SACE Emax 2

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

Instructions for using Ekip Touch protection trip units and Accessories.

ABB

Contents

Glossary

Term	Description
SACE Emax 2	New series of ABB SACE air circuit-breakers
CB	Circuit-breaker
Trip unit	Electronic unit connected to the CB, which provides measuring, monitoring and protection functions for the CB if faulty operating conditions occur. In the event of an alarm, it commands a TRIP
Ekip Touch	Trip unit for SACE Emax 2 CBs, equipped with touchscreen display and available in four different versions
Trip coil	CB opening actuator controlled directly by Trip unit
TRIP	Concluding action of protection timing or a test command which, except in special configurations applicable to the trip unit, coincides with activation of the trip coil, which instantly opens the bars of each pole and interrupts the circulating current
Vaux	Auxiliary power supply
4P / 3P / 3P + N	CB configuration: four-pole (4P), three-pole (3P) and three-pole with external neutral (3P + N)
If	Fault current measured by Trip unit, useful for calculating the trip time t_t

Introduction

1 - Contents

Overview This manual describes the characteristics of the Ekip Touch Trip units installed on SACE Emax 2 CBs, among which:

1. general overview:
2. operating conditions
3. consultation of menus for changing parameters and displaying measurements
4. overview of protections, measurements, parameters and main accessories
5. management operations: maintenance, troubleshooting

Integrated informations A full description of Ekip Touch is available in document **1SDH001330R1002** (Emax 2 engineering manual) available on the website ABB library.

recipients This manual refers to two user profiles, as defined by standard IEC 60050:

- skilled person, in the electrical field (IEV 195-04-01): person with relevant education, training, knowledge and experience to enable him or her to perceive risks and to avoid danger which electricity can create
- instructed person, in the electrical field (IEV 195-04-02): person adequately advised or supervised by electrically skilled persons to enjable him or her to perceive risks and to avoid danger which electricity can create

> **IMPORTANT: operations which can be performed by persons trained on the subject of electricity are specifically indicated in this manual. All the remaining operations described in this manual must be performed by skilled persons, in the field of electricity.ABB declines all liability for damage to persons or property caused by failure to comply with the instructions in this document.**

Specifications and supporting documents To ensure that Ekip Touch is installed and configured correctly, please read the information in this manual and in the technical documentation of the product, supplied with the circuit-breaker or available in the website **ABB LIBRARY**

Document	Description
1SDH000999R0002	Installation, operation and maintenance instructions for Sace Emax E1.2 CBs and Ekip Dip Trip units
1SDH001000R0002	Installation, operation and maintenance instructions for Sace Emax E2.2-E4.2-E6.2 CBs and Ekip Dip Trip units
1SDH001330R1002	Manual for design engineers with full information about the trip units and accessories for Emax 2
1SDH001140R0001	Communication System Interface for Emax 2 CBs
1SDC200023D0906	Sace Emax 2 CBs General catalog
1SDM000091R0001	Sace Emax 2 CBs Circuit diagrams

> ⚠ **WARNING! carefully read the instructions for putting into service and maintenance given in the installation manuals 1SDH000999R0002 (for E1.2) or 1SDH001000R0002 (for E2.2-E4.2-E6.2).**

Design notes The information in this manual was written in Italian and then translated into other languages to conform to the laws and/or commercial requirements concerning the product.

2 - Safety

Safety requirements

Figure 1

⚡ **HAZARD! RISK OF ELECTRIC SHOCK! In accordance with the local laws in force, disconnect all the electricity supplies when Ekip Touch is being assembled, installed, serviced or decommissioned if persons who are not authorized to work in live installations are present.**

⚠️ **WARNING!**

- detailed descriptions of the standard installation, operation, maintenance procedures and principles for working safely are not included; it is important to note that this document contains indications about safety and caution, against certain methods (concerning installation, operation and maintenance) which could cause imjuries to the personnel, damage devices or make them unsafe
- these warnings and alarms do not include all the conceivable methods of performing the installation, operation and maintenance operations recommended by ABB and others, which could be performed, or the possible consequences and complications of each conceivable method, neither will ABB investigate all those methods
- anyone who is implementing procedures or using maintenance devices recommended by ABB or not must check carefully that neither their personal safety nor the safety devices are endangered by the installation, operation, maintenance method or by the tools used; contact your nearest ABB representative for further information, explanations or specific problems
- this manual is written for qualified personnel only and is not intended to replace an adequate training course or experience concerning the safety procedures of this device
- regarding products equipped with communication systems, the purchaser, installer or end customer are responsible for applying all the IT security measures to prevent risks deriving from connection to communication networks; among others, these risks include use of the product by unauthorized persons, alteration of its normal operation, access to and modification of the information
- the purchaser, installer or end customer are responsible for ensuring that safety warnings and notices are affixed and moreover, that all points of access and operating devices are securely blocked when the switchgear is left even momentarily unattended
- all information in this document is based on the latest product data available at the time of printing. We reserve the right to make changes to the document at any time and without prior notice.

Warnings

⚠️ **WARNING! READ THIS MANUAL WITH CARE BEFORE INSTALLING, OPERATING OR REPAIRING THE CIRCUIT-BREAKER**

- file this manual with all the other available documents concerning the circuit-breaker
- to facilitate the work, these documents must be readily available when the CB is installed, operated and serviced
- the unit must be installed in accordance with the environmental, electrical and mechanical limitations described in the product documentation
- this circuit-breaker has been designed to operate with voltage and current values within the rating plate limits: do not install in systems that operate at values exceeding these rated limits
- comply with the safety procedures required by your Company.
- do not open covers or doors, do not work on devices before having disconnected all circuits from the electricity sources and after having made sure of this with a measuring instrument

Overview of Ekip Touch

1 - General characteristics

Families SACE Emax 2 can be configured to operate with two Trip unit families:

- Ekip Dip with interface via dip-switches
- Ekip Touch with touchscreen display

Both families provide protection and measuring functions related to signals from the installation and are available in different models and versions.

There are four Ekip Touch models available:

- Ekip Touch
- Ekip Hi-Touch
- Ekip G Touch
- Ekip G-Hi Touch

All Ekip Touch models are also available in the version with LCD display for installations situated in particularly aggressive environmental conditions.

A description of Ekip Dip is given in manuals **1SDH000999R0002**, **1SDH001000R0002** and **1SDH001330R1002**.

Main functions The Ekip Touch Trip unit provides the following functions:

1. *Measurement*: measurement of different quantities, such as: current, voltage, power, energy
2. *Protection*: depending on the measurements made and the parameters configured by the user, the Trip unit checks for the presence of alarms and commands circuit-breaker opening if necessary
3. *Signalling*: management of contacts and communication networks to optimize plant efficiency, communication among different CB and other functions

The Ekip Touch functions are provided both by means of transducers and actuators inside the circuit-breaker, and by means of a vast range of external accessories

Presentation

Figure 2

Ekip Touch has a touchscreen display (**1**) for accessing the configuration menus and checking parameters, measurements and information (page 12).

The nominal size of the Rating plug (**2**) can be checked on the front.

All the external connections, including the supply and communication modules, the external sensors and mechanical accessories, are available in the upper terminal box (**3**) (page 8 for an overview of the electronic accessories).

2 - Models and Versions

Default functions and extensions

Every Ekip Touch module has default measurement and protection functions, which can be extended with the aid of additional software packages.

The extensions (additional SW packages) can be pre-engineered when the circuit-breaker is ordered or at a later date (in this case, via ABB Ability Marketplace ™

Overview

Figure 3

Model	Ekip Touch	Ekip Hi-Touch	Ekip G Touch	Ekip G Hi-Touch
Versions	LSI, LSIG	LSI, LSIG	LSIG	LSIG
Standard protections	X	X	X	X
Voltage protections	O [1]	X	X [3]	X
Voltage advanced protections	O [1]	O	X [3]	X
Frequency protections	O [1]	X	X [3]	X
Power protections	O [1]	X [3]	X [3]	X
ROCOF protections	O [1]	O	O	X
Adaptive protections	O	X	O	X
Standard Measurements	X	X	X	X
Ekip Measuring Measurements	O	X	X	X
Class 1 Power & Energy Metering	O [2]	X	X	X
Datalogger	O [1]	X	X	X
Network Analyzer	O [1]	X	O	X

X = Available by default; O = Optional

[1] Configurable if Measuring Measurements package is present

[2] Only available at the time circuit-breaker is ordered

[3] Certain protections of the complete package are available by default; the remaining ones can be activated on request
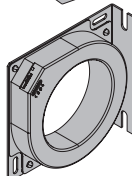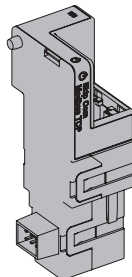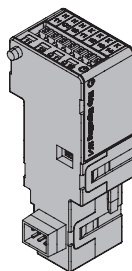
Description

Lists of the main characteristics of the protections and measurements of each package are given in the next chapters.

A description of the Datalogger and Network Analyzer functions is available in manual **1SDH001330R1002**.

3 - Accessories and software

Internal and external accessories

The functions of Ekip Touch can be expanded by further internal and external accessories, which differ as to function and assembly position.

Details of each module are available in manual **1SDH001330R1002**.

Internal modules

Name	Function
Measurement [1]	Measurement and supply from installation voltages
Ekip Signalling 4K [2][5]	Programmable digital inputs/outputs
Ekip LCD	LCD interface for aggressive environments
Rating Plug [3]	Defines rated current In

External modules for assembly in upper terminal box[5]:

Name	Description
Ekip Supply	Power supply of Trip unit and modules in terminal box
Ekip Com [4]	Communication between Trip unit and external buses (various protocols)
Ekip Link [4]	Communication between Trip units via an intranet with ABB proprietary protocol
Ekip Signalling 2K	Programmable digital inputs/outputs
Ekip Signalling 3T	Measurement from current loop and temperature sensors
Ekip Synchrocheck	Measurement of an external voltage and management of synchronism between two supply sources

Other external modules and accessories:

Name	Description
Ekip Signalling 10K [5]	Programmable digital inputs/outputs
Ekip Multimeter [5]	Panel front display
Sensor S.G.R.	Sensor for protection from earth fault currents
Toroid Rc	Sensor for protection from residual currents
External neutral	Sensor for protecting the external neutral line with 3P circuit-breaker

In addition, the supervision, configuration and reporting functions are provided by further modules for temporary communication and supply:

Name	Description
Ekip TT	Supply and tests
Ekip T&P	Supply, communication, programming and tests
Ekip Programming	Supply, communication and programming
Ekip Bluetooth Key	Bluetooth communication and programming

[1] Version and availability of the module depend on the Trip unit model and on activation of the measurements package
[2] Configurable with circuit-breakers E2.2, E4.2 and E6.2
[3] Assembled by default at the time equipment is ordered; can be replaced afterwards with a model of a different size
[4] Always supplied with contacts Ekip AUP and Ekip RTC
[5] auxiliary supply is required and, for terminal box models, the presence of Ekip Supply

Additional functions

Ekip Touch can be equipped with further software configurations compliant with different functional applications:

- Power Controller
- Load Shedding
- Interface protections (IPS)
- Synchro reclosing
- Embedded ATS

For details consult the *Technical catalog* or the summary documents of each function (page 9).

Supporting software and documents

Different softwares and documents are available; the majority are free of charge and are designed to facilitate, optimize and extend the functions and configurations of Ekip Touch in your installation:

> ℹ️ **NOTE:** *some of the documents mentioned in the next table refer to SACE Emax 2, but can also be used with SACE Tmax XT7*

Ekip Connect 3

ABB software to interface with Ekip Touch and other low voltage devices **(Link)**

EPiC

ABB APP to interface with Ekip Touch using a smartphone / tablet via Bluetooth **(Link)**

Ekip View

ABB software which supervises the communication network, analyzes the trend of the electricity values and monitors the plant conditions **(1SDH001276R0001)**

> ℹ️ **NOTE:** *the link launches the software package download, which requires about 1.3 Gb of space.*

e-Design

ABB software suite **(Link)** which includes the following tools:
- DOC, to design the single-line diagrams of low and medium voltage electrical installations, choose the operating and protection devices and check and coordinate the protections
- CAT, for technical / commercial cost estimating of ABB products
- Curves, for drawing, calibrating and printing the trip curves of the protection devices
- OTC, for assessing the thermal behavior of the switchgear and sizing its fans and air conditioners
- UniSec, for configuring medium voltage switchgear

Front CAD

Software comprising libraries of block graphics for ABB panel-making products to be used with the latest versions of AutoCAD, AutoCAD LT, IntelliCAD **(Link)**

> ℹ️ **NOTE:** *the link launches the software package download, which requires about 190 Mb of space.*

Ekip Link

Introduction to the *Ekip Link* switchgear monitoring system **(1SDC200031L0202)**

Network Analyzer

Introduction to the *Network Analyzer* measuring and analysis system **(1SDC200037L0202)**

Adaptive protectionsProtezioni adattive

White paper on adaptive protections **(1SDC007116G0201)**

Generator protections

White Paper on generator protections **(1SDC007409G0202)**

Power Controller

White Paper on the *Power Controller* function **(1SDC007410G0202)**

IPS

White paper on the Interface protection System (IPS) and Interface Device (DDI) **(1SDC007117G0202)**

Load shedding

White paper on Load Shedding - Load shedding priority **(1SDC007119G0201)**

Synchronism and reclosing

White paper for *Synchro reclosing* synchronization solutions **(1SDC007118G0201)**

White Paper on ATS systems for applications which require continuity of service **(1SDC007115G0202)**

Handbook

General overview of electrical installations **(1SDC010002D0206)**

4 - Operating features

Introduction

Ekip Touch has been developed and certified to function in specific environmental, electrical and mechanical conditions; full details are available in the *Technical catalog*.

The following sections describe the electrical and power supply characteristics that enable Ekip Touch and the relative electronic accessories to operate correctly.

Electrical characteristics

The Ekip Touch measurement and protection functions described in this document are provided with primary voltage and current values within the following nominal ranges:

Parameter	Rated operating range
Primary current	0,004 ÷ 16 In [1]
Primary voltage	5 ÷ 690 V AC [2]
Rated frequency	45 ... 55 Hz (with fn= 50 Hz) / 54 ... 66 Hz (with fn= 60 Hz)
Peak factor	Complying with standard IEC 60947-2

[1] range with reference to each phase; In refers to the rated size defined by the Rating plug installed on the Trip unit, available in models from 100 A to 6300 A

[2] rated highest line-to-line voltage connected directly to Trip unit, also to sockets inside the CB; external transformers must be used for higher voltage values, consult the chapter dedicated to the Measurement modules

Self-supply

The internal current sensors are able to supply the Trip unit directly; versions Hi-, G, G Hi- are also fitted with the *Measurement enabler with voltage sockets* module, which allows the Trip unit to be supplied by the installation voltages as well:

Parameter	Operating limits
Minimum three-phase turn-on current	> 30 A (E1.2-E2-2-E4.2 with Rating Plug < 400 A)
	> 80 A (E1.2-E2-2-E4.2 with Rating Plug ≥ 400 A)
	> 160 A (E6.2)
Minimum three-phase turn-on voltage	> 80 V

Auxiliary power supply

Ekip Touch can be connected to an external auxiliary supply source, which is useful when certain functions such as communication via Local Bus, recording manual operations, certain measurements and the datalogger must be activated.

The auxiliary supply can be provided by modules from the *Ekip Supply* range or by direct connection to the terminal box.

Direct connection must guarantee the following operating conditions:

Parameter	Operating limits
Voltage	24 V DC galvanically isolated
Tolerance	±10%
Maximum ripple	±5%
Maximum inrush current @ 24 V	10 A per 5 ms
Maximum rated power @ 24 V	4 W
Connection cable	Insulated with grounding cable (same characteristics as Belden 3105A/B or higher)

🛈 **IMPORTANT: if connection is direct, the power supply must be galvanically insulated and provide the insulation characteristics established by standard IEC 60950 (UL 1950) or equivalent.**

Interface and menus

1 - Presentation of interface

Functions   The Ekip Touch operator interface allows you to:
- display signals and measurements of the functions in progress or recorded events
- configure the parameters, the protections present and other functions of the unit
- set parameters concerning the accessory modules connected
- perform tests

Components   The Ekip Touch interface includes a touchscreen, short-cut push-buttons, status leds and a service connector for certain external accessories:
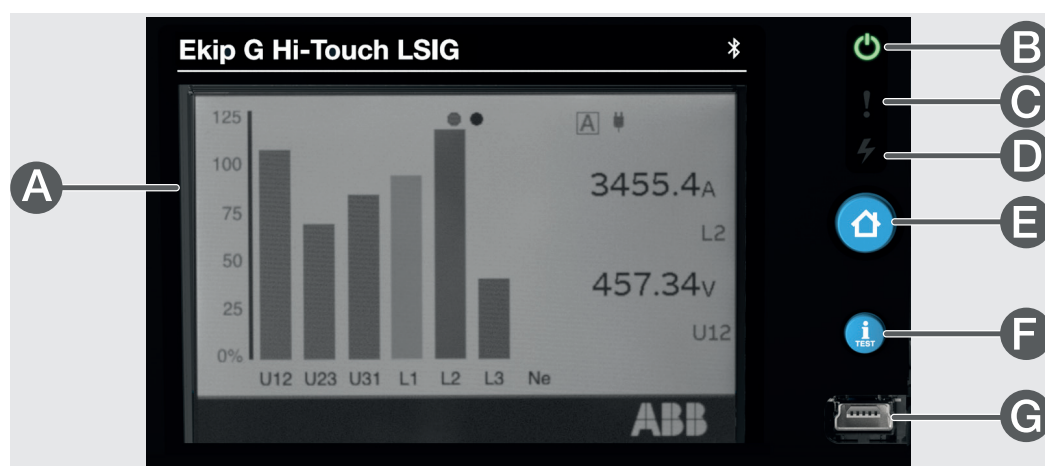
Figure 4

Pos.	Description
A	Single-touch color touchscreen display
B	**Power** led
C	**Warning** led
D	**Alarm** led
E	**HOME** push-button
F	**iTEST** push-button
G	Service connector

Display   The touchscreen display of Ekip Touch is the single-touch, color type.

The touchscreen function is active when the unit is on.
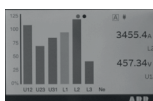
LEDs

LEDs	Colour	Description
Power ⏻	Green	Indicates the on status of Ekip Touch: • off: no power and unit off • on, steady (*Power mode*) or flashing (*Alive mode*): unit on and self-supplied by external *Vaux* or service connector The *Power mode* or *Alive mode* can be selected via Ekip Connect: if the *Alive mode* has been selected and external modules are connected, the Power leds of Ekip Touch and the modules flash in the synchronized mode.
Warnings !	Yellow	Signals that certain alarms are present: • off: no alarm • on steady: prealarm of an active protection or status contacts error • two flast flashes every 0.5 s: trip unit parameter configuration error • fast flash: *Rating Plug* or *Measurement* module installation error
Alarm ⚡	Red	Signals that an alarm is present: • off: no alarm • on steady: on steady signals a TRIP due to a protection • on flashing: protection timing tripped or alarm due to disconnection of a current sensor • two flast flashes every 2 seconds: *Rating Plug* error • on with fast flashing: protection timing tripped or alarm due to disconnection of a current sensor

If on at the same time, the Warning and Alarm leds provide further signals:
- leds on with fast flashing: no communication between display and *Mainboard*
- leds on with slow flashing: internal error
- leds on and steady internal configuration error

These cases need assistance from ABB.

Push-buttons

Push-button	Description
HOME ⌂	Allows different areas of the menu to be accessed: • from pages: *HOME, Histograms, Measuring instruments, Measurements, Main measurements* -> open: *Main page* • from pages: *Main page, Alarm list*, at any point of the menu area -> open: *HOME* page
iTest ⓘ	Allows certain pages of information about the unit to be rapidly consulted; press the button in successionj to display the following pages: • *Alarm list*, if messages are present • *Info*, if Customer Page option is active • *Protection unit*, with information about Ekip Touch • *Circuit breaker*, with information about the CB • *Last trip*, with information about the last trip, if available Consultation is active from pages: *HOME, Histograms, Measuring instruments, Measurements, Main measurements* ⓘ **NOTE**: *with Ekip Touch off and the internal battery charged, press* **iTEST** *to temporarily switch on the Power led and, in the case of a trip, the display with information about the trip protection and the Alarm led*

Service connector

The service connector enables Ekip Touch to be connected to *Ekip TT*, *Ekip T&P* and *Ekip Programming*, allowing the unit to be temporarily supplied, parameter configuration prior to putting into service, tests and extension of the configuration functions.

🚫 **IMPORTANT: only use cables supplied by ABB or with ABB accessories**

2 - Navigation

Levels and pages   The Ekip Touch menu is divided into several levels, all accessible using the touchscreen display and buttons available in the units:

Level 1 (HOME)

Page shown on power up; appears when push-button of the same name appears, as described on page 13; from here you can:

1. access the *MAIN PAGE* (level 2), by pressing the **HOME** button

2. access the *Alarm list*, by selecting the diagnostic bar at the bottom

3. access the *Summary pages* of some of the measurements by pressing on the edges
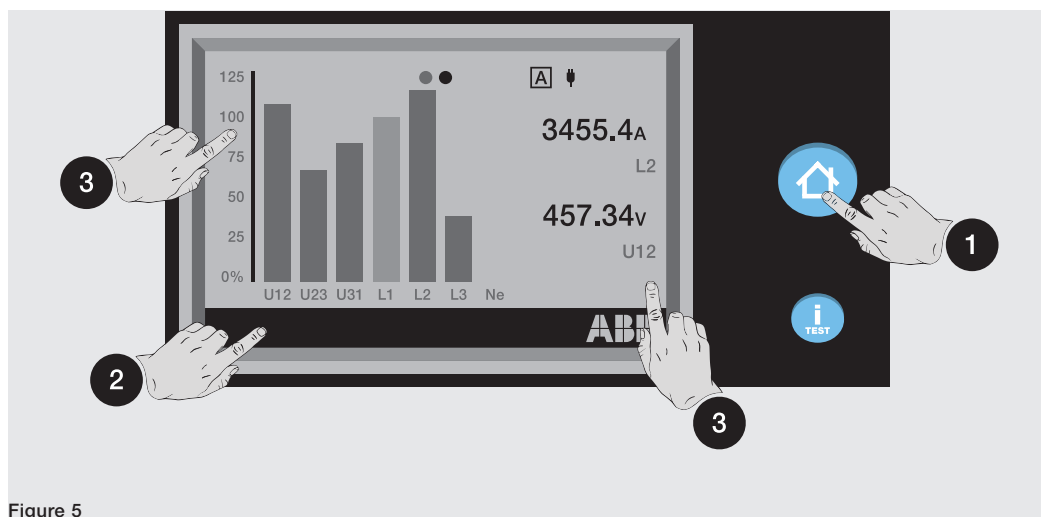
Figure 5

> **NOTE:** *Ekip Touch is supplied with the Histograms page configured as HOME; if the configuration is different, the Histograms can be set as the main page by pressing and holding the HOME key for five seconds and confirming the message on the display*

Level 2 (MAIN PAGE)

This page allows you to:

4. access one of the graphic pages: *Histograms*, *Measuring instruments* and *Measurements*

5. access the MENU AREA (level 3)

Figure 6

Level 3 (MENU AREA):

You can access all the configuration menus and consult the parameters in this page

    6. *Protections and Advanced*

    7. *Measures*

    8. *Settings*

    9. *Test*

    10. *About*
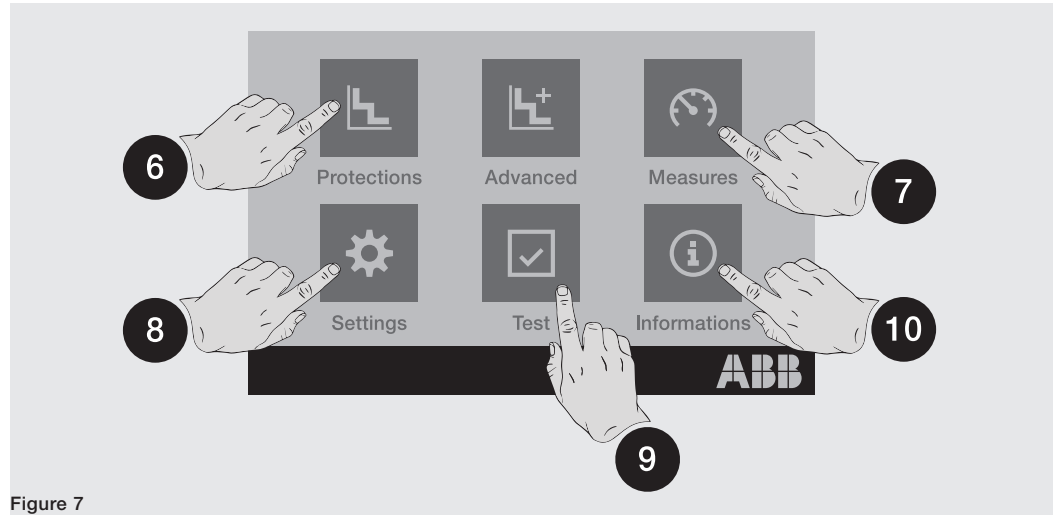
Figure 7

LEVEL 4 (MENUS and SUBMENUS)

Selection of one of the level 3 menus accesses a set of submenus with the list of available options, which are organized into several levels through to details of the specific parameter.

Each submenu has a command for returning to the previous menu (11); if the list contains more than five options, there is also a scroll bar (12) for full consultation.

Figure 8

To consult a parameter, it just needs to be selected.

Consult the dedicated section for instructions on how to configure and save the parameters (page 24).

3 - Graphic pages

Histograms The page displays the histograms of the current and voltage measurements acquired in real time and certain status information:
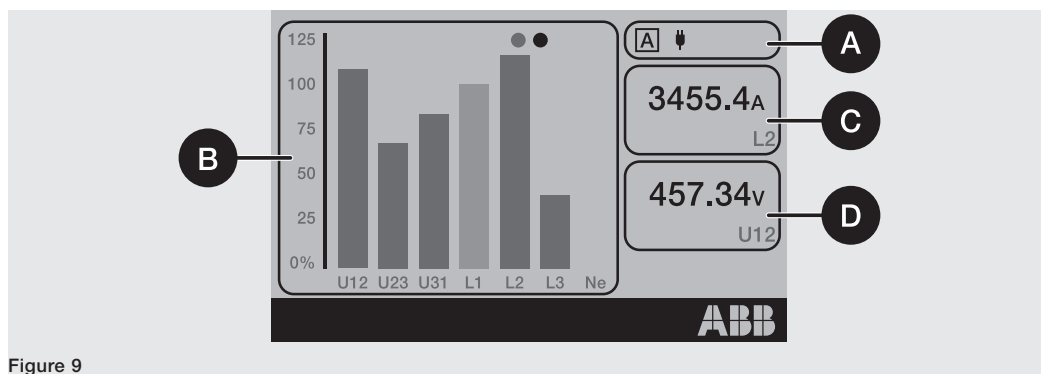
Figure 9

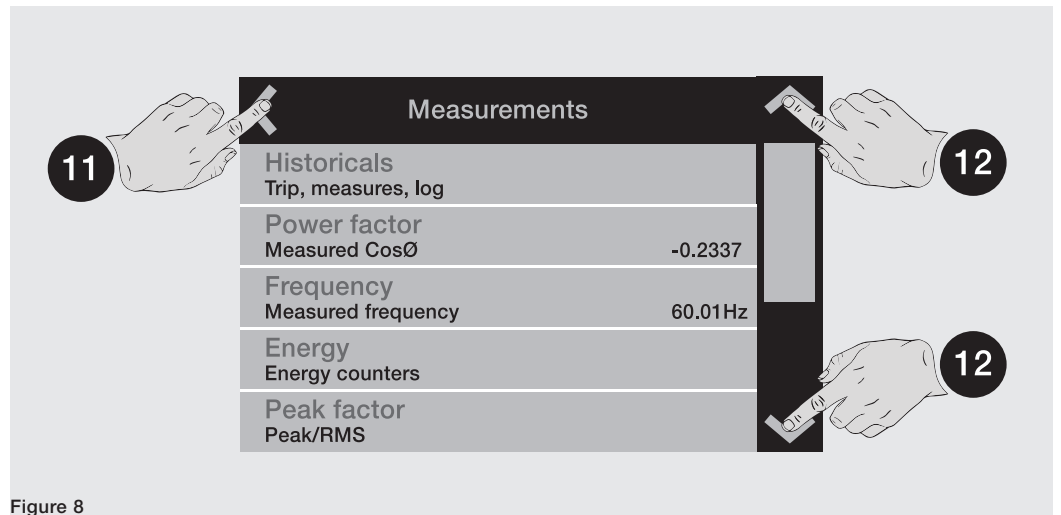| Pos.	Description	
A	Up to four information icons are available:	
	A or B (icons)	The letter corresponding to the active configuration is displayed if *Adaptive Protections* package is present and with *Dual Set enabled*;
	plug o pen (icons)	External power supply present (*Vaux* or through a service connector); the plug icon indicates *Vaux*
	(module icon)	Remote parameter writing configuration activre, modules *Ekip Com* connected, *Vaux* present
	(bluetooth icon)	Bluetooth communication activated
B	Histograms of the voltage and current measurements acquired in real time. The bar of each signal is represented in scale 0 to 125 % with reference to the rated current and voltage values of the, and can be of three colors: • light blue: no protection in alarm status • yellow: one of the tripped protections is in prealarm status with respect to set thresholds • red: one of the tripped protections is in alarm status with respect to set thresholds *(i)* **NOTE:** *Histogram Ne is available with 4P or 3P + N configurations*	
C	Maximum phase current measured in real time	
D	Maximum line-to-line voltage measured in real time	

Summary page Press on the sides of the display (**1**) from the Home page to access further summary pages for certain measurements:

- *Main measurements* page: maximum phase current, maximum line-to-line voltage, power factor, total active/reactive/apparent powers
- *Ekip Synchrocheck main measurements* page (when module is present): Int and Ext frequencies and voltages, phase difference, synchronism status (page 21)
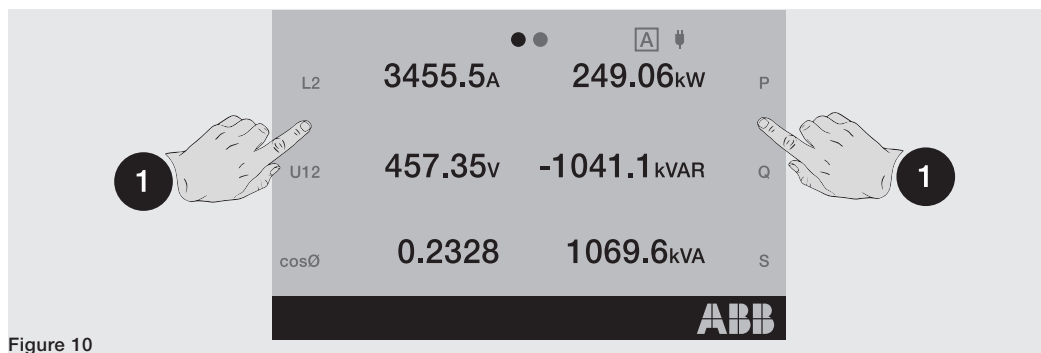
Figure 10

(i) **NOTE:** *both pages can be set as the main page by pressing HOME, holding it for five seconds and confirming the message on the display*

Measuring instruments
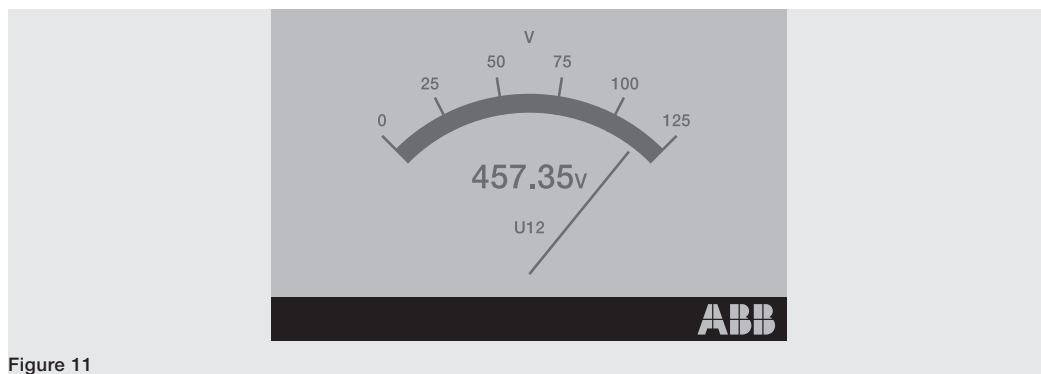
Figure 11

Depending on the Trip unit model, certain measurements acquired in real time are shown on these pages by means of a pointer; each page displays a specific measurement:

Page	Measurement type page	Unit of measurement/indicator
1	Maximum phase current	A
2	Maximum line-to-line voltage	V
3	Total active power	kW
4	Total reactive power	kVAR
5	Total apparent power	kVA

The scale of values ranges from 0 to 125 % and refers to the rated values set (for powers: rated current x rated voltage x √3).

Press on the sides of the display to browse the pages; quit the *Measurement tools* section with the **HOME** key.

Page orientation (horizontal by default) can be changed in the *Settings* menu.

NOTE: *each page can be set as the main page by pressing HOME, holding it for five seconds and confirming the message on the display*

Measurements
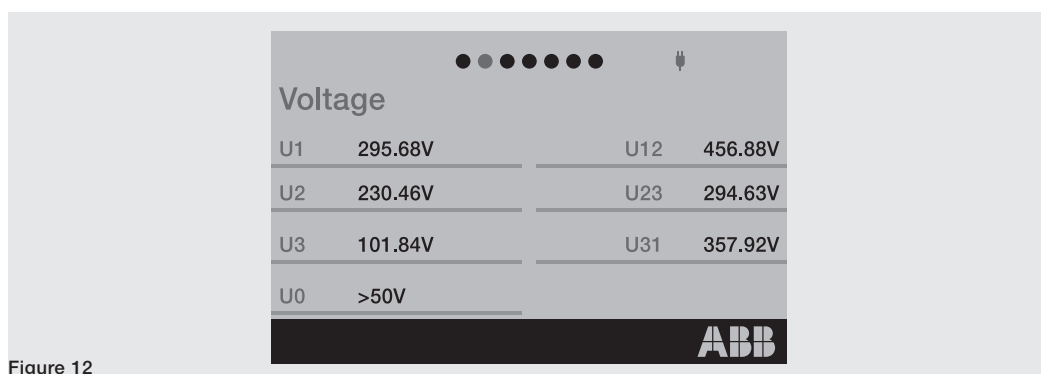
Figure 12

If provided for by Trip unit model, the **Measurements** pages contain a list of measurements acquired in real time, expressed in absolute value:

Page	Name	Measurements
1	Current	Currents: phase, earth fault, external/Rc earth fault
2	Voltage	Voltages: line-to-line, phase, neutral
3	Active power	Phase and total active powers
4	Reactive power	Phase and total reactive powers
5	Apparent power	Phase and total apparent powers
6	Energy counters	Total active, reactive and apparent energies
7	Power Controller	Power Controller measurement summary, if installed
8	Load shedding	Summary of Load Shedding measurements, if present
9	Ekip Signalling 3T	Summary of *Ekip Signalling 3T* module measurements, if present

Ekip Touch configuration involves certain exceptions:
- the Ne current measurements are available with 4P and 3P + N configurations
- the phase voltage measurements are available with the 4P and 3P + active external neutral voltage configuration
- with the 3P configuration, pages: *Active Power, Reactive Power and Apparent Power* are replaced by the *Powers* page with the total active, reactive and apparent power measurements
- Ige/Rc current available with external sensor activated
- *Power Controller* page available with Power Controller function activated
- *Load Shedding* available with Load Shedding function activated

Press the sides of the display to browse the pages; press the **HOME** key to quit.

i   **NOTE:** *each page can be set as the main page by pressing HOME, holding it for five seconds and confirming the message on the display*

Diagnosis bar and Alarm list   The Diagnosis bar lists the faults detected by the unit. It shows a detail of each alarm for about two seconds.

Figure 13

Select the bar to access the *Alarm List* page, with the list of alarms present.
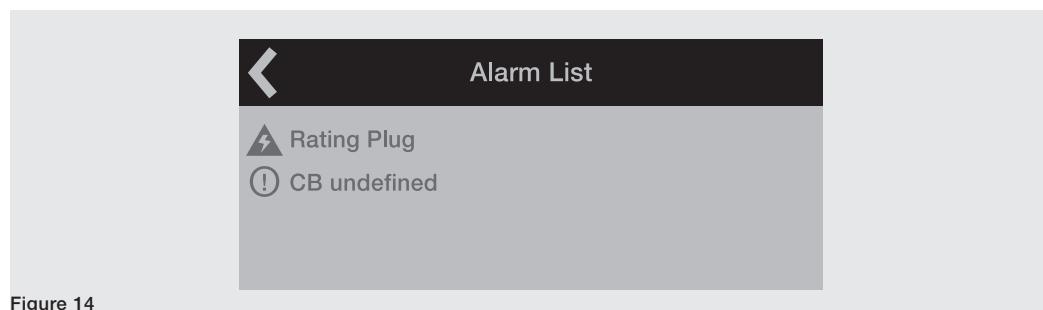
Figure 14

i   **NOTE:** *the Alarm List page also appears when the iTEST button is pressed in the cases provided for and described on page* **13**

Each signal is followed by an icon that identifies the type of alarm:

Icon	Alarm type
	Alarm
	Warning, error or prealarm
	About
	Timing due to tripped protection

The complete list of alarms is given on page 50.

4 - Menu

Introduction   Press **Enter** or **ESC** from the main page to access the different menus of the Trip unit.

The menus are the 4th level pages that can be dislpayed and comprise list of:
- submenus
- settable parameters
- information and measurements
- commands that can be executed

Selection of each menu item enables: access to submenus, consultation of information in detail, configuration of a parameter, execution of a command.

Elements of each item   The items in each list consist of:
- main name (white color)
- additional description or set value (light blue color)

Main frequency

60 Hz
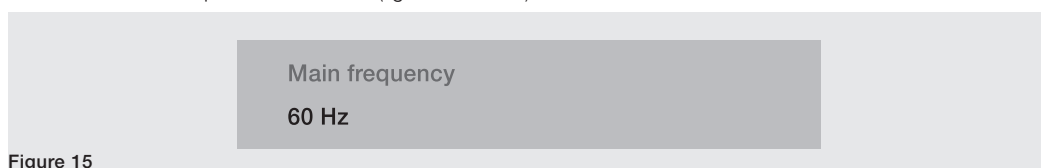
Figure 15

Protections Menu   The *Protections* menu can be used to configure the following protections [1]:

Name	Parameters	SW package
L	Description and list in manual 1SDH001330R1001	Standard Protections
S	Description and list in manual 1SDH001330R1001	
S2	Description and list in manual 1SDH001330R1001	
I	Description and list in manual 1SDH001330R1001	
G [2]	Description and list in manual 1SDH001330R1001	
Gext [2]	Description and list in manual 1SDH001330R1001	[3]

[1] if the *Adaptive Protections* package is available and *Dual set* has been activated, an intermediate menu where the set can be selected (Set A / Set B) will be available before the list of protections
[2] available for LSIG versions
[3] available if the presence of sensor S.G.R. has been activated previously

Advanced menus
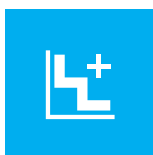
The *Advanced* menu can be used to configure the following protections [1]:

Name	Parameters	SW package
MCR	Description and list in manual 1SDH001330R1001	Standard Protections
2I	Description and list in manual 1SDH001330R1001	
IU	Description and list in manual 1SDH001330R1001	
UV [2]	Description and list in manual 1SDH001330R1001	Voltage protections
OV [2]	Description and list in manual 1SDH001330R1001	
UV2 [2]	Description and list in manual 1SDH001330R1001	
OV2 [2]	Description and list in manual 1SDH001330R1001	
VU [2]	Description and list in manual 1SDH001330R1001	
S(V) [2]	Description and list in manual 1SDH001330R1001	Voltage Advanced protections
S2(V) [2]	Description and list in manual 1SDH001330R1001	
RV [2]	Description and list in manual 1SDH001330R1001	
UF [2]	Description and list in manual 1SDH001330R1001	Frequency protections
OF [2]	Description and list in manual 1SDH001330R1001	
UF2 [2]	Description and list in manual 1SDH001330R1001	
OF2 [2]	Description and list in manual 1SDH001330R1001	
RP [2]	Description and list in manual 1SDH001330R1001	Power protections
D [2]	Description and list in manual 1SDH001330R1001	
RQ [2]	Description and list in manual 1SDH001330R1001	
OQ [2]	Description and list in manual 1SDH001330R1001	
UP [2]	Description and list in manual 1SDH001330R1001	
OP [2]	Description and list in manual 1SDH001330R1001	
ROCOF [2]	Description and list in manual 1SDH001330R1001	ROCOF protections
V DIR, VINV [2]	Description and list in manual 1SDH001330R1001	Interface protections (IPS)
59 S1 [2]	Description and list in manual 1SDH001330R1001	
Warnings	*VS Warning, FS Warning, FW1 Warning*	
Signallings	*Threshold 1 I1, Threshold 2 I1, Threshold Iw1, Threshold Iw2, Phase Sequence [2], CosØ [3]*	Standard Protections
Functions	*External Trip, Trip Reset, Switch On SET B [4]*	
Synchrocheck	Description and list in manual 1SDH001330R1001	[5]
RC	Description and list in manual 1SDH001330R1001	[6]

[1] if the *Adaptive Protections* package is available and *Dual set* has been activated, an intermediate menu where the set can be selected (Set A / Set B) will be available before the list of protections The only menu always present via *Advanced* is *Functions*

[2] available if provided for by Trip unit model or if the relative SW package has been activated, where possible (page 6)

[3] CosØ available if provided for by Trip unit model or if the *Power Protections* package has been activated

[4] *SET B* available when *Adaptive Protections* package is present

[5] available when *Ekip Synchrocheck* is present

[6] available when *Rating Plug* type *Rc* is installed in unit and when presence of *Rc sensor Rc* has been previously activated in Settings menu

Measurements Menu

Menu	Submenus	Description
Historicals	*Trip*	TRIP list
	Events	List of events recorded
	Measurements	Minimum and maximum currents recorded
Power factor [1]	-	Power factor measurement
Frequency [1]	-	Frequency measured
Energy [1]	*Energy counters*	Measurement of energies
	Reset counters	Meter reset command
	Energy RESET	Energy reset command
Peak factor [1]	-	Peak factor of each phase
Harmonic dist.	-	Activation command for current harmonic distortion monitoring
Ekip Synchrocheck [2]	-	Measurements associated with module
Network Analyzer [3]	*V Sequences*	Measurements associated with Network Analyzer function: list and description in dedicated chapter
	3s V Sequences	
	THD Current	
	THD Voltages	
	Counters	
	Waveforms	
Maintenance	*Contact Wear*	Installation and maintenance dates and commands
	LastServiceContactWear	
	Installation	
	Last Maintenance	
	Service RESET	

[1] available if provided for by Trip unit model or if SW Measuring Measurements package has been activated

[2] available when Ekip Synchrocheck module is present

[3] available if provided for by Trip unit model or if Network Analyzer SW package has been activated

Settings Menu

Menu	Submenus	Description and parameters
Circuit Breaker	*Configuration*	Phase number selection
	Hardware Trip	Protection activation command
	T Protection	Protection activation command
	Neutral Protection [2]	*Enable, Neutral threshold*
	Earth protection [7]	External sensor configuration
	Installation	Installation of modules
Main Frequency	-	Grid frequency configuration
Phase Sequence	-	Phase sequence configuration
Modules	*Local/Remote*	Parameter writing configuration
	Local Bus	Configuration of local bus presence
	Modul x [3]	Details in chapters of each module
	BLE	LV communication configuration
	Functions	*Switch On LOCAL, Signalling RESET*
Monitor time	-	Measuring range configuration
Test Bus	-	Test bus activation
Power Controller [4]	*Enable* [5]	Function enabling and parameters: see manual 1SDH001330R1001
	-	
Load Shedding [4]	*Enable* [5]	Function enabling and parameters: see manual 1SDH001330R1001
	-	
Network Analyzer [6]	*Enable* [5]	Function enabling and parameters: see manual 1SDH001330R1001
	-	
Datalogger [6]	*Enable* [5]	Function enabling and parameters: see manual 1SDH001330R1001
	-	
Dual Set [6]	*Enable* [5]	Function enabling and parameters
	Default set	
System	Date	Configuration of unit date
	Time	Configuration of unit time
	Language	Configuration of menu language
	New PIN	PIN Configuration
View	-	Representation parameters of menus and measurements: see manual 1SDH001330R1001
Functions	YO Command	*Function, Delay*
	YC Command	
Maintenance	*Alarms*	Activation of maintenance signals

[1] with CB in 3P configuration

[2] available with CB in 4P or 3P with neutral configuration

[3] the menu populates with the list of accessory modules detected by the unit with Local Bus activated and in the envisaged connection and supply conditions

[4] available if the function has been installed in the Trip unit

[5] additions are only made to the list of the specific submenu when the function is enabled (=On)

[6] available if provided for by Trip unit model or if relative SW package has been activated

[7] available with LSIG versions

Installation menu If Ekip Touch detects that *Rating Plug* or *Measurement* module have not been installed properly, it signals an alarm (page 50) and completes *Settings* menu with the specific installation section:

Menu	Submenus 1	Submenus 2	Commands
Circuit Breaker	*Installation*	*Rating Plug*	*Install*
		Ekip Measuring	*Install*

Correct installation is confirmed by a message on the display and disappearance of the alarm signal and installation menu.

ⓘ **NOTE:** *availability of submenus depends on the module, which appears to have not been installed*

Test Menu

Menu	Submenus	Description, parameters and Commands
Autotest	-	Autotest command
Trip Test	-	TRIP command
Test CB	-	*Close CB*, *Open CB*
Ekip Signalling 4K [1]	-	Module autotest command
Ekip Signalling 2K [1]	*Ekip Signalling 2K-1* [1]	Module autotest command
	Ekip Signalling 2K-2 [1]	
	Ekip Signalling 2K-3 [1]	
ZoneSelectivity [2]	*S Protection*	*Input*, *Force Output*, *Release Output*
	G Protection	
Rc Test [5]	-	Test instructions

[1] available if one or more Ekip Signalling modules are connected and detected by Ekip Touch
[2] available if Ekip Touch is on with auxiliary supply
[3] available with S and/or S2 protection enabled and curve t=k
[4] available with G and/or Gext protection enabled and curve t=k
[5] available with Rating Plug and Rc sensor present

About Menu

Menu	Submenus	Information provided
Protection Unit	-	Information about Ekip Touch: Mainboard serial number, Trip unit serial number, type, version, standard, SW version, date and time, language
Circuit Breaker	-	CB information: TAG name, CB name, rated current, number of poles, CB status and position, total operations, CB serial number
IEC61557-12 [1]	-	Status of 1% measurements (from *Class 1 Power & Energy Metering* package), serial number of assembly and current sensors connected
Feature Collection	-	List of tripped protections in Trip unit
Modules	*Modul x* [2]	Module information: serial number, SW version, status of inputs/outputs/contacts (if present)
Power Controller [3]	*Load Input Status*	Status of loads (open/closed)
	Load Active	Load configuration (activated/not activated)
Load shedding [3]	*Load Input Status*	Status of loads (open/closed)
	Load Active	Load configuration (activated/not activated)

[1] available if Class 1 Power & Energy Metering SW package is provided for by Trip unit module or if it has been previously activated
[2] available if one or more modules are connected and detected by unit
[3] available if function has been installed and enabled in Trip unit

5 - Changing parameters and commands

Changing parameters Comply with the following procedure to change one or more parameters:

> ⓘ **IMPORTANT: parameters can be changed with Trip unit in the Local mode and in the absence of timing alarms**

- 1. Select parameter and enter PIN if required
- 2. Select new value from list or with the aid of page commands
- 3. Select Confirm command if present:
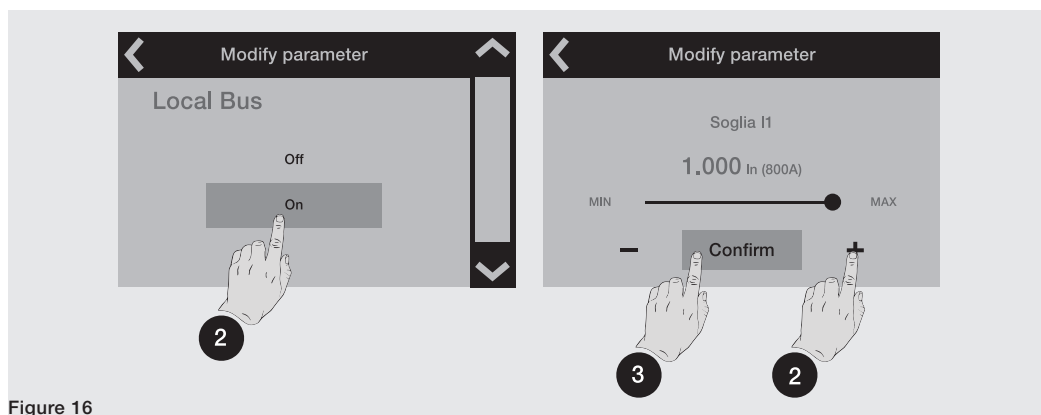
Figure 16

- 4. When the new value has been selected/confirmed, the menu of the parameter is accessed automatically, the changed item presents the new value in light blue and a tick to confirm:
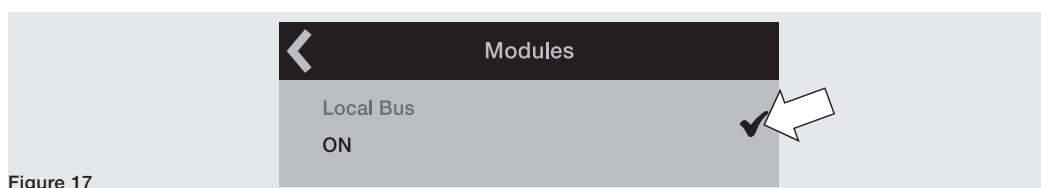
Figure 17

Now proceed by confirming the programming (Step 5) or access other parameters if further changes are required (Step 1).

- Select the arrow at the top left to access the top menu until the *Programming* page appears:
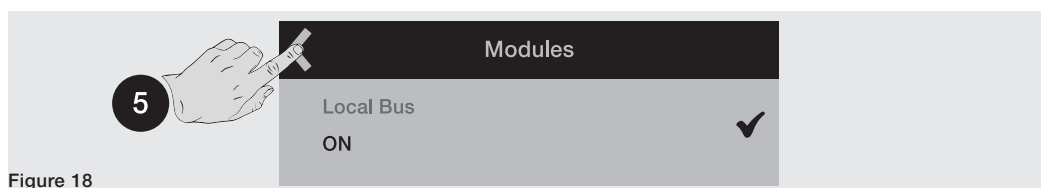
Figure 18

- 6. Various commands are enabled in the programming page:
- • *Confirm* to validate the new parameters and conclude the programming procedure
- • *Abort* to interrupt the save data process
- • *Modify* to go back to the menus and change the parameter or others

Figure 19

Commands Selection of a command implies its immediate execution or opening of an intermediate confirm window.

Correct execution is indicated by a confirm window, which disappears automatically from the display.

Certain commands, selection of which immediately activates the respective test sequences without any confirm window, are an exception to this rule:

- *Auto Test*
- *Ekip Signalling 2K* module commands

ⓘ **IMPORTANT: confirmation on the display refers to launching the command, not to verification of the operation required, which is at the user's charge whichever type of command is concerned: reset parameters, display, open/close contacts**

Exceptions Before validating a change to a parameter, the Trip unit checks all its parameters to make sure there is no conflict or incorrect condition:

- if the Trip unit detects an incorrect condition, the relative details appear on the display and parameter modification is annulled.

Before executing a command, the Trip unit checks all its parameters to ensure there is no conflict or incorrect condition:

- if the Trip unit detects an incorrect condition, the relative details appear on the display and command execution is annulled.

⚠ **WARNING! aborting the programming affects all the parameters modified during the same session**

---

6 - PIN and security

Safety

⚠️ **WARNING! the user is responsible for security against unauthorized access and modification: configure all Trip unit access points (display menu and, if present, Ekip Connect and remote communication systems) using the access PIN and controlled and authorized connection systems**

Function

The PIN code enables access to certain areas of the Trip unit and prevents unintentional setting errors from being entered via the display.

However, parameters can still be modified without having to enter the PIN via:

- service connector, using *Ekip T&P* or *Ekip Programming* and the Ekip Connect application
- bus, in the presence of Ekip Com modules and with Trip unit configured as Remote (page 43).

To ensure your unit is in secure conditions, the Wizard window immediate asks you to change the PIN code on first power up; this is strongly recommended by ABB.

Description

The PIN code is a number formed by five digits, each of which can be given a value from 0 to 9; the default value is: **00001** and can be changed in the *Settings-New PIN* menu.

The PIN code must be entered to:

- change a parameter (including the PIN code itself)
- access the *Test* menu

Once the PIN code has been entered, all menus can be browsed for two minutes: once two minutes have elapsed, the PIN code must be entered again (depending on the case in question).

ℹ️ **NOTE:** *the PIN code must also be entered again if a programming session has been annulled (page **24**).*

Entry

The following page will appear when the PIN code is requested: change (**1**) and confirm (**2**) each digit to complete the entry process.
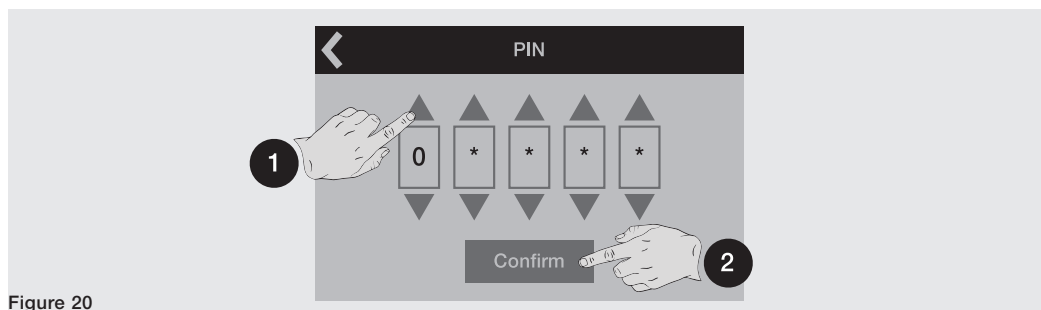
Figure 20

ℹ️ **NOTE:**

- *if the PIN is wrong, "Wrong PIN" will appear for three seconds after which the entry page will be displayed again; use the command at the top left to quit*
- *there is no limit to the number of wrong PIN that can be entered*

Disabling

The PIN code can be disabled by entering its value as: 00000; In this case, the PIN is only required to change the PIN itself in the *Settings* menu.

Recovery

if the PIN code is lost, consult document **1SDH001501R0002**, available in the ABB website, or contact ABB directly.

Protections

1 - Protections - Introduction

Operating principle The protection functions are available with all Ekip Touch models and versions.

Each protection is associated with a different signal (current, voltages, frequencies, powers, etc) but the operating principle is the same:

1. If the signal measured exceeds the set **threshold**, the specific protection activates (prealarm and/or **alarm**).

2. The **alarm** appears on the display and, after a period of time (timing t_t), depending on the protection parameters set, can convert into a **trip command (TRIP)** transmitted to the internal Trip coil of the CB.

NOTE:

- if the signal measured drops below the set threshold before the trip time has elapsed, Ekip Touch quits the alarm and/or timing status and returns to the normal operating condition
- all protections have a default configuration: check the parameters and change to suit the installation requirements before putting into service
- to allow circuit-breaker tripping to be controlled by a specific protection, the protection itself must be enabled

References Many of the protection thresholds are displayed in two different quantities: absolute value and relative value.

The relative value depends on the type of measurement:

Type of protection	Reference	Description
Current	In	Nominal current of the *Rating plug*
Voltage	Un	Line-to-line voltage setting
Frequency	fn	Frequency setting
Power	Sn	$\sqrt{3} \times$ In $\times$ Un

2 - Standard Protections

List

The Standard protections available for all Ekip Touch models, are:

Name	Type of protection	Threshold	Time	Function	Additional functions [6]
L	Overloads with inverse long-time delay	✔	✔	✔	Thermal memory, Pre-alarm threshold
S	Short-circuit with adjustable delay	✔	✔	✔	Trip enable, Zone Selectivity, Thermal memory, Startup enable, Block
S2 [1]	Short-circuit with adjustable delay	✔	✔	✔	Trip enable, Zone Selectivity, Startup enable, Block
I [3]	Instantaneous short-circuit	✔			Startup enable, Lock
G [2][5]	Earth fault with adjustable delay	✔	✔	✔	Trip enable, Zone Selectivity, Startup enable, Block, Prealarm Threshold
MCR [4]	Instantaneous short-circuit on circuit-breaker closing	✔			Monitoring period, Locking
2I	Instantaneous short-circuit programmable	✔			Activation function and mode
IU	Current unbalance	✔	✔		Trip enable
Neutral	Different protection on neutral phase	✔			
T	Abnormal temperatures	✔			Trip enable
Iinst	Instantaneous short-circuit				
Harmonic distortion [7]	Distorted waveforms				
Hardware Trip	Internal connection errors				
Current thresholds [7]	Control thresholds exceeded				Direction of current flow

Further details about the protections are given in document **1SDH001330R1002**.

[1] not available with Trip unit model Ekip G Touch

[2] not available with LSI version of Trip unit

[3] can be activated with protection MCR = Disable

[4] can be activated with protection I = Disable

[5] if the presence of sensor S.G.R. is activated, the submenu of protection G will be replaced by that of protection Gext, in the Advanced menu; with Trip unit models Ekip Hi-Touch and Ekip G Hi-Touch, the two protections are available at the same time

[6] Thermal memory available with curve $t=k/I^2$; Zone selectivity available with curve $t=k$; Block configuration available via Ekip Connect

[7] the protections do not handle the TRIP, just signaling

Neutral Protection   Neutral protection is used to characterize protections L, S and I differently on the neutral phase.

Represented as a percentage, it defines the multiplication factor applied to the tripping thresholds of the protections (example: 50% = the tripping threshold of the neutral is half the phase threshold).

The protection is available with the 4P and 3P + N configuration; the configuration parameters can be accessed via the *Settings* menu

ⓘ   **NOTE:** *the Trip unit will not accept changes to the thresholds of protection L (I1) and of the Neutral (InN) unless the following limtation is complied with: (I1 x InN) ≤ Iu; Iu is the size of the circuit-breaker*

⚠   **WARNING! With 150% and 200% threshold; if the measured neutral current exceeds 16In, the Trip unit resets the protection to 100% by itself**

T Protection   T protection protects against abnormal temperatures measured and transmitted to the sensor inside the unit; temperature verification is always active and includes three operating states:

State	Temperature range [°C]	Ekip Touch actions
Standard	-25 < t < 70	Normal operation; display state depending on type [1]
Warnings	-40 < t < -25 or 70 < t < 85	Warning led @ 0.5 Hz; display state depending on type [1]
Alarm	t < -40 or t > 85	Display off; Alarm and Warning leds @ 2 Hz; TRIP if Trip enable is activated

[1] with Ekip Touch, the display remains on within range: -20°C / +70°C; with Ekip LCD, the display remains on within range: -30°C / +80°C

All protections enabled in the unit are active in all operating states.

Iinst protection   The purpose of Iinst protection is to maintain the integrity of the circuit-breaker and installation in the case of particularly high current values requiring shorter reaction times than those provided by I protection.

The protection is always active; the trip threshold and time are reserved and defined by ABB.

Harmonic distortion   Harmonic distortion allows a monitoring alarm to be activated in the case of distorted waveforms; if enabled in the *Measurements* menu, the unit signals an alarm for peak factors exceeding 2.1.

Hardware trip protection   If enabled, the protection activates if one or more disconnections of the current sensors, Rating plug, Trip coil or an alarm inside the unit are detected.

The protection activates with a TRIP if the disconnections persist for more than one second; in the case of Trip coil disconnection, the unit merely handles alarm signaling.

Current thresholds   The Current thresholds allow checks to be set along the current lines, to be associated with the programmable contacts of the *Ekip Signalling* modules (in all versions).

The *Advanced-Signaling* menu includes two thresholds with monitoring relating to I1 (Threshold 1 I1 and Threshold 2 I1) and two with monitoring relating to In (Threshold Iw1 and Threshold Iw2).

Summary table Standard Protections

ABB	ANSI [1]	Threshold	Threshold tolerance [3]	Time	Calculation formula t_t [2][9][10][11]	Calculation example t_t [2]	Tolerance t_t [3]
L (60947-2)	49	I1 = 0.4…1 In step = 0.001 In	Activation for If in the range (1.05…1.2) x I1	t1 = 3…144 s step = 1 s	$t_t = $ (9 t1) / (If / I1) ^{2}	$t_t = $ 6.75 s with: I1 = 0.4 In; t1 = 3 s; If = 0.8 In	± 10 % with If ≤ 6 In ± 20 % with If > 6 In
L (60255-151)	49	I1 = 0.4…1 In step = 0.001 In	Activation for If in the range (1.05…1.2) x I1	t1 = 3…144 s step = 1 s	$t_t = $ (t1 x a x b) / ((If / I1) ^{k}-1)	See the table below	± 10 % with If ≤ 6 In ± 20 % with If > 6 In
S (t = k) [13]	50 TD	I2 = 0.6…10 In step = 0.1 In	± 7 % with If ≤ 6 In ± 10 % with If > 6 In	t2 = 0.05…0.8 s step = 0.01 s	$t_t = $ t2	-	The better of the two values: ± 10 % or ± 40 ms
S (t = k / I^2) [13]	51	I2 = 0.6…10 In step = 0.1 In	± 7 % with If ≤ 6 In ± 10 % with If > 6 In	t2 = 0.05…0.8 s step = 0.01 s	$t_t = $ (100 t2) / (If) ^{2}	$t_t = $ 5 s con: I2 = 1 In; t2 = 0.8 s; If = 4 In	± 15 % with If ≤ 6 In ± 20 % with If > 6 In
S2 (t = k) [13]	50 TD	I5 = 0.6…10 In step = 0.1 In	± 7 % with If ≤ 6 In ± 10 % with If > 6 In	t5 = 0,05…0,8 s step = 0.01 s	$t_t = $ t5	-	The better of the two values: ± 10 % or ± 40 ms
I	50	I3 = 1.5…15 In step = 0.1 In	± 10 %	Not adjustable	$t_t ≤$ 30 ms	-	-
G (t = k) [12][13]	50N TD	I4 [4]= 0.1…1 In step = 0.001 In	± 7 %	t4 = Instantaneous…1 s, 0.1…1s step = 0.05 s	$t_t = $ t4	-	The better of the two values: ± 10 % or ± 40 ms [8]
G (t = k / I^2) [12][13]	51N	I4 [4]= 0.1…1 In step = 0.001 In	± 7 %	t4 = 0.1…1 s step = 0.05 s	$t_t = $ 2 / (If / I4) ^{2}	$t_t = $ 0.32 s with: I4 = 0.8 In; t4 = 0.2 s; If = 2 In	± 15 %
2I	50	I31 = 1.5…15 In step = 0.1 In	± 10 %	Not adjustable	$t_t ≤$ 30 ms	-	-
MCR	-	I3 = 1.5…15 In step = 0.1 In	± 10 %	40…500 ms [5] step = 0.01 s	$t_t ≤$ 30 ms	-	-
IU	46	I6 = 2…90 % step = 1 %	± 10 %	t6 = 0.5…60 s step = 0.5 s	$t_t = $ t6	-	the better of the two values: ± 10 % or ± 40 ms (for a time set < 5 s) / ± 100 ms (for a time set ≥ 5 s)

Details of protection according to standard IEC 60255-151:

Protection	Curve parameters	Calculation formula t_t [3][9]	Calculation example t_t [3]
L (60255-151 SI)	a = 0.02; b = 0.15873; k = 0.16	$t_t = (t1 \times k \times b) / ((If / I1)^a - 1)$	t_t = 4.78 s with: I1 = 0.4 In; t1 = 3 s; If = 0.8 In
L (60255-151 VI)	a = 1; b = 0.148148; k = 13.7	$t_t = (t1 \times k \times b) / ((If / I1)^a - 1)$	t_t = 6 s with: I1 = 0.4 In; t1 = 3 s; If = 0.8 In
L (60255-151 EI)	a = 2; b = 0.1; k = 82	$t_t = (t1 \times k \times b) / ((If / I1)^a - 1)$	t_t = 8 s with: I1 = 0.4 In; t1 = 3 s; If = 0.8 In
L (60255-151 I [4])	a = 4; b = 1; k = 82	$t_t = (t1 \times k \times b) / ((If / I1)^a - 1)$	t_t = 16 s with: I1 = 0.4 In; t1 = 3 s; If = 0.8 In

Summary table of additional functions in conjunction with protections S, I, G:

ABB	ANSI [1]	Threshold	Threshold tolerance [3]	Time [7]	Calculation formula t_t [3]	Tolerance t_t [3]
S (Startup) [6]	-	$If_{startup}$ = 0.6...10 In step = 0.1 In	± 7 % with If ≤ 6 In ± 10 % with If > 6 In	$t2_{startup}$ = 0.1...30 s step = 0.01 s	t_t = t2	The better of the two values: ± 10 % or ± 40 ms
I (Startup)	-	$I3_{startup}$ = 1.5...15 In step = 0.1 In	± 10 %	$t3_{startup}$ = 0.1...30 s step = 0.01 s	t_t ≤ 30 ms	-
G (Startup) [6]	-	$I4_{startup}$ = 0.2...1 In step = 0.02 In	± 7 %	$t4_{startup}$ = 0.1...30 s step = 0.01 s	t_t = t4	The better of the two values: ± 10 % or ± 40 ms
S (SdZ)	68	-	-	$t2_{SdZ}$ = 0.04...0.2 s step = 0.01 s	-	-
G (SdZ)	68	-	-	$t4_{SdZ}$ = 0.04...0.2 s step = 0.01 s	-	-

[1] ANSI / IEEE C37-2 codification

[2] t_t calculation is valid for If values that have exceeded the trip threshold of the protection. Use fault current and threshold values expressed in In to calculate t_t, as shown in the example.

[3] Tolerance values valid with Trip unit supplied at full rate or by auxiliary power supply, trip time ≥ 100 ms, temperature and current values within operating limits. The tolerance values of the table after the notes apply if the conditions are not guaranteed

[4] All thresholds can be selected in the presence of auxiliary power supply. In self-supply conditions, the minimum threshold is limited to: 0.3 In (with In = 100 A), 0.25 In (with In = 400 A) or 0.2 In (for all the other sizes)

[5] Time MCR is the time for which the protection remains active after the circuit-breaker has closed. Similarly to protection I, the trip time cannot be adjusted

[6] Startup can only be activated with function set at fixed time

[7] For the startup functions, the time indicated is the period during which the protection remains active with the different threshold, calculated from the point in which the startup threshold is exceeded

[8] With t4 = instantaneous, the maximum tolerance is 50 ms

[9] L protection: the trip time of the protection is forcibly set at 1 s if the calculation results give a lower theoretical tt value and/or if the current reading is more than 12 In

[10] G protection: the protection deactivates automatically if disconnection of one or more sensors is detected or if current If is more than 8 In (with I4 ≥ 0.8 In), 6 In (with 0.5 In ≤ I4 < 0.8 In), 4 In (with 0.2 In ≤ I4 < 0.5 In) or 2 In (with I4 < 0.2 In)

[11] S and G protection: with curve t= k/I^2, the protection trip time is forced to the set value if the calculation results give a theoretical tt value lower than the parameter itself

[12] A maximum value of I4= 1200 A is allowed for UL versions; if an attempt is made to set a higher value, the trip unit signals an alarm and interrupts the modification

[13] For UL versions, t2 and t4 can be set at 0.4 s maximum

Protection	Tolerance threshold	Tolerance t_t
L	Activation for If in the range 1.05...1.2 I1	± 20 %
S	± 10 %	± 20 %
I	± 15 %	≤ 60 ms
G	± 15 %	± 20 % (60 ms with t4 = instantaneous)
2I	± 15 %	≤ 60 ms
Other	-	± 20 %

3 - Voltage protections

List

The Voltage protections, available by default for Ekip Hi-Touch, Ekip G Touch, Ekip G-Hi Touch models and configurable in the remaining models as additional SW package, are:

Name	Type of protection	Threshold	Time	Additional functions [2]
UV	Minimum voltage	✔	✔	Trip enable, Block
OV	Maximum voltage	✔	✔	Trip enable, Block
UV2 [1]	Minimum voltage	✔	✔	Trip enable, Block
OV2 [1]	Maximum voltage	✔	✔	Trip enable, Block
VU	Voltage unbalance	✔	✔	Trip enable, Block
Phase Sequence	Phase sequence error	✔		

Further details about the protections are given in document **1SDH001330R1002**.

[1] protections UV2 and OV2 are not available by default with Ekip G Touch. However, they can be integrated by requesting the relative SW package

[2] Block configuration available via Ekip Connect

Summary table

ABB	ANSI [5]	Threshold	Tolerance threshold	Time	Calculation formula t_t [3]	Tolerance t_t [4]
UV	27	U8 = 0,05…1 Un Step = 0,001 Un	± 2 % [7]	t8 = 0,05…120 s Step = 0,01 s	$t_t = t8$	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
OV	59	U9 = 1…1,5 Un Step = 0,001 Un	± 2 % [7]	t9 = 0,05…120 s Step = 0,01 s	$t_t = t9$	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
UV2	27	U15 = 0,05…1 Un Step = 0,001 Un	± 2 % [7]	t15 = 0,05…120 s Step = 0,01 s	$t_t = t15$	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
OV2	59	U16 = 1…1,5 Un Step = 0,001 Un	± 2 % [7]	t16 = 0,05…120 s Step = 0,01 s	$t_t = t16$	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
VU [6]	47	U14 = 2…90 % Step = 1 %	± 5 %	t14 = 0,5…60 s Step = 0,5 s	$t_t = t14$	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
Phase Sequence	47	1-2-3 / 3-2-1				

[3] calculation of t_t is valid for values which have exceeded the trip threshold of the protection

[4] tolerance values valid with Trip unit supplied at full rate or by auxiliary power supply, trip time ≥ 100 ms, temperature and current values within operating limits; the tolerance value is ± 20% if the conditions are not guaranteed

[5] ANSI / IEEE C37-2 codification

[6] protection not active if the higher of the voltages measured is less than 0.3 Un

[7] the Trip unit considers a 3% hysteresis for quitting the alarm condition

4 - Voltage Advanced protections

List

The Advanced Voltage protections, available by default for the Ekip G Touch and Ekip G Hi-Touch models and configurable in the remaining models as additional SW package, are:

Name	Type of protection	Threshold	Time	Additional functions [3]
S(V)	Short-circuit with voltammetric control	✔	✔	Mode, Trip enable, Block
S2(V) [1]	Short-circuit with voltammetric control	✔	✔	Mode, Trip enable, Block
RV [2]	Residual voltage	✔	✔	Trip enable, Block

Further details about the protections are given in document **1SDH001330R1002**.

[1] S2(V) protection is not available by default with Ekip G Touch. However, it can be integrated by requesting the relative SW package

[2] available for 4P or 3P circuit-breakers configured with external neutral voltage

[3] Block configuration available via Ekip Connect

Summary table

ABB	ANSI [6]	Threshold [7][8]	Tolerance threshold	Time	Calculation formula t_t [4]	Tolerance t_t [5]
S(V)	51V	$I20 = 0,6...10$ In step = 0,1 In [9]; $Ul = 0,2...1$ Un step = 0,01 Un [9]; $Uh = 0,2...1$ Un step = 0,01 Un [9]; $Ks = 0,1...1$ step = 0,01 [9]	± 10 %	t20 = 0,05...30 s Step = 0,01 s	$t_t = t20$	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
S2(V)	51V	$I21 = 0,6...10$ In step = 0,1 In [10]; $Ul2 = 0,2...1$ Un step = 0,01 Un [10]; $Uh2 = 0,2...1$ Un step = 0,01 Un [10]; $Ks2 = 0,1...1$; step = 0,01 [10]	± 10 %	t21 = 0,05...30 s Step = 0,01 s	$t_t = t21$	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
RV	59N	$U22 = 0,05...0,5$ Un Step = 0,001 Un	± 5 %	t22 = 0,05...120 s Step = 0,01 s	$t_t = t22$	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)

[4] calculation of t_t is valid for values which have exceeded the trip threshold of the protection

[5] tolerance values valid with Trip unit supplied at full rate or by auxiliary power supply, trip time ≥ 100 ms, temperature and current values within operating limits; the tolerance value is ± 20% if the conditions are not guaranteed

[6] ANSI / IEEE C37-2 codification

[7] S(V) protection: in the Linear mode, the current trip threshold for voltage values between Ul and Uh is calculated by performing linear interpolation between thresholds Uh and I20 (first point of the line) and Ul and Ks * I20 (second point of the line). $I_{threshold} = [I20 * (1 - Ks) * (U_{measured} - Uh)] / (Uh - Ul) + I20$

[8] S2(V) protection: in the Linear mode, the current trip threshold for voltage values between Ul2 and Uh2 is calculated by performing linear interpolation between thresholds Uh2 and I21 (first point of the line) and Ul2 and Ks2 * I21 (second point of the line). $I_{threshold} = [I21 * (1 - Ks2) * (U_{measured} - Uh2)] / (Uh2 - Ul2) + I21$

[9] the threshold Ks setting must ensure the following limitation: Ks * I20 ≥ 0.6 In; parameter Uh is available in the Linear mode; the setting must comply with the following limitation: Uh > Ul

[10] the threshold Ks2 setting must ensure the following limitation: Ks2 * I21 ≥ 0.6 In; parameter Uh2 is available in the Linear mode; the setting must comply with the following limitation: Uh2 > Ul2

5 - Frequency protections

List

The Frequency protections, available by default for Ekip Hi-Touch, Ekip G Touch, Ekip G-Hi Touch models and configurable in Ekip Touch as additional SW package, are:

Name	Type of protection	Threshold	Time	Additional functions [2]
UF	Minimum frequency	✔	✔	Trip enable, Block
OF	Maximum frequency	✔	✔	Trip enable, Block
UF2 [1]	Minimum frequency	✔	✔	Trip enable, Block
OF2 [1]	Maximum frequency	✔	✔	Trip enable, Block

Further details about the protections are given in document **1SDH001330R1002**.

[1] protections UF2 and OF2 are not available by default with Ekip G Touch. However, they can be integrated by requesting the relative SW package
[2] Block configuration available via Ekip Connect

Summary table

ABB	ANSI [5]	Threshold [7][8]	Tolerance threshold	Time	Calculation formula t_t [3]	Tolerance t_t [4]
UF [6]	81L	f12 = 0,9...1 fn Step = 0,001 fn	± 1 % [7]	t12 = 0,06...300 s Step = 0,01 s	t_t = t12	The best of the two values: ± 10 % (min = 30 ms) or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
OF [6]	81H	f13 = 1...1,1 fn Step = 0,001 fn	± 1 % [7]	t13 = 0,06...300 s Step = 0,01 s	t_t = t13	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
UF2 [6]	81L	f17 = 0,9...1 fn Step = 0,001 fn	± 1 % [7]	t17 = 0,06...300 s Step = 0,01 s	t_t = t17	The best of the two values: ± 10 % (min = 30 ms) or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
OF2 [6]	81H	f18 = 1...1,1 fn Step = 0,001 fn	± 1 % [7]	t18 = 0,06...300 s Step = 0,01 s	t_t = t18	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)

[3] calculation of t_t is valid for values which have exceeded the trip threshold of the protection
[4] tolerance values valid with Trip unit supplied at full rate or by auxiliary power supply, trip time ≥ 100 ms, temperature and current values within operating limits; the tolerance value is ± 20% if the conditions are not guaranteed
[5] ANSI / IEEE C37-2 codification
[6] the protection excludes itself if the maximum value of the line-to-line voltage is less than 32 V with hysteresis at 36 V
[7] tolerance valid for frequencies within range: fn ± 2%; a ± 5% tolerance is available for off range frequencies

6 - Power protections

List

The Power protections, available by default for Ekip Hi-Touch, Ekip G Touch, Ekip G-Hi Touch models and configurable in Ekip Touch as additional SW package, are:

Name	Type of protection	Threshold	Time	Additional functions [3]
RP	Reverse active power	✔	✔	Trip enable, Block
D [2]	Directional short-circuit with adjustable delay	✔	✔	Trip enable, Directional Zone Selectivity [4], Startup enable, Block, Direction Min Angle
OQ [1]	Maximum reactive power	✔	✔	Trip enable, Block
OP [1]	Active overpower	✔	✔	Trip enable, Block
UP [1]	Active underpower	✔	✔	Trip enable, Block, Startup enable
RQ [1][2]	Reverse reactive power	✔	✔	Trip enable, Block
Cos φ	Minimum Cos φ	✔		

Further details about the protections are given in document **1SDH001330R1002**.

[1] the protection is not available by default with Ekip Hi-Touch. However, it can be integrated by requesting the relative SW package

[2] the protection is not available by default with Ekip G Touch. However, it can be integrated by requesting the relative SW package

[3] Block configuration available via Ekip Connect

[4] Directional Zone Selectivity functions as an alternative to Zone Selectivity S and G

⚠ **WARNING! The** *Power flow* **parameters effect the sign of the power and power factor values measured by the unit.** *Power flow* **must be configured and verified on the basis of your installation to ensure that all the protections of the** *Power Protections* **package function correctly**

Summary table

ABB	ANSI [7]	Threshold	Tolerance threshold	Time	Calculation formula t_t [5]	Tolerance t_t [6]
RP	32R	P11 = -1...-0,05 Sn step = 0,001 Sn	± 10 %	t11 = 0,5...100 s step = 0,1 s	t_t = t11	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
D [8]	67	I7 Fw/Bw = 0,6...10 In step = 0,1 In	± 7 % If ≤ 6 In ± 10 % If > 6 In	t7 Fw/Bw = 0,1...0,8 s step = 0,01 s	t_t = t7	± 40 ms (for t7 ≥ 400 ms) / whichever is higher, ± 20 ms or ± 10 % (for t7 < 400 ms)
OQ	32OF	Q27 = 0,4...2 Sn step = 0,001 Sn	± 10 %	t27 = 0,5...100 s step = 0,5 s	t_t = t27	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
OP	32OF	P26 = 0,4...2 Sn step = 0,001 Sn	± 10 %	t26 = 0,5...100 s step = 0,5 s	t_t = t26	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
UP [9]	32LF	P23 = 0,1...1 Sn step = 0,001 Sn	± 10 %	t23 = 0,5...100 s step = 0,5 s	t_t = t23	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
RQ	40 / 32R	Q24 = -1...-0,1 Sn step = 0,001 Sn; Kq = -2...2 step = 0,01; Vmin = 0,5...1,2 Un step = 0,01	± 10 %	t24 = 0,5...100 s step = 0,5 s	t_t = t24	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
Cos φ	78	Cos φ = 0,5...0,95 step = 0,01				

[5] calculation of t_t is valid for values which have exceeded the trip threshold of the protection

[6] tolerance values valid with Trip unit supplied at full rate or by auxiliary power supply, trip time ≥ 100 ms, temperature and current values within operating limits; the tolerance value is ± 20% if the conditions are not guaranteed

[7] ANSI / IEEE C37-2 codification

[8] the protection does not detect the fault current direction for < 5 V voltages.

[9] not active if the circuit-breaker is open (TRIP OFF is signaled); the protection is also active for negative active power, but is independent of RP protection (Protection from inverse active power)

Summary table of additional functions in conjunction with protections D and UP:

ABB	ANSI [7]	Threshold	Tolerance threshold	Time	Calculation formula t_t [5]	Tolerance t_t [6]
UP (Startup) [10]				t23startup= 0,1...30 s, step = 0,01 s		
D (Startup)		I7startup Fw/Bw = 0,6...10 In step = 0,1 In	± 10 %	t7startup = 0,1...30 s step = 0,01 s	tt = t7startup	The better of the two values: ± 10 % or ± 40 ms
D (SdZ)	68	-	-	t7SdZ Fw/Bw = 0,1...0,8 s step = 0,01 s		

[10] UP protection startup should be considered as the temporary deactivation time of the protection, from the point in which the startup threshold is exceeded

7 - ROCOF protections

Description

The ROCOF Protection package includes the protection of the same name and is available by default for Ekip G Hi-Touch; it can be configured in the remaining models as additional SW package

ROCOF Protection protects against rapid frequency variations and has the following additional functions: Trip Enable, Trip Direction and Block.

Further details about the protections are given in document **1SDH001330R1002**.

Summary table

ABB	ANSI [3]	Threshold	Tolerance threshold	Time	Calculation formula t_t [1]	Tolerance t_t [2]
ROCOF [4]	81R	f28 = 0,4...10 Hz / s step = 0,2 Hz / s	± 10 % [5]	t28 = 0,06...300 s step = 0,01 s	t_t = t28	The best of the two values: ± 20% or 200 ms

[1] calculation of t_t is valid for values which have exceeded the trip threshold of the protection

[2] tolerance values valid with Trip unit supplied at full rate or by auxiliary power supply, trip time ≥ 100 ms, temperature and current values within operating limits; the tolerance value becomes ± 20% if the conditions are not guaranteed

[3] ANSI / IEEE C37-2 codification

[4] not active for voltage values < 30 V

[5] ± 20% for threshold 0.4 Hz / s

8 - Adaptive protections

Description

The Adaptive Protection package includes the *Double Set* protection and is available by default for Ekip G Hi-Touch; it can be configured in the remaining models as additional SW package

The *Double Set* function enables two different protection configurations to be made, one as an alternative to the other, by means of a set change with programmable events.

Parameters

The function can be activated and the Set of the main protections configured in the *Settings - Double Set* menu; the event that determines Set change (from main to secondary) can be programmed in the *Advanced - Functions* menu.

9 - Additional protections and functions

Additional protections

Some protections have additional functions which extend their characteristics and performance:

Name	Description	Protections
Thermal Memory	Reduced trip time in the case of TRIPs within brief intervals (protection against cable overheating)	L, S
Zone selectivity	Additional parameters for managing TRIP commands between circuit-breakers equipped with the same function	S, S2, G, D, Gext
Blocks	Blocking of protection on the basis of programmable events	S, I, G, MCR, S2, D, S(V), S2(V), UV, OV, VU, UV2, OV2, UP, OP, RP, RQ, OQ, RV, UF, OF, UF2, OF2, ROCOF, Gext
Startup	Different threshold of the protection for a limited time, with activation on the basis of a programmable monitoring threshold	S, I, G, S2, D, UP, Gext

Additional protections

Installation of certain accessories allows the additional protections to be activated:

Name	Type of protection	Threshold	Time	Function	Additional functions
Gext	Earth fault with current reading by S.G.R. external sensor	✔	✔	✔	Trip enable, Zone Selectivity, Startup enable, Block, Prealarm Threshold
Rc	Residual current with corrent reading by external toroid Rc	✔	✔		
Synchrocheck	Synchronism between two independent voltage sources or energizing of a busbar not active	✔	✔		

Further details about the protections are given in document **1SDH001330R1002**.

Programmable Functions and Commands

Ekip Touch has eight programmable commands, which activate on the basis of signals or events. Each command allows the activation function and event monitoring time to be programmed.

Name	Description	Menu path
External Trip	Sends a TRIP command	*Advanced - Functions*
RESET Trip	TRIP signal reset	
Activate SET B	Changes the protections set, from Set A to Set B	
Energy RESET	Resets the energy meters	*Measurements - Energy*
Command YO	Sends a command to opening coil YO	*Settings - Functions*
Command YC	Sends a command to closing coil YC	
LOCAL Switch On	Changes the configuration, from Remote to Local	*Settings - Modules - Functions*
Signaling RESET	Reset the contacts of the signalling modules	

Measurements

1 - Standard Measurements

List The Standard measurements are:

Parameter	Description
Instantaneous currents	Phase current and earth fault measurements in real time
Events	List of events, status changes, alarms, recorded by the Trip unit
Trip	List of current protection trips (TRIP)
Min-Max measurements	History of minimum and maximum currents, recorded at a settable interval
Maintenance	CB status: contact wear and last maintenance
Operation counters	Number of mechanical and electrical operations

Instantaneous currents The instantaneous currents, available in the *Measurements* pages, are real time measurements of the phase and earth fault currents expressed in root mean square value; the monitor time and performance depend on the rated current defined by the *Rating plug* (In):

Measurement	Monitor time (min-max)	Normal operating range	Accuracy of value read [1]
Phase currents [4]	0,004 ÷ 64 In	0,2 ÷ 1,2 In	1% [3]
Internal earth fault current [2]	0,08 ÷ 64 In	0,2 ÷ 1,2 In	2 % [3]
External earth fault current [2] [5]	0,08 ÷ 4 In	0,2 ÷ 1,2 In	2 %
Residual current [2] [5]	2 ÷ 32 A		5 %

[1] the accuracies refer to normal operating ranges, as established by IEC 61557-12

[2] available with LSIG versions

[3] accuracies based on Ekip Touch without Class 1 Power & Energy Metering package; if the Class 1 Power & Energy Metering package is present and for all other trip unit models, check the indicated performance values from page 41

[4] the higher phase currents are also available in the Histograms, Measuring instruments and Measurement summary pages

[5] available by activating the presence of sensor S.G.R or Rc

2 - Ekip Measuring Measurements

List The Measuring measurements are

Condition	Access
Instantaneous voltages	Phase and line-to-line voltage measurements in real time
Instantaneous powers	Real time measurements of the active, reactive, apparent phase and total powers
Instantaneous frequency	Measurement of the line frequency
Trip	List of trips (TRIP) due to voltage, frequency, power protections
Min-Max-Med measurements	History of minimum, maximum and mean voltages and powers recorded within a settable range
Peak factor	Real time measurement of the peak factor of the currents
Power factor	Real time measurement of the power factor
Energy counters	Measurement of active, reactive, apparent energy

The relative associated measurements are activated by means of the *Ekip Synchrocheck* module.

Instantaneous measurements Instantaneous currents, available in the *Summary pages*, are real time measurements of the line-to-line and phase voltages expressed in root-mean-square value.

Representation, measuring range and performance depend on the set rated voltage (Un).

Available in the Summary pages, the instantaneous powers are real time measurements of the phase and total active powers.

Representation, measuring range and performance depend on the set rated voltage (Un) and on the rated current defined by the rated size of the Trip unit (In); in addition, the reference changes on the basis of the type of measurement:

- *Sn* for total powers (Sn = In * Un * √3).
- *Pn* for phase powers (Pn = In * Un / √3).

NOTE: *the phase powers and voltages are available with 4P and 3P + N CBs*

Measurement	Monitor time (min-max)	Normal operating range	Accuracy of value read [1]
Line-to-line voltages [6]	5 V ÷ 900 V [9]	100 ÷ 690 V	0.5 % [8]
Phase voltages	5 V ÷ 900 V [9]	50 ÷ 400 V	0.5 % [8]
Line frequency	30 ÷ 80 Hz [2]	f -10 % ÷ f +10 % [4]	0,1 % [3]
Total active, reactive and apparent power [7]	|Pmin ÷ Pmax| [5]	|0,3 ÷ 1,2 Sn|	2 % [3]
Active, reactive and apparent phase power	|Pmin ÷ Pmax| [5]	|0,3 ÷ 1,2 Pn|	2 % [3]

[1] the accuracies refer to normal operating ranges, as established by IEC 61557-12

[2] available for voltage values of over 30 V (with Un < 277 V) or 60 V (with Un > 277 V)

[3] accuracies based on Ekip Touch without Class 1 Power & Energy Metering package; if the Class 1 Power & Energy Metering package is present and for all other trip unit models, check the indicated performance values from page 41

[4] 45 to 55 Hz with set frequency = 50 Hz; 54 to 66 Hz with f = 60 Hz

[5] Pmin = 0,5 In x 5 V; Pmax= 3 x 16 In x 900 V

[6] the higher line-to-line voltages are also available in the Histograms, Measuring instruments and Measurement summary pages

[7] the higher total powers are also available in the Measuring instruments and Measurement summary pages

[8] without transformers; 0.7 % with class 0.2 external transformers

[9] without transformers; with transformers, multiply the min and max values for the transformer ratio between primary and secondary voltages

Peak factor
The peak factors are real time measurements of the ratio between the peak and RMS values of the phase current; the measurement is supported by the *Harmonic distortion* protection function.

Measurement	Monitor time	Accuracy	Notes
Peak factor	0,3 ÷ 6In	1,5%	"_ _ _" (not available) is indicated for currents outside the range and disconnected sensors

Power factor
The power factor is the real time measurement of the ratio between total active power and total apparent power, expressed as cos φ.

Measurement	Monitor time	Accuracy	Notes
Power factor	0,5 ÷ 1	2,5% [1]	"_ _ _" (not available) is indicated for: active and/or reactive power not available or outside the admissible ranges

[1] accuracy based on Ekip Touch without Class 1 Power & Energy Metering package; if the Class 1 Power & Energy Metering package is present and for all other Trip unit models, check the indicated performance values from page 41

Energy counters
The energy counters are the measurements of the total reactive and apparent active energy, updated every minute.

Measurement	Monitor time	Accuracy
Total active, reactive and apparent energy	1 kWh ÷ 2 TWh; 1 kVARh ÷ 2 TVARh; 1 kVAh ÷ 2 TVAh	2 % [1]

[1] accuracy based on Ekip Touch without Class 1 Power & Energy Metering package; if the Class 1 Power & Energy Metering package is present and for all other Trip unit models, check the indicated performance values from page 41

Reset measurements

The *Energy RESET* command is available in the *Energy* menu for the purpose of resetting the energy counters (page 21).

3 - Class 1 Power & Energy Metering

List and performance

Presence of the *Class 1 Power & Energy Metering* package allows higher measuring accuracy to be obtained for the following quantities:

Measurement	Monitor time (min-max)	Normal operating range	Accuracy of read value
Phase currents [6]	0,004 ÷ 64 In	Standard IEC61557-12, tables 20-22	0,5 % [1]
Internal earth fault current [2]	0,08 ÷ 64 In	Standard IEC61557-12, table 20	0,5 % [1]
Line frequency	30 ÷ 80 Hz [3]	fn ± 10 % [4]	± 0,02 Hz
Total active and apparent power [7]	|Pmin ÷ Pmax| [5]	Standard IEC61557-12, tables 8-11-14	1 % [1]
Active and apparent phase power	|Pmin ÷ Pmax| [5]	Standard IEC61557-12, tables 8-11-14	1 % [1]
Total active and apparent energy	1 kWh ÷ 2 TWh; 1 kVARh ÷ 2 TVARh; 1 kVAh ÷ 2 TVAh	Standard IEC61557-12, tables 8-11-14	1 % [1]
Power factor	0,5 ÷ 1	Standard IEC61557-12, table 27	1% [1]

[1] the accuracy values refer to the normal operating intervals and conditions established by IEC 61557-12, for each quantity and class declared

[2] available with LSIG versions

[3] available for voltage values of over 30 V (with Un < 277 V) or 60 V (with Un ≥ 277 V)

[4] 47 ÷ 55 Hz with fn = 50 Hz; 54 ÷ 66 Hz with fn = 60 Hz

[5] Pmin = 0,5 In x 5 V; Pmax= 3 x 16 In x 900 V

[6] the higher phase currents are also available in the Histograms, Measuring instruments and Measurement summary pages

[7] the higher total powers are also available in the Measuring instruments and Measurement summary pages

Functional characteristics

The measuring performance of the *Class 1 Power & Energy Metering* package is guaranteed in the following conditions (from table 43 of standard IEC61557-12):

Characteristic	Value
Classification of performance measuring and monitoring device (PMD) in accordance with chapter 4.3 of the standard	PMD-DD
Temperature	Operating: T= -25°C to +70°C; Storage: T = -30°C to +70°C; Class: K70
humidity and altitude	Up to 90% relative humidity without condensation; From 0 to 2000 meters
Performance class for active energy and power	1

Information page

Presence of the *Class 1 Power & Energy Metering* package activates the IEC61557 12 information page, which can be consulted in the *About* menu

Figure 21

The page shows the activation state of the *Class 1 Power & Energy Metering* package (*Activated/Deactivated*) and the serial numbers of certain accessories installed on the CB for the specific purpose of conforming to the characteristics of the package (electronic units and internal current sensors)

Settings

1 - Main settings

Foreword All the following parameters are available either directly, or from the *Settings* menu, in the conditions established by Ekip Touch on the basis of the version and configuration described.

Consult manual **1SDH001330R1002** for any Main settings in the menu which are not described below and for the Integrative settings (available by accessing the unit by means of a service connector via Ekip Connect or by communication via system bus):

- Circuit-breaker: Hardware Trip, T Protection, Neutral Protection
- Phase Sequence
- Monitor time
- Power Controller
- Load Shedding
- Network Analyzer
- Datalogger
- Dual Set
- Functions
- View
- Maintenance
- Programmable states
- Filters
- TAG Name, User data, Clients Page
- Led Alive
- Supplementary settings for commands, zone selectivity, Wizard

⚠️ **WARNING! changes to the settings must be made in the absence of protection alarms**

Configuration The *Circuit breaker-Configuration* menu, allowing the presence of the *External neutral* sensor to be activated, is available for the 3P CB.

Activation of the configuration with *External neutral* (3P + N) enables:

- histograms of phase Ne in the *Histograms* page
- neutral current measurements
- submenu for configuring the Neutral protection (*Neutral Protection*)
- neutral current recording in the case of TRIP

With 3P CB, the parameter is set by default as: 3P.

Ground protection In the earth *Circuit-breaker-Protections* menu of the LSIG version of Ekip Touch you can:

- activate/deactivate the presence of external sensor S.G.R and relative Gext protection.
- activate the presence of Rc Toroid and relative protection.

ℹ️ **NOTE:** *Rc Toroid can be activated if the Measuring Measurements package and Rc version Rating plug are present; sensor presence in the menu can only be deactivated afterwards by replacing the installed Rating plug*

With Ekip Touch LSIG, the parameter is set by default as: Absent.

Line frequency Frequency adjustment is performed to set the installation frequency; the choice is between 50 Hz and 60 Hz.

ℹ️ **NOTE:** *the measurements are taken on the basis of the set grid frequency: incorrect configuration of the parameter may lead to abnormal measurements and protection*

Ekip Touch is supplied with the parameter setting that suits the ordered configuration.

Modules The *Modules* menu provides various options:

Parameter	Description	Default

Local/Remote	The parameter defines the mode in which the parameters are written in the unit:
	• *Local*: parameter editing only via the display or service connector
	• *Remote*: parameter editing only remotely (Ekip Com modules)
	
	ⓘ **NOTES**:
	  • *the Remote mode requires the presence of auxiliary power supply and Ekip Com modules, otherwise it disables automatically*
	  • *However, the Local/Remote parameter can still be edited in the Remote mode*
		Local

Local bus	The parameter enables communication between the Trip unit and modules installed via terminal box or outside the unit to be activated. Correct communication between unit and modules is confirmed by: • population of the *Modules* menu with all the modules connected • Power Leds of the modules on and synchronized like the power led of Ekip Touch • absence of Local Bus alarm in the diagnosis bar	Off
Ekip Measuring	Menu with the parameters of the module Measurement	
BLE	BLE activation parameters, see next paragraph	Off
-	Menu of every module connected and detected	
Functions	Access to the *LOCAL Switch On* and *RESET signaling* functions	

BLE - Connection security Activation of LV communication requires the Trip unit to be pre-engineered for a wireless connection: security of the data and LV connection between the Trip unit and its device is guaranteed thanks to the *ABB EPiC* application and the pairing configuration.

⚠ **WARNING!**

- **It is the customer's sole responsibility to provide and continuously ensure a secure connection between his device and the Trip unit. The plant manager must establish and maintain appropriate measures (such as but not limited to the installation of malware prevention systems, application of authentication measures, his own system and interface against any kind of security breach, unauthorized access, interference, intrusion, loss and/or theft of data or information. ABB and its affiliates are not liable for damages and/or losses related to such security breaches, unauthorized accesses, interference, intrusion, loss and/or theft of data or information, use of APPs other than those allowed.**
- **Consult the guidelines of the EPiC APP for the correct pairing procedure**

ABB recommends a few general configurations to strengthen the access of data into the Trip unit:

- activate the access PIN code in the Trip unit configure it with a value differing from the default value
- if parameters need not be written, configure the Trip unit only for parameter readout via bus (*Test bus* parameter = *Off*)
- switch off the BLE (*BLE-Enable* parameter = *Off*) after use

ⓘ **IMPORTANT: communications via LV and via service connector function alternatively: if BLE is activated there can be no communication with other accessories via the service connector**

BLE - Parameters The menu, which is available in *Settings-Modules*, enables the Bluetooth antenna on the Trip unit to be activated. This is useful for launching a communication with an external device (tablet, smartphone) according to the BLE protocol, via the *EPiC* APP (page 9).

The following parameters are available

Parameter	Description	Default
Enable	Enables/disables LV antenna switch-on and availability of the *Battery mode* parameter in the menu: • if *On*, the LV antenna comes on, on the basis of the *Battery Mode* parameter configuration • if *Off*, the antenna is off	Off
Battery mode	Defines the switch-on mode of the LV antenna, based on the presence of devices on the service connector (Ekip T&P, Ekip Programming, Ekip TT); can have two values: • --- ; with this option, the status of the LV antenna depends esclusively on the presence of devices: on if not present; off if present • **ON** ; with this option, the antenna is switched off for 15 seconds when a device is connected, after which: it remains off if communication with the device has been activated; it comes on if no communication has been activated **IMPORTANT: the typical scenario in which Battery mode should be configured = On is: Ekip Touch + Ekip TT + communication with smartphone activated; in all other cases, including System Update, configure Battery mode = ---**	---

  IMPORTANT: when LV antenna is on, communication on the service connector is not available

Test Bus The parameter allows parameter editing via the service connector to be enabled/disabled, thereby limiting the possibility of configuring all the options on the display (in the Local mode) or via modules *Ekip Com* (in the Remote mode).

Disabling the parameter, Local mode and using the password allow security against undesired modification by unauthorized persons to be increased.

  NOTE: *with Test Bus= Off, communication via service connector is still guaranteed (reading enabled)*

Ekip Touch is supplied with the parameter set to: On.

System The *System* menu provides various options:

Parameter	Description	Default
Date	Setting the current date	
Time	Setting the current time	
Language	Setting the language in display menus	English
Password	Password setting (page 26)	00001

  IMPORTANT: setting and checking Date and Time is important for all the recording functions (trips or measurements); in the event of date and time glitches, reset and if necessary replace the battery inside Ekip Touch (page 50).

Test

1 - Test

Presentation The test area can be accessed on the display; the commands available in this area allow certain functions of the Trip unit to be checked; details of all the commands available in the Test menu are given below (page 23).

Ekip T&P with Ekip Connect has a *Test Protections* section where the presence of current or voltage alarm signals can be simulated and times and trips can be checked.

Autotest The Autotest command starts an automatic sequence of the display and leds so as to enable their operation to be checked.

The sequence comprises the following test phases:

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. Lighting up, for one second, of the Warning and Alarm leds.

> **ⓘ** **NOTE:** *auxiliary power supply must be present in order to check the gradual increase of backlighting*

Trip Test Selection of the *Trip test* command accesses the dedicated page where the operator is asked to press the **iTEST** key to confirm the test operation.

An open command is transmitted to the Trip coil of the CB when the key is released.

> **❗** **IMPORTANT:**
> - **the open command is sent with the circuit-breaker closed and in the absence of current**
> - **following a command, the user is responsible for checking the effective change in status of the actuator and the information displayed: make sure that there are no alarms on the diagnosis bar before performing the test**

> **ⓘ** **NOTE: to reset the TRIP signal, go back to the HOME page and press the iTEST** *key or transmit a TRIP RESET command (via Ekip Connect or remotely)*

Test CB Selection of the *Test CB* command accesses a submenu with the *Open CB* and *Close CB* commands. The commands allow opening coil YO and closing coil YC to be activated, respectively: a window with the message "Test Executed" confirms that the command has been transmitted correctly.

Correct operation of the entire command system (Trip unit, Ekip Com Actuator and opening and closing coils) is checked by opening and closing the circuit-breaker.

> **❗** **IMPORTANT:**
> - **the open and close commands of the coils only function when the Trip unit is on and powered by an auxiliary supply**
> - **make sure that the coils are connected to the supply source**
> - **release operation is checked by the commands: faults in Ekip Com Actuator or the coils are not detected by the test**

Ekip Signalling 4K The menu activates in the presence of module *Ekip Signalling 2K* and auxiliary power supply.

The *Autotest* command is available in the menu; it activates the automatic output test sequence (contacts and leds) and provides for the following operations:

- Opening of the output contacts and switching off of output leds
- Closing in sequence of the four output contacts and switching on of the relative leds
- Reset initial conditions

> **IMPORTANT: the Autotest command closes the contacts regardless of the configuration set by the user: the user is responsible for making the devices connected to the modules secure, checking that the contacts have closed properly and that the leds have come on**

Ekip Signalling 2K The menu activates in the presence of module *Ekip Signalling 2K*, auxiliary power supply and local bus enabled.

> **NOTE:** *a menu is available for each Ekip Signalling 2K module present, up to a maximum of three*

The *Autotest* command is available in each submenu; it activates the automatic output test (Contacts and leds), input test (leds) and provides for the following operations:

1. Resetting of output contacts (= open) and leds (= off).

2. Lighting up of all leds in sequence (output and input)

3. Closing and switch-off in sequence of the two output contacts while the relative leds come on.

4. Reset initial conditions

> **IMPORTANT: the Autotest command closes the contacts regardless of the configuration set by the user: the user is responsible for making the devices connected to the Ekip Signalling 2K modules secure, checking that the contacts have closed properly and that the leds have come on**

ZoneSelectivity The menu has one or two sections, visibility of which depends on the protections available and enabled:

Submenus	Reference selectivity	Outputs/Inputs managed
S Selectivity	S, S2, D (Forward)	SZi (DFi), SZo (DFo)
G Selectivity	G, Gext, D (Backward)	GZi (DBi), GZo (DBo)

Each submenu has three fields for checking selectivity inputs and outputs:

Field	Description
Input	Provides the status of the selectivity input (On/Off)
Force output	Selectivity output activated
Force Output	Selectivity output deactivated

Consult the description of the putting into service procedure in the documents when checking the selectivity contacts 1SDH000999R0002 and 1SDH001000R0002.

RC test The command is available in the presence of *Rating plug Rc* and Rc toroid.

Selection of the command accesses a window containing the protection settings and test instructions:

1. Press the **iTEST** button to send a test signal to the toroid.

2. The toroid sends Ekip Touch a signal as though it had measured an alarm current.

3. Ekip Touch sends a TRIP command.

> **IMPORTANT: the command sends a signal to the Rc toroid and concludes with a TRIP command: the user is responsible for checking that the initial connections are correct (of the toroid and power supplies of the unit) and that TRIP is accomplished**

Accessories

1 - Introduction

Overview and connection   Emax 2 circuit-breakers have a set of electrical and mechanical accessories, the availability of which depends on the CB model.

The main electronic accessories, always present with Ekip Touch, are described below:

For a complete overview of all the other accessories, consult document **1SDH001330R1002**.

For a description of the connection, the assembly instructions for each accessory and the circuit diagrams of the circuit-breaker, consult document **1SDM000091R0001**.

2 - Rating Plug

Description   The *Rating Plug*, supplied with Ekip Touch, establishes the rated current In required by the measuring range and sets the current protections (with reference to In).
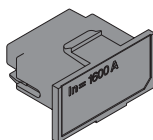
It is installed on a dedicated front connector and is accessible to the user for inspections or replacement following a change of model/size.

For further details about the available models, operations and reference documents, consult document **1SDH001330R1002**.

3 - Measurement

Presentation

Two *Measurement* modules are available:

- *Measurement enabler* installed by default on Ekip Touch and enabled in the presence of the Measuring Measurements package (enabling can be obtained both at the time the circuit-breaker is ordered or at a later date, via Market Place)
- *Measurement enabler with voltage socket* is installed by default on Ekip Hi-Touch, Ekip G Touch and Ekip G Hi-Touch; can be installed in conjunction with Ekip Touch if requested when circuit-breaker is ordered

Both modules measure voltages, frequencies, power and energy values; in addition, the *Measurement enabler with voltage socket* module allows:

- the Trip unit to be supplied directly by the voltage sockets to which it is connected
- management of the synchronism function when the *Ekip Synchrocheck* module is installed (see description of module in manual **1SDH001330R1002**).

Measurement performance

The measurement performance provided when the *Measurments* modules are installed (described on page 39), are more accurate when the *Class 1 Power & Energy Metering* package is present (described on page 41).

Configurations available

Both modules can be ordered with different connection configurations:

- connections to internal terminals or in an external terminal box
- connections to the upper or lower terminals of the poles on the basis of the expected power flow
- with normal or reverse pole order

For full details about ordering and the connections, consult technical catalog **1SDC200023D0906** and the wiring diagrams **1SDM000091R0001**.

Electrical characteristics

The *Measurement* modules function correctly in the electrical conditions described on page 11.

Installations with up to 1150 VAC line-to-line voltage can be connected and configured in the presence of connections to external sockets and an isolation transformer.

Isolation transformer

The isolation transformer must conform to standard IEC 60255-27 and possess the following characteristics:

Characteristics	Description
Electrical	• Accuracy class: ≤ 0,2 • Performance: ≥ 10 VA • Overload: 20 % permanent • Insulations: 4 kV between inputs and outputs, 4 kV between shield and outputs, 4 kV between shield and inputs • Frequency: Fn +-10% • Primary voltage: 100 to 1150 V (nominal, to be configured via menu) • Secondary voltage: 100 to 230 V (nominal, to be configured via menu)

Parameters

The specific configuration area will activate in the *Settings - Modules - Ekip Measuring* menu if the *Measurement* module is detected correctly by the trip unit.

The rated voltage, the presence and relative parameters of the isolation transformer, the power flow and presence of external neutral voltage (with 3P circuit-breaker) can be configured in this menu.

Replacement

The Measurement module can be replaced on its Trip unit, for details consult document **1SDH001330R1002**.

⚠ **WARNING! if the Class 1 Power & Energy Metering package is present, module replacement will impair the performance values indicated on page 41; consult ABB to assess solutions able to comply with your requirements**

Default

1 - Ekip TOUCH default parameters

Protections All Ekip Touch models are supplied with the protections (and relative correlated functions) off, with the exception of the protections listed below:

Protection	Configuration
L [1]	I1= 1 In; t1= 144 s; curve= t= k/I^2; prealarm: 90% I1
I	I3= 4 In; startup= OFF
Harmonic distortion	On
Rc [2]	Idn= 3 A; Tdn= 0,06 s

[1] protection always active; a model L Disable rating Plug must be used to disable it

[2] protection available and active if model Rc Rating Plus is present

Parameters Unless different specifications are requested when ordering, all Ekip Touch models are supplied with the following configurations:

Parameters	Configuration
Frequency	50 Hz (IEC) / 60 Hz (UL)
Configuration	3P (3P circuit-breaker) / 4P (4P circuit-breaker)
Neutral	Off (3P circuit-breaker) / 50% (4P circuit-breaker)
Rated voltage	400 V
Power flow	Top → Bottom
Phase Sequence	1-2-3
Local bus	Off
Mode	Local
Language	English
BLE	Off
Password	00001
Home page	Histograms
Led Alive	Disabled
View	Horizontal
Maintenance	On
Test Bus	On

Management operations

1 - Ekip Touch maintenance and troubleshooting

Introduction Correct maintenance of the unit and connected devices ensures they operate correctly over time.

The maintenance operations must be performed by expert personnel, as required by the safety regulations and maintenance schedule described in this document and in manuals **1SDH000999R0002** and **1SDH001000R0002**).

If faults are discovered, find out what is causing them and eliminate them before putting the unit back into service.

⚠ **WARNING! Detecting faults must only be managed by (electrically) skilled persons (IEV 195-04-01: person with relevant education and experience to enable him or her to perceive risks and to avoid hazards which electricity can create), as it may be necessary to perform insulation and dielectric tests on part or all the installation**

Alarms displayed and suggestions A list of faults that may appear on the Ekip Touch display is given below along with suggestions on how to resolve them:

Signal	Suggestions
Numerical alarm (e.g. 30002)	Internal error; contact ABB if this typoe of error occurs
Battery low	Change the battery (See 1SDH001000R0509 kit sheet)
Local bus	Unit on with auxiliary supply, Local Bus parameter enabled but connection to modules not present, incorrect or communication lost (for more than five seconds); check: • connection and powering of modules in terminal box or external • that the moldules connected are compatible with Ekip Touch
CB undefined	Check the circuit-breaker status signal contacts
Trip fail command (BF)	CB has failed to open and/or current still present after a TRIP command: comply with the procedure proposed in the next chapter 'Faults, causes and remedies'
Configuration	Check: • *Rating plug* of model compatible with Ekip Touch and CB size • If present, protection parameters do not conflict with size of current of unit details on page 27) • In the absence of *Vaux* threshold I4 and/or I41 > 100 A • In the absence of *Vaux* time t4 and/or t41 > 100 ms • RC protection active and *Rating Plug* not RC
Invalid Date	Wrong date and time: set in *Settings-System-Date* and *Settings-System-Time*
Ekip Com Hub	Problem of Ekip Com Hub module with: certificates, connected devices, missing Com modules (RTU or with Ethernet connection), API TLS device, Hub events, parsar configuration
Ekip Link Bus	Fault in *Ekip Link* module: check for loss of connection with one or more actors (modules) connected to Link Bus

Signal	Suggestions
Ekip Sign 3T connection	Alarm for connection of one or more analog inputs to *Ekip Signalling 3T* module
Ekip Sign 3T threshold	One or more thresholds of the *Ekip Signalling 3T* module has/have been exceeded
Internal error	Internal error; contact ABB if this typoe of error occurs
SNTP error	Fault with *Ekip Com* modules: synchronization problem of SNTP synchronization reference module
Measuring Error	*Measurement* module parameter reading error, contact ABB
Ethernet disconnected	No external cable on one or more *Ekip Com* modules with Ethernet connection
IEEE1588 synch	Synchronization problem of IEEE 1588 synchronization reference module
MAC Address	*Ekip Com* module detected with incorrect / not allowed MAC address, contact ABB.
Ekip Installation	Installation error between HMI and Mainboard, contact ABB
Measuring installation	Install *Measurement* module (*Settings-Circuit breaker-Installation-Measuring-Install*) menu
RatingPlugInstallation	Install Rating Plug (*Settings-Circuit breaker-Rating Plug-Install* menu) and check connection if there are further faults
Maintenance	Maintenance alarm: perform maintenance and then reset the alarm via Ekip Connect (see 1SDH001330R1001)
PC Power exceed	The average power limit setting of the Power Controller has been exceeded
Rating plug	*Rating plug* not present, value or size incompatible with Ekip Touch parameters
Zone Selectivity Diag	Error in zone selectivity connections (Hardware Selectivity)
Sensor L1/L2/ L3/Ne	Fault in connection of sensors to Trip unit; check status of sensors, including external Neutral, or call ABB
	Check current sensors, status of terminal and cables connecting to Ekip Touch
Configuration Session	TFTP server enabled and/or configuration session open on module *Ekip Com IEC61850* or *Ekip Hub*
Software Not Compatible	The software versions between Mainboard and display (Ekip Touch) are not compatible with each other: To restore compatibility, please consult ABB. **NOTE**: *modification of all parameters is inhibited via display; if present, protections L, I and Iinst are active and function with the parameters prior to the alarm (parameters of previous unit are active if display has been replaced)*
CB status	CB state incorrect (esample: current present but CB in open state)
TC disconnected	Disconnection of Trip coil detected, check functionality
	Check Trip coil, status of the terminal and cables connecting to Ekip Touch
Contact Wear	Make sure that the contacts/poles are in good condition.

Protections

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

Signal	Type of alarm
Trip Test	Trip test performed signal. Press **iTEST** to reset the message
Protection timing (for example: L timing)	Specific protection in time delay mode
Protection prealarm (for example: Prealarm G)	Specific protection in prealarm
Protection (Trip off) [for example: S (Trip off)]	Specific protection, configured with trip disabled, in alarm state
2I Protection Active	2I Protection active
Load LC1 / Load LC2	Current threshold 1 I1 / 2 I1 exceeded and in alarm state
Iw1 Warning / Iw2 Warning	Current threshold Iw1 / Iw2 exceeded and in alarm state
Harmonic dist.	Harmonic Distortion protection in alarm state
Power factor	Power factor measurement (cos φ) less than set threshold
Phase cycle	Phase sequence protection in alarm state
Frequency	Frequency measured off range (<30 Hz or >80 Hz)
5th harmonic above Th / I sopra Th / THD I above Th / THD V above Th	Single or total harmonic measurement above threshold

Faults, causes and remedies

A list of possible faulty situations for Ekip Touch, their possible causes and suggestions about how to resolve them are given below. Integrate the table with that of the circuit-breaker available in manuals **1SDH000999R0002** and **1SDH001000R0002**.

i **NOTE:** *check error messages on display before consulting the table; if the suggestions given fail to resolve the problem, call the ABB assistance service and provide the report produced by the Ekip Connect software if possible*

Fault	Possible causes	Suggestions
Communication problems with modules in terminal box	Circuit-breaker in withdrawn position, Vaux absent or modules not inserted properly	Insert modules, set CB to Connected position, connect Vaux
CB status not aligned with CB position	Absence of terminal box modules or of contact S75I	Check for presence of terminal box modules and connect contact S75/I
Circuit-breaker fails to react to opening/ closing command from Ekip Touch	The connections or supplies of the opening/closing actuators are not correct	Check connections and supplies.
	Absence of auxiliary power supply to Ekip Touch	Check supplies and status of Power LEDs
	Circuit-breaker is in a condition which fails to enable the selected command	Check circuit-breaker documentation and cases that fail to enable command
Display off and/or not backlit	No auxiliary supply or currents lower than minimum turn-on values	Correct operating condition.
	Temperature outside range	Correct operating condition.

Fault	Possible causes	Suggestions
Measurements incorrect or absent (current, voltage, etc)	Current below the minimum threshold that can be displayed	Correct operating condition.
	Incorrect frequency setting	Set frequency
	Harmonic distortion and/or crest factor off range	Correct operating condition.
	Incorrect connection between isolation transformer and *Measurement* module	Check connections between isolation transformer and Measurement module
	Rated Voltage parameter setting error	Set the correct parameters
The PIN is not required	The PIN has been disabled or has already been entered in the same programming session	Operating condition correct; consult chapter relating to the PIN
PIN error	PIN wrong or lost	Contact ABB or consult document 1SDH001501R0001
It is not possible to perform the trip test	Trip coil is not connected properly	Check Trip coil connection and messages on display
	CB trip signal has not been reset	Press the reset pushbutton
	The busbar current is greater than zero	Correct operating condition.
TRIP fail signaling: *Trip Fail command (BF)*	One or more of the following conditions: • Trip coil not working • status contacts not working • faulty internal wiring	1. If closed, open CB in the manual mode and check changed status. 2. Press iTest, check that the signal has disappeared from the display and the general status of the alarms. 3. Check the conditions of the wiring and internal contacts 4. Working in safety conditions, close the CB and perform a trip test via the trip unit Contact ABB if problems persist
The expected trip does not occur	Trip excluded	Operating condition correct; enable trip if necessary
Trip times different than expected	Wrong threshold/time/curve selected	Correct parameters
	Thermal memory enabled	Disable it if it is not necessary
	Zone selectivity enabled	Disable it if it is not necessary
	Incorrect neutral selection	Modify the neutral selection
Rapid trip with I3=Off	Iinst trip	Correct operating condition with short circuit at high current
High ground-fault current, but no trip occurs	Incorrect selection of the sensor	Set internal or external sensor
	Function G inhibited owing to high current	Operating condition correct (see protection description chapter)
Opening data not displayed	No auxiliary power supply and/or battery low	Correct operating condition.

1SDH001316R1002 - ECN000086501 - Rev. A