed	Short-circuit ⁽²⁾	Active open	OFF
		Active closed	ON

⁽¹⁾ $R > 100\text{ k}\Omega$

⁽²⁾ $R\text{ (wiring + short circuit contact)} < 25\text{ }\Omega$

Output Ekip Aware can be configured so that the output contacts of the module are closed or opened when one or more events occur, with different programming options (Output Parameters, page 317).

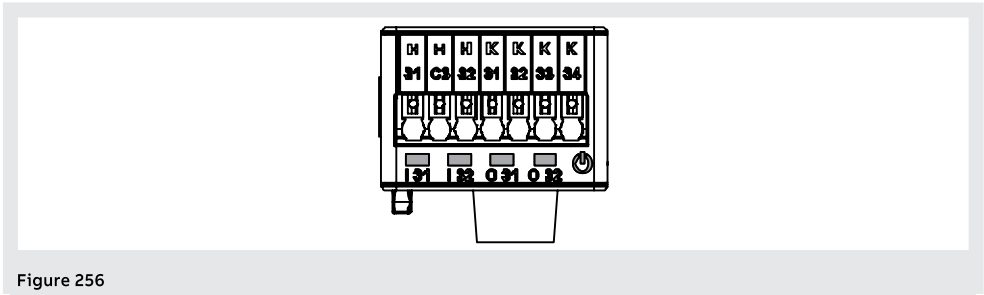
Each output consists of a contact (K31-K32 or K33-K34) isolated from the module and from the other output.

Each contact has the following electrical characteristics:

Characteristics	Maximum limit ⁽¹⁾
Maximum switchable voltage	150 VDC / 250 VAC
Breaking capacity	2 A @ 30 VDC, 0,8 A @ 50 VDC, 0,2 A @ 150 VDC, 4 A @ 250 VAC
Dielectric strength between open contacts	1000 VAC (1 minutE @ 50 Hz)
Dielectric strength between each contact and coil	1000 VAC (1 minutE @ 50 Hz)

⁽¹⁾ Data relating to a resistive load

Interface the module has three signaling leds:



LED	Description
Power	Signals the on status and correct communication with Ekip Aware: • Off: module off • on and steady or with flashing synchronized with Power LED of Ekip Aware: module on and communication with protection release present • flashing not synchroized with the Power led of Ekip Aware (2 fast flashes per second): module on and communication with Trip unit absent.
I 11, I 12	Indicate the status of the contacts of each input: • off: circuit open • on: circuit closed
O 11, O 12	Indicate the status of the contacts of each output: • off: contact open • on: contact closed

Information in menu If the module is detected correctly by Ekip Aware, the display will visualize an info area available in the *Info - Modules - Ekip RELT* menu, in which the serial number of the module, the software version of the module, the logic state of the inputs and the state of the output contacts are given.

Input parameters The inputs can be remotely configured by means of the following parameters:

Parameter	Description	Default
Polarity	Defines the state of the input (circuit closed or open) that activates the logic state ON detected by Ekip Aware	Active Closed
Delay	Minimum activation time of the input before status change is recognized; the delay is given in seconds and can be set within range: 0 s to 100 s, in 0.01 s steps i NOTES: • if the input is deactivated before this time has elapsed the status change is not recognized • if delay = 0 s, minimum input activation must in any case exceed 300 µS	0.1 s

Output parameters The outputs can be remotely configured by means of the following parameters:

Parameter	Description	Default
<i>Signal Source</i>	Condition that activates the output, by switching the contact from the rest state to the activated state. The activation condition can be configured by selecting an event from a pre-defined list or by selecting the "Customized" mode, which enables several events to be combined.	None
<i>Delay</i>	Minimum duration of the output activation condition before the output is activated; the delay is given in seconds and can be set within range: 0 s to 100 s in 0.01 s steps i NOTES: • the output will not be activated if the activation condition deactivates before this time has elapsed • if delay = 0 s, the minimum duration of the activation condition must in any case exceed 300 µs	0 s
<i>Contact Type</i>	Defines the rest state of the contact with activation condition absent between: Normally Open and Normally Closed	Normally Open
<i>Latch⁽¹⁾</i>	Allows the output to be kept activated (ON) or to deactivate (OFF) the output (and relevant state LED) when the activation condition disappears	OFF
<i>min Activation⁽²⁾</i>	Minimum duration of the activated state of the contact, in the case of shorter activation condition duration • Condition duration < minimum activation time = contact is activated for at least the minimum activation time • Condition duration ≥ Minimum activation time = contact is activated for for a duration at least equal to that of activation Choose between: 0 ms, 100 ms, 200 ms	0 ms

⁽¹⁾ deactivate the latching of the outputs used if the module is used for the Power Controller function

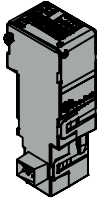
⁽²⁾ the Power Controller option will also be available if the module is used for the Power Controller function; if selected, the output remains activated for a set time that depends on the function, regardless of whether the event that activated it persists

Commands by remote control The following commands are available via USB-C port, via BLE and via system bus:

- Reset signals which, with latching activated and in the absence of the activation condition, switches any activated contacts to the rest state
- Sign Autotest, which executes the automatic output and input test sequence

Remote information Additional information, available via USB-C port, via BLE and via system bus, concerns the state and version of the module: CRC state (correctness of the software in the module), activated memory bank and security related status bits.

11 - Ekip Synchrocheck



Ekip Synchrocheck is an accessory module that is used to control closing of an actuator or interconnection circuit-breaker, when synchronism conditions exist between two independent voltage sources (e.g.: generator + grid).

To actuate synchronism:

- The module and Ekip Aware measure, respectively, the voltage on the external contacts (external voltages) and on the internal contacts (internal voltages) of the actuator
- the module manages a signalling contact



NOTES:

- *searching for the synchronism condition is only implemented among the same line-to-line voltages (V12 external and internal, V23 external and internal, V31 external and internal)*
- *with a generator and the actuator in the STANDARD configuration, the external voltages are those of the grid while the internal voltages are those of the generator*
- *the actuator is represented by the circuit-breaker in the following description*

Models Two versions of the Ekip Synchrocheck module are available: Ekip Synchrocheck and Ekip Synchrocheck Secure.

The Secure version of the module contains security artifacts for identifying and exchanging data to and from Ekip Aware (this also in the Secure version), thereby enhancing the security level.



IMPORTANT:

- **a Secure module connected to a standard Ekip Aware will function normally, without additional security functions**
- **each Ekip Aware can be connected to one single Ekip Synchrocheck module (this means that an Ekip Synchrocheck module and an Ekip Synchrocheck Secure module cannot be connected at the same time)**

Safety and cyber security



IMPORTANT: Consult chapter Cybersecurity guidelines on page 80

Mode The module operates in two modes, configurable by the user (in the manual configuration mode) or managed automatically by the Ekip Aware (in the automatic configuration mode).

Conditions	Description
Live bar	Operation with different voltage from zero selected: • synchronism search starts if the external voltage selected is more than or the same as a minimum (0.5 Un by default), for at least (1 s by default) • synchronism is considered to have been reached if the differences between the RMS values, the frequencies and the voltage phases selected are less than or the same as a maximum (0.12 Un, 0.1 Hz, and 50° by default)
Dead bar and STANDARD configuration	Operation with one of the selected voltages nil: • synchronism search starts if the internal voltage selected is more than or the same as a minimum (0.5 Un by default), for at least (1 s by default). • synchronism is considered to have been reached if the external voltage selected is less than or the same as a maximum (0.2 Un by default) for at least (1 s by default)



IMPORTANT: In the dead bar mode and with REVERSE configuration, the roles of the internal and external voltages are reversed

Synchronism signal:

- is activated upon reaching synchronism and maintained for at least 0.2 s
- is deactivated when synchronism fails or the circuit-breaker is closed (with assessment of the state of the enabled circuit-breaker) or communication with Ekip Aware is interrupted

Additional functions

The synchronism conditions described above can be configured differently by:

- selection of the line-to-line voltages to which the function must be applied
- extension of RMS value control to all the line-to-line voltages (applied, by default, only to the selected line-to-line voltage)
- enabling, as a condition, assessment of the state of the circuit-breaker (disabled by default)
- for the Live bar mode, remove the frequency and phase controls (enabled by default)
- configure the state of the signalling contact



NOTE: if the control is extended to all the line-to-line voltages, the frequency and phase controls will still only be applied to the selected voltage



IMPORTANT: before disabling the frequency and phase controls, first make sure that the required frequency and phase correspondence between external and internal contacts already exists

Connections

Install the module in the first vacant slot of the terminal box after the Ekip Supply module (Lite or Evo Modbus TCP), either on the circuit-breaker (fixed version) or on the fixed part (withdrawable version).

For references about the connection and terminals, please consult document [1SDM000056A1001](#).

Use for the external cabling:

- shielded cable type Belden 8772, or equivalent, for the inputs (VS1, VS2, VS3)
- AWG 22-16 cables with up to 1.4 mm outer diameter, or equivalent, for the outputs (KS1, KS2)

To connect the module to Ekip Aware, please consult document [1SDH002310A1513](#).

Power supply

The module is energized by *Ekip Supply* with terminal box.



IMPORTANT: communication between Ekip Aware and the module is interrupted in the absence of auxiliary power supply

Input

The module has three inputs (V S1 - V S2 - V S3) for measuring the voltages; its operation is ensured in these conditions:

Component	Operating range	Normal operating range	Accuracy ⁽¹⁾
Voltage	0 ÷ 120 VAC	10 ÷ 120 VAC	1 % ⁽²⁾
Frequency ⁽³⁾	30 ÷ 80 Hz	30 ÷ 80 Hz	0,1 % ⁽⁴⁾
Phase ⁽⁵⁾	-	-180 ÷ +180 °	1 °

⁽¹⁾ the accuracy values refer to normal operating ranges, as established by IEC 61557-12

⁽²⁾ In Live bar modality

⁽³⁾ In the Live bar mode, frequency measurement starts at ≥ 36 V AC measured voltage and ends at ≤ 32 V AC measured voltage

⁽⁴⁾ In the absence of harmonic distortion

⁽⁵⁾ Phase difference between internal and external voltages

Isolation transformer

An isolating transformer with the characteristics given below must always be installed between the external contacts of the circuit-breaker and the input of the module:

Characteristics	Description
Mechanical	• fixing: EN 50022 DIN 43880 rail • material: self-extinguishing thermoplastic • protection class: IP30 • electrostatic protection: with earth connector shield
Electrical	• accuracy class: ≤ 0,2 • performance: ≥ 4 VA • overload: 20% permanent • insulations: 4 kV between inputs and outputs, 4 kV between screen and outputs, 4 kV between screen and inputs • frequency: 45 to 66 Hz

Output The module has a contact (K S1 - K S2) used for signalling the synchronism condition. The contact is isolated from the module and has the following electrical characteristics:

Characteristics	Maximum limit ⁽¹⁾
Maximum switchable voltage	150 VDC / 250 VAC.
Breaking capacity	2 A @ 30 VDC, 0,8 A @ 50 VDC, 0,2 A @ 150 VDC, 4 A @ 250 VAC
Dielectric strength between open contacts	1000 VAC (1 minutE @ 50 Hz)
Dielectric strength between each contact and coil	1000 VAC (1 minutE @ 50 Hz)

⁽¹⁾ data relating to a resistive load

Interface the module has three signaling leds:

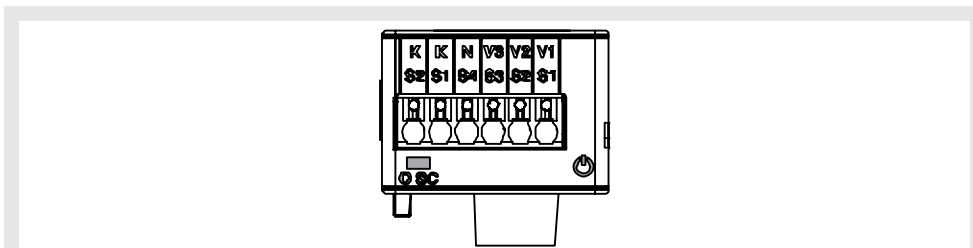


Figure 257

LED	Description
Power	Signals the on status and correct communication with Ekip Aware: - Off: module off - on and steady or with flashing synchronized with the Power LED of Ekip Aware: module on and communication with protection release present - flashing not synchronized with the Power LED of Ekip Aware (two fast flashes per second): module on and communication with protection release absent
O SC	Indicate the state of the output contact: - off: contact open - on: contact closed i NOTE: The LED only represents the state of the contact; the state corresponding to having reached the synchronism condition depends on the configuration of the rest state (Normally Open or Closed)

Configuration The synchronism function can be configured via the USB-C port, via BLE and via system bus, by means of the following parameters:

Parameter	Description	Default
Module enabled	Activates/deactivates the protection and availability of the parameters	OFF
Phase Mode	RMS value control applied solely to the selected line-to-line voltage (Single Phase) or to all the line-to-line voltages (Three Phase); in the second case, the frequency and phase controls will still only be applied to the selected voltage	Single Phase
Automatic Live-dead modality detection	Enables automatic synchronism control to be activated: - Manual = Ekip Aware considers the <i>Dead bar option</i> parameter - Automatic = Ekip Aware automatically assesses the mode to apply, either Dead bar or Live bar	Manual

Continued on the next page

Parameter	Description	Default
Automatic deadbar modality detection	Detection configuration in Dead bar mode: - Manual= Ekip Aware considers the Dead bar configuration parameter - Automatic = Ekip Touch automatically assesses the configuration to apply between: STANDARD or REVERSE	Manual
Dead bar option	ON = Dead bar; OFF = Live bar	OFF
Delta V threshold	Maximum difference between internal and external voltage (first synchronism condition) The value is given as relative value with respect to a U_n , and can be set within range: 0.02 U_n to 0.12 U_n in 0.001 U_n steps	0.12 U_n
Delta frequency ⁽⁴⁾	Maximum difference between internal and external frequency (second synchronism condition) The value is given in Hertz and can be set within range: 0.1 Hz to 1 Hz in 0.1 Hz steps	0.1 Hz
Delta phase ⁽⁴⁾	Maximum difference between internal and external phase (third synchronism condition) The value is given in degrees and can be set within range: 5° to 50° in 5° steps	50 °
Minimum matching time	With active busbar, minimum time within which the Delta Phase condition must be obtained The value is given in seconds and can be set within range: 100 ms to 3 s, in 10 ms steps i NOTE: this is not a synchronism condition, but a parameter allowing a discrimination to be made between correct and incorrect combinations of the Delta Frequency and Delta Phase conditions. Owing to worst case latencies, the time that effectively elapses before synchronism is recognized may be longer than the set time (approx. 20 ms)	100 ms
Phase check	Activates (ON) or deactivates (OFF) phase control for synchronism assessment	ON
V dead threshold ⁽¹⁾⁽²⁾	External maximum voltage (first condition of synchronism in the Dead bar mode and with STANDARD configuration) The value is given as relative value with respect to a U_n , and can be set within range: 0.02 U_n to 2 U_n in 0.001 U_n steps	0.2 U_n
Dead bar configuration	In the Dead bar mode and with generator: - STANDARD = Ekip Synchrocheck/external contacts connected to the grid - REVERSE = Ekip Synchrocheck/external contacts connected to the generator	STANDARD
V live threshold ⁽²⁾⁽³⁾	Minimum voltage for starting monitoring of voltages, external (in the Live bar mode) or internal voltage (in the dead bar mode and with STANDARD configuration) The value is given as relative value with respect to a U_n , and can be set within range: 0.5 U_n to 1.1 U_n in 0.001 U_n steps	0.5 U_n
Stability time	Minimum time within which the V live Threshold condition must be obtained in order to activate voltage monitoring The value is given in ms and can be set within range: 100 ms to 30 s, in 1 ms steps	1000 ms
Evaluate CB status	Activates (YES) or deactivates (NO) circuit-breaker open status control for synchronism assessment i NOTE: fourth synchronism condition with busbar active; second synchronism condition with dead busbar	NO

Parameter	Description	Default
Primary voltage	Rated voltage U_n of installation; the value is given as absolute value (V) and can be set within range: 100 V to 1150 V in variable steps.	100 V
Secondary voltage	Secondary voltage of the transformer; the value is given as absolute value (V) and can be set within range: 100 V to 120 V in 1 V steps.	100 V
Concatenated reference	Line-to-line voltage to which the synchronism function must be applied	U12
Contact Type	Defines the rest state of the contact with synchronism not present; either: open (Normally Open) or closed (Normally Closed)	NO

⁽¹⁾ Parameter not applied in the Live bar mode and Automatic Live-dead modality detection = Manual

⁽²⁾ in the Dead bar mode and with configuration: REVERSE, the roles of the internal and external voltages are reversed

⁽³⁾ 10% hysteresis is applied to the minimum voltage condition: once reached, the condition is lost if the voltage drops below 90% of the set limit

⁽⁴⁾ parameter not applied in the Dead bar mode and Automatic Live-dead modality detection = Manual



NOTE: all the thresholds have $\pm 10\%$ tolerance with the exception of:

- **Voltage Delta; the tolerance is the higher value between: $\pm 10\%$ of the set threshold and $0.5\% U_n$ (with $U_n > 220$ V) or $1\% U_n$ (with $U_n \leq 220$ V)**
- **Frequency Delta; the tolerance is the higher value between $\pm 10\%$ of the set threshold and 0.02 Hz**

Measurements The following measurements can be accessed via USB-C port, via BLE and via system bus:

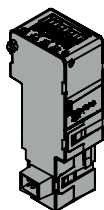
Measurement	Description
Synchrocheck Condition	• OK = Synchronism conditions fulfilled • KO = Synchronism conditions not fulfilled
Synchrocheck Condition on Frequency	• OK = Synchronism condition regarding frequencies fulfilled • KO = Synchronism condition regarding frequencies not fulfilled or frequencies outside measuring range limits
Synchrocheck Condition on Voltage	• OK = Synchronism conditions regarding voltages fulfilled. • KO = Synchronism conditions regarding voltages not fulfilled, or DC measurements less than 1 VAC
Synchrocheck Condition on Phase	• OK = Synchronism condition regarding phase difference fulfilled • KO = Synchronism condition regarding phase difference not fulfilled or frequencies outside measuring range limits
Voltage External Side V12 ⁽¹⁾ Voltage External Side V23 ⁽¹⁾ Voltage External Side V31 ⁽¹⁾	• Voltage measured by module, given in Volts • = measurement DC or less than 1 VAC
Voltage Internal side ⁽²⁾	Voltage measured by Ekip Aware, given in Volts • = measurement less than 1 VAC
Frequency external side ⁽¹⁾	Frequency measured by module • --- = measurement not available (example: for operation in the Dead bar mode or frequencies outside the measuring range)
Frequency internal side ⁽²⁾	Frequency measured by Ekip Aware • --- = measurement not available (example: for operation in the Dead bar mode or frequencies outside the measuring range)
Phase Difference ⁽¹⁾	Phase difference between voltages, given in degrees • --- = measurement not available (example: for operation in the Dead bar mode or frequencies outside the measuring range)

⁽¹⁾ voltage difference measurement accuracy is $\pm 10\%$ unless the parameter value is $0.02 U_n$, in which case accuracy is $\pm 20\%$

⁽²⁾ the characteristics of the voltage and frequency measurements coincide with those given on the internal sockets.

Information in menu	If the module is detected correctly by Ekip Aware, the display will visualize an info area available in the <i>Info - Modules - Ekip Synchrocheck</i> menu, in which the serial number and software version of the module are given.
Remote information	Additional information, available via USB-C port, via BLE and via system bus, concerns the state and version of the module: CRC state (correctness of the software in the module), activated memory bank and security related status bits.

12 - Ekip Temperature 4T



Ekip Temperature 4T is a measuring and signalling module with four analog inputs, to each of which a PT100/PT1000 two-wire temperature can be connected.

The measurements supplied by the module can be associated with different control threshold, useful for configuring alarm signals, states and programmable commands.

Models The module is available in two versions: *Ekip Temperature 4T-1* and *Ekip Temperature 4T-2*.

With the exception of the name of the inputs, menus displayed, cabling and addresses for system communication, the modules are identical to each other as to characteristics and installation methods.



NOTE: *unless different indications are given, the information in the next chapter is applicable to both models*

The two modules can be connected to Ekip Aware at the same time so as to extend the opportunities for measuring and monitoring the installation.

The Secure version is available for each type of module (4T-1 and 4T-2).

The Secure version of the module employs devices able to enhance the security level in identifying and exchanging data from and to Ekip Aware (this also in the Secure version).



IMPORTANT:

- Each Ekip Aware connects to one single module per type. Thus, for example, two Ekip Temperature 4T-1 or one Ekip Temperature 4T-1 and an Ekip Temperature 4T-1 Secure cannot be connected to the same Ekip Aware
- A Secure module connected to a standard Ekip Aware will function normally, without the additional safety functions

Safety and cyber security



IMPORTANT: Consult chapter Cybersecurity guidelines on page 80

Connections

Install the module in the first vacant slot of the terminal box after the Ekip Supply module (Lite or Evo Modbus TCP), either on the circuit-breaker (fixed version) or on the fixed part (withdrawable version).

For references about the connection and terminals, please consult document [1SDM000056A1001](#)

To connect the module to Ekip Aware, please consult document [1SDH002310A1527](#).

Use insulated cables for resistance thermometers such as PENTRONIC TEC/SITW-24F (Type TX) or similar for PT100 / PT1000 sensors. Maximum length three meters.

An equivalent shielded cable must be used for lengths over 3 meters and up to a maximum 10 meters.



IMPORTANT: the inputs are not insulated; regardless of plant voltage, the customer must ensure there is insulation between each input and between the inputs and power supply of the Ekip Supply module on the basis of the customer's own application and network.

For applications in low voltage installations ABB suggests use of the external probe PT1000 3m, is equipped with a nut and screw for use on busbars and is compatible with the dielectric withstand and insulation levels established by standard IEC 60947-2 (Ui= 1000 V, Uimp= 12 kV).

Power supply

The module is supplied directly by Ekip Supply with terminal box.



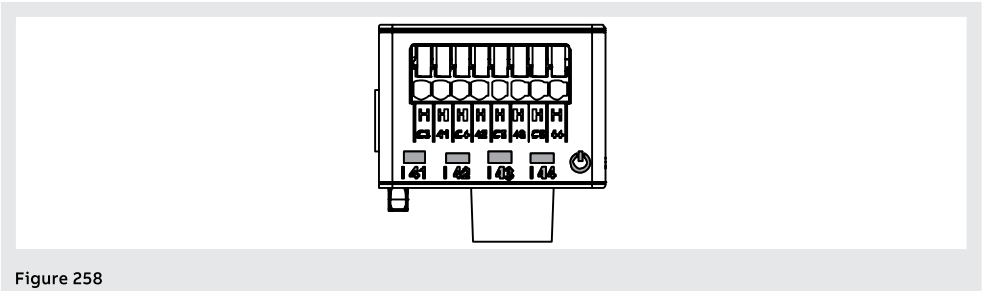
IMPORTANT: communication between Ekip Aware and the module is interrupted in the absence of auxiliary power supply

Input The module enables the following quantities to be measured

Input	Measurement	Range	Resolution	Accuracy ⁽¹⁾
PT100	Temperature	-50 ÷ 250 °C ⁽²⁾	0,01 °C	± 1°C (typ.), ± 1.5°C (max) ⁽²⁾
PT1000	Temperature	-50 ÷ 250 °C ⁽²⁾	0,01 °C	± 0.5 °C (typ.), ± 1 °C (max) ⁽²⁾

⁽¹⁾ accuracy values refer to module without sensors. For complete accuracy, consider the characteristics of the sensors and cabling used; accuracy increases by 0.5 °C with the ABB sensor
⁽²⁾ accuracy is ± 2°C for temperatures beyond the 0 to 130 °C range.

Interface Five signalling leds are available:



LED	Description
Power	Signals the on status and correct communication with Ekip Aware: • Off: module off • on and steady or with flashing synchronized with Power LED of Ekip Aware: module on and communication with Ekip Aware present • flashing not synchronized with Power led of Ekip Aware (two fast flashes per second): module on and communication with Ekip Aware absent
Modul 4T-1: I41, I 42, I 43, I 44 Modul 4T-2: I51, I 52, I 53, I 54	indicate the state of the inputs: • off: input disabled • on steady: input enabled, sensor connected • flashing: input enabled, sensor not connected

Information in menu The following information areas are activated on the display if Ekip Touch detects the module correctly:

- the Measurements-Panel-Ekip Temperatures 4T menu, which gives the measurements of the sensors
- The Info-Modules Ekip Temperatures 4T menu, which gives the serial number of the module, the software version of the module and the state of the sensors (Present or Alarm)

IMPORTANT:

- “Ekip Sign 4T connection” will appear in the diagnostics bar if one or more of the sensors is in the alarm state
- if a sensor is not enabled, the state indicated is: ---

Remote configurations and information Via USB-C port, via BLE and via system bus you can:

- configure the inputs of the module and the relevant alarm thresholds
- view the measurements taken by the module and additional information about the module itself

The pages where the measurement and information parameters can be found are given in the following paragraphs along with the relevant description

Configuration of the inputs

The module inputs can be configured separately in the *Ekip Temperatures 4T* page:

- PT1-1 (I41), PT2-1 (I42), PT3-1 (I43), PT4-1 (I44)
- PT1-2 (I51), PT2-2 (I52), PT3-2 (I53), PT4-2 (I54)

The following table lists the configurable parameters available for each input:

Parameter	Description	Default
<i>PT Temperature</i>	Enables/disables the input and relevant state and alarm controls	Enabled
<i>PT Temperature selector</i>	Selects the type of sensor connected (PT1000/PT100)	PT1000

Configuration of the alarm thresholds

The 24 available thresholds can be enabled and configured on the configuration pages of the Other parameters A , B and C protections. The thresholds are divided into two groups:

- Ekip Temperature 4T and Wireless Modules – 1 Protection, thresholds 1 to 12
- Ekip Temperature 4T and Wireless Modules – 2 Protection, thresholds 13 to 24

The configuration parameters are provided in each group.

The parameters are illustrated in the table below using threshold 1 as an example.

Parameter	Description	Default
<i>Temperature THR 1 Protection</i>	Enables verification of Temperature prot input 1 with alarm threshold set by Temperature THR 1.	Disabled
<i>Temperature THR 1 Config</i>	Defines whether the alarm must activate when the measurement is above (<i>Up</i>) or below (<i>Down</i>), with reference to the Temperature THR 1 threshold setting	Down
<i>Temperature THR 1</i>	Alarm threshold assigned to Temperature THR 1 Protection. The value is given in degrees Celsius (°C) and can be set within the range: -40°C to 240°C, in 0.1°C steps.	200 °C
<i>Temperature THR 1 hysteresis</i>	Hysteresis value, valid for exiting the alarm condition if the set Temperature THR 1 alarm threshold has been exceeded. The hysteresis parameter only allows positive values. The trip unit decides whether to add or subtract this value to or from the alarm threshold on the basis of the direction parameter, example: • <i>Direction</i> = Up, <i>Value</i> = 200°C, <i>hysteresis</i>= 10°C, the alarm activates over 200° and de-activates below 190°C The value is expressed in degrees Celsius (°C) and can be set within the range: 0°C to 50°C with 0.1°C steps.	1 °C

Each of the thresholds set can be paired to the inputs of the Ekip Temperature 4T modules or the T-Sense Ambient and T-Sense Busbar accessories.

Pairing must be performed in the Configure unit - Configure unit - Temperature Protection Input page.

This page features a drop-down menu for each threshold, which can be used to pair the threshold to the input with the Temperature prot input n parameter, where n ranges from 1 to 24.

Parameter	Description	Default
<i>Temperature prot input n</i>	Temperature input to which the n threshold refers	Ekip Temperature 4T – PT1 (I41)

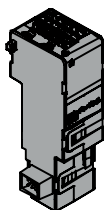
States and alarms

The state of the inputs (especially the absence of sensors connected) and the alarm thresholds can be viewed in the *Warnings/Alarms* page:

Additional information

Besides the serial number and software version of the module, the state of the CRC (correctness of software installed in the module) and activated memory bank can be viewed via USB-C port, via BLE and via system bus.

13 - Ekip Arc-Flash 6F



Ekip Arc-Flash 6F is a signalling accessory equipped with two analog inputs, each of which can connect in series to one to three electric arc detecting sensors.

The Arc Flash protections can be enabled and configured on Ekip Aware if the module is present.

Models The module is available in two versions: Ekip Arc-Flash 6F-1 and Ekip Arc-Flash 6F-2.

With the exception of the name of the inputs, menus displayed, cabling and addresses for system communication, the modules are identical to each other as to characteristics and installation methods.



NOTE: *unless different indications are given, the information in the next chapter is applicable to both models*

The two modules can be connected to Ekip Aware at the same time so as to increase the number of arc detecting sensors.

The Secure version is available for each type of module (6F-1 and 6F-2).

The Secure version of the module employs devices able to enhance the security level in identifying and exchanging data from and to Ekip Aware (this also in the Secure version).



IMPORTANT:

- each Ekip Aware can be connected to one single module per type; for example, two Ekip Arc-Flash 6F-1 or one Ekip Arc-Flash 6F-1 and an Ekip Arc-Flash 6F-1 Secure are not allowed
- a Secure module connected to a standard Ekip Aware will function normally, without additional security functions

Safety and cyber security



IMPORTANT: Consult chapter Cybersecurity guidelines on page 80

Arc sensors There are two types of arc sensors:

- light sensors, equipped with electric arc-sensitive light detector
- light and pressure sensors, equipped with electric arc-sensitive light detector and an ambient pressure sensor

The sensors must be installed in the switchboard with the light and pressure sensitive part pointing towards the area to protect without obstructions. In addition:

- one sensor per compartment is typically used
- In open spaces, such as the section with the main busbars, the Light Sense Detector sensors must be installed no more than 2 meters from each other.
- Light&Pressure Sense Detect sensors cannot be installed in open spaces

Information about how to connect and install the sensors is available in document [1SDH002310A1537](#).



IMPORTANT: The position of the sensors has a direct effect on the operation of the fault detecting system; thus, the sensors must be installed by properly trained specialists in compliance with the instructions provided by the manufacturer

The module can only be connected to sensors supplied by ABB:

- Light-Sense Detector, equipped with light detector only
- Light&Pressure-Sense Detector, equipped with both light and pressure detectors

In addition, the module can be connected to both types of sensor at the same time; choice of the type of sensor is at the customer's charge.

The Light-Sense Detector and Light&Pressure-Sense Detector sensors supplied do not need to be configured:

- the light intensity threshold of the arc is 8,000 lux
- the pressure threshold is 0.2 bars above ambient pressure

Connections Install the module in the first vacant slot of the terminal box after the Ekip Supply module (Lite or Evo Modbus TCP), either on the circuit-breaker (fixed version) or on the fixed part (withdrawable version).
For references about the connection and terminals, please consult document [1SDM000056A1001](#).
To connect the module to Ekip Aware, please consult document [1SDH002310A1558](#).
The arc sensor must be connected by three-pole shielded cable of the Belden 8772 type, Belden 9533 type or equivalent.
The maximum overall length of the sensor connections is 100 meters.

Power supply The module is supplied directly by Ekip Supply with terminal box.



IMPORTANT: communication between Ekip Aware and the module is interrupted in the absence of auxiliary power supply

Interface Three signalling LEDs are available:

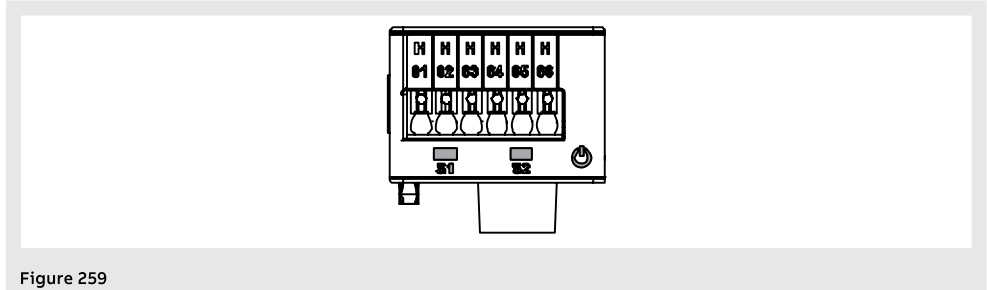


Figure 259

LED	Description
Power	Signals the on status and correct communication with Ekip Aware: - Off: module off - on and steady or with flashing synchronized with Power LED of Ekip Aware: module on and communication with Ekip Aware present - flashing not synchronized with Power led of Ekip Aware (two fast flashes per second): module on and communication with Ekip Aware absent
Module 6F-1: S1, S2 Module 6F-2: S3, S4	indicate the state of the inputs: - off: input disabled - on steady: input enabled and at least one sensor connected - flashing: input enabled and no sensor

Information in menu If the module is detected correctly by Ekip Aware, the display will visualize an info area available in the *Info/Modules/Ekip-Arc Flash 6F* giving the serial number and software version of the module.

Remote configurations and information Via USB-C port, via BLE and via system bus you can:

- configure the inputs of the module and the relevant alarm thresholds
- view the measurements taken by the module and additional information about the module itself

The pages where the measurement and information parameters can be found are given in the following paragraphs along with the relevant description