



**Carole Park Waste Water Treatment Plant
Supply Changeover Panel**

**Operations & Maintenance Manual
J&P Richardson Industries**

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JPR Job No.: C71400**

ELECTRICAL SWITCHBOARD OPERATIONS AND MAINTENANCE MANUAL FOR
QUEENSLAND URBAN UTILITIES WASTE WATER TREATMENT PLANT

CAROLE PARK W.W.T.P. SUPPLY CHANGEOVER SWITCHBOARD

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Volume 1 Introduction, System Overview, Functional Spec, Design

VOLUME 1 INTRODUCTION, SYSTEM OVERVIEW, FUNCTIONAL SPEC, DESIGN

1.1 INTRODUCTION AND SYSTEM OVERVIEW

The scope of works covered in this operation and maintenance manual is for the following new equipment added to the Carole Park Sewage Treatment Plant (STP):

- Mains-Generator automatic change over extension switchboard including supply authority revenue metering. The extension switchboard is located to the left hand end of the existing main switchboard.
- Generator feedback signals to the existing PLC and SCADA.

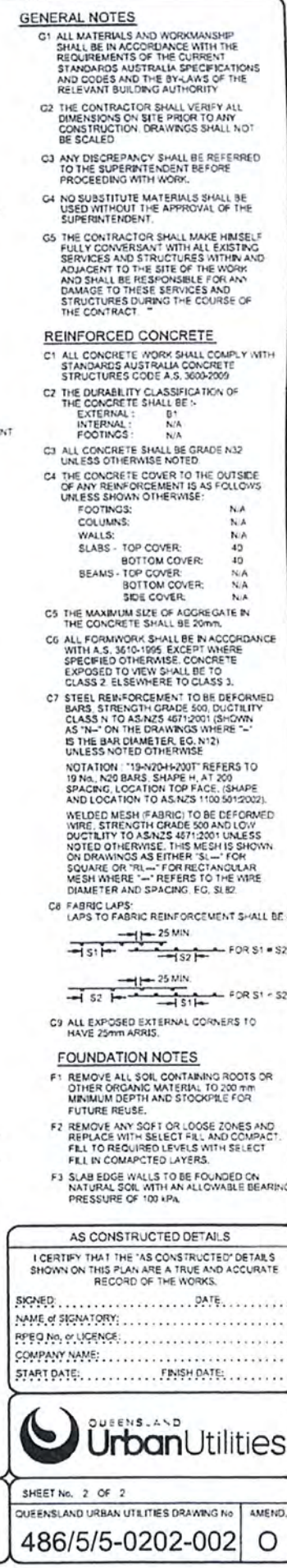
The generator is to provide standby power to the STP during mains failure.

Note: Queensland Urban Utilities has free issued a generator as part of these works, already located at Carole Park STP.

1.2 LOCATION DETAILS AND MAP

Carole Park STP – Boundary Road Carole Park (opposite corner of Boundary Road and Stephen Street, Carole Park)





1.3 DESCRIPTION OF EQUIPMENT AND PROCESS

Tembreak Automatic Transfer Switch

The Temlogic 2 TL101 automatic transfer switch controller will control & supervise the primary & secondary power of an installation and initiate transferring of the mains to a back-up source in the event of main source interruption. The utility changeover, from one power source to the other can be fully automatic or manually operated. The logic controller includes all necessary features to monitor energy distribution systems or generating sets, and relative transfer equipment, such as contactors, motorised circuit breakers and changeover switches.

The automatic transfer takes place when predefined conditions entered by the user take place such as,

- The need for a reliable power source
- Power supply voltage/frequency etc. not falling within programmed limits
- The need to use the most economical power source

The unit is simply programmed from the front panel with visual led indication and can be remotely monitored via a Modbus network. The circuit breakers can be manually controlled using the function keys on the front face of the controller. The list below details typical applications.

- Utility-utility, utility to generator or generator to generator changeover
- Control of motorised circuit breakers, motorised switches or contactors
- Generator management with automatic test and rotation emergency
- Three phase, two phase or single-phase voltage controls
- L-L voltage and/or L-N voltage control
- Controls of minimum voltage, maximum voltage, phase loss, asymmetry, minimum frequency, maximum frequency, with independent enable and delay

1.4 OPERATION MODES

The unit front panel is equipped with four Operation mode keys which allow selection of the desired operating mode. The selectable operating modes are:

- OFF RESET
- MANUAL
- AUTO
- TEST

When an operation mode is selected the corresponding red LED illuminates. If the LED showing the selected operating mode flashes, this indicates that the unit is communicating through the serial interface which may result in commands being performed via remote.

OFF-RESET MODE

- The unit is disabled in this mode and does not perform any functions. Status & measure LED's remain active.
- If the changeover devices (ie motorized circuit breakers) are pulse-type controlled, in OFF-RESET both controls remain disabled. For continuous – type controlled changeover devices the behaviour is determined by the P2.25 programming.
- To access the programming menus it is necessary to select the OFF-RESET mode before commencing.
- By pressing the OFF-RESET key retentive alarms can be cleared, provided the conditions generating the alarms have been addressed.

MANUAL MODE

- In MANUAL mode it is possible to control circuit breakers manually by pressing the relevant line ON/OFF key (YELLOW COLOUR KEY'S) for a minimum time of 300ms.
- At each key pressure the circuit breaker status is switched over. The command is accepted only when 1sec has elapsed from the end of the previous switching.
- If a manual command is given to close a circuit breaker while its paired circuit breaker is still closed, the TL101 unit will first open the currently closed circuit breaker and then close the desired circuit breaker, while interposing the programmed interlock time.
- When operating with a generator set, the generator startup and shutdown can be manually commanded on the secondary line by pressing and holding down the MANUAL key for 5 seconds.

AUTO MODE

- In the AUTO mode the TL101 unit performs both circuit breaker opening and closing operations, and manages the startup and shutdown of the generator set, if any.
- When the main line exceeds the limits, after the set delay times (line LED off), the unit disconnects the load from the main line and connects it to the secondary line. Both the startup of the generator set (if any), and the handling and interlock times between circuit breakers are controlled via the TL101 unit.
- The TL101 unit may be programmed to disconnect the load from the main line before or after the secondary line has been made available.
- When the main line returns within the limits, the TL101 unit switches over the load again and controls the generator set cooling cycle, if any.

- Automatic operating cycles vary both as a function of the type of application (utility-to-utility, utility-to-generator or generator-to-generator) and as a function of the type of switching devices used (motorised circuit breakers, switches or contactors).

TEST MODE

- The TEST mode allows the TL101 unit to confirm the proper operation of the emergency generator set while a normal operating main line power source is available.
- When TEST mode is selected the generator set on the secondary line is immediately started.
- Both voltage controls are activated and, if an anomaly occurs on the main line during the test, the load is switched over automatically.
- Under standard conditions when the main line is present, the load remains on the line and the generator set works with no load (offload test).
- To test the emergency generator under load (on-load test), the operation mode key 'TEST' and line 2 'ON/OFF' MUST BE PRESSED TOGETHER FOR 5 SECONDS.
- Once the load has been shifted to the generator under TEST mode, in the event of a main line failure or if an on-load test is being performed, the TL101 unit will not automatically revert back to the main line, unless the AUTO mode is selected.
- Delay and interlock times are the same as in the automatic mode.

MAIN LINE FAILURE SIMULATION

For the purpose of system testing it is possible to simulate a 1 minute voltage failure on the main line. The unit will respond in the same manner and timeframe set for standard automatic operation. The proper operation of transfer cycles may thus be controlled. To perform a main line failure simulation:

- Set the TL101 unit for automatic operation by selecting the AUTO key.
- Press the AUTO key and the line 2 ON-OFF key together for 10 consecutive seconds.
- The letters F.SI (Failure Simulation) will appear on the display during the execution of the whole cycle.
- To stop the test before completion, repeat the starting procedure or switch to the OFF – RESET mode.

APPLICATION OPERATION

UTILITY-TO-GENERATOR APPLICATION

When configured for use in a utility-to-generator application (U-G, default setting) the load is usually connected to the utility (Line 1). After a voltage or frequency anomaly the following occurs:

- A start signal is sent to generator (Line 2) after the delay set in P2.15,
- The generator is allowed to run 'off-load' until the voltage levels are within programmed limits, at which time the load is connected to the generator line.
- The TL101 unit continually monitors the main utility line for standard values to return.
- When the main utility line stabilises the load is transferred back to the utility line and the generator is kept in operation without load for a time set by P2.16 to allow it to cool.
- The TL101 unit then sends a start/stop command to the generator through a relay output. The TL101 unit can receive digital signals from the generator indicating its status (generator ready, ok to load taking, etc) through programmable inputs.
- An automatic test can be programmed, i.e. the generator can be started at set times to control its operation even if the utility is generally within limits, by setting execution interval, starting time, days of the week when the test shall be carried out, its duration, etc.. Refer to the relevant menu to set the automatic test.

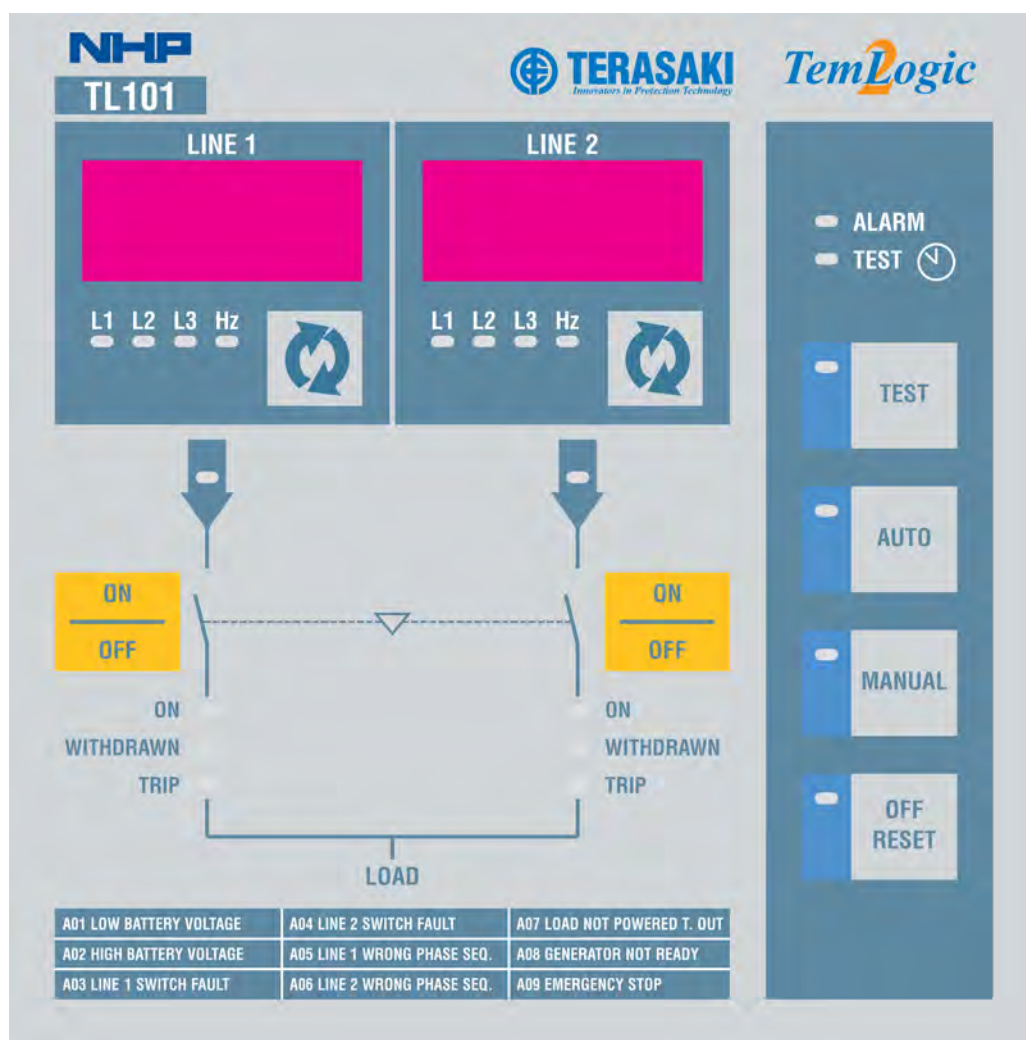
Volume 2 Proprietary Equipment Manuals, Maintenance, Service, Data Sheets

VOLUME 2 PROPRIETARY EQUIPMENT MANUALS, MAINTENANCE, SERVICE, DATA SHEETS

2.1 PROPRIETARY EQUIPMENT MANUALS

The following are the original manufacturer's equipment manuals

TemLogic



Technical manual:

Automatic Transfer Switch Controller: Model TL101

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1.0 WORKING PRINCIPAL

The Temlogic 2 **TL101** automatic transfer switch controller will control & supervise the primary & secondary power of an installation and initiate transferring of the mains to a back-up source in the event of main source interruption. The utility changeover, from one power source to the other can be fully automatic or manually operated. The logic controller includes all necessary features to monitor energy distribution systems or generating sets, and relative transfer equipment, such as contactors, motorised circuit breakers and changeover switches.

The automatic transfer takes place when predefined conditions entered by the user take place such as,

- The need for a reliable power source
- Power supply voltage/frequency etc. not falling within programmed limits
- The need to use the most economical power source

The unit is simply programmed from the front panel with visual led indication and can be remotely monitored via a **Modbus** network. The circuit breakers can be manually controlled using the function keys on the front face of the controller. The list below details typical applications.



- ⇒ Utility-utility, utility to generator or generator to generator changeover
- ⇒ Control of motorised circuit breakers, motorised switches or contactors
- ⇒ Generator management with automatic test and rotation emergency
- ⇒ Three phase, two phase or single-phase voltage controls
- ⇒ L-L voltage and/or L-N voltage control
- ⇒ Controls of minimum voltage, maximum voltage, phase loss, asymmetry, minimum frequency, maximum frequency, with independent enable and delay

2.0 TECHNICAL FEATURES

- Flush mount 144*144 mm housing
- Plug in removable connections
- AC Rated auxiliary power supply: 220-230-240VAC
- DC Rated auxiliary power supply: 12-24-48VDC
- Phase to phase voltage measure inputs: 80-800VAC
- Voltage transformer programming
- TRMS voltage measure
- Frequency measurement 45-65Hz
- Control function: phase sequence, phase loss, max/min voltage, asymmetry, max/min frequency
- Two displays for voltage/frequency viewing
- 8 digital programming inputs
- 7 relay programmable outputs
- RS232 interface

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3.0 UNIT OPERATING FEATURES

3.1 Operating Characteristics

- ⇒ Choice of single, two, three-phase lines with or without neutral
- ⇒ Supported applications include mains-mains, mains-genset and genset-genset
- ⇒ Controls include
 - Phase loss
 - Phase sequence
 - Min/Max voltage
 - Asymmetry
 - Min/Max Frequency
- ⇒ Statistical data logging
 - Number of automatic/manual transfers of line 1 & 2
 - Number of incomplete transfers of line 1 & 2
 - Time of line 1 & 2 voltage out of limits
 - Time of line 1 & 2 voltage normal
 - Time of utility power supply on line 1 & 2
 - Time of no utility power supply
- ⇒ Event logging with time and date entry: source of automatic transfer control, automatic/manual & incomplete transfer controls, operating mode change and setup data variations
- ⇒ Data and event storage in non-volatile ferromagnetic memory
- ⇒ keypad setup
- ⇒ Modbus RTU and ASCII communication protocols

3.2 Programmable functions

- ⇒ Automatic test
- ⇒ Transfer strategy
- ⇒ Signal & genset starting supervision
- ⇒ Two generator rotation
- ⇒ Principle line selection
- ⇒ Secondary loads disconnection
- ⇒ Before & after transfer indication

3.3 Transfer equipment capability

- ⇒ Contactors
- ⇒ Motorised circuit breakers
- ⇒ Motorised changeover switches

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4.0 TECHNICAL CHARACTERISTICS

Auxiliary power supply	
DC supply operating limits	9...70VDC (Us=12-24-48VDC)
AC supply operating limits	187...264VAC (Us=220-230-240VAC)
Frequency	45...65Hz
Power consumption max.	6VA (Us=240VAC)
Power dissipation max	2.8W (Us= 240VAC or Us=48VDC)
Current consumption max	420mA at 12VDC; 200mA at 24VDC
Micro-breaking immunity time	50ms
Voltage inputs	
Rated voltage Ue	690VAC phase-phase (400VAC phase-neutral)
Measure limits	80...800VAC phase-phase
Frequency limits	45...65Hz
Type of measure	TRMS (True Root Mean Square value)
Measure input impedance	>1.1M phase-phase; >0.5M phase-neutral
Type of connection	One, two or three phase
Measure error	Class 0.5 $\pm 0.25\%$ f.s. ± 1 digit
Digital inputs	
Number of inputs	8 (all programmable)
Type of input	Negative
Input current	9mA
Input signal "0" state	1.5 (2.9V typical)
Input signal "1" state	5.3 (4.3V typical)
Input signal delay	50msec
Relay outputs	
Number of outputs	7 (all programmable)
Number of control outputs for circuit breaker closing and pre-charging	2 (1 N/O – 12A/230VAC) (relay contacts with 16A capacity in AC1)
Number of control outputs for circuit breaker closing	2 relays (1 N/O – 8A/230VAC)
Number of control outputs for generating set	1 relay (1 N/O – 8A/230VAC)
Number of spare outputs	1 relay (1 C/O – 8A/230VAC)
Number of alarm outputs	1 relay (1C/O – 8A/230VAC)
Max current 1.2 and 2.2 terminals	12A
Communication interfaces	
RS232 serial port Programmable baud-rate	1200...38400 bps Connection with RJ6/6 jack
RS485 serial port (NON STANDARD)	Opto-isolated, programmable baud-rate 1200...38400 bps Plug-in / removable terminal connection
Real time clock (NON STANDARD)	
Time of backup energy	Capacitor (Super Cap)
Operating autonomy without power supply	7 days
Insulation	
Rated insulation voltage Ui	690V
Ambient conditions	
Operating temperature	-20...+60°C
Storage temperature	-30...+80°C
Relative humidity	<90%
Pollution degree maximum	2
Connections	
Type of terminal	Plug-in / removable
Conductor section min / max	0.02...2.5 mm (24 – 12 AWG)
Tightening torque	0.5 Nm (4.5 lbin)
Housing	
Material	LEXAN 3412R thermoplastic
Version	Flush mount
Dimensions l x h x d	144 x 144 x 94mm
Degree of protection	IP41 on front, IP20 rear
Weight	950g

Table 1: Technical characteristics

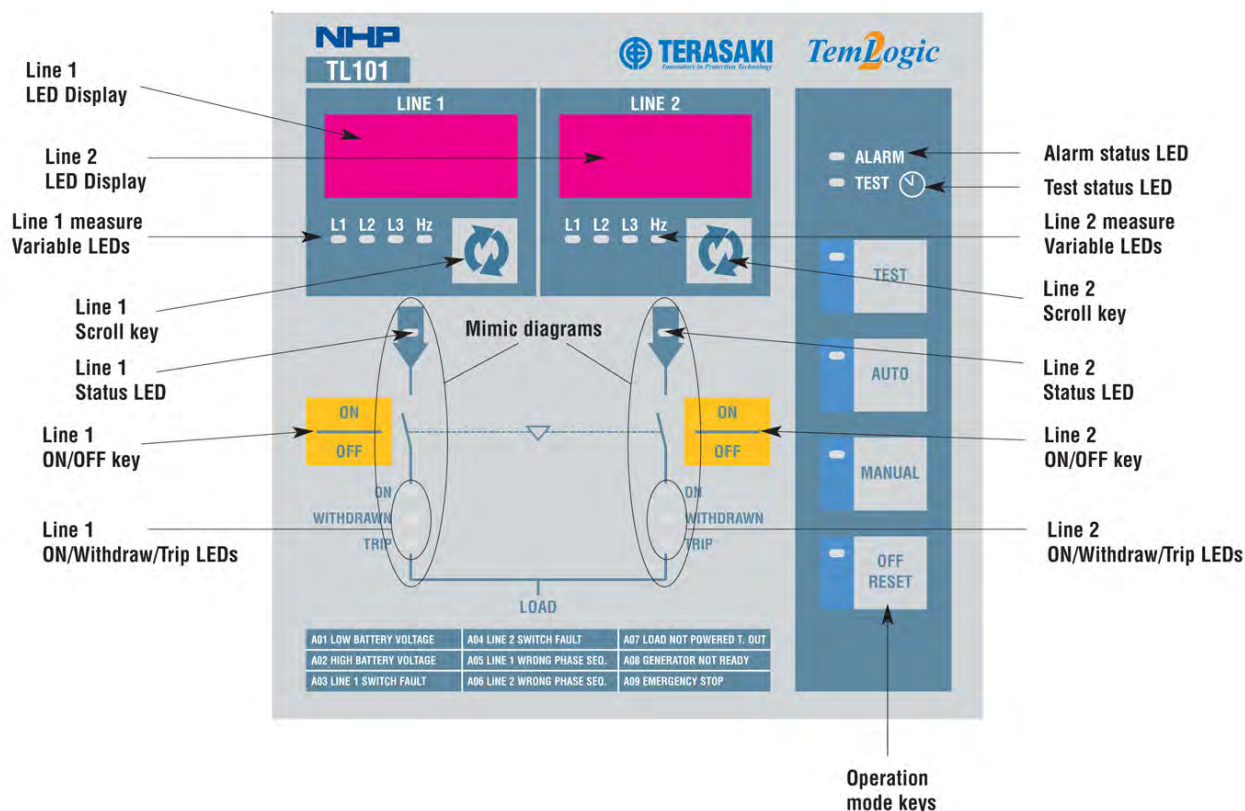
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5.0 FRONT PANEL DESCRIPTION

The TL101 Temlogic 2 controller offers full transfer control, parameter alteration and measure variable display via the panel function keys and LED displays.

Front panel summary:

- **LED displays:** Measure variables (voltages & frequency) can be viewed via the two LED displays. The 'Line 1' LED display would typically represent the 'normal' or 'main' power source and the 'Line 2' LED display would typically represent the 'emergency' or 'back-up' power source.
- **Measure variable LEDs:** These display LEDs indicate for each line whether the **LED display** is showing a line-to-line (L-L), line-to-neutral (L-N) or frequency reading.
- **Scroll Keys:** The 'Scroll keys' enable the user to switch between the available **measure variables** (L-L, L-N, frequency) which are shown via the **LED display**.
- **Mimic diagram:** Is a visual representation of the transfer switch system.
- **Line Status LEDs:** Indicate whether a supply (normal or emergency) is ready for electrical connection to a load.
- **LINE 1 / LINE 2 ON/OFF Keys:** Allows the manual control of the motorised circuit breaker.
- **ON/WITHDRAWN/TRIP Status LEDs:** Indicates the status of the circuit breaker.
- **Alarm Status LED:** Indicates an alarm event has occurred.
- **Test Status LED:** Indicates the status of the automatic test function.
- **Operation mode keys:** Four keys 'OFF RESET', 'MANUAL', 'AUTO' and 'TEST' which allow selection of the desired operating mode.



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6.0 MEASURE VARIABLE SELECTION

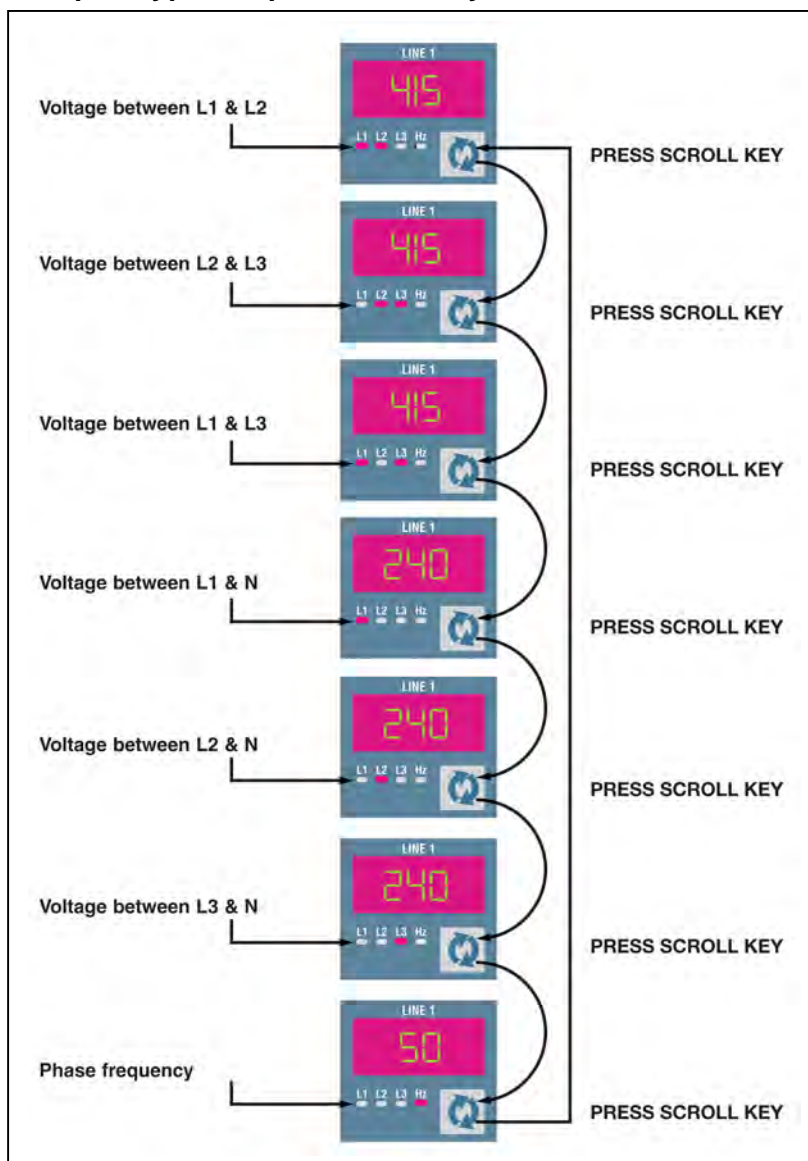


The **SCROLL** keys are the only operators required to select a desired measure variable. Each line has its own **SCROLL** key and when pressed repeatedly the line-to-line (L-L) voltage, line-to-neutral (L-N) voltage or frequency information are shown on the corresponding line LED display.



Each time a line **SCROLL** key is pressed the red **measure variable LED** combinations for the corresponding line will indicate the measure variable selected. Configuring the TL101 controller to either three-phase, two-phase or single-phase control will vary the list of measures.

Example: Typical 3 phase, 4 line system.




After 1 minute without pressing a **SCROLL** key the measure will revert to the default measure. During an alarm event the alarm code will occupy the display. Pressing the **SCROLL** key will mask the alarm temporarily and allow the measures to be accessed.

Temlogic 2 TL101 Controller Manual**7.0 STATUS LEDs**

There are six categories of status LED presented on the front panel which indicate the status of the unit and/or the circuit breaker it controls. The categories are:

- **Line Status LED**
- **ON Status LED**
- **WITHDRAWN Status LED**
- **TRIP Status LED**
- **Alarm Status LED**
- **Test Status LED**

The table below details the meaning of the different status LEDs. Some LEDs can alternate between two colours and have a different meaning depending on the colour.

LED	ON	OFF	FLASH
LINE OK 	Voltage and frequency within set limits	Voltage or frequency off limits	Presence delay time or failure in progress
ON ❶	Closed circuit breaker (green)	Open circuit breaker	Operating circuit breaker (green)
			Timeout (red)
WITHDRAWN ❷	Circuit breaker withdrawn	Circuit breaker inserted ok	Circuit breaker withdrawn alarm
TRIP ❷	Trip signal without alarm	No protection intervention	Protection intervention alarm
ALARM	—	No active alarm	One or more active alarms
TEST	Automatic test enabled (green)	Automatic test disabled Automatic test in progress (green)	Calendar watch not set (red)

❶ If auxiliary signals (feedback) have been suitably connected and programmed, the LEDs represent the status of the circuit breakers; otherwise the LEDs represent the status of the control outputs.

❷ If the respective signals are suitably connected and programmed, the LEDs represent the status of the circuit breakers, if not the status LEDs will remain off.

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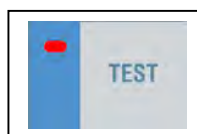


8.0 OPERATING MODE SELECTION

The unit front panel is equipped with four **Operation mode keys** which allow selection of the desired operating mode. The selectable operating modes are:

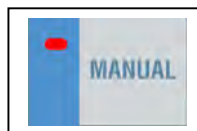
- **OFF RESET**
- **MANUAL**
- **AUTO**
- **TEST**

When an operation mode is selected the corresponding red LED illuminates. If the LED showing the selected operating mode flashes, this indicates that the unit is communicating through the serial interface which may result in commands being preformed via remote.



8.1 OFF-RESET MODE

- The unit is disabled in this mode and does not perform any functions. Status & measure LED's remain active.
- If the changeover devices (ie motorized circuit breakers) are pulse-type controlled, in **OFF-RESET** both controls remain disabled. For continuous – type controlled changeover devices the behavior is determined by the P2.25 programming.
- To access the programming menus it is necessary to select the **OFF-RESET** mode before commencing.
- By pressing the **OFF-RESET** key retentive alarms can be cleared, provided the conditions generating the alarms have been addressed.



8.2 MANUAL MODE

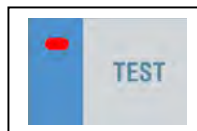
- In **MANUAL** mode it is possible to control circuit breakers manually by pressing the relevant line **ON/OFF** key (YELLOW COLOUR KEY'S) for a minimum time of 300ms.
- At each key pressure the circuit breaker status is switched over. The command is accepted only when 1sec has elapsed from the end of the previous switching.
- If a manual command is given to close a circuit breaker while its paired circuit breaker is still closed, the TL101 unit will first open the currently closed circuit breaker and then close the desired circuit breaker, while interposing the programmed interlock time.
- When operating with a generator set, the generator startup and shutdown can be manually commanded on the secondary line by pressing and holding down the **MANUAL** key for 5 seconds.

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8.3 AUTO MODE

- In the **AUTO** mode the TL101 unit performs both circuit breaker opening and closing operations, and manages the startup and shutdown of the generator set, if any.
- When the main line exceeds the limits, after the set delay times (line LED off), the unit disconnects the load from the main line and connects it to the secondary line. Both the startup of the generator set (if any), and the handling and interlock times between circuit breakers are controlled via the TL101 unit.
- The TL101 unit may be programmed to disconnect the load from the main line before or after the secondary line has been made available.
- When the main line returns within the limits, the TL101 unit switches over the load again and controls the generator set cooling cycle, if any.
- Automatic operating cycles vary both as a function of the type of application (utility-to- utility, utility-to-generator or generator-to-generator) and as a function of the type of switching devices used (motorised circuit breakers, switches or contactors).



8.4 TEST MODE

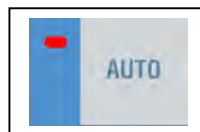
- The **TEST** mode allows the TL101 unit to confirm the proper operation of the emergency generator set while a normal operating main line power source is available.
- When **TEST** mode is selected the generator set on the secondary line is immediately started.
- Both voltage controls are activated and, if an anomaly occurs on the main line during the test, the load is switched over automatically.
- Under standard conditions when the main line is present, the load remains on the line and the generator set works with no load (offload test).
- To test the emergency generator under load (on-load test), the operation mode key '**TEST**' and line 2 'ON/OFF' **MUST BE PRESSED TOGETHER FOR 5 SECONDS.**
- Once the load has been shifted to the generator under **TEST** mode, in the event of a main line failure or if an on-load test is being performed, the TL101 unit will not automatically revert back to the main line, unless the **AUTO** mode is selected.
- Delay and interlock times are the same as in the automatic mode.

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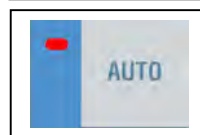


9.0 MAIN LINE FAILURE SIMULATION

For the purpose of system testing it is possible to simulate a 1 minute voltage failure on the main line. The unit will respond in the same manner and timeframe set for standard automatic operation. The proper operation of transfer cycles may thus be controlled. To perform a main line failure simulation:



- Set the TL101 unit for automatic operation by selecting the **AUTO** key.



+



- Press the **AUTO** key and the line 2 **ON-OFF** key together for 10 consecutive seconds.

- The letters **F.SI** (Failure Simulation) will appear on the display during the execution of the whole cycle.
- To stop the test before completion, repeat the starting procedure or switch to the **OFF – RESET** mode.

10.0 APPLICATION OPERATION

10.1 UTILITY-TO-GENERATOR APPLICATION

When configured for use in a **utility-to-generator application** (U-G, default setting) the load is usually connected to the utility (Line 1). After a voltage or frequency anomaly the following occurs:

- A start signal is sent to generator (Line 2) after the delay set in P2.15,
- The generator is allowed to run 'off-load' until the voltage levels are within programmed limits, at which time the load is connected to the generator line.
- The TL101 unit continually monitors the main utility line for standard values to return.
- When the main utility line stabilises the load is transferred back to the utility line and the generator is kept in operation without load for a time set by P2.16 to allow it to cool.
- The TL101 unit then sends a start/stop command to the generator through a relay output. The TL101 unit can receive digital signals from the generator indicating its status (generator ready, ok to load taking, etc) through programmable inputs.
- An automatic test can be programmed, i.e. the generator can be started at set times to control its operation even if the utility is generally within limits, by setting execution interval, starting time, days of the week when the test shall be carried out, its duration, etc.. Refer to the relevant menu to set the automatic test.

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10.2 UTILITY-TO- UTILITY APPLICATION

When configured for use in a **utility-to-utility** (U-U) application, the load is usually connected to the main utility and the transfer to the secondary utility occurs if/when a main line anomaly occurs or a transfer signal is remotely given.

10.3 GENERATOR -TO- GENERATOR APPLICATION

Generator – to – generator applications involve controlling two generators, each with a start-stop relay and possible feedback signals.

- In this application a rotation between generators can be programmed, i.e. the load can be shifted from one to the other at regular intervals, with the purpose of dividing the generator work load equally.
- It is possible to set the time of day when rotation shall occur, so that load supply cut-off occurs at a specified time.
- If a problem occurs with either generator, the load is shifted to the stand-by unit in all cases.

10.4 EJP FUNCTION

For applications requiring the EJP function, it is possible to use two programmable inputs set to functions S.GE (start generator) and E.tr (External transfer).

- Parameter P2.26 can also be used to define a generator start delay.

11.0 CONTROL OF CHANGEOVER DEVICES

The TL101 unit can control different types of devices such as motorised circuit breakers, motorised changeovers or contactors for the purpose of line changeover. Depending on the type of changeover devices used with the TL101 unit, appropriate wiring diagrams shall be used with related programming of programmable inputs /outputs.

- Programmable outputs are set by default for motorised circuit breaker applications. For further details please refer to the attached wiring diagrams at the end of this manual.
- The device status feedback inputs shall be normally wired, so as to ensure reliable system operation. Nonetheless, it is however possible to avoid their wiring and set programmable inputs for other functions. In this case the unit behaves as if the device carried out at once the command sent.
- If the device status inputs are not used, after power-on the TL101 unit will send an open command in order to set the switching devices to a definite position.
- If the device status inputs are used, after power-on the TL101 unit will not send commands to the switching device until the relative line status is not stable, that is when the presence / absence delay have elapsed.
- Internal control relays are neither interlocked electrically nor mechanically.

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11.1 CONTROL OF MOTORISED CIRCUIT BREAKER

- For the control of motorised circuit breakers, 4 outputs are needed (open and close commands for line 1 and line 2) and two inputs for circuit breakers status feedback, plus any additional optional inputs for alarm signaling (WITHDRAWN and TRIP).
- Open and close commands can be kept in continuous or pulse mode, i.e. kept until the circuit breaker has reached the required position + safety time.
- The two command modes ("Con" - continuous or "PUL" - pulse) can be selected through the appropriate parameter P2.07 in the general data menu.
- TRIP inputs are ignored for a 15-second window every time an open command is sent to the circuit breakers. This prevents a false alarm from being activated if a circuit breakers temporarily sends a TRIP signal during the opening operation initiated by the release coil.
- A 0.5-second interval is interposed between the opening and closing commands of the same circuit breaker.
- If feedback inputs are used, should the circuit breaker not close, a second attempt is conducted before generating the alarm.

11.2 CONTROL OF MOTORISED CHANGEOVER SWITCHES

Applications utilising motorised switches are configured in a similar fashion to that of motorized circuit breakers, with the following exceptions:

- Only three outputs (line1, line 2 and all open positions) and two inputs for circuit breaker status are required
- CL.1, CL.2 and OP.A output functions and Fb.1 and Fb.2 input functions are required.
- It is possible to select the command mode (either pulse or continuous).

11.3 CONTROL OF CONTACTORS

- If a pair of contactors are used, two outputs (CL.1 and CL.2) and two status inputs are required.
- In this case, the command must be programmed in contactors control mode (P2.07 = Cnt).

Temlogic 2 TL101 Controller Manual**12.0 PROGRAMMING OF CONTROLS / PARAMETERS****12.1 VOLTAGE CONTROLS**

A power source is determined to be suitable or unsuitable for use by the TL101 unit based upon user defined parameters. The menus used to establish a power sources suitability are:

- menu P1 (system ratings)
- menu P3 (line 1 voltage control)
- menu P4 (line 2 voltage control)

The systems ratings can be set through menu P1, including rated voltage and frequency, which are issued as references to set percent thresholds.

A voltage ratio (TV) can be set whenever a voltage lower than the actual system voltage is applied to the TL101 unit voltage inputs. Also in this case, both the visualisation and the setting of thresholds will be implemented in actual magnitudes referred to the system.

The controller can be programmed to perform voltage controls on three-phase with or without neutral, two-phase or single-phase utilities (P1.03).

In the case of three-phase or two-phase utilities the L-L voltage, L-N voltage, or both (P1.04) can be monitored. In every case, the rated voltage set within P1.01 has to be equal to the phase-to-phase voltage.

- At power up or resetting of the device, each line is considered stable when the voltage is within pickup limits, unless the relative circuit breaker is already closed.

The following table lists the controls made on each line. The controls marked with **OFF** may be excluded.

Control	Description	OFF
Minimum voltage	One or more phases are too low	
Maximum voltage	One or more phases are too high	●
Phase loss	Threshold below which the unit intervention is quicker than with a normal decrease	●
Asymmetry (unbalance)	Phases within the maximum-minimum range but too different from each other	●
Minimum frequency	Frequency is too low	●
Maximum frequency	Frequency is too high	●
Phase sequence	Reverse rotation of phases	●

All controls, **except** minimum voltage, may be excluded independently, by setting the relevant parameters to **OFF**.

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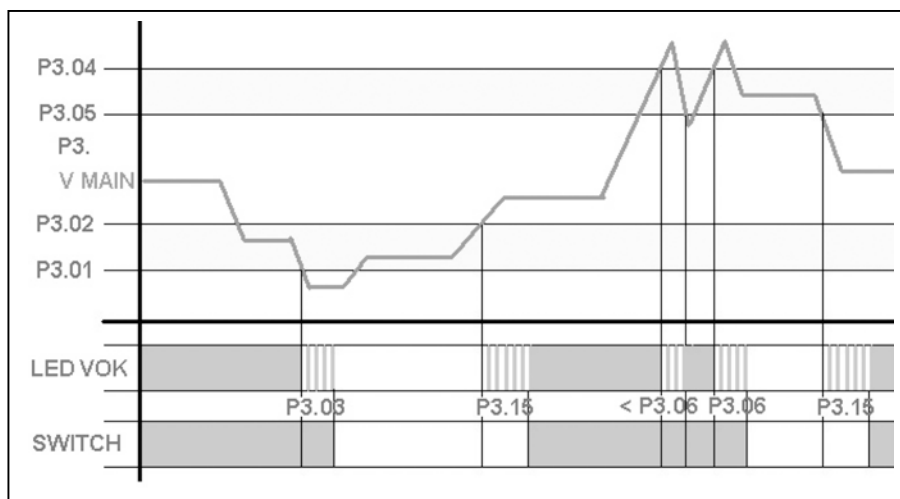
Each listed anomaly has an independent delay time. For the TL101 unit to respond to an anomaly, the event must continually persist uninterrupted more than the set delay time.

When all the line parameters are restored within the specified limits, before the line may be used, the **line presence delay time** must elapse. The duration of this time is specified by two independent parameters:

- 1) the delay time when the alternate line becomes available, and
- 2) the delay time, which is normally of shorter duration, that exists in the situation where the alternate line is not available.

Voltage minimums / maximums:

The limits of minimum and maximum voltage are specified by setting two thresholds, each one defining the point beyond which the voltage is considered no longer acceptable (e.g. P3.01, drop-out) and the other, nearer to the rated voltage, defining the point where it is again compatible (e.g. P3.02, pick-up).



The distance between these two thresholds defines hysteresis. For example, it could be stated that below 80% of the rated voltage value, the voltage source can no longer be used. For the voltage source to be deemed satisfactory, the voltage must rise above 85%, thus defining a 5% hysteresis (dead-band). The same principle is applied to maximum voltage.

Frequency thresholds: Voltage source frequency thresholds allow for a fixed hysteresis which is equal to 1% of rated frequency.

Phase loss: For the phase loss, the pick-up threshold is the same as the minimum voltage pickup threshold.

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12.2 PARAMETER MENUS

The TL101 unit has eight menus that can be accessed in order to change the operational and functional parameters of the TL101. The menus are structured as shown below:

MENU	Description
P1	System Ratings
P2	General Data
P3	Line 1 Voltage control
P4	Line 2 Voltage control
P5	Programmable Inputs
P6	Programmable Outputs
P7	Communication Ports
P8	Automatic Test

Each of the eight parameter menus contain a list of changeable parameters, functions and input / outputs. These are summarised below:

MENU P1 - RATINGS

PARA.	FUNCTION	RANGE	DEFAULT
P1.01	System rated voltage	100...690VAC	415VAC
P1.02	TV ratio	1.00 ... 9.99	1.00
P1.03	Wiring configuration	3.nE - 3 phase + Neutral 3Ph - 3 phase 2Ph- 2 phase 1Ph - single phase	3.nE
P1.04	Type of voltage control	L-L - Line - to Line L-N - Line - to - Neutral LLn - Line - to Line + Line - to Neutral	L-L
P1.05	Rated frequency	50H - 50Hz 60H - 60Hz	50Hz
P1.06	Rated battery voltage	OFF 12 - 12VDC 24 - 24VDC 48 - 48VDC	OFF

P1.01 - Rated voltage used for threshold calculation; thresholds are expressed as Un percentage. Set the line-to-neutral (L-N) or line-to-line (L-L) voltage depending on what was set on P1.04.

P1.03 - Defines the network wiring configuration used. The setting between 3- phase and 3-phase + neutral influences the visualisation only.

P1.04 - Specifies if the voltage controls are applied to L-L voltages, to L-N voltages or to both voltages.

P1.05 - Rated frequency used as reference for frequency threshold calculation.

P1.06 - Used for alarms on battery voltage.

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MENU P2 – GENERAL DATA

PARA.	FUNCTI	ON	RANGE	DEFAULT
P2.01	Type of application		U-G = Utility to Generator U-U = Utility to Utility G-G = Generator to Generator	U-G
P2.02	Phase sequence control		OFF - Disabled L1-L2-L3 - Direct L3-L2-L1 - Inverse	L1-L2-L3
P2.03	Main line selection		-1- Line 1 -2- Line 2	-1-
P2.04	Interlock time Line 1 -> Line 2		0.1 ... 90.0s	6.0s
P2.05	Interlock time Line 1 <- Line 2		0.1 ... 90.0s	6.0s
P2.06	Changeover strategy		ObP - Open Before Presence OAP - Open After Presence	ObP
P2.07	Circuit breakers control type		Con - Continuous PUL - Pulse Cnt - Contactors	PUL
P2.08	Maximum time for circuit breaker operation (A03 - A04 Alarms delay)		1...900s	5s
P2.09	Open command duration		1.0...60.0s	10.0s
P2.10	Close command duration		1.0...60.0s	1.0s
P2.11	Maximum time for load not energized (A07 Alarm intervention delay)		OFF / 1...3600s	60s
P2.12	Lock of automatic restore to main line		OFF - Disabled ON - Lock on	OFF
P2.13	Pre-transfer time		OFF / 1...300s	OFF
P2.14	Post-transfer time		OFF / 1...300s	OFF
P2.15	Generator start delay		0 900s	3s
P2.16	Generator cooling time		1...3600s	180s
P2.17	Generator rotation interval		OFF / 1h / 2h / 3h / 4h / 6h / 8h / 12h / 1d / 2d / 3d / 4d / 5d / 6d / 7d	OFF
P2.18	Generator rotation hour		0...23	12
P2.19	Generator rotation minutes		0...59	0
P2.20	Battery minimum voltage threshold		OFF / 70...100%	75%
P2.21	Battery maximum voltage threshold		OFF / 110...140%	130%
P2.22	Battery threshold delay		0...60s	10s
P2.23	Clock setting at startup		OFF / On	OFF
P2.24	Voltage control enable in MAN mode		OFF / On	OFF
P2.25	Continuous command in RESET/OFF mode		OFF - Release command output Noc - No change on command output	Noc
P2.26	EJP start delay		OFF / 1...3600s	OFF

P2.01 - Defines the type of application for the control of one or two generator sets, enabling the management of the relevant input/output signals.

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P2.03 - Defines which is the main line, i.e. the line taking on the load when both sources are available.

P2.06 - OBP (Open Before Presence) means that, in automatic mode, the open command of a circuit breaker is generated when the line concerned goes beyond limits, irrespective of the status of the alternative line.

OAP (Open After Presence) means that, in automatic mode, the open command of a circuit breaker is sent only after the alternative line is present within limits.

P2.07 - Defines whether open-close outputs must be continuously active (application with circuit breakers without feedback) or in pulse mode, i.e. activated until the circuit breaker / switch has been positioned as required. If in pulse mode, the command is extended for a specified time (see P2.09 and P2.10) even after positioning completion.

If contactors are used, P2.07 must be set to "Cnt".

P2.08 - If, after sending an open or close command to a circuit breaker, this is not positioned correctly within this time, alarms A03 or A04 are generated. It works when the auxiliary contacts of circuit breaker status are programmed and wired.

P2.09 - minimum duration of an opening command pulse. For a motorised circuit breaker application, it must be set to a time sufficient enough to allow the load of the springs. This time is considered also when working in continuous mode.

P2.10 - Duration of the opening command pulse.

P2.11 - If in automatic mode both sources are not available at the same time for a time exceeding P2.11, alarm A07 is generated.

P2.12 - If this parameter is enabled, after a transfer to the secondary line, restore to main line does not occur automatically when

the latter becomes available again, but it must be commanded in manual mode.

P2.13 - Excitation time of the pre-transfer output before switching from one line to the other.

P2.14 - Excitation time of the post-transfer output after switching from one line to the other.

P2.15 - Time elapsing between the underused line loss and the sending of the transfer signal to the generator on the alternative line. This time is independent of the circuit breaker opening time.

P2.16 - Time during which the generator is left in operation to cool after it has been disconnected from the load.

P2.17 - P2.18 - P2.19 - These parameters allow to implement a time rotation in G-G applications, switching the priority between the two generators. P2.17 defines the rotation interval between the two generators.

The time of day when rotation will occur is defined by P2.18 and P2.19. If the rotation interval exceeds 24h, then rotation always occurs at the time stated every n days. If, on

the contrary, it is less than 24h, then it occurs at the time specified and also at

submultiples. For instance, if you set time at 12:30 and rotation every 6h, there will be a changeover at 12:30, one at 18:30, one at 0:30, etc.

P2.23 - If the real-time-clock is not set after power-on, it returns to the default value.

P2.24 - Enables or disables voltage control in MAN mode. If the control is enabled, no transfers are performed between the two lines, but the individual switching device is opened/closed when its voltage goes beyond / reverts to limits.

P2.25 - Defines the behavior of the open/close command outputs when working in continuous command mode and the TL101 is in RESET/OFF mode. This parameter can be useful when working with contactors.

P2.26 - Delay between the EJP start signal and the effective start signal sent to the generator.

Temlogic 2 TL101 Controller Manual**MENU P3 – LINE 1 VOLTAGE CONTROL**

PARA.	FUNCTION	RANGE	DEFAULT
P3.01	Minimum voltage threshold - trip	70...98%	85%
P3.02	Minimum voltage threshold - restore	75...100%	90%
P3.03	Minimum voltage threshold - delay	0.1....900s	1.0s
P3.04	Maximum voltage threshold - trip	102...120% / OFF	115%
P3.05	Maximum voltage threshold - restore	100...115%	110%
P3.06	Maximum voltage threshold - delay	0.1....900s	1.0s
P3.07	Phase loss threshold	60...85% / OFF	70%
P3.08	Phase loss threshold delay	0.1...30.0s	0.1s
P3.09	Voltage unbalance threshold	1...20% / OFF	15%
P3.10	Voltage unbalance threshold delay	0.1...900s	5.0s
P3.11	Minimum frequency threshold	OFF / 80...100% Fe	95%
P3.12	Minimum frequency threshold - delay	0.1...900s	5.0s
P3.13	Maximum frequency threshold	101...120% Fe / OFF	105%
P3.14	Maximum frequency threshold - delay	0.1...900s	3.0s
P3.15	Line 1 restore within limits - delay (when line 2 source not available)	1...3600s	10s
P3.16	Line 1 restore within limits - delay (when line 2 source is available)	1...3600s	60s

P3.01 - P3.02 - P3.03 - The first two parameters define the minimum voltage threshold and the related hysteresis upon restore. P3.02 cannot be set to a lower value than P3.01. P3.03 defines the intervention delay of this protection. See paragraph Voltage Controls.

P3.04 - P3.05 - P3.06 - The first two parameters define the maximum voltage threshold and the related hysteresis upon restore. P3.05 cannot be set to a value exceeding P3.04. Setting P3.04 to OFF will 13 disable the maximum voltage control. P3.06 defines the maximum voltage intervention delay. See paragraph Voltage Controls.

P3.07 - P3.08 - Voltage threshold below which a phase loss intervention occurs, generally quicker than the drop. The delay for the phase loss is specified by P3.08.

P3.09 - P3.10 - P3.09 defines the maximum threshold for unbalance between phases, referred to voltage rating, and P3.10 defines the related intervention delay. This control may be disabled by setting P3.09 to OFF.

P3.11 - P3.12 - Threshold (it may be disabled) and intervention delay for minimum frequency.

P3.13 - P3.14 - Threshold (it may be disabled) and intervention delay for maximum frequency.

P3.15 - Delay for Line 1 restore to the limit range, used when the line 2 source is not available. Generally shorter than P3.16, as there is the urgent need to supply power because the load is not energized.

P3.16 - Delay for Line 1 restore to the limit range, used when the load can be connected to line 2. Generally longer than P3.15, as the load is energized and consequently it is possible to wait longer before considering voltage steadily restored.

Temlogic 2 TL101 Controller Manual**MENU P4 – LINE 2 VOLTAGE CONTROL**

PARA.	FUNCTION	RANGE	DEFAULT
P4.01	Minimum voltage threshold - trip	70...98%	85%
P4.02	Minimum voltage threshold - restore	75...100%	90%
P4.03	Minimum voltage threshold - delay	0.1....900s	1.0s
P4.04	Maximum voltage threshold - trip	102...120% / OFF	115%
P4.05	Maximum voltage threshold - restore	100...115%	110%
P4.06	Maximum voltage threshold - delay	0.1....900s	1.0s
P4.07	Phase loss threshold	60...85% / OFF	70%
P4.08	Phase loss threshold delay	0.1...30.0s	0.1s
P4.09	Voltage unbalance threshold	1...20% / OFF	15%
P4.10	Voltage unbalance threshold delay	0.1...900s	5.0s
P4.11	Minimum frequency threshold	OFF / 80...100% Fe	95%
P4.12	Minimum frequency threshold - delay	0.1...900s	5.0s
P4.13	Maximum frequency threshold	101...120% Fe / OFF	105%
P4.14	Maximum frequency threshold - delay	0.1...900s	3.0s
P4.15	Line 2 restore within limits - delay (when line 1 source not available)	1...3600s	10s
P4.16	Line 2 restore within limits - delay (when line 1 source is available)	1...3600s	60s

Note - For details on the functions of parameters see the previous details concerning Line 1 menu.

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MENU P5 – PROGRAMMABLE INPUTS

PARA.	FUNCTION	RANGE	DEFAULT
P5.01	Prg Input Function 1 term. 4.1	SEE P5 CODE TABLE BELOW	Breaker 1 closed feedback
P5.02	Prg Input Function 1 term. 4.2		Breaker 2 closed feedback
P5.03	Prg Input Function 1 term. 4.3		Breaker 1 tripped
P5.04	Prg Input Function 1 term. 4.4		Breaker 2 tripped
P5.05	Prg Input Function 1 term. 4.5		Force transfer
P5.06	Prg Input Function 1 term. 4.6		Inhibit re-transfer
P5.07	Prg Input Function 1 term. 4.7		OFF
P5.08	Prg Input Function 1 term. 4.8		OFF

P5 CODE TABLE

CODE	FUNCTION
OFF	Input not used
Fb.1	Line 1 circuit breaker closed (Feedback 1) Auxiliary contact informing the TL101 of the open/closed status of line 1 circuit breaker. If this signal is not programmed, the TL101 considers the status of the circuit breaker corresponding to the status of control outputs.
Fb.2	Line 2 circuit breaker closed (Feedback 2) Like Fb.1, referred to line 2.
tr.1	Line 1 circuit breaker protection (Trip 1) When the contact is opened, it generates an alarm of line 1 circuit breaker protection intervention.
tr.2	Line 2 circuit breaker protection (Trip 2) Like tr.1, referred to line 2.
dr.1	Line 1 circuit breaker withdrawn (Withdrawn 1) When the contact is open, it generates an alarm of line 1 circuit breaker withdrawn.
dr.2	Line 2 circuit breaker withdrawn (Withdrawn 2) Like dr.1, referred to line 2.
E.tr	Transfer to secondary line When closed, it causes the changeover to the secondary line even if main line voltage is within limits. The secondary line circuit breaker remains activated until this line remains within limits. Can be used for the EJP function.
In.r	Inhibit Return to main line In AUTO mode, when closed, it inhibits the return to main line after it has reverted to the limit range. It is used to prevent the second power cutout due to re-transfer from occurring automatically at an unforeseeable time.
S.GE	Start Generator In AUTO mode, when closed, it causes the generator to start after the delay specified by P2.26. It can be used for the EJP function.
EME	Emergency NC contact which, if open, causes both circuit breakers to open and generates alarm A09.
Gr.1	Line 1 generator ready (Generator ready 1) When closed it signals that the generator connected to line 1 is available for use. If this signal is missing, alarm A08 is generated.
Gr.2	Line 2 generator ready (Generator ready 2) Like Gr.1.
E.L1	Enable load on line 1 (Enable Load 1) It allows load connection on line 1, in addition to internal controls.
E.L2	Enable load on line 2 (EnableLoad 2) Like EL.1, referred to line 2.
E.C1	External control of line 1 (External control 1) Signal showing that line 1 is within limits. It replaces internal controls.
E.C2	External control of line 2 (External control 2) Like EC.1, referred to line 2.
Loc	Keypad lock (Lock) If closed, it locks all the functions from front keypad except measure viewing.
L.PA	Lock Parameters If closed, it locks the access to setup menus.
L.rc	Lock remote control If closed, locks write access through serial interface ports.

Temlogic 2 TL101 Controller Manual**MENU P6 – PROGRAMMABLE OUTPUTS**

PARA.	FUNCTION	RANGE	DEFAULT
P6.01	Prg Out Function 1 term. 1.1	SEE P6 CODE TABLE BELOW	Open line 1
P6.02	Prg Out Function 2 term. 1.3		Close line 1
P6.03	Prg Out Function 3 term. 2.1		Open line 2
P6.04	Prg Out Function 4 term. 2.3		Close line 2
P6.05	Prg Out Function 5 term. 3.1		Transfer switch ready
P6.06	Prg Out Function 6 term. 3.3-3.4		Generator 2 control
P6.07	Prg Out Function 7 term. 3.6-3.7		Global alarm

P6 CODE TABLE

CODE	FUNCTION
OFF	Output not used
OP.1	Line 1 circuit breaker open control (Open 1) A contact which closes to command the opening of the line 1 circuit breaker. It may remain energized or be released when the operation is completed, depending on P2.07 setting. (not used when contactors or switches are used).
CL.1	Line 1 circuit breaker close control (Close 1) A contact which closes to command the closing of the line 1 circuit breaker. It may remain energized or be released when the operation is completed, depending on P2.07 setting.
OP.2	Line 2 circuit breaker open control (Open 2) Like OP.1, referred to line 2.
CL.2	Line 2 circuit breaker close control (Close 2) Like CL.1, referred to line 2.
OP.A	Open control for both lines (Open All) Used to set motorised switches to the neutral position, with both lines open.
GC.1	Generator Control 1 Start / stop control for the generator connected to line 1. When closed it commands the shutdown of the generator set. Used in Gen-Gen applications only.
GC.2	Generator Control 2 Start / stop control for the generator connected to line 2. When closed it commands the shutdown of the generator set. Used in Util-Gen and Gen-Gen applications.
Rdy	TL101 Ready It signals that the TL101 is in automatic mode and without alarms, ready for intervention.
ALA	Global Alarm Energized output under standard conditions, de-energized in the presence of any alarm.
L.SH	Load Shed Disconnection of non-priority loads which are not energized by the secondary line. It is controlled also in MANUAL mode. The contact is closed before the secondary line close command and is opened before main line close command.
PrE	Pre-Transfer The output is energised before transferring the load from one line to the other, for the time set through P2.13.
PoS	Post-Transfer The output is energised after transferring the load from one line to the other, for the time set through P2.14.
L1.S	Line 1 Status The output is energised when there are all the conditions to connect load to line 1.
L2.S	Line 2 Status The output is energised when there are all the conditions to connect load to line 2.

Temlogic 2 TL101 Controller Manual**MENU P7 – SERIAL COMMUNICATION**

PARA.	FUNCTION	RANGE	DEFAULT
P7.01	RS-232 Address	1 ..245	1
P7.02	RS-232 Baud Rate	2400, 4800, 9600, 19200, 38400	9600 baud
P7.03	RS-232 Protocol	Rtu - rtu ASC - ASCII Mod - ASCII + modem	Modbus RTU
P7.04	RS-232 Parity	Non - None Odd EvE – Even	None
P7.05	RS-485 Address	1 ..245	1
P7.06	RS-485 Baud Rate	2400, 4800, 9600, 19200, 38400	9600 baud
P7.07	RS-485 Protocol	Rtu - rtu ASC - ASCII Mod - ASCII + modem	Modbus RTU
P7.08	RS-485 Parity	Non - None Odd EvE - Even	None

P7.01...P7.04 - They define the transmission format and the protocol used on the RS-232 communication port.

P7.05...P7.08 - They define the transmission format and the protocol used on the NON STANDARD RS-485 communication port.

MENU P8 – AUTOMATIC TEST

PARA.	FUNCTION	RANGE	DEFAULT
P8.01	Automatic Test Enable	OFF / On	OFF
P8.02	Automatic Test Performance Interval	1 .. 60 days	7
P8.03	Enable test on Monday	OFF / Mon	ON
P8.04	Enable test on Tuesday	OFF / Tue	ON
P8.05	Enable test on Wednesday	OFF / Wed	ON
P8.06	Enable test on Thursday	OFF / thu	ON
P8.07	Enable test on Friday	OFF / Fri	ON
P8.08	Enable test on Saturday	OFF / Sat	ON
P8.09	Enable test on Sunday	OFF / Sun	ON
P8.10	Automatic Test Start - Hour	0...23	12
P8.11	Automatic Test Start - Minutes	0...59	0
P8.12	Automatic Test Duration	1...600 min	10 MIN
P8.13	Load Changeover	OFF / On	OFF

P8.01 - In applications with generator sets, it enables or disables the performance of the periodic automatic test. This parameter can be modified directly from the front panel without accessing setup (see chapter Automatic Test) and its status is displayed by the relevant TEST LED on the front panel (see Status LEDs).

P8.02 - It defines the minimum time interval between the performance of an automatic test and the following one, as a function of the programming of the following parameters P8.03...P8.09. If on the day of expiry of the period the test is not enabled, the interval will be consequently extended.

P8.03...P8.09 - It enables performance of the automatic test on the individual days of the week. OFF means that on that day the test shall not be performed. The day is observed when the calendar clock is properly set.

P8.10 - P8.11 - It defines the starting time of the automatic test on a day. The calendar clock must be properly set.

P8.12 - It defines the duration of the automatic test in minutes.

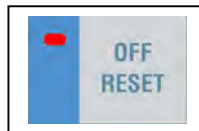
P8.13 - It defines whether the automatic test is carried out only by starting the generator or whether load must also be transferred to the same generator (On).

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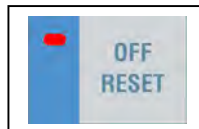


12.3 PARAMETER SETUP

To access the TL101 unit parameters follow the procedure below:



- Set the TL101 unit to the **OFF – RESET** mode by selecting the **OFF – RESET** key.



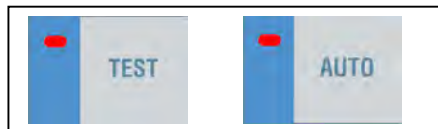
- Press the '**OFF – RESET**' key and the **line 1 SCROLL** key together for 5 consecutive seconds.

- The line 1 display will show the code of the first parameter. The first digit of the code is the menu number which blinks alternating with a P, while the two following digits indicate the number of the parameter within the menu. The first parameter is P1.01, i.e. menu P1, parameter 01.

LINE 1

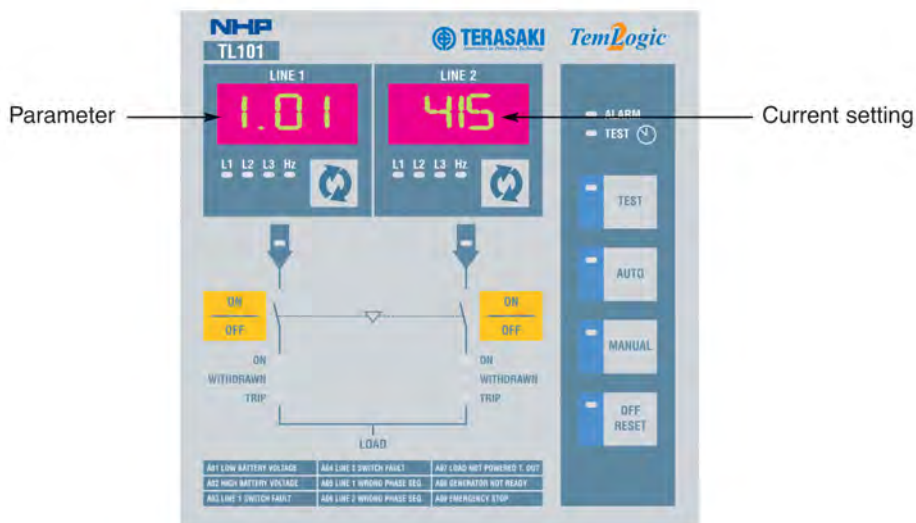


- Press the line 1 **SCROLL** to advance forward through the parameters of the same menu and the **line 1 ON/OFF** key to move backward.



- Press the **TEST** key to advance forward through different menus and the **AUTO** key to move backward.

The digit identifying the parameter is shown on the LINE 1 display, while the current setting is indicated on the LINE 2 display as shown below.



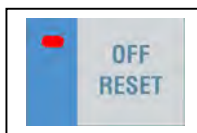
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LINE 2



Press the line 2 **SCROLL** and the line 2 **ON/OFF** to make changes to the setting of the selected parameter.

- By moving to another parameter or quitting, the setting of the selected parameter will be stored automatically.

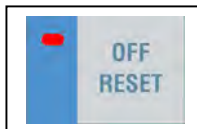


- Press the **OFF – RESET** key to quit the parameters setup.

- If no keys are pressed for more than 2 minutes, the TL101 unit exits the setup menu automatically without storing the changes.

12.4 REAL-TIME CLOCK SETUP

The procedure to set the TL101's real time clock is shown below:

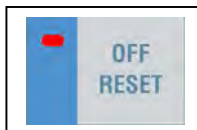


- Set the TL101 unit to the 'OFF – RESET' mode** by selecting the '**OFF – RESET**' key.



- Press the line 1 '**SCROLL**' key and the line 1 **ON/OFF** key together for 5 consecutive seconds.

- Use the line 1 '**SCROLL**' key and the line 1 **ON/OFF** key to scroll the clock parameters.
- Use the line 2 '**SCROLL**' key and the line 2 **ON/OFF** key to modify the setting of a selected parameter.



- Press the **OFF – RESET** key to quit the parameters setup.

After de-energizing and energizing the unit the calendar clock is re-set. This situation is signaled by the flashing wording SET RTC and by the flashing TEST LED.

MENU REAL – TIME CLOCK SETUP

PARA.	FUNCTION	RANGE	DEFAULT
Hou	Hours	0...23	12
Min	Minutes	0...59	00
Sec	Seconds	0...59	00
dAt	Day	0...31	1
Mon	Month	0...12	1
YEA	Year	00...99	06

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13.0 OUTPUT DATA / TESTS / REMOTE CONTROL

13.1 DISPLAY OF STATISTICAL DATA

The TL101 unit records a series of statistical data (operating times, operation counters, etc.) which are stored in a retentive memory even when the unit is de-energised.

To access the statistical data follow the procedure below:



- Press the line 1 '**SCROLL**' key and the line 2 '**SCROLL**' key together for 5 consecutive seconds starting from any operation mode.

- Each datum is shown by an acronym occupying both displays.
- To view the value of the corresponding datum the line 2 '**SCROLL**' key. Both displays will show the numeric value of the 6-digit datum. After 3 seconds the acronym will be displayed again.
- For times shorter than 10000 hours, hours and minutes are displayed in the hhhh.mm format. Only hours are displayed beyond this value.



- The different data variables available may be selected using the line 1 '**SCROLL**' and the line 1 '**ON/OFF**' key.



- Press the **OFF – RESET** key to exit the function. operating mode will not be changed.

- The operating times are identified by a cipher starting with letter t, while counters with C.
- A set of data may be cleared by pressing the line 1 '**ON/OFF**' key for 5 seconds (CLEAR is displayed).
- All times or all counters will be cleared, depending on the position from where the clear operation is performed.

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The following table lists the statistical data available.

STATISTICAL DATA TABLE

DATUM ACRONYM	DESCRIPTION
t.L1 Loa	Total time for load connected to line 1 (line 1 circuit breaker closed)
t.L2 Loa	Total time for load connected to line 2 (line 2 circuit breaker closed)
t.no Loa	Total time for load disconnected from both lines (both circuit breakers open)
t.L1 PrE	Total time for line 1 present (within limits)
t.L2 PrE	Total time for line 2 present (within limits)
t.L1 AbS	Total time for line 1 absent (off limits)
t.L2 AbS	Total time for line 2 absent (off limits)
t.totAL	Total time for TL101 operation
C.L1 Aut	Count of number of operations (closing) -line 1 circuit breaker in automatic mode
C.L2 Aut	Count of number of operations (closing) -line 2 circuit breaker in automatic mode
C.L1 Man	Count of number of operations (closing) -line 1 circuit breaker in manual mode
C.L2 Man	Count of number of operations (closing) -line 2 circuit breaker in manual mode
C.L1 Fau	Count of number of failed operations - line 1 circuit breaker (alarm A03)
C.L2 Fau	Count of number of failed operations - line 2 circuit breaker (alarm A04)
C.On OFF	Count of total number of TL101 energizing -de-energizing cycles

13.2 ALARMS

When an alarm event occurs, the TL101 either shows a code on the displays or lights up a dedicated LED.

- For non-retentive alarms, the indication disappears automatically when the alarm conditions stop, while for retentive alarms a manual reset is needed from the unit front panel: this is done by pressing the **OFF / RESET** key (and then shifting to OFF mode).
- The presence of any alarm is signaled by the relevant flashing ALARM LED illuminating.
- In the presence of an alarm, both the global alarm output (ALA) and the TL101 ready output (rdy) are de-energized.
- An alarm can be disabled by programming to **OFF** the parameter defining its threshold or the programmable input generating it.
- The following table lists the possible alarms and their meanings. The RET column specifies if the alarm is retentive, while the MODE column indicates the operating modes (**OFF** - **MANUAL** - **AUTO** - **TEST**) where the alarm is enabled.

ALARM CODE TABLE

CODE	DESCRIPTION	RET	MODE
A01	Battery voltage too low	•	O M A T
A02	Battery voltage too high	•	O M A T
A03	Line 1 circuit breaker timeout	•	A T
A04	Line 2 circuit breaker timeout	•	A T
A05	Line 1 wrong phase sequence	•	O M A T
A06	Line 2 wrong phase sequence	•	O M A T
A07	Load not powered timeout		A T
A08	Generator not available	•	O M A T
A09	Emergency	•	O M A T
LED	Withdrawn Line 1 / 2 circuit breaker withdrawn	•	A T
LED	Trip Line 1/ 2 circuit breaker protection intervention	•	A T

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A01 - A02 - Battery voltage beyond threshold for a time exceeding the time set.

A03 - A04 - The changeover device did not perform the opening or closing operation within the maximum time set. After alarm tripping, the opening or closing command is inhibited. If motorised circuit breakers are used, alarms are tripped only if at least one of the two power sources is present, i.e. if it is higher than the minimum thresholds programmed.

A05 - A06 - The phase sequence recorded does not correspond to the one programmed.

A07 - The load remained de-energized for a time exceeding the one programmed by P2.11, either because supply lines were not available or because both circuit breakers remained open.

A08 - Can be generated by the opening of the external 'generator not ready' input or when, after having started the generator, the voltage does not become acceptable within the time specified by P2.11. If the alarm is generated by the external input then it is not retentive. Otherwise it is retentive and thus must be re-set using RESET/OFF key. In applications with two generators, A08 is shown on the Line 1 or Line 2 display depending on which generator generated the alarm.

A09 - Alarm generated by the opening of the external emergency input. Both circuit breakers are opened.

LED WITHDRAWN - Generated by the opening of programmable input Withdrawn. The open and close commands of the circuit breaker concerned are inhibited.

LED TRIP - Generated by the closing of programmable input Trip. The open and close commands of the circuit breaker concerned are inhibited.

13.3 AUTOMATIC TEST

The Automatic test consists of a generator starting cycle that is executed periodically to check the efficiency of the generator itself, when TL101 is in **AUTO** mode.

- The frequency and the duration of the automatic test can be defined by the user. See setup menu P8 for a more detailed description of all parameters involved in automatic test programming.
- The dedicated LED **TEST** indicates that the automatic test is enabled. It can be activated or disabled by parameter P8.01 or directly from the front panel (without entering setup programming) by pushing line 2 **SCROLL** key and then operation mode **TEST** key. This operation does not change the TL101 operating mode.

13.4 DIAGNOSTIC MESSAGE

The TL101 display can show messages to signal the implementation of a function or a particular situation.

- By pressing one of the keys for **measure selection**, the diagnostic display is temporarily stopped to allow to view the measure.

CODE	DESCRIPTION
StA	Generator set startup
Coo	Generator set cooling cycle
FSi	Line failure simulation
—	Interlock time in progress
toL	Test with load in progress
Set rtc	Calendar clock setup needed (see P2.23)
Loc	Locked keypad
Unl	Unlocked keypad

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13.5 KEYPAD LOCK

The TL101 keypad can be locked either by means of a programmable input or with a particular procedure from front keys.

- Once the keypad is locked, it will only be possible to view measures, but not to change operating mode or to operate manually on circuit breakers. Only the keys for measure selection will remain enabled.
- Any attempt to use the locked keys will cause the word **Loc** to be displayed.
- To lock or unlock the keypad, press the line 1 SCROLL key and, while holding it down, press the line 2 SCROLL key **three** times without releasing it at the end.
- Release then the line 1 SCROLL key and then press it 5 times, then release both keys.
- When the keypad is locked, the display shows the word **Loc**. Conversely it has been unlocked, the word **UnL** would appear.

13.6 REMOTE CONTROL

It is possible to connect TL101 to a PC through its serial interface and to monitor the operation of the device using a generic SCADA software that supports Modbus protocol.

- TL101 can be connected directly in peer-to-peer configuration using the RS232 serial interface port and cable. NOTE RS485 is a non standard interface.

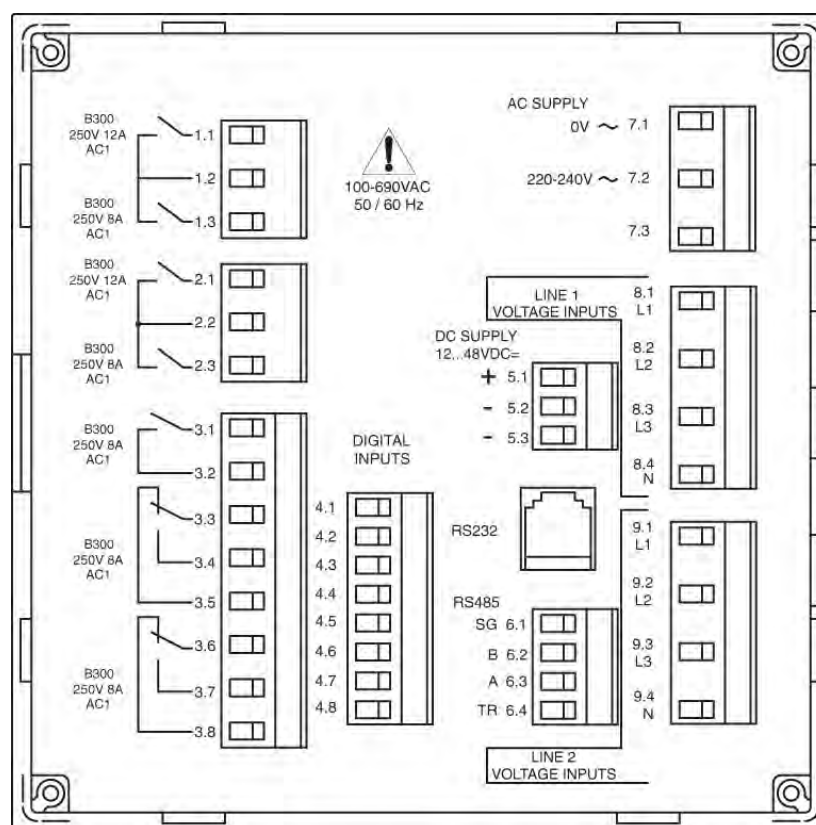


Fig.1: Controller rear terminal connections

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14.0 MECHANICAL DIMENSIONS & CUT-OUTS

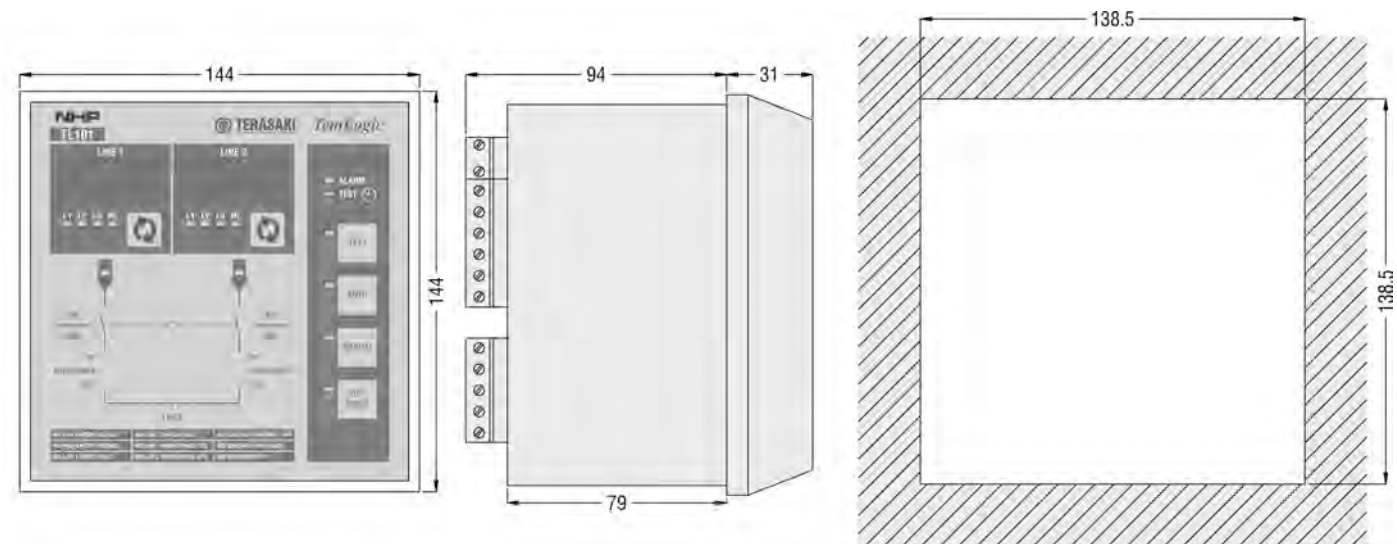


Fig.2: Controller dimensions & panel cut-out

15.0 WIRING DIAGRAMS

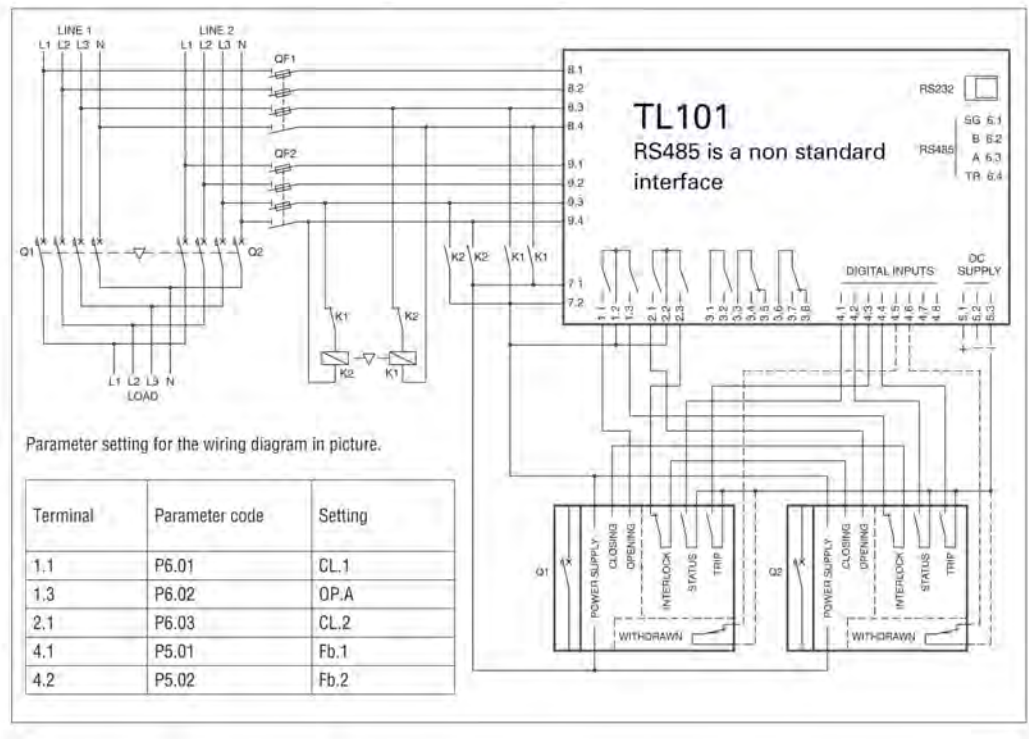


Fig.3: Motorised circuit breaker control

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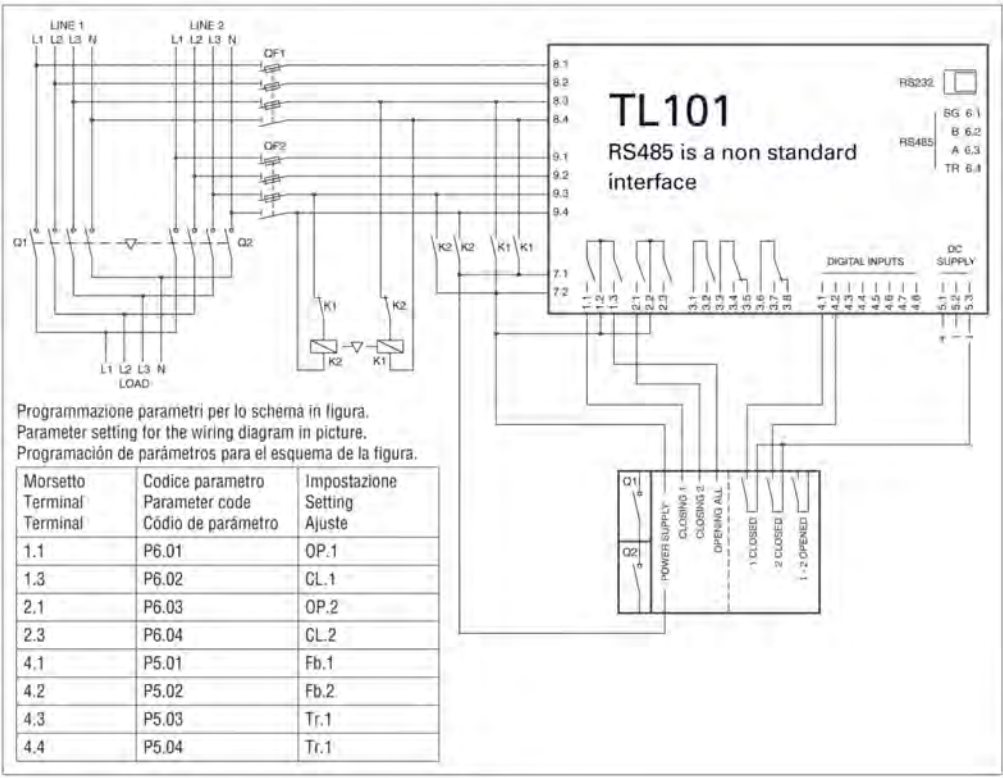


Fig.4: Motorised changeover switch control

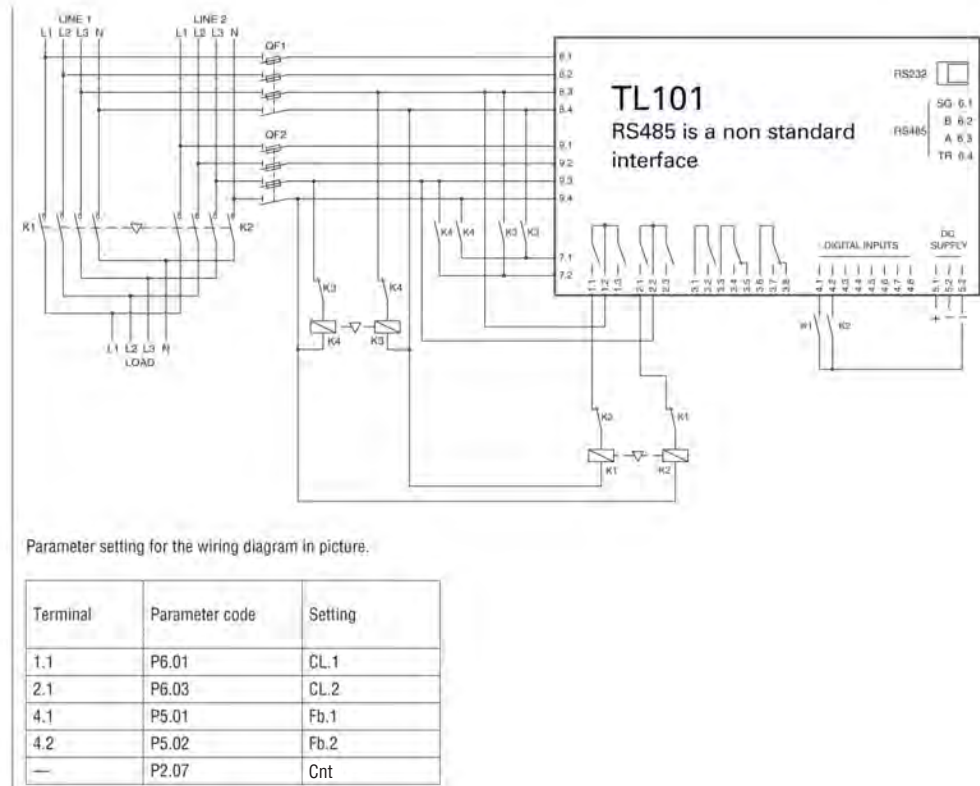


Fig.5: Contactor control

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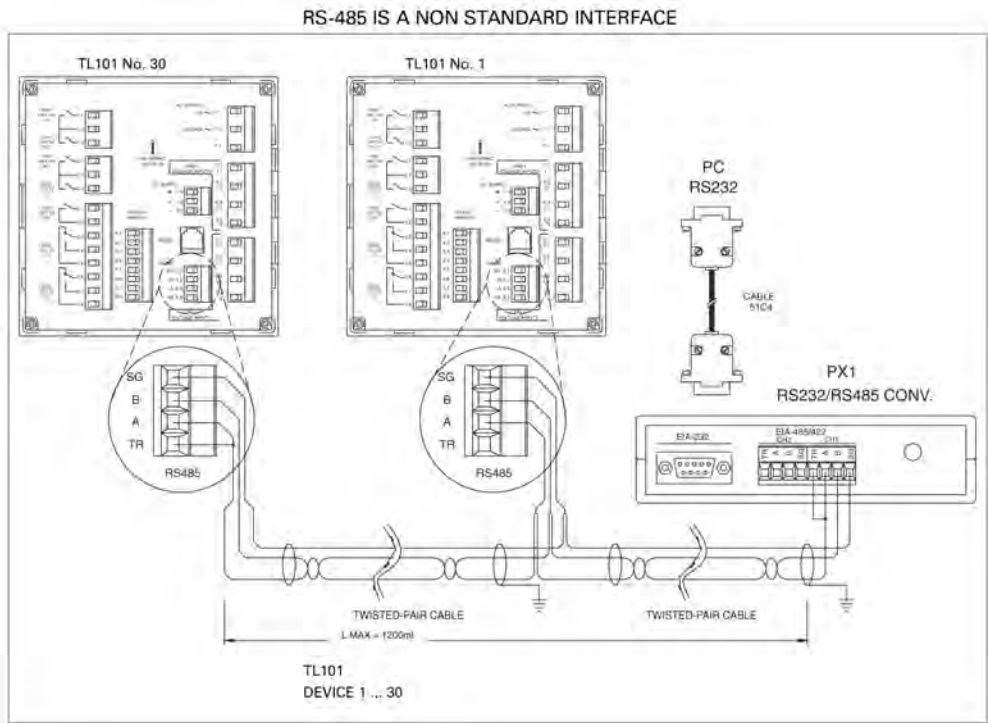


Fig.6: RS485 Interface wiring

Manual transfer switches

3 and 4 pole

MCCBs used	Ampere Range	Interrupting cap. (415 V)		OCR type	Overall (3 pole) ⁴⁾ dimensions (mm)			3 pole MTS Cat. No. ¹⁾	4 pole MTS Cat. No. ¹⁾
		Icu	Ics		W	H ³⁾	D ²⁾		
XS125CJ	40-63	18	9	Therm Mag	305	209	209	MS1C633	MS1C644
XS125CJ	63-100	18	9	Therm Mag	305	209	209	MS1C133	MS1C144
XS125CJ	79-125	18	9	Therm Mag	305	209	209	MS1C233	MS1C244
XS125NJ	40-63	30	15	Therm Mag	305	209	209	MS1N633	MS1N644
XS125NJ	63-100	30	15	Therm Mag	305	209	209	MS1N133	MS1N144
XS125NJ	79-125	30	15	Therm Mag	305	209	209	MS1N233	MS1N244
XH125NJ	40-63	50	25	Therm Mag	305	209	209	MH1N633	MH1N644
XH125NJ	63-100	50	25	Therm Mag	305	209	209	MH1N133	MH1N144
XH125NJ	79-125	50	25	Therm Mag	305	209	209	MH1N233	MH1N244
XH125PJ	40-63	50	50	Therm Mag	305	209	209	MH1P633	MH1P644
XH125PJ	63-100	50	50	Therm Mag	305	209	209	MH1P133	MH1P144
XH125PJ	79-125	50	50	Therm Mag	305	209	209	MH1P233	MH1P244
XH160PJ	100-160	50	50	Therm Mag	336	237	156	MH2P133	MH2P144
XS250NJ	100-160	35	18	Therm Mag	336	237	139	MS2N133	MS2N144
XS250NJ	163-250	35	18	Therm Mag	336	237	139	MS2N233	MS2N244
XH250NJ	100-160	50	25	Therm Mag	336	237	156	MH2N133	MH2N144
XH250NJ	100-250	50	25	Therm Mag	366	237	156	MH2N233	MH2N244
XS400CJ	100-250	35	18	Therm Mag	500	314	165	MS4C233	MS4C244
XS400CJ	250-400	35	18	Therm Mag	500	314	165	MS4C433	MS4C444
XS400NJ	163-250	50	25	Therm Mag	500	314	165	MS4N233	MS4N244
XS400NJ	250-400	50	25	Therm Mag	500	314	165	MS4N433	MS4N444
XH400PJ	250-400	65	50	Therm Mag	500	314	165	MH4P433	MH4P444
XS400SE	125-250	50	25	Electronic	500	314	165	MS4S233	MS4S244
XS400SE	200-400	50	25	Electronic	500	314	165	MS4S433	MS4S444
XH400SE	125-250	65	33	Electronic	500	314	165	MH4S233	MH4S244
XH400SE	200-400	65	33	Electronic	500	314	165	MH4S433	MH4S444
XH400PE	125-250	65	50	Electronic	500	314	165	MH4P233	MH4P244
XH400PE	200-400	65	50	Electronic	500	314	165	MH4P433	MH4P444
XS630CJ	250-400	45	23	Therm Mag	550	433	182	MS6C433	MS6C444
XS630CJ	400-630	45	23	Therm Mag	550	433	182	MS6C633	MS6C644
XS630NJ	250-400	65	33	Therm Mag	550	433	182	MS6N433	MS6N444
XS630NJ	400-630	65	33	Therm Mag	550	433	182	MS6N633	MS6N644
XH630PJ	250-400	85	50	Therm Mag	550	433	182	MH6P433	MH6P444
XH630PJ	400-630	85	50	Therm Mag	550	433	182	MH6P633	MH6P644
XS630SE	315-630	50	25	Electronic	550	433	182	MS6S633	MS6S644
XH630SE	315-630	65	33	Electronic	550	433	182	MH6S633	MH6S644
XH630PE	315-630	65	50	Electronic	550	433	182	MH6P633	MH6P644
XS800NJ	500-800	65	33	Therm Mag	550	433	182	MS8N833	MS8N844
XH800PJ	500-800	85	50	Therm Mag	550	433	182	MH8P833	MH8P844
XS800SE	400-800	50	25	Electronic	550	433	182	MS8S833	MS8S844
XH800PE	400-800	65	50	Electronic	550	433	182	MH8P833	MH8P844
XS1250SE	500-1000	65	49	Electronic	553	570	198	MS12S1033	MS12S1044
XS1250SE	625-1250	65	49	Electronic	553	550	198	MS12S1233	MS12S1244
XS1600SE	800-1600	85	64	Electronic	553	570	198	MS16S1633	MS16S1644
XS2000SE	1000-2000	100	64	Electronic	774	450	361	MS20E2033	MS20E2044
XS2500SE	1250-2500	100	64	Electronic	774	450	361	MS25E2533	MS25E2544
TL100NJ	40-63	85	85	Therm Mag	305	300	209	MT1N633	MT1N644
TL100NJ	63-100	85	85	Therm Mag	305	300	209	MT1N133	MT1N144
TL250NJ	163-250	100	100	Therm Mag	500	342	165	MT2N233	MT2N244
TL400NE	200-400	100	100	Electronic	500	342	165	MT4E433	MT4E444
TL630NE	315-630	125	70	Electronic	550	570	198	MT6E633	MT6E644
TL800NE	400-800	125	70	Electronic	550	570	198	MT8E833	MT8E844
TL1250NE	625-1250	125	65	Electronic	550	570	198	MT12E1233	MT12E1244

Note: ¹⁾ Ordering sheet refer page 9 - 20.

²⁾ Depth excludes toggle.

³⁾ Height includes attached busbar on MCCBs 630 A & above.

⁴⁾ Detailed dimensions including 4 pole types refer following pages.

Transfer switches



Power interruptions can affect productivity, cost dollars and at times, safety

In today's highly competitive environment it is essential to be able to rely on a continuous power supply. Modern buildings and industrial complexes have critical loads such as essential lighting, computers and continuously operating industrial equipment. An uninterrupted power supply is vital for these functions.

Circuit condition sensing circuit

Reliability of your power supply can be achieved with a Terasaki automatic transfer switch comprising a basic transfer switch for the actual switching and a logic control panel, or control circuit, to automatically sense when to switch. Whenever mains voltage drops below 85% of the nominal line voltage, the logic controller signals the emergency source engine to start, then automatically transfers the load to the emergency source by activating the motor driven circuit breakers in the BTS (basic transfer switch).

The transfer operation is initiated and controlled by a compact logic panel comprising voltage and phase monitoring relays, time delay relays and logic relay (or PLC logic type). An adjustable time delay relay prevents changeover due to momentary voltage fluctuation. When the load has been transferred the supply is continually monitored to determine when the load can be transferred back to the preferred supply. An adjustable time delay relay (TDEN) prevents the transfer switch returning the load to the normal supply until the voltage has stabilised.

The basic transfer section comprising motor operated circuit breakers and interlocks is controlled by the logic panel and performs the automatic transfer only when commanded to do so by the logic panel.

The logic control also provides a voltage-free contact to initiate starting the emergency engine.

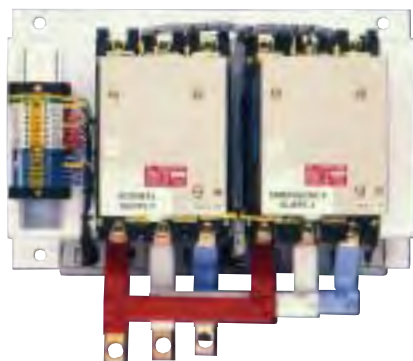
The standard TemLogic panels may be customised with up to 13 optional functions (refer pages 9 - 21 to 9 - 24 for details)



9



Vertical Slimline type
Basic transfer switch (400 A)



Transfer switch with
common loadside busbar option (125 A)



TemLogic control panel
(Micro PLC type)

Transfer switches

Basic transfer switches

Terasaki transfer switches may be supplied without TemLogic control panels where customers prefer to design their own automatic control. This assembly is known as a basic transfer switch (BTS).

Each basic transfer switch includes two motor operated circuit breakers mechanically and electrically interlocked for safety. One additional auxiliary switch for customer use is supplied as standard on each circuit breaker. The assembly is mounted on a white painted base plate and wired to WAGO terminals allowing for simple customer connection.

BTS options:

Extra auxiliary contacts.
Alarm switch.
Shunt trip.

Other options include:

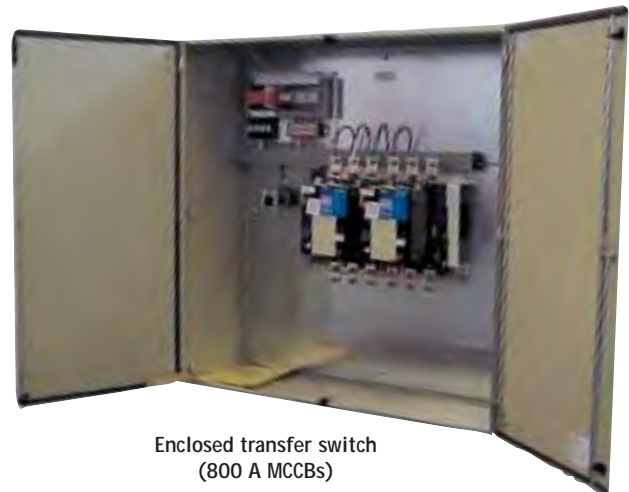
Common loadside busbars.
Enclosure.

Voltage:

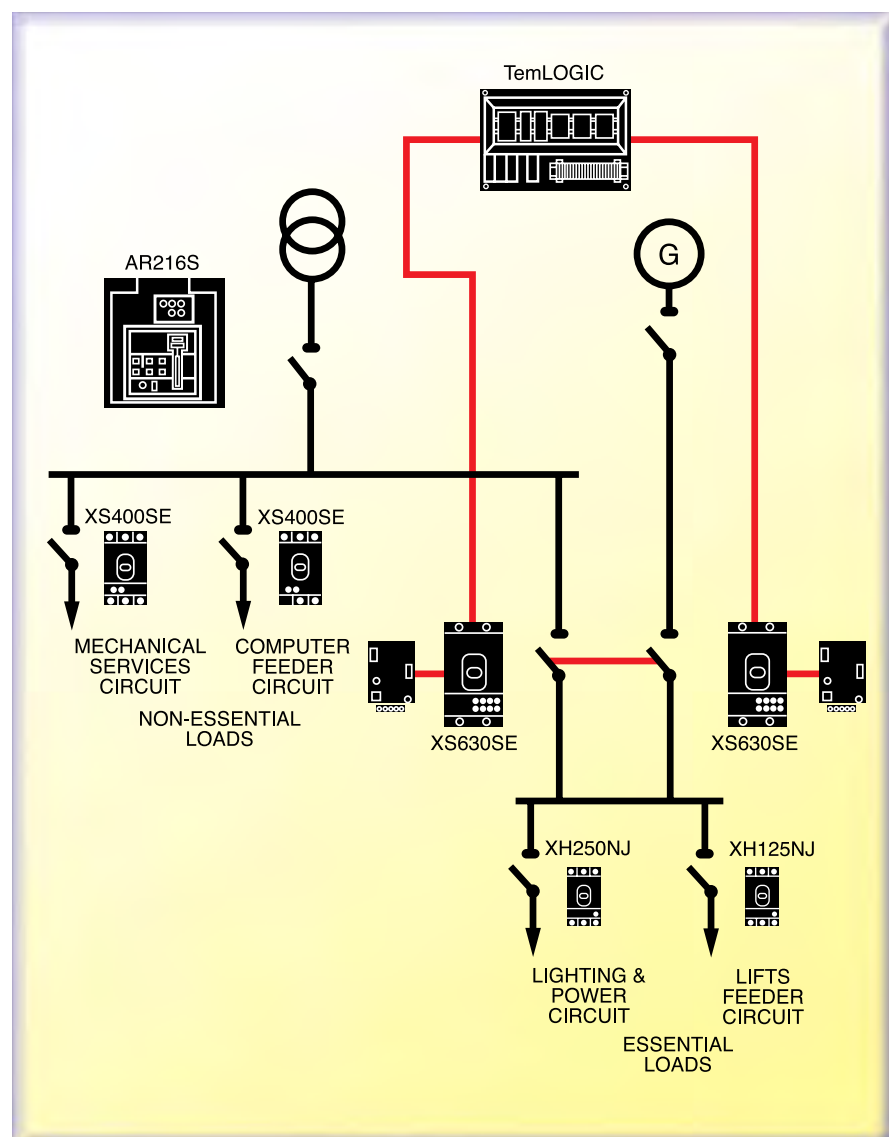
Standard voltage is 240 V AC.

Special voltages:

110 V, AC, 110 V DC, 24 V DC
available on request.



Enclosed transfer switch
(800 A MCCBs)



Transfer switches

Multiple functions - Protection, isolation and switching in one compact device

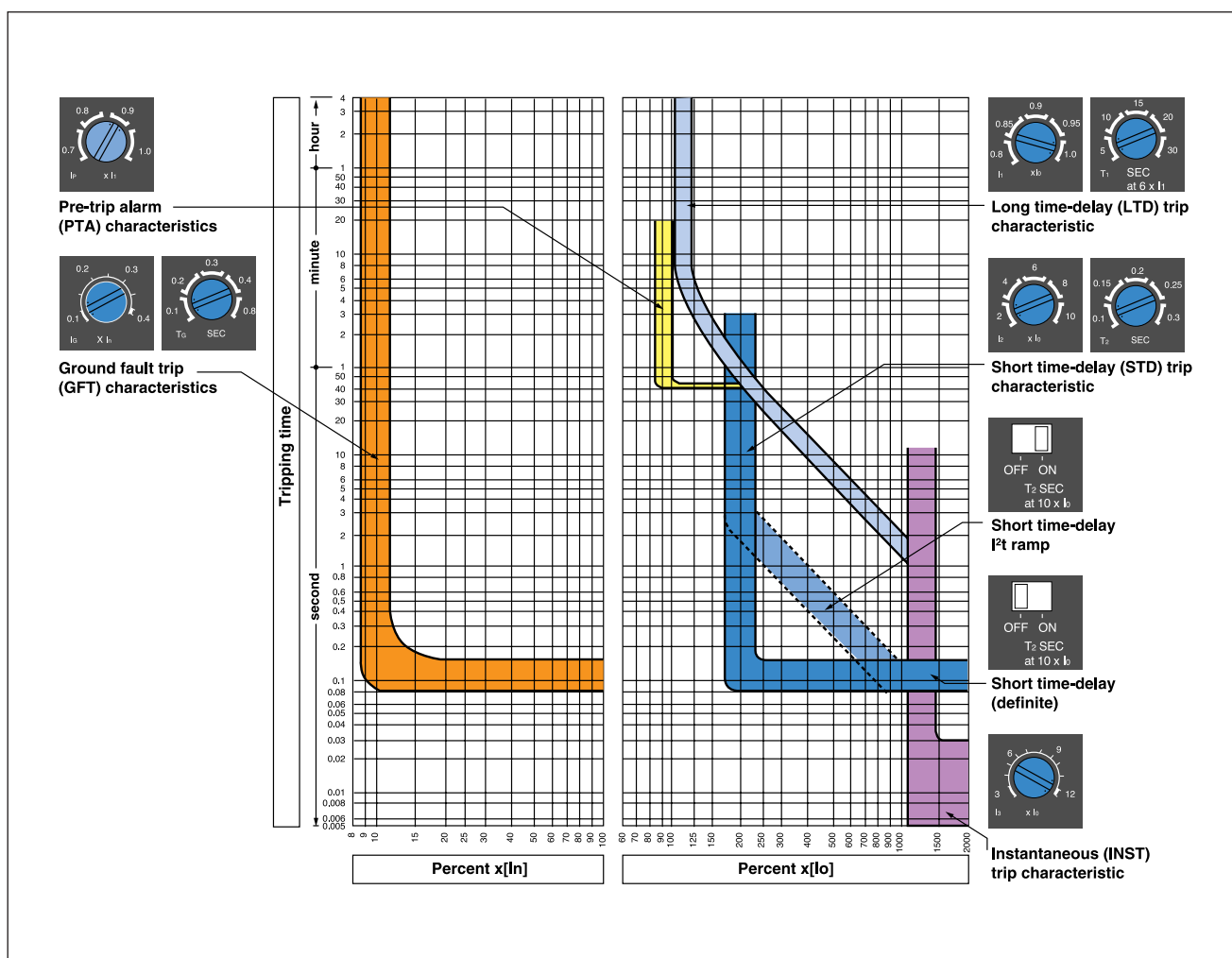
Circuit breaker transfer switches provide integral circuit protection, automatic switching and circuit isolation in one compact device. Other features include:

- A choice of moulded case or air circuit breaker.
- Auxiliary and optional alarm contacts which indicate the status of each MCCB 'on - off or tripped', and may be used to signal to a master controller or building management system.
- Indicator flags on the motor mechanism to show motor operation status.
- Dual mechanical and electrical interlocking is provided for safety.
- Simple connection. Control wiring is pre-wired to a terminal strip. External control connections are simple 3 wire on-off/reset common. Terasaki automatic transfer switches are space saving, economical and more flexible when compared to the alternative arrangement using electro-magnetic contactors and switch fuse units for circuit protection.

Precise protection co-ordination

MCCBs with microprocessor overcurrent relays, have the flexibility to provide multiple protective functions. Their precise co-ordination enables the transfer switch to become an integral part of the overall grading (selectivity) scheme.

Terasaki electronic MCCB protection characteristics

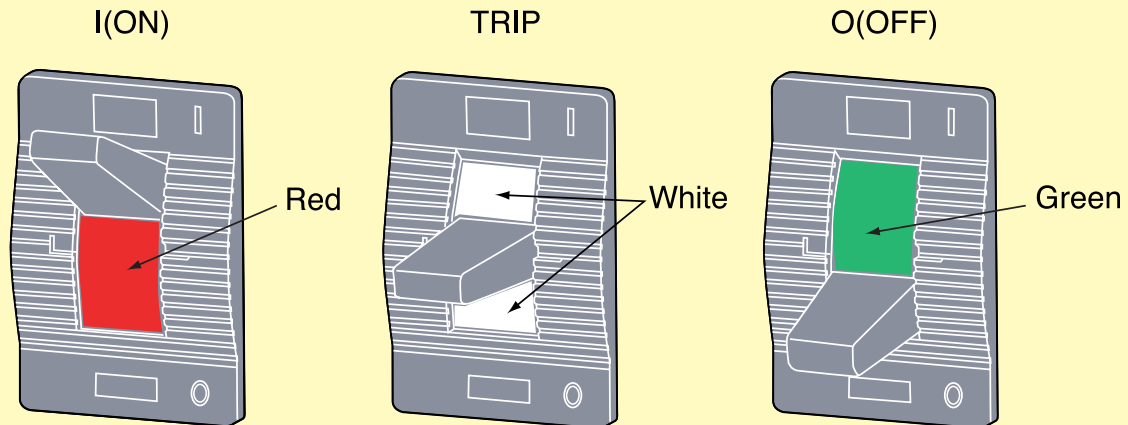


Transfer switches

Conserving energy

Circuit breaker transfer switches have three stable positions: 'on', 'off' and 'tripped'. These positions are maintained mechanically, thus energy consumption and maintenance is reduced by eliminating the need for electromagnetic coils.

3 Stable positions

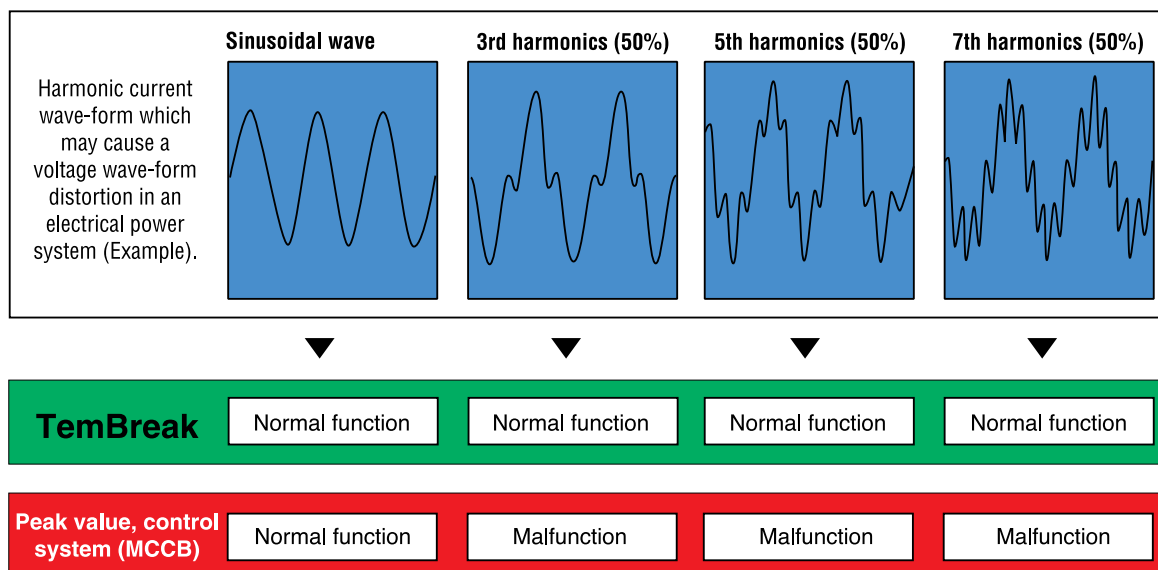


Stable positions - conserve energy, reduce maintenance

Each position is mechanically stable eliminating the need for continuously energised coils curtailing waste energy and reducing maintenance compared to electrically held devices.

True RMS monitoring unaffected by harmonics

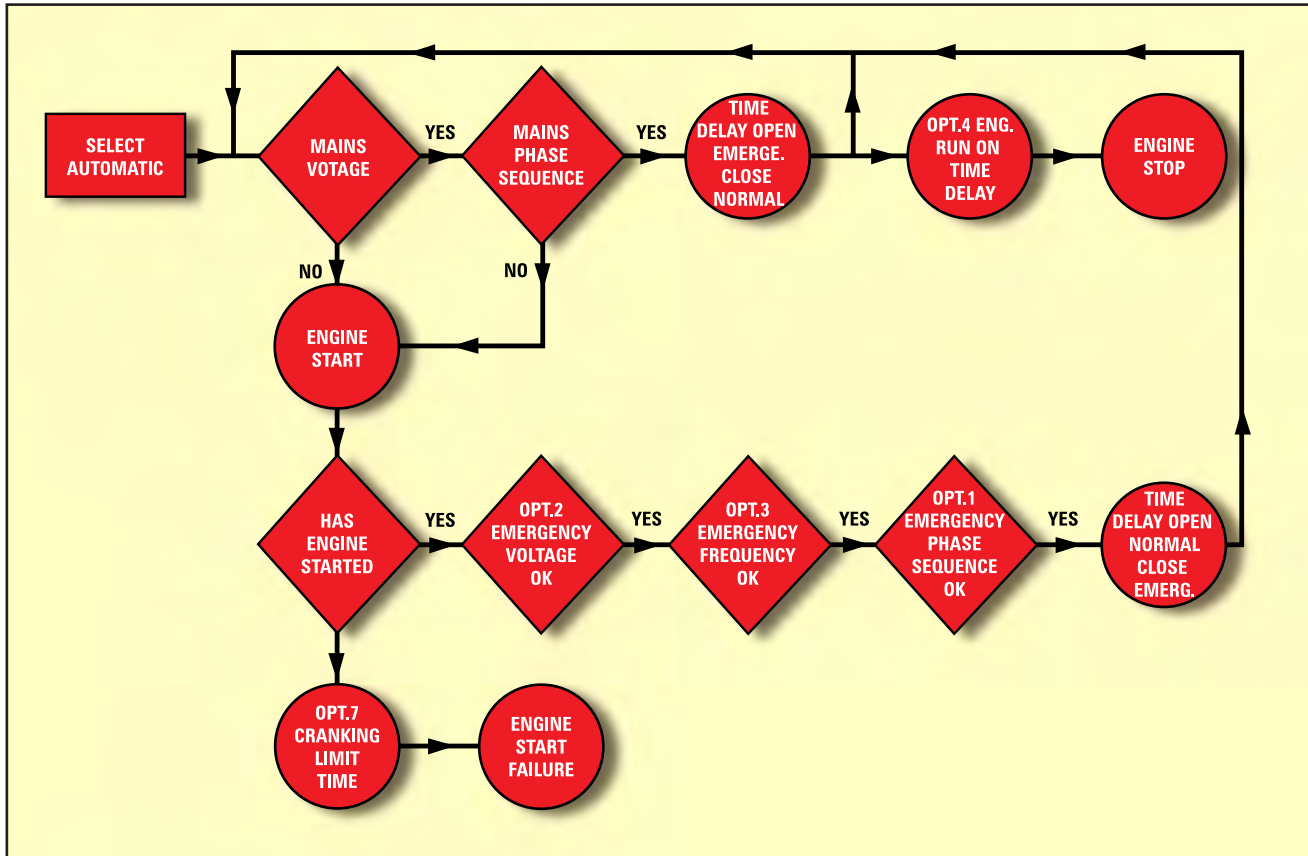
Tem-Break MCCBs with electronic OCRs detect true RMS of the load current. Therefore, the tripping characteristics are unaffected by harmonics. Thermal magnetic MCCBs are also unaffected. Nuisance tripping is avoided and precise protection is maintained.



Automatic transfer switches

Quality assurance

Each Terasaki automatic transfer switch is made to an identical bill of materials. A wiring schematic and connection diagram is supplied with each BTS to simplify installation and wiring. Quality Assurance is in accordance with Australian Standards.



Remote emergency off (optional)

9

A shunt trip (optional) is available with Terasaki automatic or basic transfer switches. This optional feature enables remote tripping of the mains or emergency circuit breakers.



Shunt trip

Auto reset (optional)

Each basic transfer switch may be equipped for auto reset. If either circuit breaker is tripped manually via a shunt trip or by the sensing of overcurrent, the auto reset automatically returns the MCCB to the 'off' position. This feature requires the use of one additional auxiliary contact or an alarm contact. Please specify when ordering.



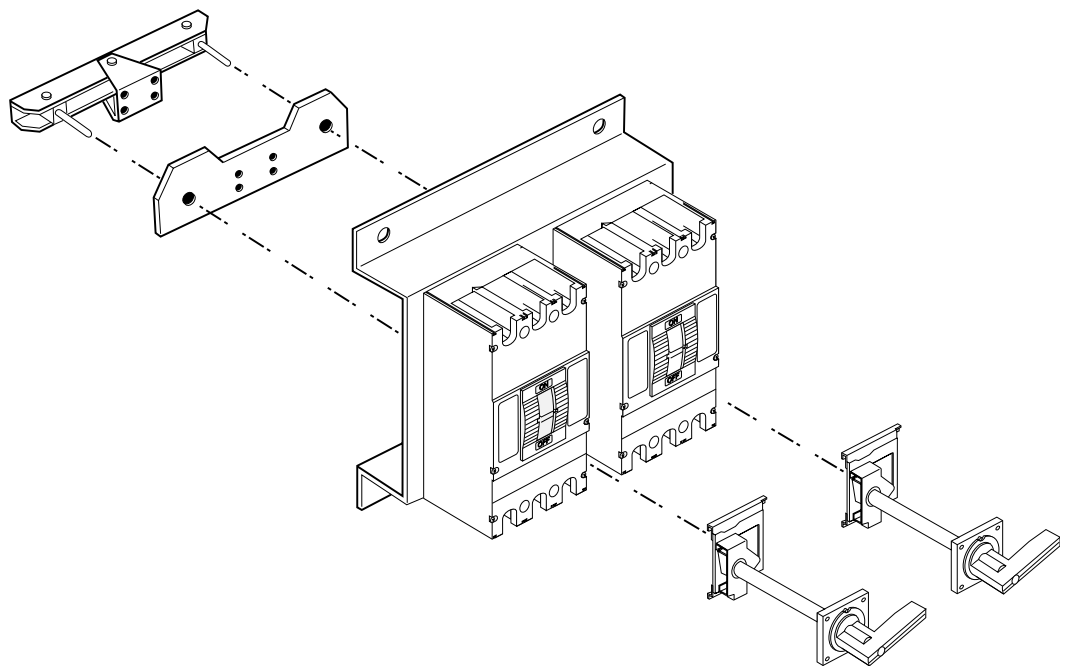
Alarm / auxiliary switch

Transfer switches

Manual Transfer Switch (MTS)

An MTS is a simple and economical means of transferring from normal to emergency supply. A walking beam mechanical interlock prevents both supplies being energised together. Circuit protection and isolation are provided in a compact device. The MTS is mounted on a white painted steel base plate to facilitate easier installation.

Optional features include: auxiliary contacts, trip alarm contact, and twin handle operation available on request. Specify when ordering.

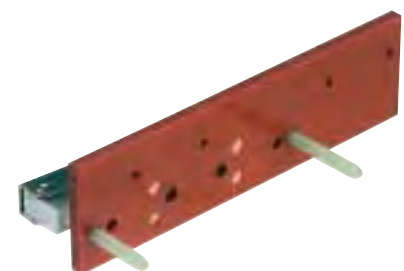


Mechanical interlocking

The standard moulded case basic transfer switch section is equipped with a reliable rear mounting, walking beam mechanical interlock, to prevent simultaneous closing of both MCCBs.

The walking beam once installed and adjusted, usually needs no further adjustment though periodic inspection or operation is recommended. An electrical interlock is provided for additional safety.

The electrical interlock prevents the mechanical interlock being subjected to mechanical damage.



Rear interlock

Transfer switches

Slimline BTS



Slimline transfer switches. Available in horizontal or vertical configurations.

Slimline transfer switches featuring the cable/rod mechanical interlock system are more flexible than the standard walking beam models and can save valuable switchboard width when in the vertical configuration. The Slimline is available in two forms:

- Fully assembled, wired and mounted, vertical *or* horizontal on a base plate (with rod type mechanical interlock).
- Without baseplate and wiring. An interlocking cable is supplied loose.

The arrangement described in b) above finds its application in Form 2, 3 and 4 compartmented switchboards. This model is supplied partially assembled to enable the interlocking cable (wire) to be passed from one compartment to another without disturbing segregation barriers.

The MCCBs are supplied with motor, mechanical interlock fitting and auxiliary contacts fully assembled. The switchboard manufacturer then has the option of mounting the MCCBs complete with accessories in the position which best suits the switchboard construction.

Flexibility in MCCB selection

Different current (and frame size) rated MCCBs may be selected where the EMERGENCY supply feeds essential circuits only. By using a smaller frame MCCB on the emergency circuit, a more economical arrangement can be achieved.

A wide diversity of Slimline transfer switches are available featuring models as diverse as 2500 A - 400 A. Three pole/four pole models are also available.

***Slimline –
a mix of MCCB sizes,
horizontal or vertical***

Transfer switches

Choice of logic controller

NHP offers a choice of electromechanical (relay) logic panels or PLC types with options.

Electromechanical logic control panels

The standard TemLogic relay logic panel features a proven circuit design and is guaranteed by NHP to carry out the transfer functions when linked to a Terasaki basic transfer switch. A 'mode' selector switch is provided with every logic panel. The selector switch enables the operator to select any one of up to 4 modes of operating for the transfer switch.

The 'automatic' position allows the logic controller to perform the control function.

When in the 'off' position, the logic circuitry is disabled preventing transfer from occurring. Both circuits are isolated.

The 'manual' position allows the transfer switch to be operated manually via the handle and pushbutton on the motor operator; a changeover may be effected manually.

In the 'test' position, the load is transferred to the emergency source to test the functioning of that source. The transfer switch will remain in the 'emergency' position and the generator will feed the load until the selector switch is returned to the 'automatic' mode.

The standard logic panel may be customised with up to 15 standard optional functions:

- Option 1 ¹⁾** - Emergency supply phase failure/sequence relay (EPFR) ¹⁾
 - detects the phase sequence is correct in the emergency supply before allowing a changeover to occur.
- Option 2 & 3 ¹⁾** - Emergency supply voltage and frequency relays (EPFR and EVSR)
 - detects if the emergency supply is at the correct voltage and frequency before allowing the changeover to take place.
- Option 4 ²⁾** - Engine run-on time delay (ERTD) - allows engine to continue running, overcoming 'run-up' delays during intermittent mains failure.
- Option 5** - Engine start-time delay (ESTD) - delays engine start-up when mains failure is momentary only and quickly restored.
- Option 6** - Inhibit return control (IRC) - prevents automatic return to the normal supply after a changeover. Normal supply must be restored manually.
- Option 7** - Cranking time limiter (CLTD) - limits the time the emergency engine can be cranked by the starter motor. Adjustable from 0-10 minutes. This prevents damage to the starter motor and battery in the event of engine or alternator failure.
- Option 8** - Additional mode selection "normal supply" (SSW2) (selector switch) disables the control logic, maintaining the system on the normal supply mode and preventing automatic changeover during maintenance of the emergency source.
- Option 9** - Mode indication lights (SSW3) provide the operator with a visual indication of the mode or status of the automatic transfer switch, eg, isolate load and reset, automatic, manual, emergency supply on, normal supply on.
- Option 10** - Alarm lockout relay (NALR-EALR) - locks out the system and prevents transfer taking place when the circuit breakers are tripped due to overload or short circuit.
- Option 11 ²⁾** - Changeover time delay (NCOTD-ECOTD) - delays changeover in the neutral (off) position to ensure that the circuit breaker supplying the load is in the 'off' position before transfer takes place.
- Option 12 ³⁾** - Normal supply phase failure/sequence relay (NPFR) - detects phase sequence is correct before the transfer switch reconnects the load to the normal source.
- Option 13** - Mains stability timer
- Option 14 ⁴⁾** - Building automation system interface
- Option 15 ⁴⁾** - Load shedding control

NOW STANDARD

Notes: ¹⁾ Options 1 and 2 are combined.

²⁾ These options are standard when a PLC logic panel is used.

³⁾ Options 12 is now standard on all basic and other logic panels.

⁴⁾ Available using PLC logic panels only.

Automatic transfer switches

Compact and flexible PLC logic panels

PLC logic panels usually comprise an NHP / Mitsubishi micro PLC. PLC logic panels provide flexibility, space saving and centralised control. The added advantage of integrating the 13 optional functions of the standard logic panel as well as other control functions into a centralised scheme is possible when using a PLC controller. PLC controllers are compact enough to mount on a standard TemLogic panel gear tray (though as standard they are in a vertical configuration). Voltage and phase sequence functions are monitored by external voltage relays. PLC controllers require 20 inputs and 26 outputs minimum to incorporate the standard logic plus all options. Specify PLC controllers when ordering.

Enclosed automatic transfer switches free standing or wall mounted

Enclosed automatic transfer switches are assembled to order from stock components on a fast track delivery system. The basic transfer switch section and associated logic panel are housed inside pre-specified Eldon enclosures. A mode selector is supplied as standard and optional indicator lights may be mounted externally on the cabinet door.

Standard features include:

- IP rating to be specified at time of ordering
- Common loadside busbars
- Standard 240 V control or other voltages on application
- Neutral and earth bars

Optional features:

- Busbar flags for large cable termination
- Pushbutton or other front control

*Custom designed
logic panels
available on
application*

Automatic transfer switches

NHP circuit breaker transfer switches

Cable interlocked moulded case circuit breakers		9 - 12
Walking beam interlock types		9 - 13
Manual transfer switches 3 pole and 4 pole	Walking beam interlock	9 - 14
Basic transfer switches 3 or 4 pole	Walking beam interlock	9 - 15
Standard basic transfer switches 3 pole and 4 pole combination	Walking beam interlock	9 - 16
Slimline standard basic transfer switches horizontal 3 pole, 3/4 pole, 4/4 pole and 4/3 pole combination	Rod interlock	9 - 17
Slimline vertical uneven transfer switches	Rod interlock	9 - 18
Enclosed transfer switches 3 pole and 4 pole combination	Walking beam or rod interlock	9 - 19
Ordering sheet		9 - 20
TemLogic controllers		9 - 21, 22
TemPower ACB transfer switches		Refer section 10

Basic transfer switches (BTS)

With motor

MCCBs used	Ampere Range	Interrupting cap. (415 V)		OCR type	Overall 3 pole ⁴⁾ dimensions (mm)			3 pole BTS Cat. No. ¹⁾	4 pole BTS Cat. No. ¹⁾
		Icu	Ics		W	H ²⁾	D		
XS125CJ	40-63	18	9	Therm Mag	305	209	235	BS1C633	BS1C644
XS125CJ	63-100	18	9	Therm Mag	305	209	235	BS1C133	BS1C144
XS125CJ	79-125	18	9	Therm Mag	305	209	235	BS1C233	BS1C244
XS125NJ	40-63	30	15	Therm Mag	305	209	235	BS1N633	BS1N644
XS125NJ	63-100	30	15	Therm Mag	305	209	235	BS1N133	BS1N144
XS125NJ	79-125	30	15	Therm Mag	305	209	235	BS1N233	BS1N244
XH125NJ	40-63	50	25	Therm Mag	305	209	235	BH1N633	BH1N644
XH125NJ	63-100	50	25	Therm Mag	305	209	235	BH1N133	BH1N144
XH125NJ	79-125	50	25	Therm Mag	305	209	235	BH1N233	BH1N244
XH125PJ	40-63	50	50	Therm Mag	305	209	235	BH1P633	BH1P644
XH125PJ	63-100	50	50	Therm Mag	305	209	235	BH1P133	BH1P144
XH125PJ	79-125	50	50	Therm Mag	305	209	235	BH1P233	BH1P244
XH160PJ	100-160	50	50	Therm Mag	336	237	258	BH2P133	BH2P144
XS250NJ	100-160	35	18	Therm Mag	336	237	241	BS2N133	BS2N144
XS250NJ	163-250	35	18	Therm Mag	336	237	241	BS2N233	BS2N244
XH250NJ	100-160	50	25	Therm Mag	336	237	258	BH2N133	BH2N144
XH250NJ	100-250	50	25	Therm Mag	336	237	258	BH2N233	BH2N244
XS400CJ	100-250	35	18	Therm Mag	500	323	325	BS4C233	BS4C244
XS400CJ	250-400	35	18	Therm Mag	500	323	325	BS4C433	BS4C444
XS400NJ	163-250	50	25	Therm Mag	500	323	325	BS4N233	BS4N244
XS400NJ	250-400	50	25	Therm Mag	500	323	325	BS4N433	BS4N444
XH400PJ	250-400	65	50	Therm Mag	500	323	325	BH4P433	BH4P444
XS400SE	125-250	50	25	Electronic	500	323	325	BS4S233	BS4S244
XS400SE	200-400	50	25	Electronic	500	323	325	BS4S433	BS4S444
XH400SE	125-250	65	33	Electronic	500	323	325	BH4S233	BH4S244
XH400SE	200-400	65	33	Electronic	500	323	325	BH4S433	BH4S444
XH400PE	125-250	65	50	Electronic	500	323	325	BH4P233	BH4P244
XH400PE	200-400	65	50	Electronic	500	323	325	BH4P433	BH4P444
XS630CJ	250-400	45	23	Therm Mag	550	433	341	BS6C433	BS6C444
XS630CJ	400-630	45	23	Therm Mag	550	433	341	BS6C633	BS6C644
XS630NJ	250-400	65	33	Therm Mag	550	433	341	BS6N433	BS6N444
XS630NJ	400-630	65	33	Therm Mag	550	433	341	BS6N633	BS6N644
XH630PJ	250-400	85	50	Therm Mag	550	433	341	BH6P433	BH6P444
XH630PJ	400-630	85	50	Therm Mag	550	433	341	BH6P633	BH6P644
XS630SE	315-630	50	25	Electronic	550	433	341	BS6S633	BS6S644
XH630SE	315-630	65	33	Electronic	550	433	341	BH6S633	BH6S644
XH630PE	315-630	65	50	Electronic	550	433	341	BH6P633	BH6P644
XS800NJ	500-800	65	33	Therm Mag	550	433	341	BS8N833	BS8N844
XH800PJ	500-800	85	50	Therm Mag	550	433	341	BH8P833	BH8P844
XS800SE	400-800	50	25	Electronic	550	433	341	BS8S833	BS8S844
XH800PE	400-800	65	50	Electronic	550	433	341	BH8P833	BH8P844
XS1250SE	500-1000	65	49	Electronic	553	530	300	BS12S1033	BS12S1044
XS1250SE	625-1250	65	49	Electronic	553	530	300	BS12S1233	BS12S1244
XS1600SE	800-1600	85	64	Electronic	553	570	320	BS16S1633	BS16S1644
XS2000SE	1000-2000	100	64	Electronic	774	490	361 ³⁾	BS20E2033	BS20E2044
XS2500SE	1250-2500	100	64	Electronic	774	490	361 ³⁾	BS25E2533	BS25E2544
TL100NJ	40-63	85	85	Therm Mag	305	300	235	BT1N633	BT1N644
TL100NJ	63-100	85	85	Therm Mag	305	300	235	BT1N133	BT1N144
TL250NJ	163-250	100	100	Therm Mag	500	323	325	BT2N233	BT2N244
TL400NE	200-400	100	100	Electronic	500	323	325	BT4E433	BT4E444
TL630NE	315-630	125	70	Electronic	553	490	320	BT6E633	BT6E644
TL800NE	400-800	125	70	Electronic	553	490	320	BT8E833	BT8E844
TL1250NE	625-1250	125	65	Electronic	553	490	320	BT12E1233	BT12E1244

Note: ¹⁾ Ordering sheet refer page 9 - 20

³⁾ Depth does not include rear connect busbars.

²⁾ Height includes attached busbar on sizes 630 A & above.

⁴⁾ Detailed dimensions 3/4 pole refer following pages.

Automatic transfer switches

Moulded case interlocked pairs

The versatility of the cable mechanical interlock fitting allows us to offer almost any combination of MCCBs from 400 A to 2500 A as an interlocked pair. Each MCCB is supplied assembled with cable mechanical interlock fitting, motor operator and auxiliary contacts for electrical interlocking plus one for customer use. The auxiliary contact leads are terminated at an auxiliary connection block on the side of the breaker for convenience of customer wiring.

The cable wire is supplied. Please specify length.

**Cable interlocking
for vertical / horizontal /
diagonal mounting**



Interlocked 3 pole type
MCCB to MCCB

Enclosed automatic transfer switches

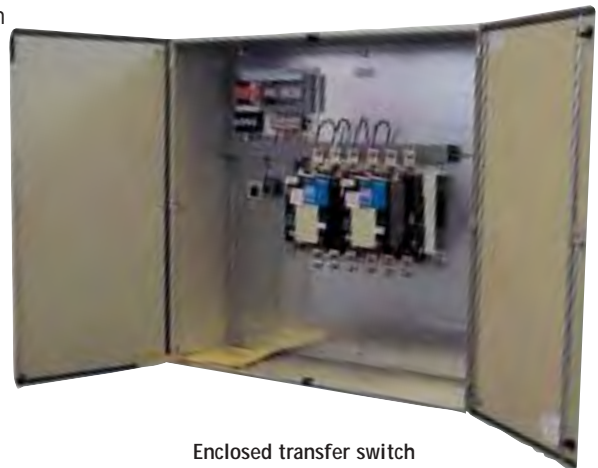
Enclosed automatic transfer switches are assembled to order from stock components on a fast track delivery system. The basic transfer switch section and associated logic panel are housed inside a standard pre-specified Eldon enclosure. A mode selector is supplied as standard and optional indicator lights may be mounted externally on the cabinet door.

Standard features include:

- IP 55 rated enclosure
- Common loadside busbars
- Standard 240 V control or other voltage on application

Optional features:

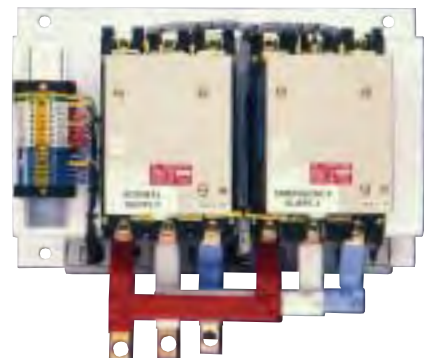
- Busbar flags for large cable termination



Enclosed transfer switch

Common loadside busbars available (optional)

Busbar Ampere Rating	Overall dimensions (mm)			Cat. No 3 pole	Cat. No 4 pole
	H	W	D		
250	97	128	118	CLSBB25033	CLSBB25044
400	130	160	141	CLSBB40033	CLSBB40044
630/800	200	250	178	CLSBB63033	CLSBB63044
1000/1250	420	360	108	CLSBB125033	CLSBB125044



Automatic transfer switch with
common loadside busbar fitted

Automatic transfer switches

Walking beam interlock type

The standard basic transfer switch comprises two motor operated circuit breakers, mechanically and electrically interlocked for safety. An additional auxiliary switch for customer use is supplied as standard on each circuit breaker. The complete assembly is mounted on a white painted steel base plate and wired for simple 3 wire customer connection. Common loadside busbars are an option (CLSBB - see previous page).

The basic transfer switch when coupled with a TemLogic control panel will effect automatic changeover to a standby source in the event of a power failure or incorrect phase sequence.

The standard models feature a simple and reliable walking beam mechanical interlock to prevent both breakers being in the ON position at the same time.

Basic types

MTS



BTS



ATS



+



The standard arrangement of MCCBs

Normal
Left
3 P

Emergency
Right
3 P

MTS = Manual transfer switch: no motors and no logic panel

BTS = Basic transfer switch: MCCBs have motors mounted on them, no logic panel

ATS = BTS and logic panel

Basic transfer switches (BTS)

3 and 4 pole combinations

MCCBs used	Ampere Range	Interrupting cap. (415 V)		OCR type	Overall dimensions (mm) ⁴⁾			3 P + 4 P BTS Cat. No. ¹⁾	4 P + 3 P BTS Cat. No. ¹⁾
		Icu	Ics		W (4 pole)	H ²⁾	D		
XS125CJ	40-63	18	9	Therm Mag	350	209	235	BS1C634	BS1C643
XS125CJ	63-100	18	9	Therm Mag	350	209	235	BS1C134	BS1C143
XS125CJ	79-125	18	9	Therm Mag	350	209	235	BS1C234	BS1C243
XS125NJ	40-63	30	15	Therm Mag	350	209	235	BS1N634	BS1N643
XS125NJ	63-100	30	15	Therm Mag	350	209	235	BS1N134	BS1N143
XS125NJ	79-125	30	15	Therm Mag	350	209	235	BS1N234	BS1N243
XH125NJ	40-63	50	25	Therm Mag	350	209	235	BH1N634	BH1N643
XH125NJ	63-100	50	25	Therm Mag	350	209	235	BH1N134	BH1N143
XH125NJ	79-125	50	25	Therm Mag	350	209	235	BH1N234	BH1N243
XH125PJ	40-63	50	50	Therm Mag	350	209	235	BH1P634	BH1P643
XH125PJ	63-100	50	50	Therm Mag	350	209	235	BH1P134	BH1P143
XH125PJ	79-125	50	50	Therm Mag	350	209	235	BH1P234	BH1P243
XH160PJ	100-160	50	50	Therm Mag	406	237	258	BH2P134	BH2P143
XS250NJ	100-160	35	18	Therm Mag	406	237	241	BS2N134	BS2N143
XS250NJ	163-250	35	18	Therm Mag	406	237	241	BS2N234	BS2N243
XH250NJ	100-160	50	25	Therm Mag	406	237	258	BH2N134	BH2N143
XH250NJ	100-250	50	25	Therm Mag	406	237	258	BH2N234	BH2N243
XS400CJ	100-250	35	18	Therm Mag	500	323	325	BS4C234	BS4C243
XS400CJ	250-400	35	18	Therm Mag	500	323	325	BS4C434	BS4C443
XS400NJ	163-250	50	25	Therm Mag	500	323	325	BS4N234	BS4N243
XS400NJ	250-400	50	25	Therm Mag	500	323	325	BS4N434	BS4N443
XH400PJ	250-400	65	50	Therm Mag	500	323	325	BH4P434	BH4P443
XS400SE	125-250	50	25	Electronic	500	323	325	BS4S234	BS4S243
XS400SE	200-400	50	25	Electronic	500	323	325	BS4S434	BS4S443
XH400SE	125-250	65	33	Electronic	500	323	325	BH4S234	BH4S243
XH400SE	200-400	65	33	Electronic	500	323	325	BH4S434	BH4S443
XH400PE	125-250	65	50	Electronic	500	323	325	BH4P234	BH4P243
XH400PE	200-400	65	50	Electronic	500	323	325	BH4P434	BH4P443
XS630CJ	250-400	45	23	Therm Mag	690	433	341	BS6C434	BS6C443
XS630CJ	400-630	45	23	Therm Mag	690	433	341	BS6C634	BS6C643
XS630NJ	250-400	65	33	Therm Mag	690	433	341	BS6N434	BS6N443
XS630NJ	400-630	65	33	Therm Mag	690	433	341	BS6N634	BS6N643
XH630PJ	250-400	85	50	Therm Mag	690	433	341	BH6P434	BH6P443
XH630PJ	400-630	85	50	Therm Mag	690	433	341	BH6P634	BH6P643
XS630SE	315-630	50	25	Electronic	690	433	341	BS6S634	BS6S643
XH630SE	315-630	65	33	Electronic	690	433	341	BH6S634	BH6S643
XH630PE	315-630	65	50	Electronic	690	433	341	BH6P634	BH6P643
XS800NJ	500-800	65	33	Therm Mag	690	433	341	BS8N834	BS8N843
XH800PJ	500-800	85	50	Therm Mag	690	433	341	BH8P834	BH8P843
XS800SE	400-800	50	25	Electronic	690	433	341	BS8S834	BS8S843
XH800PE	400-800	65	50	Electronic	690	433	341	BH8P834	BH8P843
XS1250SE	500-1000	65	49	Electronic	693	530	300	BS12S1034	BS12S1043
XS1250SE	625-1250	65	49	Electronic	693	530	300	BS12S1234	BS12S1243
XS1600SE	800-1600	85	64	Electronic	693	570	320	BS16S1634	BS16S1643
XS2000SE	1000-2000	100	64	Electronic	994	490	361 ³⁾	BS20E2034	BS20E2043
XS2500SE	1250-2500	100	64	Electronic	994	490	361 ³⁾	BS25E2534	BS25E2543
TL100NJ	40-63	85	85	Therm Mag	350	300	235	BT1N634	BT1N643
TL100NJ	63-100	85	85	Therm Mag	350	300	235	BT1N134	BT1N143
TL250NJ	163-250	100	100	Therm Mag	500	323	325	BT2N234	BT2N243
TL400NE	200-400	100	100	Electronic	500	323	325	BT4E434	BT4E443
TL630NE	315-630	125	70	Electronic	693	490	320	BT6E634	BT6E643
TL800NE	400-800	125	70	Electronic	693	490	320	BT8E834	BT8E843
TL1250NE	625-1250	125	65	Electronic	693	490	320	BT12E1234	BT12E1243

Note: ¹⁾ Ordering sheet refer page 9 - 20.

³⁾ Depth does not include rear connect busbars.

²⁾ Height includes attached busbar on sizes 630 A & above.

⁴⁾ Refer NHP for dimensions (generally similar to 4 pole sizes).

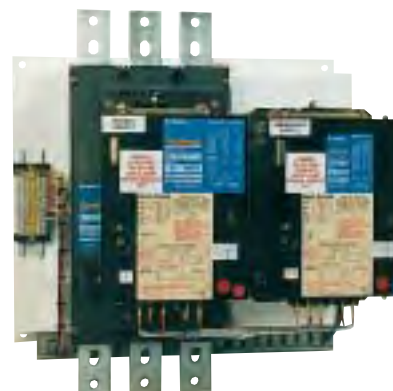
Automatic transfer switches

Slimline rod interlock horizontal mounting 3 pole type

The versatility and flexibility of the rod interlock mechanism used in the Slimline transfer switches enables NHP to provide the widest range of transfer switches available on the Australian market. Slimline transfer switches allow different MCCB frame sizes to be interlocked together. The full range of accessories available for standard basic transfer switches also apply to Slimline models.

Main components supplied as standard:

2 mechanically interlocked breakers with motor operators



Interlocked 3 pole type

MCCBs used	MCCBs used	Dimensions (mm) ²⁾			3 Pole BTS Cat. No. ¹⁾
		W	H	D	
630 Amp Frame (AF)	400 Amp Frame (AF)	475	433	361	SLHU (insert MCCB Cat. No. here)
800AF	400AF	475	433	361	"
1000AF	400AF	470	530	390	"
1250AF	400AF	485	530	390	"
1600AF	400AF	485	570	390	"
400AF	630/800AF	485	433	361	SLHU (insert MCCB Cat. No. here)
630AF	630/800AF	575	433	361	"
800AF	630/800AF	575	433	361	"
1000AF	630/800AF	545	530	410	"
1250AF	630/800AF	545	530	410	"
1600AF	630/800AF	545	530	410	"
2000AF	630/800AF	774	490	361	"
2500AF	630/800AF	774	490	361	"
400AF	1000/1250AF	485	530	390	SLHU (insert MCCB Cat. No. here)
630AF	1000/1250AF	545	530	410	"
800AF	1000/1250AF	545	530	410	"
1000AF	1000/1250AF	690	530	341	"
1250AF	1000/1250AF	690	530	341	"
1600AF	1000/1250AF	690	570	341	"
2000AF	1000/1250AF	774	490	361	"
2500AF	1000/1250AF	774	490	361	"
400AF	1600AF	485	570	390	SLHU (insert MCCB Cat. No. here)
630AF	1600AF	545	570	410	"
800AF	1600AF	545	570	410	"
1000AF	1600AF	693	570	331	"
1250AF	1600AF	693	570	350	"
2000AF	1600AF	774	570	361	"
2500AF	1600AF	774	570	361	"
630AF	2000/2500AF	774	490	361	SLHU (insert MCCB Cat. No. here)
800AF	2000/2500AF	774	490	361	"
1000AF	2000/2500AF	774	490	361	"
1250AF	2000/2500AF	774	490	361	"
1600AF	2000/2500AF	774	490	361	"
2000AF	2000/2500AF	774	490	361	"
2500AF	2000/2500AF	774	490	361	"

Note: ¹⁾ Ordering Example. How to complete a transfer switch catalogue number which contains an XS1250SE10003FC & XS400SE4003 MCCB. Looking from the front, going from right to left, use the part number SLHUXS1250SE12503FC/XS400SE4003. Specify separately any internal or external accessories required.

²⁾ Dimensions include attached busbar, except 2000/2500 A rear connect types. Contact NHP for detailed dimensions.

Automatic transfer switches

Slimline rod interlock vertical model

Slimline transfer switches are mounted vertically and feature a unique rod type interlock. The Slimline model in the standard form with the MCCBs mounted one above the other in a space saving arrangement, enables the incoming and emergency supplies to be confined to one switchboard construction. Slimline models have great flexibility and are available in vertical construction (standard) or with a combination of uneven sized MCCBs

Standard features:

- Slimline base plate
- Mechanical and electronic interlock ²⁾
- Motor operators ²⁾
- 1 spare auxiliary switch contact per MCCB ²⁾
- Wiring of terminals

Options

- Attached busbars
- Extra auxiliary contacts
- Shunt trip
- Enclosed models



Slimline transfer switch with MCCBs of the same size - vertical type.

Ampere Range	Interrupting cap. (415 V)		OCR type	Overall dimensions (mm)			MCCBs used	Slimline BTS Cat. No. ¹⁾ ²⁾
	Icu	Ics		H	W	D		
100-250	35	18	Therm Mag	825	350	358	XS400CJ	SVS4C2
250-400	35	18	Therm Mag	825	350	358	XS400CJ	SVS4C4
163-250	50	25	Therm Mag	825	350	358	XS400NJ	SVS4N2
250-400	50	25	Therm Mag	825	350	358	XS400NJ	SVS4N4
250-400	65	50	Therm Mag	825	350	358	XH400PJ	SVH4P4
125-250	50	25	Electronic	825	350	358	XS400SE	SVS4S2
200-400	50	25	Electronic	825	350	358	XS400SE	SVS4S4
125-250	65	33	Electronic	825	350	358	XH400SE	SVH4S2
200-400	65	33	Electronic	825	350	358	XH400SE	SVH4S4
125-250	65	50	Electronic	825	350	358	XH400PE	SVH4E2
200-400	65	50	Electronic	825	350	358	XH400PE	SVH4E4
250-400	45	23	Therm Mag	900	360	361	XS630CJ	SVS6C4
400-630	45	23	Therm Mag	900	360	361	XS630CJ	SVS6C6
250-400	65	33	Therm Mag	900	360	361	XS630NJ	SVS6N4
400-630	65	33	Therm Mag	900	360	361	XS630NJ	SVS6N6
250-400	85	50	Therm Mag	900	360	361	XH630PJ	SVH6P4
400-630	85	50	Therm Mag	900	360	361	XH630PJ	SVH6P6
315-630	65	33	Electronic	900	360	361	XS630SE	SVS6S6
315-630	65	33	Electronic	900	360	361	XH630SE	SVH6S6
315-630	65	50	Electronic	900	360	361	XH630PE	SVH6E6
500-800	65	33	Therm Mag	900	360	361	XS800NJ	SVS8N8
500-800	85	50	Therm Mag	900	360	361	XH800PJ	SVH8P8
400-800	50	25	Electronic	900	360	361	XS800SE	SVS8S8
400-800	65	50	Electronic	900	360	361	XH800PE	SVH8E8

Note: ¹⁾ Insert pole combination eg: 3 P/3 P, 3 P/4 P, 4 P/4 P, or 4 P/3 P.

An example would be: SVS8S833. This is an 800 A Slimline using 2 x 3 pole XS800SE MCCBs.

²⁾ To obtain a combination not listed simply insert the MCCB part numbers.

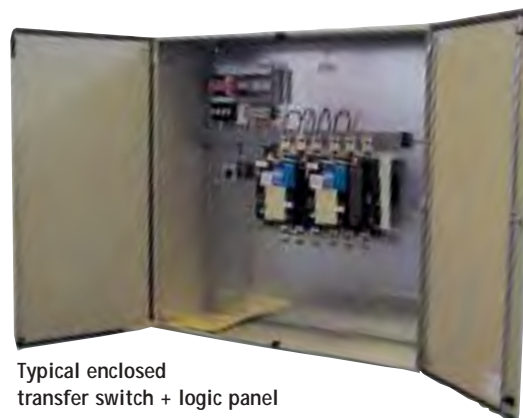
Contact NHP for any dimension requirements not listed.

Automatic transfer switches

Enclosed type

Main components supplied as standard:

- 2 mechanically interlocked breakers with motor operators
- Built to specification



Typical enclosed transfer switch + logic panel

Ordering details ³⁾

Dimensions (mm)			OCR type	Eldon enclosure ²⁾	Interrupting cap. (415 V)		Ampere Range (A)	MCCBs used	3 pole Cat. No. ¹⁾
H	W	D			Icu	Ics			
800	600	300	Therm Mag	MAS0806030	50	25	40-63	XH125NJ	EH1N6
800	600	300	Therm Mag	MAS0806030	50	25	63-100	XH125NJ	EH1N1
800	600	300	Therm Mag	MAS0806030	50	25	79-125	XH125NJ	EH1N2
800	600	300	Therm Mag	MAS0806030	50	50	40-63	XH125PJ	EH1P6
800	600	300	Therm Mag	MAS0806030	50	50	63-100	XH125PJ	EH1P1
800	600	300	Therm Mag	MAS0806030	50	50	79-125	XH125PJ	EH1P2
800	600	300	Therm Mag	MAS0806030	35	50	100-160	XH160PJ	EH2P1
800	600	300	Therm Mag	MAS0806030	35	18	100-160	XS250NJ	ES2N1
800	600	300	Therm Mag	MAS0806030	50	18	163-250	XS250NJ	ES2N2
800	600	300	Therm Mag	MAS0806030	50	25	100-160	XH250NJ	EH2N1
800	600	300	Therm Mag	MAS0806030	50	25	100-250	XH250NJ	EH2N2
1200	1800	400	Therm Mag	On application	50	25	163-250	XS400NJ	ES4N2
1200	1800	400	Therm Mag	"	65	25	250-400	XS400NJ	ES4N4
1200	1800	400	Therm Mag	"	50	50	250-400	XH400PJ	EH4P4
1200	1800	400	Electronic	"	50	25	125-250	XS400SE	ES4S2
1200	1800	400	Electronic	"	65	25	200-400	XS400SE	ES4S4
1200	1800	400	Electronic	"	65	33	125-250	XH400SE	EH4S2
1200	1800	400	Electronic	"	65	33	200-400	XH400SE	EH4S4
1200	1800	400	Electronic	"	65	50	125-250	XH400PE	EH4P2
1200	1800	400	Electronic	"	65	50	200-400	XH400PE	EH4P4
1200	1800	400	Therm Mag	On application	65	33	250-400	XS630NJ	ES6N4
1200	1800	400	Therm Mag	"	65	33	400-630	XS630NJ	ES6N6
1200	1800	400	Therm Mag	"	85	50	250-400	XH630PJ	EH6P4
1200	1800	400	Therm Mag	"	85	50	400-630	XH630PJ	EH6P6
1200	1800	400	Electronic	"	65	33	315-630	XS630SE	ES6S6
1200	1800	400	Electronic	"	65	33	315-630	XH630SE	EH6S6
1200	1800	400	Electronic	"	65	50	315-630	XH630PE	EH6P6
1200	1800	400	Therm Mag	On application	65	33	500-800	XS800NJ	ES8N8
1200	1800	400	Therm Mag	"	85	50	500-800	XH800PJ	EH8P8
1200	1800	400	Electronic	"	50	25	400-800	XS800SE	ES8S8
1200	1800	400	Electronic	"	65	50	400-800	XH800PE	EH8P8
1200	1800	400	Electronic	On application	65	49	500-1000	XS1250SE	ES12S10
1200	1800	400	Electronic	"	65	49	625-1250	XS1250SE	ES12S12
1200	1800	400	Electronic	On application	85	64	800-1600	XS1600SE	ES16S16

Note: ¹⁾ Insert pole combination eg: 3 P/3 P, 3 P/4 P, 4 P/4 P or 4 P/3 P.
 An example would be: ES8S833. This is an 800 A enclosed switch using 2 x 3 pole XS800SE MCCBs.
²⁾ Specify any alternate Eldon enclosure at time of quoting or ordering.
³⁾ Specify any special control requirements, cover controls etc. at time of quoting or ordering.

TemBreak MCCB transfer switch

Order form

Ordering branch / agent	_____		
Branch transfer order No.	_____	Quote:	_____
Customer	_____	Project	_____
	_____	Section	_____
Deliver to	_____	Circuit designation	_____
	_____	Requested delivery date	____ / ____ / ____
	_____	Prepared by	_____ Date ____ / ____ / ____
Cust. order No.	_____	Checked by	_____ Date ____ / ____ / ____
NHP order No's	_____	Planned delivery	____ / ____ / ____

BTS	Model No.	_____	Tick to order	<input type="checkbox"/>
	Type	Standard <input type="checkbox"/> Slimline vertical <input type="checkbox"/> Slimline horizontal <input type="checkbox"/>		
(1)	Alarm switches (req. with Temlogic opt. 10)	Qty. _____ / MCCB <input type="checkbox"/>		
(2)	Additional auxiliary contacts (1 standard)	Qty. _____ / MCCB <input type="checkbox"/>		
(3)	Common loadside busbars (250 amp to 1600 amp frames only)	<input type="checkbox"/>		
(4)	Special control voltage	<input type="checkbox"/>		
(5)	Status indicator lights. D7 series (supplied loose)	<input type="checkbox"/>		
(6)	Shunt trip _____ voltage	<input type="checkbox"/>	\$	_____

MTS	Model No.	_____	Tick to order	<input type="checkbox"/>
	Type	Standard <input type="checkbox"/> Slimline vertical <input type="checkbox"/> Slimline horizontal <input type="checkbox"/>		

Options

(1)	Alarm switches	Qty. _____ / MCCB <input type="checkbox"/>		
(2)	Additional auxiliary contacts (1 standard)	Qty. _____ / MCCB <input type="checkbox"/>		
(3)	Common loadside busbars (250 amp to 1600 amp frames only)	<input type="checkbox"/>		
(4)	Variable depth handles	<input type="checkbox"/>		
(5)	Breaker mounted handles	<input type="checkbox"/>		
			\$	_____

9

MCCBs	Tick to order	<input type="checkbox"/>
--------------	---------------	--------------------------

Left hand MCCB

Normal	Left/Top <input type="checkbox"/>	Right/Bottom <input type="checkbox"/>	Emergency	Right/Bottom <input type="checkbox"/>	Left/Top <input type="checkbox"/>
---------------	-----------------------------------	---------------------------------------	------------------	---------------------------------------	-----------------------------------

Notes: Standard model features walking beam interlock.

Horizontal breakers - mounted and wired on a baseplate

Poles _____ Settings: Thermal _____ Magnetic _____ Cat. No. _____

 Electronic settings: x In _____ I₁ _____ T₁ _____ I₂ _____ T₂ _____ I²t _____ I₃ _____ I_G _____ T_G _____ I_P _____

Right hand MCCB

Poles _____ Settings: Thermal _____ Magnetic _____ Cat. No. _____

 Electronic settings: x In _____ I₁ _____ T₁ _____ I₂ _____ T₂ _____ I²t _____ I₃ _____ I_G _____ T_G _____ I_P _____

Slimline	Features	Rod interlock <input type="checkbox"/>	or	Cable interlocked <input type="checkbox"/>	\$ _____
					Total Nett. \$ _____

Interlock pairs - interlock and MCCB pairs featuring cable wire interlock are to be called up separately by description, an order form is not required. MCCBs are supplied without wiring or base plate.

Special notes: _____

Temlogic controllers

Electromechanical types

NHP offers a choice of electromechanical (relay) logic control panels with up to 13 options. The basic model includes the following standard features: voltage and sequence relays, timing relays, time delay normal to emergency and time delay emergency to normal and common power supply relays. A four position mode selector switch is provided loose (manual/automatic/test/off-SSW3). Up to 13 optional features are available, see table below. Special custom designed models using relay logic are available on application.



Basic TemLogic panel TLP1

TemLogic controllers

Description		Cat. No.
Basic TemLogic panel		TLP1
Option	Description	
1	Emergency supply phase sequence relay	EPFR ¹⁾
2	Emergency supply voltage sensing relay	EVSR ¹⁾
3	Emergency supply frequency relay	ESFR
4	Engine run-on time delay	ERTD
5	Engine start time delay	ESTD
6	Inhibit return control Prevents auto return to normal from emergency	IRC
7	Cranking limiter time delay	CLTD
8	Additional mode selection "Normal supply"	SSW2
9	Additional contacts for remote indication of mode switch position (includes option 8)	SSW3
10	Alarm lock-out relay. Prevents breaker closure after overload or short circuit trip	ALR
11	Changeover time delay (required for ACB C/O switch)	COTD
12	Normal supply phase sequence relay STANDARD	NPFR ²⁾
13	Mains stability timer	MSTD

3 Panel sizes

NHP has limited the number of gear tray plates to three (3) standard sizes which cover all optional features. Custom designed panels are available on application.

NHP stock basic TLP1 logic panels. Other types are built to order.
Refer order form page 9 - 24.

Special logic panels ²⁾

Option	Description
14	Special custom logic panels

Note: PLC based control panels - refer next page.

¹⁾ Both options 1 and 2 are combined with Carlo Gavazzi relays which are now standard.

²⁾ Option 12 is now standard.

TemLogic controllers

PLC based types

NHP offers a choice of PLC based logic control panels with up to 15 options. The basic model includes the following standard features: voltage and sequence relays and common power supply relays. All other logic switching and timing functions are internal to the PLC. A four position mode selector switch is provided loose (manual/automatic/test/off-SSW4). Up to 15 optional features are available, see table below. Special custom designed models are available on application.

PLC based TemLogic controllers

Description		Cat. No.
Basic TemLogic PLC panel		TLPC1
Option	Description	
1	Emergency supply phase sequence relay	EPFR ¹⁾
2	Emergency supply voltage sensing relay	EVSR ¹⁾
3	Emergency supply frequency relay	ESFR
4	Engine run-on time delay in PLC logic panels	STANDARD ERTD
5	Engine start time delay	ESTD
6	Inhibit return control Prevents auto-return to normal from emergency	IRC
7	Cranking limiter time delay	CLTD
8	Additional mode selection "Normal supply"	SSW2
9	Additional contacts for remote indication of mode switch position (includes option 8)	SSW3
10	Alarm lock-out relay. Prevents breaker closure after overload or short circuit trip	ALR
11	Changeover time delay in PLC logic panels (required for ACB C/O switch)	STANDARD
12	Normal supply phase sequence relay	STANDARD NPFR
13	Mains stability timer	MSTD
14	Interface with building management system ²⁾	
15	Load shedding control ²⁾	



TemLogic PLC panel
TLPC1

3 Panel sizes

NHP has limited the number of gear tray plates to three (3) standard sizes which cover all optional features. Custom designed panels are available on application. PLC logic panels, built to order. Refer order form page 9 - 24.

Special logic panels

Option	Description
16	Special custom PLC logic panels

Notes: ¹⁾ Both options 1 and 2 are combined using Carlo Gavazzi relays, which are now standard.
²⁾ Options 14 and 15 are available in PLC logic panels only.

Automatic transfer switches

Method of operation - TemLogic

Mode selector switches - SSW3 (TLP1) - SSW4 (TPLC1)

Automatic control

"Automatic Control", position 2 on the selector switch. When the normal supply is interrupted, the automatic transfer logic will signal the standby alternator to start by the closing of a voltage free contact. The option of a normally closed contact opening is available. When the alternator supply is available, the load will be transferred to the emergency supply after the set time of TDNE (Time Delay Normal to Emergency).

When the normal supply is restored the signal for the standby alternator to run will be cancelled. The load will be transferred back to normal supply after the time set on timer TDEN (Time Delay Emergency to Normal).

Isolate load and reset

"Isolate Load and Reset", position 1 on the selector switch. Both circuit breakers will be open (driven off) regardless of the source of supply. The logic of the control panel is inhibited.

Manual control

"Manual Control", position 3 on the selector switch. Control power is disconnected from the motor operators and opening and closing devices. Moulded case circuit breakers can be operated by their direct drive levers/handles, or the manual open and close button located on the front of air circuit breakers.

Do not attempt to operate the circuit breakers manually in any other selected operation mode.

Emergency supply and test

"Emergency Supply and Test", position 4 on the selector switch. This mode simulates loss of normal supply. The unit will transfer to emergency supply and remain there until the switch position is changed.

Note: If the standby alternator should fail to start it will leave the normal supply circuit breaker on.

Functional options

Option 1

Emergency supply phase sequence relay (EPFR) detects the phase sequence is correct in the emergency supply before allowing a changeover to occur. ¹⁾

Option 2

Emergency supply voltage sensing relay (EVSR) detects if the emergency supply is at the correct voltage before allowing the changeover to take place. ¹⁾

Option 3

Emergency supply frequency relay (EFR) detects if emergency supply is at the correct frequency before allowing the changeover to take place.

Option 4 ²⁾

Engine run-on time delay (ERTD) allows engine to continue running and gives run-on time delay for engine cooling.

Option 5

Engine start time delay (ESTD) delays engine start-up when mains failure is momentary only and quickly restored.

Option 6

Inhibit return control (IRC) prevents automatic return to normal supply after a changeover. Normal supply must be restored manually unless the emergency supply fails.

Option 7

Cranking limiter time delay (CLTD) limits the time the emergency engine can be cranked by the starter motor. This prevents damage to the starter motor and battery in the event of engine failure.

Option 8

Additionally, mode selector "Normal Supply" (selector switch) (SSW2) disables the control logic, maintaining the system on the normal supply.

Option 9

Mode indication (selector switch) (SSW3) facilitates connection of indicator lights to provide the operator with a visual indication of the mode of the automatic transfer switch, eg. isolate load and reset, automatic, manual, emergency supply on, normal supply on.

Option 10

Alarm lock-out relay (NALR-EALR) locks out the system and prevents transfer taking place when the circuit breakers are tripped due to overload, short circuit or manual operation of the trip button.

Option 11 ²⁾

Changeover time delay (NCOTD-ECOTD) introduces an additional time delay between one circuit breaker opening and the other circuit breaker closing.

Option 12

Normal supply phase sequence relay (NPFR) detects that normal supply phase is correct. **Note: This option is now standard in basic TLP1 and TPLC1 logic panels.**

Option 13

Normal supply time delay (NSTD) a timer with an interval function which inhibits the normal supply from the logic panel while the circuit breakers are transferring to the emergency supply. The time set on NSTD must be greater than the time set on ECOTD if fitted.

Option 14 ³⁾

Load shedding control.

Option 15 ³⁾

Building automation system interface.

Note: Custom design logic panels available on application.

¹⁾ These options are now combined.

²⁾ Options 4 and 11 are standard in PLC based logic panels.

³⁾ Options 14 and 15 are available in PLC logic panels only.

Logic control panel

Order form

Ordering branch / agent _____

Branch sales order No. _____ Quote: _____

Customer _____ Project _____

_____ Section _____

Deliver to _____ Circuit designation _____

_____ Requested delivery date _____ / _____ / _____

_____ Prepared by _____ Date _____ / _____ / _____

Cust. order No. _____ Checked by _____ Date _____ / _____ / _____

Work order No's _____ Planned delivery _____ / _____ / _____

This control panel will associate with the following transfer switch on separate S/O _____

- a) TemBreak (MCCB) BTS model No. _____ (240 V AC Motors)
- Type Standard ☐ Slimline vertical ☐ Slimline horizontal ☐
- b) TemPower ACB '2' off type _____
- Type of mechanical interlock - Cable ☐ Rod ☐
- With motor and shunt fitted (240 V AC rating) ☐
- OCR type _____
- c) Aichi transfer switch (240 V AC)
- 'WN' type Mode No. _____
- 'W' type Mode No. _____

Options	Qty required	Tick to order	T/delay seconds
(1) Emergency supply phase sequence relay	} now combined	EPFR <input type="checkbox"/>	
(2) Emergency supply voltage sensing relay		EVSR <input type="checkbox"/>	
(3) Emergency supply frequency relay		EFR <input type="checkbox"/>	
(4) Engine run-on time delay		ERTD <input type="checkbox"/>	_____
(5) Engine start time delay		ESTD <input type="checkbox"/>	_____
(6) Inhibit return control			
- prevents auto return to Normal from Emergency		IRC <input type="checkbox"/>	
(7) Cranking limiter time delay		CLTD <input type="checkbox"/>	_____
(8) Additional mode selection ' Normal supply' ²⁾		SSW2 <input type="checkbox"/>	
(9) Additional contacts for remote indication of mode switch position (includes option 8) ²⁾		SSW3 <input type="checkbox"/>	
(10) Alarm lock-out relay ¹⁾			
- prevents breaker closure after overload or short circuit trip		ALR <input type="checkbox"/>	
(11) Changeover time delay (required for ACB C/O switch) ²⁾		COTD <input type="checkbox"/>	_____
(12) Normal supply phase sequence relay NOW STANDARD		NPFR <input type="checkbox"/>	
(13) Mains stability timer		MSTD <input type="checkbox"/>	
(14) Building automation system interface (PLC type only)		BASI <input type="checkbox"/>	
(15) Load shedding control (PLC type only)		LSC <input type="checkbox"/>	

Notes: ¹⁾ Not applicable for Aichi transfer switch. Alarm switch to be fitted on MCCB breaker or OCR on TemPower breaker to achieve its function.

²⁾ Not applicable for 'W' type Aichi transfer switch 0. Option 11 is compulsory for 'ACB Transfer switch' application.

Enclosure ☐ Tick to order

Equipment to be mounted in enclosure type _____

Special requirements _____

_____ Total Nett. \$ _____

_____ Routine test report ☐

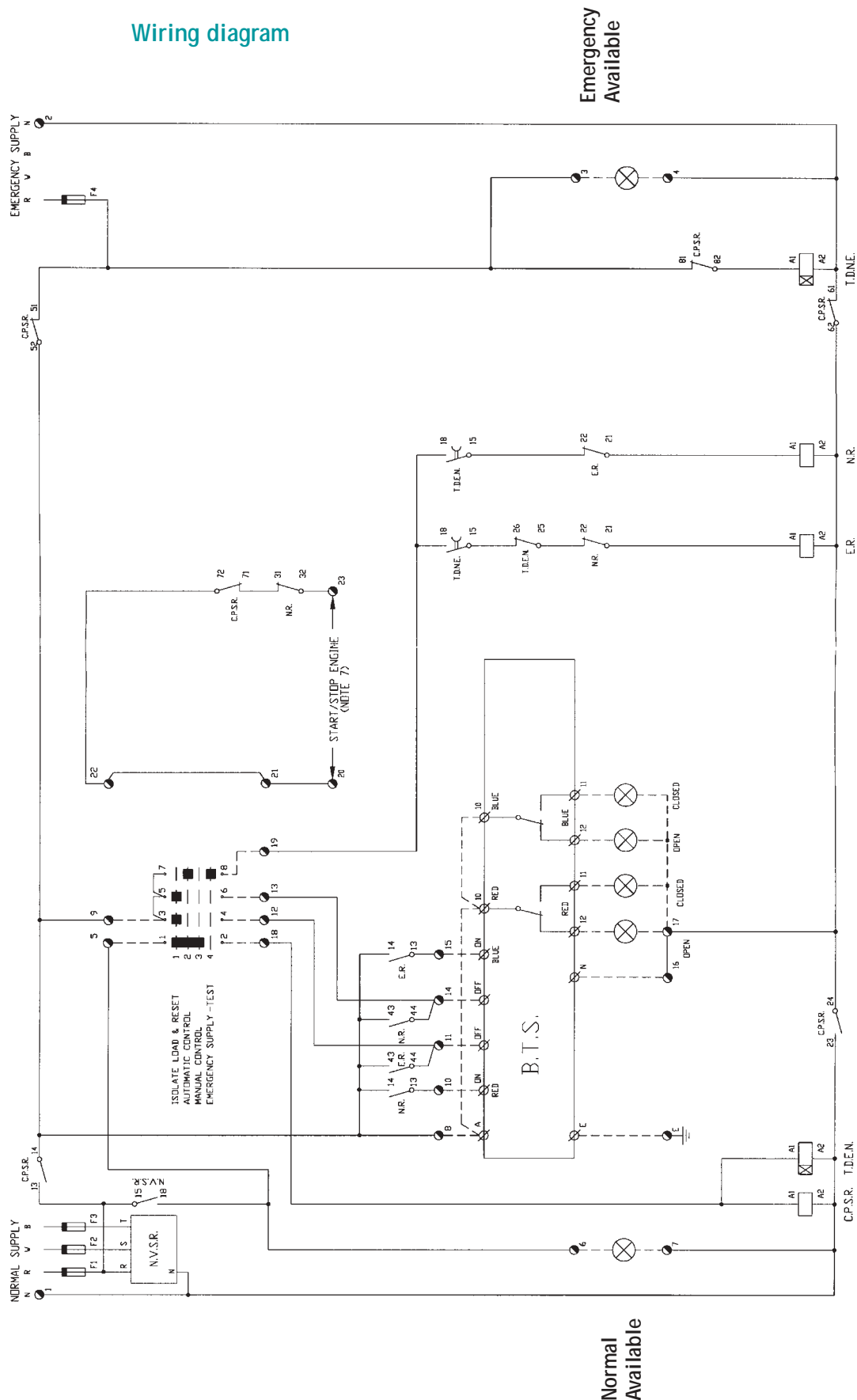
_____ Details attached ☐

NHP

Logic Panel wiring & dimensions

Basic TemLogic Panel - TLP 1

Wiring diagram



Note: Refer to DWG N° 0902NLOGIC4 for options 1 to 13.
 Refer to DWG N° 0902NLOGIC2 for parts list & assembly DWG.
 Refer to DWG N° 0902NLOGIC3 for notes.

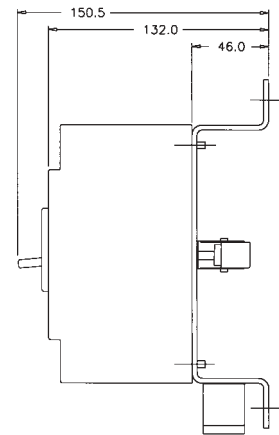
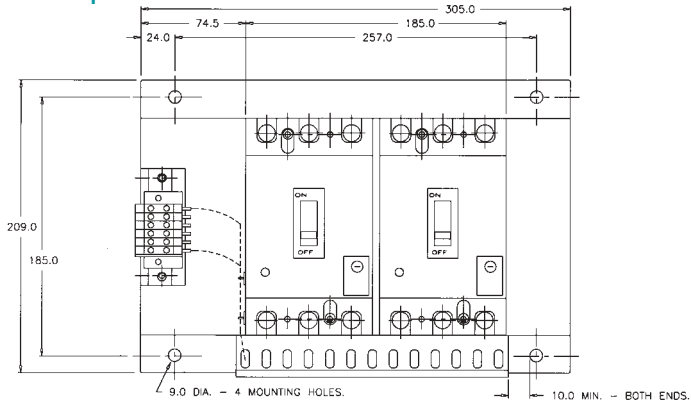
MCCB transfer switch

Layout and dimensions

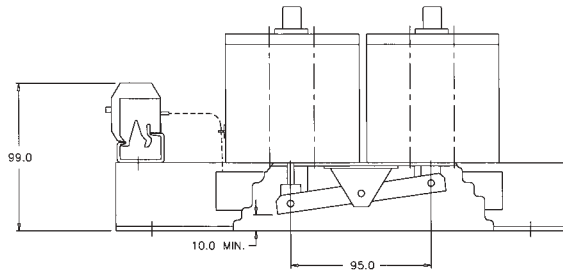
All dimensions in mm
no motor

Manual transfer switches (MTS)

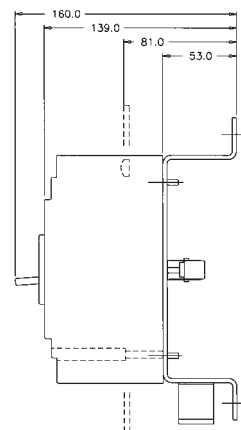
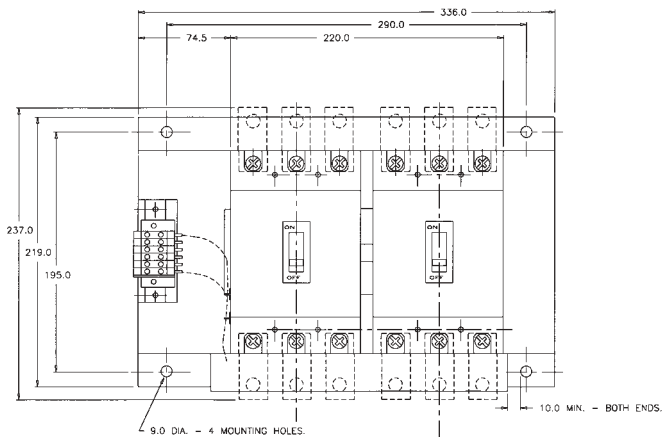
125AF 3 pole



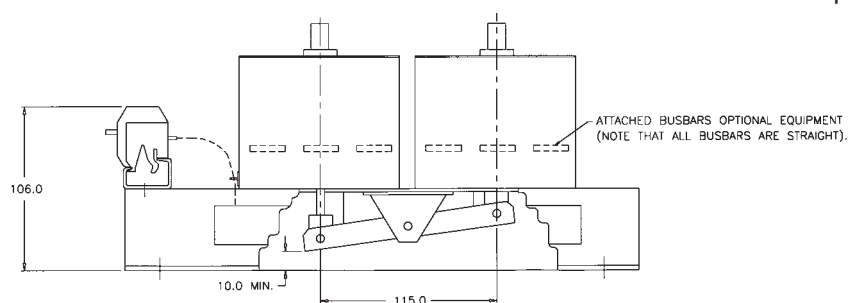
4 pole width 350 mm



250AF 3 pole



4 pole width 406 mm



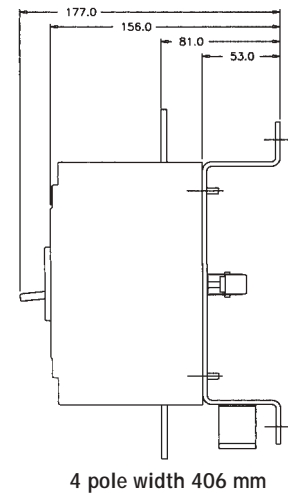
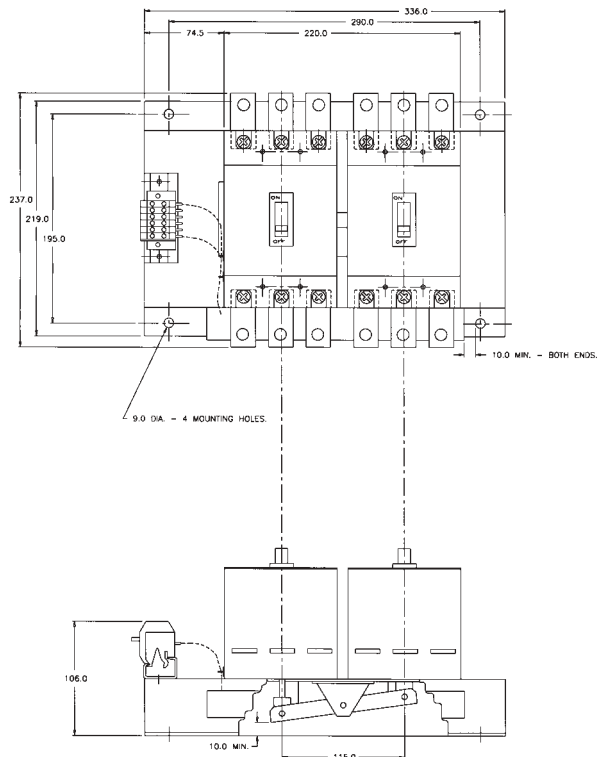
MCCB transfer switch

Layout and dimensions

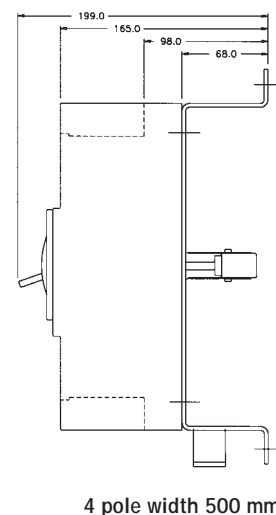
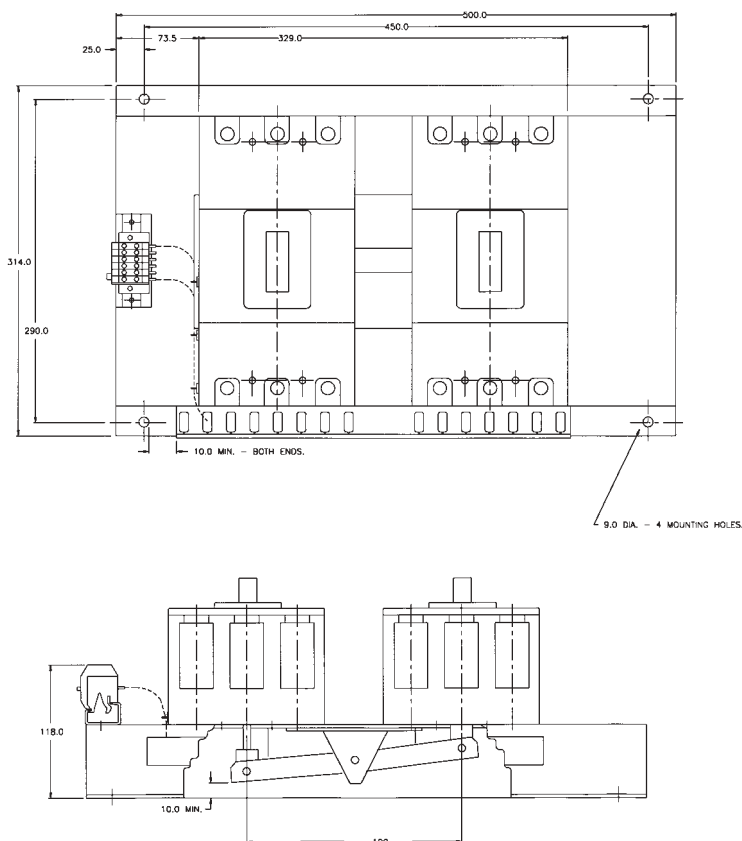
All dimensions in mm
no motor

Manual transfer switches (MTS)

250AF (3 pole XH250 - XH160)



400AF 3 pole



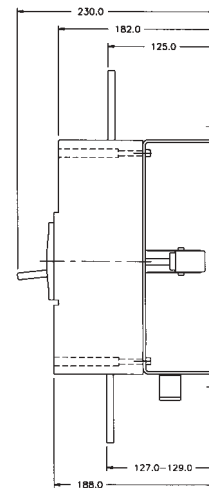
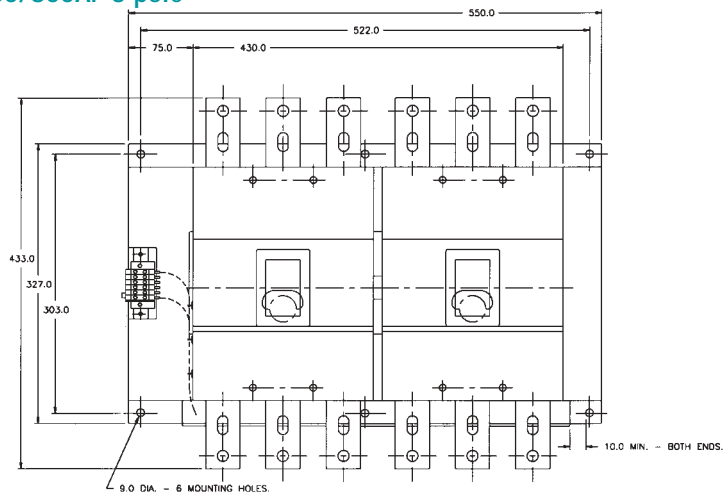
MCCB transfer switch

Layout and dimensions

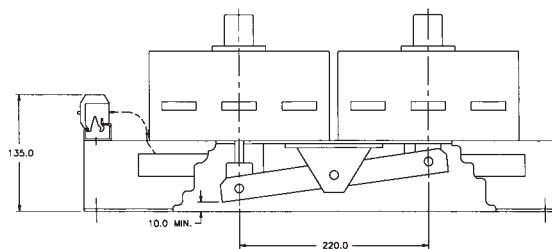
All dimensions in mm
no motor

Manual transfer switches (MTS)

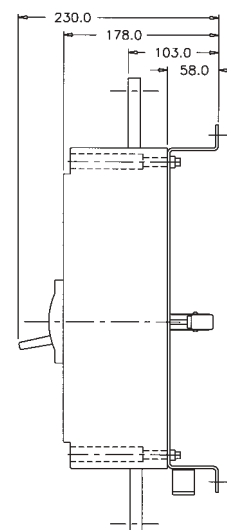
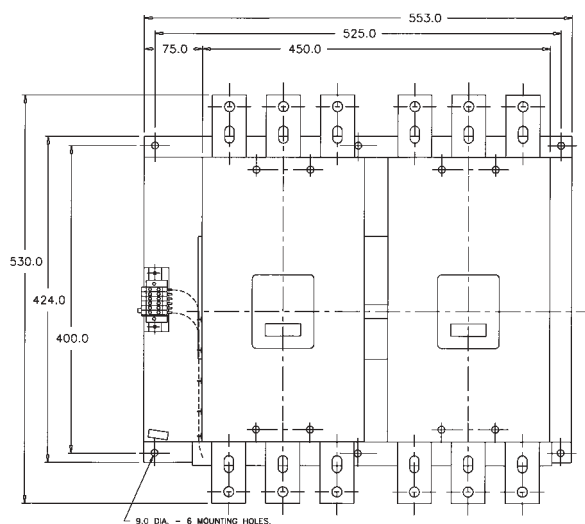
630/800AF 3 pole



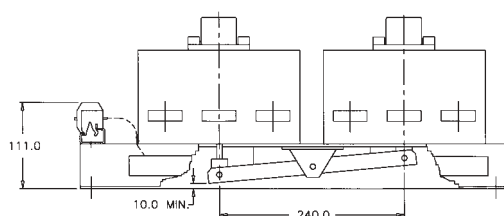
4 pole width 690 mm



1250AF 3 pole



4 pole width 693 mm



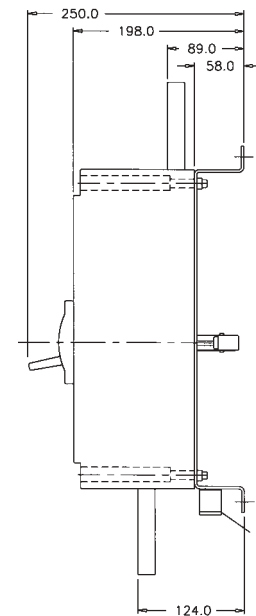
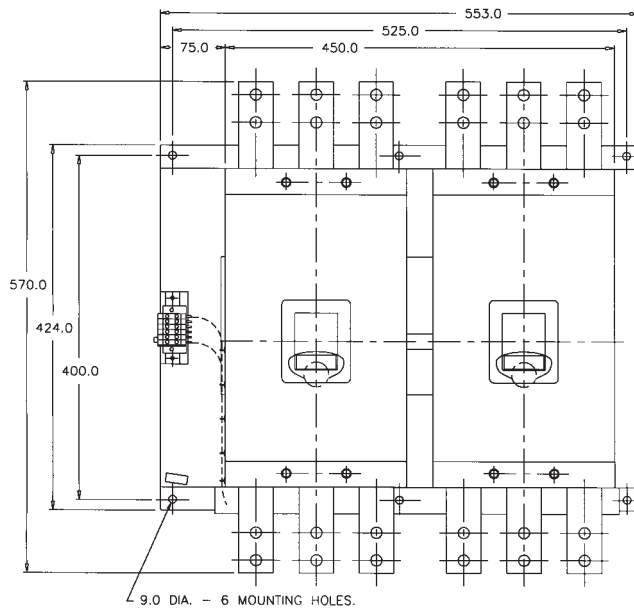
MCCB transfer switch

Layout and dimensions

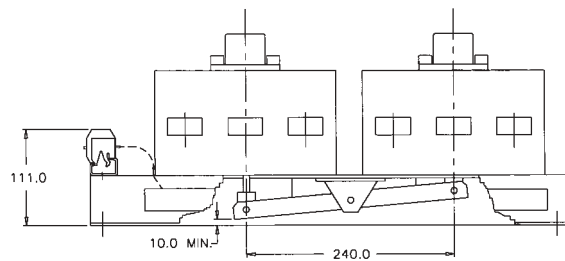
All dimensions in mm
no motor

Manual transfer switches (MTS)

1600AF 3 pole



4 pole width 693 mm



**All dimensions in mm
with motor**

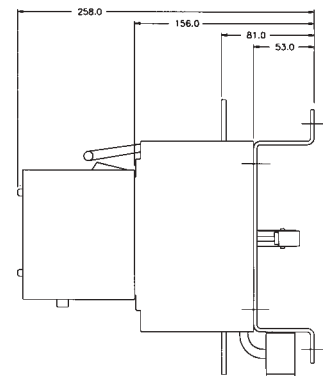
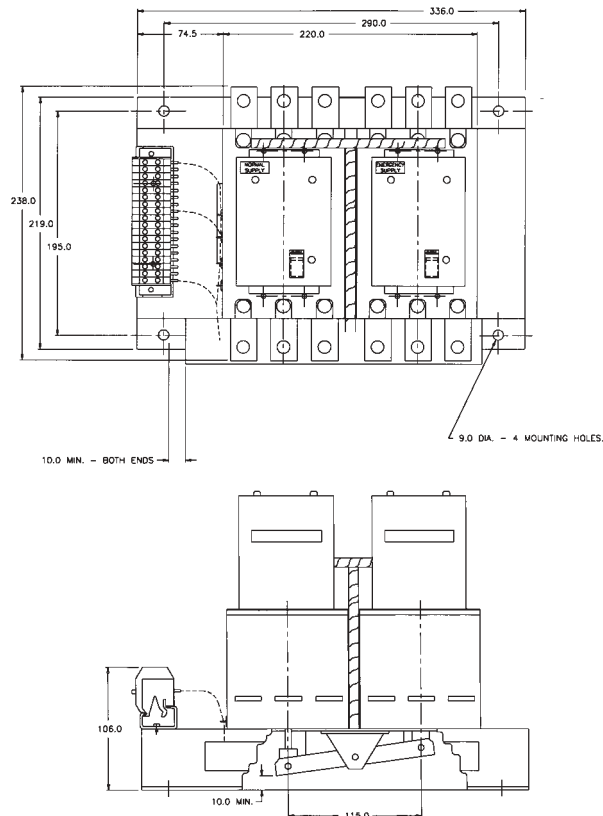
MCCB transfer switch

Layout and dimensions

All dimensions in mm
with motor

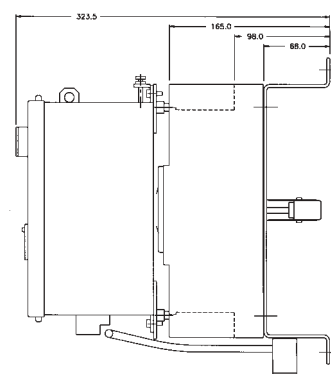
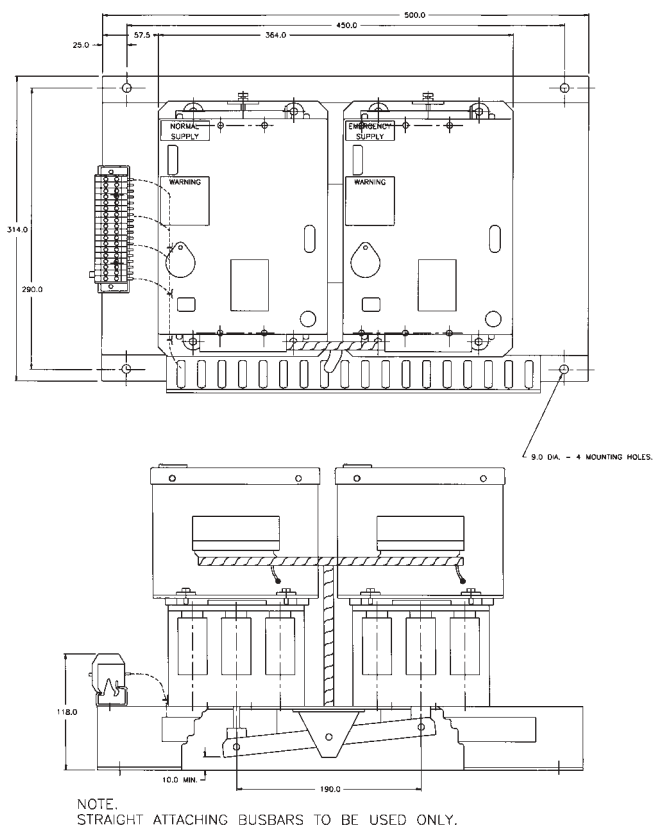
Basic transfer switches

250AF (3 pole XH250 - XH160)



4 pole width 406 mm

400AF 3 pole



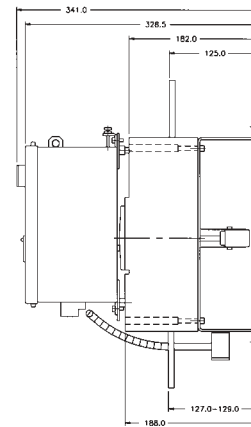
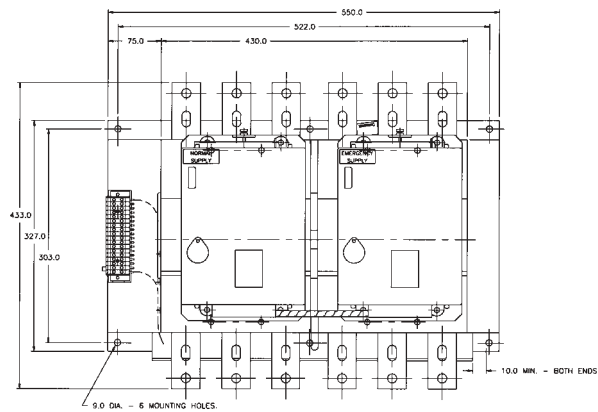
4 pole width 500 mm

MCCB transfer switch Layout and dimensions

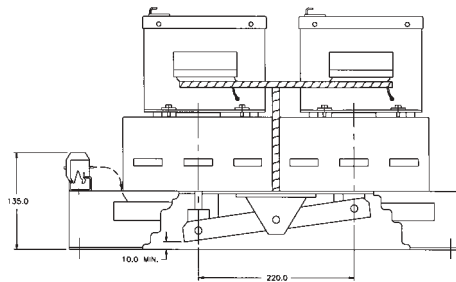
All dimensions in mm
with motor

Basic transfer switches

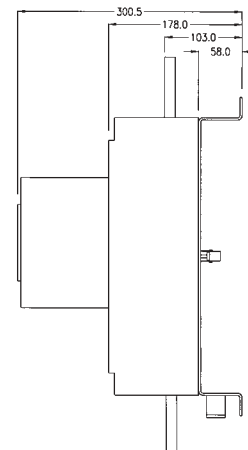
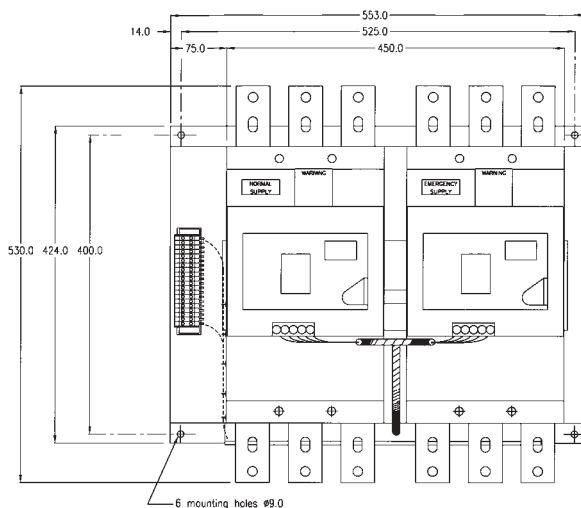
630/800AF 3 pole



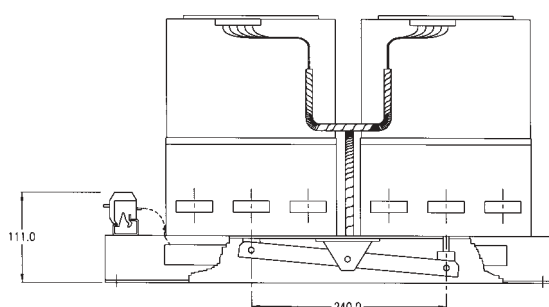
4 pole width 690 mm



1250AF 3 pole



4 pole width 693 mm



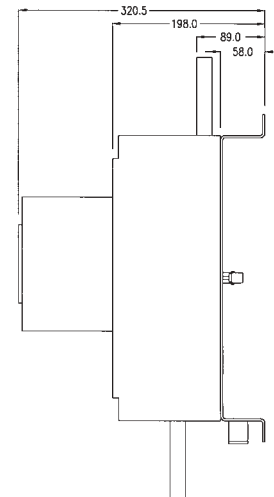
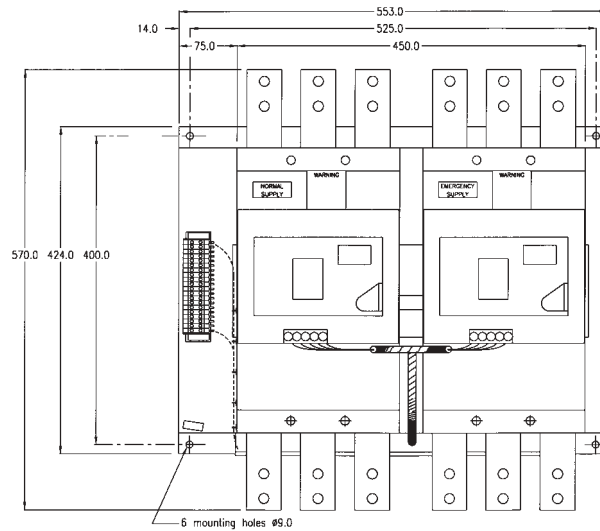
MCCB transfer switch

Layout and dimensions

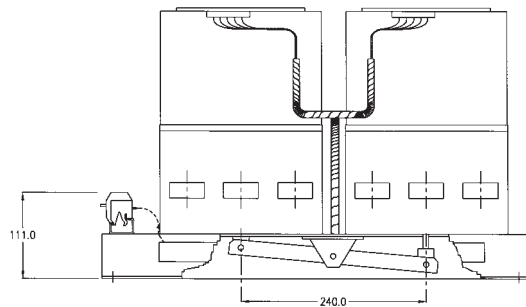
All dimensions in mm
with motor

Basic transfer switches

1600AF 3 pole



4 pole width 693 mm



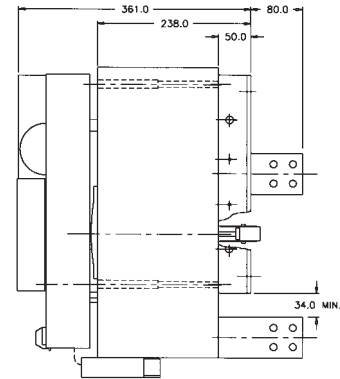
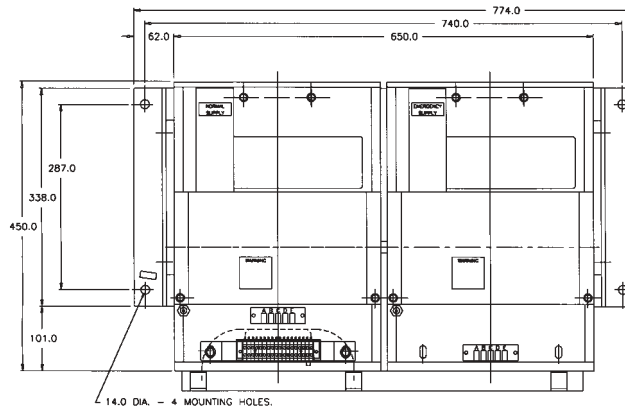
MCCB transfer switch

Layout and dimensions

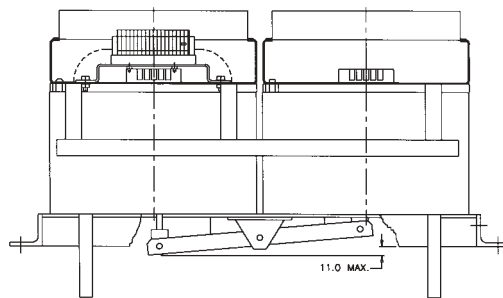
All dimensions in mm
with motor

Basic transfer switches

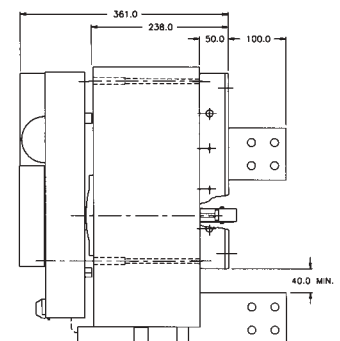
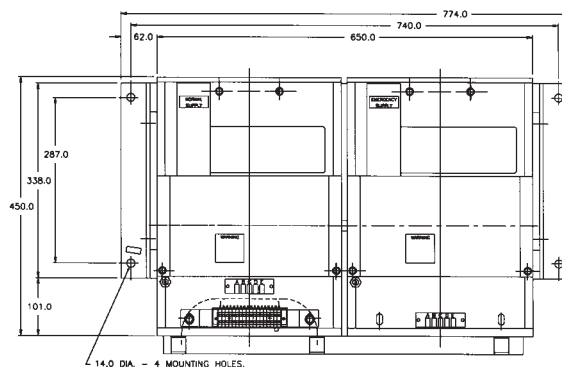
2000AF 3 pole



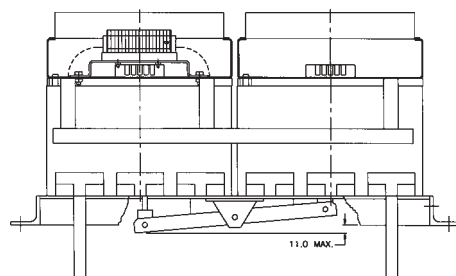
4 pole width 994 mm



2500AF 3 pole



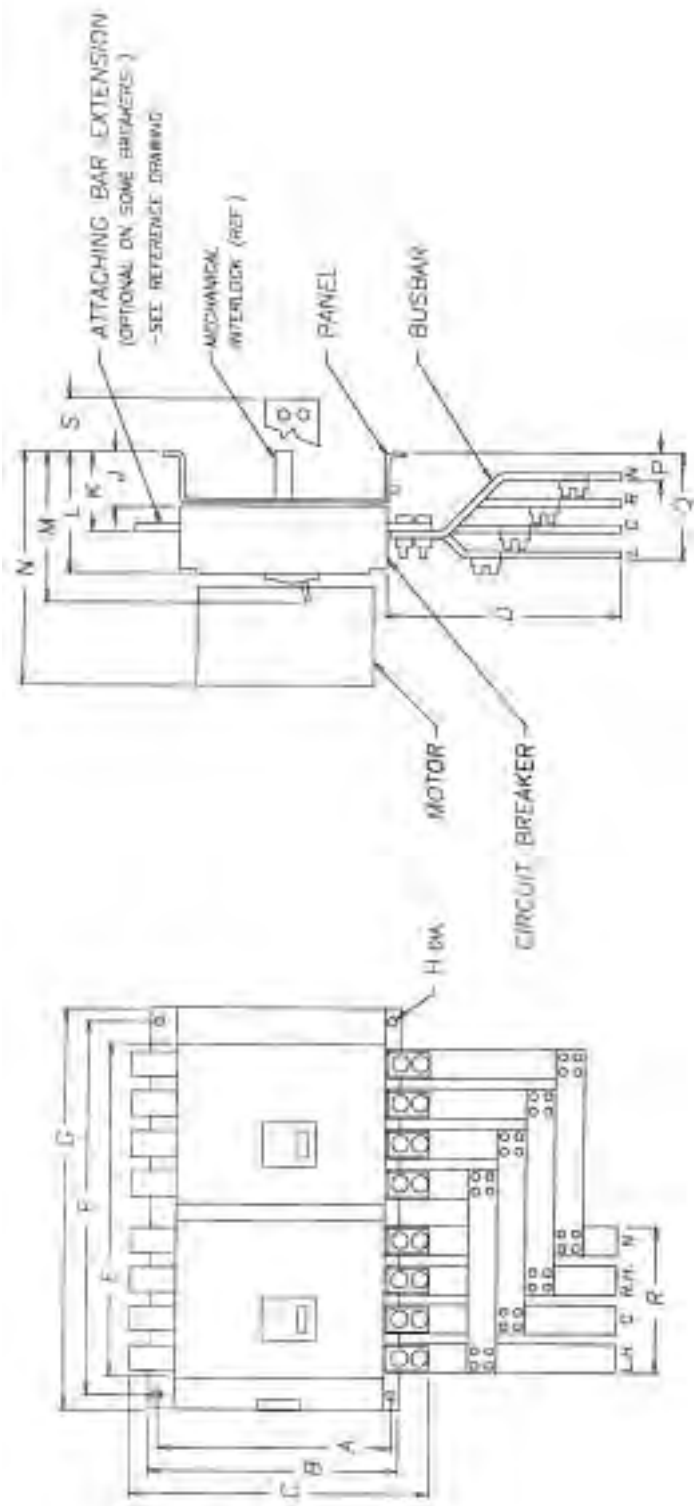
4 pole width 994 mm



MCCB transfer switch

Layout and dimensions

MTS, BTS 125 - 2500 A dimensions
including optional Common Loadside
Bus Bars (mm)



CIRCUIT BREAKER	DIMENSIONS																	
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
KS125NA, AH125NA	185.0	209.0	---	---	185.0	243.0	502.0	305.0	350.0	9.0	46.0	---	132.0	150.0	233.5	---	---	---
KS250NA	185.0	219.0	337.0	97.0	220.0	290.0	360.0	406.0	406.0	9.0	53.0	81.0	139.0	160.0	247.0	25.0	118.0	128.0
KS250NL	185.0	219.0	337.0	97.0	220.0	290.0	360.0	406.0	406.0	9.0	53.0	81.0	139.0	160.0	247.0	25.0	118.0	128.0
400 A/L	280.0	314.0	342.0	130.0	284.0	360.0	450.0	410.0	500.0	9.0	68.0	98.0	165.0	190.0	323.5	32.0	167.0	160.0
600 A/L	303.0	327.0	433.0	200	430.0	570.0	662.0	550.0	690.0	9.0	85.0	125.0	182.0	230.0	347.0	49.0	176.0	250.0
KS1250SE	400.0	424.0	530.0	420	450.0	590.0	625.0	553.0	693.0	9.0	98.0	103.0	178.0	230.0	300.5	15.0	106.0	360.0
KS1250SE	400.0	424.0	570.0	---	450.0	590.0	625.0	553.0	693.0	9.0	98.0	103.0	178.0	230.0	300.5	15.0	106.0	360.0
KS2000NE	287.0	326.0	---	---	350.0	470.0	740.0	664.0	774.0	14.0	50.0	---	238.0	293.0	361.0	---	---	90.0
KS2500NE	307.0	336.0	---	---	350.0	470.0	740.0	664.0	774.0	14.0	50.0	---	238.0	293.0	361.0	---	---	90.0

* BUSBARS ARE CONNECTED TO BREAKERS DIRECTLY ATTACHING BARS OPTIONAL

Notes: 4 + 4 and 3 + 3 combinations shown.
For details of 4 + 3, 3 + 4, etc., see reference drawings:
Dimension K general only as attaching bars arrangements vary;
See reference drawings for details;
Rear entry attaching bars for 2000 & 2500 breakers are standard;
Mounting panel for 2000 & 2500 breakers consists of stainless steel frame.

MAC-DT transfer switches

MAC DT transfer switches are a solenoid operated changeover contactor. Simplicity of operation is obtained via a unique single coil, thereby keeping control requirements to a minimum.

- AC 2, 3 and DC 1 ratings
- Compact size
- Fast operation
- Front connection
- Ease of connection
- With centre OFF position (WN type)
- Solenoid coil operation
- 2 C/O auxiliaries fitted as standard
- Additional auxiliary contacts available
- Easy manual operation if control voltage fails
- Logic panels available - for automatic sensing & switching

Transfer switches

With "OFF" position

Current rating (A)	Number of poles	depth ¹⁾ (mm)	Cat. No.
100	3	112	61WN3FD240VAC
100	4	112	61WN4FD240VAC
200	3	112	62WN3FD240VAC
200	4	112	62WN4FD240VAC
400	3	132	64WN3FD240VAC
400	4	132	64WN4FD240VAC
600	3	220	66WN3FD240VAC
600	4	220	66WN4FD240VAC
800	3	220	68WNA3FD240VAC
800	4	220	68WNA4FD240VAC
1000	3	220	610WN3FD240VAC
1000	4	220	610WN4FD240VAC
1200	3	220	612WNA3FD240VAC
1200	4	220	612WNA4FD240VAC
1600	3	220	616WN3FD240VAC
1600	4	220	616WN4FD240VAC
2000	3	340	620WN3BD240VAC
2000	4	340	620WN4BD240VAC
3000	3	370	630WN3BD240VAC
3000	4	370	630WN4BD240VAC
4000	3	380	640WN3BD240VAC
5000	3	380	650WN3BD240VAC

without "OFF" position

Current rating (A)	Number of poles	depth ¹⁾ (mm)	Cat. No.
100	3	112	61W3FD240VAC
100	4	112	61W4FD240VAC
200	3	112	62W3FD240VAC
200	4	112	62W4FD240VAC
400	3	132	64W3FD240VAC
400	4	132	64W4FD240VAC

Notes: ¹⁾ This dimension is the physical depth size only. An additional depth requirement is applicable depending on the voltage and amperage of the intended application.

See the following dimensions pages, dimension "S1".

Standard voltage: 240 V AC (for availability of 24, 48, 110 V DC and 110 V AC contact NHP.)

For an additional 2 x C/O auxiliary contacts, insert "2C" to above Cat. No. (Part prefix WN2C)

Auxiliaries are a factory fit item. Each changeover (C/O) contact is 1 N/O + 1 N/C with a common terminal: SPDT.



Cat. No 61W-4FD

COMPACT DEPTH



Cat. No 61WN-4FD



Cat. No 66WN-4FD

MAC-DT transfer switches

Ratings

“WN” with OFF position types (3 position) ¹⁾

Type				61WN		62WN		64WN		66WN		68WNA			
Rated voltage				AC 600 V / DC 125 V											
Rated current (Ie)				100 A		200 A		400 A		600 A		800 A			
Kind of throw				Double throw											
Connection				Front (back optional)											
Number of poles				3 P	4 P	3 P	4 P	3 P	4 P	3 P		4 P			
Operating coil current	Mass ²)			6 kg	8 kg	8 kg	10 kg	14 kg	18 kg	33 (43) kg		45 (51) kg			
	DC 100 V			3 A	4 A	4 A	5 A	7 A	6 A	6 A		6 A			
	AC 100 V / 110 V			3 A	4 A	4 A	5 A	7 A	6 A	6 A		6 A			
	AC 200 V / 220 V			1.5 A	2 A	2 A	2.5 A	3.5 A	3.5 A	3 A		3 A			
	DC 100 V			1 A				1.5 A			2 A				
Trip coil current	AC 100 V / 110 V			1 A				1.5 A			2 A				
	AC 200 V / 220 V			0.5 A				0.7 A			1 A				
	Rated short-time current (1 sec)				5 kA		10 kA		12 kA		15 kA				
Short circuit peak value				12.5 kA		25 kA		30 kA		37.5 kA					
Switching capacity (AC 3 / DC 1)				AC 3 (10 Ie making / 8 Ie breaking) COSø = 0.35 DC 1 (1.1 Ie making / 1.1 Ie breaking)											
Performance	Operation time	Normal	ON	55 ms		55 ms		60 ms		100 ms					
			OFF	20 ms		20 ms		25 ms		30 ms					
		Standby	ON	80 ms		80 ms		90 ms		135 ms					
			OFF	20 ms		20 ms		25 ms		30 ms					
		Life			Electrical: 50,000 operations, Mechanical: 250,000 operations										
	Switching frequency			150 operations / hour maximum											
Operation time				Opening time ≤ 0.06 sec						Closing time ≤ 0.20 sec					
Auxiliary switch				Switching capacity 1 C (AC 100 V 5 A / AC 200 V 2.5 A / DC 100 V 0.5 A)											
Accessories				Main terminal cover / surge absorber / manual handle											

“W” without OFF position types (2 position)

Type		61W		62W		64W	
Rated voltage		AC 600 V / DC 125 V					
Rated current (Ie)		100 A		200 A		400 A	
Kind of throw		Double throw					
Connection		Front (back optional)					
Number of poles		3 P	4 P	3 P	4 P	3 P	4 P
Mass		6 kg	8 kg	8 kg	10 kg	14 kg	18 kg
DC 100 V		3 A	4 A	4 A	5 A	7 A	8 A
AC 100 V / 110 V		3 A	4 A	4 A	5 A	7 A	8 A
AC 200 V / 220 V		1.5 A	2 A	2 A	2.5 A	3.5 A	4 A
Performance	Rated short-time current (1 sec)	5 kA		10 kA		12 kA	
	Short circuit peak value	12.4 kA		25 kA		30 kA	
	Switching capacity (AC 3 / DC 1)	AC 3 (10 Ie making / 8 Ie breaking) COS ϕ = 0.35 DC 1 (1.1 Ie making / 1.1 Ie breaking)					
	Life	Electrical: 50,000 operations, Mechanical: 250,000 operations					
	Switching frequency	150 operations / hour maximum					
	Operation time	Opening time \leq 0.06 sec			Closing time \leq 0.20 sec		
Auxiliary switch		Switching capacity 1 C (AC 100 V 5 A / AC 200 V 2.5 A / DC 100 V 0.5 A)					
Accessories		Main terminal cover / manual cover/ operating circuit terminal cover					

Notes: ¹⁾ Contact NHP for ratings of types above 800 A.

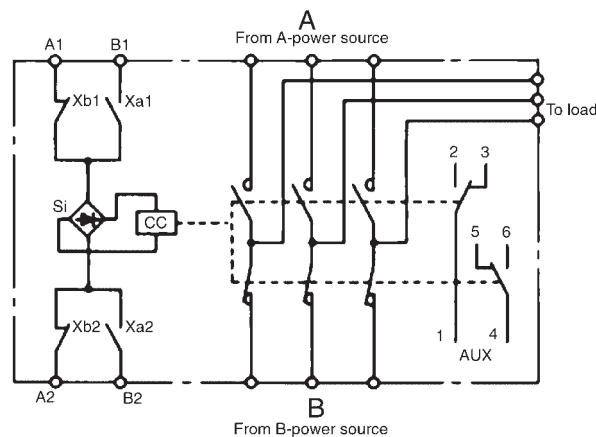
²⁾ Mass figure shown in brackets (600 A and 800 A) is for back connection model.

MAC-DT transfer switches

Technical data

Circuit diagrams

"W" range - without OFF



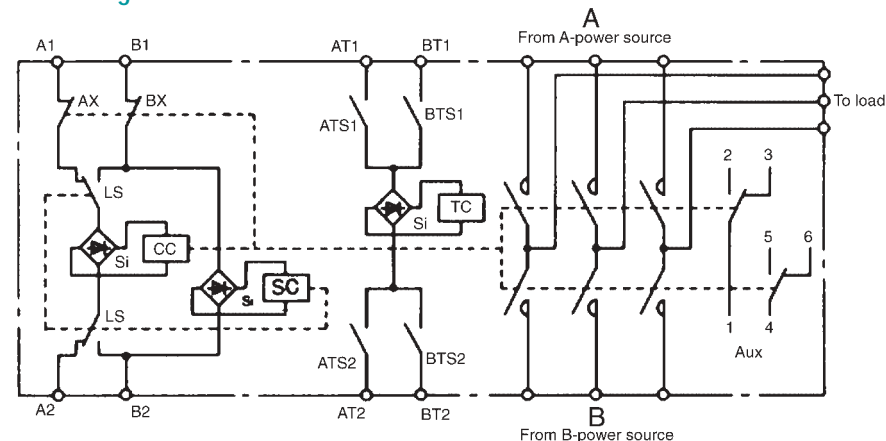
Internal control circuitry

Xa1 • Xa2: Control switch
Xb1 • Xb2:
CC: Closing coil
Si: Silicon rectifier

Operating circuit terminal

A1-A2: A power source side (ON)
B1-B2: B power source side (ON)
AUX: Auxiliary switch
External connections

"WN" range - with OFF



Internal control circuitry

CC: Closing coil
Si: Silicon rectifier
LS: Selector switch
ATS1 • ATS2: Control switch
BTS1 • BTS2:
AX • BX: Control switch
SC: Selector coil
TC: Trip coil
AUX: Auxiliary switch

Note: The above control and power circuitry is contained within the switch.

Operating circuit terminal

A1-A2: A power source side
B1-B2: B power source side
AT1-AT2: A power source side
BT1-BT2: B power source side

External connections

Note: All Aichi transfer switches are supplied with a set of varistors, which can be fitted as an option. The purpose of the varistors is to protect the control circuitry of the transfer switch against any external voltage surges. The varistors are connected across the coil terminals A1-A2, B1-B2, AT1-AT2, BT1-BT2.

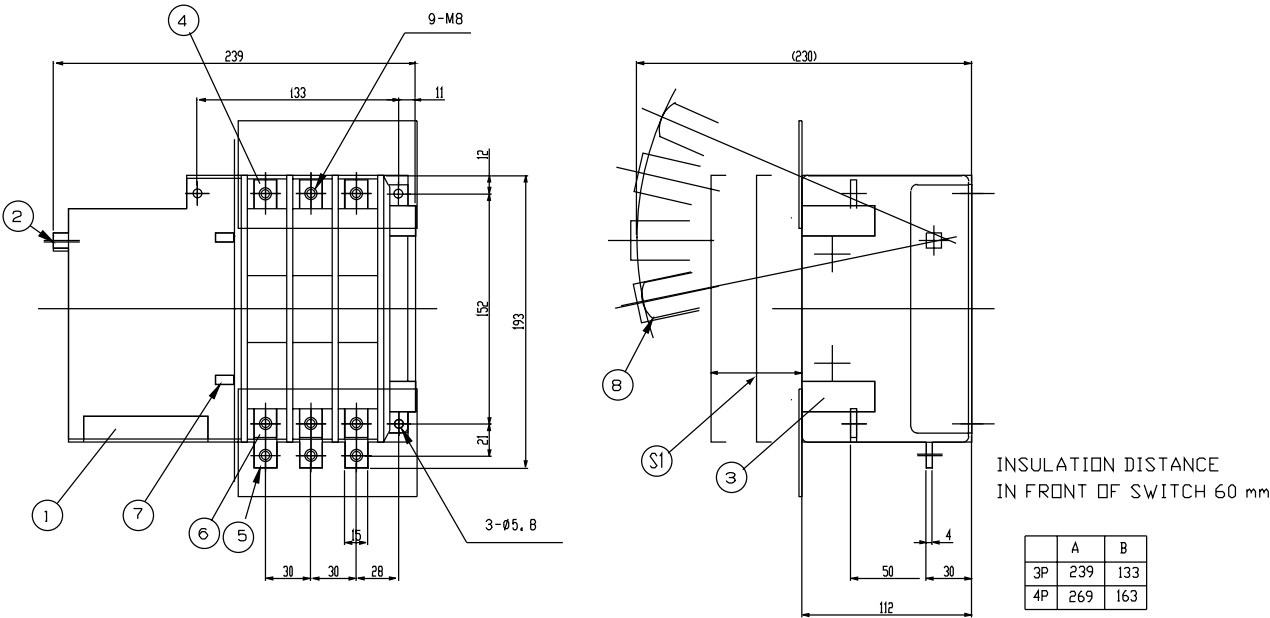
Other Drawings

Contact NHP for control circuit drawings where logic panels are used and other configurations of control equipment.

MAC-DT transfer switches

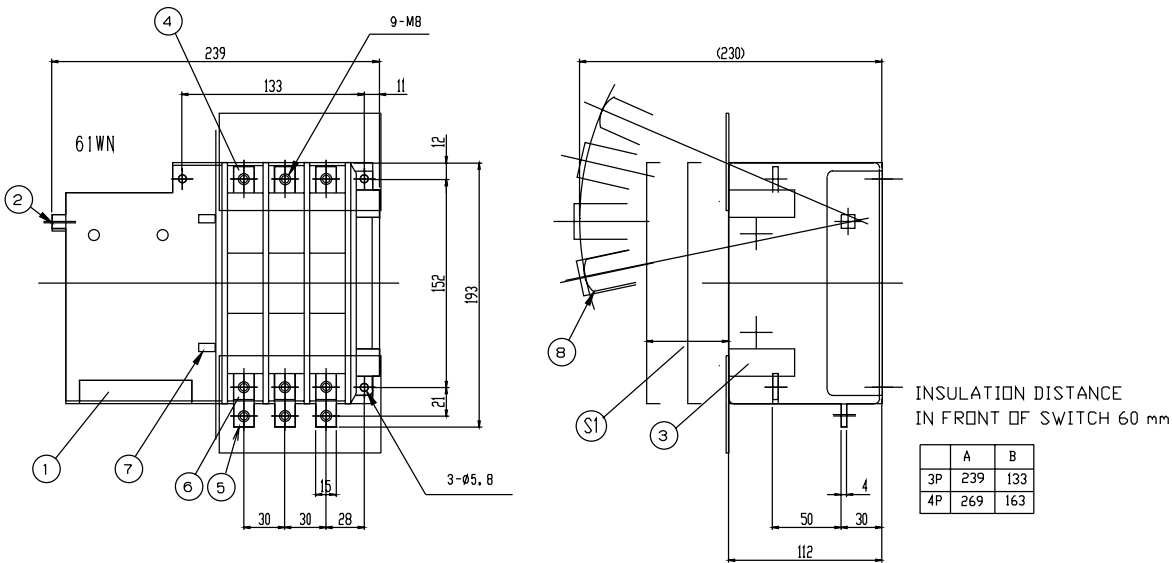
W and WN - dimensions

Type 61W



S1 distance
30 mm clearance required for up to 200 V applications and 60 mm for up to 600 A

Type 61WN



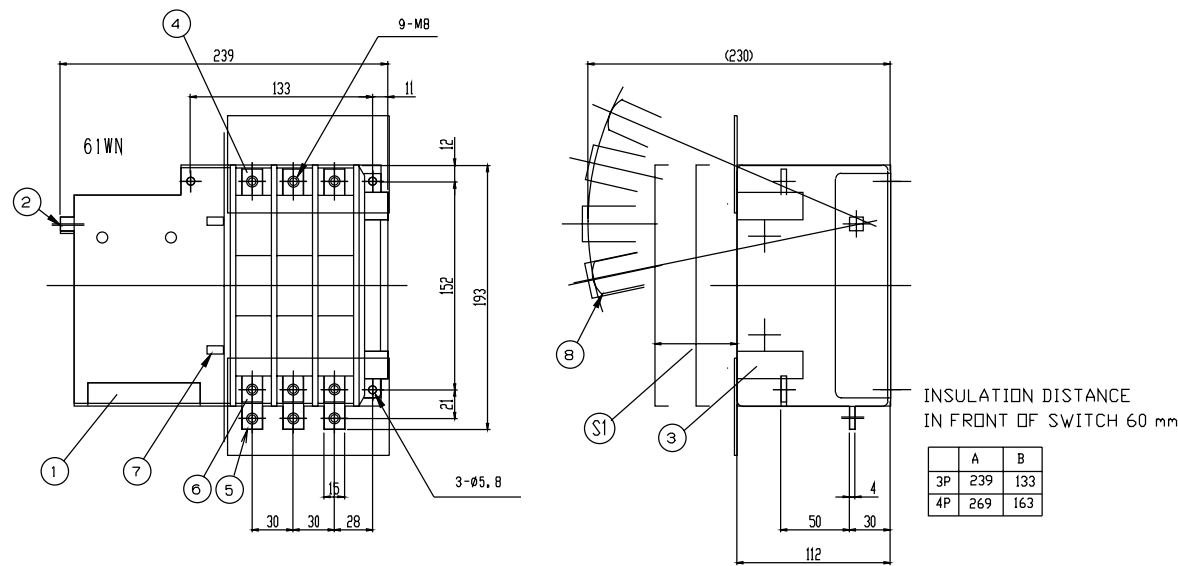
S1 distance
30 mm clearance required for up to 200 V applications and 60 mm for up to 600 A



MAC-DT transfer switches

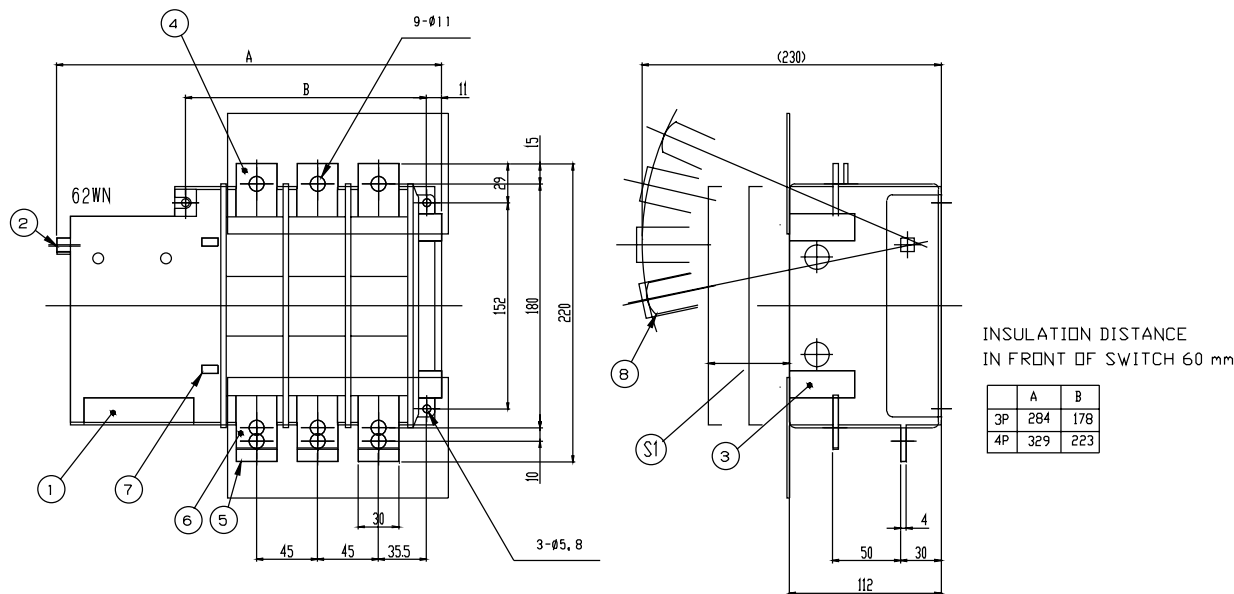
W and WN - dimensions

Type 62W



S1 distance
30 mm clearance required for up to 200 V applications and 60 mm for up to 600 A

Type 62WN

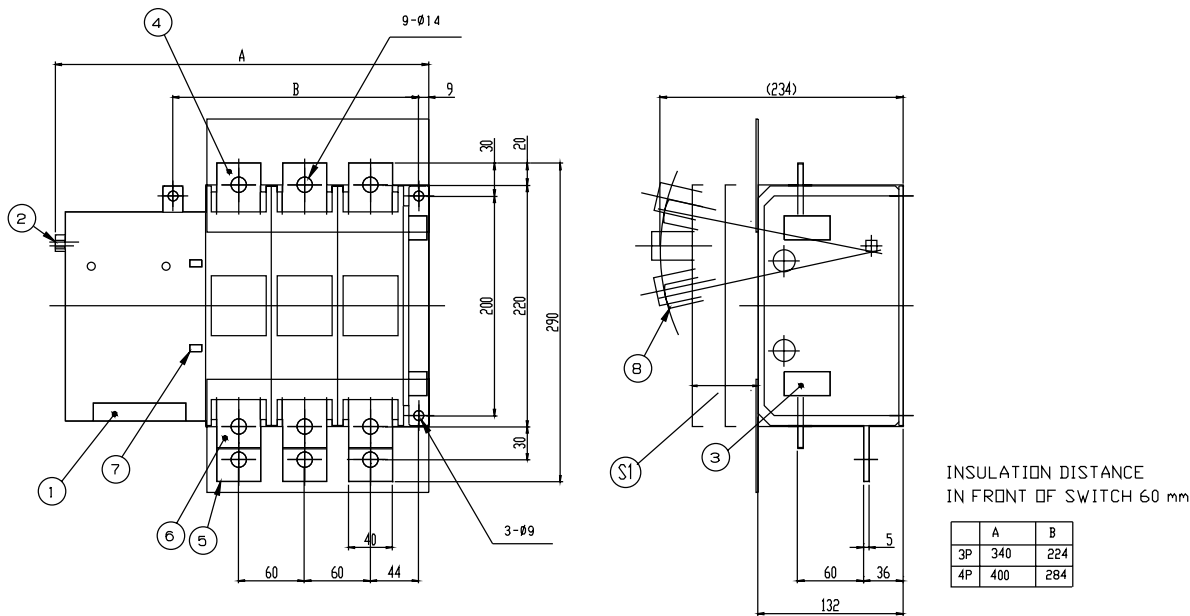


S1 distance
30 mm clearance required for up to 200 V applications and 60 mm for up to 600 A

MAC-DT transfer switches

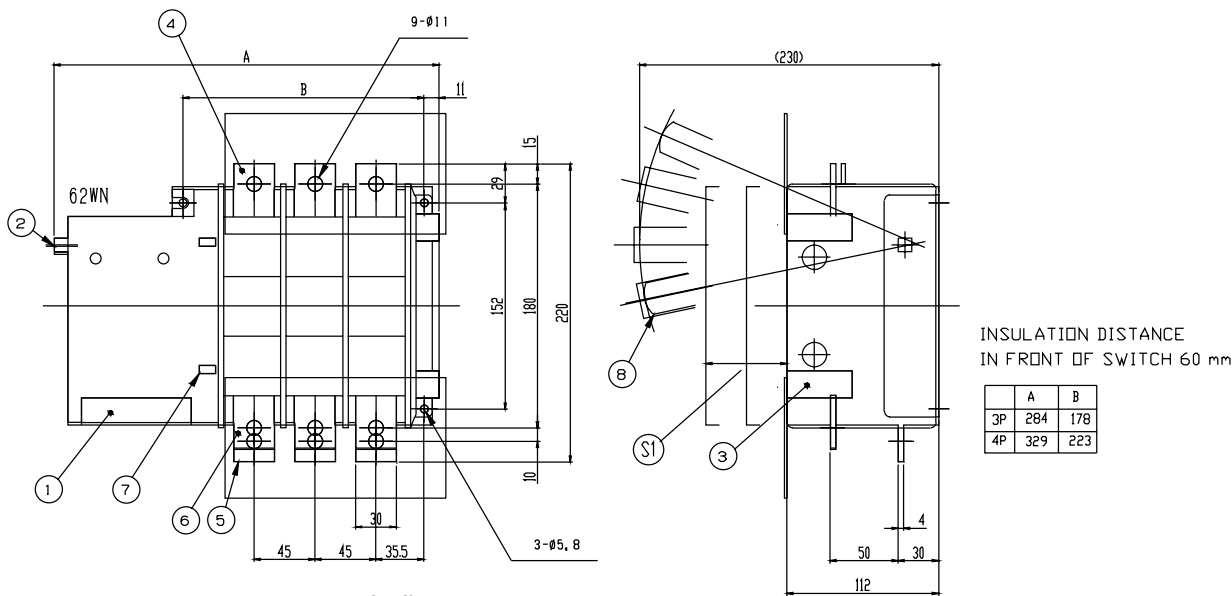
W and WN - dimensions

Type 64W



S1 distance
30 mm clearance required for up to 200 V applications and 60 mm for up to 600 A

Type 64WN



S1 distance
30 mm clearance required for up to 200 V applications and 60 mm for up to 600 A

MAC-DT transfer switches

Additional data

Environment

Do not use in any of the following locations.

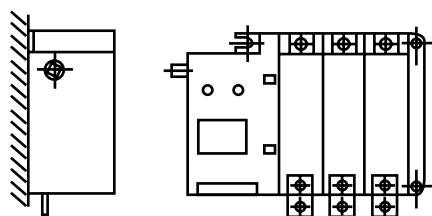
- Dusty areas.
- Corrosive environments.
- Where the ambient temperature falls below - 10 °C or exceeds + 45 °C.

Mounting direction

MAC-DT is designed for vertical mounting only.

Its characteristics may change if mounted incorrectly.

- Mount MAC-DT on the vertical surface of the panel so that its nameplate can be read normally from the front.



Normal mounting direction

- Contact NHP if normal mounting is not possible due to wiring or equipment layout.

Surge protection

Do not apply surge voltage of more than 800 V AC in control circuits.

Maintenance and inspection

Ensure regular maintenance and inspection is carried out to maintain the high performance capabilities of the MAC-DT.

Transfer switch	Rated short time current (1 sec.) kA	Short circuit peak value kA
610WN/612WNA	22	50
616WN	25	55
620WN	35	60
630WN	50	80
640WN	50	100
650WN	50	120

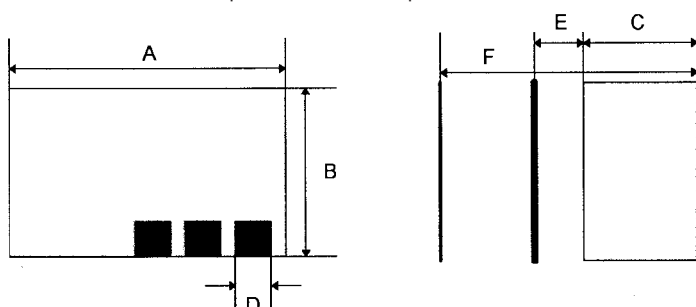
Dimensions (mm) and weights (kg)

Transfer switch	Dim A 3 pole	Dim A 4 pole	B	C	D	E	F	Weight 3 P 4 P	
61W/61WN ¹⁾	239	269	193	112	15	60	230	6	8
62W/62WN ¹⁾	289	329	220	112	30	60	230	8	10
64W/64WN ¹⁾	340	400	290	132	40	60	234	14	18
66WN ¹⁾ ³⁾	465	530	520	220	30	90	343	33	42
68WNA ¹⁾ ³⁾	465	530	520	220	30	90	343	33	42
610WN ¹⁾ ³⁾	510	590	600	220	50	90	343	39	49
612WNA ¹⁾ ³⁾	510	590	600	220	50	90	343	40	51
616WN ¹⁾ ³⁾	570	670	610	220	75	90	343	47	59
620WN ²⁾ ³⁾	675	810	580	340	100	100	405	115	135
630WN ²⁾ ³⁾	825	1010	580	370	125	100	405	150	190
640WN ²⁾ ³⁾	1040	-	610	380	190	100	520	207	-
650WN ²⁾ ³⁾	1190	-	610	380	240	100	520	265	-

Dimension D = Busbar width.

Dimension E = Distance required behind panel for insulation purposes.

Dimension F = Distance required for handle operation.



- Notes:**
- ¹⁾ Dimensions and weights for front connected units.
 - ²⁾ Dimensions and weights for rear connected units.
 - ³⁾ For more detailed dimensions, contact NHP.

Automatic transfer switches

MAC-DT Automatic transfer switches – choice of logic controller

Aichi transfer switches can be supplied with logic panels which provide a range of features similar to those used in conjunction with Terasaki circuit breakers.

Aichi logic panels

NHP offers a basic electromechanical (relay) logic panel, with up to 11 additional standard options. The basic model includes the following standard features: voltage sensing, time delay from normal to emergency, and time delay from emergency to normal and common power supply relays. Logic panels can also be supplied with a moulded case circuit breaker for main power short circuit protection, or a logic panel incorporating a programmable logic controller. Contact NHP for additional standard options or for any other requirements.



Basic logic panel WNPL1
(Indicative only - actual configuration will vary)

Aichi MAC-DT logic panels ¹⁾

Description	Cat. No.
Basic logic panel to suit "WN" switches	WNLP1
Basic logic panel to suit "W" switches	WLP1

Option

	Description	
1	Emergency supply phase sequence relay	EPFR
2	Emergency supply voltage sensing relay	EVSR
3	Emergency supply frequency relay	ESFR
4	Engine run-on time delay	ERTD
5	Engine start time delay	ESTD
6	Inhibit return control Prevents automatic return to normal from emergency	IRC
7	Cranking limiter time delay	CLTD
8	Additional mode selector "normal supply" ²⁾	REFER NHP
9	Additional contacts for remote indication of mode switch position (includes option 8 ²⁾)	REFER NHP
11	Changeover time delay - required for ACB changeover switch	COTD
12	Normal supply phase sequence relay ³⁾	NPFR
13	Mains stability timer	MSTD
14	Custom designed logic panel	

Special logic panels

15	Special custom designed logic panels (electromechanical)
16	PLC logic panels
17	A 3 phase air power, short circuit protection circuit breaker

Note: ¹⁾ When ordering please complete order form on page 9 - 24 of this catalogue.

²⁾ Not available for "W" type switches.

³⁾ NPFR now standard

Cross reference table

	Section/page
Application data	refer NHP
Accessories	refer NHP
Detailed dimensions	refer NHP

"W" switch logic panel drawing no: 059 AIC1

"WN" switch logic panel drawing no: 059 WNAICHI1



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Monitoring & Control Relays

"Reliability...you can count on"
900/901 flight

- ▼ **DIN Rail & Plug in Housings**
FOR FLEXIBILITY & CHOICE
- ▼ **Single & Extended Functions**
FOR TAILORING YOUR
PROTECTION NEEDS
- ▼ **True RMS Monitoring**
FOR TRUE MONITORING
& CONTROL

Now used in
transfer switch
logic panels



SLB Standard load-break switches

SIRCO 125 to 4000 A (cont'd)

New Range









The SIRCO range of load-break switches offer compact solutions for switching from 125 A to 4000 A. Base mounting is standard.

The SIRCO switches come complete with extended shaft and door mountable pistol grip handle. Available in three and four pole versions with a large range of accessories to choose from.




SLB 800...3150

Front operated surface mount (Supplied with external handle and shaft)

	AC 21 400 V (A)	AC 23 400 V (A)	AC 23 400 V (kW)	No. of poles ¹⁾	Cat. No.
1000 A	1000	1000	560	3	SLB 1000 3P
				4	 SLB 1000 4P
1250 A	1250	1000	560	3	SLB 1250 3P
				4	 SLB 1250 4P
1600 A	1600	1000	560	3	SLB 1600 3P
				4	 SLB 1600 4P
1800 A	1800	1000	560	3	SLB 1800 3P
				4	 SLB 1800 4P
2000 A	2000	1250	710	3	SLB 2000 3P
				4	 SLB 2000 4P
2500 A	2500	1250	710	3	SLB 2500 3P
				4	 SLB 2500 4P
3150 A	3150	1250	710	3	SLB 3150 3P
				4	 SLB 3150 4P
4000 A	4000	1250	710	3	SLB 4000 3P ²⁾
				4	 SLB 4000 4P ²⁾

Notes: ¹⁾ 6 and 8 pole switches available on indent. Refer NHP.

²⁾ Supplied with 2 N/O and 2 N/C auxiliaries as standard.

 Available on indent only.

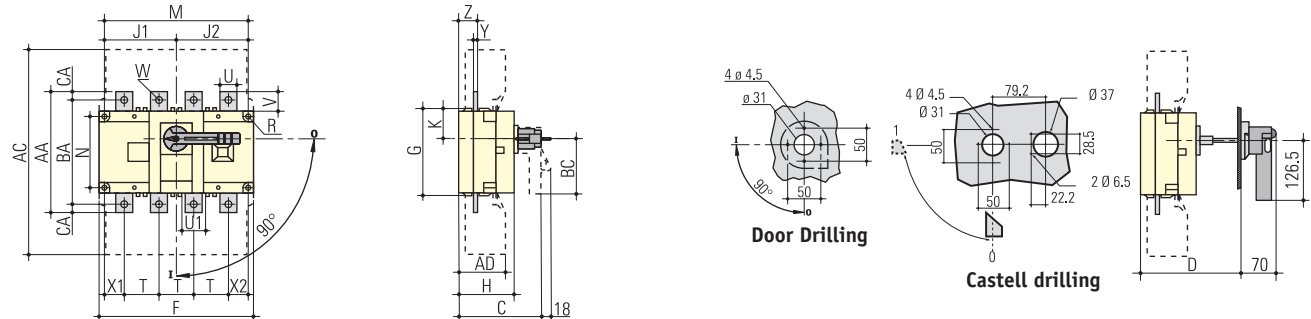


SLB 4000

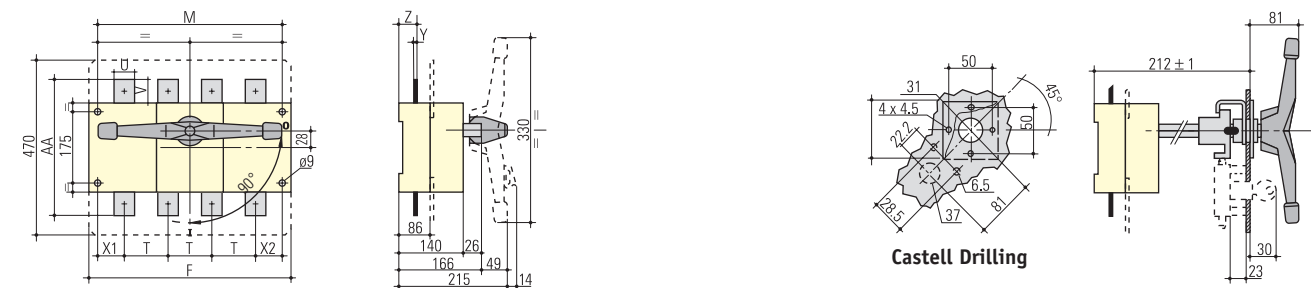
Technical data and dimensions (mm)

SIRCO SLB 125 to 2500 A

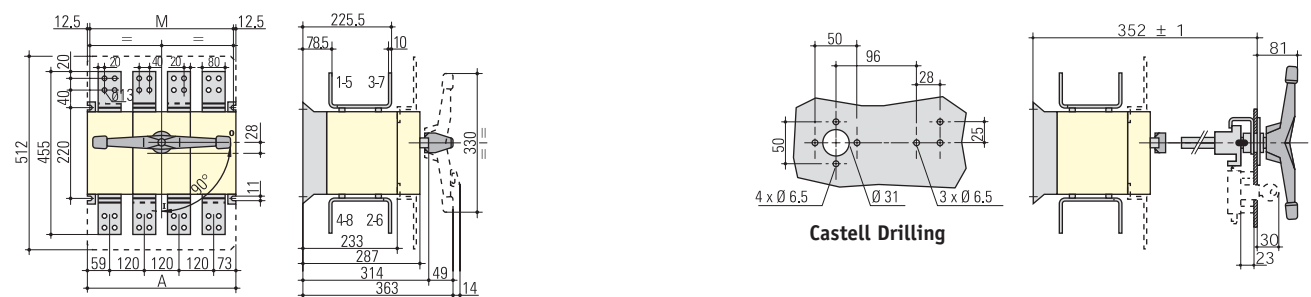
SIRCO 125 to 2500 A



Rating A	Overall dimensions C D		Terminal shrouds AC AD		Switch body F F G H J1 J1 J2 K BC 3p 4p 3p 4p									Switch mounting M M N R 3p 4p				Connection terminals T U U1 V W X1 X1 X2 Y Z AA BA CA 3p 4p													
125	120	124...354	235	50	140	170	93	65	45	75	75	31.5	80	120	150	65	5.5	36	20	20.5	25	9	28	22	20	3.5	20.5	135	115	10	
160	120	124...354	235	50	140	170	93	65	45	75	75	31.5	80	120	150	65	5.5	36	20	20.5	25	9	28	22	20	3.5	20.5	135	115	10	
200	130	135...365	290	60	180	230	108	75	55	105	105	34	115	160	210	80	5.5	50	25	25.5	30	11	33	33	27	3.5	22.5	160	130	15	
250	130	135...365	290	60	180	230	108	75	55	105	105	34	115	160	210	80	5.5	50	25	25.5	30	11	33	33	27	3.5	22.5	160	130	15	
315	165	167...397	401	89	230	290	170	110	75	135	135	55	115	210	270	140	7	65	32	45.5	37.5	11	42.5	37.5	37.5	5	36	235	205	15	
400	165	167...397	401	89	230	290	170	110	75	135	135	55	115	210	270	140	7	65	32	45.5	37.5	11	42.5	37.5	37.5	5	36	235	205	15	
500	165	167...397	401	89	230	290	170	110	75	135	135	55	115	210	270	140	7	65	32	45.5	37.5	13	42.5	37.5	37.5	5	36	235	205	15	
630	165	167...397	400	89	230	290	170	110	75	135	135	55	115	210	270	140	7	65	45	45.5	50	13	42.5	37.5	37.5	5	36	260	220	20	



Rating A	Switch body		Switch mounting		T	U	V	Connection terminals				
	F 3p	F 4p	M 3p	M 4p				Y	X1	X2	Z	AA
800	280	360	255	335	80	50	60.5	7	47.5	47.5	46.5	321
1000	280	360	255	335	80	50	60.5	7	47.5	47.5	46.5	321
1250	372	492	347	467	120	90	44	8	53.5	53.5	47.5	288
1600	372	492	347	467	120	90	44	8	53.5	53.5	47.5	288
1800	372	492	347	467	120	90	44	8	53.5	53.5	47.5	288



Rating A	Overall dimensions		Switch mounting	
	A 3p	A 4p	M 3p	M 4p
2000	372	492	347	467
2500	372	492	347	467

Technical data and ratings chart

SIRCO SLB 800 to 4000 A

Ratings to AS 3947-3 and IEC 60947-3

			800 A	1000 A	1250 A	1600 A	1800 A	2000 A	2500 A	3150 A	4000 A
Rated insulation voltage and rated operation voltage AC 20/DC 20	V		1000	1000	1000	1000	1000	1000	1000	1000	1000
Rated impulse withstand voltage	kV		12	12	12	12	12	12	12	12	12
Rated operational current											
AC 21A	400 V	A	800	1000	1250	1600	1600	2000	2500	3150	3150
	500 V	A	800	1000	1250	1600	1600	2000	2500	3150	3150
	690 V	A	800	1000	1000	1600	1600	2000	2000	2000	2000
AC 22A	400 V	A	800	1000	1250	1250	1250	2000	2000	2500	2500
	500 V	A	800	1000	1000	1250	1250	1600	1600	2000	2000
	690 V	A	800	630	630	800	800	1000	1000	1000	1000
AC 23A	400 V	A	800	1000	1000	1000	1000	1250	1250	1250	1250
	500 V	A	630	800	800	1000	1000	1000	1000	1000	1000
	690 V	A	200	400	400	500	500	800	800	800	800
Rated operational current											
DC 21A	400 V	A	800	1000	1250	1600	1600	2000	2000	2000	2000
	500 V	A	630	1000	1250	1250	1250	1250	1250	1250	1250
DC 22A	400 V	A	800	1000	1250	1250	1250	1250	1250	1250	1250
	500 V	A	800	1000	1250	1250	1250	1250	1250	1250	1250
DC 23A	400 V	A	800	1000	1000	1000	1000	1000	1000	1000	1000
	500 V	A	800	1000	1000	1000	1000	1000	1000	1000	1000
Operational power											
AC 23A	400 V	kW	450	560	560	560	560	710	710	710	710
	500 V	kW	450	560	560	710	710	710	710	710	710
	690 V	kW	185	400	400	475	475	750	750	750	750
Overload capacity											
Short time withstand current	kA		26	35 ¹⁾	50	50	50	50	50	55	70
Icw (RMS 1s) 690 V											
Breaking capacity	400 V	A	6400	8000	8000	8000	8000	10000	10000	10000	10000
AC 23A											
Fuse protected short circuit withstand. (kA RMS prospective)	400 V AC	kA	50	100	100	100	100	100	100	-	-
	Fuse	A	800	1000	1250	2x800	2x800	2x1000	2x1000	-	-
Rated capacitor power	kVAr		365	460	575	-	-	-	-	-	-
Mechanical endurance	Ops		4000	4000	4000	3000	3000	3000	2500	2500	2500
Weight (3 pole)	Kg		8	10.5	10.5	16	17	31	32	42	90
Min. tightening torque	Nm		37	37	37	50	50	60	60	60	110
Connection cable size	mm ²		2 (185/300)	2 240/4 185	4 185 max	6 240 max	-	-	-	-	-

Notes: ¹⁾ 50 kA switch available in larger frame size. Refer NHP.
240/415 V ratings suitable for use on 230/400 V in accordance with AS 60038 : 2000.

Miniature circuit breakers

Safe-T single pole width residual current circuit breakers (RCBO)

- Standards AS 3111, AS 3190.
- Approval No. N15251.
- MDA approved: - MDA Ex. 11576
- QMD 997458XU
- Current rating: 10, 16 and 20 amps.
- Voltage 240 V AC 50/60 Hz.
- Short circuit protection 6000 amps.
- Earth leakage protection 30 mA.



SRCB

Ampere rating	Poles	Modules	Trip sensitivity (mA)	Cat. No.
10	1	1	30	SRCB 1030
16	1	1	30	SRCB 1630
20	1	1	30	SRCB 2030

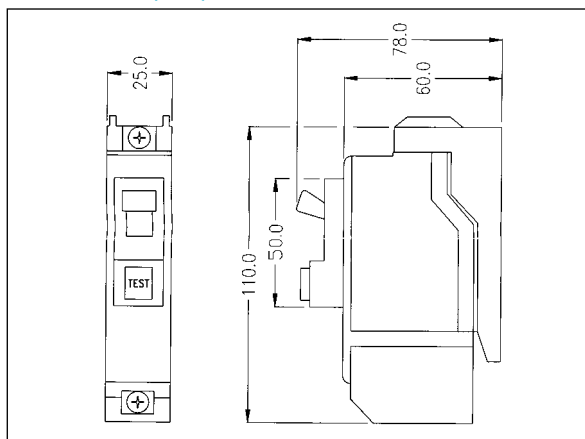
Operation

Safe-T single pole width residual current circuit breakers offer overload, short circuit and earth leakage protection in a single module width unit.

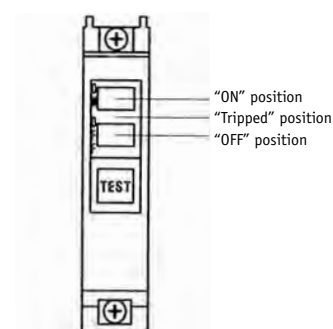
1. Overload protection is provided by its calibrated thermal overload.
2. Short circuit protection is provided by its magnetic trip mechanism up to 6 kA prospective.
3. Earth leakage protection is by its in-built electronic core-balance device.

Mounting arrangements are identical throughout the Safe-T MCB range utilising the NHP clip-tray mounting system in panelboards and loadcentres.

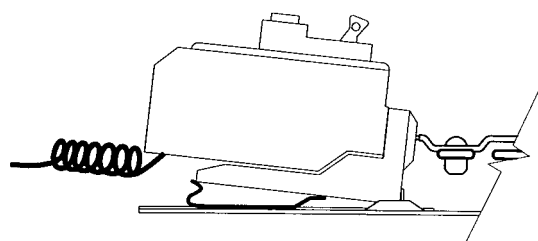
Dimensions (mm)



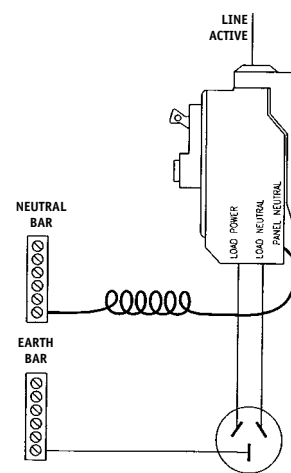
Note: Nuisance tripping may be experienced in VFD and motor starting applications refer NHP.



Toggle indication



Mounting arrangement

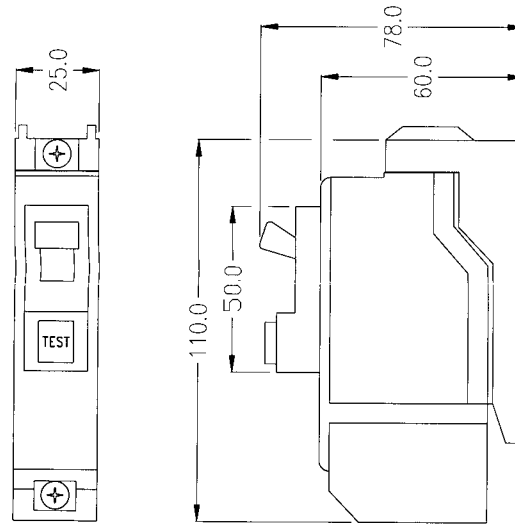


Connection diagram

Safe-T RCDs Technical data

Dimensions

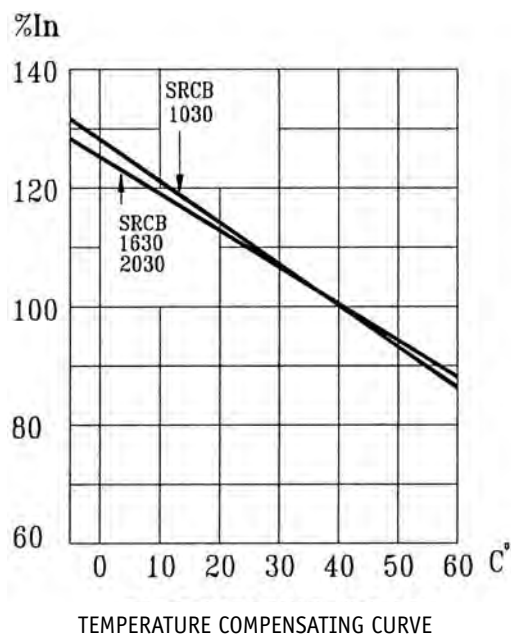
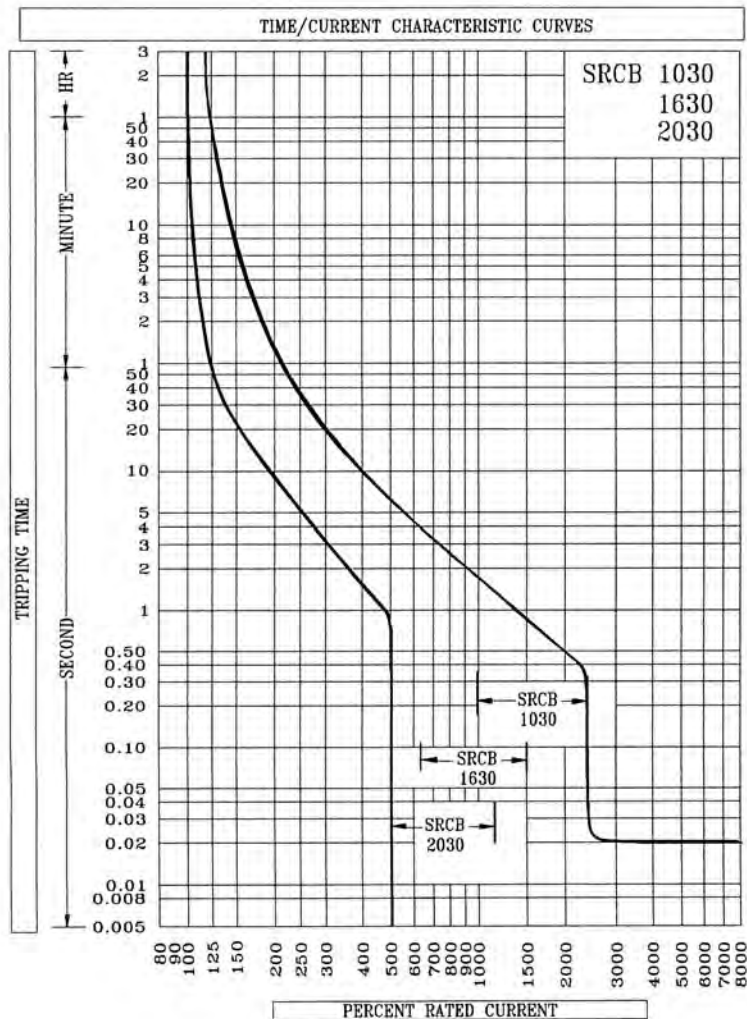
Safe-T (SRCB) RCD



All dimensions in mm

Safe-T RCDs Technical data

Tripping characteristics Safe-T SRCB, temperature compensation



2.2 OPERATIONAL PROCEDURES

The Tembreak Automatic Transfer Switch and the TL101 Controller should only require to be operated under mains power loss and routine maintenance. The following procedures detail how to operate the transfer switch

Changing the Switch Over

If required changing the TL101 from 'Auto' to 'Manual' modes, press 'Manual' button, followed by 'ON/OFF' button on required line 1 or 2.

Resetting after a Trip

Press 'OFF RESET' button, then press 'Auto' on TL101 to return to auto mode.

2.3 FAULT PROTECTION AND RECTIFICATION

Alarm, Protection and Safety Devices

The Tembreak Automatic Transfer Switch comprises of two circuit breaker protective devices. These switches are clearly labelled as 'Mains' and 'Generator' main switch. Each circuit breakers protection curve is shown in the following pages and it is recommended that they are inspected, operated and maintained every 6 months.

Consequences of Power Failure

On the event of power failure, the TL101 controller will start the generator and transfer supply to the generator. On return of mains power, the TL101 will transfer the supply back to 'Mains' and stop the generator. No operator input is necessary during the operation of the automatic transfer switch and the TL101 controller.

Trouble Shooting

Nil Identified

2.4 START UP AND SHUT DOWN PROCEDURES

Start Up

If mains power is available, no start up procedure is required, provided the TL101 control is in 'Auto' mode. If no mains power is available, the TL101 will automatically start the generator. Normal operation of the TL101 is in the 'AUTO' mode.

Shut Down

Tembreak Automatic Transfer switch can be shut down if in auto mode by pressing the 'Manual' button, then pressing 'ON/OFF' button on either line 1 or 2.

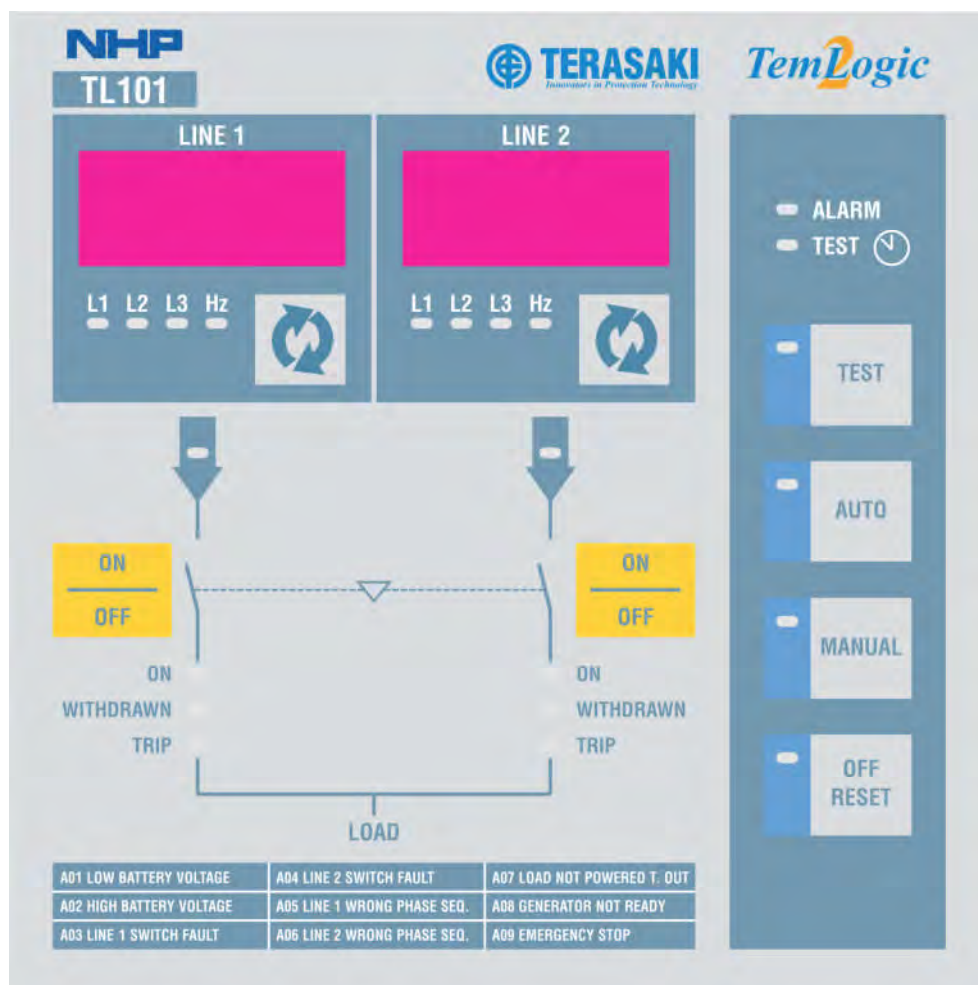
2.5 ISOLATION AND RESTORATION PROCEDURES

Isolation Procedure

1. Press 'Manual' button on TL101 control panel.
2. Press 'ON/OFF' button on the TL101 next to the switch currently indicated as on. Both switches should now indicate withdrawn on the TL101.
3. Lever out locking mechanism on both Mains & Generator switches and fit lockout device to each switch.

Restoration Procedure

1. Remove lockout devices on Mains & Generator switches.
2. Press 'AUTO' on the TL101 control panel
3. If Energex supply is available, the "Main" switch will close automatically.



2.6 PREVENTIVE MAINTENANCE

It is recommended the preventative maintenance is carried out in 6 month intervals. This preventative maintenance should include;

1. Testing of the TL101 to start generator.

Push 'TEST' button, this will start the generator. This process means the TL101 is operating the generator, but does not change supply from 'Mains' to 'Generator'.

2. Mains Line Failure Simulation.

Make sure TL101 is in 'AUTO'. Press "AUTO" & 'LINE 2 ON/OFF' buttons together for 10 consecutive seconds. This will turn 'Mains' power off, run generator for 1 minute, then change back to "Mains" power again. During the changeover between supplies, there will be a period where the switchboard is fed from neither supply. It is recommended that an operational shut procedure is in place whilst undertaking the 'Mains Line Failure Simulation'.

2.7 CORRECTIVE MAINTENANCE

In the event of equipment failure, the equipment may be required to be replaced. This may require a shutdown to isolate all sources of supply whilst corrective maintenance is carried out. The equipment would be swapped 'like for like' and re-commissioned. All these works should be carried out by a licenced electrician.

2.8 LIST OF SUB-CONTRACTORS AND PROPRIETRY EQUIPMENT

Manufacturer	Supplier	Part number	Description
Idec	IPD	RH2B-ULD 24VDC + SH2B-05C	Relay + Base
Siemens	Siemens	6ES7 131-4BF00-OAAO	Digital Input Card
Siemens	Siemens	6ES7 134-4GB11-OABO	Analog Input Card
Socomec	NHP	SLB1250	3P 1250A Isolator
Terasaki	NHP	TRFSWSPEC-BIT0131324	Basic Transfer Switch
Terasaki	NHP	TL101CIP	Electronic Controller & Interface Panel
Terasaki	NHP	TLP2L1CABLE15	1.5m Interface Controller
Terasaki	NHP	SRCB 1030	10A Safe-T RCD

Supplier: IPD Group Limited
Address: 25 Princess Road
Regents Park, New South Wales 2143 AUSTRALIA

Supplier: Siemens Ltd.
Address: 885 Mountain Highway
Bayswater, Victoria 3153 AUSTRALIA

Supplier: NHP Electrical Engineering Products Pty. Ltd.
Address: 16 Riverview Place
Murrarie, Queensland 4172 AUSTRALIA

2.9 RECOMMENDED SPARE PARTS AND SPECIAL TOOLS

The recommended spare parts and quantity required are:

- NHP – NNS6 - 6A Fuse Cartridge
 - Quantity: 3

2.10 HANDLING, UNPACKING AND STORAGE

Handling & Packing procedures:

- Cubicle shall be cleaned of all swarf and rubbish.
- Cubicle panels shall be polished.
- All isolating switches shall be closed in the 'On' position.
- All cubicle doors shall be locked closed with two keys attached and taped to each locking handle.
- The entire assembly shall be wrapped in shrink plastic to provide a weather-resistant envelope.
- Any special instructions for handling shall be indelibly marked on the wrapping.
- The switchboard should not be stored in the weather and must be out of direct sunlight at all times while wrapped in plastic.
- The switchboard delivered to site should remain in its original shipping weather-resistant wrapping until it is installed. Doors and covers must remain closed and in place during installation unless work is proceeding in the switchgear and control assembly.
- The principal advised of transport preparation.
- Under no circumstances shall the switchboard be shipped to site until the principal has approved of the dispatch.

2.11 LIST OF MANUFACTURER AND SUPPLIER DETAILS

Supplier: NHP Electrical Engineering Products Pty Ltd
Address: 16 Riverview Place, Murrarie QLD 4172
Ph: (07) 3909 4999
Fax: (07) 3399 9822
E-Mail: sales@nhp.com.au
Website: <http://www.nhp.com.au>

Supplier: Dore Electrics
Address: 20 Devlan Street, Mansfield QLD 4122
Ph: (07) 3349 5300
Fax: (07) 3349 5344
E-Mail: sales@doreelec.com.au
Website: <http://www.doreelec.com.au>

Supplier: Siemens
Address: Citilink Business Centre,
153 Campbell Street, Bowen Hills QLD 4006
Ph: 137 222
Fax: 1300 360 222
E-Mail: customercare.au@siemens.com
Website: <http://www.siemens.com.au>

Supplier: IPD
Address: 3 Miller Street, Murrarie QLD 4172
Ph: 1300 556 601
Fax: 1300 550 187
E-Mail: accsupport@ipdgroup.com.au
Website: <http://www.ipdgroup.com.au>

Volume 3 Drawings, Drawing Register, Underground Cable Routing Details

VOLUME 3 DRAWINGS, DRAWING REGISTER, UNDERGROUND CABLE ROUTING DETAILS

3.1 DRAWING REGISTER

Drawing Number	Sheet	Revision Date	Title	Rev.	Discipline
468/5/5-0250-040	00	11.13	Site Cover Sheet	B	Electrical
468/5/5-0250-041	01	11.13	Power Distribution Schematic Diagram	B	Electrical
468/5/5-0250-042	02	11.13	ATS Controls Schematic Diagram	B	Electrical
468/5/5-0250-043	03	11.13	Termination Diagram	B	Electrical
468/5/5-0250-044	04	11.13	Switchboard Cable, Equipment & Label Schedules	B	Electrical
468/5/5-0250-045	05	11.13	Switchboard Construction Details	B	Electrical
468/5/5-0250-046	06	11.13	Switchboard General Arrangement	B	Electrical

3.2 'AS CONSTRUCTED' DRAWINGS



CAROLE PARK WASTE WATER TREATMENT PLANT MAIN SWITCHBOARD & SUPPLY CHANGEOVER PANEL

COVER SHEET

ELECTRICAL DRAWINGS INDEX						
DWG No.	TITLE	SHEET	REVISIONS			
468/5/5-0250-040	SITE COVER SHEET	00	P1	0	A	B
468/5/5-0250-041	POWER DISTRIBUTION SCHEMATIC DIAGRAM	01	P1	0	A	B
468/5/5-0250-042	ATS CONTROLS SCHEMATIC DIAGRAM	02	P1	0	A	B
468/5/5-0250-043	TERMINATION DIAGRAM	03	P1	0	A	B
468/5/5-0250-044	SWITCHBOARD CABLE, EQUIPMENT & LABEL SCHEDULES	04	P1	0	A	B
468/5/5-0250-045	SWITCHBOARD CONSTRUCTION DETAILS	05	P1	0	A	B
468/5/5-0250-046	SWITCHBOARD GENERAL ARRANGEMENT	06	P1	0	A	B

AS CONSTRUCTED DETAILS	
I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.	
SIGNED: <i>[Signature]</i>	DATE: 11-13
NAME of SIGNATORY: <i>BRUCE JONES</i>	
RPEQ No. or LICENCE: <i>756</i>	
COMPANY NAME: <i>JPR</i>	
START DATE: 10-13	FINISH DATE: 11-13

J. & P. RICHARDSON INDUSTRIES PTY LTD ELECTRICAL CONTRACTORS AND ENGINEERS A.B.N. 23 001 952 325 114 CAMPBELL AVE. WACOL QLD 4076 PH. (07) 3271 2911 FAX. (07) 3271 3623 EMAIL. <i>jpr@jpr.com.au</i>

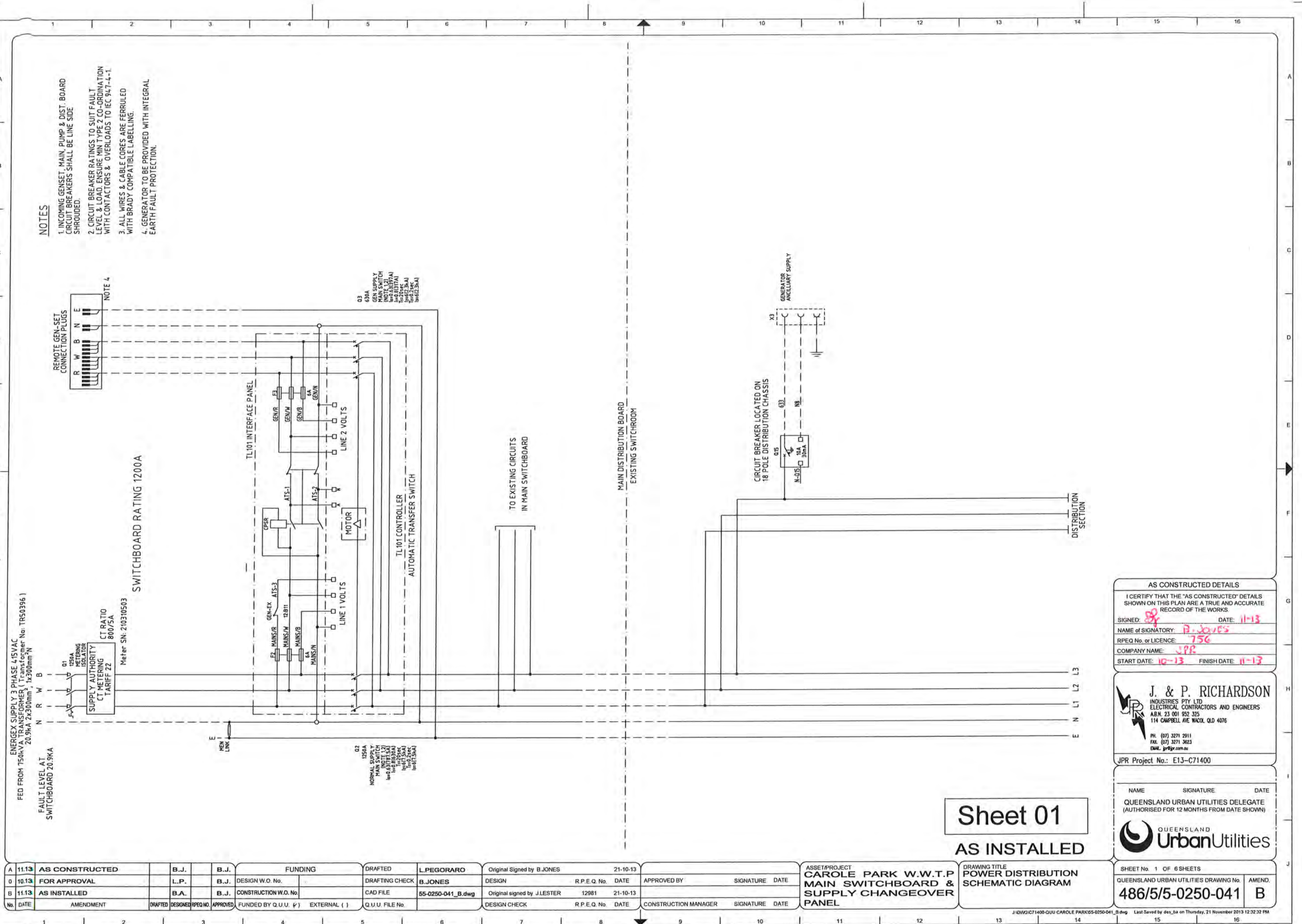
JPR Project No.: E13-C71400

NAME	SIGNATURE	DATE
QUEENSLAND URBAN UTILITIES DELEGATE (AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)		

**Sheet 00****AS INSTALLED**

A	11.13	AS CONSTRUCTED	B.J.	B.J.	FUNDING	DRAFTED	L.PEGORARO	Original Signed by B.JONES	21-10-13	ASSET/PROJECT	CAROLE PARK W.W.T.P MAIN SWITCHBOARD & SUPPLY CHANGEOVER PANEL	DRAWING TITLE	SITE COVER SHEET	SHEET No. 0 OF 6 SHEETS	QUEENSLAND URBAN UTILITIES DRAWING No.	486/5/5-0250-040	AMEND.	B
0	10.13	FOR APPROVAL	L.P.	B.J.	DESIGN W.O. No.	DRAFTING CHECK	B.JONES	DESIGN	R.P.E.Q. No. DATE	APPROVED BY	SIGNATURE DATE							
B	11.13	AS INSTALLED	B.A.	B.J.	CONSTRUCTION W.O. No.	CAD FILE	55-0250-040_B.dwg	Original signed by J.LESTER	12981 21-10-13									
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	FUNDED BY Q.U.U. ()	EXTERNAL ()	Q.U.U. FILE No.	DESIGN CHECK	R.P.E.Q. No. DATE	CONSTRUCTION MANAGER	SIGNATURE DATE					

J:\DWG\CT1400-QUU CAROLE PARK\05-0250-040_B.dwg Last Saved by des_ba on Thursday, 21 November 2013 12:32:45 PM



AS CONSTRUCTED DETAILS
 I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.
 SIGNED: *[Signature]* DATE: 11-13
 NAME OF SIGNATORY: B. JONES
 RPEQ No. or LICENCE: 756
 COMPANY NAME: JPR
 START DATE: 10-13 FINISH DATE: 11-13

J. & P. RICHARDSON
 INDUSTRIES PTY LTD
 ELECTRICAL CONTRACTORS AND ENGINEERS
 A.B.N. 23 001 952 325
 114 CAMPBELL AVE WACOL QLD 4076
 PH. (07) 3271 2911
 FAX. (07) 3271 3623
 EMAIL: jpr@jpr.com.au

JPR Project No.: E13-C71400

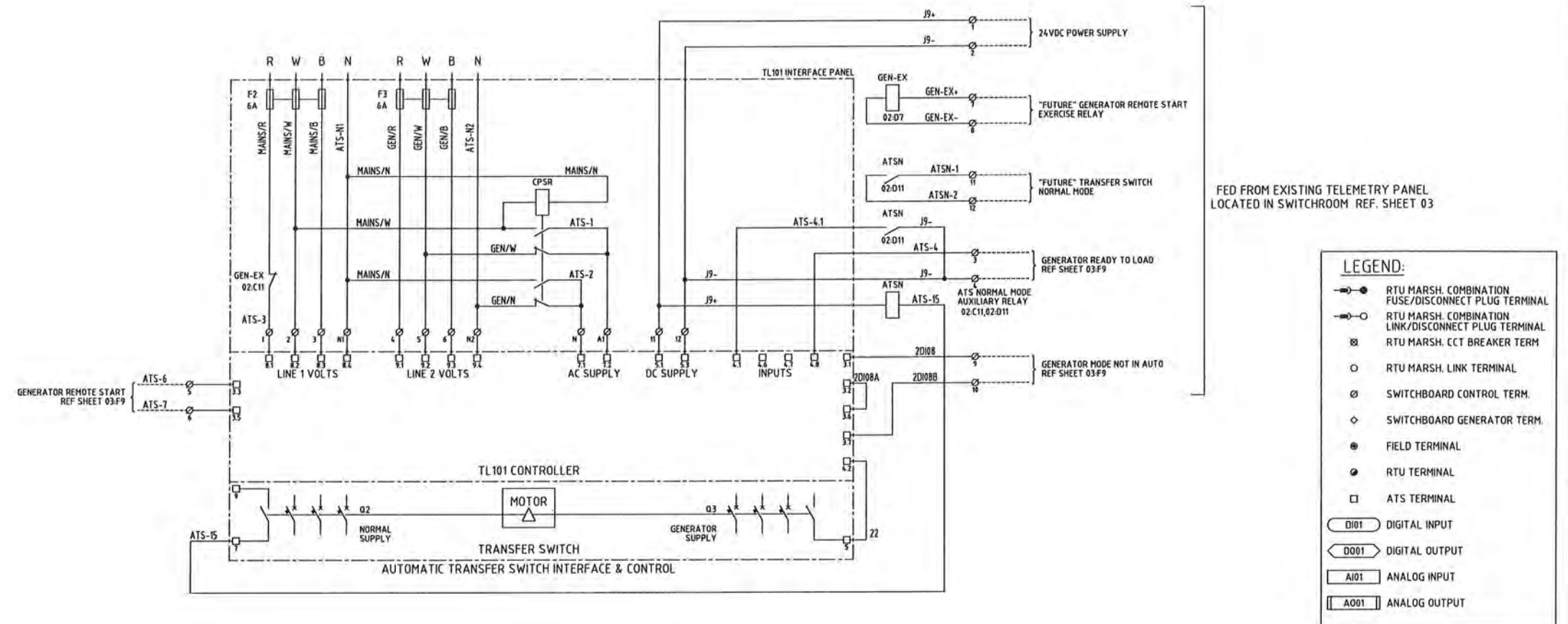
NAME SIGNATURE DATE
 QUEENSLAND URBAN UTILITIES DELEGATE
 (AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)



SHEET No. 1 OF 6 SHEETS
 QUEENSLAND URBAN UTILITIES DRAWING No. 486/5/5-0250-041
 AMEND. B

Sheet 01
AS INSTALLED

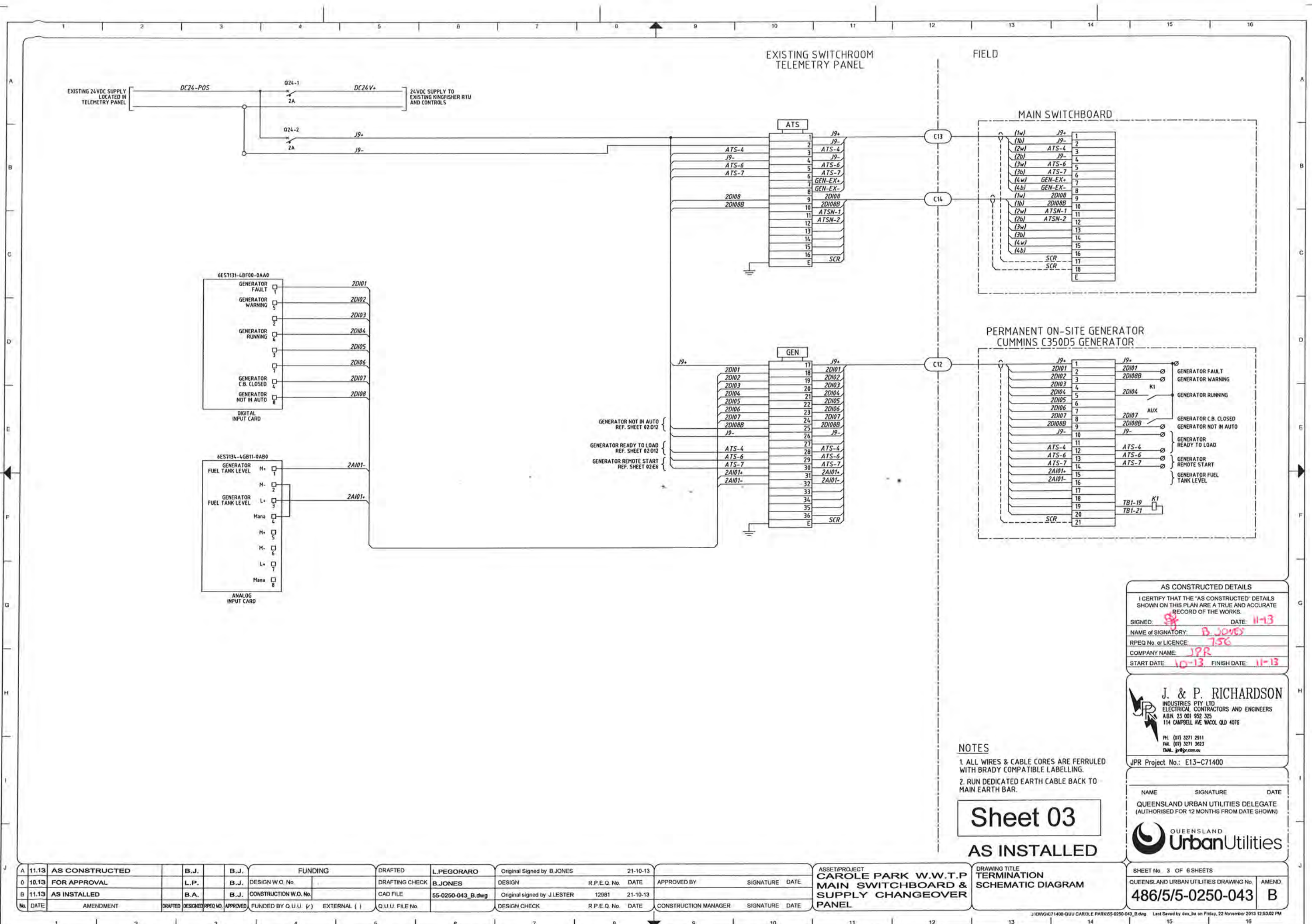
A	11.13	AS CONSTRUCTED	B.J.	B.J.	FUNDING	DRAFTED	L.PEGORARO	Original Signed by B.JONES	21-10-13	ASSET/PROJECT	CAROLE PARK W.W.T.P	DRAWING TITLE	POWER DISTRIBUTION SCHEMATIC DIAGRAM
O	10.13	FOR APPROVAL	L.P.	B.J.	DESIGN W.O. No.	DRAFTING CHECK	B.JONES	DESIGN	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE
B	11.13	AS INSTALLED	B.A.	B.J.	CONSTRUCTION W.O. No.	CAD FILE	55-0250-041_B.dwg	Original signed by J.LESTER	12981	21-10-13	CONSTRUCTION MANAGER	SIGNATURE	DATE
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	FUNDED BY Q.U.U. ()	EXTERNAL ()	Q.U.U. FILE No.	DESIGN CHECK	R.P.E.Q. No.	DATE	



Sheet 02

AS INSTALLED

A	11.13	AS CONSTRUCTED	B.J.	B.J.	FUNDING	DRAFTED	L.PEGORARO	Original Signed by B.JONES	21-10-13	ASSET/PROJECT	CAROLE PARK W.W.T.P	DRAWING TITLE	ATS CONTROLS
0	10.13	FOR APPROVAL	L.P.	B.J.	DESIGN W.O. No.	DRAFTING CHECK	B.JONES	DESIGN	R.P.E.Q. No. DATE	APPROVED BY	SIGNATURE DATE	SCHEMATIC DIAGRAM	
B	11.13	AS INSTALLED	B.A.	B.J.	CONSTRUCTION W.O. No.	CAD FILE	55-0250-042_B.dwg	Original signed by J.LESTER	12981 21-10-13	CONSTRUCTION MANAGER	SIGNATURE DATE		
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	FUNDED BY Q.U.U. ()	EXTERNAL ()	Q.U.U. FILE No.	DESIGN CHECK	R.P.E.Q. No. DATE		



CABLE No.		STATUS	SIZE	CORES	TYPE	LENGTH (m) Note 1	FROM	TO	CABLE FUNCTION	NOTES
P01	EXISTING	300mm ²	6xABC	PVC/PVC XLPE	8	ENERGEX Supply Transformer (750kVA)	ENERGEX Metering Isolator in New Switchboard Addition	Incoming Mains Supply	Refer Note 2 for Cable Protection	
E01	EXISTING	120mm ²	1C	Building Wire	8	ENERGEX Supply Transformer	Switchboard	Main Earth		
P03	NEW	120mm ²	6 x ABC, 1 x N	Building Wire XLPE	25	New Switchboard Addition	Generator Control Panel	Incoming Generator Supply		
P04	NEW	2.5mm ²	2C+E	PVC	35	Existing Distribution Switchboard in Switchroom	Generator Auxiliary Power Outlet	240VAC Supply to Generator		
C12	NEW	0.75mm ²	2TC	PVC/PMC (Screened Flex)	35	Existing Telemetry Switchboard in Switchroom	Generator Control Panel	Generator Controls	EMC Flexible Control Cable	
C13	NEW	0.75mm ²	4 Pt Decron	PVC/PMC (Screened Flex)	15	Existing Telemetry Switchboard in Switchroom	New Switchboard Addition	24VDC Generator C/O Switch Controls		
C14	NEW	0.75mm ²	4 Pt Decron	PVC/PMC (Screened Flex)	15	Existing Telemetry Switchboard in Switchroom	New Switchboard Addition	24VDC Generator C/O Switch Controls		

NOTE:

1. THE CONTRACTOR IS RESPONSIBLE IN DETERMINING THE ACTUAL CABLE LENGTHS AND VERIFICATION OF CABLE SIZES REQUIRED ON SITE.

2. PROTECT THE MAINS CABLE USING PVC SHEATHED FLEXIBLE METAL CONDUIT SUCH AS 'ADAPTALEX' FROM 150mm Min WITHIN THE PVC MAINS CONDUIT CAST IN THE SLAB UP TO THE GLAND PLATE. TERMINATE USING PROPRIETARY GLAND. SEAL AROUND CABLE AT EXIT POINT OF CONDUIT TO PREVENT INGRESS OF VERMIN. PROVIDE ADEQUATE EXCESS FOR RE-TERMINATION.

3. CABLE TO BE SIZED TO SUIT GENERATOR CIRCUIT BREAKER. TYPE - XLPE/NBR 90°C 0.6/1kV FLEXIBLE CABLE

EQUIPMENT SCHEDULE

ITEM	QTY	DESCRIPTION	MANUFACTURER	CATALOGUE No	REMARKS
1	1	Q1 METERING ISOLATOR 1250 A	SOCOME	SLB1250 3P	
2	2	ISOLATOR SHROUDS	SOCOME	26983120	
2/3	1	Q2, Q3 - BASIC TRANSFER SWITCH 1250A / 630A	TERASAKI	TRFSWSPEC-BIT0131324	XS1250SE - XMD9 , XS630SE - XMD6
1	1	Q2, Q3 - ELECTRONIC CONTROLLER & INTERFACE PANEL	TERASAKI	TL10KCP	
1	1	Q2, Q3 - INTERFACE CONTROLLER CABLE 1.5m	TERASAKI	TLP2LCABLE15	
6	6	BUSBAR SUPPORTS	DORÉ ELECTRICS	EL220	
2	2	CONTROL RELAYS - GEN-EX , ATSM	IDEC	RH2B-ULD 24VDC , SH2B-05C	
1	1	Q15 - SAFE-T 10 AMP MCB-RCD	TERASAKI	SRCB 1030	Mounted on 18 Pole Chassis DB in Switchroom
1	1	DIGITAL INPUT CARD	SIEMENS	6ES7 131 - 4BF00 - 0AA0	Mounted in Telemetry Panel in Switchroom
1	1	ANALOG INPUT CARD	SIEMENS	6ES7 134 - 4GB11 - 0AB0	Mounted in Telemetry Panel in Switchroom

LABEL SCHEDULE

ITEM	DESCRIPTION - INTERNAL LABEL	LABEL 1	LABEL 2 (IF NECESSARY)	LABEL 3 (IF NECESSARY)	TEXT HEIGHT	MATERIAL / COLOUR
01	METERING ISOLATOR	CT METERING ISOLATOR 1250A			10mm	ABS PLASTIC B/W
02	ENERGEX SUPPLY	NORMAL SUPPLY MAIN SWITCH 1250A			10mm	ABS PLASTIC B/W
03	GENERATOR SUPPLY	GENERATOR SUPPLY MAIN SWITCH 630A			10mm	ABS PLASTIC B/W
04	ATS CONTROLS	ATS CONTROLS			10mm	ABS PLASTIC W/B

EXTERNAL DOOR LABEL LIST

LABEL	TEXT	TEXT HEIGHT	PAINT FILL (LETTERING)	QUANTITY
A	SUPPLY AUTHORITY METERING ISOLATOR	10mm	White/Black	1
B	REVENUE METERING CURRENT TRANSFORMERS	10mm	White/Black	1
C	MAIN SWITCHES	10mm	White/Red	1
D	AUTOMATIC TRANSFER SWITCH	10mm	White/Black	1
E	DANGER 415V	10mm	White/Red	2
F	DANGER - 2 SOURCES OF SUPPLY	10mm	White/Red	1
G	ATS CONTROLS	10mm	White/Black	1

AS CONSTRUCTED DETAILS

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: *[Signature]* DATE: 11-13

NAME OF SIGNATORY: B. JONES

RPEQ No. or LICENCE: 756

COMPANY NAME: JPR

START DATE: 10-13 FINISH DATE: 11-13

J. & P. RICHARDSON INDUSTRIES PTY LTD
ELECTRICAL CONTRACTORS AND ENGINEERS
A.B.N. 23 001 952 325
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PH. (07) 3271 2911
FAX. (07) 3271 3623
EMAIL: jpr@jpr.com.au

JPR Project No.: E13-C71400

Sheet 04

AS INSTALLED

AS CONSTRUCTED		FUNDING		DRAFTED	L. PEGORARO	Original Signed by B. JONES	21-10-13
11-13	FOR APPROVAL	L.P.	B.J.	DRAFTING CHECK	B. JONES	DESIGN	R.P.E.Q. No. DATE
11-13	AS INSTALLED	B.A.	B.J.	CONSTRUCTION W.O. No.	55-0250-044_B.dwg	Original signed by J. LESTER	12981 21-10-13
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	FUNDED BY Q.U.U. () EXTERNAL ()

ASSET/PROJECT		DRAWING TITLE	
CAROLE PARK W.W.T.P MAIN SWITCHBOARD & SUPPLY CHANGEOVER PANEL		CABLE SCHEDULE, EQUIPMENT SCHEDULE & LABEL SCHEDULE	

QUEENSLAND UrbanUtilities

SHEET No. 4 OF 6 SHEETS

QUEENSLAND URBAN UTILITIES DELEGATE (AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)

486/5/5-0250-044 B

J:\DWG\1400-QUU CAROLE PARK\55-0250-044_B.dwg Last Saved by des_ba on Thursday, 21 November 2013 12:31:51 PM

CONSTRUCTION - INDOOR SWITCHBOARD

Cubicle construction 3mm marine grade aluminium.
 Equipment panels to be 3mm marine grade aluminium.
 Supply Authority CT section fitted with sealing facility.
 Lifting via 38mm holes in plinth.
 Plinth construction 75x40 steel channel painted Hawthorne Green.
 Fully welded on fascia of cubicle and stiffened to prevent warping and form a rigid enclosure.
 External doors and covers fitted with Adhesive backed Neoprene Rubber.
 All fixings shall be 316 grade stainless steel.
 Mearth buttons fixed to the interior of all doors and hinged escutcheons and on adjacent cubicle interior surfaces.
 Earth all doors/escutcheons with 4mm² flexible earth wire.
 Fit door switch brackets to each door opening.
 Door drop stay arms to be S/Steel and of sufficient strength to prevent being deformed when subjected to reasonable loads. Minimum 3mm S/Steel.
 Chrome Hinges (external) lift-off type.
 Star washers fitted under all hinge screws.
 Hinged escutcheons fixed with 1/4 turn coin lock with an 8mm square insert.
 All equipment to be removable via front access.
 All escutcheons to open a minimum of 90°.
 Fit drawing holder & log book holder to rear of door 3. (Refer drawings for detail)

Door 1

DORE ELECTRICS - Padlockable "L" Handle.
 ENERGEX Sealing Facility Coin Lock.

Doors 2,3

DORE ELECTRICS - Lockable "L" Handle. (Keyed 92268)
 DORE ELECTRICS - 3 point lock rod set with rollers.

Escutcheon 1,2,3

DORE ELECTRICS - 8mm Square Insert Coin Lock.

OPERATING PARAMETERS

Standard	AS 3439.1
Current & Frequency	1250A / AC 50Hz
Rated Operational Voltage Ue	415 VAC
Rated Insulation Voltage Ui	0.6/1kV
Rated Auxiliary Voltage	240 VAC / 24 VDC
Short Circuit Current Isc	25 kA
Duration of Isc	0.2 sec
Degree of Protection	Dust Proof
Internal Degree of Protection	IP20B / IP10A to AS3000:2007
Service Conditions	Outdoors
Forms of Segregation	Form 1
Earthing System	MEN
MEN Link	Required (Located in Existing Board)

PAINTING

Paint Type	Polyester Powdercoat to 50 micron thickness.
Preparation	Grind smooth all welds, descale and degrease.
Exterior/Doors Colour	Hawthorne Green
Interior Colour	Hawthorne Green
Equipment Panel Colour	Bright White
Escutcheon Colour	Bright White
Plinth Colour	Hawthorne Green

BUSBARS

Material	Hard Drawn, High Conductivity, Round Edge Copper
Finish	Natural
Joints	J&P Richardson Standard Jointing Methods Refer 055-01/0
Coating	Not Required/Heat Shrink & Shrouding Required in C.T. Section over Busbars
Identification	50mm Painted Band Every 500mm

BUSBAR SIZE/RATING

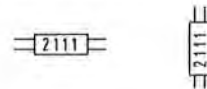
Mains/Gen Incoming Vertical Bus/Phases	2 x 63 x 6.3mm Per Phase
Main Horizontal Bus/Phases	2 x 63 x 6.3mm

BUSBAR SUPPORTS

Type	20mm Densified Wood (Permatil), Dore Electrics P/N EL270
Distance Between Centres	100mm
Distance Between Supports	350mm (Maximum)

WIRING

All wiring to be PVC V90 HT 0.6/1kV Grade with tinned conductor.
 Control and instrumentation wiring has flexible copper conductors, and is colour coded as detailed below, each individual wire shall be numbered each end, and terminated by the use of appropriate pre-insulated crimp lugs or pins.
 Separate lugs or pins shall be used for each conductor. A proprietary double pin lug may be used to terminate two conductors.
 Use proprietary bridging links when required to common up terminals.
 Not more than two wires shall be connected to any terminal.
 Power wiring to be minimum 2.5mm² stranded copper conductors, phase colour coded as detailed below.
 Control wiring to be minimum 1.0mm² flexible copper conductors, colour coded as detailed below.
 Low level control signals to be minimum 0.5mm² flexible copper conductors, colour coded as detailed below.
 4-20mA analog signals (internal & external) wired in shielded pair minimum size 0.5mm², and earthed at one end only. (Switchboard end for external signals)
 All 240VAC terminals in the Multifunction section shall be shrouded and labelled - 'Danger 240VAC'.
 Earth cables minimum 2.5mm² flexible.
 Doors and hinged escutcheons bonded with flexible earth wire.
 Switchboard to have dedicated earthing cable bonding directly to main earth bar.
 Wire numbering will be equal to Brady marking system.
 Wire numbers are readable left to right, bottom to top as shown.

**COLOUR CODE**

Phase wiring (A,B & C)	Red, White, Blue	2.5mm ² (min)
Potential Metering (240/415 VAC)	Red, White, Blue, Black	1.5mm ²
Current Metering (Secondary)	Red, White, Blue, Grey	2.5mm ²
240 VAC Control Active	Red	1.0mm ²
240 VAC Neutral	Black	1.0mm ²
Extra Low VDC Positive supplies	Orange	1.0mm ²
Extra Low VDC Negative supplies	Violet	1.0mm ²
General Extra Low VDC Wiring	Grey	1.0mm ²
RTU & PLC Wiring	Grey	0.5mm ²
Electrode Wiring	Salmon	1.0mm ²
Intrinsically safe wiring	Light Blue	1.5mm ²
Earth	Green/Yellow	2.5mm ² (min)
Door & Escutcheon Earth Bonds	Green/Yellow	4 mm ²

LABELS

Internal labels - W/B engraved Gravoply, to label schedule.
 Warning labels - R/W engraved Gravoply, to label schedule.
 E/Stop labels - Y/B engraved Gravoply, to label schedule.
 First letter = Background colour. Second letter = Lettering colour.

Main switch label		10mm 4mm	Material ABS PLASTIC Colour B/W
Pump CB labels		6mm 4mm	Material ABS PLASTIC Colour W/B
Compartment labels		10mm	Material Stainless Steel
E/Stop labels		4mm	Material ABS PLASTIC Colour Y/B
Warning labels		7mm 5mm	Material ABS PLASTIC Colour R/W

Internal labels secured by M3 316 grade stainless steel metal threads and adhesive.
 Labels obstructed by switchboard wiring are relocated to adjacent duct lid and secured by M3 nylon threads. Lid to be secured by a single cable tie at one corner.
 External labels 1mm thick 316 grade s/steel secured by M3 316 s/steel metal threads.
 All internal and external labels are to have bevelled edges.
 Label on the internal side of the escutcheon for all equipment mounted on escutcheon.
 Affix labels with double sided tape only.

Sheet 05

AS INSTALLED

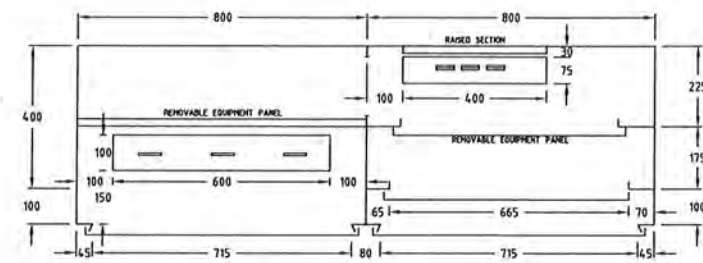
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	10.13	FOR APPROVAL	L.P.	B.J.	DESIGN W.O. No.	DRAFTING CHECK	B.JONES	DESIGN	R.P.E.Q. No.								
B	11.13	AS INSTALLED	B.A.	B.J.	CONSTRUCTION W.O. No.	CAD FILE	55-0250-045_B.dwg	Original signed by J.LESTER	21-10-13								
	No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED	FUNDED BY Q.U.U. ()	EXTERNAL ()	Q.U.U. FILE No.	DESIGN CHECK	R.P.E.Q. No.	DATE	CONSTRUCTION MANAGER	SIGNATURE	DATE	

AS CONSTRUCTED DETAILS	
I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.	
SIGNED:	DATE: 11-13
NAME OF SIGNATORY: B.JONES	
RPEQ No. or LICENCE: 756	
COMPANY NAME: JPR	
START DATE: 10-13	FINISH DATE: 11-13

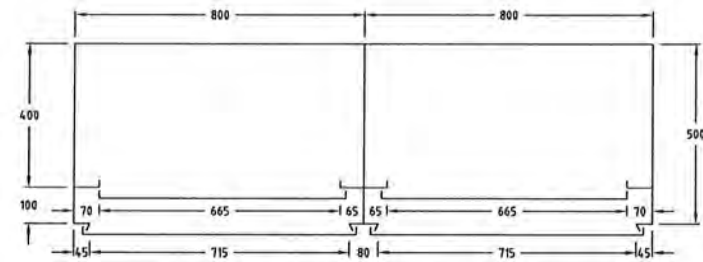
J. & P. RICHARDSON INDUSTRIES PTY LTD ELECTRICAL CONTRACTORS AND ENGINEERS A.B.N. 23 001 952 325 114 CAMPBELL AVE. MACOL QLD 4076 PH. (07) 3271 2011 FAX. (07) 3271 3023 EMAIL: jpr@jpr.com.au	
JPR Project No.: E13-C71400	

NAME	SIGNATURE	DATE
QUEENSLAND URBAN UTILITIES DELEGATE (AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)		

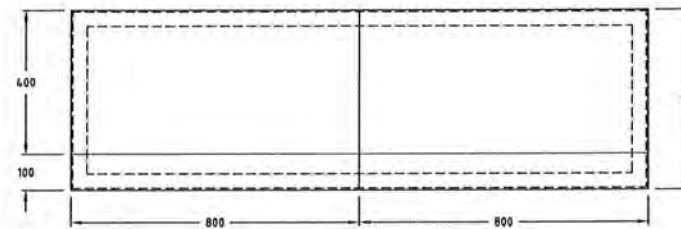




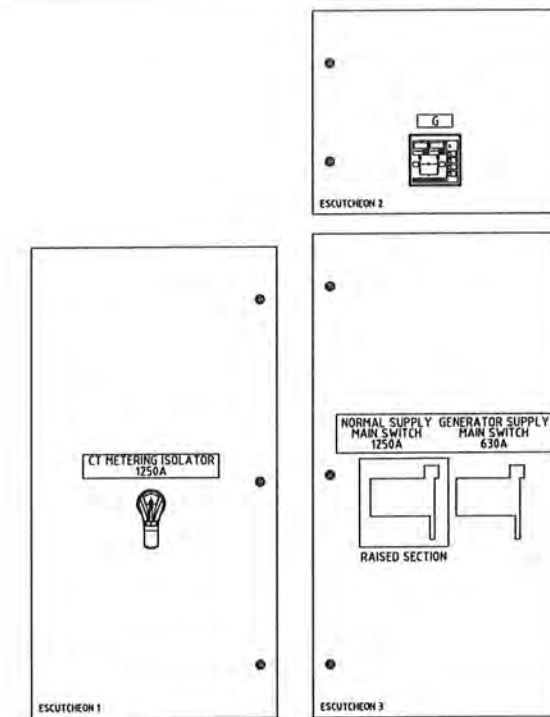
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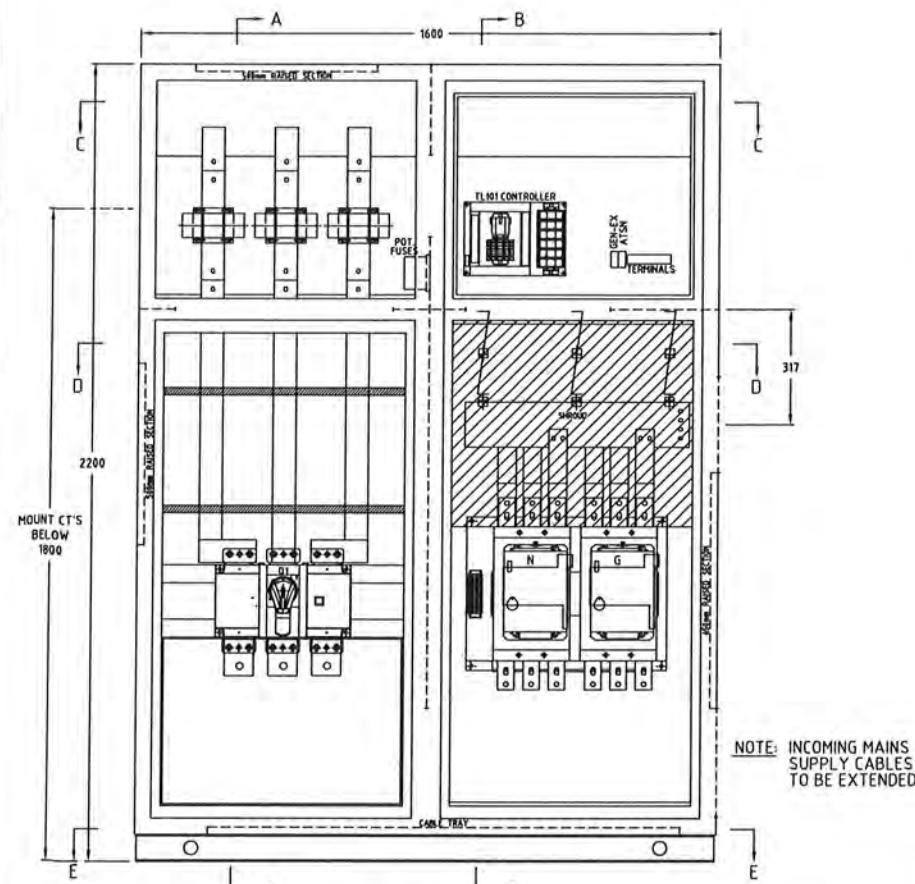
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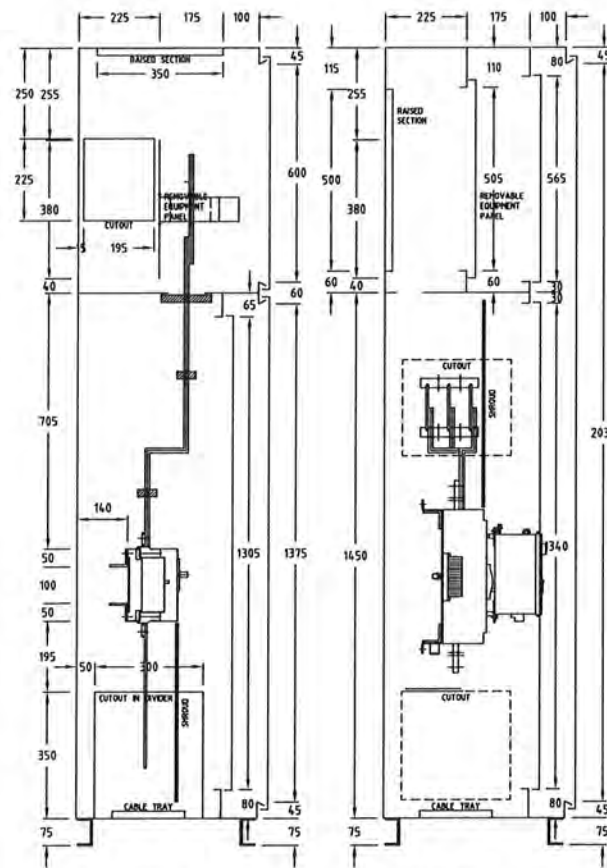
SECTION E - E



HINGED PANELS

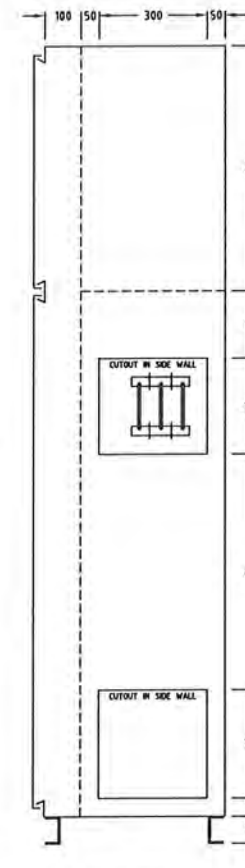


FRONT VIEW
DOORS & HINGED PANELS NOT SHOWN

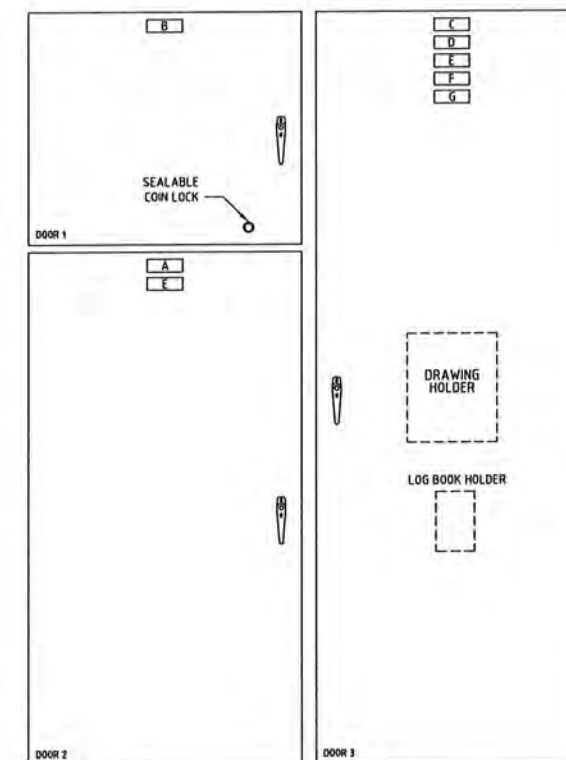


SECTION A - A

SECTION B - B



SIDE VIEW



DOORS

AS CONSTRUCTED DETAILS

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: *B. JONES* DATE: *11-13*

NAME OF SIGNATORY: *B. JONES*

RPEQ No. or LICENCE: *756*

COMPANY NAME: *JPR*

START DATE: *10-13* FINISH DATE: *11-13*

J. & P. RICHARDSON
INDUSTRIES PTY LTD
ELECTRICAL CONTRACTORS AND ENGINEERS
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PH. (07) 3271 2911
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EMAIL: *jpr@jpr.com.au*

JPR Project No.: E13-C71400

NAME SIGNATURE DATE
QUEENSLAND URBAN UTILITIES DELEGATE
(AUTHORISED FOR 12 MONTHS FROM DATE SHOWN)



SHEET No. 6 OF 6 SHEETS
QUEENSLAND URBAN UTILITIES DRAWING No. **486/5/5-0250-046** AMEND. **B**

Sheet 06

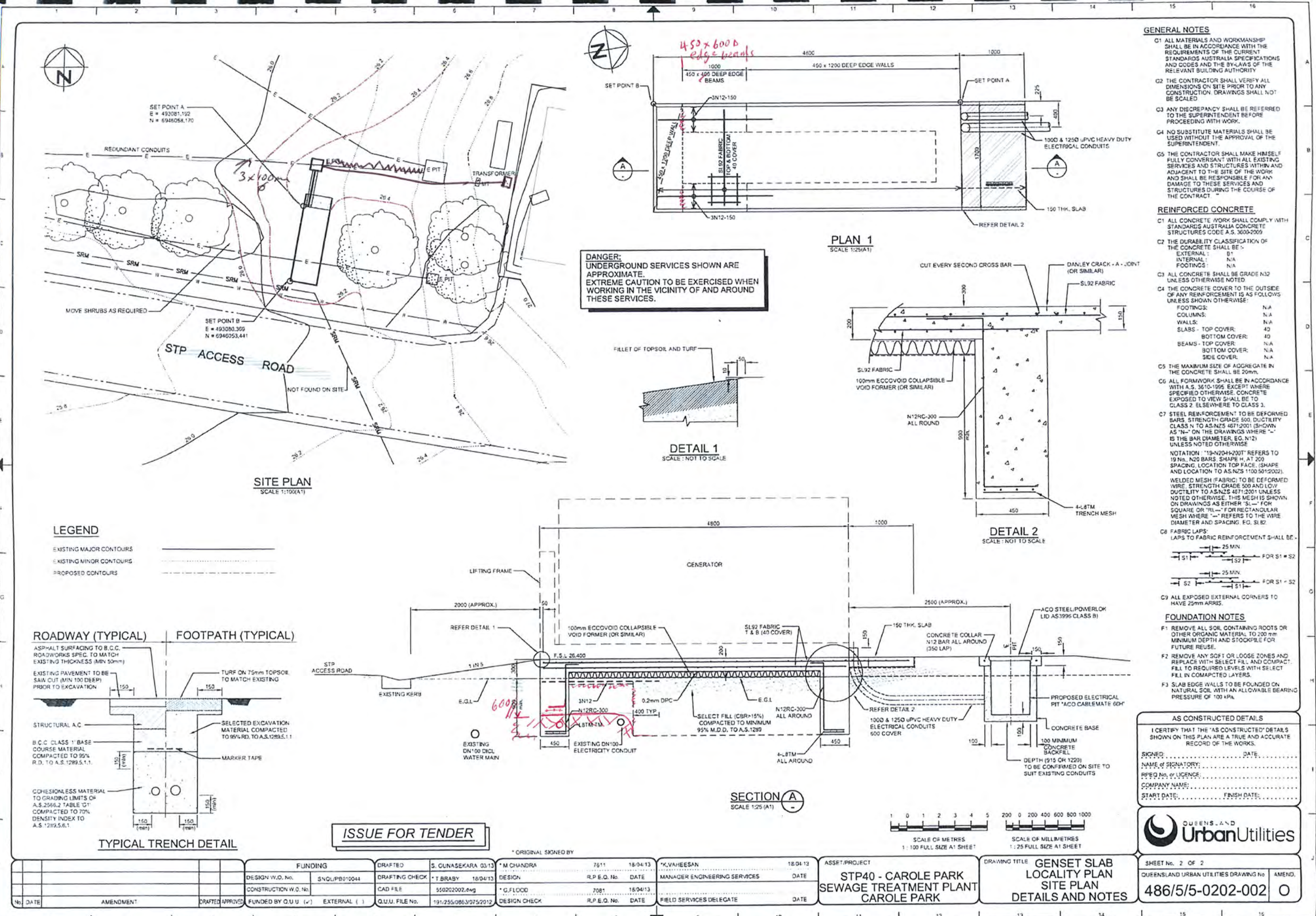
AS INSTALLED

DRAWING TITLE
**GENERAL ARRANGEMENTS
ELEVATIONS &
SECTIONAL VIEWS**

A	11.13	AS CONSTRUCTED	B.J.	B.J.	FUNDING	DRAFTED	L.PEGORARO	Original Signed by B.JONES	21-10-13	ASSET/PROJECT	CAROLE PARK W.W.T.P
O	10.13	FOR APPROVAL	L.P.	B.J.	DESIGN W.O. No.	DRAFTING CHECK	B.JONES	DESIGN	R.P.E.Q. No. DATE	APPROVED BY	SIGNATURE DATE
B	11.13	AS INSTALLED	B.A.	B.J.	CONSTRUCTION W.O. No.	CAD FILE	55-0250-046_B.dwg	Original signed by J.LESTER	12981 21-10-13	CONSTRUCTION MANAGER	SIGNATURE DATE
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ No.	APPROVED	FUNDED BY Q.U.U. ()	EXTERNAL ()	Q.U.U. FILE No.	DESIGN CHECK	R.P.E.Q. No. DATE

ASSET/PROJECT
**CAROLE PARK W.W.T.P
MAIN SWITCHBOARD &
SUPPLY CHANGEOVER
PANEL**

3.3 UNDERGROUND CABLE ROUTING DETAILS



Volume 4 Installation, Pre-Commissioning, Commissioning, System Testing, Training, Method Statements, Q.A.

VOLUME 4 INSTALLATION, PRE-COMMISSIONING COMMISSIONING, SYSTEM TESTING, TRAINING, METHOD STATEMENTS, Q.A.

4.1 TRAINING PROGRAM

The installed equipment's normal operation is in the automatic mode and therefore no operator input is required during normal operation.

During maintenance, no further training is required for the equipment to undertake maintenance as set out by this operation and maintenance manual.

4.2 COMMISSIONING REPORT



J&P RICHARDSON INDUSTRIES PTY LTD
Electrical Contractors and Engineers

Telephone 07 3271 2911 Website www.jpr.com.au
Wacol - Gold Coast - Ipswich
Sunshine Coast - Eagle Farm - Toowoomba - Chinchilla



WORKING IN PARTNERSHIP WITH



**QUUC10110-45-090 FOR
CAROLE PARK STP GENERATOR INSTALLATION
MAINS-GENERATOR CHANGEOVER
SWITCHBOARD
COMMISSIONING PLAN**

Site ID and Name <i>CAROLE PARK WWT</i>	ST41 Carole Park Sewerage Treatment Plant
Commissioning Date <i>19-11-2013</i>	19 th and 20 th November 2013

In Attendance

Name	Role During Commissioning	Company
<i>R STANAWAY</i>	<i>GL</i>	<i>JPR</i>
<i>T. DALBY</i>		<i>QUU</i>

QUUC1011-045-090 FOR CAROLE PARK STP GENERATOR INSTALLATION
Commissioning Plan

1	INTRODUCTION	3
2	PRE-CHANGE OVER WORKS CHECKLIST.....	4
2.1	SWITCHBOARD FACTORY ACCEPTANCE TEST	4
2.2	SUPPLY AUTHORITY	4
3	CHANGE OVER WORKS	5
3.1	CHANGE OVER PROCEDURE.....	5
3.2	SITE ACCEPTANCE TESTING	6
3.3	PRELIMINARY WORK COMPLETION BY ELECTRICAL J&P RICHARDSON	6
4	POST CHANGE OVER CHECKLIST	7
4.1	DELIVERABLES FROM ELECTRICAL J&P RICHARDSON	7
4.2	DELIVERABLES FROM COMMISSIONING MANAGER	7
4.3	SUGGESTIONS FOR IMPROVEMENT	7

1 INTRODUCTION

This document details the procedure for the installation of the mains-generator changeover switchboard at ST41, Carole Park Sewerage Treatment Plant. This procedure will involve two plant shutdowns, however will keep the plant operational during installation works.

QUUC1011-045-090 FOR CAROLE PARK STP GENERATOR INSTALLATION
Commissioning Plan**2 PRE-CHANGE OVER WORKS CHECKLIST**

The following checklist is to be completed and signed by the electrical J&P Richardson.

2.1 SWITCHBOARD FACTORY ACCEPTANCE TEST

J&P Richardson Task	Completed
FAT has been completed as per QUU FAT Document and all defects that were identified have been rectified.	

2.2 SUPPLY AUTHORITY

J&P Richardson Task	Outcome
The relevant supply authority has been organised to install the metering into the New Switchboard.	Company _____ Booked for 19/11/2013 @ 07-30 (time) Ref # _____ _____

Electrical Contactor's Supervisor
Name:
Date:
Signature:

QUU Commissioning Manager
Name:
Date:
Signature:

QUUC1011-045-090 FOR CAROLE PARK STP GENERATOR INSTALLATION
Commissioning Plan**3 CHANGE OVER WORKS**

The following sequence of change over works is the order in which they must be followed.

3.1 CHANGE OVER PROCEDURE**TUESDAY**

Approx. Time	Task Description	Owner	Outcome
06:00	Arrive onsite and conduct tool box meeting and complete JSA.	JPR QUU	OK <input checked="" type="checkbox"/>
06:40	Run temporary cable from generator to outside existing main switchboard.	JPR	OK <input checked="" type="checkbox"/>
06:45	Turn off existing main switch off and tag out.	JPR	OK <input checked="" type="checkbox"/>
Plant is now De-Energised			
06:50	Connect generator cable to load side of main switch.	JPR	OK <input checked="" type="checkbox"/>
07:00	Start generator and allow to run with no load.	JPR	OK <input checked="" type="checkbox"/>
07:10	Turn on Generator Circuit Breaker and Test Supply.	JPR	OK <input checked="" type="checkbox"/>
Plant is now Energised			
07:15	QUU to monitor STP plant and load shed if required	QUU	OK <input type="checkbox"/>
07:30	Energex to isolate mains via switch in pad mount transformer.	JPR Energex	OK <input checked="" type="checkbox"/>
08:00	Extend mains cable to new main switch and connect existing switchboard busbar to new switchboard busbar, connect new CT wiring to existing metering	JPR	OK <input checked="" type="checkbox"/>
10:00	Energex to reverse switching and test supply and metering.	Energex	OK <input checked="" type="checkbox"/>
11:00	JPR to manually operate ATS and test supply at line side of the existing switchboard main switch.	JPR	OK <input checked="" type="checkbox"/>
11:30	Turn off Generator Circuit Breaker.	JPR	OK <input checked="" type="checkbox"/>
Plant is now De-Energised			
11:35	Disconnect temporary generator cable from load side of the existing switchboard main switch.	JPR	OK <input checked="" type="checkbox"/>
12:00	Remove lock out tag and close main switch	JPR	OK <input checked="" type="checkbox"/>
Plant is now Energised			
12:15	QUU to confirm normal running operation of plant	QUU	OK <input type="checkbox"/>


Electrical Contractor's Supervisor

 Name: *R. Thompson*
 Date: *19-4-2013*
 Signature: *R. Thompson*




QUU Commissioning Manager

 Name: *T. Dwyer*
 Date: *19-4-13*
 Signature: *T. Dwyer*

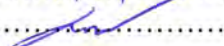
QUUC1011-045-090 FOR CAROLE PARK STP GENERATOR INSTALLATION
Commissioning Plan**3.2 SITE ACCEPTANCE TESTING**

J&P Richardson Task	Completed
SAT has been completed as per SAT Document and all defects that were identified have been rectified.	✓ H.W. 

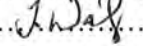
3.3 PRELIMINARY WORK COMPLETION BY ELECTRICAL J&P RICHARDSON

J&P Richardson Task	Outcome
Leave the site clean and tidy and hazard free.	OK <input checked="" type="checkbox"/> 
Confirm with QUU that the job is complete and their staff can leave.	OK <input checked="" type="checkbox"/> 
Confirm with QUU that QUU staff will lock up the site on completion of the switchboard change over work.	OK <input checked="" type="checkbox"/> 

Electrical Contactor's Supervisor

Name: H.W. WongDate: 20/11/13Signature: 

QUU Commissioning Manager

Name: T. DALBYDate: 20/11/13Signature: 

QUUC1011-045-090 FOR CAROLE PARK STP GENERATOR INSTALLATION
Commissioning Plan

4 POST CHANGE OVER CHECKLIST

4.1 DELIVERABLES FROM ELECTRICAL J&P RICHARDSON

J&P Richardson Task	Date Completed
All documentation required under the contract is to be provided with in the time specified (As Installed, Electrical Certificates etc).	/ /

4.2 DELIVERABLES FROM COMMISSIONING MANAGER

Commissioning Manager	Date Completed
All documentation is handed to the Project Manager.	
Factory Acceptance Test Sheet – Completed & signed off.	OK <input type="checkbox"/>
Electrical Inspection Sheet – Completed & signed off.	OK <input type="checkbox"/>
Site Acceptance Test Sheet – Completed & signed off.	OK <input type="checkbox"/>
Commissioning Plan – Completed & signed off.	OK <input type="checkbox"/>
As Installed Drawings have been updated, drafted and taken to site along with the Site Specific Functional Specification.	/ /

4.3 SUGGESTIONS FOR IMPROVEMENT

Suggestion	Recommended By

Electrical Contactor's Supervisor
Name:
Date:
Signature:

QUU Commissioning Manager
Name:
Date:
Signature:

4.3 COMMISSIONING PROCEDURE

1. Arrive onsite and conduct toolbox meeting and complete JSA.
2. Run temporary cable from generator to outside existing main switchboard.
3. Turn off existing main switch and tag out.

Plant is now De-Energised

4. Connect generator cable to load side of main switch.
5. Start generator and allow to run with no load.
6. Turn on Generator circuit breaker and test supply.

Plant is now Energised

7. QUU to monitor STP plant and load shed if required.
8. Energex to isolate mains via switch in pad mount transformer.
9. Extend mains cable to new mains switch and connect existing busbar to new switchboard busbar, connect new CT wiring to existing metering.
10. Energex to reverse switching, test supply and metering.
11. JPR to manually operate ATS and test supply at line side of the existing switchboard main switch.
12. Turn off Generator Circuit Breaker.

Plant is now De-Energised

13. Disconnect temporary generator cable from load side of existing switchboard main switch.
14. Remove lock out tag and close main switch.

Plant is now Energised

15. QUU to confirm normal running operation of plant.

4.4 INSPECTION, TEST PLANS AND TEST SHEETS



E-mail: jpr@jpr.com.au

[illegible]

**J. & P. RICHARDSON INDUSTRIES PTY. LTD.**

114 Campbell Avenue, WACOL QLD 4076

Ph: (07) 3271 2911 - Fax: (07) 3271 3623

E-mail: jpr@jpr.com.au

SWITCHBOARD / SHEETMETAL
INSPECTION CHECKLIST

CLIENT: QUU			JOB NO: M/S 71400		
PRODUCT DESCRIPTION: CAROLE PARK WTP MAIN SWBD ADDITION + SUPPLY CHANGE OVER PANEL			DRAWING & SCHEDULE NUMBERS 486/5/5 - 0250-040-046		
CONSTRUCTION	QUALITY		COMPLIANCE WITH DRAWINGS		REMARKS OR ACTION
	GOOD	POOR	YES	NO	
1. Folds	✓		✓		
2. Welds	✓		✓		
3. Edges / File			✓		
4. Gauge			✓		
5. Material			✓		
6. Ventilation Openings / Filter Bracket			N/A		
7. Water Ingress Test			✓		
8. Equipment Mounting Arrangement			✓		
9. Doors Stiffened			✓		
10. Escutcheons and Lexan Covers			✓		
11. Cable Saddles			✓		
12. Grinding			✓		
13. Door Stays Fitted			✓		
14. Earth Studs			✓		
15. Rubber Retainer			N/A		
16. Drawing Holder			✓		
17. Hat Sections			N/A		
18. Locking Bars Fitted			✓		
19. External Crevice Welded and Ground			✓		
20. Legend Cards			N/A		
21. General Conditions Satisfactory			✓		
22. Cabinet Clean			✓		
23. Job Name and Number Marked on Board and Panels			✓		
24. Lap Top Tray			N/A		
25. Gland Plates Fitted			N/A		
26. Sunshields Fitted			N/A		

**J. & P. RICHARDSON INDUSTRIES PTY. LTD.**

114 Campbell Avenue, WACOL QLD 4076

Ph: (07) 3271 2911 - Fax: (07) 3271 3623

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SWITCHBOARD / SHEETMETAL
INSPECTION CHECKLIST

CONSTRUCTION	QUALITY		COMPLIANCE WITH DRAWINGS		REMARKS OR ACTION
	GOOD	POOR	YES	NO	
27. Mullion Welded to Divider			✓		
28. Double Hinge Meter Panel Fitted			N/A		
29. Plinth Fitted			✓		
30. Wall Mount Brackets			N/A		
31. Light Switch Brackets			✓		
32. Cows			N/A		
INSPECTED BY: CHRIS D. CLAVE		DATE: 21.10.13			

AFFIX STATUS HERE

Yellow
Green
RedAwaiting Inspection
Inspected/Tested Passed
Inspected/Tested Awaiting Rectification



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SWITCHBOARD ELECTRICAL INSPECTION & TEST REPORT

Customer Name: <u>Q u u</u>	
Project: <u>CAROLE PARK WTP MAIN SWITCHBOARD CHANGE OVER PANEL</u>	
JPR Job No: <u>M 71400</u>	Item: <u>CHANGE OVER PANEL</u>
Constructed by: <u>T. WRIGHT</u>	Tested by: <u>A. VARY</u> Date: <u>6-11-13</u>

Item check list:		To comply with Drawings, Documents & Specification					
Main Functional Unit/s	Qty	✓	Size	✓	Settings	✓	
Fuse Fittings	Qty	✓	Size	✓	Fuse Size	✓	
Circuit Breakers	Qty		Size		Settings		
Motor Protection C.B.	Rating		Setting		Function		
Neutral	Reqd		Size		ID		
Equipment Earthing	Checked		Size				
C.T.s	Qty		Rating		Pri Inject.		
Meters	Qty		Rating		Function		
Contactors	Qty		Rating		Voltage		
Overloads	Qty		Rating		Function		
Relays	Qty	✓	Rating	✓	Voltage	✓	
Timers	Qty		Rating		Voltage		
Control Switches	Qty		Rating		Function		
Push Buttons	Qty		Rating		Function		
Pilot Lights	Qty		Rating		Voltage		
Transformers	Qty		Rating		Voltage		
ATT/VFD/Soft Starter	Qty		Rating		Function		
DC Supply	Qty	✓	Rating	✓	Voltage	✓	
Terminals	Qty	✓	Size	✓	ID	✓	
Engraving	Qty	✓	Size	✓	ID	✓	
Cabling	Type	✓	Size	✓	ID	✓	
Busbars	Type	✓	Size	✓	ID	✓	
Escutcheons / Shrouds	Type	✓	Label	✓	IP rating	✓	
S.A. Metering CTs	Qty	✓	Rating	✓			
S.A. Metering Links	Type						
S.A. Meters	Type		Size				
JPR Label	Fitted	✓	Stamped	✓	Safety Stkr	✓	
Legend Card	Qty		Correct				
PLC/Telemetry	Qty		Size				
Power Monitor Relay	Qty		Rating		Function		

General Check List:

IP Sealing	Rating	✓					
Door Latches/Hinges	Qty	✓	Type	✓	Operation	✓	
Ventilation	Required		Type		Operation		
Circuit Schedule	Markup	✓	Checked		Supplied		
Terminal Tightness	Power	✓	Control	✓	Result	✓	
Busbar System	Clearances	✓	Joints	✓	ID	✓	
Earth Continuity	Body to E	✓	Doors to E	✓	Panels to E	✓	
Cubicle Cleaned		✓					
Paint Finish Intact		✓					
Polarity Check	R - R	✓	W - W	✓	B - B	✓	
Function	Power	✓	Control	✓	PLC/Telem		
Continuity Check	R - R	✓	W - W	✓	B - B	✓	N - N
Insulation Test	R to E	W to E	B to E	R to W	R to B	W to B	N to E
1000v Test (MΩ)	500	500	500	500	500	500	500

Earth Leakage

Earth Leakage Test	Rated Current	Trip Current	Trip Time

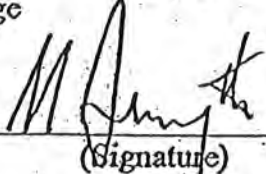
Comments:

JOB SAFETY ANALYSISLIVE LOW VOLTAGE WORKTESTING SWITCHBOARDS AND CONTROL PANELS WITHIN OUR MANUFACTURING PREM

APPROVED BY: Eric McCulloch (WHSO)

LOCATION: WACOL WORKSHOP

DATE: 7.11.13

AUTHORISATIONS		PERSONAL PROTECTIVE EQUIPMENT	
<ul style="list-style-type: none"> • Authorisation from person in charge  (Signature)	<input checked="" type="checkbox"/> YES	<ul style="list-style-type: none"> • Long cotton clothing • Insulating work gloves in test • Insulating mats / covers in test • Switchboard rescue kit in test 	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES
TASK LIVE LOW VOLTAGE WORK TESTING SWITCHBOARDS AND CONTROL PANELS WITHIN OUR MANUFACTURING PREMISES	<ul style="list-style-type: none"> • Isolation points identified and accessible • Work area clear of obstructions • Unauthorised access prevented to work area • P.P.E. is fit for purpose • Test equipment is fit for purpose • Written authority to proceed has been obtained from a person in charge. • JPR authorisation to conduct live work is current • Approved dedicated power supply only used for testing. 	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input type="checkbox"/> YES	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input type="checkbox"/> YES
OPTION (A)	Approved dedicated power supply in current test RCD protected outputs used at power supply > RCD protection checked daily prior to use > Safety Observer is is not required	<input type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES	<input type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES
OPTION (B)	Non RCD protected outputs used at power supply > Supervisor consulted prior to use > Safety Observer is in attendance	<input type="checkbox"/> YES <input type="checkbox"/> YES <input type="checkbox"/> YES	<input type="checkbox"/> YES <input type="checkbox"/> YES <input type="checkbox"/> YES

I understand and am fully aware of the requirements of this job safety analysis.

Signatures:

1.

2.

3.

4.

5.

**FOR
LIVE LOW VOLTAGE WORK**

TESTING SWITCHBOARDS AND CONTROL PANELS WITHIN JPR MANUFACTURING PREMISES
AN INDEPENDENT BODY

APPROVED BY: Eric McCulloch (WHSO)


LOCATION: WACOL WORKSHOP

DATE: / /

AUTHORISATIONS	MINIMUM PERSONAL PROTECTIVE EQUIPMENT
<ul style="list-style-type: none"> JPR induction completed <input type="checkbox"/> YES Authorisation from JPR person in control to perform live work <input type="checkbox"/> YES Independent body employee Qualifications in accordance with requirements of Electrical Safety Act. <input type="checkbox"/> YES <p style="text-align: center;">(Signature) JPR Person in Control</p>	<ul style="list-style-type: none"> Long cotton clothing <input type="checkbox"/> YES Insulating work gloves in test <input type="checkbox"/> YES Insulating mats / covers in test <input type="checkbox"/> YES Switchboard rescue kit in test <input type="checkbox"/> YES <p>Note:- Items 2,3,4 are to be supplied by the independent body and submitted to JPR for inspection prior to initial use</p>
<p style="text-align: center;">HAZARDS</p> <ul style="list-style-type: none"> CONTACT WITH LIVE LOW VOLTAGE ELECTRIC SHOCK BURNS 	<p style="text-align: center;">CONTROL MEASURES</p> <ul style="list-style-type: none"> Isolation points identified and accessible <input type="checkbox"/> YES Work area clear of obstructions <input type="checkbox"/> YES Unauthorised access prevented to work area Barriers and signage provided by independent body <input type="checkbox"/> YES P.P.E. is fit for purpose and in test <input type="checkbox"/> YES Test equipment is fit for purpose and in test <input type="checkbox"/> YES Authority to proceed has been obtained from JPR person in control <input type="checkbox"/> YES Independent body authorisation to conduct live work is current (documentation required to support evidence) <input type="checkbox"/> YES Approved dedicated power supply only used for testing. (JPR supplied) <input type="checkbox"/> YES Approved dedicated power supply in current test <input type="checkbox"/> YES <p>OPTION (A) RCD protected outputs used at power supply <input type="checkbox"/> YES</p> <p style="padding-left: 20px;">> RCD protection checked daily prior to use <input type="checkbox"/> YES</p> <p style="padding-left: 20px;">> Safety Observer is / is not required (Competent safety observer supplied by independent body for duration of live work, documentation required to support evidence) <input type="checkbox"/> YES</p> <p>OPTION (B) Non RCD protected outputs used at power supply <input type="checkbox"/> YES</p> <p style="padding-left: 20px;">> JPR person in control prior to use <input type="checkbox"/> YES</p> <p style="padding-left: 20px;">> Safety Observer is in attendance (Competent safety observer supplied by independent body for duration of live work, documentation required to support evidence) <input type="checkbox"/> YES</p>

I understand and am fully aware of the requirements of this job safety analysis.

ALL INDEPENDENT BODY EMPLOYEES ON SITE PERFORMING LIVE WORK TO SIGN

Signatures:					
Name Printed:	F. SALEH				
Date:	8/11/13				

F1330

Customer:	QUU	Sheet	1 of 1	Date:	16-11-13
Project:	CAROLE PARK WTP				
Job No:	M71400	Constructed By:	T. WRIGHT	Tested By:	A. VARY

Comments:		
Defects Completed: Yes / No	Checked By:	Date:

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Ph: (07) 3271 2911 - Fax: (07) 3271 3623

E-mail: jpr@jpr.com.au ABN: 23 001 952 325**LV CIRCUIT TEST SHEET**CUSTOMER: Quu CAROLE PARK STPJOB NO: C71400 DESCRIPTION: GENERATOR SUB - MAINSMCC / DISTRIBUTION BOARD NO: ATSKYORITSU 3132A
SER# 5160886

Tested By: <u>RYAN HORNSBY</u>	Date: <u>12 / 11 / 13</u>	Certificate No: <u>117967</u>
--------------------------------	---------------------------	-------------------------------

CIRCUIT EQUIPMENT	INSULATION RESISTANCE	EARTH CONTINUITY	FAULT LOOP IMPEDANCE	PHASE ROTATION	RCD TRIP TIME	RCD TEST TRIP CURRENT	REMARKS
GENERATOR		<u>.2Ω</u>		<u>Anti - Clock</u>			
SUB MAINS							
TO NEW							
ATS							
R-W #1	<u>>200mΩ</u>						
R-W #2	<u>>200mΩ</u>						
R-B #1	<u>>200mΩ</u>						
R-B #2	<u>>200mΩ</u>						
W-B #2	<u>>200mΩ</u>						
W-B #1	<u>>200mΩ</u>						
R-N #1	<u>>200mΩ</u>						
R-N #2	<u>>200mΩ</u>						
W-N #1	<u>>200mΩ</u>						
U-N #2	<u>>200mΩ</u>						
B-N #1	<u>>200mΩ</u>						
B-N #2	<u>>200mΩ</u>						
R-E	<u>>200mΩ</u>						
W-E	<u>>200mΩ</u>						
B-E	<u>>200mΩ</u>						

4.5 PRE-COMMISSIONING AND TEST PROCEDURES

Nil pre-commissioning and test procedures were required for this contract

4.6 SITE ACCEPTANCE

Site Acceptance Test**Major Projects & Commercial Services**



Carole Park Standby Power Project

**Carole Park Waste Water Treatment Plant
Main Switchboard & Supply Changeover Panel**
Date**20/11/13****A. Electrical Installation Test Records**

AS/NZS 3000:2007 requires that prior to placing an electrical installation or any part thereof in service following its construction, alteration, addition or repair, it shall be inspected and tested to verify that the installation is safe to energize and that it will operate correctly in accordance with the requirements of AS3000:2007.

This section is aimed to ensure that the switchboard manufacturer has carried out and documented all applicable AS3000:2007 tests considered as mandatory, prior to execution of the Factory Acceptance Test.

AS/NZS 3017 Electrical Installations – Verification Guidelines provides inspection, test methods and test acceptance parameters to verify AS3000:2007 safety requirements, however these methods are provided for guidance and other alternative methods are acceptable, AS3017:2007 may be applied through legislative requirements made in each State and Territory of Australia and in New Zealand.




Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
A.1	Records for the verification of the continuity and resistance of the earthing system shall include: a) Main earthing conductor b) Protective earthing conductors c) Earth bonding conductors.	✓				For acceptance criteria and test methods refer to: AS3000:2007 Section 8.3.5 & AS3017:2007 Section 3.1
A.2	Records for the verification of Insulation Resistance shall include: a) Insulation resistance test of complete installation b) Insulation resistance test of single circuits	✓				For acceptance criteria and test methods refer to AS3000:2007 Section 8.3.6 & AS3017:2007 Section 3.2

Site Acceptance Test**Major Projects & Commercial Services**

Carole Park Standby Power Project

B. Testing Area, Documentation and Test Set Up Arrangements

This section is aimed to ensure that all documentation and test set up arrangements have been provided to allow execution and readiness to carry out the FAT.






Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
B.1	Verify that a suitable test area has been provided, the test area shall be: <ul style="list-style-type: none"> Clearly identified and barricaded Test bench with enough space for testing equipment and documentation Well ventilated 	✓				
B.2	"As Built" drawings marked up available.	✓				
B.3	"Point to Point" and "Functional" test drawing mark-ups provided	✓				

Site Acceptance Test**Major Projects & Commercial Services**

Carole Park Standby Power Project

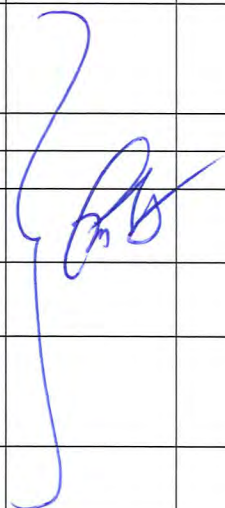
C. Visual Inspections - Sheet Metal / Mechanical Construction Works

The following visual inspections shall take place previous to energising the switchboard circuits. All power supplies shall be disconnected, including the main power supply, generator power supplies and battery power supplies.

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
C.1	Switchboard dimensions correct as per contract drawings	✓				
C.2	Panel layout as per drawings	✓				
C.3	All equipment is to be removable from switchboard via front access.	✓				
C.4	Check operation and orientation of doors and door handles	✓				
C.5	Switchboard mounting feet as per drawing	✓				
C.6	Material finish as per specification	✓				
C.7	IP Rating as per specifications.	✓				
C.8	All bolts fitted / tight	✓				
C.9	All sheet metal edging to be de-burred, special attention given to handle/lock access heat shield cuts.	✓				
C.10	Door, hinges and locks are properly fitted to allow closing without forcing the door or being loose.	✓				
C.11	Lock barrels are mounted neatly. Door penetration and holes shall be suited to the particular lock barrel type.	✓				
C.12	Lock barrel types are provided as required and operate correctly	✓				
C.13	Energex Padlock Supplied	✓				
C.14	All doors sealing shall be properly fitted and firmly secured to the switchboard.	✓				Re-used padlock from old Energex metering

Site Acceptance Test**Major Projects & Commercial Services**

Carole Park Standby Power Project

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
	Glue shall be provided if necessary.					
C.15	Cut outs from one cubicle to another shall be large enough to accommodate all cables.	✓				
C.16	Enclosure free of debris	✓				
C.17	Drawings & log book holder provided	✓				
C.18	Verify that all external labels are fitted to the switchboard.	✓				
C.19	Labelling is correct and complete - wording, size, fixing, material, level.	✓				
C.20	All internal and external labels are to have bevelled edges, sharp edges are not allowed.	✓				
C.21	Verify that 415VAC warning sign is fitted to the switchboard.	✓				

D. Visual Inspections- Neutral and Earthing

A visual inspection shall be made when work on an electrical installation has been completed in order to verify that the work complies with the requirements of AS/NZS 3000.

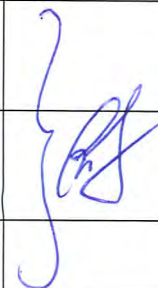
The visual inspection shall be carried out before, or in association with testing, and as far as possible it should be made before the electrical installation is placed in service.

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
D.1	N/L & E/L have adequate bolts for main Neutral & Earth	✓			/	Visual acceptance from Energex prior to power being energised
D.2	Earth bar / earth connections fitted & OK	✓				
D.3	All neutral connections are accessible	✓				
D.4	MEN connections provided	✓				
D.5	Neutral & earth connections are not in CT section	✓				

E. Visual Inspections - Electrical Components Mounting, Wiring and Labelling

As a minimum a visual inspection shall be made when work on an electrical installation has been completed in order to verify that the work complies with the requirements of AS/NZS 3000. This visual inspection section includes AS/NZS 3000 checks as well as several checks to verify that the electrical installation meets the specific design and quality requirements and scope of work.

The visual inspection shall be carried out before, or in association with testing, and as far as possible it should be made before the electrical installation is placed in service.

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
E.1	Busbars appropriately shielded					
E.2	Verify that main switches/circuit breakers and fuses are supplied to the specification (equipment schedule)			✓		FAT
E.3	Main switches lockable/ defeatable as per spec.			✓		FAT
E.4	Check operation of Main Supply and Generator supply mechanical and/or key interlocks as applicable.	✓		✓		FAT
E.5	Verify that metering fuses & CT's are fed off from main switch line side			✓		Done by Energex 19/11
E.6	Equipment fed from line side shall be appropriately labelled.			✓		FAT
E.7	All Circuit Breakers shall be set as indicated in the electrical schematic drawings.	✓				
E.8	Verify that cables current carrying capacity is as indicated in the electrical schematic drawings.	✓				
E.9	Colour coding of wiring as per specification.	✓				






Site Acceptance Test**Major Projects & Commercial Services**

Carole Park Standby Power Project

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
E.10	Check cable access dimensions	✓			Jas	
E.11	Check cable access & routes for field cabling.	✓				
E.12	Check phasing of circuits are as per drawing.	✓				
E.13	Electrical components fitted are as specified in the equipment schedule			✓		FAT.
E.14	Verify that terminals & busbar connections are tight	✓			AS	


F. Live Power and Operational Tests

The following tests shall be made with all switchboard electrical circuits energized in order to check that the switchboard meets all operational requirements.

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
F.1	Verify that all electrical components energize when power circuits are energized	✓				Tested 19/11/13
F.2	<p>For the purpose of system testing it is possible to simulate a 1 minute voltage failure on the main line. The unit will respond in the same manner and timeframe set for standard automatic operation. The proper operation of transfer cycles may thus be controlled. To perform a main line failure simulation:</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Set the TL101 unit for automatic operation by selecting the AUTO key.</p> </div> </div> <div style="display: flex; align-items: center; margin-top: 20px;">  <div style="margin: 0 10px;">+</div>  </div> <p>Press the AUTO key and the line 2 ON-OFF key together for 10 consecutive seconds.</p> <p>The letters F.SI (Failure Simulation) will appear on the display during the execution of the whole cycle.</p>	✓				

Site Acceptance Test**Major Projects & Commercial Services**



Carole Park Standby Power Project

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
	To stop the test before completion, repeat the starting procedure or switch to the OFF – RESET mode.					
F.3	<p>After a voltage or frequency anomaly the following occurs:</p> <ol style="list-style-type: none"> 1. A start signal is sent to generator (Line 2) after the delay set in P2.15, 2. The generator is allowed to run 'off-load' until the voltage levels are within programmed limits, at which time the load is connected to the generator line. 3. The TL101 unit continually monitors the main utility line for standard values to return. 4. When the main utility line stabilises the load is transferred back to the utility line and the generator is kept in operation without load for a time set by P2.16 to allow it to cool. 5. The TL101 unit then sends a start/stop command to the generator through a relay output. The TL101 unit can receive digital signals from the generator indicating its status (generator ready, ok to load taking, etc) through programmable inputs. 	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>				<p>-Tested through F.2 - Fault simulation</p>

Site Acceptance Test

Major Projects & Commercial Services

Carole Park Standby Power Project

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
F.4	Digital IO Test <ul style="list-style-type: none"> Generator Fault Generator Warning Generator Low Fuel Generator Running Generator Medium Fuel Generator Canopy Door Open Generator Mode Not Auto Generator Ready 	✓ ✓ ✓	✓	✓ ✓ ✓ ✓		} Generator - Output function needs checking. No field device. Test to terms. No field device. Test to terms. - Not Part of PLC Input. - Drawings wrong. Need Generator in Auto to get indication working with ATS O/c. - Part of ATS. Not an input to PLC
F.5	Analogue IO Tests <ul style="list-style-type: none"> Fuel Tank Level IO Min Range Max Range Status 	✓ ✓ ✓ ✓				

Site Acceptance Test**Major Projects & Commercial Services**

Carole Park Standby Power Project

Item No.	Activity Description	Results			Signed QUU	Results and comments		
		Acc	Rej	N/A				
F.6	Functional Tests							
	Alarms							
	<ul style="list-style-type: none"> Generator Fault Alarm Generator Warning Alarm Generator Low Fuel Alarm Generator Not in Auto Alarm 	✓	✓			<ul style="list-style-type: none"> - Generator function has both shutdown & warnings on this output. - No separate output for Low Fuel. - Generator function needs changing to close output on Auto. Reset 		
	ATS Operating Sequence							
	<ul style="list-style-type: none"> ATS healthy on mains Simulate mains power loss on ATS Generator starts on signal from ATS Once generator online, ATS changes supply from mains to generator Generator running ok Reinstate mains power ATS changes supply from generator to mains Generator shutdown once mains changeover complete 	✓				<ul style="list-style-type: none"> - Sequence Tested with F.2 - Fail Simulation test. - Drop phase relay. to test. 		
F.7	Level Transmitter					Setpoint	Delay	Status
	<ul style="list-style-type: none"> Low Level Alarm Low Low Level Alarm High Level Alarm High High Level Alarm 	✓				95%		
		✓				90%	2s	
		✓				10%		
		✓				5%		

G. Non-Conformances and Unauthorised Modifications

G.1	Generator status needs re-programming. Output for "In Auto" & "Fault".
G.2	AERATOR 1/2 INTERMITTENTLY TRIPPING OUT ON "ELECTRICAL FAULT (LOW VOLTAGE)" TO BE MONITORED OVER TIME.
G.3	↳ AFTER FURTHER TESTING → NEEDS TO BE INVESTIGATED FURTHER - CHECK LOW VOLTAGE PARAMETERS - DETERMINE WHY VOLTAGE FLUCTUATIONS.
G.4	
G.5	
G.6	
G.7	
G.8	
G.9	
G.10	

Site Acceptance Test**Major Projects & Commercial Services**

Carole Park Standby Power Project

This section is to be completed only at the conclusion of the FAT:

Final FAT Results	YES	NO	Results and comments
Pre-FAT Completed	✓		
Minor NCRs Generated			
Major NCRs Generated			
Pre-FAT Accepted			

Notes:

1. FAT results to be recorded above by Contractor.
2. FAT results to be approved by Queensland Urban Utilities Electrical Inspector.
3. Pre-FAT results to be approved by Queensland Urban Utilities Electrical Inspector at Pre-FAT (if present) or at the start of the FAT.
4. NCRs are to be generated by the Queensland Urban Utilities Electrical Inspector for all NCRs not resolved by the end of the test.

Contractor's Signature

Ho Wong

Date 20/11/13

Company Name

J & P Richardson Industries

Company Electrical Licence No. 756

Queensland Urban Utilities Electrical Inspector

Andrew Hawkan

Date 20/11/13

4.7 INSTALLATION PROCEDURE

1. Deliver the switchboard to site with a flatbed crane truck.
2. Unload the switchboard as close as practical to its final position.
3. Unpack and inspect the switchboard for damage occurred during transport.
4. Install the switchboard in position.
5. Run temporary cable from generator to outside existing main switchboard.
6. Turn off existing main switch and tag out.
Plant is now De-Energised
7. Connect generator cable to load side of main switch.
8. Start generator and allow to run with no load.
9. Turn on Generator circuit breaker and test supply.
Plant is now Energised
10. QUU to monitor STP plant and load shed if required.
11. Energex to isolate mains via switch in pad mount transformer.
12. Extend mains cable to new mains switch and connect existing busbar to new switchboard busbar, connect new CT wiring to existing metering.
13. Energex to reverse switching, test supply and metering.
14. JPR to manually operate ATS and test supply at line side of the existing switchboard main switch.
15. Turn off Generator Circuit Breaker.
Plant is now De-Energised
16. Disconnect temporary generator cable from load side of existing switchboard main switch.
17. Remove lock out tag and close main switch.
Plant is now Energised
18. QUU to confirm normal running operation of plant.

4.8 FACTORY ACCEPTANCE



CA17a - Factory Inspection Tests

Major Projects & Commercial Services
Carole Park Standby Power Project

**Carole Park Waste Water Treatment Plant
Main Switchboard & Supply Changeover Panel**

Date

8/11/13

A. Electrical Installation Test Records

AS/NZS 3000:2007 requires that prior to placing an electrical installation or any part thereof in service following its construction, alteration, addition or repair, it shall be inspected and tested to verify that the installation is safe to energize and that it will operate correctly in accordance with the requirements of AS3000:2007.

This section is aimed to ensure that the switchboard manufacturer has carried out and documented all applicable AS3000:2007 tests considered as mandatory, prior to execution of the Factory Acceptance Test.

AS/NZS 3017 Electrical Installations – Verification Guidelines provides inspection, test methods and test acceptance parameters to verify AS3000:2007 safety requirements, however these methods are provided for guidance and other alternative methods are acceptable, AS3017:2007 may be applied through legislative requirements made in each State and Territory of Australia and in New Zealand.

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
A.1	Records for the verification of the continuity and resistance of the earthing system shall include: a) Main earthing conductor b) Protective earthing conductors c) Earth bonding conductors.	✓				For acceptance criteria and test methods refer to: AS3000:2007 Section 8.3.5 & AS3017:2007 Section 3.1
A.2	Records for the verification of Insulation Resistance shall include: a) Insulation resistance test of complete installation b) Insulation resistance test of single circuits	✓				For acceptance criteria and test methods refer to AS3000:2007 Section 8.3.6 & AS3017:2007 Section 3.2

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B. Testing Area, Documentation and Test Set Up Arrangements

This section is aimed to ensure that all documentation and test set up arrangements have been provided to allow execution and readiness to carry out the FAT.

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
B.1	Verify that a suitable test area has been provided, the test area shall be: <ul style="list-style-type: none"> Clearly identified and barricaded Test bench with enough space for testing equipment and documentation Well ventilated 	✓				
B.2	"As Built" drawings marked up available.	✓				
B.3	"Point to Point" and "Functional" test drawing mark-ups provided	✓				

CA17a - Factory Inspection Tests**Major Projects & Commercial Services**

Carole Park Standby Power Project

C. Visual Inspections - Sheet Metal / Mechanical Construction Works

The following visual inspections shall take place previous to energising the switchboard circuits. All power supplies shall be disconnected, including the main power supply, generator power supplies and battery power supplies.

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
C.1	Switchboard dimensions correct as per contract drawings	✓				
C.2	Panel layout as per drawings	✓				
C.3	All equipment is to be removable from switchboard via front access.	✓				
C.4	Check operation and orientation of doors and door handles	✓				
C.5	Switchboard mounting feet as per drawing	✓				
C.6	Material finish as per specification	✓				
C.7	IP Rating as per specifications.	✓				
C.8	All bolts fitted / tight	✓				
C.9	All sheet metal edging to be de-burred, special attention given to handle/lock access heat shield cuts.	✓				
C.10	Door, hinges and locks are properly fitted to allow closing without forcing the door or being loose.	✓				
C.11	Lock barrels are mounted neatly. Door penetration and holes shall be suited to the particular lock barrel type.	✓				
C.12	Lock barrel types are provided as required and operate correctly	✓				
C.13	Energex Padlock Supplied					

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Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
C.14	All doors sealing shall be properly fitted and firmly secured to the switchboard. Glue shall be provided if necessary.	✓				
C.15	Cut outs from one cubicle to another shall be large enough to accommodate all cables.	✓				
C.16	Enclosure free of debris	✓				
C.17	Drawings & log book holder provided	✓				
C.18	Verify that all external labels are fitted to the switchboard.	✓				
C.19	Labelling is correct and complete - wording, size, fixing, material, level.	✓				
C.20	All internal and external labels are to have bevelled edges, sharp edges are not allowed.					
C.21	Verify that 415VAC warning sign is fitted to the switchboard.					

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D. Visual Inspections- Neutral and Earthing

A visual inspection shall be made when work on an electrical installation has been completed in order to verify that the work complies with the requirements of AS/NZS 3000.

The visual inspection shall be carried out before, or in association with testing, and as far as possible it should be made before the electrical installation is placed in service.

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
D.1	N/L & E/L have adequate bolts for main Neutral & Earth	✓				
D.2	Earth bar / earth connections fitted & OK					
D.3	All neutral connections are accessible					
D.4	MEN connections provided					
D.5	Neutral & earth connections are not in CT section					

E. Visual Inspections - Electrical Components Mounting, Wiring and Labelling

As a minimum a visual inspection shall be made when work on an electrical installation has been completed in order to verify that the work complies with the requirements of AS/NZS 3000. This visual inspection section includes AS/NZS 3000 checks as well as several checks to verify that the electrical installation meets the specific design and quality requirements and scope of work.

The visual inspection shall be carried out before, or in association with testing, and as far as possible it should be made before the electrical installation is placed in service.


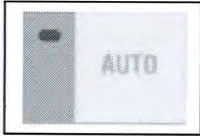

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
E.1	Busbars appropriately shielded	✓				
E.2	Verify that main switches/circuit breakers and fuses are supplied to the specification (equipment schedule)	✓				
E.3	Main switches lockable/ defeatable as per spec.	✓				
E.4	Check operation of Main Supply and Generator supply mechanical and/or key interlocks as applicable.	✓				
E.5	Verify that metering fuses & CT's are fed off from main switch line side	✓				
E.6	Equipment fed from line side shall be appropriately labelled.	✓				
E.7	All Circuit Breakers shall be set as indicated in the electrical schematic drawings.	✓				
E.8	Verify that cables current carrying capacity is as indicated in the electrical schematic drawings.	✓				

CA17a - Factory Inspection Tests

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
E.9	Colour coding of wiring as per specification.	✓				
E.10	Check cable access dimensions	✓				
E.11	Check cable access & routes for field cabling.	✓				
E.12	Check phasing of circuits are as per drawing.	✓				
E.13	Electrical components fitted are as specified in the equipment schedule	✓				
E.14	Verify that terminals & busbar connections are tight	✓				

F. Live Power and Operational Tests

The following tests shall be made with all switchboard electrical circuits energized in order to check that the switchboard meets all operational requirements.

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
F.1	Verify that all electrical components energize when power circuits are energized	✓				
F.2	<p>For the purpose of system testing it is possible to simulate a 1 minute voltage failure on the main line. The unit will respond in the same manner and timeframe set for standard automatic operation. The proper operation of transfer cycles may thus be controlled. To perform a main line failure simulation:</p> <div style="display: flex; align-items: center;">  <div style="margin-left: 10px;"> <p>Set the TL101 unit for automatic operation by selecting the AUTO key.</p> </div> </div> <div style="display: flex; align-items: center; margin-top: 20px;">  +  </div> <p>Press the AUTO key and the line 2 ON-OFF key together for 10 consecutive seconds.</p>	✓				

CA17a - Factory Inspection Tests
Major Projects & Commercial Services
 Carole Park Standby Power Project

Item No.	Activity Description	Results			Signed QUU	Results and comments
		Acc	Rej	N/A		
	The letters F.SI (Failure Simulation) will appear on the display during the execution of the whole cycle. To stop the test before completion, repeat the starting procedure or switch to the OFF – RESET mode.	✓				
F.3	After a voltage or frequency anomaly the following occurs: 1. A start signal is sent to generator (Line 2) after the delay set in P2.15, 2. The generator is allowed to run 'off-load' until the voltage levels are within programmed limits, at which time the load is connected to the generator line. 3. The TL101 unit continually monitors the main utility line for standard values to return. 4. When the main utility line stabilises the load is transferred back to the utility line and the generator is kept in operation without load for a time set by P2.16 to allow it to cool. 5. The TL101 unit then sends a start/stop command to the generator through a relay output. The TL101 unit can receive digital signals from the generator indicating its status (generator ready, ok to load taking, etc) through programmable inputs.	✓				

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G. Non-Conformances and Unauthorised Modifications

G.1	
G.2	
G.3	
G.4	
G.5	
G.6	
G.7	
G.8	
G.9	
G.10	

This section is to be completed only at the conclusion of the FAT:

Final FAT Results	YES	NO	Results and comments
Pre-FAT Completed	✓		
Minor NCRs Generated		✓	
Major NCRs Generated		✓	
Pre-FAT Accepted	✓		

Notes:

1. FAT results to be recorded above by Contractor.
2. FAT results to be approved by Queensland Urban Utilities Electrical Inspector.
3. Pre-FAT results to be approved by Queensland Urban Utilities Electrical Inspector at Pre-FAT (if present) or at the start of the FAT.
4. NCRs are to be generated by the Queensland Urban Utilities Electrical Inspector for all NCRs not resolved by the end of the test.


Contractor's Signature

Date 8/11/13
Company Name

J & P Richardson Industries

Company Electrical Licence No.

756

Queensland Urban Utilities Electrical Inspector

Date 9/11/13

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4.9 MANUFACTURERS TEST DATA & CERTIFICATES



TL101CIP LOGIC PANEL ROUTINE TEST SHEET

CUSTOMER: Stack PROJECT:
 WORK CENTER: 3002
 CUSTOMER ORDER No: CIRCUIT DESIGNATION:
 WORK ORDER No: PRO 00 25576 Date: 03/10/13

1. VERIFICATION OF OPTIONS AND SETTINGS. Circle Rating /or Setting of Option fitted.

TL101 PANEL and it's accessories

NOTE

Tick Item Checked

- 1) Standard assembly catalogue no. is **TL101CIP**. The panel size is 200x 280 mm..... ☒
- 2) If the assembly catalogue no. is **TL101CIPCOM** a 240/24VDC power supply pack
Need to be on the panel, and then panel size is 200x485mm..... ☒
- 3) If the controller to be used with TB1 BTS, an adopter cable **TLP2L1CABLE**
Is to be ORDERED with this test & and the controller to be tested with a TB1 BTS..... ☒

2. FUNCTIONAL TESTS.



Precaution

- 1) In any stage of the operation only **ONE MCCB** can be switched ON at a time.
- 2) The changeover operation is always switch OFF before switch ON the other MCCB

OFF- RESET MODE

- 1 In this mode the controller unit is disabled and does not perform any actions..... ☒ OK
- 2 Normal available display LED..... ☒ OK
- 3 Generator available display LED..... ☒ OK
- 4 NORMAL MCCB CLOSE/TRIP LED..... ☒ OK
- 5 GENERATOR MCCB CLOSE/TRIP LED..... ☒ OK
- 6 MODE DISPLAY LED'S..... ☒ OK
- 7 Line 1 Measurement data display Voltage /frequency
L1-L2, L2-L3, L1-L3, L1, L2, L3, Hz..... ☒ OK
- 8 Line 2 Measurement data display Voltage /frequency
L1-L2, L2-L3, L1-L3, L1,L2,L3, Hz..... ☒ OK

AUTOMATIC MODE

Three phase System voltage rated set at **415V +/- 10% (456 V max, 373min)**

- 1 Apply Normal supply source --- Normal MCCB close..... ☒ OK
- 2 Remove normal supply source --- Terminal 9 -10 is ON for start generator..... ☒ OK
- 3 Apply Generator supply source --- Normal MCCB OFF & GENERATOR MCCB ON..... ☒ OK
- 4 APPLY Normal and Generator source --- Generator MCCB OPEN and Normal
MCCB on Terminal 9 -10 is close circuit and LINE 2 display "COO"..... ☒ OK

Repeat above item 1-4, tested at **SYSTEM VOLTAGE 415V, 456VAC & 373VAC**

ALL OPERATIONS ARE SATISFACTORY ☒ OK

- 5 Confirm above delay changeover in between breaker time is around 6 SECONDS... ☒ OK
- 6 RAISE Normal power to 464VAC, LINE 1 available LED is still ON..... ☒ OK
- Lower Normal power below 350VAC, LINE 1 available LED is OFF..... ☒ OK
- RAISE Generator power to 464VAC, LINE 2 available LED is still ON..... ☒ OK
- Lower Generator power below 350VAC, LINE 2 available LED is OFF..... ☒ OK
- REVERSAL of any two phases for BOTH supply the available LED are OFF..... ☒ OK
- RED or BLUE phase failure. Available LED is OFF..... ☒ OK

**MANUAL MODE**

NOTE: In Manual mode, the breaker switchover by pressing the relevant push button only for a min of 0.3second, the OFF command is only accepted only when 1sec has elapsed from the end of previous switching and 3 second for ON command.

1. Press L1 ON/OFF button.

- | | | |
|---|---|--|
| a | Normal MCCB will switchover to OFF if it was ON status..... | <input checked="" type="checkbox"/> OK |
| b | Normal MCCB will switchover to ON if it was OFF status..... | <input checked="" type="checkbox"/> OK |
| c | GENERATOR MCCB will be SWITCHED OFF in the above operation..... | <input checked="" type="checkbox"/> OK |

2. Press L2 ON/OFF button

- | | | |
|---|--|--|
| a | Generator MCCB will switchover to OFF if it was ON status..... | <input checked="" type="checkbox"/> OK |
| b | Generator MCCB will switchover to ON if it was OFF status..... | <input checked="" type="checkbox"/> OK |
| c | NORMAL MCCB will be SWITCHED OFF in the above operation | <input checked="" type="checkbox"/> OK |

TEST MODE

1. NO LOAD TEST

- | | | |
|---|---|--|
| a | CHECK AND CONFIRM generator start signal on terminal 9-10 is ON when shifting to TEST mode..... | <input checked="" type="checkbox"/> OK |
| b | APPLY GENERATOR SUPPLY source, NO changeover takes place..... | <input checked="" type="checkbox"/> OK |

2. ON LOAD TEST

- | | | |
|---|--|--|
| a | Holding TEST button & L2 ON-OFF button for over 5 seconds, load will be shifted to Generator supply..... | <input checked="" type="checkbox"/> OK |
| b | L1 window display "TOL"..... | <input checked="" type="checkbox"/> OK |
| c | Remove Generator power will cause changeover to NORMAL MCCB..... | <input checked="" type="checkbox"/> OK |
| d | Apply Generator power again will cause changeover to Generator MCCB..... | <input checked="" type="checkbox"/> OK |
| e | Change Mode will cancel "TOL" Command..... | <input checked="" type="checkbox"/> OK |

LOCKOUT TEST

1. Change to AUTO MODE after Normal MCCB on, push NMCCB trip and confirm Trip LED is ON and the function as below:-

- | | | |
|---|---|--|
| a | NO changeover occur, L1 failure and L2 available..... | <input checked="" type="checkbox"/> OK |
| b | Change to MANUAL mode, reset MCCB | <input checked="" type="checkbox"/> OK |
| c | Change to OFF/RESET MODE. Reset LED alarm | <input checked="" type="checkbox"/> OK |
| d | Restore system AUTO mode..... | <input checked="" type="checkbox"/> OK |

2. Change to AUTO MODE after Generator MCCB on, push GMCCB trip and confirm Trip LED is ON and the function as below:-

- | | | |
|---|--|--|
| a | NO changeover occur, even L1 available..... | <input checked="" type="checkbox"/> OK |
| b | Change to MANUAL mode, reset GMCCB..... | <input checked="" type="checkbox"/> OK |
| c | Change to OFF/RESET MODE. Reset LED alarm..... | <input checked="" type="checkbox"/> OK |
| d | Restore system AUTO mode..... | <input checked="" type="checkbox"/> OK |

COMMENT:

TESTED BY:-

DATE 03 10 13

L:\Manufacturing Test Bay Docs\Approved test sheets\TEST SHEETS\LE0309132 TL101CIP Logic Panel Routine Test Sheet.docx

4.10 REQUIRED SERVICES

An electrical supply from the local supply authority and an electrical supply from a local generator is required for normal operation of the 'Mains Generator Changeover Switchboard'.

4.11 CONSTRUCTION & WORK METHOD STATEMENTS

Section A: DETAILS OF THE JOB AND/OR CONTRACT

J&P RICHARDSON INDUSTRIES PTY LTD
A.B.N. 23 001 952 325
114 Campbell Avenue, WACOL QLD 4076
Ph: (07) 3271 2911 - Fax: (07) 3271 3623
E-mail: jpr@jpr.com.au
SAFETY AND ENVIRONMENTAL PLAN

**Scope of Works:****Client:** Queensland Urban Utilities**Worksite address:** Carole Park STP, Oxley Creek STP, Sandgate STP & Wynnum STP**Contract No:** C1011-045-090**JPR Job No:** C71400
**Expected
Commencement
Date:** 14 / 10 / 2013

**Expected
Completion
Date:** 06 / 12 / 2013

Work to be Performed:

- Carole Park STP Generator Installation; &
- Oxley Creek, Sandgate & Wynnum STPs Blower Rooms Temperature Reduction

To be Provided by the Client or Others:*(Dial before you dig information, common plant etc)***Sub- Contractor:** *(Complete this Part if JPR have engaged a sub-contractor to perform work)***Company Name:** D & D Insulation & Sheet Metal**Contact Person:** David Pearson**Phone Number:** (07) 38129479**Company Name:** Adoni Constructions**Contact Person:** Soto Karamihas**Phone Number:** 0412760874**Company Name:****Contact Person:****Phone Number:****Key Personnel Approvals:** *(Who are the persons with authority to control the job & this part must be signed before being implemented)***Job Supervisor:** Rob Miotti**Signature:****Phone Number:** 0418763684**Date:** / / 20**Group Leader:** TBC**Signature:****Phone Number:****Date:** / / 20**JPR WHSA:** Paul Rogers**Signature:****Phone Number:** 0407645795**Date:** / / 20

Section B: EMERGENCY AND INCIDENT MANAGEMENT

All emergencies and incidents must be verbally reported as soon as possible after the event and followed up in writing by completing the appropriate form. The contacts and direction details in case of an emergency or injured worker for this worksite can be found in the site file (inside front cover)

Section C: ACTIVITIES TO BE PERFORMED AT THE WORKSITE Identify (✓ the box) the activities that will be conducted at this work-site**Part 1: High Risk Activities (Work Method Statements must be used for each high risk activity identified)**

No	✓	ACTIVITY	No	✓	ACTIVITY
1		Work where asbestos will be disturbed	2	✓	Work where there is the risk of falling more than 2 meters
3	✓	Work in or near a confined spaces	4		Work in or near a shaft / trench over 1.5m deep or a tunnel
5	✓	Working with or near moving powered mobile plant	6	✓	Work on or adjacent to a road or railway or other corridor that is in use by traffic other than pedestrians
7	✓	Work near an energised electrical installation or service (Non Electrical Work)	8	✓	Work on or near an energised electrical installation or service (Electrical Work)
9		Work in or near water or other liquid where there is a risk of drowning	10		Work on or near pressurised gas distribution main and consumer piping
11	✓	Work in an area where there are artificial extremes of temperature	12		Work in an area that may have a contaminated or flammable atmosphere
13		Work on or near a chemical, fuel or refrigerant line	14		Work on a Telecommunication Tower

Part 2: Other Activities (Refer to Section E of this document for the control measures to be installed)

No	✓	ACTIVITY	No	✓	ACTIVITY
15	✓	Using hazardous chemicals	16	✓	Working indoors
17	✓	Working outdoors	18	✓	Working where there is the risk of falling objects
19	✓	Work involving manual handling	20		Work on de-energised H.V. conductors and/or equipment
21	✓	Work on de-energised LV conductors and equipment	22		Perform HV switching
23	✓	Operate hand, power and/or air tools	24	✓	Winching and/or tensioning activities
25	✓	Working in cable jointing pits	26		Joining fibre optic cable
27	✓	Installation of cable tray or ladder and supports	28	✓	Installing or removing a switchboard or transformer
29	✓	Perform PLC testing in an energised LV switchboard or motor control centre using plug-in connectors	30	✓	Perform hot work (Grinding, Welding etc)
31	✓	Work while supervising apprentices	32	✓	Perform survey work or scope a job
33	✓	Working with declared pests and environmental issues	34	✓	Direct or indirect contact with biological hazards
35	✓	Work where there is a risk of falling up to 2 meters	36	✓	Work around excavations
37		Work in a remote or isolated location	38		
39			40		

Section D: HAZARDS ASSOCIATED WITH THIS CONSTRUCTION WORK: (Select the hazards by ✓ the box, if you are unsure contact the JPR Safety Dept)					
Part 1: DOCUMENTATION, CONSULTATION, COMMUNICATION and SUPERVISION					
Insufficient Documentation or Information	✓	Consultation or Communication	✓	Supervision	✓
Part 2: HAZARDS ASSOCIATED with ACTIVITIES					
Manual Handling	✓	Hazardous Substance	✓	Gravitation	✓
Excavations	✓	Confined Space	✓	Water	
Mobile Plant	✓	Power Tools or Equipment	✓	Traffic	✓
Electrical Energy	✓	Artificial Conditions		Pets and Animal Stock (e.g. Cattle)	
Optic Fibre		Worker Comfort	✓	General Public	
Hand Tools	✓	Isolation	✓		
Part 3: ENVIRONMENTAL HAZARDS					
Strom Water System		Land Degradation	✓	Soil Management	✓
Hazardous Substance	✓	Air Pollution		Flora and Fauna	✓
Noise Management	✓	Waste Management	✓	Declared Pests	✓
Atmospheric Conditions	✓	Natural Waterways			
Part 4: BIOLOGICAL HAZARDS					
Diseases	✓	Discarded and Used Sharps	✓		

Section E: ASSESSING THE RISK OF THE HAZARDS: *(Parts 1, 2, 3 and 4 of this Section must be referred to when completing this document)***Process:**

Step 1 – Identify the hazards (**refer to Section D**) that are known to exist with the scope of work being performed or occurring naturally at this site.

Step 2 - Delete the hazards that do not exist at this site when performing the activities (**refer to Section D for guidance**).

Step 3 - Identify the elements within the hazards that are known to exist with the activity being performed or occurring naturally at this site.

Step 4 - From the list of control measures recorded for each element identified delete those controls that are not applicable to this site.

Step 5 - Where the control measures listed for the activity are insufficient you can draft your own and include these into this document.

Step 6 – The level of risk that people will be exposed to from the hazard while at the site must now be assessed, this is a two (2) tier process

Tier 1 – The pre-determined maximum level of risk for each hazard (**this is shown as R1**), if you do not agree with the pre-determined level of risk, use the risk calculator (**Attached to the end of this Section**) and re-assess.

Tier 2 – Use the risk calculator to determine the remaining level of risk people will be exposed to when at this site after the control measures have been installed and record the result in the box provided (**this is shown as R2**).

Step 7 – Now that the remaining level of risk (**R2**) is known, refer to the Risk Calculator for the **action required** to be taken before the activity can be started.

Part 1: DOCUMENTATION, CONSULTATION, COMMUNICATION and SUPERVISION**Documentation or Information Provided****R1****6M**

Safe Work Method Statements shall be provided to workers for all designated High Risk Construction Activities

A copy of the JPR Safety and Procedures Manual must be onsite for workers to reference as required

Manufacturers installation or operators manual must be available for reference

Ensure a Job Safety Analysis (JSA) Booklet is available and provided to workers for compiling onsite for particular work areas within the worksite

Safety and Environmental Plan shall be compiled and be onsite while work is being performed

Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard

R2**1VL****Consultation or Communication****R1****6M**

The Supervisor must ensure that JPR workers comply with the requirements listed in the Employee Safety and Procedures Manual

The Supervisor must ensure that the content of the safety documents to be used onsite is discussed with the Group Leader before the job starts

The Group Leader must ensure that all workers onsite attend the daily toolbox meeting

The Group Leader must ensure that all workers onsite are involved in the development of the documents to be used at the site

The Group Leader must ensure that workers are aware that the task may require a permit to be obtained before the work starts

Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard

R2**1VL****Supervision****R1****10H**

The Group Leader must ensure all electrical and electrical linespersons apprentices are supervised in accordance with JPR procedure

The Group Leader must ensure all other apprentices used as safety observers are supervised in accordance with JPR procedure

The Group Leader must ensure that apprentice supervision for general work activities, other than electrical work or electrical linework should be as shown below

- Broad supervision is acceptable for 4th year apprentices (**Must be done by a Qualified Tradesperson**)
- Intermittent supervision is acceptable for 3rd year apprentices (**Can be done by a 4th year Apprentice or Qualified Tradesperson**)
- Direct supervision is required for all 1st and 2nd year apprentices (**Can be done by a 3rd or 4th year Apprentice or Qualified Tradesperson**)

The Group Leader shall monitor the action of all workers onsite and recommend any corrective action required to the job supervisor

The Group Leader shall ensure that all relevant site documents are completed before and during the work (if required)

Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard

R2**2L**

Part 2: HAZARDS ASSOCIATED with ACTIVITIES		
Manual Handling		R1 15H
General	JPR manual handling procedure to be adhered to at all times	
Restricted and/or Awkward work areas	Do not overreach or work with your back twisted for extended periods Move to a more suitable work area	
Lifting	Ensure the worker assesses the weight to be lifted is within the workers capacity to handle manually Whenever possible use team lifting practices Vary tasks to reduce exposure to lifting and bending Break bundles down into manageable amounts Heavy masses to be lifted by using mechanical aid	
Personal Protective Equipment	Wear suitable hand protection Wear suitable clothing to maintain working comfort	
Switchboards	The use of rollers, skates, turfor jacks and crow bars shall be in accordance with the Safe Work Procedure for installing or removing switchboards When installing or removing a switchboard manually it shall not be tilted more than 5° Floor surface shall be cleaned before attempting to move equipment into location Establish clear access to and around the work area Seek help or use mechanical aids to move heavy or awkward objects	
<i>Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard</i>		R2 3L
Hazardous Substance		R1 12H
General	Consult the Client for guidance on possible flammable substance or contaminance that may be encountered onsite Ensure that a current SDS for the substance is readily available before work starts Ensure contact details of emergency response providers is available onsite	
Use	Hazardous substances used following SDS requirements JPR Hazardous Substance Guide shall be referred to confirm whether a substance is hazardous and what action is required if exposure is experienced JPR procedure for the use of a hazardous substance shall be strictly adhered to Ensure work area is well ventilated	
Transport	Substances shall be secured during transport Substances shall be placed where their containers can't be damaged during transport	
Isolation	Identify the nearest isolation points before the job starts Obtain the service provider contact details if isolation is required Obtain the service provider isolation procedure before starting work on or in close proximity to the pipes	
Fire and Explosion	Ensure contact details of emergency response providers is available onsite A SWMS shall be developed when working in a contaminated or flammable atmosphere Define the marshalling area in the event of an evacuation	
Exclusion Zones	Implement an exclusion zone and clearly define the work area Define the work area and keep entry to the work area to the bare minimum	
Personal Protective Equipment	Ensure PPE required for the substance to be used is available and used onsite Personal washing facilities to be made available on site Wear the required PPE for the activity	
Environment	Ensure that the appropriate environmental controls are selected and installed (refer to Part 3 of this Section)	
<i>Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard</i>		R2 2L

Gravitation		R1	20A
General	Establish clear access to and around the work area Inspect surfaces for slipperiness before accessing and clean where required Check equipment and anchor point for security before work starts Visually examine overhead components for obvious defects		
Working at height	A SWMS shall be developed when working where there is the risk of falling more than 2 meters Install edge protection where a solid anchor point is not available		
Working from Ladders	Single and Extension ladders shall be correctly positioned and secured Fall arrest must be used when working from an extension ladder above 2m Double Sided Step Ladders shall only be used fully open and stays locked		
Exclusion or Drop Zones	Install an exclusion zone of 1.5m from the edges where a worker could fall A Safety Observer must be used to alert workers when an exclusion zone is encroached Define and maintain a drop zone and restrict access Entry to the drop zone shall be kept to a minimum		
Trips	Remove or define trip hazards around the work area		
Falling Objects	Raise and lower equipment and material in a controlled manner Secure tools, equipment and material with lanyards (where applicable) Use a hauling line and tool bag to manually raise or lower tools Maintain control of objects at all times		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	5M
Excavations		R1	12H
General	Ensure that the plant operator is experienced in excavating near underground services Barricade unattended excavations Required PPE shall be worn		
Locating services	Locate underground services before excavating		
Permits	Comply with work site Permit to Dig requirements		
Exclusion Zones	Entry to the exclusion zone shall be keep to a minimum when equipment is under tension		
Environment	Ensure that the appropriate environmental controls are selected and installed (refer to Part 3 of this Section)		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	2L
Confined Spaces		R1	20A
General	A SWMS shall be developed when working in or near a confined space Entry is restricted to competent and authorized persons		
Safety Observer	Competent safety observer shall be assigned to remain outside and in close proximity to the confined space entrance Safety Observer shall be in communication with the workers in the space		
Monitoring	Monitor the space for oxygen deficiencies and contaminants		
Plant use	Do not use petrol engines near or in confined spaces		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	5M

Water (Pipes, Ponds, Dams or Rivers and Creeks)		R1	10H
General	A SWMS shall be developed when working near water or another liquid where there is a risk of drowning		
Isolation	Identify the nearest isolation points before the job starts when working near live water pipes and mains		
Personal Protective Equipment	Use the appropriate PPE considered necessary (<i>flotation devices</i>)		
Environment	Ensure that the appropriate environmental controls are selected and installed (refer to Part 3 of this Section)		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	2L
Mobile Plant		R1	20A
General	A SWMS shall be developed when working with or near mobile plant Comply with the manufacturers, industry and site specific requirements Operators manual must be available for reference Check site for hazards prior to setting up and operating mobile plant Ensure the Mobile Plant has been maintained in accordance with the manufacturers specifications		
Inspections	Perform a Safety Check of the plant before using on site Perform a daily pre start inspection of mobile plant to be used on site Check that the vehicle is in a serviceable condition (Tyres, Lights etc) Perform the pre-use maintenance checks (Check all fluids)		
Instability	Use the necessary dunnage to ensure stability Ensure the vehicle is not loaded in such a way that it will become unstable The EWP must not be operated in wind speeds in excess of 45 km/h. Where any additional sail area is added to the EWP basket the max wind speed the EWP can operate in must be reduced accordingly Check with Site WHSA or Supervisor who can check the Brisbane Airport wind speed.		
Crush or Pinch	Identify potential crush or pinch areas with the particular item of plant Inform all workers to keep clear of the crush or pinch areas while the plant is operating		
Operator	Ensure the operator has a current license (where mandatory) for the mobile plant Ensure the operator is competent to operate the mobile plant where a license is not required Ensure the worker is licenced to drive that class of vehicle Ensure the worker is familiar with the operation of the mobile plant		
Registration	Ensure the plant is registered (if applicable)		
Exclusion Zones	Define and Maintain an exclusion zones around the mobile plant when in use		
Safety Observer	Safety Observer must be in communication and in clear view of the driver/operator Competent safety observer to be engaged if electrical exclusion zones could be encroached The mobile plant shall not be driven in reverse on site unless a safety observer is used		
(The use of an apprentice in the first 12months of service as a safety observer must be assessed and approved by the Electrical Safety Manager)			
Disturbing the neighbours	Neighbouring residents should be informed if an activity could cause excessive noise Neighbouring residents must be informed if any work is to be conducted outside the nominated working hours Locate equipment such as generators and compressors away from neighbours where possible		
Environmental	Ensure that the appropriate environmental controls are selected and installed (refer to Part 3 of this Section)		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	5M

Power and Hand Tools or Equipment		R1	20A
General	All equipment to be used on site shall comply with legislation and standards Operators manual must be available for reference		
Operation	Tools and equipment shall be operated by a competent person Rotate workers using equipment that causes vibrations to limit exposure to this risk The exhaust from equipment must be directed away from all workers including the operator		
Safety Features	Tools must have all handles and guards fitted as supplied by the manufacturer Tools must be fitted with a dead man or quick release trigger		
Inspections	Equipment must be undergo a safety inspection before use All tools shall undergo a pre-use check Tools and equipment shall be fit for purpose, maintained in a serviceable condition, be in current test Defective tools shall be tagged "out of service" and removed from the work site		
Winching	Powered winch shall only be operated by competent persons Personal to remain clear of the operating zone or winch rope when under tension Equipment matched to conductor or cable and the SWL shall not be exceeded Exclusion zone to be defined and maintained while the winching operation is in process		
Electrical Energy	Refer to Electrical Energy for the control necessary to minimise the risk of this hazard		
Hydraulic Energy	Power source for the hydraulic equipment shall be compatible with the equipment Gloves should be worn when using hydraulic powered equipment to compensate for the heat generated		
Hot Work	Ventilate work area and/or extract welding fumes Establish safe work zone around/under hot work area including removing all flammable material or substances Obtain a "Hot Work Permit" before starting the activity at a construction site Follow the requirements of the Hot Work Permit Ensure a serviceable fire extinguisher is close to the work area Use a safety observer to watch for and extinguish spot fires When cutting and drilling wear medium impact safety glasses		
Changing Consumables	Power and Air tools shall be isolated from the energy supply before changing discs, bits or blades		
Crush or Pinch	Identify potential crush or pinch areas with the particular item of equipment Inform all workers to keep clear of the crush or pinch areas while the equipment is being used		
Projectiles	Define and maintain an exclusion zone during the activity Perform a pre-use inspection of all equipment to ensure they are fit for purpose Required PPE shall be worn at all times		
Instability	Position equipment to be used on a stable surface All equipment to be used on site shall be assessed for suitability and serviceability Equipment maintained in a serviceable condition Ladders shall only be used on a stable surface		
Airborne Particles created	Required PPE shall be worn Use in a well ventilated area Wear a face shield or medium impact safety glasses		
Environmental	Ensure that the appropriate environmental controls are selected and installed (refer to Part 3 of this Section)		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	5M

Traffic		R1	20A
General	A SWMS shall be developed when working on or near a road or railway Traffic management shall be in accordance with company procedures		
Traffic Plans	Ensure the Guidance Scheme or Management Plan complies with the MUTCD Ensure traffic control is in accordance with the Guidance Scheme or Plan		
Traffic Controllers	Ensure traffic controllers are appropriately licensed		
Signage	Install traffic control devices to define the work area Ensure traffic control signs are regularly checked to ensure they are still visible to traffic Install signage to direct pedestrians around the worksite		
Install devices	Install screens to prevent people from welding flashes Devices shall be installed in accordance with the MUTCD		
Pedestrians	Control pedestrian movement through or around the work area		
Personal Protective Clothing	Wear high visibility clothing Wear high visibility clothing with reflective stripes when working at night		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	5M
Electrical Energy		R1	20A
General	A SWMS shall be developed when working on or near an energised electrical installation or service Ensure emergency contact details are available onsite Live Low Voltage risk assessment completed Comply with JPR Live Low Voltage work procedures Work performed by licensed electrical workers or adequately supervised electrical apprentices		
Isolation of Supply	Positively identify the equipment to be isolated Isolation, tag and lockout procedures carried out in accordance with JPR and Customer procedures Workers to be briefed on the isolation method to be used Adjacent exposed live components shall be identified and isolated or insulated		
Exclusion Zone	Exclusion zone clearances to be maintained for unauthorised persons or plant		
Safety Observer	Safety observer to be in control of the site where exclusion zones are in place		
Test	Test before you touch to prove de-energised		
Tools and Equipment	Ensure a maintained first aid kit is available onsite Ensure an in test rescue kit is available when working live All test equipment, tools and working earths to be in current test All electrical extension leads and tools shall be used through an RCD (not required when attached to a generator with floating secondary winding) Electrical extension leads shall not be placed on the ground or floor surface when in use Devices used to support extension leads shall be non-conductive and not cause damage to the lead		
Personal Protective Equipment	Required PPE shall be worn and be in current test		
Apprentices	Only 3 rd and 4 th year electrical apprentices shall be exposed to live electrical work under direct supervision		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	5M

Atmospheric Conditions		R1	15H
Poor Natural Light	Use extra lighting to improve visibility Reschedule task to another time		
UV Radiation	Long clothing shall be worn Utilized wide brim head protection or sun screen and eye protection Use 30+ SPF Sun Screen on exposed skin areas		
Inclement Weather	Wear suitable clothing to maintain working comfort Do not work outdoors when a thunder storm is overhead and a lightning strike is possible		
Personal Protective Equipment	Wear suitable clothing to maintain working comfort Monitor alertness and dexterity of other workers on site		
<i>Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard</i>		R2	3L
Worker Comfort		R1	12H
Air Flow	Use mechanical ventilation to ensure adequate air flow when required		
Fatigue	Take periodic rest breaks to maintain alertness Driving times shall be in accordance with the "Driver Fatigue Management Legislation" Monitor alertness and dexterity of the driver		
Dehydration	Maintain an adequate intake of fluids to prevent dehydration Drink sufficient cooling or warming fluids		
Personal Protective Equipment	Wear suitable clothing to maintain working comfort Monitor alertness and dexterity of other workers on site		
<i>Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard</i>		R2	2L
Part 3: ENVIRONMENTAL HAZARDS			
Insufficient Environment Documentation or Information Provided		R1	20A
Confirm with the Client if there are environmental issues known to be at the site Ensure a copy of Section 4 of the Employee Procedures Manual is available for reference at the site			
<i>Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard</i>		R2	4L
Land Degradation		R1	12H
House keeping	Good housekeeping practices shall be maintained at all times Define a location (clear of the work area) onsite to store all material and equipment No material shall be stored under the drip line of a tree The work site should be left clean and tidy with any debris associated with work cleaned up, removed and disposed off		
Vehicle operation causing damage	Assess the area to ascertain if suitable for vehicle operation Where possible restrict vehicle operation onsite to minimise damage Substitute the vehicle with another that will not cause as much damage Fill in wheel ruts with topsoil and compact moderately		
<i>Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard</i>		R2	2L

Soil Management		R1	12H
Water from site	Water runoff from site should be diverted away from drains and natural water ways If contaminated ground water is pumped away from the worksite it must be discharged to a non sensitive location		
Spoil entering a natural water way	Use sediment control devices, such as sediment fence and hay bales etc, to prevent contamination of natural water ways		
Spoil entering the storm water system	Use sediment control devices, such as sand bags and filter rolls etc, to prevent contamination of drains		
Existing Contaminated Soil	If contaminated soil is exposed work shall cease immediately. JPR supervisor shall be notified, who in turn will notify the client representative Site will then be assessed and a suitable excavation onsite to dispose of the contaminated soil will be decided upon A suitable capping material will be used to seal all exposed contaminated soil No soil is to be removed from site		
Stockpiling of fill	Soil should be stockpiled away from drainage lines, storm water drains, roads, pavements or other areas where it may be eroded and transported by the elements Stockpiles should be covered to prevent erosion by wind or water (when practical) Sediment fence to be erected around the stockpile		
Erosion by inclement weather	Ensure adequate compaction of all disturbed soil this will decrease the potential for slumping of the trench line and reduce the risk of erosion Re-vegetation must be conducted as soon as possible after works have been completed Ensure re-vegetation is well watered after planting		
Soil contamination	Spill kits of adequate size to contain any potential spill must be available on site at all times Substances stored in a bunded area Do not transport soil from one area to another for reuse unless the soil has been tested for contamination		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	2L
Hazardous Substance		R1	12H
Substance spilt	Spill kits of adequate size to contain any potential spill must be available on site at all times Notify the Principal Contractor or Client when a spill has occurred Minimum quantity to be stored onsite		
Accidental release	Notify the job supervisor immediately who will take control of the rectification process If possible take action to prevent further release Evacuate the worksite if a risk to health and safety exists		
Stored on site	Substances stored in a bunded area Ensure adequate bunding is available onsite (if required) Substances to be stored in a shaded area Substance to be stored in accordance with JPR Procedure (refer to Employee Procedure Manual – Section 10) Storage shall be in accordance with the SDS requirements		
Disposal	Disposal shall be in accordance with the SDS Containers to be disposed in accordance with JPR Procedure (refer to Employee Procedure Manual – Section 10) Must be disposed of at an approved facility		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	2L

Air Pollution		R1	8M
Dust	Restrict vehicle and mobile plant movement onsite to a minimum whenever possible Eye protection shall be worn Wear respiratory protection When drilling masonry use P2 dust mask		
Plant emissions	Ensure plant emissions are directed away from workers Do not use emission producing plant in or near a trench or excavation Do not use emission producing plant in a confined space or near the entrance to a confined space Ensure that vehicles and any other engine driven equipment are maintained to manufacturer's specifications Ensure that exhaust fume do not enter manholes, pits, tunnels or confined spaces		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	2L
Flora and Fauna		R1	4L
General	Seek information from the Client to confirm if endangered species are present at the site No material shall be stored under the drip line of a tree		
Animals	Follow the directions given in the company Environmental Management Guide for possible endangered animals in JPR work locations		
Birds	Follow the directions given in the company Environmental Management Guide for possible endangered birds in JPR work locations		
Reptiles and Spiders	Check the work area for dangerous native wild life (snakes and spiders etc) and have removed by a professional if required		
Plants	Follow the directions given in the company Environmental Management Guide for possible endangered plants at JPR work locations		
Tree/s need to be removed	Where possible realign the work path to alleviate the need to remove trees Seek written permission from the Client or Local Authority before any tree is removed		
Shrub/s need to be removed	Where possible realign the work path to alleviate the need to remove shrubs Advise the Client or Local Authority before any shrub is removed		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	1VL
Noise Management		R1	3L
General	Wear appropriate hearing protection Activities creating noise should be performed during daylight hours		
Mobile plant onsite	Restrict vehicle and mobile plant movement onsite to a minimum whenever possible Any mobile plant that creates noise should only be run when needed and not left running continuously Ensure that all mobile plant with noise attenuation devices are maintained and kept in a fit for purpose condition		
Vibrations	Rotate the task between workers when using equipment that create vibrations Any equipment that creates vibrations should be run only when needed and not left running continuously The use should be kept to short periods whenever possible Operators should take regular breaks away from the vibration source		
Portable equipment in use	Reduce the noise level at the work area by shifting the noise source Ensure that all equipment supplied with noise attenuation devices are maintained and kept in a fit for purpose condition		
Powered hand tools in use	Required PPE shall be worn where required Where possible substitute the power tool with another with a lower operating noise level		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	1VL

Waste Management		R1	4L
Solid waste	Ensure solid waste is placed in bins or at the waste storage location Install a containment fence around the waste storage area to prevent spreading by the elements Solid waste shall be transported to a suitable landfill for disposal		
Liquid waste	Shall be stored in approved containers Disposal shall be at an approved facility Concrete agitators shall empty their liquid waste into the skip provided at the worksite A suction vehicle is available to collect any liquid waste when required		
Hazardous substance waste	Disposal shall be in accordance with the SDS requirements Disposal shall be at an approved facility		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	1VL
Declared Pests		R1	16H
General	Seek information from the Property Owner to confirm if declared pests or weeds are present at the site Follow the requirements of the company DPI approved procedure when dealing with declared pests or weeds Do not transport soil from one area to another for reuse unless the soil has been tested for contamination All earthmoving equipment entering the worksite shall be inspected to ensure it is free of pests All plant leaving a contaminated worksite shall be cleaned before leaving site A clean up pad shall be established in close proximity to the entry gate of a contaminated site. (if practical)		
Fire Ants	Obtain a permit from the DPI to excavate more than 1m ³ in a restricted area Ensure the permit remains current (lasts 28 days) while the excavation work is being performed All plant used to transport or move soil shall be inspected prior to entering the site to ensure it is free of pests All plant used to transport or move soil shall be inspected when leaving the site to ensure it is free of pests		
Weeds	Restrict vehicle movement onto the site If the site requires slashing the mowing contractor shall walk the worksite and clearly mark the location of the weeds Define the location of declared weeds at the site and these marked areas shall be considered exclusion zones for all traffic onsite		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	4L
Part 4: BIOLOGICAL			
Diseases		R1	20A
Vaccinations	Ensure the employee vaccinations are current for the identified hazards		
Personal Protective Equipment	Appropriate PPE available at the work area and worn where required Personal washing facilities to be available at the work site		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	5M
Discarded and Used Sharps		R1	20A
General	Check the site for evidence of discarded sharps before work starts		
Personal Protective Equipment	When handling discarded sharps wear rubber gloves Wear a full face shield if the sharps contain fluid		
Use the risk calculator to re-asses the level of risk (R2) remaining now that control measures have been selected and/or developed to control this hazard		R2	5M

RISK CALCULATION; The **Consequences** have been rated in Levels 0 to 5, the lower the number the lower the risk level and **Likelihood** has been categorised in Level 1 to 6 also. The risk rate is determined by multiplying the Level No. X the Category No. e.g. **Level 2 X Category 3 = 6** which is a **moderate** risk.

Note: Once the consequence level is selected, the likelihood within that level of the consequence happening before and after the controls are installed must be calculated.

The consequence levels of 1 and 0 are the only levels that can be combined unless the hazard has been removed from the work area then the consequence will change.

When assessing electricity, the Consequence will always be Catastrophic but the Likelihood of it happening will change when controls are installed.

LIKELIHOOD How likely will it happen?	Category	CONSEQUENCES (How severe the injury, loss or damage will be if it happens)?					
		CATASTROPHIC <i>Fatalities or long term Environmental Impact Financial Loss >\$10M</i>	MAJOR <i>Extensive injuries and/or long term Environmental Impact Financial Loss >\$1M</i>	MODERATE <i>Medical treatment or Environmental Impact rectified with outside help Financial Loss >\$100K</i>	MINOR <i>First aid treatment or Environmental Impact easily rectified Financial Loss >\$10K</i>	INSIGNIFICANT <i>Action required to minimise the risk of Incidents or environment impact Financial loss < \$10K</i>	NEGLIGIBLE <i>No impact upon objectives or outcomes, No incidents or Environmental Impact</i>
		Level 5 Risk	Level 4 Risk	Level 3 Risk	Level 2 Risk	Level 1 Risk	Level 0 Risk
ALMOST CERTAIN <i>Is expected to happen</i>	6	30-A	24-A	18-A	12-H	6-M	0-VL
LIKELY <i>Will occur in most cases</i>	5	25-A	20-A	15-H	10-H	5-M	
POSSIBLE <i>May occur at sometime</i>	4	20-A	16-H	12-H	8-M	4-L	
UNLIKELY <i>Might happen at sometime</i>	3	15-H	12-H	9-M	6-M	3-L	
RARE <i>May occur only in exceptional circumstances</i>	2	10-H	8-M	6-M	4-L	2-L	
VERY RARE <i>Not expected to happen</i>	1	5-M	4-L	3-L	2-L	1-VL	
DETERMINE THE ACTION REQUIRED							
RISK RATE	ACTION REQUIRED						
0-1 = VERY LOW (VL)	NO ACTION REQUIRED – Reassess if an incident of any nature occurs where objectives or outcomes can’t be achieved						
2-4 = LOW (L)	OK FOR NOW – Monitor and review when performing task/s						
5-9 = MODERATE (M)	FOLLOW COMPANY PROCEDURES						
10-16 = HIGH (H)	SAFETY MANAGEMENT DECISION – Required urgently Safety refer to WH&S Manager, Electrical refer to Electrical Safety Manager						
18-30 = ACUTE (A)	URGENT – Stop the Task or Activity and make safe. Senior Management decision required before the Task or Activity can recommence.						

Section F: SITE SPECIFIC REQUIREMENTS (Signage, PPE, Common Plant, Competencies, Tools and Equipment Etc)							
CONSULTATION REQUIREMENTS (Place a ✓ in the box and/or describe as appropriate, 'E' evidence is required)							
Construction Industry Induction	E	JPR Site Specific Induction	✓	Client Site Specific Induction	✓	Daily Pre-start Tool Box Meeting	✓
Other:							
SITE SIGNAGE (Tick ✓ the box to indicate the signs required at this site)							
JPR Principal Contractor	✓	Vehicle Parking Area		Fire Extinguisher		Eye Protection	✓
Construction Site	✓	Deep Excavation		First Aid		Hearing Protection	
Visitors Report to Site Office		Moving Machinery		Safety Footwear	✓	Hard Hat	✓
Authorised Entry Only		Workers Above		High Visibility Clothing	✓		
Emergency Assembly Point		Spill Kit		Confined Space			
PPE REQUIRED TO BE WORN AND/OR USED AT THIS SITE							
Part 1: Mandatory (Tick ✓ the box for mandatory; 'U' use as required)							
High Visibility Clothing	✓	Lace-up Safety Footwear		Fall Arrest	U	Sun Screen	U
Long Pants & Long Sleeves	✓	Safety Glasses (Medium impact rated)	U	Flotation Device		Insect Repellent	U
Safety Helmet (Hard Hat)	✓	Safety Glasses (UV & Medium impact rated)	U	Hand Protection	U		
Sun Brim for Hard Hat	✓	Full Face Shield	U	Gas Monitoring Equipment	U		
Safety Footwear (any)	✓	Hearing Protection	U	P2 Dust Masks	U		
Part 2: Additional Personal Protective Equipment (Record what additional PPE is required for this site)							
COMMON PLANT AND AMENITIES TO BE USED AND/OR AVAILABLE ONSITE (Tick ✓ the box for mandatory; 'U' use as required)							
First Aid Kit	✓	Temporary Fencing	✓	Plastic Sheeting to cover ASS		Yellow/Black Striped Tape (reflective)	
Scaffolding		Orange Para fencing	✓	Site Office		Yellow/Black Striped Safety Tape	
Ladders	✓	Star-pickets and caps	✓	Portable Toilet	✓	Substance Bunding	
Formwork	✓	Witches Hats		Shaded area for rest breaks			
Mobile Generator	✓	Edge Protection		Rubbish Bins with fitted lids			
Mobile Welder		Silt containment fence		Mini Skip			
Flashing Lights		Silt Socks		Site Container			

LICENCES & COMPETENCIES REQUIRED TO PERFORM THE SELECTED ACTIVITIES**Part 1 – Licence required to construct, perform, operate or enter** (Tick ✓ the box where required; S-C = Sub Contractor)

Required for	JPR	S-C	Required for	JPR	S-C
Enter a Confined Space	✓		Operate a Fork Lift (Not required for pedestrian operated)		
Operate a Mobile Elevating Work Platform over 11m boom length	✓		Operate an Excavator (With an engine capacity of more than 2L)		✓
Operate a Vehicle Loading Crane over 10m/t lifting capacity.	✓		Operate a Skid Steer Loader (With an engine capacity of more than 2L)		✓
Drive a Heavy Vehicle (Record the minimum required) HC, HR, MR, LR	MR ✓		Operate a Backhoe (With an engine capacity of more than 2L)		✓
Construct Scaffold over 4m high			Perform Dogger activities	✓	
Electrical Tradesperson	✓				
Electrical Linesperson					

Part 2 – Competency required to construct, perform, operate or enter (Tick ✓ the box where required; S-C = Sub Contractor)

Required for	JPR	S-C	Required for	JPR	S-C
Working at Heights			Construct Scaffold under 4m high		
Operate a Mobile Elevating Work Platform under 11m boom length			Operate a Vehicle Loading Crane under 10m/t lifting capacity.		
Installing temporary edge protection					

Part 3 – Competent Safety Observer (Tick ✓ the box where required; S-C = Sub Contractor)

Required for	JPR	S-C	Required for	JPR	S-C
Performing Live Electrical work	✓		Work being performed in a Confined Space	✓	
Working at heights from a Mobile Elevating Work Platform	✓		Working in close proximity to Mobile Plant	✓	✓

Q-Pulse Id: TMS592

Section G: SITE RULES**Part 1: Mandatory Site Rules** (Tick ✓ the box to indicate the rules that are mandatory at this site)

All workers must show evidence of General Construction Induction	✓
All workers must be site inducted and attend the daily pre-start toolbox meeting	✓
Alcohol or Illegal drugs are not permitted onsite	✓
The Group Leader shall conduct a daily toolbox meeting to allocate tasks and discuss any necessary changes to the site documents	✓
The controls detailed in this Safety and Environmental Plan shall be discussed/referred to at the daily pre-start toolbox meetings	✓
A copy of this Safety and Environmental Plan shall be onsite at all times while work is being performed	✓
The Group Leader in consultation with the Workers shall compile a daily pre-start JSA	✓
The Group Leader shall discuss with all workers onsite of any changes required to minimize risks identified in the daily pre-start JSA	✓
All workers must be familiar with the contents of their employers safety documents used at this worksite	✓
The Group Leader shall ensure that all workers are to be consulted in the development of SWMS to be used onsite	✓
JPR Group Leader must confirm the controls are used effectively at least daily and when tasks change	✓
The Group Leader shall ensure that all mobile plant used onsite is checked daily by a competent person before use	✓
Common Plant installed onsite shall not be tampered with	✓
PPE listed in Section F must be worn as instructed	✓
Defective Plant shall be tagged “out of service” and not used	✓

Part 2: Additional Site Specific Rules (Tick ✓ the box to indicate the rules that are to be followed at this site)

All workers must sign the acknowledgement form/s	✓
Vehicles must park in allotted areas	✓
Visitors must report to the Site Office	✓
All hired mobile plant brought onto site must undergo a safety inspection before use	✓
The Supervisor and Group Leader shall liaise with the client and other Contractors where work areas overlap	✓
Sub-contractor documentation shall be approved by a JPR Safety staff member before work is permitted to proceed	✓
Traffic Management used at this site shall be checked by the Group Leader to ensure it is in accordance with the Plan, Guidance Schedule or Company Procedure	✓
Signage for Traffic Control shall be checked every 3 hours to ensure it is still visible to the oncoming traffic	✓
JPR Safety Section will periodically conduct inspections of this site	Frequency: WEEKLY ✓
The Job Supervisor shall perform a Safety and Environmental check to ensure the necessary controls have been installed (Use Form F1260)	✓

Section H: CONFIRMATION OF SITE SAFETY BY THE GROUP LEADER (✓ the box)	
Part 1: Before the job starts <i>(The Group Leader must complete this Section before the job starts)</i>	
The Group Leader confirms that the Job Supervisor has completed Sections A to F before the work starts	
The Group Leader confirms that the requirements listed in Sections A to J have be acted upon and will be adhered to at all times	
The Group Leader confirms that a pre-start tool box meeting will be conducted to discuss the contents of this Safety and Environmental Plan	
The Group Leader confirms that all workers at the worksite have received a General Construction Induction and has supporting evidence <i>(have their induction card onsite)</i>	
The Group Leader confirms that all workers onsite will be advised of the requirements of this Safety and Environmental Plan	
The Group Leader confirms that all workers onsite have signed the acknowledgement section of this Safety and Environmental Plan (refer to Section I)	
Part 2: Before work starts <i>(The Group Leader must complete this Section before work at the site starts and act upon these points at the daily tool box meeting)</i>	
The Group Leader confirms that a pre-start tool box meeting will be conducted to consult and advise workers if this Safety and Environmental Plan is changed	
The Group Leader confirms that a JSA will be compiled in consultation with all workers using the JSA for the particular work area	
The Group Leader confirms that all workers will sign the daily tool box meeting form and the JSA in use at the particular work area	
The Group Leader confirms that the SWMS's in use at this site are reviewed at the daily toolbox meeting and any changes are noted in the appropriate JSA's	
The Group Leader confirms that the control measures listed in Section E are installed and used effectively	
The Group Leader confirms that all hired plant to be used onsite will be subjected to a safety inspection (use Form F1275) before use	
The Group Leader confirms that all mobile plant used onsite is checked by a competent person before use	
The Group Leader confirms that all workers at the worksite have received a Site Specific Induction	
Part 3: Signatures to confirm compliance <i>(The Job Supervisor and the Group Leader must sign where indicated)</i>	
Directions	Signatures
The Group Leader must sign to confirm that the requirements of Part 1 and 2 of this section have been acted upon as directed	
The Job Supervisor must sign to confirm that the requirements of Part 1 and 2 of this section have been acted upon by the Group Leader	

Section I: REFERENCE MATERIAL *(Reference material must be used then developing a SWMS)***Part 1 – Acts**

Work Health & Safety Act - 2011	Electrical Safety Act - 2002	Vegetation Management Amendment Act - 2008
Environmental Protection Act - 1994	Mining and Quarrying Safety and Health Act - 1999	Land Protection (Pest and Stock Route Management) Act - 2002
Land Act - 1994	Building Act - 1975	Transport Operations (Road Use Management) Act - 1995
Nature Conversation Act - 1992	Vegetation Management Act - 1999	Plant Protection Act - 1989

Part 2 - Regulations

Work Health & Safety Regulations - 2011	Mining and Quarrying Safety and Health Regulation - 2001
Environmental Protection Regulations - 2008	Transport Operations (Road Use Management – Vehicle Standards and Safety) Regulations - 2010
Traffic Regulations - 1962	Transport Operations (Mass, Dimensions and Loading) Regulation - 2005
Fatigue Management Regulations - 2008	Transport Operations (Road Use Management – Dangerous Goods) Regulation - 2000
Electrical Safety Regulations - 2002	Transport Operations (Road Use Management – Road Rules) Regulations - 2009

Part 3 – Codes of Practice

Electrical Safety Code of Practice – Electrical Work - 2010	Code of Practice – How to manage Work Health and Safety Risks - 2011
Electrical Safety Code of Practice – Works - 2010	Code of Practice – Traffic Management for Construction or Maintenance Work - 2012
Code of Practice – Hazardous Chemicals - 2003	Code of Practice – Management and control of Asbestos at the Workplace - 2005
Code of Practice – First Aid - 2004	Code of Practice – Managing Noise and Preventing Hearing Loss at Work - 2004
Code of Practice – Scaffolding - 2009	Code of Practice – Prevention of Workplace Harassment - 2004
Code of Practice – Plant - 2005	Electrical Safety Code of Practice – Risk Management - 2010
Code of Practice – Hazardous Manual Tasks - 2011	Electrical Safety Code of Practice – Working Near Exposed Live Parts - 2010
Code of Practice – Mobile Crane - 2006	Code of Practice – How to Safely Remove Asbestos - 2011
Code of Practice – Confined Space - 2011	Code of Practice – Managing the Risk of Falls at Workplaces - 2011
Code of Practice – Induction for Construction Work - 2007	

Part 4 - Standards

AS/NZS 4801 OH&S Management	AS2550.11 – Vehicle Loading Cranes Safe Use
AS2550.10 – Elevating Work Platform Safe Use	AS/NZS 4836 – Safe Working On or Near Low Voltage Electrical Installations and Equipment
AS/NZS ISO 14001 Environmental Management	

Part 5 - Manuals

HSE Management System Manual	Employee Safety & Procedures Manual	Manual of Uniform Traffic Control Devices - 2010
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Section J: ACKNOWLEDGEMENT – *GL = Group Leader, T = Tradesperson, A = Apprentice, SO = Safety Observer, SC = Sub-Contractor, JS = Job Supervisor*

[illegible]

4.12 QUALITY ASSURANCE RECORDS



Lic No. 756

J. & P. RICHARDSON INDUSTRIES PTY. LTD.

A.B.N. 23 001 952 325

114 CAMPBELL AVENUE, WACOL, BRISBANE, QLD. 4076
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INDUSTRIAL - COMMERCIAL - MINING

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- PUMPING EQUIPMENT MECHANICAL SERVICE & REPAIRS
- SHEETMETAL FABRICATION

BRANCHES

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PH: (07) 3868 3535

IPSWICH
PH: (07) 3281 1399

TOOWOOMBA
PH: (07) 4634 3800

GOLD COAST
PH: (07) 5591 6340

SUNSHINE COAST
PH: (07) 5476 5133

CHINCHILLA
PH: (07) 4662 7452

YATALA
PH: (07) 3386 1355

Letter Ref: rb0080
Job Ref: C71400

Queensland Urban Utilities
15 Green Square Close
Fortitude Valley, QLD, 4006

21st November 2013

Certificate of Compliance **Carole Park Waste Water Treatment Plant** **Main Switchboard and Changeover Panel**

Please be advised the above mentioned switchboard and its containing equipment has been manufacture and installed as per our offer and drawings set 486/5/5-0250set_B.

All applicable work was carried out to AS3000:2007 and has been tested in accordance with the prescribed procedure and that such work complies in every respect with the requirement of the electrical safety regulation 2002.

Should you require further information or clarification please do not hesitate in contacting the undersigned.

Yours faithfully,
J & P Richardson Industries Pty Ltd

Roland Barrett
Project Manager



Volume 5 Design Reports, Appropriate Records & Appendices

VOLUME 5 DESIGN REPORTS, APPROPRIATE RECORDS & APPENDICES

5.1 DESIGN DETAILS

JPR will conduct non-intrusive site investigations of the existing main switchboard and associated distribution boards to gather data for a comprehensive switchboard design. Additionally, JPR will trace out the existing cables and mark them in preparation for the switchboard changeovers.

Upon receipt of the site investigation data, our switchboard designers will produce a 'For Approval' suite of drawings for the new switchboard. The drawings will be produced in AutoCAD on the QUU D&C Title Block and to QUU's drafting standards. The drawing suite for each switchboard will consist of,

- Single Line Diagrams
- Wiring Schematics
- General Arrangements and Construction Details
- Equipment Schedules

During this design period, our switchboard designers will be in communication with equipment suppliers to ensure availability and viability of equipment for the manufacture of the switchboards.

To ensure the electrical design is fully compliant with legislative requirements, JPR will produce a design and power system analysis report detailing compliance of the electrical scope of works, to accompany the design. The report will include detail on protection device settings and coordination.

JPR's Registered Practicing Engineer(s) of Queensland (RPEQ) will review and certify the 'For Approval' drawings. Each switchboards drawing suite will be forwarded to QUU for their review and approval.

The switchboard would be designed to be constructed from 3mm Aluminium, Powdercoated, on a 75mm Steel powdercoated plinth. The Normal Supply switch will be 1250A, suitable to withstand a fault level of 25kA for 1 second. The Generator Supply switch will be a 630A wound down to 400A.

The Switchboard will consist of:

- 1250A Main Isolator,
- Supply Authority CT Section,
- 1250A/ 630A Automatic Changeover Main Switches and
- ATS Control Panel.

The existing PLC and SCADA system will be modified to include monitoring of the generator status. The following signals will be provided and displayed on the SCADA system:

- Generator remote mode
- Generator local mode
- Generator running
- Generator fault status
- Fuel tank low level
- Fuel tank analogue level

This will include trending of analogue levels and generator fault alarms.

The generator start/stop sequence will be controlled by the ATS. The PLC modifications will not include a staged loading/unloading sequence for generator changeover and the existing SCADA license will not be changed. The existing plant functional specification will be modified to reflect these changes.

5.2 DESIGN CRITERIA

LV DESIGN CALCULATIONS

Developed By



J. & P. RICHARDSON INDUSTRIES PTY LTD
114 CAMPBELL AVENUE
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Ph (07) 3271 2911
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Document Revision History

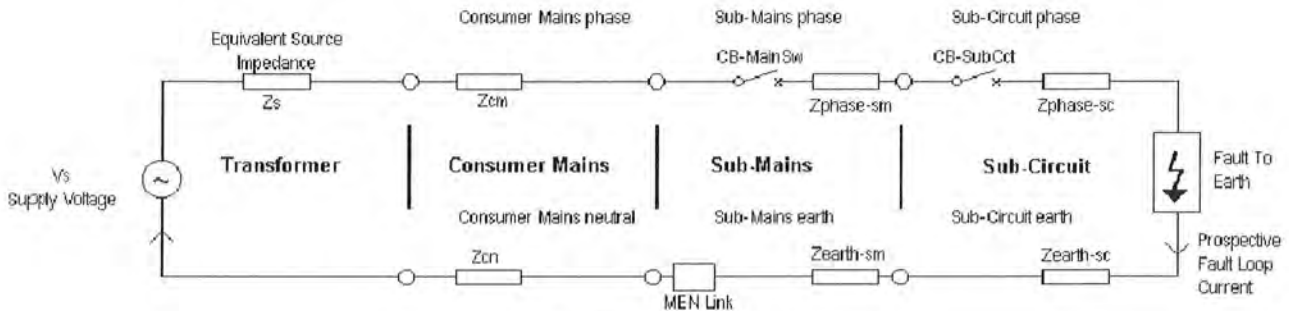
Revision	Date	By	Authorised By	Short Desc. of changes
A	8/11/2013	Johnathon Lester		Final Revision

J. & P. RICHARDSON INDUSTRIES PTY LTD
TOUCH POTENTIAL/FAULT CURRENT CALCULATIONS
Main Switchboard

Generator Supply

Site/Installation Description:

Equivalent Circuit



Enter data into grey areas

Generator		
Capacity	kVA	350
Impedance (Direct Axis Sub-Transient Reactance)		0.12
Full Load Current of Generator	A	487.00
Prospective Fault Current of Generator	A	4012.00
Typical or Advised Fault Current of Generator at 0.02s duration	A	4012
Source Impedance Z_s at 230Vac	Ω	0.059820538

Generator Mains		
Length of Generator Mains cable	m	0
Size of active conductor	mm ²	1
Number of parallel active conductors		1
Size of associated earth-return conductor	mm ²	1
Number of parallel earth-return conductors		1
Impedance of single-core of active cable @ 75°C ¹	Ω /km	25.8007
Impedance of single-core of earth cable @ 75°C ¹	Ω /km	25.8007
Impedance of active conductors Z_{CM}	Ω	0.0000
Impedance of earth (neutral) conductors Z_{CH}	Ω	0.0000

¹ From Table A4 of HB 301 - 2001

Sub Mains		
Length of Sub-mains cable	m	0
Size of active conductor	mm ²	1
Number of parallel active conductors		1
Size of associated earth conductor	mm ²	1
Number of parallel earth conductors		1
Impedance of single-core of active cable @ 75°C ¹	Ω /km	25.8007
Impedance of single-core of earth cable @ 75°C ¹	Ω /km	25.8007
Impedance of active conductors $Z_{PHASE-SM}$	Ω	0.0000
Impedance of earth (neutral) conductors $Z_{EARTH-SM}$	Ω	0.0000

¹ From Table A4 of HB 301 - 2001

Sub-Circuit		
Length of Sub-circuit (motor) cable	m	0
Size of active conductor	mm ²	1
Number of parallel active conductors		1
Size of associated earth conductor	mm ²	1
Number of parallel earth conductors		1
Impedance of single-core of active cable @ 75°C ¹	Ω /km	25.8007
Impedance of single-core of earth cable @ 75°C ¹	Ω /km	25.8007
Impedance of active conductors $Z_{PHASE-SC}$	Ω	0.0000
Impedance of earth conductors $Z_{EARTH-SC}$	Ω	0.0000

¹ From Table A4 of HB 301 - 2001

Fault Current & Touch Potential		
Impedance of active circuit Z_A	Ω	0.0598
Impedance of earth/neutral circuit Z_E	Ω	0.0000
Fault Current I_{SC} (at 240Vac)	A	4012.00
Touch Potential V_T at point of fault	Vac	0.00
Total Upstream Impedance	Ω	0.0598

Examine the time-current curve for the circuit-breaker/fuse which is providing the overcurrent protection to ensure that I_{SC} is high enough to guarantee operation of the protective device within the specified time.

Use the table "Additional Earth" within this workbook to examine the effect on I_{SC} and V_T of adding additional earth conductors.

J & P Richardson Industries Pty Ltd																																	Cable List				
A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	T	V	AE	AF	AG	AH	AI	AL	AN	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC
1	Line	Feed from	To Location	Starter	Volt	Kw	FLA	Cable Size (mm2)	No in /r	Cable Length (m)	Cable Type	Voltage Drop Cable	Cable Earth Size	Sup Earth Size	Active Earth Fault A (calculated)	Touch Potential	Circuit Status PASS / FAIL	Clearance Time - Actual	Clearance Time - Required	Margin 0.4s	Margin 5s	Notes on Calculation	Action Required re Supplementary Earth	Circuit Breaker Tag Name	Circuit Breaker Part No.	Amps	Poles	KiloAmps	Make	Series	Supplier	SS Trip Amps	0.4S Trip Amps	Comments			
2	1	Gen-Set	Switchboard	DOL	415			120	2	25	XLPE/PVC		120		2089.2	5.8	PASS	0.050	5.000	589	599				32993	630	3	50	Merlin Gerin	Compact NS630N STR23SE	Schneider	1500.0	1500.0				
3	2											#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
4	4											#N/A	#N/A		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A					#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		

DESIGN CALCULATIONS

Developed By



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Document Revision History

Revision	Date	By	Authorised By	Short Desc. of changes
A	8/11/2013	Johnathon Lester		Fault Study and Cable Sizing for QUU Carole Park



J. & P. RICHARDSON INDUSTRIES PTY LTD

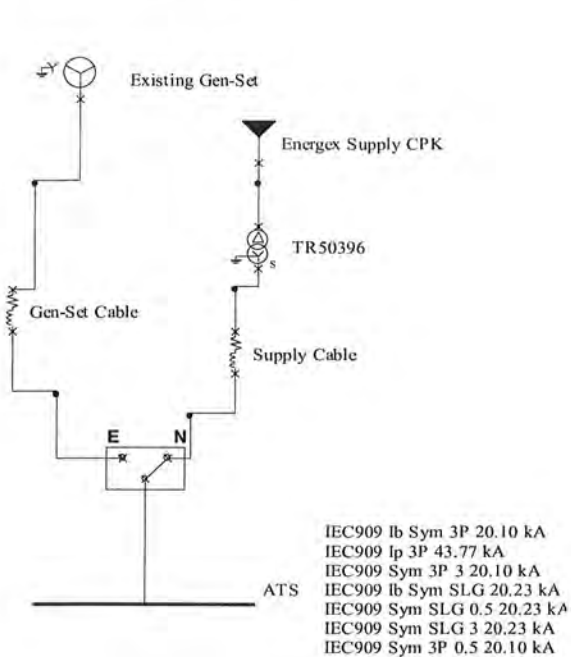
FAULT CURRENT CALCULATIONS

Site/Installation Description:

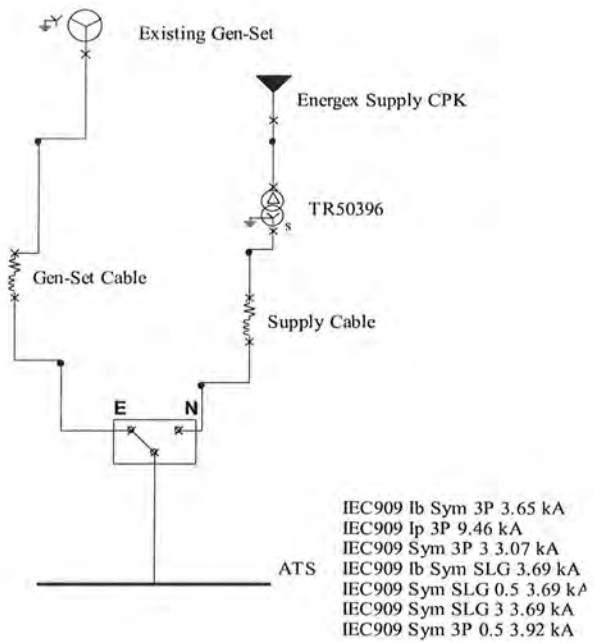
QUU - Carole Park WWTP

PTW Model and Results

Normal Supply



Generator Supply



Enter data into grey areas

Transformer Carole Park		
Capacity	kVA	750
Impedance	%	5
Primary Voltage	kV	11
Secondary Voltage	kV	0.415
X/R Ratio	X/R	5.00
Prospective Fault Current of Transformer(Secondary) [†]	kA	20.87
Calculated Fault Current of Transformer (Secondary)	kA	20.1
HV Through Current for LV Fault	kA	0.76
[†] The transformer calcs neglect any impedance upstream of the transformer		

Generator		
Capacity	kVA	350
X"d	pu	0.12
Rgf	pu	0.018
Voltage	kV	0.415
Zg	pu	0.12
Prospective Fault Current of Generator	kA	4.01
Calculated Fault Current of Generator	kA	3.92

J. & P. RICHARDSON INDUSTRIES PTY LTD

CABLE SIZING CALCULATIONS

Generator Cable Sizing

Site/Installation Description: QUU - Carole Park WWTP

PTW Model and Results

Maximum load/Feeder capacity:

Generator		
Capacity	kVA	350
Voltage	V	0.415
Current	A	487

Using AS3008

Current Carrying Capacity:
487A

Conduit Installation - AS3008 Table 8 Column 24
Apply Additional Derating Factor from Table 26 Column 2

Select 2 x 120mm², 6 current carrying conductors installed in 125mm conduit

120mm² Current Carrying Capacity = 284A
Apply derating factor of 0.83, Revised Current Carrying Capacity = 236A

Using 2 x 120mm², Circuit Current Carrying Capacity = 472A

Neutral Size:
Refer to AS3000 Section 3.5.2
Based on existing 50% size, select 1 x 120mm²

Voltage Drop
Ignore due to small cable length and large cable size

Short Circuit Performance

Fault Current	A	3920
Clearance Time	s	1
K (Conductor Type)		130
Min. Conductor Size	mm ²	30.15

Earth Size:
Refer to AS3000 Section 5.3.3, min size is 2 x 35mm² (70mm²)
Select 1 x 120mm²

Active Conductors:

2 x 120mm² XLPE/PVC / per phase

Neutral Conductors:

1 x 120mm² XLPE/PVC

Earth Conductor

1 x 120mm² PVC/PVC



Selectivity Analysis Program

Ph No. :

Mobile No. :

Fax No. :

Email :

Project :

File :

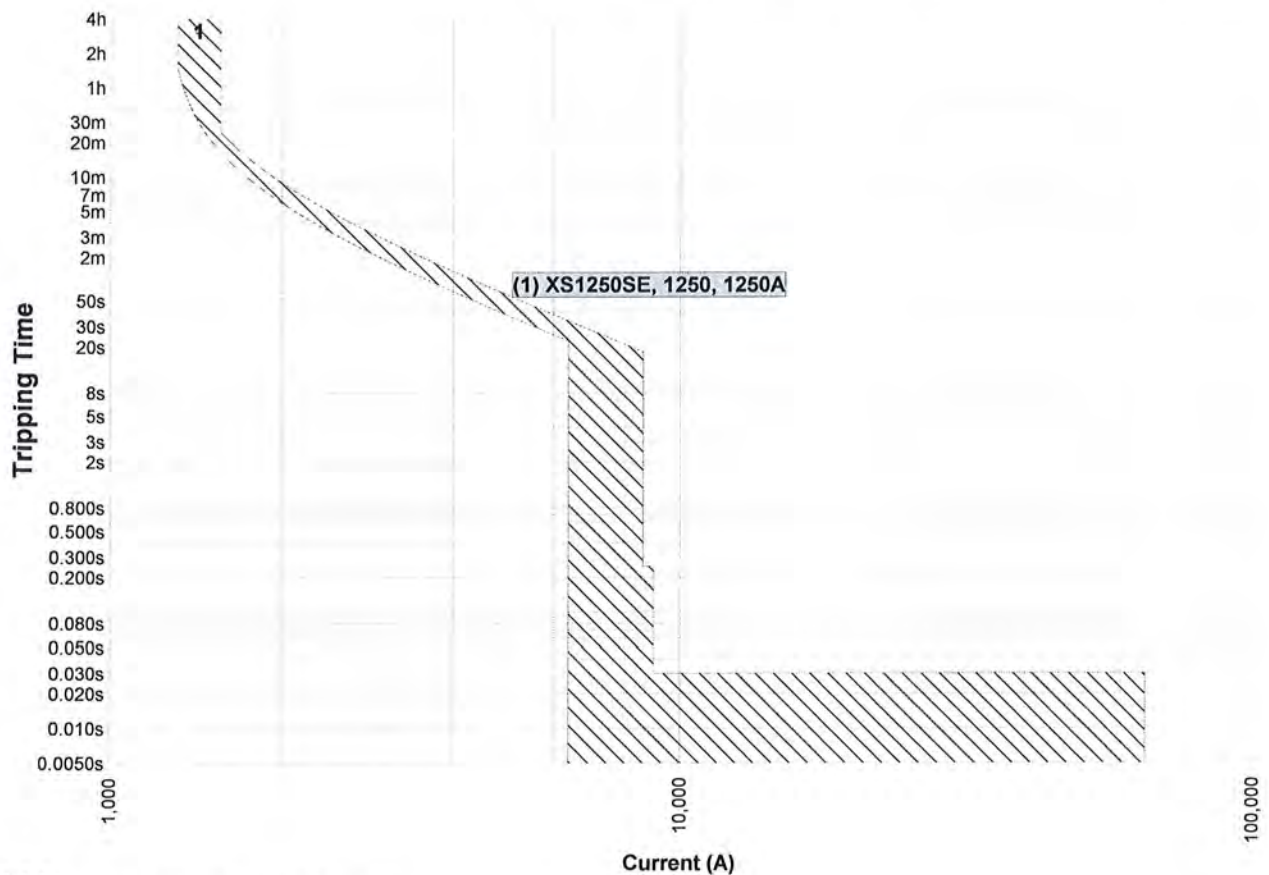
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SUPPLY

Circuit: **MSB - C (3Ø)**

TIME/CURRENT CURVE



① Down Stream - MSB (3Ø) :

Circuit I.D. : C2 (3Ø)

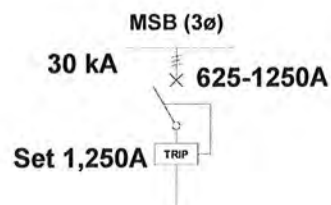
Circuit Breaker (MCCB) Model : XS1250SE

OCR : 1250

Trip Setting : 1,250 A

Breaking Capacity : 65 kA

Catalogue # : XS1250SE 1250 3FC



NHP

Adjustable Settings:

I _o	I ₁	T ₁	I ₂	T ₂	Ramp	I ₃
1	1	20 sec	6	0.2 sec	Off	6
1,250 A	1,250 A		7,500 A			7,500 A

Ph No. :

Mobile No. :

Fax No. :

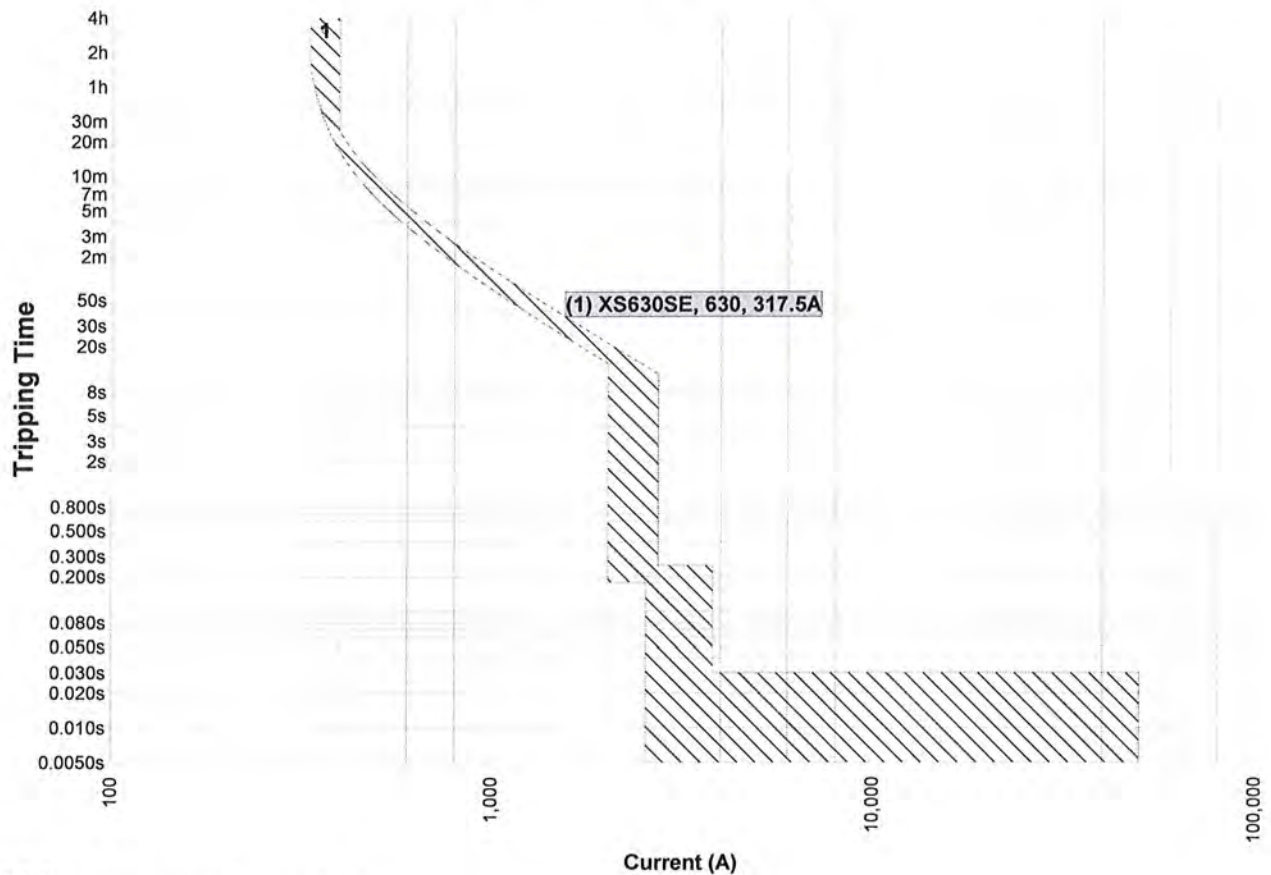
Email :

Project :

File :

Printed : 14 Nov 2013

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SUPPLYCircuit: **MSB - C (3ø)****TIME/CURRENT CURVE****1 Down Stream - MSB (3ø) :**

Circuit I.D. : C5 (3ø)

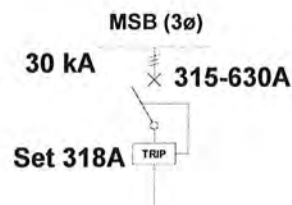
Circuit Breaker (MCCB) Model : XS630SE

OCR : 630

Trip Setting : 318 A

Breaking Capacity : 50 kA

Catalogue # : XS630SE 630 3

**NHP****Adjustable Settings:**

I ₀	I ₁	T ₁	I ₂	T ₂	Ramp	I ₃
0.63	0.8	20 sec	6	0.2 sec	Off	8
396.9 A	317.5 A		2,381.4 A			3,175.2 A

5.3 PROCESS DESIGN DESCRIPTION

A generator will be installed to provide standby power in case of mains failure. The supplied generator is a Cummings diesel generator which will be located behind the main control building. An automatic changeover switch (ATS) will be installed alongside the main switchboard to facilitate changeover between mains and generator supply.

Control Methodology

The generator start/stop sequence is controlled by the ATS. When a power failure is detected by the ATS a start signal is sent to the generator. Once the generator is online the ATS switches to the standby supply. When mains power is restored the ATS switches back to mains supply and issues a stop signal to the generator. The mains and standby supply circuit breakers are mechanically interlocked to prevent supply from both sources from being active at the same time.

The following signals will be displayed on the SCADA system:

- Generator Fault
- Generator Warning
- Generator Low Fuel
- Generator Running
- Generator Medium Fuel
- Generator Canopy Door Open
- Generator Mode Not Auto
- Generator Ready
- Fuel Tank Level

The following alarms will be reported by the SCADA system:

- Generator Fault
- Generator Warning
- Generator Low Fuel
- Generator Not in Auto

Hardware Configuration

The following new PLC hardware will be supplied for connection of the generator signals:

1 x 2 channel analogue input card type Siemens ET 200S

1 x 8 channel digital input card type Siemens ET 200S

This hardware will be installed on the existing Siemens PLC rack in the Telemetry Switchboard.