

SACE Emax 2

Open Emax low voltage circuit-breakers E1.2-E2.2-E4.2-E6.2

Instructions for using Ekip Touch protection releases and Accessories.



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Introduction to Ekip protection releases

1 - Presentation

Families and functionality Emax 2 can be configured with five different types of protection release, distinguished by type of interface and functionality. One release has a dip-switch interface (Ekip Dip) while the others are equipped with a display touchscreen (Ekip Touch).

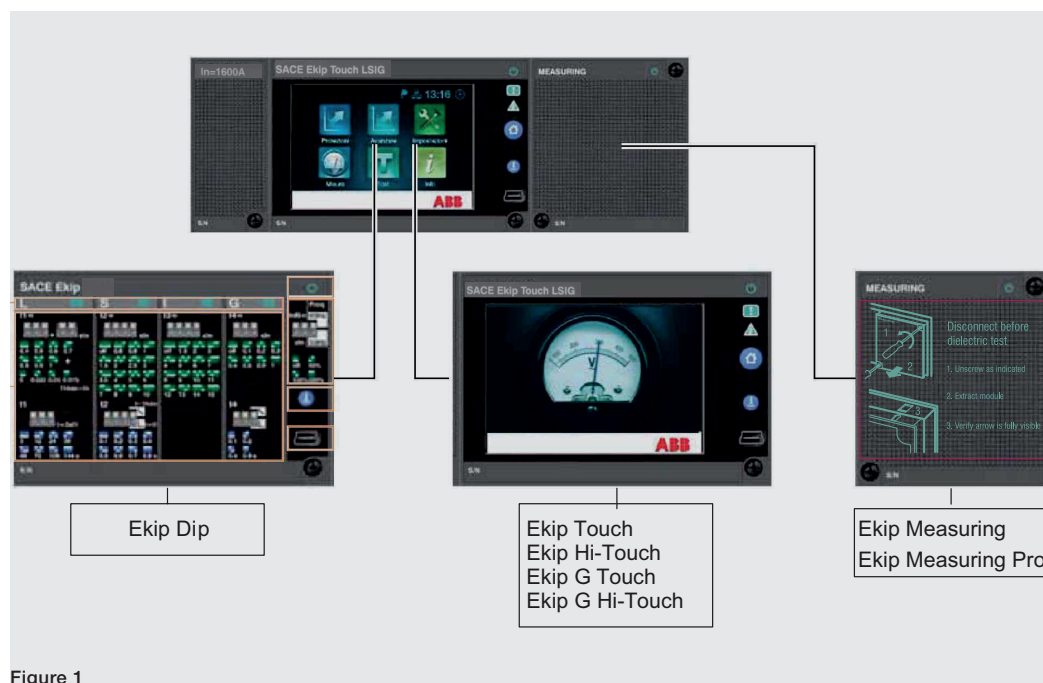


Figure 1

All versions of the releases include protection and measurement functions referring to the primary installation currents.

The Ekip Touch version can be equipped with the Ekip Measuring module to extend measurement functions or (with the Ekip Measuring Pro module) protection and measurement functions, to voltages, powers and energies.



NOTE: the Ekip Hi-Touch, Ekip G Touch and Ekip G Hi-Touch versions have the Ekip Measuring Pro module mounted as standard.

Ekip Touch is described starting from page 9.

The description of Ekip DIP is available at the web site <http://www.abb.com/abblibrary/DownloadCenter/> in the installation manuals [1SDH000999R0002](#) (for circuit breakers E1.2) and [1SDH001000R0002](#) (for circuit breakers E2.2-E4.2-E6.2).

Protections Numerous protection functions are available to protect the circuit-breaker in abnormal conditions of the installation. The combination of the protection functions varies depending on the type of release, as shown in the following table:

Dip	Touch			
	DISTRIBUTION		GENERATORS	
Dip	Touch	Hi-Touch	G Touch	G Hi-Touch
P. Dip	P. Touch	P. Touch	P. Touch	P. Touch
	P. Measuring Pro	P. Measuring Pro	P. Measuring Pro	P. Measuring Pro
		P. Hi-Touch	P. G Touch	P. Hi-Touch
				P. G Touch
				P. G Hi-Touch
External toroid				
S.G.R.			Rc	

All the protections are described by type:
Touch protections (page 28), Measuring Pro protections (page 31), Hi-Touch protections (page 32), G Touch protections (page 33), G Hi-Touch protections (page 34).
Touch releases can be connected to an SGR sensor or to an RC sensor, which allow activation, respectively, of the **Gext** protections (page 101) e **RC** (page 101).

Measurements The releases include a huge range of measurements. As for the protections, availability and combinations vary for each version of the release:

Dip	Touch			
	DISTRIBUTION		GENERATORS	
Dip	Touch	Hi-Touch	G Touch	G Hi-Touch
M. Dip	M. Touch	M. Touch	M. Touch	M. Touch
	M. Measuring	M. Measuring	M. Measuring	M. Measuring
		M. Hi-Touch		M. Hi-Touch

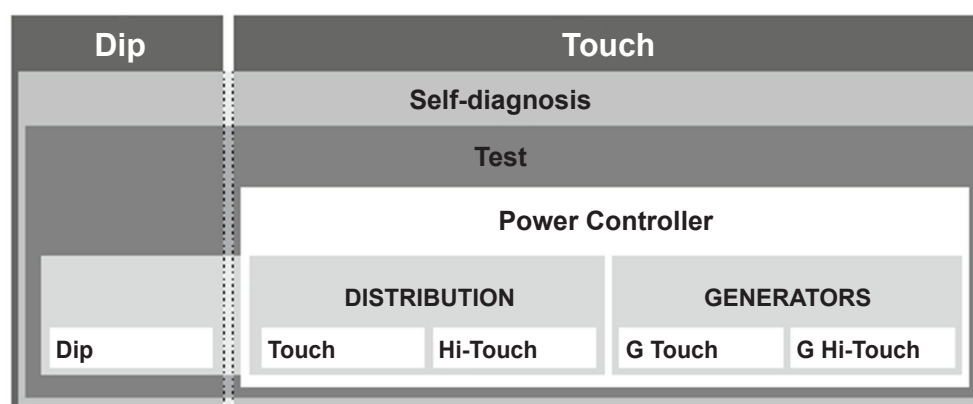
All the measurements are described by type:
Touch measurements (page 36), Measuring Measurements (page 37), Hi-Touch measurements (page 38).

Integrated functions: Self-diagnosis, Test and Power Controller

All the protection releases for Emax 2 integrate:

- Self-diagnosis: continuous monitoring of the state of the internal and external connections, with signalling of any faults that may occur.
- Test: checking of the protections and the other functionalities.

In addition, releases of the Ekip Touch series can be supplied equipped with Power Controller to regulate the energy demand.



The additional functions are described starting from page 39.

Accessorizing modules

The Emax 2 circuit-breakers and Ekip releases can be accessorized as indicated in the combination tables on page 47.

Various types of modules are available, differing in functionality and the position in which they are mounted on the circuit-breaker.

The modules that can be connected directly to the solid-state release are:

Name	Description	Page
Ekip Measuring Ekip Measuring Pro	Power supply, protection and measurement modules.	60
Ekip Signalling 4K	Signalling module.	69



NOTE: the Ekip Signalling 4K module is not available for E1.2 model circuit-breakers.

The modules available for the terminal box of the circuit-breaker are:

Name	Description	Page
Ekip Supply	Power supply module.	58
Ekip Signalling 2K	Signalling module.	74
Ekip Synchrocheck	Module for measuring voltage and synchronism between two power sources	65
Ekip Com Modbus RTU Ekip Com Profibus DP Ekip Com DeviceNet Ekip Com Modbus TCP Ekip Com Profinet Ekip Com EtherNet/IP Ekip Com IEC 61850	Communication module	79
Link	Communication module	97

Continued on the next page

The modules external to the circuit-breaker are:

Name	Description	Page
Ekip Multimeter	Power supply and measurement module.	103
Ekip Signalling 10K	Signalling module.	104

The supervision, configuration and reporting functions are, in addition, guaranteed by further modules for temporary power supply and communication (test modules):

Name	Description	Page
Ekip TT	Power supply and test module	103
Ekip T&P	Power supply, communication and test module	103
Ekip Programming	Power supply, communication and programming module.	103
Ekip Bluetooth	Power supply and communication module	102

Ekip Touch protection release

1 - Layout of the interface

Components of the interface The operator interface for the Ekip Touch releases appears as follows:



Figure 2

The following table provides a description of the parts of the interface:

Pos.	Description
A	Touchscreen display.
B	Power LED, green.
C	Led Warning, yellow.
D	Led Alarm, red.
E	HOME key: opens the main page, or the start page.
F	iTEST key. If the main page or a level 2 page is displayed (see below), whenever you press on it the following pages are displayed in succession: • List of Alarms, if there are any messages present. • Protection unit, with information on Mainboard and release. • Circuit-breaker, with information on the circuit-breaker. • Last opening, with information on the last opening. If the Trip Test item has been selected in the Test menu, if you keep it pressed for at least 7 seconds it will run the opening command.
G	Test connector.

Signallings The following table provides a description of the signals of the interface:

LED	Description
Green	The possible states are: - Off: power supply absent. - On, fixed or flashing: power supply present, and release on. i NOTE: if the release is off and no opening has taken place, if you press the iTEST key the LED comes on for 6 s.
Yellow	The possible states are: - Off: no warning or error. - On, blinking rapidly: absence of communication between release and Mainboard, or installation error (of the Rating Plug, or the Ekip Measuring module, or Ekip Measuring Pro). - On, flashing slowly: internal error. - On, with two quick flashes every 0,5 s: parametrization error. - On, fixed: prealarm of protection L, or circuit-breaker status error.
Red	The possible states are: - Off: no alarm or error. - On, blinking rapidly: absence of communication between release and Mainboard, or Trip coil disconnected, or current sensor disconnected, or delay active.. - On, with two quick flashes every 2 s: Rating Plug error. - On, flashing slowly: internal error. - On, fixed: tripping signal.

Structure of the pages The following table illustrates how the pages shown on the display are structured:

Level 1	Level 2	Level 3
Diagnosis bar.	Alarm list page	
	Histograms page	
	Menu page	Basic protections menu
		Advanced protections menu
		Measurements menu
		Settings menu
		Test menu
		Information menu
	Measuring instruments pages	
	Measurements pages	

Diagnosis bar. The diagnostics bar is present in the main page and the level 2 pages, along the lower side of the display, and its function is to display the messages present.

The bar appears as follows:

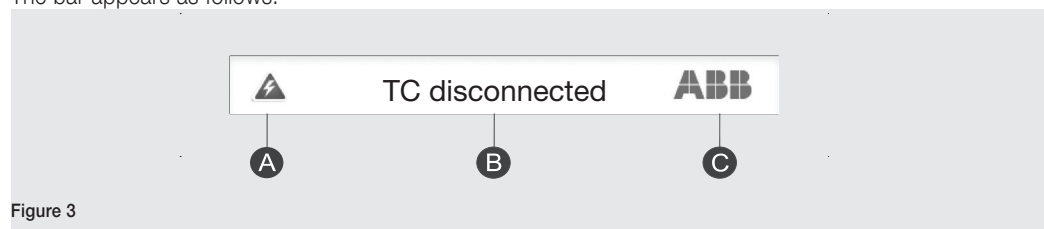


Figure 3

Continued on the next page

The following table provides a description of the various areas of the bar:

Pos.	Description
A	It shows the type of message: •  Alarm. •  Warning, error, or prealarm. •  Information. •  Active delay.
B	It displays the active messages one by one in a loop.
C	ABB logo.

Main page To open the page, press the key **HOME**.

The page appears as follows:

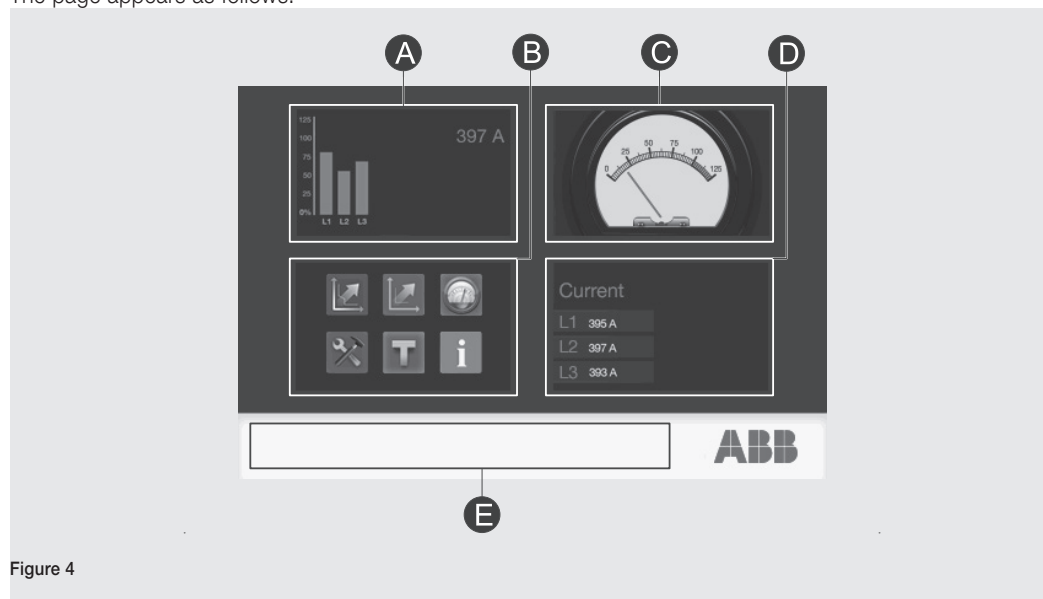


Figure 4

The following table provides a description of the various areas of the page:

Pos.	Function
A	Opens the Histograms page.
B	Opens the Menu page.
C	Opens the Measuring instruments page.
D	Opens the Measurements page.

Start page To open the page, press the **HOME** key until it is displayed.

The system returns automatically to this page after some minute of inactivity.

The default start page is the page **Histograms**.

Any graphical level 2 page (accessible from the main page) can be set as the start page, except for the pages **Alarm List** and **Menu**.

To set a page as the start page, you need to:

1. Open the page
2. Keep the **HOME** key pressed for at least 5 seconds.
3. Select **Yes** in the confirmation window that has appears on the display.

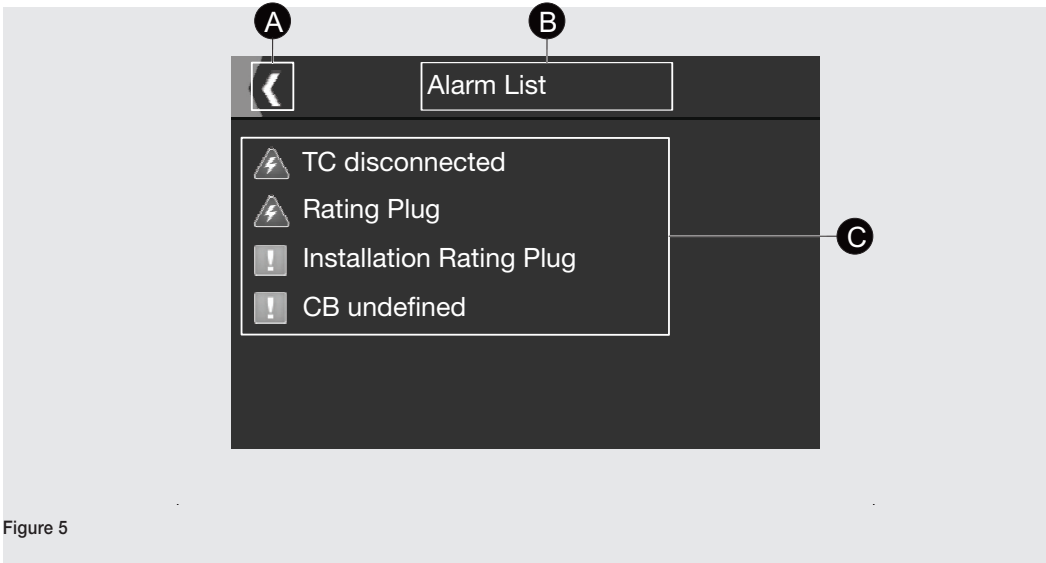
From this page, in the presence of an Ekip Measuring module, by touching the sides of the display you can open a page that displays a summary of the active measurements (maximum phase current, maximum phase-to-phase voltage, power factor, active, reactive and apparent power).

2 - Alarm List Page

When there are messages present the page is accessed:

- By touching the diagnosis bar, in the message display area.
- By pressing the key **iTEST**.

The page appears as follows:



The following table provides a description of the various areas of the page:

Pos.	Function
A	Opens the page displayed previously.
B	Shows the name of the page.
C	It shows the list of messages of: • ⚡ Alarm. • ! Warning, error, or prealarm. • i Information. • ⌚ Active delay.

3 - Histograms page

The page appears as follows:

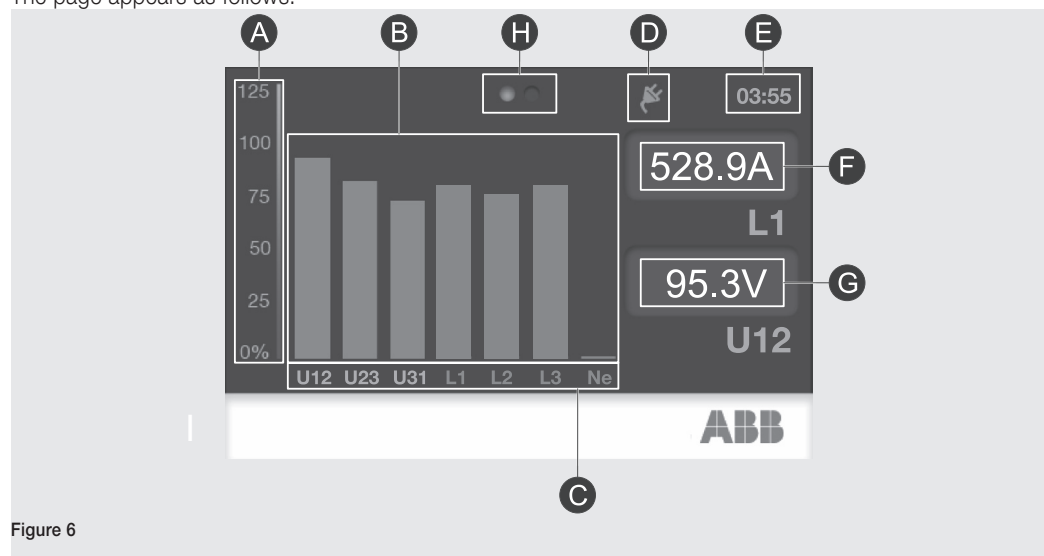


Figure 6

The following table provides a description of the various areas of the page:

Pos.	Description
A	Histogram ordinate, with the measurements expressed as percentages of the nominal values set.
B	Bars that represent the measurements of phase-to-phase voltages U12 U23 U31, and of the phase currents L1 L2 L3 and of the neutral Ne: - In blue: no alarm. - In yellow: voltage or current in prealarm, in relation to the set thresholds. - In red: voltage or current in alarm, in relation to the set thresholds.
C	Abscissa of the histogram. NOTE: - The voltage histograms are shown with the Ekip Measuring accessory module. - The Ne current histogram is shown with circuit-breaker configured with neutral.
D	Signalling and functions in progress: - Remote connection, visible with auxiliary voltage and Ekip COM accessory modules. - Auxiliary voltage or Test connection. - If the Dual Set function is enabled (see the Settings menu), the letter identifies the active configuration.
E	Current time.
F	- Measurement of the maximum phase current, as an absolute value (Ampere). - Phase to which the measurement refers.
G	Displayed with the Ekip Measuring module: - Measurement of the maximum phase-to-phase voltage, as an absolute value (Volt). - Concatenated to which the measurement refers.
H	Viewed with the Ekip Measuring module, it indicates the presence of several pages, that you can scroll through by touching the sides of the display, and in which of these pages it is located.

4 - Measuring instruments page

The pages appear as follows:

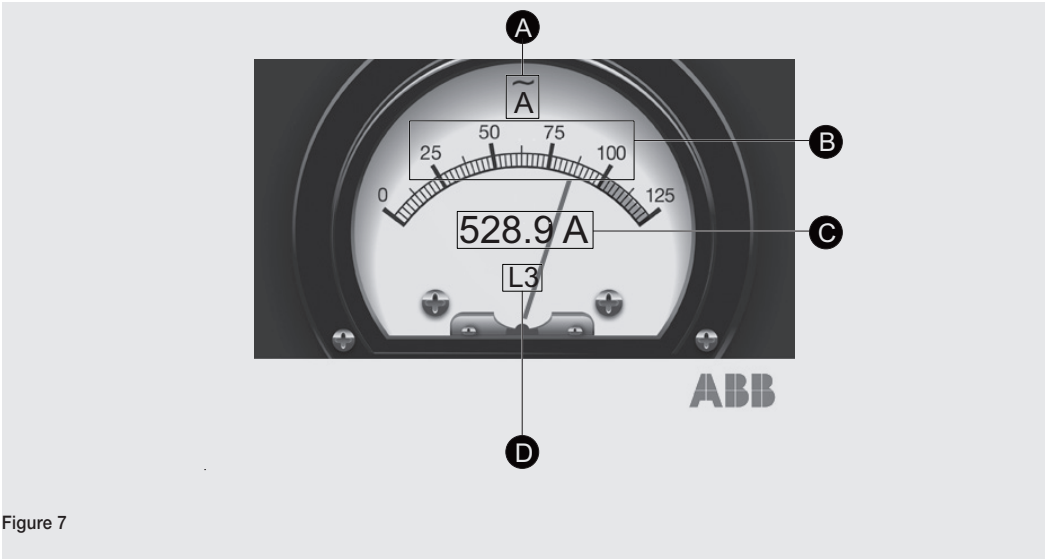


Figure 7

The following table provides a description of the various areas of the pages:

Pos.	Description
A	Type of indicator: • A: ammeter, with measurement of the maximum phase current. • V: ammeter, with measurement of the maximum phase-to-phase voltage. • kW: measurement of the active power. • kVAR: measurement of the reactive power. • kVA: measurement of the apparent power. <i>i NOTE: all the indicators except the ammeter are available with the Ekip Measuring module.</i>
B	Measurement expressed as percentage of the nominal value set.
C	Measurement as an absolute value (A, V, kW, kVA).
D	Phase current or phase-to-phase voltage, to which the measurement refers.

In these pages, by touching the sides of the display you can scroll through the available indicators.

5 - Measurements Page

The pages appear as follows:

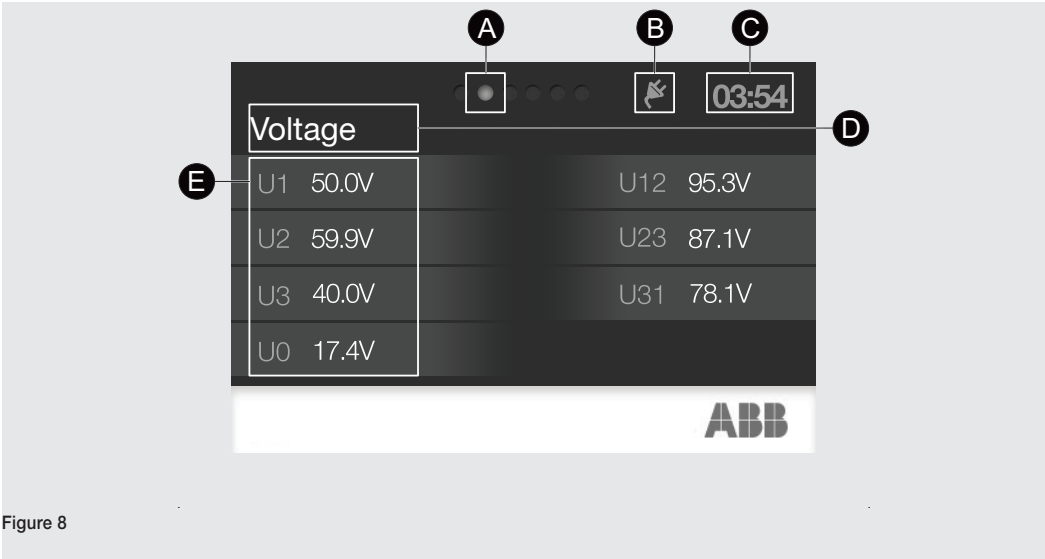


Figure 8

The following table provides a description of the various areas of the pages:

Pos.	Description
A	Viewed with the Ekip Measuring module, it indicates the presence of several pages, that you can scroll through by touching the sides of the display, and in which of these pages it is located.
B	Signalling and functions in progress (see the Histograms page)
C	Current time.
D	Unit in which the measurements are displayed.
E	Real time measurements of the dimension in position D.

NOTE: the voltage and power measurements, and the measurements related to the energy meters and the Power Controller function, are available with the Ekip Measuring module.

In these pages, by touching the sides of the display you can scroll through the pages containing the available indicators.

6 - Menu

Components of the page The page appears as follows:

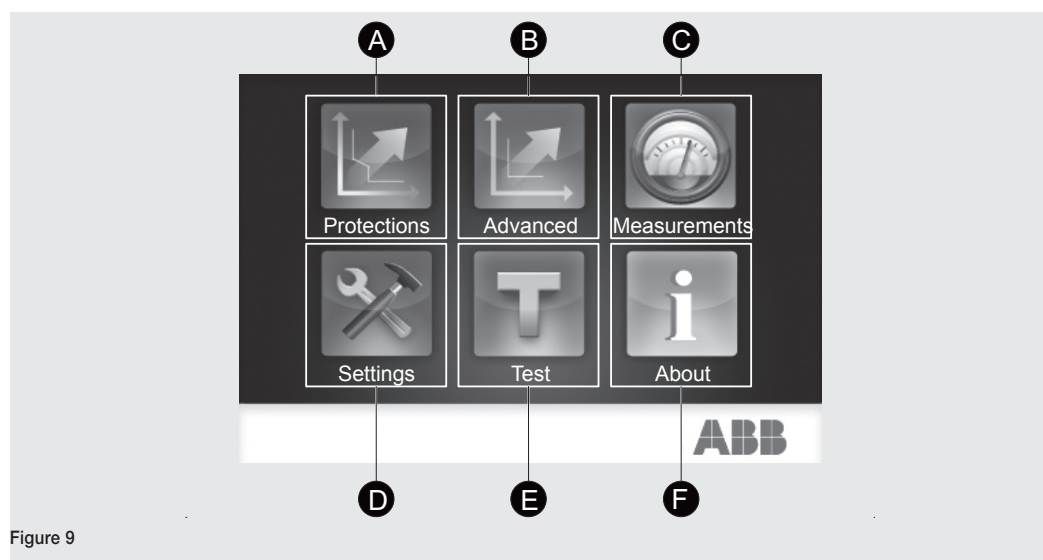


Figure 9

The following table provides a description of the various areas of the page:

Pos.	Function
A	Open the Protections menu.
B	Open the Advanced Protections menu.
C	Open the Measurements menu.
D	Open the Settings menu.
E	Open the Test menu.
F	Open the Information menu.

Components of the menus

The menus appear as follows:

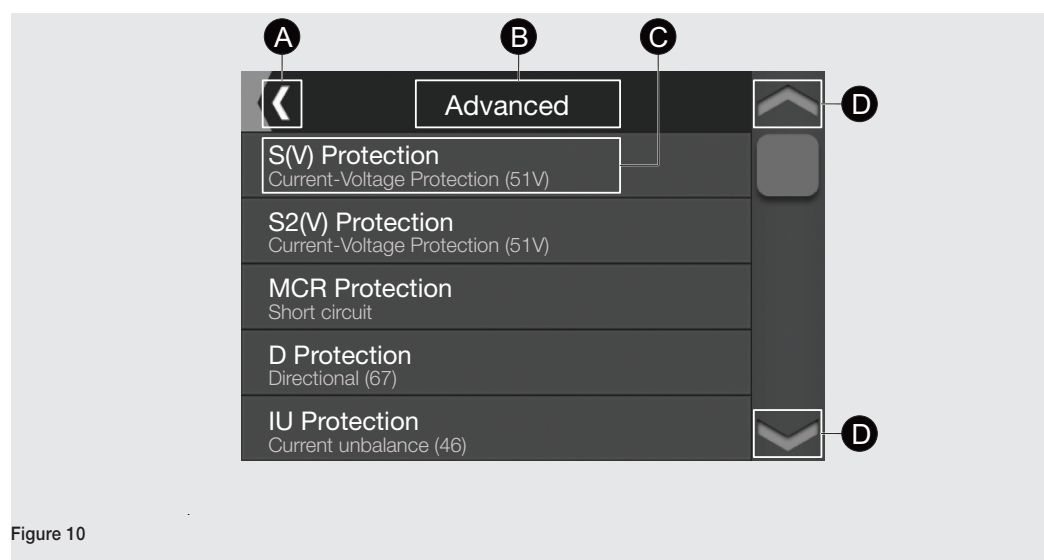


Figure 10

The following table provides a description of the various areas of the menus:

Pos.	Function
A	It opens the higher level menu, or if there is no higher level, the Menu page.
B	It displays the name of the menu.
C	• It displays a list of the available submenus, the parameters that can be set, and the commands that can be performed • Depending on which it is selected, it opens a submenu, the Edit Parameters page, or an information page, or performs a command.
D	Scroll the list

Last Opening measurements To open the page, from the menu **Measurements**, you need to select *History - Measurements*, and an opening of the list.

Alternatively, if the main page or a level 2 page is displayed, you can open the page relating to the last opening by pressing the **iTEST** key until the page is displayed.



NOTE: when an opening occurs, the page relating to the last opening is opened automatically.

To exit the page, press the **iTEST** key. Now the page is open.

The page appears as follows:

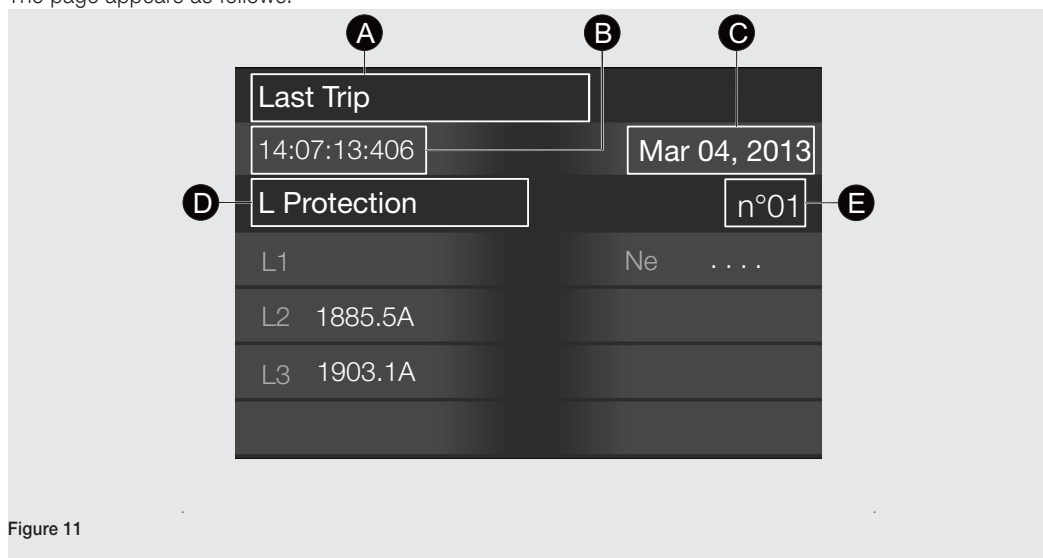


Figure 11

The following table provides a description of the various areas of the page:

Pos.	Description
A	Name of the page.
B	Time at which the selected opening occurred (time set on the release at the moment of the opening)
C	Date at which the selected opening occurred (date set on the release at the moment of the opening)
D	The protection that tripped.
E	Number of the selected opening.
	NOTE: every new opening is associated to an incremental number
F	Measurements related to the protection tripped, at the time of opening.

Measurements history To open the page, from the menu **Measurements**, you need to select *History - Measurements*, and an item in the list.

The page appears as follows:

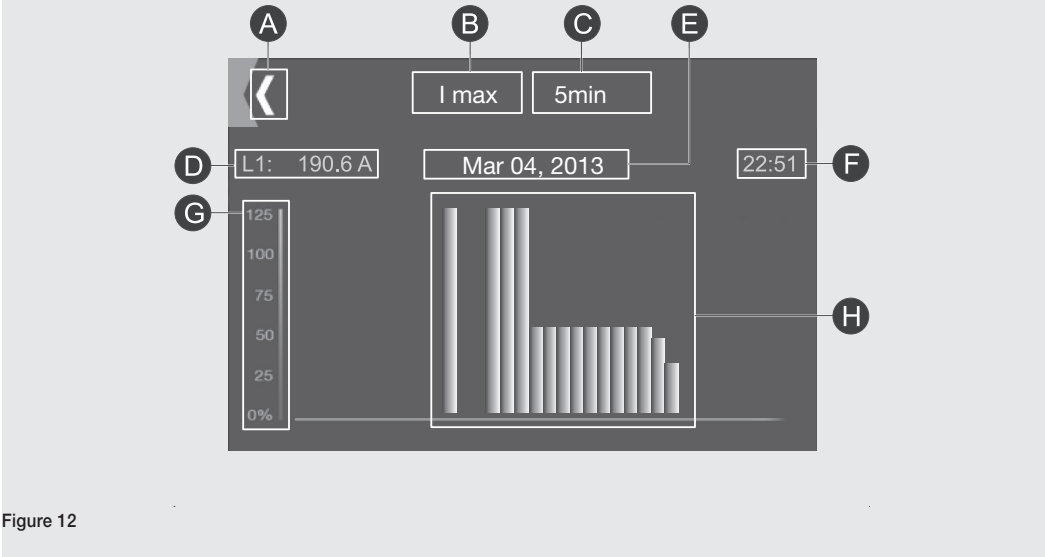


Figure 12

The following table provides a description of the various areas of the page:

Pos.	Description
A	It cancels the operation, and opens the Measurements list.
B	Item selected in the Measurements list.
C	Time interval between one measurement and the next.
D	The quantity with which the history is displayed, and the measurement in numerical form of the bar that is flashing in the histogram.
E	Date to which the measurement of the flashing bar refers (date set on the release at the moment of the measurement).
F	Time to which the measurement of the flashing bar refers (time set on the release at the moment of the measurement).
G	Histogram ordinate, with the measurements expressed as percentages of the nominal value set.
H	Bars that represent the measurements of the dimension in position D.

In this page, by touching the sides of the display you can scroll along the time axis, and select the bar before or after the flashing bar.

Wave forms To open the page, from the menu **Measurements**, you need to select *Network Analyzer - Wave forms*, and a dimension from the list.

The page appears as follows:

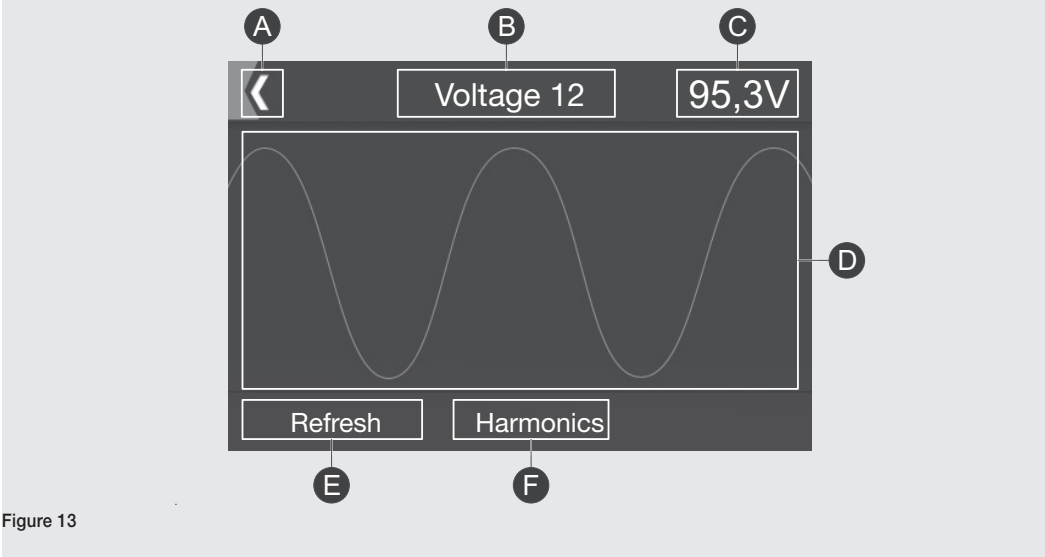


Figure 13

The following table provides a description of the various areas of the page:

Pos.	Description
A	It cancels the operation, and opens the Wave forms list.
B	Quantity selected in the Wave forms list.
C	The value of the quantity in position B at the time of selection.
D	The wave form of the quantity in position B at the time of selection.
E	Refresh key: performs a new acquisition.
F	Harmonics key: available if the measurement of harmonics is enabled (see the menu Set-tings, Network Analyzer), open the Harmonic Measurements page.

Harmonics Measurement To open the page, from the page with the wave form, press the key **Harmonics**.

i **NOTE:** to view measurement of the harmonics, measuring must be enabled from the Settings, Network Analyzer menu, selecting I Harmonic Analysis to enable measurement of the harmonics of the currents, and V Harmonic Analysis to enable measurement of voltage harmonics.

The page appears as follows:

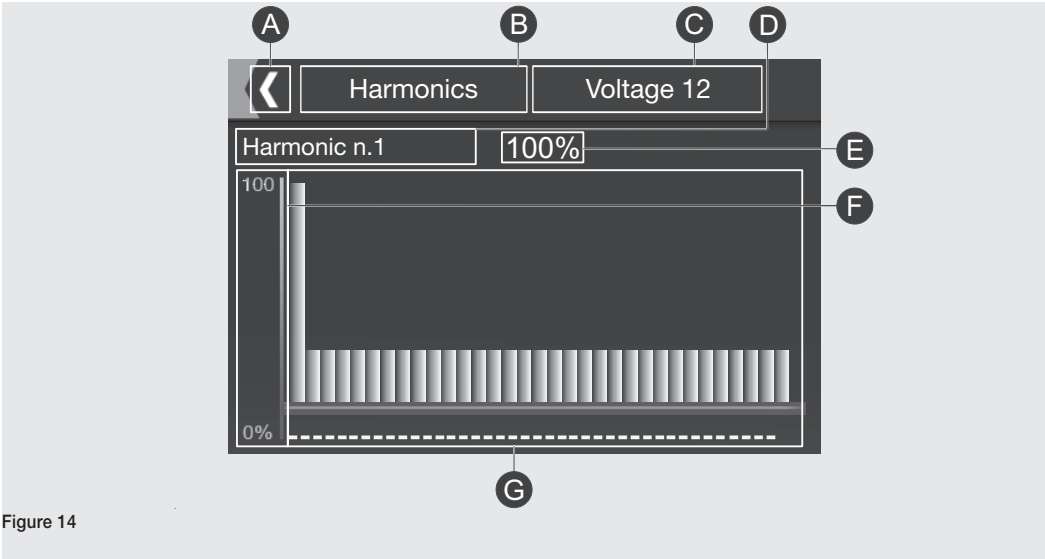


Figure 14

The following table provides a description of the various areas of the page:

Pos.	Description
A	It cancels the operation, and opens the Wave forms list.
B	Name of the page.
C	Quantity in which the harmonics are displayed.
D	The harmonic to which the flashing bar in the histogram corresponds.
E	Measurement of the flashing bar in the histogram in numerical form.
F	Histogram ordinate, with the measurements expressed as percentages of the fundamental component.
G	Bars that represent the measurements of the harmonics of dimension in position C.

In this page, by touching the sides of the display you can scroll through the harmonics, and select the bar before or after the flashing bar.

7 - Insertion of the password

Description The page for the insertion of the password is open if a parameter to be set is selected, or the menu **Test**, or if you want to change the password.

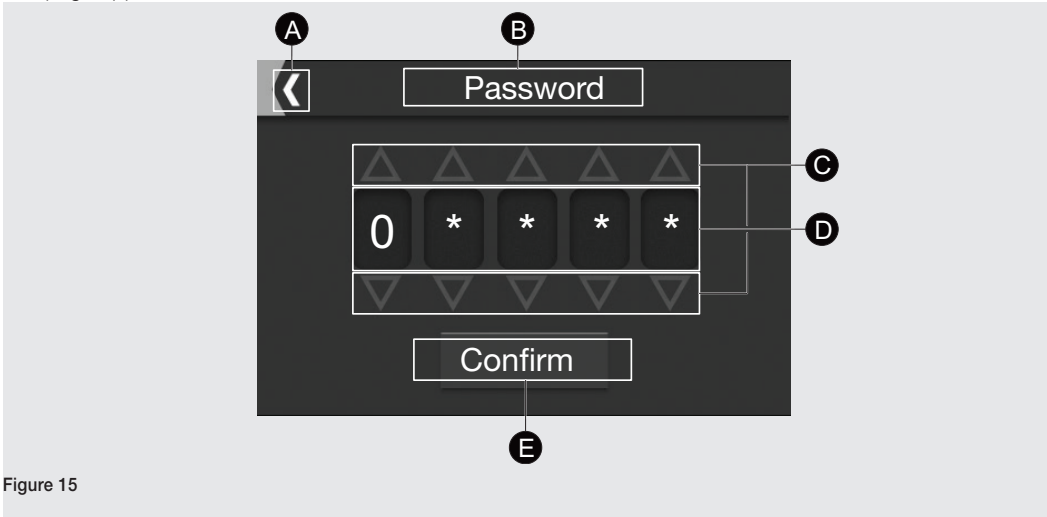


NOTE: insertion of the password is requested, if:

- The password has never been inserted.
- After programming has been cancelled.
- After a few minutes of inactivity have passed.

The password is composed of five digits, each of which can have a value from 0 to 9.
The default value is "00001", and it must be modified after the first switch-on in order to prevent access by unauthorized personnel.
In order to modify the password, from the menu **Settings**, you need to select *System - New Password*.
It is possible to disable the password by inserting "00000" as the new password .

Components of the page The page appears as follows:



The following table provides a description of the various areas of the page:

Pos.	Function
A	Cancels the operation, and opens the start menu.
B	Shows the name of the page.
C	Keys to increment and decrement the corresponding digit.
D	It displays the digits of the password.
E	Confirm key: • Confirmation after inserting a digit in a position from 1 to 4 will automatically bring you to the next digit. • When the fifth digit is confirmed, the entire password is confirmed and the selected page is opened.



NOTE:

- If you are changing the password, after the first confirmation of the new password, the page opens again for the reconfirmation.
- In the case of an incorrect password, the message "Wrong Password" appears for approximately 3 seconds, and the page for insertion of the password will open again.
- There is no limit to the number of incorrect passwords that you can insert.
- If the password is lost, contact ABB Service.

8 - Setting the parameters

Modifying a parameter To set a parameter, you need to select it. Selecting a parameter opens the page **Modify Parameter**.

There are two possible types of **Modify Parameter** page:

- By option: consists of a list of the values that can be assigned to the parameter (see page 24).
- By value: graphical page with a bar for assigning the parameter a numerical value within a range. (see page 25).

Programming the release When a value different to the current value is assigned to the parameter, the new value is indicated in the start menu, and the parameter is associated to a tick symbol.

The menu with submenus and parameters with tick signs appears as follows:

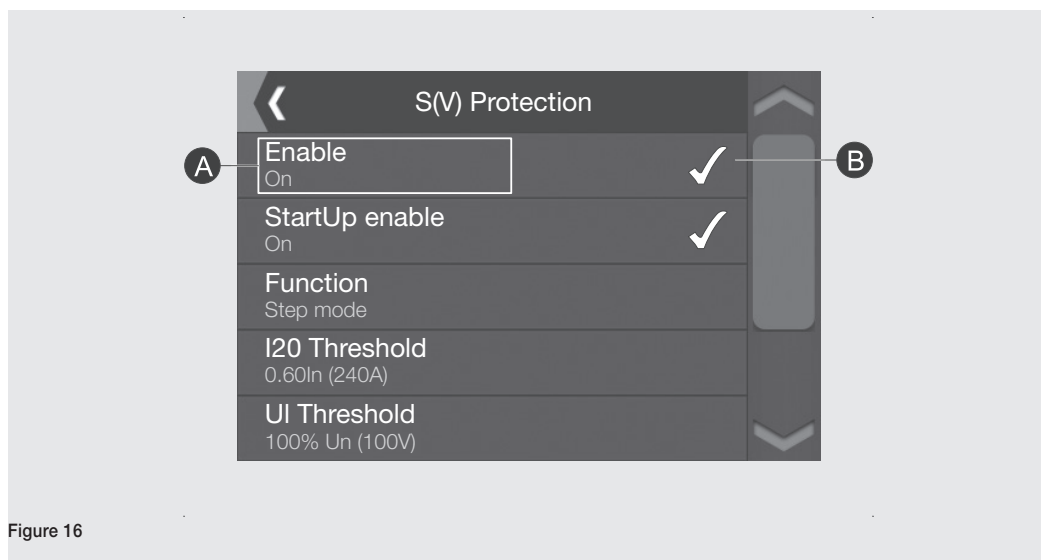


Figure 16

The tick signs indicate that the changes are not effective. In order make a change effective, the release must be programmed. To program the release, you need to press the key **HOME**, that it opens the page **Programming**. Alternatively, you can go up to the higher level menus until the page is displayed.

In the page **Programming**:

- A list of the changes made is displayed.
- You are asked to confirm, cancel, or modify the settings.

Edit Parameters by option page

The page appears as follows:

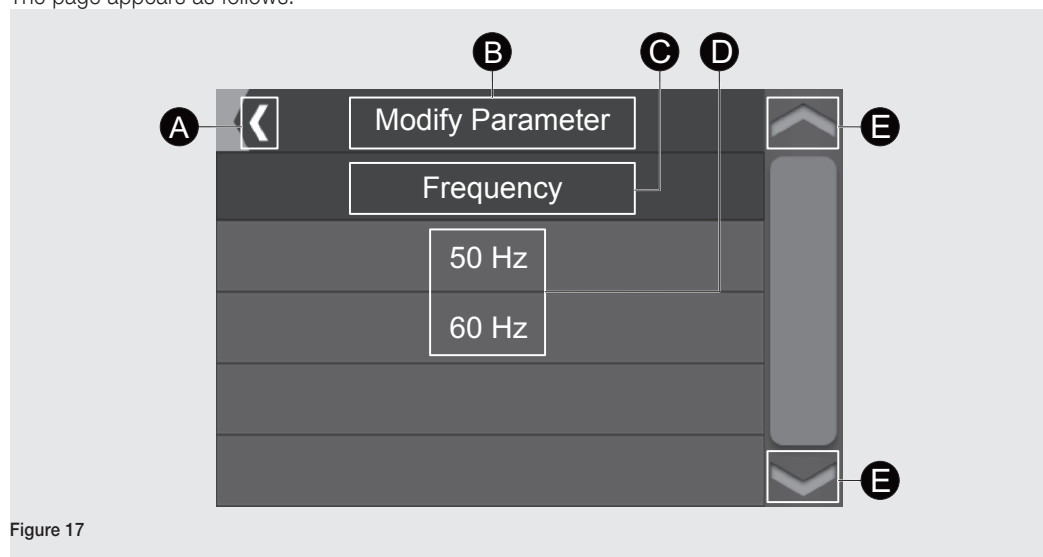


Figure 17

The following table provides a description of the various areas of the page:

Pos.	Description
A	Cancels the operation, and opens the start menu.
B	Name of the page.
C	Name of the parameter to be set.
D	List of the selectable values.
E	Scroll the list

Edit Parameters by value page

The page appears as follows:

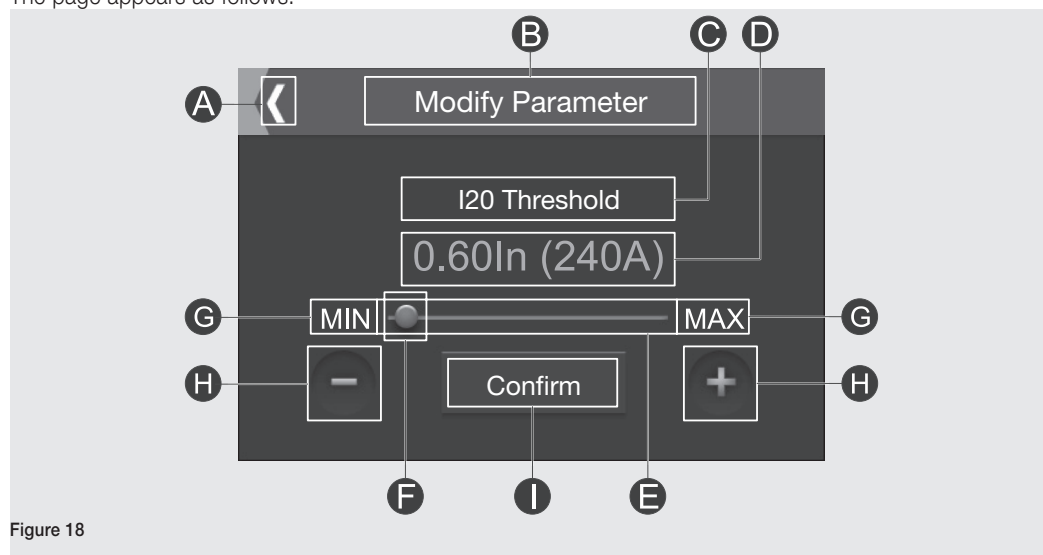


Figure 18

The following table provides a description of the various areas of the page:

Pos.	Description
A	Cancels the operation, and opens the start menu.
B	Name of the page.
C	Name of the parameter to be set.
D	Value selected for the parameter.
E	Bar: represents the range of selectable values graphically.
F	Cursor: represents the selected value graphically.
G	MIN key: selects the minimum value. MAX key: selects the maximum value.
H	- and + keys: allow you to increase and decrease the value selected.
I	Confirm key: confirms the selected value.

Programming Page

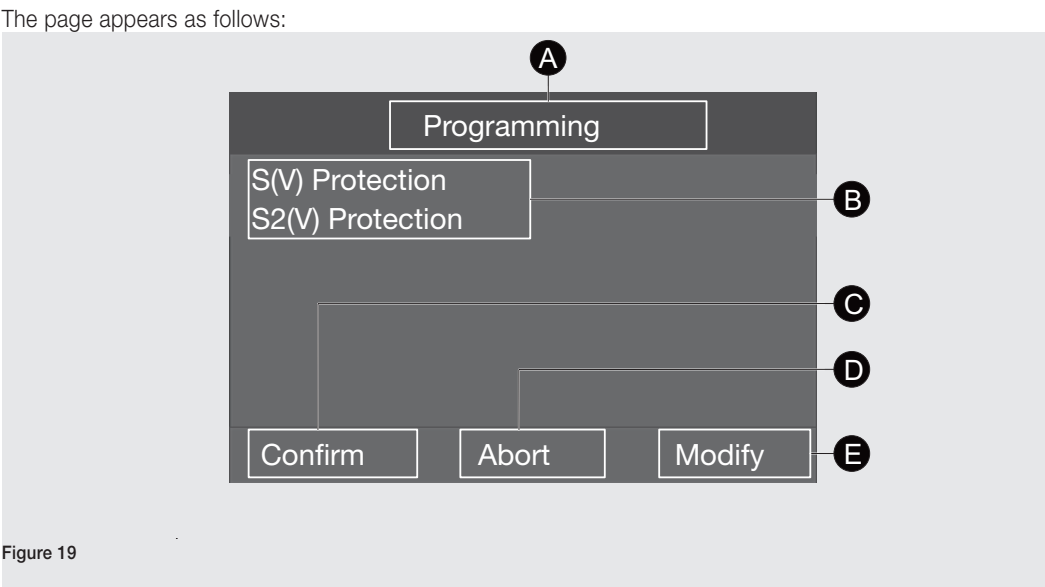


Figure 19

The following table provides a description of the various areas of the page:

Pos.	Description
A	Name of the page.
B	List of changes made.
C	Confirm key: confirms the changes (programs the release), and opens the Menus page.
D	Cancel key: cancels the changes, and opens the Menus page.
E	Modify key: it keeps the changes and opens the menu with tick symbols, for correction of the changes or to make other changes.

9 - Protections

Operating principle All the protections present in the electronic releases with a display (Ekip Touch, Ekip Hi-Touch, Ekip G Touch, Ekip G Hi-Touch) have a delay time before entering alarm status and acting on the circuit-breaker.

The duration of the delay depends on the various parameters set: threshold, time, curve. Depending on which current the release will read there are two possible behaviours:

- Current above the protection threshold, persistent alarm condition, the release will open the circuit-breaker.
- Current below the protection threshold, alarm condition and delay interrupted.

The protection threshold relates to different parameters, according to the type:

Type	Reference
Current	Nominal current of the rating plug (I_n).
Voltage	Voltage set (U_n)
Frequency	Frequency set (f_n)
Power / Power rating	Product of current and rated voltage ($S_n = \sqrt{3} * I_n * U_n$)



IMPORTANT:

- **To manage the tripping of the circuit-breaker with a specific protection, the protection itself must be enabled.**
- **All the protections have a default configuration: in the event of activation, check the parameters and make changes according to the requirements of your installation.**

10 - Touch protections

Availability (Performance) The following is a complete list of the protections (and related parameters) available with all the releases equipped with a display, in the Protections and Advanced menus:

Name	Protection against	Th-reshold	Time	Function	Auxiliary functions ⁽⁵⁾ ⁽⁸⁾
L ⁽¹⁾	Overload with long-time delay	X	X	X	Thermal memory, Prealarm threshold
S ⁽⁹⁾	Selective short-circuit	X	X	X	Trip Enable, Zone Selectivity, Thermal Memory, Startup enable, Lock
I ⁽²⁾	Instantaneous short-circuit	X	--	--	Startup enable, Lock
G ⁽⁴⁾⁽⁶⁾⁽⁹⁾⁽¹⁰⁾	Earth fault	X	X	X	Trip Enable, Zone Selectivity, Startup enable, Lock
2I ⁽²⁾	Instantaneous short-circuit programmable	X	--	--	--
MCR ⁽³⁾	Instantaneous short circuit on closing	X	--	--	Trip Time, Lock
IU	Current unbalancing	X	X	--	Trip enable
OT ⁽⁷⁾	Temperature outside range	--	--	--	Trip enable
IInst	Instantaneous short-circuit	--	--	--	--

⁽¹⁾ The protection forces the tripping time to 1 second in two cases:

- if according to the calculation the time is less than 1 second.
- if the fault current is greater than 12 I_n.

⁽²⁾ Activatable with protection MCR= Off.

⁽³⁾ Activatable with protection I= Off.

⁽⁴⁾ The protection automatically deactivates in the event of a connection error of 1 or more sensors, or if the measured current is higher than a maximum value:

- 8 I_n (with I₄ ≥ 0,8 I_n).
- 6 I_n (with 0,5 I_n ≤ I₄ < 0,8 I_n).
- 4 I_n (with 0,2 I_n ≤ I₄ < 0,5 I_n).
- 2 I_n (with I₄ < 0,2 I_n).

⁽⁵⁾ Detailed description in the Design Engineer's manual.

⁽⁶⁾ If the presence of the SGR sensor is activated, the adjustment of protection G is replaced by the item Gext, in the Advanced section. With Ekip G Hi-Touch both items, G and Gext, are available.

⁽⁷⁾ Available in the Settings-Circuit Breaker menu.

⁽⁸⁾ Locking Function available via Ekip Connect.

⁽⁹⁾ For all the UL versions, the maximum time allowed by the release is 0.4 seconds. If a higher value is set, the release signals the error and forces the parameter to 0.4 seconds.

⁽¹⁰⁾ For all the UL versions the maximum threshold allowed by the release is 1200 A. If a higher value is set, the release signals the error and forces the parameter to 1200 A.

Neutral Adjusting the neutral setting serves to characterize the protections L, S and I on the Neutral pole with a control factor different to the other phases.

Expressed as a percentage, it defines the multiplication factor of the neutral current (example: 50%= the tripping threshold of the neutral is half the phase threshold).



NOTE: use adjustment of the neutral setting only with four-pole or three-pole circuit-breakers with external neutral.

Summary table of Basic protections

ABB	ANSI ⁽⁹⁾	Threshold	Threshold tolerance ⁽³⁾	Time	Calculation formula t_t ⁽²⁾	Example calculation t_t ⁽²⁾	Tolerance t_t ⁽³⁾
L (60947-2)	49	$I1 = 0.4...1 \text{ In}$ step = 0.001 In	Activation for If in the range (1.05...1.2) x I1	$t1 = 3...144 \text{ s}$ step = 1 s	$t_t = (9 t1) / (If / I1)^2$	$t_t = 6.75 \text{ s}$ with: $I1 = 0.4 \text{ In}$; $t1 = 3 \text{ s}$; $If = 0.8 \text{ In}$	$\pm 10 \%$ with $If \leq 6 \text{ In}$ $\pm 20 \%$ with $If > 6 \text{ In}$
L (60255-3) ⁽¹⁾	49	$I1 = 0.4...1 \text{ In}$ step = 0.001 In	Activation for If in the range (1.05...1.2) x I1	$t1 = 3...144 \text{ s}$ step = 1 s	$t_t = (t1 \times a \times b) / ((If / I1)^{k-1})$	See the table below	$\pm 10 \%$ with $If \leq 6 \text{ In}$ $\pm 20 \%$ with $If > 6 \text{ In}$
S ($t = k$)	50 TD	$I2 = 0.6...10 \text{ In}$ step = 0.1 In	$\pm 7 \%$ with $I2 \leq 6 \text{ In}$ $\pm 10 \%$ with $I2 > 6 \text{ In}$	$t2 = 0.05...0.8 \text{ s}$ step = 0.01 s	$t_t = t2$	-	The better of the two values: $\pm 10 \%$ or $\pm 40 \text{ ms}$
S ($t = k / I^2$)	51	$I2 = 0.6...10 \text{ In}$ step = 0.1 In	$\pm 7 \%$ with $I2 \leq 6 \text{ In}$ $\pm 10 \%$ with $I2 > 6 \text{ In}$	$t2 = 0.05...0.8 \text{ s}$ step = 0.01 s	$t_t = (100 t2) / (If)^2$	$t_t = 5 \text{ s}$ con: $I2 = 1 \text{ In}$; $t2 = 0.8 \text{ s}$; $If = 4 \text{ In}$	$\pm 15 \%$ with $If \leq 6 \text{ In}$ $\pm 20 \%$ with $If > 6 \text{ In}$
I	50	$I3 = 1.5...15 \text{ In}$ step = 0.1 In	$\pm 10 \%$	Not adjustable	$t_t \leq 30 \text{ ms}$	-	-
G ($t = k$)	50N TD	$I4$ ⁽⁴⁾ = 0,1...1 In step = 0.001 In	$\pm 7 \%$	$t4 = 0...1 \text{ s}$ step = 0.05 s	$t_t = t4$	-	The better of the two values: $\pm 10 \%$ or $\pm 40 \text{ ms}$ ⁽⁸⁾
G ($t = k / I^2$)	51N	$I4$ ⁽⁴⁾ = 0,1...1 In step = 0.001 In	$\pm 7 \%$	$t4 = 0.1...1 \text{ s}$ step = 0.05 s	$t_t = 2 / (If / I4)^2$	$t_t = 0.32 \text{ s}$ with: $I4 = 0.8 \text{ In}$; $t4 = 0.2 \text{ s}$; $If = 2 \text{ In}$	$\pm 15 \%$
2I	50	$I31 = 1,5...15 \text{ In}$ step = 0.1 In	$\pm 10 \%$	Not adjustable	$t_t \leq 30 \text{ ms}$	-	-
MCR	-	$I3 = 1.5...15 \text{ In}$ step = 0.1 In	$\pm 10 \%$	40...500 ms ⁽⁵⁾ step = 0.01 s	$t_t \leq 30 \text{ ms}$	-	-
IU	46	$I6 = 2...90 \%$ step = 1 %	$\pm 10 \%$	$t6 = 0.5...60 \text{ s}$ step = 0.5 s	$t_t = t6$	-	-
Inst	-	Defined by ABB	-	Instantaneous	-	-	-
Current thresholds (1 and 2)	-	50...100 % I1 step = 1 %	-	-	-	-	-
Current thresholds (Iw1 and Iw2)	-	0.3...10 In step = 0.01 In	-	-	-	-	-

Continued on the next page

The following are the details of the protections according to standard IEC 60255-3:

Protection	Curve parameters	Calculation formula $t_t^{(3)}$	Example calculation $t_t^{(3)}$
L (60255-3 SI)	$a = 0.14$; $b = 0.15873$; $k = 0.02$	$t_t = (t_1 \times a \times b) / ((I_f / I_1)^{k-1})$	$t_t = 4.78$ s with: $I_1 = 0.4$ In; $t_1 = 3$ s; $I_f = 0.8$ In
L (60255-3 VI)	$a = 13.5$; $b = 0.148148$; $k = 1$	$t_t = (t_1 \times a \times b) / ((I_f / I_1)^{k-1})$	$t_t = 6$ s with: $I_1 = 0.4$ In; $t_1 = 3$ s; $I_f = 0.8$ In
L (60255-3 EI)	$a = 80$; $b = 0.1$; $k = 2$	$t_t = (t_1 \times a \times b) / ((I_f / I_1)^{k-1})$	$t_t = 8$ s with: $I_1 = 0.4$ In; $t_1 = 3$ s; $I_f = 0.8$ In
L (60255-3 I ⁴)	$a = 80$; $b = 1$; $k = 4$	$t_t = (t_1 \times a \times b) / ((I_f / I_1)^{k-1})$	$t_t = 16$ s with: $I_1 = 0.4$ In; $t_1 = 3$ s; $I_f = 0.8$ In

Table of Additional Functions of the protections

The following table summarises the additional functions combined with protections S, I, G:

ABB	Threshold	Threshold tolerance ⁽³⁾	Time ⁽⁷⁾	Calculation formula $t_t^{(3)}$	Tolerance $t_t^{(3)}$
S (Startup) ⁽⁶⁾	$I_{2_startup} = 0.6...10$ In step = 0.1 In	$\pm 7\%$ with $I_2 \leq 6$ In $\pm 10\%$ with $I_2 > 6$ In	$t_{2_startup} = 0.1...30$ s step = 0.01 s	$t_t = t_2$	The better of the two values: $\pm 10\%$ or ± 40 ms
I (Startup) ⁽⁶⁾	$I_{3_startup} = 1.5...15$ In step = 0.1 In	$\pm 10\%$	$t_{3_startup} = 0.1...30$ s step = 0.01 s	$t_t \leq 30$ ms	-
G (Startup) ⁽⁶⁾	$I_{4_startup} = 0.2...1$ In step = 0.02 In	$\pm 7\%$	$t_{4_startup} = 0.1...30$ s step = 0.01 s	$t_t = t_4$	The better of the two values: $\pm 10\%$ or ± 40 ms
S (SdZ)	-	-	$t_{2_SdZ} = 0.04...0.2$ s step = 0.01 s	-	-
G (SdZ)	-	-	$t_{4_SdZ} = 0.04...0.2$ s step = 0.01 s	-	-

⁽¹⁾ For details see the table with all curves defined by standard 60255-3 that can be selected by the user.

⁽²⁾ The calculation of t_t is valid for values of I_f that have exceeded the activation threshold of the protection.

⁽³⁾ Valid tolerances with release energized in service conditions or with the auxiliary, tripping time ≥ 100 ms, temperature and currents within operating limits. If the conditions are not guaranteed, the tolerances in the table that follows the notes.

⁽⁴⁾ In the presence of an auxiliary power supply all the thresholds are active. If the auxiliary power supply is not present, the minimum threshold is automatically limited to the higher value between 100 A and 25 In

⁽⁵⁾ The MCR time is to be understood as the time for which the protection remains active after the circuit-breaker is closed. Tripping time, not adjustable, as for protection I.

⁽⁶⁾ Startup can be activated only with the function set to fixed time.

⁽⁷⁾ For the startup functions, the specified time is the period for which the protection with the different threshold remains active, calculated from when the startup threshold is exceeded.

⁽⁸⁾ With $t_4 = 0$ seconds, the maximum tolerance is 50 ms.

⁽⁹⁾ ANSI / IEEE C37-2 encoding.

Protection	Tolerance threshold	Tolerance t_t
L	Activation for I_f in the range 1.05...1,2 I1	$\pm 20\%$
S	$\pm 10\%$	$\pm 20\%$
I	$\pm 15\%$	≤ 60 ms
G	$\pm 15\%$	$\pm 20\%$ (60 ms with $t_4 = 0$)
2I	$\pm 15\%$	≤ 60 ms
Other	-	$\pm 20\%$

11 - Measuring Pro protections

Availability (Performance)

The following is a complete list of the protections (and related parameters) available with all the releases of the Touch range equipped with an Ekip Measuring Pro module, in the Protections and Advanced menus:

Name	Protection against	Threshold	Time	Auxiliary functions ^{(3) (4)}
UV	Minimum voltage	X	X	Trip Enable, Lock
OV	Maximum voltage	X	X	Trip Enable, Lock
VU ⁽¹⁾	Voltage unbalancing	X	X	Trip Enable, Lock
UF ⁽²⁾	Minimum frequency	X	X	Trip Enable, Lock
OF ⁽²⁾	Maximum frequency	X	X	Trip Enable, Lock
RP	Reverse active power	X	X	Trip Enable, Lock
Phase Sequence	Phase sequence error	X	--	
Cosφ	Power factor error	X	--	

⁽¹⁾ Protection not active if the highest of the voltages measured is in any case less than 30% of Un.

⁽²⁾ Protection not active for voltages <30V.

⁽³⁾ Detailed description in the Design Engineer's manual

⁽⁴⁾ Locking Function available via Ekip Connect.

Summary table of Measuring Pro protections

ABB	ANSI ⁽³⁾	Threshold	Tolerance threshold	Time	Calculation formula t_t ⁽¹⁾	Tolerance t_t ⁽²⁾
UV	27	U8 = 0.5...0.98 Un step = 0,001 Un	± 2 %	t8 = 0.05...60 s step = 0.05 s	$t_t = t8$	The better of the two values: ± 10 % or ± 40 ms
OV	59	U9 = 1.02...1.5 Un step = 0,001 Un	± 2 %	t9 = 0.05...60 s step = 0.05 s	$t_t = t9$	The better of the two values: ± 10 % or ± 40 ms
VU	47	U14 = 2...90 % step = 1 %	± 5 %	t14 = 0.5...60 s step = 0.5 s	$t_t = t14$	The better of the two values: ± 10 % or ± 40 ms
UF	81L	f12 = 0.9...0.99 fn step = 0,01 fn	± 1 % ⁽⁴⁾	t12 = 0.2...60 s step = 0.1 s	$t_t = t12$	The better of the two values: ± 10 % (min. 30 ms) or ± 40 ms
OF	81H	f13 = 1.01...1.1 fn step = 0,01 fn	± 1 % ⁽⁴⁾	t13 = 0.5...60 s step = 0.01 s	$t_t = t13$	The better of the two values: ± 10 % or ± 40 ms
RP	32R	P11 = -1...-0.08 Sn step = 0,001 Sn	± 10 %	t11 = 0.5...100 s step = 0.1 s	$t_t = t11$	The better of the two values: ± 10 % or ± 40 ms
Synchrocheck	25	Ulive = 0,5...1,1 Un; step = 0,01 Un ΔU = 0,02...0,12 Un; step = 0,01 Un Δf = 0,1...1 Hz; step = 0,1 Hz ΔCos φ = 5...50° elt; step = 5° elt tsyn = 0,1...3 s; step = 0,1 s	± 10 %	tref = 0.1...30 s step = 0.1 s	-	-
Cyclic direction of the phases	47	1-2-3 or 3-2-1	-	-	-	-
Cos φ	78	Cos φ = 0.2...0.95 step = 0,01	-	-	-	-

⁽¹⁾ Calculation of t_t is valid for values that have exceeded the tripping threshold of the protection.

⁽²⁾ Valid tolerances with release energized in service conditions or auxiliary, tripping time ≥ 100 ms, temperature and currents within operating limits. If the conditions are not guaranteed, the tolerance of the tripping time becomes ± 20%.

⁽³⁾ ANSI / IEEE C37-2 encoding.

⁽⁴⁾ Valid tolerance for frequencies in the range: fn ± 2 %. For frequency outside the range a tolerance of ± 5 % applies.

12 - Hi-Touch protections

Availability (Performance)

The following is a complete list of the protections (and related parameters) available with all the Ekip Hi-Touch and Ekip G Hi-Touch releases, in the Protections and Advanced menus:

Name	Protection against	Threshold	Time	Auxiliary functions ^{(1) (2)}
S2 ⁽³⁾	Selective short-circuit	X	X	Trip Enable, Zone Selectivity, Startup enable, lock
D	Directional short circuit	X	X	Trip Enable, Directional Zone Selectivity ⁽⁴⁾ , Startup enable, Lock
UV2	Minimum voltage	X	X	Trip Enable, Lock
OV2	Maximum voltage	X	X	Trip Enable, Lock
UF2 ⁽⁵⁾	Minimum frequency	X	X	Trip Enable, Lock
OF2 ⁽⁵⁾	Maximum frequency	X	X	Trip Enable, Lock

⁽¹⁾ Detailed description in the Design Engineer's manual.

⁽²⁾ Locking Function available via Ekip Connect.

⁽³⁾ For all the UL versions, the maximum time allowed by the release is 0.4 seconds. If a higher value is set, the release signals the error and forces the parameter to 0.4 seconds.

⁽⁴⁾ Directional Zone Selectivity works as an alternative to S and G Zone Selectivity.

⁽⁵⁾ Protection not active for voltages <30V.

Enabling the Set A-B function allows 2 different protection configurations to be managed, one alternative to the other, depending on certain user programmable events.

Summary table of Hi-Touch protections

ABB	ANSI ⁽⁴⁾	Threshold	Tolerance threshold	Time	Calculation formula t_t ⁽¹⁾	Tolerance t_t ⁽²⁾
S2	50 TD	$I5 = 0.6...10 I_n$ step = 0.1 I_n	$\pm 7\% I5 \leq 6 I_n$ $\pm 10\% I5 > 6 I_n$	$t5 = 0.05...0.8 s$ step = 0.01 s	$t_t = t5$	The better of the two values: $\pm 10\%$ or $\pm 40 ms$
D	67	$I7 = 0.6...10 I_n$ step = 0.1 I_n	$\pm 7\% I7 \leq 6 I_n$ $\pm 10\% I7 > 6 I_n$	$t7 = 0.2...0.8 s$ step = 0.01 s	$t_t = t7$	The better of the two values: $\pm 10\%$ or $\pm 40 ms$
UV2	27	$U15 = 0.5...0.98 U_n$ step = 0,001 U_n	$\pm 2\%$	$t15 = 0.05...60 s$ step = 0.05 s	$t_t = t15$	The better of the two values: $\pm 10\%$ or $\pm 40 ms$
OV2	59	$U16 = 1.02...1.5 U_n$ step = 0,001 U_n	$\pm 2\%$	$t16 = 0.05...60 s$ step = 0.05 s	$t_t = t16$	The better of the two values: $\pm 10\%$ or $\pm 40 ms$
UF2	81L	$f17 = 0.9...0.99 f_n$ step = 0,01 f_n	$\pm 1\%$ ⁽⁵⁾	$t17 = 0.2...60 s$ step = 0.1 s	$t_t = t17$	The better of the two values: $\pm 10\%$ (min. 30 ms) or $\pm 40 ms$
OF2	81H	$f18 = 1.01...1.1 f_n$ step = 0,01 f_n	$\pm 1\%$ ⁽⁵⁾	$t18 = 0.5...60 s$ step = 0.01 s	$t_t = t18$	The better of the two values: $\pm 10\%$ or $\pm 40 ms$

Table of Additional functions of the protections

The following table summarises the additional functions combined with protections S2 and D:

ABB	Threshold	Threshold tolerance ⁽²⁾	Time ⁽³⁾	Calculation formula t_t ⁽¹⁾	Tolerance t_t ⁽²⁾
S2 (Startup)	$I5_{startup} = 0.6...10 I_n$ step = 0.1 I_n	$\pm 7\%$ with $I5 \leq 6 I_n$ $\pm 10\%$ with $I5 > 6 I_n$	$t5_{startup} = 0.1...30 s$ step = 0.01 s	$t_t = t5_{startup}$	The better of the two values: $\pm 10\%$ or $\pm 40 ms$
D (Startup)	$I7_{startup} = 0.6...10 I_n$ step = 0.1 I_n	$\pm 10\%$	$t7_{startup} = 0.1...30 s$ step = 0.01 s	$t_t = t7_{startup}$	The better of the two values: $\pm 10\%$ or $\pm 40 ms$
D (SdZ)	-	-	$t7_{SdZ} = 0.13...0.5 s$ step = 0.01 s	-	-

⁽¹⁾ Calculation of t_t is valid for values that have exceeded the tripping threshold of the protection.

⁽²⁾ Valid tolerances with release energized in service conditions or auxiliary, tripping time $\geq 100 ms$, temperature and currents within operating limits. If the conditions are not guaranteed, the tolerance of the tripping time becomes $\pm 20\%$.

⁽³⁾ For the startup functions, the specified time is the period for which the protection with the different threshold remains active, calculated from when the startup threshold is exceeded.

⁽⁴⁾ ANSI / IEEE C37-2 encoding.

⁽⁵⁾ Valid tolerance for frequencies in the range: $f_n \pm 2\%$. For frequency outside the range a tolerance of $\pm 5\%$ applies.

13 - G Touch protections

Availability (Performance)

The following is a complete list of the protections (and related parameters) available with all the Ekip G Touch and Ekip G Hi-Touch releases, in the Protections and Advanced menus:

Name	Protection against	Th-reshold	Time	Additional parameters ⁽²⁾	Auxiliary functions ^{(2) (3)}
S(V)	Voltage control short-circuit	X	X	X	Trip enable, lock
RV ⁽¹⁾	Residual voltage	X	X		Trip enable, lock
RQ	Reversal of reactive power	X	X	X	Trip Enable, Lock
OQ	Maximum reactive power	X	X		Trip Enable, Lock
OP	Maximum active power	X	X		Trip Enable, Lock
UP ⁽⁴⁾	Minimum active power	X	X		Trip Enable, Lock, startup enable

⁽¹⁾ Available for four-pole or three-pole circuit-breakers equipped with an external neutral.

⁽²⁾ Detailed description in the Design Engineer's manual.

⁽³⁾ Locking Function available via Ekip Connect.

⁽⁴⁾ Not active for voltages <30V and if the circuit-breaker is open. The protection is also active for negative (reverse) active power, but it is independent of the RP protection (Protection against reverse active power).

Summary table for G Touch protections

ABB	ANSI ⁽⁵⁾	Threshold	Tolerance threshold	Tripping time	Calculation formula t_t ⁽²⁾	Tolerance t_t ⁽³⁾
S(V) (Step)	51V	$I_{20} = 0,6...10 I_n$; step = 0,1 In ⁽⁶⁾ $U_I = 0,2...1 U_n$; step = 0,01 Un $K_s = 0,1...1$; step = 0,01 ⁽⁶⁾	± 10 %	$t_{20} = 0.05...30$ s step = 0.01 s	$t_t = t_{20}$	The better of the two values: ± 10 % or ± 40 ms
S(V) (Linear)	51V	$I_{20} = 0,6...10 I_n$; step = 0,1 In $U_I = 0,2...1 U_n$; step = 0,01 Un $U_h = 0,2...1 U_n$; step = 0,01 Un $K_s = 0,1...1$; step = 0,01	± 10 %	$t_{20} = 0.05...30$ s step = 0.01 s	$t_t = t_{20}$ ⁽⁴⁾	The better of the two values: ± 10 % or ± 40 ms
RV	59N	$U_{22} = 0.1...0.5 U_n$ step = 0,001 Un	± 5 %	$t_{22} = 0.5...60$ s step = 0.05 s	$t_t = t_{22}$	The better of the two values: ± 10 % or ± 40 ms
RQ	40/32R	$Q_{24} = -1...-0,1 S_n$; step = 0,001 Sn $K_q = -2...2$; step = 0,01	± 10 %	$t_{24} = 0.5...100$ s step = 0.1 s	$t_t = t_{24}$	The better of the two values: ± 10 % or ± 40 ms
OP	32OF	$P_{26} = 0.4...2 S_n$ step = 0,001 Sn	± 10 %	$t_{26} = 0.5...100$ s step = 0.5 s	$t_t = t_{26}$	The better of the two values: ± 10 % or ± 40 ms
OQ	32OF	$Q_{27} = 0.4...2 S_n$ step = 0,001 Sn	± 10 %	$t_{27} = 0.5...100$ s step = 0.5 s	$t_t = t_{27}$	The better of the two values: ± 10 % or ± 40 ms
UP	32LF	$P_{23} = 0.1...1 S_n$ step = 0,001 Sn	± 10 %	$t_{23} = 0.5...100$ s step = 0.5 s	$t_t = t_{23}$	The better of the two values: ± 10 % or ± 40 ms

Table of Additional functions of the protections

Protection UP has Startup Enable:

ABB	Time ⁽⁴⁾
UP (Startup)	$t_{23_startup} = 0.1...30$ s step = 0.01 s

⁽¹⁾ Calculation of t_t is valid for values that have exceeded the tripping threshold of the protection.

⁽²⁾ Valid tolerances with release energized in service conditions or auxiliary, tripping time ≥ 100 ms, temperature and currents within operating limits. If the conditions are not guaranteed, the tolerance of the tripping time becomes ± 20%.

⁽³⁾ The tripping threshold of the current for voltage values between U_I and U_h is calculated by performing the linear interpolation between the thresholds U_h and I_{20} (first point on the line) and U_I and $K_s * I_{20}$ (second point on the line). $I_{threshold} = [(I_{20} * K_s * I_{20}) / (U_h * U_I)] / (U_{measured} * U_h) + I_{20}$.

⁽⁴⁾ The startup of protection UP is to be considered as the temporary deactivation time of the protection, starting from the exceeding of the startup threshold.

⁽⁵⁾ ANSI / IEEE C37-2 encoding.

⁽⁶⁾ The release accepts the I_{20} and K_s parameters provided that their product is greater than or equal to 0,6: $K_s * I_{20} \geq 0,6$.

14 - G Hi-Touch protections

Availability (Performance)

The following is a complete list of the protections (and related parameters) available with all the Ekip G Touch and Ekip G Hi-Touch releases, in the Protections and Advanced menus:

Name	Protection against	Threshold	Time	Additional parameters ⁽²⁾	Auxiliary functions ^{(2) (3)}
ROCOF ⁽¹⁾	Frequency derivation	X	X	X	Trip enable, lock
S2(V)	Voltage control short-circuit	X	X	X	Trip enable, lock
RQ2	Reversal of reactive power	X	X	X	Trip Enable, Lock

⁽¹⁾ Not active for voltages <30V.

⁽²⁾ Detailed description in the Design Engineer's manual.

⁽³⁾ Locking Function available via Ekip Connect.

Summary table of G Hi-Touch protections

ABB	ANSI ⁽¹⁾	Threshold	Tolerance threshold	Tripping time	Calculation formula t_t ⁽²⁾	Tolerance t_t ⁽³⁾
S2(V) (Step)	51V	I21 = 0,6...10 In; step = 0,1 In ⁽⁴⁾ UI2 = 0,2...1 Un; step = 0,01 Un Ks2 = 0,1...1; step = 0,01 ⁽⁴⁾	± 10 %	t21 = 0.05...30 s step = 0.01 s	$t_t = t_{21}$	The better of the two values: ± 10 % or ± 40 ms
S2(V) (Linear) ⁽⁵⁾	51V	I21 = 0,6...10 In; step = 0,1 In UI2 = 0,2...1 Un; step = 0,01 Un Uh2 = 0,2...1 Un; step = 0,01 Un Ks2 = 0,1...1; step = 0,01	± 10 %	t21 = 0.05...30 s step = 0.01 s	$t_t = t_{21}$	The better of the two values: ± 10 % or ± 40 ms
RQ2 ⁽⁶⁾	40/32R	Q24 = -1...-0,1 Sn; step = 0,001 Sn Q25 = -1...-0,1 Sn; step = 0,001 Sn Kq = -2...2; step = 0,01; Kq2 = -2...2; step = 0,01	± 10 %	t24 = 0.5...100s step = 0.1 s	$t_t = t_{24}$	The better of the two values: ± 10 % or ± 40 ms
ROCOF	81R	f28 = 0.4...10 Hz / s step = 0,2 Hz / s ⁽⁷⁾	± 10 % ⁽⁸⁾	t28 = 0,5...10 s step = 0.1 s	$t_t = t_{28}$	The better of the two values: ± 20 % or 200 ms

⁽¹⁾ ANSI / IEEE C37-2 encoding.

⁽²⁾ Calculation of t_t is valid for values that have exceeded the tripping threshold of the protection.

⁽³⁾ Valid tolerances with release energized in service conditions or auxiliary, tripping time ≥ 100 ms, temperature and currents within operating limits. If the conditions are not guaranteed, the tolerance of the tripping time becomes ± 20%.

⁽⁴⁾ The release accepts the I21 and Ks2 parameters provided that their product is greater than or equal to 0,6 Hz / s: $Ks2 * I21 \geq 0,6 \text{ Hz / s}$.

⁽⁵⁾ The tripping threshold of the current for voltage values between UI2 and Uh2 is calculated by performing the linear interpolation between the thresholds Uh2 and I21 (first point on the line) and UI2 and Ks2 * I20 (second point on the line). $I_{\text{threshold}} = [(I21 * Ks2 * I20) / (Uh2 * UI2)] / (U_{\text{measured}} * Uh2) + I21$.

⁽⁶⁾ The tripping threshold of protection RQ2 is calculated by the intersection of the 2 straight lines formed by Q24 and Kq ($P_{\text{threshold}} = Q_{\text{measured}} * Kq + Q24$) and from Q25 and Kq2 ($P_{\text{threshold}} = Q_{\text{measured}} * Kq2 + Q25$). If constants Kq and Kq2 are set to 0, the higher threshold applies (considering that the values are negative, the applicable threshold is the one nearest to 0).

⁽⁷⁾ The parameter f28 limits the selectable minimum value of t28 as follows: 0.4 s ($0.4 \leq f28 < 1 \text{ Hz / s}$); 0.25 s ($1.2 < f28 < 5 \text{ Hz / s}$); 0.15 s ($f28 \geq 5.2 \text{ Hz / s}$).

⁽⁸⁾ ± 20 % for the threshold 0,4 Hz / s.

15 - External toroid protections

Availability (Performance)

The list of protections (and relative parameters) available with all the protection releases of the Touch range connected to external toroids S.G.R. and Rc is given below

List of protections

Name	Protection against	Threshold	Time	Auxiliary functions
Gext	Earth fault on toroid with adjustable delay	X	X	Trip Enable, Zone Selectivity, Startup enable, Lock
Rc	Residual current	X	X	-

Gext protection notes

⁽¹⁾ The menu with the Gext protection parameters activates if the presence of external toroid S.G.R. has been enabled beforehand in the Settings, Circuit-breaker, Earth Protection menu.

⁽²⁾ The protection is automatically inhibited by the protection release if absence of external toroid S.G.R. is detected.

⁽³⁾ If the presence of the SGR toroid is activated, the adjustment of protection G is replaced by the item Gext. With Ekip Hi-Touch and Ekip G Hi-Touch both items, G and Gext, are available.

⁽⁴⁾ The maximum time permitted by the release for type UL circuit-breakers is 0.4 s. If a higher value is entered, the protection release will signal error and force the parameter to 0.4 s.

Rc protection notes

⁽⁵⁾ The menu with the Rc protection parameters activates if the Rating Plug type Rc and Ekip Measuring Pro modules are present and correctly installed.

⁽⁶⁾ If presence of external toroid Rc is activated, regulation of G protection is substituted by item Rc. Both items G and Rc are available with Ekip Hi-Touch and Ekip G Hi-Touch.

Summary table of external toroid protections

ABB	ANSI ⁽¹⁾	Threshold	Threshold tolerance ⁽³⁾	Time	Calculation formula t_t ⁽²⁾	Example calculation t_t ⁽²⁾	Tolerance t_t ⁽³⁾
Gext ($t = k$)	50GTD	$I_4 = 0,1...1 \text{ In}$ toroid step = 0,001 In	$\pm 7 \%$	$t_4 = 0,1...1 \text{ s}$ step = 0,05 s ⁽⁶⁾	$t_t = t_4$	-	$\pm 7 \%$
Gext ($t = k / I^2$)	51G	$I_4 = 0,1...1 \text{ In}$ toroid step = 0,001 In	$\pm 7 \%$	$t_4 = 0,1...1 \text{ s}$ step = 0,05 s ⁽⁶⁾	$t_t = 2 / (I_f / I_4)^2$	$t_t = 0,32 \text{ s}$ con: $I_4 = 0,8 \text{ In}$; $t_4 = 0,2 \text{ s}$; $I_f = 2 \text{ In}$	The better of the two values: $\pm 10 \%$ or $\pm 40 \text{ ms}$
Rc	64 50NTD	$I_{dn} = 3 - 5 - 7 - 10 - 20 - 30 \text{ A}$	$-20 \% \div 0$	$t_{dn} = 0,06 - 0,1 - 0,2 - 0,3 - 0,4 - 0,5 - 0,8 \text{ s}$	$t_t = t_{dn}$	-	0,06 s

Table of additional function of the Gext protection

ABB	Threshold	Threshold tolerance ⁽³⁾	Time ⁽⁵⁾	Calculation formula t_t ⁽³⁾	Tolerance t_t ⁽³⁾
Gext (Startup) ⁽⁴⁾	$I_4 \text{ startup} = 0,1...1 \text{ In}$ toroid step = 0,02 In toroid	$\pm 7 \%$	$t_4 \text{ startup} = 0,1...30 \text{ s}$ step = 0,01 s	$t_t = t_4$	The better of the two values: $\pm 10 \%$ or $\pm 40 \text{ ms}$
Gext (SdZ)		$\pm 7 \%$	$t_4 \text{ sdz} = 0,04...0,2 \text{ s}$ step = 0,01 s	$t_t = 2 / (I_f / I_4)^2$	-

⁽¹⁾ ANSI / IEEE C37-2 encoding.

⁽²⁾ Calculation of t_t is valid for values of I_f that have exceeded the tripping threshold of the protection.

⁽³⁾ Tolerances valid with release energized in service conditions or with auxiliary power supply, tripping time $\geq 100 \text{ ms}$, temperature and currents within operating limits. If the conditions are not guaranteed, the threshold tolerance becomes: $\pm 15 \%$ and tolerance t_t becomes: $\pm 20 \%$.

⁽⁴⁾ Startup can be activated only with the function set to fixed time.

⁽⁵⁾ For the startup functions, the specified time is the period for which the protection with the different threshold remains active, calculated from when the startup threshold is exceeded.

⁽⁶⁾ The maximum time permitted by the release for type UL circuit-breakers is 0.4 s. If a higher value is entered, the protection release will signal error and force the parameter to 0.4 s.

16 - Touch measurements

Presentation Touch measurements are available in all the models of releases of the Ekip Touch range.

The following is a list of the measurements:

Measurements	Description
Instantaneous currents	Real Time measurements of the currents
Openings	List of the tripping for Basic protections
Events	List of events, changes of state, alarms recorded by the release
Maximum current	History of the maximum currents recorded with an interval that can be set
Minimum current	History of the minimum currents recorded with an interval that can be set
Peak factor	Real time measurement of the peak factor of the currents
Contact wear	Calculation of the wear of the contacts
Datalogger	Recording of the wave form of the currents and the digital states
Operation counters	Number of mechanical and electrical operations

Instantaneous currents **Description**

Instantaneous currents are real time measurements of earth fault and phase currents.



NOTE:

- The measurements in Amperes are available from a minimum value of 0.03 In for the phase currents, and 0.08 In for earth fault current. For lower currents “...” is shown.

Openings **Path**

Main page - Menus - Measurements - History

Description

The release is able to record the last 30 openings of the circuit-breaker caused by protection trips (trips).

The openings are correlated by the following information:

- The protection that tripped.
- The progressive number of the opening.
- The date and time of the opening (referring to the internal clock).
- The measurements associated to the trip protection.



NOTE:

- Each opening is associated to a progressive number that is incremented with every trip.
- If the release has exceeded the threshold of the 30 openings, the oldest ones are progressively overwritten.

Events **Path**

Main page - Menus - Measurements - History

Description

The release can record the last 200 events, referring mainly to variations in status and operation.

Summary table of base measurements The following table summarises the base measurements:

Quantities measured	Measurement interval	Normal operating interval	Accuracy
Phase currents (I1, I2, I3, Ine)	03...16 In	0.2...1.2 In	1 %
Earth fault current (Ig)	08...4 In	0.2...1.2 In	2 %



NOTE: the precisions refer to the normal operational intervals

17 - Measuring Measurements

Presentation Measuring Measurements are available in all the models of releases of the Ekip TOUCH range supplied with Ekip Measuring module or Ekip Measuring Pro.

The following is a list of the measurements:

Measurements	Description
Instantaneous voltages	Real Time measurements of the voltages
Instantaneous powers	Real Time measurements of the active, reactive, apparent power
Trips	List of the trips due to voltage, frequency, power
Maximum voltage	History of the maximum voltages recorded with an interval that can be set
Minimum voltage	History of the minimum voltages recorded with an interval that can be set
Maximum power	History of the maximum active powers recorded with an interval that can be set
Average power	History of the average active powers recorded with an interval that can be set
Power factor	Real time measurement of the power factor
Instantaneous frequency	Measurement of the line frequency
Energy meters	Measurement of active, reactive, apparent energy

With the Ekip Measuring Pro module and Ekip Synchrocheck, a further set with of measurements is activated:

Measurements	Description
Synchrocheck	Measurements related to the function of synchronism between two independent power supply systems

Instantaneous voltages *Description*

Instantaneous voltages are measurements in real time of the phase-to-phase voltages and phase voltages.



NOTE: the measurements of the phase voltages are available with four-pole or three-pole circuit-breakers configured with external neutral.



NOTE:

- For voltages lower than 5 V "... " is displayed, for voltages greater than 1.25 Un "> 1.25 Un is displayed (example: with Un = 100 V, "> 125 V" is displayed).
- In the Histograms page, the graphical representation of the voltages is in relation 1 Un, with a maximum value of 1.25

Summary table of Measuring measurements

The following table summarises the base measurements:

Quantities measured	Measurement interval	Normal operating interval	Accuracy
Line-to-line and phase voltages	5 V...1,25 Un	50...400 V (phase) 100...690 V (phase-to-phase)	0.5 %
Line frequency	30...80 Hz	45...66 Hz	0.1 %
Active, reactive, and apparent power (total and phase)	-(16 In * 1,25 Un)...(16 In * 1,25 Un)	-6...-0.3 Pn / 0.3...6 Pn	2 %
Power factor	-1...1	-	2 %
Total apparent active, reactive, and apparent energy	1 kWh ... 2 TWh 1 kVAh ... 2 TVARh 1 kVARh ... 2 TVAh	-	2 %



NOTE: the precisions refer to the normal operational intervals

18 - Hi-Touch measurements

Presentation Hi-Touch measurements are available for Ekip Hi-Touch and Ekip G Hi-Touch releases.



IMPORTANT: the measurements are available with releases equipped with auxiliary power supply.

The following is a list of the measurements:

Measurements	Description
wave forms	View of the wave forms of the voltage and current signals and current
Harmonics	View of the harmonic component of the voltage and current signals
Network Analyzer	Statistical analysis of voltages and currents

Network Analyzer *Path*

Main page - Menus - Measurements - Network Analyzer (for the measurements and the counters)

Main page - Menus - Settings - Network Analyzer (for the control parameters)



NOTE: All the detailed information on the Network analyzer functionality are available in the Design Engineer's manual.

19 - Test

Path *Main page - Menus - Test*

Presentation All the releases of the Ekip Touch range allow you to carry out various checks directly from the display:

- **Self-test**, for the check on the display and the LEDs.
- **Trip Test**, for the check on the circuit breaker opening command.
- **Test CB**, for the check on the controls of the circuit-breaker opening and closing coils
- **Zone Selectivity**, for the check on Zone Selectivity inputs and outputs.

In the presence of auxiliary power supply and contact type modules, the dedicated sections are enabled:

- **Ekip Signalling 4K**, it allows the check of LED and contacts of the module.
- **Ekip Signalling 2K-1, 2K-2, 2K-3**, it allows the check of LED and contacts of the module.
- **Ekip Signalling 10K-1, 10K-2, 10K-3**, it allows the check of LED and contacts of the module.

In the presence of an Rc type release and auxiliary power supply, the dedicated test section is enabled:

- **Rc Test**, allows you to check the connection of the toroid Rc and that it is working properly.



NOTE: access to the test menu requires the insertion of the password.

Using the test accessories Ekip T&P and Ekip Bluetooth it is also possible to verify the commands of the protections.

Self-test The automatic sequence of the display and the LED is activated by selecting the command **Self-test**.

The sequence includes the following test phases:

Phase	Operation
1	Screen with message "www.abb.com"
2	Darkening of the display
3	Color sequence with red, green, blue bands, with gradual increase of backlighting
4	Warning and Alarm LEDs switched on for 1 second

Trip Test Selecting the command **Trip test** opens a dedicated page that asks you to confirm running the test by pressing the iTest key for at least 7 seconds.

When the key is pressed, an opening command is sent to the trip coil.



IMPORTANT: the opening command is performed with circuit-breaker closed and absence of circulating currents.



IMPORTANT: the Zone Selectivity commands work with:

- **Auxiliary power supply present.**
- **Circuit-breaker open and, in the case of the withdrawable version, in connected or test position.**

Test CB Selecting the command **Test CB** opens a submenu containing the commands **Open CB** e **Close CB**.

The commands allow you to activate coil opening and closing respectively: the correct sending of the command is confirmed by a window with the message "Test Executed".

The correct operation of the entire command system (release, Ekip Com Actuator and opening and closing coils) is verified with the opening and/or the closing of the circuit-breaker.



NOTE:

- *The command Open CB is sent in the presence of a closed or open circuit breaker.*
- *The Close CB is activated in the presence of an open circuit-breaker.*

Continued on the next page

**IMPORTANT:**

- The coil opening and closing commands work only with the release powered by auxiliary power supply.
- Make sure that the coils are connected to the power supply source.
- The commands verify the operation of the release: eventual faults on Ekip COM Actuator or the coils are not found by the test.

Zone Selectivity The command **Zone Selectivity** allows you to select the line you want to check: **Protection S** or **Protection G**.

The following are available for each command:

- **Input**, to check the state of the Zone Selectivity input.
- **Output force**, in order to force the state of the Zone Selectivity output to high.
- **Release Output**, to release the override on the Zone Selectivity output.

Ekip Signalling The submenus for testing the Ekip Signalling modules in the various versions 4K, 2K-1, 2K-2, 2K-3, 10K-1, 10K-2, 10K-3 allow you to send the command **Self-test**.

The command activates an automatic sequence of test LED and contacts:

Phase	Operation
1	Reset led and output contacts
2	Switch-on in sequence of all LEDs and the closing in sequence of all the associated output contacts
3	Reset initial conditions



NOTE: with Ekip Signalling modules 2K-1, 2K-2, 2K-3, the sequence includes testing of the LEDs of the inputs.



IMPORTANT: the self-test sequence involves the sending of the close command of the output contacts: the check on the correct closing is the user's responsibility.

Rc Test Submenus for the test of the Rc toroid involve the command **Self-test**, that allows you to send the command to the toroid to check of the correct operation.



NOTE: the test is available only with toroid correctly connected, release in Rc configuration, auxiliary power supply present.

Protection test To perform the protection command test, follow the following procedure:

Phase	Operation
1	Make sure that the circuit-breaker is closed and that there are no currents circulating
2	Connect a test front unit between Ekip T&P or Ekip Bluetooth
3	Start the communication with Ekip Connect
4	Open the Information page and select the Test command, which opens the protection test page
5	Set up the test as required and verify that the release functions properly

20 - Self-diagnosis

Alarms and signals **Alarm Tests**

Ekip Touch provides a series of signals that indicate its operating state, alarms present, or configuration errors in progress.

The signals are provided:

- With LEDs, as described on page 9.
- With messages on the diagnosis bar

The messages on the diagnostics bar can be divided into three categories: self-diagnosis, protection or measurement alarms, and programming error.

Self-diagnosis Ekip Touch continuously monitors its own operating state and that of all the devices to which it is connected. In the event of an error, the fault detected is reported:

Signal	Description
Local Bus	Local Bus enabled but no module detected on the terminal box
TC disconnected	Trip coil not connected
L1 Sensor	Current sensor not connected
L2 Sensor	Current sensor not connected
L3 Sensor	Current sensor not connected
Ne Sensor	Current sensor not connected
Gext Sensor	Toroid S.G.R. not connected
Rating Plug	Rating plug not connected or invalid value
Internal Error	Internal error
Invalid Date	Date not set
CB status	Circuit-breaker status contacts error
RatingPlug installation	Rating Plug not installed
Battery low	Battery low or absent
Measuring installation	Ekip Measuring module not installed
Measuring Error	Ekip Measuring module in error
Software Not Compatible	Software versions between Mainboard and Ekip Touch are not compatible with each other: editing of all parameters is inhibited on the display. Protections L, I and I _{inst} are activated and operative with the parameters entered in the previous protection release. Please consult ABB if compatibility needs to be restored.



NOTE: for information on resolving signalling, see the Fault Resolution section in the manuals [1SDH000999R0002](#) for Emax E1.2 and [1SDH001000R0002](#) for Emax E2.2, E4.2 and E6.2.

Protections and Measurements In the event of protection or measurement alarms, the associated signals are reported:

Signal	Alarm type
2I attiva	Protection 2I active
L Prealarm	L Protection
G Prealarm	Protection G
GExt/Rc Prealarm	Gext protection
S (Trip off)	Protection S
S2 (Trip off)	Protection S2
T Prealarm	Protection T
UV (Trip off)	Protection UV
OV (Trip off)	Protection OV
G (Trip off)	Protection G
Gext (Trip off)	Gext protection
T Alarm	Protection T
T (Trip off)	Protection T
RV (Trip off)	Protection RV
RP (Trip off)	Protection RP

Continued on the next page

Signal	Alarm type
UF (Trip off)	Protection UF
OF (Trip off)	Protection OF
UP (Trip off)	Protection UP
OQ (Trip off)	Protection OQ
UV2 (Trip off)	Protection UV2
OV2 (Trip off)	Protection OV2
UF2 (Trip off)	Protection UF2
OF2 (Trip off)	Protection OF2
ROCOF (Trip off)	Protection ROCOF
Load LC	Current thresholds protections
Iw1 Warning	Current thresholds protections
Contact wear	Contact wear measurement
Harmonic Distortion	Harmonic distortion measurement
Power factor	Measures a power factor below the set threshold
Phase cycle	Cyclical sequence measurement
Frequency	Frequency measurement
Harmonic V Over Th	Harmonics measurement
Harmonic I Over Th	Harmonics measurement
THD I Over Th	Harmonics measurement
THD V Over Th	Harmonics measurement

Programming errors If during the programming of the parameters an attempt is made to violate certain limitations, the release blocks the saving procedure and signals the error:

Type of error	Error description
L Th $\geq$ S Th	Errors in the adjustment of the protection thresholds
S Th $\geq$ I Th	Errors in the adjustment of the protection thresholds
L Th $\geq$ S2 Th	Errors in the adjustment of the protection thresholds
S2 Th $\geq$ I Th	Errors in the adjustment of the protection thresholds
L Th $\geq$ D Th	Errors in the adjustment of the protection thresholds
D Th $\geq$ I Th	Errors in the adjustment of the protection thresholds
D Zone Sel = On while S / S2 / G / Rc = On	Activation of Zone Selectivity with protections S, S2, G or Rc enabled
S(V) t20 and S(V) I20 error	Incorrect configuration of the protection S(V)
RQ Q24 > Q25	Incorrect configuration of the protection RQ
SYNCHRO parameters error	Error in the parameters of the Ekip Synchrocheck module
ROCOF t28 error	Incorrect configuration of the protection ROCOF
And the MCR enabled together	Simultaneous enabling of the protections I and MCR
High priority alarm	Protection and delay alarms present during programming
Rc toroid error	Attempt to activate the Rc toroid without Ekip Measuring or Rating Plug of the Rc type
Internal neutral config error	It tries to set the internal neutral setting with a value that is not allowed
Change nr datalogger with dlogger not stopped	Change datalogger parameters with datalogger active
Error Reverse pole order	Change in the parameter "pole order" with a Half size circuit-breaker.
Programming Session Timeout	Timeout for saving data

21 - Operating features

Electrical characteristics

Currents and operating voltages

The correct operation of Ekip Touch releases is guaranteed with primary currents with clearly defined characteristics.

In addition, Ekip Touch releases can be powered directly by the internal current sensors or, in the presence of the Ekip Measuring Pro module, by the installation voltage.

The following are the specifications:

Parameter	Operating limits
Minimum three-phase turn-on current	> 80 A (E1.2-E2.2-E4.2) > 160 A (E6.2)
Rated Frequency	50 / 60 Hz $\pm$ 10 %
Peak Factor	Conforming to standard IEC 60947-2
Minimum three-phase turn-on voltage	> 80 V

Auxiliary power supply

All the releases of the Ekip Touch range can be connected to an external auxiliary power supply source, useful for activating certain functions such as communication on a Local Bus, recording of manual operations, certain measurements and the datalogger.

The auxiliary power can be supplied by the modules of the Ekip Supply range (for further functional details, see page 58), or with direct connection to a terminal box.

The direct connection must be made guaranteeing the operating following conditions:

Parameter	Operating limits
Voltage	24 V DC galvanically isolated
Tolerance	$\pm$ 10 %
Maximum ripple	$\pm$ 5 %
Maximum inrush current @ 24 V	10 A per 5 ms
Maximum rated power @ 24 V	4 W
Connection cable	Insulated with earth cable (advised Belden 3105A/B)



IMPORTANT:

- **With a direct connection, the power must be galvanically isolated and must ensure the insulation characteristics retrieved from IEC 60950 (UL 1950) or equivalent standards that ensure a common mode current, or leakage current, (see IEC 478/1, CEI 22/3) no greater than 3.5 mA.**
- **The Ekip Supply modules do not require galvanic insulation.**

Functional specifications

The Ekip Touch release, in addition to the protection and measurement menus, also allows various operating and configuration parameters to be set on the screen:

- **Line frequency**, to set the installation frequency.
- **Remote / Local Mode**, to set the operating mode and enable editing of parameters and sending commands remotely.
- **Local Bus**, to enable communication with the terminal modules and communication on the Local Bus.
- **Harmonics**, to enable the calculation of harmonic currents and voltages.
- **Power controller**, to enable the function Ekip Power Controller.
- **Programmable functions**, to combine modification of parameters and configurations with Ekip Signalling modules.
- **System**, to modify system data such as date, time, language and password.
- **Maintenance**, to optimize maintenance operations on the circuit-breaker.
- **Programmable states**, to increase and extend the signalling functionalities.
- **Filters**, to increase filter performance for some measurements.

22 - Default parameters

Ekip TOUCH default parameters The Ekip Touch releases are supplied with the following default parameters:

Protection/Parameter	Value ⁽¹⁾
L	1 In; 144 s; Prealarm: 90 %
S ⁽²⁾	Off; 2 In; 50 ms; Curve: t = k
I	4 In
G ⁽²⁾	Off; 0.25 In; 400 ms; Curve: t = k
2I	Off; 1,5 In
MCR	Off; 6 In; 40 ms
IU	Off; 50%; 5 s
OT	Off
Current thresholds	Off; 1: 50 %; 2: 75 %
Current thresholds	Off; Iw1: 3 In; Iw2: 3 In
Harmonic Distortion	On
Gext ^{(2) (3)}	Off; 0.2 In; 400 ms; Curve: t = k
Rc ⁽³⁾	Off; 3 A; 60 ms
Frequency	50 Hz (IEC) / 60 Hz (UL)
Neutral	Off (for circuit breakers three-pole) 50 % (for four-pole circuit-breaker)
Datalogger	Off
Power Controller	See note ⁽⁴⁾
Hardware Trip	Disabled
Measurement interval	5 minutes
Local Bus	Disabled
Alive LED	Disabled
Language	English
Password	00001
Mode	Local
Modbus RTU par	Address: 247; baudrate: 19.2 Kb
Profibus	Address: 2
DeviceNet	MAC ID: 63; baudrate: 125 Kb
Modbus TCP/IP	Static IP: 0.0.0.0

⁽¹⁾ Thermal memory, startup, Zone Selectivity set to Off.

⁽²⁾ Protection S available with LSI and LSiG versions of the release. Protection G available with LSiG version.

⁽³⁾ Protections available in presence of the respective toroid (SGR or Rc).

⁽⁴⁾ Protection activated on request when purchasing the release.

The protections activated by the presence of the Ekip Measuring Pro module, have the following default parameters:

Protection/Parameter	Value
VU	Off; 50%; 5 s
UV	Off; 0.9 Un; 5 s
OV	Off; 1.05 Un; 5 s
UF	Off; 0.9 fn; 3 s
OF	Off; 1.1 fn; 3 s
RP	Off; 0.1 Sn; 10 s
Phase Sequence	1-2-3
Cos φ	Off; 0.95

Continued on the next page

The Ekip Hi-Touch and Ekip G Hi-Touch releases have additional protections, provided with the following default parameters:

Protection/Parameter	Value ⁽¹⁾
S2	Off; 2 In; 50 ms; Curve: t = k
D	Off; 2 In; 200 ms
UV2	Off; 0.9 Un; 5 s
OV2	Off; 1.05 Un; 5 s
UF2	Off; 0.9 fn; 3 s
OF2	Off; 1.1 fn; 3 s
Network Analyzer	Off
Harmonic calculation	Off
Set A-B	Off

The Ekip G Touch and Ekip G Hi-Touch releases have additional protections, provided with the following default parameters:

Protection/Parameter	Value ⁽¹⁾
S(V)	Off; type = step; 1 In; UI = 1 Un; Ks = 0.6; t20 = 1 s
RV	Off; 0.15 Un; 15 s
RQ	Off; Kq = -2; Q24 = 0,1 An
OQ	Off; 1 Sn; 1 s
OP	Off; 1 Sn; 1 s
UP	Off; 1 Sn; 1 s

The Ekip G Hi-Touch release has additional protections, provided with the following default parameters:

Protection/Parameter	Value
Rocof	Off; 0,6 Hz; 500 ms
S2(V)	Off; type = step; 1 In; UI2 = 1 Un; Ks2 = 0.6; t21 = 1 s
RQ2	Off; Kq = -2; Kq2 = 2; Q24 = 0,1 An; Q25 = 0,11 An; Vmin = 0,5 Un; 100 s

23 - Ekip Power Controller

Presentation The Ekip Power Controller function allows you to manage the load of an installation according to the power input, in order to contain the consumptions and to optimize the energy efficiency.

The various parameters related to this function can be configured using a dedicated tool in the Ekip Connect software.

All the detailed information on the Power Controller function are contained in the manual [1SDH001330R0002](#) and in the White Paper [1SDC007410G0901](#).

Releases The function Power Controller can be activated for all the releases of the Ekip TOUCH range, and allows you to do the following via display:

- Modify some of the parameters of the function.
- Display some measurements of the function.
- View the status of the loads.



NOTE: the Power Controller function is available if requested when ordering the CB or the protection Release.

Parameters on the display The parameters available following the path *Main page - Menus page - Settings - Power Controller* are:

Parameter	Description
Enable	It allows you to activate/deactivate the Power Controller function.
Load Operating Mode	It allows you to set the configuration of each of the 15 programmable loads Automatic or Manual configurations available.
Power limits	It allows you to set the four power limits (from 0 to 10000 kW, step 10kW).



NOTE: for the characterization of all the parameters of the function you are advised to configure the parameters via Ekip Connect first, and only subsequently to operate on the release in order to enable or to modify load and power limits.

Measurements on the display The measurements are available by following the path *Main page - Measurements page - Page Power Controller*, they are:

Measurement	Description
Ea	Expected energy
DT	Time elapsed inside of the evaluation window
LOADS	Number of loads monitored
LOADS Shed	Number of shed loads
Sp	Shed priority set
T	Evaluation window

Information displayed Information about the state of the loads is available by following the path *Main page - Menus page - Information - Power Controller*.

Accessories

1 - Preliminary considerations

Introduction All the circuit-breakers have a series of electrical and mechanical accessories that can be applied according to the circuit-breaker type, and a series of electronic accessories that can be applied according to the type of Ekip release with which the circuit-breaker is equipped.

Accessory combination tables The following table shows the possible combinations of the electrical and mechanical accessories E1.2:

Type of accessory	Accessory	Circuit-breakers	Disconnectors
Electrical signalling	AUX 4Q	S	R
	AUX 15Q	R	R
	Ekip AUP (*)	R	R
	Ekip RTC	R	R
	S51	S	-
	S33 M/2	R	R
Electrical control	YO-YC	R	R
	YO2	R	R
	YU	R	R
	M	R	R
	YR	R	-
Safety mechanical	KLC and PLC	R	R
	KLP and PLP (*)	R	R
	SL (*)	S	S
	DLC	R	R
	Anti-racking-in lock	S	S
	MOC	R	R
Protection mechanical	PBC	R	R
	IP54	R	R
	HTC-LTC	R	R
	PB	R	R
Interlocks	MI	R	R

S: Standard. R: on request. (*): only for withdrawable version.

Continued on the next page

The following table shows the possible combinations of the electrical and mechanical accessories E2.2-E4.2-E6.2:

Type of accessory	Accessory	Circuit-breakers	Disconnectors	Derived versions		
				CS	MV	MTP
Electrical signalling	AUX 4Q	S	R	-	-	-
	AUX 6Q	R	R	-	-	-
	AUX 15Q	R	R	-	-	-
	Ekip AUP (*)	R	R	R	R	R
	Ekip RTC	R	R	-	-	-
	S51	S	-	-	-	-
	S33 M/2	R	R	-	-	-
Electrical control	YO-YC	R	R	-	-	-
	YO2-YC2	R	R	-	-	-
	YU	R	R	-	-	-
	M	R	R	-	-	-
	YR	R	-	-	-	-
Safety mechanical	KLC and PLC	R	R	-	-	-
	KLP and PLP (*)	R	R	-	-	R
	SL (*)	S	S	-	-	S
	SLE (*)	R	R	-	-	-
	DLR (*)	R	R	-	-	R
	DLP (*)	R	R	-	-	R
	DLC	R	R	-	-	R
	Anti-racking-in lock	S	S	-	-	S
	MOC	R	R	-	-	R
Protection mechanical	PBC	R	R	-	-	R
	IP54	R	R	-	-	R
Interlocks	MI	R	R	-	-	R

S: Standard. R: on request. (*): only for withdrawable version.

The following table shows the possible combinations of the electronic accessories:

Type of accessory	Accessory	Release				
		Ekip Dip	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
Power supply	Ekip Supply	R	R	R	R	R
Connectivity	Ekip Com	-	R	R	R	R
	Ekip Com Redundant	-	R	R	R	R
	Ekip Com Actuator	R	R	R	R	R
	Ekip Link	R	R	R	R	R
	Ekip Bluetooth	R	R	R	R	R
Signal	Ekip Signalling 2K	-	R	R	R	R
	Ekip Signalling 4K	-	R	R	R	R
	Ekip Signalling 10K	-	R	R	R	R
Measurement and Protection	Ekip Measuring	-	R	-	-	-
	Ekip Measuring Pro	-	R	S	S	S
	Ekip Synchrocheck	-	R	R	R	R
	Ekip Fan	R	R	R	R	R
	Rating Plug	R	R	R	R	R
	Toroid S.G.R.	-	R	R	R	R
	Rc Toroid	-	R	R	R	R
	External neutral sensor	R	R	R	R	R
Display and Supervision	Ekip Multimeter	R	R	R	R	R
	Ekip Control Panel	R	R	R	R	R
Testing and Programming	Ekip TT	R	S	S	S	S
	Ekip T&P	R	R	R	R	R
	Ekip Programming	R	R	R	R	R

S: Standard. R: on request.



NOTE: Ekip Signalling 4K module available for E2.2-E4.2-E6.2 circuit-breakers.

Disassembly operations for circuit breakers E1.2

To dismantle the accessories, the following parts must be removed from the circuit-breaker:

- Escutcheon plate (A) and protection (F) by removing the screws (B and C).
- For circuit-breakers in four-pole versions, the lateral protection (D) by removing the screws (C and E).

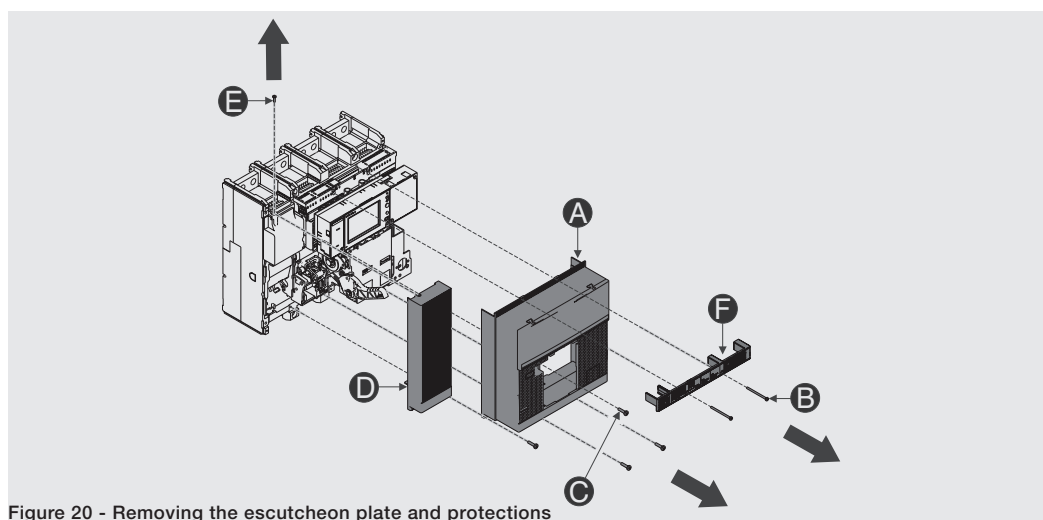


Figure 20 - Removing the escutcheon plate and protections

After reassembling the accessories, the parts previously disassembled must be reassembled as indicated:

- Escutcheon plate (A) and protection (F) by screwing the fixing screws (B and C). Lock with tightening torque 0.8 Nm - 7 lb in (B) and 1.5 Nm - 13 lb in (C).
- For circuit-breakers in four-pole versions, the lateral protection (D) by removing the screws (C and E). Tighten with tightening torque 1.5 Nm - 13 lb in.

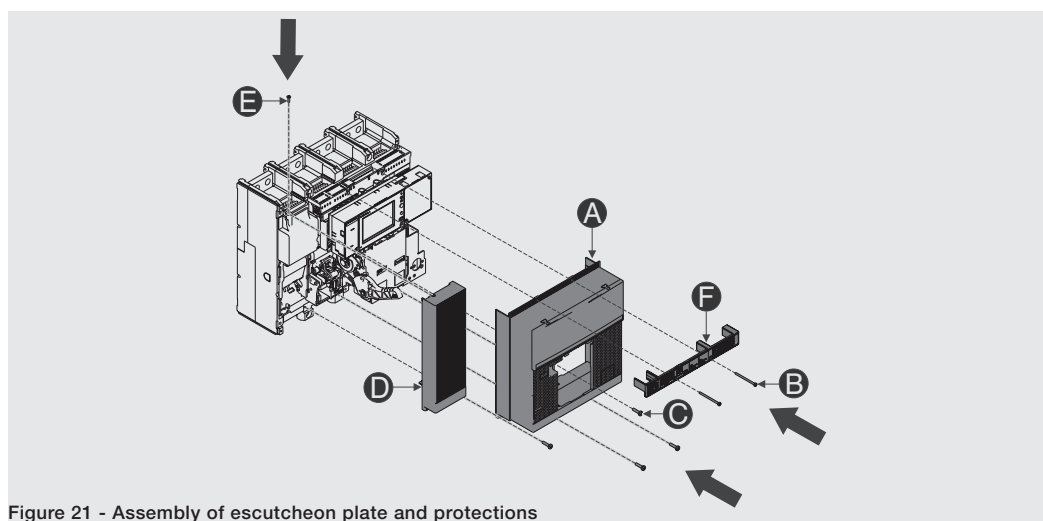


Figure 21 - Assembly of escutcheon plate and protections

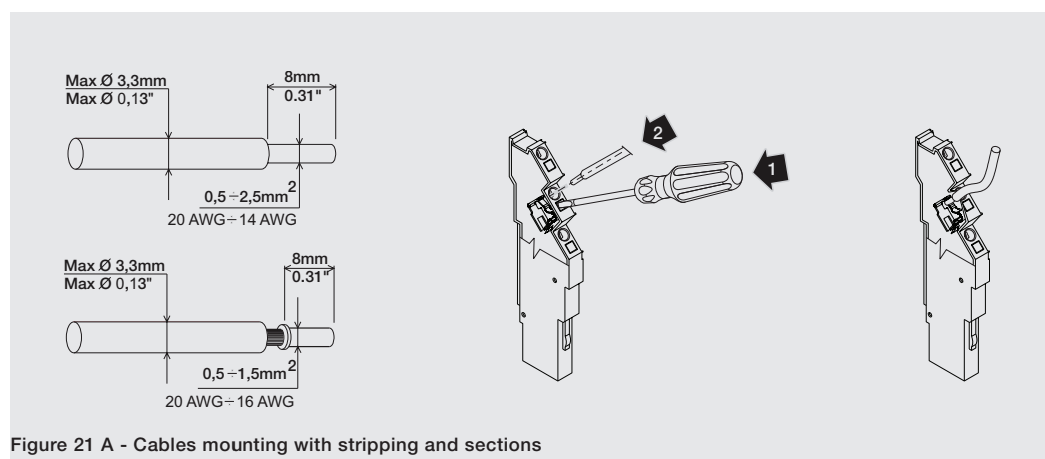


Figure 21 A - Cables mounting with stripping and sections

Disassembly operations for circuit breakers E2.2-E4.2-E6.2

To dismantle the accessories, the following parts must be removed from the circuit-breaker:

- Transparent flange (A) of the release, by turning the screws (B).
- Escutcheon plate of the circuit-breaker (C), by removing the mounting screws (D).

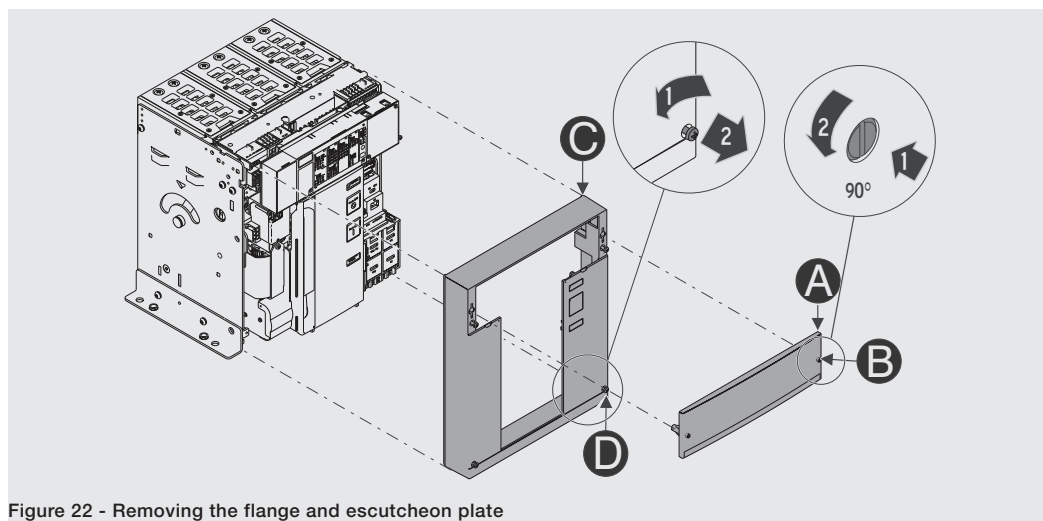


Figure 22 - Removing the flange and escutcheon plate

After reassembling the accessories, the parts previously disassembled must be reassembled as indicated:

- Escutcheon plate of the circuit-breaker (C), by screwing in the mounting screws (D). Tighten with tightening torque 1.1 Nm - 9,74 lb in.
- Transparent flange (A) of the release, by turning the screws (B).

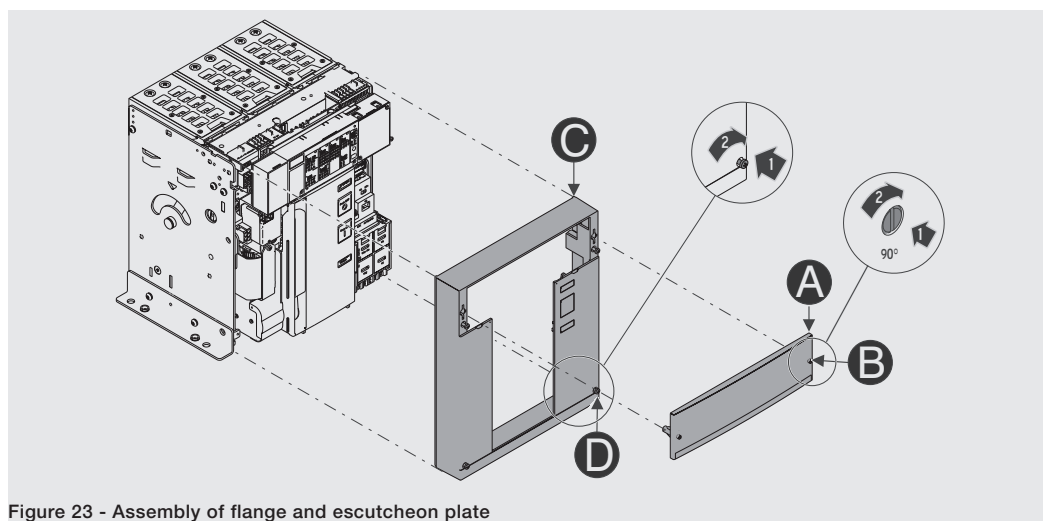


Figure 23 - Assembly of flange and escutcheon plate

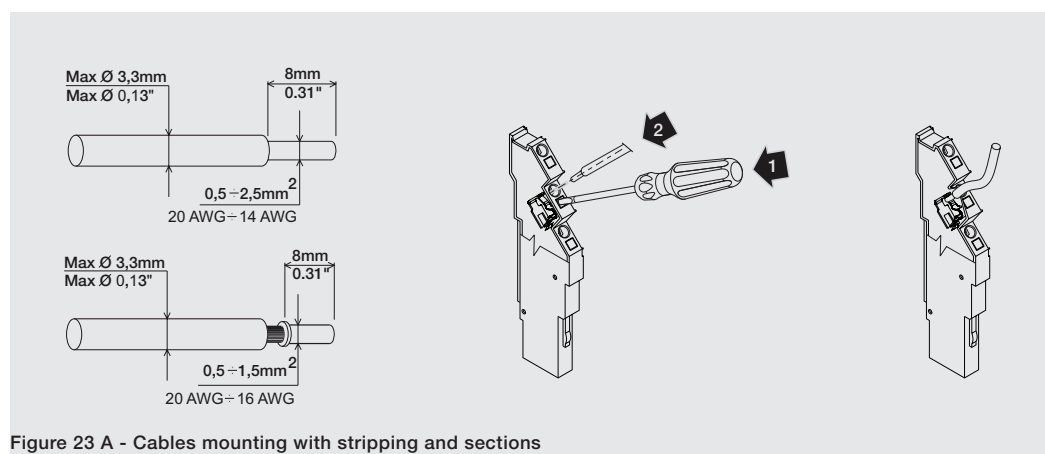


Figure 23 A - Cables mounting with stripping and sections

2 - Wiring diagrams

General wiring diagrams The following is the wiring diagram of the circuit-breaker:

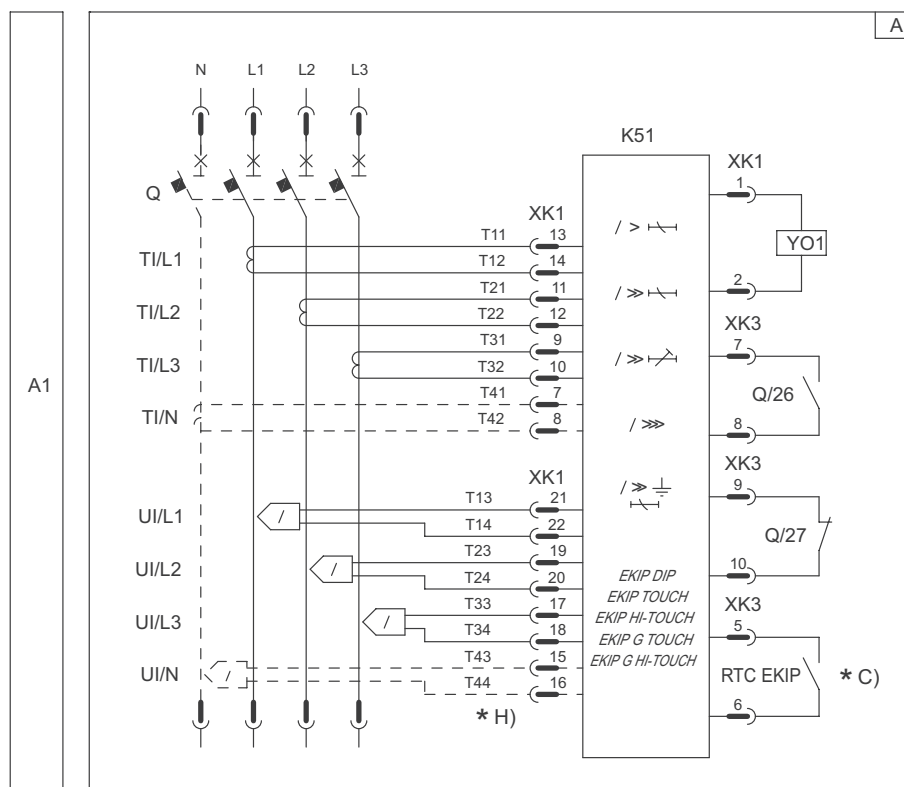


Diagram A - General diagram of the circuit-breaker



NOTE: The diagram is shown in the following conditions:

- *Circuit-breaker in withdrawable version (also valid for fixed version), open and connected.*
- *Circuits de-energized.*
- *Releases not tripped.*
- *Motor operator with springs unloaded.*

The following is the wiring diagram of the switch-disconnector:

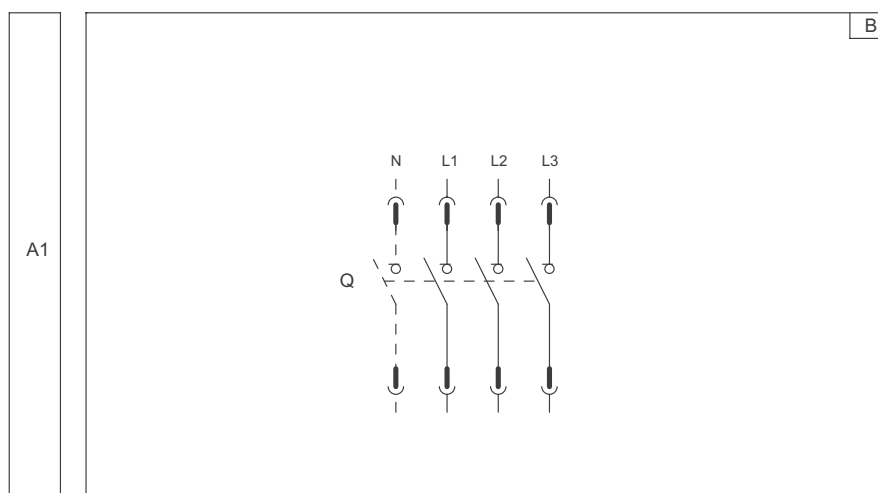


Diagram B - General diagram switch-disconnector

Continued on the next page

The wiring diagram of the circuit breaker is illustrated without any indication of the auxiliary power supply of the Ekip release. If the circuit-breaker is accessorized with the Ekip Supply module, for information see the page 58.

If the circuit-breaker is not accessorized with the Ekip Supply module, for the connection of the auxiliary power supply of the Ekip release see the direct power supply diagram shown below:

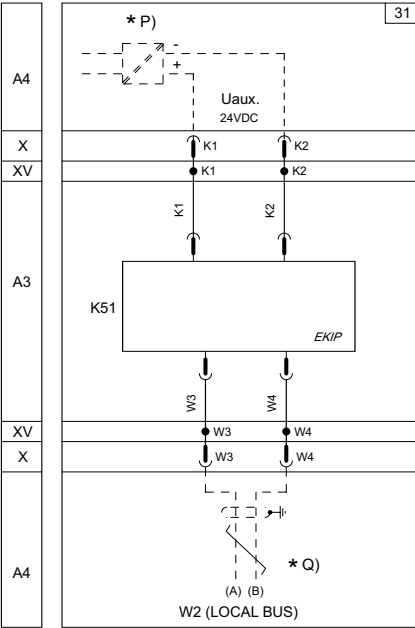


Diagram 31 - Direct auxiliary power supply

Circuit-breaker terminal box The circuit-breaker is equipped with a terminal box for the wiring of the accessories that varies according to the type of circuit-breaker:

- Terminal box for circuit-breaker in fixed version.
- Terminal box for circuit-breaker in withdrawable version.

The following is a view of the terminal box of E1.2 circuit-breakers in both fixed and withdrawable versions with the differences highlighted:

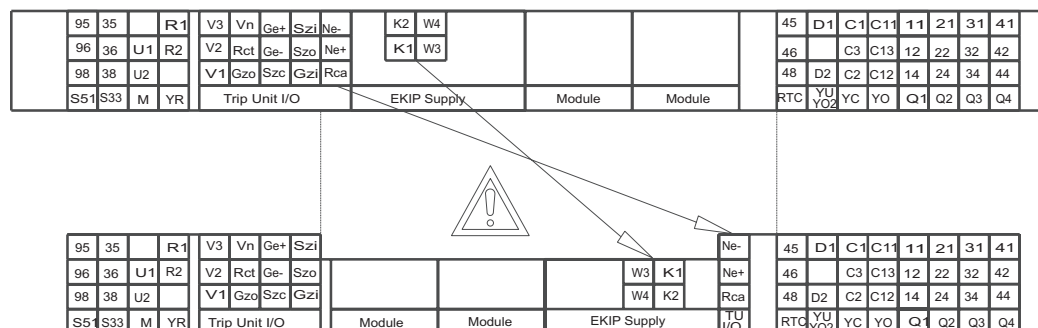


Figure 24

The following is a view of the terminal box of E2.2-E4.2-E6.2 circuit-breakers in both fixed and withdrawable versions with the differences highlighted:

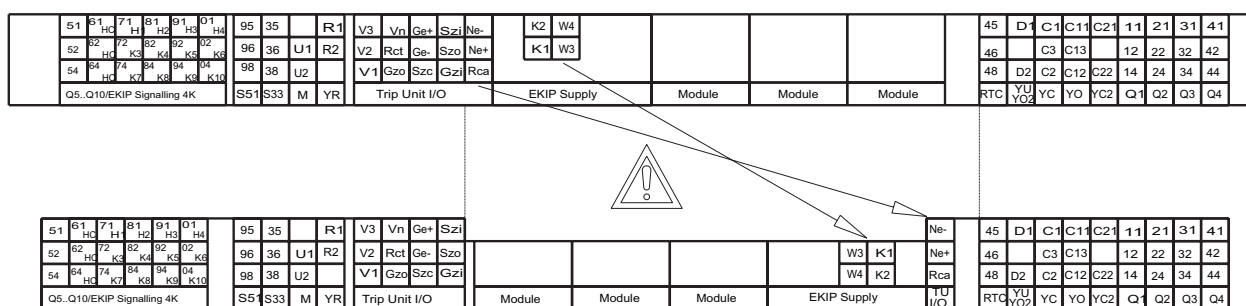


Figure 25



NOTE: for the details of the wiring diagram of each individual accessory, please refer to the specific pages that describe the accessory in question.

In addition, the terminal box of the Emax E1.2 circuit-breaker has two differences compared to the terminal box for Emax E2.2-E4.2-E6.2 circuit-breakers:

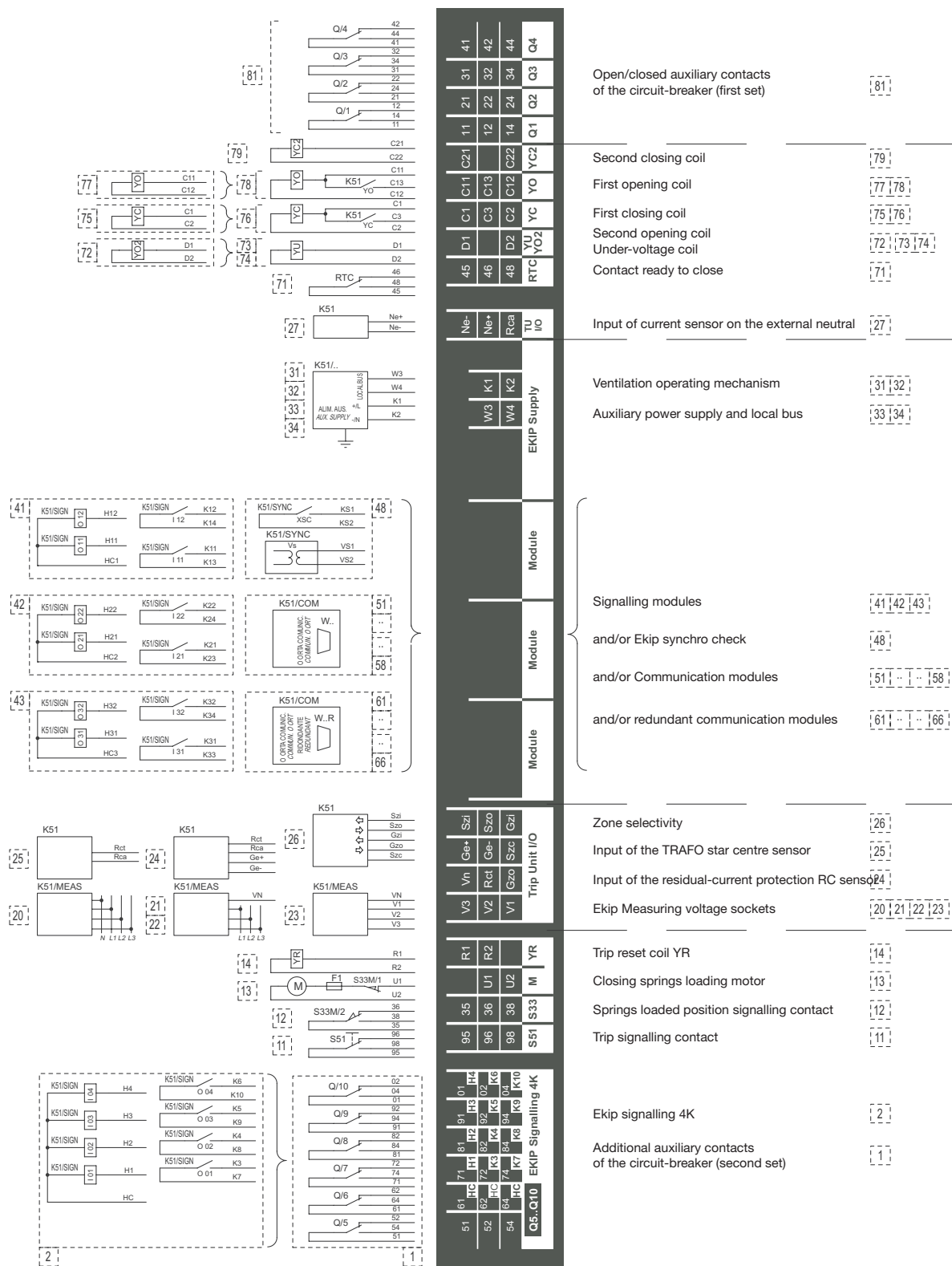
- Module compartments: Emax E1.2 can house three modules (one Supply + two Modules), compared with four for E2.2-E4.2-E6.2 (one Supply + three Modules).
- Modulo Ekip Signalling 4K: Emax E1.2 fails to present the connections for Q5...Q10 / Ekip Signalling 4K.

For convenience, in the following chapters the version of the E2.2-E4.2-E6.2 circuit breakers is always provided.

Continued on the next page

A the representation of the terminal box for a circuit-breaker in fixed version is provided below:

Figure number of the diagram



Continued on the next page

Symbol	Description
*	See the note indicated by the letter
A1	Applications applied to the moving part of the circuit-breaker
A3	Applications applied to the fixed part of the circuit-breaker
A4	Indicative equipment and connections for operating and signalling, external to the circuit-breaker
BUS1	Serial interface with the external bus
D	Electronic time-delay device of the under-voltage coil YU, external to the circuit-breaker
F1	Time-delayed trip fuse
GZi(DBi)	Input for Zone Selectivity for protection G or input in "inverse" direction for protection D
GZo(DBo)	Output for Zone Selectivity for protection G or output in "inverse" direction for protection D
I O1...32	Programmable digital inputs of the Ekip protection release
K51	Overcurrent protection solid-state release
K51 / COM	Communication module
K51 / FAN	Fan power supply module
K51 / MEAS	Measurement module
K51 / SIGN	Signalling module
K51 / SUPPLY	Optional auxiliary power supply module (24-48Vdc and 110-220Vac / dc)
K51 / SYNC	Synchronization module
K51 / YC	Closing command via Ekip protection release
K51 / YO	Opening command via Ekip protection release
M	Motor for loading the closing springs
M2	Fan motor
O 01...32	Programmable signalling contacts of the Ekip protection release
O SC	Contact of the Ekip protection release for synchronism control
Q	Circuit breaker
Q / 1...Q / 27	Auxiliary contacts of the circuit-breaker
Rc	Rc Toroid
RT1...RT3	Temperature sensors
RTC EKIP	Auxiliary contact ready to close the circuit-breaker
RTC	Contact for signalling circuit-breaker ready to close
S33M / 1...2	Spring loading motor limit contacts
S43	Switch for setting remote/local control
S51	Opening signalling contact
S75E / 1...4	Contacts for signalling circuit-breaker in disconnected position (only with withdrawable circuit-breakers)
S75I / 1...5	Contacts for signalling circuit-breaker in connected position (only with withdrawable circuit-breakers)
S75T / 1...2	Contacts for signalling circuit-breaker in test position (only with withdrawable circuit-breakers)
SC	Push-button or contact for closing the circuit-breaker
SO	Push-button or contact for immediate opening of the circuit-breaker
SO1	Push-button or contact for opening the circuit-breaker with time-delayed trip

The following is a key to the symbols used in the wiring diagrams:

Continued on the next page

Symbol	Description
SR	Push-button or contact for electrical reset of the break contact S51
SZi(DFi)	Input for Zone Selectivity for protection S or input in “inverse” direction for protection S
SZo(DFo)	Output for Zone Selectivity for protection S or output in “direct” direction for protection D
TI / L1	Current transformer, phase L1
TI / L2	Current transformer, phase L2
TI / L3	Current transformer, phase L3
TI / N	Current transformer on the neutral
TU1...TU2	Isolation voltage transformer (external to the circuit-breaker)
Uaux	Auxiliary power supply voltage
UI / L1	Current sensor, phase L1
UI / L2	Current sensor, phase L2
UI / L3	Current sensor, phase L3
UI / N	Current sensor on the neutral
UI / O	Toroid S.G.R.
W2	Serial interface with the internal bus (Local Bus)
W9...W13	RJ45 connector for communication modules
W9R...W11R	RJ45 connector for redundant communication modules
X	Delivery connector for the auxiliary circuits of the circuit-breaker in withdrawable version
XB1...XB7	Connectors for the circuit-breaker applications
XF	Delivery terminal box for the position contacts of the circuit-breaker in withdrawable version
XF1...XF2	Contact of the Ekip protection release for activation of the fans
XK1...XK3	Connectors for the auxiliary circuits of the Ekip protection release
XK7	Connector for the auxiliary circuits of the communication modules
XV	Delivery terminal box for the auxiliary circuits of the circuit-breaker in fixed version
YC	Closing coil
YC2 ⁽¹⁾	Second closing coil
YO	Opening coil
YO1	Opening coil for overcurrent
YO2	Second opening coil
YR	Coil for electrical reset of the break contact S51
YU	Under-voltage coil

⁽¹⁾ Only for E2.2-E4.2-E6.2.

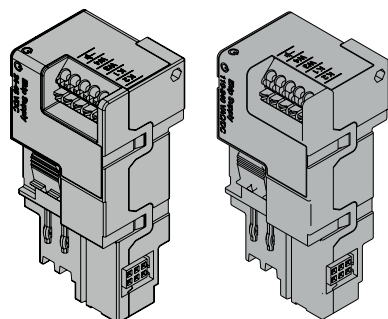
Continued on the next page

Note	Description
A)	The auxiliary power supply for the Ekip release is obligatory.
C)	Always supplied with the Ekip Com module.
D)	Always supplied with the motor for loading the closing springs (diagram 13)
E)	Isolation transformer, mandatory in the case of external outlet sockets. External outlet sockets, mandatory for systems with rated voltage higher than 690 V.
F)	Connections between toroid Rc and the poles of connector X (or XV) of the circuit-breaker must be made with screened two-pole cable with paired braided conductors (Belden 9696 paired type or equivalent), no more than 10 m in length. The screen must be earthed on the circuit-breaker side.
G)	With all the electronic protection releases equipped with a display interface with LSIG protections, protection against earth faults (Gext) is available through a current sensor positioned on the star centre of the MV/LV transformer. The connection between terminals 1 and 2 of the UI/O current transformer and the Ge+ and Ge- poles of connector X (or XV) must be implemented with two-pole shielded stranded cable (Belden 9841 type or equivalent) no more than 15 m in length.
H)	The connection must be implemented with the 2m supplied cable. With three-pole circuit-breakers Ne+ and Ne- poles of connector X (or XV) must be short-circuited if the external neutral is not present.
I)	Mandatory if any Ekip module is present.
J) ⁽¹⁾	Only for withdrawable circuit breakers as an alternative to diagrams 31-32-33.
K) ⁽¹⁾	Only for withdrawable circuit breakers as an alternative to the diagrams 31-32-33.
L)	In the presence of diagram 32, up to two/three applications among diagrams 41...58 can be supplied, taken only once. In addition it is possible to duplicate an Ekip Com module that may be selected choosing between diagrams 61...66.
M) ⁽¹⁾	In the presence of diagram 33, up to three applications can be provided between diagrams 41... 58 taken only once. It is possible to duplicate the selected Ekip Com module choosing between diagrams 61...66.
N) ⁽¹⁾	In the presence of diagram 34, only one application among diagrams 41... 58 can be provided.
O)	In the presence of multiple Ekip Com modules with circuit-breakers in withdrawable version, the contact S75I/5 must be connected only once on a single module.
P)	The auxiliary voltage Uaux allows all the functions of the Ekip electronic protection releases to be activated "Galvanically separated converters" conforming to standard IEC 60950 (UL 1950) or the equivalent standards, able to guarantee current in the common mode or leakage current (see IEC 478/1, CEI 22/3) that is no more than 3.5 mA (IEC 60364-41 and CEI 64-8) must be used since the Uaux must be isolated from the earth.
Q)	The maximum length of the cable for the Local Bus is 15 m.

⁽¹⁾ Only for E2.2-E4.2-E6.2.

Electronic accessories

1 - Ekip Supply modules



Description The Ekip Supply is a power supply accessory module.

There are two types, depending on the input voltages to be supplied:

- Ekip Supply 24-48Vdc.
- Ekip Supply 110-240Vac/dc.

Compatibility The modules can be installed in the presence of releases of Ekip Dip, Ekip Touch, Ekip Hi-Touch, Ekip G Touch, and Ekip G Hi-Touch releases.

Electrical characteristics The following table lists the electrical characteristics:

Module	Power supply voltages	Frequency	Power input
Ekip Supply 24-48Vdc.	21.5...53 V DC	-	Maximum 10W
Ekip Supply 110-240Vac/dc	105...265 V AC/DC	45...66 Hz	Maximum 10 VA / W

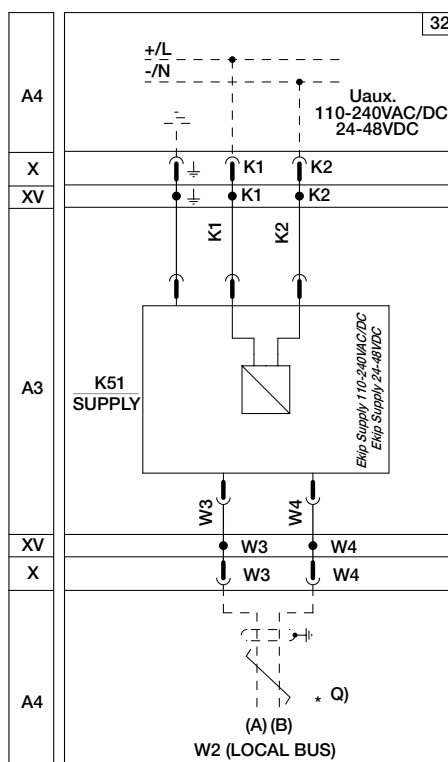
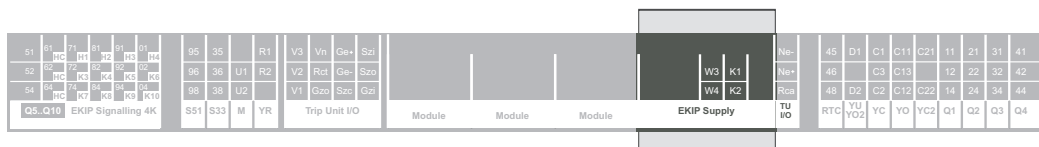
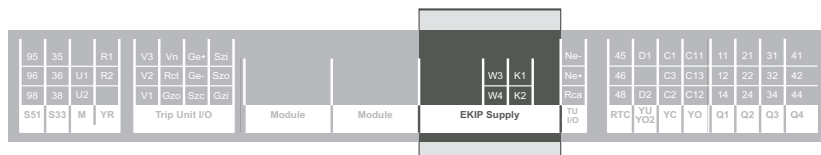
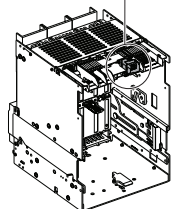
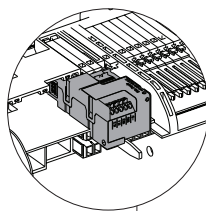
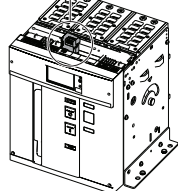
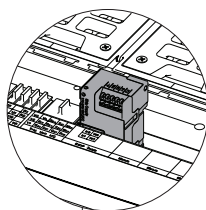
Connections

The modules must be mounted on the terminal box of the circuit-breaker or of the fixed part of the withdrawable circuit-breaker, in the first free slot.

Information on the assembly is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet **1SDH001000R0511**.

An example with an E2.2 circuit-breaker in fixed and withdrawable versions is provided to the side.

The following is a view of the terminal box of E1.2 and E2.2-E4.2-E6.2 circuit-breakers, and the wiring diagram:



* A), * I)

Diagrams 32

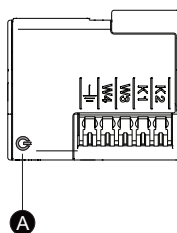
For external wiring, AWG 22-16 cables with a maximum external diameter of 1.4 mm must be used.

Further information is available on page 55, or on the site <http://www.abb.com/abblibrary/DownloadCenter/>, where the wiring diagram is available **1SDM000091R0001**.

Signallings

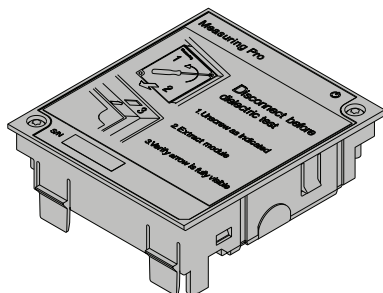
The following table illustrates the possible signals, and their meaning:

Pos.	Description
A	Power LED, green. The possible states are: • Off: power supply absent. • On fixed: power supply present.



2 - Ekip Measuring modules

Description



The Ekip Measuring is an accessory module for measurement of voltage, power and energy.

There are two possible types:

- Ekip Measuring, equipped only with the measuring function.
- Ekip Measuring Pro, with a measuring function, possibility of powering the release, and activation of the Measuring protections.

With the Ekip Measuring Pro module, the power supply of the release is guaranteed, if at least one phase-to-phase voltage is greater than or equal to 80 V AC.

Compatibility and power supply

The Ekip Measuring and the Ekip Measuring Pro module can be installed with an Ekip Touch release, the former if you only wish to implement the measurement function and the latter if you also wish to implemented the power supply function and activate the Measuring protections With Ekip Hi-Touch, G Touch, and G Hi-Touch releases, Ekip Measuring Pro is provided as standard.

The Ekip Measuring module requires the release to be powered with an auxiliary voltage (for example: supplied by an Ekip Supply module). The auxiliary power supply is not necessary with Ekip Measuring Pro.

Electrical characteristics

The following table lists the electrical characteristics of the modules:

Component	Characteristics
Phase-to-phase input voltage	0...760 V AC
Frequency in input	30...80 Hz

Isolation transformer

If the input phase-to-phase voltage supplied to the modules is greater than nominal 690 V AC (maximum 760 V AC), external socket-outlets must be used.

In the presence of external socket-outlets, the use of an isolation transformer is mandatory. The following table lists the specifications that the transformer must have:

Characteristics	Description
Mechanical	• Mounting: EN 50022 DIN43880 guide. • Material: self-extinguishing thermoplastic. • Protection class: IP30. • Electrostatic protection: with screen to be connected to earth.
Electrical	• Precision class: ≤ 0.5. • Performance: ≥ 10 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...66 Hz.

Measurements

The following table lists the measurement precision for the modules:

Quantity	Interval	Accuracy
Phase-to-phase voltage ⁽¹⁾	100...1150 V AC	± 0.5 % @ 45...66 Hz
Frequency ⁽²⁾	30...80 Hz	± 0.1 % ⁽³⁾

⁽¹⁾ With phase-to-phase voltage V greater than nominal 690 AC (maximum 760 V AC), in the presence of external socket-outlets and an isolation transformer.

⁽²⁾ The measurement of the frequency is started up with a measured phase-to-phase voltage ≥ 36 V AC, and is stopped with a measured phase-to-phase voltage ≤ 32 V AC.

⁽³⁾ In the absence of harmonic distortion.

Connections

The modules must be mounted directly on the Mainboard, to the right of the release. In parallel they are connected to a connector, to which the phase and neutral voltages arrive on the internal contacts of the circuit-breaker, or on the external sockets.

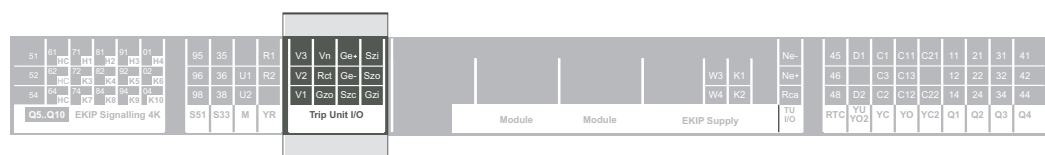
Information on the assembly is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet [1SDH001000R0505](#).



IMPORTANT: in the case of dielectric tests, you need to disconnect the modules as illustrated in the assembly diagram, and to disconnect the external socket-outlets from the terminal box. It is not necessary to remove the modules.

An example with an E2.2 circuit-breaker in fixed and withdrawable versions is provided to the side.

The following is a view of the terminal box of E1.2 and E2.2-E4.2-E6.2 circuit-breakers, and the wiring diagram:



Access from the display



With the release energized, the presence of the modules activates the following on the display:

- Additional graphical pages, that display measurements.
- Additional menus.

The additional graphical pages are:

- A summary of the measurements in progress (maximum phase current, maximum phase-to-phase voltage, power factor, and the active, reactive and apparent power), accessible from the page **Histograms** (see page 13).
- The indicators of the maximum phase-to-phase voltage, and of the active, reactive and apparent power, accessible by selecting the pages **Measuring instruments** (see page 14).
- The measurements of the phase and phase-to-phase voltages, and of the active, reactive and apparent power, as well as the energy meters, accessible by selecting the pages **Measurements** (see page 15).
- The wave forms and the harmonics of the phase-to-phase voltages, accessible from the menu **Measurements**.

The history of the minimum and maximum phase-to-phase voltages and maximum and mean powers, accessible from the menu **Measurements**.

The following table illustrates the path from the display to access the configuration parameters of the protections activated by the Ekip Measuring Pro module:

Advanced 	...	
	IU Protection	
	RC Protection ⁽¹⁾	
	Protection UV	
	Protection UV2	
	Protection OV	
	Protection OV2	
	Protection RV	
	Protection VU	
	Protection UF	
	Protection UF2	
	Protection OF	
	Protection OF2	
	Protection ROCOF	
	Protection RP	
	Protection RQ	
	Protection OP	
	Protection OQ	
	Protection UP	
	Syncrocheck	
	Signallings	Phase Sequence
		Cos φ
	Current thresholds	
	...	

⁽¹⁾ Protection available with Rating Plug RC and Ekip Measuring Pro, and toroid RC (see the menu Settings, Circuit-breaker, Earth protection), and alternative to the Gext protection (see the Protections menu).

Continued on the next page

The following table illustrates the path from the display for viewing the measurements and commands activated by the modules and accessible from the menus:

Measure- ments 	History	...	
		Events	
		Measurements	...
			I Max
			U Min
			U Max
			P Max
			P Mean
			Q Max
			Q Mean
			S Max
			S Mean
			Reset Measurements
	Measurement interval		
	Power factor		
	Frequency		
	Energy	Energy meters	
		Reset Meters	
		RESET Energy	
	Peak Factor		
	Harmonic distortion		
	Ekip Synchrocheck		
	Network Analyzer	...	
		Counters	
		Wave forms	...
			Ne
			Voltage 12
			Voltage 23
			Voltage 31
	Maintenance		

Continued on the next page

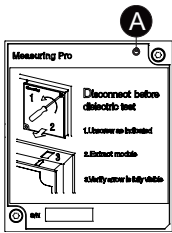
The following table illustrates the path for accessing the configuration parameters of the modules from the display:

Settings 	...	
	Network frequency	
	Modules	Local/Remote
		Local Bus
		...
		Ekip Measuring
		Voltage Transformer
		Rated voltage
		Primary voltage
		Secondary voltage
		Flow of power
		Neutral connection
		...
		Functions
	Power Controller	
	...	

The following table illustrates the path from the display for displaying information on the modules:

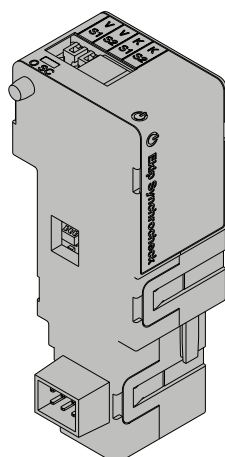
About 	Protection Unit	
	Circuit breaker	
	Modules	...
		Ekip Measuring
		...
	Power Controller	

Signallings The following table illustrates the possible signals, and their meaning:



Pos.	Description
A	Power status LED, green; present only on the Ekip Measuring Pro. The possible states are: • Off: the power supplied by the Ekip Measuring Pro to the release is absent. • On fixed: the power supplied by the Ekip Measuring Pro to the release is present.

3 - Ekip Synchrocheck module



Description The Ekip Synchrocheck is an accessory module that, combined with the Ekip Measuring or Ekip Measuring Pro module serves to recognize whether the synchronism conditions exist between the internal and external contacts of the circuit-breaker, necessary for closing the circuit-breaker.



IMPORTANT: only one Ekip Synchrocheck can be installed on each circuit-breaker.

Compatibility and power supply The module can be installed in the presence of Ekip Touch, Hi-Touch, G Touch, and G Hi-Touch releases, and requires the presence of an Ekip Supply module in the first slot of the circuit-breaker terminal box.

Electrical characteristics The following table lists the electrical characteristics of the module:

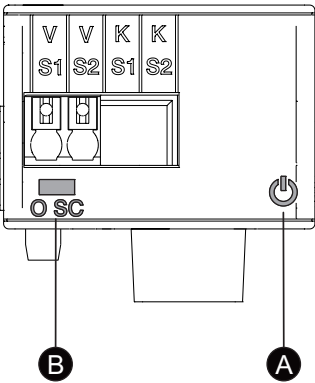
Component	Characteristics
Input voltage	0...120 V AC nominal
Frequency in input	30...80 Hz
Output contact	• Maximum switching power ⁽¹⁾: 1250 VA. • Maximum switching voltage ⁽¹⁾: 150 V DC / 250 V AC. • Breaking power ⁽¹⁾: 2 A @ 30 V DC, 0.8 A @ 50 V DC, 0.2 A @ 150 V DC, 4A @ 250 V AC. • Dielectric strength between open contacts: 1000 V AC (1 minute @ 50 Hz). • Dielectric strength between each contact and coil: 1000 V AC (1 minute @ 50 Hz).

⁽¹⁾ Data related to a resistive load.

Isolation transformer Between the external contacts of the circuit-breaker and the inputs of the module, an isolation transformer must always be installed that has the characteristics listed in the following table:

Characteristics	Description
Mechanical	• Mounting: EN 50022 DIN43880 guide. • Material: self-extinguishing thermoplastic. • Protection class: IP30. • Electrostatic protection: with screen to be connected to earth.
Electrical	• Precision class: ≤ 0.5. • Performance: ≥ 5 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...66 Hz.

Signallings The following table illustrates the possible signals, and their meaning:



Pos.	Description
A	Power LED, green. The possible states are: • Off: power supply absent. • On fixed: power supply and communication with the release present (with a release with the Alive LED option disabled). • On, with one flash per second (synchronized with that of the green LED on the release): power supply and communication with release present (with a release with the Alive LED option enabled). • On, with two quick flashes per second (not synchronized with those of the green LED on the release): power supply present, and communication with release absent (for example: because Local Bus disabled).
B	LED O SC, green. The possible states are: • Off: contact K open (with contact normally open, synchronization KO; with contact normally closed, synchronization OK) ⁽¹⁾. • On fixed: contact K closed (with contact normally open, synchronization OK; with contact normally closed, synchronization KO) ⁽¹⁾.

⁽¹⁾ For the configuration of the contact, see page 68.

Access from the display

With the module energized, and the Local Bus enabled, the presence of the module on the terminal box activates additional menus on the display:

To enable the Local Bus, you need to select "On" in the menu *Settings - Modules - Local Bus*.

The configuration parameters of the synchronism function are different depending on whether the dead busbar option is enabled or not.

The following table illustrates the path from the display to access the configuration parameters of the function, and the parameters available with dead busbar disabled:

Advanced	...	
	Protection UP	
	Syncrocheck	Activate
		Delta U Threshold
		U Live Threshold
		Delta Frequency
		Delta Phase
		Stability time U
		Dead busbar option (Off)
	Signallings	
	...	

The following table illustrates the path from the display to access the configuration parameters of the function, and the parameters available with dead busbar enabled:

Advanced	...	
	Protection UP	
	Syncrocheck	Activate
		U Dead Threshold
		U Live Threshold
		Stability time U
		Dead busbar option (On)
		Config. dead busbar
	Signallings	
	...	

Continued on the next page



NOTE: the module can also be configured the Ekip Connect software (see the chapter "14 - Other accessories", and the paragraph "Ekip Connect software" on page 102).

The following table illustrates the path from the display for viewing the measurements related to the synchronism function:

Measurements	...
	Harmonic distortion
	Ekip Synchrocheck
	Network Analyzer
	...

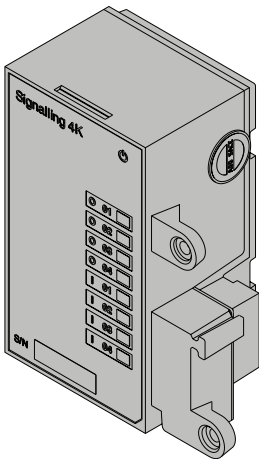
The following table illustrates the path for accessing the configuration parameters of the module from the display:

Settings	...		
	Network frequency		
	Modules	Local/Remote	
		Local Bus	
		...	
		Ekip Synchrocheck	Primary voltage
			Secondary voltage
			Network voltage Ref
			Contacts NO
		...	
		Functions	
	Power Controller		
	...		

The following table illustrates the path from the display to view information on the module and synchronism status:

About	Protection Unit		
	Circuit breaker		
	Modules	...	
		Ekip Synchrocheck	
	Power Controller	...	

4 - Ekip Signalling 4K module



Description The Ekip Signalling 4K is a signalling accessory module.

The module has:

- Four contacts for output signals.
- Four digital inputs.
- A power status LED, and eight signalling LEDs (one LED for every output/input).



NOTE:

- *The module is only available for E2.2-E4.2-E6.2 circuit breakers.*
- *It is possible to order the module only if the circuit-breaker is not equipped with AUX 6Q contacts.*

Compatibility and power supply The module can be installed in the presence of Ekip Touch, Hi-Touch, G Touch, and G Hi-Touch releases, and requires the presence of an Ekip Supply module in the first slot of the circuit-breaker terminal box.

Electrical characteristics The following table lists the electrical characteristics of the outputs of the module:

Component	Characteristics
Output contacts	• Maximum switching power⁽¹⁾: 1250 VA. • Maximum switching voltage⁽¹⁾: 150 V DC / 250 V AC. • Breaking power⁽¹⁾: 2 A @ 30 V DC, 0.8 A @ 50 V DC, 0.2 A @ 150 V DC, 4A @ 250 V AC. • Dielectric strength between open contacts: 1000 V AC (1 minute @ 50 Hz). • Dielectric strength between each contact and coil: 1000 V AC (1 minute @ 50 Hz).

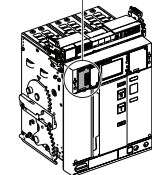
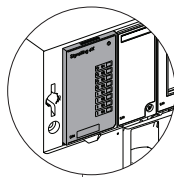
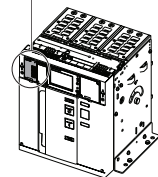
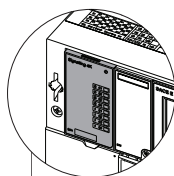
⁽¹⁾ Data relating to a resistive load.

Connections The module must be mounted directly on the Mainboard, to the left of the release. The outputs and inputs of the module are therefore accessible from the terminal box of the circuit-breaker.

Information on the assembly is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet [1SDH001000R0516](#).

An example with an E2.2 circuit-breaker in fixed and withdrawable versions is provided to the side.

The wiring diagram for the module is included below:



--	--	--	--	--	--	--	--	--	--	---	--	--	--	--	--	--	--	--	--

Access from the display

To configure the module the release must be on.
Then the presence of the module activates the additional menus on the display.



The following table illustrates the path for accessing the configuration parameters of the module from the display:

Settings

Modules	...		
	Network frequency		
	Local/Remote		
	Local Bus		
	...		
	Ekip Signalling 4K	I 01	Polarity
			Delay
		I 02	(1)
		I 03	(1)
		I 04	(1)
		O 01	Signal source
			Delay
			Contact type
			Self-latching
			Min activation time
		O 02	(2)
		O 03	(2)
O 04	(2)		
...			
Functions			
Power Controller			
...			

(1) Like the menu I 01.
(2) Like the menu O 01.

NOTE: the module can also be configured the Ekip Connect software (see the chapter "14 - Other accessories", and the paragraph "Ekip Connect software" on page 102).

The following table illustrates the path from the display for accessing information on the module:

About	Protection Unit	
	Circuit breaker	
	Modules	...
		Ekip Signalling 4K
	Power Controller	

Continued on the next page

The following tables illustrate the paths from the display to access the pages for programming the actions you wish the release to perform in the event of an input being activated.

Advanced 	...	
	Current thresholds	
	Functions ⁽¹⁾	External Trip Trip RESET

⁽¹⁾ Menus available with the Double Set function disabled

Advanced 	Set A	
	Set B	
	Functions ⁽¹⁾	External Trip Trip RESET Turn on SET B

⁽¹⁾ Menus available with the Double Set function enabled

Measurements 	...	
	Frequency	
	Energy ⁽¹⁾	Energy meters Reset Meters RESET Energy
	Peak Factor	
	...	

⁽¹⁾ Menu available with Ekip Measuring or Ekip Measuring Pro modules.

Settings 		...	
	Circuit breaker	Earth protection Installation	
	Network frequency		
	Modules	...	
		Functions	Turn on LOCAL RESET Signalling
	Power Controller		
	...		
	System		
	Functions	YO Command YC Command	
	Maintenance		

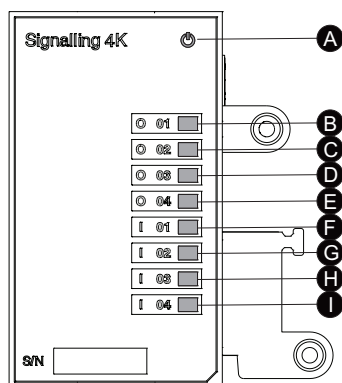
The following table illustrates the path for accessing the test command of the module:

Test 	...	
	Test CB	
	Ekip Signalling 2K ⁽¹⁾	
	Ekip Signalling 4K	Auto Test
	Zone Selectivity (68)	

⁽¹⁾ Menu available with module Ekip signalling 2K.

Signallings

The following table illustrates the possible signals, and their meaning:

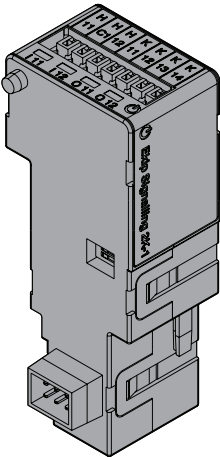


NOTE: for the references of contacts and inputs, see the paragraph “Connections”, on page 70.

Pos.	Name	Description
A	-	Power LED, green. The possible states are: • Off: power supply absent. • On fixed: power supply present.
B	O 01	LED for signalling the state of contact the K3 - K7, green. The possible states are: • Off: contact open. • On fixed: contact closed.
C	O 02	LED for signalling the state of contact the K4 - K8, green. The possible states are: • Off: contact open. • On fixed: contact closed.
D	O 03	LED for signalling the state of the contact K5 - K9, green. The possible states are: • Off: contact open. • On fixed: contact closed.
E	O 04	LED for signalling the state of the contact K6 - K10, green. The possible states are: • Off: contact open. • On fixed: contact closed.
F	I 01	LED for signalling the physical state of the input H1, green ⁽¹⁾ . The possible states are: • Off: floating input. • On fixed: input short-circuited on HC.
H	I 02	LED for signalling the physical state of the input H2, green ⁽¹⁾ . The possible states are: • Off: floating input. • On fixed: input short-circuited on HC.
G	I 03	LED for signalling the physical state of the input H3, green ⁽¹⁾ . The possible states are: • Off: floating input. • On fixed: input short-circuited on HC.
I	I 04	LED for signalling the physical state of the input H4, green ⁽¹⁾ . The possible states are: • Off: floating input. • On fixed: input short-circuited on HC.

⁽¹⁾ The LED turns on and off according to the physical state of the input, without taking any account of how the Delay parameter is set.

5 - Ekip Signalling 2K modules



Description The Ekip Signalling 2K is a signalling accessory module.

The module has:

- Two digital inputs, and two contacts for output signals.
- A power status LED, and four signalling LEDs (one LED for every input/output).



IMPORTANT: on each circuit-breaker, a maximum of two (for E1.2 circuit-breakers) or three (for E2.2-E4.2-E6.2 circuit breakers) Ekip Signalling 2K modules can be installed: one 2K-1, one 2K-2, and one 2K-3 (only for E2.2-E4.2-E6.2 circuit breakers). These modules by their name and label, and have distinct wiring, but they are identical in terms of their characteristics and manner of installation.

Compatibility and power supply The modules can be installed in the presence of Ekip Touch, Hi-Touch, G Touch, and G Hi-Touch releases, and require the presence of an Ekip Supply module in the first slot of the circuit-breaker terminal box.

Electrical characteristics The following table lists the electrical characteristics of the modules:

Component	Characteristics
Output contacts	• Maximum switching power ⁽¹⁾: 1250 VA. • Maximum switching voltage ⁽¹⁾: 150 V DC / 250 V AC. • Breaking power ⁽¹⁾: 2 A @ 30 V DC, 0.8 A @ 50 V DC, 0.2 A @ 150 V DC, 4A @ 250 V AC. • Dielectric strength between open contacts: 1000 V AC (1 minute @ 50 Hz). • Dielectric strength between each contact and coil: 1000 V AC (1 minute @ 50 Hz).

⁽¹⁾ Data relating to a resistive load.

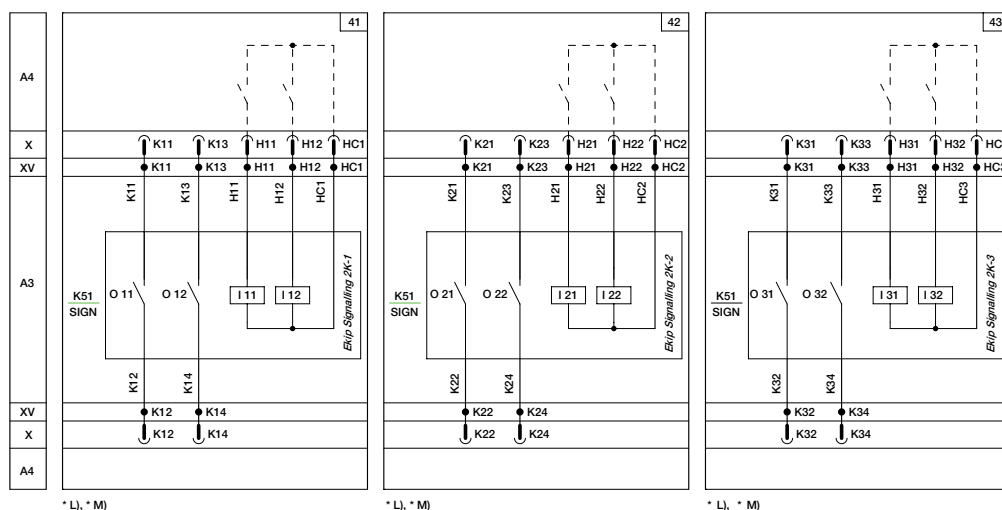
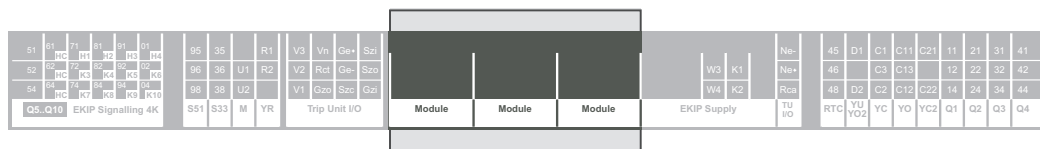
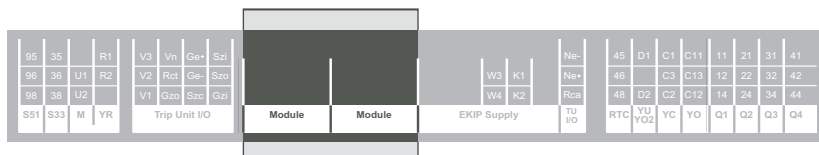
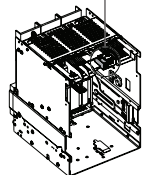
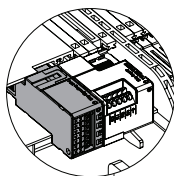
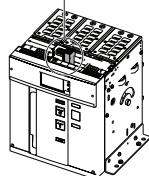
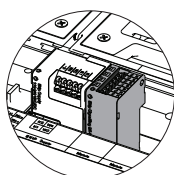
Connections

The modules must be mounted on the terminal box of the circuit-breaker or of the fixed part of the withdrawable circuit-breaker, in the first free slot after the Ekip Supply module.

Information on the assembly is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet **1SDH001000R0524**.

An example with an E2.2 circuit-breaker in fixed and withdrawable versions is provided to the side.

The following is a view of the terminal box of E1.2 and E2.2-E4.2-E6.2 circuit-breakers, and the wiring diagram:



Diagrams 41 - 42 - 43

For external wiring, AWG 22-16 cables with a maximum external diameter of 1.4 mm must be used.

Further information is available on page 55, or on the site <http://www.abb.com/abblibrary/DownloadCenter/>, where the wiring diagram is available **1SDM000091R0001**.

Access from the display



With modules energized, and Local Bus enabled, the presence of the modules on the terminal box activates additional menus on the display.

To enable the Local Bus, you need to select "On" in the menu *Settings - Modules - Local Bus*.

The following table illustrates the path for accessing the configuration parameters of the modules from the display:

Settings

Modules	...			
	Network frequency			
	Ekip Signalling 2K-1	Local/Remote		
		Local Bus		
		...		
		I 01	Signal source	
			Delay	(1)
		I 02	Signal source	
			Delay	
		O 01	Contact type	
			Self-latching	
			Min activation time	
			O 02	(2)
	Ekip Signalling 2K-2	(3)		
	Ekip Signalling 2K-3	(3)		
	...			
	Functions			
Power Controller				
...				

(1) Like menu I 01.

(2) Like menu O 01.

(3) Like menu Signalling 2K-1.



NOTE: the modules can also be configured with the Ekip Connect software (see the chapter "14 - Other accessories", and the paragraph "Ekip Connect software" on page 102).

The following table illustrates the path from the display for accessing information on the modules:

About 	Protection Unit	
	Circuit breaker	
	Modules	...
		Ekip Signalling 2K-1
		Ekip Signalling 2K-2
		Ekip Signalling 2K-3
		...
	Power Controller	

Continued on the next page

The following tables illustrate the paths from the display to access the pages for programming the actions you wish the release to perform in the event of an input being activated.

Advanced 	...	
	Current thresholds	
	Functions ⁽¹⁾	External Trip Trip RESET

⁽¹⁾ Menus available with the Double Set function disabled

Advanced 	Set A	
	Set B	
	Functions ⁽¹⁾	External Trip Trip RESET Turn on SET B

⁽¹⁾ Menus available with the Double Set function enabled

Measurements 	...	
	Frequency	
	Energy ⁽¹⁾	Energy meters Reset Meters RESET Energy
	Peak Factor	
	...	

⁽¹⁾ Menu available with Ekip Measuring or Ekip Measuring Pro modules.

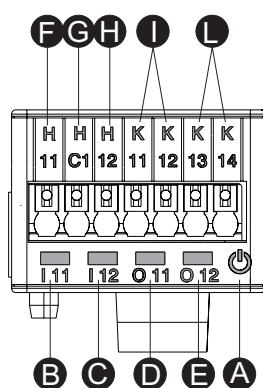
Settings 	...	
	Circuit breaker	... Earth protection Installation
	Network frequency	
	Modules	... Functions Turn on LOCAL RESET Signalling
	Power Controller	
	...	
	System	
	Functions	YO Command YC Command
	Maintenance	

The following table illustrates the path for accessing the test command of the module:

Test 	...	
	Test CB	
	Ekip Signalling 2K	Auto Test
	Ekip Signalling 4K ⁽¹⁾	
	Zone Selectivity (68)	

⁽¹⁾ Menu available with module Ekip signalling 4K.

Signals and inputs/outputs



The following table illustrates the signals, inputs and outputs of the module:

Pos.	Name	Description
A	-	Power LED, green. The possible states are: • Off: power supply absent. • On fixed: power supply and communication with the release present (with a release with the Alive LED option disabled). • On, with one flash per second (synchronized with that of the green LED on the release): power supply and communication with release present (with a release with the Alive LED option enabled). • On, with two quick flashes per second (not synchronized with those of the green LED on the release): power supply present, and communication with release absent (for example: for Local Bus disabled) ⁽¹⁾.
B	I x1 ⁽²⁾	LED for signalling the physical state of the input H x1, green ⁽³⁾ . The possible states are: • Off: floating input. • On fixed: input short-circuited on H Cx.
C	I x2 ⁽²⁾	LED for signalling the physical state of the input H x2, green ⁽³⁾ . The possible states are: • Off: floating input. • On fixed: input short-circuited on H Cx.
D	O x1 ⁽²⁾	LED for signalling contact K x1 - K x2, green. The possible states are: • Off: contact open. • On fixed: contact closed.
E	O x2 ⁽²⁾	LED for signalling the state of the contact K x3 - K x4, green. The possible states are: • Off: contact open. • On fixed: contact closed.
F	H x1 ⁽²⁾	Input I x1.
G	H Cx ⁽²⁾	Conductive part of the inputs H x1 and H x2.
H	H x2 ⁽²⁾	Input I x1.
I	K x1, K x2 ⁽²⁾	Output contact pin O x1.
L	K x3, K x4 ⁽²⁾	Output contact pin O x2.

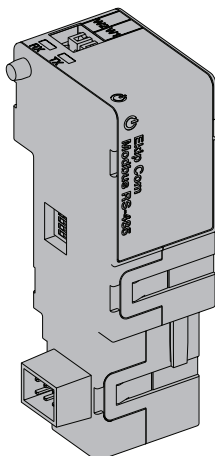
⁽¹⁾ The absence of communication is signalled immediately by the power LED, unlike the outputs which (apart from those programmed to be activated in the case of disconnection) are deactivated if the condition persists for at least 8 s.

⁽²⁾ With x = 1, 2, or 3.

⁽³⁾ The LED turns on and off according to the physical state of the input, without taking any account of how the Delay parameter is set.

6 - Ekip Com Modbus RTU modules

Description The Ekip Com Modbus RTU is a communication accessory module, that integrates the circuit-breaker in an industrial remote supervision and control network.



Remote opening and closing of the circuit-breaker can be performed only if the circuit-breaker is equipped with an Ekip Com Actuator module (see page 100).

For applications in which a high network reliability is necessary, the module can be installed along with the corresponding Redundant module.

The Redundant module is identical in terms of specifications and installation methods, but its wiring is different to the first one.

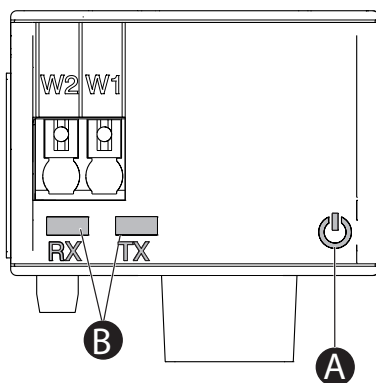


IMPORTANT: on each circuit-breaker, a single Ekip Com Modbus RTU, and a single Ekip Com Modbus RTU Redundant can be installed.

The modules are always supplied with Ekip AUP and Ekip RTC contacts (see the chapter "14 - Other accessories" on page 101).

Compatibility and power supply The modules can be installed in the presence of Ekip Touch, Hi-Touch, G Touch, and G Hi-Touch releases, and require the presence of an Ekip Supply module in the first slot of the circuit-breaker terminal box.

Signallings The following table illustrates the possible signals, and their meaning:



Pos.	Description
A	Power LED, green. The possible states are: • Off: power supply absent. • On fixed: power supply and communication with the release present (with a release with the Alive LED option disabled). • On, with one flash per second (synchronized with that of the green LED on the release): power supply and communication with release present (with a release with the Alive LED option enabled). • On, with two quick flashes per second (not synchronized with those of the green LED on the release): power supply present, and communication with release absent (for example: because Local Bus disabled).
B	RX and TX LEDs, green. The possible states are: • Off: Modbus RTU communication not active. • On, flashing rapidly: Modbus RTU communication active.

Termination resistor The modules provide the possibility to insert a 120 Ω termination resistor on the RS-485 bus, by setting the dip-switches **Rterm** on the side of the modules, in position **on**. This option must be selected before the installation of the modules.

For the positions **on** and **off** of the dip-switches **Rterm**, see the following figure (on Modbus RTU communication modules, the dip-switches **Rpol** are not used).

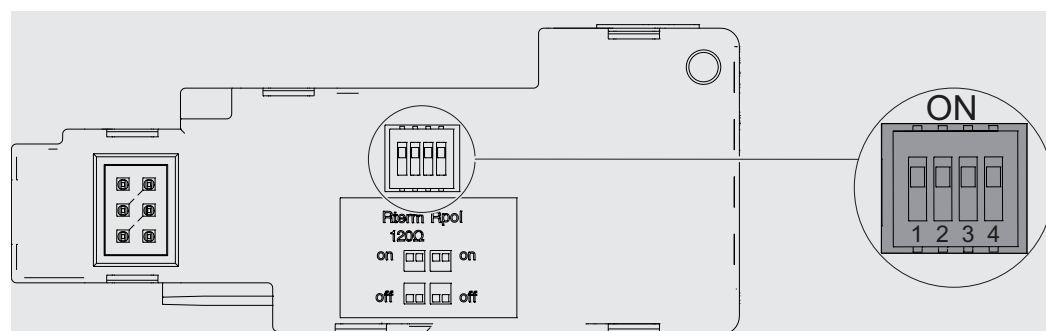
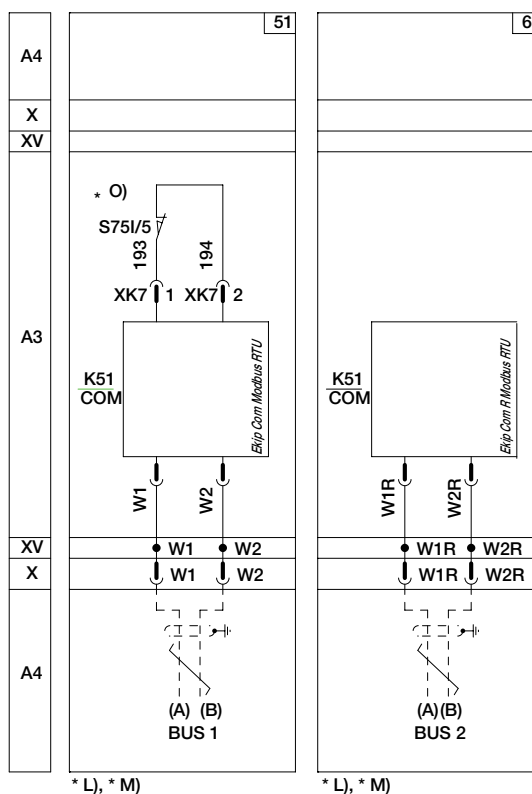
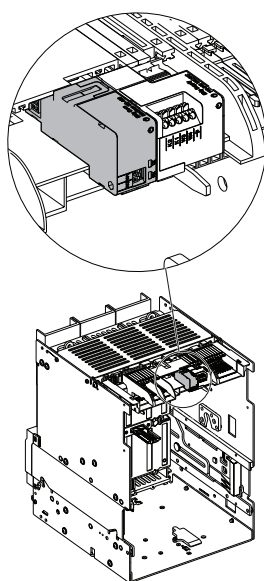
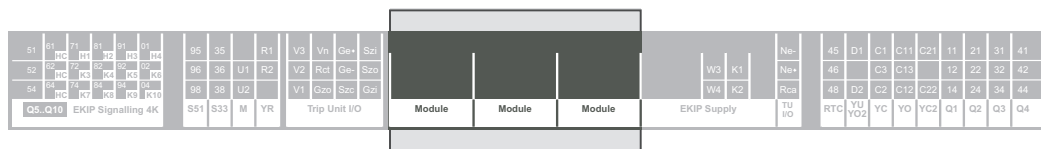
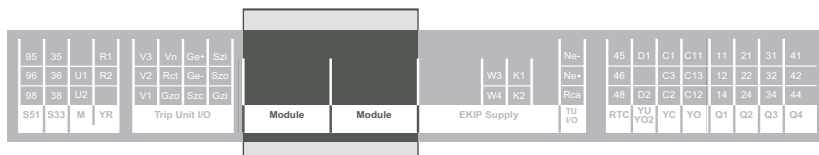
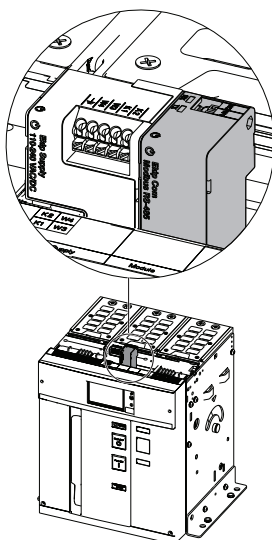


Figure 26

Information on the assembly is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet **1SDH001000R0512**.

The following is a view of the terminal box of E1.2 and E2.2-E4.2-E6.2 circuit-breakers, and the wiring diagram:

 $^* L), ^* M)$

* L), * M)

For the communication lines (A) and (B), Belden type 3105A or equivalent cables must be used.

Further information is available on page 55, or on the site <http://www.abb.com/abblibrary/DownloadCenter/>, where the wiring diagram is available **1SDM000091R0001**.

Access from the display



With modules energized, and Local Bus enabled, the presence of the modules on the terminal box activates additional menus on the display.

To enable the Local Bus, you need to select "On" in the menu *Settings - Modules - Local Bus*.

The following table illustrates the path for accessing the configuration parameters of the modules from the display:

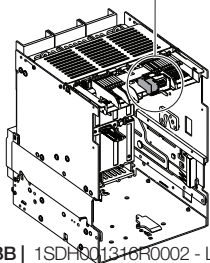
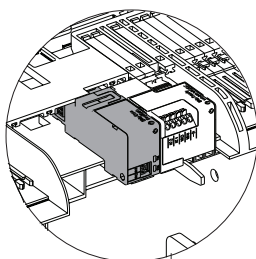
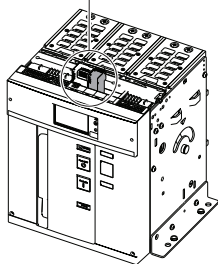
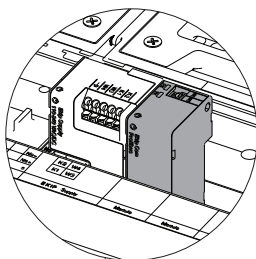
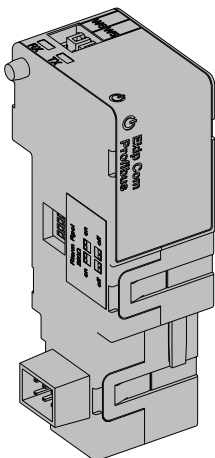
Settings	...	
	Network frequency	
	Modules	Local/Remote
		Local Bus
		...
		Ekip Com Modbus RTU
		Serial address
		Baudrate
		Physical protocol
		Ekip Com Modbus RTU *R
		(1)
		...
		Functions
	Power Controller	
	...	

(1) Like the Ekip Com Modbus RTU.

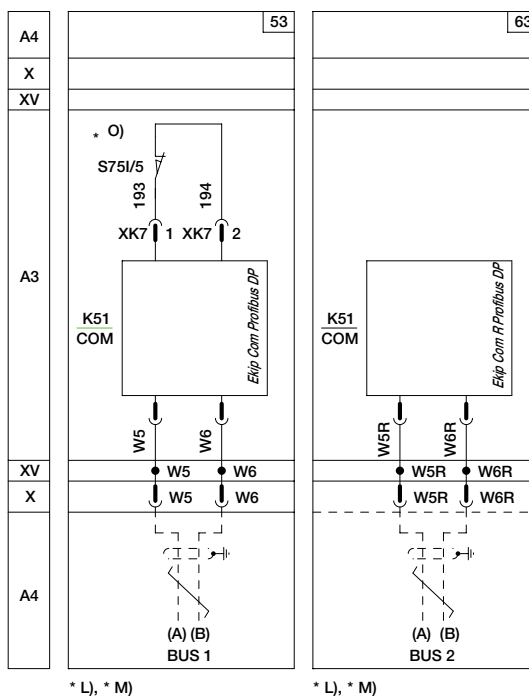
NOTE: the modules can also be configured with the Ekip Connect software (see the chapter "14 - Other accessories", and the paragraph "Ekip Connect software" on page 102).

The following table illustrates the path from the display for accessing information on the modules:

About	Protection Unit	
	Circuit breaker	
	Modules	...
		Ekip Com Modbus RTU
		Ekip Com Modbus RTU *R
		...
	Power Controller	

[illegible]

51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	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Diagrams 53 - 63

For the communication lines (A) and (B), Belden type 3079A or equivalent cables must be used.

Further information is available on page 55, or on the site <http://www.abb.com/abblibrary/DownloadCenter/>, where the wiring diagram is available [1SDM000091R0001](#).

Termination resistors The modules provide the possibility to insert a 220 Ω termination resistor on the RS-485 bus, by setting the dip-switches **Rterm** on the side of the modules, in position **on**.

In the event of termination of the bus, a 390 Ω pull-up or pull-down resistor must also be inserted on the lines, by setting the dip-switches **Rpol**, in position **on**.

These options must be selected before installation of the modules.

For the positions **on** and **off** of the dip-switches, see the following figure.

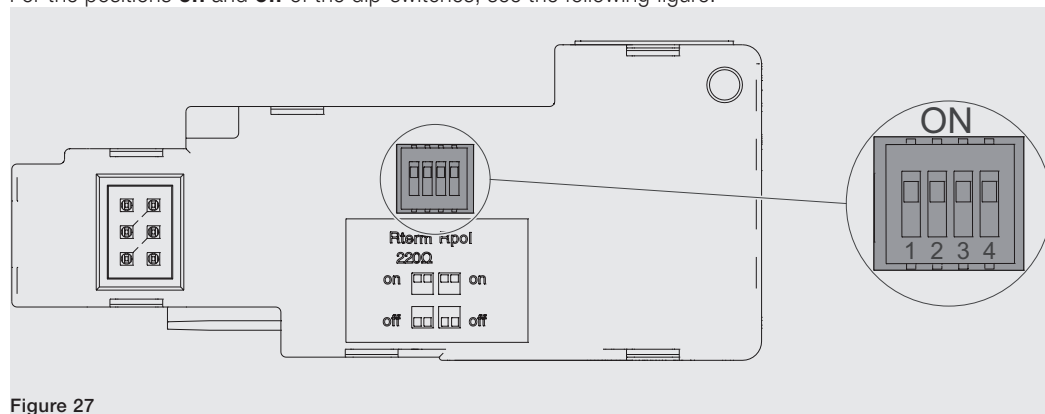


Figure 27

Access from the display



With modules energized, and Local Bus enabled, the presence of the modules on the terminal box activates additional menus on the display.

To enable the Local Bus, you need to select "On" in the menu **Settings, Modules, Local Bus**.

The following table illustrates the path for accessing the configuration parameters of the modules from the display:

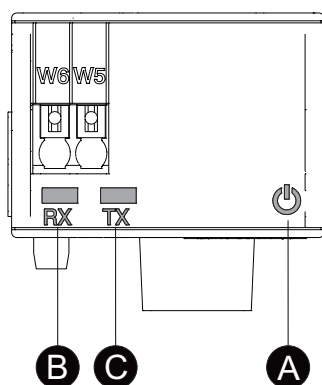
Settings 	...		
	Network frequency		
	Modules	Local/Remote	
		Local Bus	
		...	
		Ekip Com Profibus DP	Serial address
		Ekip Com Profibus DP *R	Serial address
		...	
		Functions	
	Power Controller		
	...		

The following table illustrates the path from the display for accessing information on the modules:

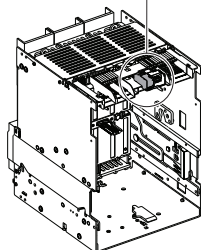
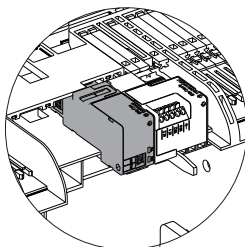
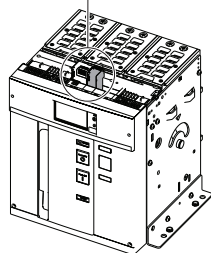
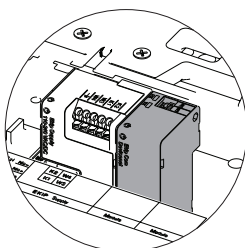
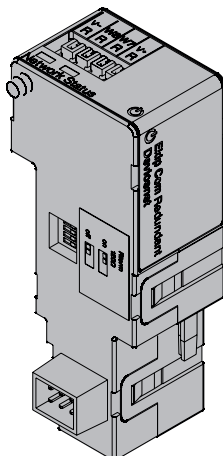
About 	Protection Unit		
	Circuit breaker		
	Modules	...	
		Ekip Com Profibus DP	
		Ekip Com Profibus DP *R	
		...	
	Power Controller		

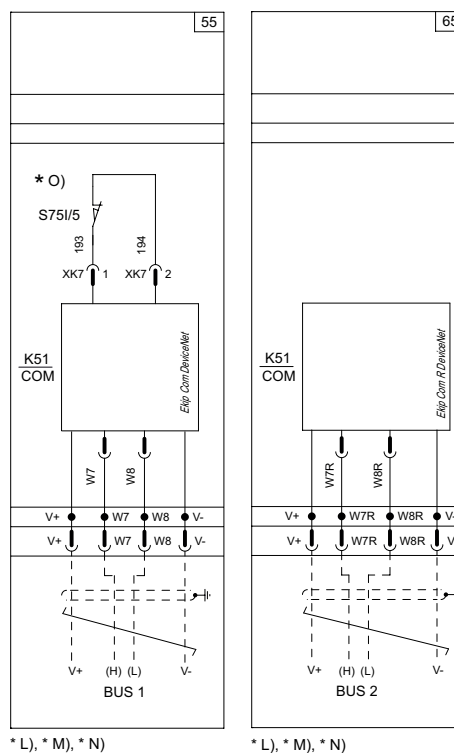
Signallings

The following table illustrates the possible signals, and their meaning:



Pos.	Description
A	Power LED, green. The possible states are: • Off: power supply absent. • On fixed: power supply and communication with the release present (with a release with the Alive LED option disabled). • On, with one flash per second (synchronized with that of the green LED on the release): power supply and communication with release present (with a release with the Alive LED option enabled). • On, with two quick flashes per second (not synchronized with those of the green LED on the release): power supply present, and communication with release absent (for example: because Local Bus disabled).
B	RX LED, green. The possible states are: • Off: communication between master and release not active. • On fixed: communication between master and release active.
C	TX LED, green. The possible states are: • Off: communication between master and release not active. • On flashing: communication between master and release active.

[illegible][illegible]



Diagrams 55 - 65

For the communication buses BUS1 and BUS2, Belden type 3084A or equivalent cables must be used.

Further information is available on page 55, or on the site <http://www.abb.com/abblibrary/DownloadCenter/>, where the wiring diagram is available [1SDM000091R0001](#).

Termination resistor The modules provide the possibility to insert a 120 Ω termination resistor on the RS-485 bus, by setting the dip-switches **Rterm** on the side of the modules, in position **on**. This option must be selected before the installation of the modules.

For the positions **on** and **off** of the dip-switches **Rterm**, see the following figure (on DeviceNet communication modules, the remaining dip-switches are not used).

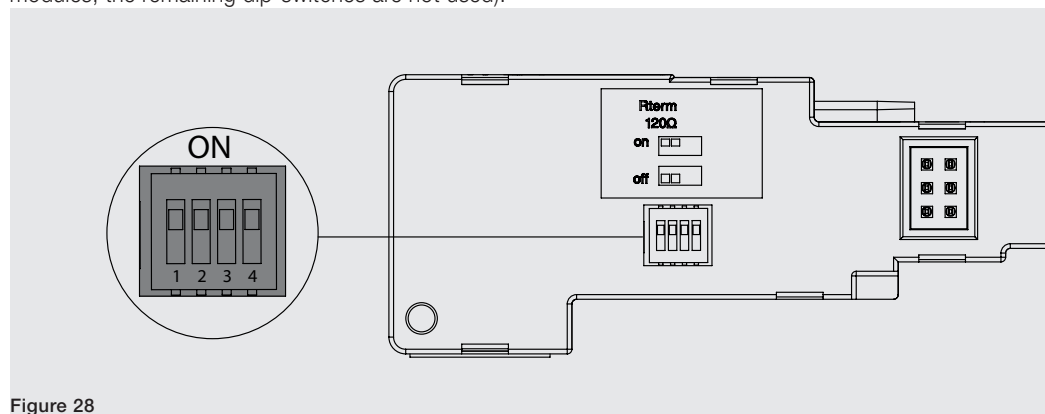


Figure 28

Access from the display



With modules energized, and Local Bus enabled, the presence of the modules on the terminal box activates additional menus on the display.

To enable the Local Bus, you need to select "On" in the menu **Settings, Modules, Local Bus**.

The following table illustrates the path for accessing the configuration parameters of the modules from the display:

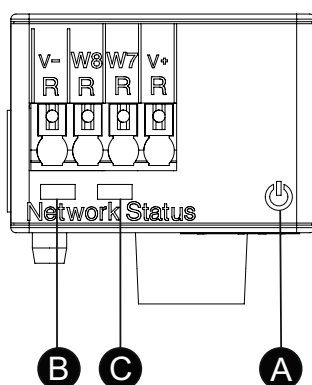
Settings 	...		
	Network frequency		
	Modules	Local/Remote	
		Local Bus	
		...	
		Ekip Com DeviceNet	MAC Address
			Baudrate
		Ekip Com DeviceNet *R	MAC Address
			Baudrate
		...	
		Functions	
	Power Controller		
	...		

The following table illustrates the path from the display for accessing information on the modules:

About 	Protection Unit		
	Circuit breaker		
	Modules	...	
		Ekip DeviceNet	
		Ekip DeviceNet *R	
		...	
	Power Controller		

Signallings

The following table illustrates the possible signals, and their meaning:

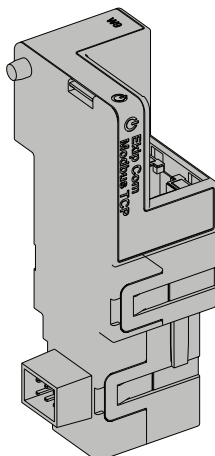


Pos.	Description
A	Power LED, green. The possible states are: - Off: power supply absent. - On fixed: power supply and communication with the release present (with a release with the Alive LED option disabled). - On, with one flash per second (synchronized with that of the green LED on the release): power supply and communication with release present (with a release with the Alive LED option enabled). - On, with two quick flashes per second (not synchronized with those of the green LED on the release): power supply present, and communication with release absent (for example: because Local Bus disabled).
B	Red Led. The possible states are: - Off: device off line (with red TX LED off) ⁽¹⁾, or in error conditions (with red TX LED on). - On fixed: device on line, and allocated on a master (operating condition). - On flashing: device on line, but not allocated on a master (device ready for communication).
C	Green Led. The possible states are: - Off: no error. - On fixed: device in bus off, or Network Power absent condition. - On flashing: I/O connection (cyclic data) in timeout.

⁽¹⁾ The device has not yet sent Duplicate ID sequence on line.

9 - Ekip Com Modbus TCP modules

Description



The Ekip Com Modbus TCP is an accessory module that can function as a communication module by integrating the circuit-breaker in an industrial remote supervision and control network or as an HTTP server. These operating modes are alternatives.



IMPORTANT: since the module allows control of the circuit-breaker and access to the data contained in the release, it can only be connected to networks that meet all the necessary requirements for safety and prevention of unauthorized access (for example, the network of the control system of an installation). It is the installer's responsibility to ensure that all the necessary safety measures are adopted (for example, firewalls, and so on). The module cannot be connected directly to the Internet. It is recommended to connect it only to dedicated Ethernet networks, with the Modbus TCP communication protocol.

For applications in which a high network reliability is necessary, the module can be installed along with the corresponding Redundant module.

The Redundant module is identical in terms of specifications and installation methods, but its wiring is different to the first one.



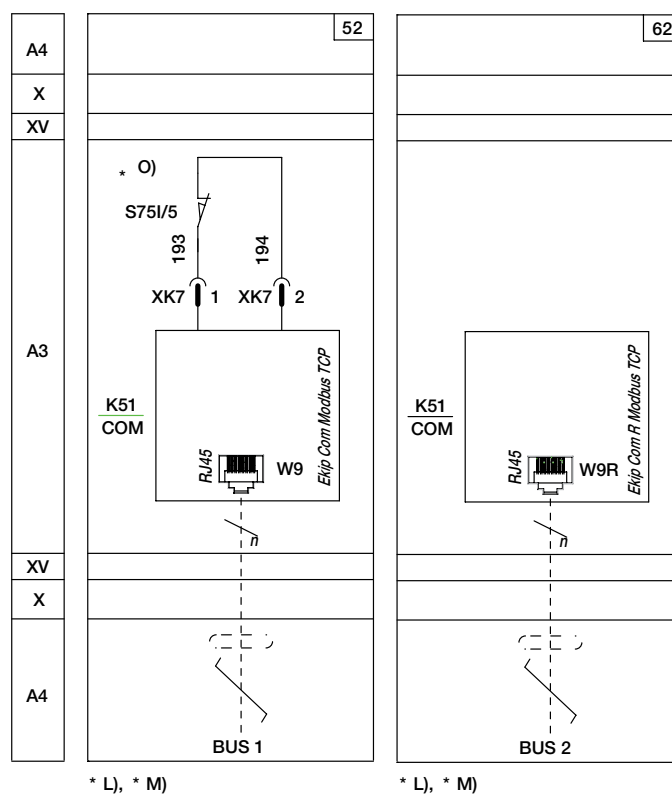
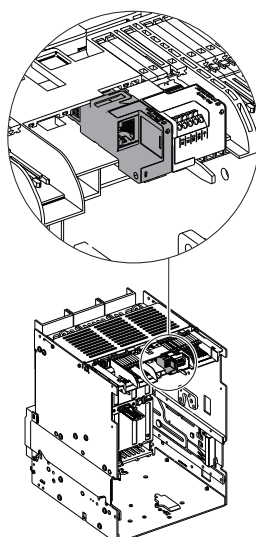
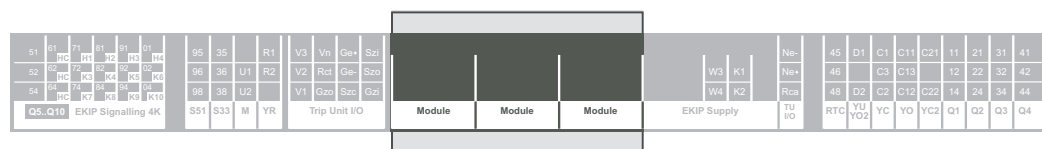
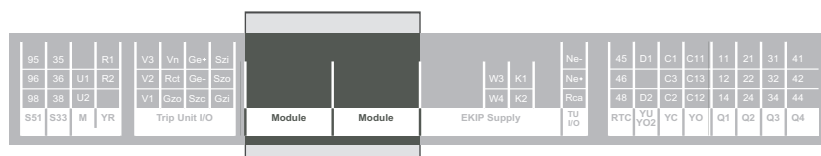
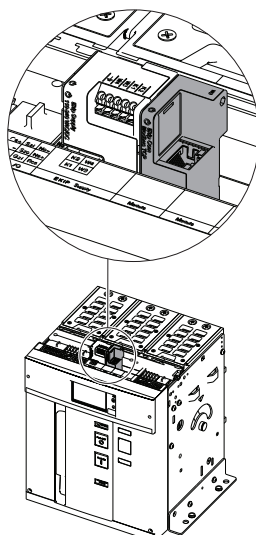
IMPORTANT: on each circuit-breaker, a single **Ekip Com Modbus TCP**, and a single **Ekip Com Modbus TCP Redundant** can be installed.

The modules are always supplied with Ekip AUP and Ekip RTC contacts (see the chapter "14 - Other accessories" on page 101).

Compatibility and power supply

The modules can be installed in the presence of Ekip Touch, Hi-Touch, G Touch, and G Hi-Touch releases, and require the presence of an Ekip Supply module in the first slot of the circuit-breaker terminal box.

The following is a view of the terminal box of E1.2 and E2.2/E4.2/E6.2 circuit-breakers, and the wiring diagram:



Further information is available on page 55, or on the site <http://www.abb.com/abblibrary/DownloadCenter/>, where the wiring diagram is available **1SDM000091R0001**.

Access from the display



With the modules energized, and the Local Bus enabled, the presence of the modules on the terminal box activates additional menus on the display:

To enable the Local Bus, you need to select "On" in the menu *Settings - Modules - Local Bus*.

The following table illustrates the path from the display, for setting the function and addressing of the modules:

Settings 	...		
	Network frequency		
	Modules	Local/Remote	
		Local Bus	
		...	
		Ekip Com Modbus TCP	Function
			Force Static IP address
			Static IP Address
			Static Network Mask
			Static Gateway addr
		Ekip Com Modbus TCP *R	(1)
		...	
		Functions	
	Power Controller		
	...		

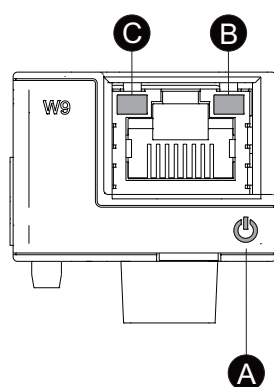
(1) Like the Ekip Com Modbus TCP menu.

The following table illustrates the path from the display for accessing information on the modules:

About 	Protection Unit		
	Circuit breaker		
	Modules	...	
		Ekip Com Modbus TCP	
		Ekip Com Modbus TCP *R	
		...	
	Power Controller		

Signallings

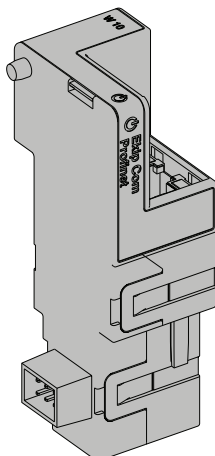
The following table illustrates the possible signals, and their meaning:



Pos.	Description
A	Power LED, green. The possible states are:
	• Off: power supply absent.
	• On fixed: power supply and communication with the release present (with a release with the Alive LED option disabled).
	• On, with one flash per second (synchronized with that of the green LED on the release): power supply and communication with release present (with a release with the Alive LED option enabled).
B	Link LED, green. The possible states are:
	• Off: connection error (signal absent).
	• On fixed: correct connection.
C	Activity LED, yellow. The possible states are:
	• Off: no activity on the line.
	• On flashing: activity present on the line (in reception and/or transmission).

10 - Ekip Com Profinet modules

Description The Ekip Com Profinet is a communication accessory module, that integrates the circuit-breaker in an industrial remote supervision and control network.



IMPORTANT: the module can only be connected to networks that meet all the necessary requirements for safety and prevention of unauthorized access (for example, the network of the control system of an installation). It is the installer's responsibility to ensure that all the necessary safety measures are adopted (for example, firewalls, and so on). It is recommended to connect it only to dedicated Ethernet networks, with the Profinet communication protocol. The module cannot be connected to the Internet.

For applications in which a high network reliability is necessary, the module can be installed along with the corresponding Redundant module.

The Redundant module is identical in terms of specifications and installation methods, but its wiring is different to the first one.



IMPORTANT: on each circuit-breaker, a single Ekip Com Profinet, and a single Ekip Com Profinet Redundant can be installed.

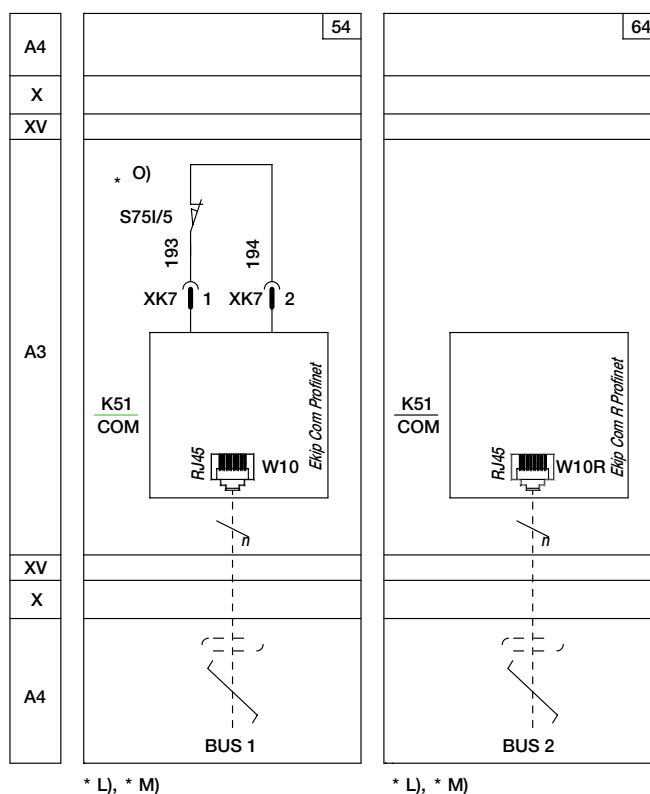
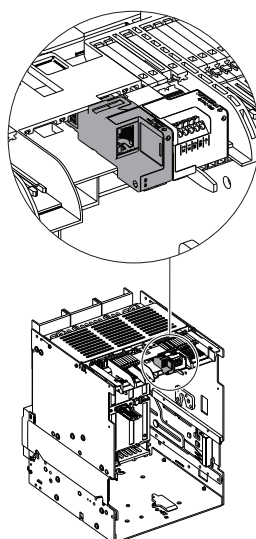
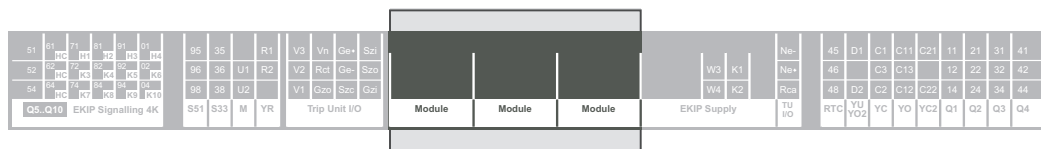
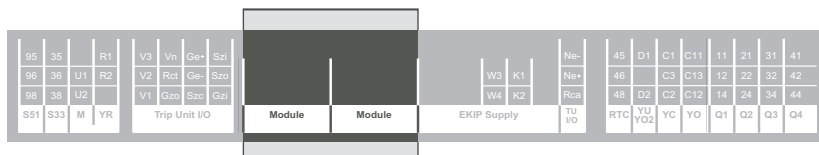
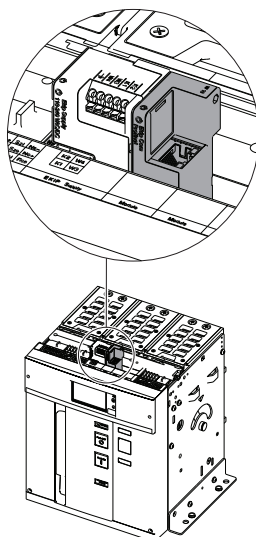
The modules are always supplied with Ekip AUP and Ekip RTC contacts (see the chapter "14 - Other accessories" on page 101).

Compatibility and power supply

The modules can be installed in the presence of Ekip Touch, Hi-Touch, G Touch, and G Hi-Touch releases, and require the presence of an Ekip Supply module in the first slot of the circuit-breaker terminal box.

Information on the assembly is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet **1SDH001000R0514**.

The following is a view of the terminal box of E1.2 and E2.2-E4.2-E6.2 circuit-breakers, and the wiring diagram:



* L), * M)

* L), * M)

For the communication bus, a cable of type Cat.6 S/FTP must be used (Cat.6 with S/FTP double shielding).
If the circuit-breaker is the withdrawable type, it is recommended to use cables fitted with a RJ45 socket with output at 90°.

Further information is available on page 55, or on the site <http://www.abb.com/abblibrary/DownloadCenter/>, where the wiring diagram is available **1SDM000091R0001**.

Access from the display



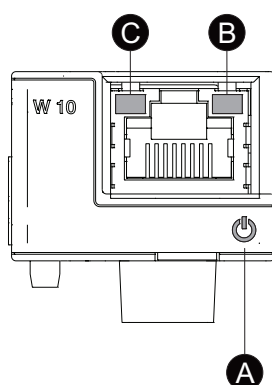
With the modules energized and Local Bus enabled, the modules can be viewed on the display.

To enable the Local Bus, you need to select "On" in the menu *Settings - Modules - Local Bus*.

The following table illustrates the path from the display for accessing information on the modules:

About i	Protection Unit	
	Circuit breaker	
	Modules	...
		Ekip Com Profinet
		Ekip Com Profinet *R
	Power Controller	...

Signallings

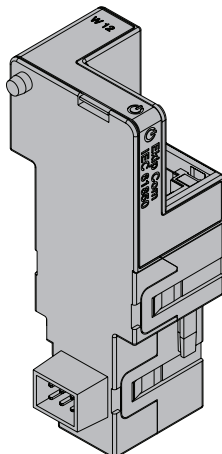


The following table illustrates the possible signals, and their meaning:

Pos.	Description
A	Power LED, green. The possible states are: • Off: power supply absent. • On fixed: power supply and communication with the release present (with a release with the Alive LED option disabled). • On, with one flash per second (synchronized with that of the green LED on the release): power supply and communication with release present (with a release with the Alive LED option enabled). • On, with two quick flashes per second (not synchronized with those of the green LED on the release): power supply present, and communication with release absent (for example: because Local Bus disabled).
B	Link LED, green. The possible states are: • Off: connection error (signal absent). • On fixed: correct connection.
C	Activity LED, yellow. The possible states are: • Off: no activity on the line. • On flashing: activity present on the line (in reception and/or transmission).

11 - Ekip Com IEC 61850 modules

Description The Ekip Com IEC 61850 is an accessory module that can function as a communication module by integrating the circuit-breaker in an industrial remote supervision and control network.



IMPORTANT: since the module allows control of the circuit-breaker and access to the data contained in the release, it can only be connected to networks that meet all the necessary requirements for safety and prevention of unauthorized access (for example, the network of the control system of an installation). It is the installer's responsibility to ensure that all the necessary safety measures are adopted (for example, firewalls, and so on). The module cannot be connected directly to the Internet. It is recommended to connect it only to dedicated Ethernet networks, with the IEC 61850 communication protocol.

For applications in which a high network reliability is necessary, the module can be installed along with the corresponding Redundant module.

The Redundant module is identical in terms of specifications and installation methods, but its wiring is different to the first one.



IMPORTANT: on each circuit-breaker, a single Ekip Com IEC 61850, and a single Ekip Com IEC 61850 Redundant can be installed.

The modules are always supplied with Ekip AUP and Ekip RTC contacts (see the chapter "14 - Other accessories" on page 101).

Compatibility and power supply The modules can be installed in the presence of Ekip Touch, Hi-Touch, G Touch, and G Hi-Touch releases since version 2.0 software, and require the presence of an Ekip Supply module in the first slot of the circuit-breaker terminal box.

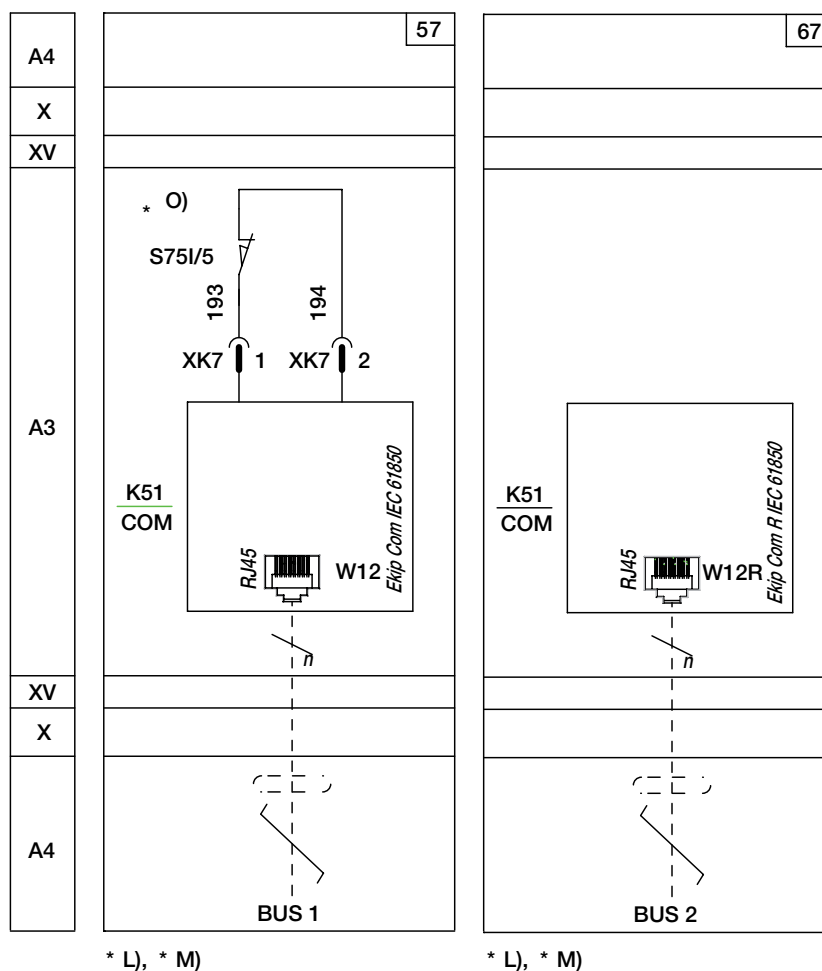
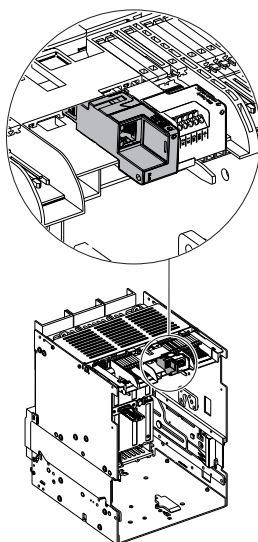
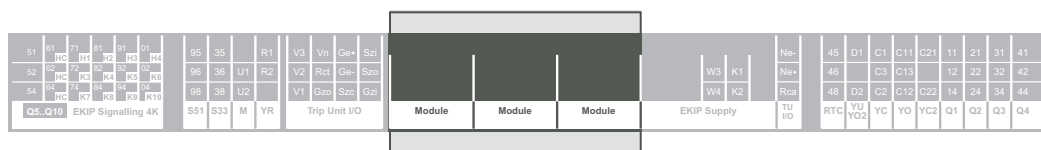
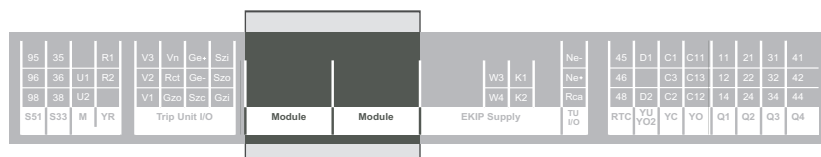
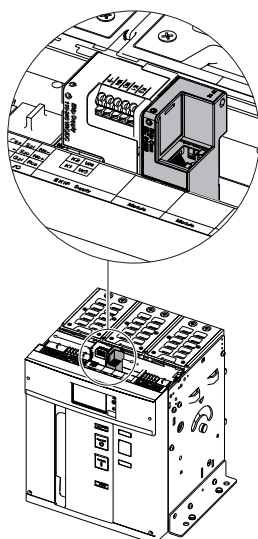
Connections An example with an E2.2 circuit-breaker in fixed and withdrawable versions is provided to the side.

The modules must be mounted on the terminal box of the circuit-breaker or of the fixed part of the withdrawable circuit-breaker, in the first free slot after the Ekip Supply module.

Information on the assembly is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet [1SDH001000R0514](#).

An example with an E2.2 circuit-breaker in fixed and withdrawable versions is provided to the side.

The following is a view of the terminal box of E1.2 and E2.2-E4.2-E6.2 circuit-breakers, and the wiring diagram:



Diagrams 57 - 67

For the communication bus, a cable of type Cat.6 S/FTP must be used (Cat.6 with S/FTP double shielding).

If the circuit-breaker is the withdrawable type, it is recommended to use cables fitted with a RJ45 socket with output at 90°.

Further information is available on page 55, or on the site <http://www.abb.com/abblibrary/DownloadCenter/>, where the wiring diagram is available [1SDM000091R0001](#).

Access from the display



With the modules energized, and the Local Bus enabled, the presence of the modules on the terminal box activates additional menus on the display:

- To set the modules.
- In order to display information on the modules.

To enable the Local Bus, you need to select "On" in the menu *Settings - Modules - Local Bus*.

The following table illustrates the path from the display, for setting the function and addressing of the modules:

Settings 	...	
	Network frequency	
	Modules	Local/Remote
		Local Bus
		...
		Ekip Com IEC 61850
		Force Static IP address
		SNTP client abilit.
		Static IP Address
		Static Network Mask
		Static Gateway addr
		SNTP Indir. Server
		Ekip Com IEC 61850 *R ⁽¹⁾
		...
		Functions
	Power Controller	
	...	

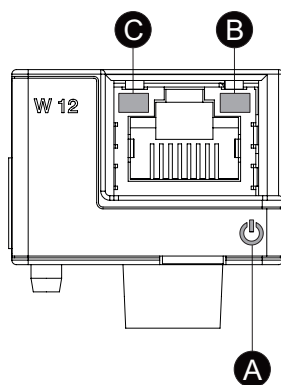
⁽¹⁾ Like the Ekip Com IEC 61850.

The following table illustrates the path from the display for accessing information on the modules:

About 	Protection Unit	
	Circuit breaker	
	Modules	...
		Ekip Com IEC 61850
		Ekip Com IEC 61850 *R
		...
	Power Controller	

Signallings

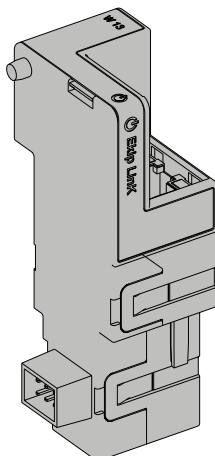
The following table illustrates the possible signals, and their meaning:



Pos.	Description
A	Power LED, green. The possible states are:
	• Off: power supply absent.
	• On fixed: power supply and communication with the release present (with a release with the Alive LED option disabled).
	• On, with one flash per second (synchronized with that of the green LED on the release): power supply and communication with release present (with a release with the Alive LED option enabled).
B	Link LED, green. The possible states are:
	• Off: connection error (signal absent).
	• On fixed: correct connection.
C	Activity LED, yellow. The possible states are:
	• Off: no activity on the line.
	• On flashing: activity present on the line (in reception and/or transmission).

12 - Ekip Link module

Description Ekip Link is a communication accessory module that integrates the circuit-breaker in an internal Ethernet network with an ABB proprietary protocol.



IMPORTANT: the module can be connected only to internal Ethernet networks with one or more switchboards, to which releases or ABB Emax 2 accessories are connected. It is the installer's responsibility to ensure that all the necessary safety measures are adopted for all the connected devices (for example, the necessary access authorisations, and so on). The module cannot be connected to other Ethernet networks (for example, with the purpose of monitoring the system, or the office), or to the Internet.

The module is necessary if you wish to implement these functions:

- Power Controller.
- Zone Selectivity.
- Programmable Logic.

For these functions, the releases of the system that are involved must be equipped with an Ekip Link, and for each of these the IP addresses of the Ekip Link modules of the other releases must be inserted.

Only with Ekip Dip releases, the module can also be used with a function similar to that one of the Ekip Com Modbus TCP module, but with possibility to communicate only with an ABB master (for example: Ekip Connect or Ekip Control Panel).

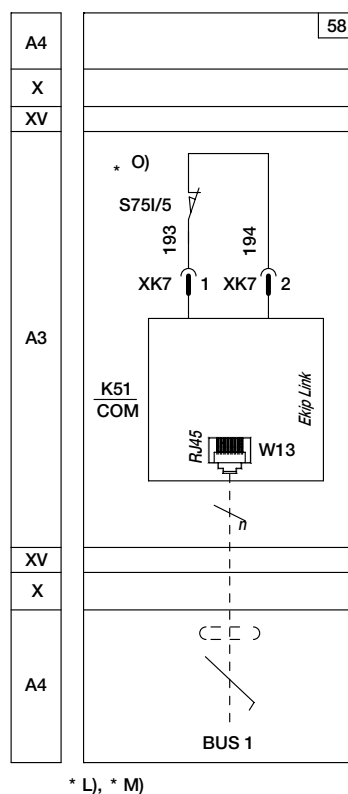
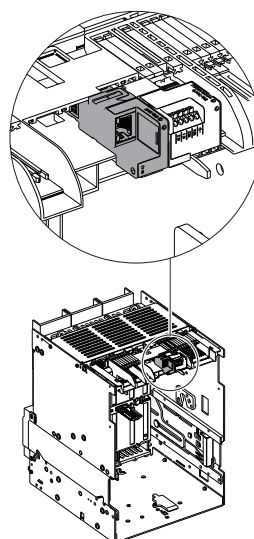
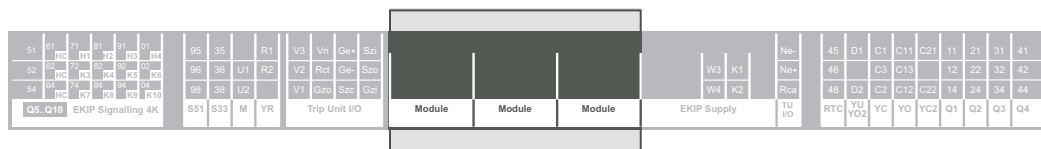
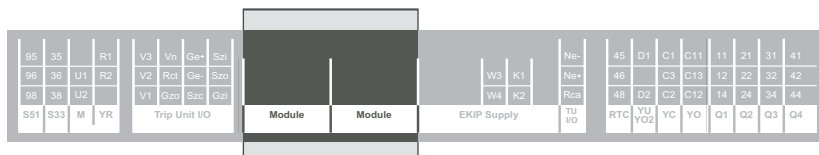
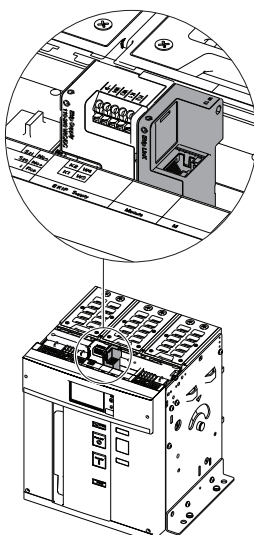


IMPORTANT: only one Ekip Link can be installed on each circuit-breaker.

The modules are always supplied with Ekip AUP and Ekip RTC contacts (see the chapter "14 - Other accessories" on page 101).

Compatibility and power supply The module can be installed in the presence of Ekip Dip, Touch, Hi-Touch, G Touch, and G Hi-Touch releases, and requires the presence of an Ekip Supply module in the first slot of the circuit-breaker terminal box.

The following is a view of the terminal box of E1.2 and E2.2-E4.2-E6.2 circuit-breakers, and the wiring diagram:



* L), * M)

Further information is available on page 55, or on the site <http://www.abb.com/abblibrary/DownloadCenter/>, where the wiring diagram is available **1SDM000091R0001**.

Access from the display



With the module energized, and the Local Bus enabled, the presence of the module on the terminal box activates additional menus on the display :

To enable the Local Bus, you need to select "On" in the menu *Settings - Modules - Local Bus*.

The following table illustrates the path from the display to set addressing of the module:

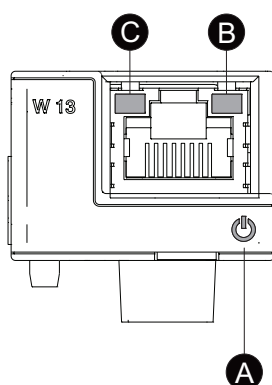
Settings 	...	
	Network frequency	
	Modules	Local/Remote
		Local Bus
		...
		Ekip Link
		Force Static IP address
		Static IP Address
		Static Network Mask
		Static Gateway addr
	...	
	Functions	
	Power Controller	
	...	

The following table illustrates the path from the display for accessing information on the module:

About 	Protection Unit	
	Circuit breaker	
	Modules	...
		Ekip Link
		...
	Power Controller	

Signallings

The following table illustrates the possible signals, and their meaning:



Pos.	Description
A	Power LED, green. The possible states are:
	• Off: power supply absent.
	• On fixed: power supply and communication with the release present (with a release with the Alive LED option disabled).
	• On, with one flash per second (synchronized with that of the green LED on the release): power supply and communication with release present (with a release with the Alive LED option enabled).
B	Link LED, green. The possible states are:
	• Off: connection error (signal absent).
	• On fixed: correct connection.
C	Activity LED, yellow. The possible states are:
	• Off: no activity on the line.
	• On, fixed or flashing: activity present on the line (in reception and/or transmission). When it is on, it may be fixed or flashing (communication is active in both cases).

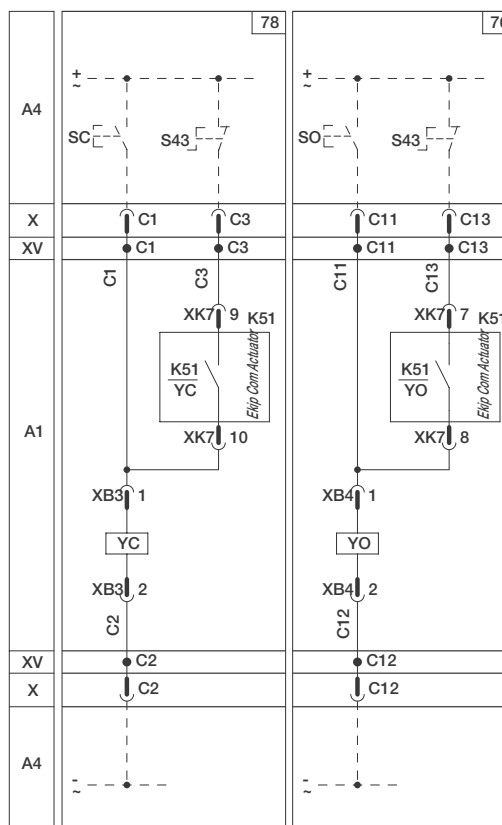
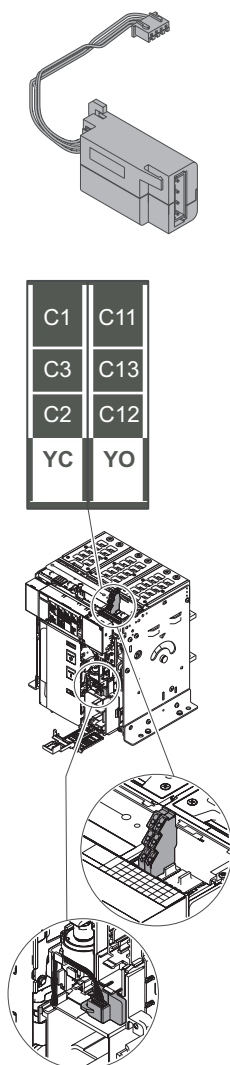
13 - Ekip Com Actuator module

Description Ekip Com Actuator is an accessory module that allows the SACE Emax 2 circuit-breakers to be opened and closed remotely.

Connections Ekip Com Actuator is installed on the front of the circuit-breaker in the accessories area.

Information on the assembly is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet [1SDH001000R0501](#).

Wiring diagrams are provided below for the module:



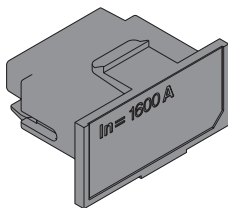
Diagrams 78 - 76

Further information is available on page 55, or on the site <http://www.abb.com/abblibrary/DownloadCenter/>, where the wiring diagram is available [1SDM000091R0001](#).

Compatibility Ekip Com Actuator module is supplied on request and is compatible with all Ekip releases if there is an Ekip Com or Ekip Link module present.

14 - Other accessories

Rating Plug The Rating Plug defines the rated current I_n , necessary in order to set the current protections on the release, where these refer to I_n .



It is supplied with all Ekip releases, mounted on a front connector dedicated and accessible to the user, and can be replaced with release off and circuit breaker open.



IMPORTANT: the replacement of the Rating Plug with release on or circuit breaker closed may cause malfunction of the release, or unwanted opening of the switch.



NOTE: a trip unit can be equipped with any Rating Plug with a rated current of up to I_n , i.e. the rated uninterrupted current of the circuit-breaker (indicate on the rating plate of the circuit-breaker).

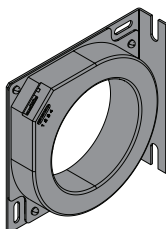
The release continuously checks for the presence of the Rating Plug, signalling its absence or any errors in assembly or installation.

Once mounted, when the release is energized, its installation is requested.

On the Touch, Hi-Touch, G Touch and G Hi-Touch releases to activate the residual current protection, it is necessary to mount a Rating Plug Rc. They are also available Rating Plug L = OFF, which allow you to cancel the protection L.

Further information on mounting the Rating Plug is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet [1SDH001000R0510](#).

Toroid S.G.R. SGR or Source Ground Return is the external homopolar current sensor that can be installed with the following releases: Ekip Touch, Hi-Touch, G Touch, and G Hi-Touch, LSiG version.



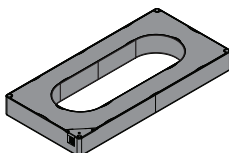
During programming of the release, its presence must be selected (see the menu **Settings, Circuit breaker, Earth protection**) that activates the protection against the Gext earth fault (see the menu **Advanced**).



IMPORTANT: Toroid S.G.R. can be selected as an alternative to the Rc type. Gext and Rc protections are therefore alternatives.

Further information on the connection of the S.G.R. toroid is available at the site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in kit sheet [1SDH001000R0507](#).

Rc Toroid Rc is the external residual current sensor, that can be installed with Ekip Touch, Hi-Touch, G Touch, and G Hi-Touch releases equipped with Rating Plug Rc Ekip Measuring Pro and Ekip Supply modules.



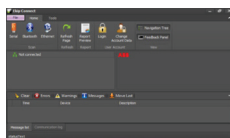
During programming of the release, its presence must be selected (see the menu **Settings, Circuit breaker, Earth protection**), that activates the Rc residual current protection (see the menu **Advanced**).



IMPORTANT: the Rc toroid can be selected as an alternative to the Gext sensor. Therefore the Rc and Gext protections are alternatives.

Further information on the connection of the Rc toroid is available at the site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in kit sheet [1SDH001000R0521](#).

Ekip Connect software



Ekip Connect is the free software for communication and testing of ABB low voltage circuit-breakers equipped with compatible releases, in particular Ekip releases.

It must be installed on PCs equipped with the Microsoft Windows® operating system by downloading it from the site <http://www.abb.com/abblibrary/DownloadCenter>.

With its communication function, it allows you to:

- Monitor the state of the circuit-breakers connected and record information.
- Execute the operation, reset, signalling commands, etc...
- Configure the protection releases with customized parameters.
- Configure the electronic accessories, connected to the release via Local Bus.
- Download information from releases equipped with Datalogger.
- Create communication reports.
- Reset configurations.

With test function, and Ekip T&P module (see page 103), it allows you to:

- Simulate fault conditions by performing manual or automatic tests.
- Perform trip tests.
- Create test reports.

Further information on the Ekip Connect application is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the manual [1SDH000891R0002](#).

Ekip Bluetooth module



The Ekip Bluetooth allows connection via Bluetooth between the Ekip releases, and a support (PC, tablet, or smart phone) with the Ekip Connect software installed the (see the previous paragraph).



IMPORTANT: the Ekip Bluetooth module can also be connected to the releases when in service.



NOTE: *Ekip Bluetooth only powers the release. Therefore, in order to set and to display information on any electronic accessories connected to the terminal box, these must be powered with an Ekip Supply module (see page 58).*

It draws its power from a rechargeable lithium-polymer battery supplied with the unit. It is connected directly to the front test connector of the release, and allows a release without auxiliary voltage to be powered.

It is switched on by pressing the power button on the side, and is equipped with two LEDs:

- The first lit in green with the device on and the battery charge, red with the device turned on and low battery.
- The second flashing blue with active Bluetooth communication.



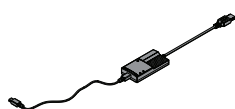
NOTE: *the red flashing LED indicates that battery is completely drained, an error condition, or malfunction of the module.*

The battery charging is performed by connecting the module to the USB ports of a PC with the supplied cable. Connection to a PC automatically switches the module on, and charging in progress is indicated by the flashing green LED, with increasing frequency as the level of charging rises. Completion of charging is indicated by the green LED on (fixed).



NOTE: *during recharging, the module must be kept energized.*

Further information on Ekip Bluetooth is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet [1SDH001000R0518](#), and in the Ekip Connect software manual [1SDH000891R0002](#).

Ekip T&P module

The Ekip T&P module is part of the Ekip T&P programming and test kit for Ekip releases, and allows you to:

- In the absence of auxiliary voltage, to supply the release.
- With Ekip Connect software (see page 102), access the information and the pages for programming the release, and to activate the test pages.



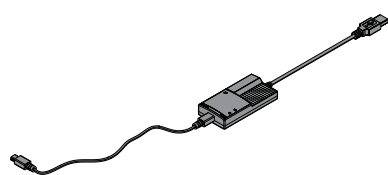
IMPORTANT: Ekip T&P can also be connected to the releases when in service. In the case of connection to releases in service, it is not possible to perform a trip test.



NOTE: *Ekip T&P only powers the release. Therefore, in order to set and to display information on any electronic accessories connected to the terminal box, these must be powered with an Ekip Supply module (see page 58).*

It draws its power from the PC, and connects one side directly to the test connector at the front of the release, and on the other to the USB ports of the PC with the cable supplied.

It turns on after connecting to the PC, and is equipped with two LEDs, a green one indicating that the module is on, and a yellow one indicating active communication.

Module Ekip Programming

Ekip Programming allows you to:

- In the absence of auxiliary voltage, to supply the release.
- With Ekip Connect software (see page 102), access the information and pages for programming the release.



IMPORTANT: Ekip Programming can be connected the releases also when they are in service.



NOTE: *Ekip Programming only powers the release. Therefore, to set and display the information for any electronic accessories connected to the terminal box, those accessories must be powered with an Ekip Supply module (see page 58).*

It draws its power from the PC, and connects one side directly to the test connector at the front of the release, and on the other to the USB ports of the PC with the cable supplied.

It turns on after connecting to the PC, and is equipped with two LEDs, a green one indicating that the module is on, and a yellow one indicating active communication.

Ekip TT module

Ekip TT is supplied as standard with Ekip Dip releases not mounted on a circuit-breaker, and with Touch, Hi-Touch, G Touch, and G Hi-Touch releases, and allows the following:

- Check that the opening mechanism of the circuit-breaker functions properly by commanding an opening by means of the test procedure.
- In the absence of auxiliary voltage and where the circuit breaker is open due to a protection tripping, power the release so that you can see which protection tripped either on the display or through the lighting of the corresponding LEDs.
- In the absence of auxiliary voltage, power the Ekip Touch, Hi-Touch, G Touch, and G Hi-Touch releases in order to set the protections.



IMPORTANT: Ekip TT can also be connected to the releases when in service. In the case of connection to releases in service, it is not possible to perform a trip test.



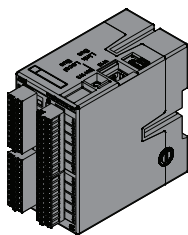
NOTE: *the Ekip TT only powers the release. Therefore, in order to set and to display information on any electronic accessories connected to the terminal box, these must be powered with an Ekip Supply module (see page 58).*

Draws its power from three AA alkaline batteries 1.5V, connects to the test connector at the front of the trip unit with the supplied cable, and is turned on by setting the side switch to ON.

It includes a led that is green when the device is energized and the batteries are charged, and red when the batteries are drained and need to be replaced.

Further information on Ekip TT is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet [1SDH001000R0519](#), and in the Ekip Connect software manual [1SDH000891R0002](#).

Ekip Signalling 10K modules



The Ekip Signalling 10K is an external signalling accessory module that can be installed on a DIN rail.

It can be installed in the presence of Ekip Dip, Touch, Hi-Touch, G Touch, and G Hi-Touch releases. It must be powered independently from the releases to which it is connected, and can be powered in AC at nominal 110...240 V AC, or in DC at nominal 24...48 V DC.



IMPORTANT: AC and DC power supplies cannot be present at the same time.

On the front it has:

- 10 contacts for output signals.
- 10 or 11 digital inputs.
- A power LED, and 20 or 21 signalling LEDs (one for each output/input).

It can communicate with the outside in two alternative modes:

- Via Local Bus, with a single release equipped with an Ekip Supply module (see page 58).
- Via Link Bus, with a maximum of four releases, each equipped with an Ekip Link module (see page 97).



IMPORTANT: the module can be connected only to internal Ethernet networks with one or more switchboards, to which releases or ABB Emax 2 accessories are connected. It is the installer's responsibility to ensure that all the necessary safety measures are adopted for all the connected devices (for example, the necessary access authorisations, and so on). The module cannot be connected to other Ethernet networks (for example, with the purpose of monitoring the system, or the office), or to the Internet.

With communication via Local Bus, unless the release is disconnected, the closing/opening of the contacts of the module is commanded by the release, and the information on the state of the inputs is transmitted by the module to the release. In particular, the trip unit can be programmed so that:

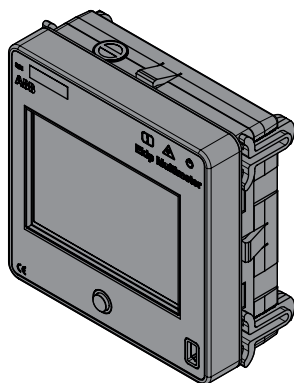
- The closing/opening of a contact corresponds to a desired event or combination of events detected by the trip unit.
- The activation of an input corresponds to an action by the trip unit.

With multiple 10-K modules connected via Local Bus to the same trip unit, these can be at most three, and must be configured differently as a 10K-1 a 10K-2 and a 10K-3.

With communication via Link Bus:

- The module is connected to a network on which the releases equipped with an Ekip Link module share data packets containing information on their state.
- The IP Addresses of the releases to which you wish to connect it must be inserted on the module, and each contact can be programmed so as to be closed/opened in correspondence to an event or combination of events regarding a connected release.
- If the module receives a packet sent by a trip unit connected, the module reads the contents of the packet, and initiates any programmed action.

Further information on Ekip Signalling 10K is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the manual [1SDH001318R0002](#).

Ekip Multimeter module

The Ekip Multimeter is a remote viewing unit on the front of the switchgear and is equipped with a touchscreen display.

It can be installed in the presence of Ekip Dip, Touch, Hi-Touch, G Touch and G Hi-Touch releases, with which it communicates via Local Bus. It must be powered independently from the release to which it is connected, and can be powered in AC at nominal 110... 240 V AC, or DC at nominal 24...48 V DC.

One release can communicate with a maximum of four Ekip Multimeters. On the other hand, the module can be connected to only one release.

In addition, the module makes an auxiliary voltage of 24 V DC available, which can be used to power the release. If the release is powered through Ekip Multimeter, the power supply must be applied directly on the terminal box of the circuit-breaker: in fact the Ekip Multimeter is sized in order to supply only the release, and therefore it is not able to supply sufficient power to supply an Ekip Supply module and any other electronic accessories connected to the terminal box.

In the case of connection to an Ekip Touch, Hi-Touch, G-Touch, and G Hi-Touch release, as well as displaying the measurements, the module also allows you to set parameters and the protection thresholds.

Further information on Ekip Multimeter is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet [1SDH001000R0520](#).

External neutral

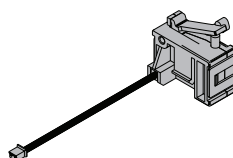
This is a current sensor for the neutral pole outside the circuit-breaker.

It is supported only for three-pole circuit breakers. It allows protection of the neutral to be implemented through connection to the Ekip release. It is supplied on request.

Further information on the connection of the external neutral is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the sheets:

- [1SDH001000R0506](#) for circuit breakers E2.2.
- [1SDH001000R0515](#) for circuit breakers E4.2 and E6.2.

Further information on the connection of the external neutral is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet: [1SDH001000R0506](#).

Contacts Ekip AUP

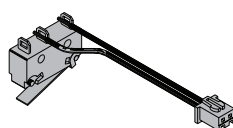
The communication modules are always supplied with dedicated Ekip AUP auxiliary position contacts, which in the case of a withdrawable circuit-breaker supply the inserted/extracted signal of the moving part from the fixed part.

The assembly assures that the position signalling is also maintained with the moving part withdrawn.



IMPORTANT: in the presence of multiple communication modules, only one of these can be connected to the Ekip AUP contacts.

Further information on assembling Ekip AUP modules and contacts is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet [1SDH001000R0603](#).

Ekip RTC contact

The communication modules are always supplied with an Ekip RTC auxiliary contact, which supplies the release with the signal indicating that the circuit-breaker ready to receive a close command.

Further information on the assembly of the Ekip RTC contact is available from the web site <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the kit sheet [1SDH001000R0604](#).

