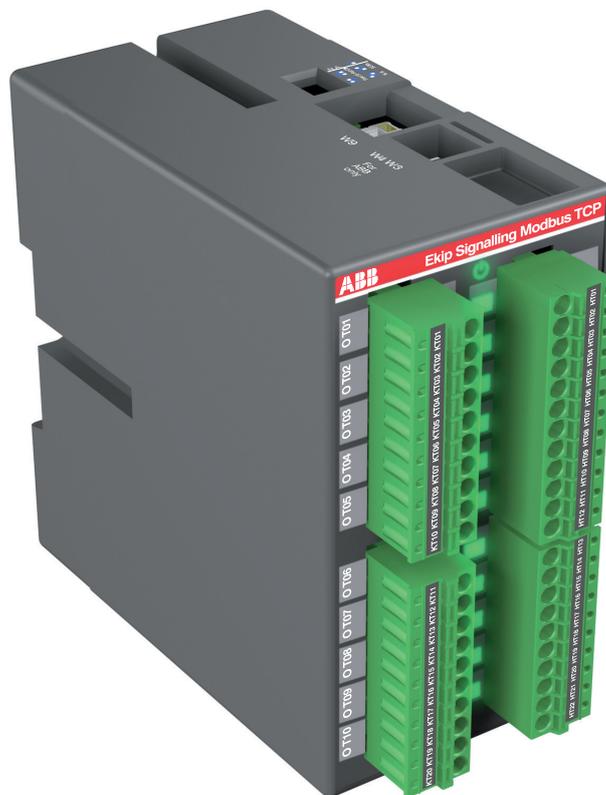


Ekip Signalling Modbus TCP

EMAX2 signalling unit

Installation and operation instructions



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Ekip Signalling Modbus TCP

1 - Presentation

Description The Ekip Signalling Modbus TCP is an external accessory module that can be installed on a standard 35 mm DIN rail (DIN EN 50022 type TS 35 x 15 mm).

Its function is to share, via an Ethernet network with Modbus TCP communication protocol, information about the state of circuit-breakers that may even be without the ability to provide such information via Ethernet, and to allow these circuit-breakers to be operated via remote control.



IMPORTANT: since the module allows circuit breakers to be controlled, it can only be connected to networks that meet all the necessary requirements for security and prevention of unauthorized access (for example, the network of the control system of an installation). It is the responsibility of the installer to make sure that all the necessary security measures have been adopted (for example, firewalls and so on). The module can not be connected directly to the Internet. It is recommended to connect only to dedicated Ethernet networks using the Modbus TCP communication protocol.

To perform its function, the front of the module has:

- Eleven digital inputs (I T01...I T11)
- Ten output contacts (O T01...O T10)

The inputs allow information on the circuit breakers to be collected, while the outputs allow commands to be performed on the circuit breakers.

To switch the state of an input, a short-circuit must be created between the input itself and its reference on the same connector (contact isolated, without electric potential). Then, to obtain the state information required, connect the input and its reference to the terminals of the contact of the circuit-breaker whose closing or opening provides the above information.

Similarly, by connecting the terminals of the output contacts appropriately it is possible to execute commands such as opening or closing the circuit breaker, for example by closing the power circuits of any opening or closing coils.

The module also has a power LED on the front and twenty-one LEDs indicating the state of inputs and outputs (one for each input or output):

- The power led comes on if the module is on. The led is on steady or flashing depending on the user's settings.
- The signalling leds are on if the relative inputs are short-circuited or if the relative output contacts are closed.



NOTE: for the positioning of inputs, outputs and LEDs and the meaning of the LEDs see the chapter "5 - Connectors and LEDs".

Power supply The module must be energized separately from the circuit-breakers to which it is connected and can be powered in either AC or DC.



NOTE: for power supply characteristics, see the paragraph "**Electrical characteristics**".



IMPORTANT: the 110-240 VAC/DC and 24-48 VDC power supplies cannot be present at the same time.

Electrical characteristics The following table lists the electrical specifications of the module power supplies and outputs:

Component	Description
Supply 110-240 VAC/DC	Voltage: 105...265 V AC / DC. Frequency: 45...66 Hz. Max power consumption: 10 VA / W Inrush current: 1 A for maximum 10 ms.
Supply 24-48 VDC	Voltage: 21.5...53 V DC. Max power consumption: 10 W Inrush current: 1 A for maximum 10 ms.
Output contacts	Maximum switching voltage ⁽¹⁾ : 150 V DC / 250 V AC. Maximum switching current ⁽¹⁾ : 2 A @ 30 V DC, 0,8 A @ 50 V DC, 0,2 A @ 150 V DC, 4 A @ 250 V AC. Dielectric strength between open contacts and between each contact and the supply: 1000 V AC (1 minute @ 50 Hz).

⁽¹⁾ Data related to a resistive load.

2 - Operating modes

Description The module can operate in three alternative modes:

- CB Supervisor
- Multi MCCB Supervisor
- Free I/O

The operating mode can be selected by configuring the switches provided on the module, see the paragraph "Configuration using switches".

Mode CB Supervisor In CB Supervisor mode:

- The module can be associated to a single ABB SACE air or moulded case circuit breaker.
- The type of circuit breaker to which the module can be associated can only be selected from a predefined list.
- The meaning and characteristics of six inputs and three outputs of the module are predefined, without any need to configure them.

In this mode, the pre-defined inputs and outputs must therefore be wired as shown in the enclosed circuit diagrams.

However, it is possible to set some parameters, in order to reconfigure the characteristics of inputs and outputs differently to the default.

The remaining inputs and outputs are available, however, and can be used freely, but the meaning assigned to them by the user cannot be managed by the module (for example, to calculate the statistics for the number of times the state of the circuit breaker has been switched).

In CB Supervisor mode, one of the following circuit breakers can be selected:

- Generic CB
- Isomax S1-S2
- Isomax S3
- Isomax S4-S5
- Isomax S6-S7 (AC+DC)
- Tmax T1-T2-T3 5 wires solenoid
- Tmax T4-T5-T6 (AC+DC)
- Tmax T7-X1 (AC+DC)
- Emax E1-E6 and New Emax E1-E6 (AC+DC)
- Emax 2 (AC+DC)

In CB Supervisor mode, if a generic circuit breaker is selected (Generic CB), it's also possible to enable or disable checking of the springs charged state, disabled by default.

In the other cases, checking the springs charged state is disabled if a moulded case circuit breaker (Isomax and Tmax) is selected, and enabled if an air circuit breaker (Emax or Emax2) is selected.

-
- Mode Multi MCCB Supervisor** In Multi MCCB Supervisor mode:
- The module can be associated with up to five ABB SACE moulded case circuit breakers.
 - For each circuit-breaker, one of the module inputs provides information about the closed or open state of the circuit-breaker itself, while another of the module inputs provides information about the tripped or not-tripped state of the circuit-breaker, for a total ten inputs.
 - For each circuit-breaker, one of the module outputs commands circuit-breaker opening, while another of the module outputs commands circuit-breaker closing, for a total ten outputs.

In this mode, the pre-defined inputs and outputs must therefore be wired as shown in the enclosed circuit diagrams.

Also in this mode, it is in any case possible to set some parameters, in order to reconfigure the characteristics of inputs and outputs differently to the default.

Also in this mode, the remaining input is available, however, and can be used freely, but the meaning assigned to it by the user cannot be managed by the module (for example, to calculate the statistics for the number of times the state of the circuit breaker has been switched).

Mode Free I/O In Free I/O mode, the inputs and outputs are fully configurable.

So, unlike the predefined inputs and outputs in the other modes, the user can assign an arbitrary meaning to each of the inputs and outputs.

Configuration using switches The operating mode of the module must be configured during installation.

Position the switches on the upper side of the module in order to configure the operating mode.

The table and figure below show the possible configurations:

Switch	Mode CB Supervisor	Mode Multi MCCB Supervisor	Mode Free I/O
1	ON	ON	OFF
2	ON	OFF	OFF
3	Irrelevant	Irrelevant	Irrelevant

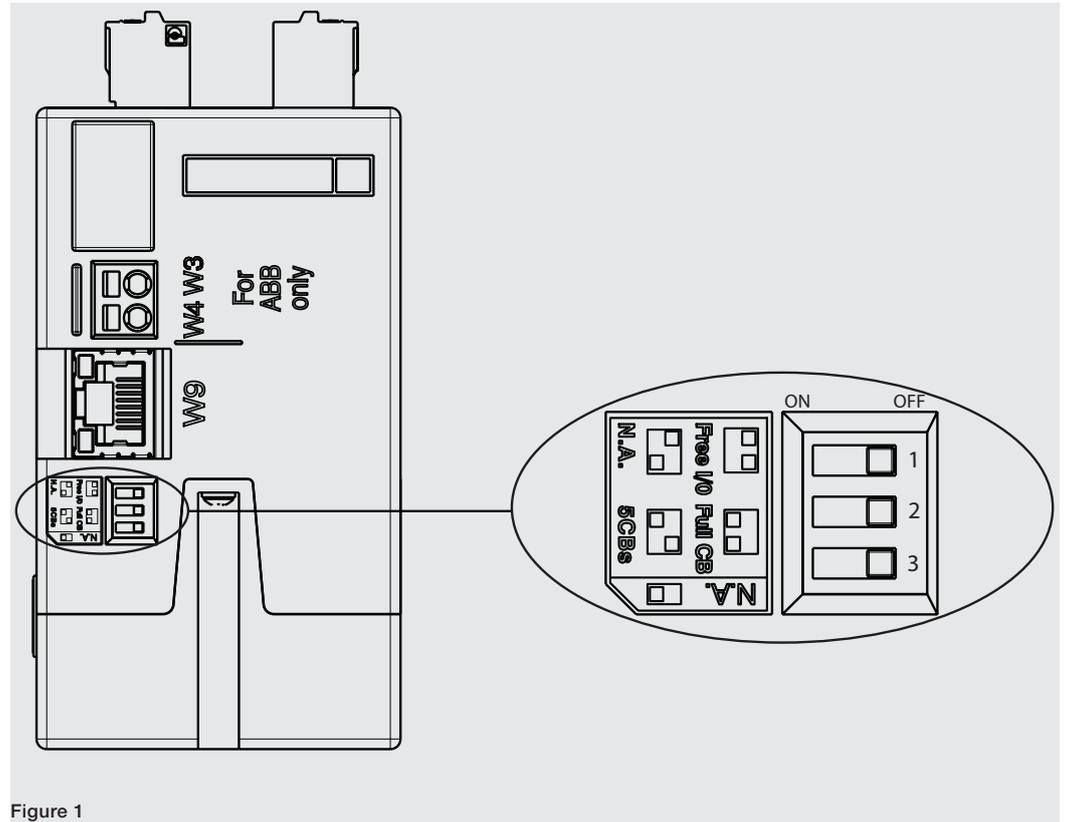


Figure 1

The position of switch 3 has no effect. On the other hand, the N.A. configuration of switches 1 and 2 with switch 1 OFF and switch 2 ON is not managed. Therefore, with this configuration the module will not be identified by an Ethernet scan.

The configuration of the switches is only read at switch-on of the module. Therefore, if the module is on, it must be switched off and back on in order for it to recognise a new configuration.



NOTE: if prior to switching from one operating mode to another you were connected to the module via Ethernet, after restarting it may be necessary to perform another scan, see the chapter "3 - Access via Ethernet".



IMPORTANT: before performing any other operation after switching from one operating mode to the other and re-connecting, remember to restore the default settings of the parameters and reset the statistics, in this order, see the paragraph "Available commands".

3 - Access via Ethernet

Description Once it has been configured using the switches, the module can only be configured via Ethernet by means of the Modbus TCP communication protocol.

Up to three clients (supervisors) are possible via Ethernet.

Via Ethernet you can:

- View information on the module and the network, the state of inputs and outputs, and statistics about the number of times that inputs and outputs have been activated or deactivated, see the paragraphs "Available information" and "Available statistics".
- Insert the TAG Name and the User data, to facilitate identification of the module in subsequent Ethernet scans.
- Set the module addressing, by selecting either a dynamic or a static IP address, see the paragraph "Network configuration".
- Set the type of access, by selecting either remote or local, see the paragraph "Module protection".
- Manage protection of the module configuration via password, see the paragraph "Module protection".
- In Multi MCCB Supervisor and Free I/O mode, enter up to five serial numbers of circuit breakers to which the module is associated.
- Configure the inputs and the outputs, see the paragraph "Configuration of inputs and outputs".
- Restore the default configurations of inputs and outputs, see the paragraph "Available commands".
- Activate/deactivate the outputs, in other words close/open the output contacts if configured as normally open, or open/close them if configured as normally closed, see the paragraph "Available commands".
- Deactivate all the outputs, see the paragraph "Available commands".
- Reset the statistics for inputs and outputs, see the paragraph "Available commands".
- Activate or eliminate rapid flashing of the power LED to facilitate identification of the module in the installation, see the paragraph "Available commands".
- Enable the Power option or alternatively the Alive option, see the paragraph "LEDs".

The information and parameter addresses are given in document [1SDH001527R0001](#). The document also describes how to read the information, program the parameters and execute commands.

The free ABB Ekip Connect application can also be used to access the available information and program the module. Consult the manual for more details about the Ekip Connect application [1SDH000891R0002](#).

Available information The following information is available:

- The serial number and the software version of the module.
- The operating mode.
- Information on the network.
- In CB Supervisor and Multi MCCB Supervisor mode, status information relating to the circuit breakers that is provided by the predefined inputs.
- The logical state of the generic inputs ("Off" if not active, "On" if active).
- In CB Supervisor mode, the logical state of all the outputs ("Inactive" if not active, "Active" if active), and the physical state of the generic outputs ("Closed" if the contacts are closed, "Open" if the contacts are open).
- In Multi MCCB Supervisor and Free I/O mode, the physical and logical state of all outputs.
- In CB Supervisor mode, the outcome of the circuit breaker operation commands.
- Statistics relating to inputs and outputs, namely the number of times that inputs and outputs are activated or deactivated.
- In CB Supervisor mode, other statistics relating to switching of the circuit breaker state.



NOTE: *in CB Supervisor mode, through the information provided by the predefined inputs, the module is able to determine whether or not the operating commands were successful and to generate more complex statistics relating to switching of the circuit breaker state compared to the number of times that the inputs and outputs were activated or deactivated. In the other modes, the outcome of the commands and any other statistics are delegated to the circuit-breaker monitoring and control system.*

Network configuration The following table shows the information and settings related to the network:

Information	Description
IP address	<p>It's the address assigned to the module at the moment of connection to the network. It consists of four bytes (for a total of 32 bits), each of which can have value from 0 to 255.</p> <p>By default, allocation is dynamic. With dynamic allocation, the module waits to receive the IP address from a DHCP server.</p> <p>Without a DHCP server, the module adopts an Autoconfiguration IP address in the range 169.254.xxx.xxx, calculated in a pseudo-random way so that it's the same at every power on.</p> <p>Alternatively, it's possible to enable the Static IP address option, that allows the IP address to be forced. Then it's necessary to make sure that the inserted IP address is different from the ones of the other devices connected to the same network.</p>
Network Mask	<p>It's the subnet mask, and it identifies the method to recognize the subnet to which the module belongs, with the possibility to search for the module within a defined set of recipients.</p> <p>If the Static IP address option is enabled, the correct Network Mask must also be inserted.</p>
Gateway address	<p>It's the IP address of the node to which the module is connected, in the presence of multiple subnets.</p> <p>If the Static IP address option is enabled, the correct Gateway address must also be inserted.</p>
MAC address	It's the address assigned by ABB, having an OUI equal to ac:d3:64.
Connected client 1...3	They are the IP addresses of the clients (supervisors) connected to the module.

The following table illustrates the ports used by the module:

Port	Service	Description
502/tcp	Modbus TCP	Protocol used by the module in case of Modbus TCP / IP communication.

Module protection The module can be protected in two ways:

- By changing access from remote to local.
- By password.

With local access:

- All further changes via Ethernet are inhibited.
- To restore remote access, set the module switches OFF for at least 1 s and then ON again. Once remote access has been restored, set the switches back to their original positions.



NOTE: *to restore remote access, there is no need to turn the module off and on after the switches commutation.*

To protect the module by means of a password, access via the remote mode, then select the "Password Required" operating mode instead of "Standard mode". After this, no further changes can be made via Ethernet unless the password has been entered.

The password:

- Has a default value equal to 1.
- It can only be modified in "Password required" mode, by selecting the "Change Password" command and filling in the field "Insert new password".
- Can have a numerical value between 0 and 99999.
- Can be reset (with default value restored) by setting the switches OFF for at least 1 s and then ON again. Once the password has been reset, set the switches back to their original positions.



NOTE:

- *If any zeros or spaces are typed before the password they will be ignored (for example, typing 0120 is the same as typing 120).*
 - *To reset the password, after the commutation of the switches, it's not necessary to turn the module off and on.*
-

Configuration of inputs and outputs

The meaning of the input and output configuration parameters is the same in all the operating modes.

The table below illustrates the configuration parameters of the inputs (I Txx), the values that can be selected and the default values of the generic inputs. For the default values of the predefined inputs, see the paragraph "Predefined inputs and outputs".

Parameter	Selectable values	Default value of generic inputs	Meaning
Input TAG Name	Any alphanumeric string, with a maximum of 16 characters.	Generic Input	Label identifying the input.
Config	Active Closed, Active Open	Active Closed	<ul style="list-style-type: none"> • Active Closed = To be considered active, the input must be short-circuited to its reference. • Active Open = To be considered active, the input must be open (no short-circuit).
Filter time	0.00...100.00 s in steps of 0.01 s	0.00 s	Time waited after input has changed state before changed state is validated (if input is reset before this time has elapsed, its state will not change). The input has 300 µs minimum delay, always present.

Continued on the next page

The table below illustrates the configuration parameters of the outputs (O Txx), the values that can be selected and the default values of the generic outputs. For the default values of the predefined outputs, see the paragraph "Predefined inputs and outputs".

Parameter	Selectable values	Default value of generic outputs	Meaning
Output TAG Name	Any alphanumeric string, with a maximum of 16 characters.	Generic Output	Label identifying the output.
Contact status	Norm.Open, Norm.Closed	Norm.Open	<ul style="list-style-type: none"> • Norm.Open = Normally open contact (activation of output closes contact). • Norm.Closed = Normally closed contact (activation of output opens contact).
Contact type ⁽¹⁾	Latched, Not Latched	Latched	<p>Latched = Self-latching enabled: once activated, the output is kept permanently active.</p> <p>Not Latched = Latching disabled: once activated, output is maintained in active state for selected time (Duration).</p>
Duration ⁽²⁾	0,00...10,00 s in steps of 0.01 s	0.00 s	When latching is disabled, it is the activation time of the output. The output is not active if 0.00 s is selected.

⁽¹⁾ Parameter that can only be set in CB Supervisor and Free I/O mode, excluding the "CB Closed command" and "CB Reset command" signals in CB Supervisor mode.

⁽²⁾ In CB Supervisor mode, for the predefined outputs the "Duration" parameter is available only with a generic circuit breaker and a minimum value of 0.02 s. In Multi MCCB Supervisor mode, the minimum value that the "Duration" parameter can assume is 0.1 s.

Predefined inputs and outputs

Predefined inputs and outputs can only be used as indicated here.

The remaining inputs and outputs are available, however, and can be used freely, but the meaning assigned to them by the user cannot be managed by the module (for example, to calculate the statistics for the number of times the state of a circuit breaker has been switched).

The following table illustrates the predefined inputs and outputs.

For the meaning of the configuration parameters, see the paragraph "Configuration of inputs and outputs".

For the ways in which information is provided at the input and the output commands executed, see the chapter "4 - Circuit diagrams".

Mode	Input or output	Signal	Possible signal values	Default input or output configuration	Description
CB Supervisor	I T01	Springs	Discharged, Charged	<ul style="list-style-type: none"> • TAG Name = Spring Charged • Config = Active Closed • Filter time = 0,00 s 	<ul style="list-style-type: none"> • If not active, the springs are discharged (Discharged). • If active, the springs are charged (Charged).
	I T02	Protection	Normal, Tripped	<ul style="list-style-type: none"> • TAG Name = Prot Tripped • Config = Active Closed • Filter time = 0,00 s 	<ul style="list-style-type: none"> • If not active, the protection has not tripped (Normal). • If active, the protection has tripped (Tripped).
	I T03	CB Connection status	Isolated, Inserted	<ul style="list-style-type: none"> • TAG Name = CB Inserted • Config = Active Open • Filter time = 0,00 s 	<ul style="list-style-type: none"> • If not active, the circuit-breaker is isolated (Isolated). • If active, the circuit-breaker is inserted (Inserted).
	I T04	CB Status	Open, Closed	<ul style="list-style-type: none"> • TAG Name = CB Closed • Config = Active Closed • Filter time = 0,00 s 	<ul style="list-style-type: none"> • If not active, the circuit-breaker is open (Open). • If active, the circuit-breaker is closed (Closed).
	I T05	CB Tripped status	Normal, Tripped	<ul style="list-style-type: none"> • TAG Name = CB Tripped • Config = Active Closed • Filter time = 0,00 s 	<ul style="list-style-type: none"> • If not active, the circuit-breaker has not tripped (Normal). • If active, the circuit-breaker has tripped (Tripped).
	I T06	Device Mode	Local, Remote	<ul style="list-style-type: none"> • TAG Name = Remote Status • Config = Active Open • Filter time = 0,00 s 	<ul style="list-style-type: none"> • If not active, the circuit-breaker is in the local mode (Local). • If active, the circuit-breaker is in the remote mode (Remote).
CB Supervisor	O T01	Open command	Inactive, Active	<ul style="list-style-type: none"> • TAG Name = Open Command • Contact status = Norm.Open • Contact type = Not Latched • Duration = 0,02 s⁽¹⁾ 	If active (Active), it commands the opening of the circuit breaker.
	O T02	Close command	Inactive, Active	<ul style="list-style-type: none"> • TAG Name = Close Command • Contact status = Norm.Open • Duration = 0,02 s⁽¹⁾ 	Active, commands circuit-breaker closing. Only available if "Open command" output is "Not Latched".
	O T03	Reset command	Inactive, Active	<ul style="list-style-type: none"> • TAG Name = Reset Command • Contact status = Norm.Open • Duration = 0,02 s⁽¹⁾ 	When active (Active), it commands the reset of the circuit breaker.

⁽¹⁾ In the CB Supervisor mode, the "Duration" parameter can only be set with a generic circuit-breaker.

Continued on the next page

Mode	Input or output	Signal	Possible signal values	Default input or output configuration	Description
Multi MCCB Supervisor	I T01	CB 1 Open/ Closed	Open, Closed	<ul style="list-style-type: none"> • TAG Name = CB Closed • Config = Active Closed • Filter time = 0,00 s 	If not active, circuit-breaker No. 1 is open (Open). If active, circuit-breaker No. 1 is closed (Closed).
	I T02	CB 1 Normal/ Tripped	Normal, Tripped	<ul style="list-style-type: none"> • TAG Name = CB Tripped • Config = Active Closed • Filter time = 0,00 s 	If not active, circuit-breaker No. 1 has not tripped (Normal). If active, circuit-breaker No. 1 has tripped (Tripped).
	I T03	CB 2 Open/ Closed	Open, Closed	<ul style="list-style-type: none"> • TAG Name = CB Closed • Config = Active Closed • Filter time = 0,00 s 	If not active, circuit-breaker No. 2 is open (Open). If active, circuit-breaker No. 2 is closed (Closed).
	I T04	CB 2 Normal/ Tripped	Normal, Tripped	<ul style="list-style-type: none"> • TAG Name = CB Tripped • Config = Active Closed • Filter time = 0,00 s 	If not active, circuit-breaker No. 2 has not tripped (Normal). If active, circuit-breaker No. 2 has tripped (Tripped).
	I T05	CB 3 Open/ Closed	Open, Closed	<ul style="list-style-type: none"> • TAG Name = CB Closed • Config = Active Closed • Filter time = 0,00 s 	If not active, circuit-breaker No. 3 is open (Open). If active, circuit-breaker No. 3 is closed (Closed).
	I T06	CB 3 Normal/ Tripped	Normal, Tripped	<ul style="list-style-type: none"> • TAG Name = CB Tripped • Config = Active Closed • Filter time = 0,00 s 	If not active, circuit-breaker No. 3 has not tripped (Normal). If active, circuit-breaker No. 3 has tripped (Tripped).
	I T07	CB 4 Open/ Closed	Open, Closed	<ul style="list-style-type: none"> • TAG Name = CB Closed • Config = Active Closed • Filter time = 0,00 s 	If not active, circuit-breaker No. 4 is open (Open). If active, circuit-breaker No. 4 is closed (Closed).
	I T08	CB 4 Normal/ Tripped	Normal, Tripped	<ul style="list-style-type: none"> • TAG Name = CB Tripped • Config = Active Closed • Filter time = 0,00 s 	If not active, circuit-breaker No. 4 has not tripped (Normal). If active, circuit-breaker No. 4 has tripped (Tripped).
	I T09	CB 5 Open/ Closed	Open, Closed	<ul style="list-style-type: none"> • TAG Name = CB Closed • Config = Active Closed • Filter time = 0,00 s 	If not active, circuit-breaker No. 5 is open (Open). If active, circuit-breaker No. 5 is closed (Closed).
	I T10	CB 5 Normal/ Tripped	Normal, Tripped	<ul style="list-style-type: none"> • TAG Name = CB Tripped • Config = Active Closed • Filter time = 0,00 s 	If not active, circuit-breaker No. 5 has not tripped (Normal). If active, circuit-breaker No. 5 has tripped (Tripped).
Multi MCCB Supervisor	O T01	Output O T01	Inactive, Active	<ul style="list-style-type: none"> • TAG Name = Open Command • Status = Norm.Open • Duration = 0,12 s 	If Active, commands opening of circuit-breaker No. 1.
	O T02	Output O T02	Inactive, Active	<ul style="list-style-type: none"> • TAG Name = Close Command • Status = Norm.Open • Duration = 0,12 s 	If Active, commands closing of circuit-breaker No. 1.
	O T03	Output O T03	Inactive, Active	<ul style="list-style-type: none"> • TAG Name = Open Command • Status = Norm.Open • Duration = 0,12 s 	If Active, commands opening of circuit-breaker No. 2.
	O T04	Output O T04	Inactive, Active	<ul style="list-style-type: none"> • TAG Name = Close Command • Status = Norm.Open • Duration = 0,12 s 	If Active, commands closing of circuit-breaker No. 2.
	O T05	Output O T05	Inactive, Active	<ul style="list-style-type: none"> • TAG Name = Open Command • Status = Norm.Open • Duration = 0,12 s 	If Active, commands opening of circuit-breaker No. 3.
	O T06	Output O T06	Inactive, Active	<ul style="list-style-type: none"> • TAG Name = Close Command • Status = Norm.Open • Duration = 0,12 s 	If Active, commands closing of circuit-breaker No. 3.
	O T07	Output O T07	Inactive, Active	<ul style="list-style-type: none"> • TAG Name = Open Command • Status = Norm.Open • Duration = 0,12 s 	If Active, commands opening of circuit-breaker No. 4.
	O T08	Output O T08	Inactive, Active	<ul style="list-style-type: none"> • TAG Name = Close Command • Status = Norm.Open • Duration = 0,12 s 	If Active, commands closing of circuit-breaker No. 4.
	O T09	Output O T09	Inactive, Active	<ul style="list-style-type: none"> • TAG Name = Open Command • Status = Norm.Open • Duration = 0,12 s 	If Active, commands opening of circuit-breaker No. 5.
	O T10	Output O T10	Inactive, Active	<ul style="list-style-type: none"> • TAG Name = Close Command • Status = Norm.Open • Duration = 0,12 s 	If Active, commands closing of circuit-breaker No. 5.

Available statistics The following table illustrates the statistics available:

Mode	Statistical	Description
CB Supervisor	Number of CB Trips ⁽¹⁾	Number of openings for the circuit breaker trip (number of times that input I T05 has been activated).
	Number of Protection Trips	Number of trips of the protections (number of times that input I T02 has been activated).
	Number of Manual Opens	Number of manual openings of the circuit breaker (number of times that input I T04 has been deactivated without the "CB Open" command being performed).
	Number of Open Commands	Number of times that the "CB Open" command has been performed with the circuit breaker closed and a successful outcome (number of times that input I T04 switched from active to inactive when the command was executed).
	Total number of Close to Open	Total number of times that the circuit breaker switched from closed to open (number of times that input I T04 has been deactivated).
	Number of Discharged-to-Charged transitions	Number of times that the circuit breaker switched from the springs discharged to springs charged state (number of times that input I T01 has been activated).
	Number of Protection Normal-to-Tripped transitions	Number of times that the circuit breaker switched from protection not tripped to protection tripped state (number of times that input I T02 has been activated).
	Number of CB Isolated-to-Inserted transitions	Number of times circuit-breaker state has switched from isolated to inserted (number of times input I T03 has been activated).
	Number of Local-to-Remote transitions	Number of times the circuit breaker was switched from local mode to remote mode (number of times that input I T06 has been activated).
	Input I T07...11 number of activations	Five statistics, each of which indicates the number of times that the corresponding input has been activated.
	Number of CB Open commands	Number of times that the "CB Open" command has been performed (output O T01 has been activated).
	Number of CB Close commands	Number of times that the "CB Close" command has been performed (output O T02 has been activated).
	Number of CB Reset commands	Number of times that the "CB Reset" command has been performed (output O T03 has been activated).
	Number of Output O T04...10 commands	Seven statistics, each of which indicates the number of times that the corresponding output has been activated.

⁽¹⁾ Information not available in the case of air circuit breakers, since there is no contact available that can be connected to input I T05 that provides the information on the tripped or not-tripped state of the circuit breaker.

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Mode	Statistical	Description
Multi MCCB Supervisor	CB 1...5 Number of Open To Close	Five statistics, each of which indicates the number of times that the corresponding circuit breaker has been closed (the input that indicates the closed or open state of the circuit breaker has been activated).
	CB 1...5 number of Normal To Tripped	Five statistics, each of which indicates the number of times that the corresponding circuit breaker has tripped (the input that indicates the tripped or not-tripped state of the circuit breaker has been activated).
	Input I T11 number of activations	Number of times that input I T11 has been activated.
	CB 1...5 Number of Open commands	Five statistics, each of which indicates the number of times that the corresponding circuit breaker has been opened (the "Open CB" command has been performed).
	CB 1...5 Number of Close commands	Five statistics, each of which indicates the number of times that the corresponding circuit breaker has been closed (the "Close CB" command has been performed).
Free I/O	Input I T01...11 number of activations	11 statistics, each of which indicates the number of times that the corresponding input has been activated.
	Number of Output O T01...10 commands	10 statistics, each of which indicates the number of times that the corresponding output has been activated.

Available commands The available commands change depending on the operating mode and are shown in the table below.

Mode	Command	Description
All	Wink	Makes power led flash fast to allow module in installation to be easily identified.
	Start Autotest	This will test all the LEDs and contacts: 1. It turns off all the LEDs and opens all the contacts. 2. It turns on the power LED and the input signaling LEDs in succession. 3. It turns off all the LEDs. 4. Closes and opens all the contacts in succession while simultaneously turning on and off the corresponding signaling LEDs. 5. It restores the initial state of LEDs and contacts.
	Change Password	In "Password required" mode, after entering the password, it enables the field "Insert new password" where to enter the new password.
	Reset Signals	It disables all the outputs.
	Reset statistics	It resets the statistics for inputs and outputs.
	Reset Default parameters	It restores the default configuration of all the parameters.

Continued on the next page

Mode	Command	Description
CB Supervisor	CB Open	It commands the opening of the circuit breaker, by activating output O T01.
	CB Close	It commands the closing of the circuit breaker: <ul style="list-style-type: none"> • If the "Open command" output is "Not Latched", activating output O T02. • If the "Open command" output is "Latched", deactivating output O T01. <p>i NOTE: command is only executed if circuit-breaker is inserted (input I T03 active), open (input I T04 not active), not in tripped state (input I T05 not active), and with protection not tripped (input I T02 not active).</p>
	CB Reset	It commands a reset of the circuit breaker, by activating output O T03. <p>i NOTE: command is only executed if circuit-breaker is inserted (input I T03 active), open (input I T04 not active) and in tripped state or with protection tripped (input I T02 or I T02 active).</p>
	Set Output O T04...10	Seven commands, each of which activates the corresponding generic output.
	Reset Output O T04...10	Seven commands, each of which deactivates the corresponding generic output.
Multi MCCB Supervisor	Open CB 1...5	Five commands, each of which controls the opening of the corresponding circuit breaker.
	Close CB 1...5	Five controls, each of which commands closing of the relative circuit-breaker. <p>i NOTE: command is only executed if circuit-breaker is open and not in tripped state.</p>
Free I/O	Set Output O T01...10	10 commands, each of which activates the corresponding generic output.
	Reset Output O T01...10	10 commands, each of which deactivates the corresponding generic output.

**NOTE:**

- Operations via Ethernet (execution of commands and configuration changes) may only be performed if the access is remote (see paragraph "Module protection").
- With remote access, commands in CB Supervisor mode may only be performed if circuit breaker is also in remote mode (see "Device Mode" signal in paragraph "Predefined inputs and outputs"). With remote access and circuit breaker in local mode, configuration of the inputs and outputs can still be changed.

Result of the operating commands

The result of the circuit-breaker operating commands is available in the CB Supervisor mode. The values are as follows:

- "Command processing", if the command is running or the result is being processed.
- "Command successful", if the command performed was successful.
- "Open Command failed", if after running the "CB Open" command the circuit breaker is closed.
- "Close Command failed", if after running the "CB Close" command the circuit breaker is open.
- "Springs Command failed", if the check on the springs charged state is enabled (see the paragraph "Mode CB Supervisor"), and after running the "CB Close" command the circuit breaker is closed, but with springs discharged.
- "Reset Command failed", if after running the "CB Reset" command the circuit breaker is in the tripped state or the protection tripped state has not been deactivated.

4 - Circuit diagrams

Description The circuit-diagrams for connecting the power supply and communication signals of the module, and the inputs and outputs in the CB Supervisor and Multi MCCB Supervisor modes are given below.

For connecting the power supply signals and the inputs and outputs, AWG 16-22 cables with a maximum external diameter of 1.4 mm must be used.

Cable of the Class 6 S/FTP type (Class 6 with double screening S/FTP) must be used for communication via Ethernet.



NOTE: *the terminals of the module have a spring contact. Insert a flat-tip screwdriver into the rectangular slot and the cable into the circular slot. Remove the screwdriver and make sure that the inserted cable has been hooked up correctly.*

The diagrams below refer to the following conditions:

- Circuit-breaker in withdrawable version (if present), inserted, open and not tripped
- Isomax and T1...T6 circuit-breakers in remote mode
- Circuit-breakers T7 and ACB (Emax, New Emax and Emax 2) in local mode
- Protection not tripped
- Circuit-breakers T7 and ACB (Emax, New Emax and Emax 2) with springs discharged
- Circuit-breakers S3...S7 and T4-T5-T6 with motor starting contactor open and motor operator with springs charged
- Circuits de-energized
- Default configuration of module inputs and outputs



IMPORTANT: with circuit-breakers T7 and ACB (Emax, New Emax and Emax 2) and contact S43 closed, the "Device Mode" input configuration must be switched from the Active Open default setting to Active Closed to allow the module to recognize the remote mode (see section "Predefined inputs and outputs"). Alternatively, open contact S43.

For further details, see the document [1SDM000109R0001](#) with the circuit diagrams of the module.

Power supply and communication

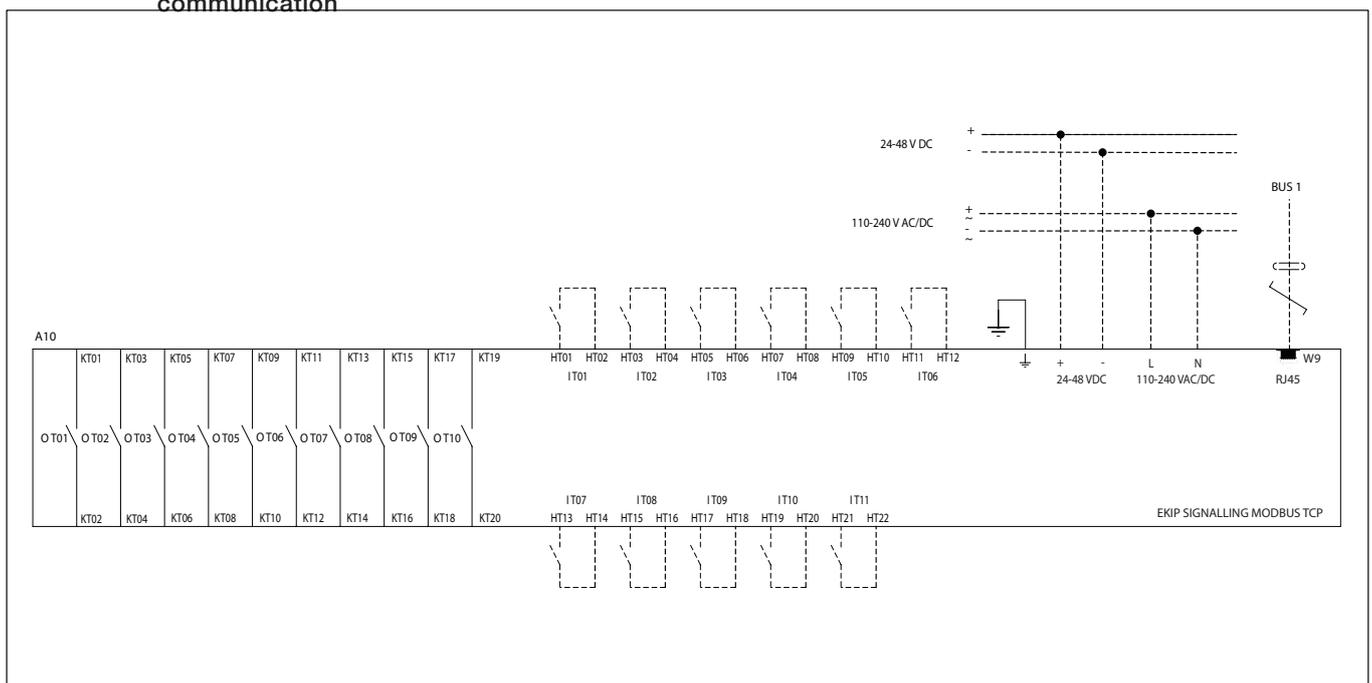


Figure 2

Mode CB Supervisor **Isomax S1-S2 circuit breakers**

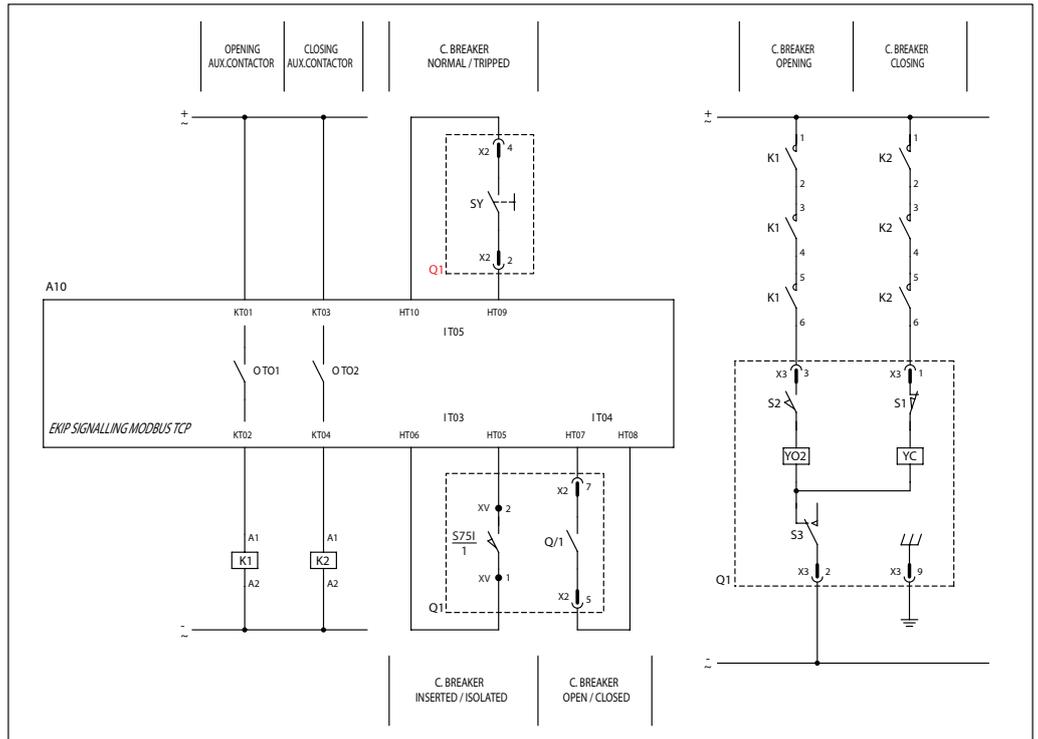


Figure 3

Isomax S3 circuit breakers

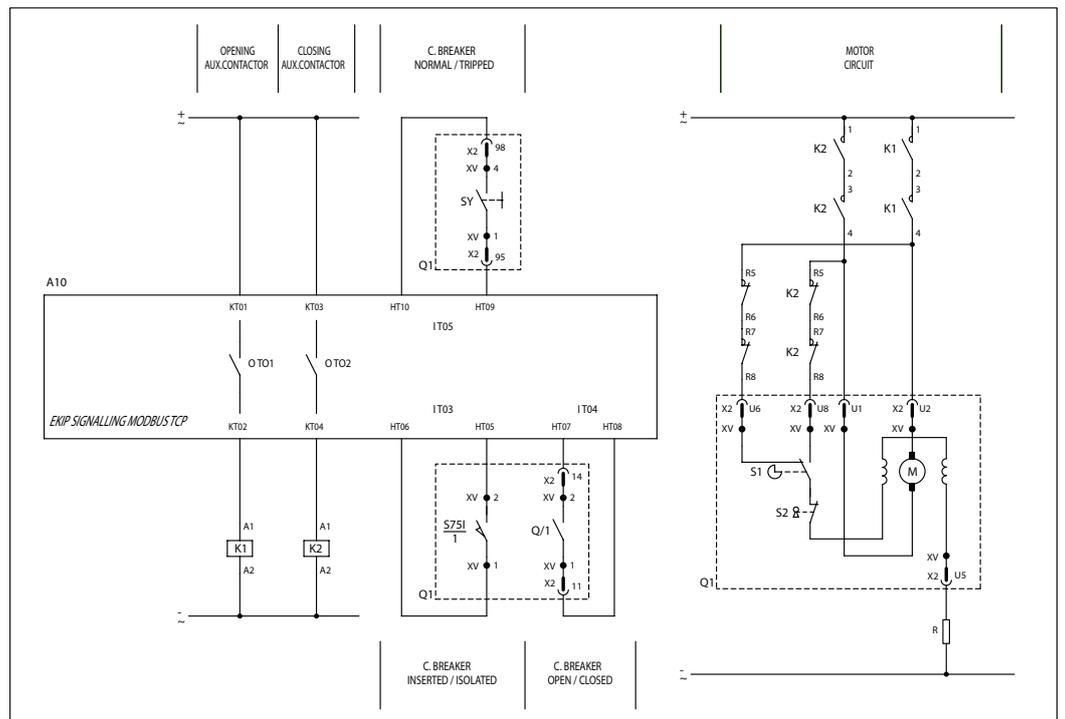


Figure 4

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Isomax S6-S7 circuit breakers with DC and AC power supply > 250 V AC

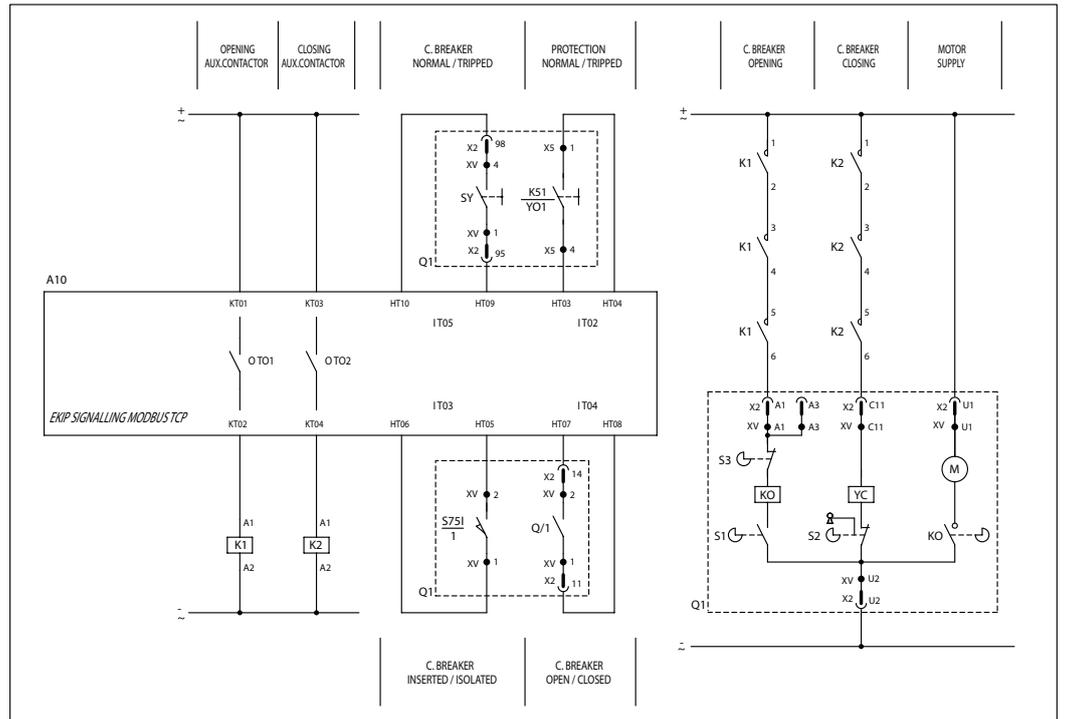


Figure 7

Tmax T1-T2-T3 circuit breakers with 5-wire solenoid

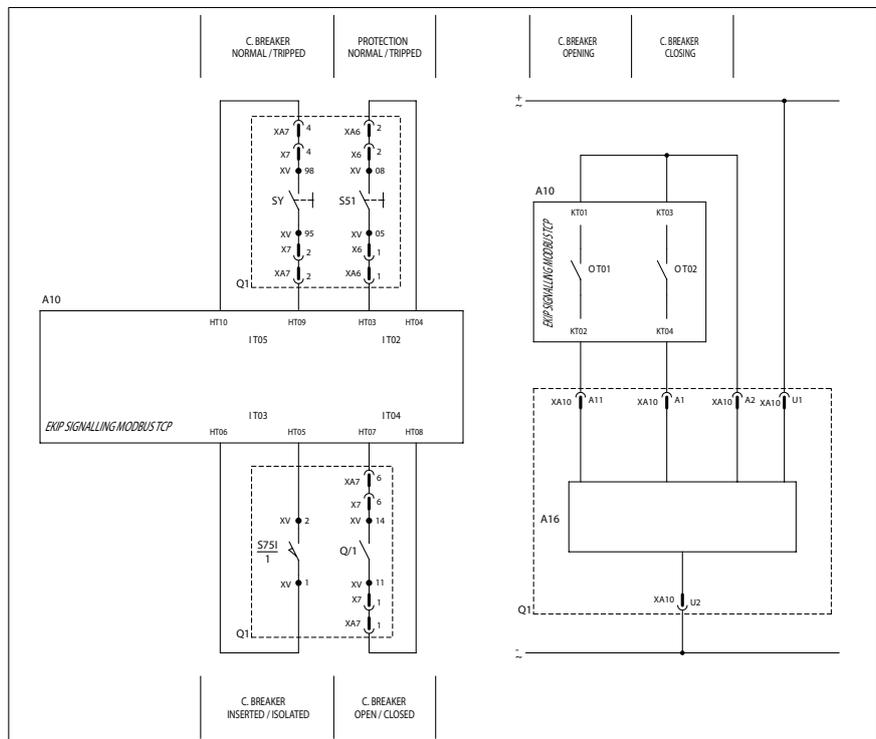


Figure 8

Continued on the next page

Tmax T4-T5-T6 circuit breakers with AC power supply ≤ 250 V AC

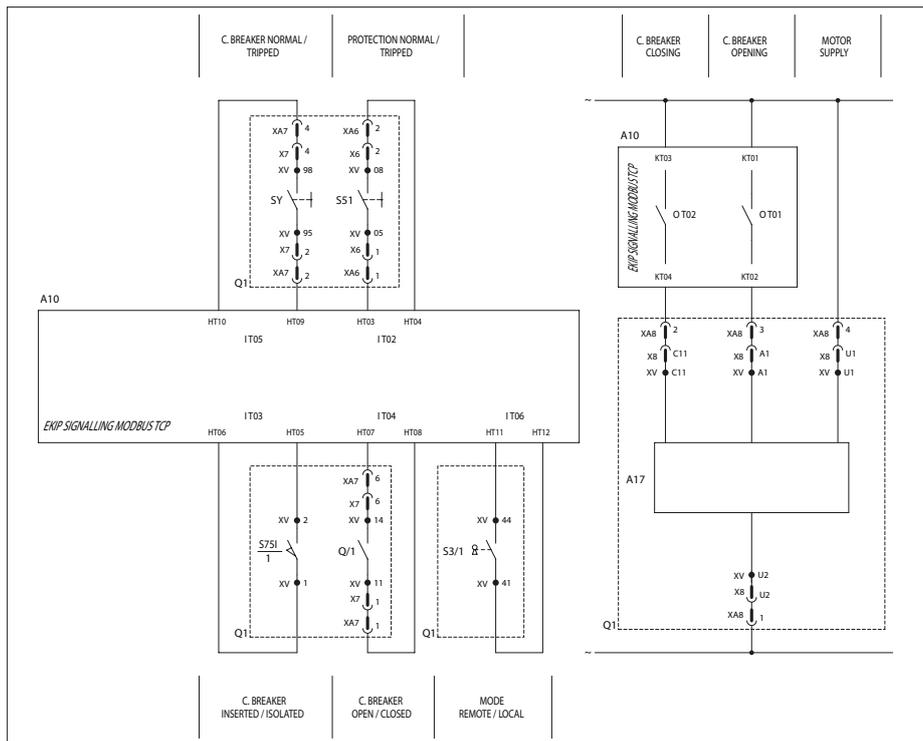


Figure 9

Tmax T4-T5-T6 circuit breakers with DC and AC power supply > 250 V AC

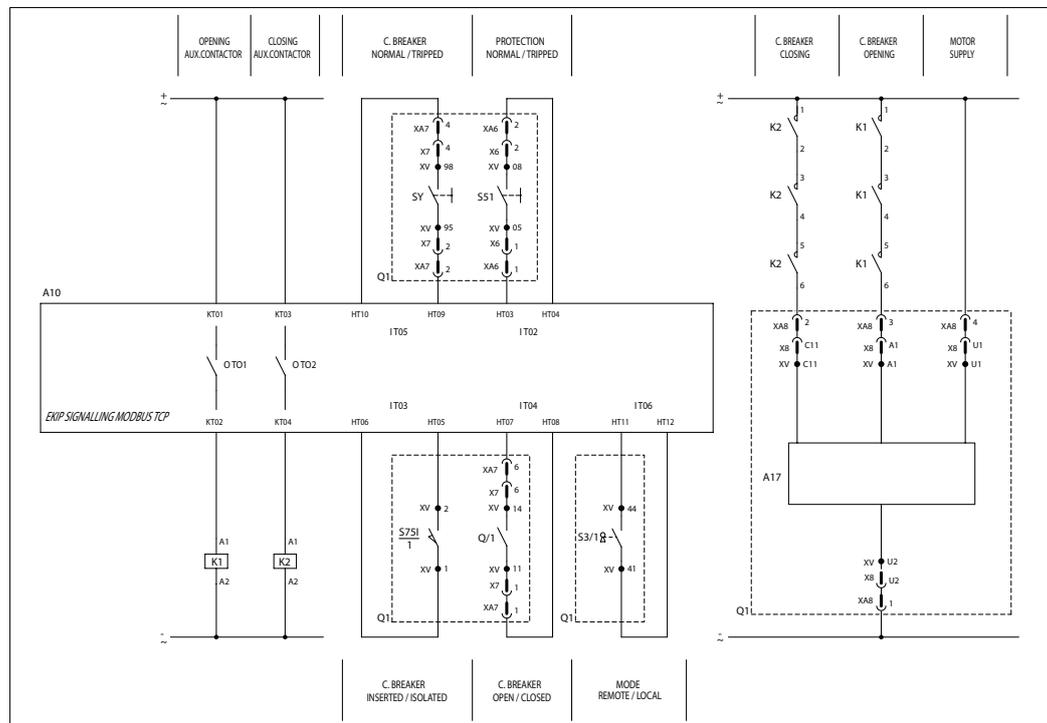


Figure 10

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Tmax T7 and Emax X1 circuit breakers with AC power supply ≤ 250 V AC

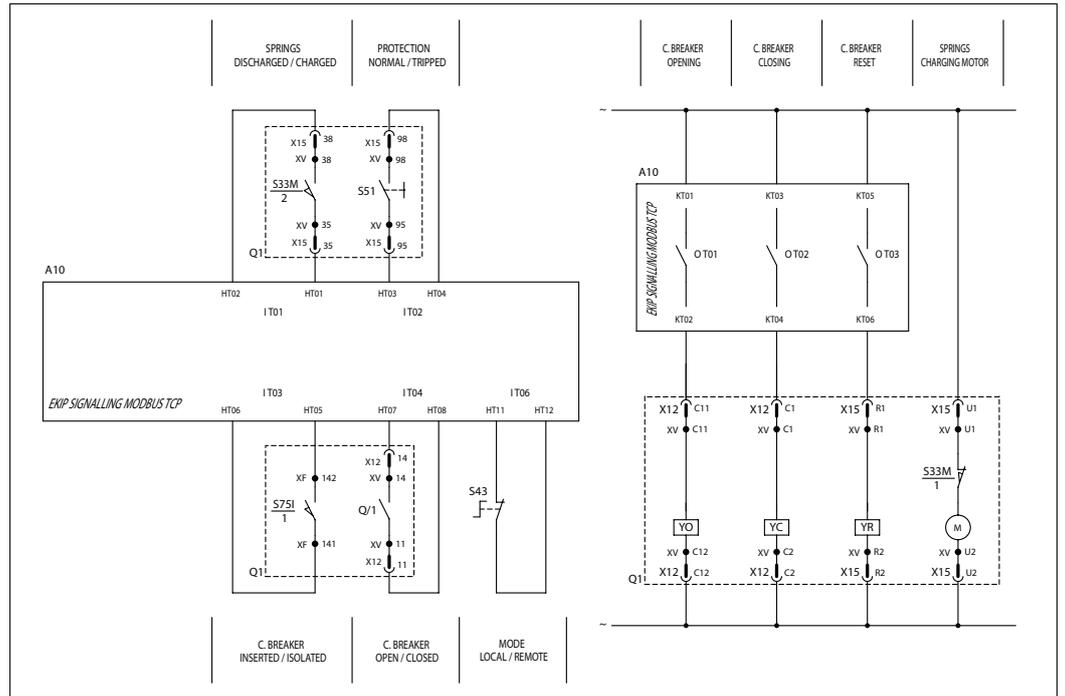


Figure 11

Tmax T7 and Emax X1 circuit breakers with DC and AC power supply > 250 V AC

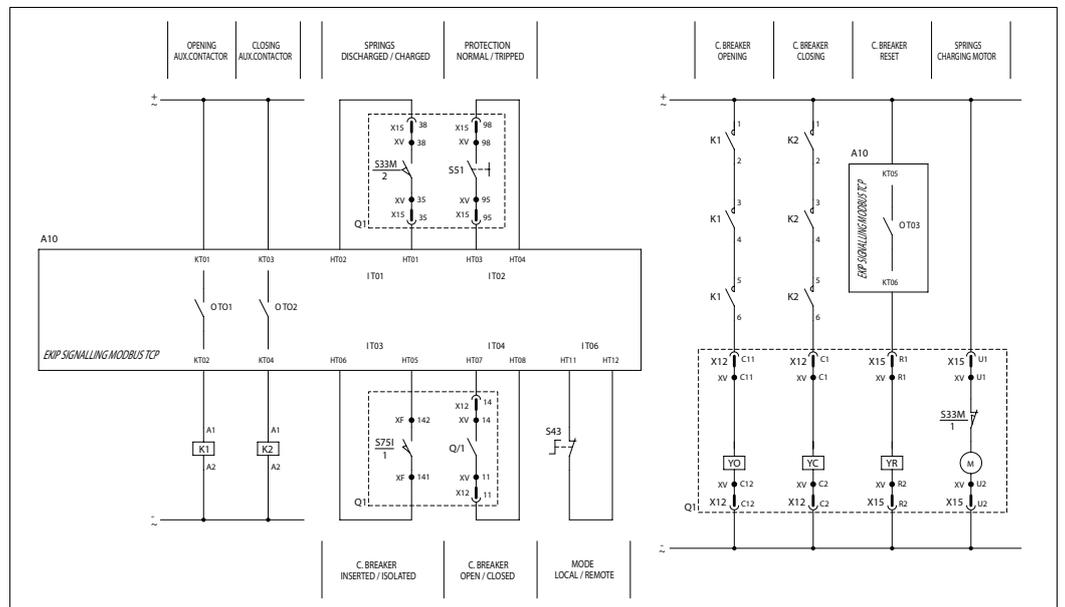


Figure 12

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Emax E1...E6 circuit breakers with AC power supply ≤ 250 V AC

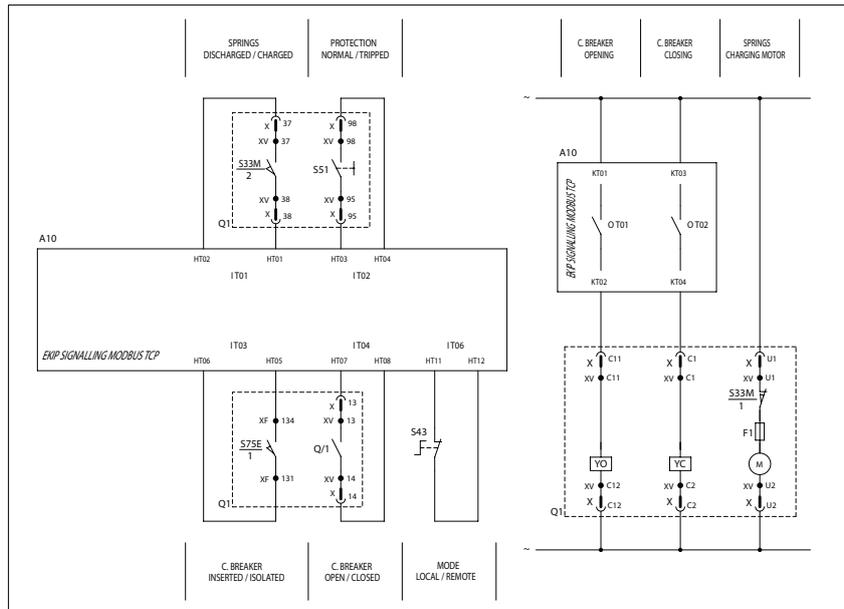


Figure 13

Emax E1...E6 circuit breakers with DC and AC power supply > 250 V AC

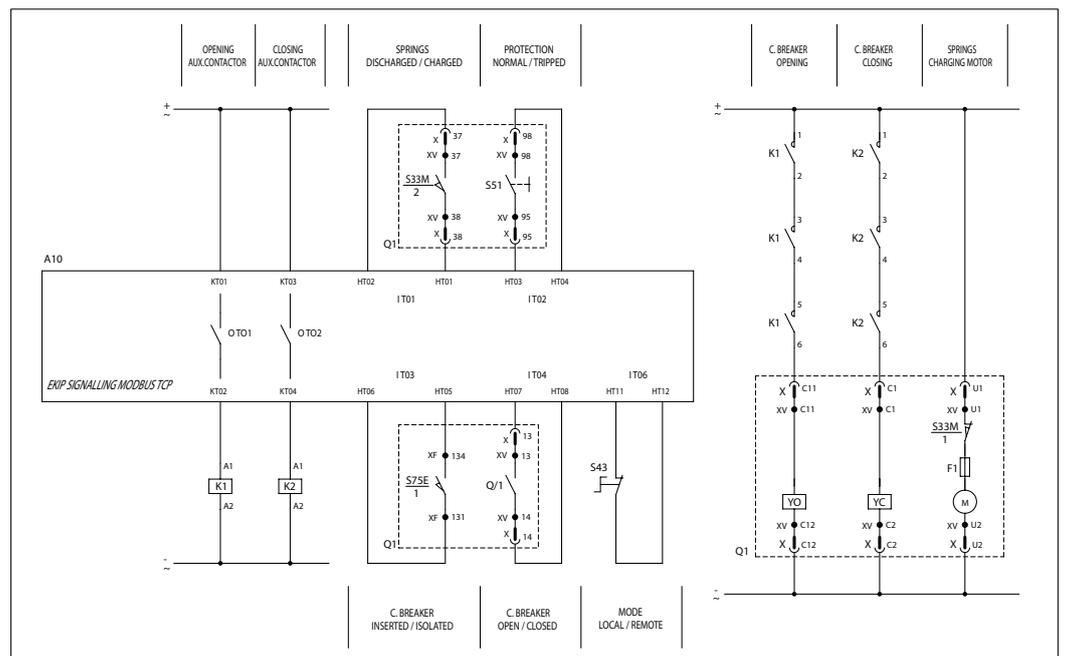


Figure 14

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New Emax E1...E6 circuit breakers with AC power supply ≤ 250 V AC

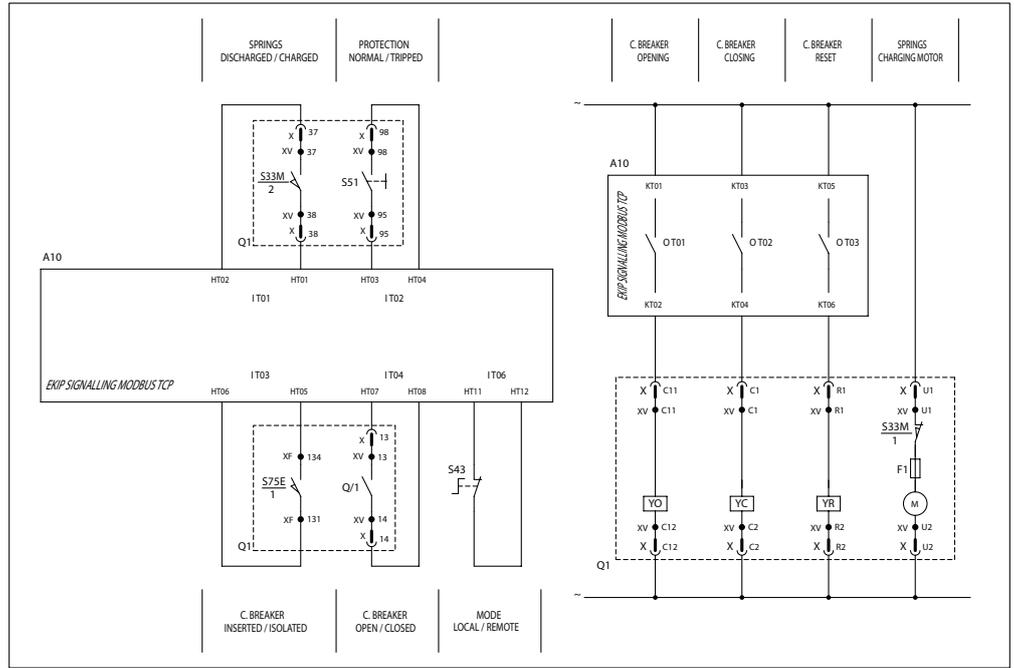


Figure 15

New Emax E1...E6 circuit breakers with DC and AC power supply > 250 V AC

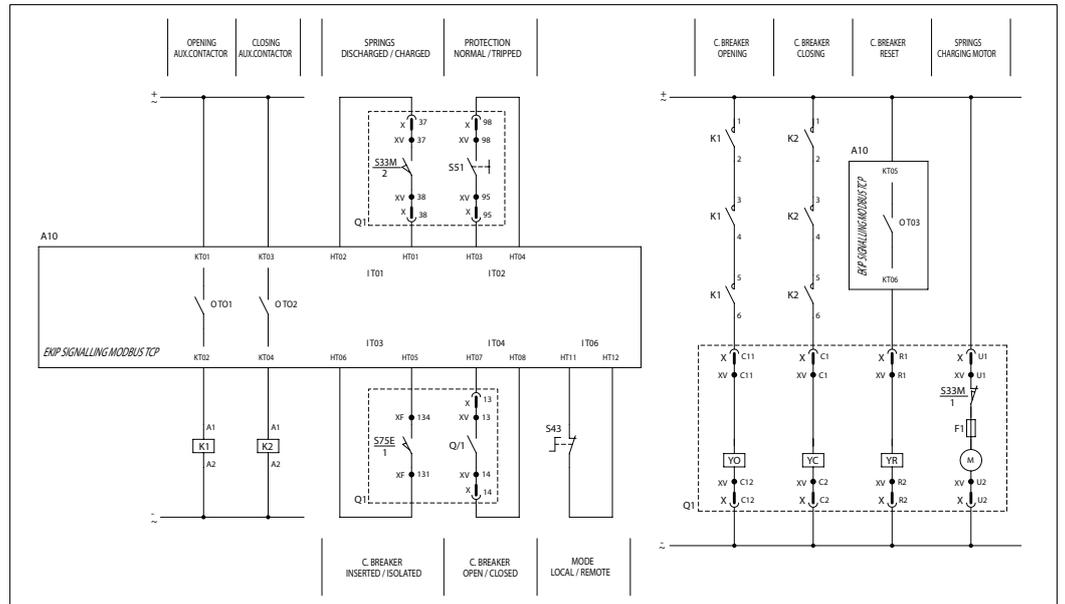


Figure 16

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Emax 2 E1.2 circuit breakers with AC power supply ≤ 250 V AC

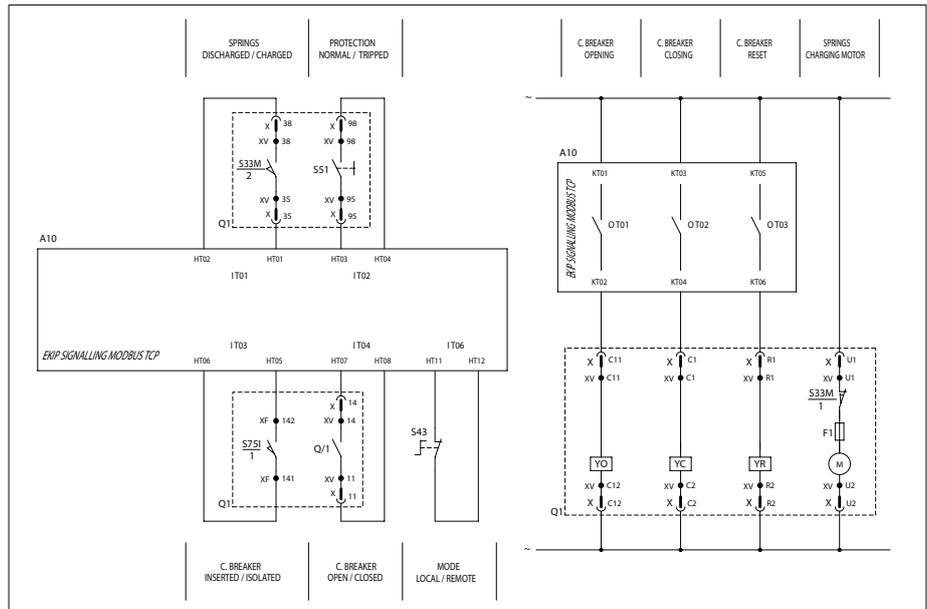


Figure 17

Emax 2 E1.2 circuit breakers with DC and AC power supply > 250 V AC

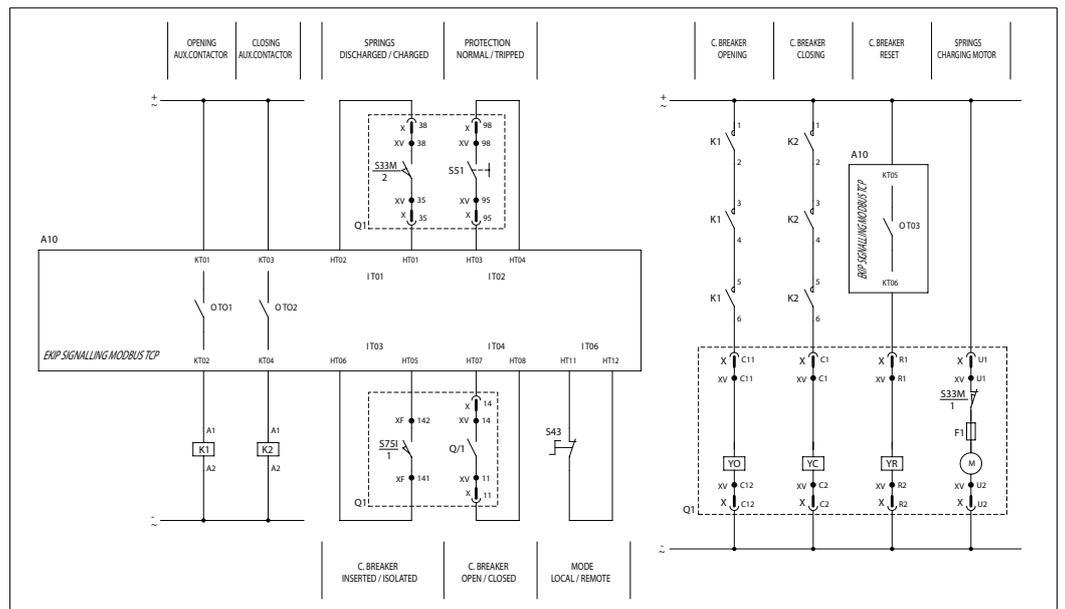


Figure 18

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Emax 2 E2.2...E6.2 circuit breakers with AC power supply ≤ 250 V AC

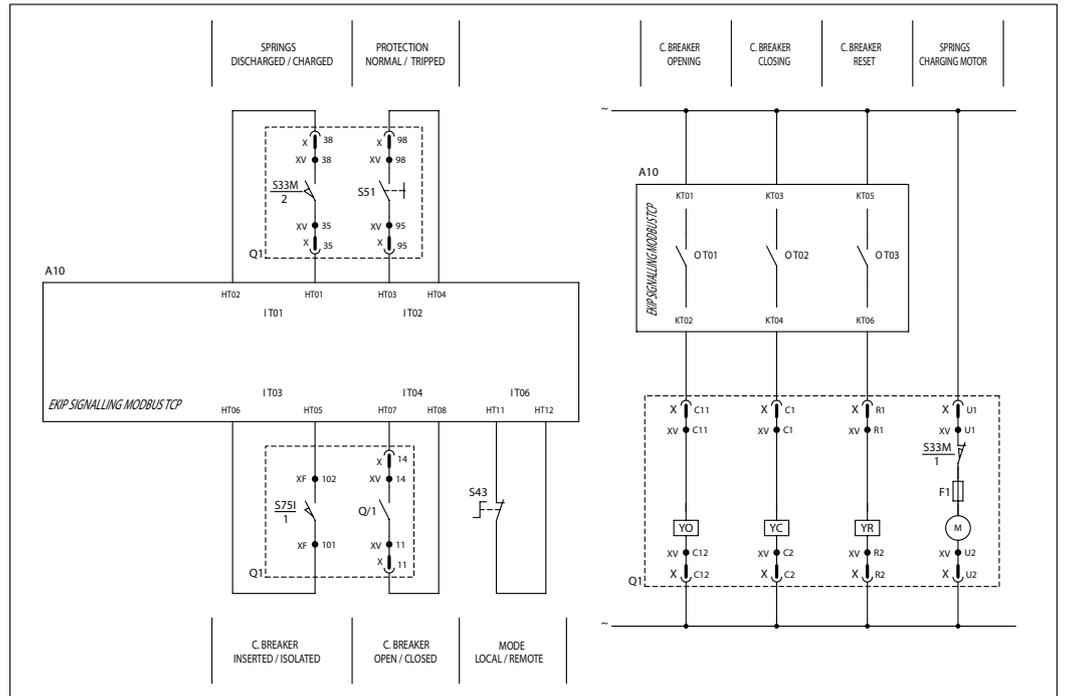


Figure 19

Emax 2 E2.2...E6.2 circuit breakers with DC and AC power supply > 250 V AC

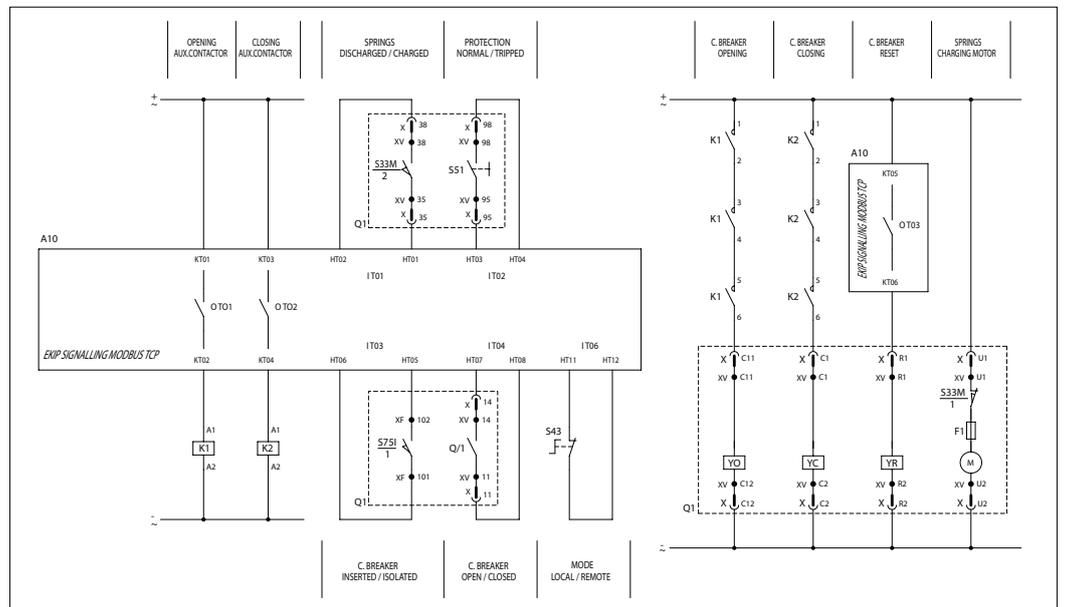


Figure 20

Mode Multi MCCB Supervisor In the Multi MCCB Supervisor mode, the circuit-breakers must be connected as shown in section "Predefined inputs and outputs".

Circuit-breaker No. 1 (CB 1) must be connected to inputs I T01 (CB 1 Open/Closed) and I T02 (CB 1 Normal/Tripped) and to outputs O T01 (CB 1 Open command) and OT02 (CB 1 Close command), circuit-breaker No. 2 (CB 2) must be connected to inputs I T03 (CB 2 Open/Closed) and I T04 (CB 1 Normal/Tripped) and to outputs O T03 (CB 2 Open command) and OT04 (CB 2 Close command), etc...

For example, in the case of connection of a T4-T5-T6 circuit-breaker with AC power supply \leq than 250 V AC, with reference to diagram "Tmax T4-T5-T6 circuit breakers with AC power supply \leq 250 V AC" only the following circuit-breaker terminals must be connected to the module:

- XA7.1 and 6, which provide information about the closed or open states.
- XA7.2 and 4, which provide information about the tripped or not tripped states
- XA8.1...3, for closing and opening.

In addition, if the circuit breaker corresponds to circuit breaker 2 associated with the module, according to the indications in paragraphs "Predefined inputs and outputs" and "Digital inputs and outputs" the following terminals of the module must be connected:

- HT05 and HT06 (instead of terminals HT07 and HT08 in the circuit diagram), to receive information on the closed or open state.
- HT07 and HT08 (instead of terminals HT09 and HT10 in the circuit diagram), to receive information on the tripped or not-tripped state.
- KT05 and KT06 (instead of terminals KT01 and KT02 in the circuit diagram), to command the opening.
- KT07 and KT08 (instead of terminals KT03 and KT04 in the circuit diagram), to command the closing.

Etc.

The following circuit diagram shows the connections required if the module is in the Multi MCCB Supervisor mode, and circuit-breakers Tmax T4-T5-T6 with AC power supply \leq than 250 V AC corresponding to circuit-breakers No. 1 and No. 2 associated with the module:

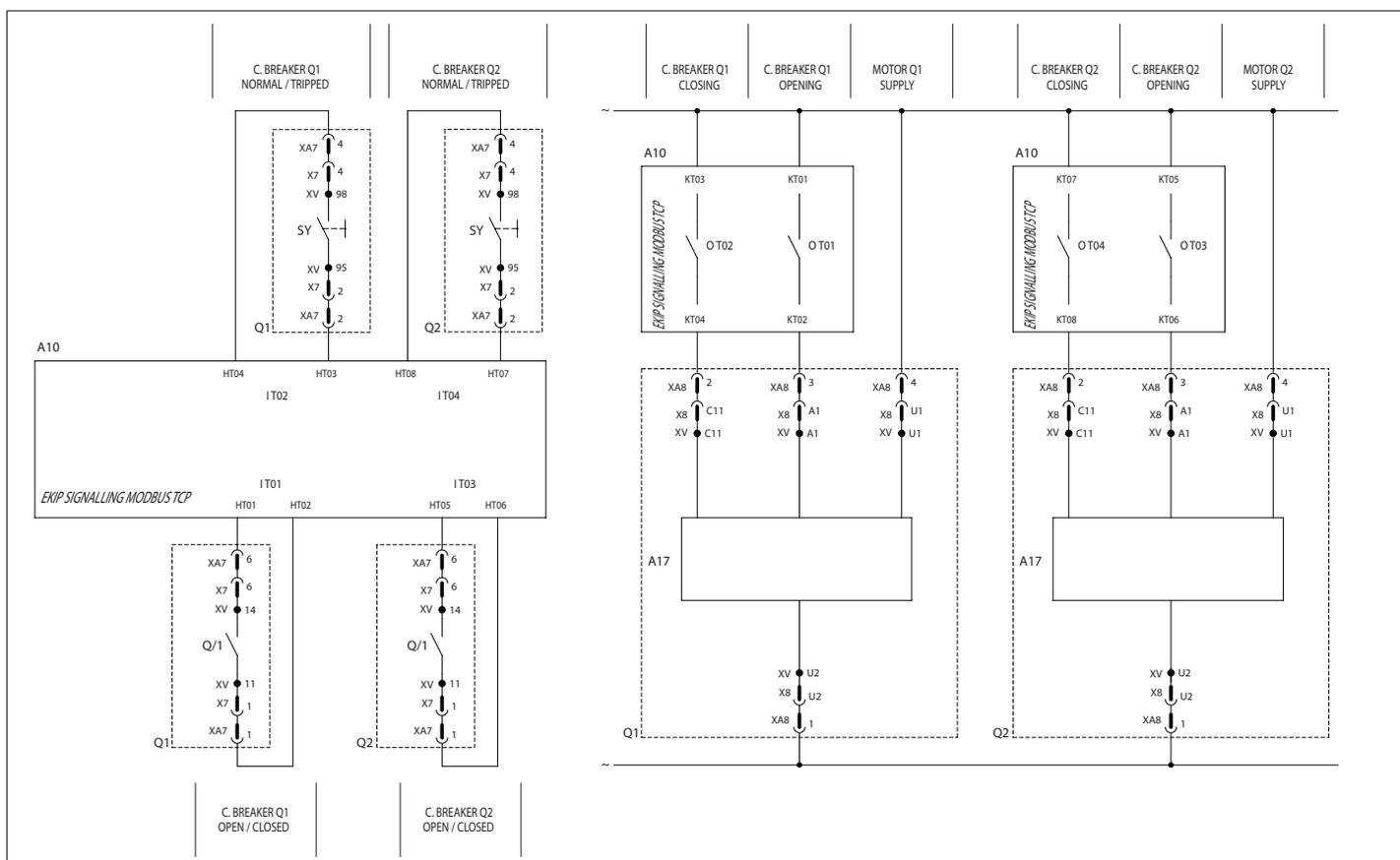


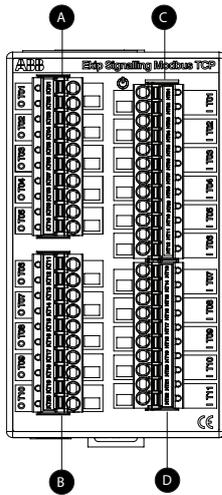
Figure 21

5 - Connectors and LEDs

Digital inputs and outputs

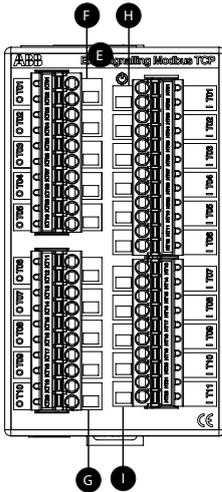
The inputs and outputs are accessible on connectors located on the front of the module.

The following table illustrates the terminals of these connectors:



Position	Identification	Description
A	KT01, KT02	Terminals of the contact of output O T01.
	KT03, KT04	Terminals of the contact of output O T02.
	KT05, KT06	Terminals of the contact of output O T03.
	KT07, KT08	Terminals of the contact of output O T04.
	KT09, KT10	Terminals of the contact of output O T05.
B	KT11, KT12	Terminals of the contact of output O T06.
	KT13, KT14	Terminals of the contact of output O T07.
	KT15, KT16	Terminals of the contact of output O T08.
	KT17, KT18	Terminals of the contact of output O T09.
	KT19, KT20	Terminals of the contact of output O T10.
C	HT01, HT02	Input I T01 and its reference.
	HT03, HT04	Input I T02 and its reference.
	HT05, HT06	Input I T03 and its reference.
	HT07, HT08	Input I T04 and its reference.
	HT09, HT10	Input I T05 and its reference.
D	HT11, HT12	Input I T06 and its reference.
	HT13, HT14	Input I T07 and its reference.
	HT15, HT16	Input I T08 and its reference.
	HT17, HT18	Input I T09 and its reference.
	HT19, HT20	Input I T10 and its reference.
	HT21, HT22	Input I T10 and its reference.

LEDs The following table illustrates the power LED:



Position	Description
E	<p>Power LED, green. The possible states are:</p> <ul style="list-style-type: none"> • Off: power supply absent. • On steady: supply present, Power option enabled ⁽¹⁾, and Wink command deactivated. • On, slowly flashing (one flash every two seconds): supply present, Alive option enabled ⁽¹⁾, and Wink command deactivated. • On, flashing quickly (one flash every 0.5 seconds): power present, and Wink command active.

⁽¹⁾ Power and Alive are alternative options and are used to configure the power led: on steady in the first case, on flashing in the second case.

The following table illustrates the signals related to the outputs:

Position	Identification	Description
F	O T01...05	<p>LED for signalling the state of the contact O T01...05, green.</p> <p>The possible states are:</p> <ul style="list-style-type: none"> • Off: contact open. • On fixed: contact closed.
G	O T06...10	<p>LED for signalling the state of the contact O T06...10, green.</p> <p>The possible states are:</p> <ul style="list-style-type: none"> • Off: contact open. • On fixed: contact closed.

The following table illustrates the signals related to the inputs:

Position	Identification	Description
H	I T01...06	<p>LED for signalling the physical state of the input I T01...06, green.</p> <p>The possible states are:</p> <ul style="list-style-type: none"> • Off: HT terminals of input open. • On steady: HT terminals of input short-circuited.
I	I T07...11	<p>LED for signalling the physical state of the input I T07...11, green.</p> <p>The possible states are:</p> <ul style="list-style-type: none"> • Off: HT terminals of input open. • On steady: HT terminals of input short-circuited.

Ethernet connection The Ethernet connector is located on the upper side of the module.

The position of the connector and meanings of the leds are given in the table and figure below:

Position	Description
J	Label with serial number and matrix code.
K	LED Link, green. The possible states are: <ul style="list-style-type: none"> • Off: with Led Activity on, bad connection (no signal, for example because the cable is disconnected); with Led Activity off, Ethernet communication deactivated. • On fixed: correct connection.
L	LED Activity, yellow. The possible states are: <ul style="list-style-type: none"> • Off: Ethernet communication deactivated (for example: due to N.A. configuration of switches 1 and 2). • On, fixed: Ethernet communication active.

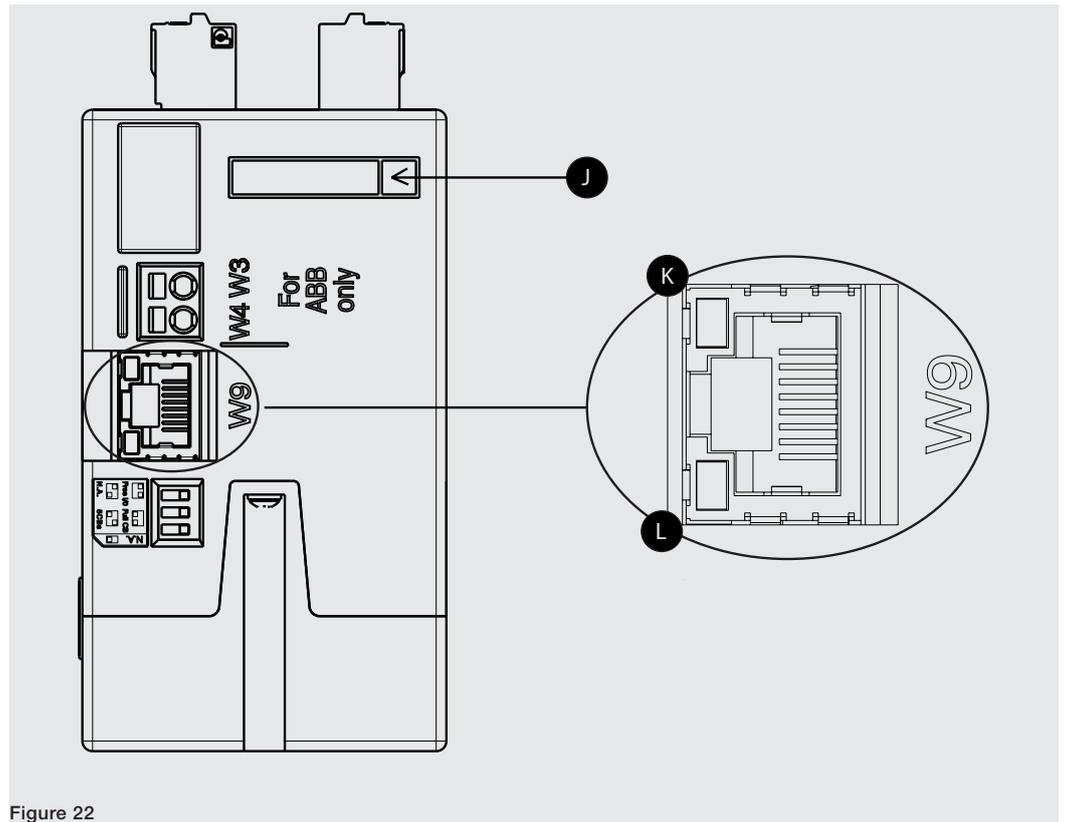
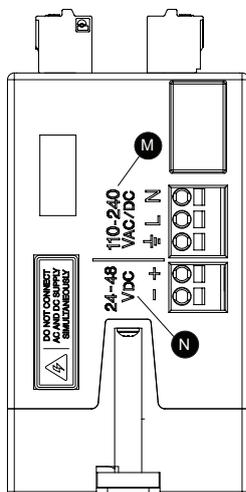


Figure 22

Power supply inputs The power supply connectors are positioned on the lower side of the module.

The following table illustrates the power supply inputs:

Position	Identification	Description
M	110-240 VAC/DC L	AC / DC + power input
	110-240 VAC/DC N	AC / DC - power input
		Earth connection
N	24/48 VDC +	DC + power input
	24/48 VDC -	DC - power input



NOTE: the earth terminal must only be connected in the case of 110-240 VAC/DC supply.

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