



OPERATION, MAINTENANCE, AND INSTALLATION GUIDE

## Zenith ZBTS T-series

For ZBTS T-series bypass isolation automatic transfer switches, 1000A-3000A, 200-480 Vac





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# Receiving, handling and storage

**Warning**

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

**Avvertimento:**

Indica una situazione pericolosa che, se non evitata, potrebbe causare la morte o gravi lesioni.

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## HAZARD OF EQUIPMENT OVERTURNING

When moving with a fork lift, do not remove the shipping packaging until the device is in its final location.

**Failure to follow this instruction may result in personal injury or equipment damage.**

## Receiving and handling

Upon receipt, carefully inspect the transfer switch for damage that may have occurred during transit. If damage is evident, or there is visible indication of rough handling, immediately file a damage claim with the transportation company, and notify your local ABB sales office.

Do not remove the shipping packaging until ready to install the switch.

## Storage

If the unit will not be placed into service immediately, store the transfer switch in its original package in a clean, dry location. To prevent condensation, maintain a uniform temperature. Store the unit in a heated building, allowing adequate air circulation and protection from dirt and moisture. Storing the unit outdoors could cause harmful condensation inside the transfer switch enclosure.

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# Read these safety instructions carefully before using this product!

**Danger**

Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

**Danger**

Indique une situation dangereuse qui, si elle n'est pas évitée, entraînera la mort ou de graves blessures.

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## HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- Apply appropriate personal protective equipment and follow safe electrical work practices.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Before performing visual inspections, tests, or maintenance on the equipment, disconnect all sources of electric power. Assume that all circuits are live unless they are completely de-energized, tested, grounded, and tagged. Pay particular attention to the design of the power system. Consider all sources of power, including the possibility of backfeeding.
- Disconnect all sources of electric power before removing or making source side or load side connections to the transfer switch.
- Always use a properly rated voltage sensing device at all line and load connections to confirm transfer switch is disconnected from all live electrical sources.
- Turn off power supplying transfer switch before doing any other work on or inside switch.

**Failure to follow these instructions could result in death or serious injury.**

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# Operation, maintenance, and installation instruction

Bypass isolation  
Automatic transfer  
switches, Zenith  
ZBTS T-series ATS

OPERATION AND MAINTENANCE  
INSTRUCTIONS, ZENITH  
ZBTS T-SERIES ATS,  
CHAPTERS 1–8

INSTALLATION INSTRUCTIONS,  
ZENITH ZBTS T-SERIES ATS,  
CHAPTERS 9–11

1

2



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# Operation and maintenance instruction

## Bypass isolation Automatic transfer switches, ZBTS T-series

<b>1. Introduction</b>	<b>11</b>
1.1 Hazard Categories	11
1.2 Definitions	12
1.3 Warranty	13
1.4 Product Specification	14
<b>2. Product overview</b>	<b>15</b>
2.1 General overview	16
2.1.1 Operation types	20
2.2 Controller and HMI	21
2.2.1 Controller	21
2.2.2 HMI	21
2.3 Zenith ZBTS T-series features	22
2.4 Typical applications	25
2.5 Sequence of Operation	27
2.5.1 Switching sequence / Automatic (Open / Delayed transition)	27
2.5.2 Switching sequence (Closed transition)	33
2.6 Special features description	37
2.6.1 Automatic configuration	37
2.6.2 In-phase monitor	37
2.6.3 Powering supply scenarios	37
<b>3. General operation</b>	<b>39</b>
3.1 ATS position indication	39
3.1.1 Position Indication	39
3.2 Manual operation of ATS equipment	40
3.3 LED functionality in HMI	43

3.4	Using Level 4 (touch) control interface HMI	45
3.4.1	Keypad	45
3.4.2	Navigating in menu	45
3.5	Bypass isolation ATS indication panel	46
3.6	Bypass access panel	48
3.7	Bypass manual operation	49
3.8	Bypass-isolation operation	50
3.8.1	ATS Rack Out Operation	51
3.8.2	ATS Rack In Operation	56
3.9	ATS operation	61

#### **4. Navigating HMI menu 63**

4.1	Start Menu	63
4.2	Using main menu and setting parameters	65
4.3	Menus and parameters	66
4.4	Analog meters and Measures	79

#### **5. Electronic accessories 81**

5.1	Ekip Connect -software	82
5.2	Ekip Programming -module	83
5.2.1	LED indications	83
5.3	Auxiliary power supply module	84
5.3.1	Electrical characteristics	84
5.3.2	LED indications	84
5.4	Ekip Signalling 2K-_ -module	85
5.4.1	Electrical characteristics of Ekip Signalling 2K-_ -module	85
5.4.2	Access from the display / Ekip Signalling 2K-_ -module	85
5.4.3	LED indications and inputs/outputs of Ekip Signalling 2K-_ -module	89
5.5	Ekip Com _ -modules	90
5.5.1	Ekip Com Modbus RTU -module	90
5.5.2	Ekip Com Profibus DP -module	93
5.5.3	Ekip Com DeviceNet -module	96
5.5.4	Ekip Com Modbus TCP -module	100
5.5.5	Ekip Com Profinet -module	104
5.5.6	Ekip Com EtherNet/IP -module	107

5.5.7	Ekip Com Hub -module	111
5.6	Ekip Signaling 10k module	115
5.7	Current measurement -modules	116
5.7.1	Rating Plug	116
5.7.2	Current Sensors	116
5.8	Temperature measurement	117
5.9	Switch-Test/Auto/Inhibit/Start	118
5.10	Audible Transfer Alarm	119
<b>6.</b>	<b>Troubleshooting</b>	<b>121</b>
6.1	Alarms	121
6.2	Warnings	123
6.3	Information	124
6.4	Light indication and alarm	125
6.5	Elimination of simple malfunctions	125
<b>7.</b>	<b>Technical data</b>	<b>127</b>
7.1	General technical data	127
7.2	Circuit diagrams	130
7.3	Overall Dimensions	134
<b>8.</b>	<b>Maintenance</b>	<b>137</b>
<b>9.</b>	<b>Installation</b>	<b>139</b>
9.1	Basic Tools for Installation and Maintenance	140
9.2	Equipment Inspection and Storage	140
9.3	Lifting and Mounting the Panel	141
9.3.1	Forklift transport guidelines	142
9.3.2	ATS lifting	143
9.4	Mounting the automatic transfer switch	145
9.5	Wire Connection	147
9.5.1	Main circuit	147
9.5.2	Fire Fighting	147
9.5.3	Generator start/stop and ATS contact position	148
9.6	Final Equipment Inspection	150
9.7	Initial Energizing	151

**10. Accessories 153**

- 10.1 Auxiliary power supply and Ekip -modules 153
- 10.2 HMI protective cover 155

**11. Replacement Parts 157**

# 1. Introduction

This manual describes the installation, basic operation, and maintenance of the Zenith ZBTS T-series (1000A-3000A) bypass isolation automatic transfer switches, manufactured by ABB. Installation for the transfer switch and available accessories can be found in chapters 9 and 10.

## 1.1 Hazard Categories

The following important highlighted information appears throughout this document to warn of potential hazards or to call attention to information that clarifies a procedure.

Carefully read all instructions and become familiar with the devices before trying to install, operate, service or maintain this equipment.



### **Danger**

Indicates a hazardous situation that, if not avoided, will result in death or serious injury.

### **Danger**

Indique une situation dangereuse qui, si elle n'est pas évitée, entraînera la mort ou de graves blessures.



### **Warning**

Indicates a hazardous situation that, if not avoided, could result in death or serious injury.

### **Avertissement**

Indique une situation dangereuse qui, si elle n'est pas évitée, pourrait entraîner la mort ou de graves blessures.



### **Caution**

Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury. Failure to comply with these instructions may result in product damage.

### **Mise en garde**

Indique une situation dangereuse qui, si elle n'est évitée, pourrait entraîner de petites blessures ou modérées. Le non-respect de ces instructions peut entraîner des dommages au produits.



### **Notice**

It is used to notify of practices not related to personal injury. Failure to comply with these instructions may result in product damage.

### **Remarque**

Il est utilisé pour notifier des pratiques non liées à des blessures corporelles. Le non-respect de ces instructions peut entraîner des dommages au produits.

## 1.2 Definitions

### **Bypass Isolation Automatic Transfer Switch**

A single-unit enclosed LV transfer switch system that combines a drawout automatic transfer switch with an isolation mechanism and a manual bypass switch – enabling redundant power transfer and maintenance capability while maintaining power supply to the load

### **ATS**

Automatic transfer switch – the primary load transfer device in the Bypass Isolation Automatic Transfer Switch

### **Bypass**

The manual transfer switch utilized for load transfer when the ATS is racked out in TSET or ISOLATED positions

### **ATS/BYP PARALLEL**

Both ATS and Bypass switch contacts are connected to source 1 power / source 2 power

### **Ekip**

Electronic accessories / Ekip-modules; communication, signaling and connectivity modules

### **HMI**

Human Machine Interface for operating and configuring of the ATS control system

### **Level 4 Controls**

Controls with touch screen HMI and sensor module

### **MTS**

Manual transfer switch

### **Programming port**

Only for Ekip Programming module (USB port)

### **S1**

SOURCE 1, power supply

### **S2**

SOURCE 2, power supply

### **TruCONTROL**

ATS controller type OXCO\_, product name

## 1.3 Warranty

This document is based on information available at the time of its publication. While efforts have been made to ensure accuracy, the information contained herein does not cover all details or variations in hardware and software, nor does it provide for every possible contingency in connection with installation, operation, and maintenance. Features that are not present in all hardware and software systems may be described herein.

ABB Inc. assumes no obligation of notice to holders of this document with respect to changes subsequently made. ABB Inc. makes no representation or warranty, expressed, implied, or statutory, and assumes no responsibility for the accuracy, completeness, sufficiency, or usefulness of the information contained herein. No warranties of merchantability or fitness for purpose shall apply.

Contact your local sales office if further information is required concerning any aspect of the bypass isolation automatic switch operation or maintenance.

### **Warranty Period**

The standard warranty period for ZBTS T-series transfer switch products is twenty-four (24) months from the date of shipment.

### **Notes:**

This warranty is valid only for products sold in the United States – consult your local ABB representative for Non-US warranty terms and conditions.

For support in the United States, contact service team at +1 800 637 1738 or [epis.pqservice@abb.com](mailto:epis.pqservice@abb.com) for 24-hour support.

For international support, contact [epis.pqservice@abb.com](mailto:epis.pqservice@abb.com).

## 1.4 Product Specification

### Quality Assurance

All ABB Zenith bypass isolation automatic transfer switches have been designed and manufactured to the highest technical standards. Strict procedures ensure first-class product quality.



### Applicable standards

- UL1008 Standard for Safety - Transfer Switch Equipment
- IEC60947-6-1 Low-voltage switchgear and controlgear – Part 6-1: Multiple function equipment – Transfer switching equipment
- Utilization category: AC33A (IEC 60947-6-1)
- Classification: PC (IEC 60947-6-1)
- EMC:
  - Radiated emissions: Class A (CISPR11)
  - AC mains power input/output ports emissions: Class A (CISPR11)
  - Electrostatic discharge: EN 61000-4-2 (Level 2)
  - Radio frequency electromagnetic field (80 MHz to 6 000 MHz): EN61000-4-3(Level 3)

- Fast transient common mode: EN61000-4-4(Level 3)
- Surges to power ports: EN61000-4-5(Level 2)
- Radio frequency common mode: EN61000-4-6(Level 3)
- Voltage dips and interruptions: EN61000-4-11(Class 3)
- Harmonics and inter harmonics: EN61000-4-13(Class 3)

### Product Withstand rating

For UL 1008 'withstand' and 'close on short circuit' ratings, refer to ABB publication number 1SCC303020C0201.

### Product Serial Number

Please have the serial number available when communicating about the automatic transfer switch. The serial number can be found on the product nameplate affixed to each power panel assembly. See example below.

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## 2. Product overview

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Zenith ZBTS T-series bypass isolation automatic transfer switches, from 1000 A up to 3000 A, are designed for use in Business, industrial and Mission critical low-voltage automatic transfer switch applications that require the highest level of power continuity and redundancy. The ZBTS T-series is a single-unit enclosed LV transfer switch system that combines a drawout automatic transfer switch with an isolation mechanism and a manual bypass switch – enabling redundant power transfer and maintenance capability while maintaining power supply to the load. For regular operation, the Zenith ZBTS T-series bypass isolation ATS can be configured, monitored, and controlled by a touchscreen control interface (HMI).

The available operation types for automatic transfer switches:

- Open (standard) transition Zenith ZBTS T-series ATS, type codes beginning ZSBO\_ from 1600A-3000 A, 200-480 Vac
- Delayed transition Zenith ZBTSD T-series ATS, type codes beginning ZSBD\_ from 1600A-3000 A, 200-480 Vac
- Closed transition Zenith ZBTSCT T-series ATS, type codes beginning ZSBC\_ from 1000A-3000 A, 200-480 Vac

## 2.1 General overview



Fig. 2.1 Front exterior view – Bypass isolation ATS, Zenith ZBTS T-series

- 1 Door latch and lock
- 2 Bypass operator access panel door
- 3 Bypass indication panel
- 4 HMI
- 5 ATS view window

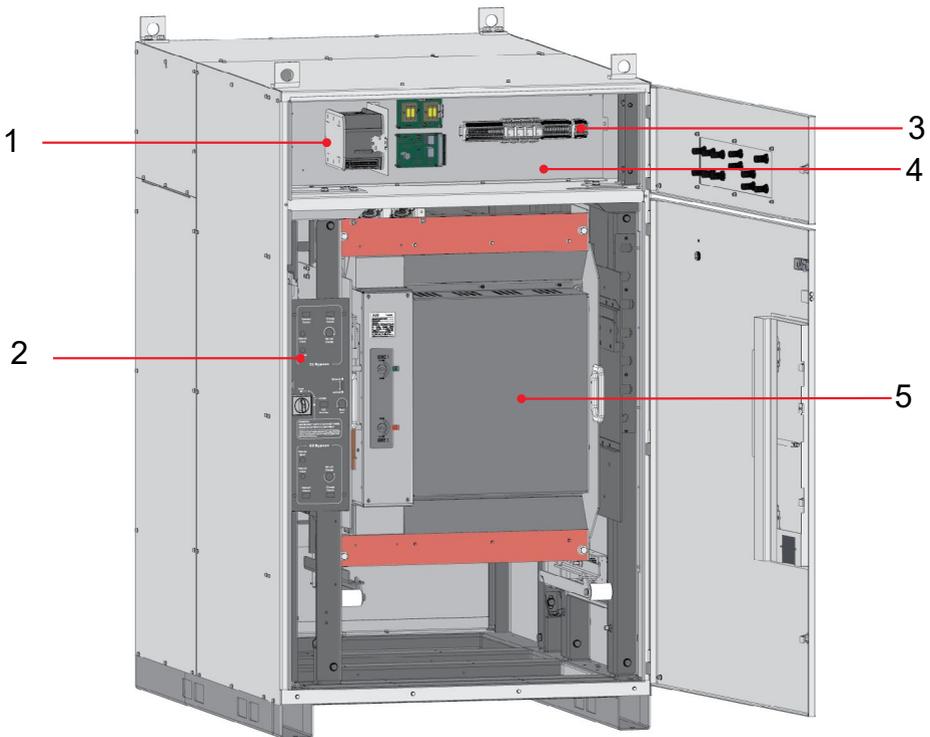


Fig. 2.2 Front exterior view with door open – Bypass isolation ATS, Zenith ZBTS T-series

- 1 TruCONTROL ATS controller
- 2 Bypass operator panel
- 3 Engine start contact and ATS auxiliary position contacts
- 4 Electrical controls compartment
- 5 ATS

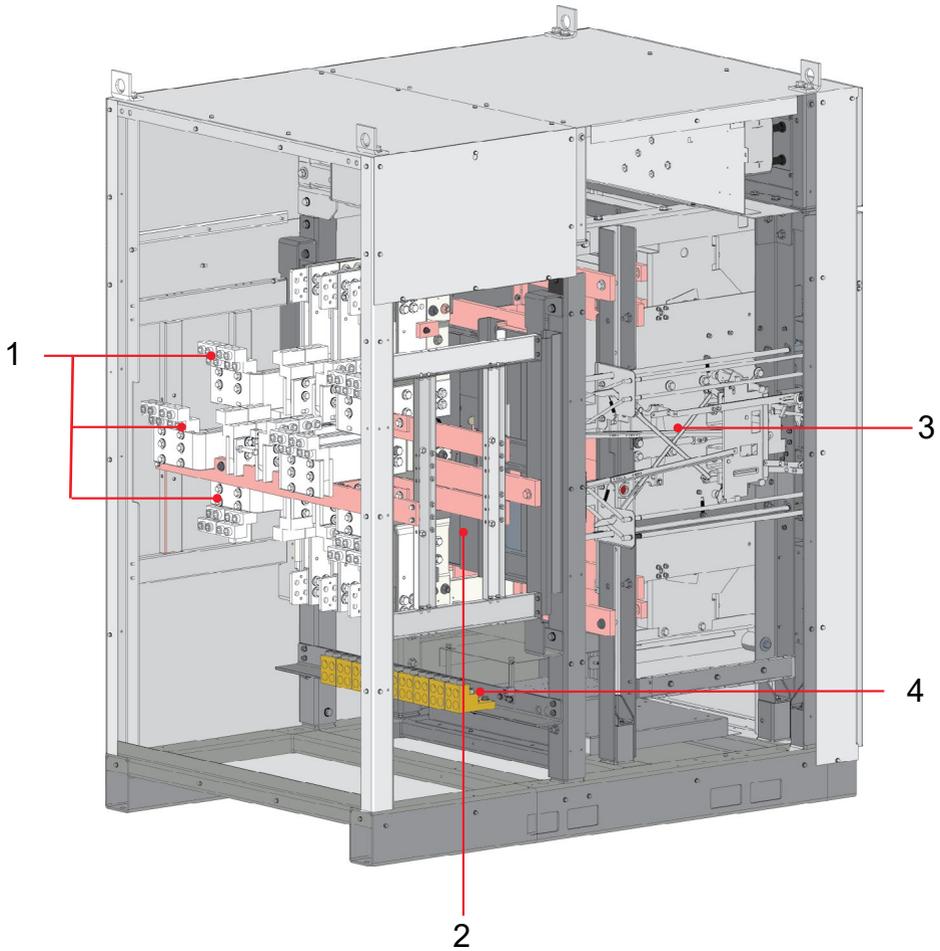


Fig. 2.3 Rear internal view – Bypass isolation ATS, Zenith ZBTS T-series

- 1 Mechanical screw-type lug terminals for S1, S2, and Load
- 2 MTS
- 3 Bypass isolation mechanism and interlock system
- 4 Ground bar

## Standard Transition Shown

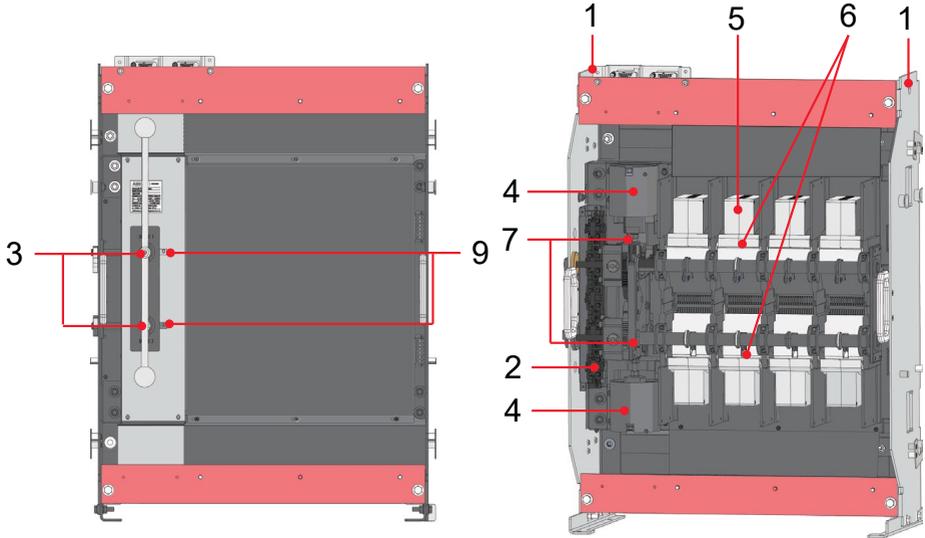


Fig. 2.4 ATS-R5B with and without covers shown

- 1 Lifting eye
- 2 SCR Assemblies. Access by removing cover screws on the front of panel
- 3 Customer manual operating ports
- 4 Transfer Coil Solenoids
- 5 Arc Chute Assemblies (Arc Quenching assemblies)
- 6 Movable Contact Assemblies
- 7 Position Limit Switches Auxiliary Contact Limit Switches
- 8 Mechanical Drive Assembly -mechanical interlock system
- 9 Source position status
  - I= contacts closed
  - O= contacts open

### 2.1.1 Operation types

In this table you can find the differences of the automatic transfer switch open and delayed transition operation types. Due to the different transition types, there are variances with HMI and on wiring of I/O contacts. For more information on HMIs, see Chapter 2.2.

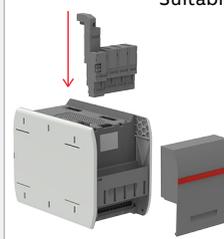
Operation types, ZBTS T-series ATS		Ekip-modules suitable
Delayed transition, ZBTSD Closed transition, ZBTSCT  S1   O   II   S2 	Open transition, ZBTS  S1     II   S2 	
ZBTS T-series HMI (with touch screen) and connections of control circuit		
		Suitable 

Table 2.1 The differences of level types / operation types and the suitability of Ekip-modules

## 2.2 Controller and HMI

### 2.2.1 Controller

The ATS Controller OXCO\_ TruCONTROL is designed for use with Zenith ZBTS T-series. A color touchscreen HMI (Human Machine Interface) is used to operate the TruCONTROL ATS controller.

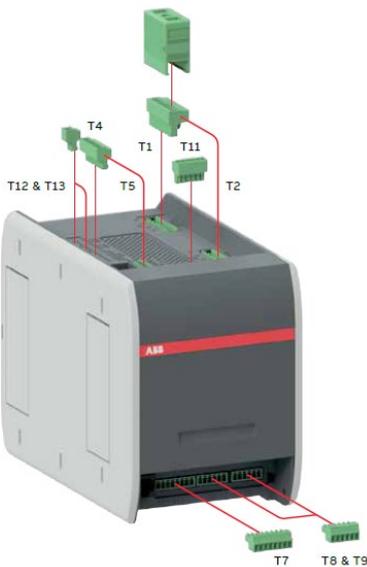


Fig. 2.5 TruCONTROL ATS controller, type OXCO

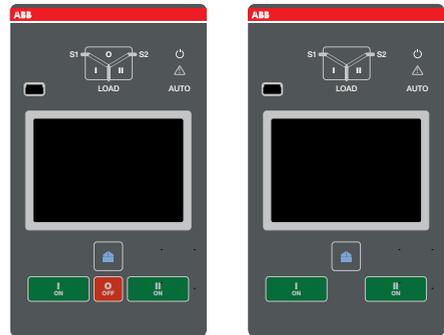
- T1: Source 1
- T2: Source 2
- T4: Current sensor
- T5: ATS transfer command
- T8: Digital output
- T9: Digital and fire fighting input
- T11: ATS status
- T12: Temperature sensor
- T13: CAN bus(Ekip 10k)

### 2.2.2 HMI

The HMI is the control interface (Human Machine Interface) of the ATS.

Zenith ZBTS T-series has a color touchscreen LCD HMI with push buttons. The HMI is used to configure parameters for automatic operation.

**ZBTS:**  
HMI with  
Touch screen



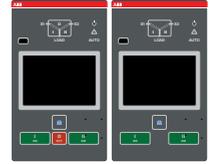
I - O - II (or II - O - I)

Fig. 2.6 The HMI form will correspond to the type of ZBTS T-series - open or delayed transition

## 2.3 Zenith ZBTS T-series features

### Features

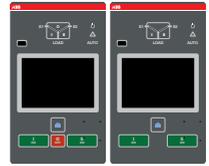
### ZBTS controls (Touch screen)



Ampere sizes available	UL: 1600-3000A (open & delayed transition) 1000-3000A (closed transition)
Rated voltage	208-480 Vac, configuration dependent
Rated frequency	50 / 60 Hz
Phase system	Three
Number of poles	3 and 4
<b>Neutral configuration</b>	
Switched	Yes
<b>Product type</b>	
Open transition (I-II)	Yes
Delayed transition (I - O - II or II - O - I)	Yes
Closed transition	Yes
<b>Voltage and frequency settings</b>	
Pick up SOURCE 1 Voltage	85-99 %, 101-119 %
Drop out SOURCE 1 Voltage	75-98 %, 102-120 %
Pick up SOURCE 2 Voltage	85-99%, 101-119 %
Drop out SOURCE 2 Voltage	75-98 %, 102-120%
Pick up SOURCE 1 Frequency	80.5-99.5 %, 100.5-119.5%
Drop out SOURCE 1 Frequency	80-99 %, 101-120 %
Pick up SOURCE 2 Frequency	80.5-99.5 %, 100.5-119.5 %
Drop out SOURCE 2 Frequency	80 – 99 %, 101-120 %
<b>Time delay settings</b>	
Override momentary SOURCE 1 Outage, sec	0-60

## Features

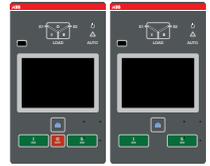
## ZBTS controls (Touch screen)



Transfer from SOURCE 1 to SOURCE 2, sec	0-3600
Override momentary SOURCE 2 Outage, sec	0-60
Transfer from SOURCE 2 to SOURCE 1, min	0-120
Generator stop delay, min	0-60
Center-OFF delay, sec	0-300
Post-transfer delay S1 to S2, sec	0-300
Pre-transfer delay from S2 to S1, sec	0-300
Post-transfer delay from S2 to S1, sec	0-300
Elevator Pre-signal delay S1 to S2, sec	0-60
Elevator Post-signal delay S1 to S2, sec	0-60
Elevator Pre-signal delay S2 to S1, sec	0-60
Elevator Post-signal delay S2 to S1, sec	0-60
Load shed delay, sec	0-60
<b>Source failure detections</b>	
No voltage	Yes
Undervoltage	Yes
Overvoltage	Yes
Phase missing	Yes
Voltage imbalance	Yes
Invalid frequency	Yes
Incorrect phase sequence	Yes
<b>Measuring and control features</b>	
Controls	Touch + keys
LED indications for ATS, S1 and S2 status	Yes
Programmable digital inputs/outputs	Yes
Auto config (voltage, frequency, phase system)	Yes
Source priority	SOURCE 1/2, No priority
Manual re-transfer	Yes

**Features**

**ZBTS controls (Touch screen)**



In-phase monitor (synchro check)	Yes
Genset exercising: on-load, off-load	Yes
In-built power meter module	Yes
Load shedding	Yes
Real time clock	Yes
Event log	Yes
Predictive maintenance	Yes
Harmonics measuring	Voltage, current
<b>Field-mount accessories</b>	
Auxiliary contacts for position indication	Yes
Digital input/output modules	Yes
12-24 Vdc aux supply module for controller	Yes
Communication modules	Yes
<b>Connectivity</b>	
Modbus RTU (RS-485)	Yes
Modbus/TCP	Yes
Profibus DP	Yes
ProfiNet	Yes
DeviceNet	Yes
Ethernet IP	Yes
Ekip Com Hub (monitoring via ABB Ability™: Energy and Asset Manager)	Yes
<b>Enclosures</b>	
Type 1, 3R, 4, 12, and 4X	Yes
<b>For applications<sup>1)</sup></b>	
Mains - Mains	Yes
Mains - Generator1	Yes

<sup>1)</sup> Primary source is only available for source 1

Table 2.2 Zenith ZBTS T-series features not limited to what is in the table above

## 2.4 Typical applications

Zenith ZBTS T-series automatic transfer switches from 100 A up to 3000 A, are designed for use in emergency or standby systems to choose and to switch between two power sources. See possible supply phase scenarios on next page. You have to define your own supply phase system - reference Chapter 4 / Navigating menu / Parameters: Power distribution systems. Factory setting: 3 phases with neutral.

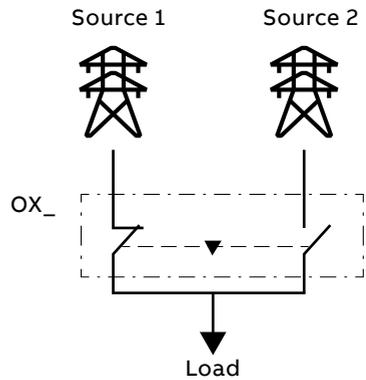
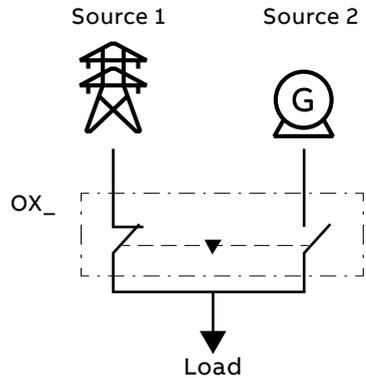
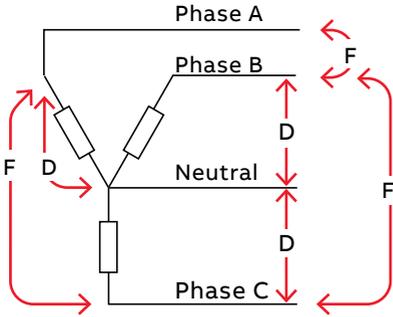
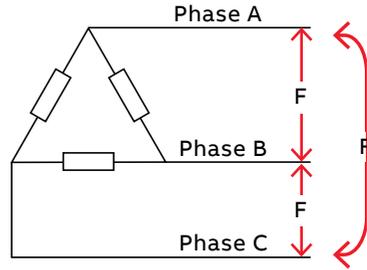


Fig. 2.7 Typical applications of automatic transfer switches

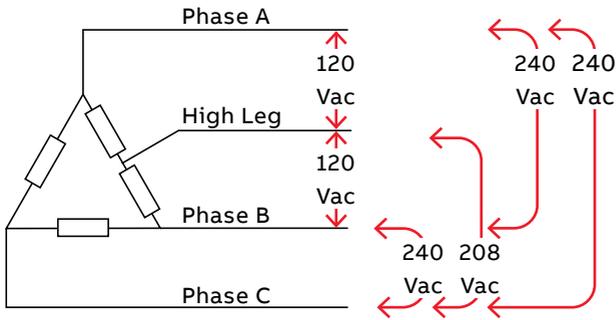


Three-phase, four-wire



Three-phase, three-wire

D	E	F
200-480 Vac L-N	200-480 Vac L-L	200-480 Vac L-L



Three-phase, with high leg delta

Fig. 2.8 Possible supply phase scenarios

## 2.5 Sequence of Operation

### 2.5.1 Switching sequence / Automatic (Open / Delayed transition)

#### 2.5.1.1 SOURCE 1 Priority (SOURCE 2 = Generator)

The switching sequence can be summarized in the following steps:

1. An anomaly occurs on SOURCE 1
2. Override momentary S1 outage delay
3. Generator start
4. SOURCE 2 OK
5. Transfer from S1 to S2 delay
6. Pre-transfer signal on
7. Load shed signal on
8. Pre-transfer S1 to S2 delay
9. Load shed delay
10. Transfer switch to position O
11. Center-off delay (only with Delayed transition I - O - II type)
12. Transfer switch to position II
13. Post-transfer S1 to S2 delay
14. Pre-transfer signal off

The re-transfer sequence can be summarized in the following steps:

1. SOURCE 1 is restored
2. Transfer from S2 to S1 delay
3. Pre-transfer signal on
4. Pre-transfer S2 to S1 delay
5. Transfer switch to position O
6. Center-off delay (only with Delayed transition I - O - II type)
7. Transfer switch to position I
8. Load shed signal off
9. Generator stop delay
10. Post-transfer S2 to S1 delay
11. Pre-transfer signal off
12. Generator stop
13. SOURCE 2 off

**SOURCE 1 priority (SOURCE 2 = generator)**

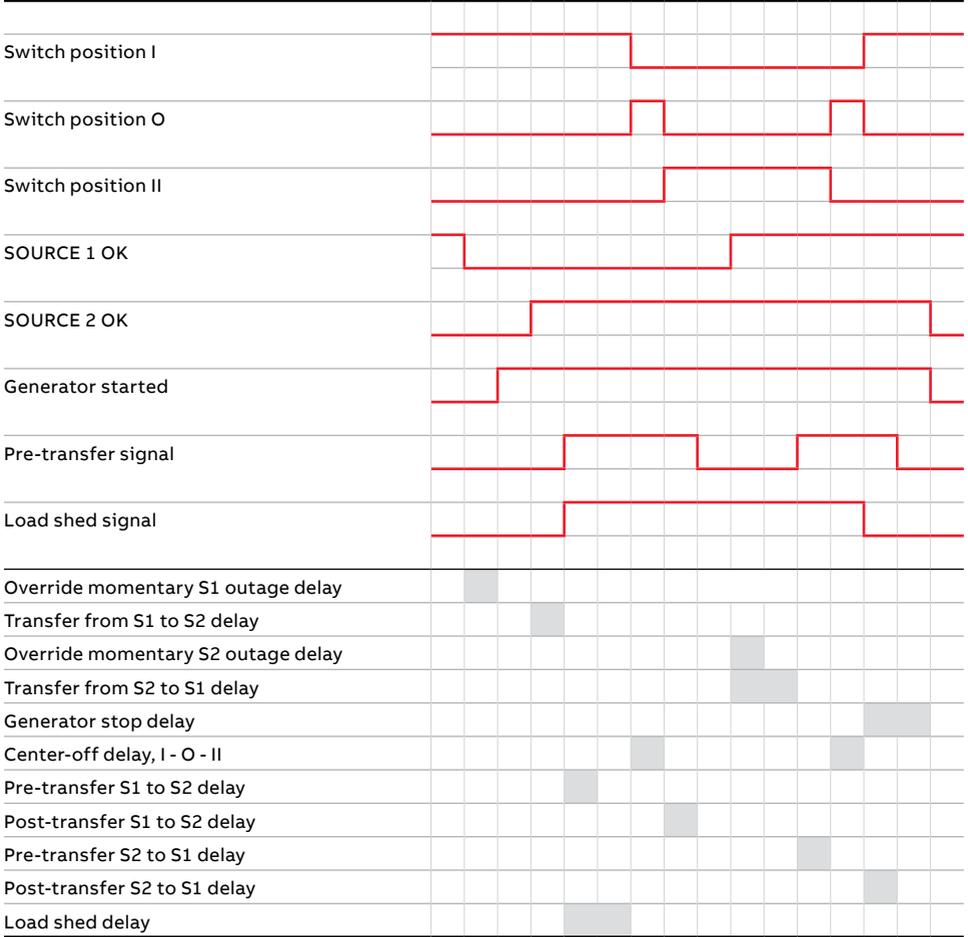


Table 2.3 Automatic Switching Sequences, SOURCE 1 Priority (SOURCE 2 = Generator)

Note: The functionality and sequence of ‘Elevator pre- and post-signals’ is equivalent to ‘Pre- and Post-transfer’ features.

### 2.5.1.2 SOURCE 2 Priority (No generator)

The switching sequence can be summarized in the following steps:

1. An anomaly occurs on SOURCE 2
2. Override momentary S2 outage delay
3. Transfer from S2 to S1 delay
4. Pre-transfer signal on
5. Load shed signal on
6. Pre-transfer S2 to S1 delay
7. Load shed delay
8. Transfer switch to position O
9. Center-off delay (only with Delayed transition I - O - II type)
10. Transfer switch to position I
11. Post-transfer S2 to S1 delay
12. Pre-transfer signal off

And the re-transfer sequence can be summarized in the following steps:

1. SOURCE 2 is restored
2. Transfer from S1 to S2 delay
3. Pre-transfer signal on
4. Pre-transfer S1 to S2 delay
5. Transfer switch to position O
6. Center-off delay (only with Delayed transition I - O - II type)
7. Transfer switch to position I
8. Load shed signal off
9. Post-transfer S1 to S2 delay
10. Pre-transfer signal off

**SOURCE 2 priority (no generator)**

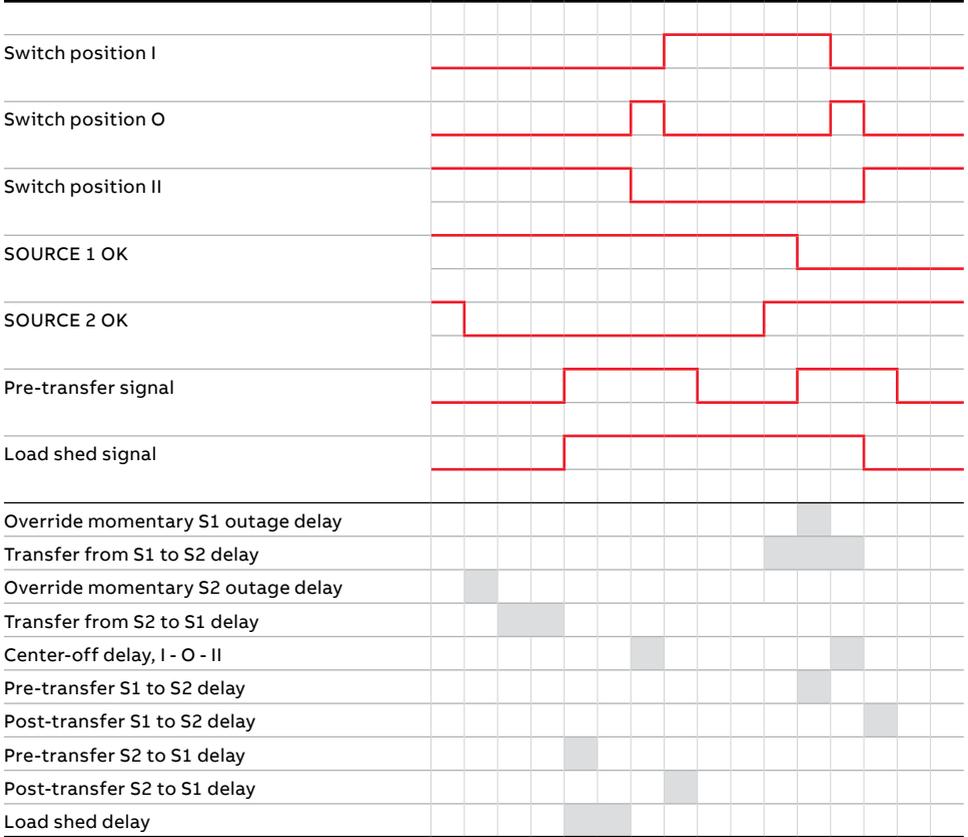


Table 2.4 Automatic Switching Sequences, SOURCE 2 Priority (No generator)

Note: The functionality and sequence of ‘Elevator pre- and post-signals’ is equivalent to ‘Pre- and Post-transfer’ features.

### 2.5.1.3 No Source Priority (Generator and load shed usage disabled)

The switching to available source can be summarized in the following steps:

1. An anomaly occurs on SOURCE 1
2. Override momentary S1 outage delay
3. Pre-transfer signal on
4. Pre-transfer S1 to S2 delay
5. Transfer switch to position O
6. Center-off delay (only with Delayed transition I - O - II type)
7. Transfer switch to position II
8. Post-transfer S1 to S2 delay
9. Pre-transfer signal off

When an anomaly occurs in the source in-use, the re-transfer to available source can be summarized in the following steps:

1. SOURCE 1 is restored
2. An anomaly occurs on the SOURCE 2
3. Pre-transfer signal on
4. Pre-transfer S2 to S1 delay
5. Transfer switch to position O
6. Center-off delay (only with Delayed transition I - O - II type)
7. Transfer switch to position I
8. Post-transfer S2 to S1 delay
9. Pre-transfer signal off

**No source priority (generator and load shed usage disabled)**

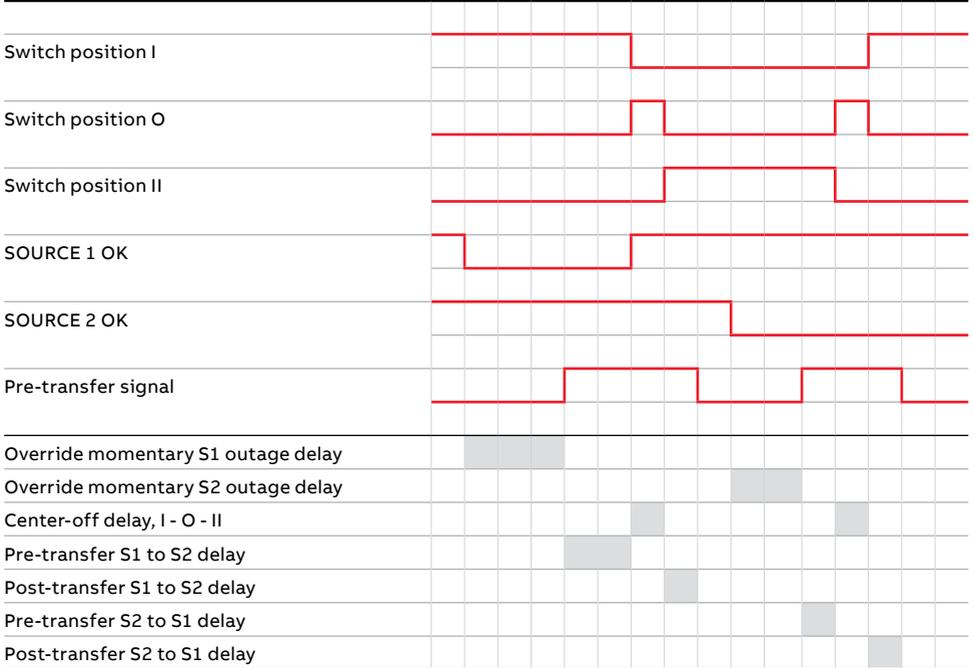


Table 2.5 Automatic Switching Sequences, No Source Priority (Generator and load shed usage disabled)

Note: The functionality and sequence of ‘Elevator pre- and post-signals’ is equivalent to ‘Pre- and Post-transfer’ features.

## 2.5.2 Switching sequence (Closed transition)

### 2.5.2.1 SOURCE 1 Priority (SOURCE 2 = Generator)

The switching sequence can be summarized in the following steps:

1. Activate test on load (HMI or digital input)
2. Generator start
3. Run engine warm-up timer
4. Pre-transfer S1 to S2 delay
5. Check source synchronization
6. Close SOURCE 2 contacts
7. Open SOURCE 1 contacts, start ETT timer (parallel mode)
8. Post-transfer S1 to S2 delay

The re-transfer sequence can be summarized in the following steps:

1. Cancel test on load (HMI or digital input)
2. SOURCE 1 availability timer
3. Pre-transfer S2 to S1 delay
4. Check source synchronization
5. Close SOURCE 1 contacts
6. Open SOURCE 2 contacts, start ETT timer (parallel mode)
7. Post-transfer S2 to S1 delay
8. Run engine cool down timer
9. Generator stop

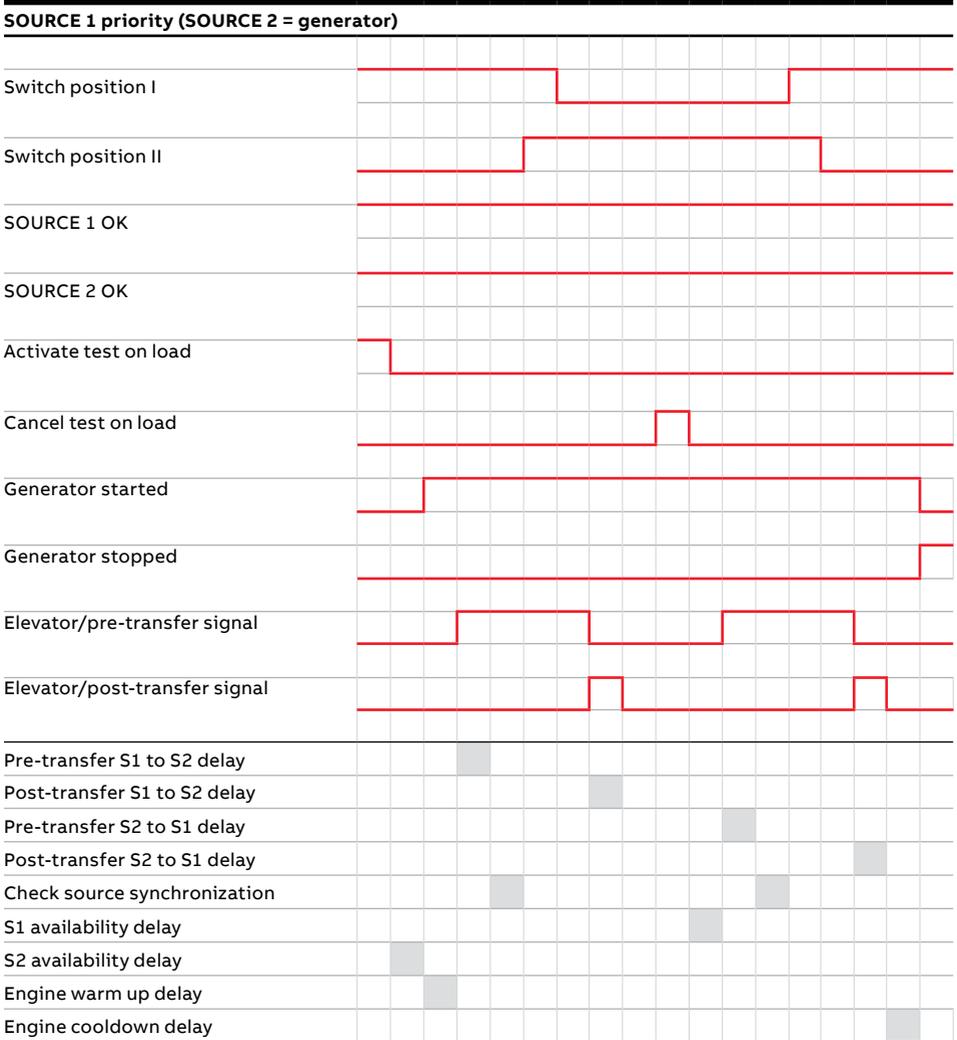


Table 2.6 Closed Transition Switching Sequences, SOURCE 1 Priority (SOURCE 2 = Generator)

### 2.5.2.2 SOURCE 2 Priority (No Generator)

The switching sequence can be summarized in the following steps:

- 1 Activate test on load (HMI or digital input)
- 2 Pre-transfer S2 to S1 delay
- 3 Check source synchronization
- 4 Close SOURCE 1 contacts
- 5 Open SOURCE 2 contacts, start ETT timer (parallel mode)
- 6 Post-transfer S2 to S1 delay

The re-transfer sequence can be summarized in the following steps:

- 1 Cancel test on load (HMI or digital input)
- 2 SOURCE 2 availability timer
- 3 Pre-transfer S1 to S2 delay
- 4 Check source synchronization
- 5 Close SOURCE 2 contacts
- 6 Open SOURCE 1 contacts, start ETT timer (parallel mode)
- 7 Post-transfer S1 to S2 delay

**SOURCE 2 priority (no generator)**

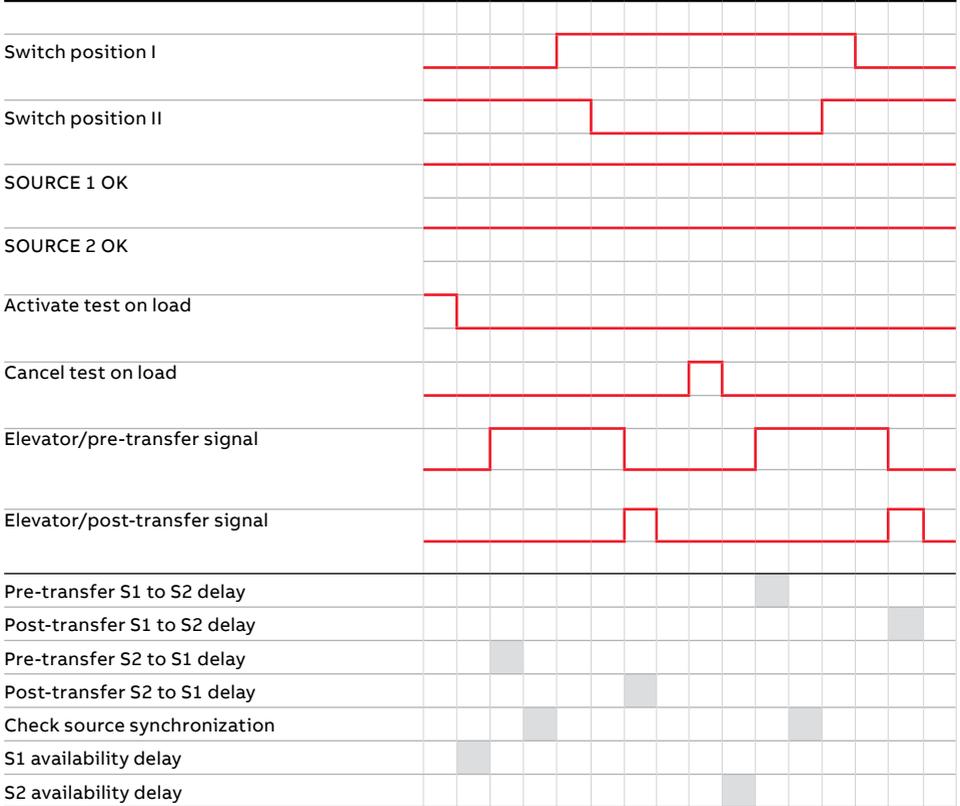


Table 2.7 Closed Transition Switching Sequences, SOURCE 2 Priority (No Generator)

## 2.6 Special features description

### 2.6.1 Automatic configuration

Basic system parameters can be automatically configured from the HMI: rated voltage, rated frequency, each supply power distribution system type, and neutral location will be recognized and set by the controller. Other parameters are set to factory values; see Chapter 4, Navigating menu.

### 2.6.2 In-phase monitor

In-phase monitor can be set On/Off by using HMI (controller levels 2, 3 and 4) or Ekip Connect tool (levels 3 and 4).

Function calculates the phase difference of voltage sources and enables the automatic transfer sequence I -> II or II -> I only when sources are synchronized. Frequency difference of the sources must be less than 0.2 Hz. Otherwise in-phase monitor activates 'Frequency Difference' alarm and disables transfer operations.

### 2.6.3 Powering supply scenarios

Device can be powered by the the following methods:

- Direct from SOURCE 1 or SOURCE 2: Controller and HMI are powered and ATS can be operated electrically.
- Auxiliary power supply module, OXEA1: Controller and HMI are powered, but load transfer cannot be performed.
- Programming port on HMI (USB port): Only the main board is powered. Allows software update to main device and connection of Ekip Connect commissioning tool.



1

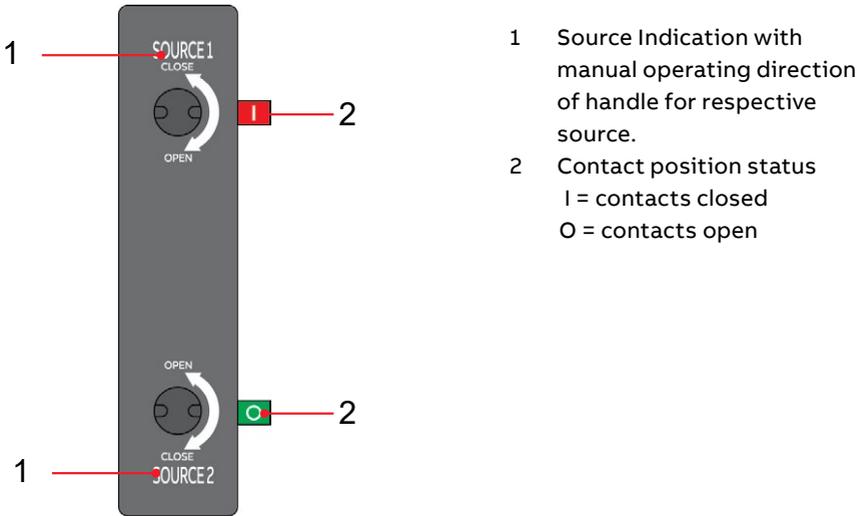
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# 3. General operation

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## 3.1 ATS position indication

### 3.1.1 Position Indication



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Fig. 3.1 View of Automatic Transfer Switch (standalone) panel highlighting customer points of interest. Applicable for Standard, Delay, and Close Transition Type Automatic Transfer Switch Equipment.

## 3.2 Manual operation of ATS equipment



### **Danger**

#### **Hazardous Voltage May Cause Severe Injury or Death**

Manual opening and closing of the contacts should only be performed with the power disconnected.

Failure to comply with these instructions may result in death or serious injury.

### **Danger**

Une tension dangereuse peut causer de graves blessures ou la mort. L'ouverture ou la fermeture manuelle des contacts ne doivent être effectuées qu'avec l'alimentation déconnectée. Le non-respect de ces instructions peut entraîner la mort ou de graves blessures.



### **Warning**

#### **Improper Installation Operation and Maintenance**

Ensure only qualified personnel install, operate, service and maintain all electrical equipment. DISCONNECT all power sources prior to installation, operation, service, and maintenance of all electrical equipment. These activities shall be performed only by certified ABB Zenith technicians or qualified electricians. Only use the charging handle to perform manual operation of the transfer switch. No motorized device shall be used as a substitute.

Failure to comply with these instructions may result in death or serious injury.

### **Avertissement**

Mauvais fonctionnement et maintenance de l'installation.

Assurez-vous que seul le personnel qualifié installe, utilise, entretient et exploite tous les équipements électriques.

Debranchez toutes les sources d'alimentation avant l'installation, l'utilisation, l'entretien, et la maintenance de tous les équipements électriques. Ces activités doivent être effectuées seulement par des techniciens certifiés par ABB Zenith ou des électriciens qualifiés.

Utilisez uniquement la poignée de charge pour effectuer une opération manuelle du commutateur de transfert. Aucun appareil motorisé ne doit être utilisé comme substitut.

Le non-respect de ces instructions peut entraîner la mort ou de graves blessures.

Stand-alone ABB Zenith automatic transfer switches are not designed to be operated manually under load. In the event the automatic transfer switch has to be operated manually, with no power available, please follow these steps:

1. Verify all voltage input sources to the automatic transfer switch have been removed with proper LOTO procedures followed. Consider stored energy sources as well.
2. Verify all load connections have been removed with proper LOTO procedures followed. Consider stored energy for load equipment as well.
3. Insert the manual handle into the desired port of the automatic transfer switch (Fig. 3.2).

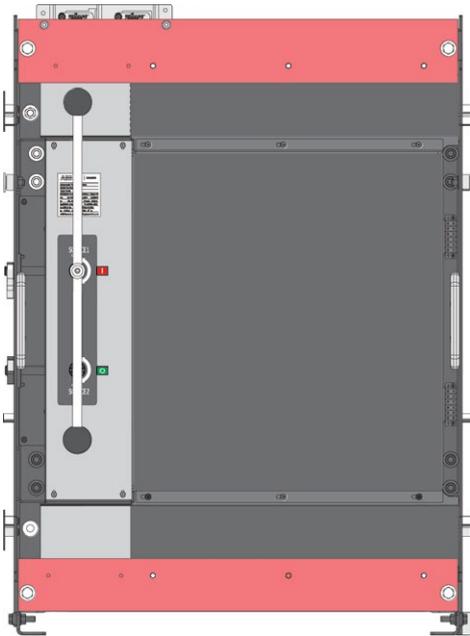
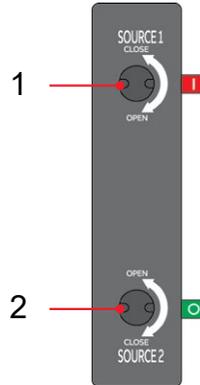


Fig. 3.2 Operating handle inserted for manual operation

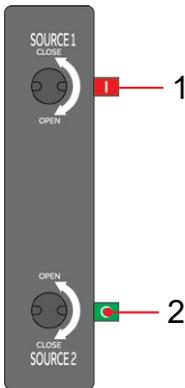
4. Rotate handle with two hands, in the direction as shown on the markings, to achieve the proper contact state (Fig. 3.3).



- 1 Close - Open Source 1
- 2 Close - Open Source 2

Fig. 3.3 Source Ha1-Source 2 direction of handle rotation

5. Verify that the rotation of the handle has come to full rest with markings clearly visible in the status window. Be sure to rotate the handle until no further travel is permissible, but **DO NOT** over-rotate. Over-rotation of handle may lead to equipment damage. Remove the manual operating handle and return it to the proper storage location before conducting any electrical transfers.



- 1 Contact State = Closed
- 2 Contact State = Open

Red + I = Contact Closed  
Green + O = Contact Open

Fig. 3.4 Contact status of automatic transfer switch

6. To return to Automatic transfer mode, return both source contacts to Open position and return the HMI Transfer Settings to Automatic transfer mode (see Section 4.3).

### 3.3 LED functionality in HMI

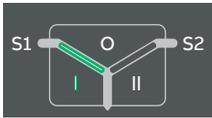
At the top of the ZBTS Lvl 4 HMI, there is a set of LEDs intended to model the state of the transfer switch sources, position, alarms, and mode. A considerable amount of information can be deciphered from the LED states. See the tables below for more information.



Fig. 3.5 On left: LEDs in ZTBSD/ ZBTSC2 delayed/closed transition, I - O - II. On right: LEDs in ZBTS, open transition I - II.

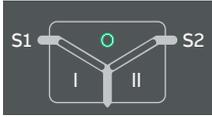
LED	Indication	Description
<b>Power led</b>		
	ON, fixed light	Power supply and communication present
	2 quick flashes/1 s	Power supply present, communication absent between switch and the HMI
	OFF	No power available for HMI.
<b>S1 and S2 leds</b>		
	ON, fixed light	S1 or / and S2 is present and within user defined limits
	2 quick flashes/1 s	Undervoltage
	Flash/1 s, 90 %/10 %	Invalid frequency
	Flash/1 s, 10 %/90 %	Unbalance
	5 flashes/1 s, 50 %/50 %	Overvoltage
	Flash/2 s, 50 %/50 %	Incorrect phase sequence
	Flash/4 s, 50 %/50 %	Phase missing
	Flash/1 s, 50 %/50 %	Generator stop delay ongoing
	OFF	No voltage

**I, II and 0 leds**



ON, fixed light

Switch position is indicated with fixed light in I, O or II led. Only one can be on simultaneously

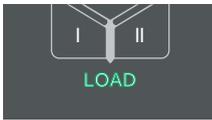


Flash/1 s, 50 %/50 %

Delay ongoing. Going to move away from the blinking status



**Load led**



ON

Supply ok and connected to load

OFF

Not connected to load

**Auto led**



ON, fixed light

Switch is in automatic mode

Flash/1 s, 50 %/50 %

Test on load

Flash/1 s, 90 %/10 %

Test off load

Flash/1 s, 10 %/90 %

If blinks simultaneously with Alarm led then 'Remote control to S1', 'Remote control to S2', 'Remote control to OFF' or 'Inhibit transfer' digital input is activated.

5 flashes/1 s, 50 %/50 %

Autoconfig completed

**Alarm led**



OFF

No alarms

ON, fixed light

Handle attached, locked, other alarm

2 quick flashes/1s

Control Alarm

5 flashes/1 s, 50 %/50 %

Auto configuration ongoing

Flash/1 s, 50 %/50 %

Control Retry

Flash/1 s, 10 %/90 %

Auto mode off

Flash/1 s, 10%/90 %

If blinks simultaneously with Alarm led then 'Remote control to S1', 'Remote control to S2', 'Remote control to OFF' or 'Inhibit transfer' digital input is activated. If Auto led is fixed light then manual retransfer is required.

Table 3.1 LED functionality

## 3.4 Using Level 4 (touch) control interface HMI

### 3.4.1 Keypad

- 1 **Home Button:** Opens up the root menu or brings user to the homepage if defined. While viewing a specific page, it can be defined as the home page by pressing the home button for 3 seconds. All pages, except for the menus, can be set as home page. Home page is automatically shown after inactivity.
- 2 **I ON:** Operate switch to I position.
- 3 **II ON:** Operate switch to II position.
- 4 **O OFF:** Operate switch to O position and disable automatic control mode (only in delayed/closed transition I-O-II type).

### 3.4.2 Navigating in menu

See the menu tree in Chapter 4.

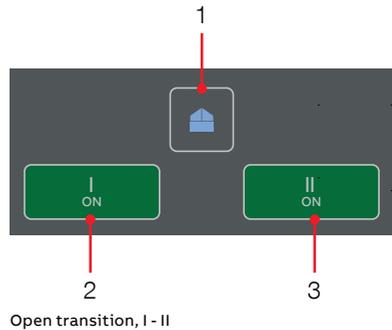
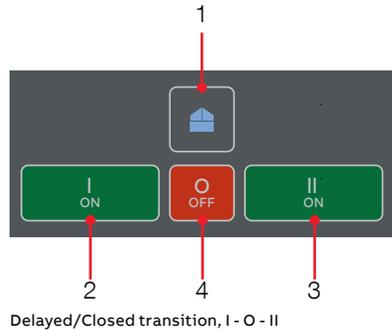


Fig. 3.6 Keypad in Level 4 HMI with touch screen

### 3.5 Bypass isolation ATS indication panel

The bypass isolation ATS indication panel is located at the top of the equipment enclosure. This panel is connected to the electrical controls compartment and TruCONTROL. Status and alarm signals are displayed on this indication panel, as well as the HMI.

Specifically, the Bypass Panel indicates connection status of S1, S2, Bypass device and ATS. ATS racking in/out status is also shown by the panel. This panel is illustrated in figure 3.12. Detailed LED descriptions are listed below in table 3.2.

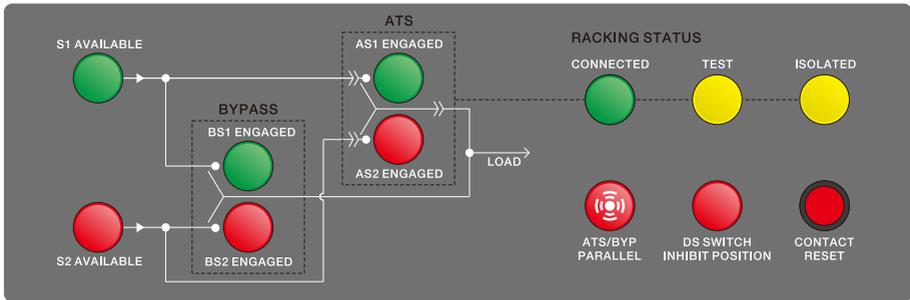


Fig. 3.7 Bypass isolation ATS indication panel

Light or button name	Meaning
S1 AVAILABLE	ATS contacts are on source 1
S2 AVAILABLE	ATS contacts are on source 2
BS1 ENGAGED	Bypass switch contact are on source 1
BS2 ENGAGED	Bypass switch contact are on source 2
AS1 ENGAGED	ATS contacts are on source 1
AS2 ENGAGED	ATS contacts are on source 2
CONNECTED	ATS is on the “CONNECTED” position
TEST	ATS is on the “TEST” position
ISOLATED	ATS is on the “ISOLATED” position
ATS/BYP PARALLEL	Both ATS and Bypass switch contacts are connected to source 1 power / source 2 power

Continued on the next page

DS SWITCH INHIBIT POSITION	Disconnect switch (Auto/Inhibit) inhibits ATS automatic transfer when it is on the “Inhibit” position (LED on) and allows automatic operation when it is on the “Auto” position (LED off)
CONTACT RESET	Only available in delayed and closed transition. Pushing the button will make the ATS contacts switch to the same source as the MTS

—  
Table 3.2 Bypass isolation ATS indication panel LED descriptions

### 3.6 Bypass access panel

The bypass access panel illustrates MTS contact position of both source 1 and source 2. The access panel is also the control interface of the MTS

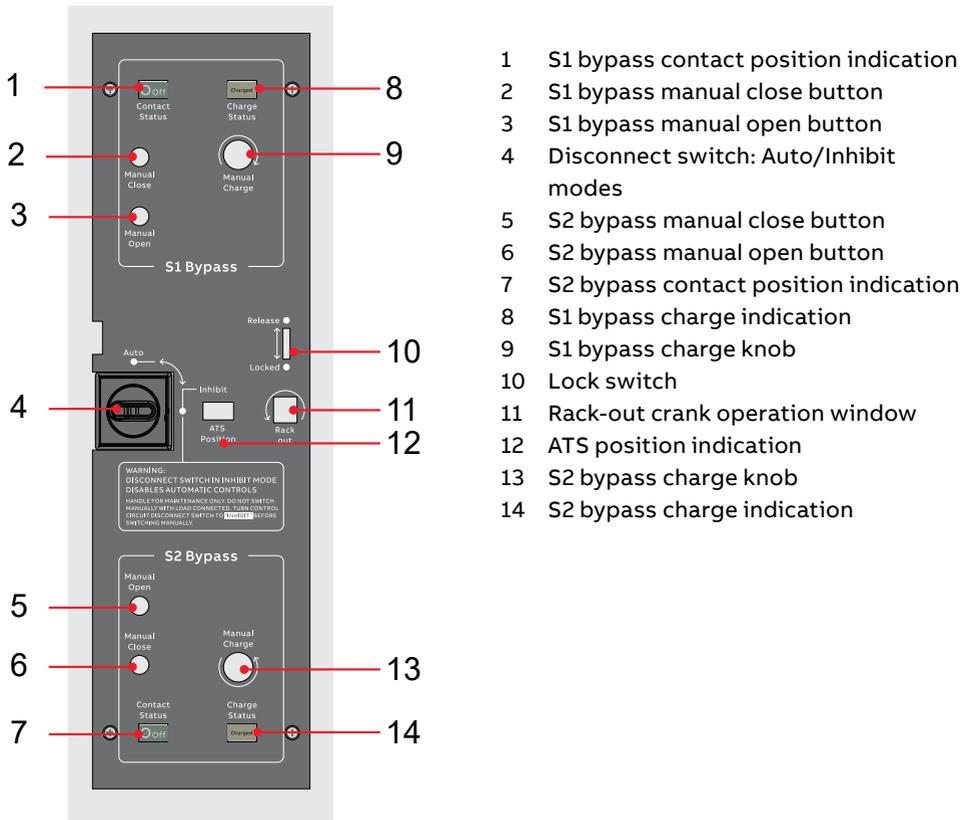


Fig. 3.8 Bypass access panel

### 3.7 Bypass manual operation

“Manual Close” button for closing MTS contact. Control mechanism needs charging.

“Manual Close” instruction:

- 1 Manually turn the “Manual Charge” knob on the Bypass access panel until the “charge status” window become full green and display “Charged”.
- 2 Then, press “Manual Close” button. This will close the MTS contacts to corresponding source

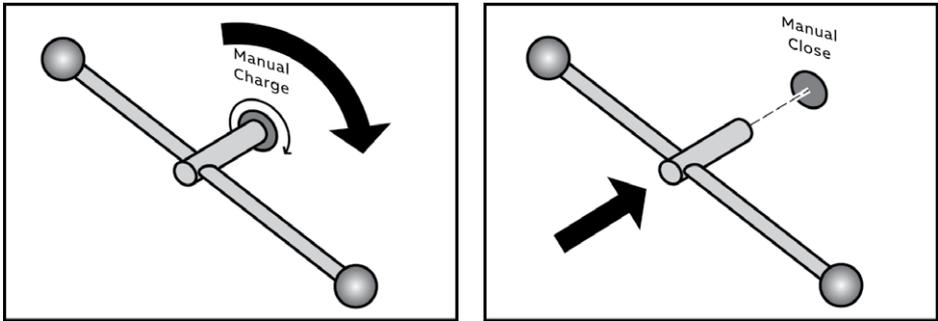


Fig. 3.9 Bypass manual close instruction

“Manual Open” button for Open MTS contact. Control mechanism does not need charging.

“Manual Open” instruction:

Press “Manual Open” button. This will switch the MTS contacts to off position.

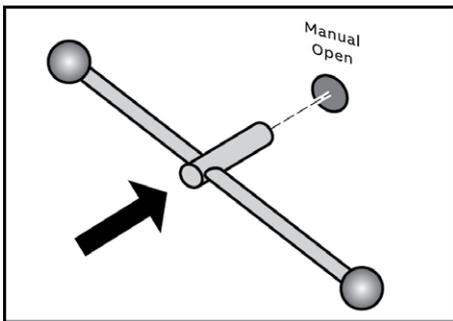


Fig. 3.10 Bypass manual open instruction

### 3.8 Bypass-isolation operation

There are three positions for the ATS: CONNECTED, TEST, and ISOLATED. The ATS can be racked out/in to these positions manually as desired.

The operation instructions for racking out/in the ATS to the three positions are mounted on the front of door along with bypass operator access panel.

The Bypass MTS is normally open on both sources with the ATS feeding the system load. During bypass-isolation operation, the Bypass MTS is closed paralleling the ATS contacts, which then allows withdrawal of the ATS to the “TEST” or “ISOLATED” positions. Mechanical and electrical interlocks are included to prevent cross-servicing or bypassing to a dead source.

In the “TEST” position, the ATS is disconnected from the load (now fed through the bypass MTS), but the control power is present to allow complete operational testing through the control panel of the ATS.

In the “ISOLATED” position, the Isolation ATS is completely withdrawn and may be removed from the enclosure for maintenance if desired. And the control power is NOT available in this position.

After the isolation operation, if the Bypass MTS is closed on Source 1 which fails, an auxiliary contact on the bypass control

will automatically start the engine-generator set. When the second source is available, the Bypass MTS may be operated to transfer the load to the available source.

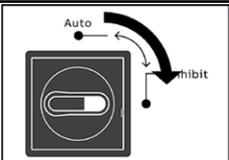
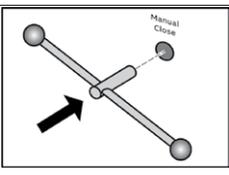
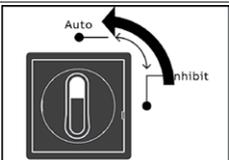
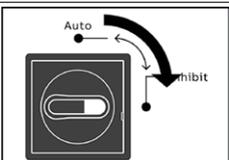
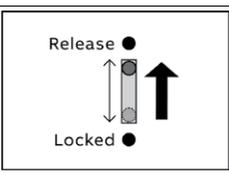
Use the key to open bypass operator access panel door before you do bypass-isolation operation.



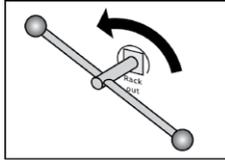
Fig. 3.11 Open bypass operator access panel

### 3.8.1 ATS Rack Out Operation

For the Delayed, Closed ATS (from CONNECTED to TEST):

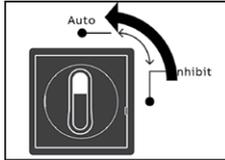
Step	Process	Picture	Requirements or Instructions
1	Turn the disconnect switch from "Auto" to "Inhibit".		Auto mode on HMI should be disable
2	Close MTS contact into the same source with the ATS (For detailed "Manual Close", please refer to section 3.7)		The alarm of Manual-Auto Mode on HMI should be active
3	Turn the disconnect switch from "Inhibit" to "Auto".		
4	Push "OFF" button on HMI display		ATS contact should be closed to off position
5	Turn the disconnect switch from "Auto" to "Inhibit"		Auto mode on HMI should be disable
6	Move the switch lock of the bypass access panel to "Release" position		

7 Rack out the ATS to "TEST" position. When the ATS goes to "TEST" position, the switch lock will then switch back to "Lock" automatically and the "TEST" light on the bypass panel will be on.



The ATS is disconnected from the main bus, so no current will flow through its contacts. But the control circuit is still connected to the power supply, so HMI operation is available

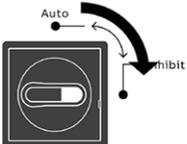
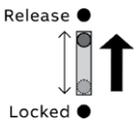
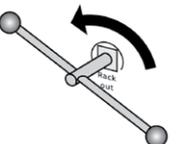
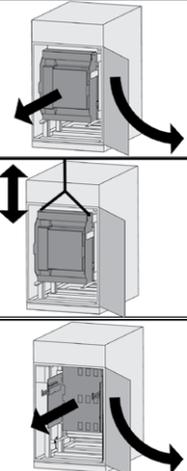
8 Turn the disconnect switch from "inhibit" to "Auto" if manual transfer operations as necessary.



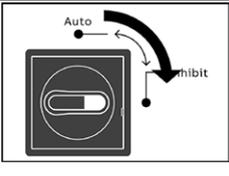
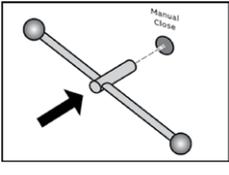
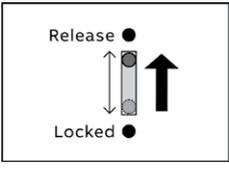
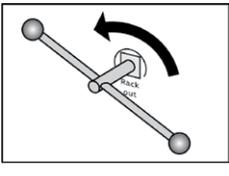
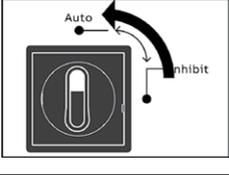
This will allow the ATS to close into available source via manual operation

1

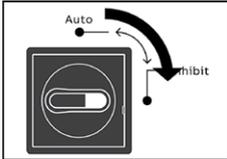
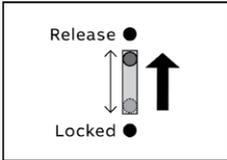
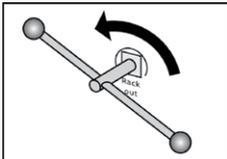
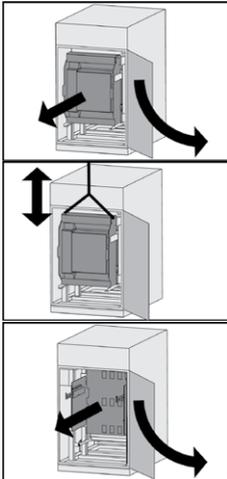
For the Delayed,Closed ATS (from TEST to ISOLATED):

Step	Process	Picture	Requirements or Instructions
1	Turn the disconnect switch from "Auto" to "Inhibit" if the disconnect switch is at "Auto" position		Auto mode on HMI should be disable
2	Move the switch lock of the bypass access panel to "Release" position		
3	Rack out the ATS to "ISOLATED" position. When the ATS goes to "ISOLATED" position, the switch lock will then switch back to "Lock" automatically and the "ISOLATED" light on the bypass panel will be on.		the ATS is fully disconnected.
4	Open the front door and pull out the ATS. Then the ATS can be removed from the cabinet by lifting		

For the Open(Standard) ATS (from Connected to Test):

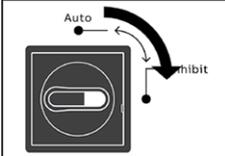
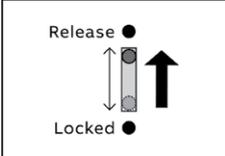
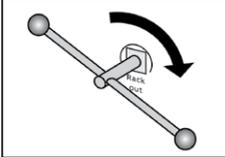
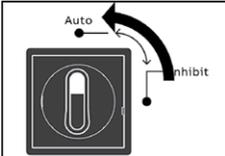
Step	Process	Picture	Requirements or Instructions
1	Turn the disconnect switch from "Auto" to "Inhibit".		Auto mode on HMI should be disable
2	Close MTS contact into the same source with the ATS (For detailed "Manual Close", please refer to section 3.7)		The alarm of Manual-Auto Mode on HMI should be active
3	Move the switch lock of the bypass access panel to "Release" position		
4	Rack out the ATS to "TEST" position. When the ATS goes to "TEST" position, the switch lock will then switch back to "Lock" automatically and the "TEST" light on the bypass panel will be on.		The ATS is disconnected from the main bus, so no current will flow through its contacts. But the control circuit is still connected to the power supply, so HMI operation is available
5	Turn the disconnect switch from "inhibit" to "Auto" if manual transfer operations as necessary.		This will allow the ATS to close into available source via manual operation.

For the Open(Standard) ATS (from TEST to ISOLATED):

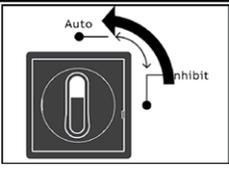
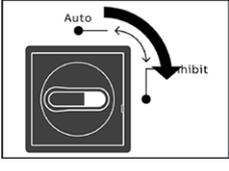
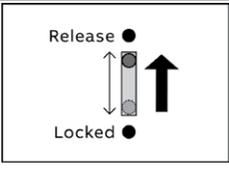
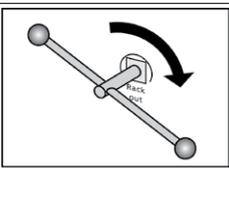
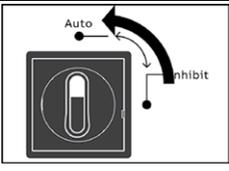
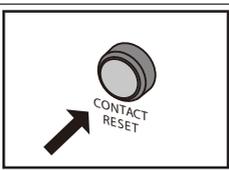
Step	Process	Picture	Requirements or Instructions
1	Turn the disconnect switch from "Auto" to "Inhibit" if the disconnect switch is on "Auto" position	 <p>The diagram shows a square panel with a circular dial. An arrow points from the 'Auto' position to the 'Inhibit' position, indicating a clockwise rotation.</p>	Auto mode on HMI should be disable
2	Move the switch lock of the bypass access panel to "Release" position	 <p>The diagram shows a vertical switch lock. An upward arrow indicates the movement from the 'Locked' position to the 'Release' position.</p>	
3	Rack out the ATS to "ISOLATED" position. When the ATS goes to "ISOLATED" position, the switch lock will then switch back to "Lock" automatically and the "ISOLATED" light on the bypass panel will be on.	 <p>The diagram shows a mechanical arm with a handle being rotated. The handle is labeled 'Rack out' and the rotation is indicated by a curved arrow.</p>	the ATS is fully disconnected.
4	Open the front door and pull out ATS. Then the ATS can be removed from the cabinet by lifting	 <p>The diagram consists of three vertically stacked panels. The top panel shows the front door of the cabinet being opened. The middle panel shows the ATS unit being pulled out of the cabinet. The bottom panel shows the ATS unit being lifted out of the cabinet.</p>	

### 3.8.2 ATS Rack In Operation

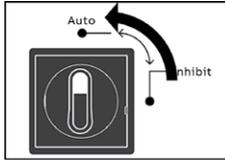
For the Delayed,Closed ATS (from ISOLATED to TEST):

Step	Process	Picture	Requirements or Instructions
1	<p>Make sure MTS contacts are on one source.                      Make sure the front cabinet door is closed. Racking in operation could not be done if the cabinet front door is not closed.</p>		
2	<p>Turn the disconnect switch from "Auto" to "Inhibit" if the disconnect switch is on "Auto" position</p>		<p>Auto mode on HMI should be disable</p>
3	<p>Move the switch lock of the bypass access panel to "Release" position</p>		
4	<p>Rack in the ATS to "TEST" position.                      When the ATS goes to "TEST" position, the switch lock will then switch back to "Lock" automatically and the "TEST" light on the bypass panel will be on.</p>		<p>The ATS is disconnected from the main bus, so no current will flow through its contacts. But the control circuit is connected to the power supply, so HMI operation is available</p>
5	<p>Turn the disconnect switch from "inhibit" to "Auto" if manual transfer operations as necessary. .</p>		<p>This will allow the ATS to close into available source via manual operation</p>

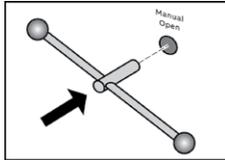
For the Delayed,Closed ATS (from TEST to CONNECTED):

Step	Process	Picture	Requirements or Instructions
1	Turn the disconnect switch from "Inhibit" to "Auto" if the disconnect switch is on "Inhibit" mode and ATS is not in off position		
2	Push "OFF" button on HMI display if ATS is not in off position		ATS contact should be closed to off position
3	Turn the disconnect switch from "Auto" to "Inhibit".		Auto mode on HMI should be disable
4	Move the switch lock of the bypass access panel to "Release" position		
5	Rack in the ATS to "CONNECTED" position. When the ATS goes to "CONNECTED" position, the switch lock will then switch back to "Lock" automatically and the "CONNECTED" light on the bypass panel will be on.		The alarm of Manual-Auto Mode on HMI should be active
6	Turn the disconnect switch from "Inhibit" to "Auto".		This will allow the ATS to close into available source via manual operation
7	Press the "Contact reset" button on the bypass panel.		This will reconnect the ATS to the same source with the MTS (At this point the current through the ATS has been reconnected)

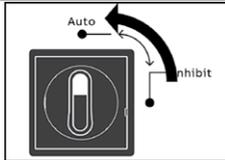
8 Turn the disconnect switch from "Auto" to "Inhibit".



9 Open MTS contact which is at "Off" position. (Note: For detailed "Manual open" instruction, please refer to section 3.7)

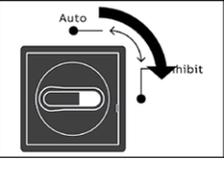
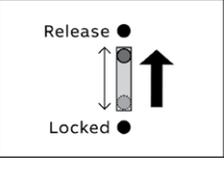
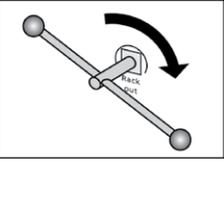
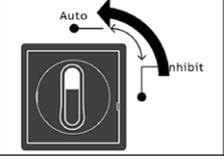


10 Turn the Bypass access panel disconnect switch from "Inhibit" to "Auto".

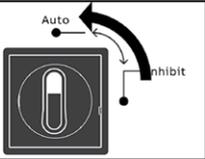
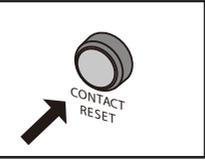
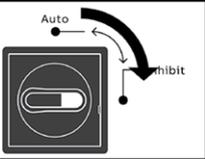
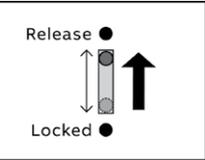
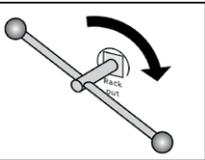
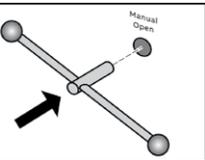
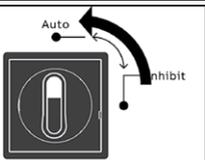


Check if the "Auto" indication light on the HMI is on.

For the Open(Standard) ATS (from ISOLATED to TEST)

Step	Process	Picture	Requirements or Instructions
1	<p>Make sure MTS contacts are on one source.                      Make sure the front cabinet door is closed. Racking-in operation could not be done if the cabinet front door is not closed.</p>		
2	<p>Turn the disconnect switch from "Auto" to "Inhibit" if the disconnect switch is on "Auto" position</p>		<p>Auto mode on HMI should be disable</p>
3	<p>Move the switch lock of the bypass access panel to "Release" position</p>		
4	<p>Rack in the ATS to "TEST" position.                      When the ATS goes to "TEST" position, the switch lock will then switch back to "Lock" automatically and the "TEST" light on the bypass panel will be on.</p>		<p>The ATS is disconnected from the main bus, so no current will flow through its contacts. But the control circuit is connected to the power supply, so HMI operation is available</p>
5	<p>Turn the disconnect switch from "inhibit" to "Auto" if manual transfer operations as necessary.</p>		<p>This will allow the ATS to close into available source via manual operation</p>

For the Open(Standard) ATS (from TEST to CONNECTED):

Step	Process	Picture	Requirements or Instructions
1	Turn disconnect switch from "Inhibit" to "Auto" if ATS and MTS not on the same source and disconnect switch is on "Inhibit" mode		
2	If the ATS and MTS not on the same source and disconnect switch is on "Auto" mode, press contact reset button on indication panel		ATS contact would be closed to the same source with MTS contact
3	Turn the disconnect switch from "Auto" to "Inhibit".		Auto mode on HMI should be disable
4	Move the switch lock of the bypass access panel to "Release" position		
5	Rack in the ATS to "CONNECTED" position. When the ATS goes to "CONNECTED" position, the switch lock will then switch back to "Lock" automatically and the "CONNECTED" light on the bypass panel will be on.		
6	Open MTS contact is on "Off" position. (Note: For detailed "Manual open" instruction.		
7	Turn the Bypass access panel disconnect switch from "Inhibit" to "Auto".		Check if the "Auto" indication light on the HMI is on.

---

## 3.9 ATS operation

For the description of possible ATS switching sequences, refer to section 2.5



1

# 4. Navigating HMI menu

## 4.1 Start Menu

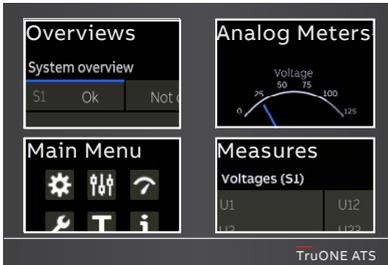


Fig. 4.1

Fig. 4.1 By touching on one of Start Menu choices, you can choose the Overviews -pages (upper left corner), Main Menu -pages (lower left corner), Analog Meters -pages (upper right corner) or Measures -pages (lower right corner)

Fig. 4.2 By touching on Start Menu upper left corner -image you can move to the Overviews -pages, where you will find Switch status and Supply info views, see the table below

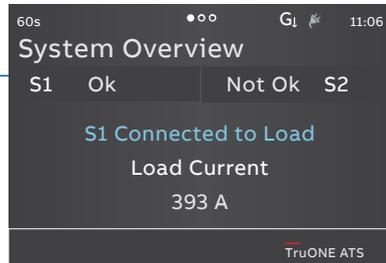
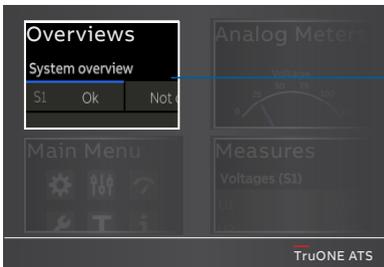


Fig. 4.2

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### System Overview (Switch status)

Shows voltages and frequencies of both supplies and the switch position.

### Supply info view

Shows voltages and frequencies of both supplies.

### Temperature view

Shows the HMI, device and pole temperatures.

HMI temperature indicates ambient temperature where the ATS power panel is installed, when HMI is mounted to door.

Device temperature indicates the temperature inside the ATS controller.

Pole temperature indicates the temperature on the load side terminals.

### Synchronization view (Enabled only when In-phase monitor is on)

Show the time to next sync, sync period.

---

### Alarm List

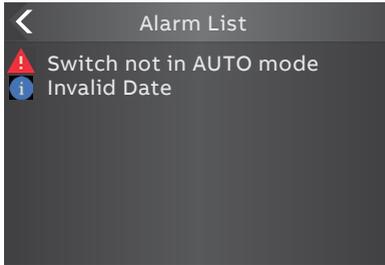


Fig. 4.3  
By touching on the alarm indication on the lower edge of the screen you will get the Alarm List.

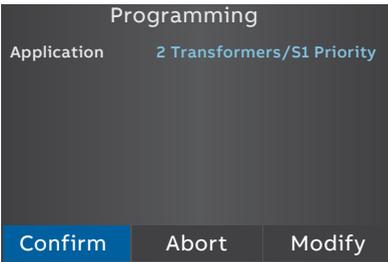


Fig. 4.5  
After you have changed the parameter, go back in the menu by pressing the < on the top left corner or Home key and when prompted confirm changes by Confirm option.

**On the lower edge** of the screen you can see the Alarms. If you touch on the alarm you will get the Alarm List.



**Notice**  
When a parameter is changed, always go back in the menu by pressing the home button and confirm the change when asked.

For more information, see chapter 6, Troubleshooting.

### Description of the icons



Fig. 4.4  
The location of the small icons and the alarms.

The small icons in System Overview -pages are:

#### On upper right corner

●○○○ Indicates the amount of pages and the page where you are at the moment



Auxiliary voltage connected

11:06 Time



Application set up as Transformer-Generator. Generator start-up signal deactivated



Application set up as Transformer-Generator. Generator start-up signal activated

#### On upper left corner

60s Time delay, in Alarm list you can see the name of delay at the same time, e.g. Override S1 Fail

## 4.2 Using main menu and setting parameters

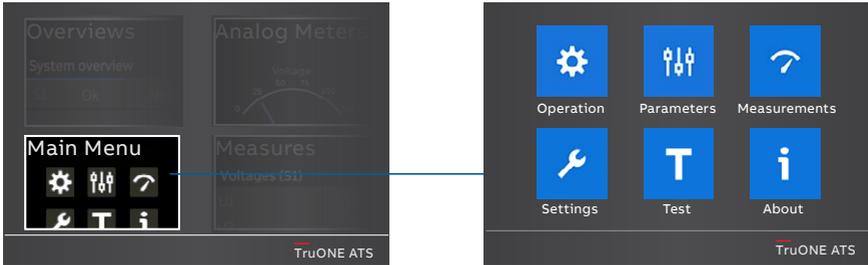


Fig. 4.6

By touching on Start Menu lower left corner -image you can move to the Main Menu page of Operation, Parameters, Measurements, Settings, Test and About, see the table below for the selections.



### Information

When you have changed the parameter, go always back in the menu and confirm the change always when asked.



### Information

The default values are marked in the menu tree by \*-marking.

### Password

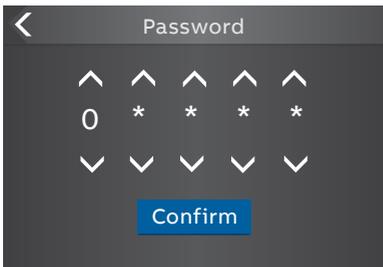


Fig. 4.7

Enter the password when asked, choose the right number by arrowheads and confirm, go forward entering number after number.



The default password is 00001, enter the password when prompted (see Fig. 4.1).

## 4.3 Menus and parameters

Operation	*Default
 Alarm Reset	Reset any active switch control alarms (open I failure, close I failure, open II failure, close II failure)
Bypass Time Delay	Bypass any currently running time delay
HMI Control Keys <sup>1)</sup>	Enabled* Disabled
Energy Counters	Reset energy values
Operation mode	AUTO* Automatic switch control mode. <sup>2)</sup> MAN Momentary Manual operation mode but warning that device is in manual mode will be shown by HMI. ATS will automatically send and remove the generator start signal but user intervention is required to initiate transfer and retransfer. MAN Permanent Manual operation mode but no manual mode warnings are shown by HMI. ATS will automatically send and remove the generator start signal but user intervention is required to initiate transfer and retransfer. MAN retransfer Same as Automatic Operation Mode but automatic retransfer sequence is disabled. Load will be kept on non-priority source until operator manually (by HMI or manual handle) or remotely operates the load back to priority source.

<sup>1)</sup> Note: Disables also 0-key in Delayed Transition models and Closed Transition models!

<sup>2)</sup> Note: When automatic mode parameter is confirmed there is 3 second delay before entering it.

Parameters	*Default
 System parameters	
Start Automatic Configuration	
Power distribution systems (see Fig. 2.2)	
Source 1	1 Phase, 2 Wire
	1 Phase, 3 Wire (Split-Phase)
	3 Phases, no Neutral (3ph3w)
	3 Phase with Neutral (3ph4w)*
	3 Phase, High-Leg Delta
Source 2	1 Phase, 2 Wire
	1 Phase, 3 Wire (Split-Phase)
	3 Phases, no Neutral (3ph3w)
	3 Phase with Neutral (3ph4w)*
	3 Phase, High-Leg Delta
Rated Voltage	
200 V (3ph), 208 V (3ph), 220 V (3ph), 230 V (3ph), 240 V (3ph), 277 V (3ph), 347 V (3ph), 380 V (3ph), <b>400 V (3ph)*</b> , 415 V (3ph), 440 V (3ph), 460 V (3ph), 480 V (3ph), 200 V (1ph), 220 V (1ph), 230 V (1ph), 240 V (1ph)	
Rated Frequency	
50 Hz*	
60 Hz	
Neutral Pole Location	
Pole 4* <sup>1)</sup>	
Pole 1	
Phase Sequence	
ABC*	
ACB	
Not Enabled	

<sup>1)</sup> Overlapping neutral always on Pole 4, this cannot be changed.

Continued on the next page

**Parameters (continued)** **\*Default**



Device Parameters

In-phase Monitor

Enable	Off*	
	On	
Synchronization Window	±1...10 % (±1* %)	A phase angle difference limits to restrict live to live source transfers unless both sources are within this certain window of electrical degrees.

Time Delays

Override S1 Failure	0...60 s (2* s)	S1 priority: How long the device is waiting S1 recovery before starting transfer sequence to S2. S2 priority: How long the device is keeping the load on failed S1 although S2 is already available.
Transfer from S1 to S2	0...60 min (2* s)	S1 priority: How long the device is keeping the load on failed S1 after S2 becomes available. S2 priority: How long the device waits before transfer sequence back to available S2 begins. This delay is bypassed by 'Override S1 Failure' in case of S1 failure.

Pre-transfer signal 1 / 2 / 3 / 4

Pre-transfer S1 to S2 Post-transfer S1 to S2 Pre-transfer S2 to S1 Post-transfer S2 to S1	0*...300 s	Enabled only when any digital outputs is configured as 'Pre-transfer Signal'.  Pre-transfer: How long the device is keeping pre-transfer signal activated before transferring from S1 to S2 or S2 to S1.  Post-transfer: How long the device is keeping pre-transfer signal activated after transferring from S1 to S2 or S2 to S1.
--	------------	---

Center-Off	0*...300 s	Only delayed transition I-O-II type. How long the switch is stopped at position O while transferring from S1 to S2 or from S2 to S1 and the original source is not completely down. Center-OFF delay is bypassed in case all phases are missing from the original source which we are leaving.
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Continued on the next page

Parameters (continued)		*Default
	Device Parameters (contuned)	
	Time Delays (continued)	
Override S2 Failure	0...60 s (2* s)	S1 priority: How long the device is keeping the load on failed S2 although S1 is already available. S2 priority: How long the device is waiting S2 recovery before starting transfer sequence to S1.
Transfer from S2 to S1	0...120 min (2* s)	S1 priority: How long the device waits before transfer sequence back to available S1 begins. This delay is overridden by 'Override S2 Failure' in case of S2 failure. S2 priority: How long the device is keeping the load on failed S2 although S1 is already available.
Elevator Pre-transfer signal 1 / 2 / 3 / 4		
Elevator Pre-signal S1-S2	0*...60 s	Enabled only when any digital output is configured as 'Elevator pre-signal'.
Elevator Post-signal S1-S2		Pre-transfer: How long the device is keeping pre-signal activated before transferring from S1 to S2 or from S2 to S1.  Post-transfer: How long the device is keeping pre-signal activated after transferring from S1 to S2 or from S2 to S1.
Elevator Pre-signal S2-S1		
Elevator Post-signal S2-S1		
Generator Stop	0...60 min (5* min)	Enabled only when generator is in use. Generator cooling time, how long the device is keeping the generator running without load after returning to priority source.
Load Shed	0*...60 s	Enabled only when any digital output is configured as 'Load Shed'. How long before the transfer from priority to non-priority source the device activates load shed signal.

Continued on the next page

Parameters (continued)	*Default	
<b>Device Parameters (continued)</b>		
 <p>Voltage &amp; Frequency Setpoints</p>	<p>Defines the voltage and frequency limits for source being acceptable. Source has an anomaly when measured voltage/frequency goes out of range drop-out lower/drop-out Upper. Source becomes acceptable when measured voltage/frequency goes back in range pick-up lower/pick-up higher.</p>	
<b>S1 Setpoints</b>		
S1 Drop-out Voltage	Upper Threshold	102...120 % Un (115* % Un)
	Lower Threshold	75...97 % Un (85* % Un)
S1 Pick-up Voltage	Upper Threshold	101...119 % Un (114* % Un)
	Lower Threshold	85...99 % Un (90* % Un)
S1 Drop-out Frequency	Upper Threshold	101...120 % fn (115* % fn)
	Lower Threshold	80...99 % fn (85* % fn)
S1 Pick-up Frequency	Upper Threshold	100.5...119.5 % fn (114* % fn)
	Lower Threshold	80.5...99.5 % fn (86* % fn)
<b>S2 Setpoints</b>		
S2 Drop-out Voltage	Upper Threshold	102...120 % Un (115* % Un)
	Lower Threshold	75...97 % Un (85* % Un)
S2 Pick-up Voltage	Upper Threshold	101...119 % Un (114* % Un)
	Lower Threshold	85...99 % Un (90* % Un)
S2 Drop-out Frequency	Upper Threshold	101...120 % fn (115* % fn)
	Lower Threshold	80...99 % fn (85* % fn)
S2 Pick-up Frequency	Upper Threshold	100.5...119.5 % fn (114* % fn)
	Lower Threshold	80.5...99.5 % fn (86* % fn)
Voltage Unbalance Setpoints	Options to change voltage unbalance measurement limits or disable unbalance measurement completely.	
Unbalance Drop-Out	±5...30 % Un (±10* % Un)	
Unbalance Pick-Up	±3...28 % Un (±8* % Un)	
Unbalance Measuring	Off*	
	On	

Continued on the next page

**Parameters** (contunued) **\*Default**



Device Parameters (continued)

Generator Exercisers

Switch and generator functioning can be tested automatically and also periodically by using four independent exerciser events. Test on load function starts the generator and transfers the load to it. Test off load function only starts the generator for the duration of the event. Overlapping events are prioritized, event 1 has the highest priority.

Exerciser 1 / 2 / 3 / 4

Status

Disabled\*

Non-periodic

Daily

Weekly

Bi-weekly

Monthly

Yearly

Function

No Function\*

Test on Load

Test off load

Duration  
(hh:mm:ss)

00:00:00...24:00:59 (00:01:00\*)

Time  
(hh:mm)

Starting time of the event.  
00:00\*...23:59

Date (month day,  
year)

Starting date of the event  
Jan 01, 2020... (---\*)

Application

S1-Transformer/S2-Generator\*

S2-Transformer/S1-Generator

2 Transformers/S1 Priority

2 Transformers/S2 Priority

2 Transformers/No Priority

Commit Transfer

Off\*

If priority source fails, device cancels the transfer sequence to non-priority source (generator) if priority source returns before non-priority source becomes acceptable.

On

If priority source fails, device continues transfer sequence to non-priority source (generator) even if priority returns before non-priority souce becomes acceptable. Retransfer sequence according to time delays.

Parameters (continued)	*Default
<b>Device Parameters (continued)</b>	
<b>High current alarm</b>	
Status	
Enabled	If measured current is higher than ten times the nominal value device will prevent all operations and show high current alarm on-screen. After high current status is over, device will start operating normally.
Disabled*	
Alarm reset required	
Yes	User confirmation is required before re-entering normal operation after high current status.
No*	Normal operation is started automatically after high current status.
Transfer to Dead Source	
On*	User can transfer to an unavailable source by using HMI keys I/II or by a remote command.
Off	Transfer to an unavailable source is disabled.
Source Loss Center-Off Delay	
On*	User can select whether to always run the 'center-off' timer or skip it if there is no voltage on any of the phases on the source from where the ATS is transferring from.
Off	
Source Loss Pre-Signal Delay	
On*	User can select whether to always run the pre-signal delays 'elevator pre-signal S1-S2', 'elevator pre-signal S2-S1', 'pre-transfer S1 to S2', 'pre-transfer S2 to S1' timers or skip these if there is no voltage on any of the phases on the source from where the ATS is transferring from.
Off	
Gen Start in Manual Mode	
Yes*	User may choose if device sends generator start signal when slide switch is not in AUTO mode.
No	Send the generator start signal regardless of slide switch position.
No	If slide switch is in lock or MAN mode device won't send the generator start signal.
MAN Retransfer w/ Override	
Off*	Affects only MAN retransfer mode. Select whether to stay in failed non-priority or transfer automatically back to priority if it is healthy.
On	Stay at failed non-priority.
On	Transfer to priority if non-priority is not ok.

## Measurements



### Switch Diagnostic

Total operations	I-O-II switches: Total number of transfers I-O, O-II, II-O and O-I. I-II switches: Total number of transfers I-II and II-I
Manual operations	Total transfers operated by the handle.
Number of load transfers	Total number of transfers I-II and II-I
Transfer time	Time it took to transfer the load between sources (ms)
Source fail transfers	Total number of automatic transfers due to source failures.
Days energized	
Total time on S1	Hours
Total time on S2	Hours
Time S1 available	Minutes
Time S2 available	Minutes
Last generator start	MMM DD, YYYY hh:mm:ss
Generator starting time	How long it took for the generator to become acceptable after latest start (s).
In-phase time	How long it took for the in-phase monitor to achieve synchronized transfer (s).

### Event Log

View Log	250 time stamped events, latest first.
Clear Log	Delete all log entries.

### Harmonics

Harmonic components up to 15th are calculated for the selected phase.

Measured Phase	Disabled*	
	Phase 1	
	Phase 2	
	Phase 3	
Voltage	Total distortion	THD for each phase of both voltage sources.
	S1 Components	Each harmonic component of the selected S1 phase.
	S2 Components	Each harmonic component of the selected S2 phase.

### Power Factor

Enabled only when current measurement module is connected.

**Settings**

**\*Default**



Standard I/O settings

I 01 / I 02 / I 03

Function	No function	Input disabled.
Emergency Stop		Transfers to O position in delayed transition I-O-II type switches. Disables automatic control mode in both delayed and open transition types.
Remote Test On Load		Start/stop test on load sequence in rising (NO) or falling (NC) edge of the input signal.
Remote Test Off Load		Start/stop test off load sequence in rising (NO) or falling (NC) edge of the input signal.
Inhibit ATS		Prevent switch control operations, configuration, test sequences and generator start in case of priority source failure.
Manual Retransfer		Disables automatic retransfer back to priority source.
Source Priority S1		Sets priority for source 1 in transformer-transformer application.
Source Priority S2		Sets priority for source 2 in transformer-transformer application.
Inhibit Transfer		Disables automatic transfer from priority to non-priority source.
Bypass Running Time Delays		Bypass any currently running time delay.
Remote Control to S1* (default in I 01)		Transfer to S1 when active. Overridden by activated 'Remote Control to OFF' signal.
Remote Control to OFF		Transfer to O position when active.
Remote Control to S2* (default in I 02)		Transfer to S2 when active. Overridden by activated 'Remote Control to OFF' or 'Remote Control to S1' signals.
Reset Alarm		Reset any active switch control alarms (open I failure, close I failure, open II failure, close II failure).
Inhibit Transfer w/ Override		Prevent transfer from an acceptable power source.
Load Shed Input Signal		Transfer to priority source in 2-position switches. Transfer to Off position in 3-position switches in case the priority source is not acceptable.
Manual-Auto Mode* (default in I 03)		Toggle automatic/HMI control mode, input is active only in rising/falling edge according to contact type.
Contact Type	NC	Active open
	NO*	Active closed

Continued on the next page

**Settings** (continued)**\*Default**

## Standard I/O settings (continued)

O 01, O 02, O 03, O 04

Function	No function	Output disabled.
Alarm / Product availability		Signals any active alarms or ATS being disabled for automatic transfer operations.
Load Connected to S1*(default in O 01)		Switch in position I.
Load Disconnected		Switch in position O.
Load Connected to S2*(default in O 02)		Switch in position II.
Pre-transfer Signal 1		Signal is activated and transfer is delayed according to pre-transfer delay. Signal is kept activated according to post-transfer delay after transfer.
Pre-transfer Signal 2		Signal is activated and transfer is delayed according to pre-transfer delay. Signal is kept activated according to post-transfer delay after transfer.
Pre-transfer Signal 3		Signal is activated and transfer is delayed according to pre-transfer delay. Signal is kept activated according to post-transfer delay after transfer.
Pre-transfer Signal 4		Signal is activated and transfer is delayed according to pre-transfer delay. Signal is kept activated according to post-transfer delay after transfer.
Source 1 available* (default in O 03)		No anomalies in S1 voltage supply.
Source 1 available* (default in O 04)		No anomalies in S2 voltage supply.
Load Shed Output Signal		Used for shedding non-essential loads before transferring to non-priority source. Signal is activated before transferring to non-priority source according to load shed delay and kept activated until load is transferred back to priority source.

Continued on the next page

Settings (continued)		*Default
		
Standard I/O settings (continued)		
O 01, O02, O03, O04 (continued)		
Function (continued)		
	Elevator pre-signal 1	Signal is activated and transfer is delayed according to Elevator pre-signal delay. Signal is kept activated according to Elevator post-signal delay after transfer.
	Elevator pre-signal 2	Signal is activated and transfer is delayed according to Elevator pre-signal delay. Signal is kept activated according to Elevator post-signal delay after transfer.
	Elevator pre-signal 3	Signal is activated and transfer is delayed according to Elevator pre-signal delay. Signal is kept activated according to Elevator post-signal delay after transfer.
	Elevator pre-signal 4	Signal is activated and transfer is delayed according to Elevator pre-signal delay. Signal is kept activated according to Elevator post-signal delay after transfer.
	Transfer Alarm	Activate output after ATS has transferred to nonpriority source.
Contact Type	NC	Active open.
	NO*	Active closed.
Modules (See Chapter 5, Electronic accessories)		
System		
	RESET to Factory Setting	Restore default parameter values
	Date <sup>1)</sup>	Month day, year
	Time <sup>1)</sup>	Hours:Minutes
Language	English*	
	Italian	
	French	
	German	
	Spanish	
	Russian	
	Chinese	
	New Password	Five digits
Temperature Unit	Celsius*	
	Fahrenheit	
Clock Format	24 h*	
	12 h	

<sup>1)</sup> Clock capacitor must be charged before inserting Date/Time. Clock capacitor is charged from source voltage (not AUX) and takes about 10 minutes. Clock capacitor keeps the date/time saved for 48 h in case of no source voltage available.

**Settings (continued)****\*Default**

## Standard I/O Settings (continued)

View

## Ammeter Phase

I Max\*

Ne

L1

L2

L3

## S1 Voltmeter Phase

V Max\*

U12

U23

U31

## S2 Voltmeter Phase

V Max\*

U12

U23

U31

Test	*Default
	On-Load Test Settings
	Bypass Local Test
	Bypass if Generator Fails*
	Stay on Generator
	Bypass Remote Test
	Bypass if Generator Fails*
	Stay on Generator
	Bypass Generator Exerciser
	Bypass if Generator Fails*
	Stay on Generator
Test On Load	Test generator with transferring the load. Test with switch transfer.
Test Off Load	Test generator without transferring the load. Test without switch transfer.
HMI Test	Initiate display test screen and turn all LED's on. This function is not available when time delay is ongoing.
Optional modules (See Chapter 5, Electronic accessories)	

## About

	HMI	HMI serial number
		Software version
		Software subversion
		HMI Type code
	Controller Unit	Time
	Date	
	Serial number	
	Normative	
	Controller software version	
	Controller software subversion	
Automatic Transfer Switch	TAG name	
	ATS Type Code	
	ATS serial number	
	Rated current	
	Number of Poles	
	ATS Type	
Modules (See Chapter 5, Electronic accessories)		

## 4.4 Analog meters and Measures

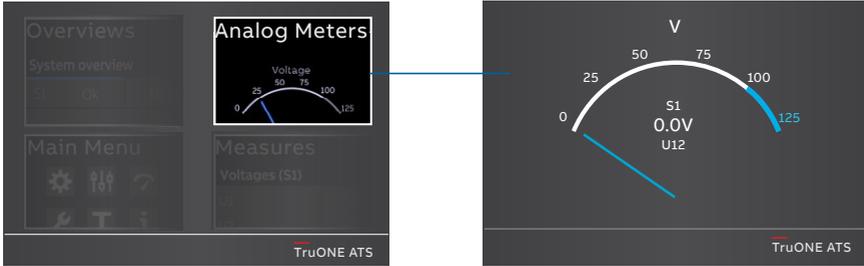


Fig. 4.3 By touching on Start Menu upper right corner -image you can find the analog meters information, see the table below

---

S1 Voltage meter

S2 Voltage meter

Current meter

Power meter

VAR meter

VA meter

---

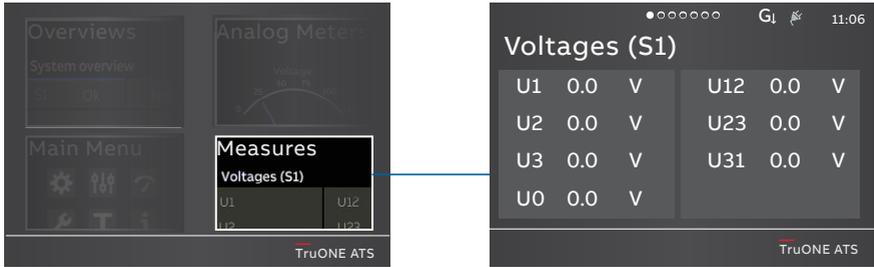


Fig. 4.9 By touching on Start Menu lower right corner -image you can find the measured data, see the table below

---

Voltages (S1)

---

Voltages (S2)

---

Current

---

Active power

---

Reactive power

---

Apparent power

---

Energy counters

---

# 5. Electronic accessories



**Warning**

Hazardous voltage may be present within the panel when connecting electronic accessories. Disconnect all sources of power to the ATS panel before connecting Ekip modules.

**Avertissement**

Une tension dangereuse peut-être présente dans le panneau lors de la connexion d'accessoires électroniques. Déconnectez toutes les sources d'alimentation du panneau ATS avant de connecter les modules EKIP.

Ekip Connect Software and Programming -modules are suitable for ZBTS Bypass isolation automatic transfer switches, see chapters 5.1...5.2.

- Ekip Connect -software
- Ekip Programming -module

Ekip Signaling and Com -modules are available for ZBTS 1000A-3000A, Bypass isolation automatic transfer switches with Level 4 controllers (Touch control interfaces). These modules are mounted with auxiliary power supply module, OXEA1 (see the mounting steps in section 2, Chapter 9, Mounting of accessories).



Fig. 5.1 Ekip Programming

(except Ekip Signalling 10K) are mounted with auxiliary power supply module are (see Chapters 5.3...5.5):

- Ekip signalling modules;
  - Ekip signalling 2K-1-OX
  - Ekip signalling 2K-2-OX
  - Ekip signalling 2K-3-OX
  - Ekip Signalling 10K (mounting separate on DIN-rail)
- Ekip Com modules;
  - Ekip Com Modbus RTU
  - Ekip Com Modbus TCP
  - Ekip Com Profibus DP
  - Ekip Com DeviceNet
  - Ekip Com Profinet
  - Ekip Com EtherNet/IP
  - Ekip Com Hub



Fig. 5.2 Ekip Signalling and Com -modules are mounted to Bypass isolation automatic transfer switch with a auxiliary power supply module, OXEA1.

## 5.1 Ekip Connect -software

Ekip Connect is a freeware for communication and test of TruONE automatic transfer switches. The software is compatible with all TruONE automatic transfer switches. It can be installed on PCs equipped with the Microsoft Windows® operating system. Download it from the website, see the address below:  
<http://www.abb.com/abblibrary/DownloadCenter/>

With its communication function, it allows you to:

- Monitor the state of the connected automatic transfer switches and record in-for
- Configure automatic transfer switches with customized parameters.
- Configure electronic accessories, connected to automatic transfer switch via Local Bus.
- Download information from automatic transfer switches.
- Create communication reports.
- Reset configurations.

Further information on the Ekip Connect application is available from the web site, see the address below, particularly the manual 1SDH000891R0002.

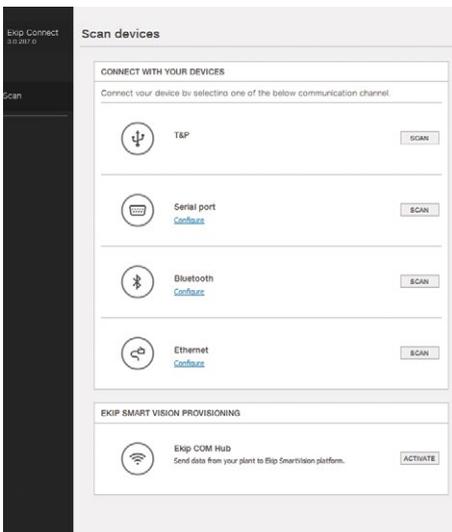


Fig. 5.3 Ekip Connect -software

## 5.2 Ekip Programming -module

The Ekip Programming -module is suitable to use with all ZBTS 1000A-3000A, Bypass isolation automatic transfer switches. You can connect the module via the programming port, see Fig. 5.5. The programming port is only compatible for use with Ekip Programming.

Ekip Programming -module allows you to:

- With Ekip Connect software update the software and load, set and read the parameters

If the firmware is updated while the device is powered via either voltage source, the disconnect switch must be in INHIBIT mode.

If the firmware is updated, HMI (RJ45) cable should be replaced and the max length is less than 1 meter.



Fig. 5.4 Ekip Programming -module

The Ekip Programming -module draws its power from the PC and connects one side directly to the programming port (see Fig. 5.6) and on the other to the USB port of the PC with the cable supplied.



### Notice

Ekip Programming only powers the controller board (HMI and external modules excluded). Therefore, in order to identify all connected parts with Ekip Connect, the auxiliary power supply module, type OXE A1, must be used (see chapter 5.4).

### Remarque

Ekip programmation alimente uniquement la carte de contrôleur (IHM et modules externes exclus). Par conséquent, afin d'identifier toutes les parties connectées avec Ekip Connect, le module d'alimentation auxiliaire, type OXE A1, doit être utilisé (voir chapitre 5.4).

### 5.2.1 LED indications

Ekip Programming -module turns on after connecting to the PC, and is equipped with two LEDs. The first, illuminates green indicating that the module is on, and the second, illuminates yellow indicating active communication.



Fig. 5.5 Programming port (USB port) is situated in the front of the HMI, on left side

## 5.3 Auxiliary power supply module

The auxiliary power supply module, type OXE1, supplies non-insulated power to the external Ekip-modules, HMI and main control unit. It is supplied by external supply, for example from generator battery or from isolated transformer connected to the main circuit. Powering product only with auxiliary power supply module limits some operation functions of the main

control unit, for example: operation of sensor module is not possible.

Connections are push-in spring terminals, no tool is required.

For external wiring, cable cross section; AWG 22-16 / 0.5-1.5 mm<sup>2</sup>.

### 5.3.1 Electrical characteristics

The following table lists the electrical characteristics:

Module	OXEA1
Power supply input voltage	12 - 24 V DC $\pm$ 10 % SELV
Nominal power consumption	5 - 12 W
Inrush current	Maximum 2 A

Table 5.1 Electrical characteristics of auxiliary power supply module OXE1



Fig. 5.6 Auxiliary power supply module, type OXE1, is needed when Ekip Signalling, Com and Link -modules are mounted to TruCONTROL\_

### 5.3.2 LED indications

LED	Indication	Description
Power LED, green	On, fixed	Power is connected to the input of the module.
	Off	Power is not connected.

Table 5.2 Indication / auxiliary power supply module OXE1



Fig. 5.7 Signals of auxiliary power supply module OXE1

## 5.4 Ekip Signalling 2K-\_ -module

The Ekip Signalling 2K-\_ is a signalling accessory module. It is suitable for Level 4 controllers (touch control interfaces). The module has:

- Two digital inputs, and two contacts for output signals.
- A power status LED, and four signalling LEDs (one LED for every input/output).



### Notice

On each ATS, a maximum of three Ekip Signalling 2K modules can be installed: one 2K-1, one 2K-2, and one 2K-3. These modules differ by their name and label, and have distinct wiring, but they are identical in terms of their characteristics and manner of installation.

### Remarque

Sur chaque ATS, un maximum de trois modules Ekip signalisation 2K peuvent être installés: un 2K-1, un 2K-2 et un 2K-3. Ces modules diffèrent par leur noms et leur labels, et ont un câblage différent, mais ils sont identiques par leurs caractéristiques et leur mode d'installation.

### 5.4.1 Electrical characteristics of Ekip Signalling 2K-\_ -module

The following table lists the electrical characteristics of the module:



Fig. 5.8 Ekip Signalling 2K -module

Component	Characteristics
Output contacts	Maximum switching voltage*: 150 V DC / 250 V AC
	Breaking power*: 2 A @ 30 V DC, 0.8 A @ 50 V DC, 0.2 A @ 150 V DC, 4 A @ 250 V AC
	Dielectric strength between each contact and coil: 1000 V AC (1 minute @ 50 Hz)
Input contacts	Dielectric strength between open contacts: 1000 V AC (1 minute @ 50 Hz)
	5 V@2.5 mA Do not connect to any power supply

Table 5.3 Electrical characteristics of Ekip Signalling 2K-\_ -module

### 5.4.2 Access from the display / Ekip Signalling 2K-\_ -module

With modules energized, and Local Bus enabled, the presence of the modules on the module slot activates additional menus on the display:

- In order to configure the inputs and output contacts.
- To display information on the modules and the state of inputs and outputs.

The following table illustrates the path for accessing the configuration parameters of the module from the display:

Settings (*Default)		Description
Modules (Optional modules)		
Ekip Signalling 2K-1 / -2 / -3		
I 11/12, I 21/22, I 31/32		
Function	No Function*	Input disabled
	Emergency Stop	Transfers to O position in delayed transition I-O-II type switches. Disables automatic control mode in both delayed and open transition types.
	Remote Test on Load	Starts/stops test on load sequence in rising (NO) or falling (NC) edge of the input signal.
	Remote Test off Load	Starts/stops test off load sequence in rising (NO) or falling (NC) edge of the input signal.
	Inhibit ATS	Prevents switch control operations, configuration, test sequences and generator start in case of priority source failure.
	Manual Retransfer	Disables automatic transfer back to priority source.
	Source Priority S1	Sets priority for source 1 in transformer-transformer application.
	Source Priority S2	Sets priority for source 2 in transformer-transformer application.
	Inhibit Transfer	Disables automatic transfer from priority source to non-priority source.
	Bypass Running Time Delays	Bypass any currently running time delay.
	Remote Control to S1	Transfers to S1 when active. Overridden by activated 'Remote Control to OFF' signal.
	Remote Control to OFF	Transfers to position O when active.
	Remote Control to S2	Transfers to S2 when active. Overridden by activated 'Remote Control to OFF' or 'Remote Control to S1' signals.
	Reset Alarm	Resets any active switch control alarms (open I failure, close I failure, open II failure, close II failure).
	Inhibit Transfer w/ Override	Prevent transfer from an acceptable power source.
	Load Shed Input Signal	Transfer to priority source in 2-position switches. Transfer to Off position in 3-position switches in case the priority source is not acceptable.
	Manual-Auto Mode	Manual-Auto mode transition.
Contact Type	NC	Active open
	NO*	Active closed

Continued on the next page

Settings (*Default)		Description
Modules (Optional modules) (continued)		
Ekip Signalling 2K-1 / -2 / -3		
O 11/12, O 21/22, O 31/32		
Function	No Function*	Input disabled
	Alarm/Product Availabilit	Signals any active alarms or ATS being disabled for automatic transfer operations.
	Load Connected to S1	Switch in position I.
	Load Disconnected	Switch in position O.
	Load Connected to S2	Switch in position II
	Pre-transfer Signal 1	Signal is activated and transfer is delayed according to pre-transfer delay. Signal is kept activated according to post-transfer delay after transfer.
	Pre-transfer Signal 2	Signal is activated and transfer is delayed according to pre-transfer delay. Signal is kept activated according to post-transfer delay after transfer.
	Pre-transfer Signal 3	Signal is activated and transfer is delayed according to pre-transfer delay. Signal is kept activated according to post-transfer delay after transfer.
	Pre-transfer Signal 4	Signal is activated and transfer is delayed according to pre-transfer delay. Signal is kept activated according to post-transfer delay after transfer.
	Source 1 Available	No anomalies in S1 voltage supply.
	Source 2 Available	No anomalies in S2 voltage supply.
	Load Shed Output Signal	Used for shedding non-essential loads before transferring to non-priority source. Signal is activated before transferring to non-priority source according to load shed delay and kept activated until load is transferred back to priority source.
	Elevator pre-signal 1	Signal is activated and transfer is delayed according to Elevator pre-signal delay. Signal is kept activated according to Elevator post-signal delay after transfer.
	Elevator pre-signal 2	Signal is activated and transfer is delayed according to Elevator pre-signal delay. Signal is kept activated according to Elevator post-signal delay after transfer.
	Elevator pre-signal 3	Signal is activated and transfer is delayed according to Elevator pre-signal delay. Signal is kept activated according to Elevator post-signal delay after transfer.
	Elevator pre-signal 4	Signal is activated and transfer is delayed according to Elevator pre-signal delay. Signal is kept activated according to Elevator post-signal delay after transfer.
	Transfer Alarm <sup>1)</sup>	Activate output after ATS has transferred to non-priority source.
Contact Type	NC	Active open
	NO*	Active closed

**Test**

:

Modules (Optional modules)

Ekip Signalling 2K-1 / -2 / -3

Auto Test

:

Table 5.4 Configuration and test parameters of Ekip Signalling 2K\_-module in HMI

The following table illustrates the path from the display for accessing information on the module:

**About****Description**

:

Modules (Optional modules)

Ekip Signalling 2K-1 / -2 / -3

SN

Serial number

Version

Software version

Input 1

The logical state of the inputs:

Input 2

"Off" if not active, "On" if active

Output 1

The state of the output contacts:

Output 2

"Open" if open, "Closed" if closed

:

Table 5.5. Information of Ekip Signalling 2K\_-module in HMI

### 5.4.3 LED indications and inputs/outputs of Ekip Signalling 2K\_-module

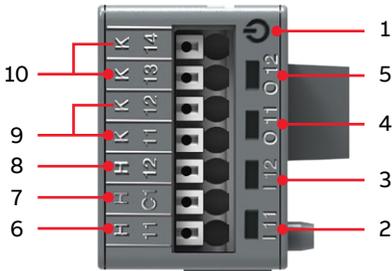


Fig. 5.9 Signals and inputs/outputs of Ekip Signalling 2K\_-module

- 1 Power LED, green. The possible states are:
    - Off: power supply absent.
    - On fixed: power supply and communication with the device present (with a device with the Alive LED option disabled).
    - On, with one flash per second (synchronized with that of the green LED on the device): power supply and communication with device present (with a device with the Alive LED option enabled)
    - On, with two quick flashes per second (not synchronized with those of the green LED on the device): power supply present, and communication with device absent (for example: for Local Bus disabled) <sup>1)</sup>
  - 2 Green<sup>3)</sup> LED for signalling the physical state of the input H x 1<sup>2)</sup>. The possible states are:
    - Off: floating input
    - On fixed: input short-circuited on H Cx<sup>2)</sup>
  - 3 Green<sup>3)</sup> LED for signalling the physical state of the input H x 2<sup>2)</sup>. The possible states are:
    - Off: floating input
    - On fixed: input short-circuited on H Cx
  - 4 Green<sup>3)</sup> LED for signalling contact K x 1 - K x 2<sup>2)</sup>. The possible states are:
    - Off: contact open
    - On fixed: contact closed
  - 5 Green<sup>3)</sup> LED for signalling the state of the contact K x 3 - K x 4<sup>2)</sup>. The possible states are:
    - Off: contact open
    - On fixed: contact closed
  - 6 Input I x 1
  - 7 Conductive part of the inputs H x 1 and H x 2<sup>2)</sup>
  - 8 Input I x 2<sup>2)</sup>
  - 9 Output contact pin O x 1<sup>2)</sup>
  - 10 Output contact pin O x 2<sup>2)</sup>
- 1) The absence of communication is signalled immediately by the power LED, unlike the outputs which (apart from those programmed to be activated in the case of disconnection) are deactivated if the condition persists for at least 8 s
- 2) With x = 1, 2, or 3
- 3) The LED turns on and off according to the physical state of the input, without taking any account of how the Delay parameter is set.

Connections are push-in spring terminals, no tool is required.

For external wiring, cable cross section; AWG 22-16 / 0.5-1.5 mm<sup>2</sup>.

## 5.5 Ekip Com \_ -modules

Suitable Ekip Com \_ -modules are:

- Ekip Com Modbus RTU -OX
- Ekip Com Modbus TCP-OX
- Ekip Com Profibus DP
- Ekip Com DeviceNet
- Ekip Com Profinet
- Ekip Com EtherNet/IP
- Ekip Com Hub

### 5.5.1 Ekip Com Modbus RTU -module

The Ekip Com Modbus RTU is a communication accessory module, which integrates the automatic transfer switch in an industrial remote supervision and control network. The module is suitable for all ZBTS 1000A-3000 A and ZTSC 400-3000 A, Bypass Isolation ATS.

It can be connected to a RS-485 network with a Modbus RTU communication protocol, and allows you to:

- Connect the automatic transfer switch to the network, with dialog functionality.
- Provide the status information of the automatic transfer switch (open, closed).

For the communication lines W1 and W2, Belden type 3105A or equivalent cables must be used.



Fig. 5.10 Ekip Com Modbus RTU -module

**5.5.1.1 Signalling**

The following table illustrates the possible signals, and their meaning:

LED	Indication	Description
Power LED, green	Off	Power supply absent.
	On fixed	Power supply and communication with the device present.
	On, with two quick flashes per second	Power supply present, and communication with device absent.
RX and TX LEDs, green	Off	Modbus RTU communication not active.
	On, flashing rapidly	Modbus RTU communication active.

Table 5.6 Indication / Ekip Com Modbus RTU -module

**5.5.1.2 Termination resistor**

On the Ekip Com Modbus RTU module, it is possible to activate the terminating resistance  $R_{term} = 120 \Omega$ . To enable the  $R_{term}$ , the corresponding dip-switches 1 and 2 (on the side of the module) must be positioned to ON. This option must be selected before the installation of the module. With the Ekip Com Modbus RTU modules, the dip-switches 3 and 4 of the Rpol (polarization resistance) are not used.



Fig. 5.11 Signals of Ekip Com Modbus RTU -module

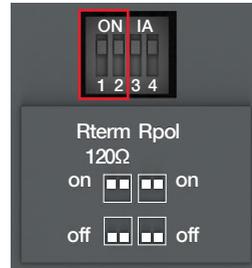


Fig. 5.12 Termination resistor; To enable the  $R_{term}$ , the dip-switches 1 and 2 must be positioned to ON. This option must be selected before the installation of the module

**5.5.1.3 Access from the display / Ekip Com Modbus RTU –module**

With modules energized, the presence of the modules on the module slot activates additional menus on the display.

The following table illustrates the path for accessing the configuration parameters of the modules from the display:

Settings (*Default value)		Description
:		
Modules (Optional modules)		
Ekip Com Modbus RTU		
Serial address	1-247, default 247*	Address to be assigned to the modules. NOTE: devices connected to the same network must have different addresses
Baudrate	9600 bit/s, 19200 bit/s*, 38400 bit/s	Data transmission speed
Physical protocol	8.E,1*, 8.O,1, 8.N,2, 8.N,1	8.E,1 = 8 data bits, 1 EVEN parity bit, 1 STOP bit 8.O,1 = 8 data bits, 1 ODD parity bit, 1 STOP bit 8.N,2 = 8 data bits, no parity bit, 2 STOP bits 8.N,1 = 8 data bits, no parity bit, 1 STOP bit
:		

Table 5.7 The path for accessing the configuration parameters of the Ekip Com Modbus RTU -module from the display

The following table illustrates the path from the display for accessing information on the module:

About	Description
:	
Modules (Optional modules)	
Ekip Com Modbus RTU	
SN	Serial number
Version	Software version
:	

Table 5.8 Information of Ekip Com Modbus RTU -module in HMI

### 5.5.2 Ekip Com Profibus DP -module

The Ekip Com Profibus DB is a communication accessory module, which integrates the automatic transfer switch in an industrial remote supervision and control network. The module is suitable for all ZBTG 1000A-3000A Bypass Isolation ATS.

It can be connected to a network RS-485 with protocol of Profibus communication, and allows of:

- Connect the automatic transfer switch as slaves to the network, with dialog functionality.
- Provide the status information of the automatic transfer switch (open, closed).

For the communication lines W5 and W6 , Belden type 3079A or equivalent cables must be used.



Fig. 5.13 Ekip Com Profibus DP -module

### 5.5.2.1 LED indications

The following table illustrates the possible signals, and their meaning:

LED	Indication	Description
Power LED, green	Off	Power supply absent.
	On fixed	Power supply and communication with the device present.
	On, with two quick flashes per second	Power supply present, and communication with device absent.
RX LED, green	Off	Communication not active.
	On, fixed	Communication active.
TX LED, green	Off	Communication not active.
	On, flashing	Communication active.

Table 5.9 Indication / Ekip Com Profibus DP -module

### 5.5.2.2 Termination resistor

The Ekip Com Profibus DP modules provide the possibility to insert a 220 Ω termination resistor on the RS-485 bus, by setting the DIP-switches Rterm (1 and 2) on the side of the modules in position ON.

In the event of termination of the bus, a 390 Ω pull-up or pull-down resistor must also be inserted on the lines, by setting the DIP-switches Rpol (3 and 4) in position ON.

These options must be selected before installation of the modules.



Fig. 5.14 Signals of Ekip Com Profibus DB -module

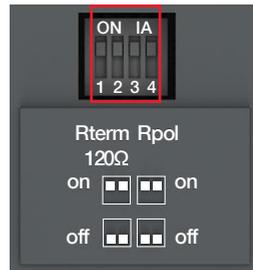


Fig. 5.15 Termination resistor; To enable the Rterm, the dip-switches 1 and 2 must be positioned to ON. When Rterm is activated, the Rpol must also be activated by turning dip-switches 3 and 4 to ON position. These options must be selected before the installation of the modules

### 5.5.2.3 Access from the display / Ekip Com Profibus DB -module

With modules energized, the presence of the modules on the module slot activates additional menus on the display.

The following table illustrates the path for accessing the configuration parameters of the modules from the display:

Settings (*Default value)	Description
:	
Modules (Optional modules)	
Ekip Com Profibus DB	
Serial address	1-125, default 125*
	Address to be assigned to the modules. IMPORTANT: devices connected to the same network must have different addresses
:	

Table 5.10 Configuration of Ekip Com Profibus DB -module in HMI

The following table illustrates the path from the display for accessing information on the module:

About	Description
:	
Modules (Optional modules)	
Ekip Com Profibus DB -module	
SN	Serial number
Version	Software version
:	

Table 5.11 Information of Ekip Com Profibus DP -module in HMI

### 5.5.3 Ekip Com DeviceNet -module

The Ekip Com DeviceNet –module is a communication accessory module, which integrates the automatic transfer switch in an industrial remote supervision and control network. The module is suitable for Level 4 controllers (touch control interfaces).

It can be connected to a CAN network with a DeviceNet™ communication protocol, and allows you to:

- Connect the automatic transfer switch as slaves to the network, with dialog functionality.
- Provide the status information of the automatic transfer switch (open, closed).

For the communication lines, Belden type 3084A or equivalent cables must be used.



Fig. 5.16 Ekip Com DeviceNet -module

### 5.5.3.1 LED indications

The following table illustrates the possible signals, and their meaning:

LED	Indication	Description
Power LED, green	Off	Power supply absent.
	On fixed	Power supply and communication with the device present.
	On, with two quick flashes per second	Power supply present, and communication with device absent.
Network LED, red	Off	Device off line (with red LED off) <sup>1)</sup> , or in error conditions (with red LED on).
	On, fixed	Device on line, and allocated on a master (operating condition).
	On, flashing	Device on line, but not allocated on a master (device ready for communication).
Status LED, green	Off	No error.
	On, fixed	Device in bus off, or Network Power absent condition.
	On, flashing	I/O connection (cyclic data) in timeout.

<sup>1)</sup> The device has not yet sent Duplicate ID sequence on line.

Table 5.12 Indication / Ekip Com DeviceNet -module in HMI



Fig. 5.17 Signals of Ekip Com DeviceNet -module

### 5.5.3.2 Termination resistor

The modules provide the possibility to insert a 120 Ω termination resistor on the CAN bus, by setting the DIP-switches Rterm (1 and 2) on the side of the modules in position ON. This option must be selected before the installation of the modules. With the Ekip Com DeviceNet - modules, the dip-switches 3 and 4 of the Rpol (polarization resistance), are not used.



**Notice**

Do not include the termination resistors in the nodes because this could easily lead to a network with improper termination (impedance too high or too low), potentially causing a failure. For example, the removal of a node that includes a termination resistor could result in a network failure. Do not install the termination resistors at the end of a branch (drop line). Install the termination resistors at the two ends of the main backbone (trunk line).

**Remarque**

N'incluez pas les résistances de terminaison dans les noeuds car cela pourrait entraîner facilement à un réseau avec une terminaison incorrecte (impédance trop élevée ou impédance trop basse), conduisant une panne. Par exemple, la suppression d'un noeud qui comprend une résistance de terminaison peut entraîner défaillance du réseau. N'installez pas les résistances de terminaison à l'extrémité d'une dérivation (ligne de dérivation). Installez les résistances de terminaison aux deux extrémités de la dorsale principale (ligne principale)

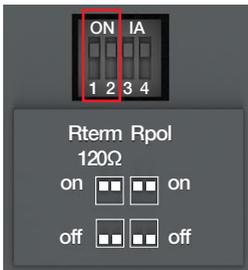


Fig. 5.18 Termination resistor; To enable the Rterm, the dip-switches 1 and 2 must be positioned to ON. This option must be selected before the installation of the module.

### 5.5.3.3 Access from the display / Ekip Com DeviceNet –module

With modules energized, the presence of the modules on the module slot activates additional menus on the display.

The following table illustrates the path for accessing the configuration parameters of the modules from the display:

Settings (*Default value)	Description
:	
Modules (Optional modules)	
Ekip Com DeviceNet	
MAC address      1-63, default 63*	Address to be assigned to the modules. IMPORTANT: devices connected to the same network must have different addresses
Baudrate            125 kbit/s, 250 kbit/s*, 500 kbit/s	Data transmission speed
:	

Table 5.13 The path for accessing the configuration parameters of the Ekip Com DeviceNet -module from the display

The following table illustrates the path from the display for accessing information on the module:

About	Description
:	
Modules (Optional modules)	
Ekip Com DeviceNet	
SN	Serial number
Version	Software version
:	

Table 5.14 Information of Ekip Com DeviceNet -module in HMI

### 5.5.4 Ekip Com Modbus TCP -module

Ekip Com Modbus TCP is an accessory module that can function as a communication module integrating the automatic transfer switch in an industrial remote supervision and control network or as an HTTP Server. The module is suitable for Level 4 controllers(touch control interfaces).

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

- Connecting the automatic transfer switch to the network with dialog functionality.
- Provide the status information of the automatic transfer switch (open, closed).

As an HTTP Server connected to an Ethernet network, it allows read-only access to the information of the automatic transfer switch. This access is possible through a browser by inserting the IP address of the module as the URL. Once the switch is found, a login page prompts and asks for the user password. Insert the same password used for editing parameters.



#### Notice

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

#### Remarque

Sachant que ce module permet d'accéder aux données contenues dans le commutateur de transfert automatique ou l'auto-commutateur, il ne doit être connecté qu'aux réseaux répondant à tous les critères ou exigences nécessaires à la sécurité et à la prévention des accès non autorisés (par exemple, le réseau du système de contrôle d'une installation). Il est de la responsabilité de l'installateur de s'assurer que toutes les mesures de sécurité nécessaires sont adoptées (par exemple, pare-feu et les autres mesures). Le module ne peut être connecté directement à l'internet. Il est recommandé de le connecter uniquement qu'aux réseaux Ethernet dédiés avec le protocole de communication Modbus TCP.



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

Fig. 5.19 Ekip Com Modbus TCP -module

The following table illustrates the ports used by the module:

Port	Service	Notes
502/tcp	Modbus TCP	When the module is used as a Modbus TCP/IP communication module.
80/tcp	Server HTTP	When the module is used as a Server HTTP.
319/udp	IEEE 1588	When IEEE protocol 1588 is enabled
320/udp		

Table 5.15 Ports of Ekip Com Modbus TCP -module

### 5.5.4.1 LED indications

The following table illustrates the possible signals, and their meaning:

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

Table 5.16 Indication / Ekip Com Modbus TCP -module

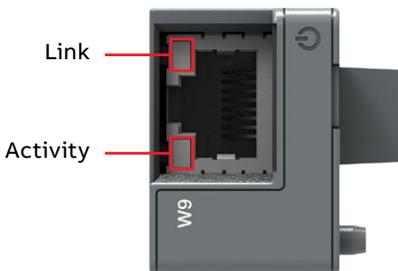


Fig. 5.20 Signals of Ekip Com Modbus TCP -module

### 5.5.4.2 Access from the display / Ekip Com Modbus TCP –module

With modules energized, the presence of the modules on the module slot activates additional menus on the display:

- For setting the function and addressing of the modules.
- In order to display information on the modules.

The following table illustrates the path from the display, for setting the function and addressing of the modules:

Settings (* Default value)	Description	
:		
Modules (Optional modules)		
Ekip Com Modbus TCP		
Function	HTTP Server	HTTP Server operating mode.
	TCPSModbus*	Communication module operating mode.
Force Static IP Address	Off*	Dynamic IP address.
	On	Static IP address.
Static IP Address		Displayed with static IP address enabled. It must be selected in order to insert the IP address of the modules.
Static Network Mask		Displayed with static IP address enabled. It must be selected in order to insert the subnet mask of the modules.
Static Gateway Address		Displayed with static IP address enabled. It must be selected in the presence of multiple subnets, in order to insert the IP address of the node to which the modules are connected.
:		

Table 5.17 The path for setting the function and addressing of the modules of the Ekip Com Modbus TCP -module from the display

The following table illustrates the path from the display for accessing information on the module:

About	Description
:	
Modules (Optional modules)	
Ekip Com Modbus TCP	
SN	Serial number
Version	Software version
IP Address	The address assigned to the modules at the moment of connection to the network. It consists of four bytes (for a total of 32 bits), each of which can have value from 0 to 255. By default, allocation is dynamic. With dynamic allocation, the modules wait to receive the IP address from a DHCP server. Without a DHCP server, the modules adopt an Autoconfiguration IP Address in the range 169.254.xxx.xxx, calculated in a pseudo random manner so as to be the same at every switch-on. Alternatively, you can enable the static IP address option, which allows the IP address to be forced. In this case, you must make sure that the IP address inserted is different to those of the other devices connected to the same network.
Network Mask	The subnet mask which identifies the method to recognize the subnet to which the modules belong, with the possibility of searching for the modules within a defined set of recipients. If you enable the static IP address option, you must also enter the correct Network Mask.
Gateway Address	The IP address of the node to which the module is connected in the presence of multiple subnets. If you enable the Static IP address option, you must also enter the correct Gateway Address.
TCP Client	Three IP addresses of the client devices connected to the modules.
MAC Address	The address assigned by ABB, having an OUI equal to ac:d3:64 <sup>1)</sup> .
:	

<sup>1)</sup> Organizationally Unique Identifier, formed of the first three bytes of a MAC address, that uniquely identifies the manufacturer of an Ethernet device.

Table 5.18 Information of Ekip Com Modbus TCP -module in HMI

### 5.5.5 Ekip Com Profinet -module

The Ekip Com Profinet is a communication accessory module which integrates the automatic transfer switch in an industrial remote supervision and control network. The module is suitable for Level 4 controllers (LCD and touch control interfaces).

It can be connected to an Ethernet network with a Profinet communication protocol, and allows you to:

- Connect the automatic transfer switch to the network, with dialog functionality.
- Provide the status information of the automatic transfer switch (open, closed).



#### Notice

The module should only be connected to networks that meet all the necessary requirements for safety and prevention of unauthorized access (for example, the network of the control system of an installation). It is the installer's responsibility to ensure that all the necessary safety measures are adopted (for example, firewalls, and other measures). It is recommended to connect it only to dedicated Ethernet networks with the Profinet communication protocol. The module cannot be connected directly to the Internet.

#### Remarque

Le module ne doit être connecté qu'aux réseaux qui répondent à tous les critères ou exigences nécessaires pour la sécurité et la prévention des accès non autorisés (par exemple, le réseau du système de contrôle d'une installation). Il est de la responsabilité de l'installateur de s'assurer que toutes les mesures de sécurité nécessaires sont adoptées (par exemple, pare-feu et les autres mesures). Il est recommandé de le connecter uniquement aux réseaux Ethernet dédiés avec le protocole de communication Profinet. Le module ne peut pas être connecté directement à l'internet.

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



Fig. 5.21 Ekip Com Profinet -module

The following table illustrates the ports used by the module:

Ethertype	Port	Service	Notes
0x88CC	-	LLDP	Link Layer Discovery Protocol
0x8892 (Profinet)	-	Profinet IO	Specific for real time communications (RT)
0x0800	34964/udp	Profinet-cm (Context Manager)	DCE/RP

Table 5.19 Ports of Ekip Com Profinet –module

### 5.5.5.1 LED indications

The following table illustrates the possible signals, and their meaning:

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

Table 5.20 Indication / Ekip Com Profinet -module

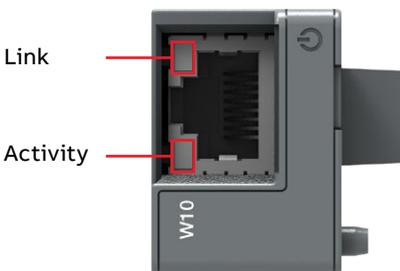


Fig. 5.22 Signals of Ekip Com Profinet -module

### 5.5.5.2 Access from the display / Ekip Com Profinet -module

The following table illustrates the path from the display for accessing information on the module:

About	
:	
Modules (Optional modules)	
Ekip Com Profinet -module	
SN	Serial number
Version	Software version
MAC Address	The address (with an OUI) assigned by ABB equal to ac:d 3:64 Organizationally Unique Identifier, formed of the first three bytes of a MAC address, that uniquely identifies the manufacturer of an Ethernet device.
:	
—	

Table 5.21. Information of Ekip Com Profinet -module

### 5.5.6 Ekip Com EtherNet/IP -module

The Ekip Com EtherNet/IP is an accessory module that can act as a communication module integrating the automatic transfer switch in an industrial remote supervision and control network. The module is suitable for Level 4 controllers (LCD and touch control interfaces).

It can be connected to an Ethernet network with a EtherNet/IP™ -communication protocol, and allows you to:

- Connect the automatic transfer switch to the network with dialog functionality.
- Provide the status information of the automatic transfer switch (open, closed).



Fig. 5.23 Ekip Com EtherNet/IP -module



#### Notice

Because this module allows access to the data contained in the automatic transfer switch, it should only be connected to networks possessing all the necessary requirements for security and prevention of unauthorized access (for example, the network of the control system of an installation). It is the responsibility of the installer to make sure that all the necessary security measures are adopted (for example firewalls and other measures). The module cannot be connected directly to the Internet. It is recommended to connect it only to dedicated Ethernet networks using the EtherNet/IP™ -communication protocol.

#### Remarque

Parce que ce module permet d'accéder aux données contenues dans le dans le commutateur de transfert automatique ou l'auto-commutateur, il doit ne doit être connecté qu'aux réseaux possédant toutes les conditions nécessaires à la prévention des accès non autorisés (par exemple, le réseau du système de contrôle d'une installation). Il est de la responsabilité de l'installateur de s'assurer que toutes les mesures de sécurité nécessaires sont adoptées (par exemple, le pare-feu et les autres mesures). Le module ne peut pas être connecté directement à l'internet. Il est recommandé de connecter uniquement qu'aux réseaux Ethernet dédiés utilisant le protocole de communication EtherNet/IP.

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

The following table illustrates the ports used by the module:

Port	Protocol	Notes
44818	TCP	Encapsulation Protocol (example: ListIdentity, UCMM, CIP Transport Class 3)
44818	UDP	Encapsulation Protocol (example: ListIdentity)
2222	UDP	CIP Transport Class 0 or 1

Table 5.22 Ports of Ekip Com EtherNet/IP -module

### 5.5.6.1 LED indications

The following table illustrates the possible signals, and their meaning:

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

Table 5.23 Indication / Ekip Com EtherNet/IP -module

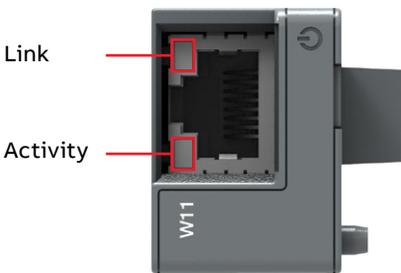


Fig. 5.24 Signals of Ekip Com EtherNet/IP -module

### 5.5.6.2 Access from the display / Ekip Com EtherNet/IP

With modules energized, the presence of the modules on the module slot activates additional menus on the display:

- To set the addressing of the modules.
- In order to display information on the modules.

The following table illustrates the path from the display, for setting the function and addressing of the modules:

Settings (*Default value)	Description
:	
Modules (Optional modules)	
Ekip Com EtherNet/IP	
Force Static IP Address	Off* On
	Dynamic IP address. Static IP address.
Static IP Address	Displayed with static IP address enabled. It must be selected in order to insert the IP Address of the modules.
Static Network Mask	Displayed with static IP address enabled. It must be selected in order to insert the subnet mask of the modules.
Static Gateway Address	Displayed with static IP address enabled. It must be selected in the presence of multiple subnets, in order to insert the IP address of the node to which the modules are connected.
:	

Table 5.24 The path for setting the function and addressing of the modules of the Ekip Com EtherNet/IP -module from the display

The following table illustrates the path from the display for accessing information on the module:

About	Description
:	
Modules (Optional modules)	
Ekip Com EtherNet/IP	
SN	Serial number
Version	Software version
IP Address	The address assigned to the modules at the moment of connection to the network. It consists of four bytes (for a total of 32 bits), each of which can have value from 0 to 255. By default, allocation is dynamic. With dynamic allocation, the modules wait to receive the IP address from a DHCP server. Without a DHCP server, the modules adopt an Autoconfiguration IP address in the range 169.254.xxx.xxx, calculated in a pseudo random manner so as to be the same at every switch-on. Alternatively, you can enable the static IP address option, which allows the IP address to be forced. In this case, you must make sure that the IP address inserted is different to those of the other devices connected to the same network.
Network Mask	The subnet mask that identifies the method to recognize the subnet to which the modules belong, with the possibility of searching for the modules within a defined set of recipients. If you enabled the option Static IP Address, you must also enter the correct Network Mask.
Gateway Address	The IP address of the node to which the module it is connected, in the presence of multiple subnets. If you enabled the Static IP Address option, you must also enter the correct Gateway Address.
TCP Client	The three IP addresses of the client devices connected to the modules.
MAC Address	The address assigned by ABB, having a OUI equal to ac:d3:64 <sup>1)</sup> .
:	

<sup>1)</sup> Organizationally Unique Identifier, formed of the first three bytes of a MAC address, that uniquely identifies the manufacturer of an Ethernet device.

Table 5.25 Information of Ekip Com EtherNet/IP -module in HMI

### 5.5.7 Ekip Com Hub -module

Ekip Com Hub is a communication module for cloud-based connectivity through the ABB Ability™ Electrical Distribution Control System (EDCS).

TruCONTROL equipped with Ekip Com Hub can establish the connection to ABB Ability for the whole low-voltage power distribution panel. This dedicated cartridge-type communication module just needs to be inserted into the TruONE and connected to the internet.

The Ekip Com Modbus RTU and Ekip Com Modbus TCP modules can be configured to support Ekip Com Hub in the collection of data to send to cloud.



#### Notice

It is the customer's sole responsibility to provide and continuously ensure a secure connection between Ekip Com Hub and customer network or any other network (as the case may be). It is the installer's responsibility to ensure that all the necessary safety measures are adopted (for example, firewalls, and other measures.) to protect the product, the network, the customer system and interface against any kind of security breaches, unauthorized access, interference, intrusion, loss and/ or theft of data or information.

#### Remarque

Il est de la seule responsabilité du client de fournir et d'assurer en permanence une connexion sécurisée entre Ekip Com Hub et le réseau du client ou tout autre réseau (selon le cas). Il est de la responsabilité de l'installateur de s'assurer que toutes les mesures de sécurité nécessaires sont adoptées (par exemple, pare-feu et les autres mesures) pour protéger le produit, le réseau, le système du client, et l'interface contre toute forme d'atteinte à la sécurité, d'accès non autorisé, ingérence, intrusion, perte et ou vol de données ou d'informations.

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

The following table illustrates the ports used by the module:

Port	Service	Notes
67/udp 68/udp	DHCP client	DHCP enabled as an alternative to Static address = On
443/tcp	HTTPS	Always active when module is enabled Active with SNMP client enabled
123/udp	SNTP	enabled
53/udp	DNS	Always active

Table 5.26 Ports of Ekip Com Hub -module



Fig. 5.25 Ekip Com Hub -module

### 5.5.7.1 LED indications

The following table illustrates the possible signals, and their meaning:

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

Table 5.27 Indication / Ekip Com Hub -module

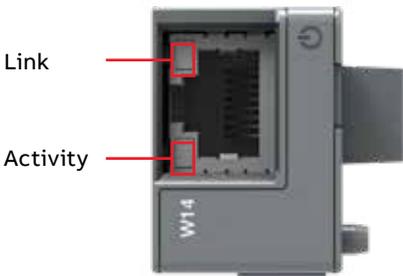


Fig. 5.26 Signals of Ekip Com Hub -module

### 5.5.7.2 Access from the display / Ekip Com Hub

With modules energized, the presence of the modules on the module slot activates additional menus on the display:

- To set the addressing of the modules.
- In order to display information on the modules.

The following table illustrates the path from the display, for setting the function and addressing of the modules:

Settings (*Default value)	Description		
:			
Modules (Optional modules)			
Ekip Com Hub			
Enable	Off*	Switch communication between module and server	
	On		
Force Static IP Address	off*	Dynamic IP address.	
	on	Static IP address.	
	Se	On all the associated parameters are enabled.	
Static IP Address	0.0.0.0*	Enables the static IP address to be selected.	
Network Mask Static	0.0.0.0*	Enables the subnet mask to be selected.	
Static Gateway Address	0.0.0.0*	When there are several subnets, enables the IP address of the node to which the module is connected to be selected.	
SNTP Client Enabled	Off*	Enables the SNTP protocol for distribution of the clock and synchronization signal to be enabled.	
	on		
SNTP Server Address	0.0.0.0*	Enables the network server that supplies the SNTP to be set.	
Password	---	Code required to register module on cloud.	
Remote firmware update		Enables the firmware of the module to be updated.	
		OFF Automatic*	
		Enable	To configure firmware download.
		Automatic	To automate module update.
:			

Table 5.28 The path for setting the function and addressing of the modules of the Ekip Com Hub -module from the display

The following table illustrates the path from the display for accessing information on the module:

About	Description
:	
Modules (Optional modules)	
Ekip Com Hub	
SN	Serial number
Version	Software version
IP Address	Address of the module, assigned to the module by a DHCP server at the time of connection to the network in the case of configuration with a dynamic IP, or can be set via the menu in the event of a static IP. NOTE: without a DHCP server, the module automatically adopts a random IP address within the 169.254.xxx.xxx range.
Network Mask	Subnet mask; identifies the method for recognizing the subnet to which the modules belong and enables modules to be searched for within a defined set of recipients.
Gateway Address	IP address of the node to which the module is connected, in the presence of several subnets.
MAC Address	The address (with an OUI) assigned by ABB equal to ac:d3:64 Organizationally Unique Identifier, formed of the first three bytes of a MAC address, that uniquely identifies the manufacturer of an Ethernet device

:

Table 5.29 Information of Ekip Com Hub -module in HMII

## 5.6 Ekip Signaling 10k module

The Ekip Signaling 10k is an accessory module for external signaling that can be installed on a standard 35 mm DIN rail (DIN EN 50022 type TS 35×15mm). In certain ZBTS T-series offerings, this module is pre-installed, with a certain number of pre-programmed functions.

This Ekip module has:

- Ten programmable output contacts.
- Ten or eleven programmable digital inputs.
- A power-on LED, and twenty or twenty-one signaling LEDs (one for each output/input).

The module is connected to TruCONTROL via Local Bus connection and supplied by 24V DC.

Further information on Ekip Signalling 10K is available on the website <http://www.abb.com/abblibrary/DownloadCenter/>, in particular in the manual 1SDH001318R0002.

**IMPORTANT:** Make sure that you have read the recommendations concerning security and precaution from unauthorized access.



Fig. 5.27 Ekip 10k module

## 5.7 Current measurement -modules

Zenith ZBTS T-series includes embedded current measurement in the standard offering. The current measurement module utilizes rating plugs to improve measurement accuracy.

### 5.7.1 Rating Plug

The rating plugs are field interchangeable from the front of the TruCONTROL ATS controller. An assortment of rating plugs are provided with the equipment. The rating plug sized for the expected typical operational load should be installed for best measurement accuracy.

Rating plugs for currents 1000A-4000A

- 1SDA074224R1 1000A
- 1SDA079730R1 1200A
- 1SDA074226R1 1600A
- 1SDA074227R1 2000A
- 1SDA074228R1 2500A
- 1SDA074229R1 3200A



Fig. 5.28 Rating plug

### 5.7.2 Current Sensors

Type C sensors are openable sensors without bushing bar. Current sensors are installed on each phase; the rated unit current can be configured with the interchangeable rating plug module.

Type C sensors guarantee an insulation resistance of 1000 Vrms CAT III / 600 Vrms CAT IV and an IP67 protection degree.

Sensor type code includes three or four sensors of the same type and size, depending on the automatic transfer switch (3P or 4P) operated by TruCONTROL ATS controller.

Available sizes / internal diameter of the sensors: 4000 A / 120 mm

Sensor type codes:

- Open CS 3P type C120 1SDA083372R1
- Open CS 4P type C120 1SDA083373R1



Fig. 5.29 Current sensor

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## 5.8 Temperature measurement

High precision temperature sensors are used on the Zenith ZBTS T-series Bypass-Isolation ATS. Sensors are installed on the highest temperature contact of the load (L2). Therefore, measuring the temperature of L2 can indicate the accurate temperature.

Type code 1SDA085695R1 is used. The code includes one single probe (length: 3 m).



---

Fig. 5.30 Temperature measurement

## 5.9 Switch-Test/Auto/Inhibit/Start

The 4-position switch is an optional accessory which can change the ATS status by switching the key position. The 4-position switch can send signal via controller to control the ATS. Operation of 4 positions are listed below:

- Auto: ATS will function as normal ATS.
- Test: “Remote test on load” input active. ATS will send signal to start the alternate source and transfer to alternate source.
- Off: “Inhibit auto mode” input active. ATS will be in inhibit mode. It will not take any action no matter the condition of sources. ATS will also not start the alternate source if the main source fails.
- Engine start: “remote test off load” input active. ATS will send signal to start the alternate source only. It will not transfer to alternate source (transformer and generator).

Instructions:

MODE SELECTOR (MS) SWITCH CHART

	Switch Position				Operator	Note: program the ATS input to:
	1 TEST	2 AUTO	3 OFF	4 ENG START	Contact block P/N & mounting location	
Contact Block 1 (A) (Load Test)	x	o	o	o	Mounted on position 4	N.O.
Contact Block 2 (B) (Off)	o	o	x	o	Mounted on position 2	N.O.
Contact Block 3 (C) (No Load Test)	o	o	o	x	Mounted on position 3	N.O.

x - closed contact

o – open contact

---

## 5.10 Audible Transfer Alarm

The audible transfer alarm will sound and illuminate when the ATS is connected to source 2 (normally, the default main power supply is source 1). Alarm can be silenced via the HMI and will otherwise be reset by retransferring back to source 1.



1

# 6. Troubleshooting



**Warning**

Any troubleshooting should be conducted by trained and authorized personnel only. Appropriate personal protective equipment (PPE) should be used when troubleshooting the ATS panel. Hazardous voltage may be present. Disconnect all power sources before performing work inside the ATS panel.

Failure to do so may result in serious injury or death.

**Avvertimento**

Tout dépannage doit être effectué uniquement que par un personnel formé et autorisé. Un équipement de protection individuelle (EPI) approprié doit être utilisé lors du dépannage du panneau ATS. Une tension dangereuse peut être présente. Débranchez toutes les sources d'alimentation avant d'effectuer des travaux à l'intérieur du panneau d'ATS. Ne pas le faire peut entraîner des graves blessures ou la mort.

## 6.1 Alarms



Touch

Message	Fault	Action
Switch not in AUTO mode, Alarm LED on	Disconnect switch is on the "Inhibit" position. MTSE close into source 1 or source 2 Operation mode is not in Auto mode ATS not in connect location	Turn disconnect switch into the AUTO position Close MTSE contact into "off" position. Configure the operation mode is in Auto mode Rack in ATS into connected location
Phases crossed	Phase rotation of sources 1 and 2 are different	Connect the phases of both sources in the same order
S1 undervoltage	Voltage of source 1 is under the threshold level set in parameter "Drop-out voltage, lower threshold"	Check the correlation between power source and device configuration
S1 overvoltage	Voltage of source 1 is over the threshold level set in parameter "Drop-out voltage, upper threshold"	Check the correlation between power source and device configuration
S1 phase missing	One or two phases of source 1 are missing	Check the power source and connections
S1 unbalance	Phases of source 1 are not symmetric	Check the power source
S1 phase rotation	Phase rotation of source 1 is different from the value of parameter "Phase sequence"	Connect the phases according to the configuration
S1 invalid frequency	Frequency of source 1 is out of range set in parameters "Drop-out frequency, upper threshold" and "Drop-out frequency, lower threshold"	Check the correlation between power source and device configuration
S1 neutral disconnected	Neutral is disconnected from source 1. Note: The loss of neutral will be detected in 3 phase distribution systems with unbalanced loads	Check connection of neutral in source 1 and that the corresponding power distribution system parameter is set correctly

Continued on the next page

Message (continued)	Fault	Action
S2 undervoltage	Voltage of source 2 is under the threshold level set in parameter "Dropout voltage, lower threshold"	Check the correlation between power source and device configuration
S2 overvoltage	Voltage of source 2 is over the threshold level set in parameter "Dropout voltage, upper threshold"	Check the correlation between power source and device configuration
S2 phase missing	One or two phases of source 2 are missing	Check the power source and connections
S2 unbalance	Phases of source 2 are not symmetric	Check the power source
S2 phase rotation	Phase rotation of source 2 is different from the value of parameter "Phase sequence"	Connect the phases according to the configuration
S2 neutral disconnected	Neutral is disconnected from source 2. Note: The loss of neutral will be detected in 3 phase distribution systems with unbalanced loads	Check connection of neutral in source 2 and that the corresponding power distribution system parameter is set correctly
S2 invalid frequency	Frequency of source 2 is out of range set in parameters "Drop-out frequency, upper threshold" and "Drop-out frequency, lower threshold"	Check the correlation between power source and device configuration
Frequency Difference	Frequency difference of voltage sources is greater than 0.2 Hz while in phase monitor is on	Alarm is active and transfer operations disabled as long as the frequency difference is above the accepted level
High current alarm	Measured current is higher than ten times the nominal value	Alarm is active and transfer operations disabled as long as the high current status remains
Open I failure, Alarm LED blinking	Switch transfer from position I to O or II failed	Reset alarm by pressing Auto button or via menu page Operation / Alarm Reset
Close I failure, Alarm LED blinking	Switch transfer to position I failed	Reset alarm by pressing Auto button or via menu page Operation / Alarm Reset
Open II failure, Alarm LED blinking	Switch transfer from position II to O or I failed	Reset alarm by pressing Auto button or via menu page Operation / Alarm Reset
Close II failure, Alarm LED blinking	Switch transfer to position II failed	Reset alarm by pressing Auto button or via menu page Operation / Alarm Reset
Switch position alarm, Alarm LED on	Switch position indication inputs are activated correctly	ATS is not in the Connected/Test position. Switch service needed
Pole temperature alarm	Measured pole temperature is too high	Load is too high Switch service needed

Continued on the next page

Local bus	Communication between HMI and switch controller is off	Check connection
Ethernet disconnected	Ethernet module not connected	Check connection
Fire Fighting	Fire fighting input activated	Alarm is active and disable transfer operations as long as the input is active
Control Voltage Low	Switch control voltage is below the minimum	Check power source
Configuration Error	Invalid configuration	Check parameter values
Ekip Com Hub Alarm	Ekip Com Hub failure	Check configuration
HMI Not Compatible	Firmware versions of HMI and device are not compatible to be used together	Check current versions and update compatible versions

Table 6.1 Alarms-list in touch control interfaces

## 6.2 Warnings



Touch

Message	Reason
S1 and S2 not in sync	Voltage sources are not synchronized
Voltage Not Calibrated	Calibration data in power module is invalid or unavailable
Current Not Calibrated	Calibration data in current measurement module is invalid or unavailable
Control Retry	Failed transfer sequence retry activated
Pole temperature warning	Measured pole temperature is near the alarm level
Auto Control Disabled	Device is in manual operating mode
Local Bus	Module heartbeat error. Check connection. Can be cleared using "Alarm Reset"
Configuration	Configuration session ports are open
Clock capacitor charging	Real time clock is not yet operational, date & time setting is disable as long as this warning is active. Clock capacitor is charged from source voltage (not AUX) and takes about 10 minutes
Generator failed to start	Generator has not been started within 1 minute after sending start signal or it has failed during any test sequence

Table 6.2 Warnings-list in touch control interfaces

## 6.3 Information



Message	Description
Invalid Date	Date not set
Test on Load	Test on load sequence active
Test off Load	Test off load sequence active
Alarm/Product Availability	Digital output function activated
Position I	Digital output function activated
Position O	Digital output function activated
Position II	Digital output function activated
Pre-transfer Signal	Digital output function activated
Source 1 Available	Digital output function activated
Source 2 Available	Digital output function activated
Load Shed	Digital output function activated
Emergency Stop	Digital input function activated
Remote Test on Load	Digital input function activated
Remote Test off Load	Digital input function activated
Inhibit Auto Mode	Digital input function activated
Manual Retransfer	Digital input function activated
Priority S1	Digital input function activated
Priority S2	Digital input function activated
Inhibit Transfer	Digital input function activated
Bypass Running Delays	Digital input function activated
Remote Control to S1	Digital input function activated
Remote Control to Off	Digital input function activated
Remote Control to S2	Digital input function activated
Alarm Reset	Digital input function activated
Manual-Auto Mode	Digital input function activated

Table 6.3 Info statements in touch control interfaces

## 6.4 Light indication and alarm

Bypass panel, located on the upper part of the cabinet, shows status of bypass device and the ATS.

Message	Description
S1 AVAILABLE, LED off	S1 is not available
S2 AVAILBALE, LED off	S2 is not available
BS1 ENGAGED, LED off	Bypass contact is not connected to source 1
BS2 ENGAGED, LED off	Bypass contact is not connected to source 2
AS1 ENGAGED, LED off	ATS contact is not connected to source 1
AS2 ENGAGED, LED off	ATS contact is not connected to source 2
ATS/BYP PARALLEL, Alarm LED on	ATS and bypass contact are connected to the same source.
DS SWITCH INHIBIT POSITION, Alarm LED on	Disconnect switch is in the inhibit mode

Table 6.4 Bypass panel LED indication and alarm

## 6.5 Elimination of simple malfunctions

Disturbance	Reason
ATS can't be transfer by HMI button "I ON", "II ON", "O off"	Disconnect switch is in the inhibit position ATS is in the Auto mode
ATS can't be transfer to the same source with MTS during pressing "contact reset" button	Disconnect switch is in the inhibit position MTS contact is not close into Source1 or Source2 TruControl Input had not configuration correctly
Disconnect switch is turned into "Auto" position, but "Auto mode" on HMI have not been lighted	ATS not in the Connected/Test position. MTS contact is not in off position ATS not configurate to Auto Mode
Operation handle can't insert into RIRO hole	MTS S1 and S2 both at "Open" position Disconnect switch is in the "Auto" position RIRO release sheet at "Lock" position The front door is opened (If the door interlock has been applicated)
ATS can't be rack out from Connected position	ATS and MTS connected to different source (For Open ATS). ATS is not at "O off" status (For Delay/Close ATS) Bypass Panel lock is not at "Release" position Disconnect switch is in the "AUTO" position

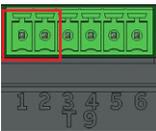
ATS can't be rack into Connected position	ATS and MTS connected to different source (For Open ATS). ATS no at "O off" status (For Delay/Close ATS) Bypass Panel lock not at "Release" position Disconnect switch is in the "AUTO" position
ATS can't be rack out from Test position	Bypass Panel lock not at "Release" position Disconnect switch is in the "AUTO" position
ATS can't be rack into Test position	ATS not at "Isolation" position before rack in. Bypass Panel lock not at "Release" position Disconnect switch is in the "AUTO" position
MTS can't be manual close	ATS is in the "Connected" position and already connected to another source. MTS have not been charged. MTS already connected to another source. Disconnect switch is in the "AUTO" position. Operation bar be inserted at RIRO hole. Bypass Panel lock not at "Lock" position. ATS not at "ISOLATION"/ "TEST"/ "Connected" position.
Bypass Panel lock can't be release	Insert Operation handle into RIRO hole and rotate Clockwise or anti-clockwise slightly.
Door can't be open	Door only could be opened when ATS is in the "Isolation" position (If the door interlock has been applied).
Disconnect switch can't be switch to AUTO position	Operation bar be inserted at RIRO hole.

# 7. Technical data

## 7.1 General technical data

Automatic transfer switch, power circuit		Value	
Rated operational voltage		200-480 Vac	
Rated frequency		50 / 60 Hz	
Rated impulse withstand voltage		12 kV	
Operating times		See Table 7.4	
Automatic transfer switch, control circuit		Value	Remark
Voltage supply		200-480 Vac	
Operating voltage range		±20 %	
Voltage measurement accuracy		1 %	
Rated frequency		50 / 60 Hz	
Operating frequency range		±20 %	
Frequency measurement accuracy		0.5 %	
Rated impulse withstand voltage		6 kV	
Rated impulse withstand voltage $U_{imp}$ for digital outputs and generator control		4 kV	Connectors T7 and T8
Automatic transfer switch, I/O contacts		Cabling / Terminal	Rating / Remark
Generator start/stop		0.75...2.5mm <sup>2</sup> 18...12 AWG	
Generator start/stop, NO		E11 & E12	5A@250V AC, 5A@30V DC
Generator start/stop, NC		E13 & E12	5A@250V AC, 5A@30V DC
ATS contact position indication		0.75...2.5mm <sup>2</sup> 18...12 AWG	
ATS in source 1 position, NO		A41NO & A41C	10A@250V AC, 250mA@ 250 DC
ATS in source 1 position, NC		A41NC & A41C	
ATS in source 1 position, NO		A42NO & A42C	10A@250V AC, 250mA@250 DC
ATS in source 1 position, NC		A42NC & A42C	
ATS in source 2 position, NO		A31NO & A31C	10A@250V AC, 250mA@250 DC
ATS in source 2 position, NC		A31NC & A31C	
ATS in source 2 position, NO		A32NO & A31C	10A@250V AC, 250mA@250 DC
ATS in source 2 position, NC		A32NC & A31C	10A@250V AC, 250mA@250 DC

Continued on the next page

Automatic transfer switch, I/O contacts	Cabling/Terminal	Rating / Remark
Fire Fighting applications	Cable size: ".08...1.5 mm <sup>2</sup> 28...16 AWG"	Only in ZBTSD/CT-types, delayed/closed transition, I-O-II or II-O-I
	Fire fighting input 24 Vdc (+)	T9 - 1
	Fire fighting input 24 Vdc (-)	T9 - 2
		24 Vdc 5mA
		24 Vdc 5mA

<sup>1</sup>Refer to programming/I/O packages for terminal usage

<sup>2</sup>Cable size recommended between Generator start/stop terminal block and ATS is 2.1...3.3 mm<sup>2</sup> (14...12 AWG)

Table 7.1 Automatic transfer switch I/O contacts

AC15		AC12			AC13	
U <sub>e</sub> /[V]	I <sub>e</sub> /[A]	U <sub>e</sub> /[V]	I <sub>e</sub> /[A]	P/[W]	I <sub>e</sub> /[A]	P/[W]
230	6	24	10	240	2	50
400	4	72	4	290	0.8	60
415	4	125	2	250	0.55	70
690	2	250	0.55	140	0.27	
		440	0.1	44		

Table 7.2 Technical data for auxiliary contacts according to IEC 60947-5-1, for OA1G\_, OA3G\_

### Recommended Operating / Storage Temperature

Do not store the automatic transfer switch in corrosive environments above LC1 (sea salt mist) and G1 as per ANSI/ISA-S71.04-1985. Failure to comply with

these instructions may result in product damage. Store the automatic transfer switch and related accessories in a clean, dry location in their original packaging.

Environmental	Value
Operating temperature	-20... +65 °C
Transportation and storage temperature	-20... +75 °C
Altitude	Up to 2000 m

Table 7.3 General technical data of automatic transfer switch

Type	Voltage [Vac]	Nominal current* [A]	Contact transfer time <sup>1</sup> I-II or II-I [ms]
ZBTS 1600A-3000A	200 - 480	65	<75
ZBTSD 1600A-3000A	200 - 480	65	<75
ZBTST 1000A-3000A	200 - 480	65	<75

<sup>1</sup>Under nominal conditions

<sup>2</sup>All times consider that all timers are set to "0"

Table 7.4 Specified technical data of operating times

## 7.2 Circuit diagrams

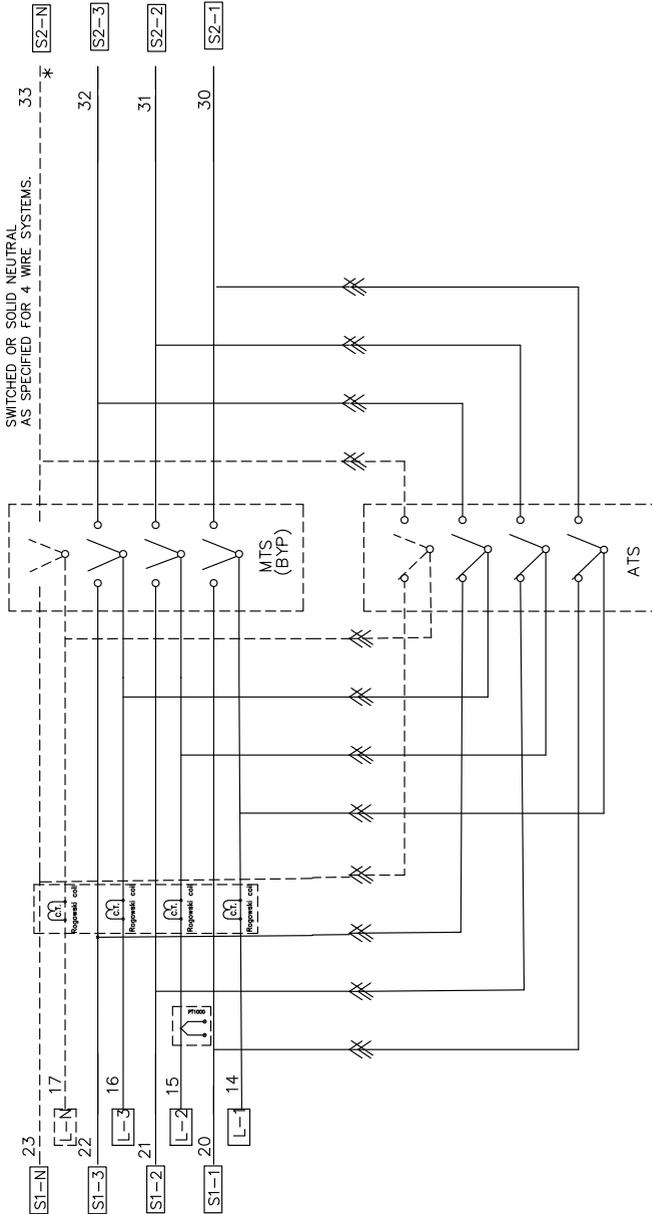


Fig. 7.1 Primary circuit for ATS and bypass





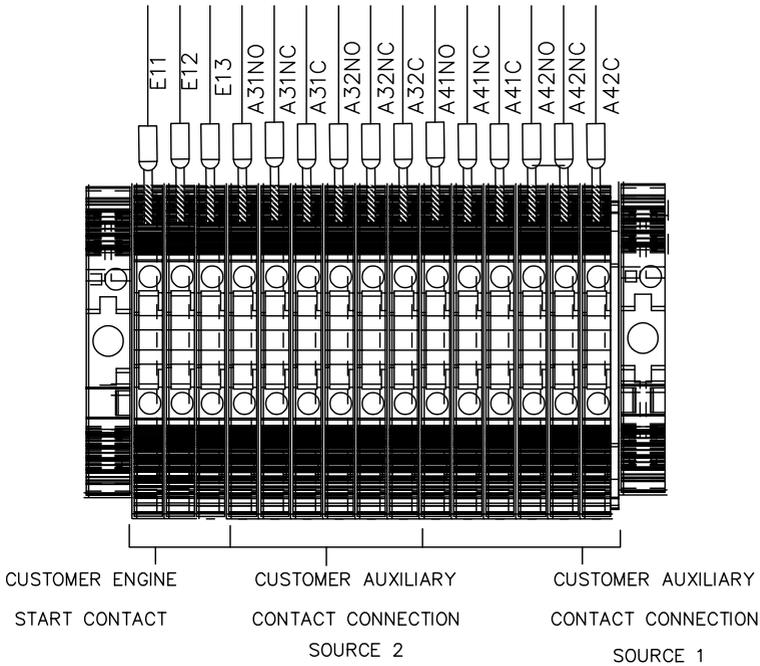


Fig. 7.4 Customer Engine start and Auxiliary contact relay

Customer Engine Start Contact connection				
Contact	S1 available	S1 not available	Cable	Rating
E11&E12	Open	Close	0.75...2.5mm2 18...12 AWG	5A@250V AC, 5A@30V DC
E13&E12	Close	Open	0.75...2.5mm2 18...12 AWG	5A@250V AC, 5A@30V DC

Customer ATS Auxiliary Contact connection				
X=Actuated	ATSE		Cable	Rating
	I	OFF II		
A31, A32		X	0.75...2.5mm2 18...12 AWG	10A@250V AC, 250mA@250V DC
A41, A42	X		0.75...2.5mm2 18...12 AWG	10A@250V AC, 250mA@250V DC

**Note:**

- 1 Program "Application" = " S1-Transformer/S2-Generator"
- 2 Generator starts and shuts down by TruControl in the "Connected" and "test" positions, starts and shuts down by the RNH relay in the "Isolated" position.

**EKIP Input/Output**

Modules	Cable	Input	Output
EKIP2K	0.75...2.5mm <sup>2</sup>	5V@2.5mA	2A@30V DC; 0.8A@50V DC
EKIP10K	28...16 AWG	Do not connect to any power supply	0.2A@150V DC; 4A@250V AC

Table 7.5 Customer Ekip module -Input/output

**Fire Fighting**

Modules	Description	Cabling	Remark
T9-1	Fire fighting input 24V DC(+)	0.75...2.5mm <sup>2</sup>	Only in I-O-II
T9-2	Fire fighting input 24V DC(-)	0.75...2.5mm <sup>2</sup>	

Table 7.6 Customer Fire fighting

## 7.3 Overall Dimensions

Model	Poles	Ref.	Weight Kg (lbs)	Height	Width	Depth
				mm(inch) A	mm(inch) B	mm(inch) C
NEMA 1	3P	7.7	1370(3020)	2023(79.66)	1157(45.55)	1718(67.65)
	4P	7.7	1620(3575)	2023(79.66)	1157(45.55)	1718(67.65)
NEMA3R/4/12/4X	3P	7.7	1470(3241)	2024(79.69)	1165(45.87)	1794(70.64)
	4P	7.7	1720(3792)	2024(79.69)	1165(45.87)	1794(70.64)
Open style	3P	7.7	1050(2325)	1640(64.56)	1150(45.58)	1685(66.34)
	4P	7.7	1163(2564)	1640(64.56)	1150(45.58)	1685(66.34)
ATSE	3P	7.8	301(664)	1113(43.82)	831(32.72)	537(21.14)
	4P	7.8	349(770)	1113(43.82)	831(32.72)	537(21.14)

Table 7.7 Overall dimensions

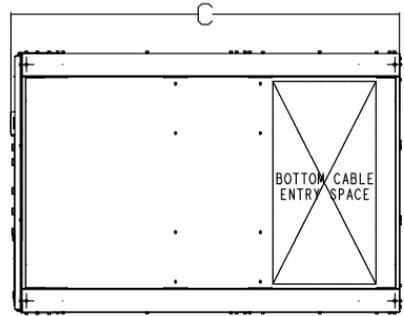
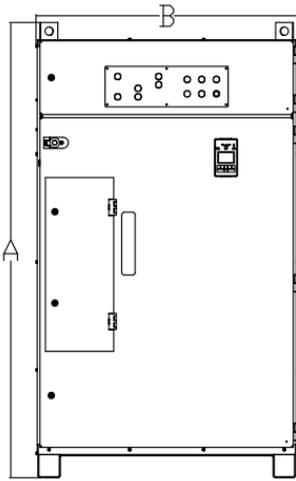


Fig. 7.5 Overall dimensions

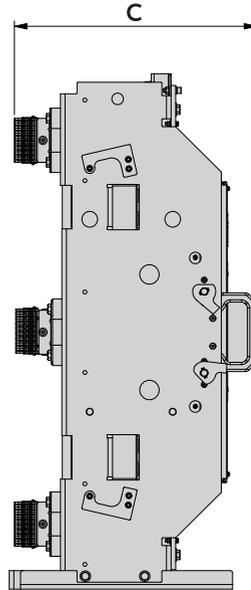
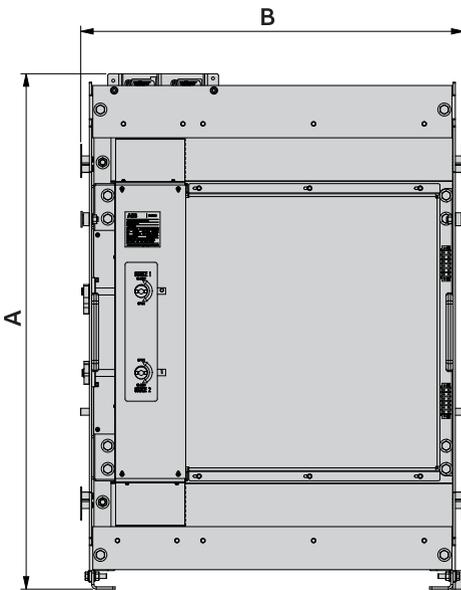


Fig. 7.6 ATSE dimensions



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## 8. Maintenance

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### Warning

Any maintenance should be conducted by trained and authorized personnel only. Appropriate personal protective equipment (PPE) shall be used when performing maintenance on the ATS panel. Hazardous voltage may be present. Disconnect all power sources before performing work inside the ATS panel. Failure to do so may result in serious injury or death.

### Avvertissement

Toute maintenance doit être effectuée que par un personnel formé et autorisé. Un équipement de protection individuelle (EPI) approprié doit être utilisé lors de la maintenance du panneau d'ATS. Une tension dangereuse peut être présente. Débranchez toutes les sources d'alimentation avant d'effectuer des travaux à l'intérieur du panneau d'ATS. Ne pas le faire peut entraîner des graves blessures ou la mort.

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### Maintenance Principle

The Zenith ZBTS T-series 1000A-3000 A, Bypass Isolation Automatic Transfer Switches, are designed so that the contacts last their designed lifetime without replacing any parts. If there are abnormal conditions such as a fault or overload without adequate protection, or extreme environment conditions, a failure of ATS components may occur. Fortunately, all critical modules, including complete mechanism with electronics (controller, power module, and solenoid mechanism), lights, HMI, and accessories are easily replaceable. Refer to Chapter 11 for replacement parts.

Note: The designed lifecycle for lights is 5 years. Please check the brightness regularly and replace any malfunctioning light. Please note that malfunctioning light may mislead users.

On the other hand, when the contacts have seen an event, or have met the end of their lifetime, the whole switch should be replaced – which can be done easily by replacing the complete ZBTS power panel within the enclosure.

In the case you suspect a failure may be due to manufacturing defect and covered under warranty, see Chapter 1.3.

Refer to Chapter 7 Technical data for ATS contact endurance and note that the number of operations can be viewed in the information menu from the HMI.

### Routine Inspection

ABB recommends a routine (such as annual) inspection to, for example, check electrical termination temperatures, ensure the unit is clean, check voltage levels, test transfers, check number of operations, etc. to ensure everything is in proper working order.

Recommended annual inspection includes:

- Review event log
- Check number of operations and other switch status figures
- Visually inspect both inside and outside of enclosure for damage or debris
- Test transfer of load
- Observe voltage levels of both sources within expected range
- Verify cable lug torque
- Check lights brightness
- Lubricate MST interlock mechanical parts



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# 9. Installation

Before mounting the product, please check the product identification from the product identification label, which is located on the front panel under the control interface unit (HMI). This label indicates the product model (type number) and important technical information including but not limited to, suitable wire.



#### Notice

Final inspection of the equipment should be performed prior to energizing the automatic transfer switch.

Remove any dirt or debris that may have collected during shipment or installation. NEVER use compressed air. Doing so could drive dirt or other foreign objects into electrical or mechanical components, which could cause damage. Use an industrial-quality vacuum cleaner to remove any dirt or foreign objects.

Be certain all cable connections are correct and that the phase rotation of both sources match.

Inspect the engine start connections and verify the correct connection of all control wires.

Check all programmable set points and adjust as necessary. In addition, adjust any optional accessories as required.

Be certain that the actual lug torque values are within the requirements outlined in the instruction book to ensure the integrity of power connections.

Check to be sure that all covers and barriers are properly installed and fastened.

If any damage is found or suspected, file a claim as soon as possible with the carrier, and notify the nearest ABB Zenith representative, or call 1-800-637-1738

#### Remarque

L'inspection finale de l'équipement doit être effectuée avant de mettre sous tension l'autocommutateur ou le commutateur de transfert automatique.

Enlevez toute la saleté ou des débris qui pourraient s'être accumulés lors de l'expédition ou de l'installation.

N'utilisez jamais de compresseur d'air. Cela pourrait entraîner de la saleté ou d'autres nouveaux objets dans les composants électriques ou mécaniques, ce qui pourrait causer des dommages. Utilisez un aspirateur industriel de qualité pour enlever toute sorte de saleté ou de nouveaux objets.

Assurez-vous que toutes les connexions de câbles sont correctes et que la rotation de phase des deux sources correspondent.

Inspectez les connexions de démarrage du moteur et vérifiez que la connexion de tous les câbles de commande est correcte.

Vérifiez tous les points programmables et ajustez-les si nécessaire. En plus, réglez les accessoires optionnels selon les besoins.

Assurez-vous que les valeurs de couple de cosse réelles sont conformes aux exigences décrites dans le manuel d'instructions pour garantir l'intégrité de la connexion d'alimentation.

Assurez-vous que tous les couvercles et barrières sont correctement installés et fixés. Sides dommages sont découverts ou suspectés, déposez une réclamation le plutôt que possible auprès du transporteur et informez le représentant de ABB Zenith le plus ou appelez le 1-800-637-1738.

## 9.1 Basic Tools for Installation and Maintenance

Tool	Task
1/4" to 1/2" Allen head socket driver	Power cable connection
Torque wrench	Torquing of the lugs and other hardware as required. Range of device to be 50 - 500 in-lbs (5-57 N-m)
Torque screwdriver	Torquing of control wire terminations, auxiliary contact input terminals. 5 - 25 in-lbs (0.5 - 2.8 N-m)
Wire cutters/wire crimpers	Auxiliary contacts wire installation, optional accessory installation
Voltmeter	Trouble shooting tool for measuring incoming voltage, frequency, continuity and control signal transmission.
Controller default password 00001	Changing parameters within the controller

Table 9.1 Required tools for common installation and maintenance tasks

## 9.2 Equipment Inspection and Storage



### Warning

When performing a hi-pot or dielectric test on the power section of the ATS panel, DISCONNECT the complete electronics, controller and mechanism section of the ATS from the power section to avoid potential damage to the electronics.

### Avertissement

Lors de l'exécution d'un test diélectrique ou diélectrique sur la section du panneau d'ATS, déconnectez la section complète de l'électronique, du contrôleur et du mécanisme de l'ATS de la section d'alimentation pour éviter d'endommager l'électronique.

Before installation, if it is necessary, store the transfer switch in a clean, dry place, protected from dirt and water. Provide ample air circulation and heat, if necessary, to prevent condensation.

See table 7.3 for recommended storage and operating ambient temperatures.

Once you receive the transfer switch, inspect it for any damage. This includes damage to the enclosure, power panel, control panel and wiring harness. If any damage is found or suspected, file a claim as soon as possible with the carrier and notify the nearest ABB representative.

## 9.3 Lifting and Mounting the Panel

### Lifting guidelines

Adequate lifting means must be used to mount the transfer switch into place. The recommended method for moving the ABB Zenith Bypass Isolation Automatic Transfer Switch in the enclosure, is using forklift and forklift equipment properly rated for the equipment/enclosure weight.

**THE LIFTING EYELETS ON THE ENCLOSURE ARE FOR ASSEMBLY PURPOSES ONLY. LIFTING OF COMPLETE ASSEMBLY SHOULD ONLY BE DONE FROM BOTTOM SURFACES USING APPROPRIATELY RATED LIFT EQUIPMENT.**

### Lifting Guidelines for Bypass Isolation Transfer Switches

The safe operation of your Bypass Isolation Automatic Transfer Switch at all times is paramount to ABB. Please recognize that hazardous voltages and currents can exist during normal operation, and any maintenance on the transfer switch must be performed utilizing appropriate safety measures. Installation, adjustment, maintenance or removal of the switch must only be carried out by qualified personnel and with all power to the switch turned off. It is recommended that only qualified electricians be allowed to install or provide maintenance on the switch.

Prior to installation, store the transfer switch in a clean dry location, protected from dirt and water. Provide ample air

circulation and heat if necessary to prevent condensation. See table 7.3 for recommended storage and ambient operating temperatures.

ABB Zenith Bypass Isolation Automatic Transfer Switches are packaged as per the standard packaging regulatory standards suitable for domestic and international shipment through all modes of transportation (air, sea and road). Once you unpack the units, please make sure all the components are received as per the BOM. For any missing items, contact your local ABB Zenith service representative.

### 9.3.1 Forklift transport guidelines

1. ABB Zenith Bypass Isolation Automatic Transfer Switches are mounted and secured onto a wooden enclosure using bolts and nuts
2. Refer to table 7.7 for the enclosure/ equipment weight and make sure that the forklift is properly rated to handle the weight.
3. Make sure that there is enough space for transporting the enclosure to its destination and there are no obstacles on the way.
4. Check if the floor can bear the weight.
5. Check the enclosure center of mass and make sure the enclosure does not wobble or fall during the transportation.

Figure 9.1 shows the enclosure. Two indication marks for forklift points are located at the bottom of the enclosure. When using a forklift, make sure the forks are inserted into correct position and completely through the package.



Fig. 9.1 package

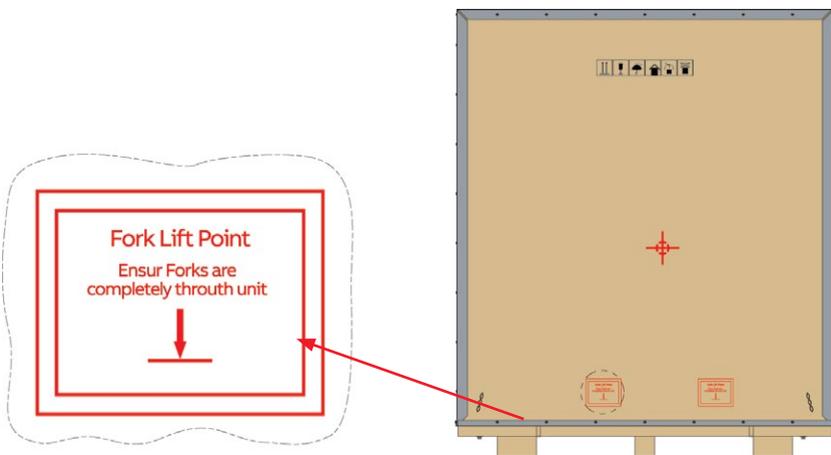


Fig. 9.2 Fork lift point indication marks.

### 9.3.2 ATS lifting

1. ABB Zenith Bypass Isolation Automatic Transfer Switches are mounted onto a wooden pallet using bolts and nuts. Please remove the bolts and nuts prior to lifting.
2. Make sure the Bypass Isolation Automatic Transfer Switch is on “ISOLATED” position before lifting – refer to session 3.8.
3. ABB Zenith Bypass Isolation Automatic Transfer Switches have the provisions for lifting through lifting holes as shown in Fig. 9.3.

4. Refer to Table 7.7 for the weight information, or the dimensional drawing for the center of gravity dimensional drawing for the CG, weight information, and lifting provisions to select the properly rated lifting devices.
5. While lifting the unit using lifting chains, it is recommended to maintain a 45° angle as shown in Fig. 9.3.
6. ABB Zenith Automatic Transfer Switch units should be lifted using properly rated lifting devices.

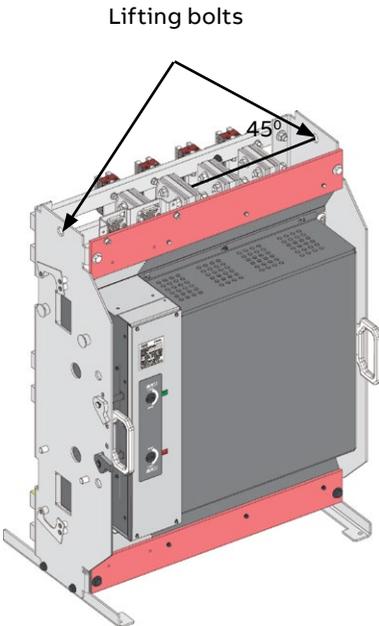


Fig. 9.3 ATS lifting.



**Danger**  
Hazardous Voltage can Cause Severe Injury or Death

Disconnect all power before installing, adjusting, or removing transfer switch or any of its components.

**Danger**  
Une tension dangereuse peut causer de graves blessures ou la mort. Débranchez toute alimentation avant d'installer, de régler ou de retirer le commutateur/ l'autocommutateur de transfert ou l'un des composants.



**Warning**

Due to hazardous voltages and currents, ABB recommends that only an ABB certified technician or a qualified electrician perform the installation & maintenance of the switch.

**Avertissement**

En raison des tensions et courants dangereux, ABB recommande qu'un technicien certifié d'ABB ou un electricien qualifié effectue l'installation et la maintenance de l'interrupteur.



**Danger**  
**Hazardous Voltage can Cause Severe Injury or Death**

Automatic Transfer Switch Equipment must be electrically grounded. Failure to do so may result in malfunction of the switch and possible damage to surrounding equipment.

**Danger**  
 Une tension dangereuse peut causer de graves blessures ou la mort.  
 L'équipement du commutateur de transfert automatique doit être établi à la terre électriquement.  
 Le non-respect de cette consigne peut entraîner un dysfonctionnement de l'interrupteur et des dommages éventuels à l'équipement environnant.



**Warning**  
 Before drilling conduit entry holes or any accessory mounting holes, cover and protect the switch and control panel to prevent dirt and metal fragments from entering the mechanical and electrical components.

**Avertissement**  
 Avant de percer des trous d'entrée ou des trous de montage d'accessoires, couvrez et protégez l'interrupteur et le panneau de commande pour empêcher la saleté et les fragments de métal de pénétrer dans les composants mécaniques et électriques.



**Warning**  
 Not following ABB lifting guidelines may result in severe injury or death.

**Avertissement**  
 Ne pas suivre les directives de levage d'ABB peut entraîner de graves blessures ou la mort.

## 9.4 Mounting the automatic transfer switch

Before mounting, please make sure there is enough space for the cabinet.

In order to fully open the cabinet door, the smallest distance from front door to any barrier is 47.5 in (1.2 m). Allow at least 39.5 in (1 m) of clearance behind enclosure, and 20 in (0.5 m) of clearance above the enclosure. Please note that these values provided are for the minimum required room size, For reasonably practical operation such as lifting, racking in/out, a larger space is recommended. Please consult qualified personnel to obtain space size.

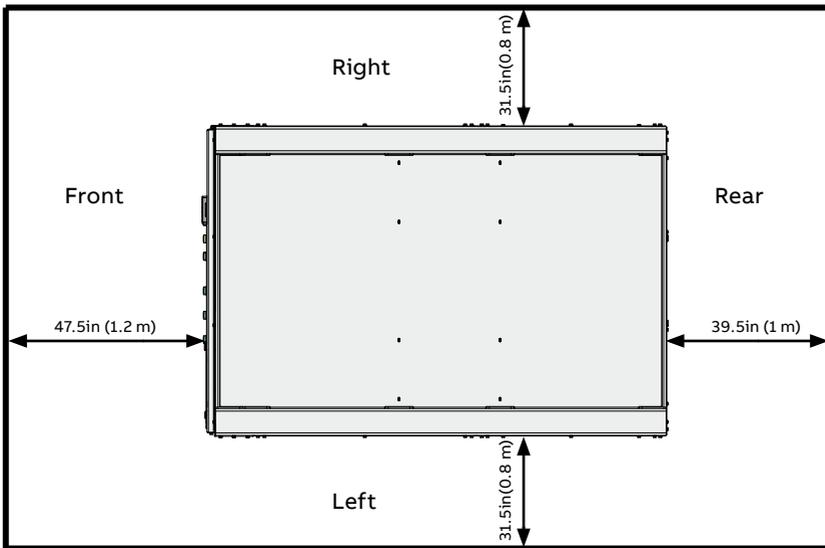


Fig. 9.4 Minimum distance from the cabinet top to the ceiling. Unit: Inch (mm)

At the bottom of the cabinet, there are two base steels which fix the cabinet on a platform or ground. On each base steel, two 15mm diameter holes allow the cabinet is fixed via screws. Mounting hole dimensions are shown in figure 9.6.

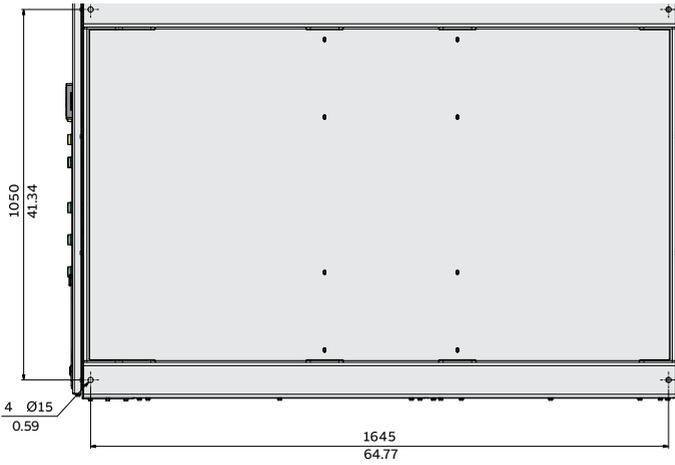


Fig. 9.5 Mounting hole dimensions.

## 9.5 Wire Connection

### 9.5.1 Main circuit

Function	LUG Type	Wire Range	Cables per pole	Tightening Torque <sup>1</sup> , lb-in (N-m)
Source 1 / Source 2 / Load	S-1392F	600 MCM	8	500/56.5
Source 1 / Source 2 / Load	S-1399R	750MCM	8	500/56.5
Source 1 / Source 2 / Load	PS-8419	500MCM	8	600/67.5
Source 1 / Source 2 / Load	PS-8420	750MCM	6	600/67.5

Table 9.2 Power Cable Torque Requirements

Detailed dimensions and location of S1, S2, Load and Ground bars are shown in market drawing.

### 9.5.2 Fire Fighting

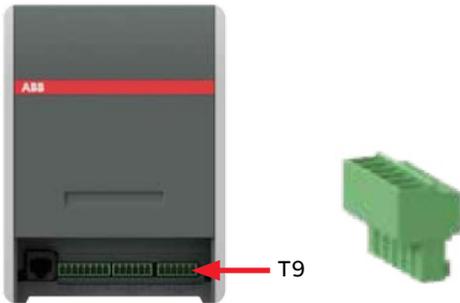


Fig. 9.6 Fire Fighting connector located on the front of ATS Controller OXCO\_

Connector/				
pin no	Function	Cable	Type	Voltage
T9	Digital input	1.5mm <sup>2</sup> /AWG16 max		0...24Vdc
1	Fire Fighting Input (+)		Input	
2	Fire Fighting (-)		Input	

### 9.5.3 Generator start/stop and ATS contact position

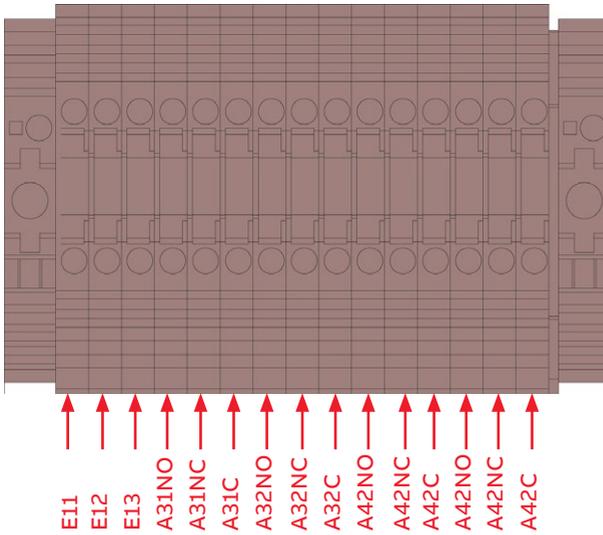


Fig. 9.7 Generator start/stop and ATS contact position located on electrical panel

Connector/				
pin no	Function	Cable	Type	Voltage
	Digital output	0.75...2.5mm <sup>2</sup> 18...12 AWG		10A @ 250V AC, 250mA @ 250 DC
E11	Generator start NC		Output	
E12	Generator start COM		Output	
E13	Generator start NO		Output	
A31NO	ATS contact is in Source 2 position NO		Output	
A31NC	ATS contact is in Source 2 position NC		Output	
A31C	ATS contact is in Source 2 position COM		Output	
A32NO	ATS contact is in Source 2 position NO		Output	
A32NC	ATS contact is in Source 2 position NC		Output	

Continued on the next page

A32C	ATS contact is in Source 2 position COM	Output
A41NO	ATS contact is in Source 1 position NO	Output
A41NC	ATS contact is in Source 1 position NC	Output
A41C	ATS contact is in Source 1 position COM	Output
A42NO	ATS contact is in Source 1 position NO	Output
A42NC	ATS contact is in Source 1 position NC	Output
A42C	ATS contact is in Source 1 position COM	Output

Table 9.3 Generator start/stop and ATS contact position

## 9.6 Final Equipment Inspection

Prior to energizing the transfer switch:

1. Remove any debris incurred, with a vacuum, due to shipment or installation.
2. Verify that all cabled connections are correct and that phase rotation of both sources match.
3. Check engine start connections.
4. Verify the correct connection of all control wires.
5. Check settings of all timers and adjust as necessary.
6. Adjust any optional accessories as required.
7. Check the lug torque values of the power connections.
8. Make sure that all covers and barriers are installed and properly fastened.

Each ABB Zenith transfer switch is factory wired and tested. A complete information package is furnished with each switch which includes:

- Sequence of operation.
- Description and operation of all accessories supplied.
- Power panel connection diagram and schematic.
- Description and identification of all customer field connections.

Installation of ABB Zenith Bypass isolation automatic transfer switch includes:

- Mounting the ATS cabinet
- Connection of Source 1, Source 2, and Load cables or bus bars.
- Connection of external control circuits as required.

For simple details on start-up refer to ZTG Quick start guide document number 1SCC303023K0201.

## 9.7 Initial Energizing

Before proceeding, refer to the information package supplied with the ATS and read and understand the information on all accessories provided, including this complete document.

### Before energizing the panel

1. Confirm that installation has been performed by a qualified person and in accordance with NFPA 70 (NEC).



**Notice**

This installation should be properly operated and maintained in accordance with the safety practices of NFPA 70E.

**Remarque**

Cette installation doit être correctement exploitée et entretenue conformément aux pratiques de sécurité de la norme NFPA 70E.

2. Confirm rating label matches the installed application. Rating label is located inside the panel enclosure.
3. Confirm that cables are connected properly and torqued according to the ATS labeling.
4. Verify that the enclosure ground connection is properly terminated.
5. Confirm that control wiring for engine start is properly terminated to the engine start contact (located in Chapter 9.5.3). Additionally, connect all applicable digital I/O, communications, and auxiliary contact wiring.
6. Flip slide switch (Fig. 3.13 number 4) to AUTO.
7. Ensure that all objects and debris are removed from enclosure, and enclosure is closed and latched.

### Energizing the panel

1. Close Source 1 circuit breaker.

**NOTE:** The HMI should illuminate if line voltage is present and S1 LED should light up.

2. Verify the phase to phase voltages at the Source 1 terminals.
3. Initiate auto configure from HMI default screen: Enter > Parameters > System Parameters > Start Automatic Configuration and allow a few seconds for system parameters to set"

4. Close the Source 2 circuit breaker.

5. Start the generator engine.

**NOTE:** If generator voltage is present at Source 2 terminals, S2 LED should light up.

6. Verify phase rotation of S1 matches that of S2.

**NOTE:** The ATS will not allow transfer if phase rotation does not match.

7. Shut down the generator engine.

8. Place the ATS in AUTO mode from the HMI by pressing AUTO key.

8. For additional start-up guidance for the ATS, please refer to ZTG Quick Start , Guide, document number 1SCC303023K0201.



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# 10. Accessories

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### Warning

Any troubleshooting should be conducted by trained and authorized personnel only. Appropriate personal protective equipment (PPE) should be used when troubleshooting the ATS panel.

Hazardous voltage may be present. Disconnect all power sources before performing work inside the ATS panel.

Failure to do so may result in serious injury or death.

### Avvertissement

Tout dépannage doit être effectué uniquement que par un personnel formé et autorisé. Un équipement de protection individuelle (EPI) approprié doit être utilisé lors du dépannage du panneau d'ATS. Une tension dangereuse peut être présente. Débranchez toutes les sources d'alimentation avant d'effectuer des travaux à l'intérieur du panneau d'ATS. Ne pas le faire peut entraîner des graves blessures ou la mort.

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## 10.1 Auxiliary power supply and Ekip -modules

ZBTS T-series bypass isolation automatic transfer switches, 1000A-3000A, 200-480 Vac can be equipped with Ekip-modules.

Ekip-modules are mounted with a auxiliary power supply module, OXEA1.

Suitable Ekip-modules are: Ekip link, signalling and connectivity modules.

For more information, see Chapter 5, Electronic accessories. The maximum number of Ekip-modules is 4.

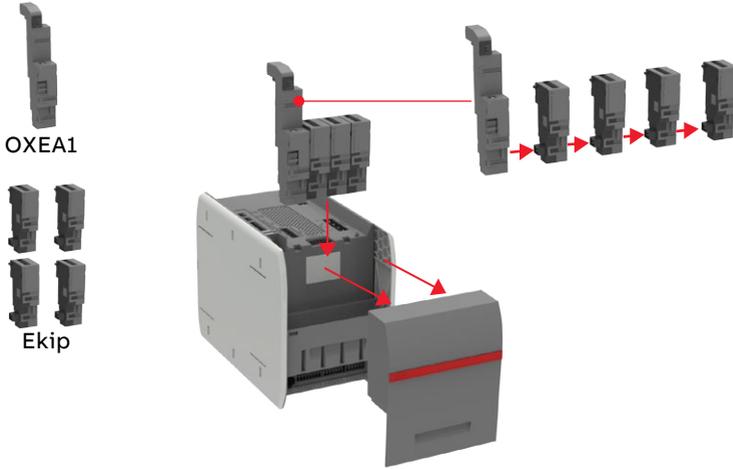


Fig. 10.1 Mounting of the auxiliary power supply module OXE1 and Ekip –modules

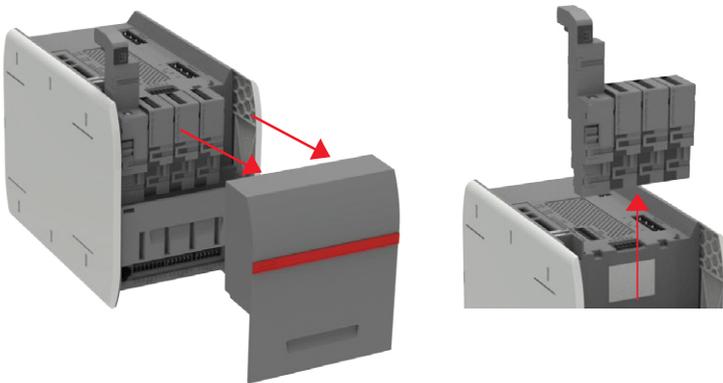
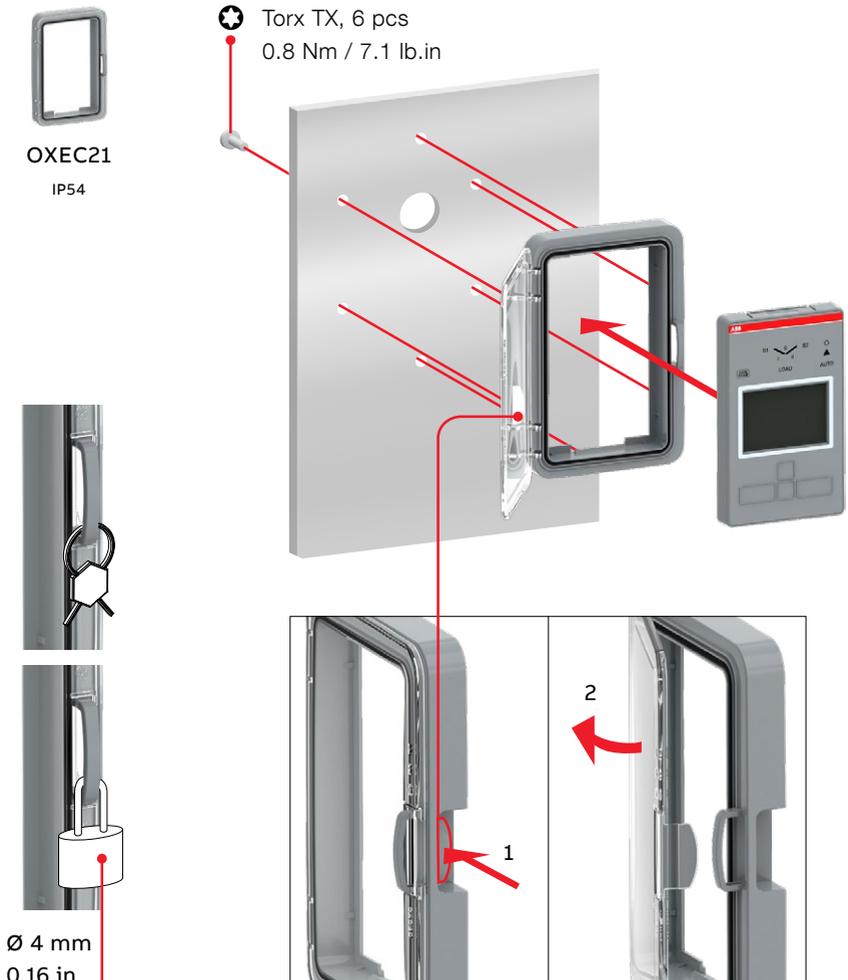


Fig. 10.2 Removing the auxiliary power supply module OXE1 and Ekip –modules from the automatic transfer switch

## 10.2 HMI protective cover

UL Type 3R HMI protective cover, type OXEC21, provides protection against water ingress. It comes standard with NEMA 3R enclosures, and is available as a replacement part.

Fig. 10.3 Mounting of HMI protective cover, type OXEC21





# 11. Replacement Parts

Mark	DESCRIPTION	ABB Part number
Operating handle	Rotary handle	7004629208a
Limit switch (SN, SE, A3, A4)	Limit switch	5GX.043.006
	208V/240V standard solenoid	70010259508A
	380V/400V/415V Standard 3P solenoid	70010425427A
	440V/480V Standard 3P solenoid	70010425470A
	380V/400V/415V Standard 4P solenoid	7006019398A
	440V/480V/ Standard 4P solenoid	70010259489A
	208V/240V Delay/Close solenoid	70010270854A
	380V/400V/415V Delay/Close solenoid	7008561306A
Solenoid	440V/480V Delay/Close solenoid	70010276342A
	SCR	5GX.579.001 or PS-8903
ATS Harness for BYPASS, OPEN		2TFR360463A1001
ATS Harness for BYPASS, Close and Delay		2TFR360463A1002
DS SWITCH	DISCONNECT SWITCH-BODY	2TFR360012A1001
	DISCONNECT SWITCH-AUXILIARIA SWITCH	2TFR360013A1001
	DISCONNECT SWITCH-SELECTOR HANDLES	2TFR360014A1001
LIGHT	LIGHT RED VOLTAGE 24 V AC / DC	2TFR360017A1001
	LIGHT GREEN VOLTAGE 24 V AC / DC	2TFR360018A1001
	LIGHT YELLOW VOLTAGE 24 V AC / DC	2TFR360019A1001
PUSHBUTTONS	FLUSH PUSHBUTTONS - MOMENTARY	2TFR360020A1001
RELAY	POWER RELAY MY4-D DC24V	2TFR360021A1001
	RELAY SOCKET PYFZ-14-E	2TFR360022A1001
LIMIT SWITCH(AI,AT,AA)	LIMIT SWITCH SPDP PIN PLUNGER	2TFR360023A1001
LIMIT SWITCH(AB3,AB4)	LIMIT SWITCH SPDP HINGE LEVER	2TFR360024A1001
Terminal	TERMINAL WDU 2.5 FEED-THROUGH	2TFR360025A1001
	CROSS-CONNECTOR WQV 2.5/2 W-SERIES	2TFR360026A1001
	END PLATE WAP 2.5-10 W-SERIES	2TFR360027A1001
	END BRACKET WEW-35/2 W-SERIES	2TFR360028A1001
	PCB TERMINALS FASTON 0.250	2TFR360031A1001
	BYPASS BRAIN XFR ASY 416-440	150045790
	BYPASS BRAIN XFR ASY 208-220 (211V)	150045787
PCBA	BYPASS BRAIN XFR ASY 230-240	150045788
	BYPASS BRAIN XFR ASY 380-400 (386V)	150045789
	BYPASS BRAIN XFR ASY 460/480	150045791
	BYPASS LOGIC BOARD ASSY	150044004
	Open CS 3P type C 120	1SDA083372R1
Current sensors	Open CS 4P type C 120	1SDA083373R1
	Temperature sensor	External probe PT1000 3 m

Continued on the next page

Rating Plug	Rating Plug 1600A	1SDA074226R1
	Rating Plug 2000A	1SDA074227R1
	Rating Plug 2500A	1SDA074228R1
	Rating Plug 3200A	1SDA074229R1
Controller	TruController	OXCO1
HMI	HMI-ASSEMBLY LEVEL 4, I-II	OXAMI1-L4
HMI	HMI-ASSEMBLY LEVEL 4, I-O-II	OXBMI1-L4
	HMI protective cover, IP54	OEXEC21
Cable lugs-Compression	Lug, Comp. Copper 2-H, Cable 500, SB	PS-8419
	Lug, Comp. Copper 2-H, Cable 750, SB	PS-8420
Cable Lugs - Mechanical	4 PORT LUG 600MCM MTU	S-1392F
	4 PORT LUG 750MCM MTU	S-1399R
Harness	Harness FRAME-POWER OUTPUT-PA2 PB2	2TFR360131A1001
	Harness FRAME-ATS POWER PLUG-TP1-1	2TFR360132A1001
	Harness FRAME-ATS POWER RECEP-TP1-2	2TFR360133A1001
	Harness FRAME-ATS SINGNAL PLUG-TP2-1	2TFR360134A1001
	Harness FRAME-ATS SINGNAL RECEP-TP2-2	2TFR360135A1001
	Harness FRAME-ATS LOCATION-PE-2	2TFR360136A1001
	Harness FRAME-MTS POSITION-PF-2	2TFR360137A1001
	Harness FRAME-DISCONNECT SWITCH-PG-2	2TFR360138A1001
	Harness DISPLAY PANEL-LIGHT PH-2	2TFR360139A1001
	Harness DISPLAY PANEL-SWITCH-PI-2	2TFR360140A1001
	Harness DISPLAY PANEL-GND 81	2TFR360141A1001
	Harness ELEC PANEL-POWER INPUT-PA1	2TFR360142A1001
	Harness ELEC PANEL-CONTROLLER PC-1	2TFR360143A1001
	Harness ELEC PANEL-CONTROLLER-PD-1	2TFR360144A1001
	Harness ELEC PANEL-CONTROLLER-PE-1	2TFR360145A1001
	Harness ELEC PANEL-MTS POSITION-PF-1	2TFR360146A1001
	Harness ELEC PANEL-DISCONNECT SW -PG-1	2TFR360147A1001
	Harness ELEC PANEL-LIGHT-PH-1	2TFR360148A1001
	Harness ELEC PANEL-ENGINE CONTACT-PI-1	2TFR360149A1001
	Harness ELEC PANEL-25ZA	2TFR360150A1001
	Harness ELEC PANEL-ENGINE START	2TFR360153A1001
	Harness ELEC PANEL-24V-80	2TFR360154A1001
	Harness ELEC PANEL-GND-81	2TFR360155A1001
Harness ELEC PANEL-CONTACT RESET	2TFR360156A1001	
Harness HMI-CAT.5E-3.0M BLACK	2TFR360169A1001	





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