

# Automatic transfer switch ATS022

Installation and operating instructions



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# 1. Safety notes



Before using the ATS022 unit, read the following "Safety notes": using the unit without following the indications can lead to malfunctioning and, in some cases, hazardous conditions.

If there are doubts about safe use, the unit must be put out of service.

The automatic transfer switch ATS022 must be prevented from operating the circuit breakers before:

- accessing the circuit breakers
- performing maintenance on circuit breakers or any electrical circuits powered by them
- performing any operation where opening/closing the circuit breaker could be dangerous

During maintenance:

- set the "Manual" mode.
- lock the circuit breaker mechanically in the open position.

Safe use is not guaranteed if:

- the device has been damaged during transport
- the device shows visible signs of damage
- the device does not work
- the device has been stored for a long period

Even if the device seems to be in stand-by status switch it off from the control circuit, as there is risk of it operating the circuits without warning.

## 2. Explanation of abbreviations and terms

### 2.1. General information

<b>ATS:</b>	Automatic Transfer Switch; automatic switching device.
<b>ATS022:</b>	ATS of the ATS02x series, version with display and Modbus communication.
<b>CB:</b>	Circuit Breaker; low voltage automatic Circuit Breaker.
<b>CB1:</b>	CB on line LN1.
<b>CB2:</b>	CB on line LN2.
<b>CB3:</b>	CB for Bus Tie, NPL and NPL BUS TIE operating modes.
<b>LN1:</b>	Power supply line No.1.
<b>LN2:</b>	Power supply line No.2.
<b>Bus Tie:</b>	Operating mode with busbar tie circuit breaker.
<b>NPL:</b>	Operating mode with non priority control circuit breaker.
<b>NPL BUS TIE:</b>	Operating mode with non priority control circuit breaker for non priority loads control.
<b>Modbus RTU:</b>	Communication protocol.

### 2.2. Times

**NOTE:** All the details of the times and switching logics are described in the Chapters concerned.

<b>TS:</b>	<ul style="list-style-type: none"><li>- Opening delay of main line CB, after detection of fault in mains (generator is not in use).</li><li>- Generator start delay, after detection of fault in mains (generator in use).</li></ul>
<b>TCE:</b>	Closing delay of CB2 of line LN2.
<b>TBS:</b>	Opening delay of emergency line CB, after detection of stabilised voltage on main line.
<b>TCN:</b>	Closing delay of CB1 of line LN1.
<b>TGOFF:</b>	Generator switching off delay, after closure of main line CB.
<b>TC:</b>	Delay in opening and closing of CB3 in Bus Tie application.
<b>TL</b>	Delay in activation of outlet DO7, after detection of the fault on both lines LN1 and LN2.

## 3. Introduction

### 3.1 Product overview

The automatic transfer switch ATS022 is used in all installations where switching is required between two lines to ensure the supply of loads in case of a fault on one line.

ATS022 selects the power supply line by acting directly on the CBs provided on the lines: ATS022 can be used with automatic CBs and ABB SACE switch-disconnectors.

The device monitors the voltage of the main line and emergency line and records the following faults:

- Maximum and minimum voltage
- Maximum and minimum Frequency
- Phase balance
- Voltage imbalance
- Frequency imbalance

ATS022 does not require an auxiliary safety power supply since it is powered directly by the line voltages.

If both lines are absent, ATS022 enters Powersave mode (maximum duration 1 minute) in which the device is active and in stand-by for one of the power supply lines to be restored. When the Powersave period ends, the LED switches off and the device awaits a line voltage. The moment the main or the emergency line is restored, the unit analyses the conditions of the lines monitored and the status of the circuit breakers and proceeds with the switching operation in accordance with the situation concerned.

The safety auxiliary supply is obligatory in the following cases:

- utilisation of Modbus RS485 communication
- utilisation in systems with rated frequency 16 2/3Hz
- utilisation in single-phase systems with  $U_n$  57,5...109VAC

A 24VDC ...110VDC auxiliary safety power supply can be used (-10%, +15%).

ATS022 can be used in systems with rated frequency 50Hz, 60Hz, 400Hz, 16 2/3 Hz that can be set from the menu.

The device can be used in systems with single-phase, three-phase with Neutral and three-phase without neutral, setting can be done from the menu. ATS022 makes it possible to select from the display a different distribution system between Line LN1 and Line LN2. ATS022 can be used in manual or automatic mode. In the first case the circuit breakers must be controlled by means of the pushbuttons present on the front panel of the device, while in automatic mode, the switching logic is controlled directly by the device

The device is equipped with a front graphic display by means of which the user can check the settings and display the status of the unit and the circuit breakers connected to it.

It is also possible to integrate the ATS022 device inside a communication network which uses the Modbus RS485 protocol.

## 3.2 Application scenarios

The ATS022 device can be used in the following applications:

- Main line – Emergency line switching
- Main line – Emergency generator switching

ATS022 makes it possible to operate a third circuit breaker CB3 and can therefore also be used in the following applications which can be set on the menu:

- non priority loads control with CB3 on starting line (3CBs NPL)
- non priority loads control with CB3 Bus Tie (3CBs NPL Bus Tie)
- control of two independent power supply lines separated by Bus Tie (3CBs Bus Tie)

The ATS022 also makes it possible to select which of the lines is the main one and which one is secondary, also with the system running.

The following selections are possible, set from the menu:

- Main line: Line LN1
- Main line: Line LN2
- No priority line

In automatic mode, it is possible to select whether or not the switching procedure must include inverse switching.

The following selections are possible:

- with inverse procedure
- without inverse procedure

## 4. Applications of device ATS022

The ATS022 device controls all the switching sequences by applying the time delays that can be set:

Time delays	Description	Value
TS Delay	Opening delay of main line CB after detection of a fault in the mains (Generator is not in use).	0...30s
	Generator start delay after detection of a fault in the mains (Generator in use).	
TBS Delay	Opening delay of emergency line CB.	0...59s, 1,2,3...30min
TCE Delay	Closing delay of line LN2 CB2.	0...60s
TCN Delay	Closing delay of CB1 of line LN1.	0...60s
TC Delay	Opening and closing delay of CB3 if used in Bus Tie application.	0...60s
TGOFF Delay	Generator switching off delay after closure of line LN1 CB1.	0...59s, 1,2,3...30min
TL Delay	Delay in activation of outlet DO7, after detection of the fault on both lines LN1 and LN2.	0...60s

Table 4.1: Description of time delays

**ATTENTION:** it is necessary to take into consideration that the total switching time, in addition to the set up delay, includes also the internal time of ATS.

### 4.1 Switching Main Line – Emergency Line (2CBs)

#### Description

Both lines are normally present; in cause of anomaly on the main line, ATS022 switches to the emergency line used as the reserve line.

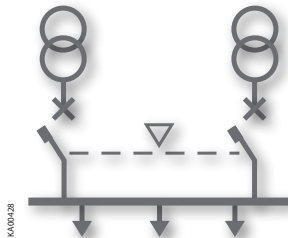


Figure 4.1: 2CBs application layout – generator not in use



## Time diagrams

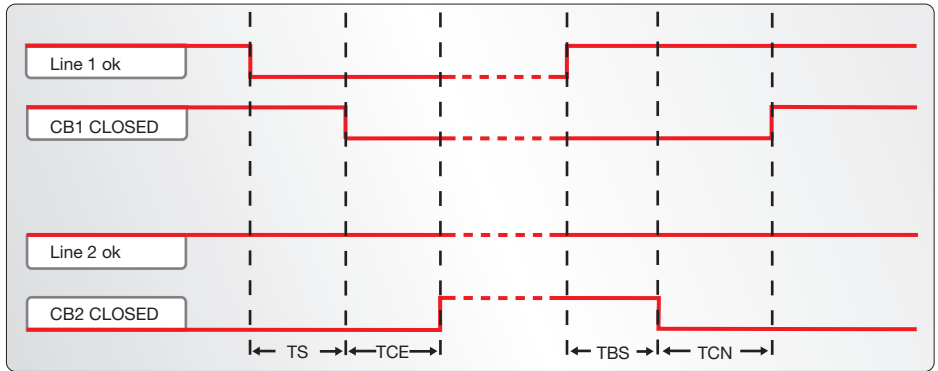


Figure 4.2: 2CBs application time diagram - main line LN1

**Special cases:** if LN1 returns to normal during TS, the changeover is interrupted; if LN1 returns to normal during TCE, the changeover is completed. If LN1 disappears during TBS, the changeover is interrupted; if LN1 disappears during TCN, the changeover is completed. If LN2 is absent, after TS the unit waits for the presence of LN2 in order to send the opening command to CB1. If LN2 disappears during TCE, the procedure is in any case completed.

## 4.2 Switching Main Line – Emergency generator (2CBs)

### Description

In case of main line failure ATS022 automatically starts up an emergency generator and, as soon as power on the generator side is available, ATS022 starts the automatic switching procedure.

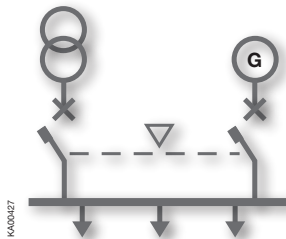


Figure 4.3: 2CBs application layout – generator in use

## Time diagrams

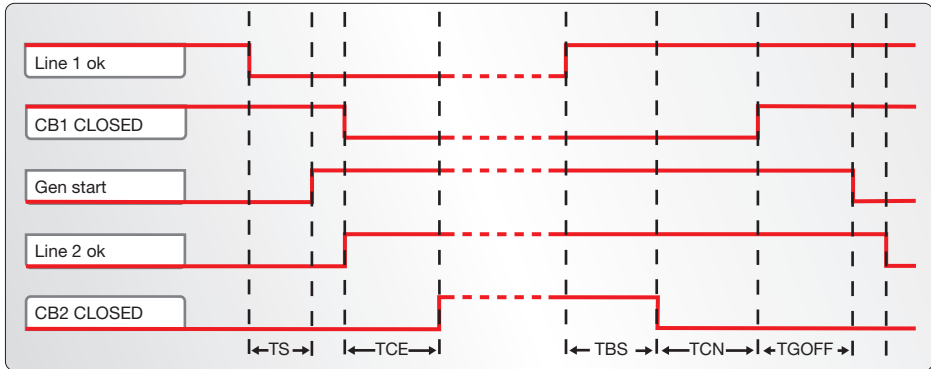


Figure 4.4: 2CBs application time diagram - generator in use

**Special cases:** if LN1 returns to normal before LN2, the sequence is interrupted and the generator is turned off; if LN1 returns to normal during TCE, the sequence is completed. If LN1 disappears during TBS, the sequence is interrupted; if LN1 disappears during TCN, the switchboard starts TS running in order to re-enter on LN2. If LN2 disappears during TCE, the procedure is in any case completed.

## 4.3 Non priority loads control (NPL)

### Description

In case of main line failure the ATS022 starts the switching procedure and controls the non priority loads by opening closing circuit breaker CB3.

ATS022 acquires the CB3 open/close status from the dedicated input DI11 and commands the opening and closing by activating output DO11.

The application of non priority loads requires the use of two CT-AWE typed timed relays for operating the opening and closing of CB3.

Two configurations are possible for utilisation depending on the position of circuit breaker CB3:

- CB3 in Bus Tie position (3CBs NPL – BUS TIE)
- CB3 on starting line (3CBs NPL).

It is possible to select from two options from the menu on the display for the 3CBs NPL - Bus Tie configuration:

- only disconnection of non priority loads by opening CB3 (manual re-closure). In this case timed relays CT-AWE are not necessary
- disconnection and re-connection of non priority loads by opening and closing of CB3

For more details refer to the wiring diagrams of the product.

**Usage notes:** the NPL loads are always combined with line LN1: configuring the unit without a priority line or with LN2 as the priority line does not change the way changeover of CB3 is managed. NPL

configuration requires configuration with 2 lines or with a line and an emergency generator.

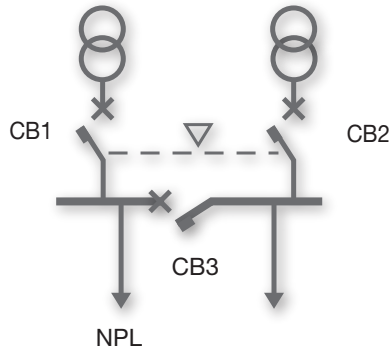


Figure 4.5: Application layout 3CBs NPL BUSTIE

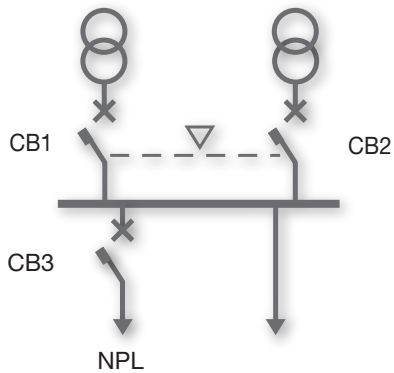


Figure 4.6: Application layout 3CBs NPL

### Time diagrams

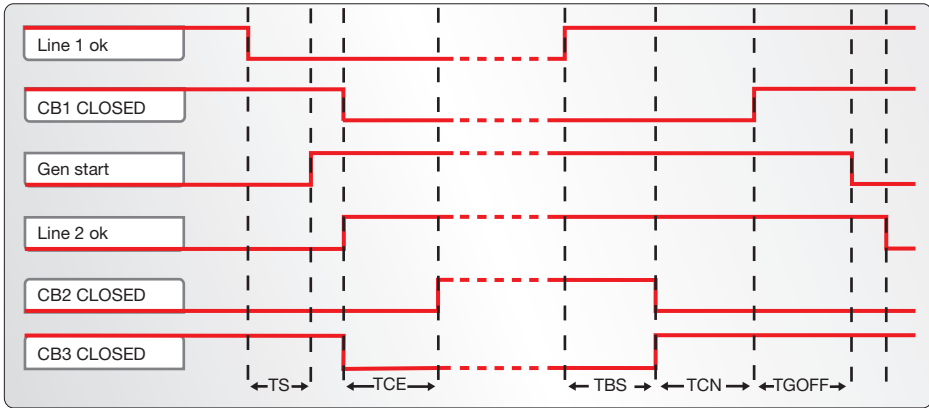


Figure 4.7: Application time diagram 3CBs NPL BUS TIE - generator in use

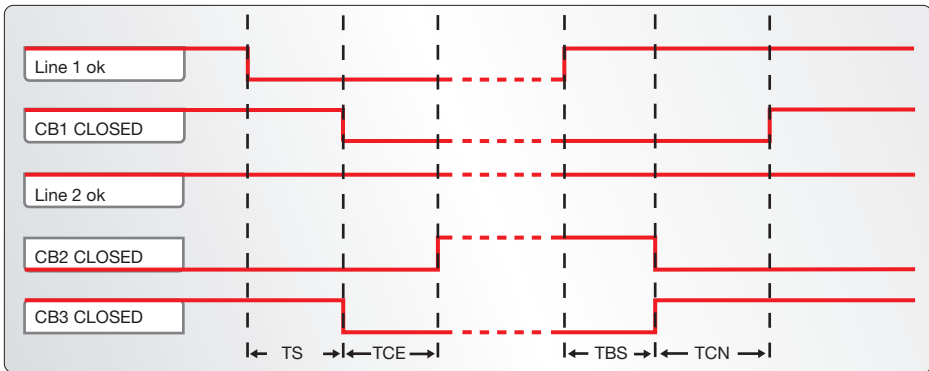


Figure 4.8: Application time diagram 3CBs NPL BUS TIE - generator not in use

**Special cases:** if LN1 returns to normal before LN2, the sequence is interrupted and the generator is switched off; if LN1 returns to normal during TCE, the sequence is completed. If LN1 disappears during TBS, the sequence is interrupted; if LN1 disappears during TCN, the switchboard starts TS running in order to re-enter on LN2. If LN2 disappears during TCE, the procedure is in any case completed. main line LN1.

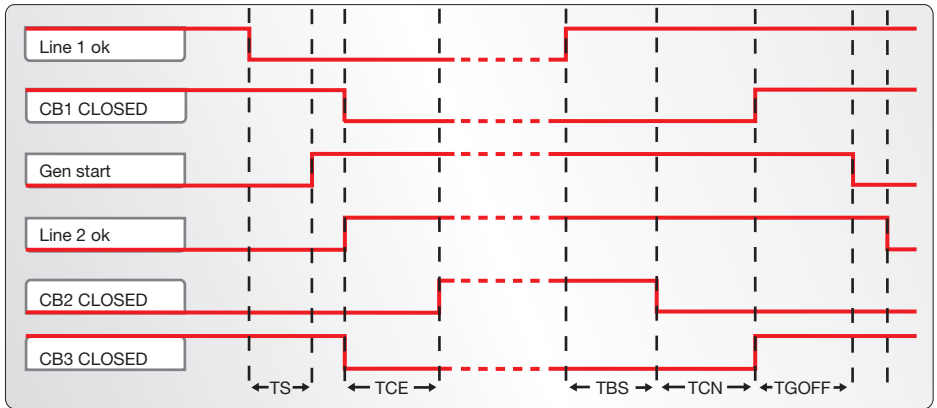


Figure 4.9: Application time diagram 3CBs NPL - generator in use

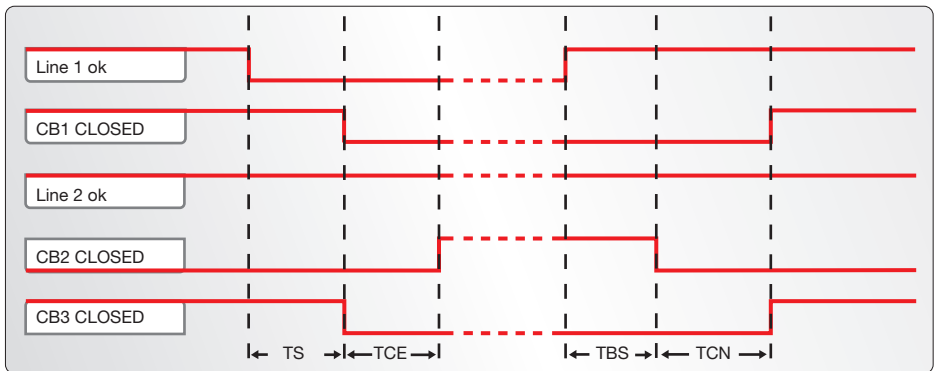


Figure 4.10: Application time diagram 3CBs NPL - generator not in use - main line LN1

**Special cases:** if LN1 returns to normal before LN2, the sequence is interrupted and the generator is switched off; if LN1 returns to normal during TCE, the sequence is completed. If LN1 disappears during TBS, the sequence is interrupted; if LN1 disappears during TCN, the switchboard starts TS running in order to re-enter on LN2. If LN2 disappears during TCE, the procedure is in any case completed.

## 4.4 Control of two independent power supply lines separated by Tie (3CBs Bus Tie)

### Description

Lines LN1 and LN2 supply two different sections of the plant separated by a bus tie circuit breaker CB3, normally open. In case of failure of one of the two supply lines, ATS022 closes CB3; the available line thus powers both the sections downline. When the line is restored ATS022 restores the normal plant conditions by opening CB3. ATS022 acquires the open/close status of the device by means of dedicated input DI11 and commands the opening and closing by activating output DO11. The Bus Tie application requires the use of two CT-AWE type timed relays for operating the opening and closing of CB3. The three circuit breakers CB1 – CB2 – CB3 must be interlocked mechanically for reasons of safety (Emax circuit breakers – C type interlock).

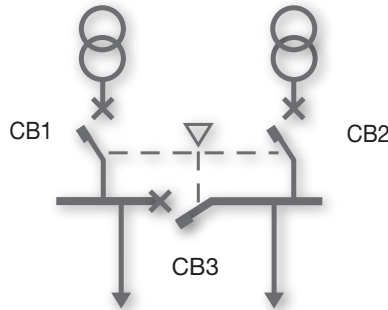


Figure 4.11: Application layout 3CBs BUS TIE

### Time diagrams

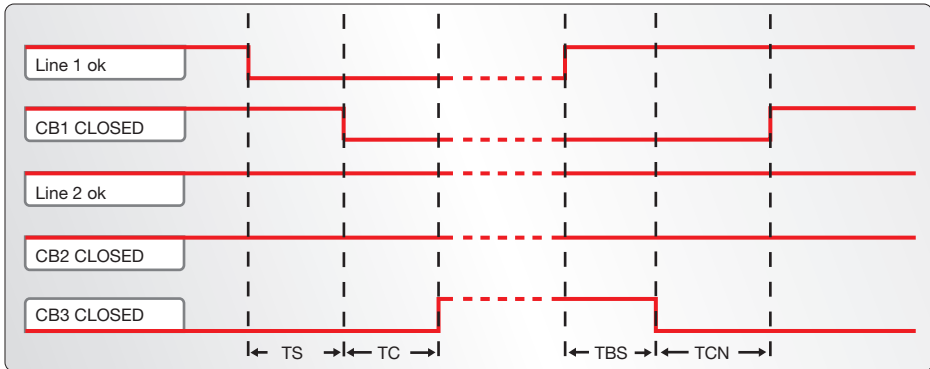


Figure 4.12: Application time diagram 3CBs BUS TIE – line LN1 failure

**Special cases:** if LN1 returns to normal during TS, the changeover is interrupted; if LN1 returns to normal during TC, the changeover is completed. If LN1 disappears during TBS, the changeover is interrupted; if LN1 disappears during TCN, the changeover is completed. If LN2 disappears during TS, the changeover is interrupted. If LN2 disappears during TC, the changeover is completed.

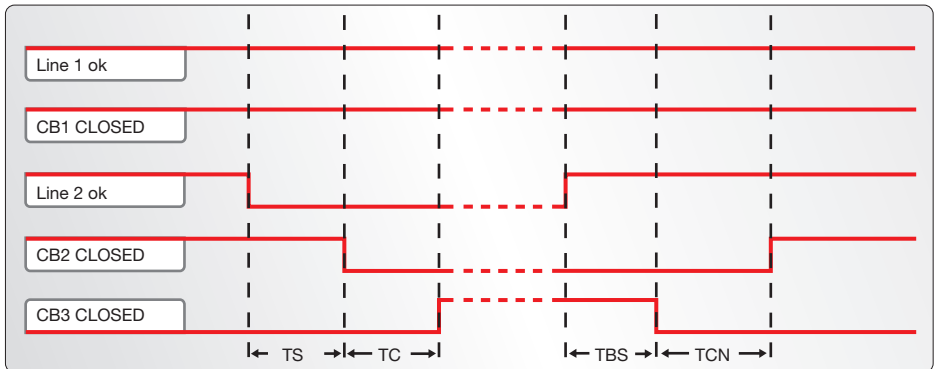


Figure 4.13: Application time diagram 3CBs BUS TIE – line LN2 failure

## 4.5 Automatic switching without inverse procedure

### Description

Following an anomaly of the main line, ATS022 switches on an emergency line (1). If the mains supply is restored, the inverse switching procedure is not started up (2). If there is a fault in the reserve line, ATS022 must open the emergency switch (3) and wait for restoration of the emergency line to reclose (4), without in any case providing for switching on the main line. This operating mode is also applicable if the generator is present: in this case, after time  $T_s$  the generator is started up and as soon as the emergency line is available CB1 is opened.

**ATTENTION** If ATS022 is not powered by the auxiliary supply and by any of the two lines the device waits for at least one of the two lines (5) to return before proceeding with the switching procedure (6).

The option is not available in case of 3CBs Bus Tie application and in case of selection of the no priority line option.

### Time diagrams

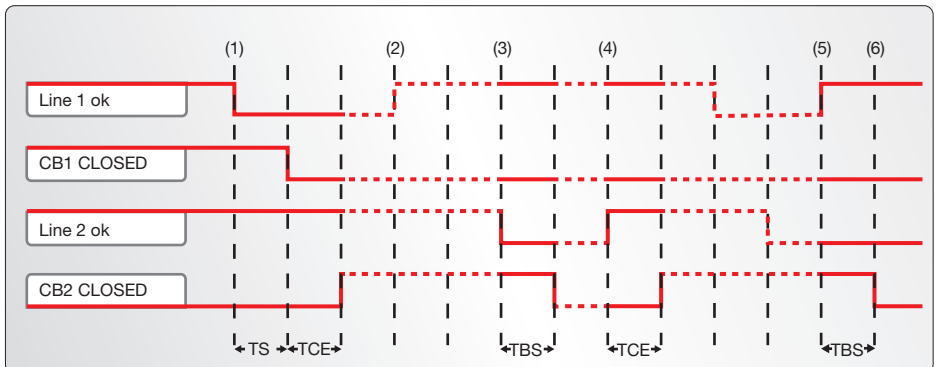


Figure 4.14: 2CBs application time diagram - generator not in use – without inverse switching procedure

## 4.6 Line Priority Selection

### Description

ATS022 allows selection of the main line by means of the menu on the display. The following selections are possible:

- main line: Line LN1
- main line: Line LN2 (selection possible only if generator is not in use)
- no line priority: ATS022 ensures power supply to the load from any of the two lines without considering either of these as priority, therefore, for example, following switching on line LN2 due to failure of line LN1, ATS022 remains on line LN2 even if LN1 is restored.

### Time diagrams

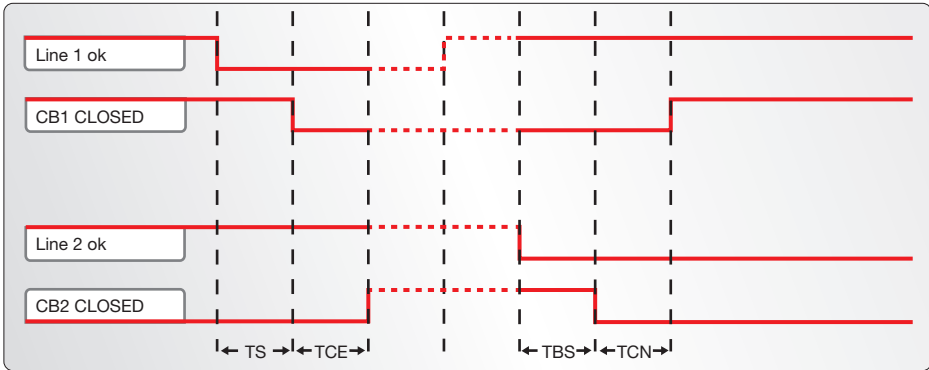


Figure 4.16: Time Diagram no line priority – generator non in use

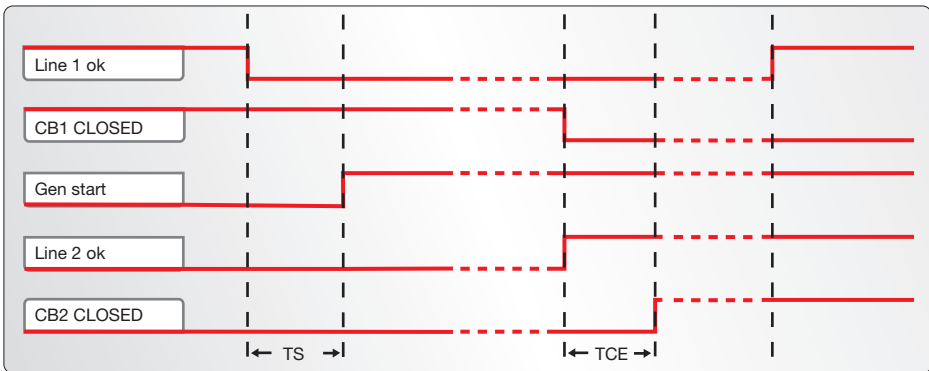


Figure 4.17: Time diagram no line priority – generator in use



## 5. Using the automatic transfer switch

### 5.1 Interface

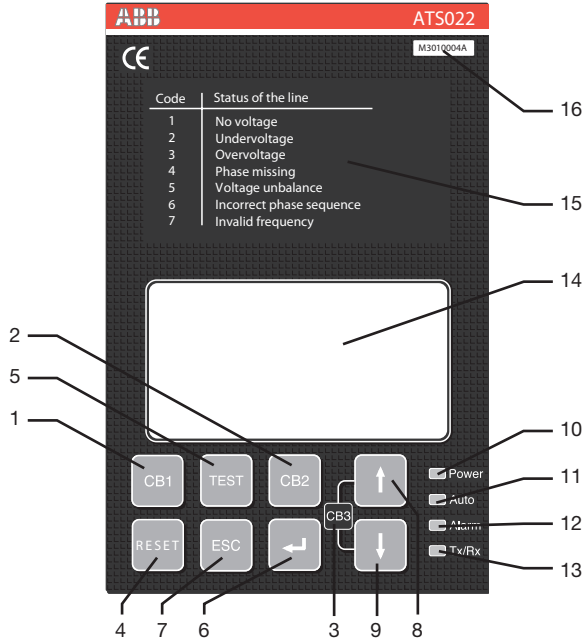


Figure 5.1: Description of ATS022 front panel interface

Ref.	Description
1	CB1: pushbutton for opening/closing circuit breaker CB1
2	CB2: pushbutton for opening/closing circuit breaker CB2
3	CB3: CB3 opening/closure procedure graphic indication (combination of UP-DOWN keys for at least 2sec)
4	RESET: pushbutton for automatic/manual mode selection and alarms reset
5	TEST: test modes selection pushbutton
6	ENTER: pushbutton for confirming an action
7	ESC: pushbutton for returning to the previous step
8	UP: pushbutton for moving up on the menu
9	DOWN: pushbutton for moving down on the menu
10	LED POWER: indicates presence of power supply
11	LED AUTO: indicates automatic or manual mode

Ref.	Description
12	LED ALARM: indicates active alarm
13	Tx/Rx LED: indicates bus communication status
14	GRAPHIC DISPLAY
15	PLATE SHOWING LINES STATUS CODES
16	Serial No.

Table 5.1: Description of ATS022 interface

## 5.2 LED indicators

### Alarm

The steady red Alarm LED may indicate the switching logic disabled condition or one of the following events:

- circuit breakers command failed
- protection releases tripped
- removal of circuit breakers
- generator alarm
- logic disabling from input DI3
- CBs closed (2 or 3 depending on the configuration)

The alarm LED switches Off indicating that the switching logic is enabled and no alarms are present

### Auto

The Auto LED indicates the operating mode:

- manual: LED Off
- automatic: steady green LED
- test: flashing green LED

### Power

LED Power LED indicates the presence of power supply:

- power supply present: steady green LED indicates power supply from line voltage or from auxiliary source present
- no power supply: LED Off indicates that both lines are not present and that the Powersave condition has ended. The switching logic is in stand-by for return of one of the line voltages
- Powersave: green flashing LED indicates, if both lines are absent and if no auxiliary power supply is present, that the device is active and is in stand-by for return of one of the line voltages (maximum duration 1 minute). When the Powersave period ends, the LED switches off and the device awaits a line voltage. The moment the normal or the emergency line is restored, with ATS022 in automatic, the unit analyses the conditions of the lines monitored and the status of the circuit breakers and proceeds with the switching operation in accordance with the situation concerned.

### TX/RX

The TX/RX LED indicates the bus communication status.

- Communication via bus under way: green LED flashing at variable frequency
- Communication via bus not active: LED Off

## 5.3 Keypad keys

### **CB1 key**

In manual mode, press the CB1 key for Opening/Closure of circuit breaker CB1.

### **CB2 key**

In manual mode, press the CB2 key for Opening/Closure of circuit breaker CB2.

### **RESET**

Press RESET to select the Manual or Automatic operating mode.

In case of alarm, press RESET to reset the alarm and the device returns to manual mode. Press RESET again to bring the device to automatic mode.

### **TEST key**

Press the TEST key to set the test modes of the direct and inverse switching sequences.

ATS022 must be in the manual position. To exit TEST mode press RESET.

### **Enter key**

Used for confirming the action or entry to the menu.

### **ESC key**

Used for cancelling an action and returning to previous menu.

### **UP key**

Used for moving up on the menu.

### **DOWN key**

Used for moving down on the menu.

## 5.4 Setting the operating modes

### 5.4.1 Manual mode

To select the Manual operating mode of unit ATS022:

- Make sure the Power LED is On, see Figure 5.2/1
- If the Auto LED is OFF, see Figure 5.2/2, the automatic transfer switch is in Manual mode.
- If the AUTO LED is ON, press RESET, see Figure 5.2/3 . The Auto LED switches to OFF and the device is in Manual Mode, see Figure 5.2/4 .

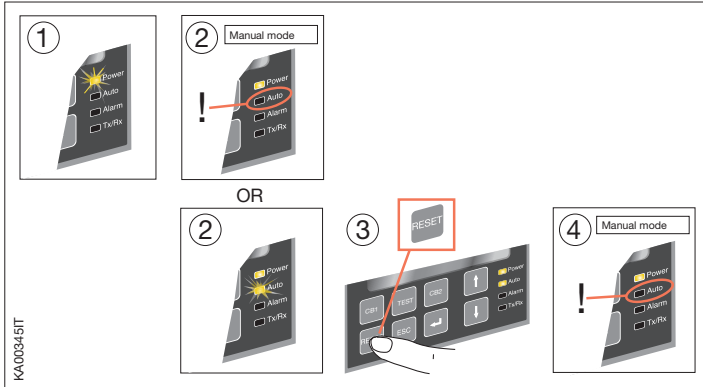


Figure 5.2: Description of manual mode selection procedure for ATS022

### 5.4.2 Automatic mode

To select the Automatic operating mode of unit ATS022:

- Make sure the Power LED is On, see Figure 5.3/1
- Press RESET once, see Figure 5.3/2. If the Auto LED is ON, the automatic transfer switch ATS022 is in Automatic mode, see Figure 5.3/3
- If the Auto LED is OFF, press RESET again, see Figure 5.3/3; the Auto LED switches to ON and the device is in Automatic mode/ Figure 5.3/4

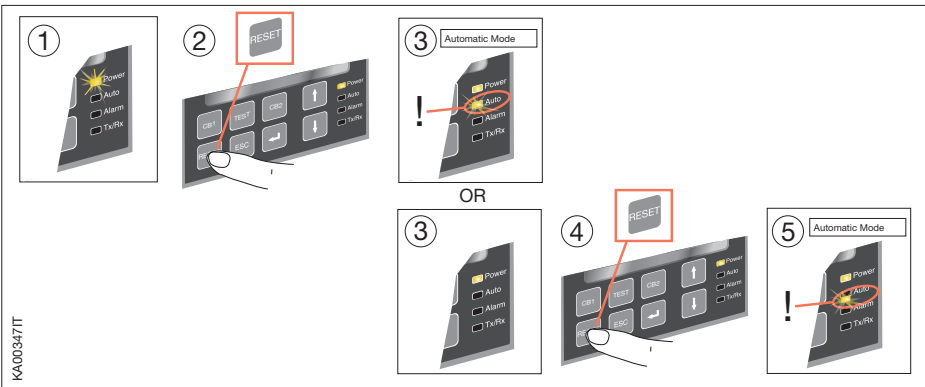


Figure 5.3: Description of automatic mode selection procedure for ATS022

## 5.5 Graphic Display

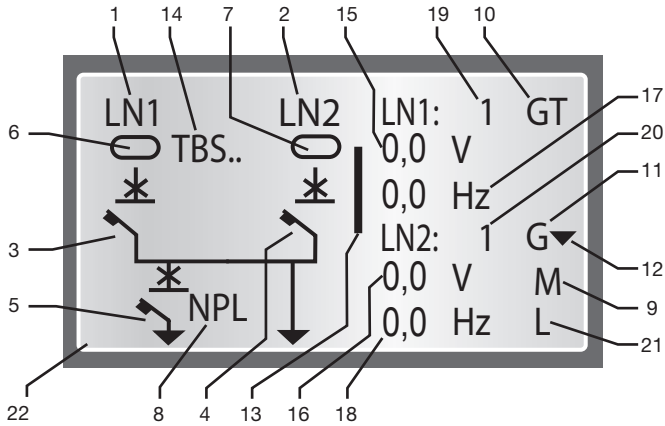


Figure 5.4: Description of ATS022 display

Ref.	Description
1	LN1: line 1
2	LN2: line 2
3	CB1 status graphic indicator
4	CB2 status graphic indicator
5	CB3 status graphic indicator
6	LN1 power presence icon
7	LN2 power presence icon
8	application type indicator
9	manual mode indicator
10	test mode indicator
11	generator presence indicator
12	generator start (UP arrow)/stop (DOWN arrow) indicator
13	open/close command execution indicator
14	timing indicator
15	LN1 power measurement
16	LN2 power measurement
17	LN1 frequency measurement
18	LN2 frequency measurement
19	LN1 line status code
20	LN2 line status code
21	local/remote mode indicator
22	outlet DO7 activation indicator

Table 5.2: Description of ATS022 display

### 5.5.1 LN1 and LN2 lines status indication

The presence/absence of lines LN1 and LN2 is shown graphically on the display by means of filled/empty icons, see Figure 5.4/6 – 5.4/7, and a specific status code

If there is an anomaly on the line voltage, the icon concerned is empty and the error code is displayed as defined by the following Table:

Line status	Code	Description
No power	1	No voltage on the phases (one in the case of a single-phase configuration, three in the case of a 3P or 3P+N three-phase configuration).
Minimum voltage	2	One or more phases with voltages less than the set threshold.
Maximum voltage	3	One or more phases with voltages greater than the set threshold.
Phase missing	4	Loss of one or two phases in 3P or 3P + N systems.
Phase imbalance	5	Imbalance between the voltages of the individual phases (the difference between the phase with the higher voltage value and that with the smaller is higher than the set voltage threshold) (*).
Inverted sequence	6	Inversion of the sequence between two or more phases (the correct sequence is L1, L2, L3).
Frequency out of range	7	One or more frequency values outside the set limits.

(\*) = The check on the imbalance is performed between phase-to-phase voltages in the case of a 3P configuration, and between phase voltages in the case of a 3P + N configuration.

Table 5.3: Description of line status codes ATSO22

### 5.5.2 Browsing through the Menu

Press Enter to access the main Menu. Three different levels of configuration of the unit can be accessed from the main menu:

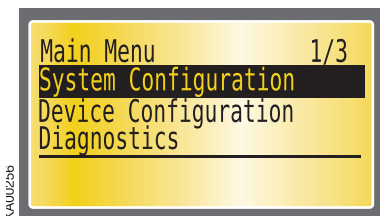


Figure 5.5: Description of main menu ATSO22

Access to the configuration pages requires a 4-digit password which must be entered using the UP, DOWN and ENTER keys.

The password is valid for one minute after the last pressing of a key.

For the first access to the system the password is 0001; subsequently change the password as desired.

If the password is lost or forgotten, contact the service centre.

## Configuration of the System

The system configuration section makes it possible to set:

### - The parameters of the two lines

Parameters of lines LN1 - LN2	Value	Factory settings
Rated voltage	100V/57V– 115V/66V - 120V/70V - 208V/120V - 220V/127V - 230V/132V - 240V/138V - 277V/160V - 347V/200V - 380V/220V - 400V/230V - 415V/240V - 440V/254V - 480V/277V	400V/230V
Rated frequency	50Hz - 60 Hz, 16 2/3 Hz, 400 Hz	50Hz
Number of phases LN1	1 phase / 3 phases with N / 3 phases without N	3 phases with N
Number of phases LN2	1 phase / 3 phases with N / 3 phases without N	3 phases with N
Presence of external voltage transformer (parameters in the table Technical data)	absent/present (for voltages greater than 480VAC)	absent
Primary voltage TV	100V/57V– 115V/66V - 120V/70V - 208V/120V - 220V/127V - 230V/132V - 240V/138V - 277V/160V - 347V/200V - 380V/220V - 400V/230V - 415V/240V - 440V/254V - 480V/277V - 500V/288V - 550V/317V - 600V/347V - 660V/380V - 690V/400V - 910V/525V - 950V/550V - 1000V/577V - 1150V/660V	690V/400 V
Secondary voltage TV	100V/57V– 115V/66V - 120V/70V - 208V/120V - 220V/127V - 230V/132V - 240V/138V - 277V/160V - 347V/200V - 380V/220V - 400V/230V - 415V/240V - 440V/254V - 480V/277V	400V/230 V

Table 5.4: Description of parameters of lines ATS022

### - Type of application

Type of application	Value	Factory settings
Protection devices	2CBs / 3CBs NPL opening only / 3CBs NPL opening&closing / 3CBs NPL BusTie / 3CBs Bus Tie	2CBs
Utilisation of generator	Generator not in use / Generator in use	Generator not in use
Priority Line	Line LN1 / Line LN2 / No priority Line	Line LN1
Switching	With inverse procedure/Without inverse procedure	With inverse procedure

Table 5.5: Description of types of application ATS022

## Device configuration

The device configuration section makes it possible to set:

### - Limit thresholds

Limit thresholds	Value	Factory settings
Min/max voltage threshold	-30% ...-5%, +5% ... +30%, step $\pm 1\%$ (Imbalance of voltage set at same threshold)	-15%; +15%
Min/max frequency threshold	-10% ...-1%, +1% ... +10%, step $\pm 1\%$	-1%; +1%

Table 5.6: Description of limit thresholds ATS022

### - Time delays

Time delays	Value	Factory settings
TS Delay	0...30s, step 1s	0s
TBS Delay	0...59s, , step 1s, 1,2,3...30min, step 1min	0s
TCE Delay	0...60s, step 1s	3s
TCN Delay	0...60s, step 1s	3s
TC Delay	0...60s, step 1s	3s
TGOFF Delay	0...59s, , step 1s, 1,2,3...30min, step 1min	5s
TL Delay	0...60s, step 1s	0s

Table 5.7: Description of time delays ATS022

### - Digital inputs

Digital Input	Value	Factory settings
Digital Input DI10 - function	disabled/generator start/logic enabling/remote reset/EMERGENCY BLOCK	Generator Start
Digital Input DI10 - type	NO/NC	NO
Digital Input DI8 - type	NO/NC	NO

Table 5.8: Description of inputs ATS022

### - Modbus parameters

Modbus	Value	Factory settings
Modbus Address	1...247	1
Modbus Baud Rate	9600/19200/38400 bps	9600
Modbus Stop Bits	0,1	1
Modbus Parity	even, odd, absent	absent
mode	local, remote	local

Table 5.9: Description of Modbus parameters ATS022

### - Language and backlit display

Function	Value	Factory settings
Backlighting duration	Always On, 0...59s, step 1s, 1,2,3...30min, step 1min	Always On
Language	English/Italian/German/French/Spanish/Finnish/ Russian/Chinese	English

Table 5.10: Description of language and backlighting ATS022



## Diagnostics

The diagnostics section makes it possible to access the following pages:

Values Measured: the voltage and frequency values measured on lines LN1 and LN2 can be consulted on the display.

Alarms Log: the latest alarms/events are displayed, up to a maximum of 20. The number of alarms is shown at the top of the page and the latest alarm is always at the top of the list. The log is cleared by selecting Clear Log and pressing Enter.

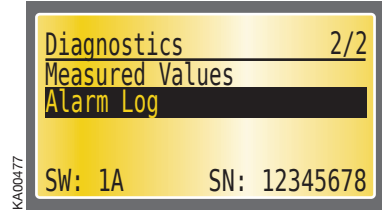


Figure 5.5: Description of diagnostics menu ATS022

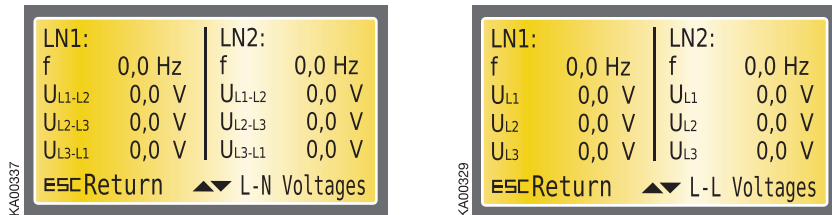


Figure 5.6: diagnostics – values measured page ATS022

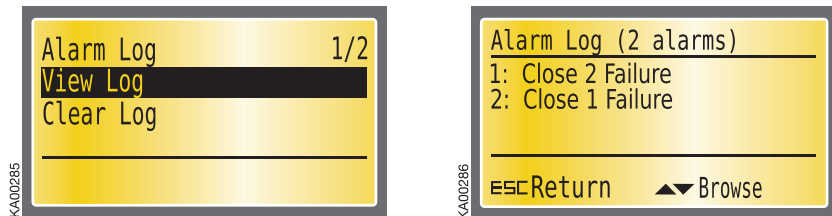


Figure 5.7: diagnostics – Alarms Log page ATS022

## 5.6 Using pushbuttons in manual mode

### Opening/Closing circuit breakers CB1, CB2

In manual mode the circuit breakers can be controlled by means of pushbuttons CB1 and CB2. In case of a fault, the alarms are activated by the same methods as those for the automatic switching sequence.

Pressing the CB1 key:

- If CB1 is closed, the opening command is sent to CB1
- If CB1 and CB2 are both open, the closing command is sent to CB1
- If CB1 is open and CB2 is closed, no operation is carried out

Pressing CB2 key:

- If CB2 is closed, the opening command is sent to CB2
- If CB2 and CB1 are both open, the closing command is sent to CB2
- If CB2 is open and CB1 is closed, no operation is carried out

### Opening/Closing circuit breaker CB3

In manual mode, combination of the UP and DOWN keys allows Opening/Closing of circuit breaker CB3.

- CB3 opening: press the UP and DOWN keys simultaneously for at least 2 seconds.
- CB3 closing: press the UP and DOWN keys simultaneously for at least 2 seconds.

### Manual Start/Stop of generator

In manual mode, the combination of the ENTER, CB1 and CB2 keys allows Start/Stop of the generator.

- Generator Start: keeping ENTER pressed, press CB1
- Generator Stop: keeping ENTER pressed, press CB2

## 5.7 Test Modes

ATS022 makes it possible to select two different test modes:

- testing the entire switching procedure (complete Test)
- generator start/stop test (gen set test)

**WARNING:** when the test procedure ends, the user must make sure the device is not left accidentally in TEST mode

### Complete Test

With ATS022 in manual mode, press TEST: all the LEDs, except Tx/Rx, flash twice simultaneously and then the Auto LED Auto flashes every 0.5 sec.; the graphic display shows the icon T.

The test procedure varies according to the application selected:

2 CBs	3CBs NPL
<ol style="list-style-type: none"> <li>1. Press TEST; start generator (not performed if generator is NOT in use)</li> <li>2. Press TEST; CB1 Opening</li> <li>4. Press TEST; CB2 Closure</li> <li>5. Press TEST; CB2 Opening</li> <li>6. Press TEST; CB1 Closure</li> <li>8. Press TEST; stop generator (not performed if generator is NOT in use)</li> </ol>	<ol style="list-style-type: none"> <li>1. Press TEST; start generator (not performed if generator is NOT in use)</li> <li>2. Press TEST; CB1 Opening</li> <li>3. Press TEST; CB3 Opening</li> <li>4. Press TEST; CB2 Closure</li> <li>5. Press TEST; CB2 Opening</li> <li>6. Press TEST; CB1 Closure</li> <li>7. Press TEST; CB3 Closure (not performed if ATS022 has activated the DISCONNECTION ONLY function)</li> <li>8. Press TEST; stop generator (not performed if generator is NOT in use)</li> </ol>
3CBs NPL Bus Tie	3CBs Bus Tie
<ol style="list-style-type: none"> <li>1. Press TEST; start generator (not performed if generator is NOT in use)</li> <li>2. Press TEST; CB1 Opening</li> <li>3. Press TEST; CB3 Opening</li> <li>4. Press TEST; CB2 Closure</li> <li>5. Press TEST; CB2 Opening</li> <li>6. Press TEST; CB3 Closure</li> <li>7. Press TEST; CB1 Closure</li> <li>8. Press TEST; stop generator (not performed if generator is NOT in use)</li> </ol>	<ol style="list-style-type: none"> <li>1. Press TEST; CB1 Opening</li> <li>2. Press TEST; CB3 Closure</li> <li>3. Press TEST; CB3 Opening</li> <li>4. Press TEST; CB1 Closure</li> <li>5. Press TEST; CB2 Opening</li> <li>6. Press TEST; CB3 Closure</li> <li>7. Press TEST; CB3 Opening</li> <li>8. Press TEST; CB2 Closure</li> </ol>

Table 5.11: Description of complete TEST mode ATS022

At the end of the procedure, press TEST again to resume the sequence.

Alarms, if any, on the protection devices control are activated in the same manner as the automatic and manual operating modes.

The user can stop the TEST sequence by pressing the RESET.

### Gen Set Test

This test mode makes it possible to test only the generator start and stop with the plant running without operating the circuit breakers on the line in any manner whatsoever, only if the ATS022 is set with the generator in use, otherwise the Gen Set Test is not performed.

With ATS022 in manual mode, keep the TEST key pressed for at least 3 seconds, on releasing the TEST key, all the LEDs, except Tx/Rx, flash simultaneously four times and then the Auto LED flashes at 0.5Hz; the graphic display shows the GT icon.

The test procedure is as follows:

1. Press TEST; start generator
2. Press TEST; stop generator

Table 5.12: Description of test method GEN SET ATS022

## 5.8 Modbus Communication

ATS022 can be integrated in a network Modbus RS485, and consent to access remotely to the informations, parameters and commands.

To integrate properly ATS022 inside a network Modbus, it is necessary:

- Set the communication parameters (address, Baudrate, stop bit, parity), available in the menu device Configuration-Modbus.
- Configuring the software used for the management of its own network Modbus; in ABB library is available the document 1SDH001337R0001 including all the information, the registers, the commands of ATS022 that are remotely available.

In the ABB library it is also possible to download the software ABB EKIP connect 2 that enables a rapid and easy remote management of the measures, parameters, and the commands of ATS022.

### 5.8.1 Local / Remote Configuration

In the Modbus-Device Configuration Menu, a parameter Local/remote is available, which enables to choose how to manage the commands and modify the parameters.

With ATS022 configured locally:

- The modification of the parameters is permitted only by the menu interface on ATS022.
- The commands, with unity in Manual mode, are allowed only through buttons set on ATS022.
- From remote the reading of all the parameters is available.
- The display shows the symbol "L."

With ATS022 configured in remote:

- The change of the parameters is admitted only from remote.
- The commands, with unity in Manual mode, are allowed only by remote.
- To display the reading of all the parameters is available.
- The display shows the symbol "R".

**ATTENTION:** The modification of the Local/Remote parameter is also allowed in configuration Remote by ATS022.

## 6. Input and output signals

### 6.1 Output signals (DO1...DO12)

#### DO1, DO2, DO3, DO4: Circuit breakers open/close command

Output signals DO1, DO2, DO3, DO4 control the opening and closure of circuit breakers CB1 and CB2 connected to ATS022.

The control logic integrated in the device punctually checks the correct operation of the circuit breakers following the command.

If the change in status of the circuit breaker is not received within 5 seconds of sending the command, the device considers the command as failed and operates as below:

- alarm LED lights up.
- DO6 alarm output activation
- DO9 alarm output activation

The alarm relative to the failed operation is recorded in the section concerned of the "Alarms Log".

To reset the alarm press RESET:

the alarm is reset and ATS022 goes into manual mode.

Press RESET again to bring ATS022 to automatic mode.

#### DO5 Emergency generator start/stop command

Start and stop of the Emergency generator are controlled by means of a bistable relay, making it possible to maintain the generator start command even when the powersave mode runs out.

- contact DO5 (X23:1 ; X23:2 - NO):
  - stop unit = contact open
  - start unit = contact closed
- contact DO5 (X23:2 ; X23:3 - NC):
  - stop unit = contact closed
  - start unit = contact open

#### DO6 Alarm signal

When an alarm is generated, contact DO6 switches, the switching logic is disabled and the alarm LED lights up.

To reset the alarm press RESET:

the alarm is reset, the Alarm LED turns Off and the ATS022 enters manual mode.

Press RESET again to bring ATS022 to automatic mode.

#### DO7 Load protection device

**Note** : valid for SW $\geq$  2H

the programmable contact DO7 closes for 1s if both the lines have one or more alarms of the same type, and is useful for protecting sensitive loads that could be damaged in the event of abnormal power supplies.

The contact can be programmed with 2 variables:

- Time TL: time that the fault is present on both lines after which the contact is activated.
- Function DO7: the parameter available on ATS022 is a number in decimal format that, if converted into binary, allows 6 bits to be managed corresponding to the types of alarms (bit set to 0= alarm deactivated; bit set to 1= alarm activated)

bit	Alarm
0 (least significant)	No voltage and undervoltage
1	Overtoltage
2	Phase missing
3	Unbalance
4	Incorrect phase sequence
5	Invalid frequency

If, for example, you wish to monitor a frequency alarm (bit 6) and/or an overvoltage (bit 2) alarm, the corresponding binary code is 100010, which converted to decimal becomes 34. The decimal number must be selected directly from the DO7 menu in the device.

For correct operation of DO7 the presence of an auxiliary power supply is required.

DO7 must not be used in installation configurations with circuit-breakers T1-T2-T3 and motor operator MOS.

The Unbalance alarm also includes cases of undervoltage or overvoltage (for example, the drop of one phase in a 3P or 3P + N system).

In the absence of voltages, ATS022 cannot calculate the angle between the various phases and therefore it considers this condition as: Incorrect phase sequence.

### DO8 Not available

### DO9 Circuit breaker operation failed alarm indication

When the opening or closing command of a circuit breaker fails, contact DO9 closes; the switching logic is disabled and the Alarm LED lights up.

To reset the alarm press RESET:

the alarm is reset, the Alarm LED turns Off and the ATS022 enters manual mode.

Press RESET again to bring ATS022 to automatic mode.

### DO10 Automatic/Manual mode indication

Contact DO10 indicates the operating mode of the device:

- DO10 open: ATS022 operates in automatic mode
- DO10 closed: ATS022 operates in manual mode

### DO11 CB3 circuit breaker control

Depending on the operating mode set, contact DO11 allows control of only opening or opening/closing of circuit breaker CB3:

Protection Devices selection	DO11	NOTES
2 CBs	not used	
3CBs NPL	used	CT-AWE type timed relays required if selected opening&closing option
3CBs NPL Bus Tie	used	CT-AWE* type timed relays required
3CBs Bus Tie	used	CT-AWE* type timed relays required
*The CT-AWE must be adjusted with a time between 200ms and 300ms.		

Table 6.1: Description of DO11 functions - ATS022

### DO12 Logic enabled/disabled indication

Contact DO12 indicates whether switching logic is enabled or disabled:

- DO12 open: logic enabled
- DO12 closed: logic disabled

## 6.2 Input signals

### DI1, DI2 Status signals of circuit breakers CB1, CB2

Inputs DI1, DI2 must be connected to auxiliary contacts of the status of the circuit breakers of the normal and emergency lines

- DI1, DI2 open: CB open
- DI1, DI2 closed: CB closed

### DI3 Switching Logic Activation/Deactivation

Input DI3 is used for enabling/disabling the switching logic. The function may be used for integrating generic alarms coming from the plant the presence of which leads to disabling of ATS022 automatic switching logic.

- DI3 open: logic disabled
- DI3 closed: logic enabled

### DI4, DI5 Circuit breakers activation indication

The auxiliary opening contacts of the normal and emergency lines must be connected to contacts DI4, DI5 for activation of the trip.

- DI4, DI5 open: CB tripped
- DI4, DI5 closed: CB not tripped

In case of trip of a circuit breaker (CB1 or CB2):

- the trip indication contact opens
- the switching logic is disabled
- Alarm contact DO6 is closed
- contact DO12 is closed
- the Alarm LED lights up
- the Auto LED switches Off

To reset the TRIP indication press RESET.

- The TRIP indication is reset
- Alarm LED switches Off
- ATS022 operates in manual mode
- contact DO10 is closed

Press RESET again to bring ATS022 to Automatic mode

- contact DO10 is opened
- the Auto LED lights up

### DI6, DI7 Circuit breakers CB1, CB2 removed/inserted position indication

The auxiliary position contacts of the circuit breakers of the normal and emergency lines must be connected to inputs DI6 and DI7 in removable execution.

- DI6, DI7 open: CB removed
- DI6, DI7 closed: CB inserted

If the circuit breaker is removed:

- the position indication contact opens
- the switching logic is disabled
- Alarm contact DO6 is closed
- contact DO12 is closed
- the Alarm LED lights up
- the Auto LED switches Off

When the circuit breaker is inserted:

- the position indication contact closes
- the switching logic is re-enabled
- Alarm LED switches Off
- ATS022 operates in manual mode
- contact DO10 is closed
- Alarm contact DO6 is opened
- contact DO12 is opened
- the Auto LED switches Off

To set the device in automatic mode press RESET

- contact DO10 is Opened
- the Auto LED lights up

### DI8 Generator Alarm

Input DI8 is used for connecting various alarms coming from the emergency generator: drop in oil pressure, Over Temperature, etc.

Input DI8 may be set as normally open (NO) or normally closed (NC) by means of the menu on the graphic display.

In case of an active generator alarm

- the switching logic is disabled
- Alarm contact DO6 is closed
- contact DO12 is closed
- the Alarm LED lights up
- the Auto LED switches Off
- contact DO10 is closed
- the display shows "generator alarm"

When the DI8 signal is deactivated:

- Alarm LED switches Off
- Alarm contact DO6 is opened
- contact DO12 is opened
- ATS022 operates in manual mode
- the "generator alarm" message disappears from the display

To set the device in automatic mode press RESET

- contact DO10 is Opened
- the Auto LED lights up

### DI9 Forced switching on emergency power supply line

In certain industrial processes, supply of power from the emergency generator may be required instead of from the normal power supply line, for brief moments, in order to avoid possible operating anomalies of the supply and ensure high levels of reliability.

In automatic mode, by activating input DI9 the forced switching procedure is started up on the emergency line:

- Generator Start
- opening of circuit breaker on normal line
- closure of circuit breaker on emergency line

The power supply from the emergency line persists as long as the command remains active. When the command is deactivated, the unit proceeds with the switching procedure on the normal line.



**2 CBs:**

If DI9 is closed:

- Generator Start
- Opening of circuit breaker CB1
- closure of circuit breaker CB2

If DI9 is open:

- opening of circuit breaker CB2
- closure of circuit breaker CB1
- generator stop

**3CBs NPL:**

If DI9 is closed:

- Generator Start
- Opening of circuit breakers CB1 and CB3
- closure of circuit breaker CB2

If DI9 is open:

- opening of circuit breaker CB2
- closure of circuit breakers CB1 and CB3
- generator stop

**3CBs NPL BUS TIE:**

If DI9 is closed:

- Generator Start
- Opening of circuit breakers CB1 and CB3
- closure of circuit breaker CB2

If DI9 is open:

- opening of circuit breaker CB2
- closure of circuit breakers CB3 and CB1
- generator stop

**DI10 Programmable input**

The function associated with input DI10 can be selected from the menu on the display, from among the following options:

- **forced generator start:** this function makes it possible to test the correct switching ON/OFF of the generator with the plant running

Contact type set	Description of function
NC	Open =gen start; Closed = gen stop
NO	Closed =gen start; Open = gen stop

The DI10 contact programmed as a generator starting override is active with ATS022 configured with priority line LN1 and with backswitching.

If one of these conditions does not exist, the option is not available or, if activated previously, will be automatically DISABLED.

NOTE: DI10 in Generator Start configuration has to coexist with other ATS022 functions that impact the management of the generator; for this reason there is a hierarchy and some limitations, which are outlined below.

In automatic configuration, DI10 is managed as follows:

- LN1 present: DI10 determines the activation and deactivation of the generator.
- Switching in progress or line LN2 present: DI10 is ignored by ATSO22.

When changing over from automatic to manual, DI10 is handled differently depending on the initial state of the command to the generator:

- gen stop active: DI10 determines the activation and deactivation of the generator.
- gen start active: the generator is kept active, even with DI10 disabled. To return to controlling the generator with DI10, you need to follow this sequence: 1) DI10 activated 3) DI10 deactivated.

With DI9 active, the status of DI10 is not taken into account in the management of the generator.

- **Enabling automatic switching logic:** this function makes it possible to inhibit the automatic switching logic of the device following an alarm present in the field.

The logic can, however, be disabled if one of the conditions involving the disabling exist

Contact type set	Description of function
NC	Closed = switching enabled; Open switching disabled
NO	Open = switching enabled; Closed switching disabled

- **Reset from Remote:** this function allows reset of the device logic in remote by means of remote actuator.

Contact type set	Description of function
NC	Closed = remote reset not active; Open = remote reset active
NO	Closed = remote reset active; Open = remote reset not active

- **Emergency Block:** this function allows prior opening of both circuit breakers of the power supply and emergency lines and permanent disabling of the switching logic. This function can be used, for example, in case of an alarm coming from a fire-fighting system which requires immediate opening of the circuit breakers and disabling of the switching logic.

Contact type set	Description of function
NC	Closed = emergency block not active; Open = emergency block active
NO	Closed = emergency block active; Open = emergency block not active

Input DI10 may be set as normally open (NO) or normally closed (NC) by means of the menu on the graphic display.

### DI11 CB3 circuit breaker status signal

Input DI11 is connected to the CB3 circuit breaker status auxiliary contacts.

- DI11 open: CB open
- DI11 closed: CB closed

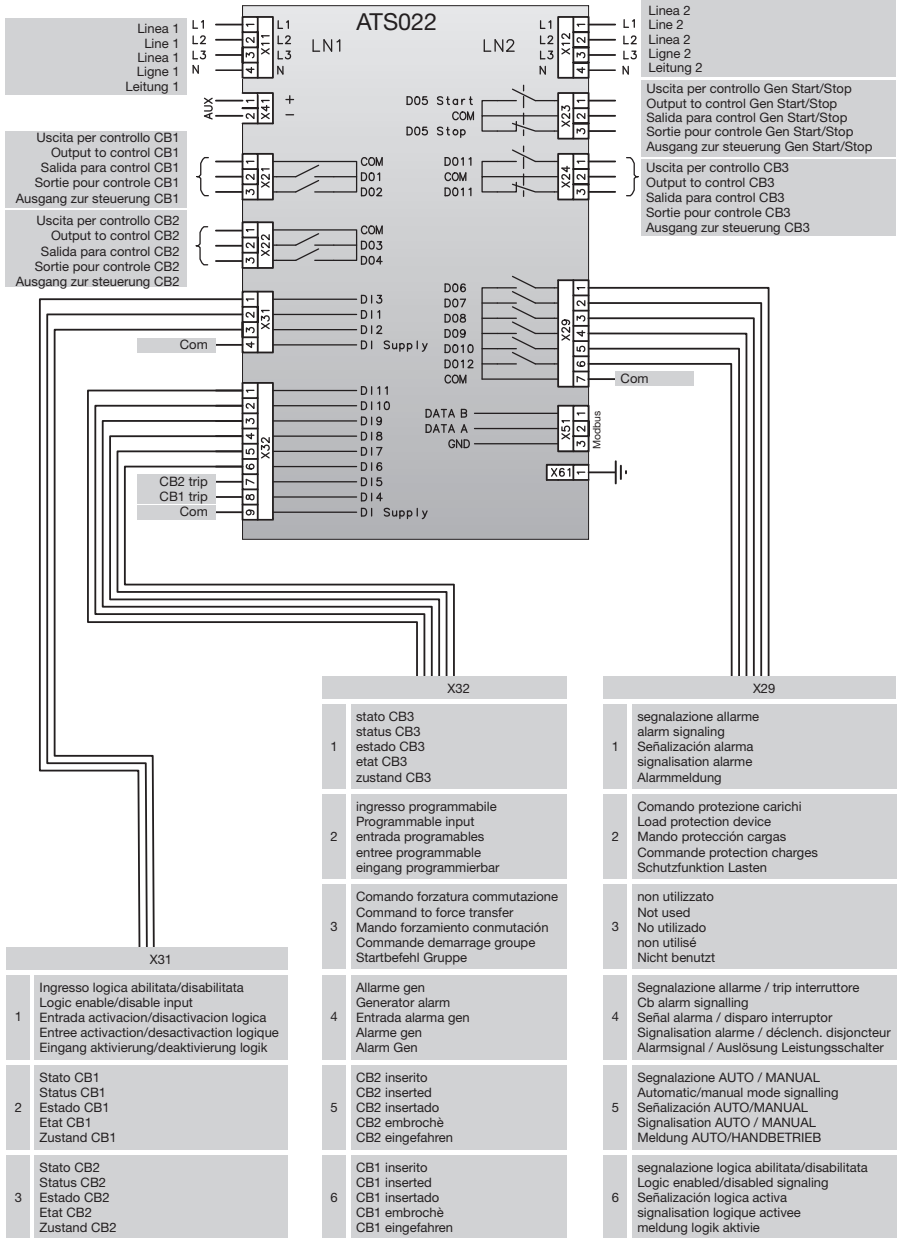


Figure 6.1: Control circuit diagram ATS022

Connectors	Description	DI/DO	Type
X11:1	Normal Line LN1: L1	-	-
X11:2	Normal Line LN1: L2	-	-
X11:3	Normal Line LN1: L3	-	-
X11:4	Normal Line LN1: N	-	-
X12:1	Emergency Line LN2: L1	-	-
X12:2	Emergency Line LN2: L2	-	-
X12:3	Emergency Line LN2: L3	-	-
X12:4	Emergency Line LN2: N	-	-
X41:1	+ Auxiliary power supply	-	-
X41:2	- Auxiliary power supply	-	-
X21:1	Com	-	-
X21:2	CB1 opening command	DO1	NO
X21:3	CB1 closure command	DO2	NO
X22:1	Com	-	-
X22:2	CB2 opening command	DO3	NO
X22:3	CB2 closure command	DO4	NO
X23:1	generator start/stop command	DO5	Open = gen stop; Closed = gen start
X23:2	Com	-	-
X23:3	generator start/stop command	DO5	Closed = gen stop; Open = gen start
X24:1	CB3 opening command	DO11	NO
X24:2	Com	-	-
X24:3	CB3 closure command	DO11	NC
X29:1	ATS022 unit alarm indication	DO6	Open = no alarm; Closed = alarm
X29:2	Load protection device	DO7	Open = no alarm; Closed = alarm
X29:3	not used	DO8	-
X29:4	circuit breakers command alarm indication	DO9	Open = no alarm; Closed = alarm
X29:5	automatic/manual mode indication	DO10	Open = Automatic; Closed = Manual
X29:6	logic enabled/disabled indication	DO12	Open = logic enabled; Closed = logic disabled
X29:7	Com	-	-
X31:1	logic enabling input	DI3	Open = logic disabled; Closed = logic enabled
X31:2	CB1 status input	DI1	0=CB open; I=CB closed
X31:3	CB2 status input	DI2	0=CB open; I=CB closed
X31:4	Com	-	-
X32:1	CB3 status input	DI11	0=CB open; I=CB closed
X32:2	programmable input	DI10	NO/NC
X32:3	switching forcing input	DI9	NO
X32:4	generator alarm input	DI8	NO/NC

Connectors	Description	DI/DO	Type
X32:5	CB2 position input	DI7	0=CB removed; I=CB inserted
X32:6	CB1 position input	DI6	0=CB removed; I=CB inserted
X32:7	CB2 trip input	DI5	0=CB trip; I=no CB trip
X32:8	CB1 trip input	DI4	0=CB trip; I=no CB trip
X32:9	Com	-	-
X51:1	Modbus DATA B	-	-
X51:2	Modbus DATA A	-	-
X52:3	Modbus GND	-	-
X61	Earth connection	-	-

Table 6.2: Description of function and type connector ATS022

## 7. Technical data

ATS022		Value
Three-phase voltage used		
	Connected voltage	100Vac - 480Vac (+/-20%)
	Phase voltage	57,7Vac - 277Vac (+/-20%)
	Safety auxiliary voltage	24Vdc - 110 Vdc (-10% / +15%)
	Frequency	50-60-400-16 2/3 Hz
Single-phase voltage used		
	Phase voltage	57,7Vac - 277Vac (+/-20%) <sup>(1)</sup>
	Safety auxiliary voltage	24Vdc - 110 Vdc (-10% / +15%) <sup>(2)</sup>
	Frequency	50-60-400-16 2/3 Hz <sup>(3)</sup>
Measurement precision		
	Voltage	1%
	Frequency	1% <sup>(5)</sup>
Relay utilization category		8 A, AC1, 250 V
Relay/connectors utilization category		6 A, AC1, 250 V
Over voltage category		III, Uimp 6 kV
Power consumption		Max 12W
IP rating		IP20
Device weight		1314g
Operating temperature		-20 / +60 °C <sup>(4)</sup>
Storage temperature		-25 / +80°C
Humidity		r.h=95% T=25...60°C
Altitude		Max. 2000m
External voltage transformer		
	Mounting	EN 50022 DIN43880 guide
	Material	self-extinguishing thermoplastic
	Protection class	IP30
	Electrostatic protection	with screen to be connected to earth
	Precision class	≤ 0.5
	Performance	≥ 40 VA (≥10 VA if the auxiliary power supply is present)
	Overload	20 % permanent
	Insulations	4 kV between inputs and outputs, 4 kV between screen and outputs, 4 kV between screen and inputs
	Frequency	50-60-400-16 2/3 Hz <sup>(6)</sup>
NOTES		
(1) In single-phase system it is not possible to select Un 100 V, 115 V, 120 V.		
(2) In single-phase system, if Un is between 57.7 - 109 V an auxiliary safety power supply is necessary.		
(3) In case of rated frequency 16 2/3 Hz, an auxiliary safety power supply must be used. If the rated voltage is greater than 100 VAC external transformers must be used.		
(4) If the ATS022 is used in environments with extremely low temperatures (less than - 10°C) it is advisable to use a safety auxiliary power supply to avoid display problems of the graphic display.		
(5) In the presence of high THD values, the precision of the frequency may be outside the specified range. In these cases it is advisable to raise the frequency control thresholds set on the unit.		
(6) In case of rated frequency 16 2/3 Hz, an auxiliary safety power supply must be used.		

Table 7.1: Technical data ATS022

## 8. Installation of device ATS022

The automatic transfer switch ATS022 can be mounted on the front of the panel door or on DIN rail.

### 8.1. Door-mounted Automatic Transfer Switch ATS022

The Automatic Transfer Switch ATS022 can be door-mounted as shown in Figure 8.1.

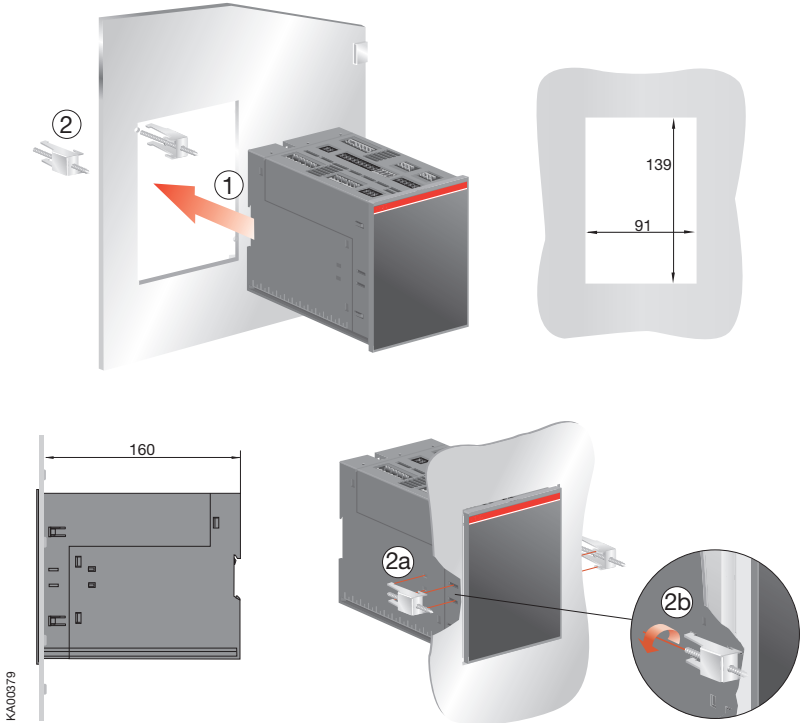


Figure 8.1: Door-mounted ATS022

## 8.2. DIN rail-mounted Automatic Transfer Switch ATS022

The automatic transfer switch ATS022 can be mounted on a 35mm DIN rail as shown in Figure 8.2.

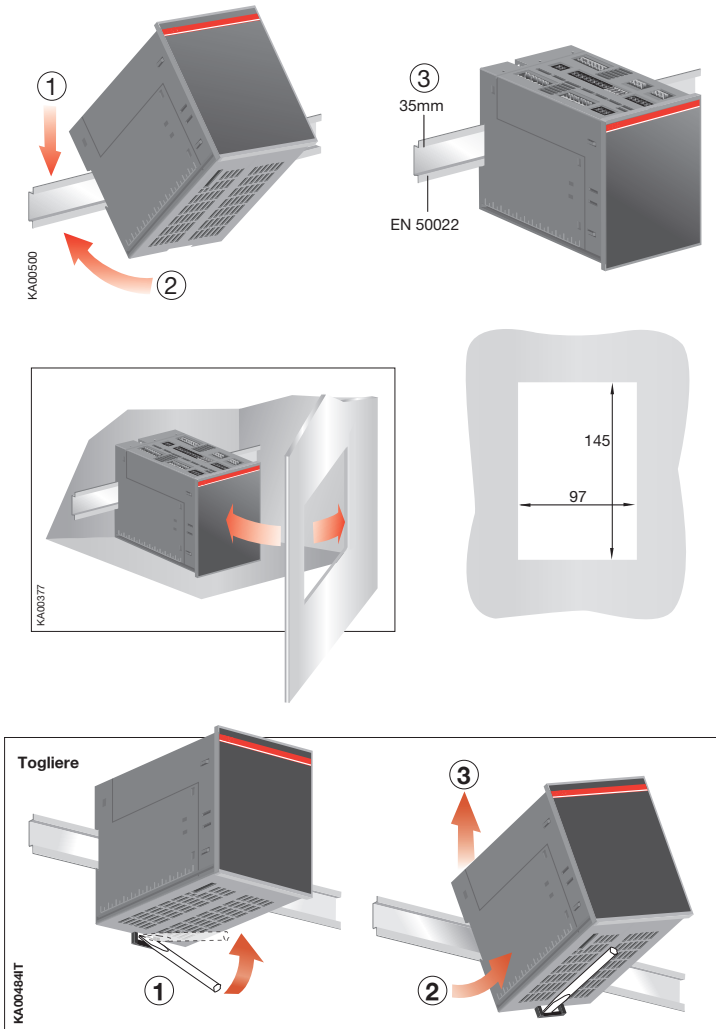


Figure 8.2: DIN rail-mounted ATS022



## 9. Regulatory standards

ATS022 conforms to the following regulatory standards:

- European Directive 73/23 “LVD – Low Voltage Directive”
- EN 50178 electronic equipment for use in power Installations
- EN-IEC 62103 electronic equipment for use in power Installations
- EN-IEC 60947-5-1 low voltage switchgear and control gear: control circuit devices and switching elements
- Electromagnetic compatibility EN 50081-2, EN 50082-2
- Environmental conditions IEC 68-2-1, IEC 68-2-2, and IEC 68-2-3
- EN-IEC 61000-4-2: Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques Section 2: Electrostatic discharge immunity test Basic EMC Publication (IEC 61000-4-2 [8KV air, 4KV cont])
- EN-IEC 61000-4-3, Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques Section 3: Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3)
- EN-IEC 61000-4-4, Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques Section 4: Electrical fast transient/burst immunity test Basic EMC Publication (IEC 61000-4-4)
- EN-IEC 61000-4-5, Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques Section 5: Surge immunity test (IEC 61000-4-5)
- EN-IEC 61000-4-6: Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques (IEC 61000-4-6)
- EN-IEC 61000-4-8: Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques (IEC 61000-4-8)
- EN 50093, Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques Section 11: Voltage dips, short interruptions and voltage variations immunity test (IEC 61000-4-11, [100ms/5s] B, C criterion)
- CISPR11 (30MHz...1GHz): Emission (Generic Standard, Industrial) – Radiated
- CISPR11 (0.15MHz...30MHz): Emission (Generic Standard, Industrial) – Conducted
- CISPR/CEI 1000-6-3: Part 6: Generic standards – Section 3: Emission standard for residential, commercial and light-industrial environments
- IEC 60068-2-2: Environmental testing. Part 2: Tests. Test B: Dry heat
- IEC 60068-2-6: Environmental testing. Part 2: Tests. Test Fc: vibration (sinusoidal)
- IEC 60068-2-27: Environmental testing. Part 2: Tests. Test Ea and guidance: shock
- IEC 60068-2-30: Environmental testing. Part 2: Tests. Test Db and guidance: Damp heat, cyclic
- IEC 60068-2-1: Environmental testing. Part 2: Tests. Test A: cold (-20 °C ± 3 °C, 16 hours)

## 10. Troubleshooting

The alarms are shown by means of a message on the ATS022 display. The Alarm messages are shown in the Table below:

Table 10.1: Alarms ATS022

Alarm	Fault	Action
CB1 opening failed	circuit breaker CB1 on normal line does not open within 5s	the alarm can be reset by means of the RESET button.
CB2 opening failed	circuit breaker CB2 on emergency line does not open within 5s	the alarm can be reset by means of the RESET button.
CB3 Opening failed	circuit breaker CB3 bus-tie does not open within 5s	the alarm can be reset by means of the RESET button.
CB1 closure failed	circuit breaker CB1 on normal line does not close within 5s	the alarm can be reset by means of the RESET button.
CB2 closing failed	circuit breaker CB2 on emergency line does not close within 5s	the alarm can be reset by means of the RESET button.
CB1 removed	circuit breaker CB2 is removed	The logic is blocked and ATS enters manual mode. Reset by inserting CB1.
CB2 removed	circuit breaker CB2 is removed	The logic is blocked and ATS enters manual mode. Reset by inserting CB2.
Logic block	Enabled/disabled logic input DI3 inactive	The logic is blocked. Reset by activating DI3.
External fault	Both circuit breakers are closed (DI1 and DI2 active)	Check wiring
Trip CB1	Circuit breaker CB1 has tripped	The logic is blocked as long as input DI4 is deactivated.
Trip CB2	Circuit breaker CB2 has tripped	The logic is blocked as long as input DI5 is deactivated.
Generator alarm	Generator alarm input DI8 active	The logic is blocked as long as input DI8 is activated.

Table 10.1: Alarms ATS022

For more information please contact:

**ABB S.p.A.**

**ABB SACE Division**

Via Pescaria, 5

24123 Bergamo - Italy

**[www.abb.com](http://www.abb.com)**

Due to possible development of Standards as well as of materials, the characteristics and dimensions specified in this Installation and operating instructions may be considered as binding only after confirmation by ABB SACE Division.

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