

EMAX LOW VOLTAGE AIR CIRCUIT-BREAKERS E1.2-E2.2-E4.2-E6.2

SACE Emax 2

Instructions for using Ekip Touch protection trip units and Accessories.



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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 sufficient training and experience to enable him or her to perceive risks and avoid the dangers potentially created by electricity)
- instructed person, in the electrical field (IEV 195-04-02): person adequately advised or supervised by electrically skilled persons to enable 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 manual [1SDH001330R1002](#).

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

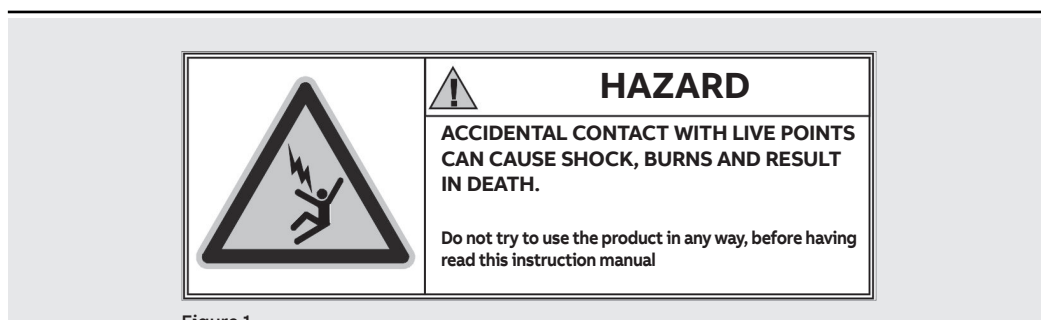


Figure 1



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 injuries 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

Trip unit Overview

1 - General characteristics

Main functions SACE Emax 2 can be configured using the Ekip Touch trip unit, which is available in several versions and able to provide, protection, measurement and signalling functionalities.

Emax 2 can be provided with mechanical, electronic and testing accessories, and is supported by many different types of software and applications enabling the functions of the Trip unit and circuit-breaker to be expanded.

Detailed information is available in manual 1SDH001330R1001. [1SDH001330R1002](#).

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

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
Measuring Measurements	O	X	X	X
Class 1 Power & Energy Metering	O ⁽²⁾	X	O	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](#).

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; certain accessories can also be configured with Ekip Dip.

In manual [1SDH001330R1002](#) Contains the lists and descriptions of all the available accessories, the support software and all the additional functions.

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, depending on the circuit-breaker model used

⁽²⁾ for Ekip Touch 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; Ekip Touch 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 if available.

Auxiliary power supply can be provided by modules from the || Ekip Supply|| range or by direct connection to the terminal box; a direct connection can also be made. Details are available in the manual [1SDH001330R1002](#).

Ekip Touch - 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 for the connected accessory modules
 - 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 2

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

LED



LED	Colour	Description
Power 	Green	Indicates the on status of Ekip Touch: <ul style="list-style-type: none"> • off: no power and unit off • on, steady (<i>Power mode</i>) or flashing (<i>Alive mode</i>): unit on and self-supplied by external Vaux or service connector The <i>Power mode</i> or <i>Alive mode</i> can be selected via Ekip Connect: if the <i>Alive mode</i> 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: <ul style="list-style-type: none"> • off: no alarm • on: steady prealarm of an active protection or status contacts error • two fast flashes every 0.5 s: trip unit parameter configuration error • fast flash: <i>Rating Plug</i> or <i>Measurement</i> module installation error
Alarm 	Red	Signals that an alarm is present: <ul style="list-style-type: none"> • off: no alarm • on and steady: TRIP signalling due to protection or internal error; check message on diagnosis bar to find out which • fast flash: one or more of the following signals: protection timing active, disconnection of a current sensor, trip coil disconnected, failed trip command • two fast flashes every 2 seconds: <i>Rating Plug</i> error

If on at the same time, the Warning and Alarm leds provide further signals:

- LEDs on and flashing fast: absence of communication between Trip unit and Mainboard or T protection timing
- leds on with slow flashing: internal error

These cases need assistance from ABB.

Push-buttons



Push-button	Description
HOME 	Allows different areas of the menu to be accessed: <ul style="list-style-type: none"> • from pages <i>HOME</i>, <i>Histograms</i>, <i>Measuring instruments</i>, <i>Measurements</i>, <i>Main measurements</i> open the page <i>Main page</i>; • from pages <i>Main page</i>, <i>Alarm list</i>, at any point of the menu area open: <i>HOME</i> page.
iTest 	Allows certain pages of information about the unit to be rapidly consulted; press the button in succession to display the following pages: <ul style="list-style-type: none"> • <i>Alarm list</i>, if messages are present; • <i>Info</i>, if Customer Page option is active; • <i>Protection unit</i>, with information about Ekip Touch; • <i>Circuit breaker</i>, with information about the CB; • <i>Last trip</i>, with information about the last trip, if available. Consultation is active from pages: <i>HOME</i> , <i>Histograms</i> , <i>Measuring instruments</i> , <i>Measurements</i> , <i>Main measurements</i> <i>NOTE:</i> with <i>Ekip Touch</i> 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 9; 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

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)

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*

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.

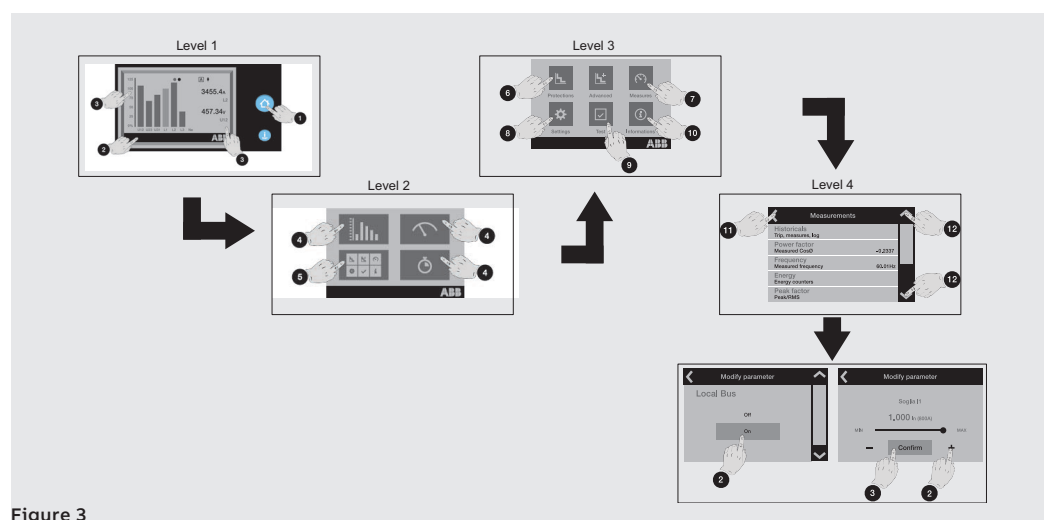


Figure 3

3 - 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:

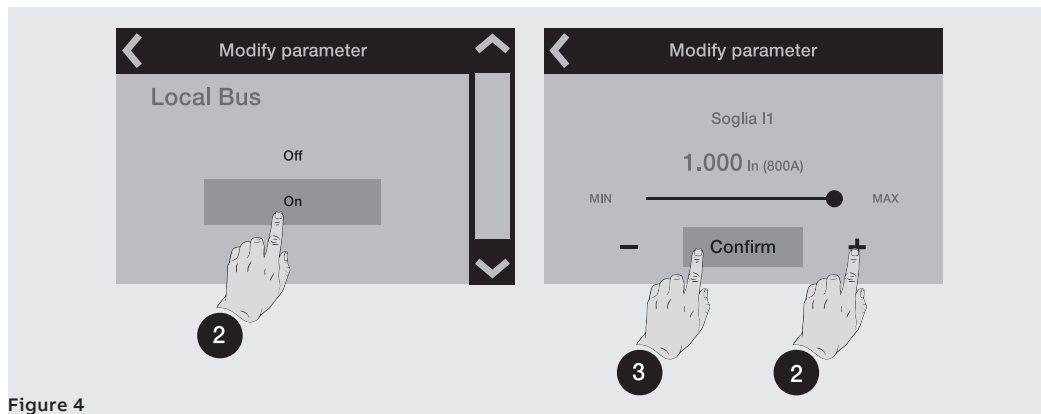


Figure 4

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:

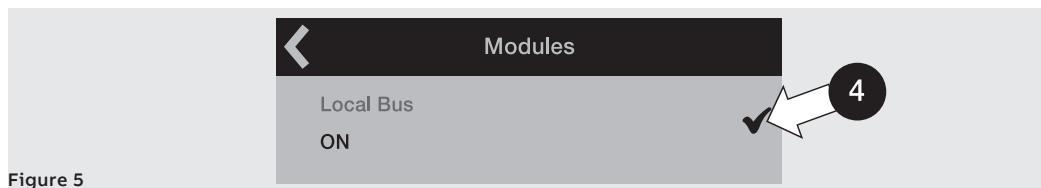


Figure 5

Now proceed by confirming the programming (Step 5) and make further changes (Step 1).

or access other parameters

5. Select the arrow at the top left to access the top menu until the *Programming* page appears:

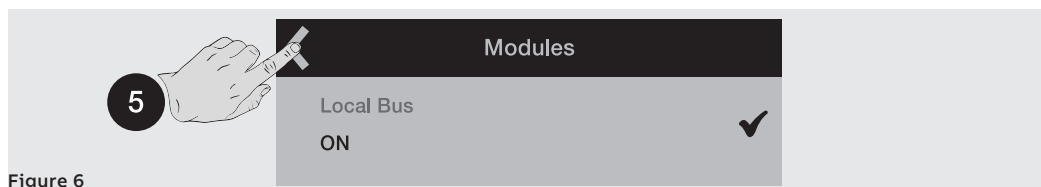


Figure 6

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 7

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

4 - 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 27).

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).



NOTE: the PIN code must also be entered again if a programming session has been annulled (page 11).

Entry

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

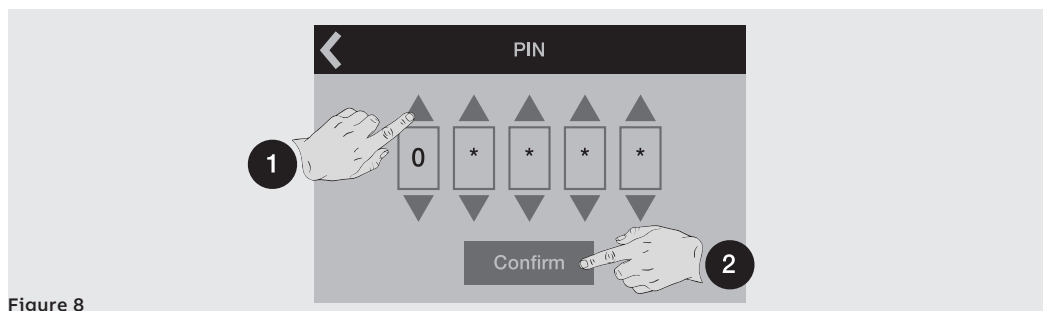


Figure 8



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

Contact ABB directly if PIN code is lost.

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** condition).
2. The **alarm** appears on the display and, after a period of time (timing t_p), 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	I_n	Nominal current of the <i>Rating plug</i>
Voltage	U_n	Line-to-line voltage setting
Frequency	f_n	Frequency setting
Power	S_n	$\sqrt{3} \times I_n \times U_n$

2 - Standard Protections

List

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

Name	Type of protection	Th-reshold	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, Lock
S2	Short-circuit with adjustable delay	✓	✓	✓	Trip Enable, Zone Selectivity, Startup enable, Lock
I ⁽³⁾	Instantaneous short-circuit	✓			Startup enable, Lock
G ⁽²⁾⁽⁵⁾	Earth fault with adjustable delay	✓	✓	✓	Trip enable, Zone Selectivity, Startup enable, Locking, Pre-alarm threshold
MCR ⁽⁴⁾	Instantaneous short-circuit on circuit-breaker closing	✓			Monitoring period, Locking
2I	Instantaneous short-circuit programmable	✓			Zone selectivity, activation function and mode, Delay ON/OFF
IU	Current unbalance	✓	✓		Trip enable, Algorithm
Neutral	Different protection on neutral phase	✓			
T	Abnormal temperatures	✓			Trip enable
Iinst ⁽¹⁾	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⁾ protection cannot be deactivated; its trip parameters are set by ABB and cannot be edited

⁽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 (I_L) and of the Neutral (I_{nN}) unless the following limitation is complied with: $(I_L \times I_{nN}) \leq I_u$; I_u is the size of the circuit-breaker



WARNING! With 150% and 200% threshold; if the measured neutral current exceeds $16I_n$, 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: $-20^\circ\text{C} / +70^\circ\text{C}$; with Ekip LCD, the display remains on within range: $-30^\circ\text{C} / +80^\circ\text{C}$

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

Other protections

The linst, Harmonic distortion, Hardware trip and Current threshold protections are described in detail in the manual [1SDH001330R1002](#).

Continued on the next page

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	$I_1 = 0.4...1 I_n$ step = 0.001 I_n	Activation for I_f in the range (1.05...1.2) x I_1	$t_1 = 3...144$ s step = 1 s	$t_t = (9 t_1) / (I_f / I_1)^2$	$t_t = 6.75$ s with: $I_1 = 0.4 I_n$; $t_1 = 3$ s; $I_f = 0.8 I_n$	± 10 % with $I_f \leq 6 I_n$ ± 20 % with $I_f > 6 I_n$
L (60255-151)	49	$I_1 = 0.4...1 I_n$ step = 0.001 I_n	Activation for I_f in the range (1.05...1.2) x I_1	$t_1 = 3...144$ s step = 1 s	$t_t = (t_1 \times k \times b) / ((I_f / I_1)^a - 1)$	See the table below	± 10 % with $I_f \leq 6 I_n$ ± 20 % with $I_f > 6 I_n$
S ($t = k$) ⁽¹³⁾	50 TD	$I_2 = 0.6...10 I_n$ step = 0.1 I_n	± 7 % with $I_f \leq 6 I_n$ ± 10 % with $I_f > 6 I_n$	$t_2 = 0.05...0.8$ s step = 0.01 s	$t_t = t_2$	-	The better of the two values: ± 10 % or ± 40 ms
S ($t = k / I^2$) ⁽¹³⁾	51	$I_2 = 0.6...10 I_n$ step = 0.1 I_n	± 7 % with $I_f \leq 6 I_n$ ± 10 % with $I_f > 6 I_n$	$t_2 = 0.05...0.8$ s step = 0.01 s	$t_t = (100 t_2) / (I_f)^2$	$t_t = 5$ s con: $I_2 = 1 I_n$; $t_2 = 0.8$ s; $I_f = 4 I_n$	± 15 % with $I_f \leq 6 I_n$ ± 20 % with $I_f > 6 I_n$
S2 ($t = k$) ⁽¹³⁾	50 TD	$I_5 = 0.6...10 I_n$ step = 0.1 I_n	± 7 % with $I_f \leq 6 I_n$ ± 10 % with $I_f > 6 I_n$	$t_5 = 0.05...0.8$ s step = 0.01 s	$t_t = t_5$	-	The better of the two values: ± 10 % or ± 40 ms
I	50	$I_3 = 1.5...15 I_n$ step = 0.1 I_n	± 10 %	Not adjustable	$t_t \leq 30$ ms	-	-
G ($t = k$) ⁽¹²⁾⁽¹³⁾	50N TD	$I_4^{(4)} = 0.1...1 I_n$ step = 0.001 I_n	± 7 %	$t_4 =$ Instantaneous...1 s, 0.1...1 s step = 0.05 s	$t_t = t_4$	-	The better of the two values: ± 10 % or ± 40 ms ⁽⁸⁾
G ($t = k / I^2$) ⁽¹²⁾⁽¹³⁾	51N	$I_4^{(4)} = 0.1...1 I_n$ step = 0.001 I_n	± 7 %	$t_4 = 0.1...1$ s step = 0.05 s	$t_t = 2 / (I_f / I_4)^2$	$t_t = 0.32$ s with: $I_4 = 0.8 I_n$; $t_4 = 0.2$ s; $I_f = 2 I_n$	± 15 %
2I	50	$I_{31} = 1.5...15 I_n$ step = 0.1 I_n	± 10 %	Not adjustable	$t_t \leq 30$ ms	-	-
MCR	-	$I_3 = 1.5...15 I_n$ step = 0.1 I_n	± 10 %	0.04...0.5 s ⁽⁵⁾ step = 0.01 s	$t_t \leq 30$ ms	-	-
IU	46	$I_6 = 2...90$ % step = 1 %	± 10 %	$t_6 = 0.5...60$ s step = 0.5 s	$t_t = t_6$	-	the better of the two values: ± 10 % or ± 40 ms (for a time set < 5 s) / ± 100 ms (for a time set ≥ 5 s)

Continued on the next page

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)	$a = 0.02$; $b = 0.15873$; $k = 0.16$	$t_t = (t_1 \times k \times b) / ((I_f / I_1)^a - 1)$	$t_t = 4.78$ s with: $I_1 = 0.4 I_n$; $t_1 = 3$ s; $I_f = 0.8 I_n$
L (60255-151 VI)	$a = 1$; $b = 0.148148$; $k = 13.7$	$t_t = (t_1 \times k \times b) / ((I_f / I_1)^a - 1)$	$t_t = 6$ s with: $I_1 = 0.4 I_n$; $t_1 = 3$ s; $I_f = 0.8 I_n$
L (60255-151 EI)	$a = 2$; $b = 0.1$; $k = 82$	$t_t = (t_1 \times k \times b) / ((I_f / I_1)^a - 1)$	$t_t = 8$ s with: $I_1 = 0.4 I_n$; $t_1 = 3$ s; $I_f = 0.8 I_n$
L (60255-151 I ⁴)	$a = 4$; $b = 1$; $k = 82$	$t_t = (t_1 \times k \times b) / ((I_f / I_1)^a - 1)$	$t_t = 16$ s with: $I_1 = 0.4 I_n$; $t_1 = 3$ s; $I_f = 0.8 I_n$



NOTE: the performance of the additional Startup and Zone selectivity functions is described in the manual [1SDH001330R1002](#).

⁽¹⁾ ANSI / IEEE C37-2 codification

⁽²⁾ t_t calculation is valid for I_f values that have exceeded the trip threshold of the protection. Use fault current and threshold values expressed in I_n 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: $0.3 I_n$ (with $I_n = 100$ A), $0.25 I_n$ (with $I_n = 400$ A) or $0.2 I_n$ (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 $t_4 =$ 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 t_t value and/or if the current reading is more than $12 I_n$

⁽¹⁰⁾ G protection: the protection deactivates automatically if disconnection of one or more sensors is detected or if current I_f is more than $8 I_n$ (with $I_4 \geq 0.8 I_n$), $6 I_n$ (with $0.5 I_n \leq I_4 < 0.8 I_n$), $4 I_n$ (with $0.2 I_n \leq I_4 < 0.5 I_n$) or $2 I_n$ (with $I_4 < 0.2 I_n$)

⁽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 t_t value lower than the parameter itself

⁽¹²⁾ A maximum value of $I_4 = 1200$ 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, t_2 and t_4 can be set at 0.4 s maximum

Protection	Tolerance threshold	Tolerance t_t
L	Activation for I_f in the range $1.05...1.2 I_1$	± 20 %
S	± 10 %	± 20 %
I	± 15 %	≤ 60 ms
G	± 15 %	± 20 % (60 ms with $t_4 =$ 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	Th-reshold	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 = 0,5...1 Un Step = 0,001 Un	$\pm 2\%$ ⁽⁷⁾	t8 = 0,05...120 s Step = 0,01 s	$t_t = t8$	The best of the two values: $\pm 10\%$ 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	$\pm 2\%$ ⁽⁷⁾	t9 = 0,05...120 s Step = 0,01 s	$t_t = t9$	The best of the two values: $\pm 10\%$ or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
UV2	27	U15 = 0,5...1 Un Step = 0,001 Un	$\pm 2\%$ ⁽⁷⁾	t15 = 0,05...120 s Step = 0,01 s	$t_t = t15$	The best of the two values: $\pm 10\%$ 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	$\pm 2\%$ ⁽⁷⁾	t16 = 0,05...120 s Step = 0,01 s	$t_t = t16$	The best of the two values: $\pm 10\%$ or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
VU ⁽⁶⁾	47	U14 = 2...90 % Step = 1 %	$\pm 5\%$	t14 = 0,5...60 s Step = 0,5 s	$t_t = t14$	The best of the two values: $\pm 10\%$ 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 $\pm 20\%$ 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 3% hysteresis for quitting 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	$I_{20} = 0,6...10 I_n$ step = $0,1 I_n$ ⁽⁹⁾ ; $U_I = 0,2...1 U_n$ step = $0,01 U_n$ ⁽⁹⁾ ; $U_h = 0,2...1 U_n$ step = $0,01 U_n$ ⁽⁹⁾ ; $K_s = 0,1...1$ step = $0,01$ ⁽⁹⁾	$\pm 10 \%$	$t_{20} = 0,05...30 \text{ s}$ Step = $0,01 \text{ s}$	$t_t = t_{20}$	The best of the two values: $\pm 10\%$ or $\pm 40 \text{ ms}$ (for set time $< 5 \text{ s}$) / $\pm 100 \text{ ms}$ (for set time $\geq 5 \text{ s}$)
S2(V)	51V	$I_{21} = 0,6...10 I_n$ step = $0,1 I_n$ ⁽¹⁰⁾ ; $U_{I2} = 0,2...1 U_n$ step = $0,01 U_n$ ⁽¹⁰⁾ ; $U_{h2} = 0,2...1 U_n$ step = $0,01 U_n$ ⁽¹⁰⁾ ; $K_{s2} = 0,1...1$; step = $0,01$ ⁽¹⁰⁾	$\pm 10 \%$	$t_{21} = 0,05...30 \text{ s}$ Step = $0,01 \text{ s}$	$t_t = t_{21}$	The best of the two values: $\pm 10\%$ or $\pm 40 \text{ ms}$ (for set time $< 5 \text{ s}$) / $\pm 100 \text{ ms}$ (for set time $\geq 5 \text{ s}$)
RV	59N	$U_{22} = 0,05...0,5 U_n$ Step = $0,001 U_n$	$\pm 5 \%$ ⁽¹¹⁾	$t_{22} = 0,05...120 \text{ s}$ Step = $0,01 \text{ s}$	$t_t = t_{22}$	The best of the two values: $\pm 10\%$ or $\pm 40 \text{ ms}$ (for set time $< 5 \text{ s}$) / $\pm 100 \text{ ms}$ (for set time $\geq 5 \text{ s}$)

⁽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 $\geq 100 \text{ ms}$, temperature and current values within operating limits; the tolerance value is $\pm 20\%$ 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 U_I and U_h is calculated by performing linear interpolation between thresholds U_h and I_{20} (first point of the line) and U_I and $K_s * I_{20}$ (second point of the line). $I_{threshold} = [I_{20} * (1 - K_s) * (U_{measured} - U_h)] / (U_h - U_I) + I_{20}$

⁽⁸⁾ S2(V) protection: in the Linear mode, the current trip threshold for voltage values between U_{I2} and U_{h2} is calculated by performing linear interpolation between thresholds U_{h2} and I_{21} (first point of the line) and U_{I2} and $K_{s2} * I_{21}$ (second point of the line). $I_{threshold} = [I_{21} * (1 - K_{s2}) * (U_{measured} - U_{h2})] / (U_{h2} - U_{I2}) + I_{21}$

⁽⁹⁾ the threshold K_s setting must ensure the following limitation: $K_s * I_{20} \geq 0,6 I_n$; parameter U_h is available in the Linear mode; the setting must comply with the following limitation: $U_h > U_I$

⁽¹⁰⁾ the threshold K_{s2} setting must ensure the following limitation: $K_{s2} * I_{21} \geq 0,6 I_n$; parameter U_{h2} is available in the Linear mode; the setting must comply with the following limitation: $U_{h2} > U_{I2}$

⁽¹¹⁾ tolerance values valid with Trip unit supplied at full rate or by auxiliary power supply, trip time $\geq 100 \text{ ms}$, temperature and current values within operating limits; the tolerance value is $\pm 10\%$ if the conditions are not guaranteed

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 the remaining models 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	$t_t = t_{12}$	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	$t_t = t_{13}$	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	$t_t = t_{17}$	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	$t_t = t_{18}$	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
CosΦ	Minimum cosφ	✓		

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...120 s step = 0,01 s	$t_t = t_{11}$	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	$t_t = t_7$	± 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	$t_t = t_{27}$	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	$t_t = t_{26}$	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	$t_t = t_{23}$	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	$t_t = t_{24}$	The best of the two values: ± 10% or ± 40 ms (for set time < 5 s) / ± 100 ms (for set time ≥ 5 s)
CosΦ	78	Cosφ = 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)

Continued on the next page

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⁾				$t_{23startup} = 0,1...30 \text{ s}$, step = 0,01 s		
D (Startup)		$I_{7startup} Fw/Bw = 0,6...10 \text{ In}$ step = 0,1 In	$\pm 10 \%$	$t_{7startup} = 0,1...30 \text{ s}$ step = 0,01 s	$t_t = t_{7startup}$	The better of the two values: $\pm 10 \%$ or $\pm 40 \text{ ms}$
D (SdZ)	68	-	-	$t_{7SdZ} Fw/Bw = 0,1...0,8 \text{ s}$ 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	$f_{28} = 0,4...10 \text{ Hz / s}$ step = 0,2 Hz / s	$\pm 10 \%$ ⁽⁵⁾	$t_{28} = 0,06...300 \text{ s}$ step = 0,01 s	$t_t = t_{28}$	The best of the two values: $\pm 20\%$ 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 $\geq 100 \text{ ms}$, temperature and current values within operating limits; the tolerance value becomes $\pm 20\%$ if the conditions are not guaranteed

⁽³⁾ ANSI / IEEE C37-2 codification

⁽⁴⁾ not active for voltage values $< 30 \text{ V}$

⁽⁵⁾ $\pm 20\%$ 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, MDGF
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, MDGF
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, MDGF

Additional protections

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

Name	Type of protection	Th-res	Time	Function	Additional functions
Gext	Earth fault with current reading by S.G.R. external sensor	✓	✓	✓	Trip enable, Zone Selectivity, Startup enable, Locking, Pre-alarm threshold
Rc	Residual current with current reading by external toroid Rc	✓	✓		
Synchrocheck	Synchronism between two independent voltage sources or energizing of a busbar not active	✓	✓		
MDGF	Earth fault with current reading by MDGF external sensor	✓	✓	✓	Trip enable, Zone Selectivity, Startup enable, Locking, Pre-alarm threshold

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

Ekip Touch - Measurements

1 - 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⁾ ⁽⁸⁾	0,004 ÷ 64 In	Standard IEC 61557-12, tables 20-22	0,5 % ⁽¹⁾
Internal earth fault current ⁽²⁾	0,08 ÷ 64 In	Standard IEC 61557-12, 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 IEC 61557-12, tables 8-11-14	1 % ⁽¹⁾
Active and apparent phase power	Pmin ÷ Pmax ⁽⁵⁾	Standard IEC 61557-12, tables 8-11-14	1 % ⁽¹⁾
Total active and apparent energy	1 kWh ÷ 2 TWh; 1 kVARh ÷ 2 TVARh; 1 kVAh ÷ 2 TVAh	Standard IEC 61557-12, tables 8-11-14	1 % ⁽¹⁾
Power factor	0,5 ÷ 1	Standard IEC 61557-12, 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

⁽⁸⁾ internal phase current; in the presence of an external Neutral, the accuracy of current Ne is 1%

Functional characteristics

The measuring performance of the *Class 1 Power & Energy Metering* package is guaranteed in the following conditions (from table 43 of standard IEC 61557-12):

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 IEC 61557-12 information page, which can be consulted in the *About* menu



Figure 9

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)

Ekip Touch - 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 toroid S.G.R and relative Gext protection.
- activate the presence of Rc Toroid and relative protection.
- activate/deactivate the MDGF transformer presence and relative MDGF protection.



NOTE: Rc Toroid can be activated if the *Measuring Measurements package* and Rc version *Rating plug* are present; Toroid 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.



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	<p>The parameter defines the mode in which the parameters are written in the unit:</p> <ul style="list-style-type: none"> • <i>Local</i>, parameter editing only via the display or service connector • <i>Remote</i>, parameter editing only remotely (Ekip Com modules) <p>NOTES:</p> <ul style="list-style-type: none"> • 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	<p>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:</p> <ul style="list-style-type: none"> • population of the <i>Modules</i> 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 Signalling 4K	Menu with the parameters of the Ekip Signalling 4K module, if present	
Ekip Measuring	Menu with the parameters of the module <i>Measurement</i>	
-	Menu of every module connected and detected	
Functions	Access to the <i>LOCAL Switch On</i> and <i>RESET signaling</i> functions	

Bluetooth Low Energy - Connection security Details of connection Security are available in manual [1SDH0013300R1002](#).

Bluetooth Low Energy - Parameters

The following parameters are available

Parameter	Description	Default
<i>Enable</i>	Enables/disables Bluetooth Low Energy antenna switch-on and availability of the other parameters in the menu: • if <i>On</i> , the antenna comes on, on the basis of the <i>Battery Mode</i> parameter configuration • if <i>Off</i> , the antenna is off	Off
<i>Battery mode</i>	Defines the switch-on mode of the Bluetooth Low Energy antenna, based on the presence of the devices on the service connector (Ekip T&P, Ekip Programming, Ekip TT); can have two values: • --- ; with this option, the state of the antenna depends exclusively 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 = ---	---
<i>Start Pairing</i>	Command which starts Pairing between Trip unit and external device. To perform the operation correctly: 1. Press Connect on EPiC APP, select the Trip Unit from among the units in the list and then select Connect again 2. Press Start Pairing in the Trip unit menu, enter the PIN, then press Start Pairing again 3. Press Start Pairing on EPiC APP and confirm the operations until the code request appears 4. Check that the pop up with the Passkey appears on the display of the Trip unit (about 20 seconds) and enter it in EPiC APP 5. The Trip unit will be connected to the external device from this moment on; for the successive re-connections, it will be sufficient to just repeat point 1 i NOTES: • execute the procedure within 120 seconds • the command is not available if communication with a device is activated	---
<i>Decouple devices</i>	Command that deletes the list of devices coupled to the Trip unit i NOTE: the command is not available if communication with a device is activated	---
<i>Version</i>	FW version of the Bluetooth Low Energy module installed on board	---



IMPORTANT: when Bluetooth Low Energy 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 PIN 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
PIN	PIN setting (page#s#13)	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 31).

Accessories

1 - 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](#)).

Configurations available Consult the manual for the electrical specifications and connection to the isolation transformer with respect to the available configurations [1SDH001330R1002](#).

Electrical characteristics The *Measurement* modules function correctly in the electrical conditions described on page 7. Installations with up to 1200 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	<ul style="list-style-type: none"> • Accuracy class: $\leq 0,2$ • 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: $F_n \pm 10\%$ • Primary voltage: 100 to 1200 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 following items can be configured in this menu:

- the rated voltage
- presence of the isolation transformer and the mode in which the values of the relative parameters are selected
- the power flow
- presence of external neutral voltage (with 3P circuit-breaker)

Replacement The *Measurement* module can be replaced on its Trip unit, for details consult document [1SDH001000R0528](#).

If the *Measurement* module is replaced, module change is indicated on the display by an alarm in the diagnosis bar when the apparatus is powered for the first time.

To install the new module:

- Confirm the installation module which appears automatically on the display



WARNING! if the Class 1 Power & Energy Metering package is present, module replacement will impair the performance values indicated on page 25; consult ABB to assess solutions able to comply with your requirements

Ekip Touch - 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 (excluding Ekip M Touch)	I1= 1 In; t1= 12 s; curve= t= k/I ² ; prealarm: 90% I1I1= 1 In; t1= 48 s; curve= t= k/I ² ; prealarm: 90% I1
L (only Ekip M Touch)	I1= 1 In; t1= 22 s (Class= 10E); Thermal Memory= On; Prealarm: 90 % I1I1= 0,4 In; t1= 45 s (Class= 20E); Thermal Memory= On; Prealarm: 90 % I1
L ⁽¹⁾	I1= 1 In; t1= 144 s; curve= t= k/I ² ; prealarm: 90% I1
I	I3= 5.5 In (all except Ekip M Touch) / 6 In (Ekip M Touch); startup= OFF
I	I3= 4 In; startup= OFF
Harmonic distortion	On
Rc ⁽¹⁾	I _{dn} = 3 A; T _{dn} = 0,06 s
Rc ⁽²⁾	I _{dn} = 3 A; T _{dn} = 0,06 s

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

⁽¹⁾⁽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	Bottom → Top
Phase Sequence	1-2-3
Local bus	Off
Mode	Local
Language	English
Bluetooth Low Energy	Off
Password	00001
Home page	Histograms
LED Alive	Disabled
View	Horizontal
Maintenance	On
Test Bus	On
Modbus RTU par	Address: 247; baudrate: 19.2 kbit/s
Profibus	Address: 125
DeviceNet™	MAC ID: 63; baudrate: 125 kbit/s
Modbus TCP/IP	Static IP: 0.0.0.0

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 the 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 type of error occurs
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: <ul style="list-style-type: none"> • connection and powering of modules in terminal box or external • that the modules connected are compatible with Ekip Touch
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: <ul style="list-style-type: none"> • <i>Rating plug</i> 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 14) • In the absence of <i>Vaux</i> threshold I4 and/or I41 > 100 A • In the absence of <i>Vaux</i> time t4 and/or t41 > 100 ms • RC protection active and <i>Rating Plug</i> not RC
Ekip CI	Ekip CI module not detected or absent, with Ekip M Touch and Open Mode configuration = Normal
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, parser configuration
Ekip Link Bus	Fault in <i>Ekip Link</i> module: check for loss of connection with one or more actors (modules) connected to Link Bus
Ekip Sign 3T connection	Alarm for connection of one or more analog inputs to <i>Ekip Signalling 3T</i> module
Ekip Sign 3T threshold	One or more thresholds of the <i>Ekip Signalling 3T</i> module has/have been exceeded

Continued on the next page

Signal	Suggestions
Internal error	Internal error; contact ABB if this type of error occurs
SNTP error	Fault with <i>Ekip Com</i> modules: synchronization problem of SNTP synchronization reference module
Measuring Error	<i>Measurement</i> module parameter reading error, contact ABB
Ethernet disconnected	No external cable on one or more <i>Ekip Com</i> modules with Ethernet connection
IEEE 1588 synch	Synchronization problem of IEEE 1588 synchronization reference module
MAC Address	<i>Ekip Com</i> module detected with incorrect / not allowed MAC address, contact ABB.
Ekip Installation	Installation error between HMI and Mainboard, contact ABB
Measuring installation	Install <i>Measurement</i> module (<i>Settings-Circuit breaker-Installation-Measuring-Install</i>) menu
RatingPlugInstallation	Install Rating Plug (<i>Settings-Circuit breaker-Rating Plug-Install</i> menu) and check connection if there are further faults
Maintenance	Maintenance alarm: carry out maintenance and then reset the alarm via Ekip Connect (see 1SDH001330R1002)
PC Power exceed	The average power limit setting of the Power Controller has been exceeded
Rating plug	<i>Rating plug</i> not present, value or size incompatible with Ekip Touch parameters
Zone Selectivity Diag	Error in zone selectivity connections (Hardware Selectivity)
S.G.R. Toroid	Check connection and state of toroid
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 <i>Ekip Com IEC 61850</i> or <i>Ekip Hub</i>
Software Not Compatible	<p> IMPORTANT! Ignore the message if all the following conditions are present at the same time:</p> <ul style="list-style-type: none"> • Vaux absence • Absence of Ekip TT/Ekip T&P/Ekip Programming • Presence of primary current near to self supply powering minimum value (condition in which the Power LED flashes) • After having pressed and held the Trip unit test button for at least three seconds <p>__logo__note_tab__NOTE: If for further confirmation that the alarm is unwarranted and must therefore be ignored, temporarily power by even only one of these sources and check that the alarm is no longer displayed: [ii]</p> <ul style="list-style-type: none"> • Vaux (24 VDC) -> K1 K2. For further details, consult page #7 • Ekip TT/Ekip T&P/EKIP Programming <p>If the conditions indicated above are not present, the software versions between Mainboard and display (Ekip Touch) are not compatible with each other: to restore compatibility, please contact ABB</p> <p> 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)</p>
CB status	CB state incorrect (example: current present but CB in open state)
Switchboard Actor communication Error	Check configuration and connection of <i>Ekip Link</i> module
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.

Continued on the next page

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 (cosφ) 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.



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

Faults	Possible causes	Suggestions
The circuit-breaker doesn't close when the closing pushbutton is pressed	The trip signal of the protection trip unit has not been reset	Press the TU mechanical reset pushbutton or operate the electrical reset remotely.
	The open-position key lock or padlock is activated	Unlock the lock in open position using the relevant key
	The circuit-breaker is in an intermediate position between connected and isolated for test or between isolated for test and disconnected	Complete the rack-in operation
	The undervoltage coil is not energized	Check the power supply circuit and the power supply voltage
	The opening coil is permanently energized	Correct operating condition.
	The trip unit pushbutton is pressed (withdrawable version)	Rotate the crank to complete

Continued on the next page

Faults	Possible causes	Suggestions
The circuit-breaker doesn't close when the closing coil is powered	The trip signal of the protection trip unit has not been reset	Press the TU Reset button
	The power supply voltage of the auxiliary circuits is too low	Measure the voltage: it should not be lower than 70% of the rated voltage of the coil
	The power supply voltage is different from that indicated on the rating plate	Check the voltage on the rating plate
	The cables of the coil are not inserted correctly in the terminals	Make sure there is continuity between cable and terminal and if necessary reconnect the cables of the coil to the terminals
	The connections in the power supply circuit are wrong	Check the connections using the relevant wiring diagram
	The closing coil is damaged	Replace the coil
	The operating mechanism is blocked	Perform the closing operation manually; if the fault persists contact ABB
	The open position key lock is activated	Unlock the lock in open position using the relevant key
	The circuit-breaker is in an intermediate position between connected and test or the trip unit pushbutton is pressed (withdrawable version)	Complete the rack-in operation
	The undervoltage coil is not energized	Make sure that undervoltage coil is energized properly
	The opening coil is permanently energized	Correct operating condition. If necessary, disconnect the power from the opening coil
	The racking out crank handle is inserted (withdrawable version)	Remove the crank
The circuit-breaker doesn't open when the opening pushbutton is pressed	The operating mechanism is blocked	Contact ABB
The circuit-breaker doesn't open when the opening coil is powered	The operating mechanism is blocked	Contact ABB
	The power supply voltage of the auxiliary circuits is too low	Measure the voltage: it should not be lower than 85 % of the rated voltage of the coil
	The power supply voltage is different from that indicated on the rating plate	Use the correct voltage
	The cables of the coil are not inserted correctly in the terminals	Make sure there is continuity between cable and terminal and if necessary reconnect the cables of the coil to the terminals
	The connections of the power supply circuit are wrong	Check the connections using the relevant wiring diagram
	The opening coil is damaged	Replace the coil
The circuit-breaker doesn't open despite the command of the undervoltage coil	The operating mechanism is blocked	Perform the opening operation manually; if the fault persists contact ABB
It is not possible to charge the closing springs by means of the manual charging lever	The operating mechanism is blocked	Contact ABB

Continued on the next page

Faults	Possible causes	Suggestions
It is not possible to charge the closing springs by means of the gearmotor	The cables of the gearmotor are not inserted correctly in the terminals	Make sure there is continuity between cable and terminal and if necessary reconnect the cables of the gearmotor to the terminals
	The connections of the power supply circuit are wrong	Check the connections using the relevant wiring diagram
	The circuit-breaker is in disconnected position	Switch the circuit-breaker to the test or connected position
	The gearmotor protection internal fuse has tripped	Replace the fuse
	The gearmotor is damaged	Replace the gearmotor
It is not possible to press the button in order to insert the racking out crank handle	The circuit-breaker is closed	Press the opening pushbutton in order to allow the insertion of the crank with the circuit-breaker open
It is not possible to insert the moving part in the fixed part	The racking-in/racking-out operation is not performed correctly	See the document 1SDH002013A1001
	The moving part is incompatible with the fixed part	Check the compatibility between the moving part and the fixed part
It is not possible to lock the circuit-breaker in the open position	The opening pushbutton is not being pressed	Press the opening pushbutton and activate the lock
	The lock in open position is defective	Contact ABB
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.
It is not possible to remove the circuit-breaker from the disconnected position	Fail Safe lock active	Discharge the closing springs of the command
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	Inst 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	Correct operating condition (see use cases in the chapter that describes the protection)
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.

Continued on the next page

Faults	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 <i>Measurement</i> module	Check connections between isolation transformer and Measurement module
	Rated voltage parameter setting Error	Set the correct parameters
The expected trip does not occur	Trip excluded	Correct operating condition. Enable trip if necessary
Opening data not displayed	No auxiliary power supply and/or battery low	Correct operating condition.
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
Impossible to change any of the parameters	Trip unit in alarm condition	Correct operating condition.
The language cannot be changed	Trip unit set remotely	Set it in local mode
	The circuit-breaker is not open	Open the circuit-breaker
	One of the possible power supplies is not present	Power the trip unit with Vaux, Ekip T&P or Ekip TT
PIN error	PIN wrong or lost	Contact ABB or consult document 1SDH001501R0001
Communication problems with Ekip Com, Ekip Link, Ekip Signalling or Ekip CI	Circuit-breaker in withdrawn position, Vaux absent or modules not inserted properly	Insert modules, set circuit-breaker to Connected position, connect Vaux
State of CB Position field not aligned with circuit-breaker position	Absence of Ekip Com or Ekip Link modules, or contact S75I	Check for presence of Ekip Com or Ekip Link 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
TRIP fail signaling: <i>Trip Fail command (BF)</i>	One or more of the following conditions: <ul style="list-style-type: none"> • 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



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