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USER MANUAL

ITS2.1

Slimline, Inlinell and Standalone ITS2



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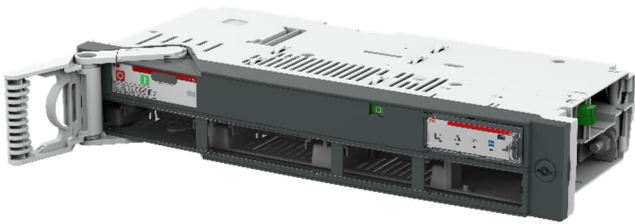
1 PRODUCT OVERVIEW

1.1 Slimline XRG00



Refer the installation instruction for XRG00 ITS2.

1.2 Slimline XRG1



Refer the installation instruction for XRG1 ITS2.

1.3 Slimline XRG2 and XRG3



Refer the installation instruction for XRG23 ITS2.

1.4 Inline II ZHBM00



Refer the installation instruction for Inlinell ZHBM-ITS.

1.5 Inline II ZHBM123



Refer the installation instruction for Inlinell ZHBM-ITS.

1.6 Standalone ITS



Refer the installation instruction for ITS2.1 Standalone.

1.7 ITS2.1 Overview



TEST/Prg

1 The TEST/Prg is for use of configuration tool Ekip Connect.

Important: This is NOT an ordinary USB connection, always use the T&P test and program unit when connecting a laptop to the ITS2.1 unit

Fuse Blown LED

4 Fuse Blown LED indicates as follows:

- Dark : All fuses are OK
- Lit : One or more fuses are blown
- Flashing :
Nominal line voltage is not set ($\frac{1}{2}$ Hz)
Switch opened by motor operation when fuse blown (2 Hz)

Power LED

2 The power LED can be configured in two ways:

- Power indication with a steady light
- Alive indication with a flash rate of $\frac{1}{2}$ Hz.

When configuring the light is in WINK LED mode (2Hz).

Local/Remote indicator LED and pushbutton

5 Local/Remote LED indicates as follows (2):

- Dark : Local mode, commands or setting of parameters are refused
- Lit : Remote mode, commands or setting of parameters are accepted

The push button (Rem) selects mode.

Communication LED

3 The communication LED indicates as follows:

- Dark : No valid message received
- Flashing : Valid message with wrong address
- Lit : Communication OK

If requests from master ends, the LED will go dark after 30 s.

1.8 Prerequisites



Warning

Do not use a standard USB cable. This can lead to hazardous voltage damages at the laptop.
Connecting a laptop/computer to the ITS unit will require an Ekip T&P adapter.

1.9 Download and install the Ekip Connect software

- 1) Go to <http://www.abb.com/abblibrary/DownloadCenter>
- 2) Search Ekip Connect
- 3) Download software
- 4) Unzip 1SDC20011X3000.zip and run setup

1.10 Ekip T&P test and programming unit

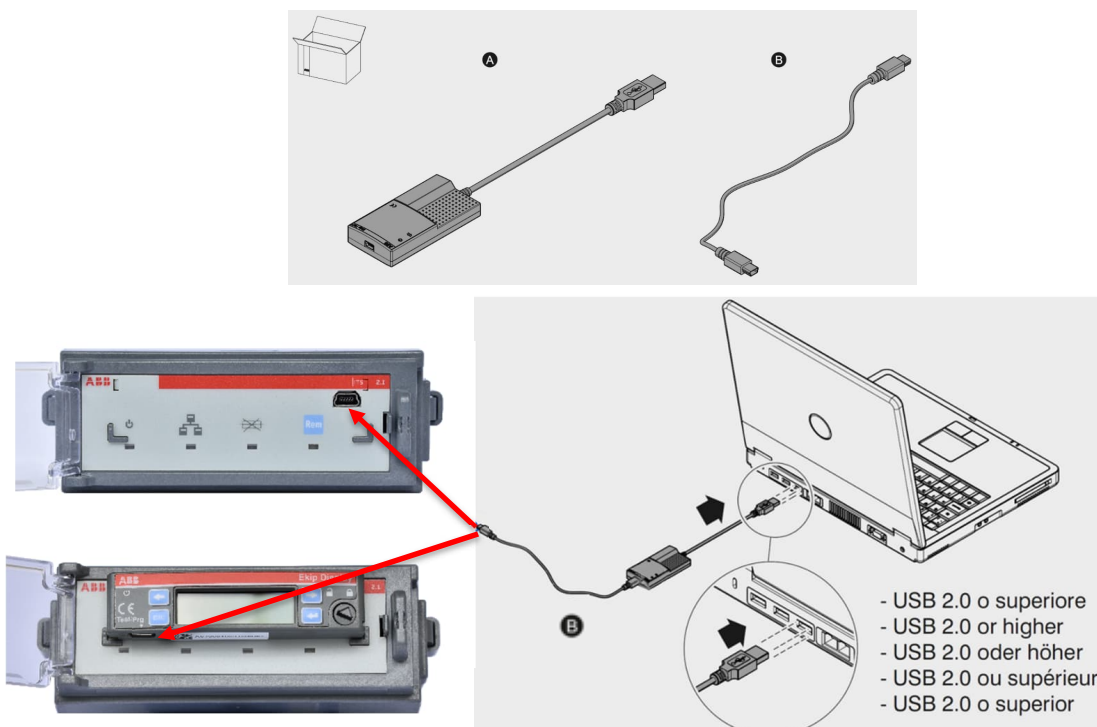
Order code: 1SDA076154R1

Ekip T&P unit is suitable for ITS2.1. You can connect the module via the programming port as below. The programming port can only be used with Ekip T&P.

Ekip T&P unit allows you to update the software as well as load, set and read the parameters on Ekip Connect software.

Connect one side of cable B to the programming unit (A) and the other side of cable B to ITS2.1 programming port. Insert the USB (A) to your computers USB port, Ekip T&P unit draws its power from the PC.

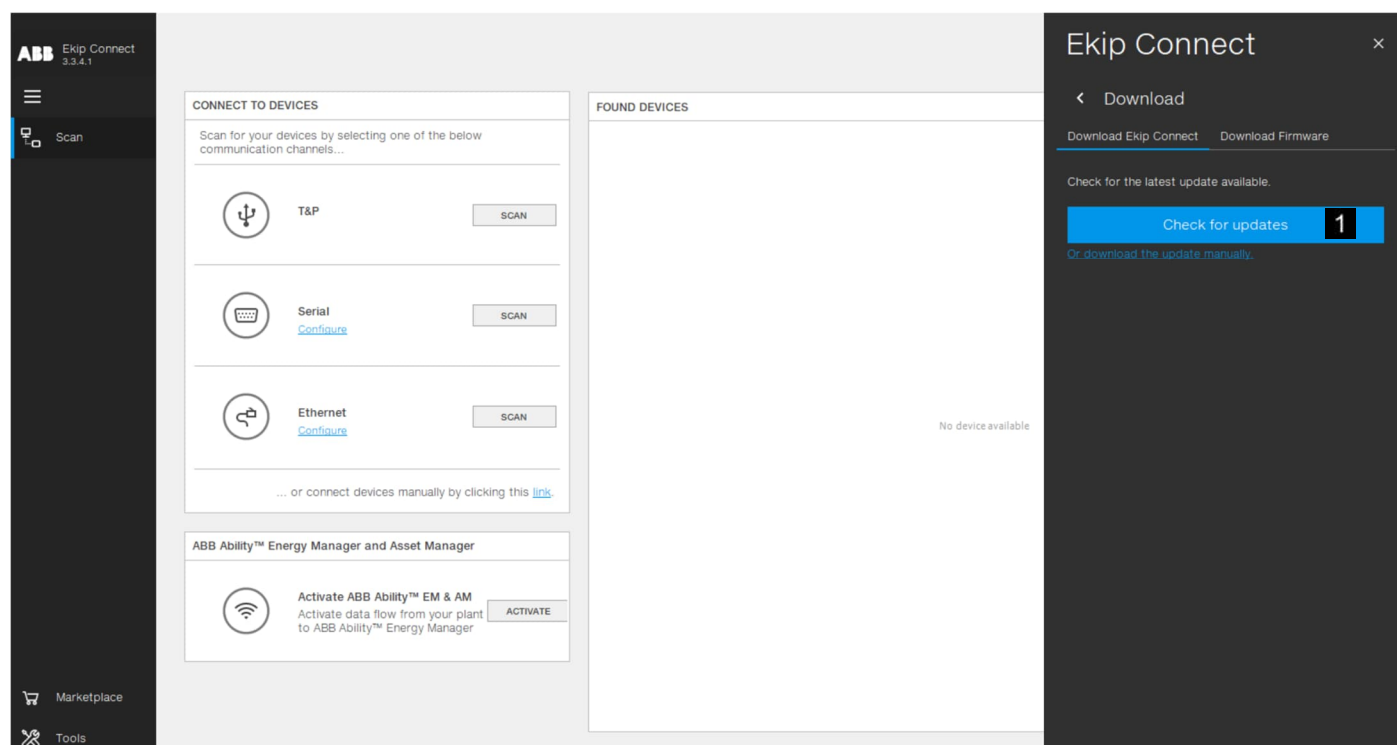
Ekip T&P unit turns on after connecting it to the PC. It is equipped with two LEDs, a green one indicating that the module is on, and an orange one indicating active communication.



2 THE EKIP CONNECT SOFTWARE

2.1 Starting Ekip connect and check for latest update

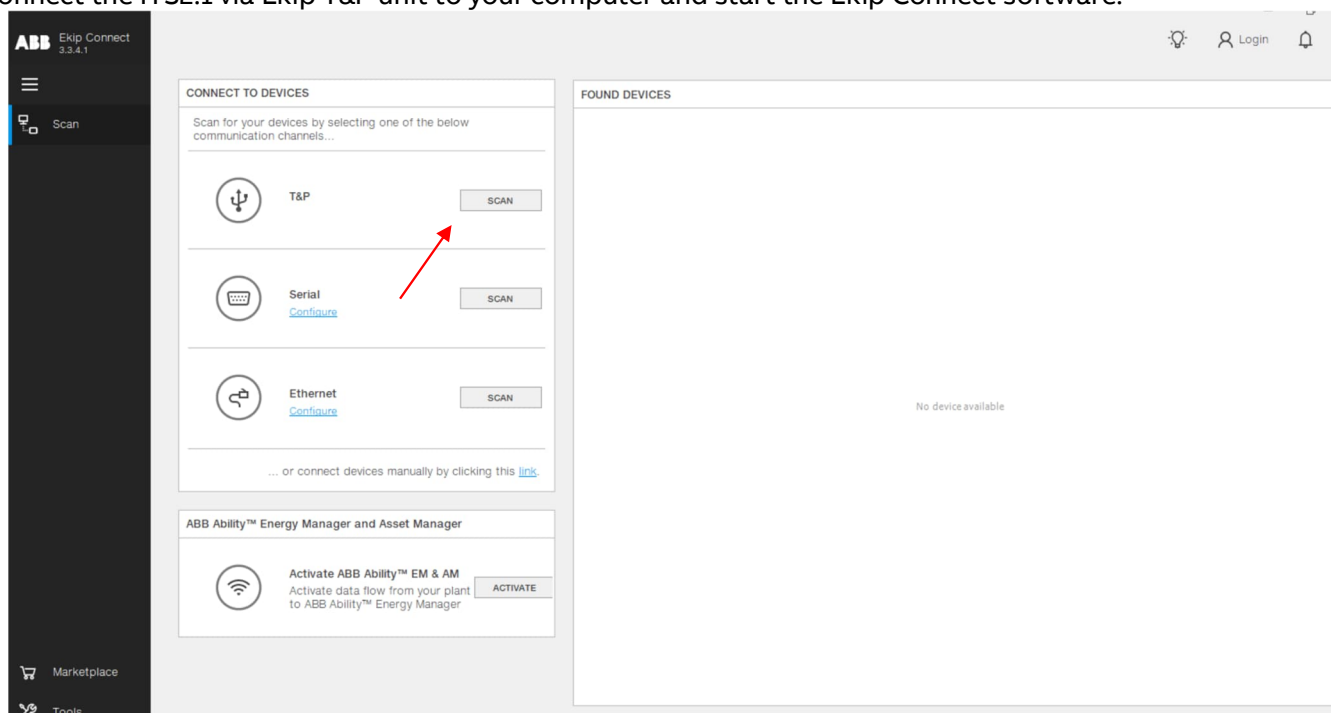
Start Ekip Connect. For a more extensive guide, please refer to Ekip Connect – user manual.



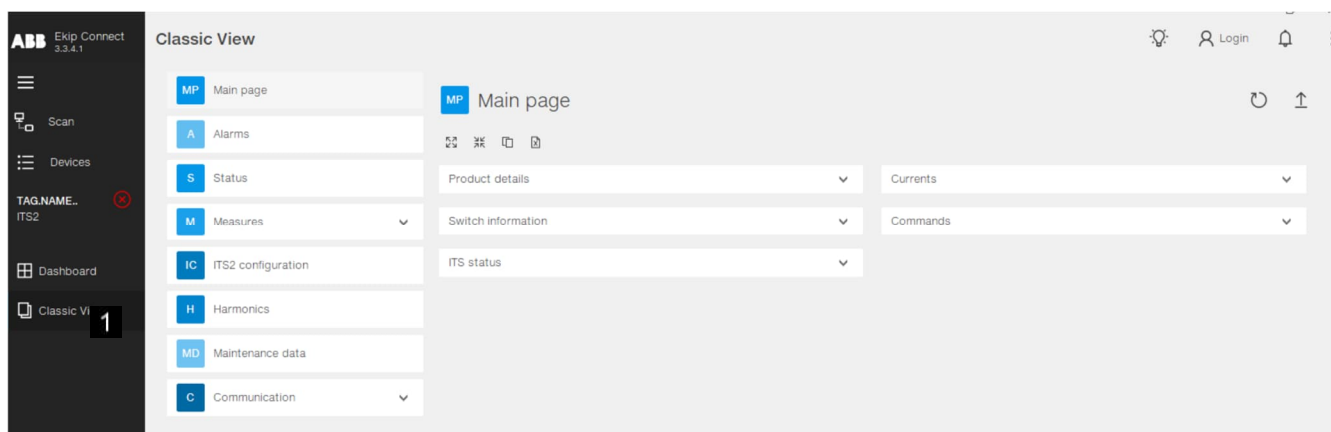
Searching for latest version of Ekip Connect and Device Description files are quite easy. However, the computer must have access to internet to check for and download an update. **1**

3 BASIC PARAMETER SETTING

Connect the ITS2.1 via Ekip T&P unit to your computer and start the Ekip Connect software.



Click on the '**SCAN**' button in the T&P section of the 'CONNECT WITH YOUR DEVICE' area, the ITS2.1 unit will be detected and then click the 'Classic view'. **1**



Since the ITS2.1 unit is powered by the Ekip T&P unit, configuration of the ITS2.1 unit can be carried out without having it fitted into the switch.

The following parameters must be set for the ITS2.1 unit:

1. Select «**Switch type**» according to the actual switch type, six basic switches Slimline XR, Inlinell, OS, OT, Other or SLE can be selected, each switch type has several different current sizes, make sure your switch type and rated current are all correct. **2**
2. Set «**Nominal Line Voltage**» according to the system voltage. If the line voltage in the system is 400 V, the Nominal Line Voltage should be set equal, if not correctly set, the Fuse monitoring will not work. **3**
3. Depending on the feeding direction of the Slimline XRG or Inlinell ZHBM switch, Busbar or terminal supply, Power direction must be set accordingly. **4**

4. Synchronize system time. Click on the “🕒” button in the Time area and then click the “⬆” button. **5**

Note: For standalone ITS, mount the voltage sensing cable on the outgoing side of the switch.

Every time the ITS was powered on, the system time must be update through Ekip Connect 3.

IC ITS2 configuration

Preventive overload protection handling

Fuse blown handling

ITS status

Display status

Custom fields

Nominal line voltage **3**

Nominal line voltage status VALID

Nominal line voltage 100 V

Switch type **2**

Switch type Slimline XRD0: 160 A

Minimum current value

Feeding side **4**

Feeding side BUSBAR SIDE

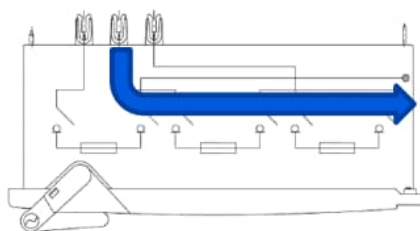
Error code

Time **5**

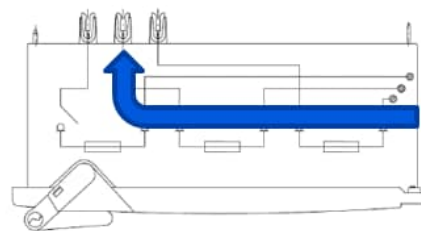
Time 31/12/1999 00:11:15

Time Setting 31 December 1999 00:00:00

Slimline XRG



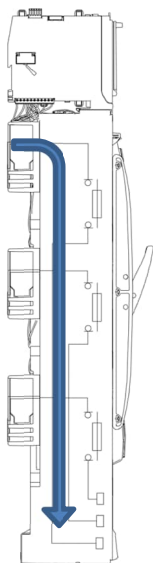
Busbar Side



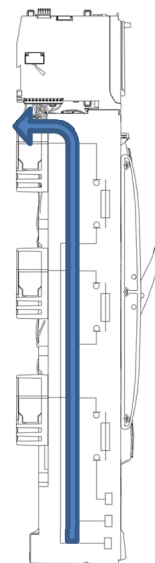
Terminal Side

Important for XRG 1,2 and 3: The straps on the fuse boards inside the XRG apparatus must be set according to the feeding direction. When changing the power direction, these must be changed accordingly, study chapter 8

Inline II



Busbar side



Terminal side

Important for Inline II: The feeding direction can be set by a jumper connector on ITS adapter unit. When changing the power direction, these must be changed accordingly, study chapter 9.

5. Give the ITS unit a unique Modbus slaver address (between 1 – 247).
If necessary, the communication parameters must be changed to correspond with system builder's settings (factory setting is 247). **6**

The screenshot displays the 'Modbus RTU (Embedded System Bus)' configuration page. The left sidebar contains navigation links: MP Main page, A Alarms, M Measures, IC ITS2 configuration, H Harmonics, MD Maintenance data, C Communication (expanded), and C Communication. The main content area shows the 'Modbus RTU communication configuration (Embedded System bus)' section with the following fields:

- Slave address: 247 (highlighted with a red box and the number 6)
- Baud rate: 19200
- Protocol type: E,8,1

Below these fields is a section for 'Modbus communication statistics (Embedded System bus)'. The right sidebar includes 'Refresh' and 'Apply' buttons.

6. If an Ekip Com Modbus TCP module is connected, the module's static IP address can be force set at Ekip COM Modbus TCP page. **7**

Classic View

MP Main page

A Alarms

M Measures

IC ITS2 configuration

H Harmonics

MD Maintenance data

C Communication

Modbus RTU (Embedded System Bus) v3

Ekip COM Modbus TCP

C Communication

EC Ekip COM Modbus TCP

Information

Serial Number	A02039952040W001
SW version	3.10
HW version	0.13
Boot version	5.1
MAC address	AC:D3:64:10:65:A7

Settings

Module Function HTTP Server

Network settings

IP address	192.168.0.5
Network Mask	255.255.255.0
Gateway address	192.168.0.3

Connections

Connected client 1	0.0.0.0
Connected client 2	0.0.0.0
Connected client 3	0.0.0.0

Static IP Address 7

Force Static IP Address OFF

Static IP address 192.168.0.5

Static Network Mask 255.255.255.0

Static Gateway address 192.168.0.3

Security features

Disable Gratuitous ARP ANP enabled

Password

Password protected access Standard mode

Password Modbus TCP 0



Information

After you modified the parameters on each page, click «Apply» button to download the parameters to ITS unit and activate it

4 ADDITIONAL PARAMETER SETTINGS

The parameter settings below can be set according to special requirements.

FUSE BLOWN HANDLING

1	
Fuse blown switch open (motor operated device only)	This function is relevant only if the switch is equipped with motor operation. If ENABLED the motor will open the switch if one or more fuses are blown.

PREVENTIVE OVERLOAD PROTECTION

2	
Protection Enable	If ENABLED, a current and time limit can be set. When the current limit is exceeded the timer will start. Once both the current limit and the time limit are exceeded an alarm will be signaled or the motorized switch will switch off. If the current level goes back to accepted level timer will stop and no signal will be sent
Fuse protection switch open Enable	This function is relevant only if the switch is equipped with motor operation. If ENABLED, when the current exceeds the threshold for a preset time, the switch will be driven to open
Threshold	Select a limit for the current, between -40% to +40% of the rated current
Time	Set a time limit between 0-180min

ITS STATUS**3**

Operating mode	If set in REMOTE mode, commands sent on Modbus are accepted. Remote/Local indicate LED in front will be lit. A pushbutton in front of the ITS unit can be used to switch between REMOTE/LOCAL
LED mode	ALIVE MODE: The power LED in front of the ITS unit is flashing. This is a more reliable power on indication since it requires the software to be up and running. POWER MODE: There is a steady light in the power LED. A hangup due to software failure will not be indicated

CUSTOM FIELDS**4**

Tag name	The customer can enter a relevant name
User data	The customer can enter a relevant data
Switch Installation Date	The customer can enter the switch installation date

MINIMUM CURRENT VALUE**5**

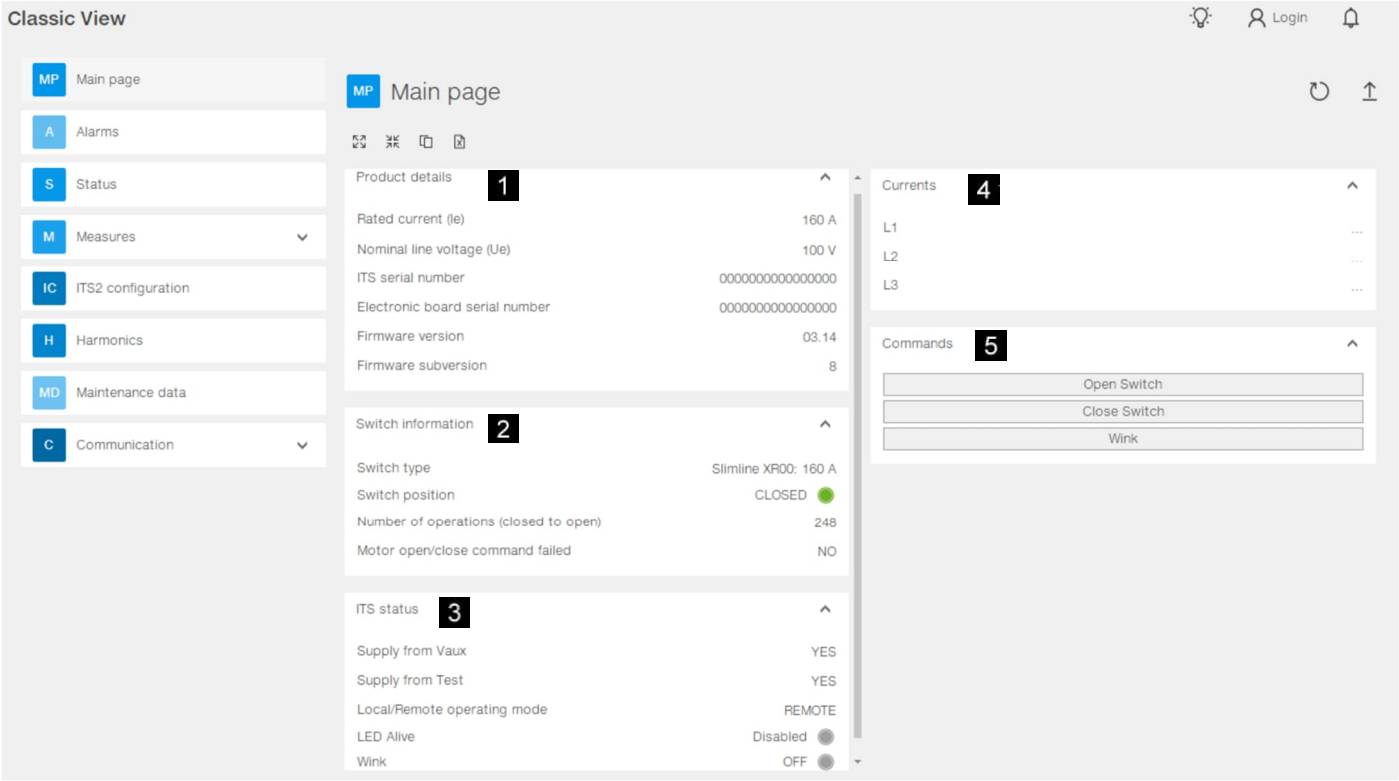
Minimum current value	Sets the threshold for the minimum value for the measured current to be displayed, 0.5% or 2% of measured range
-----------------------	---

ERROR CODE**6**

Error code	If a programming session fails, a code relevant to the wrong parameters is set. The error code is the Modbus address of the parameter
------------	---

5 ITS VALUES AND STATUS INFORMATION

5.1 Main page



PRODUCT DETAILS

1	
Rated current (Ie)	160A, 250A, 400A, 630A, 800A, 1000A, 1250A, 1600A, 2000A, 2500A
Nominal line voltage (Ue)	Shows configured nominal voltage, NOT measured
ITS2.1 Serial number	Located on label outside of unit
Electronic board serial no.	Located on label on board
Firmware version	-
Firmware subversion	-

CURRENTS

4	
L1, L2, L3	Measured currents

SWITCH INFORMATION**2**

Switch type	Indicates main switch type, Slimline XRG00, Slimline XRG1, Slimline XRG2, Slimline XRG3, Inlinell, OT, OS, SLE 1, SLE 2, OTHER
Switch position	Indicates switch status, open or closed
Number of operations (closed to open)	Counts the number of times the switch has gone from a closed to open status
Motor open/close command failed.	Set if a command sent to the switch fails

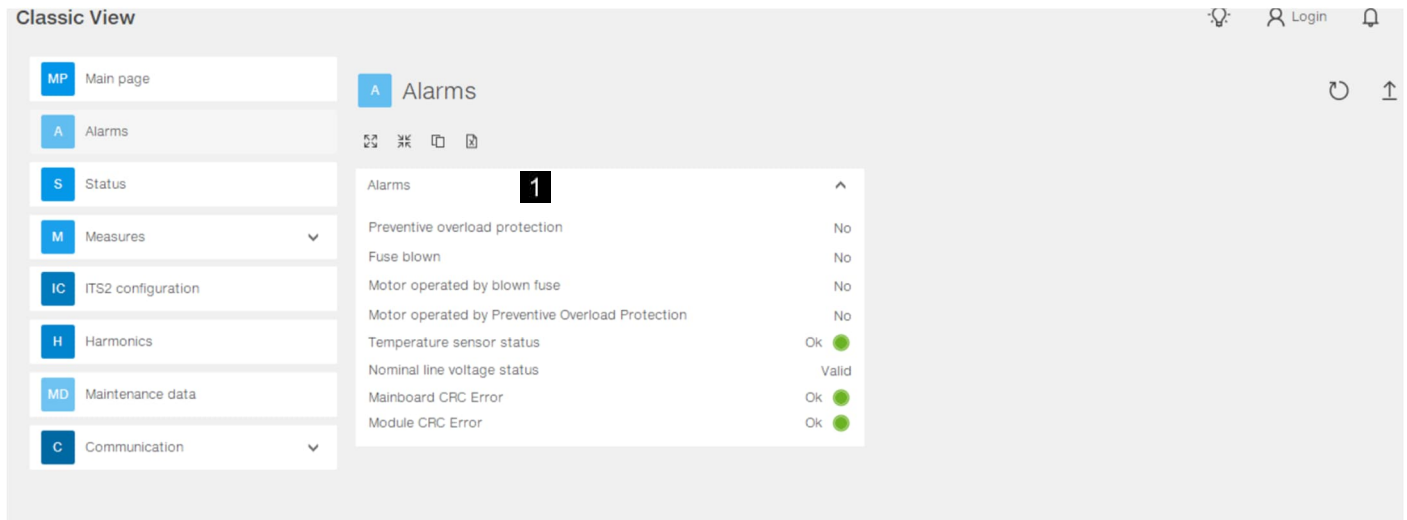
COMMANDS**5**

Open switch	If equipped with motor, switch will open when selected
Close switch	If equipped with motor, switch will close when selected
Wink	Power LED flashes with 2 Hz when selected

ITS STATUS**3**

Supply from Vaux	Should indicate YES when the ITS2 unit is fitted into a main switch and 24 VDC is present
Supply from test	YES when the ITS2 unit is connected to a laptop by T&P
Local/Remote operating mode	Remote: commands on Modbus is accepted Local: commands on Modbus are rejected.
LED alive	If ENABLED, the power LED will flash.
Wink	Used to identify the ITS2 unit when several units are connected to a Modbus line. The Power LED will flash with 2 Hz

5.2 Alarms

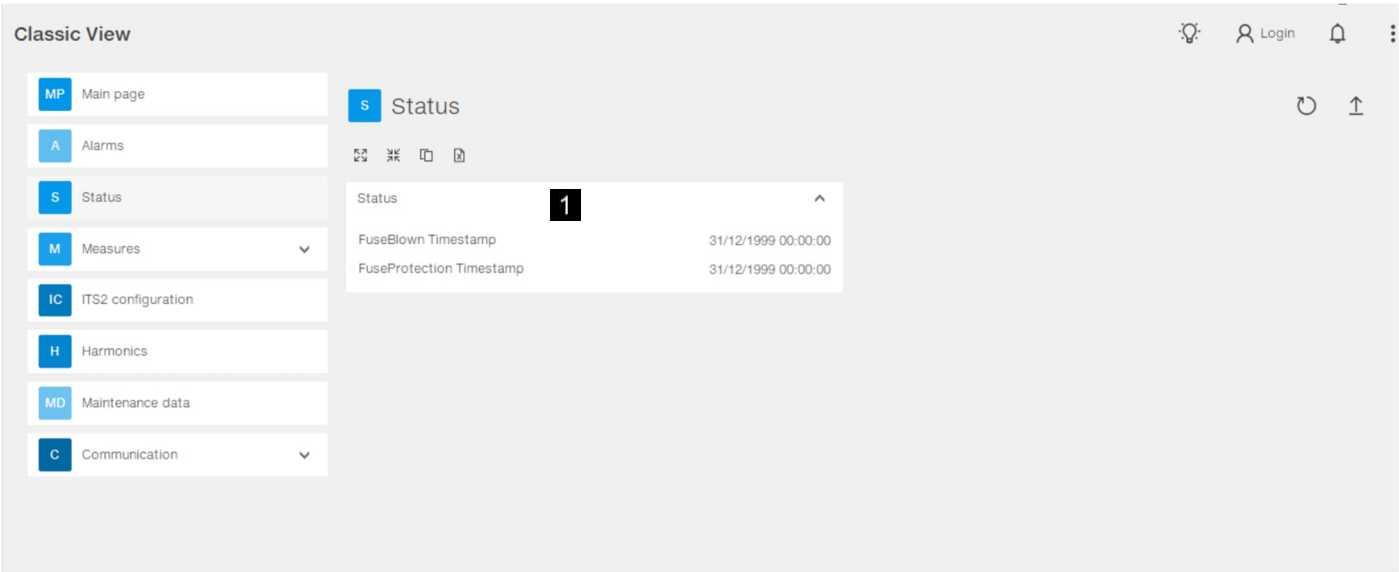


ALARMS

1	
Preventive overload protection	Show YES if preventive overload protection occurs
Fuse blown	Show YES if one or more fuses blown
Motor operated by blown fuse	Shows YES if the Slimline XRG or OS switch is equipped with motor operation and configured to open when one or more fuses are blown
Motor operated by preventive overload protection	Shows YES if the Slimline XRG or OS switch is equipped with motor operation and configured to open when overload protection
Temperature sensor status	Shows status of temperature sensor
Nominal voltage status	The Electronic Fuse Monitor (EFM) uses the measured line voltage when determining if one or more fuses are blown or not, hence the correct nominal line voltage must be configured by the user. By factory default the nominal line voltage is set to an invalid value, forcing the user to configure a correct one
Mainboard CRC Error	Shows status to mainboard CRC result
Module CRC Error	Shows status to module CRC result



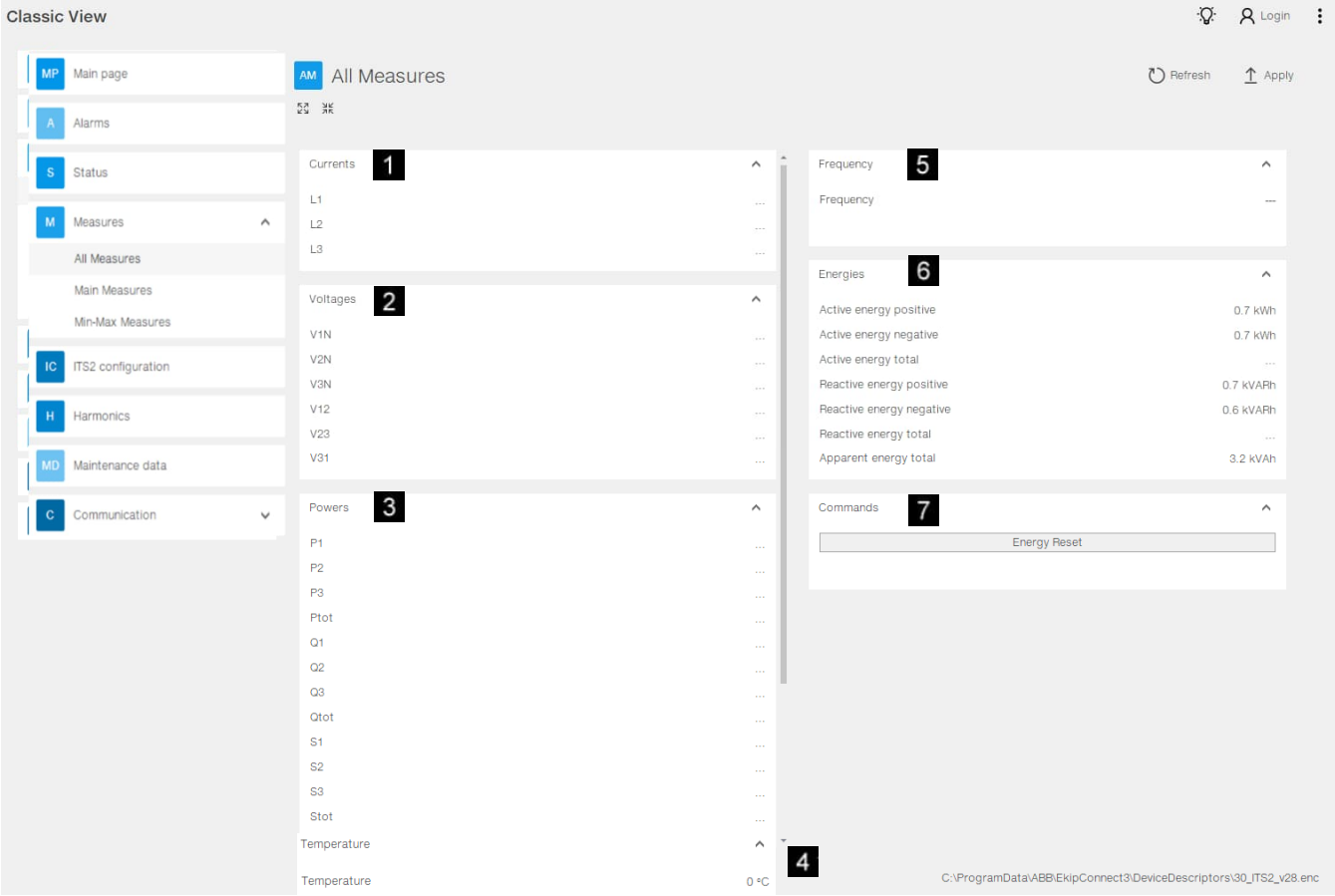
5.3 Status



STATUS

1	
Fuse blown Timestamp	If Fuse blown occurs, the time of occurrence is displayed. Otherwise displays 31/12/1999 00:00:00
Fuse protection Timestamp	If Fuse overload protection occurs, the time of occurrence is displayed. Otherwise displays 31/12/1999 00:00:00

5.4 All Measures



CURRENTS

1	
L1, L2, L3	Actual currents

VOLTAGES

2	
V1N, V2N, V3N	Actual phase voltages (1)
V12, V23, V31	Actual line voltages (1)

(1) Accuracy of measured voltages depend on a symmetric, equilibrated system.

FREQUENCY

5	
Frequency	Actual frequency

POWERS**3**

P1, P2, P3	Calculated active power (kW)
Ptot	Calculated 3 phase active power (kW)
Q1, Q2, Q3	Calculated reactive power (kVAR)
Qtot	Calculated 3 phase reactive power (kVAR)
S1, S2, S3	Calculated complex power (kVA)
Stot	Calculated 3 phase complex power (kVA)
Cos phi1, 2, 3	Calculated cos phi for each phase
Cos phi tot	Calculated 3 phase power factor

TEMPERATURE**4**

Temperature	Actual temperature measured
-------------	-----------------------------

ENERGIES**6**

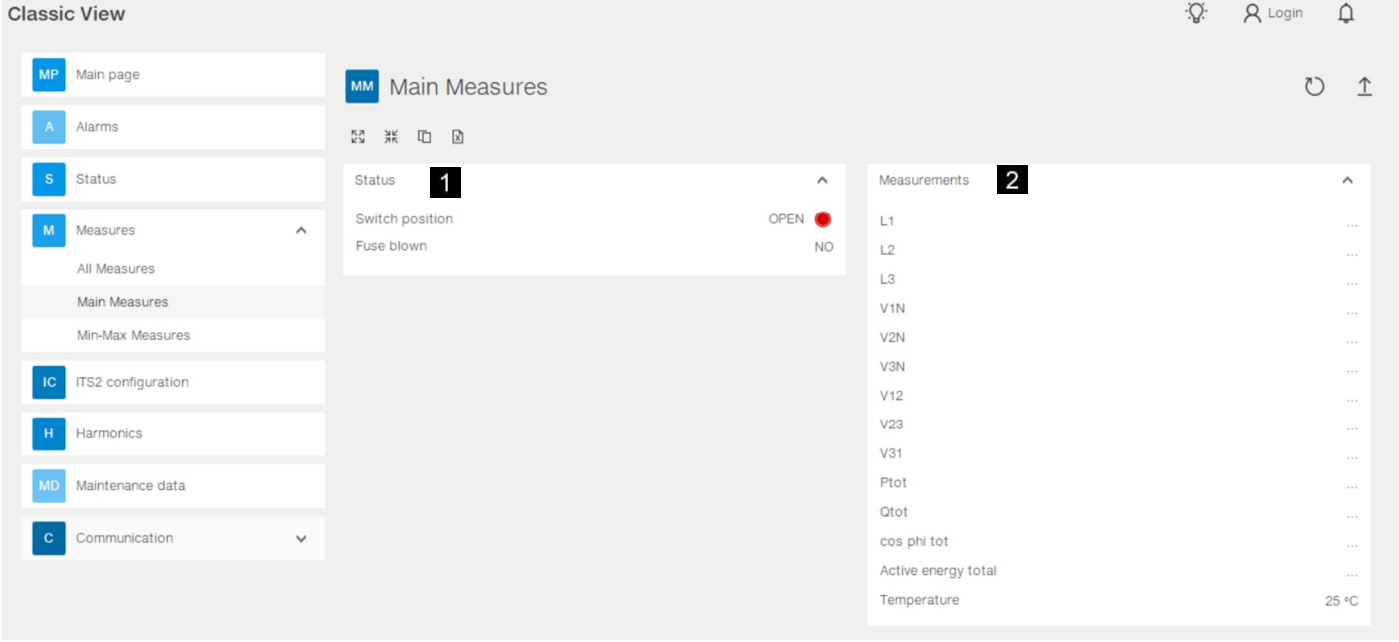
Active energy positive	Calculated positive active energy (kWh)
Active energy negative	Calculated negative active energy (kWh)
Active energy total	Sum of positive and negative active energy (kWh)
Reactive energy positive	Calculated positive reactive energy (kvarh)
Reactive energy negative	Calculated negative reactive energy (kvarh)
Reactive energy total	Sum of positive and negative reactive energy (kvarh)
Apparent energy total	Total Apparent energy (kVAh)

COMMANDS**7**

Energy Reset	Reset energy counter
--------------	----------------------



5.5 Main Measures



STATUS

1	
Switch position	Indicates switch status is open or closed
Fuse blown	Indicates that one or more fuses are blown

MEASUREMENTS

2	
L1, L2, L3	Actual currents
V1N, V2N, V3N	Actual phase voltages (1)
V12, V23, V31	Actual line voltages (1)
<i>(1) Accuracy of measured voltages depend on a symmetric, equilibrated system</i>	
Ptot	Calculated 3 phase active power (kW)
Qtot	Calculated 3 phase reactive power (kVAR)
Cos phi tot	Calculated 3 phase power factor
Active energy total	Sum of positive and negative active energy (kWh)
Temperature	Actual temperature measured on L2 cable terminal

5.6 Min - max Measures

Classic View

MP Main page

A Alarms

S Status

M Measures

- All Measures
- Main Measures
- Min-Max Measures

IC ITS2 configuration

H Harmonics

MD Maintenance data

C Communication

MM Min-Max Measures

1

Currents

L1 min	...	
L1 min Timestamp	31/12/1999 00:00:00	
L1 max	...	
L1 max Timestamp	31/12/1999 00:00:00	
L2 min	...	
L2 min Timestamp	31/12/1999 00:00:00	
L2 max	...	
L2 max Timestamp	31/12/1999 00:00:00	
L3 min	...	
L3 min Timestamp	31/12/1999 00:00:00	
L3 max	...	
L3 max Timestamp	31/12/1999 00:00:00	

2

Voltages

V1N min	...	
V1 min Timestamp	31/12/1999 00:00:00	
V1N max	...	
V1 max Timestamp	31/12/1999 00:00:00	
V2N min	...	
V2 min Timestamp	31/12/1999 00:00:00	
V2N max	...	
V2 max Timestamp	31/12/1999 00:00:00	
V3N min	...	
V3 min Timestamp	31/12/1999 00:00:00	
V3N max	...	
V3 max Timestamp	31/12/1999 00:00:00	

5

Powers

P1 min	...	
P1 min Timestamp	31/12/1999 00:00:00	
P1 max	...	
P1 max Timestamp	31/12/1999 00:00:00	
P2 min	...	
P2 min Timestamp	31/12/1999 00:00:00	
P2 max	...	
P2 max Timestamp	31/12/1999 00:00:00	
P3 min	...	
P3 min Timestamp	31/12/1999 00:00:00	
P3 max	...	
P3 max Timestamp	31/12/1999 00:00:00	
Ptot min	...	
Ptot min Timestamp	31/12/1999 00:00:00	
Ptot max	...	
Ptot max Timestamp	31/12/1999 00:00:00	
Q1 min	...	
Q1 min Timestamp	31/12/1999 00:00:00	
Q1 max	...	
Q1 max Timestamp	31/12/1999 00:00:00	
Q2 min	...	
Q2 min Timestamp	31/12/1999 00:00:00	
Q2 max	...	
Q2 max Timestamp	31/12/1999 00:00:00	
Q3 min	...	
Q3 min Timestamp	31/12/1999 00:00:00	
Q3 max	...	

3

Other measures

Frequency min	NOT AVAILABLE	
Frequency max	...	
Temperature min	25 °C	
Temperature max	25 °C	

4

Commands

Min-Max Reset

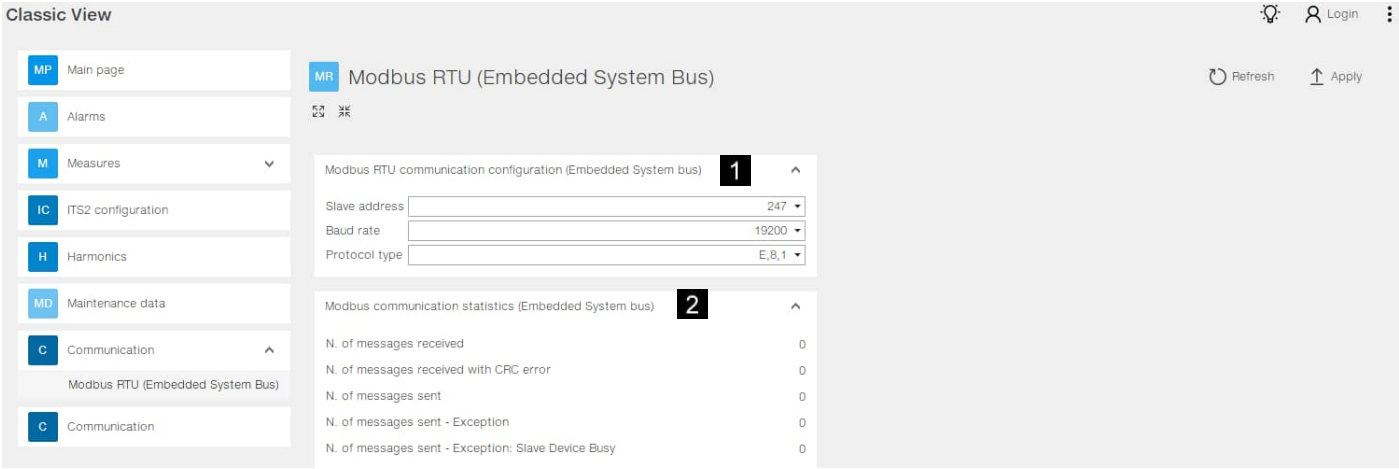
CURRENTS 1		POWERS 5	
L1, L2, L3 min - max	Actual min - max currents	P1, P2, P3 min - max	Calculated min – max active power (kW)
VOLTAGES 2		Ptot min - max	Calculated min – max 3 phase active power (kW)
V1N, V2N,V3N min - max	Actual min-max phase voltages	Q1, Q2, Q3 min - max	Calculated min – max reactive power (kVAR)
V12, V23, V31 min - max	Actual min - max line voltages	Qtot min - max	Calculated min – max 3 phase reactive power (kVAR)
OTHER MEASURES 3		S1, S2, S3 min - max	Calculated min – max complex power (kVA)
Frequency min - max	Actual min – max frequency	Stot min - max	Calculated min – max 3 phase complex power (kVA)
Temperature min - max	Actual min - max temperature		
COMMANDS 4			
Min - max Reset	Resets all min – max measures		

NOTE:

- If the ITS has been powered off or the main line has been powered off, the “Min - Max Reset” is required before measurement.
- Whenever the measured value (including voltage, current, active power, reactive power and apparent power) exceeds the previous extreme (max or min), the time of this event will be recorded.



5.7 Modbus RTU



Modbus RTU communication configuration (Embedded System bus)

1		
Slave address	Set the address of the connected ITS module, 0~247 selectable, default 247	
Baud rate	Set the baud rate of the connected ITS module, 9600, 19200 selectable, default 19200	
Protocol type	Set the physical protocol	
	E,8,1	1 EVEN parity bit, 8 data bits, 1 STOP bit, default
	O,8,1	1 ODD parity bit, 8 data bits, 1 STOP bit
	N,8,2	No parity bit, 8 data bits, 2 STOP bits
	N,8,1	No parity bit, 8 data bits, 1 STOP bit

Modbus communication statistics (Embedded System bus)

2	
N. of messages received	Number of messages received by Ekip connect from ITS
N. of messages received with CRC error	Number of messages received by Ekip connect with CRC error from ITS
N. of messages sent	Number of messages sent by Ekip connect to ITS
N. of messages sent-Exception	Number of messages sent by Ekip connect to ITS and received by ITS successfully
N. of messages sent-Exception: Slave Device Busy	Number of messages sent by Ekip connect to ITS but not received by ITS because ITS busy

5.8 Modbus TCP

Classic View

MP Main page

A Alarms

M Measures

IC ITS2 configuration

H Harmonics

MD Maintenance data

C Communication

Modbus RTU (Embedded System Bus)

Ekip COM Modbus TCP

C Communication

EC Ekip COM Modbus TCP

Refresh

Apply

Information **1**

Serial Number A02039852040W001

SW version 03.10

HW version 00.13

Boot version 05.01

MAC address AC.D3.64.10.65.A6

Network settings **2**

IP address 192.168.0.10

Network Mask 255.255.255.0

Gateway address 192.168.0.3

Connections **3**

Connected client 1 0.0.0.0

Connected client 2 0.0.0.0

Connected client 3 0.0.0.0

Static IP Address **4**

Force Static IP Address OFF

Static IP address 192.168.0.10

Static Network Mask 255.255.255.0

Static Gateway address 192.168.0.3

Status

Flash CRC algorithm status active

Flash CRC algorithm result Ok

Ethernet Link Status Error !!

Security features

Disable Gratuitous ARP ARP enabled

Information

1	
Serial Number	Ekip com modbus TCP module Serial Number
SW version	Ekip com modbus TCP module software version
HW version	Ekip com modbus TCP module hardware version
Boot version	Boot version
Mac address	It is the address assigned by ABB, it has the following OUI AC:D3:64

Network settings

2	
IP address	This is the address assigned to the modules at the moment of connection to the network. It consists of four bytes, each of which can have value from 0 to 255. By default, allocation is Dynamic. With dynamic allocation, the modules wait to receive the IP address from a DHCP server. Without a DHCP server, the modules adopt an Autoconfiguration IP Address in the range 169.254.xxx.xxx, calculated in a pseudo random manner so as to be the same at every switch-on. Alternatively, you can enable the static IP address option, which allows the IP address to be forced, in this case, you must make sure that the IP Address inserted is different to that of the other devices connected to the same network
Network Mask	This is the subnet mask, and identifies the method to recognize the subnet to which the modules belong, with the possibility of searching for the modules within a defined set of recipients. If you enabled the option Static IP Address, you must also enter the correct Network Mask.
Gateway Address	The IP address of the node to which the module it is connected, in the presence of multiple subnets. If you enabled the Static IP Address option, you must also enter the correct Gateway Address

Connections

3

Connected client	There are three IP Addresses of the client devices connected to the modules.
------------------	--

Static IP Address

4

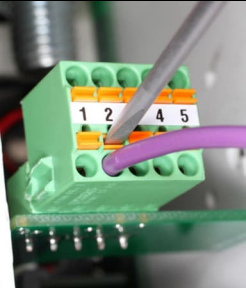
Force Static IP address	Off: Dynamic IP address On: Static IP address
Static IP Address	Displayed with the static IP Address enabled, it must be selected in order to insert the IP address of the modules
Static Network Mask	Displayed with static IP Address enabled, it must be selected in order to insert the subnet mask of the modules
Static Gateway address	Displayed with static IP Address enabled, it must be selected in the presence of multiple subnets, in order to insert the IP Address of the mode to which the modules are connected


6 MULTIPLUG TERMINAL

6.1 Slimline XRG and Inline II ZHBM ITS multiplug

For simplicity of looping several XRG switches together in a multi drop topology, the multiplug terminal is equipped with two rows of terminals.

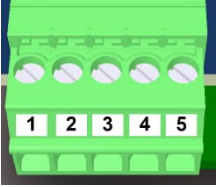
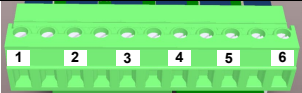
For Inlinell ZHBM switches, another multiplug terminal with screw is used and assembled on the ITS adapter.

Slimline XRG Multi plug terminal	Terminal pins definition		
	Terminal	Signal	Cable
	X1:1	24 VDC power supply input	AWG22~16, 300/500V, Temp 125°C
	X1:2	24 V GND (0V)	
	X1:3	RS-485 0V	Belden 3105A or equivalent
	X1:4	RS-485 + (A)	
	X1:5	RS-485 – (B)	

Inlinell ZHBM Multi plug terminal	Terminal pins definition		
	Terminal	Signal	Cable
	X1:1	24 VDC power supply input	AWG22~16, 300/500V, Temp 125°C
	X1:2	24 V GND (0V)	
	X1:3	RS-485 0V	Belden 3105A or equivalent
	X1:4	RS-485 + (A)	
	X1:5	RS-485 – (B)	

6.2 Standalone ITS module multiplug

For OT&OS and other switches, ITS and adapter module is a standalone product which needs to be connected to switch by external cable.

Multiplug to user side		Terminal pins definition		
		Terminal	Signal	Cable
		X1:1	24 VDC power supply input	AWG22~16, 300/500V, Temp 125°C
		X1:2	24 V GND (0V)	
		X1:3	RS-485 0V	Belden 3105A or equivalent
		X1:4	RS-485 + (A)	
		X1:5	RS-485 – (B)	
Other signals Multiplug to Switch side		Terminal pins definition		
1	8	Terminal	Signal	Cable
		X2:1	Temperature sensor base polar	ABB provides
9	16	X2:2	Not in use	-
		X2:3	L3 Current sensing signal Negative	AWG18, 300/500V, Temp 125°C
		X2:4	L2 Current sensing signal Negative	AWG18, 300/500V, Temp 125°C
		X2:5	L1 Current sensing signal Negative	AWG18, 300/500V, Temp 125°C
		X2:6	Switch position input signal Positive	AWG24, 300/500V, Temp 125°C
		X2:7	Not in use	-
		X2:8	Switch control common port	AWG24, 300/500V, Temp 125°C
		X2:9	Temperature sensor emitter polar	ABB provides
		X2:10	ITS GND(0V)	ABB provides
		X2:11	L3 Current sensing signal Positive	AWG18, 300/500V, Temp 125°C
		X2:12	L2 Current sensing signal Positive	AWG18, 300/500V, Temp 125°C
		X2:13	L1 Current sensing signal Positive	AWG18, 300/500V, Temp 125°C
		X2:14	Switch position input signal negative	AWG24, 300/500V, Temp 125°C
		X2:15	Switch open control signal output	AWG24, 300/500V, Temp 125°C
		X2:16	Switch close control signal output	AWG24, 300/500V, Temp 125°C
Voltage Multiplug to Switch side		Terminal pins definition		
		Terminal	Signal	Cable
		X3:4	L3 voltage input	AWG20, 1000V Temp 200 °C
		X3:5	L2 voltage input	AWG20, 1000V Temp 200 °C
		X3:6	L1 voltage input	AWG20, 1000V Temp 200 °C

7 MODBUS RTU

Default setting	19200 E,8,1 Default Modbus addr. 247
Baudrates	9600, 19200
Parity, stop- start bits	E,8,1 – O,8,1 – N,8,2 – N,8,1
Modbus address range	1 – 247

7.1 Special sequence Modbus telegram

The parameters presented in the Main Measures menu is available as one contiguous block in the Modbus mapping, making it easy and time saving to read the most common parameters from the ITS2.1 unit.

The following parameters can be read:

Modbus address	Parameters	Comment
100-104	L1, L2, L3	Actual current measure by the CT's
150-152	V1N, V2N, V3N	Actual phase voltages
154-156	V12, V23, V31	Actual line voltages
206-207	Ptot	Calculated 3 phase active power (kW)
214-215	Qtot	Calculated 3 phase reactive power (kvar)
304-305	Active energy total	Sum of positive and negative active energy (kWh)
250-252	Power factor	Calculated 3 phase power factor
279	Temperature	Actual temperature measure on the L2 cable terminal
4926	Status	Switch status and Fuse blown status

7.2 Modbus RTU trouble and fault finding

There are several ways to troubleshoot a Modbus line.

Assuming the Modbus line is OK hardware wise: correct polarity, no similar addresses, trouble with termination, reading of Modbus register issues etc., a laptop with USB – RS-485 converter and Ekip connect can be used for testing the Modbus line. It will even handle multidrop.

7.3 Modbus RTU cabling

A shielded twisted pair cable is required for Modbus, we recommend Belden 3105A. Other cables are acceptable if they have equivalent specifications.

7.3.1 Terminating resistors (TR)

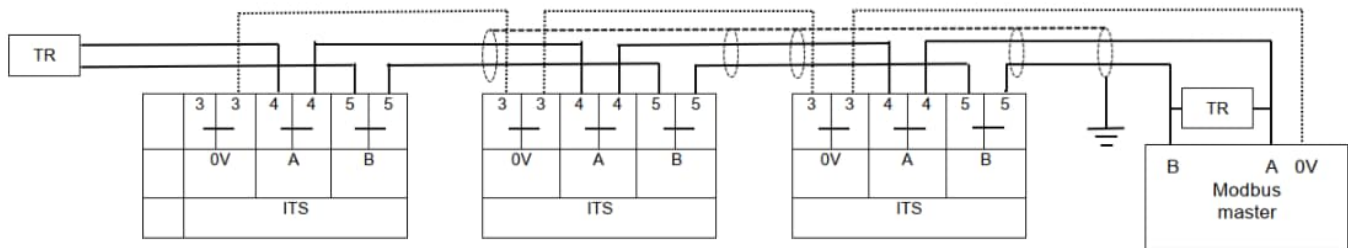
In order to avoid reflections of the signal, a 120 Ohm terminating resistor must be mounted at both ends of the main cable. An internal terminating resistance is fitted in the ITS if other devices are connected in addition to the ITS, it is necessary to verify whether they are equipped or not with terminating resistors (in this case, it is usually possible to activate or deactivate it). Termination resistors must be used only at both ends of the main cable.

If the total length of the main cable is less than 50 m, the termination resistors at both ends of the main cable can be avoided.

7.3.2 Grounding of shielding

The shield of the cable must be connected to ground at a single point (at the master side).

If there is a long distance between the master and the ITS, different potentials may occur, resulting in loss of communication. To equalize potentials, the 0V line may be used.



8 Ekip COM MODBUS TCP MODULE

Ekip Com Modbus TCP is an accessory module that can function as a communication module integrating the ITS2.1 in an industrial remote supervision and control network.

As Communication module, it can be connected to an Ethernet network with the Modbus TCP communication, and allows:

- Connect the ITS to the network, with dialog functionality
- Provide the status information of the switch or fusegear (open, closed)



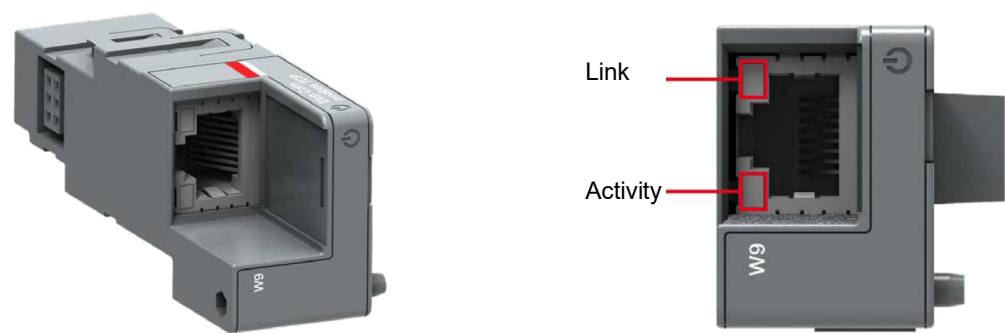
Information

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

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

The following table illustrates the possible signals of Ekip com Modbus TCP module, and their meaning:

LED	Indication	Description
Power LED, green	Off	Power supply absent
	On fixed	Power supply and communication with the device present
	On, with two quick flashes per second	Power supply present, and communication with device absent
Link LED, green	Off	Connection error (signal absent)
	On, fixed	Correct connection
Activity LED, yellow	Off	No activity on the line
	On, flashing	Activity present on the line (in reception and/or transmission)



For the installation of the Ekip Com Modbus TCP module, please refer to Slimline/InlineII/Standalone ITS installation instruction.

9 CYBER SECURITY

Disclaimer	It is the sole responsibility of the customer to provide and continuously ensure a secure connection between the product and the customer network or any other network. The customer is required to establish and maintain any appropriate measures (including but not limited to the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breach, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB and its affiliates are not liable for damage and/or losses related to such security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.
Secure Deployment	The user of the product should be aware that the unsecure nature of the serial Modbus protocol exposes the communication between the product and the control system. Encryption, authentication or integrity of transmitted data are not provided by the protocol. To prevent equipment to operate in an unsafe or undesirable manner due to malicious activities the product must be positioned in a trusted network, strictly limited and in a hosted portion of a network or control system. The recommendation is also to restrict physical access to the product/system to only allow authorized people to make changes to the system. Besides, the user can setup system to trigger alarm when communication is interrupted (device stops responding) and check if there are any unsafe condition.

10 POWER DIRECTION SETTING

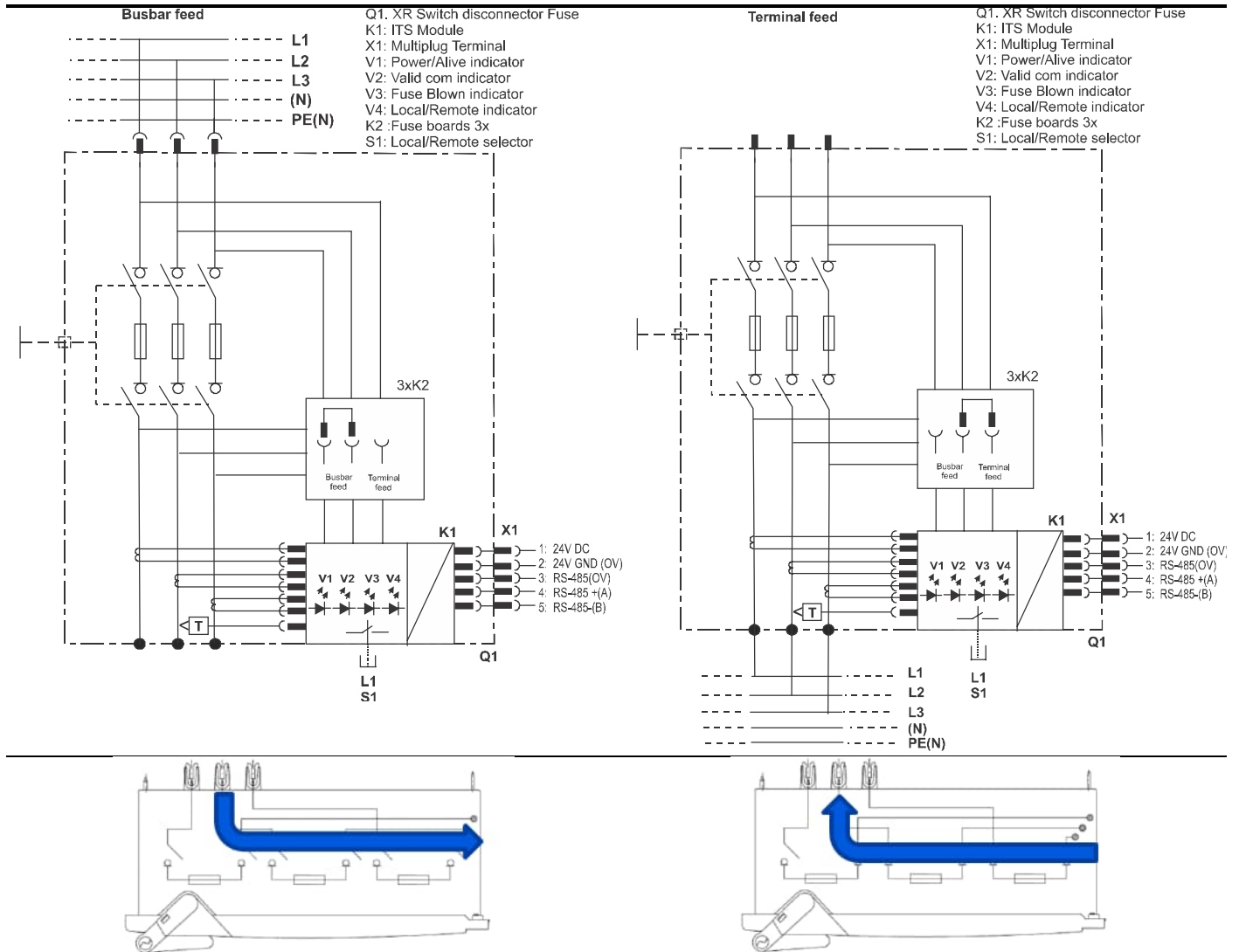
10.1 Slimline XRG power direction setting

Note: Relevant for XRG1,2 and 3 only, XRG00 is made for busbar feed only

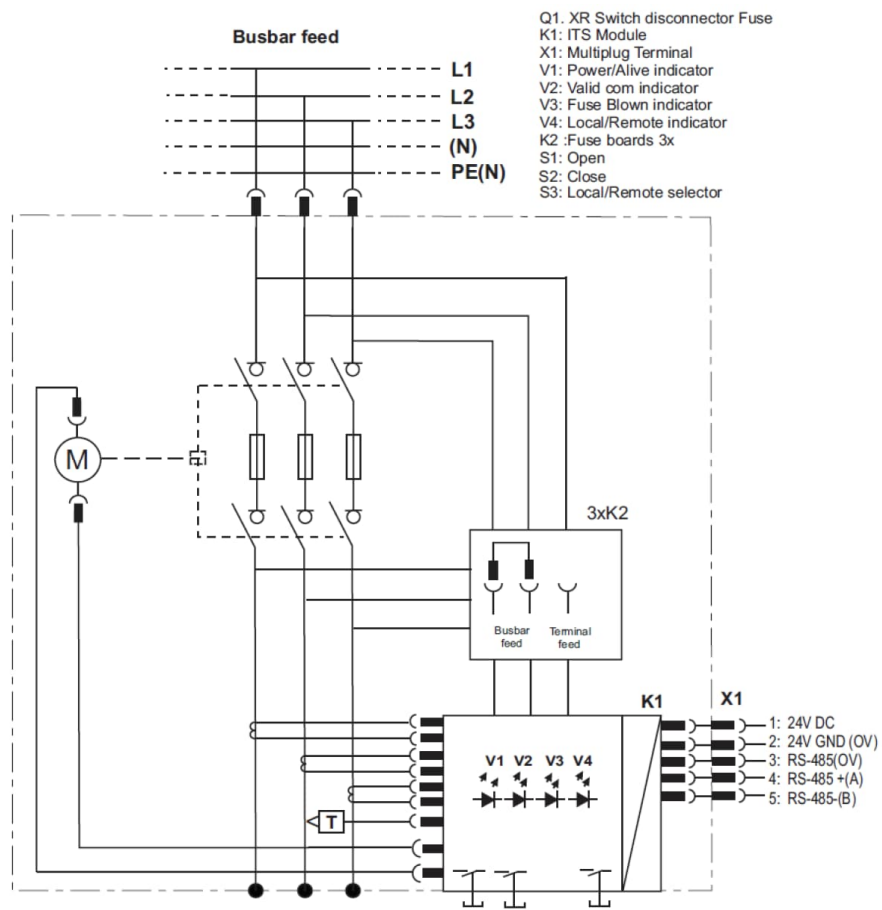
This is done by placing straps on the Fuse boards located behind the fuses in correct position.

By default the straps are set in the position marked “Busbar Feed”.

Note: Make sure the feeding side setting in Ekip connect aligns to the power direction setting on slimline.



- XRG1, 2 and 3 can be fed from the busbar side (busbar feed) or from the cable terminal side (terminal feed)
- By default the straps are set in the position marked “Busbar Feed” and the corresponding feeding side in Ekip connect is BUSBAR SIDE.

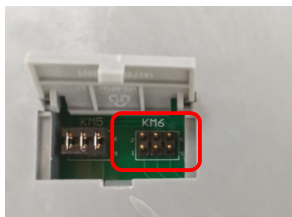
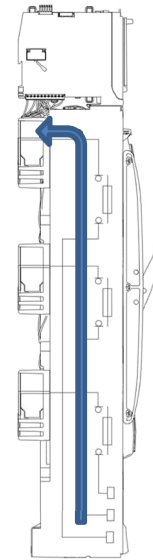
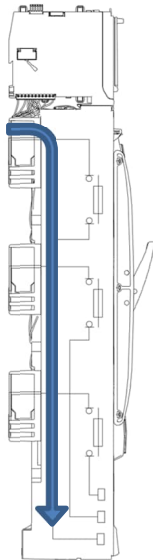
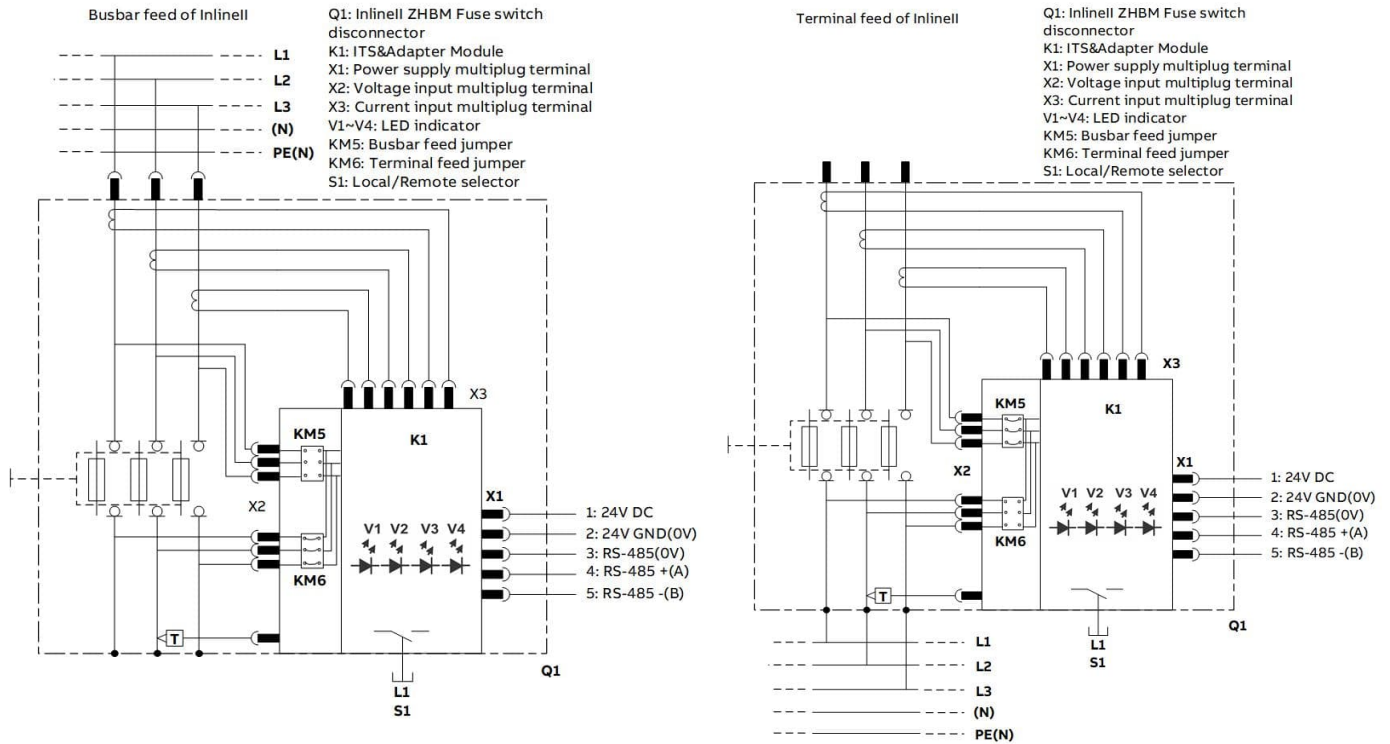


10.2 Inlinell ZHBM power direction setting

For Inlinell ZHBM, the power direction setting is done by connecting a jumper to the outlet on ITS adapter PCBA. When connect to KM6, Busbar Feed is set, when connect to KM5, Terminal Feed is set.

By default the jumper is connected to KM6, so the default mode is Busbar Feed.

Note: Make sure the feeding side setting in Ekip connect aligns to the power direction setting on Inline.



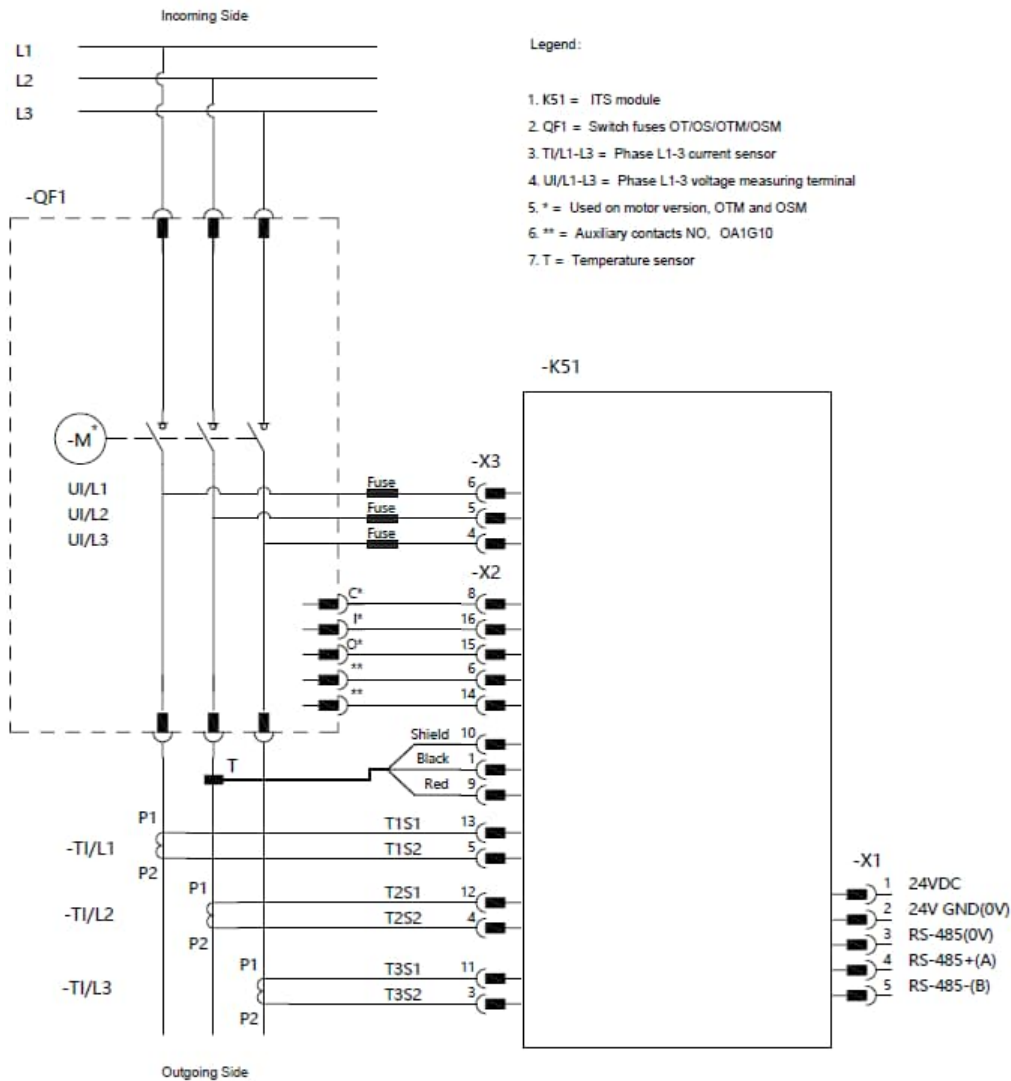
- ZHBM can be fed from the busbar side (busbar feed) or from the cable terminal side (terminal feed)
- By default the jumper is connected to KM6 and the corresponding feeding side in Ekip connect is BUSBAR SIDE.

10.3 Power direction for other switches

The ITS and adapter module is also a standalone product that can be used for OT&OS or other low voltage switchgear. In this application, ITS and adapter module needs to be fixed separately and connected to switch by external cable, refer to the ITS standalone product installation instruction.

The power direction setting is done by users themselves, just connect the three phase voltage cables (from outgoing side) to the voltage sensing connector X3 on the standalone ITS.

Note: In Ekip Connect, keep the feeding side is 'BUSBAR SIDE'.



11 TECHNICAL DATA

Technical data for ITS2.1

Input voltage limits	
Power supply	24 VDC \pm 20%
Power consumption	2W
Functional characteristics	
Voltage measuring range	10 – 900 VAC
Measured current range	0 – 1,3 x In
Measuring range temperature	0 – 127 °C
Measuring accuracy (Voltage and current)	\pm 1 %
Electronic Fuse Monitoring detection level	Nominal line to line voltage – 20%
Electronic Fuse Monitoring operating time	\geq 1 s
Modbus communication and configuration	
Default setting	19200 E,8,1 Default Modbus addr. 247
Baudrates	9600, 19200
Parity, stop- start bits	E,8,1 – O,8,1 – N,8,2 – N,8,1
Modbus address range	1 – 247
Configuration tool	Ekip connect
Termination resistor	No internal resistor. If needed, place on terminal X1:4, X1:5 on last ITS unit in multidrop line.
Insulation test	The ITS unit must be removed during dielectric test.

12 REFERENCE TO SUPPLEMENTARY DOCUMENTATION

Title	Art. No.	
Slimline XRG00 ITS2 Installation instruction	1SEP619478P0001	Follows product
Slimline XRG1 ITS2 Installation instruction	1SEP619482P0001	Follows product
Slimline XRG23 ITS2 Installation instruction	1SEP619493P0001	Follows product
Inline II ZHBM-ITS Installation instruction	1SEP622739P0001	Follows product
ITS2.1 Standalone Module Installation instruction	1SEP622726P0001	Follows product
Modbus mapping	1SEB000478	System interface ITS2.1
Technical Application Papers No.9 Bus communication with ABB circuit-breakers	1SDC007108G0202	Cover ABB SACE's products, but useful for the ITS2 as well.

13 XR ITS2.D WITH EKIP DISPLAY

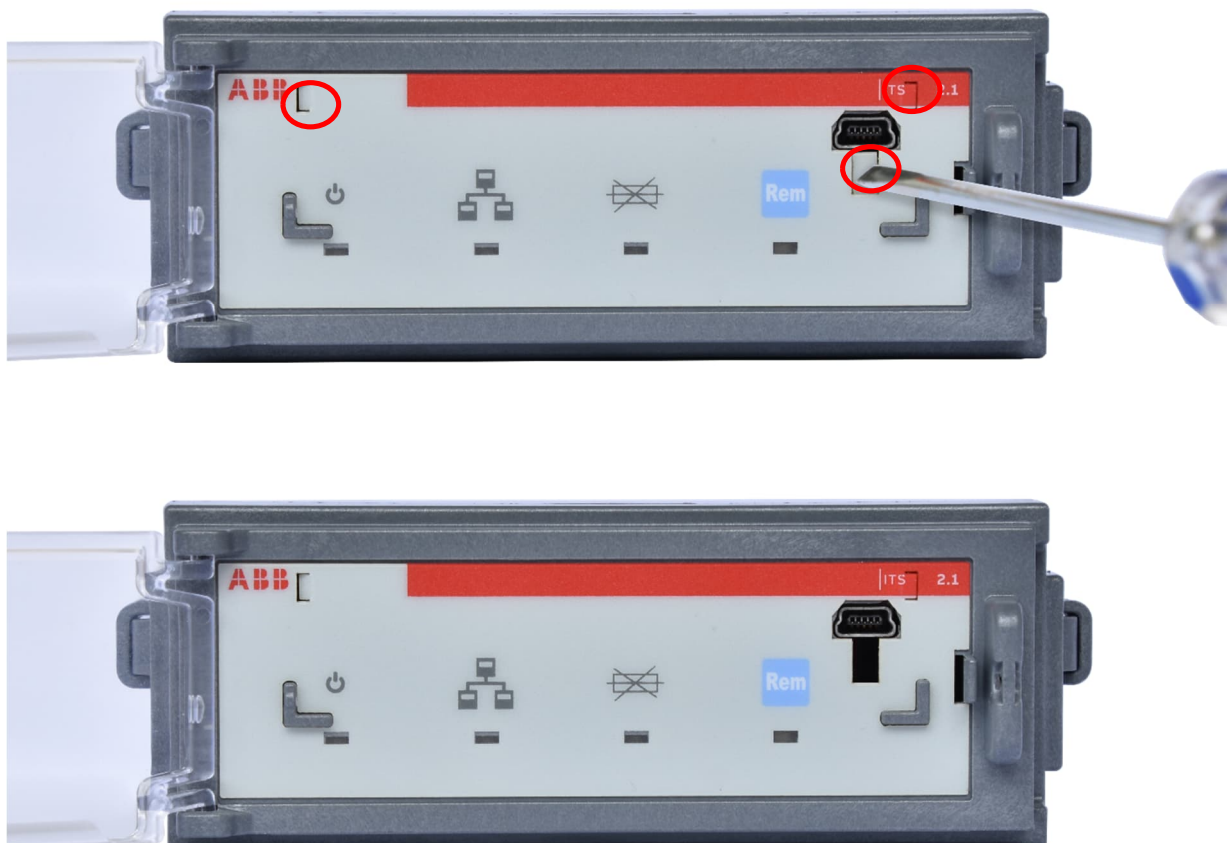


Information

ITS2.D with Ekip display is only available for Slimline XRG switch

13.1 How to plug in the Ekip Display at an XR ITS2.1 unit

1. Press in the 3 dedicated areas at the ITS2.1 front panel for fixing the Ekip Display unit.



2. Plug the Ekip Display into the front of the ITS2.1.
(1) Plug first in the guide pin at the left side and then the USB connector (2) at the right side



3. Fix the Ekip Display by rotating the closing button to closed position by using a screw driver



The ITS2.D can be connected to a laptop for configuration by using the T&P cable unit to the USB connector at the lower side of the Ekip Display unit.



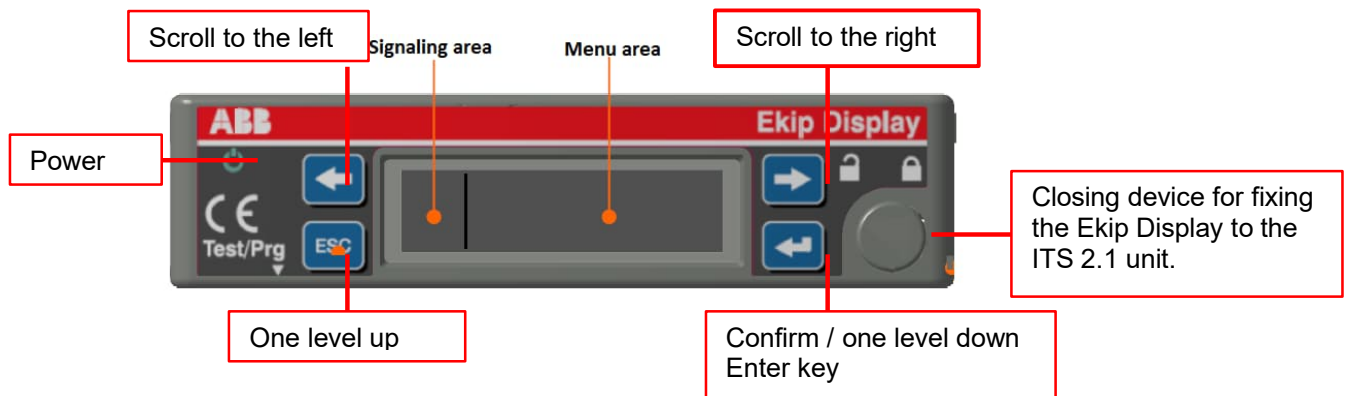
14 EKIP DISPLAY

14.1 Ekip Display power LED

Power LED (green) will replicate the behaviour of the Power LED on the ITS2 (Power/Alive setting/Wink).

14.2 Ekip Display front overview.

Ekip Display LCD view area is divided in 2 separate section: **Signalling area** and **Menu area**

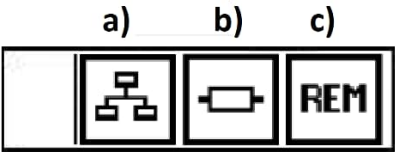


Menu area can have different behaviour (views) depending on where you are in the navigation tree. Signalling area behaviour is fixed (see Ekip display signalling area paragraph).






14.3 Ekip Display Start Menu





Ekip Display Start menu will replace the function of the LED’s placed on the ITS 2.1 front.





a) : 3 status alternatives :

Icon	Description
	Communication active on bus and ITS
	No communication on the bus
	Communication on the bus, but no address to ITS (undefined)

b) : 4 status alternatives for XR MOT / 3 status alternatives for XR manually operated

Icon	Description
	Fuses OK
	Fuse blown (FB)
	Voltage undefined
	Fusegear open after automatic switch off by the MOT. (Available at XR MOT only, parameter setting at Ekip Connect or at the Display settings)

C) : 2 status alternatives at XR MOT only :








Icon	Description
	Remote operated MOT (Motor)
	Local operated MOT (Motor)

14.4 Ekip Display signaling area

Signalling area is always present on the Display and it will show the actual status of the ITS device (exception is when Ekip T&P and/or Ekip TT is connected to the display through the lower mini USB connector).

The actual status is represented by icons (see Table 1), due to the limited space available only one icon at the time is shown, cycling through all the active icons in loop.

Table 1: Signalling area icons

Icon	Description
REM LOC	Local/Remote setting of XR ITS2.D when MOT (Motor)
	ON if power supply is present
	ON if communication between ITS/Ekip Display is lost
	ON if Plant nominal voltage is INVALID
	ON if Fuse blown
	ON if Fuse is blown and the MOT has disconnected the apparatus.
	ON if no communication with the SCADA system
	ON if undefined communication with the SCADA system
FAIL	ON if last command (Motor operated) failed



The ITS2.D connected with the T&P cable unit to the USB connector at the lower side of the Ekip Display unit.

14.5 Ekip Display navigation view (menu area)



1. Enter the Top Level Menu from the Start menu by using the  button.


















Top Level Menu



In Table 2 is illustrated the navigation tree of the actual Ekip Display unit. Top Level Menu, Second, Third and Forth Level. Horizontally navigation (next/previous level) is achieved by the ENTER and ESC keys, vertically navigation (move right/left through menu or page of the same level) is achieved by the ARROWS keys.

Table 2: Menu area tree :

Top Level Menu	Second Level Menu	Third Level Menu
	Energy	<div>E (P):</div> <div>E (Q):</div> <div>E (S):</div> <div>E (P+):</div> <div>E (P-):</div> <div>E (Pt):</div> <div>E (Q+):</div> <div>E (Q-):</div> <div>E (Qt):</div>
	Power	<div>P</div> <div>Q</div> <div>S</div> <div>P(L1):</div> <div>P(L2):</div> <div>P(L3):</div> <div>Q(L1):</div> <div>Q(L2):</div> <div>Q(L3):</div> <div>S(L1):</div> <div>S(L2):</div> <div>S(L3):</div>
	Voltage	<div>U1:</div> <div>U2:</div> <div>U3:</div> <div>U12:</div> <div>U23:</div> <div>U12: (2)</div>
	Current	<div>I1:</div> <div>I2:</div> <div>I3:</div>
	Additional data	<div>F:</div> <div>PF:</div> <div>T(L2):</div> <div>Cosφ(L1):</div> <div>Cosφ(L2):</div> <div>Cosφ(L3):</div>
	Open switch FB (Fuse blown)	<div>Enabled</div> <div>Enable / Disable the MOT to disconnect the apparatus when a fuse is blown.</div>
	Power direction	<div>Busbar side</div> <div>To select if the supply is from the Busbar side or the Terminal side. Only for XR size 1,2 and 3</div>
	Nominal Voltage	<div>100 V</div> <div>Nominal Voltage has to be set.</div>
	Minimum current value	<div>0.5%</div> <div>Minimum level measured current : 0.5% / 2% of rated max current of the XR apparatus size.</div>
	LED mode	<div>Power</div> <div>Power indicator : Selectable pulse or fixed LED</div>
	Local/Remote	<div>Local</div> <div>Local / Remote operation of the XR MOT.</div>

Automatic return to Start Menu		On : Automatic return to the Start Menu. Off : No automatic return to the Start Menu.
	 Mode  On	
Communication	  Code 245	Modbus slave address 1-247
	  Code E,8,1	Parity Data stop bits.
	 Code Bit/s 19200	Baud rate.
Information		<ul style="list-style-type: none"> • XR size (XR00 XR1 XR2 XR3) • In (160A 250A 400A 630A) • Vn (100V ... 690V)
		<ul style="list-style-type: none"> • ITS SW Version • ITS Serial No • Electronic Board Serial No
		<ul style="list-style-type: none"> • Display SW Version
Settings	Auto Test	
	 Test	ESC   
	 Min Max	

After you remove the display, it takes about 2s (time out) to light on the LED and take re-activate LOC/REM push-button.

15 TROUBLE SHOOTING

Fault Description	Fault Analysis	Trouble shooting method
Detected current value cannot match to actual current	Switch rated current may not be set correctly	Check rated current setting on Ekip connect Main page and correct it on ITS2 configuration page
Slimline/OTM/OSM cannot be controlled to open/close by ITS	Switch type may be set as Inlinell but Inlinell has no motor	Check switch type setting on Ekip connect Main page and correct it on ITS2 configuration page
Fuse blown function cannot work	This function wasn't enabled	Check Fuse blown handling setting on Ekip connect Main page and correct it on ITS2 configuration page
	Nominal line voltage wasn't set correctly	Check nominal line voltage setting on Ekip connect Main page and correct it on ITS2 configuration page
No voltage data showed	Feeding direction wasn't set correctly on switch	Check the feeding direction setting according to Section 9



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