

TS 890

AUTOMATIC TRANSFER SWITCH

INSTALLATION, OPERATING, & SERVICE MANUAL



PM045 Rev 3 00/02/29

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1. CAUTION!

Before opening the transfer switch enclosure to perform any service task, or to manually transfer the mechanism, it is imperative to isolate the transfer switch from any possible source of power. Failure to do so may result in serious personal injury or death due to electrical shock.

Service procedures must be undertaken by qualified personnel only!

NOTE: - All information contained in this manual is for reference only, and is subject to change without notice.

Contact Thomson Technology Inc. for clarification of current revisions or if in doubt about any matter relating to installation, operation or maintenance.

This revision Instruction Manual is intended for TS 890 Transfer Switch products which have been manufactured subsequent to the revision date. For products manufactured previous to this date contact Thomson Technology to obtain applicable manuals.

2. NOTE TO INSTALLER

To ensure satisfactory installation of this equipment be sure to observe "Recommended Connection Tightness" and "Requirements for Upstream Circuit Protective Devices" located in this manual.

All mechanical and electrical connections must be checked for tightness prior to placing this equipment in service to ensure proper operation and to validate applicable warranty coverage. If the transfer switch has programmable multi-tap voltage capability (refer to electrical schematic), confirm the transfer switch has been configured for the system voltage prior to installation.

Warning

Failure to confirm and match transfer switch voltage with the system voltage could cause serious equipment damage.

The voltage selections and connections are shown on the electrical schematics attached to each transfer switch. The factory default settings will be indicated on the calibration label attached on the

inside of the enclosure door (supplied loose on open style models). A blank label is included to record the applicable settings if the configuration is changed from the factory default settings.

To change the transfer switch configuration the following must be accomplished:

- Change voltage taps of PT's to system voltage (refer to schematics)
- Change TSC 800 programming (refer to sections 6.2.2, 6.2.4, 6.2.5, 6.3, and 6.4 of the TSC 800 instruction manual). The following settings may require reprogramming (depending on options purchased):
 - System voltage
 - System frequency
 - System phase
 - Utility undervoltage pickup (typically 90% of system voltage)
 - Utility undervoltage dropout (typically 80% of system voltage)
 - Utility overvoltage pickup (typically 110% of system voltage)
 - Utility overvoltage dropout (typically 105% of system voltage)
 - Utility underfrequency (typically 95% of system frequency)
 - Utility overfrequency (typically 105% of system frequency)
 - Generator undervoltage pickup (typically 90% of system voltage)
 - Generator undervoltage dropout (typically 80% of system voltage)
 - Generator overvoltage pickup (typically 110% of system voltage)
 - Generator overvoltage dropout (typically 105% of system voltage)
 - Generator underfrequency (typically 95% of system frequency)
 - Generator overfrequency (typically 105% of system frequency)

Record any changed setting on the TSC 800 Programming Data Sheets for future reference.

Complete the blank calibration label and attach to the inside of the transfer switch enclosure door.

INSTALLATION OF OPEN TYPE TRANSFER SWITCHES - Please refer to the factory for additional information.

3. GENERAL DESCRIPTION

(See **CAUTION!** on Page #1)

The automatic transfer switch employs two moulded-case switching devices which may be:

- a) non-automatic circuit interrupters ("type A" transfer switch)
- b) automatic circuit interrupters with integral trip units; ("type B" transfer switch)

In this manual, the switching devices will be referred to as "breakers". The breakers are independently operated by motor operated mechanisms within each breaker. The transfer switch provides automatic transfer of an electrical load to a standby power supply in the event of drop or loss of voltage of any or all phases of the primary power supply. Upon restoration of the primary supply, the electrical load is automatically retransferred to the primary power supply (after an adjustable time delay). All necessary control components for automatic transferring are located in the control compartment and on each associated breaker.

The transfer motor utilizes the power from the source to which the electrical load is being transferred. The mechanism provides a positive mechanical interlock to prevent both breakers from being closed at the same time. The mechanism is also designed to leave both breakers "trip free" in the closed position, permitting incorporation of overload and/or short-circuit protection in either or both breakers ("type B"). After tripping, the breaker of a "type B" transfer switch must be manually reset.

Note: For the purpose of this manual, the term UTILITY indicates the primary power, and the term GENERATOR indicates the standby power.

4. GENERAL SEQUENCE OF OPERATION

4.1. TYPE A TRANSFER SWITCH

When utility supply voltage drops below a preset nominal value (70-100% of rated adjustable) on any phase, an engine start delay circuit will be initiated and the transfer to utility supply signal will be removed (i.e. contact opening). Following expiry of the engine start delay period an engine start signal (contact closure) will be given.

Once the engine starts, the transfer switch controller will monitor the generator's output voltage. Once the generator voltage and frequency rises above preset values (70 - 100% nominal adjustable), the transfer to generator supply signal (contact closure) will be given to

the transfer switch mechanism. This will trip open the utility supply breaker and following a neutral time delay period (0 - 10 sec adjustable) will close the generator supply breaker to re-energize the load.

The generator will continue to supply the load until the utility supply has returned and the retransfer sequence is completed as follows: When the utility supply voltage is restored to above the preset values (70 - 100% of rated adjustable) on all phases, a transfer return delay circuit will be initiated. Following expiry of the transfer return timer (0 - 30 min. adjustable), the transfer to generator supply signal will be removed (contact opening). This will trip open the generator supply breaker and following a neutral time delay period (0 - 10 sec adjustable) will close the utility supply breaker to re-energize the load.

An engine cooldown timer circuit will be initiated once the load is transferred from the generator supply. Following expiry of the cooldown delay period (0 - 30 min. adjustable) the engine start signal will be removed (contact opening) to initiate stopping of the generator set.

4.2. TYPE B TRANSFER SWITCH

The general sequence of operation for a type B transfer switch is identical to the type A transfer switch except for the following conditions:

4.2.1. Overcurrent Trip of Utility Transfer Breaker

Should the utility transfer breaker (UCB) contain an overcurrent trip device and it is activated due to an overcurrent condition on the load, the transfer switch logic will issue an engine start signal and will force a transfer to the generator supply (if within normal voltage and frequency limits). The transfer to the generator supply will occur irrespective of the utility supply voltage condition. The generator will remain on load until the UCB “tripped” indicator (on the breaker) is manually reset and the utility supply is within normal limits. **Note:** Type B transfer switches will be supplied with the above logic as standard. Other optional logic configurations may be installed on the transfer switch. Contact the TTI factory for further information.

4.2.2. Overcurrent Trip of Generator Transfer Breaker

Should the generator transfer breaker (GCB) contain an overcurrent trip device and it is activated due to an overcurrent condition on the load, the transfer switch logic will cause a transfer to the utility supply (if within normal voltage and frequency limits). The transfer to the utility supply will occur irrespective of the generator supply voltage condition. The transfer switch will not transfer to the generator supply should a subsequent utility failure occur until the GCB "tripped" indicator (on the breaker) is manually reset and the generator supply is within normal limits. **Note:** Type B transfer switches will be supplied with the above logic as standard. Other optional logic configurations may be installed on the transfer switch. Contact the TTI factory for further information.

4.3. SERVICE ENTRANCE RATED TRANSFER SWITCH

(Note: This applies only to service entrance transfer switches supplied with a Padlockable Disconnect Switch. Contact TTI for other types.)

4.3.1. Normal Operation

Under normal conditions, the load is energized from the utility supply through the closed utility transfer breaker. If the utility power fails, the generator will start and the load will be re-energized via the closed generator transfer breaker.

In the normal operating mode, the Service Disconnect switch shall be in the "energized" position.

4.3.2. SERVICE DISCONNECT PROCEDURE

To perform a service disconnect (i.e. to disconnect the utility and generator supplies), the following procedure is required:

1. Move the "Service Disconnect" control switch located on the door of the transfer switch to the "Disconnected" position.
2. Verify that the "Service Disconnected" pilot light is illuminated. *If the Light is illuminated, the service has been successfully disconnected and it is safe to perform any maintenance procedures as required.* In this condition, the transfer switch is in the neutral position, with both utility and transfer breakers open. The transfer switch will remain in this condition, regardless of condition of the utility and generator supplies (i.e. if the utility power fails, the generator will not receive a start condition,

nor will the transfer switch move to the generator position). If the Light is **not** illuminated, further procedures are required (refer to the following procedure #4).

3. Attach safety lockout padlock to the "Service Disconnect" control switch to prevent unauthorized change in operating condition and verify transfer switch door is locked closed. If the door is not locked, turn and remove door key.

4. If the "Service Disconnected" pilot light is **not** illuminated, the service will **not** have been successfully disconnected and it is therefore **not** safe to perform any maintenance until the following additional procedures are performed:

Warning

Qualified personnel must undertake the following procedures **only!** Failure to do so may result in **serious personal injury or death** due to electrical shock.

- Open the door to the transfer switch using a suitable tool and opening the door lock with the key.
- Visually inspect the actual position of the transfer switch mechanism. If the position of the transfer switch mechanism is clearly in the "neutral position", the service has been successfully disconnected.

Notes: 1) If the position of the transfer switch mechanism is clearly in the "neutral position, the "service disconnected" pilot light may not have illuminated due to the following reasons:

- a) Utility and generator supply voltages are not present (the pilot light requires AC supply voltage to be present).
- b) The pilot light may be burnt out. The bulb should be immediately replaced with a suitably rated bulb.
- c) Failure of one or more of the sensing/logic contacts. A qualified service technician is required to trouble shoot this specific condition. Unplug the control circuit isolation plug to de-energize all AC power to the control circuits. Note: The AC power conductors will still remain energized. Once the control circuit isolation plug is removed the "Service Disconnected" pilot light will not illuminate due to loss of control power.

Note: to return the transfer switch back to normal operation, the control circuit isolation plug must be reconnected for correct operation.

- The transfer switch door should then be securely closed using a suitable tool and locked in the closed position with the key. Once the transfer switch door has been positively locked closed and secured and only then is, it is safe to perform any maintenance procedures as required.
- *If the position of the transfer switch mechanism is **not** in the "neutral position" further procedures are required (refer to the following procedure)*

Warning

Failure to positively lock closed and secure the transfer switch door may result in **serious personal injury or death** due to electrical shock.

- If the position of the transfer switch mechanism is **not** in the "neutral position" the transfer switch mechanism must be manually operated as follows. To operate manually, pull the manual release plunger on the mechanism, releasing the motor drive rod from motor drive arm and move the knob and yoke to the marked "**Neutral**" position.

Warning

Failure to move the mechanism to the Neutral Position may result in **serious personal injury or death** due to electrical shock.

The transfer switch door should then be securely closed using a suitable tool and locked in the closed position with the key. Once the Transfer switch door has been positively locked closed and secured and only then is, it is safe to perform any maintenance procedures as required.

Warning

Failure to positively lock closed and secure the transfer switch door may result in **serious personal injury or death** due to electrical shock.

To re-energize the load, the padlock(s) should be removed from the "Service Disconnect" control switch, and move the switch to the "Energized" position. The transfer switch will immediately return to the utility or generator supply if within normal operating limits.

5. TYPE A AND TYPE B DEFINITION

"Type A" transfer switch means an automatic transfer switch that does not employ integral overcurrent devices.

"Type B" transfer switch means an automatic transfer switch that does employ integral overcurrent protection (in at least one of its two breakers).

"Type A" transfer switches are not equipped with trip units, and require properly coordinated upstream protection. Information on closing and withstand ratings, and recommendations for maximum upstream protective devices for "type A" units are in this manual. (Some "type A" models do employ "high-magnetic" trips in the breakers, however these are set to trip at a higher than normal current for that amperage circuit, so that the possibility of tripping is very remote. Since these trips are not intended to provide overcurrent protection, but are rather employed to ensure the integrity of the transfer switch under all circumstances, they are still classed as "type A").

"Type B" transfer switches are typically equipped with standard thermal-magnetic trips which will provide the required overload and short circuit protection. "Type B" can also be built using solid state trip breakers, which can include ground fault tripping as well as overload and short circuit protection.

It should be noted that a "type B" transfer switch with overcurrent protection in only one breaker will require the same consideration for upstream protection in the feeder of the breaker with no trip (as applies to a "type A" transfer switch).

6. GENERAL NOTES ON SERVICING

(See **CAUTION!** on Page #1)

When performing any service work it is imperative that the following be observed:

- 6.1. To maintain mechanical integrity, ensure that:
 - All linkages are correctly adjusted.
 - Mechanical interlocking is correct - it should not be possible to close a breaker without first opening the other breaker.
 - All fasteners are adequately tightened.
 - The operating linkages are not damaged or bent, and that all bearing points operate freely.
- 6.2. To maintain electrical integrity, ensure that:

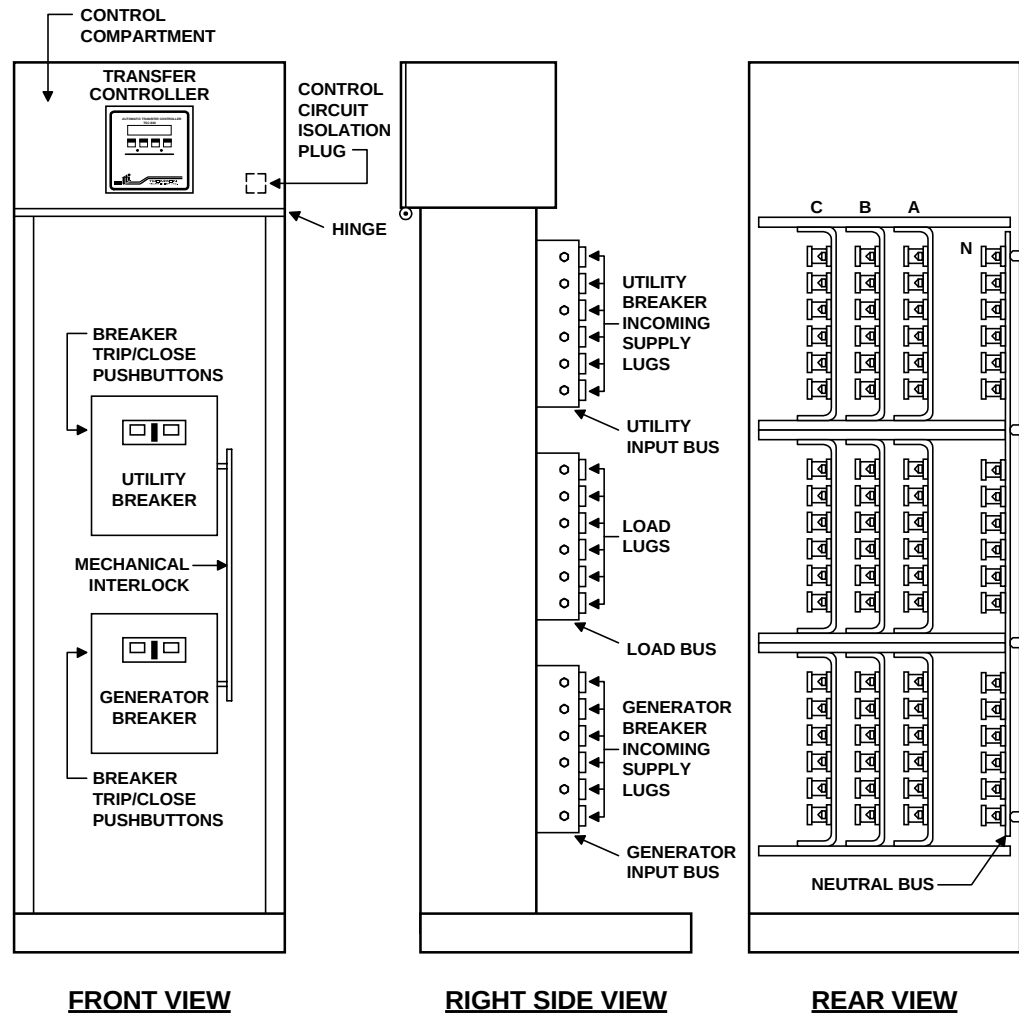
- All electrical connections, especially power connections, are clean and adequately tightened. Corroded or loose power connections will cause destructive heating, and may cause premature tripping in the type "B" units.
- All insulating devices are in place and in good condition.
- No moisture or other contamination is present.
- Electrical conductors are adequately secured away from moving parts.

6.3. To maintain operational integrity, ensure that:

- All control devices are in good condition and correctly calibrated.
- All control devices are adequately secured in their plug-in fixtures

Service work should be undertaken only by qualified personnel. Failure to correctly maintain an automatic transfer switch may represent a hazard to life and equipment. Full operational testing must be done prior to placing a transfer switch in service subsequent to any maintenance or repair. Any service work involving electrical components requires high-potential testing to ensure that required insulation levels have been maintained.

7. TRANSFER SWITCH MECHANISM DRAWING



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8. TS 890 TRANSFER MECHANISM - 800 THROUGH 3200 AMP

The transfer mechanism consists of two electrically operated breakers and a mechanical interlock.

The transfer switch mechanism has three possible positions:

- a) The utility breaker closed and the generator breaker open;
- b) The generator breaker closed and the utility breaker open;
- c) Both the utility and the generator breakers open, but **NEVER** both the utility and generator breakers closed at the same time.

8.1. MANUAL OPERATION

(See **CAUTION!** on Page#1)

Isolate the transfer switch from both sources of power before opening the enclosure for manual switching!

9. TRANSFER MODE SELECTOR

This is a two position selector switch that selects the required mode of operation of the transfer switch as described below.

- 9.1. **AUTO:** This selects automatic operation of the transfer switch. The transfer breakers will automatically open/close as detailed in the sequence of operation.
- 9.2. **MAN:** This position inhibits automatic operation. The transfer switch breakers must be manually operated via pushbuttons located on the face of the circuit breakers to open/close them as required.

To transfer manually to generator - turn the transfer mode selector to MANUAL, trip T/S utility breaker, close T/S generator breaker, using breaker trip/close pushbuttons.

To transfer manually to utility - trip T/S generator breaker, close T/S utility breaker using breaker trip/close pushbuttons.

10. RECOMMENDED MAINTENANCE

(See **CAUTION!** on Page # 1)

- 10.1. DO NOT perform dielectric tests on the equipment with the control components in the circuit.
- 10.2. Check if control components are tight in sockets.
- 10.3. Periodically inspect all terminals (load, line and control) for tightness. Re-torque all bolts, nuts and other hardware. Clean or replace any contact surfaces which are dirty, corroded or pitted.
- 10.4. Transfer switches should be in clean, dry and moderately warm locations. If signs of moisture are present, dry and clean transfer switch. If there is corrosion, try to clean it off. If cleaning is unsuitable replace the corroded parts. Should dust and/or debris gather on the transfer switch, brush, vacuum, or wipe clean. DO NOT blow dirt into the breaker or terminals.
- 10.5. Test the transfer switch operation. While the unit is exercising, check for freedom of movement, hidden dirt or corrosion and any excessive wear on the mechanical operating parts.
- 10.6. Check all adjustable control components (time delay and voltage sensing relays) for correct settings.

11. TROUBLESHOOTING

(See **CAUTION!** on Page #1)

Symptom

- will not re-transfer to utility source upon restoration
- will not transfer to generator source upon failure of utility source
- transfer to generator source without a power failure in the utility source
- generator does not start up or stop when it should
- no time delay when there should be
- power is not available at the load terminals but the utility or generator breaker appears to be closed to a live source

Possible Causes

- control wiring isolation plug is removed
- a test mode has been activated (check TSC 800 status LCD display)
- transfer mode selector is not in "auto" position
- utility voltage or frequency is outside the pre-programmed limits (check utility source for adequate voltage & frequency)
- a loose control connection
- faulty circuit breaker (refer to Circuit Breaker Troubleshooting)
- defective TSC 800 controller (verify output signals with circuit board mounted diagnostic LED's)
- control wiring isolation plug is removed
- generator set not producing enough voltage/frequency or output circuit breaker open
- warmup time delay function has not timed out yet (verify TSC 800 timer setting)
- transfer mode selector is not in "auto" position
- a loose control connection
- faulty circuit breaker (refer to Circuit Breaker Troubleshooting)
- defective TSC 800 controller (verify output signals with circuit board mounted diagnostic LED's)
- a test mode has been activated (check TSC 800 status LCD display)
- defective TSC 800 controller (verify output signals with circuit board mounted diagnostic LED's)
- verify remote engine control panel is set for automatic mode
- verify time delay function in the TSC 800 program setting as per programming sheets as supplied with the transfer switch
- the breaker's trip unit (Type B style only) has tripped on a fault on the system. Correct the fault, and manually reset the breaker in the transfer switch.

DEFECTIVE COMPONENTS

Return defective components to Thomson Technology Inc. for repair. Be sure to advise model and serial number of the transfer switch.

12. CIRCUIT BREAKER TROUBLESHOOTING

MALFUNCTIONS	PROBABLE CAUSES	CORRECTIVE ACTIONS
The circuit breaker cannot be opened locally.	- Open push-button locked. - Faulty mechanism or main circuits bonded.	- Remove the locking. - Contact TTI Service Department.
The circuit breaker cannot be manually closed.	- Circuit breaker closing on short-circuit. - Fault trip indicator-button not reset . (Type B T/S's) - Circuit breaker not fully connected. (drawout type only) - Anti-pumping function. - Circuit breaker not charged. - Closing release XF continuously supplied. - Shunt release MX supplied. - Undervoltage release (instantaneous or delayed) not supplied or faulty. - Circuit breaker locked in "open" position. - Circuit breaker interlocked.	- Clear the fault. Check circuit breaker condition before putting back into operation. - Reset fault trip indicator-button. - Connect circuit breaker fully. - Cut the closing release XF power supply, then resupply the XF. - Check the geared motor power supply ($U > 0.85 U_n$). Check the power supply circuit. Attempt a manual recharging. Replace the geared motor if necessary. (Contact TTI Service Dept.) - Cut the closing release XF power supply and try again to close the breaker only if it is ready to close. - Locate the causes of this power supply. Cut the MX power supply, then try to close with the XF. - Supply the MN at $U > 0.85 U_n$, then try to close with the XF. If impossible, check with the escutcheon removed, that the MN is drawing properly. If not, replace it. - Remove the locking. - Check whether this refusal to close is not normal.
The circuit breaker does not recharge electrically.	- Geared motor supply voltage too low ($< 0.85 U_n$).	- Apply a voltage $U < 0.85 U_n$. Check the geared motor electrical circuit. Attempt to recharge manually. If problem: mechanism is faulty. Contact TTI Service Dept. If okay: geared motor faulty. Replace it.
It is impossible to insert the racking handle to connect or to disconnect the circuit breaker.	- There is a padlock or a key-lock for connected or disconnected position. There is a racking interlock. - The extraction rails or the breaker is not completely pushed in.	- Remove disabling. - Push the rails or the breaker completely in.

MALFUNCTIONS	PROBABLE CAUSES	CORRECTIVE ACTIONS
It is impossible to extract the right side rail (on chassis alone) or the breaker.	- The racking handle is remained inserted. - The breaker is not completely disconnected. - There is a padlock or a key-lock for connected or disconnected position. There is a racking interlock.	- Remove the racking handle and put it in its storage. - Disconnect the breaker. - Remove disabling.
It is impossible to extract the circuit breaker whenever it is charged.	- There is an extraction locking when breaker is charged.	- Discharge the circuit breaker (open, close then open again the circuit breaker). - If the circuit breaker is equipped with MN or MNR or MNRI: - cut the supply of MCH - come back in test position - supply the MN (or if it is impossible, remove the front cover and then release MN). - close the circuit breaker. - draw out the circuit breaker.
It is impossible to rack in the circuit breaker.	- The chassis does not correspond with the circuit breaker. - The plastic ties which hold clusters during transport are not removed. - The clusters positions are not correct. - There is a safety shutters locking.	- Fit fouling-plate on your chassis and breakers to avoid new mistakes. - Remove the plastic ties. - Put them in order again. - Remove this locking.

13. REQUIREMENTS FOR UPSTREAM CIRCUIT PROTECTIVE DEVICES

Short Circuit Current Rating (Amps RMS Sym)

STANDARD MODELS (Type A)

Basic Model	Maximum Voltage	Rated Current (A)	Closing Rating (kA peak)	Short Circuit Current Rating (kA RMS)
TS 890 - 800A	600	800	105	50
TS 890 - 1000A	600	1000	105	50
TS 890 - 1200A	600	1200	105	50
TS 890 - 1600A	600	1600	105	50
TS 890 - 2000A	600	2000	105	50
TS 890 - 2500A	600	2500	105	50
TS 890 - 3200A	600	3200	105	50

STANDARD MODELS (Type B)

Basic Model	Maximum Voltage	Rated Current (A)	Closing Rating (kA peak)	Short Circuit Current Rating (kA RMS)
TS 890 - 800B	600	800	105	150
TS 890 - 1000B	600	1000	105	150
TS 890 - 1200B	600	1200	105	150
TS 890 - 1600B	600	1600	105	150
TS 890 - 2000B	600	2000	143	143
TS 890 - 2500B	600	2500	143	143
TS 890 - 3200B	600	3200	143	143

Please refer to the factory for further information on upstream protection requirements, if required.

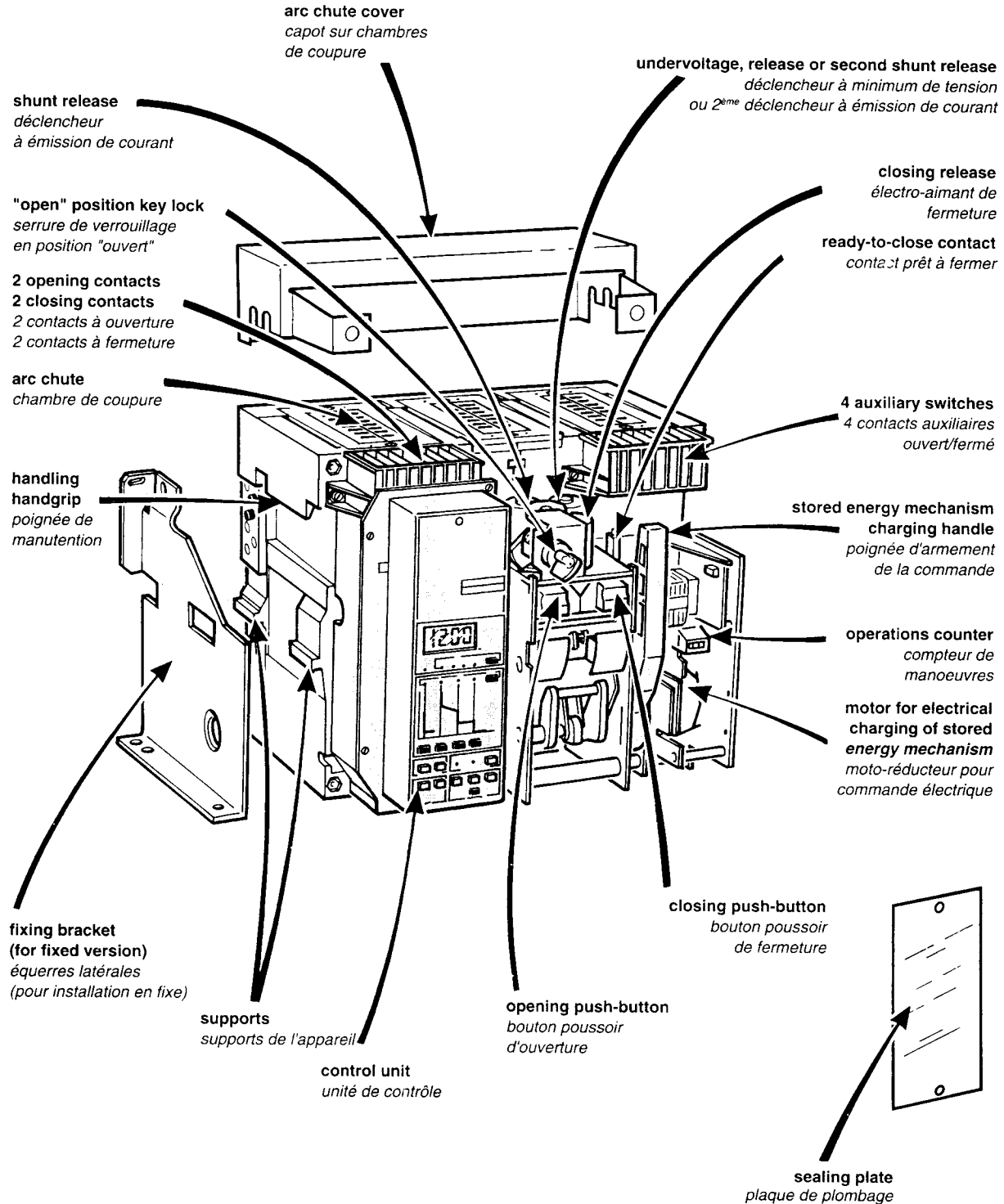
INSTALLATION OF OPEN TYPE TRANSFER SWITCHES - Please refer to the factory for additional information.

14. CABLE LUG TIGHTENING TORQUE VALUES**TIGHTENING TORQUE IN INCH POUNDS****LUG TYPE****CABLE CLAMP**

TA - 2/0	180
TA - 3/0	250
TA - 4/0	250
TA - 250	325
TA - 350	325
TA - 500	375
TA - 600	375
TA - 800	375
TA - 750	375
TA - 800	500
TA - 1000	500

15. CIRCUIT BREAKER DRAWING

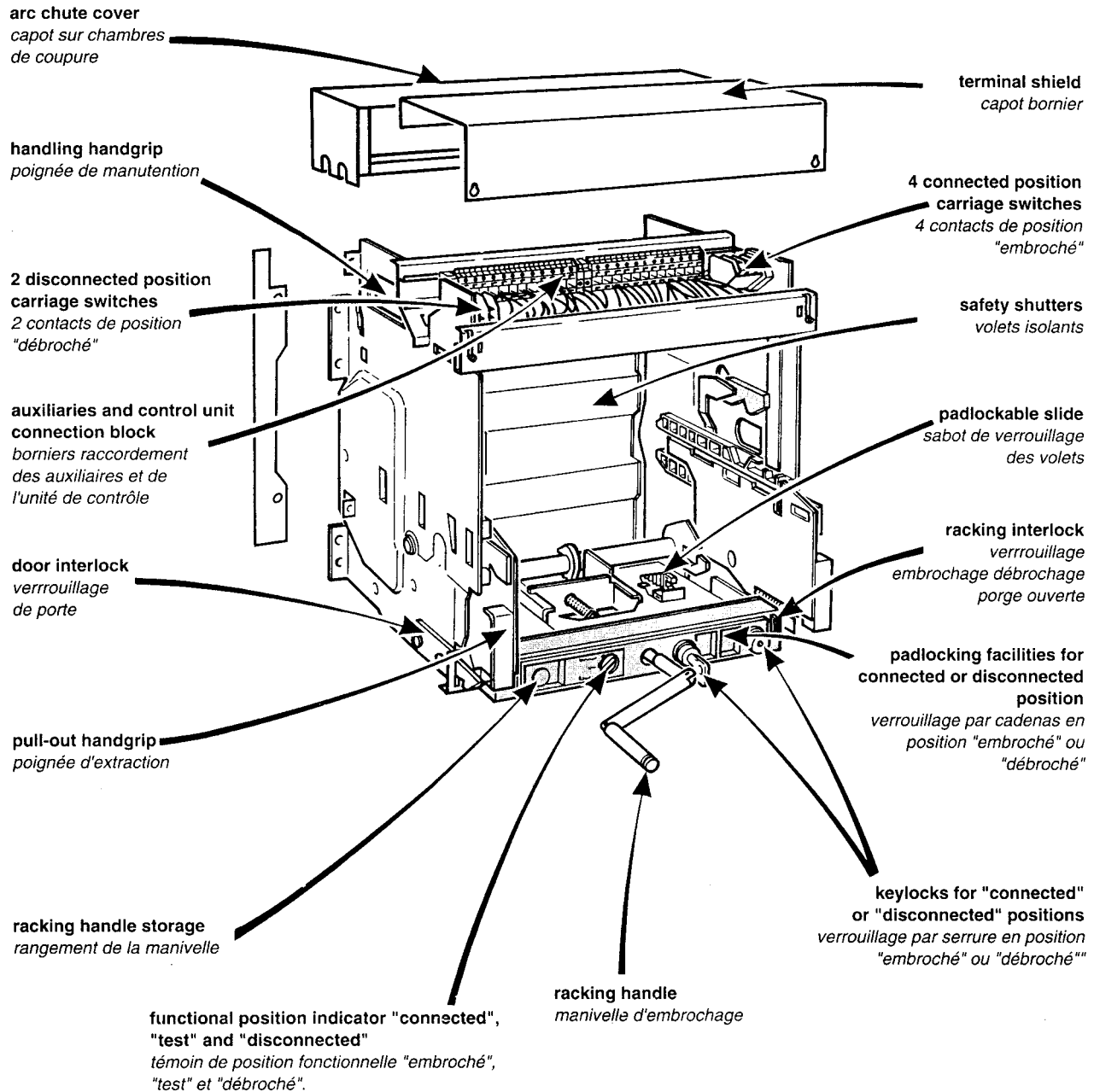
circuit-breaker disjoncteur



16. DRAWOUT CHASSIS ENGINEERING DRAWING

chassis

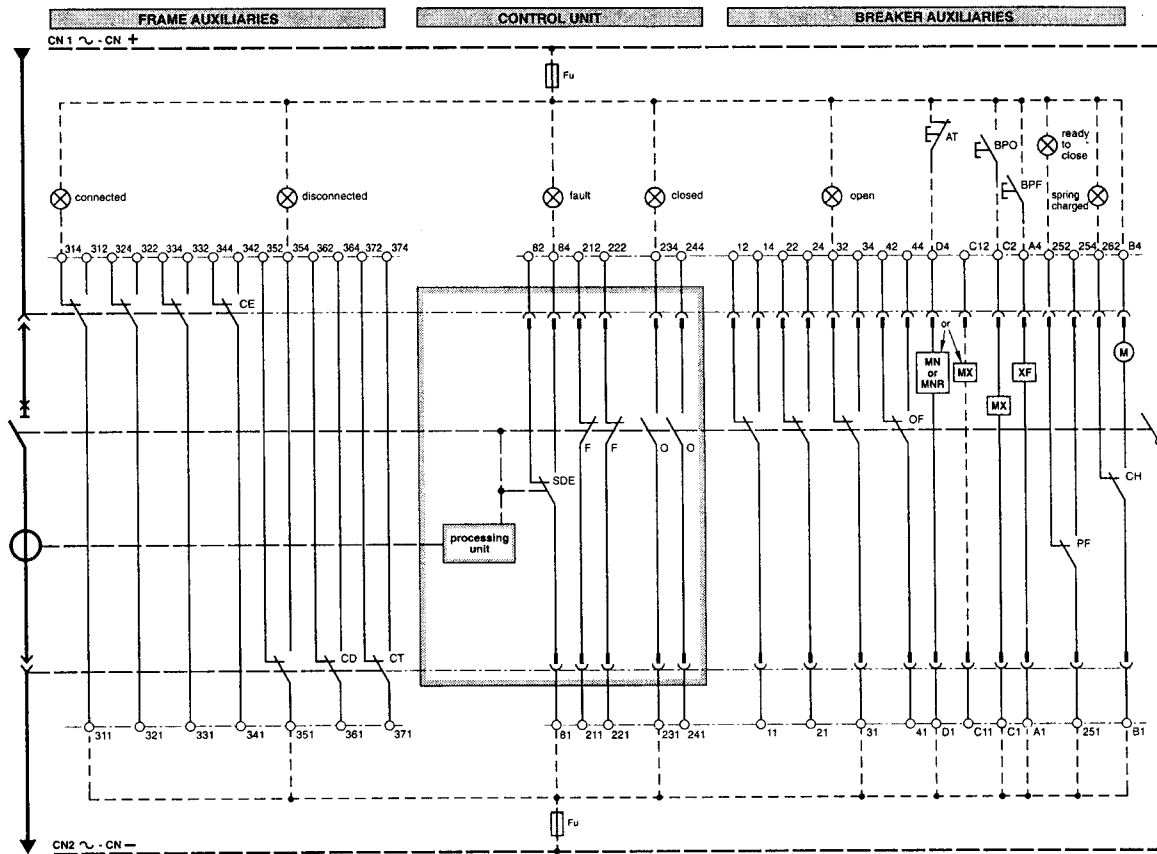
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17. WIRING DIAGRAM ENGINEERING DRAWING.

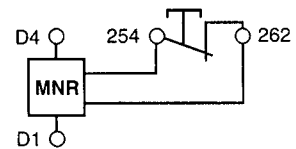
wiring diagrams

general diagram
for basic version
STR 08 to 58



- | | |
|---|--|
| Fu : fuse 2A | O : 2 auxiliary NO contacts (10A/240V AC) |
| AT : emergency off | F : 2 auxiliary NC contacts (10A/240V AC) |
| BPO : open pushbutton | SDE : fault trip indication contact (10A/240V AC)(except STR 08) |
| BPF : close pushbutton | CH : "spring charged" contact (10A/240V AC) |
| CE : "connected" position contact (10A/240V AC) | PF : ready to close contact (10A/240V AC) (closing possible if breaker is open, not locked and operating mechanism charged) |
| M : spring charging motor (180VA) | CD : "disconnected" position contact (10A/240V AC) |
| XF : closing release (20VA) | CT : "test" position contact (10A/240V AC) |
| MX : shunt release (20VA) | |
| MN : undervoltage release (20VA) | |
| MNR : time delayed undervoltage release (20VA) | |
| OF : auxiliary changeover contacts (10A/240V AC) | |

MNR wiring for instantaneous tripping



Use the terminals 262 ("spring charged contact") and 254 (normally open contact of the PF)

18. NOTES