

Automatic Transfer Switch Solution



Transfer switch

Power Reliability starts here

- Primary power source provides power to all loads for an indefinite long time
- Secondary/backup source provides power in case power supply from the utility is interrupted or differs from nominal values:
 - Generator sets
 - Separate feeder of supply network that is independent of the normal feeder
 - Uninterruptible power supply (UPS)
- A transfer switch is an electrical switch whose primary function is to switch between the primary and the secondary source of electricity.



Application list



Transfer Switch Solutions classification

Switching device

- Switches
- Circuit breakers
- Contactors
- Static transfer switch



Class PC

+Operation Mechanism Design - Require additional protective device



+Number of life cycle - No Short Circuit Capacity & Withstand



Class CB

+Overcurrent protection included - Number of components



Solid-state SCR switching >> no moving parts

+Very High Speed (>1/4cycle) - Require Sync live sources

IEC60947-6-1

Class PC TSE

transfer switch equipment based on mechanical switching devices, that do not need electrical power to hold the main contacts open or closed and capable of making, carrying, and breaking currents under normal circuit conditions including operating overload conditions, and making and withstanding short-circuit currents

Note 1 to entry: For the purposes of this document, a fuse-combination unit is considered a Class PC device capable of breaking short-circuit current.

Class CB TSE

transfer switch equipment based on mechanical switching devices and capable of making, carrying and breaking currents under normal circuit conditions including operating overload conditions, and making and breaking short-circuit currents

Note 1 to entry: Class CB TSE for which the manufacturer has assigned a short-time withstand current are also capable of withstanding short-circuit currents.

Class CC TSE

transfer switch equipment based on mechanical switching devices having only one position of rest, operating otherwise than by hand, and capable of making, carrying and breaking currents under normal circuit conditions including operating overload conditions

Note 1 to entry: Class CC TSE are not capable of making or breaking short-circuit currents. They are only capable of withstanding conditional short-circuit currents.

Note 2 to entry: Class CC TSE is not suitable for isolation.

Transfer Switch Solutions classification

Controlling method	 Manual transfer switch (MTS) – operated manually with handle
	 – Remotely operated transfer switch (RTS) – motorized or with solenoid, controlled remotely with rotary switch or push button
	 Automatic transfer switch (ATS) – equipped with ATS controller or embedded ATS software

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¹⁾Delayed transition is also know as Open transition with stable OFF between positions I and II ²⁾the categorization is according to IEC 60947-6-1: Transfer switching equipment

Transfer Switching

Transition Types

Delayed Transition I – O- II



LOAD

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LOAD

Open Transition I -II





Closed Transition I – I+II - II





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LOAD

Delayed transition is also known as open transition with stable OFF position between positions I and II

Automatic transfer switches

Transition types

Delayed transition: I – 0 – II

- Commonly preferred transition type in the "IEC market"
- Operation is independent of electrical synchronization between both sources of power
- Mechanical or/and electrical interlock is needed to prevent overlapping of contacts
- Time delay in OFF position prevents high current and torque transient from appearance in case of inductive loads transfer (pumps station, water treatment plants, manufacturing facilities)

Application: two power interruptions (transfer to emergency power source plus re-transfer) **with duration of "seconds"** is acceptable or UPS is installed to cover the downtime



Automatic transfer switches

Transition types

Open transition: I – II

- Commonly preferred transition type in the North American market
- The transfer switch has to be equipped with in-phase monitor
- The transfer will not occur if both sources of power are available, but unable to meet synchronization criteria
- Rapid contact transfer time < 50 ms between two available power sources. The transfer is accomplished without appreciable power interruption to the general loads

Application: loads are not sensitive to the power off time < 50 ms (Small business, residential installation without sensitive load).



Automatic transfer switches

Transition types

Closed transition: I – I+II – II

- Closed transition ATS has to check synchronization conditions between two power sources (V, F, phase angle)
- Closed transition allows completely eliminate the power interruption during the transfer **between two available power** sources.
- Some utilities require closed transitions to comply with interconnect requirements
- Closed transitions can produce **higher fault current**

Application: loaded generator engine testing (e.g. Hospitals, Airports), transformer maintenance, elimination of second power interruption during the re-transfer phase.



Open type



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¹⁾Delayed transition is also know as Open transition with stable OFF between positions I and II

ATS by Switch Solution Portfolio

IEC Standard																
Series	40	60/	80	100	125	160/200	250/315	400	500	630	800	1000	1250	1600	40 - 125	160 - 3200
ATS Switches solution	nes solution Compact ATS (OTM_21D) TruOne OX_Level2/Level3/Level4						OTM Mot Switch	orized Change Over + OMD Controller								



OTM...21D Types





OX.... Types

OTM...+OMD Types

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ATS by Switch Solution Portfolio

UL Standard													
Series	40	60/ 63	80	100	125	160/200 250/315	400	500	630	800	1000	1200	Up to 4000A
ATS Switch Solution Open & Delay Transition		TruOne OX_Level3/Level4							###				
Open & Delay & Closed Transition													Zenith – T Series , ZTS (closed transition start from 100A)
OX Types									TTS				

Offering



IEC 200-250A UL 30-200A



IEC 315-400A UL 260A



IEC 500-800A UL 400-600A



IEC 1000-1600A UL 800-1200A

	IEC 60947-6-1	UL 1008
Rated voltage [Vac]	200-480	200-480
Number of poles	2, 3, 4	2, 3, 4*
Open transition, I-II	Yes	Yes
Delayed transition, I-O-II	Yes	Yes
[A] IEC	Up to 1600	
[A] UL		Up to 1200

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TruONE™ - World's first true all-in-one ATS

The only ATS engineered to incorporate switch and controller in one seamless unit.



Conventional ATS technology

Simplicity vs Complexity – TruONE ATS

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ABB TruONE

TruOne Standard Feature



Standard 🗏

- IEC 60947-6-1 (OX...E..)
- UL 1008 (OX...U..)

Current range 🖽

- IEC : 200 1600A
- UL:200-1200A

Standard feature 🂍

- Complete with controller and cable 1.5m
- Solenoid
- 3poles ,4poles
- Double throw
- Auto and Manual transfer
- LCD Display
- Voltage drop, pick-up setting range
- Frequency drop, pick-up setting range
- Gen exercise programable
- Overlapping Neutral type

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TruOne Highlight Feature



Highlight Feature 📕



- Easy to install and Save space
- Transfer time below 50ms
- **In-phase** monitoring
- Load shedding function
- Programable DI/DO
- Event log
- Predictive maintenance (Level 4 version)
- Harmonic measuring ٠

Communication & Measuring

- Optional communication : Modbus , Profibus , Ethernet
- **Optional Cloud monitoring**
- Current , Power , VAR , VA monitoring display (Level 4 version) ٠

TruONE™ - World's first true all-in-one ATS

For all application requirement

Highlights

- The all-new ATS from ABB is the world's first true, purpose-built ATS integrating switch and controller in one seamless unit
- With UL short-time ratings (STR) in every frame, TruONE stands ready to ensure the steady delivery of critical power at all times
- Its **predictive maintenance** (IvI 4 controller) and modular construction simplify service
- Its unique switch design allows manual operation, even when power is on
- And its advanced connectivity with 7 comm protocols is ready for the future
- Fast in-phase open transition, up to 50ms transfer time; delayed transition also available











TruONE™ - World's first true all-in-one ATS

Power panel features



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*Level 3 & Level 4 only Link to manual and automatic operation video: https://www.youtube.com/watch?v=bosvSPVi2sM

Logical Sequence from S1 to S2



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Logical Sequence from S2 back to S1



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HMI – Level 4 interface, delay times

Delay times

Override S1 Failure 0...60 s
 Transfer from S1 to S2 0...60 min
 Center-off 0...300 s
 Override S2 Failure 0...60 s
 Transfer from S2 to S1 0...120
 Generator Stop 0...60 min
 Pre-transfer S1 to S2 0...60 s
 Post-transfer S1 to S2 0...60 s
 Pre-transfer S2 to S1 0...60 s
 Post-transfer S2 to S1 0...60 s
 IL Load Shed 0...60 s







The operation manual of the TSE shall include the description of the operating sequences. An example is shown in Figure 1.

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^a equal to operating transfer time when all purposely introduced time delays (t_2 , respectively t_6 , t_4) are set to a minimum value.

^b equal to contacts transfer time when all purposely introduced time delays (t₄) are set to a minimum value.



Mechanism with embedded electronics – manual and automatic operation



Power poles - configurations





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Power poles – internal parts



Position indication module – Open and delayed transition



Open transition without the OFF indication

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Mechanism with embedded electronics





Mechanism with embedded electronics – MAN/AUTO selector



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TruONE™ - World's first true all-in-one ATS

Mechanism removal



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Controllers for every need

Level 2 (DIP)



- DIP switch controls
- Mains-Mains and Mains-Generator applications
- Standard features to meet the basic application requirements

Level 3 (LCD)



In addition to Level 2 features:

- LCD screen controls
- Programmable inputs and outputs (I/O)
- Flexible dropout limits and time delays
- Field-mountable Ekip Com accessories for advanced communication

Level 4 (Touch)







In addition to Level 3 features:

- Touch screen controls
- Power measurement
- Predictive maintenance





HMI



TruONE[®] feature comparison

TruOne Types

Main features in the table below. Consult ABB for more information.



Feature comparison

2	Level 2 controls	Level 3 controls	Level 4 controls
Ampere sizes available	IEC: 200-1600 A	IEC: 200-1600 A	IEC: 200-1600 A
	UL: 30-1200 A	UL: 30-1200 A	UL: 30-1200 A
Rated voltage	200-480Vac	200-480Vac	200-480Vac
Rated frequency	50 / 60 Hz	50 / 60 Hz	50 / 60 Hz
Phase system	Single and Three	Single and Three	Single and Three
Number of poles	2, 3 and 4	2, 3 and 4	3 and 4
Neutral configuration			
Switched	Yes	Yes	Yes
Overlapping	No	Yes	Yes
Product type			
Open transition (I-II)	Yes	Yes	Yes
Delayed transition (I-O-II)	Yes	Yes	Yes
Voltage and frequency settings			
Pick up Voltage Source 1	Fixed 2% above drop out	71-99%, 101-119%	71-99%, 101-119%
Drop out Voltage Source 1	+/-5, 10, 15, 20%	70-98%, 102-120%	70-98%, 102-120%
Pick up Voltage Source 2	Fixed 2% above drop out	71-99%, 101-119%	71-99%, 101-119%
Drop out Voltage Source 2	+/-5, 10, 15, 20%	70-98%, 102-120%	70-98%, 102-120%
Pick up Frequency Source 1	Fixed 1% above drop out	80.5-99.5%, 100.5-119.5%	80.5-99.5%, 100.5-119.5%

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TruOne Types



Feature comparison

-

	Level 2 controls	Level 3 controls	Level 4 controls
Source failure detections			
No voltage	Yes	Yes	Yes
Undervoltage	Yes	Yes	Yes
Overvoltage	Yes	Yes	Yes
Phase missing	Yes	Yes	Yes
Voltage unbalance	Yes	Yes	Yes
Invalid frequency	Yes	Yes	Yes
Incorrect phase sequence	Yes	Yes	Yes

TruOne Types







DIP + keys	LCD + keys	Touch + keys
Yes	Yes	Yes
0/1	1/1	2/1
1 / 1	2 / 1	3/1
No	Yes	Yes
Yes	Yes	Yes
Source 1, No priority	Source 1/2, No priority	Source 1/2, No priority
Yes	Yes	Yes
Yes	Yes	Yes
via HMI	via HMI, digital inputs	via HMI, digital inputs
via Ekip Connect	via HMI, Ekip Connect	via HMI, Ekip Connect
No	No	Yes
No	Yes	Yes
via Ekip Connect	via HMI, Ekip Connect	via HMI, Ekip Connect
via Ekip Connect	via HMI, Ekip Connect	via HMI, Ekip Connect
No	No	Yes
No	Voltage	Voltage, current
	DIP + keys Yes 0 / 1 1 / 1 No Yes Source 1, No priority Yes Yes Via HMI via Ekip Connect No Via Ekip Connect via Ekip Connect No No No No	DIP + keysLCD + keysYesYes0 / 11 / 11 / 12 / 11 / 12 / 1NoYesYesYesYesYesSource 1, No prioritySource 1/2, No priorityYesYesYesYesYesYesYesYesYesYesYesYesYia HMIVia HMI, digital inputsVia Ekip ConnectVia HMI, Ekip ConnectNoYesVia Ekip ConnectVia HMI, Ekip ConnectVia Ekip ConnectVia HMI, Ekip ConnectVia Ekip ConnectVia HMI, Ekip ConnectNo

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HMI – Level 2 interface



Delayed transition



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HMI – Level 4 interface

Home key opens <u>start menu</u>



HMI – Level 4 interface



HMI – Level 4 interface



HMI – Level 4 interface



Voltage, current, active, apparent and reactive power

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HMI – Level 4 interface





HMI – Level 4 interface



Start menu - Main menu -Measurements





HMI – Level 4 interface



*modules menu missing from the image

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Load shed – where to get the signal



Mechanism with embedded electronics – number of standard I/O



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HMI – Level 4 interface, input and output functions

Input functions

Output functions

Emergency Stop Remote Test On Load **Remote Test Off Load** Inhibit AUTO Mode Manual Retransfer to Priority Source Priority S1 **Source Priority S2** Inhibit Transfer **Bypass Running Time Delays** Remote Control to S1 **Remote Control to OFF** Remote Control to S2 **Reset Alarm**

Alarm / Product availability Load connected S1 Load disconnected Load connected S2 Pre-transfer Signal Source 1 available Source 2 available Load Shed 1 Load Shed 2

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Pre-Transfer signal

What are pre-transfer

- To signal downstream equipment that ATS is about to transfer
- Why
 - To stop loads prior the transfer
 - Elevator controller to move elevator to the next available floor, open doors and let people to exit the elevator prior the transfer
- How
 - By sending a signal in practice by activating/closing a digital output – which is taken to a elevator controller, control room, contactor, which disconnects load or inhibits the operation



Downstream equipment -Elevator controller -Control room -PLC -Motors

Load Shed

What is load shed

- To disconnect non-priority loads before transferring the load on generator
- Why
 - To reserve power only for the critical loads
 - If the generator is not sized to manage all loads
- How
 - By sending a signal in practice by activating/closing a digital output – which is taken to a control room, or contactor, which disconnects the load





HMI – Level 4 interface



*Optional modules menu missing from the image

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HMI – Level 4 advanced features



Advanced connectivity with EDCS and predictive maintenance

Level 3

In addition to typical measurements and indications (voltage, ATS position...) TruONE[®] provides also the following diagnostics:

- Number of total operations
- Number of load transfers
- Transfer time
- Source fail transfers
- Days energized
- Total time on Source 1 and Source 2
- Time Source 1 and Source 2 available
- Last generator start
- Generator starting time

Level 4 with predictive maintenance

In addition to Level 3:

- Build-in power metering
- For predictive maintenance purposes:
 - temperature measurement on load terminals for loose contact indication
 - temperature measurement on the device for panel internal temperature indication
 - temperature measurement on the HMI for ambient temperature indication where the ATS panel is installed to (when HMI is mounted to the door)
 - contact wear



Accessory Installation



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Unmatched connectivity

Ekip Com modules

- TruONE has market leading communication capabilities
- It uses the same seven communication modules as Emax2 circuit breaker:
 - Modbus RS485, TCP/IP
 - Profibus DP
 - ProfiNet
 - DeviceNet
 - Ethernet IP
 - IEC 61850
- Additional digital inputs/outputs are available with Ekip com 2K signalling
- Ekip Com Hub enables cloud-based services within ABB Ability EDCS
- All modules mounted inside the switch body





ABB Ability™ applications already available



ABB Ability[™] applications available – Digital Solution At Edge & Cloud Electrical Distribution Control System



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Easy to install.





REDUCE INSTALLATION TIME BY UP TO 80%.

Single-wire installation saves time and up to 60 meters of wire. HMI mounts with locking nut on panel door. Door drillings are reduced to just one All accessories snap on, even within a finished panel. Enables panel customization without tools, even at the site.

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Safety and protection.





REDUCE THE RISK OF OPERATOR INJURY.

Enables safe emergency manual operation with panel door closed—even under load.

No dangerous line voltages connected to the panel door in any HMI installation method.

Costly downtime is minimized.

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TruONE[®] ATS Optimum interface.





SIMPLIFY CONNECTIVITY.

Cloud-based connectivity through ABB Ability[™] Electrical Distribution Control System (EDCS).

- Simplified implementation and coordination with other ABB devices.
- One common user interface and one common software environment.
- Access to critical data remotely in real time.
- Optimized energy efficiency.

User-friendly multiline display with seven communication protocols.

Ready to meet future digital demands (IoT).



A major shift in engineering. A critical breakthrough for critical power.

Stands ready to ensure delivery of critical power at all times. Features all-in-one design to minimizes installation time and connection failures.

Ensures best-in-class reliability.

Allows emergency manual operation under load for immediate power restoration in the event of an equipment malfunction.

Offers advanced connectivity that's ready for the future.

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