

Automatic transfer switch ATS021

Installation and operating instructions



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1. Introduction

This manual describes the installation and the basic operation of the automatic transfer switch ATS021 used with circuit breakers.

1.1. Use of symbols



Hazardous voltage: warns about a situation where a hazardous voltage may cause physical injury to a person or damage to equipment.



General warning: warns about a situation where something other than electrical equipment may cause physical injury to a person or damage to equipment.



Caution: provides important information or warns about a situation that may have a detrimental effect on equipment.



Information: provides important information about the equipment.

1.2. Standards

The ATS021 are compliant with the following standards:

- ▶ European Directive 73/23 “LVD – Low Voltage Directive”
- ▶ EN-IEC 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 1000-4-2 [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 1000-4-3 [level 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 1000-4-4 [level 2/3])
- ▶ EN-IEC 61000-4-5, Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques Section 5: Surge immunity test (IEC 1000-4-5 [level 1/2])
- ▶ EN-IEC 61000-4-6: Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques (IEC 1000-4-6 [level 3])

- ▶ EN-IEC 61000-4-8: Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques (IEC 1000-4-8 [level 5])
- ▶ EN-IEC 50093, Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques
- ▶ Section 11: Voltage dips, short interruptions and voltage variations immunity test (IEC1000-4-11, [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)

1.3. Safety notes

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

The control unit ATS021 must be prevented from operating the circuit breaker before

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

During maintenance, it is advisable to lock the circuit breaker mechanically to the open position

Safe use is not possible if:

1. The unit has been damaged during transport
2. The unit shows visible signs of damage
3. The unit does not work
4. The unit has been stored for a long period



Even if the unit seems to be in stand by status, switch it OFF before operating on circuit breakers. It may happen that the unit would operate the circuit breakers without warning.

1.4. Explanations of abbreviations and terms

ATS:	The control unit of automatic transfer switching equipment, in this document called the automatic transfer switch
ATS021:	The automatic transfer switch, standard version
CB:	Circuit Breaker
DIP:	Dual Inline Package
Emergency line:	Power supply line, the secondary line used in emergency cases
Lim:	Rotary switch; the selection of the operating mode: Manual / Automatic, and the selection of voltage threshold
Normal line:	Power supply line, the primary line normally used
TGOFF:	Generator stop delay, setting by DIP switches
Test sequence:	A sequence to test the functionality of the ATS and the connected circuit breakers
Ts:	Rotary switch; the delay time for automatic switching

2. Product overview

The transfer switch concept is applied to any installations requiring switching from the main power circuit to another to ensure the supply of loads.

2.1. Typical applications

A. Network line – GenSet line

In case of loss of the main's network, the ATS021 device manages the switching to the emergency line equipped with a GenSet system.

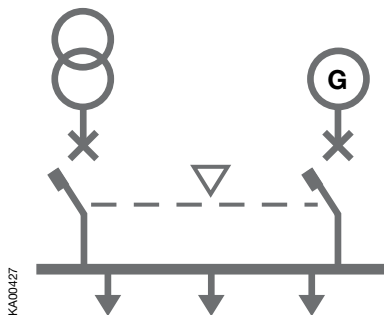


Figure 2.1 Network line - GenSet line

B. Network line a – Network line b

In case of loss of the main's network, the ATS021 device manages the switching to a second line used as an emergency source.

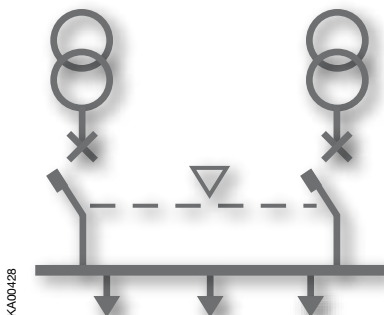


Figure 2.2 Network line a - Network line b

Automatic transfer switch type ATS021 is designed for single- and three-phase distribution systems in diverse applications. ATS021 will control the switching between two power supplies. The ATS021 unit measures the voltage level of the normal line and controls the two main protection devices of the two monitored lines in order to guarantee the continuity of the power supply.

2.2. Functions of automatic transfer switch ATS021

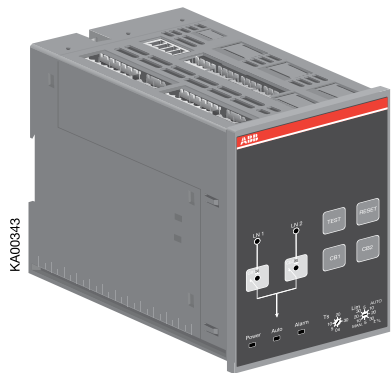


Figure 2.3 Automatic transfer switch ATS021

ATS021:

Analyzing the voltage, frequency, and phase balance. Includes the generator START / STOP command.

ATS021 has two sensors to monitor two three-phase power lines, both able to also work with single phase.

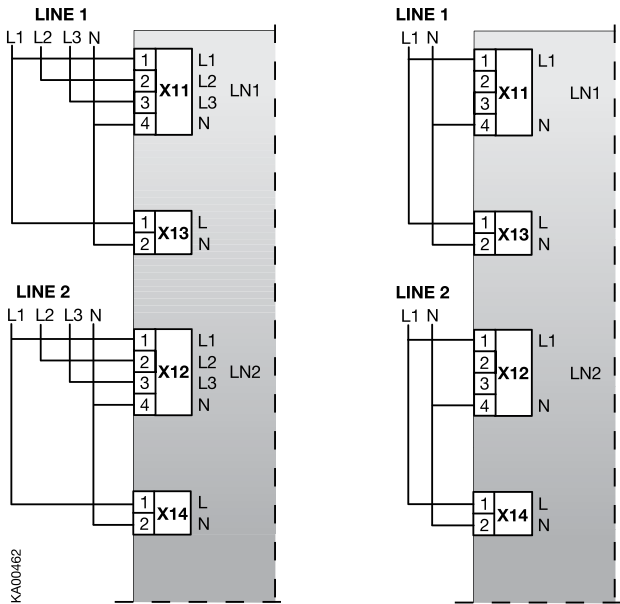


Figure 2.4 ATS021 have the capability to monitor two three-phase power lines, both able to also work with single phase.

With DIP switches, it can be chosen whether or not the N-line is connected. If ATS021 is used without the N-line, the external transformer must be used.

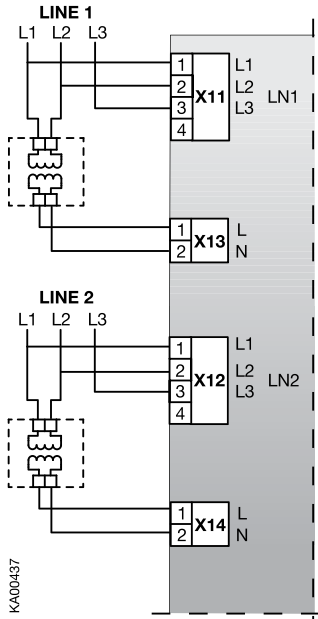


Figure 2.5 If ATS021 is used without the N-line, the external transformer must be used.

3. Description

3.1. Application scenarios

ATS021 is connected to two incoming power lines; two scenarios are available:

- ▶ Both lines are the secondary section of a medium-low voltage transformer (network a - network b). Line 2 is used in an emergency case.
- ▶ One normal line and an emergency generator line.

ATS021 monitors both power lines continuously and analyzes:

- ▶ frequency ($0.9f_n > f > 1.1f_n$)
- ▶ voltage
- ▶ phase balance (set by Lim parameter)

If the difference between the rated voltage and the measured voltage is greater than the threshold value set by parameter Lim, the line is considered to have an anomaly. The same threshold value applies to the difference between the highest and the lowest phase voltage. An invalid frequency ($0.9f_n > f > 1.1f_n$) also causes an anomaly.

3.1.1 Automatic functions

If an anomaly occurs on line 1, ATS021 will perform the switching sequence:

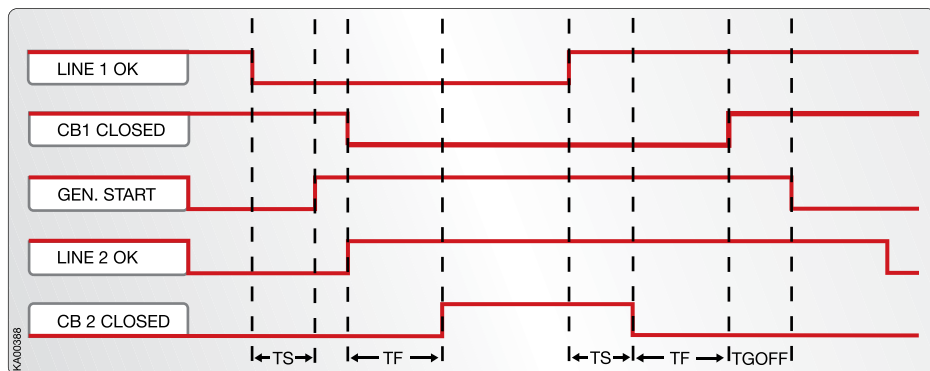
1. Delay TS (set by rotary switch Ts: 0, 5, 10, 15, 20, 25, 30 seconds)
2. Start the generator
3. When line 2 voltage is ON and no anomalies occur, send an opening command to CB1. If CB1 is still closed after 5 seconds, the alarm "Open 1 Failure" is activated. The alarm is indicated by a blinking Alarm LED, and the CB1 LED will stay ON. The alarm is cleared and logic restarted by pressing the RESET button.
4. Fixed delay TF (3.5 seconds)
5. Send a closing command to CB2. If CB2 is still open after 5 seconds, alarm "Close 2 Failure" is activated. A blinking Alarm and CB2 LEDs indicates alarm. The alarm is cleared and logic is restarted by pressing the RESET button.

If CB1 is initially open, the switching sequence is started directly from step 4.

If line 1 voltage comes back without any anomalies, a back-switching sequence will be performed:

1. Delay TS
2. Send an opening command to CB2. If CB2 is still closed after 5 seconds, the alarm "Open 2 Failure" is activated. A blinking Alarm LED indicates an alarm and the CB2 LED will stay on. The alarm is cleared and logic restarted by pressing the RESET button.
3. Fixed delay TF
4. Send a closing command to CB1. If CB1 is still open after 5 seconds, "Close 1 Failure" is activated. A blinking alarm and CB1 LEDs indicate an alarm. The alarm is cleared and logic restarted by pressing the RESET button.
5. Delay TGOFF (5, 10, 15, 20, 25, 30 seconds or 5 minutes)
6. Stop the generator

If CB2 is initially open, a back-switching sequence is started directly from step 4.



TS: Switching delay 0, 5, 10, 15, 20, 25, 30 s
 TF: Fixed time delay (3.5 s)

TG OFF: Generator stop delay; -Dip Switch to set OFF; TG OFF = switching delay TS
 -Dip Switch to set ON; TG OFF = 5 minutes

Figure 3.1 Automatic Switching Sequences

3.1.2 Manual functions

Circuit breakers can be controlled by CB1 and CB2 buttons in MANUAL mode. Alarms are activated in the same way as in automatic sequences if control fails.

CB1 button pressed:

- ▶ If CB1 is closed, send opening command to CB1
- ▶ If CB1 and CB2 are both open, send closing command to CB1
- ▶ If CB1 is open and CB2 closed, no operation

CB2 button pressed:

- ▶ If CB2 is closed, send opening command to CB2
- ▶ If CB2 and CB1 are both open, send closing command to CB2
- ▶ If CB2 is open and CB1 closed, no operation

3.1.3 Test sequence

Switching sequences can be simulated in a special TEST mode that can be entered by pressing the TEST button. Pressing the RESET button exits the TEST mode. More information, see page 16.

3.1.4 Missing of both lines

If the voltage of both lines drops, ATS021 will enter the POWERSAVE mode, which is indicated by a blinking Power LED. After TS delay, the generator is started, and the device will then wait for return of voltage in either line. If both lines are missing more than one minute, ATS021 will shut down.

During missing of the both lines the contact DO6 is activated.

3.1.5 Logic Enable/Disable input

When this digital input is inactivated by opening the short-circuit, the logic is enabled and the Alarm LED is switched on.

3.2. Parameter settings

The parameter settings of automatic transfer switch ATS021 are performed by the DIP switches (see pages 17-19) and by the rotary switches (see page 15). ATS021 has a total of eight (8) adjustable parameters:

Un	Rated voltages, setting by DIP switches: Main voltage: 208 - 480 Vac Phase voltage: 120 - 277 Vac
fn	Rated frequency, setting by DIP switches: 50 Hz or 60 Hz
N	N in use, setting by DIP switches
Ph	Number of phases, setting by DIP switches: Single or three-phase
Gen	Generator in use, setting by DIP switches
Tgoff	Generator stop delay, setting by DIP switches: Same as switching delay Ts or Tgoff= 5 min
TS	Switching delay, setting by Ts rotary switch: 0, 5, 10, 15, 20, 25, 30 s
THR	Voltage threshold, setting by Lim rotary switch: In MANUAL Mode: ± 5 , ± 10 , ± 20 , ± 30 % In AUTOMATIC Mode: ± 5 , ± 10 , ± 20 , ± 30 %.

4. Operating

Before using of the Automatic transfer switch ATS021, read carefully chapter 1 “Safety notes” in order to avoid malfunctions or dangerous operating conditions.



Never open any covers on the product. There may be dangerous external control voltages inside the ATS_ automatic transfer switch even if the voltage is turned off.



Never handle control cables when the voltage of the ATS_ automatic transfer switch or external control circuits are connected.



Exercise sufficient caution when handling the unit.

4.1. Automatic transfer switch ATS021 in Manual Mode

The automatic transfer switch ATS021 is selected to the Manual Mode by the Lim rotary switch on the front panel.

The operating mode and the voltage threshold are selected simultaneously by setting the Lim rotary switch to the desired position. The available selections in Manual Mode are: ± 5 , ± 10 , ± 20 , ± 30 %.

For example, when the Lim rotary switch is set to “20 MAN.”, the device is in the Manual Mode and the voltage threshold is ± 20 %. More information of the selection of voltage threshold, see pages 15 and 26.

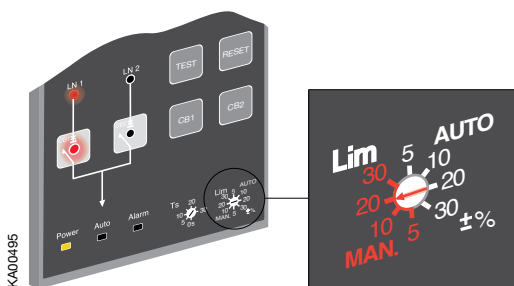


Figure 4.1 Selecting the automatic transfer switch ATS021 to Manual Mode

To select the operating line by the automatic transfer switch ATS021 in Manual Mode:

- a. Push the appropriate CB1 or CB2 key
- b. When pushing the CB1 key (see the Figure 4.2/①), the circuit breaker CB1 will be in the ON position (the status and the line indication, see the Figure 4.2/②) and the circuit breaker CB2 will be in the OFF position. When the circuit breaker CB1 is already in the ON position, the CB1 led is ON (see the Figure 4.2). During switching the CB1 led blinks 50% ON and 50% OFF. If the circuit breaker CB1 is already in the ON position, pushing the CB1 key opens the circuit breaker.

- c. When pushing the CB2 key, the the circuit breaker CB2 will be in the ON-position and the circuit breaker CB1 will be in the OFF position.
- d. If you push the CB1 key while the circuit breaker CB2 is in the ON position, nothing happens. Before pushing the CB1 key, you have to push the CB2 key to open the circuit breaker CB2.

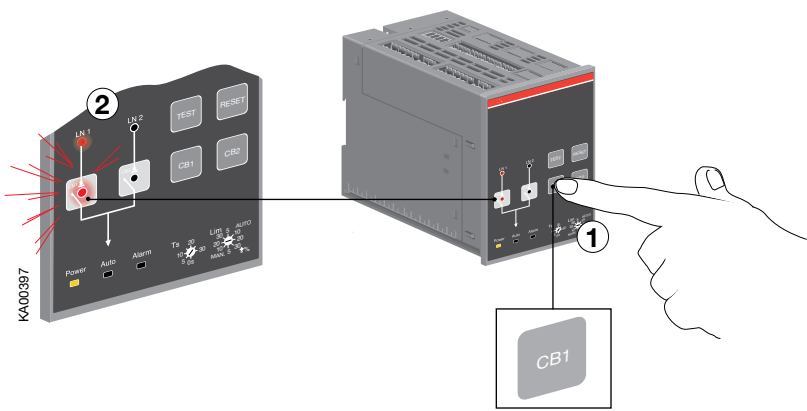


Figure 4.2 Selecting the operating line, the circuit breaker status and the chosen line indication with LEDs in ATS021

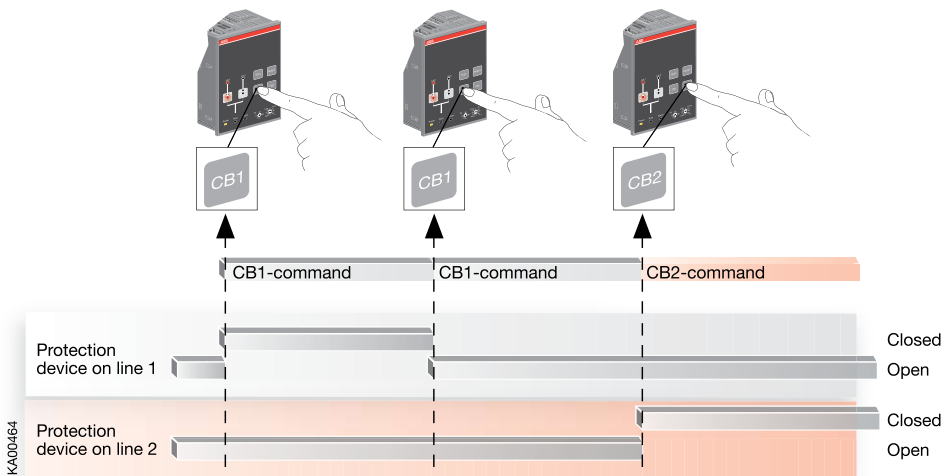


Figure 4.3 Manual Mode control

4.2. Automatic transfer switch ATS021 in Automatic Mode

The automatic transfer switch ATS021 is selected to the Automatic Mode by the Lim rotary switch on the front panel.

The operating mode and the voltage threshold are selected simultaneously by setting the Lim rotary switch to the desired position. The available selections in Automatic Mode are: ± 5 , ± 10 , ± 20 , ± 30 %.

For example, when the Lim rotary switch is set to "20 AUTO", the device is in the Automatic Mode and the voltage threshold is ± 20 %. More information of the selection of voltage threshold, see pages 16 and 26.

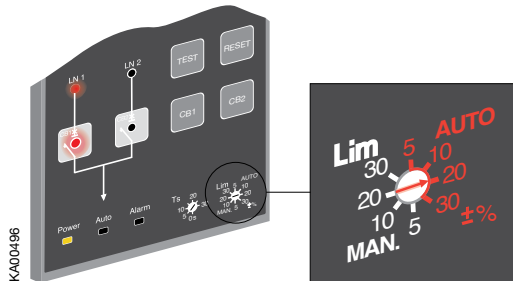


Figure 4.4 Selecting the automatic transfer switch ATS021 to Automatic Mode

4.3. Selection of delay time and voltage threshold

The delay time and the voltage threshold are set by the rotary switches in automatic transfer switch ATS021.

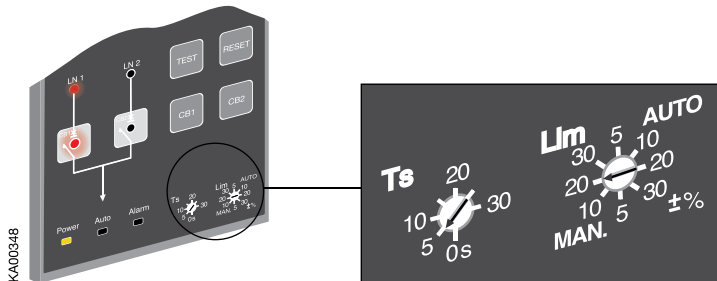


Figure 4.5 Selection of delay time and voltage threshold in ATS021

Ts = Delay time for automatic switching

The delay time is the time before activating the switching sequence and the back-switching sequence. Available selections for the delay time are: 0, 5, 10, 15, 20, 25, 30 s.

Lim = Voltage threshold

If difference between the rated voltage and measured voltage is greater than threshold value set by parameter Lim, the line is considered to have an anomaly. The same threshold value applies to difference between the highest and the lowest phase voltage. Available selections for voltage threshold are:

- ▶ In MANUAL Mode: ± 5 , ± 10 , ± 20 , ± 30 %
- ▶ In AUTOMATIC Mode: ± 5 , ± 10 , ± 20 , ± 30 %

By setting the voltage threshold, the unbalance is also set to the same level. (NOTE: Max. +20% for the main voltage 480 Vac and min. -20% for the main voltage 277 Vac). The operating mode and the voltage threshold are selected simultaneously by setting the Lim rotary switch to the desired position. For example, when the Lim rotary switch is set to "20 MAN.", the device is in the Manual Mode and the voltage threshold is ± 20 %.

4.4. TEST sequence

When pushing the TEST key, the automatic transfer switch (ATS021) enters the test sequence in which it is possible to simulate switching and back-switching sequences step-by-step, by pressing the TEST key. ATS021 must be in MANUAL mode before entering the test sequence. Flashing all LEDs twice and then blinking the Auto LED indicates TEST mode start. Exiting from test sequence is done by RESET key.

Steps in the TEST sequence are:

1. Press TEST; generator starts (skipped if the generator is not in use)
2. Press TEST; Open CB1
3. Press TEST; Close CB2
4. Press TEST; Open CB2
5. Press TEST; Close CB1
6. Press TEST; stop generator (skipped if the generator is not in use)

Pressing TEST after that; sequence restarts. Alarms are activated in the same way as in automatic sequences, if circuit breaker control fails. The user can stop the TEST sequence by pressing the RESET key. After stopping the TEST sequence the device returns to the default page and the settings are exactly the same as they were before starting the TEST sequence.

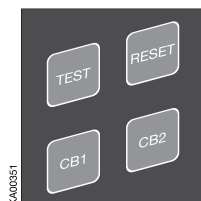


Figure 4.6 TEST sequence to simulate the functions



Before starting the TEST sequence, please, make sure that CB1 is in closed position and the both lines have the voltage on.

5. Installation

5.1. Parameter settings in automatic transfer switch ATS021



Only an authorised electrician may perform the electrical installation and maintenance of automatic transfer switches. Do not attempt any installation or maintenance actions when an automatic transfer switch is connected to the electrical mains. Before starting work, make sure that the circuit breaker is de-energised.

Automatic transfer switch ATS021 has total of eight (8) adjustable parameters. The parameter settings of ATS021 are performed by the DIP switches (see next page) and by the rotary switches (see page 16).

Un	Rated voltage, setting by DIP switches S23-1...3
fn	Rated frequency, setting by DIP switch S23-4
N	N in use, setting by DIP switch S24-1
Ph	Number of phases, setting by DIP switch S24-2
Gen	Generator in use, setting by DIP switch S24-3
Tgoff	Generator stop delay , setting by DIP switch S24-4
TS	Switching delay, setting by Ts rotary switch, see page 16
THR	Voltage threshold, setting by Lim rotary switch, see page 16

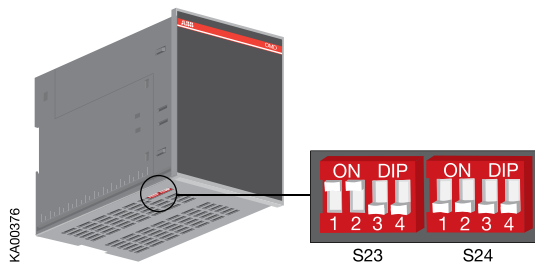


Figure 5.1 Places of the DIP switches



If single phase is used, the neutral should be connected.

5.1.1 Parameter settings by DIP switches

S23 S24

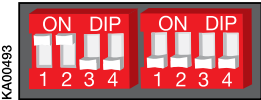












Figure 5.2 DIP switches in ATS021, the positions are factory default settings

DIP switches S23

DIP switches S23-1...3 to set the rated voltage of monitored lines



S23-1...3	Positions	Un = main/phase voltage
	OFF, OFF, OFF	Un = 480/277 V
	ON, OFF, OFF	Un = 440/254 V
	OFF, ON, OFF	Un = 415/240 V
	ON, ON, OFF	Un = 400/230 V (default)
	OFF, OFF, ON	Un = 380/220 V
	ON, OFF, ON	Un = 230/130 V
	OFF, ON, ON	Un = 220/127 V
	ON, ON, ON	Un = 208/120 V

DIP-switch S23-4 to set rated frequency of the monitored lines

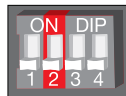

S23-4	Position	Rated frequency fn
	OFF	50Hz (default)
	ON	60Hz

DIP switches S24



DIP-switch S24-1 to set neutral

S24-1	Position	Neutral N
	OFF	N used (default)
	ON	N not in use



DIP- switch S24-2 to set phase system

S24-2	Position	Phase system
	OFF	three-phase (default)
	ON	single phase

DIP-switch S24-3 to set the gen use

S24-3	Position	Generator
	OFF	not in use (default)
	ON	in use

DIP-switch S24-4 to set the generator stop delay Tgoff

S24-4	Position	Tgoff
	OFF	Tgoff = TS (default)
	ON	Tgoff = 5 minutes

5.2. Mounting the automatic transfer switch ATS021

The automatic transfer switch ATS021 can be mounted on the door or the DIN-rail.

5.2.1 Automatic transfer switch ATS021, door mounting

The automatic transfer switch ATS021 can be mounted on the door with the fastener, see Figure 5.3 /① and ②. Door drilling when mounted on the door according to Figure 5.3.

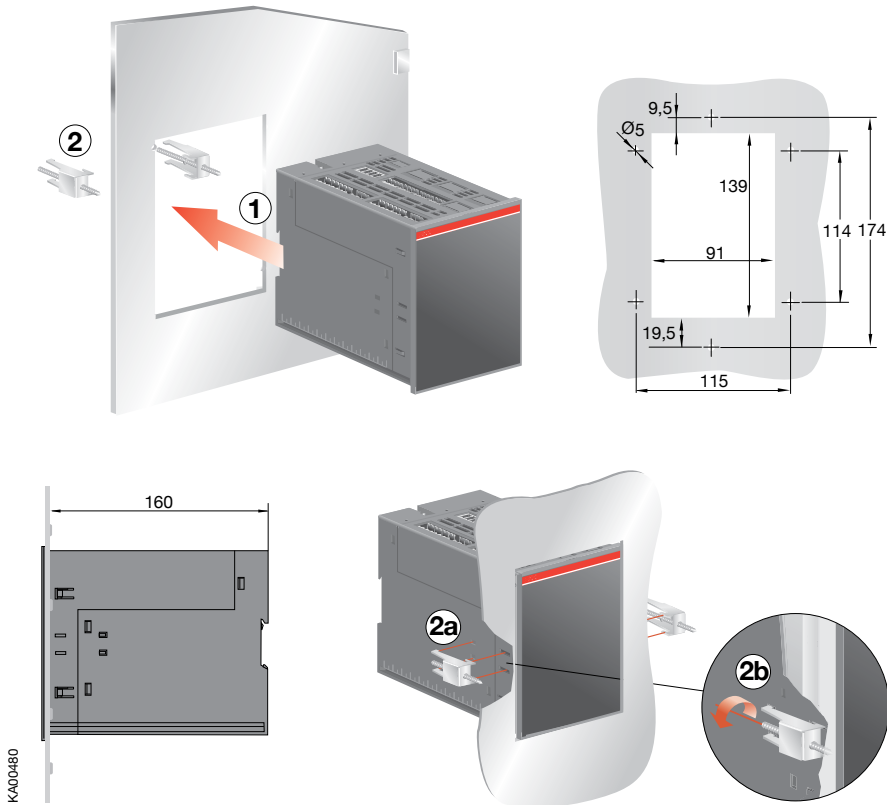


Figure 5.3 Automatic transfer switch ATS021, door mounting

5.2.2 Automatic transfer switch ATS021, DIN-rail mounting

The automatic transfer switch ATS021 can be mounted on the 35 mm DIN-rail, see the Figure 5.4. Door drilling, if needed, according to Figure 5.4.

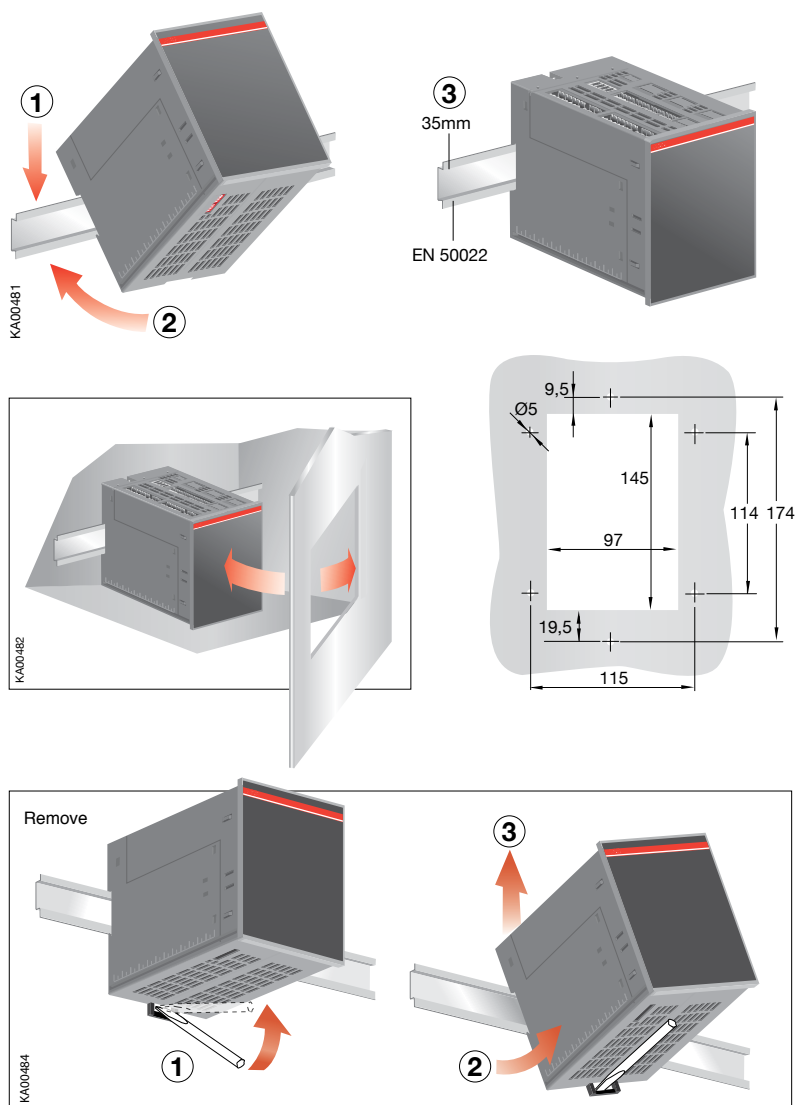


Figure 5.4 Automatic transfer switch ATS021, DIN-rail mounting

6. Connecting



Only an authorised electrician may perform the electrical installation and maintenance of automatic transfer switches. Do not attempt any installation or maintenance actions when an automatic transfer switch is connected to the electrical mains. Before starting work, make sure that the circuit breaker is de-energised.

6.1. Power circuit

Operating voltage, setting with DIP-switches

Main voltage: 208Vac - 480Vac ($\pm 20\%$)

Phase voltage: 120Vac - 277Vac ($\pm 20\%$)

Frequency: 50Hz - 60Hz ($\pm 10\%$)

Phase setting with DIP switches: Single phase or Three-phase (**default**).

If the automatic transfer switch ATS021 is used without neutral (three-phase connection), the external transformer must be used. The transformer will drop the main voltage to the phase voltage level. Neutral has to be connected when using a single phase connection.

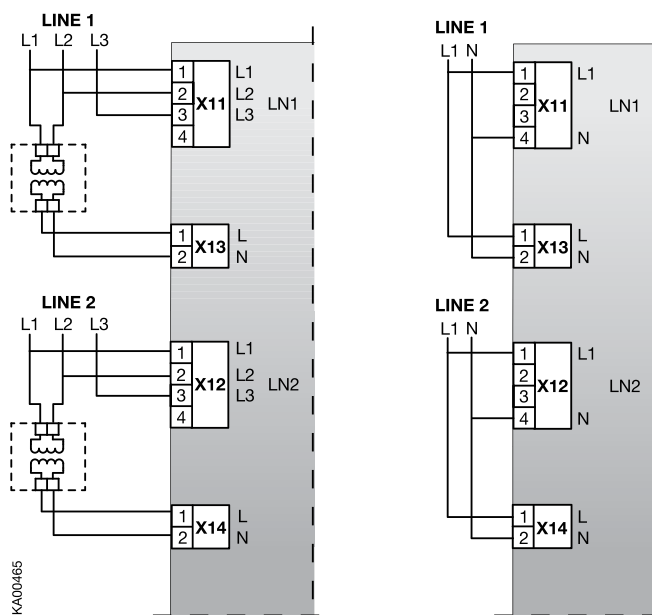


Figure 6.1

The external transformer must be used, if the automatic transfer switch ATS021 is used without neutral (three-phase connection). Neutral has to be connected when using a single phase connection.

6.2. Control circuit



When relay outputs are used with inductive loads (such as relays, contactors and motors), they must be protected from voltage spikes using varistors, RC-protectors (AC current) or DC current diodes (DC current).

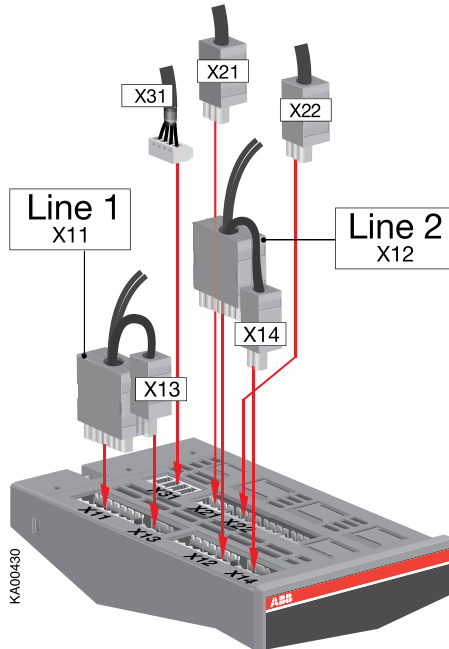


Figure 6.2 Control circuit connections in ATS021

KA00463

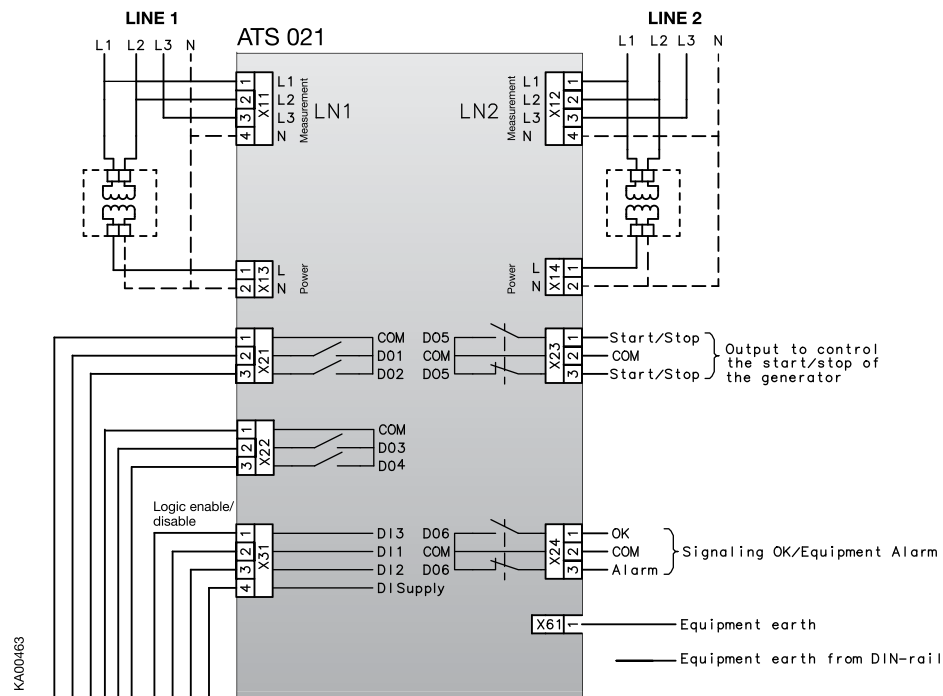


Figure 6.3 Control circuit diagram ATS021

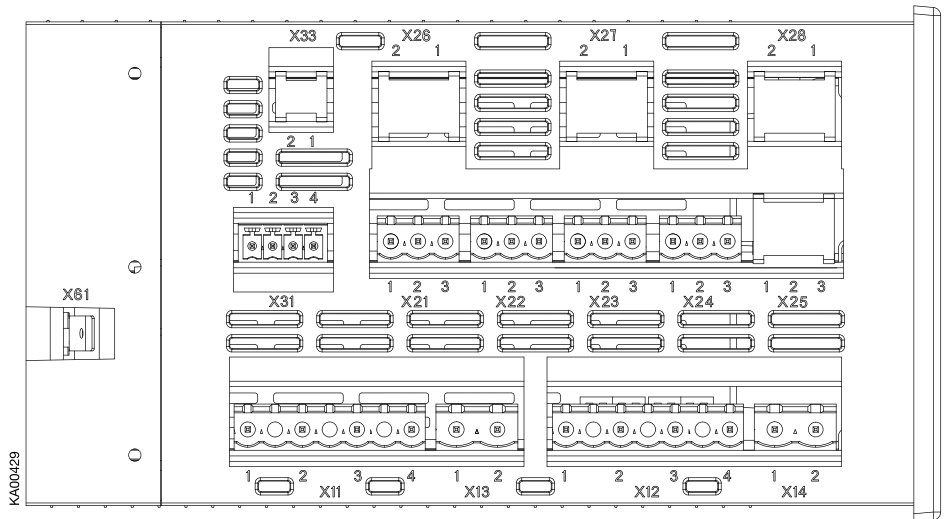
Connectors, ATS021

Figure 6.4 Connectors, ATS021

Con- nector	Description
X11:1	Normal line LN1: L1
X11:2	Normal line LN1: L2
X11:3	Normal line LN1: L3
X11:4	Normal line LN1: N
X13:1	Normal line (power supply): L
X13:2	Normal line (power supply): 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
X14:1	Emergency line (power supply): L
X14:2	Emergency line (power supply): N
X21:1	Common
X21:2	DO1
X21:3	DO2
X22:1	Common
X22:2	DO3
X22:3	DO4
X23:1	DO5 start
X23:2	Common
X23:3	DO5 stop
X24:1	DO6 ok
X24:2	Common
X24:3	DO6 alarm

Con- nector	Description
X31:1	DI3
X31:2	DI1
X31:3	DI2
X31:4	DI supply
X61	Equipment earth

Output	Description
D01	Output to open the protection device of the normal line (normal open)
D02	Output to close the protection device of the normal line (normal open)
D03	Output to open the protection device of the emergency line (normal open) (only breaker)
D04	Output to close the protection device of the emergency line (normal open) (only breaker)
D05	Output to control the startup of the generator (exchange)
D06	Signaling emergency / alarm (exchange)

Input	Description
DI1	Protection device on normal line status input (0 open, 1 close)
DI2	Protection device on emergency line status input (0 open, 1 close)
DI3	Logic enable/disable

Table 6.1 Connectors / Outputs / Inputs

7. Using automatic transfer switch ATS021

7.1. Interface

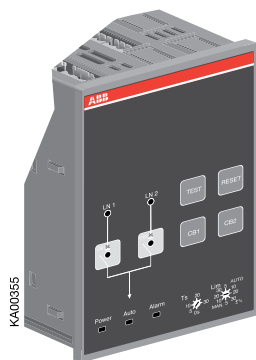


Figure 7.1 Interface of ATS021

7.2 Configuration

7.2.1 Rotary Switches

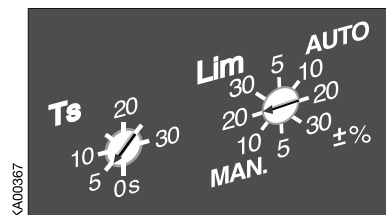


Figure 7.2 Selection of delay time and voltage threshold, the factory settings are shown in the figure

Ts = Delay time for automatic switching

The delay time is the time before activating the switching sequence and the back-switching sequence. Available selections for the delay time are: 0, 5, 10, 15, 20, 25, 30 s.

Lim = Voltage threshold

If difference between the rated voltage and measured voltage is greater than threshold value set by parameter Lim, the line is considered to have an anomaly. The same threshold value applies to difference between the highest and the lowest phase voltage. Available selections for voltage threshold are:

- ▶ In MANUAL Mode: ± 5 , ± 10 , ± 20 , ± 30 %
- ▶ In AUTOMATIC Mode: ± 5 , ± 10 , ± 20 , ± 30 %.

The MAX acceptable voltage threshold selection for 480 Vac voltage is + 20% and the MIN acceptable voltage threshold selection for 208 Vac is - 20%. By setting the voltage threshold, the unbalance is also set to the same level. The operating mode and the voltage threshold are selected simultaneously by setting the Lim rotary switch to the desired position. For example, when the Lim rotary switch is set to "20 MANUAL", the device is in the manual mode and the voltage threshold is $\pm 20\%$.

7.2.2 Keypad

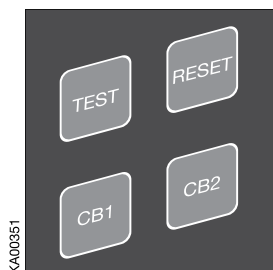


Figure 7.3 Keypad on ATS021

RESET key

An active alarm can reset by the RESET key.

TEST key

Setting the automatic transfer switch to test sequence in which it is possible to simulate switching and back-switching sequences step-by-step, by pressing the TEST key. This is possible only if the automatic transfer switch is in manual mode. Exiting from test sequence is done by RESET key. See pages 16 and 30.

CB1 key

Setting in manual mode the circuit breaker CB1 to open/close position. When the circuit breaker CB1 will be in the ON position then the circuit breaker CB2 will be in the OFF position.

CB2 key

Setting in manual mode the circuit breaker CB2 to open/close position. When the circuit breaker CB2 will be in the ON position then the circuit breaker CB1 will be in the OFF position.

7.2.3 LEDs

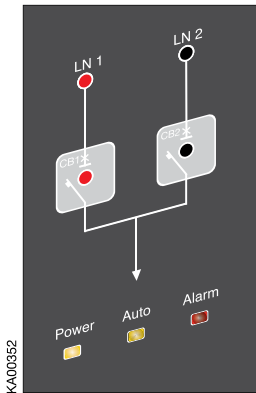


Figure 7.4 LEDs on ATS021

LN 1 - CB1

A red LN 1 LED signals the status of the line LN 1 (normal line), when the circuit breaker CB1 is ON. Line status is explained in the table below.

LN 2 - CB2

A red LN 2 LED signals the status of the line LN 2 (emergency line), when the circuit breaker CB2 is ON. Line status is explained in the table below.

Line Status	LED Indication
Voltage OK	ON
No voltage	OFF
Overvoltage	Fast blinking (5 Hz)
Undervoltage	Blinking (1 Hz, 50% ON / 50% OFF)
Invalid frequency	Blinking (1 Hz, 90% ON / 10% OFF)
Unbalance	Blinking (1Hz, 10% ON / 90% OFF)

Table 7.1 Line status indication

CB1

A red CB1 LED is ON, when the circuit breaker CB1 is in the ON position (the circuit breaker CB1 is ON and the circuit breaker CB2 is OFF), the LED is OFF otherwise. While the circuit breaker CB1 is opening or closing the CB1 led will blink. If the opening command fails, CB1 led will stay ON. If closing command fails, CB1 led will blink.

CB2

A red CB2 LED is ON, when the circuit breaker CB2 is in the ON position (the circuit breaker CB2 is ON and the circuit breaker CB1 is OFF), the LED is OFF otherwise. While the circuit breaker CB2 is opening or closing the CB2 led will blink. If the opening command fails, CB2 led will stay ON. If closing command fails, CB2 led will blink.

Alarm

A red Alarm LED signals an external alarm (switching logic disabled or status of both breakers is closed). Alarm status is explained in the table below.

Alarm Status	LED Indication
External alarm (logic locked): - Both DI1 and DI2 active - DI3 inactive	ON
Switching logic alarm	Blinking
No alarm	OFF

Table 7.2 Alarm status indication



When Alarm LED is ON or blinking, turn the Lim rotary switch to MAN position, check the state of the automatic transfer switch and repair the possible fault situation before resetting the alarm. The automatic transfer switch is reset by pushing the RESET key.

Auto

A green Auto LED signals the automatic or the manual mode. When the ATS021 is in automatic mode, the Auto LED is ON. When the device is in manual mode, the Auto LED is OFF. In test sequence the Auto LED is blinking.

Power

A green Power LED signals the power status. When power is ON, the Power LED is ON. The ATS021 will remain in a standby state at least one minute after power failure. A blinking Power LED indicates standby mode.

7.2.4 External transformer

External transformer must be used when

- ▶ N-line is not connected

The transformer has to fulfil the following requirements:

- ▶ Transformer has to be Main to Phase Voltage Transformer
- ▶ Transformer has to be isolative
- ▶ Effective value has to be 40 VA

7.3. TEST sequence

By pushing the TEST key the automatic transfer switch ATS021 enters the test sequence. All the LEDs are first blinking a couple of times to give the information that the LED is functioning.

In the TEST position it is possible to simulate switching and back-switching sequences step-by-step by pressing the TEST key. This is possible only if the automatic transfer switch is in manual mode. The user can interrupt the simulation at any place and return to normal use of the device. Exiting from test sequence is done by RESET key. More information, see the page 16.

NOTE: In the TEST sequence the power circuit is switched on!

NOTE: After testing the user must ensure that the device is not left in the TEST position by accident.

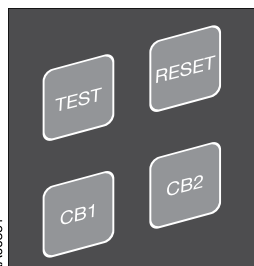


Figure 7.5 ATS021 is set to the TEST position by pushing the TEST key

8. Technical data of the automatic transfer switch ATS021

ATS021	Value
Operating voltage	
Main voltage	208Vac - 480 Vac ± 20 %
Phase voltage	120Vac - 277 Vac ± 20 %
Rated frequency	50 Hz, 60 Hz ± 10 %
Rated impulse withstand voltage U_{imp}	6 kV
Voltage and frequency sensing precision	
Voltage	5 %
Frequency	1 %
Relay utilization category	8 A, AC1, 250 V
1/3 phase	
Over voltage category	III, U_{imp} 6 kV
IP rating	IP20 for the front panel
Temperature area	-20... +60 °C
Transportation and storage temperature	-40... +90 °C
Altitude	Max. 2000 m
Humidity r.h. = 95 % T = 25...55 °C	
with condensation	5 % - 98 %
without condensation	5 % - 90 %

Table 8.1 Technical data of ATS021

9. Troubleshooting

Alarm	Fault	Action
ALARM_OPEN_1	The protection device on the normal line LN 1 does not open. After 5 seconds the alarm LED starts blinking and the CB1 LED turns ON.	The alarm can be reset by the RESET key. If the alarm does not disappear, there is some malfunction in the protection device and it has to be changed.
ALARM_OPEN_2	The protection device on the emergency line LN 2 does not open. After 5 seconds the alarm LED starts blinking and the CB2 LED turns ON.	The alarm can be reset by the RESET key. If the alarm does not disappear, there is some malfunction in the protection device and it has to be changed.
ALARM_CLOSE_1	The protection device on the normal line LN 1 does not close. After 5 seconds the alarm LED and the CB1 LED are blinking.	The alarm can be reset by the RESET key. If the alarm does not disappear, there is some malfunction in the protection device and it has to be changed.
ALARM_CLOSE_2	The protection device on the emergency line LN 2 does not close. After 5 seconds the alarm LED and the CB2 LED are blinking.	The alarm can be reset by the RESET key. If the alarm does not disappear, there is some malfunction in the protection device and it has to be changed.

Table 9.1 Fault situations in ATS021

9.1 Explanations of internal faults ATS021

When digital Input 1 and 2 are both active, logic is locked and the Alarm LED is ON.

When digital Input 3 is active, logic is locked and the Alarm LED is ON.

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Due to possible developments of standards as well as of materials, the characteristics and dimensions specified in the present installation and operating instructions may only be considered binding after confirmation by ABB SACE Division.

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