# Queensland Urban Utilities <br> C1011-045-QUU037 

## S095 Harrisville Flow Meter Operation and Maintenance Manual



## Lend Lease

## Lend Lease

# SECTION 1 

## S095 Harrisville Flow Meter Functional Description

- 3S0016 - Harrisville Flow meter Functional Specification


## Lend Lease

## S095 Harrisville Flow Meter

Control System Functional Specification

## Client

## Queensland Urban Utilities

## Document No

3S0016 - Harrisville Flow meter Functional Specification

## REVISION C

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Control Sheet

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## Revision List

| Rev | Date | Comment | Operative |
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| A | $29 / 06 / 2013$ | Issued for review | Tim Bowman |
| B | $13 / 10 / 2013$ | Approved for issue to client | Nicolas Munro |
| C | $31 / 01 / 2014$ | As Built | Richard Behan-Howell |
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| Abbreviations and Definitions |  |
| :---: | :---: |
| Abbreviation | Definition |
| ACMA | Australian Communications and Media Authority |
| ADSL | Asymmetric Digital Subscriber Line |
| CMI | Control Microsystems |
| CMF | Central Monitoring Facility |
| CPU | Central Processing Unit |
| DOL | Direct On-Line |
| EP Rating | Environmental Priority Rating |
| FAT | Factory Acceptance Testing |
| GST | Goods and Service Tax |
| HLZ | High Level Zone |
| HMI | Human Machine Interface |
| 10 | Inputs and Outputs |
| ISaGRAF | ICS Triplex ISaGRAF is an IEC-61131-3 compliant software development application |
| ITP | Inspection and Test Plan |
| KFII | King Fisher Series II Protocol |
| km | Kilometre |
| LAN | Local Area Network |
| LCD | Liquid Crystal Display |
| OS | Operating System |
| PAT | Performance Acceptance Testing |
| PCS | Process Control System |
| PDD | Project Definition Document |
| PLC | Programmable Logic Controller |
| RF | Radio Frequency |
| RSSI | Received Signal Strength Indication |
| RTU | Remote Telemetry Unit |
| SAT | Site Acceptance Testing |
| SCADA | Supervisory Control and Data Acquisition |

[^0]
## Document Control

| Prepared For: | Queensland Urban Utilities |
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| Project Name: | SO95 Harrisville Flow Meter |
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| Prepared By: | Technical Officer |
|  | Richard Behan-Howell |
| Reviewed By: | Senior Control Systems Engineer |
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## 1 Introduction

The purpose of this documentation is to detail the functional operation of a standard flow meter site.
Reconfigure the existing Elpro site on the Boonah Elpro system to Ipswich Citect SCADA system. Essentially the operation of the site will be the same as existing QUU Ipswich flow meter sites (S094 Peak Crossing) connected to the Kingfisher/Trio infrastructure.

### 1.1 S095 Harrisville Overview

The Harrisville site will incorporate a Kingfisher Series II RTU. It will operate as per the following functional specification. It is a monitoring site only, communications will be sent through the existing Kingfisher/Trio radio telemetry network via the Brassall repeater.

Essentially the system follows the format of other flow meter sites in the QUU Ipswich area providing the same method of control to operators.

Note that the following document details all available signals and alarms. The S095 Harrisville signals to SCADA via the link mentioned above will be a subset of these available signals detailed separately.

## 2 Control System Functional Requirements

### 2.1 Analogue Inputs

All analogue inputs will be tested for validity. If the input is determined valid it will be scaled to produce a value in Engineering Units, (EGU). If an input is invalid, i.e. < 2 mA , an alarm will be raised and it will not be scaled. This is as per existing sites

### 2.2 Digital Inputs

Standard Kingfisher digital inputs will be used. De-bouncing will be provided in code where necessary.

### 2.3 Flow Control Monitoring

The flow meter is located on the common delivery main on the switchboard side of the highway in a ditch.
Should the flow meter fail, the fault will be generated via the failure of the analogue input. (Refer 2.1 Analogue Inputs ). The flow value will be available for display on the SCADA.

Also there is a high instantaneous flow alarm with operator adjustable set point.

### 2.4 RTU Communications

The RTU will communicate with the Operation Control Room when any of the following occur:

- A significant event occurs, as determined by the configuration of the RTU. Please see attached IO list that includes Category 1 alarms that will instigate a force poll of the site.
- Polled by Operation Control Room/Master RTU, either a forced poll by the operator or a cyclic timed background poll.


### 2.5 Flow Totalisations

The flow input signal is totalised. This is done by using a kL representative pulse input from the flow meter.

At midnight, the current total is passed to a second register and stored. (Yesterday's total). The current total is then reset to zero.

## 3 Alarms

Further to the alarms mentioned above, the following alarms are also generated by the site.
Please see attached IO details for all alarms that are in operation.

### 3.1 Analogue Inputs

All analogue inputs have a loop failure test. If the loop current falls below 2 mA , a loop fault bit is set (transmitter fault). These events are logged by the RTU.

### 3.2 Flow Alarms

### 3.2.1 Flow Transmitter Fault

See section 2.3 Flow Control Monitoring

### 3.2.2 Flow High Alarm

The RTU checks the flow value against a high flow set point. If the flow exceeds this set point, a high alarm bit is set. The alarm has hysteresis to prevent excessive events being generated as the set point is reached.

### 3.3 General Site Alarms

### 3.3.1 RTU Comms Failure

SCADA will handle will handle communications with the RTU. It will have procedures in place to check that healthy communications is maintained to the site. As this is not part of the scope of this project, it is not covered here.

### 3.3.2 Comms Bus Fail

The Kingfisher RTU has several modules that communicate with each other via a common bus. If the RTU detects a failure of this bus an alarm Comms Bus Failure will be generated.

### 3.3.3 RTU Module Hardware/Card Hardware Fault

If the RTU detects a failure in its module or a failure in the hardware modules attached to it, it generates an RTU Module Hardware fault.

### 3.3.4 RTU Battery Not Charging

The RTU is fitted with a battery backup facility. If the charging circuit fails an alarm will be generated.

### 3.3.5 Real Time Clock Fault

The RTU monitors its internal clock. If a fault develops it generates a Real Time Clock Fault.

### 3.3.6 RTU Battery Flat Alarm

The RTU has internal monitoring points for several power supply parameters. The battery voltage is monitored and if it falls below 12.7 volts an alarm is generated. This point has a delay ( 20 minutes) to prevent spurious alarms as well as hysteresis (the voltage must rise above 12.8 v to reset).

### 3.3.7 Watchdog Timer Fail

The watch dog timer is triggered by hardware 5 second time-out or supply voltage below $\sim 4.5 \mathrm{~V}$. This generates a Watchdog Timer Fail alarm.

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## SECTION 2

## 3S0016 - Harrisville Flow meter Control System FAT

- 3S0016-Control System FAT - S095 Harrisville


## QUU Kingfisher/SCADA

# Control System FAT - Harrisville Flow Meter 

## Client <br> Queensland Urban Utilities

Document No<br>3S0016-CONTROL SYSTEM FAT - S095 Harrisville.doc<br>REVISIONA

| Site ID and Name | S095 Harrisville |
| :--- | :---: |
| Test Date | $12 / 06 / 2013$ |
| Lend Lease Operative | Tim Bowman |

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## Lend Lease

## Contral Sheet

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| 30/05/13 |  |  |  |  |
| Checked By: | Nicolas Munro | Date: |  |  |
| Authorised For Issue By: |  |  |  |  |

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## Revision List



| QUU |
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| CONTROL SYSTEM FAT |$\quad$ Lend Lease Job: 3S0016 | Page 2 of 9 |
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[^1]Kingfisher/SCADA - CONTROL SYSTEM FAT

## Abbreviations and Definitions

| Abbreviation | Definition |
| :---: | :---: |
| ACMA | Australian Communications and Media Authority |
| ADSL | Asymmetric Digital Subscriber Line |
| CAL | Client Access Licence |
| CAT | Commissioning Acceptance Testing |
| CMI | Control Microsystems |
| CMF | Central Monitoring Facility |
| CPU | Central Processing Unit |
| CSV | Comma Separated Variable File |
| DMR | Digital Microwave Radio |
| DMZ | Demilitarized Zone |
| DOL | Direct On-Line |
| EP Rating | Environmental Priority Rating |
| ES | Engineering Station |
| FAT | Factory Acceptance Testing |
| GST | Goods and Service Tax |
| GUI | Graphical User Interface |
| HLZ | High Level Zone |
| HMI | Human Machine Interface |
| I\&C | Instrumentation \& Controls |
| 10 | Inputs and Outputs |
| 11 | Lend lease Infrastructure Soricos |
| IS | Information Systems |
| ISaGRAF | ICS Triplex ISaGRAF is an IEC-61131-3 compliant software development application |
| ITP | Inspection and Test Plan |


| QUU CONTROL SYSTEM FAT | Lend Lease Job: 3S0016 | Page 3 of 9 |
| :--- | :---: | :---: |

3S0016-CONTROL SYSTEM FAT-S095 HARRISVILLEx

Kingfisher/SCADA - CONTROL SYSTEM FAT

| KFII | King Fisher Series II Protocol |
| :---: | :---: |
| km | Kilometre |
| KVM | Keyboard Video Mouse (Switch) |
| LAN | Local Area Network |
| LCD | Liquid Crystal Display |
| MTU | Master Telemetry Uniit |
| OS | Operating System |
| PAT | Performance Acceptance Testing |
| PCS | Process Control System |
| PDD | Project Definition Document |
| PDF | Portable Document Format |
| PLC | Programmable Logic Controller |
| QA | Quality Assured |
| RF | Radio Frequency |
| RSSi | Received Signal Strength Indication |
| RTU | Remote Telemetry Unit |
| SAT | Site Acceptance Testing |
| SCADA | Supervisory Control and Data Acquisition |
| SOW | Scope of Works |
| SWR | Standing Wave Ratio |
| TIA | Totally Integrated Automation |
| UHF | Ultra High Frequency |
| W | Watt |


| QUU CONTROL SYSTEM FAT | Lend Lease Job: 3S0016 | Page 4 of 9 |
| :--- | :---: | :---: |

## Document Control

| Prepared For: | Queensland Urban Utilities |
| :---: | :---: |
| Project Name: | Harrisville flow meter |
| Lend Lease Job Code: | 350016 |
| Document Type: | CONTROL SYSTEM FAT |
| File Name: | 350016-CONTROL SYSTEM FAT- 5095 Harrisville.doc |
| Revișion: | A |
| Status: |  |
| Release Date: | 30/05/2013 |
| Prepared By: | Tim Bowman |
|  | Technician |
| Reviewed By: |  |
| Lend Lease Approval By: |  |
|  |  |
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## Kingfisher/SCADA - CONTROL SYSTEM FAT

## 1. Overview

The following document details and records the functional testing of Harrisville flow meter switchboard. This switchboard is based from existing Water Base Type 18a.

## 2. Methodology

As the testing will occur in a 'factory' location, the site equipment will be replicated using switches and current sources for inputs. Outputs will be confirmed via software.

## 3. KINGFISHER RTU

### 3.1. Power up board

| Task | Complete |
| :---: | :---: |
| Check that the RTU powers up OK | OK $\downarrow$ |
| Check all boards mounted in backplane | OK $\dot{\square}$ |
| Using Toolbox32, set the communication port to communicate to the Harrisville RTU. Then open the Harrisville sdb and get its Status. | OK $\square^{7}$ |

### 3.2. Battery

| Task | Completed |
| :---: | :---: |
| Connect DC supply to RTU | OK |
| Check that the battery is connected and charging (i.e.12VDC across the terminals) | OK $\square^{\circ}$ |
| Disconnect Mains supply - RTU runs from battery | OK |
| Reconnect Mains supply. | OK [0] |
| Disconnect Battery. Check battery fail and not charging alarms active | OK 园 |
| Dattery<12.7V, Battery [lat alarm is raised | OKV |


| QUU CONTROL SYSTEM FAT | Lend Lease Job: 3S0016 | Page 7 of 9 |
| :--- | :--- | :--- |

## 4. IO Testing



### 4.1.1. Module 2 - IO3



| QUU CONTROL SYSTEM FAT | Lend Lease Job: 3S0016 | Page 8 of 9 |
| :--- | :--- | :--- |

### 4.2. Sign off/Notes

### 4.2.1. ReCORD OF SETUP/WITNESS

| Lend Lease Operative | Signature | Date |
| :--- | :--- | :--- |
| Rim BowmAn | 230 | $12 / 613$. |


| QUU | Signature | Date |
| :--- | :--- | :--- |
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### 4.2.2. NOTES

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## Lend Lease

# SECTION 3 

## S095 Harrisville Flow Meter Control System SAT

- Completed 3S0016-Control System SAT - S095 Harrisville


## QUU Kingfisher/SCADA

# Control System SAT - Harrisville Flow Meter 

## Client

## Queensland Urban Utilities

Document No<br>3S0016-CONTROL SYSTEM SAT - S095 Harrisville.doc REVISIONA

| Site ID and Name | s095 Harrisville |
| :--- | :---: |
| Test Date | $/ 8 / 07 / 2013$ |
| Lend Lease Operative | Tim Bowman |

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| Authorised For Issue By: |  |  |  |

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## Revision List

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| A |  |  |  |
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| QUU <br> CONTROL SYSTEM SAT | Lend Lease Job: 3S0016 | Page 2 of 12 |
| :--- | :---: | :---: |

350016-CONTROL SYSTEM SAT - S095 HARRISVILLEx

## Abbreviations and Definitions

| Abbreviation | Definition |
| :---: | :---: |
| ACMA | Australian Communications and Media Authority |
| ADSL | Asymmetric Digital Subscriber Line |
| CAL | Client Access Licence |
| CAT | Commissioning Acceptance Testing |
| CMI | Control Microsystems |
| CMF | Central Monitoring Facility |
| CPU | Central Processing Unit |
| CSV | Comma Separated Variable File |
| DMR | Digital Microwave Radio |
| DMZ | Demilitarized Zone |
| DOL | Direct On-Line |
| EP Rating | Environmental Priority Rating |
| ES | Engineering Station |
| SAT | Factory Acceptance Testing |
| GST | Goods and Service Tax |
| GUI | Graphical User Interface |
| HLZ | High Level Zone |
| HMI | Human Machine Interface |
| I\&C | Instrumentation \& Controls |
| 10 | Inputs and Outputs |
| LL | Lend Lease Infrastructure Services |
| 15 | Information Systems |
| ISaGRAF | ICS Triplex ISaGRAF is an IEC-61131-3 compliant software development application |
| ITP | Inspection and Test Plan |

[^2]350016-CONTROL SYSTEM SAT - 5095 HARRISVILLEx

Kingfisher/SCADA - CONTROL SYSTEM SAT

| KFII | King Fisher Series II Protocol |
| :---: | :---: |
| km | Kilometre |
| KVM | Keyboard Video Mouse (Switch) |
| LAN | Local Area Network |
| LCD | Liquid Crystal Display |
| MTU | Master Telemetry Unit |
| OS | Operating System |
| PAT | Performance Acceptance Testing |
| PCS | Process Control System |
| PDD | Project Definition Document |
| PDF | Portable Document Format |
| PLC | Programmable Logic Controller |
| QA | Quality Assured |
| RF | Radio Frequency |
| RSSI | Received Signal Strength Indication |
| RTU | Remote Telemetry Unit |
| SAT | Site Acceptance Testing |
| SCADA | Supervisory Control and Data Acquisition |
| sow | Scope of Works |
| SWR | Standing Wave Ratio |
| TIA | Totally Integrated Automation |
| UHF | Ultra High Frequency |
| W | Watt |


| QUU CONTROL SYSTEM SAT | Lend Lease Job: 3S0016 | Page 4 of 12 |
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## Document Control



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## 1. Overview

The following document details and records the functional testing of Harrisville flow meter switchboard. This switchboard is based from existing Water Base Type 18a.

## 2. Methodology

When required field equipment shall be simulated for these tests.

## 3. KINGFISHER RTU

### 3.1. POWER UP BOARD

| Task | Complete |
| :--- | ---: |
| Check that the RTU powers up OK | OK |
| Check that the Radios powers up OK | OK |
| Confirm communication between Master RTU and Harrisville RTU. Using Toolbox32, set the <br> communication port to communicate to the Master RTU Ethernet port. Then open the Harrisville sdb <br> and get its Status. | OK 国 |
| Save radio configuration file | OK R |
| Perform and save radio commissioning record | $\mathbf{7 8 0 2 5}$ |
| Record radio serial number | OK |
| Confirm communication between the Citect Server to the Harrisville RTU. Poll the site via Citect <br> Popup. |  |

### 3.2. BATtERY

| Task | Completed |
| :---: | :---: |
| Connect DC supply to RTU | OK |
| Check that the battery is connected and charging (i.e.12VDC across the terminals) | OK |
| Disconnect Mains supply - SCADA Alarms ( 30 secs delay - RTU Runs from Battery Alarm)Battery Alarm) | OK $\mathrm{O}^{\prime}$ |
| Reconnect Mains supply. Check alarm clears. Disconnect Mains supply for the next test Disconnect Mains supply for the next test | OK ${ }^{\text {W }}$ |


| QUU CONTROL SYSTEM SAT | Lend Lease Job: 3S0016 | Page 7 of 12 |
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3S0016-CONTROL SYSTEM SAT - S095 HARRISVILLE

## Kingfisher/SCADA - CONTROL SYSTEMSAT

When Battery < 12.7 V for 20 mins, RTU Battery not Charging Alarm is active. [\#R125.2: LOSAlarm]
When Battery < 12.7V, Battery Flat alarm is raised [NOT \#DI13.3 = NOT \#R124.3 = Battery Low]
OK

## 4. IO TESTING

### 4.1 Modules

| Task | Completed |
| :--- | ---: |
| Disconnect Module 2 - I03. Module alarm raised (Hardware Fault Card 3) | OK 器 |

### 4.1.1. Module 2 - IO3



| QUU CONTROL SYSTEM SAT | Lend Lease Job: 3S0016 | Page 8 of 12 |
| :--- | :--- | :--- |

## 5. Functional Tests

### 5.1. IO Checks

| SCADA Tag | 10 Designation | SCADA Display | SCADA Alarm | SCADA Trend |
| :---: | :---: | :---: | :---: | :---: |
| 5095_FIT0001 | SL03IO3:Al1 | $0 k$ | LPF | \% |
| S095_FlowPls01 | SL03IO3:DI3 | $\bigcirc \%$ | NA | 4 A |

## 6. ALARMS

### 6.1 Digital Alarms

| SCADA Tag | SCADA Alarm <br> Description | IO Designation | SCADA Display | SCADA Trend |
| :--- | :--- | :--- | :--- | :--- |
| S095_OScan | IO Scanning <br> Disabled | NA | res/No | NA |
| S095_LLen | Ladder Program <br> Disabled | NA | Yes/No | NA |


| QUU CONTROL SYSTEM SAT | Lend Lease Job: 3S0016 | Page 9 of 12 |
| :--- | :--- | :--- |

Kingfisher/SCADA - CONTROL SYSTEM SAT

### 6.2 Time Stamped Alarms

| SCADA Tag | SCADA Alarm <br> Description | 10 Designation | SCADA Display | SCADA Trend |
| :---: | :---: | :---: | :---: | :---: |
| S095_CBusFail | Comms Bus Fail | NA | (es)No | NA |
| S095_FIT0001CalcHiTD | Harrisville Flow 1 <br> Calculated kL > Pulse kL Today | NA | Yes/No | NA |
| S095_FIT0001CalchiYd | Harrisville Flow 1 <br> Calculated kL > Pulse kL <br> Yesterday | NA | vird <br>  1.4 4 , 4 \% | NA |
| S095_FIT0001HA | Flow 1 High Alarm | NA | (es) No | NA |
| S095_FIT0001LPF | Flow 1 Trans mitter Fault | NA | Tested in 5.1 | NA |
| S095_FIT0001PulseHiTD | Harrisville Flow 1 Pulse <br> kL > Calculated kL Today | NA | vesino | NA |
| S095_FIT0001PulseHiYD | Harrisville Flow 1 Pulse <br> kL > Calculated kL Yesterday | NA | $\begin{aligned} & \text { Yes/No } \\ & \text { Pidatel, } \end{aligned}$ | NA |
| S095_HW Alarm | RTU Module Hardware Alarm | NA | Ces/No | NA |
| S095_HWFltC3 | Hardware Fault Card 3 | NA | Tested in 4.1 yes. | NA |
| S095_LOSAlarm | RTU Battery not Charging Alarm | NA | Yes/No | NA |
| S095_RTCFail | Real Time erock Fail | NA |  | NA |
| S095_Sup plyOK | RTU Battery Flat Alarm $<12.7 \mathrm{~V}$ | NA | $\mathrm{Cles} / \mathrm{No}$ | NA |
| S095_WDTFail | Watchdog_Timor-Fait .-m. | NA | Kes/NO | NA |


| QUU CONTROL SYSTEM SAT | Lend Lease Job: 3S0016 | Page 10 of 12 |
| :--- | :--- | :--- |

7. Trends
7.1. Flow Meter Trends

| SCADA Tag | SCADA Alarm <br> Description | IO <br> Designation | SCADA Display | SCADA Trend |
| :--- | :--- | :--- | :--- | :--- |
| S095_FIT0001 | S095 Flow 1 | NA | (Cs/No | Yes |
| S095_FIT0001FlowTD | S095 Flow Today | NA | Ces/No | Yes |
| S095_FIT0001FlowYD | S095 Flow Yesterday | NA | Yes/No | Yes |


| QUU CONTROL SYSTEM SAT | Lend Lease Job: 3S0016 | Page 11 of 12 |
| :--- | :--- | :--- |

## 8. Sign off/Notes

### 8.1 RECORD OF SETUP/WITNESS

| Lend Lease Operative | Signature | Date |
| :---: | :---: | :---: |
| Tin Bownomoy | Lhamer | $18 / 7 / 13$ |


| QuU | Signature | Date |
| :--- | :--- | :--- |
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### 8.1.1 Notes

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## Lend Lease

# SECTION 4 

S095 Harrisville Flow Meter Kingfisher IO List

- 3 S0016 S095 IO List Harrisville Flowmeter


## S095-Harrisville Flowmeter



## S095-Harrisville Flowmeter



# Advanced Alarms 



Time Stamped Alarms

|  |  |  |  |  |  |  | SCADA Raw scaling |  | SCADA Eng scaling |  | Units Alarm Logic in SCADA |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Tag Name | Alarm Description | RTU Address | Category | SP Address | SP Raw | SP Scaled | Scaling min | Scaling max | Scaling min | Scaling max |  |  |
| S095_CBusFail | Comms Bus Fail | D014 | 1 |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_CBusFailEA |
| S095_FIT0001HA | Flow 1 High Alarm | \#R153.2 | 2 |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_FIT0001HAEA |
| S095_FIT0001LPF | Flow 1 Transmitter Fault | \#R153.16 | 1 |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_FIT0001LPFEA |
| S095_HWAlarm | RTU Module Hardware Alarm | \#R125.1 | 1 |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_HWAlarmEA |
| S095_HWFItC1 | Hardware Fault Card 1 | \#R126.1 | 1 |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_HWFItC1EA |
| S095_HWFItC2 | Hardware Fault Card 2 | \#R126.2 | 1 |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_HWFItC2EA |
| S095_HWFItC3 | Hardware Fault Card 3 | \#R126.3 | 1 |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_HWFItC3EA |
| S095_HWFItC4 | Hardware Fault Card 4 | \#R126.4 | 1 |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_HWFItC4EA |
| S095_LOSAlarm | RTU Battery not Charging Alarm | \#R125.2 | 1 |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_LOSAlarmEA |
| Not used | Not used | \#R193.1 |  |  |  |  | n/a | n/a | n/a | n/a | n/a | Not used |
| S095_RTCFail | Real Time Clock Fail | \#R125.12 | 1 |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_RTCFailEA |
| S095_SupplyOK | RTU Battery Flat Alarm <12.7V | \#R124.3 | 1 |  |  |  | n/a | n/a | n/a | n/a | n/a | not S095_SupplyOKEA |
| Not used | Not used | \#R193.2 |  |  |  |  | n/a | n/a | n/a | n/a | n/a | Not used |
| S095_WDTFail | Watchdog Timer Fail | \#R125.13 | 1 |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_WDTFailEA |
| S095_FIT0001CalchiTD | Flow 1 Calc kL value > Pulse kL value TD | \#R127.1 | 1 |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_FIT0001CalchiTDEA |
| S095_FIT0001PulseHiTD | Flow 1 Pulse kL value > Calc kL value TD | \#R127.2 | 1 |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_FIT0001PulseHiTDEA |
| S095_FIT0001CalchiYD | Flow 1 Calc $k L$ value > Pulse kL value YD | \#R127.3 |  |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_FIT0001CalchiYDEA |
| S095_FIT0001PulseHiYD | Flow 1 Pulse kL value > Calc kL value YD | \#R127.4 | 1 |  |  |  | n/a | n/a | n/a | n/a | n/a | S095_FIT0001PulseHiYDEA |



SCADA to local RTU Event Setpoints

|  |  |  |  |  | SCADA Raw scaling |  | SCADA Eng scaling |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Tag Name | Setpoint Description | SP Address | SP Raw | SP Scaled | Scaling min | Scaling max | Scaling min | Scaling max | Units |
| S095 ESP[0] | Not used | \#R993 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[1] | Not used | \#R994 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[2] | Not used | \#R995 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[3] | Not used | \#R996 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[4] | Not used | \#R997 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[5] | Not used | \#R998 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[6] | Not used | \#R999 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[7] | Not used | \#R1000 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[8] | Not used | \#R1001 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[9] | Not used | \#R1002 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[10] | Not used | \#R1003 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[11] | Not used | \#R1004 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[12] | Not used | \#R1005 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[13] | Not used | \#R1006 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[14] | Not used | \#R1007 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |
| S095_ESP[15] | Not used | \#R1008 | 0 |  | 0 | 32767 | 0 | 32767 | n/a |


\section*{| Location | Harrisville |
| :--- | :--- |}


| Harrisville |  |  |
| :--- | :---: | :---: |
| RTU Backplane | BA-4 | Kingfisher |
| RTU Slot 1(\#13) | PC-1 - CPU Card | Kingfisher |

ADA to local RTU Hour Run Setpoints

|  |  |  |  |  | SCADA Raw scaling |  | SCADA Eng scaling |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Tag Name | Setpoint Description | SP Address | SP Raw | SP Scaled | Scaling min | Scaling max | Scaling min | Scaling max | Units |
| S095_HSP[0] | Not used | \#R1009 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[1] | Not used | \#R1010 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[2] | Not used | \#R1011 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[3] | Not used | \#R1012 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[4] | Not used | \#R1013 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[5] | Not used | \#R1014 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[6] | Not used | \#R1015 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[7] | Not used | \#R1016 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[8] | Not used | \#R1017 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[9] | Not used | \#R1018 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[10] | Not used | \#R1019 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[11] | Not used | \#R1020 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[12] | Not used | \#R1021 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[13] | Not used | \#R1022 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[14] | Not used | \#R1023 | 0 |  | 0 | 6000 | 0 | 100 | Hr |
| S095_HSP[15] | Not used | \#R1024 | 0 |  | 0 | 6000 | 0 | 100 | Hr |

## Lend Lease

# SECTION 5 

## 3S0016 S095 Harrisville Flow meter Electrical Drawings

- Please see separate A3 Folder for hard copy
- AutoCAD soft copy on disc
- PDF soft copy on disc


## ouenstano <br> UrbanUtilities

## S095 HARRISVILLE FLOWMETER SITE WARRIL VIEW / PEAK CROSSING RD. (LOCATION: $27^{\circ} 47^{\prime} 43.94$ "S 152²4'34.87"E)

## SITE COVER SHEET

| ELECTRICAL DRAWING INDEX |  |  |
| :---: | :---: | :--- |
| DRAWING NUMBER | REV. | DRAWING TITLE |
| $486 / 4 / 6-0048-000$ | A | SITE COVER SHEET AND DRAWING INDEX |
| $486 / 4 / 6-0048-001$ | A | NEW RTU PANEL INCOMING MAINS \& POWER SUPPLIES SCHEMATIC DIAGRAM |
| $486 / 4 / 6-0048-002$ | A | NEW RTU PANEL RTU BACKPLANE AND SLOT 1 CPU SCHEMATIC DIAGRAM |
| $486 / 4 / 6-0048-003$ | A | NEW RTU PANEL RTU SLOT 2 I/O MODULE SCHEMATIC DIAGRAM |
| $486 / 4 / 6-0048-004$ | A | NEW RTU PANEL EMFLUX M300 FLOWMETER SCHEMATIC DIAGRAM |
| $486 / 4 / 6-0048-005$ | A | NEW RTU PANEL GENERAL ARRANGEMENT |
| $486 / 4 / 6-0048-006$ | A | NEW RTU PANEL WIRING DETALLS AND PARTS LIST |
| $486 / 4 / 6-0048-007$ | A | NEW RTU PANEL CABLE SCHEDULE |
| $486 / 4 / 6-0048-008$ | A | NEW RTU PANEL LABEL DETAILS |
| $486 / 4 / 6-0048-009$ | - | SPARE SHEET |
| $486 / 4 / 6-0048-010$ | - | SPARE SHEET |




AS CONSTRUCTED AS CONSTRUCTED DETALLS

SIINED:
NAME of SIGNATORY: John DALIEL
NAME O SIINATORY: JOHN DAL
RPEQ No. OLLICENCE: 104697 RPEQ No. or LLCENCE 104697
COMPAN NAME L LNO LEASE SERVICES


## Lend Lease

| Lend Lease infrastructure Serices Pry |
| :---: |
| ABN |
| 870815150 |
| 1047 |


$\square$



AS CONSTRUCTED
 SIINED: NAMED Ot SIGNATORY: JOHN DALI RPEQ No. OLLCENCE: 10469 COMPANY NAME L LNN LEASE SERYICES START DATE: DEC 2012 FMISH DATE: NOV 2013

## Lend Lease

 ABN 87081540847
Water Quensland offic
 Title rtu panel NEW RTU PANEL
RTU SLOT IIO MODULE
SCHEMATIC DIAGRAM

| A 0713 | As Constructed | गНО | soc) | ORaFte | ЈНо | - | ${ }^{012023}$ |  |  |  | Ssit | TTLE NEW RTU PANEL RTU SLOT 2 I/O MODULE | SHEET No. $03 \times 1$. |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\bigcirc 0613$ | ISSUED For construction | эо | Do | DRAFTING CHECK | л.S | design | EQ. No. date | N MANA | Date | Uenstand | SARRISVILLE FLOWMETER SIT |  |  |  |
| P1 0143 | ISSUEP For Customer comment | Јно |  | ${ }^{\text {CAO FILE }}$ | 4864.4.00488003 | D. Darmono | ${ }_{5055} 070$ | - |  |  | WARRIL VIEW / PEAK CROSSING RD |  |  |  |



AS CONSTRUCTED AS CONSTRUCTED DETALLS
 SIINED:
NAME Ois
Name of IISNATtor: John dalzII
RPEQ No. or LICENCE: 10469 companv name Leno Lease services START DATE: DEC 2012 FINSH DATE: NOV 2013

## Lend Lease

Lend Lease infrasturcture Sevices Pry Ltd
ABr 870815408847 ABN 87081540847
Water Ouensland office

$\qquad$


EXTERNAL FRONT ELEVATION


EXTERNAL RIGHT HAND SIDE ELEVATION

mOUNTING PLATE LAYOUT
AS CONSTRUCTED
 SIINED:
NAME O SIIC $\qquad$

Lend Lease
 Water Queensland office
 TITE
NEWTU RANEL
GENERAL ARRANGEMENT

| A 07713 | As Constructeo | ЈН | soc | DRatted | ЈН | ग. DatzIEL | ${ }^{012013}$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| - o613 | ISSUE For construction | נно | DD | DRAFTING CHECK | jc.s | design | R.P.E. . No. DATE | Principal design manager |
| P1 01113 | ISUUED For custom | JН |  | CAD Fle | 486-4.4.0048-005 | D. DAYMOND | 5050 |  |
| Nod date | AMENDMENT | dre. | APD. | в.c.c. fue no. |  | Desion chick | R.P.E.e. No. Date | cuent delegate |

$\square$ (.) UuEnsland Siter site

SIE
SO995
HARISVILLE FLOWMETER SITE


WRING
Wring to be PVC V90 HT $0.6 / 1 \mathrm{KV}$ Grade with timed conductor. Control and instrunentation wiring has flexile copper conductors, and is colour
ooded as detailed below, each individual wire shall be numbered each end, and coded as tetalied below, each individual wire shall be numbered each end
terminated by the use of appropriate pre-insuluted limip lugs or pins. Seporate luys or pins shall be used for each conductor. A proprietary double lug nay be used to terninate two conductors.
Sse propietary bridging links when required to common up terminals.
 phase colour coded as detailed below.
Control wiring to be mininum $1.0 \mathrm{~m}^{2}$ flexible coner cond
olour coded as detailed below.
Wievel control signals to be minnum $0.5 \mathrm{~mm}^{\mathrm{n}}$ fiexble copper conductors,
olour coded as detailed below.
20 mA analog signals linternal \& external) wired in shielded pair mininum size
a. $5 \mathrm{~mm}^{2}$. and earthed at one end only. (Switchboard end for external signals)
all 240 VACC terminals shall be shouded and labelled - - Danger 240 VaC

Earth cables ninimum $2.5 \mathrm{~m}^{2}$ flexible.
Soors and hinged escutcheons bonded with $4 \mathrm{~mm}^{2}$ fiexible earth wire.
Switchboard to have dedicated earthing cabbe bonding directly to main earth bar. Switchboard to have dedicated earthing cable bonding directly to
Wire numbering will be equal to Braty marking systen.
wire numbers are readable left to right, bottom to top as shown.

$$
=\underline{\underline{111}=}
$$

## COOUR CODE

Phase wiring $\left(A, B\right.$ B \& $\quad$ Red, white, Bive $\quad 25 \mathrm{~mm}^{2}$ min


240 VAC Neutral
Extra Low voc positiva Red $\begin{aligned} & \text { Red } \\ & \text { Back }\end{aligned}$
Exxra Low VOC Postive supples Orange
Extra Low VOC Negative supplies Vilet
General Extra Low VOC Wring Gre
RTU \& PIC Wing
RTU \& PLC Wining
Electrode WFing

${ }_{\text {Earth }}$


| PARTS LST |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| ${ }_{\text {desionalion }}^{\text {ITEM }}$ | atr | descripton | PART NuMEER | SUPPLER |
| ${ }^{\text {A1 }}$ | 1 | ENCLOSURE $600 \times 600 \times 300 \mathrm{~mm} 316$ STANLESS STEEL | N06063/s | BaR Enclosures |
|  | 1 | PADLOCKABLE SWNG HANOLE 316 STAINLESS STEEL | SHPSS | DORE ELECCRICS |
|  | 2 | VENTLATION LOUVRE 316 Stancess Steel | PPY/S | BaR Enclosures |
| ANTI | 1 | 9 Element Yacl telemerry antenna | Ye9-61 | RF INOUSTRES |
| B1 | 1 | EMELUX FLOWMETER SENSOR | M300 | COMBINED INSTRUMENT SYSTEMS |
| EB | 1 | EARTH BAR goa 12 WAY | 90612 | DORE ELECTRCS |
| F1 | 1 | FUSE HOLDER IN LINE 15A | 497-6254 | RS COMPONENTS |
|  | 1 | FUSE $5 \times 20 \mathrm{~mm} 4 \mathrm{~A}$ | 563-407 | RS COMPONENTS |
| FIT | 1 | EMELUX FLOMMETER CONVERTER | M300 | COMBINED INSTRUMENT SYSTEMS |
| 61 | 1 | POWER SUPPLY UNT 240VAC/24VCC 60W | PB8RN60524-A | PowERBOX |
| 62 | 1 | POWER SUPPLY UNT 240VAC/12VDC 60W | PbBRN60512-A | PowERBOX |
| к1 | 1 | BATTERY 7200mAh | LC-R127R2P1 | PANASONC |
|  | 1 | RELAY 2 POLE C/0 24VC | 5532007424 VOC | NHP |
|  | 1 | RELAY BASE | 9404 | NHP |
| RTU-BP | 1 | KIIGFISHER BA-4 RTU BACKPLANE | BA-4 | CSE-SEMAPHORE |
| RTU-SLOT1 | 1 | KINGFISHER CPU / POWER SUPPLY MOOULE | PC-1-0S1 | CSE-SEMAPHORE |
| RTU-SLOT2 | 1 | KINGFISHER COMBINATION I/O MODULE | 10-3-1 | CSE-SEMAPHORE |
| U1 | 1 | Telemetry data rado | ER450-53A02-EHO | SCHNEDER |
| x1 | 2 | THROUGH TERMNAL 4mm sq. | UK5N (3004362) | PHOENX CONTACT |
|  | 2 | FUSE TERMNAL BLOCK | UK5-HESI (3004100) | Phoen CONTACT |
|  | 1 | END Cover | D-UK4/10 (3003020) | PHOENX CONTACT |
|  | 2 | END CLAMPS | E-UK (1201422) | Phoen CONTACT |
|  | 1 | CARTRIDGE FUSE $5 \times 20 \mathrm{~mm} 2 \mathrm{~A}$ | 563-609 | RS COMPONENTS |
|  | 1 | CARTRIGEE FUSE $5 \times 20 \mathrm{~mm} 4 \mathrm{~A}$ | 563-407 | RS COMPONENTS |
| X2 | 1 | Double socket outiet + MOUNT | C2025NE + 499A | CLIPSAL |
| 21 | 1 | COAXXAL SURGE PROTECTOR | 15-850.N-C2 | RF INOUSTRES |
| MISCELAANEOUS |  |  |  |  |
| ADAPTER | 1 | RJ45 T0 TRIO SERALL PoRT ADAPTER | ADP16 | CSE-SEMAPHORE |
| CONNECTORS | 1 | COAX CABLE CONNECTOR (SURGE PROTECTOR TO CNT-400) | N-203HS | RF INDUSTRES |
|  | 1 | COAX CABLE CONNECTOR (CNT-400 To Yacl Antenna) | ${ }^{\mathrm{N}-203 \mathrm{HS}}$ | RF INOUSTRES |
|  | 1 | COAX PATCH LEAD (RADIO TO SURGE PROTECTOR) | S-1832 | RF INDUSTRES |
| BRACKET | 1 | MOUNTNG BRACKET FOR RADIO AND SURGE PROTECTOR | CUSTOM BULL (3mm ALUMNUM SHEET) | me Workshop |

AS CONSTRUCTED

## ELECTRICAL CABLE SCHEDULE

| CABLE No. | STATUS | SIZE | CORES | TYPE | LENGTH | FROM | TO | FUNCTION | NOTE |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| W1 | EXISTING | $6 \mathrm{~mm}^{2}$ | 1 C | V90 PVC CAble | 8 m | MAIN SWITCHBOARD | RTU CABINET | EARTH CONTINUITY CONDUCTOR |  |
| W2 | NEW | $2.5 \mathrm{~mm}^{2}$ | $2 \mathrm{C}+\mathrm{E}$ | V90 PVC/PVC POWER CABLE | 8 m | MAIN SWITCHBOARD | RTU CABINET | POWER SUPPLY |  |
| W3 | NEW | $1 \mathrm{~mm}^{2}$ | $2 \mathrm{C}+\mathrm{E}$ | V90 PVC/PVC FLEXIBLE CORD WITH MOULDED 10A PLUG | 1 m | RTU CABINET GPO X1 | RTU CABINET POWER SUPPLY UNIT G1 | POWER SUPPLY FOR 24V PSU |  |
| W4 | NEW | $1 \mathrm{~mm}^{2}$ | $2 \mathrm{C}+\mathrm{E}$ | V90 PVC/PVC FLEXIBLE CORD WITH MOULDED 10A PLUG | 1 m | RTU CABINET GPO $\times 1$ | RTU CABINET POWER SUPPLY UNIT G1 | POWER SUPPLY FOR 12 V PSU |  |
| w5 | NEW | - | 4 PAIR | UTP RJ45 TO RJ45 PATCH CABLE | 1 m | RTU SERIAL PORT | TRIO DATA RADIO SERIAL PORT B | SERIAL DATA TO RADIO |  |
| w6 | EXISTING | $0.75 \mathrm{~mm}^{2}$ | 3 C | SCREENED INSTRUMENT CABLE | TBC | FLOWMETER CONVERTER | FLOWMETER SENSOR | FLOW SIGNAL |  |
| W7 | EXISTING | $1.5 \mathrm{~mm}^{2}$ | $2 \mathrm{C}+\mathrm{E}$ | V90 PVC/PVC POWER CABLE | TBC | FLOWMETER CONVERTER | FLOWMETER SENSOR | SENSOR POWER SUPPLY |  |
| COAX1 | NEW | - | 1 | S-1832 COAX PATCH LEAD | 1 m | TELEMETRY RADIO | COAX SURGE PROTECTOR | DATA TRANSMISSION |  |
| COAX2 | EXISTING | - | 1 | CNT-400 50 OHM COAXIAL | 6 m | COAX SURGE PROTECTOR | YAGI TELEMETRY ANTENNA | DATA TRANSMISSION |  |

## Lend Lease

Lend Lease infastructure Services pyy Water Pueensland ofice
and stret, Rocklea, QLD 4106 , Austraia

STAINLESS STEEL LABELS
these labels are all to be laser engraved on grade 316
STAINLESS STEEL SHEET.
all holes are 3.2 mm diameter centred 5 mm from the label edges

10 mm text

## S095 HARRISVILLE FLOW METER

## TRAFFOLYTE LABELS

these labels are all to be engraved with black text on a WHITE BACKGROUND ON 1.6 mm THICK LASER ENGRAVING LAMINATE.
AlL holes are 3.2 mm Diameter centred 5 mm from the label edges


| 4 mm TEXT | 4 mm TEXT | $4 m \mathrm{mext}$ | 4 mm TEXT |  |
| :---: | :---: | :---: | :---: | :---: |
| $\bigcirc$ FIT 0 | $\bigcirc \quad$ U1 0 | $\bigcirc$ RTU 0 | $\bigcirc \quad \mathrm{z1}$ ○ | ALL $40 \mathrm{~mm} \mathrm{~W} \times 16 \mathrm{~mm}$ H |
| 4 mm TEXT | 4 mm TEXT | 4 mm TEXT | 4 mm TEXT |  |
| $\bigcirc$ G3 0 | $\bigcirc$ eb o | - $\mathrm{X2}$ - | A1 | ALL $40 \mathrm{~mm} \mathrm{~W} \times 16 \mathrm{~mm}$ H |

3.5mm text

## Lend Lease

# SECTION 6 

## 3S0016 S095 Harrisville Flow meter Electrical Test Documents

- Certificate of Test
- Completed Site ITP
- M300 Service, Calibration report


## Service/ Callibration Report 8616

Service - Workshop
22 Palmerin Street, Warwick. QLD. 4370
Email: Robert, Briggs (@pentalr.com
Service - Victoria
295 Benalla Road, Shepparton, VIC. 3630
Mob: 0400049483
Email: Ryan.Lindsay@@pentair.com

Customer / Service Details

Lend Lease Infrastructure Services-Rocklea
39 Suscatand Street
Rocklea
QLD
Tim Bowman
Quotation:
Drder Number

GRA 3922 M300 S/N 09856
Date of Manufacture/Last Service: 01-Sep-97
Date Received: 02-Jul-13
Type Of Service: Service
Status: Dispatched
Dispatch Date: 15-Jul-13
PCB \#: EC108980
Exchange PCB\#:
Display PCB \#: EC121644
Display PCB Exchange\#:

Fault Found

Faulty Analog Output
Reading approx 140 mA
Faulty shorted transistor ón Analog board Check Calibration
Faulty $4-20 \mathrm{~mA}$ output
NOTE: ENSURE EQUIPMENT THAT THE 4-20mA LOOP
IS CONNECTED TO IS NOT SOURCING LOOP POWER
AS THIS MAY DAMAGE CURRENT OUTPUT.
M300 4-20mA OUTPUT SOURCES OWN POWER.

## Repair Action

Replace faulty transistor Q1, BC337A
on $4-20 \mathrm{~mA}$ Analogue Output board
Check ADC reference voltage
Calibrate and check on all functions
Set coil current
Test $4-20 \mathrm{~mA}$
Test Relays
Test Pipe Not Full

Calibration Detalls

| ADC Ref: | 9.913 |
| :--- | :--- |
| Coil Current: | 500 |
| 5ignal Input: | PASS |
| 4-20mA \#1 O/P: | PASS |
| 4-20mA \#2 O/P: | N/A |
| Digital \#1 O/P: | PASS |
| Digital \#2 O/P: | N/A |
| Relay \#1 O/P: | PASS |
| Relay \#2 O/P: | PASS |
| Relay \#3 O/P: | N/A |
| Relay \#4 O/P: | N/A |
| Flow Sim mV: | 6.3028 |

## Calbration Equipment

EQ-0442 / Agilent U1252A \# TW48160186 / CAL N/A
EQ-0427 / SEW Megger \# 9652093 / CAL - NA
EQ-0439 / TES Flow 5IM \# 1004 / CAL \# NA / CAL Due 2.11.2013

## M300 PARAMETER LIST

| Serial No: | 9856 |
| :--- | :--- |
| Model No: | M300-M-1A-2R-F-R |

CIS Ref No:

| PARAMETER | SELECTION | PARAMETER | SELECTION |
| :--- | :--- | :--- | :--- |
|  |  |  |  |
| PIN: | 121 | Pipe Size Units: | mm |
| Pipe Size: | 150 | Flow Tube Factor: | 9.119 |
| Flow Tube Zero: | -0.0007 | Display Units: | l/sec |
| Display Digits: | 4 | Totaliser Units: | kL |
| Totaliser Scaling: | x1 | Totaliser Zeroed: | No |
| Flow Full Scale: | 100 | Low Flow Cut Off: | 0.5 |
| Response Time: | 15 | Coil Frequency: | 16.0 |
| Digital Output 1: | Volume/Pulse | Digital Output 1 fsd: | 1 |
| Digital Output 2: | Volume/Pulse | Digital Output 2 fsd: | 1 |
| Pulse Width: | 100 |  |  |
| Fullscale 4-20 1: | 100 |  | - |
| Fail Safe Mode: | Low | Cullscale 4-20 2: | - |
| Coil Off Time: | - | Reverse Flow: | Disabled |
| Nett Flow: | - |  |  |
| Relay 1 Setup: | System Fault | Relay 2 Setup: | System Fault |
| Relay 3 Setup: | - | Relay 4 Setup: | - |
| Relay 1 On: | - | Relay 2 On: | - |
| Relay 1 Off: | - | Relay 2 Off: | - |
| Relay 3 On: | - | Relay 4 On: | - |
| Relay 3 Off: | - | Relay 4 Off: | - |
| Simulation Value: |  | Simulation: | Disabled |

## M300 FACTORY CALIBRATION PARAMETER LIST

| Serial No: | 9856 |
| :--- | :--- |
| Model No: | M300-M-1A-2R-F-R |

M300-M-1A-2R-F-R

## SELECTION PARAMETER

3275
Calibrate 4-20 1:
9.913

Empty Pipe Detect:
Field Comp. 100\%:
Relays Fitted:
Enable Tot. Zero:
Median Filter:

Disabled
0
2
No
Off

Calibrate 4-20 2:
Cleaning Signal:
Set Coil Current:
Field Comp. 50\%:
4-20 Fitted:
Mains Frequency:

## SELECTION

- 

Enabled 1435
0
1
50 Hz

> Switch $1=\mathrm{Off}$
> Switat $2=\mathrm{O}$
> Switch $3=\mathrm{Off}$
> Switch $4=\mathrm{Off}$

| Job No | 3S0016 | Contract / PO Number |
| :---: | :---: | :---: |
| Job Name | Harrisville Flow Meter |  |
| ITP Description |  |  |
| Component | Power cables | Item / Tag Number / Panel No |
| Drawing Reference |  | Client Document Number |
| Drawing Reference |  |  |
| Cable Schedule | 486/4/6-0048-007 |  |
| Technical Ref |  |  |

* Do not energise equipinent during this stage of checks. All equlpment is to be correctly tagged and isolated.* Do not begin any testing until the surrounding area is safe to work and appropriate Job Safety Analysis' or equivalent have been consulted.

| Cable checks: Each of the below tests are to be completed on the cables included in this test sheet. |  |  |
| :---: | :--- | :---: |
| A | Cable glands appropriate size, with shrouds and lock nuts tight. |  |
| B | Cable installed correctiy, supported and protected from damage. |  |
| C | Cable numbers fitted and correct as per cable schedule. |  |
| D | All terminations completed and tested as per the termination drawing. |  |
| E | Cable schedule and termination drawing updated when required. |  |

Note: Insulation Resistance test the cables Core - Core and Core - Earth at 500 V (Minimum reeding of only 25Mn allowed). Resistance test each earth conductor to earth (Maximum reading of $0.5 \Omega$ allowed).


Insulation Tester
Multimeter
Mutimeter Equipment No
Authorised Person Comments \& Notes:
Equipment No


| Job No | 3 30016 | Contract / PO Number |
| :---: | :---: | :---: |
| Job Name | Harrisville Flow Meter |  |
| ITP Description | Control cables |  |
| Component |  | Item / Tag Number / Panel No |
| Drawing Reference |  | Client Document Number |
| Drawing Reference |  |  |
| Cable Schedule | 486/4/6-0048-007 |  |
| Technical Ref |  |  |

* Do not energise equipment during this stage of checks. All equipment is to be correctly tagged and isolated. * Do not begin any testing until the surrounding area is safe to work and appropriate Job Safety Analysis' or equivalent have been consulted.

| Cable checks: Each of the betow tests are to be completed on the cables Included in this test sheet. |  |
| :---: | :--- |
| A | Cable glands appropriate size, with shrouds and lock nuts tight. |
| B | Cable installed correctly, supported and protected from damage. |
| C | Cable numbers fitted and comect as per cable schedule. |
| D | All terminations completed and tested as per the termination drawing. |
| E | Cable schedule and termination drawing updated when required. |

Note: Resistance test each earth conductor to earth (Maximum reading of $0.5 \Omega$ allowed). DO NOT INSULATION RESISTANCE TEST THE CONTROL CABLES!!


Tests have been carried out in accordance with AS/NZS 3000;2007 and AS/NZS 3012
Authorised Person Comments 8. Notes


## Lend Lease

Water Queensland: 39 Suscatand Street, Rocklea Qld 4106

## CERTIFICATE OF:

(Please mark relevant check-box)

* Work performed for:

| * Name |  | Queensland Urban | Utilities |
| :---: | :---: | :---: | :---: |
|  | Title | Given name/s | Surname |
| * Address | Warrill View - Peak Crossing Road |  |  |

$\frac{\text { Harrisville }}{\text { Suburb/town }} \frac{4307}{\text { Postcode }}$

* Electrical installation / equipment tested (detailed list of all work done):
- of new replacemment switchboard including DGPO, RTU, antenna, radio and controls, reconnect existing Emflux flow meter.
* Date of test $13 / 6 \quad / 2013$ * Electrical contractor licence number 66516

Name on contractor licence Lend Lease Infrastructure Services Pty Ltd

Electrical contractor phone number 0737177217
For electrical installations, this certifies that the electrical installation, to the extent it is affected by the electrical work, has been tested to ensure that it is electrically safe and is in accordance with the requirements of the wiring rules and any other standard applying under the Electrical Safety Regulation 2002 to the electrical installation.
For electrical equipment, this certifies that the electrical equipment, to the extent it is affected by the electrical work, is electrically safe.

Name Shane Holding


## Lend Lease

# SECTION 7 

## S095 Harrisville Flow Meter

## Switchgear Data Sheets

- B \& R NI Stainless Steel Enclosures
- Clipsal Series 2000
- Dore Electrical Components
- Dore Switchboard Hardware
- Emflux M300_manual (See Flow meter Section)
- Kingfisher Hardware
- NHP_Relays
- Panasonic_VRLA_LC-R127R2P
- Phoenix Contact D-UK 410
- Phoenix contact E-UK
- Phoenix Contact UK 5 N
- Phoenix contact UK 5-HESI
- Powerbox PBDRN60
- RFI IS-B50LN-C2
- RFI N-203HS
- RFI YB9-series
- RS 497-6254
- RS 563407
- RS 563609
- Schneider E Series User Manual


## Universal NI 316 Stainless Steel



## INDEX

## Leaflet

Catalogue Information
Technical Drawings

## WEB LINKS

Universal NI-316 Stainless Steel Information Page
Ask a question / Send us an enquiry
Information about B\&R
Local Sales Team Phone Numbers

## Universal NI - 316 Stainless Steel

## Features

- Protection rating - IP66
- Flexible equipment mounting options
- Specially designed gutter system
- Foamed in place polyurethane gasket
- Robust fully welded construction
- Easy access with reversible door opening to $120^{\circ}$
- Corrosion resistant 316 stainless steel with N4 surface finish to reduce 'tea staining'



## OVERVIEW

The Universal NI is a general purpose enclosure designed for harsh and aggressive environments. Manufactured from 316 stainless steel for the ultimate corrosion resistance. Ease of use is assured by the reversible door, which opens to $120^{\circ}$.

## MATERIALS

- Body - 316 stainless steel
- Body thickness - 1.2 / 1.5 mm
- Gasket - FIP polyurethane
- Surface finish - N4


## INCLUSIONS

- 2 mm steel mounting pan powdercoated white
- 7 mm square turnbuckle lock (NI020/PS)
- Door rails
- Earth strap kit


Universal NI - Stainless Steel

## SELECTION GUIDE

| Catalogue No. | Dimensions (mm) |  |  |  | Mounting Pan (mm) |  |  | Door Rails |  | Fixing points** | No of locks | Weight (kg) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Height | Width | Depth | Usable Depth* | Thk. | Height | Width | Vertical | Horizontal |  |  |  |
| NI03021/S | 300 | 200 | 150 | 125 | 1.2 | 250 | 150 |  |  | 4 | 1 | 3.9 |
| NI03031/S | 300 | 300 | 150 | 125 | 1.2 | 250 | 250 |  |  | 4 | 1 | 5.3 |
| NI04031/S | 400 | 300 | 150 | 125 | 1.2 | 350 | 250 |  |  | 4 | 1 | 6.8 |
| NI03041/S | 300 | 400 | 150 | 125 | 1.2 | 250 | 350 |  |  | 4 | 1 | 6.7 |
| NIO4032/S | 400 | 300 | 200 | 175 | 1.5 | 350 | 250 |  |  | 4 | 1 | 9.0 |
| NIO3042/S | 300 | 400 | 200 | 175 | 1.5 | 250 | 350 |  |  | 4 | 1 | 8.9 |
| NIO4042/S a | 400 | 400 | 200 | 175 | 1.5 | 350 | 350 | - |  | 4 | 1 | 11.2 |
| N $105042 / \mathrm{Sa}$ | 500 | 400 | 200 | 175 | 1.5 | 450 | 350 | - |  | 4 | 1 | 14.0 |
| NI06042/S | 600 | 400 | 200 | 175 | 1.5 | 550 | 350 | - |  | 4 | 1 | 15.9 |
| N $105052 / \mathrm{S}$ - | 500 | 500 | 200 | 175 | 1.5 | 450 | 450 | - |  | 4 | 1 | 16.2 |
| NI06062/S | 600 | 600 | 200 | 175 | 1.5 | 550 | 550 | - |  | 4 | 1 | 22.1 |
| NI08062/S a | 800 | 600 | 200 | 175 | 1.5 | 750 | 550 | - |  | 6 | 2 | 28.5 |
| NI10082/S | 1000 | 800 | 200 | 175 | 1.5 | 950 | 750 | - |  | 6 | 2 | 44.6 |
| N $106043 / \mathrm{S}$ - | 600 | 400 | 300 | 275 | 1.5 | 550 | 350 | - |  | 4 | 1 | 18.5 |
| N $106063 / \mathrm{S}$ - | 600 | 600 | 300 | 275 | 1.5 | 550 | 550 | - |  | 4 | 1 | 25.2 |
| N $108063 / \mathrm{S}$ - | 800 | 600 | 300 | 275 | 1.5 | 750 | 550 | - |  | 6 | 2 | 32.2 |
| NI10063/S | 1000 | 600 | 300 | 275 | 1.5 | 950 | 550 | - |  | 6 | 2 | 39.2 |
| NI08083/S\# | 800 | 800 | 300 | 275 | 1.5 | 750 | 750 | - | - | 6 | 2 | 40.6 |
| NI10083/S\# | 1000 | 800 | 300 | 275 | 1.5 | 950 | 750 | - | - | 6 | 2 | 49.4 |
| NI12083/S\# | 1200 | 800 | 300 | 275 | 1.5 | 1150 | 750 | - | - | 8 | 2 | 58.1 |

* Mounting pan to inside of door
** Suits M8 fixing
- Available with vertical door rail
\# Available with horizontal or vertical door rail


## ACCESSORIES

| Product | Description | Catalogue No. |
| :---: | :---: | :---: |
| Rainhood | 30 mm high | NIRH021/S |
|  | 30 mm high | NIRH031/S |
|  | 30 mm high | NIRH032/S |
|  | 30 mm high | NIRH041/S |
|  | 30 mm high | NIRH042/S |
|  | 30 mm high | NIRH043/S |
|  | 30 mm high | NIRH062/S |
|  | 30 mm high | NIRH063/S |
|  | 30 mm high | NIRH082/S |
|  | 30 mm high | NIRH083/S |
| Vent kit-external | $130 \times 130 \mathrm{~mm}$ | IPVK/S |
| Wall mounting brackets | 316 stainless steel (4) | MEB/S |
| Mounting flange kit <br> - 316 stainless steel | $75 \times 200 \mathrm{~mm}$ | MF2/S |
|  | $75 \times 300 \mathrm{~mm}$ | MF3/S |
|  | $75 \times 400 \mathrm{~mm}$ | MF4/S |
|  | $75 \times 500 \mathrm{~mm}$ | MF5/S |
|  | $75 \times 600 \mathrm{~mm}$ | MF6/S |
|  | $75 \times 800 \mathrm{~mm}$ | MF8/S |



Vent kit


Rainhood

| Queensland | P +61 737141000 |
| :---: | :---: |
| Townsville | P +61 747756255 |
| Sydney | P +61 288677688 |
| Newcastle | P+61249614433 |
| Victoria | P +61 385888400 |
| South Australia | P +61 884176200 |

Western Australia P $\quad 61892489744$
Tasmania
Northem Territory
sales@brenclosures.com.au
brenclosures.com.au

## Technical Drawings



Front View


Bottom View


Front View With Internals


Side View


| Catalogue No. | Dimensions (mm) |  |  |  |  |  |  |  |  |  |  |  |  | No of Fixing Points | No of Locks |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | External |  |  |  | Internal Depth |  | Mounting Pan |  | Opening Size |  | Fixing Centres |  |  |  |  |
|  | A | B | C | D | E | F | G | H | 1 | $J$ | K | L | M |  |  |
| NI03021/S | 300 | 200 | 150 | 129 | 145 | 108 | 250 | 15 | 255 | 155 | 225 | 125 | - | 4 | 1 |
| NI03031/S | 300 | 300 | 150 | 129 | 145 | 108 | 250 | 250 | 255 | 255 | 225 | 225 | - | 4 | 1 |
| NI03041/S | 300 | 400 | 150 | 129 | 145 | 108 | 250 | 350 | 255 | 355 | 225 | 325 | - | 4 | 1 |
| NI04031/S | 400 | 300 | 150 | 129 | 145 | 108 | 350 | 250 | 355 | 255 | 325 | 225 | - | 4 | 1 |
| NI03042/S | 300 | 400 | 200 | 179 | 195 | 158 | 250 | 350 | 255 | 355 | 225 | 325 | - | 4 | 1 |
| NI04032/S | 400 | 300 | 200 | 179 | 195 | 158 | 350 | 250 | 355 | 255 | 325 | 225 | - | 4 | 1 |
| NI04042/S | 400 | 400 | 200 | 179 | 195 | 158 | 350 | 350 | 355 | 355 | 325 | 325 | - | 4 | 1 |
| NI05052/S | 500 | 500 | 200 | 179 | 195 | 158 | 450 | 450 | 455 | 455 | 425 | 425 | - | 4 | 1 |
| NI06042/S | 600 | 400 | 200 | 179 | 195 | 158 | 550 | 350 | 555 | 355 | 525 | 325 | - | 4 | 1 |
| NI06062/S | 600 | 600 | 200 | 179 | 195 | 158 | 550 | 550 | 555 | 555 | 525 | 525 | - | 4 | 1 |
| NI08062/S | 800 | 600 | 200 | 179 | 195 | 158 | 750 | 550 | 755 | 555 | 725 | 525 | - | 6 | 2 |
| NI10082/S | 1000 | 800 | 200 | 179 | 195 | 158 | 950 | 750 | 955 | 755 | 925 | 725 | - | 6 | 2 |
| NI06043/S | 600 | 400 | 300 | 279 | 295 | 258 | 550 | 350 | 555 | 355 | 525 | 325 | - | 4 | 1 |
| NI06063/S | 600 | 600 | 300 | 279 | 295 | 258 | 550 | 550 | 555 | 555 | 525 | 525 | - | 4 | 1 |
| NI08063/S | 800 | 600 | 300 | 279 | 295 | 258 | 750 | 550 | 755 | 555 | 725 | 525 | - | 6 | 2 |
| NI08083/S | 800 | 800 | 300 | 279 | 295 | 258 | 750 | 750 | 755 | 755 | 725 | 725 | - | 6 | 2 |
| NI10063/S | 1000 | 600 | 300 | 279 | 295 | 258 | 950 | 550 | 955 | 555 | 925 | 525 | - | 6 | 2 |
| NI10083/S | 1000 | 800 | 300 | 279 | 295 | 258 | 950 | 750 | 955 | 755 | 925 | 725 | - | 6 | 2 |
| NI12083/S | 1200 | 800 | 300 | 279 | 295 | 258 | 1150 | 750 | 1155 | 755 | 1125 | 725 | 337.5 | 6 | 2 |




## Switches

2000 Series offers the choice of both standard and architrave size switches. Standard size switches are available in vertical and horizontal formats with up to six switches. Architrave switches are available with up to four switches.

The impact-resistant gridplates ensure that 2000 Series switches are protected against the occasional use of excessive force and the 2000 Series surround completes the sophisticated look of the product.

## Power Points

The 2000 Series offers a wide range of power points, including single, double and automatically switched versions.

The 2000 Series double power point is not only the most popular product in the Clipsal range; it is also the most popular double power point in Australia. Vertical and horizontal versions are available in the single and double power point ranges to give you more options. Added extras such as neons, safety shutters and extra switches allow for even more versatility /safety shutters prevent accidental contact with live terminals within the power point).

Surface mounted single and double power points are available if they are required and we also offer power points with earth leakage and surge protection for your safety.


## Entertainment; Communication and Home Office

Computers, fax machines, televisions and telephones are now an everyday part of our lives. Clipsal 2000 Series includes TV, computer and communications accessories for every application.

There are a number of TV sockets |suitable for free-to-air and pay TV) available in 2000 Series gridplates, which provide a secure connection to antenna cables to ensure optimum reception. There are also telephone, computer and speaker outlet plates available.

2000 Series has the flexibility to fully cater for your home entertainment, communication and office needs.


## Matisse

Adding to the immense 2000 Series range is the Clipsal Matisse M2000 Series. Suitably named after the French artist 'Matisse', who was renowned for his creativity, flair, boldness and unique style, the Matisse range combines all of these qualities, resulting in a smooth switch with European style and unique design.

The M2000 range offers a choice of one, two and three gang easily operated switches (with or without inbuilt neons) and

## Multigang Surrounds

The neatest way to keep your switches and power points together is with Clipsal 2000 Series Multigang Surrounds.

Available in two and three gang horizontal versions and two, three and four gang vertical versions, they neatly house and fully integrate all 2000 Series and Matisse gridplates into a single surround.


2000 Series with 3 gang horizontal surround (2000H3)


## Timers

The 2000 Series also offers a range of timers for lights and fans. This is great for places like the bathroom or toilet where lights and fans sometimes get left on accidentally.

So when the lights or fan are left on, 2000 Series timers will turn them off for you. The results are real energy and cost savings in a variety of applications.

## Safety Switches and Surge Protectorss

Clipsal 2000 Series provides several earth leakage protected and surge protected power points for added protection against electrocution and electrical surges.

These types of power points can give protection to specific areas of the house, for example, the kitchen, nursery, garage, home office, bedroom, bathroom or laundry.


Earth leakage and surge protected power points could save someone you love from being electrocuted, or your expensive electronic equipment from being damaged. Give your family the best protection money can buy!

2000 Series dimmers let you adjust the lighting levels in any area for any occasion. For instance, you may want to add a little romance to an intimate dinner, create the right mood for a movie, or leave just enough light on to navigate your way to the bathroom.

Using dimmers also saves energy and reduces your power bill.

2000 Series also offers a range of fan controllers that allow you to control the speed of ceiling sweep fans and exhaust fans. This way you can adjust the air movement to suit your situation.


## Weatherproof Switches

The outstanding features and stylish good looks of the 2000 Series weatherproof switches make them the ideal choice for bathrooms and laundries.

A simple solution to the longstanding problem of using electricity near water, 2000 Series weatherproof switches are designed specifically for the restricted zones of kitchens, bathrooms, laundries and other wet areas, where both safety and aesthetics are important.

Their hardwearing, UV stabilised polycarbonate surface also makes them suitable for a wide variety of outdoor areas such as carports and pergolas.


## STANDARD SIZE FLUSH SWITCHES

| 2031 HA | A | 1 Gang Horizontal Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way |
| :--- | :---: | :--- |
| 2032 HA | B | 2 Gang Horizontal Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way |
| 2033 HA | C | 3 Gang Horizontal Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way |
| 2034 HA | D | 4 Gang Horizontal Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way |
| 2031 VA | E | 1 Gang Vertical Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way |
| 2032 VA | F | 2 Gang Vertical Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way |
| 2033 VA | G | 3 Gang Vertical Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way |
| 2034 VA | H | 4 Gang Vertical Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way |
| 2035 VA | I | 5 Gang Vertical Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way |
| 2036 VA | J | 6 Gang Vertical Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way |



ARCHITRAVE SIZE FLUSH SWITCHES

| 2030 | A | 1 Gang Vertical Architrave Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way |
| :--- | :---: | :--- |
| 2032 A | B | 2 Gang Vertical Architrave Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way |
| 2033 A | C | 3 Gang Vertical Architrave Swith, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way |
| 2034 A | D | 4 Gang Vertical Architrave Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way |

STANDARD SIZE FLUSH SURROUNDS AND GRIDS - HORIZONTAL/VERTICAL MOUNTING

| $2031 V X$ | A | Flush Surround and Blank Gridplate |
| :--- | :---: | :--- |
| 2031 VXCB | A | Flush Surround and Blank Gridplate with 30A Terminal Block |
| 2031 VH | B | Flush Surround and 1 Gang Gridplate |
| 2032 VH | C | Flush Surround and 2 Gang Gridplate |
| 2033 VH | D | Flush Surround and 3 Gang Gridplate |
| 2034 VH | E | Flush Surround and 4 Gang Gridplate |
| 2035VH | F | Flush Surround and 5 Gang Gridplate |
| 2036VH | G | Flush Surround and 6 Gang Gridplate |



ARCHITRAVE SIZE FLUSH SURROUNDS AND GRIDS

| 2031 | A | 1 Gang Architrave Flush Surround and Gridplate |
| :---: | :---: | :---: |
| 2032 | B | 2 Gang Architrave Flush Surround and Gridplate |
| 2033 | C | 3 Gang Architrove Flush Surround and Gridplate |
| 2034 | D | 4 Gang Architrave Flush Surround and Gridplate |
| SURROUNDS |  |  |
| 2000 | A | Single Flush Surround, Curved Sided |
| 2000M | A | Metal Flush Surround, Curved Sided (please nominate finish in colour code) |
| 2000 T | B | Trendsetter Single Flush Bevelled Edge Surround (suits 2000 Series grid plates) |
| 2000F | C | Struight Sided Single Flush Surround |
| 2000R | D | Single Flush Surround, Curved Sided with round hole (suits 2009R) |
| 2000R2 | E | Single Flush Surround, Curved Sided with 2 round holes (suits $2 \times 2009 \mathrm{R}$ ) |
| 2000/2 | F | Two Gang Flush Surround, Curved Sided |
| 2000H2 | G | Two Gang Flush Surround, Curved Sided, Horizontal |
| 2000/2R | H | Iwo Gang Surround, Curved Sided with 2 round holes (suits $2 \times 2009 \mathrm{R}$ ) |
| 2000/3 | 1 | Three Gang Flush Surround, Curved Sided |
| 2000H3 | J | Three Gang Flush Surround, Curved Sided, Horizontal |
| 2000/3R | K | Three Gang Flush Surround, Curved Sided with 3 round holes (suits $3 \times 2009 \mathrm{R}$ ) |
| 2000/4 | L | Four Gang Flush Surround, Curved Sided |
| 2001 | M | Single Gang Flush Surround, Curved Sided (archirrave) |
| 2002 | N | Two Gang Flush Surround, Curved Sided (archirrave) |
| 2003/4 | 0 | Three/Four Gang Flush Surround, Curved Sided (architrave) |



## CIRCUIT IDENTIFICATION CAPS

| 2009 | A | Oval Identification Cap (suits 2000 Series gridplate mount) - Concealed |
| :--- | :---: | :--- |
| 2009R | B | Round Identification Cap (suits 2000 Series gridplate mount) - Visible |
| BK2009/_ | C | Oval Identification Cap (add preferred number, 2 digit limit) |
| BK2009RH_ | D | Round Identification Cap (suits horizontal mounting - add preferred number - 2 digit limit) |
| BK2009RV_ | D | Round Identification Cap (suits vertical mounting - add preferred number - 2 digigit limit) |



IP66 RATED WEATHERPROOF FLUSH SWITCHES

| 2031 V 66 | A | 1 Gang Weatherproof Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way, vertical mounting |
| :--- | :---: | :--- |
| 2031 H 66 | B | 1 Gang Weatherproof Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way, horizontal mounting |
| 2032 V 66 | C | 2 Gang Weatherproof Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way, vertical mounting |
| 2032 H 66 | D | 2 Gang Weatherproof Switch, $250 \mathrm{~V} / 10 \mathrm{~A}, 1$ way $/ 2$ way, horizontal mounting |



C-THRUTM LIGHT DIMMERS \& FAN SPEED CONTROLLERS

| 2032E450L | A | C-Thru Light Dimmer, Leading Edge, 250V AC/450W |
| :--- | :---: | :--- |
| 32E450LM | B | C-Thru Light Dimmer Mechanism, Leading Edge, 250V AC/450W |
| 2032E450T | A | C-Thru Light Dimmer, Trailing Edge, 250V AC/450W |
| 32E450TM | B | C-Thru Light Dimmer Mechanism, Triling Edge, 250V AC/450W |
| 2032E500F | C | C-Thru Fan Controller, 250V AC/500W |
| 32E500FM | B | C-Thru Fan Controller Mechanism, 250V AC/500W |
| 2031E800T | D | High Power Dimmer, 250V/800VA, Trailing Edge |
| 2031E1000L | D | High Power Dimmer, 250V/1000VA, Leading Edge |
| 2031VF3CA | E | 3 Speed Capacitor Ceiling Sweep Fan Controller, 250V, 100VA (suits ACES36AL \& ACES48AL) |
| 2031VF3CB | E | 3 Speed Capacitor Ceiling Sweep Fan Controller, 250V, 100VA (suits ACES56AL \& AFLR48) |



A


B


C

## ELECTRONIC TIMER CONTROLS

| $2031 V E T R$ | A | Electronic Timer Control, 254 Minute Time Delay, 250V/10A, 2 wire |
| :--- | :---: | :--- |
| $2031 V$ VTR3 | A | Electronic Timer Control, 15 Hour Time Delay, 250V/10A, 3 wire |
| $2031 V E T F$ | B | Electronic Timer Control, 10 Minutes Time Delay, 250V/10A, Fans/Lights |

## FLUSH MOUNTED RESIDUAL CURRENT DEVICES

| $2031 R C 10$ | A | Single Gang RCD, 250V/20A, 10mA, Double Pole, horizontal mounting |
| :--- | :---: | :--- |
| 2031 VRC10 | B | Single Gang RCD, 250V/20A, 10mA, Double Pole, vertical mounting |
| 2031 RC30 | A | Single Gang RCD, 250V/20A, 30mA, Double Pole, horizontal mounting |
| 2031 VRC30 | B | Single Gang RCD, 250V/20A, 30mA, Double Pole, vertical mounting |

## ELECTRIC RANGE SWITCHES (COOKER SWITCHES)

| $2031 / 45$ | $\mathbf{A}$ | Electric Range Switch, 250V/45A, single pole |
| :--- | :---: | :--- |
| $2031 / 45 \mathrm{~N}$ | $\mathbf{B}$ | Electric Range Switch, 250V/45A, single pole with neon |
| $2031 D 40$ | $\mathbf{A}$ | Electric Range Switch, 250V/40A, double pole |
| $2031 D 40 \mathrm{~N}$ | $\mathbf{B}$ | Electric Range Switch, 250V/40A, double pole with neon |

TELEPHONE DATA OUTLET PLATES - STANDARD SIZE

| 2031 VT0 | A | Telephone Outlet Plate - Telstra 610 type |
| :--- | :---: | :--- |
| 2031 VRJ | B | Single Telephone/Dota Outlet Plate |
| 2031 VIJA5 | C | Single Data Outlet Plate (100Mbs) |
| 2031 VRJD | D | Single Data Outlet Plate - marked 'DATA' |
| 2031 VRJT | E | Single Telephone Outlet Plate - marked ‘TELEPHONE' |
| 2032 VRJ | F | Double Telephone/Data Outee Plate |
| 2032VRJA5 | G | Double Data Outlet Plate (100Mbs) |



AUDIO CONNECTION PLATE - STANDARD SIZE

2032SPK

## TV ANTENNA CONNECTION ACCESSORIES

| 2031VTV05 | A | TV Outlet Plate, with half inch hole |
| :---: | :---: | :---: |
| 2031VTV75 | B | Coaxial TV Socket in standard size plate, 750 hm |
| 2031VTV75ACF | C | Single Gang TV Socket, with 3kVAc isolation, 750 hm |
| 2031VTV75F | D | Single Gang TV Socket, with F type connection, 750 hm |
| 2032VTV75FM | E | Two Gang TV - FM Splitter in standard size plate |
| 2031TVF | F | Two Gang PAY TV Antenna Socket in standard size plate |
| 2032TVACFF | G | Two Gang PAY TV / FTA TV, with AC isolation, 75 Ohm, in standard size plate |
| 2032TVFF | H | Two Gang PAY TV / FTA TV, with F type connection, 75 Ohm, in standard size plate |
| 2032TVSF | I | Two Gang PAY TV / FTA TV Screw Coaxial Connection in standard size plate |

SINGLE AUTOMATICALLY SWITCHED POWER POINTS - STANDARD SIZE - HORIZONTAL MOUNTING

| 2010 | A | Single Automatically Switched Power Point, 250V/10A |
| :--- | :---: | :--- |
| $2010 / 15$ | B | Single Automatically Switched Power Point, 250V/15A |
| $2010 / 15 \mathrm{~N}$ | C | Single Automatically Switched Power Point, 250V/15A, with safety shutters and neon |
| $2010 / 15 \mathrm{~S}$ | B | Single Automatically Switched Power Point, 250V/15A, with safety shutters |
| 2010 L | D | Single Automatically Switched Power Point, 250V/10A, with round earth pin for lighting |
| 2010 LN | E | Single Automatically Switched Power Point, 250V/10A, with round earth pin for lighting, safety shutters and neon |
| 2010 LS | D | Single Automatically Switched Power Point, 250V/10A, with round earth pin for lighting and safety shutters |
| 2010 N | F | Single Automatically Switched Power Point, 250V/10A, with safety shutters and neon |
| 2010 S | A | Single Automatically Switched Power Point, 250V/10A, with safety shutters |

SINGLE SWITCHED POWER POINTS - STANDARD SIZE - HORIZONTAL MOUNTING

| 2015 | A | Single Switched Power Point, 250V/10A |
| :--- | :---: | :--- |
| 2015 S | A | Single Switched Power Point, 250V/10A, with safety shutters |
| 2015 N | B | Single Switched Power Point, 250V/10A, with safety shutters and neon |
| 2015 D | A | Single Switched Power Point, 250V/10A, double pole |
| 2015 L | C | Single Switched Power Point, 250V/10A, with round earth pin for lighting |
| $2015 / 15$ | D | Single Switched Power Point, 250V/15A |
| $2015 / 15 \mathrm{~N}$ | E | Single Switched Power Point, 250V/15A, with safety shutters and neon |
| $2015 / 20$ | F | Single Switched Power Point, 250V/20A |
| 2015 N 20 | G | Single Switched Power Point, 250V/20A, with neon |
| 2015020 | F | Single Switched Power Point, 250V/20A, double pole |
| 20150 N 20 | G | Single Switched Power Point, 250V/20A, double pole with neon and safety shutters |
| 2015 X | H | Single Switched Power Point, 250V/10A, with removable extra switch |
| $2015 X \mathrm{~N}$ | I | Single Switched Power Point, 250V/10A, with safety shutters, neon and removable extra switch |
| $2015 X X$ | J | Single Switched Power Point, 250V/10A, with 2 removable extra switches |
| $2015 X X X$ | K | Single Switched Power Point, 250V/10A, safety shutters, neon and 2 removable extra switches |
| $2015 S M$ | L | Single Switched Power Point, 250V/10A, with surface mounting kit |
| $2015 X S M$ | M | Single Switched Power Point, 250V/10A, with surface mounting kit and extra switch |

DOUBLE SWITCHED POWER POINTS - STANDARD SIZE - HORIZONTAL MOUNTING

| 2025 | A | Double Switched Power Point, 250V/10A |
| :---: | :---: | :---: |
| 2025 S | A | Double Switched Power Point, 250V/10A, with safety shutters |
| 2025N | B | Double Switched Power Point, 250V/10A, with safety shutters and neons |
| 2025L | C | Double Switched Power Point, 250V/10A, with round earth pin for lighting |
| 20250C | A | Double Switched Power Point, 250V/10A, Quick Connect |
| 202550 | D | Double Power Point, 250V/10A, printed with 'Not protected by safety swich. Fridge/frezzer oniy' |
| 2025XA | E | Double Switched Power Point, 250V/10A, with removable extra switch |
| 2025XAN | F | Double Switched Power Point, 250V/10A, with safety shutters, neons and removable extra switch |
| 2025SM | G | Double Switched Power Point, 250V/10A, with surface mounting kit |
| 2025XASM | H | Double Switched Power Point, 250V/10A, with surface mounting kit and removable extra switch |



 The shape of the switch dolly is a trade mark of Gerard Industries Pty Ltd

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| :--- | :--- | ---: |
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|  | Country Areas | (03) 92073200 |
| QLD | Brisbane | $(07) 3243893$ |
|  | Townsville | $(07) 47293333$ |
| SA | Adelaide | $(08) 82680400$ |

SA Adelaide
(08) 82680400

| WA | Perth | $(08) 94424444$ |
| :--- | :--- | :--- |
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## clipsal.com

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## clipsal.com

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## Electrical Components

| Automatic Transfer Switch | B43 | Liquid Level Relays | B24 |
| :---: | :---: | :---: | :---: |
| Bells | B11 | Load Break Disconnectors/Fused/HDT1/QP | B42-B43 |
| Bus Bar Cleats | B20-B21 | Main Switches | B30 |
| Bus Plugs | B18 | MCB's-Miniature Circuit Breakers \& Accessories | B30-B31 |
| Buzzers | B13 | MCB Covers \& Boxes \& Flush Adaptors | B32 |
| Cam Switches | B26 | Meter Disconnect Links | B15 |
| Contactors \& Accessories | B38-B40 | Meters -Voltmeters/Ammeters/Hour Run | B28 |
| Control Relays | B25 | Motor Protection Circuit Breakers | B33 |
| Current Transformers | B29 | Moulded Case Circuit Breakers \& Accessories | B34-B36 |
| Din Base + Cartridges | B41 | Phase Failure Relays | B24 |
| Din Fuse Carrier + Cartridges | B33 | Pilot Lights | B4-B9 |
| Distribution Boards | B32 | Plugs, Sockets \& Switches - Industrial | B2-B3 |
| Distribution Panel Boards | B31 | Power Rails | B18 |
| Door Switch | B12 | Power Supplies | B45 |
| Earth + Neutral + Active Bars | B13-B14 | Push Button Adaptors | B32 |
| Emergency Lighting Test Kit | B26 | Push Buttons | B5-B8 |
| Enclosure Accessories | B51 | Relays \& Bases | B27 |
| Enclosures - Metal (Beige \& Orange) | B50 | Rocker Switches | B4 |
| Enclosures - PVC - Polyester | B46-B49 | Rotating Lights | B10 |
| Enclosures - Stainless Steel | B51 | Selector Switches | B6-B9 |
| Fans \& Accessories | B16-B17 | Sensors | B25 |
| Flashing/Rotating Lights | B10 | Sirens | B13 |
| Flip Flop Relay | B25 | Solid State Relays | B11 |
| Float Switches | B24 | Star Delta Timer | B24 + B25 |
| Foot Switches | B11 | Strobe Lights | B10 |
| GPO's - Din Mount | B15 | Surge Protector | B32 |
| GPO's - Weatherproof | B15 \& B32 | Tape - Double Sided/Packing/Masking | B52 |
| Hoist Pendants | B12 | Taptites | B52 |
| Impulse Counters | B23 | Thermostat - Mechanical | B17 |
| Insulators - Low \& High Voltages | B19 | Timers \& Accessories | B22-B23 |
| Isolating Switches - Weatherproof | B15 | Toggle Switches | B4 |
| Kilowatt Hour Run Meter | B37 | Tower Flashing Light w/- Buzzer | B10 |
| Lamps to suit Pilot Lights | B9 | Transformers - Auto Starters | B45 |
| Legends to suit 22mm Pilot Lights | B5 | Transformers - Open/Mining | B44 |
| Limit Switches | B12 |  |  |

66 Series - Industrial Switches \& Plugs
IP66
Schedule 1

| RATING | $\frac{\text { STRAIGHT }}{\text { PLUGS }}$ | PRICE | $\begin{aligned} & \text { ANGLE } \\ & \hline \text { PLUGGS } \end{aligned}$ | PRICE | $\frac{\text { EXTENSION }}{\underline{\text { SOCKET }}}$ | PRICE |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { AUSTRALIAN } \\ & \hline \underline{\text { STANDARD }} \end{aligned}$ |  |  |  |  | $\left(c^{5}\right)^{2}$ |  |
| 250V 10A 3 Flat Pins | PLS1PH310 | \$23.96 |  |  | SCO3P10 | \$45.45 |
| 250V 15A 3 Flat Pins | PLS1PH315 | \$29.52 |  |  | SCO3P15 | \$45.45 |
| 250V 20A 3 Round Pins | PLS1PH320 | \$60.80 |  |  | SCO3P20 | \$65.00 |
| 250V 32A 3 Round Pins | PLS1PH332 | \$75.00 |  |  | SCO3P32 | \$65.00 |
| $440 \mathrm{~V} 10 \mathrm{~A} 3 \mathrm{P}+\mathrm{N}$ | PLS3PH410 | \$60.08 | PLA3PH410 | \$60.08 | SCO4P10 | \$75.09 |
| 440 V 10A $3 \mathrm{P}+\mathrm{N}+\mathrm{E}$ | PLS3PH510 | \$75.09 | PLA3PH510 | \$75.09 | SCO5P10 | \$90.09 |
| $440 \mathrm{~V} 20 \mathrm{~A} 3 \mathrm{P}+\mathrm{N}$ | PLS3PH420 | \$60.08 | PLA3PH420 | \$60.08 | SCO4P20 | \$75.09 |
| $440 \mathrm{~V} 20 \mathrm{~A} 3 \mathrm{P}+\mathrm{N}+\mathrm{E}$ | PLS3PH520 | \$75.09 | PLA3PH520 | \$75.09 | SCO5P20 | \$90.09 |
| $440 \mathrm{~V} 32 \mathrm{~A} 3 \mathrm{P}+\mathrm{N}$ | PLS3PH432 | \$93.05 | PLA3PH432 | \$93.05 | SCO4P32 | \$114.10 |
| $440 \mathrm{~V} 32 \mathrm{~A} 3 \mathrm{P}+\mathrm{N}+\mathrm{E}$ | PLS3PH532 | \$102.12 | PLA3PH532 | \$102.07 | SCO5P32 | \$117.13 |
| $440 \mathrm{~V} 40 \mathrm{~A} 3 \mathrm{P}+\mathrm{N}$ | PLS3PH440 | \$152.46 |  |  |  |  |
| $440 \mathrm{~V} 40 \mathrm{~A} 3 \mathrm{P}+\mathrm{N}+\mathrm{E}$ | PLS3PH540 | \$163.35 |  |  | SCO5P40 | \$145.00 |
| 440V 50A 3 P + N | PLS3PH450 | \$163.35 |  |  |  |  |
| $440 \mathrm{~V} 50 \mathrm{~A} 3 \mathrm{P}+\mathrm{N}+\mathrm{E}$ | PLS3PH550 | \$199.65 |  |  | SCO5P50 | \$186.56 |

IEC 309
STANDARD

| 440V 63A 3 P + N +E | PLS3PH563 | $\$ 188.00$ |  |  | SCO5P63 |
| :--- | :---: | :---: | :---: | :---: | :---: |
| 440V 125A 3 P + N +E | PLS3PH5125 | $\$ 370.00$ |  |  | SCO5P125 |


| SWITCHES |  | PRICE |
| :--- | :--- | :--- |
| S2P10 | 250V 10A 2 pole | $\$ 84.70$ |
| S2P20 | 250V 20A 2 pole | $\$ 87.12$ |
| S3P20 | 440 V 20A 3 pole | $\$ 89.54$ |
| S3P32 | 440 V 32A 3 pole | $\$ 93.50$ |
| S3P63 | 440 V 63A 3 pole | $\$ 115.50$ |


| REVERSING SWITCH | PRICE |  |
| :--- | :--- | :--- |
| $\mathbf{S 3 P 2 0 F} / \mathbf{R}$ | $\$ 114.95$ |  |


| CHANGEOVER SWITCH | PRICE |
| :--- | :--- | :--- |
| $\mathbf{S 3 P 2 0 C} / \mathbf{O}$ | P99.22 |

66 Series - Industrial Switches \& Plugs
IV $\mathrm{C}^{\prime}$ Done Electrice

| $\begin{gathered} \text { SURFACE } \\ \hline \text { SOCKET } \end{gathered}$ | PRICE | $\begin{aligned} & \text { SWITCH } \\ & \hline \text { SOCKET } \end{aligned}$ | PRICE | $\begin{aligned} & \underline{\text { AUTO }} \\ & \underline{\text { SWITCH }} \end{aligned}$ | $\begin{aligned} & \text { TRADE } \\ & \hline \text { PRICE } \end{aligned}$ | $\begin{aligned} & \text { APPLIANCE } \\ & \hline \text { INLET SOC. } \end{aligned}$ | PRICE |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |
| SC310 | \$66.07 | C01PH310 | \$77.44 | SC310A | \$70.00 | SC310R | \$75.00 |
| SC315 | \$66.07 | C01PH315 | \$88.94 | SC315A | \$70.00 | SC315R | \$75.00 |
| SC320 | \$85.00 | C01PH320 | \$139.58 |  |  |  |  |
| SC332 | \$85.00 | CO1PH332 | \$148.58 |  |  |  |  |
| SC410 | \$93.12 | CO3PH410 | \$165.17 |  |  |  |  |
| SC510 | \$99.10 | CO3PH510 | \$174.12 |  |  |  |  |
| SC420 | \$93.12 | CO3PH420 | \$165.17 |  |  |  |  |
| SC520 | \$99.10 | CO3PH520 | \$174.12 |  |  | SC520R | \$190.00 |
| SC432 | \$102.07 | CO3PH432 | \$174.12 |  |  |  |  |
| SC532 | \$114.10 | CO3PH532 | \$204.19 |  |  | SC532R | \$210.00 |
| SC440 | \$118.58 | CO3PH440 | \$338.80 |  |  |  |  |
| SC540 | \$142.78 | CO3PH540 | \$357.28 |  |  |  |  |
| SC450 | \$142.78 | CO3PH450 | \$360.58 |  |  |  |  |
| SC550 | \$158.51 | CO3PH550 | \$415.25 |  |  |  |  |


| SC563 | $\$ 180.00$ |  |  |  |  |  |  |
| :---: | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| SC5125 | $\$ 335.00$ |  |  |  |  |  |  |


| COVERS | With Mounting Bracket \& Neon | PRICE |
| :--- | :--- | :--- |
| CBC1PN | $1-3$ Pole MCB Cover | $\$ 54.03$ |
| CBC4P | $1,2,3 \& 4$ Pole Cover | $\$ 81.07$ |


| ADAPTOR GLAND |  | PRICE |
| :--- | :--- | :--- |
| PLADPT | 25mm Plug | $\$ 10.43$ |
| PLADPT/L | 25 mm Plug/Large | $\$ 10.43$ |

MOUNTING
ENCLOSURES

| G1E | 1 Module Base | $\$ 13.50$ |
| :--- | :--- | :--- |
| G2E | 2 Module Base | $\$ 24.02$ |
| G3E | 3 Module Base | $\$ 61.83$ |
| G4E | 4 Module Base | $\$ 66.07$ |
| G6E | 6 Module Base | $\$ 90.09$ |
| G8E | 8 Module Base | $\$ 105.00$ |
| G9E | 9 Module Base | $\$ 135.00$ |
| E1COVER | 1 Module Cover | $\$ 8.87$ |
| E2COVER | 2 Module Cover | $\$ 13.50$ |

Toggle Switch - 15 Amps - Quick Connect
SChedule 1

| Part No. | Type | Switching | Price |
| :--- | :--- | :--- | :--- |
| ETS101QC | On - Off | SPST | $\$ 6.00$ |
| ETS103QC | On - Off - On | SPDT | $\$ 6.00$ |
| ETS201QC | On - Off | SPDT | $\$ 6.00$ |
| ETS202QC | On - On | DPDT | $\$ 6.00$ |
| ETS203QC | On - Off - On | DPDT | $\$ 7.25$ |
| ETS111QC | Off-On-Mon | SPST | $\$ 6.00$ |
| ETS112QC | On-On-Mon | SPDT | $\$ 6.00$ |
| ETS212QC | On-On-Mon | DPDT | $\$ 7.25$ |
| ETS223QC | Mon-On-Off-Mon-On | DPDT | $\$ 7.25$ |
| ETS1000 | Weather proof Boot |  | $\$ 3.40$ |

Rocker Switch- 15 Amps - Quick Connect
SCHEDULE 1

| Part No. | Type | Switching | Price |
| :--- | :--- | :--- | :--- |
| RS1011B | On - Off | SPST | $\$ 6.80$ |
| RS1033A | On - Off - On | SPDT | $\$ 6.80$ |
| RS2011A | On - Off | DPST | $\$ 6.80$ |

## Pilot Lights LED © 8mm <br> Schedule 1 <br> - LED's with Built in Diodes <br> - Chrome Body, Leads

|  | $\mathbf{1 2}$ Volt | 24 Volt | 220 Volt |  |
| :--- | :--- | :--- | :--- | :--- |
| Colour | Part No. | Part No. | Part No. | Trade <br> Price |
| Red | PL8R12 | PL8R24 | PL8R220 | $\$ 6.66$ |
| Green | PL8G12 | PL8G24 | PL8G220 | $\$ 6.66$ |
| Amber | PL8A12 | PL8A24 | PL8A220 | $\$ 6.66$ |
| Blue | PL8B12 | PL8B24 | PL8B220 | $\$ 6.66$ |

## Pilot Lights LED $\otimes$ 12mm

- LED's with Built in Diodes
- Chrome Body, Leads

|  |  |  |  | 12 Volt |
| :--- | :--- | :--- | :--- | :--- |
|  | 24 Volt | 220 Volt |  |  |
| Colour | Part No. | Part No. | Part No. | Trade <br> Price |
| Red | PL12R12 | PL12R24 | PL12R220 | $\$ 6.66$ |
| Green | PL12G12 | PL12G24 | PL12G22 | $\$ 6.66$ |
| Amber | PL12A12 | PL12A24 | PL12A220 | $\$ 6.66$ |
| Blue | PL12B12 | PL12B24 | PL12B220 | $\$ 6.66$ |

## Pilot Lights - Neon $\theta$ 8mm

- Flush Mount w/- Quick Connect Terminals

| Colour | Part No. | Voltage | Mtg. Hole | Trade <br> Price |  |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Red | PLF8R240 | 240 | 8 mm | $\$ 6.66$ |  |
| Green | PLF8G240 | 240 | 8 mm | $\$ 6.66$ |  |
| Amber | PLF8A240 | 240 | 8 mm | $\$ 6.66$ |  |

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Pilot Lights © 16mm - Less Lamp LE10 Series 6- 240V - IP44

| Part No. | Lens Colour | Mtg. Hole | Price |
| :--- | :--- | :--- | ---: |
| PLCA16R | Red | 16 mm | $\$ 9.08$ |
| PLCA16G | Green | 16 mm | $\$ 9.08$ |
| PLCA16A | Amber | 16 mm | $\$ 9.08$ |
| PLCA16B | Blue | 16 mm | $\$ 9.08$ |
| PLCA16C | Clear | 16 mm | $\$ 9.08$ |

Pilot Lights $\Theta 16 \mathrm{~mm}$ Built in LED - IP65

| 12 Volt _AC/DC |  | 24 Volt_Ac/DC | 220 Volt |  |
| :--- | :--- | :--- | :--- | ---: |
| Colour | Part No. | Part No. | Part No. | Price |
| Red | PL16R12LED | PL16R24LED | PL16R240LED | $\$ 7.62$ |
| Green | PL16G12LED | PL16G24LED | PL16G240LED | $\$ 7.62$ |
| Yellow | PL16Y12LED | PL16Y24LED | PL16Y240LED | $\$ 7.62$ |
| Blue | PL16B12LED | PL16B24LED | PL16B240LED | $\$ 7.62$ |
| White | PL16W12LED | PL16W24LED | PL16W240LED | $\$ 7.62$ |
| Red - Quick Connect | PL16R24LEDQ | PL16R240LEDQ | $\$ 7.62$ | $\$ 7.62$ |
| Green - Quick Connect | PL16G24LEDQ | PL16G240LEDQ | PL16---- |  |

Push Buttons $\mathcal{Q} 16 \mathrm{~mm} \& 18 \mathrm{~mm} \quad$ IP42 screpuir

| Part No. | Button Colour | Contact | Mtg. Hole | Price |  |
| :--- | :---: | :--- | :--- | :--- | ---: |
| PBCA16R | Red | $1 \times$ N/C | 16 mm | $\$ 18.15$ |  |
| PB01102G | Green | $2 \times$ N/O | 18 mm | $\$ 21.78$ |  |
| PB01102R | Red | $1 \times$ N/O $+1 \times \mathrm{N} / \mathrm{C}$ | 18 mm | $\$ 21.78$ | PBCA16R |

Legends to suit 22mm Pilot Lights, Pushbuttons \& Selector Switches scurdur 1

| Part Number | Description | Price | Part Number | Description | Price |
| :--- | :--- | :--- | :--- | :--- | :--- |
| LEGEND/102 | $1-0-2$ | $\$ 1.03$ | LEGEND/ONOFFON | ON- OFF-ON | $\$ 1.03$ |
| LEGEND/12 | $1-2$ | $\$ 1.03$ | LEGEND/OPEN | OPEN | $\$ 1.03$ |
| LEGEND/CLOSE | CLOSE | $\$ 1.03$ | LEGEND/POWERON | POWER - ON | $\$ 1.03$ |
| LEGEND/DOWN | DOWN | $\$ 1.03$ | LEGEND/RESET | RESET | $\$ 1.03$ |
| LEGEND/FAST | FAST | $\$ 1.03$ | LEGEND/REVERSE | REVERSE | $\$ 1.03$ |
| LEGEND/FORWARD | FORWARD | $\$ 1.03$ | LEGEND/RIGHT | RIGHT | $\$ 1.03$ |
| LEGEND/INCH | INCH | $\$ 1.03$ | LEGEND/SLOW | SLOW | $\$ 1.03$ |
| LEGEND/LEFT | LEFT | $\$ 1.03$ | LEGEND/START | START | $\$ 1.03$ |
| LEGEND/MOA | MAN-OFF-AUTO | $\$ 1.03$ | LEGEND/STOP | STOP | $\$ 1.03$ |
| LEGEND/OC | OPEN/CLOSE | $\$ 1.03$ | LEGEND/STOPSTAR | STOP/START | $\$ 1.03$ |
| LEGEND/OFF | OFF | $\$ 1.03$ | LEGEND/TOR | TEST OFF RESET | $\$ 1.03$ |
| LEGEND/OFFON | OFF-ON | $\$ 1.03$ | LEGEND/TRIP | TRIP | $\$ 1.03$ |
| LEGEND/ON | ON | $\$ 1.03$ | LEGEND/UP | UP | $\$ 1.03$ |
| EMLEGEND | EMERGENCY STOP | $\$ 9.20$ |  |  |  |



Industrial Electrical Components Suppliers

## Control \& Signalling Units 22MM <br> 22mm Cut Out <br> - IP65

Push Buttons

| Part No. | Description | Contact | Price |
| :--- | :--- | :--- | ---: |
| PBF22R | Red | $1 \times \mathrm{N} / \mathrm{C}$ | $\$ 8.66$ |
| PBF22G | Green | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 8.66$ |
| PBF22Y | Yellow | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 8.66$ |
| PBF22B | Blue | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 8.66$ |
| PBF22BLK | Black | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 8.66$ |

Push Buttons Emergency Stop

| Part No. | Description | Contact | Price |
| :--- | :--- | :--- | ---: |
| EB22R | Red Mushroom | $1 \times \mathrm{N} / \mathrm{C}$ | $\$ 9.44$ |
| LEB22R | Red Mushroom Latching | $1 \times \mathrm{N} / \mathrm{C}$ | $\$ 13.55$ |

Illuminated Push Buttons
(Lamp not included)

| Maximum 120V, 2 | Watt Filament Lamp or 240V Neon or 240V LED - LBA9 |  |  |  |
| :--- | :--- | :--- | ---: | :--- |
| Part No. | Description | Contact | Price |  |
| LXBG22R | Red | $1 \times \mathrm{N} / \mathrm{C}$ | $\$ 14.88$ |  |
| LXBG22G | Green | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 14.88$ |  |
| LXBG22Y | Yellow | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 14.88$ |  |
| LXBG22B | Blue | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 14.88$ |  |
| LXBG22W | White | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 14.88$ |  |

## Accessories

| Part No. | Description | Contact | Price |
| :--- | :--- | :--- | :---: |
| BNO | Contact Block | N/O | $\$ 4.11$ |
| BNC | Contact Block | N/C | $\$ 4.11$ |
| BLH | Lamp Holder |  | $\$ 7.26$ |

Lamp Holder
Pilot Lights (Lamp not included LBA9)

| Part No. | Description | Price |
| :--- | :--- | :---: |
| PLN22R | Red | $\$ 7.26$ |
| PLN22G | Green | $\$ 7.26$ |
| PLN22Y | Yellow | $\$ 7.26$ |
| PLN22B | Blue | $\$ 7.26$ |
| PLN22C | Clear | $\$ 7.26$ |

## Selector Switches

## Short Operator

| Part No. | Description | Contact | Price |
| :--- | :--- | :--- | ---: |
| CS222B | 2 Position | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 10.65$ |
| CS223B | 3 Position | $2 \times \mathrm{N} / \mathrm{O}$ | $\$ 14.76$ |
| RS222B | 2 Position Spring | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 11.01$ |
| RS223B | 3 Position Spring | $2 \times \mathrm{N} / \mathrm{O}$ | $\$ 15.13$ |
| Key Operator |  |  |  |
| KS222B |  |  |  |
| KS222 | 2 Position | $1 \times \mathrm{N} / \mathrm{O}$ |  |
| KS223 | 3 Position | $2 \times \mathrm{N} / \mathrm{O}$ | $\$ 33.52$ |
| KSR223S | 2 Position Spring Return | $1 \mathrm{~N} / \mathrm{O} \& 1 \mathrm{~N} / \mathrm{C}$ | $\$ 45.00$ |

# Pilot Lights $\bigcirc 22 \mathrm{~mm}$ (w/- LED Fitted * Monoblock) - IP65 

SChedule 1
240 Volt
Part No.


PL22G240LED
PL22Y240LED
PL22W240LED
PL22B240LED

110 Volt AC/DC Part No. | PL22R110LED |
| :--- |
| PL 22G110LED | PL22Y110LED PL22W110LED PL22B110LED $\quad$ PL22B24LED

12 Volt AC/DC 24 Volt AC/DC
Part No. Part No. PL22R12LED
PL22G12LED
PL

Heavy Duty Metal Surround $\otimes 22 \mathrm{~mm}$ - IP66 Push Buttons

| Part No. | Description | Contact | Price |
| :--- | :--- | :--- | ---: |
| BA21 | Black | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 15.00$ |
| BA31 | Green | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 15.00$ |
| BA51 | Yellow | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 15.00$ |
| BA61 | Blue | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 15.00$ |
| BA42 | Red | $1 \times \mathrm{N} / \mathrm{C}$ | $\$ 15.00$ |

## Push Button Emergency Stop Red

| Part No. | Description | Contact | Price |
| :--- | :--- | :--- | :--- |
| BC42 | 40 mm Mushroom | $1 \times \mathrm{N} / \mathrm{C}$ | $\$ 20.00$ |
| BR42 | 60 mm Mushroom | $1 \times \mathrm{N} / \mathrm{C}$ | $\$ 22.00$ |
| BS542 | 40 mm Mushroom Latching | $1 \times \mathrm{N} / \mathrm{C}$ | $\$ 20.00$ |
| BS142 | 40 mm Mushroom Latch Key | $1 \times \mathrm{N} / \mathrm{C}$ | $\$ 45.00$ |
| BS642 | 60 mm Mushroom Latching | $1 \times \mathrm{N} / \mathrm{C}$ | $\$ 22.00$ |

## Illuminated Push Buttons - Less Lamp lba9

| Part No. | Description | Contact | Price |
| :--- | :--- | :--- | ---: |
| BW3161 | White | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 25.00$ |
| BW3361 | Green | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 25.00$ |
| BW3561 | Yellow | $1 \times$ N/O | $\$ 25.00$ |
| BW3661 | Blue | $1 \times$ N/O | $\$ 25.00$ |
| BW3462 | Red | $1 \times$ N/C | $\$ 25.00$ |

Selector Switch - Black

| Part No. | Description | Contact | Price |
| :--- | :--- | :--- | ---: |
| BD25 | 2 Position | $1 \times \mathrm{N} / \mathrm{O} 1 \times \mathrm{N} / \mathrm{C}$ | $\$ 20.00$ |
| BD33 | 3 Position | $2 \times \mathrm{N} / \mathrm{O}$ | $\$ 22.00$ |
| BD45 | 2 Position Spring | $1 \times \mathrm{O}$ 1xN/C | $\$ 20.00$ |
| BD53 | 3 Position Spring | $2 \times \mathrm{N} / \mathrm{O}$ | $\$ 45.00$ |

## Selector Switch - Key Operated - Key 455

| Part No. | Description | Contact | Price |
| :--- | :--- | :--- | ---: |
| BG21 | 2 Position | $1 \times$ N/O | $\$ 45.00$ |
| BG33 | 3 Position | $2 \times$ N/O | $\$ 50.00$ |
| BG41 | 2 Position Spring | $1 \times$ N/O | $\$ 48.00$ |
| BG53 | 3 Position Spring | $2 \times$ N/O | $\$ 53.00$ |



## Accessories

| Part No. | Description | Price |
| :--- | :--- | ---: |
| BE101 | N/O Contact | $\$ 8.00$ |
| BE102 | N/C Contact | $\$ 8.00$ |
| BZ101 | Base \& N/O Contact | $\$ 10.00$ |
| BZ102 | Base \& N/C Contact | $\$ 10.00$ |
| PE22A | Weather Proof Boot | $\$ 3.00$ |
| EB40P | Padlockable Cover | $\$ 8.00$ |




| Transformer Type | - | Comes with Lamp |  |  |
| :--- | :--- | :--- | ---: | ---: |
| Part No. | Size | Lamp to Suit | Price |  |
| PL221(Colour) 240 | 22/25mm | LBA906/2 | $\$ 17.55$ |  |
| Lens Colours = Red, |  |  | Green, White, Blue \& Amber |  |



Transformer Type Push Button Pilot Light

- Comes with Lamp

| Part No. | Size | Lamp to Suit | Price |
| :--- | :--- | :--- | ---: |
| PLPB221(Colour) 240 | $22 / 25 \mathrm{~mm}$ | LBA906/2 | $\$ 61.47$ |



## Push Buttons



22 mm

- IP65

Schedule 1

|  |  |  | Contact | Price |  |
| :--- | :--- | :--- | :--- | ---: | :--- |
| Part No. | Size | Type | $1 \times \mathrm{N} / \mathrm{C}$ | $\$ 12.10$ |  |
| PB221B (Blue) | 22 mm | Push Button | $1 \times \mathrm{N} / \mathrm{C}$ | $\$ 12.10$ |  |
| PB221BL (Black) | 22 mm | Push Button | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 12.10$ |  |
| PB221R (Red) | 22 mm | Push Button | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 12.10$ |  |
| PB221G (Green) | 22 mm | Push Button | $1 \times \mathrm{N} / \mathrm{O} \mathrm{\&} \mathrm{1X} \mathrm{N/C}$ | $\$ 32.07$ |  |
| RTS22LRED | 22 mm | Latching Emergency | $1 \times \mathrm{N} / \mathrm{O} \mathrm{\&} \mathrm{1X} \mathrm{N/C}$ | $\$ 32.07$ |  |
| RTS22NLRED | 22 mm | Non-Latching Emergency |  | $\$ 9.20$ |  |
| EMLEGEND | 22 mm | Emergency Legend |  | $\$ 4.54$ |  |
| CBA |  | Contact Block | $1 \times \mathrm{N} / \mathrm{O}$ |  |  |
| CBB | Contact Block | $1 \times \mathrm{N} / \mathrm{C}$ | $\$ 4.54$ |  |  |
| PSF22 |  | 22 mm | Push Button Sealable Flap |  | $\$ 13.31$ |

## Push Button Illuminated $Q$ 22mm - IP65 scumoler

**Lamp not included** (Press to Test Button)

| Part No. | Size | Lamp to Suit | Contact | Price |
| :--- | :--- | :--- | :--- | ---: |
| PBPL221 (Colour) | $22 / 25 \mathrm{~mm}$ | LBA9 | $1 \times$ N/O \& 1X N/C | $\$ 30.61$ |

Colours = Red, Green, Blue, Yellow \& White


PBPL221

| Selector Switch riuminated | 22mm | - IP65 |  |  |  |
| :--- | :--- | :--- | :--- | :--- | ---: |
| $* *$ Lamp not included** |  |  |  |  |  |
| Sart No. | Size | Lamp to Suit | Contact | Positions | Price |
| STPL22OFOG (Green) | $22 / 25 \mathrm{~mm}$ | LBA9 | $2 \times \mathrm{N} / \mathrm{O}$ | 3 | $\$ 30.61$ |
| STPL22FOG (Green) | $22 / 25 \mathrm{~mm}$ | LBA9 | $1 \times \mathrm{N} / \mathrm{O}$ | 2 | $\$ 26.62$ |
| STPL22FOW (White) | $22 / 25 \mathrm{~mm}$ | LBA9 | $1 \times \mathrm{N} / \mathrm{O}$ | 2 | $\$ 26.62$ |


| Selector Switches \& Key Switches $\mathcal{L}$ 22mm IP44 |  |  |  | Schedule 1 | EROD |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Part No. | Type | Contact | Price |  |  |
| ST221FO | 2 Position | $2 \times \mathrm{N} / \mathrm{O}$ | \$17.85 |  |  |
| ST2210FO | 3 Position | $2 \times \mathrm{N} / \mathrm{O}$ | \$18.88 |  |  |
| ST2210FOS | 3 Position Spring Return | $2 \times \mathrm{N} / \mathrm{O}$ | \$24.20 |  |  |
| RKR22FO | 2 Position Keyed | $1 \times \mathrm{N} / \mathrm{O}$ \& $1 \mathrm{X} \mathrm{N} / \mathrm{C}$ | \$43.26 |  |  |
| RKR220FO | 3 Position Keyed | $2 \times \mathrm{N} / \mathrm{O}$ | \$51.30 |  |  |

Boxes © 22mm Holes IP65
Schedule 1

| Part No. | No. of Holes | Price | Part No. | No. of Holes | Price |
| :--- | :--- | :--- | :--- | :--- | ---: |
| BX1 | 1 | $\$ 17.30$ | BX3 | 3 | $\$ 24.68$ |
| BX1Y | 1 Yellow | $\$ 17.30$ | BX4 | 4 | $\$ 29.28$ |
| BX2 | 2 | $\$ 19.31$ | BX4Y | 4 Yellow | $\$ 29.28$ |
| BX2Y | 2 | Yellow | $\$ 19.31$ | BX5 | 5 |

## Lamps - LBA9

| Part No. | Volts | Watts | Type | Price |
| :--- | :--- | :--- | :--- | ---: |
| LBA906/2 | 6 | 2 | Filament | $\$ 2.12$ |
| LBA912/2 | 12 | 2 | Filament | $\$ 2.12$ |
| LBA924/2 | 24 | 2 | Filament | $\$ 2.12$ |
| LBA930/2 | 30 | 2 | Filament | $\$ 2.12$ |
| LBA936/2 | 36 | 2 | Filament | $\$ 5.32$ |
| LBA9120/2 | 120 | 2 | Filament | $\$ 5.32$ |
| LBA9240/3 | 240 | 3 | Filament | $\$ 6.66$ |
| LBA96LED/-- | 6 | Cluster | Colour | $\$ 9.44$ |
| LBA912LED/-- | 12 | Cluster | Colour | $\$ 9.44$ |
| LBA924LED/- | 24 | Cluster | Colour | $\$ 9.44$ |
| LBA9110LED/-- | 110 | Cluster | Colour | $\$ 9.44$ |
| LBA9240LED/-- | 240 | Cluster | Colour | $\$ 13.31$ |
| LBA9110/R | 110 | Neon | Red | $\$ 6.90$ |
| LBA9220/R | 240 | Neon | Red | $\$ 6.90$ |
| LBA9220/G | 240 | Fluoro | Green | $\$ 6.90$ |

Schedule 1

Led Colours = Red, Green, Blue \& Amber

## Lamps - LE10

| Part No. | Volts | Watts | Type | Price |
| :--- | :--- | :--- | :--- | ---: |
| LE106/2 | 6 | 2 | Filament | $\$ 2.12$ |
| LE1012/2 | 12 | 2 | Filament | $\$ 2.12$ |
| LE1024/2 | 24 | 2 | Filament | $\$ 2.12$ |
| LE1030/2 | 30 | 2 | Filament | $\$ 2.12$ |
| LE1036/2 | 36 | 2 | Filament | $\$ 5.32$ |
| LE1048/2 | 48 | 2 | Filament | $\$ 5.32$ |
| LE10120/2 | 120 | 2 | Filament | $\$ 5.32$ |
| LE10240/2 | 240 | 2 | Filament | $\$ 6.66$ |
| LE106LED/-- | 6 | Cluster | Colour | $\$ 11.62$ |
| LE1012LED/-- | 12 | Cluster | Colour | $\$ 11.62$ |
| LE1024LED/-- | 24 | Cluster | Colour | $\$ 11.62$ |
| LE10110LED/-- | 110 | Cluster | Colour | $\$ 11.62$ |
| LE10240LED/-- | 240 | Cluster | Colour | $\$ 11.62$ |
| LE10240 | 240 | Neon | Red | $\$ 6.90$ |
| LE10240G | 240 | Fluoro | Green | $\$ 6.90$ |
| LE10240W | 240 | Neon | White | $\$ 6.90$ |
| LE10240A | 240 | Neon | Amber | $\$ 6.90$ |
| Led Colours $=$ Red, Green, Blue \& Amber |  |  |  |  |

## DORE ELECTRICS

Industrial Electrical Components Suppliers

## Flashing/Rotating Lights

© $22 \mathrm{~mm}, 80 \mathrm{~mm}, 110 \mathrm{~mm} \& 150 \mathrm{~mm}$

Operating Continuous - Weatherproof IP65

| Part No. | Light Dia. | Voltage | Price |
| :--- | :---: | :---: | ---: |
| PL22R220LEDF | 22 mm | AC220 | $\$ 19.36$ |
| PL22R24LEDF | 22 mm | AC/DC24 | $\$ 17.60$ |
| PL3027 (Colour) | 80 mm | AC24 | $\$ 38.72$ |
| PL3047 (Colour) | 80 mm | AC240 | $\$ 70.18$ |
| VRMDC12 (Colour) | 110 mm | DC12 | $\$ 106.48$ |
| VRMAC12 (Colour) | 110 mm | AC12 | $\$ 106.48$ |
| VRMAC24 (Colour) | 110 mm | AC24 | $\$ 106.48$ |
| VRMDC24 (Colour) | 110 mm | DC24 | $\$ 106.48$ |
| VRMAC110 (Colour) | 110 mm | AC110 | $\$ 106.48$ |
| VRMAC240 (Colour) | 110 mm | AC240 | $\$ 106.48$ |
| RB190AC240 (Colour) | 150 mm | AC240 | $\$ 178.60$ |

**Lens Colours = Red, Green, Amber \& Blue**

## Strobe Lights $\Theta$ 100mm

Schedule 1
Operation Continuous - Weatherproof IP65-Power Consumption 3W

| Part No. | Voltage | Price |
| :--- | :---: | ---: |
| JBSDC12 (Colour) | DC12 | $\$ 85.43$ |
| JBSDC24 (Colour) | DC24 | $\$ 85.43$ |
| JBSAC240 (Colour) | AC240 | $\$ 85.43$ |
| SYF13DC12 (Colour) | DC12 | $\$ 106.48$ |
| SYF13DC24 (Colour) | DC24 | $\$ 106.48$ |
| SYF13AC240 (Colour) | AC240 | $\$ 106.48$ |
| **Lens Colour $=$ Red, Blue \& Amber** |  |  |



Rotating Light with Buzzer $Q$ 110mm-Ip43

| Part No. | Voltage | Price |
| :--- | :---: | ---: |
| LTEDC24 (Colour) | DC24 | $\$ 129.47$ |
| LTEAC24 (Colour) | AC24 | $\$ 129.47$ |
| LTEAC220 (Colour) | AC240 | $\$ 129.47$ |
| **Lens Colour $=$ Red, Green \& Amber** |  |  |

## Flashing Tower Light with Buzzer

| Part No. | Voltage | Price |
| :--- | :---: | ---: |
| LTADC24 | DC24 | $\$ 181.50$ |
| LTAAC24 | AC24 | $\$ 181.50$ |
| LTAAC220 | AC240 | $\$ 181.50$ |
| **Lens Colour $=$ Red, Green \& Amber** <br> (Incandescent Bulb) |  |  |


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Industrial Electrical Components Suppliers

## Solid State Relays

Z Zero Crossing Turn On
Z With LED Indication

Z Zero Current Turn Off
$\mathrm{Z} \quad$ Operating Temperature $-\mathbf{2 0}^{\circ} \mathrm{C}$ to $\mathbf{8 0}{ }^{\circ} \mathrm{C}$

| Part No. | Load Current AC <br> When fitted with <br> Heat Sink | Load Voltage <br> Range | Input Signal | Heat Sink <br> Fitted | Price |
| :--- | :--- | :--- | :--- | :--- | ---: |
| SRU2440N | 40 Amp | $90-240 \mathrm{~V}$ AC | $3-32 \mathrm{~V} \mathrm{AC/DC}$ | NO | $\$ 56.87$ |
| SRU2440IS | 40 Amp | $90-240 \mathrm{~V}$ AC | $3-32 \mathrm{~V}$ AC/DC | YES | $\$ 79.86$ |
| SRU4840N | 40 Amp | $90-480 \mathrm{~V}$ AC | $3-32 \mathrm{~V} \mathrm{AC/DC}$ | NO | $\$ 63.80$ |
| SRU4840IS | 40 Amp | $90-480 \mathrm{~V}$ AC | $3-32 \mathrm{~V} \mathrm{AC/DC}$ | YES | $\$ 90.20$ |
| SRA4840N | 40 Amp | $90-440 \mathrm{~V}$ AC | $90-250 \mathrm{~V}$ AC | NO | $\$ 60.50$ |
| SRR2540N | 40 Amp | 250 V AC | VR-B200K-POT | NO | $\$ 67.76$ |
| HSIS | Aluminium | Vertical Heat Sink only |  | $\$ 24.20$ |  |
| HMSSR | Heat Membrane Suit SSR |  | $\$ 0.97$ |  |  |
| DINCLIP | Din Rail Mounting Clip |  | $\$ 5.00$ |  |  |

Solid State Relay w/- Heat Sink Fitted


SRR2540N

Bells - Industrial Type $=$ Grey - Fire Alarm Type $=$ Red
$\mathrm{Z} \quad 100 \mathrm{~mm}$ IP32 $\quad \mathrm{Z} \quad 150 \mathrm{~mm}, \mathbf{2 0 0} \mathrm{~mm}$ \& 250 mm IP44

| $\boldsymbol{G} \boldsymbol{R} \boldsymbol{E Y}$ | $\boldsymbol{R E D}$ |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | ---: |
| Part No. | Part No. | Size | Voltage | dB | Price |
| CB4BDC24G | CB4BDC24R | 100 mm | 24 DC | 86 | $\$ 68.15$ |
| CB4BAC24G | CB4BAC24R | 100 mm | 24 AC | 86 | $\$ 68.15$ |
| CB4BAC220G | CB4BAC220R | 100 mm | 220 AC | 86 | $\$ 68.15$ |
| CB6BDC12G | CB6BDC12R | 150 mm | 12 DC | 96 | $\$ 83.49$ |
| CB6BDC24G | CB6BDC24R | 150 mm | 24 DC | 96 | $\$ 83.49$ |
| CB6BAC24G | CB6BAC24R | 150 mm | 24 AC | 96 | $\$ 83.49$ |
| CB6BAC220G | CB6BAC220R | 150 mm | 220 AC | 96 | $\$ 83.49$ |
| CB8BDC24G | CB8BDC24R | 200 mm | 24 DC | 102 | $\$ 118.80$ |
| CB8BAC24G | CB8BAC24R | 200 mm | 24 AC | 102 | $\$ 118.80$ |
| CB8BAC220G | CB8BAC220R | 200 mm | 220 AC | 102 | $\$ 118.80$ |
| CB10BDC24G | CB10BDC24R | 250 mm | 24 DC | 104 | $\$ 137.89$ |
| CB10BAC220G | CB10BAC220R | 250 mm | 220 AC | 104 | $\$ 137.89$ |



Foot Switch

| Part No. | Rating | Contact |  | Price |
| :--- | :--- | :---: | :--- | ---: |
| FS2 | 10 Amp 250V | $1 \mathrm{C} / \mathrm{O}$ |  | $\$ 27.83$ |
| FS3 | 10 Amp 250V | $1 \mathrm{C} / \mathrm{O}$ | Aluminium | $\$ 33.88$ |
| FS4 | 15 Amp 250V | $1 \mathrm{C} / \mathrm{O}$ | Aluminium | $\$ 90.75$ |
| FS5 | 15 Amp 250V | $1 \mathrm{C} / \mathrm{O}$ | Aluminium | $\$ 93.17$ |
| TFS305 | 10 Amp 250V Push-On/Push-Off | $1 \mathrm{C} / \mathrm{O}$ | Aluminium | $\$ 122.43$ |
| SFMS15 | 10 Amp 250V Twin Pedals | $2 \mathrm{C} / \mathrm{O}$ | Aluminium | $\$ 252.23$ |
| Z15GW | Micro Switch 15A suit Foot S/W | $1 \mathrm{C} / \mathrm{O}$ |  | $\$ 16.94$ |


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Trade Price List B-2012

## Limit Switch

DORE ELECTRICS
Industrial Electrical Components Suppliers Tel: 61-7-3349-5300
Fax: 61-7-3349-5344

Schedule 1

| Part No. | Type | Entry Gland | IP Rating | Price |
| :--- | :--- | :--- | ---: | ---: |
| SM202 | Lever |  | IP42 | $\$ 26.62$ |
| SM500 | Plunger -12 mm |  | IP42 | $\$ 29.04$ |
| VM1308 | Plunger |  | IP43 | $\$ 16.94$ |
| VAPY | Boot to suit VM1308 |  |  | $\$ 6.17$ |
| TZ5102 | Metal Button Plunger w/- Roller | 22 mm | IP65 | $\$ 93.96$ |
| TZ5104 | Metal Non Adj. Roller Lever | 22 mm | IP65 | $\$ 99.41$ |
| TZ5107 | Metal Adj. Rod Lever | 22 mm | IP65 | $\$ 102.97$ |
| TZ5108 | Metal Adj. Roller Lever | 22 mm | IP65 | $\$ 108.48$ |
| TZ9208 | Plastic Adj. Roller Lever | 22 mm | IP65 | $\$ 57.72$ |



SM202



VM1308


VAPY


Hoist Pendants

* Weather Proof


| Part No. | Type | Price |
| :--- | :--- | ---: |
| THS62 | 2 Button Single Speed | $\$ 153.91$ |
| THS64 | 4 Button Single Speed | $\$ 184.83$ |
| THS66 | 6 Button Single Speed | $\$ 244.06$ |
| THSEP213E | 2 Button E/Stop \& Red Indicator | $\$ 164.56$ |
| THSE123E | 4 Button E/Stop \& Red Indicator | $\$ 203.28$ |



Door Switch
SCHEDULE 1

| Part No. | Type | Price |
| :--- | :--- | ---: |
| 6006D | Door Switch 10A - SPST | $\$ 14.77$ |



Door Switch

## Buzzers

| Part No. | Type | Dia. | dB | Price |
| :--- | :--- | :--- | :--- | :--- |
| $\Omega$ | Buzzer $\mathbf{w} /-$ | Flashing Light |  |  |
| BZ22R12AC/DC | Flashing-Red | 22 mm | 80 | $\$ 26.62$ |
| BZ22R24AC/DC | Flashing-Red | 22 mm | 80 | $\$ 26.62$ |
| BZ22R240 | Flashing-Red | 22 mm | 80 | $\$ 26.62$ |
| $\Omega$ | Buzzer Only |  |  |  |
| BZ22AC/DC12 | Flush | 22 mm | 80 | $\$ 26.62$ |
| BZ22AC/DC24 | Flush | 22 mm | 80 | $\$ 26.62$ |
| BZ22AC240 | Flush | 22 mm | 80 | $\$ 26.62$ |
| BZ30DC24 | Flush | 30 mm | 75 | $\$ 53.24$ |
| BZ30AC24 | Flush | 30 mm | 75 | $\$ 53.24$ |
| BZ30AC110 | Flush | 30 mm | 75 | $\$ 53.24$ |
| BZ30AC240 | Flush | 30 mm | 75 | $\$ 53.24$ |
| BZ80DC24 | Flush | 80 mm | 85 | $\$ 53.24$ |
| BZ80AC24 | Flush | 80 mm | 85 | $\$ 53.24$ |
| BZ80AC240 | Flush | 80 mm | 85 | $\$ 53.24$ |
| BZ82AC12 | Surface | 82 mm | 85 | $\$ 53.24$ |
| BZ82DC12 | Surface | 82 mm | 85 | $\$ 53.24$ |
| BZ82DC24 | Surface | 82 mm | 85 | $\$ 53.24$ |
| BZ82AC24 | Surface | 82 mm | 85 | $\$ 53.24$ |
| BZ82AC240 | Surface | 82 mm | 85 | $\$ 53.24$ |

## Sirens \& Hooters

| SCZDC24 | Siren | 100 mm | 105 | $\$ 63.89$ |
| :--- | :--- | :--- | :--- | ---: |
| TCZAC230 | Siren | 75 mm | 105 | $\$ 90.51$ |
| TSDAC220 | Siren | 123 mm | 120 | $\$ 181.50$ |
| TCZDC24 | Hooter | 135 mm | 105 | $\$ 150.40$ |
| TCZAC240 | Hooter | 135 mm | 105 | $\$ 150.40$ |

Schedule 1



## EROD <br> 7y Cd Done Elecrnics

Enclosed Active \& Neutral Bars 100 Amp

- Clear Cover

| Holes | Part Number | Price | Terminals |  |
| ---: | :--- | ---: | ---: | ---: |
| 5 | 100A5C | $\$ 13.31$ | $2 \times 25 \mathrm{~mm}$ | $3 \times 10 \mathrm{~mm}$ |
| 7 | 100A7C | $\$ 14.64$ | $2 \times 25 \mathrm{~mm}$ | $5 \times 6 \mathrm{~mm}$ |
| 9 | 100A9C | $\$ 20.10$ | $3 \times 16 \mathrm{~mm}$ | $6 \times 10 \mathrm{~mm}$ |
| 12 | 100A12C | $\$ 22.99$ | $3 \times 16 \mathrm{~mm}$ | $9 \times 10 \mathrm{~mm}$ |
| 13 | 100A13C | $\$ 23.69$ | $3 \times 16 \mathrm{~mm}$ | $10 \times 6 \mathrm{~mm}$ |

Enclosed Active \& Neutral Heavy Duty Bars

Schedule 1

## Earth \& Neutral Bars - 90/140, 165 \& 250 Amps

| No. of Holes | 90/140Amp |  | 165 Amp |  | 250 Amp |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Part No. | Price | Part No. | Price | Part No. | Price |
| 6 | 90E6 | \$7.70 | 165E6 | \$8.53 |  |  |
| 12 | 90 E 12 | \$13.65 | 165 E 12 | \$10.45 |  |  |
| 18 | 90 E 18 | \$19.36 | 165 E 18 | \$13.43 |  |  |
| 24 | 90E24 | \$23.23 | 165E24 | \$18.76 | 250E24 | \$23.10 |
| 30 |  |  | 165 E30 | \$23.69 |  |  |
| 36 | 90E36 | \$30.49 | 165 E36 | \$28.88 | 250E36 | \$34.65 |
| 42 |  |  | 165E42 | \$30.94 |  |  |
| 48 |  |  | 165 E 48 | \$33.00 | 250E48 | \$39.60 |
| 54 |  |  | 165 E 54 | \$42.49 |  |  |
| 60 |  |  | 165E60 | \$45.38 | 250E60 | \$54.45 |
| 72 |  |  | 165E72 | \$50.88 | 250E72 | \$61.05 |
| 80 |  |  | 165 E80 | \$54.18 |  |  |
| 84 |  |  | 165 E84 | \$54.18 | 250E84 | \$65.01 |
| 96 |  |  | 165 E 96 | \$75.35 | 250E96 | \$90.42 |
| 108 |  |  | 165E108 | \$96.25 |  |  |
|  | 5 | " | epenin | Emis | P |  |

## Mounting Feet for Earth Bars - Fits all sizes up to 165 Amp Schedule 1

| Description | Colour | Price per <br> Each |
| :--- | :--- | :---: |
| E/NFEET | Red | $\$ 1.42$ |
| E/NFEETSMALL | Black | $\$ 1.42$ |

## Active, Earth \& Neutral Links - 200, 400, 600 \& 800Amps schipule 1

- Main Stud for Incoming
- Main Stud for Bridging

|  | 200 Amp |  | 400 Amp |  | 600 Amp |  | 800 Amp |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| No. of Studs | Part No. | Price | Part No. | Price | Part No. | Price | Part No. | Price |
| 2-4 | 200E4 | \$117.37 |  |  |  |  |  |  |
| 2-6 | 200E6 | \$122.21 | 400E6 | \$145.20 | 600E6 | \$197.23 | 800E6 | \$268.62 |
| 2-8 | 200E8 | \$127.05 | 400E8 | \$187.55 | 600E8 | \$256.52 |  |  |
| 2-14 |  |  | 400E14 | \$248.05 | 600E14 | \$262.57 | 800E14 | \$387.20 |
| 2-26 |  |  | 400E26 | \$379.94 |  |  | 800E26 | \$525.14 |
| 2-35 |  |  | 400E35 | \$499.73 |  |  |  |  |

*ABOVE ARE MADE TO ORDER - NO RETURNS*

## Meter Disconnect Link

* Supplied with Solid Link - 125 Amp
* Suitable to take 80/100 Amp Cartridge * Clear Case
* AS/NZS60269.1-2000 Approved
* Meter Seal Eyelets
* Backwired, suitable for $4 \times 34 \mathrm{Sq} \mathrm{mm}$

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| AU410NCS | Meter Dis. Link w/- Small Solid Link - Backwired/Backwired | $\$ 18.15$ |
| :--- | :--- | ---: |
| AU410FWFW | Meter Dis. Link w/- Small Solid Link - Frontwired/Frontwired | $\$ 18.15$ |
| AU410FWBW | Meter Dis. Link - Frontwired/Backwired | $\$ 13.97$ |
| FL100 | 100Amp Service Fuse Cartridge | $\$ 11.25$ |
| FL410N | Solid Link | $\$ 2.54$ |
| NS540 | Nylon Screw 5x40mm (100 Pack) | $\$ 31.46$ |
| NN5 | Nylon Nut M5 (100 Pack) | $\$ 29.04$ |



## Isolating Switches - Industrial



## Compact Weatherproof Isolating Switches

| $*$ | Weatherproof IP66 | $*$ | 6 Cable Entries |
| :--- | :--- | :--- | :--- |
| $*$ | Padlockable On \& Off |  |  |
| WP121 | 1 Pole 21 Amp | $\$ 18.80$ |  |

## Weatherproof Isolating Switches


GPO - Weatherproof - Surface Mount

|  |  |  |
| :---: | :---: | :---: |
| WPGP02 | Double GPO 10A | \$ 35.20 |

## GPO - Din Mount

| DINGPO | Din Mount GPO 10A | $\$$ | 17.99 |
| :--- | :--- | :--- | :--- |
| DPDGPO | Din Mount GPO 15A Double Pole Auto Switch w/- Lamp | $\$$ | 20.00 |



## Fans \& Accessories

- Housing Aluminium
- Top \& Bottom Ball Bearings
- Operating Temperature -20E - 80Ec
- Approvals - UL, CSA, TUV \& UDE

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## Vent Kits

| Part Number | Description | Price |  |
| :--- | :--- | :---: | :---: |
| DF1 | $200 \mathrm{~mm} \times 80 \mathrm{~mm}$ | $\$$ | 16.21 |
| DF2 | $460 \mathrm{~mm} \times 80 \mathrm{~mm}$ | $\$$ | 22.99 |

## Fan Accessories

| Large Filter |  | Wire Guard |  | Wire Screen |  | Vent Louvre |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Part No. | Price IP53 | Part No. | Price <br> me | Part No. | Price | Part No. Be | Price <br> ld as Pair |
| CT801 | \$19.36 | G80 | \$3.39 | MF80S | \$14.52 |  |  |
| CT801 | \$19.36 | G80 | \$3.39 | MF80S | \$14.52 |  |  |
| CT801 | \$19.36 | G80 | \$3.39 | MF80S | \$14.52 |  |  |
|  |  | G92 | \$3.39 |  |  |  |  |
| CT205 | \$29.04 | G109 | \$7.26 | MF120S | \$16.94 | VK1 | \$31.90/PR |
| CT205 | \$29.04 | G109 | \$7.26 | MF120S | \$16.94 | VK1 | \$31.90/PR |
| CT205 | \$29.04 | G109 | \$7.26 | MF120S | \$16.94 | VK1 | \$31.90/PR |
| CT205 | \$29.04 | G109 | \$7.26 | MF120S | \$16.94 | VK1 | \$31.90/PR |
| CT205 | \$29.04 | G109 | \$7.26 | MF120S | \$16.94 | VK1 | \$31.90/PR |
| CT256 | \$42.35 | G172 | \$9.68 | MF172S | \$19.36 |  |  |
| CT256 | \$42.35 | G172 | \$9.68 | MF172S | \$19.36 |  |  |
|  |  | G205 | \$19.36 |  |  |  |  |
| CT320 | \$72.60 | G225 | \$30.25 |  |  |  |  |




## Filter Kits Comprise

| Small | Guard, Retainer \& Filter |
| :--- | :--- |
| Large | Guard, Retainer \& Filter |

## Mechanical Thermostat

| Part No. | Description | Price |
| :--- | :--- | ---: |
| MT011 | MECHANICAL THERMOSTAT 0-60ㅇ | $\$ 13.34$ |
|  | N/O CONTACT 10A AC1 |  |
| MTD02 | DUAL THERMOSTAT HEATING/COOLING | $\$ 38.00$ |
|  | N/O N/C CONTACT 10A AC1 |  |


MT011

MTD02

## Bus Plugs - Female - Male - 3 Phase

* 660 Volt Rated
* High Dielectric Strength
* Arc Quenching \& Non Tracking
* For 6.3mm Bus Bar
* 60 mm Centres
* Non Flammable
* Chemical \& Oil Resistant

Female

| Part Number | Rating | Price |
| :--- | :--- | ---: |
| JC601/160 | 160 Amp | $\$ 84.70$ |
| JC601/400 | 400 Amp | $\$ 101.04$ |
| JC601/630 | 630 Amp | $\$ 186.34$ |

Male

| Part Number | Rating |  |
| :--- | :--- | ---: |
| JC6011/160 | 160 Amp | $\$ 79.86$ |
| JC6011/400 | 400 Amp | $\$ 84.70$ |
| JC6011/630 | 630 Amp | $\$ 140.36$ |



## Shutters to suit 160 \& 400 Amp Female Bus Plug

| Part Number | Description |  | Price |
| :--- | :--- | ---: | ---: |
| FM60/160 | Suits 160 Amp Female Bus Plugs | $\$$ | 18.15 |
| FM60/400 | Suits 400 Amp Female Bus Plugs | $\$$ | 18.15 |

## Power Rails - for 19 Inch Rack

- With Lead and 10 Amp Plug Top \& Socket
- With M.C.B. Fitted to Power Rails

| Part Number | Description | Price |  |
| :---: | :---: | :---: | :---: |
| PRHCB6 | 6 Sockets Horizontal | \$ 142.78 |  |
| PRHCB10 | 10 Sockets Horizontal | \$ 205.70 |  |
| PRVCB10 | 10 Sockets Vertical | \$ 205.70 |  |
| PRVCB16 | 16 Sockets Vertical | \$ 266.20 |  |

## Insulators (Stand-Off)

600Volts Rated - Compression Moulded - Glass Re-Inforced Polyester Material

- High Dielectric Strength
- Arc Quenching and Non Tracking Non Flammable
- Wear and Corrosion Resistant
- Chemical and Oil Resistant High Mechanical Strength
- Dimensional Stability
- Moulded In Brass Inserts
- Metric Thread Sizes

| Part No. | Type | Height | Dia. | Thread | Price |
| :--- | :---: | :--- | :--- | :---: | ---: |
| BBLVV5 | A | 25 mm | 28 mm | M6 | $\$ 8.71$ |
| BBLV55H | H | 25 mm | 22 mm | M6 | $\$ 7.12$ |
| BBLVV30H | H | 30 mm | 33 mm | M8 | $\$ 7.12$ |
| BBLV35D | D | 35 mm | 32 mm | M8 | $\$ 7.26$ |
| BBLV35D10 | D | 35 mm | 32 mm | M10 | $\$ 7.26$ |
| BBLV35E | E | 35 mm | 32 mm | M8 | $\$ 7.26$ |
| BBLV35 | B | 35 mm | 46 mm | M8 | $\$ 10.29$ |
| BBLV35M10 | B | 35 mm | 46 mm | M10 | $\$ 10.29$ |
| BBLV38 | B | 38 mm | 47 mm | M8 | $\$ 10.62$ |
| BBLV38M10 | B | 38 mm | 47 mm | M10 | $\$ 10.62$ |
| BBLV40H8 | H | 40 mm | 40 mm | M8 | $\$ 7.38$ |
| BBLV40H | H | 40 mm | 40 mm | M10 | $\$ 7.38$ |
| BBLV45 | B | 45 mm | 47 mm | M10 | $\$ 10.80$ |
| BBLV50 | B | 50 mm | 47 mm | M10 | $\$ 11.03$ |
| BBLV50H | H | 50 mm | 45 mm | M10 | $\$ 7.50$ |
| BBLV50E | E | 51 mm | 36 mm | M8 | $\$ 7.38$ |
| BBLV50E10 | E | 51 mm | 36 mm | M10 | $\$ 7.38$ |
| BBLV50S | S | 50 mm | 27 mm | M10 | $\$ 9.92$ |
| BBLV60H | H | 60 mm | 50 mm | M12 | $\$ 8.43$ |
| BBLV60L | A | 60 mm | 60 mm | M10 | $\$ 10.50$ |
| BBLV60S | S | 60 mm | 30 mm | M10 | $\$ 9.80$ |
| BBLV63S | S | 63 mm | 30 mm | M10 | $\$ 9.80$ |
| BBLV75D | D | 75 mm | 55 mm | M10 | $\$ 8.47$ |
| BBLV75D12 | D | 75 mm | 55 mm | M12 | $\$ 8.47$ |
| BBLV75S | S | 75 mm | 27 mm | M10 | $\$ 10.62$ |
| BBLV75 | B | 75 mm | 47 mm | M10 | $\$ 14.64$ |
| BBLV76E | E | 76 mm | 50 mm | M10 | $\$ 10.11$ |



Type D


Type H

## Bracket (Horizontal - Vertical)

| Part No. | Description | Price |
| :--- | :--- | :---: |
| ACCP2 | For Transformation Horizontal - Vertical | $\$ 6.05$ |

## Standoff with foot

| Part No. | Type | Height | Thread | Price |
| :--- | :---: | :--- | :--- | :---: |
| NBB745 | F | 50 mm | M8 | $\$ 10.30$ |

## Insulators - High Voltage 3.3-36 KV

Compression Moulded - Glass Re-Inforced Poly Material - UL94 $145^{\circ} \mathrm{C}$

| Part No. | Rated Voltage | Bil | Height | Diameter | Price |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| EL3M | 3.3 KV | 60 KV | 60 mm | 70 mm | \$22.02 | EL3M | EL6M |
| EL6M | 6.6 KV | 75 KV | 90 mm | 70 mm | \$31.94 |  |  |
| EL12 | 12 KV | 95 KV | 130 mm | 58 mm | \$38.12 | 3 |  |
| EL15 | 15 KV | 110 KV | 142 mm | 70 mm | \$39.57 |  |  |
| EL24 | 24 KV | 125 KV | 210 mm | 70 mm | \$46.59 |  |  |
| EL30N | 36KV | 200KV | 310 mm | 100 mm | \$242.00 | EL12 | EL15 |

## Control Circuit Plug \& Socket

| Part No. | Description | Material | Price |  |
| :--- | ---: | :--- | ---: | ---: |
| $\mathbf{7 1 5}$ | 20 Pin -10 Amp | Polyester | $\$ 150.04$ |  |

## Bus Bar Cleats

* 600 Volts Rated
* Compression Moulded
* Glass Reinforced Polyester Material
* High Dielectric Strength
* Dimensional Stability
* Wear and Corrosion Resistant
* Test Report Number 100784
* High Mechanical Strength
* Non Flammable
* Quality Finish and Appearance
* Arc Quenching and Non Tracking
* Chemical and Oil Resistant
* Stud Tension 12 Nm



## EL170

Polyester
40KA \& 200mm
Centres
For 6.3mm Bus Bar
$\$ 7.74$


EL215
Polyester
40KA \& 200mm
Centres
For 6.3mm Bus Bar
$\$ 9.80$


## EL180

Polyester
40KA \& 200mm
Centres
For 6.3mm Bus Bar
\$7.74


EL180/11
Polyester
40KA \& 200mm
Centres
For 10mm Bus Bar
\$7.74

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## Bus Bar Cleats

Schedule 1
Industrial Electrical Components Suppliers Tel: 61-7-3349-5300 Fax: 61-7-3349-5344

## EL220

Polyester
40KA \& 200 mm
Centres
For 6.3mm Bus Bar \$12.00

EL300
Polyester
$40 \mathrm{KA} \& 200 \mathrm{~mm}$
Centres
For 6.3mm Bus Bar \$15.00

## BBC31PN

Polyester
63KA \& 350mm
Centres
\$29.04


SIDE ELEVATION

## BBC42PN

Polyester
$63 \mathrm{KA} \& 350 \mathrm{~mm}$
Centres
$\$ 52.45$

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Time Clock * 1 Module $=18 \mathrm{~mm}$

| Part No. | Channel | Settings | Voltage | Mod | Time | Reserve | Price |
| :--- | :---: | :--- | :---: | :---: | :---: | :--- | :---: |
| TM848C2 | 1 | 8 On/Off | AC240 | 2 | 7 days | 3 Months | $\$$ |
| TM848-DC12 | 1 | 2 | 8 On/Off | DC12 | 2 | 7 days | 3 Months |
| TM812M2 | 2 | 4 On/Off per Channel | AC240 | 3 | 7 days | 3 Months | $\$ 141.57$ |
| TB370 | 1 | Analogue 15min Pins | AC240 | 3 | 24 hrs | 150 Hours | $\$ 72.60$ |
| TB45 | 1 | Analogue 15min Pins Control | $100-240 \mathrm{~V}$ | 1 | 24 hrs | 100 Hours | $\$$ |



## Set-Range/Set-Voltage Timers - On Delay

Contact Mode:
Contacts:
Indication:
Base:
$1 \times$ C/O Instantaneous, $1 \times$ C/O Delay
3 Amp 250V AC Resistive Load
Power-On Red LED, Time up Red LED
Plug in 8 Pin

| Part No. | Time | AC Volts | Price |
| :--- | :---: | :---: | ---: |
| TH3A10SAC240 | $0-12 \mathrm{Sec}$ | 240 | $\$ 52.88$ |
| TH3A30SAC240 | $0-30 \mathrm{Sec}$ | 240 | $\$ 52.88$ |
| TH3A60SAC240 | $0-60 \mathrm{Sec}$ | 240 | $\$ 52.88$ |
| TH3A3MAC240 | $0-3 \mathrm{Min}$ | 240 | $\$ 52.88$ |
| TH3A10MAC240 | $0-12 \mathrm{Min}$ | 240 | $\$ 52.88$ |
| TH3A30MAC240 | $0-30 \mathrm{Min}$ | 240 | $\$ 52.88$ |
| TH3A3HAC240 | $0-3 \mathrm{Hr}$ | 240 | $\$ 52.88$ |
| TH3A30HAC240 | $0-30 \mathrm{Hr}$ | 240 | $\$ 52.88$ |
| TH3A30SAC24 | $0-30 \mathrm{Sec}$ | 24 | $\$ 52.88$ |
| TH3A3MAC24 | $0-3 \mathrm{Min}$ | 24 | $\$ 52.88$ |
| TH3A10MAC24 | $0-10 \mathrm{Min}$ | 24 | $\$ 52.88$ |
| TH3A30MAC24 | $0-30 \mathrm{Min}$ | 24 | $\$ 52.88$ |
| TH3A3HAC24 | $0-3 \mathrm{Hr}$ | 24 | $\$ 52.88$ |
| PFO83AE | Socket to Suit |  | $\$ 8.23$ |
| FMB | Flush Clip to Suit |  | $\$ 3.63$ |
| P3G08 | Rear Socket to Suit |  | $\$ 6.05$ |
|  |  |  |  |



Multi-Range/Set-Voltage Timer - On Delay

| Contact Mode: |  |  |  |
| :---: | :---: | :---: | :---: |
| Contacts: | 10 Amps 120V |  |  |
| Indication: | Power-On Red LED, Time up Red LED |  |  |
| Base: | Plug in 8 Pin |  |  |
| Part No. | Multi-Time Selection | Voltage | Price |
| TH3CU | 0-6S, 60S, 6M, 60M | AC/DC 24-240 | \$79.86 |
| TH3EU | 0-3M, 30M, 3H, 30H | AC/DC 24-240 | \$79.86 |
| PFO83AE | Socket |  | \$8.23 |
| FMB | Flush Cl |  | \$3.63 |
| P3G08 | Rear Soc |  | \$6.05 |



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Industrial Electrical Components Suppliers Tel: 61-7-3349-5300

## Timers \& Accessories

# Multi-Range/Multi-Function/Multi-Voltage Timer - On Delay 

| Multi-Function Contacts: | A-Mode <br>  <br> B-Mode | $1 \times$ C/O Instantaneous - $1 \times$ C/O Delay |
| :--- | :--- | :--- |
| Multi-Voltage: | $24-240$ Volt AC or DC | $2 \times$ C/O Delay |
| Indication: | Power on Red LED - Switched Green LED |  |
| Contacts: | 3 Amp 250V AC Resistive |  |
| Base: | Plug in 8 Pin |  |


| Part No. | Multi Time Selection | Price |
| :--- | :--- | ---: |
| TM48S30M | $0-$ 3Sec, 30Sec, 3Min, \& 30Min | $\$ 106.48$ |
| TM48S60M | $0-6 \mathrm{Sec}$, 60Sec, 6Min, \& 60Min | $\$ 106.48$ |
| TM48S30H | $0-$ 3Min, 30Min, 3Hr, \& 30Hr | $\$ 106.48$ |
| PFO83AE | Socket to Suit (Surface/Din Mounted) | $\$ 8.23$ |
| FMA | Flush Clip to Suit | $\$ 3.63$ |
| P3G08 | Rear Socket to Suit | $\$ 6.05$ |



## Sockets - To Suit Timers

| Part No. | Type | Pins | Price |
| :--- | :--- | :--- | ---: |
| PFO83AE | Surface Din Mounting | 8 Round | $\$ 8.23$ |
| P2CF11 | Surface Din Mounting with Clips | 11 Round | $\$ 10.89$ |
| P3G08 | Rear | 8 Round | $\$ 6.05$ |
| US08 | Rear Plug top | 8 Round | $\$ 6.05$ |
| 8PFA | Surface Star Delta | 8 Round | $\$ 9.68$ |
| PF113AE | Din Mounting | 11 Round | $\$ 9.68$ |
| FMA | Flush Bracket TM |  | $\$ 3.63$ |
| FMB | Flush Bracket TH |  | $\$ 3.63$ |



## Solid State Timers

| Time Range: <br> Contact: <br> Voltage: | 0.3-10 Minutes <br> 1 Amp Resistive <br> 19-288 Volts AC |
| :--- | :--- | :---: |
| Part NC. DC |  |



IDUV480


MDUV480

## Impulse Counters

| Part No. | Size | Voltage | Price |
| :--- | ---: | ---: | ---: |
| LFC6SAC240 | $53 \mathrm{~mm} \times 28 \mathrm{~mm}-$ with Reset | 240 | $\$ 70.18$ |
| Cut out size $=50.5 \mathrm{~mm} \times 25.5 \mathrm{~mm}$ |  |  |  |
|  |  |  |  |

## Protection Devices

## Phase Failure Relay

- Phase Sequence
- Adjustable Under, Over Voltage

| Part No. | Description | Contacts | Price |
| :--- | :--- | :--- | ---: |
| VP0021 | 1 Phase 240 Volt | $1 \times$ C/O | $\$ 96.80$ |
| JVMAC415 | 3 Phase 415Volt | 1 x C/O | $\$ 121.00$ |
| HRN35 | 1 Phase 240 Volt | 1 $\times$ C/O | $\$ 120.00$ |
| HRN54N | 3 Phase 415Volt | 1 $\times$ C/O | $\$ 145.00$ |
| PF113AE | Socket Surface Din Mount - Suits above | $\$$ | 9.68 |



JVMAC415

Off Delay Timer

| Part No. | Description | Contacts | Price |
| :--- | :--- | :--- | ---: |
| JTFNAC240 | $0-30$ Sec 240 Volt | $1 \times \mathrm{C} / \mathrm{O}$ | $\$ 145.20$ |
| 8PFA | Socket Surface Din Mount |  | $\$ 9.68$ |



JTFNAC240

Multi Functional Timer

| In |  $\quad$Repeat Cycle <br> Reverse Repeat Cycle |  |  |
| :---: | :---: | :---: | :---: |
| Part No. | Description | Contacts | Price |
| JMB51A | 1M - 10M - 1H-10H 240 Volt | $1 \times \mathrm{C} / \mathrm{O}$ | \$ 108.90 |
| PFO83AE | Socket Surface Din |  | \$ 8.23 |



JMB51A

## Star Delta Timer

| Part No. | Description | Contacts | Price |
| :--- | :--- | :--- | ---: |
| TRDNAC240 | $0 / 30$ Sec 240 Volt | $1 \times$ N/O Delay <br> $1 \times$ C/O Instant | $\$ 76.23$ |
| 8PFA | Socket Surface Din Mount |  | $\$ 9.68$ |

Twin Timer

| Part No. | Description | Contacts | Price |
| :--- | :--- | :--- | ---: |
| CATDVNAC240 | $0 / 60$ Sec $\times 0 / 60$ Sec | $1 \times$ C/O | $\$ 91.96$ |
| 8PFA | Socket Surface Din Mount |  | $\$ 9.68$ |



Liquid Level Relay \& Float Switch

| Part No. | Description | Contacts | Price |
| :--- | :--- | ---: | ---: |
| JLC1AC220 | 220 Volt | $1 \times$ C/O | $\$ 72.60$ |
| 8PFA | Socket Surface Din Mount | $\$ 9.68$ |  |
| PS3S | Electro Holder | $\$ 24.20$ |  |
| SUSA | Rod Threader 1 Metre SS | $\$ 10.89$ |  |
| SUSS | Rod Joiner | $\$ 3.63$ |  |
| CB2005L5 | Float Switch 1C/O 10 Amp AC1 w/- 5 Mtr Lead | $\$ 76.23$ |  |
| CB2005L10 | Float Switch 1C/O 10 Amp AC1 w/- 10 Mtr Lead | $\$ 80.00$ |  |
| CB2005L20 | Float Switch 1C/O 10 Amp AC1 w/- 20 Mtr Lead | $\$ 83.00$ |  |



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## Control Relays

## Multi Function Timer - On Delay

* Multi Range $0.1 \mathrm{Sec}-10$ Days
* Output 1 Changeover 16 Amp
* Multi Function

| Part No. | Description | Contacts | Price |
| :--- | :--- | :--- | ---: |
| CRM91H230 | AC230 V | 1 C/O | $\$ 117.84$ |
| CRM91HU | AC/DC $12-240 \mathrm{~V}$ | $1 \mathrm{C} / \mathrm{O}$ | $\$ 130.68$ |
| TIG19M | AC/DC $24-240$ | $1 \mathrm{C} / \mathrm{O}$ | $\$ 99.00$ |



Multi Function Timer - Off Delay - without supply voltage

* Multi Range 0.1 Sec - 10 Min
* Output 2 Changeover 8 Amp

| Part No. | Description | Price |
| :--- | :--- | ---: |
| CRM82TO | AC/DC 12-240V | $\$ 147.86$ |



## Twin Timer

* Multi Range $0.1 \mathrm{Sec}-100$ Days x 2
* Output 1 Changeover 16Amp

| * Output | Changeover 16Amp | Price |
| :--- | :--- | ---: |
| Part No. | Description | $\$ 126.57$ |
| CRM2H | AC/DC 12-240V |  |



CRM2H

## Star/Delta Timer

* Multi Range 0.1 Sec - 10 Days
* Output 2 Changeover 16Amp

| Part No. | Description | Price |
| :--- | :--- | ---: |
| CRM2TU | AC/DC 12-240V | $\$ 159.72$ |



## Flip-Flop Relay

* Latching Changeover Relay
* Output 1 or 2 Changeover 16Amp

| Part No. | Description | Price |
| :--- | :--- | ---: |
| MR41AC240 | AC/DC $12-240 \mathrm{~V}-1$ Changeover | $\$ 89.54$ |
| MR42AC240 | AC/DC $12-240 \mathrm{~V}-2$ Changeover | $\$ 99.22$ |



## Sensors

| Part No. | Description | Price |
| :---: | :---: | :---: |
| C1203 | Current Sensor Mini Solid Core Analogue 0-15A Fixed Range 0-5VDC | \$ 104.00 |
| C1205 | Current Sensor Mini Solid Core 0-15A Fixed Range 4-20ma | \$ 113.00 |
| C2344 | Current Sensor Split Core Analogue 30,60,120A Selectable Range 0-10DC | \$ 140.00 |
| C1200 | Current Sensor Mini Solid Core 0.1to50A Range 1A@30VAC/DC GO/NOGO | \$ 70.00 |
| C1200HV | Current Sensor Mini Solid Core 0.1to50A Range .5A@120VAC/DC | \$ 70.00 |
| C2300 | Current Sensor Mini Solid Core . 15 to 200A Range 1A@30VAC/DC | \$ 88.00 |
| C 1220 | Current Sensor Preset Solid Core . 75 to50A Range 1A@30VAC/DC Adjustable | \$ 97.00 |
| C2320 | Current Sensor Preset Split Core 1 to 100A Range 1A@30VAC/DC | \$ 160.00 |
| C2330 | Current Sensor Auto Set Split Core 2.5 to 135A Range 1A@30VAC/DC | \$ 207.00 |
| C2345 | Current Sensor Split Core Loop 30A-60A-120A Range 4-20MA | \$ 160.00 |

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## Emergency Lighting Test Kit

Schedule 1

## * Supplied on Din Rail - 240 Volt Operation

* All Components Din Modular

| Part No. | Description | Price | S/W - RS223B | Timer | Contactor |
| :---: | :---: | :---: | :---: | :---: | :---: |
| ELTKO | Unwired | \$157.30 | Bracket M22IVS | TIG19M | TS425AC240 |
| ELTKW | Wired | \$205.70 |  |  |  |
| ELTKWK | Wired in MCB Box | \$240.19 | Legend TOR |  | 4 Normally Closed |

## Cam Switches - IP42

| Part No. | Poles | Description | Price |
| :--- | :--- | :--- | :--- |

10 Amp AC1 Switches

| RCS2P10P | 2 | Off - On (Single Hole) | $\$ 19.36$ |
| :--- | :--- | :--- | :--- |
| RCS4P10P | 4 | Off - On (Single Hole) | $\$ 24.20$ |



## 16 Amp AC1 Switches - 5.5Kw AC3

| ST1FO | $1-2$ | Off - On | $\$ 20.57$ |
| :--- | :---: | :--- | :---: |
| ST3FO | $3-4$ | Off - On | $\$ 25.41$ |
| ST1AOM | 1 | Man - Off - Auto | $\$ 26.62$ |
| ST3AOM | 3 | Man - Off - Auto | $\$ 29.04$ |
| ST3CO | $3+3$ | On - Off - On (3 PH-Rev) | $\$ 35.09$ |
| VSW1 | $3 P H+N$ | Voltmeter | $\$ 37.51$ |
| ASW1 | 3 CT | Ammeter | $\$ 37.51$ |
| RCS2P | 2 | Off - On (Single Hole Mtg.) | $\$ 20.57$ |
| RCS4P | 4 | Off - On (Single Hole Mtg.) | $\$ 25.41$ |

32 Amp AC1 Switches - 11Kw AC3

| RCS4P32 | 4 | Off - On | $\$ 50.82$ |
| :--- | :--- | :--- | :--- |
| RCS4P32P | 4 | Off - On Yellow Pad-lockable | $\$ 53.24$ |
| RCS4CO32 | 4 | $1-$ Off - 2 | $\$ 65.34$ |
| RCS4P32PXD | 4 | Off-On Yell Pad Door Ext Handle Din Rail Mtg | $\$ 70.18$ |

63 Amp AC1 Switches - 18.5Kw AC3

| RCS4P63 | 4 | Off - On | $\$ 72.60$ |
| :--- | :--- | :--- | :--- |
| RCS4P63P | 4 | Off - On Yellow Pad-lockable | $\$ 82.28$ |
| RCS4CO63 | 4 | $1-$ Off -2 | $\$ 106.48$ |
| RCS4P63PXD | 4 | Off-On Yell Pad Door Ext Handle Din Rail Mtg | $\$ 108.90$ |



100 Amp AC1 Switches - 30Kw AC3

| RCS3P100P | 3 | Off - On Yellow Pad-lockable | $\$ 100.00$ |
| :--- | :--- | :--- | :--- | :--- |
| RCS4P100PXD | 4 | Off-On Yell Pad Door Ext Handle Din Rail Mtg | $\$ 145.20$ |

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## - LED to Indicate Coil Energized <br> - Test Button to Manually Operate Relay <br> - Contacts Enclosed in ARC Barriers

Relays With LED's \& Test Button - (Flat Pin Miniature Relays)
SCHEDULE 1

| 5 Amp Relays <br> 2 Pole C/O (BMY) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | 2 Pole C/O (BLY) |  |  |
| Part No. | Coil | Price | Part No. | Coil | Price |
| SCLB2AC12LM | 12 V AC | \$10.23 | SCL2AC12LM | 12 V AC | \$11.66 |
| SCLB2DC12LM | 12 V DC | \$10.23 | SCL2DC12LM | 12 V DC | \$11.66 |
| SCLB2AC24LM | 24 V AC | \$10.23 | SCL2AC24LM | 24 V AC | \$11.66 |
| SCLB2DC24LM | 24 V DC | \$10.23 | SCL2DC24LM | 24 V DC | \$11.66 |
| SCLB2AC110LM | 110 V AC | \$10.23 | SCL2AC110LM | 110 V AC | \$11.66 |
| SCLB2AC240LM | 240 V AC | \$10.23 | SCL2AC240LM | 240 V AC | \$11.66 |
| PYF8AE | Base to Suit | \$7.26 | PTF8AE | Base to Suit | \$8.47 |
| 4 Pole C/O (BMY) |  |  | 4 Pole C/O (No Test Button) |  |  |
| Part No. | Coil | Price | Part No. | Coil | Price |
| SCLD4AC12LM | 12 V AC | \$11.25 | BLY4AC24 | 24 V AC | \$21.78 |
| SCLD4DC12LM | 12 V DC | \$11.25 | BLY4DC24 | 24 V DC | \$21.78 |
| SCLD4AC24LM | 24 V AC | \$11.25 | BLY4AC240 | 240 V AC | \$21.78 |
| SCLD4DC24LM | 24 V DC | \$11.25 | PTF14AE | Base to Suit | \$17.55 |
| SCLD4AC110LM | 110 V AC | \$11.25 | Relay Hold down Clips |  |  |
| SCLD4AC240LM | 240 V AC | \$11.25 | RCAE - Suits PYF |  | \$0.48 Each |
| PYF14AE | Base to Suit | \$8.47 | RC1O - Suits PTF |  | \$0.73 Each |
| PYF944 | Tower Base | \$8.47 |  |  |  |



## Sockets to suit Relays

SCHEDULE 1

| Part No. | Type | Pins | Price |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| PYF8AE | Surface Din Mounting 5 Amp | 8 Flat | \$ 7.26 |  |  |  |
| PTF8AE | Surface Din Mounting 10 Amp | 8 Flat | \$ 8.47 |  |  |  |
| PYF14AE | Surface Din Mounting 5Amp | 14 Flat | \$ 8.47 |  | 最 |  |
| PYF944 | Tower Base Din Mounting | 14 Flat | \$ 8.47 |  |  |  |
| PTF14AE | Surface Din Mounting 10Amp | 14 Flat | \$17.55 | PTF8AE | PYFl4AE | PYF944 |

## Slim Line Relay \& Socket (Base)

- With LED Indication
- $\quad$ Socket with Built In Diode Bridge, accepts AC/DC
- Socket 6 mm Pitch Din Rail Mount
- Relay Contacts 1 Changeover 6 Amps AC

| Part No. | Description | Price |
| :--- | :--- | :---: |
| 882DC12 | Relay 12V Coil | $\$ 9.08$ |
| 882DC24 | Relay 24V Coil | $\$ 9.08$ |
| SLS38 | Socket (Base) AC/DC | $\$ 9.08$ |
| 37504 | Bridging bar to suit | POA |

## Switchboard Meters 72 \& 96mm

## Voltmeter $90^{\circ}$

| Voltage | Part No. 72mm x 72mm | Price | Part No. 96mm x 96mm | Price |
| :--- | :--- | :--- | :--- | :--- |
| $0-30$ | C72V30 | $\$ 44.77$ |  |  |
| $0-300$ | C72V300 | $\$ 44.77$ | C96V300 | $\$ 45.98$ |
| $0-500$ | C72V500 | $\$ 48.40$ | C96V500 | $\$ 49.61$ |

## Ammeters Direct Connect 90웅 Over-scale

| Amps | Part No. 72mm x 72mm | Price | Part No. 96mm x 96mm | Price |
| :--- | :--- | :--- | :--- | :--- | :--- |
| $0-5$ | C72A5 | $\$ 42.35$ | C96A5 | $\$ 43.56$ |
| $0-10$ | C72A10 | $\$ 42.35$ | C96A10 | $\$ 43.56$ |
| $0-25$ | C72A25 | $\$ 42.35$ | C96A25 | 4 |
| $0-60$ | C72A60 | $\$ 42.35$ | C96A60 | $\$ 43.56$ |
| $0-100$ |  |  | C96A100 | $\$ 43.56$ |

## Ammeters 5 Amp CT Operated $90^{\circ}$ Over-scale

|  | Part No. 72mm x 72mm | Price | Part No. 96mm x 96mm | Price |
| :---: | :---: | :---: | :---: | :---: |
| 5 Amp | C72A5CT | \$35.09 | C96A5CT | \$36.30 |
| Scale to Suit | C72A(Scale) | \$4.24 | C96A(Scale) | \$4.24 |
| C T Operated Ammeter Scales are the same as CT Ratios |  |  |  |  |

Maximum Demand Meters 5Amp

| Part No. 96mm x 96mm | Description | Price |
| :--- | :--- | :--- |
| BE96MDI5CT | Combined Maximum Demand Ind. \& Amps | $\$ 127.05$ |
| BE96MDI (Scale) | Scale to suit MDI | $\$ 4.24$ |
| Scales are the same as CT Ratio |  |  |
| Bezel to Suit BE96 (Blue, Red \& White) | $\$ 4.24$ |  |

## Frequency Meter Pointer Type $\mathbf{9 0}^{\circ}$

| Frequency | Part No. <br> 72mm $\times 72 \mathrm{~mm}$ | Price | Part No. <br> $\mathbf{9 6 m m} \times \mathbf{9 6 m m}$ | Price |
| :--- | :--- | :--- | :--- | :--- |
| $44-55 \mathrm{~Hz} 240 \mathrm{~V}$ | C72F | $\$ 139.15$ | C96F | $\$ 146.41$ |

## Switchboard Meters 50mm

| Part No. | Description | Price |  |
| :--- | :--- | :--- | :--- |
| SF50V300 | Voltmeter AC $0-300 \mathrm{Volts}$ | $\$ 41.14$ |  |
| SF50F | Pointer Frequency 50 Hz | $\$ 60.50$ |  |
| SF50V30DC | Voltmeter DC $0-30 \mathrm{Volts}$ | $\$ 41.14$ |  |

## Meter Hole cut out sizes:

$50 \mathrm{~mm} \times 50 \mathrm{~mm}-\mathrm{Cut}$ Out $45 \mathrm{~mm} \otimes \quad 72 \mathrm{~mm} \times 72 \mathrm{~mm}-$ Cut out $68 \mathrm{~mm} \times 68 \mathrm{~mm} \quad 96 \mathrm{~mm} \times 96 \mathrm{~mm}-\mathrm{Cut}$ out $90 \mathrm{~mm} \times 90 \mathrm{~mm}$

Hour Run Meters - Cut out size: $44 \mathrm{~mm} \times 44 \mathrm{~mm}$



$\square$

## Multi-functional Digital Meters - 96mm

|  |  |  |
| :--- | :--- | :--- |
| PART NUMBER | DESCRIPTION |  |
| SFDB96x5 | $\bullet$ Volts: Phase-Neutral Phase-Phase 415V 3Ph |  |
|  | $\bullet$ | Amps 3 Phase 5A/CT Program Ratio 3Ph |
|  | $\bullet$ | Frequency Hz |
|  | $\bullet$ | LED Segment Display |

TRADE PRICE \$180.00

Part Number Description
SFDB96D3 - Volts Phase-Neutral Phase-Phase 415 3Ph

- Amps 3 Phase 5A/CT Program Ratio 3Ph
- Frequency Hz

Power Factor
Power Active Kwh with Pulse Output
Power Reactive KvaRH with Pulse Output
Output RS485 - MODBUS - RTU

- Output 4 Channel Switching Contacts

5 Line LCD Screen
TRADE PRICE \$430.00

## Part Number Description

 SFDB96D5- Volts Phase-Neutral Phase-Phase 415 3Ph
- Amps 3 Phase 5A/CT Program Ratio 3Ph
- Frequency Hz
- Power Factor
- Active Power Kw and Total Power Kwh with Pulse Output
- Reactive Power KvAp and Total KvaRH with Pulse Output
- Active Energy
- Reactive Energy
- Output RS485 - MODBUS - RTU
- Analogue Output 4 Channel $4-20 \mathrm{~mA}$
- LED Segment Display

TRADE PRICE \$675.00

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DORE ELECTRICS
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Current Transformers - All CT's are 5 Amps Secondary
Schedule 1

| Ratio | Part No. | Price | Part No. | Price | Part No. | Price | Part No. | Price |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 30 | CT1/30* | $\$ 21.78$ |  |  | CT3/30* | $\$ 22.39$ |  |  |
| 40 | CT1/40* | $\$ 21.78$ |  |  | CT3/40* | $\$ 22.39$ |  |  |
| 50 | CT1/50* | $\$ 21.78$ |  |  | CT3/50* | $\$ 22.39$ |  |  |
| 60 | CT1/60 | $\$ 21.78$ |  |  | CT3/60 | $\$ 22.39$ |  |  |
| 75 | CT1/75 | $\$ 21.78$ |  |  | CT3/75 | $\$ 22.39$ |  |  |
| 100 | CT1/100 | $\$ 21.78$ |  |  | CT3/100 | $\$ 22.39$ |  |  |
| 150 | CT1/150 | $\$ 21.78$ |  |  | CT3/150 | $\$ 22.39$ |  |  |
| 200 |  |  | CT2/200 | $\$ 22.02$ |  |  | CT4/200 | $\$ 27.83$ |
| 250 |  |  | CT2/250 | $\$ 22.02$ |  |  | CT4/250 | $\$ 27.83$ |
| 300 |  | CT2/300 | $\$ 22.02$ |  |  | CT4/300 | $\$ 27.83$ |  |
| 400 |  | CT2/400 | $\$ 22.02$ |  |  | CT4/400 | $\$ 27.83$ |  |
| 500 |  | CT2/500 | $\$ 22.02$ |  |  |  |  |  |


| Ratio | Part No. | Price | Part No. | Price | Part No. | Price | Part No. | Price |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 300 | CT6/300 | $\$ 36.30$ |  |  |  |  |  |  |
| 400 | CT6/400 | $\$ 36.30$ |  |  |  |  |  |  |
| 500 | CT6/500 | $\$ 36.30$ |  |  |  |  |  |  |
| 600 | CT6/600 | $\$ 36.30$ | CT8/600 | $\$ 53.24$ |  |  |  |  |
| 800 | CT6/800 | $\$ 36.30$ | CT8/800 | $\$ 53.24$ |  |  |  |  |
| 1000 | CT6/1000 | $\$ 36.30$ | CT8/1000 | $\$ 53.24$ | CT10/1000 | $\$ 76.23$ |  |  |
| 1200 |  |  | CT8/1200 | $\$ 53.24$ | CT10/1200 | $\$ 76.23$ |  |  |
| 1500 |  | CT8/1500 | $\$ 53.24$ | CT10/1500 | $\$ 76.23$ | CT12/1500 | $\$ 93.17$ |  |
| 1600 |  |  | CT8/1600 | $\$ 53.24$ | CT10/1600 | $\$ 76.23$ | CT12/1600 | $\$ 93.17$ |
| 2000 |  |  |  | CT10/2000 | $\$ 76.23$ | CT12/2000 | $\$ 93.17$ |  |
| 2500 |  |  |  |  | CT10/2500 | $\$ 76.23$ | CT12/2500 | $\$ 93.17$ |
| 3000 |  |  |  |  |  |  | CT12/3000 | $\$ 93.17$ |
| 4000 |  |  |  |  |  |  | CT12/4000 | $\$ 93.17$ |

## = 2 Turn Primary

## Dimensions

| Dim. | CT1 | CT2 | CT3 | CT4 | CT6 | CT8 | CT10 | CT12 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| A | 22 | 31 | 33 | 43 | 63 | 83 | 103 | 123 |
| B | 75 | 65 | 96 | 104 | 124 | 147 | 158 | 192 |
| C | 27 | 27 | 44 | 44 | 44 | 44 | 44 | 44 |
| D | 52 | 52 | 75 | 82 | 101 | 125 | 141 | 161 |

## Selector Switches - IP42

| Part No. | Poles | Description | Price |
| :--- | :---: | :--- | :--- | :--- |
| VSW1 | $3 \mathrm{PH}+\mathrm{N}$ | Voltmeter | $\$ 37.51$ |
| ASW1 | 3 CT | Ammeter | $\$ 37.51$ |



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## Miniature Circuit Breakers

1 Pole - 10KA

| Part No. | Description |  | Price |
| :--- | :--- | :---: | :---: |
| MCB1P1 | 1 Amp | $\$$ | 8.07 |
| MCB2P1 | 2 Amp | $\$$ | 8.07 |
| MCB4P1 | 4 Amp | $\$$ | 8.07 |
| MCB6P1 | 6 Amp | $\$$ | 8.07 |
| MCB10P1 | 10 Amp | $\$$ | 8.07 |
| MCB16P1 | 16 Amp | $\$$ | 8.07 |
| MCB20P1 | 20 Amp | $\$$ | 8.07 |
| MCB25P1 | 25 Amp | $\$$ | 8.07 |
| MCB32P1 | 32 Amp | $\$$ | 8.07 |
| MCB40P1 | 40 Amp | $\$$ | 8.07 |
| MCB50P1 | 50 Amp | $\$$ | 8.07 |
| MCB63P1 | 63 Amp | $\$$ | 8.07 |

Main Switch - 100Amp


## 1 Pole Residual Current Circuit Breaker - 10KA

| Part No. | Description |  | Price |
| :--- | :--- | :---: | :---: |
| RCBO10P1 | RCD/MCB 1 Pole 10A 30MA | $\$ 53.00$ |  |
| RCBO16P1 | RCD/MCB 1 Pole 16A 30MA | $\$ 53.00$ |  |
| RCBO20P1 | RCD/MCB 1 Pole 20A 30MA | $\$ 53.00$ |  |
| RCBO25P1 | RCD/MCB 1 Pole 25A 30MA | $\$ 53.00$ |  |
| RCBO32P1 | RCD/MCB | 1 Pole 22A 30MA | $\$ 53.00$ |

## 2 Pole Residual Current Circuit Breaker - 6KA

| Part No. | Description | Price |  |
| :--- | :--- | :--- | :--- |
| RCBO10P2 | RCD/MCB | 2 Pole 10A 30MA | $\$$ |
| RCBO16P2 | RCD/MCB | 2 Pole 16A 30MA | $\$ 50.00$ |
| RCBO20P2 | RCD/MCB | 2 Pole 20A 30MA | $\$ 50.00$ |
| RCBO25P2 | RCD/MCB | 2 Pole 25A 30MA | $\$ 50.00$ |
| RCBO32P2 | RCD/MCB | 2 Pole 32A 30MA | $\$$ |

## Residual Current Devices - 10KA

| Part No. | Description | Price |
| :--- | :--- | :---: | :---: |
| RCD40P2 | 2 Pole 40 Amp 30MA | $\$ 44.00$ |
| RCD63P2 | 2 Pole 63 Amp 30MA | $\$ ~ 44.00$ |
| RCD40P4 | 4 Pole 40 Amp 30MA | $\$ 55.00$ |
| RCD63P4 | 4 Pole 63 Amp 30MA | $\$ 55.00$ |

Bridging Bar

| Part No. | Phases | Rating | Terminals | Length | Price |
| :--- | :---: | :---: | :---: | :---: | ---: |
| BBM1PH | 1 | 125 A | 55 | 1 Mtr | $\$ 40.00$ |
| BBM2PH | 2 | 125 A | 27 | 1 Mtr | $\$ 54.00$ |
| BBM3PH | 3 | 125 A | 27 | 1 Mtr | $\$ 60.00$ |
| BBM1PN | $1 \mathrm{P}+\mathrm{N}$ | 32 A | 56 | 1 Mtr | $\$ 54.00$ |

End Caps for Bridging Bar
Terminal Adaptor

| Part No. | Phases | Price |
| :--- | :--- | ---: |
| ECBB1 | 1 | $\$ 1.20$ |
| ECBB3 | 3 | $\$ 1.80$ |


| Part No. | Size | Price |
| :--- | :---: | ---: |
| BA1 | $25 \mathrm{~mm}^{2}$ | $\$ 4.00$ |

MCB Accessories

| Part Number | Description | Contact | Rating | Price |
| :--- | :--- | :--- | :--- | :---: |
| AUXMCB | Aux Switch | 1 C/O | AC1 6A 240V | $\$ 38.00$ |
| ALARMMCB | Alarm MCB | Alarm 1 C/O | AC1 6A 240V | $\$ 38.00$ |

MCB Padlock Device

| Part No. | Poles | Price |
| :--- | :--- | ---: |
| PDMCB | 1 PH | $\$ 4.00$ |


| Main Switch for Chassis 250Amp Din Mtg |  |  |
| :--- | :--- | ---: |
| Part No. | Description | Price |
| MS3250 | 3 Pole 250Amp w/- Shrouds | $\$ 95.00$ |
| MS4250 | 4 Pole 250Amp w/- Shrouds | $\$ 137.50$ |
| MS250PD | Padlock Device | $\$ 6.00$ |

MCB 3 Phase Chassis 250 Amp - 17.5mm Spacing

| Part No. | Poles | Feed | Price |
| :--- | :---: | :---: | :---: |
| CH250D24 | 24 | Dual | POA |
| CH250D36 | 36 | Dual | POA |
| CH250D48 | 48 | Dual | POA |
| CH250D60 | 60 | Dual | POA |
| CH250D72 | 72 | Dual | POA |
| CH250D84 | 84 | Top | POA |

## Distribution Panel Board

* IP55
* w/- 250 Amp Main Switch
* Available in Beige or orange

| Poles | Part No. Beige | Part No. Orange | Price | External Dimensions |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Hight | Width | Depth |
| 24 | DPB24B | DPB240 | POA | 800 mm | 600 mm | 200 mm |
| 36 | DPB36B | DPB360 |  | 800 mm | 600 mm | 200 mm |
| 48 | DPB48B | DPB480 |  | 1000 mm | 600 mm | 200 mm |
| 60 | DPB60B | DPB600 |  | 1000 mm | 600 mm | 200 mm |
| 72 | DPB72B | DPB720 |  | 1200 mm | 600 mm | 200 mm |

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## Distribution Board

* Earth \& Split Neutral
* Clear Plastic Cover

Surface Mount Flush Mount

| Part No. | Part No. | Description | Price |
| :--- | :--- | :---: | :---: | :---: |
| MD8S | MD8F | 8 Pole | $\$ 49.50$ |
| MD12S | MD12F | 12 Pole | $\$ 55.00$ |
| MD18S | MD18F | 18 Pole | $\$ 82.50$ |
| MD24S | MD24F | 24 Pole | $\$ 110.00$ |
| MD36S | MD36F | 36 Pole | $\$ 137.50$ |



Distribution Board


Clear Cover
Surface Mount

| Poles |  | Price |
| :--- | ---: | :---: |
| 4 | $\$$ | 35.00 |
| 5 | $\$$ | 40.00 |
| 6 | $\$$ | 51.00 |
| 8 | $\$$ | 62.00 |
| 12 | $\$$ | 102.00 |
| 18 | $\$ 120.00$ |  |
| 24 | $\$$ | 135.00 |



## MCB Covers

| Part No. | Poles |  | Price |
| :--- | :--- | ---: | ---: |
| DAL1 | 1 | $\$$ | 6.05 |
| DAL2 | 2 | $\$$ | 6.38 |
| DAL4 | 4 | $\$$ | 8.25 |
| DAL8 | 8 | $\$$ | 17.93 |



## MCB Accessories

Flush Adaptors

| Part No. | Poles |  | Price |  | Part No. | Poles |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| MCB1FA | 1 | $\$$ | 2.42 |  | MCB3FA | 3 | $\$$ |
| MCB2FA | 2 | $\$$ | 3.63 |  | MCB4FA | 4 | 4.06 |



Flush Adaptor

Din Rail Fittings

| Part No. | Description | Price |  |
| :--- | :--- | ---: | ---: |
| M22IVS | Pushbutton Din Rail Bracket | $\$$ | 14.52 |
| DINGPO | Din Mount GPO 10A | $\$$ | 17.99 |
| DPDGPO | Din Mount GPO 15A Double Pole Auto Switch w/- Lamp | $\$$ | 20.00 |



M22IVS


DINGPO

## Surge Protector

* Nominal discharge current 40 KA at 8 times response 20 u seconds
* Clip voltage 270 V
* Rated voltage for single and three phase applications Phase/Neutral to Earth 420V

| Part No. | Description | Price |
| :--- | :--- | :---: | :---: |
| SP140 | Surge Protector 1 Pole 40kA | $\$ 84.70$ |
| SP140E | Element to suit Surge Protector | $\$ 55.66$ |

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## Din Fuse Carrier \& Cartridges - AC

| $\Sigma$ | 1 Din Module |
| :--- | :--- |
| $\Sigma$ | Cartridge size 10x38mm |

$\Sigma \quad 32$ Amp 500 Volts AC 50 Ka
$\Sigma \quad$ Fitted with lamp indicator

| Part No. | Description |  | Price |
| :--- | :--- | :---: | :---: |
| RT1832 | Din Fuse Holder | $\$$ | 5.50 |
| R0156 | 6 Amp Cartridge | $\$$ | 1.45 |
| R0158 | 8 Amp Cartridge | $\$$ | 1.45 |
| R01510 | 10 Amp Cartridge | $\$$ | 1.45 |
| R01516 | 16 Amp Cartridge | $\$$ | 1.45 |
| R01520 | 20 Amp Cartridge | $\$$ | 1.45 |
| R01525 | 25 Amp Cartridge | $\$$ | 1.45 |
| R01532 | 32 Amp Cartridge | $\$$ | 1.45 |



RT1832


RO1532

## Din Fuse Carrier \& Cartridges - DC - Solar

$\Sigma \quad$ Suitable for use on Photovoltaic System
$\Sigma \quad$ Cartridges 1000V DC 33kA DC
$\Sigma \quad$ Cartridge size 10x38mm
$\Sigma \quad$ Fittings to IEC 60269 600V AC 1000 V DC 30 Amps $\Sigma 1$ Din Module Fitting

| Part No. | Description | Price |  |
| :--- | :--- | :--- | :--- |
| CHM1DPV | Din Fuse Holder | $\$$ | 7.50 |
| PV6 | 6 Amp Cartridge | $\$ 9.50$ |  |
| PV8 | 8 Amp Cartridge | $\$ 9.50$ |  |
| PV10 | 10 Amp Cartridge | $\$$ | 9.50 |
| PV15 | 15 Amp Cartridge | $\$$ | 9.50 |
| CHM1DPV | PV-- |  |  |

## Motor Protection Circuit Breakers

Thermal Magnetic Type - Rotary Actuator

| Part No. | Setting <br> Range A | AC-3 Rating <br> 415Kw | Ka @ 415V | Price |
| :--- | :---: | :---: | :---: | :---: |
| MMS-32H.16 | $0.1-0.16$ | 0.02 | 100 | $\$ 139.30$ |
| MMS-32H.25 | $0.16-0.25$ | 0.06 | 100 | $\$ 139.30$ |
| MMS-32H.4 | $0.25-0.4$ | 0.09 | 100 | $\$ 139.30$ |
| MMS-32H.63 | $0.4-0.63$ | 0.12 | 100 | $\$ 139.30$ |
| MMS-32H1 | $0.63-1$ | 0.25 | 100 | $\$ 139.30$ |
| MMS-32H1.6 | $1-1.6$ | 0.55 | 100 | $\$ 139.30$ |
| MMS-32H2.5 | $1.6-2.5$ | 0.75 | 100 | $\$ 139.30$ |
| MMS-32H4 | $2.5-4$ | 1.5 | 100 | $\$ 139.30$ |
| MMS-32H6 | $4-6$ | 2.2 | 100 | $\$ 139.30$ |
| MMS-32H8 | $6-8$ | 3 | 100 | $\$ 139.30$ |
| MMS-32H10 | $8-10$ | 4 | 100 | $\$ 139.30$ |
| MMS-32H13 | $10-13$ | 5.5 | 100 | $\$ 139.30$ |
| MMS-32H17 | $13-17$ | 7.5 | 38 | $\$ 139.30$ |
| MMS-32H22 | $17-22$ | 115 | $\$ 139.30$ |  |
| MMS-32H26 | $22-26$ | 15 | 38 | $\$ 139.30$ |
| MMS-32H32 | $26-32$ |  | 38 | $\$ 139.30$ |

## Motor Protection Circuit Breaker Accessories

| Part No. | Description | Price |  |
| :---: | :---: | :---: | :---: |
| MMS-FX | Top mount auxiliary contact c/w 1N/O 1N/C | \$20.55 |  |
| MMS-LX | Side mount (Left side) auxiliary contact c/w 1N/O 1N/C | \$22.50 |  |
| MMS-LA | Side mount (Left side) trip indication c/w 1N/O 1N/C | \$36.10 |  |
| MMS-RS | Side mount (Left side) shunt release c/w 1N/O 1N/C | \$62.40 |  |
| MMS-RU | Side mount (Right side) under voltage release c/w 1N/O 1N/C | \$62.40 | MMS-FX |

## Susol Moulded Case Circuit Breakers \& Accessories

## TS Range of MCCB Units \& Accessories from 32 to 1600A

From 32A to 1600A with short circuit and overload release 50, 65 and 85 kA units available Electronic and Thermal Magnetic protection
Accessories include:
Fixed and external handles
Terminal spreaders and covers
Fixed and removable locking devices
Under voltage and shunt trip fault alarm contacts, motor operators
Double and single sided 630A chassis to 36 pole
Non auto units to 800A available
TS100/160/250 are the same physical frame size
Please enquire for cascade and discrimination data. CAD blocks CD Available

## TS100 Range 32 - 100A 50kA

| Part No. | Description | Price |
| :--- | :--- | ---: |
| TS100NFMU40 | 32-40A 50kA Thermal Magnetic MCCB | $\$ 262.25$ |
| TS100NFMU63 | 50-63A 50kA Thermal Magnetic MCCB | $\$ 262.25$ |
| TS100NFMU80 | 64-80A 50kA Thermal Magnetic MCCB | $\$ 331.45$ |
| TS100NFMU100 | 80-100A 50kA Thermal Magnetic MCCB | $\$ 331.45$ |
| TS100NETS100 | 40-100A 50kA Electronic MCCB | $\$ 622.40$ |

TS100 Range 32 - 100A 65kA

| Part No. | Description | Price |
| :--- | :--- | ---: |
| TS100HFMU40 | 32-40A 65kA Thermal Magnetic MCCB | $\$ 368.50$ |
| TS100HFMU63 | 50-63A 65kA Thermal Magnetic MCCB | $\$ 368.50$ |
| TS100HFMU80 | 64-80A 65kA Thermal Magnetic MCCB | $\$ 429.20$ |
| TS100HFMU100 | 80-100A 65kA Thermal Magnetic MCCB | $\$ 429.20$ |
| TS100HETS100 | 40-100A 65kA Electronic MCCB | $\$ 649.40$ |

TS160 Range 80 - 160A 50kA

| Part No. | Description | Price |
| :--- | :--- | ---: |
| TS160NFMU100 | 80-100A 50kA Thermal Magnetic MCCB | $\$ 411.20$ |
| TS160NFMU125 | 100-125A 50kA Thermal Magnetic MCCB | $\$ 411.20$ |
| TS160NFMU160 | 125-160A 50kA Thermal Magnetic MCCB | $\$ 478.60$ |
| TS160NETS160 | 65-160A 50kA Electronic MCCB | $\$ 703.30$ |

TS160 Range 80 - 160A 85kA

| Part No. | Description | Price |
| :--- | :--- | ---: |
| TS160HFMU100 | 80-100A 85kA Thermal Magnetic MCCB | $\$ 548.25$ |
| TS160HFMU125 | 100-125A 85kA Thermal Magnetic MCCB | $\$ 548.25$ |
| TS160HFMU160 | 125-160A 85kA Thermal Magnetic MCCB | $\$ 613.45$ |
| TS160HETS160 | 65-160A 85kA Electronic MCCB | $\$ 769.60$ |

TS250 Range 100 - 250A 50kA

| Part No. | Description | Price |
| :--- | :--- | ---: |
| TS250NATU125 | 100-125A 50kA Thermal Magnetic MCCB | $\$ 469.60$ |
| TS250NATU160 | 125-160A 50kA Thermal Magnetic MCCB | $\$ 597.70$ |
| TS250NATU200 | 180-200A 50kA Thermal Magnetic MCCB | $\$ 651.65$ |
| TS250NATU250 | 200-250A 50kA Thermal Magnetic MCCB | $\$ 667.35$ |
| TS250NETS250 | 100-250A 50kA Electronic MCCB | $\$ 793.20$ |

TS250 Range 100-250A 85kA

| Part No. | Description | Price |
| :--- | :--- | ---: |
| TS250HATU125 | $100-125 A$ 85kA Thermal Magnetic MCCB | $\$ 660.60$ |
| TS250HATU160 | $125-160 \mathrm{~A}$ 85kA Thermal Magnetic MCCB | $\$ 725.80$ |
| TS250HATU200 | $180-200 \mathrm{~A}$ 85kA Thermal Magnetic MCCB | $\$ 788.70$ |
| TS250HATU250 | 200-250A 85kA Thermal Magnetic MCCB | $\$ 824.65$ |
| TS250HETS250 | 100-250A 85kA Electronic MCCB | $\$ 943.75$ |



TS250NATU125

## Susol Moulded Case Circuit Breakers \& Accessories

TS400 / 630 / 800 Range 160-800A 65kA

| Part No. | Description | Price |
| :--- | :--- | ---: |
| TS400NETS400 | 160-400A 65kA Electronic MCCB | $\$ 1011.15$ |
| TS630NETS630 | 250-630A 65kA Electronic MCCB | $\$ 1458.30$ |
| TS800NETS800 | 320-800A 65kA Electronic MCCB | $\$ 1909.95$ |
| TS400 / 630 / 800 Range 160 - 800A 85kA |  |  |
| Part No. | Description | Price |
| TS400HETS400 | 160-400A 85kA Electronic MCCB | $\$ 1313.40$ |
| TS630HETS630 | 250-630A 85kA Electronic MCCB | $\$ 1572.90$ |
| TS800HETS800 | 320-800A 85kA Electronic MCCB | $\$ 1990.20$ |

TS400 / 630 / 800 Range 160-800A 65 \& 85kA - Fully Adjustable

| Part No. | Description | Price |
| :--- | :--- | ---: |
| TS400NETM400 | 160-400A 65kA Electronic fully adjustable MCCB | $\$ 1415.60$ |
| TS630NETM630 | 250-630A 65kA Electronic fully adjustable MCCB | $\$ 2041.60$ |
| TS800NETM800 | 320-800A 65kA Electronic fully adjustable MCCB | $\$ 2673.95$ |
| TS800HETM800 | 320-800A 85kA Electronic fully adjustable MCCB | $\$ 2786.30$ |

TS Range Non Auto Isolator 100 - 800A

| Part No. | Description | Price |
| :--- | :--- | ---: |
| TS100DSU100 | 100A Non Auto Isolator | $\$ 240.30$ |
| TS160DSU160 | 160A Non Auto Isolator | $\$ 317.95$ |
| TS250DSU250 | 250A Non Auto Isolator | $\$ 440.40$ |
| TS400DSU400 | 400A Non Auto Isolator | $\$ 928.00$ |
| TS630DSU630 | 630A Non Auto Isolator | $\$ 1348.00$ |
| TS800DSU800 | 800A Non Auto Isolator | $\$ 1727.00$ |
| TS800 /1000 / 1250 Range 320 - 1600A 50kA |  |  |
| Part No. | Description | Price |
| TS1000NAG5800 | 320-800A 50kA Electronic MCCB | $\$ 4780.00$ |
| TS1000NAG51000 | 400-1000A 50kA Electronic MCCB | $\$ 5020.00$ |
| TS1250NAG51250 | 500-1250A 50kA Electronic MCCB | $\$ 6680.00$ |
| TS1600NAG51600 | 640-1600A 50kA Electronic MCCB | $\$ 7030.00$ |
| TS800 /1000 / 1250 Range 320 - 1600A 70kA |  |  |
| Part No. | Description | Price |
| TS1000HAG5800 | 320-800A 70kA Electronic MCCB | $\$ 4910.00$ |
| TS1000HAG51000 | 400-1000A 70kA Electronic MCCB | $\$ 5420.00$ |
| TS1250HAG51250 | 500-1250A 70kA Electronic MCCB | $\$ 7250.00$ |
| TS1600HAG51600 | 640-1600A 70kA Electronic MCCB |  |



TS400NETS400


TS630NETS630


TS800NETS800


TS630NETM630


TS160NAG5160CA

All TS800/TS1000/TS1250 and TS1600 MCCB units come complete with AG5 type trip units - For other trip units available Please refer to attached list, please enquire for wide range of removable trip blocks which can include:

- Ground fault protection
- With communication
- With Earth Leakage Protection
- Pre Trip Alarm
- Thermal, power, ammeter and Harmonic Annunciation


## Other Features:

4 Pole units available

- Switch disconnector type units available
- Please call for a comprehensive catalogue and dimensions


## Susol Moulded Case Circuit Breakers \& Accessories

TD160 Range 16 - 160A 50KA (1 Pole, 240VAC)

| Part No. | Description | Price |
| :--- | :--- | ---: |
| TD160HFMU16 | 10-16A 65kA Thermal Magnetic 1 Pole MCCB | $\$ 185.60$ |
| TD160HFMU20 | 16-20A 65kA Thermal Magnetic 1 Pole MCCB | $\$ 195.80$ |
| TD160HFMU25 | 20-25A 65kA Thermal Magnetic 1 Pole MCCB | $\$ 210.15$ |
| TD160HFMU32 | 25-32A 65kA Thermal Magnetic 1 Pole MCCB | $\$ 235.00$ |
| TD160HFMU40 | 32-40A 65kA Thermal Magnetic 1 Pole MCCB | $\$ 245.00$ |
| TD160HFMU50 | 40-50A 65kA Thermal Magnetic 1 Pole MCCB | $\$ 255.00$ |
| TD160HFMU63 | 50-63A 65kA Thermal Magnetic 1 Pole MCCB | $\$ 265.00$ |
| TD160HFMU80 | 63-80A 65kA Thermal Magnetic 1 Pole MCCB | $\$ 278.00$ |
| TD160HFMU100 | 80-100A 65kA Thermal Magnetic 1 Pole MCCB | $\$ 320.00$ |
| TD160HFMU125 | 100-125A 65kA Thermal Magnetic 1 Pole MCCB | $\$ 330.00$ |
| TD160HFMU160 | 125-160A 65kA Thermal Magnetic 1 Pole MCCB | $\$ 355.00$ |

Extended \& Direct Mount Lockable Handles

| Part No. | Description | Suits MCCB | Price |
| :--- | :--- | :--- | ---: |
| LS-DH2-S-TS | Direct rotary handle | TS100/160/250 | $\$ 103.35$ |
| LS-DH3-S-TS | Direct rotary handle | TS400/630 | $\$ 160.65$ |
| LS-DH5-S-TS | Direct rotary handle | TS800/1000/1250/1600 | $\$ 320.00$ |
| LS-DHK5-TS | Direct rotary handle w/- key <br> lockable attachment | TS800/1000/1250/1600 | $\$ 400.00$ |
| LS-EH2-S-TS | Extended rotary handle \& shaft | TS100/160/250 | $\$ 155.05$ |
| LS-EH3-S-TS | Extended rotary handle \& shaft | TS400/630 | $\$ 193.25$ |
| LS-EH4-S-TS | Extended rotary handle \& shaft | TS800 | $\$ 278.60$ |
| LS-EH5-S-TS | Extended rotary handle \& shaft | TS800/1000/1250/1600 | $\$ 320.00$ |

Locking Devices

| Part No. | Description | Suits MCCB | Price |
| :--- | :--- | :--- | ---: |
| LS-PL2-TS | Removable locking device | TS100/160/250 | $\$ 31.45$ |
| LS-PL3-TS | Removable locking device | TS400/630 | $\$ 38.20$ |
| LS-PL4-TS | Removable locking device | TS800 | $\$ 44.95$ |
| LS-PL5-TS | Removable locking device | TS800/1000/1250/1600 | $\$ 60.00$ |
| LS-PHL2-TS | Fixed locking device | TS100/160/250 | $\$ 51.70$ |
| LS-PHL3-TS | Fixed locking device | TS400/630 | $\$ 80.90$ |
| LS-PHL4-TS | Fixed locking device | TS800 | $\$ 83.15$ |
| LS-PHL5-TS | Fixed locking device | TS800/1000/1250/1600 | $\$ 110.00$ |

Mechanical Interlock

| Part No. | Description | Suits MCCB | Price |
| :--- | :--- | :--- | ---: |
| LS-MIT53-TS | Mechanical interlock assembly | TS800/1000/1250/1600 | $\$ 101.50$ |

## Terminal Covers

| Part No. | Description | Suits MCCB | Price |
| :--- | :--- | :--- | ---: |
| LS-ITL23-TS | Terminal cover long type - Set | TS100/160/250 | $\$ 32.60$ |
| LS-ITL33-TS | Terminal cover long type - Set | TS400/630 | $\$ 70.80$ |
| LS-ITL43-TS | Terminal cover long type - Set | TS800 | $\$ 141.55$ |
| LS-ITL53-TS | Terminal cover long type - Set | TS800/1000/1250/1600 | $\$ 172.00$ |
| LS-ITS23-TS | Terminal cover short type - Set | TS100/160/250 | $\$ 15.75$ |
| LS-ITS33-TS | Terminal cover short type - Set | TS400/630 | $\$ 29.20$ |
| LS-ITS43-TS | Terminal cover short type - Set | TS800 | $\$ 44.95$ |
| LS-ITS53-TS | Terminal cover short type - Set | TS800/1000/1250/1600 | $\$ 121.00$ |



LS-ITS33-TS


LS-SP33A-TS

Rear Connection Studs - ( 3 per set)

| Part No. | Price | Part No. | Price | Suits MCCB |
| :--- | :--- | :--- | :--- | :--- |
| LS-RTB23-TS | $\$ 266.20$ | LS-SP23A-TS | $\$ 29.20$ | TS100/160/250 |
| LS-RTB33-TS | $\$ 508.20$ | LS-SP33A-TS | $\$ 103.35$ | TS400/630 |
| LS-RTB43-TS | $\$ 968.00$ | LS-SP43A-TS | $\$ 231.45$ | TS800 |
|  |  | LS-SP53A-TS | $\$ 482.00$ | TS $800 / 1000 / 1250 / 1600$ |

## Kilowatt Hour Meter - Single Phase - Three Phase

Single Phase $\mathbf{- 2 4 0}$ Volt $\mathbf{5 0 H z}$

| Part Number | Description | Counter | Size | Price |
| :--- | :--- | :--- | :---: | ---: |
| SPKWH65 | 65 Amps Direct Connect | Analogue | 1.5 Mod | $\$ 209.00$ |
| SPKWH80 | 80 Amps Direct Connect | Analogue | 4 Mod | $\$ 222.00$ |
| SPKWH100 | 100 Amps Direct Connect | Analogue | 4 Mod | $\$ 235.00$ |
| SPKWH100D | 100 Amps Direct Connect | Digital + RS485 | 4 Mod | $\$ 274.00$ |

Three Phase - $\mathbf{4 1 5}$ Volt 50Hz

| Part Number | Description | Counter | Size | Price |
| :--- | :--- | :---: | :---: | :---: |
| TPKWH100 | 100 Amps Direct Connect | Analogue | 7 Mod | $\$ 388.00$ |
| TPKWH100D | 100 Amps Direct Connect | Digital + RS485 + SO | 7 Mod | $\$ 438.00$ |
| TPKWH5CTD | 5 Amp CT | Digital w/- Ratio Select + RS485 + SO | 7 Mod | $\$ 464.00$ |

* To IEC61036 and IEC62053-21
* All KWH Meters have 6 Digit - both Analogue \& Digital
* Class Accuracy

| Single Phase 65Amps | Class 1 |
| :--- | :--- |
| Single Phase $80 \& 100$ Amps | Class 0.5 |
| Three Phase 100 Amps | Class 0.5 |
| Three Phase 5A CT | Class 0.5 |

* Din Rail Mount or Base Mount - Suitable for MCB Enclosures
* LED Power On Indication
* All KWH Meters have Pulse Output with LED Indication
* Digtal KWH Meters have extra RS485 Output
* Single Phase 80 \& 100 Amp Meters have Through Body - Easy Connection no Cutting of Mains
* TPKWH5CTD have Selectable Ratio CT Input Control
* All Terminals can be sealed
* Small Size Space saving


SPKWH65
$\leftarrow 75 \mathrm{MM} \rightarrow$

$\leftarrow 125 \mathrm{MM} \rightarrow$


TPKWH100 \& CT

## Delixi Contactors \& Accessories

Mini Contactor

| Part No. | AC1 Amp <br> $\mathbf{6 6 0 V}$ | AC3 Amp <br> $\mathbf{3 8 0 V}$ | Kilowatt | Auxiliary | Price |
| :--- | :---: | :---: | :---: | :---: | :---: |
| CX2AC-- | 16 | 9 | 4 | $1 \times \mathrm{N} / \mathrm{O}$ | $\$ 35.09$ |
| *Must specify coil voltage $*$ | $24,240 \& 415 \mathrm{AC}$ |  |  |  |  |



## Spare Coils to Suit Mini Contactors

| Part No. | Description | Price |
| :--- | :--- | :---: |
| CJ24 | 24 Volt AC | $\$$ |
| CJ240 | 240 Volt AC | $\$ 8.15$ |
| CJ415 | 415 Volt AC | $\$ 8.15$ |

Reversing Contactor

| Part No. | AC1 Amp <br> $\mathbf{6 6 0 V}$ | AC3 Amp <br> $\mathbf{3 8 0 V}$ | Kilowatt | Auxiliary | Price |
| :--- | :---: | :---: | :---: | :---: | :---: |
| CX2RAC240 | 16 | 9 | 4 | $2 \times$ N/O | $\$ 72.60$ |
| CX2RAC240NC | 16 | 9 | 4 | $2 \times$ N/C | $\$ 72.60$ |



Emergency Lighting Contactor $-4 \times \mathrm{N} / \mathrm{C}$ or N/O Contacts

| Part No. | Description |  |  |  |  | Price |
| :--- | :--- | :--- | :---: | :--- | :--- | :--- |
| VS425AC240 | 25 | 9 | 4 | $4 \times \mathrm{N} / \mathrm{C}$ | Din | $\$ 90.00$ |
| TS425AC240 | 25 | 9 | 4 | $4 \times$ N/C | Din | $\$ 90.00$ |
| VS425-40-AC240 | 25 | 9 | 4 | $4 \times$ N/O | Din | $\$ 90.00$ |



Auxiliary Contact Block

| Part No. | Contacts |  | Price |
| :--- | :--- | :--- | :--- |
| F311E | $1 \times$ X /O \& 1 X N/C | 6 Amps | $\$ 18.15$ |



Din Contactors - 2 and 4 Pole N/O Contacts

| Part No. | Description |  |  | Price |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| JVC3AC24 | $2 \times \mathrm{N} / \mathrm{O}$ | 20A - AC1 | 1 Mod | \$ | 82.00 |
| JVC3AC240 | $2 \times \mathrm{N} / \mathrm{O}$ | 20A - AC1 | 1 Mod | \$ | 82.00 |
| JVC1AC24 | $4 \times \mathrm{N} / \mathrm{O}$ | 24A - AC1 | 2 Mod | \$ | 90.00 |
| JVC1AC240 | $4 \times \mathrm{N} / \mathrm{O}$ | 24A - AC1 | 2 Mod | \$ | 90.00 |



Din LED Signal Light

| Part No. | Description |  | Price |  |  |
| :--- | :--- | :--- | :--- | :--- | :---: |
| SLAC230G | 240V LED | Green | 1 Mod | $\$$ | 20.57 |
| SLAC230R | 240 V LED | Red | 1 Mod | $\$$ | 20.57 |



Spare Coils to suit CDC17 Contactors

| Part No. | Voltages available | Suits the following Contactors | Price |
| :--- | :--- | :--- | :---: |
| 17C18AC-- | $24,32,48,110,240 \& 415$ | CDC1712 to CDC1718 | $\$ 21.78$ |
| 17C32AC-- | $24,48,110,240 \& 415$ | CDC1725 to CDC1732 | $\$ 48.40$ |
| 17C95AC-- | $24,48,110,240 \& 415$ | CDC1740 to CDC1795 | $\$ 72.60$ |
| 17C150AC- | $240 \& 415$ | CDC17115 to CDC17150 | $\$ 94.38$ |

Industrial Electrical Components Suppliers

## Delixi Contactors \& Accessories

Schedule 11

| Contactors AC - 3 Pole + AUX |  |  |  | *Must specify coil voltage* |  |  | Available in the |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Part No. | $\begin{gathered} \hline \text { AC1 Amp } \\ 440 \mathrm{~V} \\ \hline \end{gathered}$ | $\begin{gathered} \text { AC3 Amp } \\ 440 \mathrm{~V} \end{gathered}$ | $\begin{aligned} & \text { Kilowatt } \\ & 440 \mathrm{~V} \end{aligned}$ | Auxiliary | Overload Size | Price |  |
| CDC1712AC-- | 20 | 12 | 5.5 | 1 X N/O | 1 | \$37.82 |  |
| CDC1718AC-- | 32 | 18 | 7.5 | 1 X N/O | 1 | \$60.50 | following |
| CDC1725AC-- | 40 | 25 | 11 | 1 X N/O | 2 | \$78.65 | Coil Sizes |
| CDC1732AC-- | 50 | 32 | 15 | 1 X / $/ \mathrm{O}$ | 2 | \$121.00 | 24, 48, 110, 240 |
| CDC1740AC-- | 60 | 40 | 18.5 | 1 X N/O \& 1 X N/C | 3 | \$151.25 | \& 415 |
| CDC1750AC-- | 80 | 50 | 22 | 1 X N/O \& 1 X N/C | 3 | \$189.97 |  |
| CDC1765AC-- | 80 | 65 | 30 | 1 X N/O \& 1 X N/C | 3 | \$202.68 |  |
| CDC1780AC-- | 125 | 80 | 37 | 1 X N/O \& 1 X N/C | 3 | \$266.20 |  |
| CDC1795AC-- | 125 | 95 | 45 | 1 X N/O \& 1 X N/C | 3 | \$320.65 | 2 |
| CDC17115AC-- | 200 | 115 | 55 | 2 X N/O \& 2 X N/C | 4 | \$544.50 | +1\% |
| CDC17150AC-- | 200 | 150 | 75 | 2 X N/O \& 2 X N/C | Electronic | \$605.00 |  |
| CDC17185AC-- | 230 | 185 | 90 | 2 X N/O \& 2 X N/C | Overload | \$710.27 |  |
| CDC17225AC-- | 250 | 225 | 110 | 2 X N/O \& 2 X N/C |  | \$847.00 |  |
| CDC17265AC-- | 330 | 265 | 132 | 2 X N/O \& 2 X N/C |  | \$1,240.25 |  |
| CDC17330AC-- | 330 | 330 | 160 | 2 X N/O \& 2 X N/C | CDRE05 | \$1,547.59 |  |

Spare Coils to suit are on previous Page
Control Contactors - 4 Pole

| Part No. | AC1 Amp <br> 440V | AC3 Amp <br> 440V | Kilowatt <br> 440V | Contacts | Price |
| :--- | :---: | :---: | :---: | :---: | :---: |

4 Pole 4 N/O Contacts

| CDC1712AC240 | 20 | 12 | 5.5 | $4 \times \mathrm{N} / \mathrm{O}$ | $\$ 37.82$ |
| :--- | :--- | ---: | ---: | ---: | ---: |
| CDC425AC240 | 40 | 25 | 11 | $4 \times \mathrm{N} / \mathrm{O}$ | $\$ 80.00$ |

Contactors - 24VDC Coils

| Part No. | AC1 Amp <br> 440V | AC3 Amp <br> 440V | Kilowatt <br> 440V | Auxiliary | Price |
| :--- | :---: | :---: | :---: | :--- | ---: |
| CDC1718DC24 | 32 | 18 | 7.5 | $1 \times \mathrm{X} \mathrm{N} / \mathrm{O}$ | $\$ 84.70$ |
| CDC1732DC24 | 50 | 32 | 15 | $1 \times \mathrm{X} / \mathrm{O}$ | $\$ 169.40$ |
| CDC1750DC24 | 80 | 50 | 22 | 1 X N/O \& 1 X N/C | $\$ 265.96$ |

Overload Relays

| Part No. | Amp Range | Size | Price | Part No. | Amp Range | Size | Price |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| CDR17A0.3 | 0.25-0.36 | 1 | \$48.40 | CDR17A21 | 18-25 | 2 | \$59.90 | 15 |
| CDR17A0.5 | 0.5-0.7 | 1 | \$48.40 | CDR17A29 | 23-32 | 2 | \$84.70 | -3] |
| CDR17A0.8 | 0.63-0.9 | 1 | \$48.40 | CDR17A36 | 30-40 | 2 | \$90.75 | Din Mt Base |
| CDR17A1.4 | 1-1.6 | 1 | \$48.40 | CDR9A32 | 23-32 | 3 | \$169.40 |  |
| CDR17A2.2 | $1.8-2.5$ | 1 | \$48.40 | CDR9A40 | 30-40 | 3 | \$181.50 | 2 |
| CDR17A3.5 | 2.5-3.6 | 1 | \$48.40 | CDR9A46 | 37-50 | 3 | \$181.50 |  |
| CDR17A5 | 4.5-6.3 | 1 | \$48.40 | CDR9A60 | 48-65 | 3 | \$187.55 |  |
| CDR17A6 | 5-7 | 1 | \$48.40 | CDR9A65 | 55-70 | 3 | \$205.70 |  |
| CDR17A9 | 6.3-9 | 1 | \$48.40 | CDR9A71 | 63-80 | 3 | \$211.75 |  |
| CDR17A11 | 9-12 | 1 | \$48.40 | CDR9A85 | 80-93 | 4 | \$260.15 |  |
| CDR17A16 | 14-18 | 1 | \$56.87 | EAZ22H | Din Mt Base |  | \$36.37 |  |

Industrial Electrical Components Suppliers

## Delixi Contactors \& Accessories

Electronic Overload Relays

| Part No. | Amp Range | Price |
| :--- | :---: | ---: |
| CDRE05 | $0.5-5$ | $\$ 96.80$ |
| CDRE30 | $3-30$ | $\$ 96.80$ |
| CDRE60 | $5-60$ | $\$ 96.80$ |

Separate Mount Overload Base

| Part No. | Size | Price |
| :--- | :---: | ---: |
| CDR1725J | 1 | $\$ 30.00$ |
| CDR1736J | 2 | $\$ 31.25$ |
| CDR1793J | 3 | $\$ 36.00$ |

## Reversing Contactors

| Part No. | Kilowatt Range | Price | Part No. | Kilowatt Range | Price |
| :--- | :---: | ---: | :--- | :---: | ---: |
| CDC1740RAC240 | 18.5 | $\$ 365.42$ | CDC17150RAC240 | 75 | $\$ 1090.00$ |
| CDC1750RAC240 | 22 | $\$ 442.49$ | CDC17185RAC240 | 90 | $\$ 1,602.04$ |
| CDC1765RAC240 | 30 | $\$ 468.27$ | CDC17225RAC240 | 110 | $\$ 1865.00$ |
| CDC1795RAC240 | 45 | $\$ 734.47$ | CDC17265RAC240 | 132 | $\$ 2700.00$ |
| CDC17115RAC240 | 55 | $\$ 1052.00$ | CDC17330RAC240 | 160 | $\$ 2870.00$ |

DOL Starter w/- Push Buttons IP65 up to 7.5KW

| Part No. | Description | Price |  |
| :--- | :--- | :--- | ---: |
| LE1D | $* * *$ Without Contactor or Overload*** | $\$ 41.14$ |  |
| Suits: | Contactors: <br> Overloads: | CDC1712 - CDC1718 |  |

## Star/Delta Starter - Open

$3 \times$ Contactors - $1 \times$ Timer - All wired on Mounting Plate

| Part No. | Description |  | Price |
| :---: | :---: | :---: | :---: |
| CDC5.5SD240 | 240 Volt / 5.5 KW | Star/Delta | \$552.97 |
| CDC5.5SD415 | 415 Volt / 5.5 KW | Star/Delta | \$552.97 |
| CDC7.5SD240 | 240 Volt / 7.5 KW | Star/Delta | \$552.97 |
| CDC7.5SD415 | 415 Volt / 7.5 KW | Star/Delta | \$552.97 |
| CDC11SD240 | 240 Volt / 11 KW | Star/Delta | \$552.97 |
| CDC11SD415 | 415 Volt / 11 KW | Star/Delta | \$552.97 |
| CDC15SD240 | 240 Volt / 15 KW | Star/Delta | \$552.97 |
| CDC15SD415 | 415 Volt / 15 KW | Star/Delta | \$552.97 |
| CDC18SD240 | 240 Volt / 18 KW | Star/Delta | \$652.80 |
| CDC18SD415 | 415 Volt / 18 KW | Star/Delta | \$652.80 |
| CDC22SD240 | 240 Volt / 22 KW | Star/Delta | \$786.50 |
| CDC22SD415 | 415 Volt / 22 KW | Star/Delta | \$786.50 |
| CDC37SD240 | 240 Volt / 30 KW - 37KW | Star/Delta | \$1,101.10 |
| CDC37SD415 | 415 Volt / 30 KW - 37KW | Star/Delta | \$1,101.10 |
| CDC45SD240 | 240 Volt / 45 KW | Star/Delta | \$1,573.00 |
| CDC45SD415 | 415 Volt / 45 KW | Star/Delta | \$1,573.00 |

## Auxiliary Contact Blocks - top Mounting

| Part No. | Contacts | Price | Part No. | Contacts | Price |
| :--- | :--- | ---: | :--- | :--- | ---: |
| F411 | $1 \times$ X N/O \& 1 X N/C | $\$ 18.15$ | F440 | $4 \times$ N/O | $\$ 42.35$ |
| F420 | $2 \times$ N/O | $\$ 18.15$ | F404 | $4 \times$ N/C | $\$ 42.35$ |
| F402 | $2 \times$ N/C | $\$ 18.15$ | F422 | $2 \times$ N/O \& 2 x N/C | $\$ 42.35$ |

Mechanical Interlock

| Part No. | Size | Price |
| :--- | :--- | ---: | ---: |
| MI32 | $12-32$ | $\$ 42.35$ |

Delay Timers - 1 N/O \& 1 N/C

| Part No. | Description | Price |
| :--- | :--- | ---: |
| LA2D22 | On Delay 0-30 Sec | $\$ 90.75$ |
| LA3D22 | Off Delay $0-30$ Sec | $\$ 90.75$ |

- Rated Operational Voltage660V
- Short Circuit Rated 50KA

| 3 Pole Din Base Enclosed | Cartridges |  |  |  |  |
| :--- | :--- | :---: | ---: | :--- | :--- | :--- |
| Part Number | Rating | Size | Price | Part Number | Price |
| NHR17-160 | 160 Amp | 00 | $\$ 66.00$ | NT0050/NT0063/NT0080/NT00100/NT00125/NT00160 | $\$ 7.70$ |
| NHR17-250 | 250 Amp | 1 | $\$ 163.35$ | NT163/ NT180/ NT1100/ NT1125/ NT1160/ NT1200/ NT1250 | $\$ 13.31$ |
| NHR17-400 | 400 Amp | 2 | $\$ 302.50$ | NT2200/ NT2250/ NT2315/ NT2355/ NT2400 | $\$ 19.36$ |
| NHR17-630 | 630 Amp | 3 | $\$ 356.95$ | NT3315/ NT3355/ NT3400/ NT3500/ NT3630 | $\$ 48.40$ |

## 4 Pole Din Base Enclosed

| NHR174-160 | 160 Amp | 00 | $\$ 100.00$ | NT0050/NT0063/NT0080/NT00100/NT00125/NT00160 | $\$ 7.70$ |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |

## 3 Pole Din Base Open

| BO3P | 160 Amp | 00 | $\$ 37.51$ | NT0050/NT0063/NT0080/NT00100/NT00125/NT00160 | $\$ 7.70$ |
| :--- | :--- | :--- | :--- | :--- | :--- |



Open Base


Din Cartridge

Extraction Handle - For Din Cartridges

| Part No. | Price |
| :--- | :--- |
| FH1 | $\$ 22.39$ |



## QSA Fused Load Break Disconnector

* Double Break Contacts
* Padlocking in off position
* w/- Extension Shaft, Handle \& Door Clutch
* Takes Din Cartridges


## Fused Disconnector Cartridges

| Part Number | Rating | Price | Part Number | Price |
| :--- | :--- | ---: | :--- | ---: | ---: |
| QSA/160 | 160 Amp | $\$ 314.60$ | NT0050/NT0063/NT0080/NT00100/NT00125/NT00160 | $\$ 7.70$ |
| QSA/250 | 250 Amp | $\$ 484.00$ | NT163/ NT180/ NT1100/ NT1125/ NT1160/ NT1200/NT1250 | $\$ 13.31$ |
| QSA/400 | 400 Amp | $\$ 532.40$ | NT2200/ NT2250/ NT2315/ NT2355/ NT2400 | $\$ 19.36$ |
| QSA/630 | 630 Amp | $\$ 1,210.00$ | NT3315/ NT3355/ NT3400/ NT3500/ NT3630 | $\$ 48.40$ |
| FH1 | Cartridge Extractor |  | $\$ 22.39$ |  |


| Specification |  | QSA63 | QSA125 | QSA160 | QSA250 | QSA400 | QSA630 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Number of main Poles |  | 2, 3, 4 |  |  | 2, 3 |  |  |
| Rated insulation voltages | $\mathrm{V} \sim$ | 1000 |  |  |  |  |  |
| Rated operational voltage | $\mathrm{V} \sim$ | AC:380V 660V DC:220V 440V |  |  |  |  |  |
| Rated conventional thermal current I the | A | 80 | 160 | 160 | 400 | 400 | 800 |
| Rated enclosed thermal current I the | A | 63 | 125 | 160 | 250 | 400 | 630 |
| Rated operational current (I e)/power (AC) |  |  |  |  |  |  |  |
| $380 \mathrm{C} \cos \phi 0.35 \mathrm{AC}-23$ | A/KW | 63/30 | 125/75 | 160/90 | 250/132 | 400/200 | 630/333 |
| $600 \mathrm{C} \cos \phi 0.35 \mathrm{AC}-23$ | A/KW | 63/55 | 125/110 | 160/150 | 250/220 | 400/375 | 630/560 |
| Rated Fused short-circuit current | KAr.m.s | 100 (380V) |  |  |  |  |  |
|  |  | 50 (660V) |  |  |  |  |  |
| Max fuse - link | A | 160 |  | 400 |  | 630 |  |
| Mechanical endurance | Operations | 15000 |  | 12000 |  | 3000 |  |
| Electrical endurance | Operations | 1000 |  | 300 |  | 200 |  |
| Weight | Kg | 1.6 | 1.7 | 4.1 | 4.5 | 4.7 | 14.0 |
| Fuse type NT (RT16) | Size | 00 |  | 1-2 |  | 3 |  |
| Required torque | Nm | 7.5 |  | 16 |  | 30 |  |
| Auxiliary Switch (380V AC-15) (220V DC-13) | A | 4 |  |  | 6 |  |  |
| Switched neutral pole I the/Ie (AC-22) | A/A | 63/63 | 125/125 | 160/160 | 250/250 | 400/400 | ---- |
| Neutral links I the | A | 63 | 125 | 160 | 250 | 400 | 630 |



## Q P Load Break Disconnector 3 Pole

* Double Break Contact
* Padlocking in off position
* High Short-Time Ratings IEC 947-3
* W/- Extension Shaft, Handle \& Door Clutch

| Part Number | Rating | KA Rating |  | Price | Part Number | Rating | KA Rating | Price |
| :--- | :---: | :---: | ---: | ---: | :--- | :---: | ---: | ---: |
| QP/250 | 250 | 8 | $\$$ | 199.65 | QP/1250 | 1250 | 50 | $\$ 1,210.00$ |
| QP/400 | 400 | 15 | $\$$ | 290.40 | QP/1600 | 1600 | 50 | $\$ 1,331.00$ |
| QP/630 | 630 | 32 | $\$$ | 441.65 | QP/2500 | 2500 | 80 | $\$ 2,178.00$ |
| QP/1000 | 1000 | 32 | $\$$ | 653.40 | QP/3150 | 3150 | 80 | $\$ 2,783.00$ |

Technical parameter conform to IEC947-3 GB14048.3

| Specification | QP250 | QA400 | QP630 | QP1000 | QP1250 | QP1600 | QP2500 | QP3150 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Number of Main Poles | 3 |  |  |  |  |  |  |  |
| Rated Insulation Voltage $\quad \mathrm{V} \sim$ | 1000 |  |  |  |  |  |  |  |
| Rated Operational Voltage $\quad \mathrm{V} \sim$ | 660 V |  |  |  |  |  |  |  |
| Rated Conventional Thermal Current Ith A | 250 | 400 | 630 | 1000 | 1250 | 1600 | 2500 | 3150 |
| Rated Enclosed Thermal Current I the A | 250 | 400 | 630 | 1000 | 1250 | 1600 | 2500 | 3150 |
| Rated Operation Current ( Ie ) (AC) |  |  |  |  |  |  |  |  |
| $380 \mathrm{C} \cos \phi 0.95 \mathrm{AC}-21$ A | 250 | 400 | 630 | 1000 | 1250 | 1600 | 2500 | 3150 |
| $380 \mathrm{C} \cos \phi 0.65 \mathrm{AC}-22$ A | 250 | 400 | 630 | 630 | 800 | 800 | - | - |
| $660 \mathrm{C} \cos \phi 0.95 \mathrm{AC}-21$ A | 250 | 400 | 630 | 1000 | 1250 | 1470 | 2500 | 2500 |
| Rated Short-Circuit Making capacity ( 660 V Peak) KA | 39 | 50 | 60 |  | 85 |  | 130 |  |
| Rated short-time withstand current duration 1 Sec ( 660 V ) KAr.m.s | 8 | 15 | 32 |  | 50 |  | 80 |  |
| Mechanical Endurance operations | 15000 | 12000 |  |  | 3000 |  | 1000 |  |
| Electric Endurance operations | 1000 | 300 | 200 | 150 | 100 |  |  |  |
| Weight kg | 1.9 | 4.1 | 5.0 | 5.4 | 14.0 | 14.5 | 49.0 | 52.2 |
| Required Torque Nm | 7.5 | 16 |  |  | 30 |  | 70 |  |
| Auxiliary Switch (380V AC-15) (220V DC-13) A | 4 |  |  |  | 6 |  |  |  |
| Switched Neutral Pole I the/Ie (AC-22) A/A | 250/250 | 400/400 | 400/400 | 500/500 | --- |  |  |  |
| Neutral Links It he A | 250 | 400 | 400 | --- | 1000 | 1000 | --- |  |

DORE ELECTRICS
Industrial Electrical Components Suppliers

# HDT1 Load Break Disconnector 3 Pole 

* 4 Pole On-Off Load Break Disconnector
* Double Break Contact
* Padlocking in off position

| Part Number | Rating | KA Rating |  | Price |
| :--- | :---: | :---: | :---: | :---: |
| HDT1/63 | 63 | 3 | $\$$ | 81.07 |
| HDT1/125 | 125 | 5 | $\$$ | 90.75 |

## DGL Load Break Disconnector

## 3 Pole - ON - OFF Load Break Diconnector

* Double Break Contact
* Padlocking in OFF position
* High Short Current Ratings IEC 947-3
* W/- Extension Shaft, Handle \& Door Clutch

| Part Number | Rating | KA Rating | Price |  |
| :--- | :---: | :---: | :---: | :---: |
| DGLC160 | 160 A | 10 | $\$ 157.30$ |  |
| DGLC250 | 250 A | 12 | $\$ 169.40$ |  |
| DGLC315 | 315 A | 20 | $\$ 217.80$ |  |
| DGLC400 | 400 A | 20 | $\$ 302.50$ |  |
| DGLC630 | 630 A | 25 | $\$ 399.30$ |  |

* Vertical Stacked
* ON - OFF - ON Operation

| Part Number | Rating | KA Rating | Price |
| :--- | :--- | :--- | ---: |
| DGLZ250 | 250 A | 12 | $\$ 338.80$ |
| DGLZ400 | 400 A | 20 | $\$ 605.00$ |
| DGLZ630 | 630A | 25 | $\$ 798.60$ |



## Automatic Transfer Switches

* IEC 60947-6-1 Rated AC 690V
* Compact Size Change Over Contactor
* Fast Solenoid Operation
* With On-Off-On Operation 4 Pole
* High Short-Time Ratings IEC 947-3
* W/- Extension Shaft, Handle \& Door Clutch

Change Over Load Break Disconnector 3 Pole scmpoli 1

| Part No | Description | Price | $\$ 3500.00$ |
| :--- | :--- | :--- | :--- |
| WN3/200LCD | ATS 200 Amp 4 Pole w/- LCD Controller | $\$ 4250.00$ | $\$ 7150.00$ |
| WN3/400LCD | ATS 400 Amp 4 Pole w/- LCD Controller |  |  |
| WN3/630LCD | ATS 630 Amp 4 Pole w/- LCD Controller |  |  |

## Transformers

DORE ELECTRICS
Industrial Electrical Components Suppliers Tel: 61-7-3349-5300 Email: sales@doreelec.com.au Fax: 61-7-3349-5344

Transformer VA = Secondary Volts $x$ Load Current (Amps)


## Dimensions for TOH-- Transformers

| Ratings | Width | Length | Projection | Ratings | Width | Length | Projection |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 40VA | 85 | 65 | 90 | 500 VA | 150 | 108 | 145 |  |
| 63VA | 85 | 65 | 90 | 630 VA | 150 | 132 | 145 |  |
| 100VA | 85 | 80 | 95 | 1000 VA | 150 | 150 | 170 |  |
| 160VA | 95 | 90 | 105 | 1600 VA | 180 | 220 | 170 |  |
| 250VA | 120 | 100 | 122 | 2000 VA | 250 | 200 | 175 |  |

## Legrand Transformers

|  | Primary: 230-400Volt Secondary: 12Volt | $\begin{aligned} & \text { Primary: 230-400Volt } \\ & \text { Secondary: 24-48Volt } \\ & + \text { or }-15 \mathrm{~V} \end{aligned}$ | $\begin{aligned} & \text { Primary: 230-400Volt } \\ & \text { Secondary: 115-230Volt } \\ & \text { + or - 15V } \\ & \hline \end{aligned}$ |
| :---: | :---: | :---: | :---: |
| VA <br> Rating | Part Number | Part Number | Part Number |
| 40 | 42840 | 44231 | 44261 |
| 63 | 42841 | 44232 | 44262 |
| 100 | 42842 | 44233 | 44263 |
| 160 | 42843 | 44234 | 44264 |
| 220 | 42844 |  |  |
| 250 |  | 44235 | 44265 |
| 400 |  | 44236 | 44266 |
| 630 |  | 44237 | 44267 |
| 1000 |  | 44238 | 44268 |
| 1600 |  | 44239 | 44269 |
| 2500 |  | 44240 | 44270 |
| 4000 |  |  | 44271 |
| 5000 |  |  | 44272 |
| 6300 |  |  | 44273 |
| 8000 |  |  | 44274 |

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## DC Power Supplies

Line/Load Regulation 1\%

## AC to DC

Approvals CE, C Tick, UL, TUV

SCHEDULE 1

- Primary Voltage 176 - 264 50Hz

| Panel Mount |  |  |  |  |
| :--- | :---: | :---: | :---: | ---: |
| Part No. | Output VDC | Load Amps | Output Watts | Price |
| SKS2512 | 12 V | 2.1 A | 25 W | $\$ 62.00$ |
| SKS5012 | 12 V | 4.2 A | 50 W | $\$ 81.00$ |
| SKS14512 | 12 V | 8.5 A | 145 W | $\$ 100.00$ |
| SKS5024 | 24 V | 2.1 A | 50 W | $\$ 81.00$ |
| SKS10024 | 24 V | 4.5 A | 100 W | $\$ 85.00$ |
| SKS14524 | 24 V | 6 A | 145 W | $\$ 100.00$ |
| SKS24024 | 24 V | 10 A | 240 W | $\$ 230.00$ |
| SKS50024 | 24 V | 20 A | 500 W | $\$ 448.00$ |
| SKS1DIN | DIN RAIL BRACKET | $25 \& 50$ WATT |  | $\$ 23.10$ |
| SKS2DIN | DIN RAIL BRACKET | $60-150$ WATT |  | $\$ 25.30$ |



SKS2512

| Part No. | Output VDC | Load Amps | Output Watts | Price |
| :---: | :---: | :---: | :---: | :---: |
| DR4512 | 12 V | 3.5 A | 45W | \$ 71.00 |
| DR2524 | 24 V | 1.0A | 25W | \$ 80.00 |
| DR6024 | 24V | 2.5 A | 60W | \$ 86.00 |
| DR12024 | 24V | 5.0A | 120W | \$128.00 |
| DRP24024 | 24V | 10A | 240W | \$180.00 |
| DRP48024 | 24V | 20A | 480W | \$331.00 |
| * Slim Line/Din Rail Mount |  |  |  |  |
| Part No. | Output VDC | Load Amps | Output Watts | Price |
| MDR4012 | 12 V | 3.3A | 40W | \$ 80.00 |
| MDR6012 | 12 V | 5.0 A | 60W | \$ 88.00 |
| MDR6024 | 24 V | 2.5 A | 60W | \$ 88.00 |

## Auto - Starter Transformers

| Part <br> No. | KW |  |  | Dimensions MM |  |  | Weight | Coils | Price |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Duty (ASC1202) |  |  |  |  |  |  |  |  |
|  | 0.03 | 0.1 | 0.3 |  |  |  |  |  |  |
|  | 3S/Hr | 12S/Hr | 30S/Hr | Depth | Width | Height |  |  |  |
| 30005 | 5 | 3.5 | 2 | 83 | 267 | 153 | 10 | 3 | POA |
| 30006 | 8 | 5.5 | 2.5 | 96 | 267 | 153 | 13 | 3 | POA |
| 30010 | 10 | 7.5 | 3.5 | 115 | 267 | 153 | 15 | 3 | POA |
| 30015 | 15 | 11 | 5.5 | 121 | 318 | 179 | 17 | 3 | POA |
| 30020 | 20 | 15 | 7.5 | 121 | 318 | 179 | 20 | 3 | POA |
| 30025 | 25 | 18 | 9 | 121 | 318 | 179 | 24 | 3 | POA |
| 30030 | 30 | 22 | 11 | 159 | 369 | 229 | 30 | 3 | POA |
| 30040 | 40 | 30 | 15 | 172 | 369 | 229 | 37 | 3 | POA |
| 30050 | 50 | 38 | 18 | 191 | 369 | 229 | 43 | 3 | POA |
| 30060 | 60 | 45 | 22 | 209 | 369 | 229 | 50 | 3 | POA |
| 30070 | 70 | 52 | 26 | 176 | 432 | 280 | 59 | 3 | POA |
| 30075 | 75 | 55 | 25 | 178 | 432 | 280 | 59 | 3 | POA |
| 30100 | 100 | 70 | 35 | 178 | 432 | 280 | 63 | 3 | POA |
| 30125 | 125 | 90 | 45 | 191 | 432 | 280 | 73 | 3 | POA |
| 30150 | 150 | 112 | 55 | 216 | 432 | 280 | 114 | 3 | POA |
| 30175 | 175 | 125 | 65 | 223 | 483 | 331 | 119 | 3 | POA |
| 30200 | 200 | 150 | 75 | 235 | 483 | 331 | 127 | 3 | POA |
| Thermistors |  | POA | Each |  |  |  |  |  |  |
| Micro Therms |  | POA | Each | ( $\mathrm{N} / \mathrm{O}$ or |  |  |  |  |  |

trical Switchboard OM Manual
DORE ELECTRICS
Industrial Electrical Components Suppliers

Tel: 61-7-3349-5300
Fax: 61-7-3349-5344

- Ratings Weatherproof to IP56
- $\quad$ Self Extinguishing To UL94-5VA
- Material ABS - Impact Resistant UV Stabilised



## * With Built-in Universal Hinges

## Heavy Duty PVC Box - IP66

Schedule 1
Size

| H x W x D | Part No. |  | Price |
| :--- | :--- | :---: | :---: |
| $100 \times 100 \times 90$ | E1BOX | $\$$ | 10.00 |
| $200 \times 100 \times 90$ | E2BOX | $\$$ | 15.00 |

## ABS Enclosures w/- Mounting Plate scumpule 1

- Ratings Weatherproof to IP66
- $\quad$ Self Extinguishing To UL94-5VA
- Material ABS - Impact Resistant
- UV Stabilised

Size

| H $\times$ W $\times$ D | Part No. |  | Price |
| :--- | :--- | ---: | ---: |
| $110 \times 80 \times 70$ | $\mathbf{4 3 3}$ | $\$$ | 9.80 |
| $130 \times 80 \times 70$ | $\mathbf{5 3 3}$ | $\$$ | 10.70 |
| $180 \times 80 \times 70$ | $\mathbf{7 3 3}$ | $\$$ | 15.20 |
| $200 \times 150 \times 100$ | $\mathbf{8 6 3 5}$ | $\$$ | 23.00 |
| $250 \times 150 \times 100$ | $\mathbf{1 0 6 4}$ | $\$$ | 28.00 |
| $200 \times 200 \times 130$ | $\mathbf{8 8 5}$ | $\$$ | 40.00 |
| $380 \times 280 \times 130$ | $\mathbf{1 5 1 1 5}$ | $\$$ | 110.00 |



## Polyester Enclosures

SCHEDULE 8

- Glass fiber reinforced poyester with protective door flange
- IP66 - ROHS
- Excellent resistance to corrosion, UV, Saline, Oils and Greases
- Operating temperature $-\mathbf{4 0} \mathrm{c}$ to $+\mathbf{8 0}$ 元
- With Galvanised Steel Mounting Plate

| Outside Size | Part No. | Price |  | Part No. | Price |
| :--- | :--- | :--- | :--- | :--- | :--- |
| H x W x D | Grey Door |  |  |  |  |
| $300 \times 250 \times 140$ | TIP325 | $\$ 176.00$ |  | $\$ 245.00$ |  |
| $400 \times 300 \times 200$ | TIP43 | $\$ 220.00$ | TX43 | $\$ 370.00$ |  |
| $500 \times 400 \times 200$ | TIP54 | $\$ 332.00$ | TX54 | $\$ 490.00$ |  |
| $600 \times 400 \times 230$ | TIP64 | $\$ 440.00$ | TX64 | $\$ 740.00$ |  |
| $600 \times 500 \times 230$ | TIP65 | $\$ 660.00$ | TX65 | $\$ 980.00$ |  |
| $800 \times 600 \times 300$ | TIP86 | $\$ 880.00$ | TX86 | $\$$ |  |



## PVC Enclosures

## Hi Box Don 1 ABS Fixed Grey Lid - IP66

| Part Number | Description W x H x D | Price |
| :--- | :--- | ---: |
| DSAG0811 | $80 \times 110 \times 70 \mathrm{Hi}$ Box Don 1 ABS | $\$ 25.96$ |
| DSAG0811-1 | $80 \times 110 \times 85 \mathrm{Hi}$ Box Don 1 ABS | $\$ 29.52$ |
| DSAG0811-S | $80 \times 110 \times 45 \mathrm{Hi}$ Box Don 1 ABS | $\$ 21.66$ |
| DSAG0813 | $80 \times 130 \times 70 \mathrm{Hi}$ Box Don 1 ABS | $\$ 28.80$ |
| DSAG0813-1 | $80 \times 130 \times 85 \mathrm{Hi}$ Box Don 1 ABS | $\$ 32.67$ |
| DSAG0818 | $80 \times 180 \times 70 \mathrm{Hi}$ Box Don 1 ABS | $\$ 31.22$ |
| DSAG0818-1 | $80 \times 180 \times 85 \mathrm{Hi}$ Box Don 1 ABS | $\$ 35.94$ |
| DSAG0825 | $80 \times 250 \times 70 \mathrm{Hi}$ Box Don 1 ABS | $\$ 37.99$ |
| DSAG0825-1 | $80 \times 250 \times 85 \mathrm{Hi}$ Box Don 1 ABS | $\$ 41.14$ |
| DSAG1212 | $125 \times 125 \times 100$ Hi Box Don 1 ABS | $\$ 41.99$ |
| DSAG1212-S | $125 \times 125 \times 75$ Hi Box Don 1 ABS | $\$ 40.17$ |
| DSAG1217 | $125 \times 175 \times 75$ Hi Box Don 1 ABS | $\$ 46.83$ |
| DSAG1217-1 | $125 \times 175 \times 100$ Hi Box Don 1 ABS | $\$ 50.09$ |
| DSAG1417 | $140 \times 170 \times 95$ Hi Box Don 1 ABS | $\$ 48.28$ |
| DSAG1520-1 | $150 \times 200 \times 130$ Hi Box Don 1 ABS | $\$ 56.39$ |
| DSAG1525 | $150 \times 250 \times 100$ Hi Box Don 1 ABS | $\$ 56.39$ |
| DSAG2020 | $200 \times 200 \times 130$ Hi Box Don 1 ABS | $\$ 62.07$ |
| DSAG2020-S | $200 \times 200 \times 95$ Hi Box Don 1 ABS | $\$ 60.62$ |

Hi Box Don 1 ABS Fixed Clear Lid - IP66

| Part Number | Description W x H x D | Price |
| :--- | :--- | ---: |
| DSAT0811 | $80 \times 110 \times 70 \mathrm{Hi}$ Box Don 1 ABS | $\$ 28.80$ |
| DSAT0811-1 | $80 \times 110 \times 85 \mathrm{Hi}$ Box Don 1 ABS | $\$ 33.03$ |
| DSAT0811-S | $80 \times 110 \times 45 \mathrm{Hi}$ Box Don 1 ABS | $\$ 23.96$ |
| DSAT0813 | $80 \times 130 \times 70$ Hi Box Don 1 ABS | $\$ 32.43$ |
| DSAT0813-1 | $80 \times 130 \times 85 \mathrm{Hi}$ Box Don 1 ABS | $\$ 39.20$ |
| DSAT0818 | $80 \times 180 \times 70 \mathrm{Hi}$ Box Don 1 ABS | $\$ 35.94$ |
| DSAT0818-1 | $80 \times 180 \times 85 \mathrm{Hi}$ Box Don 1 ABS | $\$ 41.38$ |
| DSAT1212 | $125 \times 125 \times 100 \mathrm{Hi}$ Box Don 1 ABS | $\$ 46.59$ |
| DSAT1212-S | $125 \times 125 \times 75 \mathrm{Hi}$ Box Don 1 ABS | $\$ 41.87$ |
| DSAT1217 | $125 \times 175 \times 75 \mathrm{Hi}$ Box Don 1 ABS | $\$ 48.16$ |
| DSAT1217-1 | $125 \times 175 \times 100$ Hi Box Don 1 ABS | $\$ 51.43$ |
| DSAT1417 | $140 \times 170 \times 95$ Hi Box Don 1 ABS | $\$ 56.27$ |
| DSAT1520 | $150 \times 200 \times 100$ Hi Box Don 1 ABS | $\$ 63.16$ |
| DSAT1520-1 | $150 \times 200 \times 130$ Hi Box Don 1 ABS | $\$ 61.47$ |
| DSAT1525 | $150 \times 250 \times 100$ Hi Box Don 1 ABS | $\$ 62.80$ |
| DSAT1525-1 | $150 \times 250 \times 130$ Hi Box Don 1 ABS | $\$ 68.97$ |
| DSAT2020 | $200 \times 200 \times 130$ Hi Box Don 1 ABS | $\$ 66.55$ |
| DSAT2020-S | $200 \times 200 \times 95$ Hi Box Don 1 ABS | $\$ 65.70$ |



## Hi Box Don 2 ABS Fixed Grey Lid - IP66

| Part Number | Description W x H x D | Price |
| :--- | :--- | ---: |
| DSAG1919 | 190x190x130 Hi Box Don 2 ABS | $\$ 102.61$ |
| DSAG2819 | $190 \times 280 \times 130$ Hi Box Don 2 ABS | $\$ 130.08$ |
| DSAG3819 | 190x380x130 Hi Box Don 2 ABS | $\$ 154.88$ |
| DSAG2838-1 | $280 \times 380 \times 180$ Hi Box Don 2 ABS | $\$ 225.06$ |

## Hi Box Don 2 ABS Clear Fixed Clear Lid - IP66

| Part Number | Description W x H x D | Price |
| :--- | :--- | ---: |
| DSAT2834 | 280x340x130 Hi Box Don 2 ABS | $\$ 192.87$ |
| DSAT3819-1 | 190x380x180 Hi Box Don 2 ABS | $\$ 195.90$ |
| DSAT2838-1 | $280 \times 380 \times 180$ Hi Box Don 2 ABS | $\$ 252.65$ |



## PVC Enclosures

SCHEDULE 10

## Hi Box Don 3 ABS Hinged Grey Lid - IP66

| Part Number | Description W x H x D | Price |
| :--- | :--- | ---: |
| NEAG1515 | $150 \times 150 \times 90 \mathrm{Hi}$ Box Don 3 ABS | $\$ 44.65$ |
| NEAG1929 | 190x290x140 Hi Box Don 3 ABS | $\$ 119.43$ |
| NEAG2939 | $290 \times 390 \times 160 \mathrm{Hi}$ Box Don 3 ABS | $\$ 165.41$ |
| NEAG2939-S | 290x390x100 Hi Box Don 3 ABS | $\$ 134.67$ |
| NEAG3030 | $300 \times 300 \times 180 \mathrm{Hi}$ Box Don 3 ABS | $\$ 150.04$ |
| NEAG3030-S | $300 \times 300 \times 130 \mathrm{Hi}$ Box Don 3 ABS | $\$ 125.60$ |
| NEAG3546 | $350 \times 465 \times 200 \mathrm{Hi}$ Box Don 3 ABS | $\$ 252.65$ |
| NEAG3546-S | $350 \times 465 \times 160 \mathrm{Hi}$ Box Don 3 ABS | $\$ 237.40$ |
| NEAG5070 | $500 \times 700 \times 250 \mathrm{Hi}$ Box Don 3 ABS | $\$ 734.47$ |

## Hi Box Don 3 ABS Hinged Clear Lid - IP66

| Part Number | Description W x H x D | Price |
| :--- | :--- | ---: |
| NEAT1515 | 150x150x90 Hi Box Don 3 ABS | $\$ 59.77$ |
| NEAT1929 | 190x290x140 Hi Box Don 3 ABS | $\$ 128.26$ |
| NEAT1929-S | 190x290x100 Hi Box Don 3 ABS | $\$ 119.79$ |
| NEAT2939 | 290x390x160 Hi Box Don 3 ABS | $\$ 169.40$ |
| NEAT3030 | $300 \times 300 \times 180 \mathrm{Hi}$ Box Don 3 ABS | $\$ 159.12$ |
| NEAT3030-S | $300 \times 300 \times 130 \mathrm{Hi}$ Box Don 3 ABS | $\$ 134.67$ |
| NEAT3546 | 350x465x200 Hi Box Don 3 ABS | $\$ 261.84$ |
| NEAT5070 | 500x700×250 Hi Box Don 3 ABS | $\$ 757.82$ |
| NEAT5070-S | $500 \times 700 \times 180 \mathrm{Hi}$ Box Don 3 ABS | $\$ 675.18$ |

Don 1 Mounting Plates

| Part Number | Description | Price |
| :--- | :--- | ---: |
| DS0811PP | $80 \times 110$ Don 1 M/Plate | $\$ 6.05$ |
| DS0813PP | $80 \times 130$ Don 1 M/Plate | $\$ 6.05$ |
| DS0818PP | $80 \times 180$ Don 1 M/Plate | $\$ 6.29$ |
| DS0825PP | $80 \times 250$ Don 1 M/Plate | $\$ 13.31$ |
| DS1212PP | $125 \times 125$ Don 1 M/Plate | $\$ 6.53$ |
| DS1217PP | $127 \times 174$ Don 1 M/Plate | $\$ 7.74$ |
| DS1417PP | $140 \times 170$ Don 1 M/Plate | $\$ 12.71$ |
| DS1520PP | $150 \times 200$ Don 1 M/Plate | $\$ 15.97$ |
| DS1525PP | $150 \times 250$ Don 1 M/Plate | $\$ 18.03$ |
| DS2020PP | $200 \times 200$ Don 1 M/Plate | $\$ 14.16$ |

Don 2 Mounting Plates

| Part Number | Description | Price |
| :--- | :--- | ---: |
| DS1919PP | 190x190 Don 2 M/Plate | $\$ 12.95$ |
| DS2819PP | 190x280 Don 2 M/Plate | $\$ 15.97$ |
| DS2834PP | 280x340 Don 2 M/Plate | $\$ 24.56$ |
| DS2838PP | 280x380 Don 2 M/Plate | $\$ 26.98$ |
| DS3819PP | 190x380 Don 2 M/Plate | $\$ 19.72$ |

## Don 3 Mounting Plates

| Part Number | Description | Price |
| :--- | :--- | ---: |
| NE1515PP | 120x125 Don 3 M/Plate | $\$ 7.38$ |
| NE1929PP | 160x240 Don 3 M/Plate | $\$ 15.73$ |
| NE2939PP | 250x350 Don 3 M/Plate | $\$ 31.46$ |
| NE3030PP | 280x280 Don 3 M/Plate | $\$ 27.23$ |
| NE3546PP | 325x455 Don 3 M/Plate | $\$ 46.59$ |
| NE5070PP | 470x670 Don 3 M/Plate | $\$ 79.74$ |



DS 2819 PP


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## PVC Enclosures

Schedule 1

- Ratings Weatherproof to IP557
- Resistance to Chemicals

Size

| Siz | Grey Enclosures |  | Clear Lid Enclosures |  | Mounting Plate |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Hx W x D | Part No. | Price | Part No. | Price | Part No. | Price |
| $75 \times 110 \times 65$ | 93210 | \$10.45 |  |  | 93310 | \$5.28 |
| $90 \times 180 \times 85$ | 93205 | \$21.23 |  |  |  |  |
| $110 \times 110 \times 65$ | 93220 | \$12.60 |  |  | 93320 | \$6.77 |
| $110 \times 150 \times 75$ | 93234 | \$17.27 | 93239 | \$26.68 | 93330 | \$8.25 |
| $110 \times 110 \times 112$ | 93221 | \$18.15 |  |  | 93320 | \$6.77 |
| $110 \times 150 \times 100$ | 93230 | \$23.38 | 93235 | \$31.13 | 93330 | \$8.25 |
| $110 \times 150 \times 150$ | 93231 | \$29.43 | 93236 | \$39.00 | 93330 | \$8.25 |
| $150 \times 150 \times 75$ | 93264 | \$28.55 |  |  | 93360 | \$11.99 |
| $150 \times 150 \times 100$ | 93260 | \$32.84 | 93265 | \$45.76 | 93360 | \$11.99 |
| $150 \times 150 \times 150$ | 93261 | \$46.70 | 93266 | \$62.32 | 93360 | \$11.99 |
| $150 \times 220 \times 75$ | 93244 | \$33.77 |  |  | 93340 | \$15.02 |
| $150 \times 220 \times 100$ | 93240 | \$43.29 | 93245 | \$57.92 | 93340 | \$15.02 |
| $150 \times 220 \times 150$ | 93241 | \$57.09 | 93246 | \$77.77 | 93340 | \$15.02 |
| $220 \times 300 \times 75$ | 93254 | \$84.70 |  |  | 93350 | \$19.47 |
| $220 \times 300 \times 150$ | 93251 | \$95.04 | 93256 | \$141.74 | 93350 | \$19.47 |
| $300 \times 220 \times 100$ | 93250 | \$84.70 | 93255 | \$109.78 | 93350 | \$19.47 |
| $166 \times 121 \times 75$ | P161275 | \$19.36 |  |  |  |  |
| $191 \times 151 \times 84$ | P191583 | \$27.83 |  |  |  |  |

- Self Extinguishing
- U.L. Compliance


## PVC Enclosures

- Ratings Weatherproof to IP56
- Resistance to Chemicals
- In-built Universal Hinges

Size

| H x W x D | Part No. | Pric |
| :--- | :--- | ---: |
| $150 \times 110 \times 70$ | $\mathbf{4 4 2 0 6}$ | $\$ 23.43$ |
| $190 \times 140 \times 70$ | $\mathbf{4 4 2 0 7}$ | $\$ 43.12$ |
| $240 \times 190 \times 90$ | $\mathbf{4 4 2 0 8}$ | $\$ 59.79$ |
| $120 \times 80 \times 120$ | $\mathbf{4 4 2 1 5}$ | $\$ 20.63$ |
| $300 \times 220 \times 120$ | $\mathbf{4 4 2 0 9}$ | $\$ 105.16$ |
| $380 \times 300 \times 120$ | $\mathbf{4 4 2 1 0}$ | $\$ 151.86$ |
| $460 \times 380 \times 120$ | $\mathbf{4 4 2 1 1}$ | $\$ 204.93$ |
| $150 \times 110 \times 140$ | $\mathbf{4 4 2 1 6}$ | $\$ 30.1$ |
| $190 \times 140 \times 140$ | $\mathbf{4 4 2 1 7}$ | $\$ 51.70$ |
| $240 \times 190 \times 160$ | $\mathbf{4 4 2 1 8}$ | $\$ 71.8$ |
| $300 \times 220 \times 180$ | $\mathbf{4 4 2 1 9}$ | $\$ 116.7$ |
| $380 \times 300 \times 180$ | $\mathbf{4 4 2 2 0}$ | $\$ 168.0$ |
| $460 \times 380 \times 180$ | $\mathbf{4 4 2 2 1}$ | $\$ 233.1$ |

Schedule 1

## - $\quad$ Self Extinguishing <br> - UV Stabilised Thermoplastic

Mounting Plates Enclosures

| Part No. | Price | Part No. | Price |  |
| :--- | ---: | :--- | ---: | ---: |
| $\mathbf{4 4 4 2 6}$ | $\$ 66.17$ | $\mathbf{7 0 6 9}$ | $\$ 10.56$ |  |
|  |  |  | $\mathbf{7 0 7 7}$ | $\$ 10.67$ |
| $\mathbf{4 4 4 2 8}$ | $\$ 107.91$ | $\mathbf{7 0 8 5}$ | $\$ 14.74$ |  |
|  |  |  | $\mathbf{7 0 6 1}$ | $\$ 10.01$ |
| $\mathbf{4 4 4 2 9}$ | $\$ 155.43$ | $\mathbf{7 0 9 3}$ | $\$ 22.55$ |  |
| $\mathbf{4 4 4 3 0}$ | $\$ 221.54$ | $\mathbf{7 1 0 1}$ | $\$ 42.19$ |  |
| $\mathbf{4 4 4 3 1}$ | $\$ 341.72$ | $\mathbf{4 4 6 1 9}$ | $\$ 59.18$ |  |
| $\mathbf{4 4 4 3 6}$ | $\$ 73.76$ | $\mathbf{7 0 6 9}$ | $\$ 10.56$ |  |
| $\mathbf{4 4 4 3 7}$ | $\$ 86.41$ | $\mathbf{7 0 7 7}$ | $\$ 10.67$ |  |
| $\mathbf{4 4 4 3 8}$ | $\$ 129.42$ | $\mathbf{7 0 8 5}$ | $\$ 14.74$ |  |
| $\mathbf{4 4 4 3 9}$ | $\$ 180.95$ | $\mathbf{7 0 9 3}$ | $\$ 22.55$ |  |
| $\mathbf{4 4 4 4 0}$ | $\$ 278.58$ | $\mathbf{7 1 0 1}$ | $\$ 42.19$ |  |
| $\mathbf{4 4 4 4 1}$ | $\$ 371.69$ | $\mathbf{4 4 6 1 9}$ | $\$ 59.18$ |  |

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## Metal Enclosures

Schedule 8

* IP65 to EN529 Nema 4
* Finish in RAL 7032
* Mounting Plate \& Quarter Turn Locks
* With Gland Plate

| Part Number | Outside Size |  | Mtg Plate |  | Locks | Price |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | ---: |
|  | H | W | D | H | W |  |  |
| MB2315 | 300 | 200 | 150 | 250 | 150 | 1 | $\$ 118.80$ |
| MB3315 | 300 | 300 | 150 | 250 | 250 | 1 | $\$ 139.70$ |
| MB3415 | 400 | 300 | 150 | 350 | 250 | 1 | $\$ 143.00$ |
| MB4320 | 300 | 400 | 200 | 250 | 350 | 1 | $\$ 148.50$ |
| MB442 | 400 | 400 | 200 | 350 | 350 | 1 | $\$ 168.85$ |
| MB4520 | 500 | 400 | 200 | 450 | 350 | 1 | $\$ 194.70$ |
| MB4620 | 600 | 400 | 200 | 550 | 350 | 2 | $\$ 225.50$ |
| MB5520 | 500 | 500 | 200 | 450 | 450 | 2 | $\$ 250.80$ |
| MB5720 | 700 | 500 | 200 | 650 | 450 | 2 | $\$ 275.00$ |
| MB6420 | 400 | 600 | 200 | 350 | 550 | 2 | $\$ 225.50$ |
| MB6620 | 600 | 600 | 200 | 550 | 550 | 2 | $\$ 272.80$ |
| MB4625 | 600 | 400 | 250 | 550 | 350 | 2 | $\$ 225.50$ |
| MB6825 | 800 | 600 | 250 | 750 | 550 | 2 | $\$ 452.10$ |
| MB6630 | 600 | 600 | 300 | 550 | 550 | 2 | $\$ 330.00$ |
| MB6830 | 800 | 600 | 300 | 750 | 550 | 2 | $\$ 501.60$ |
| MB61030 | 1000 | 600 | 300 | 950 | 550 | 2 | $\$ 561.00$ |
| MB8830 | 800 | 800 | 300 | 750 | 750 | 2 | $\$ 602.80$ |
| MB81030 | 1000 | 800 | 300 | 950 | 750 | 2 | $\$ 649.00$ |
| MB81230 | 1200 | 800 | 300 | 1150 | 750 | 2 | $\$ 745.80$ |
| MB101030 | 1000 | 1000 | 300 | 950 | 950 | 2 | $\$ 858.00$ |
| MB101230 | 1200 | 1000 | 300 | 1150 | 950 | 2 | $\$ 973.50$ |
| WMB4 | Wall Mounting Brackets |  |  | $\$ 11.00$ |  |  |  |
| VK1 | Vent Kit - 2 per kit - Vent, Gasket \& Gauze |  | $\$ 31.90$ |  |  |  |  |
| TUP | Touch Up Paint - RAL7032 |  |  | $\$ 29.04$ |  |  |  |



## Metal Enclosures - Orange

* Mounting Plate \& Quarter Turn Locks $\quad * \quad$ w/- 2 x Door Rails \& Gland Plate

| Part Number | Outside Size |  |  | Mtg Plate |  | Locks | Price |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | ---: |
|  | H | W | D | H | W |  |  |
| MBO3415 | 400 | 300 | 150 | 350 | 250 | 1 | $\$ 143.00$ |
| MBO4420 | 400 | 400 | 200 | 350 | 350 | 1 | $\$ 168.30$ |
| MBO4620 | 600 | 400 | 200 | 550 | 350 | 2 | $\$ 225.50$ |
| MBO5520 | 500 | 500 | 200 | 450 | 450 | 2 | $\$ 250.80$ |
| MBO6620 | 600 | 600 | 200 | 550 | 550 | 2 | $\$ 272.80$ |
| MBO6825 | 800 | 600 | 250 | 750 | 550 | 2 | $\$ 452.10$ |
| MBO61030 | 1000 | 600 | 300 | 950 | 550 | 2 | $\$ 561.00$ |
| MBO81030 | 1000 | 800 | 300 | 950 | 750 | 2 | $\$ 649.00$ |
| MBO81230 | 1200 | 800 | 300 | 1150 | 750 | 2 | $\$ 745.80$ |
| WMB4 | Wall Mounting Brackets |  |  |  |  |  | $\$ 11.00$ |



## Replacement Locks to suit Metal Enclosures

| Part Number | Description | Price |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| SL8S \& YL26S | 8 mm Square Solid \& Tongue | \$15.43 |  |  |  |
| SL8D3 \& YL26S | 3 mm Pin Double Bit \& Tongue | \$15.43 |  |  |  |
| SL8K \& YL26S | Key Action 92268 \& Tongue | \$15.43 | 8 mm Square | 3 mm Pin Double Bit | Key Action |

## Stainless Steel Enclosures

Schedule 8

* IP65
* Stainless Steel 316SS
* Mounting Plate \& Quarter Turn Locks

| Part Number | Outside Size |  |  |  | Mtg Plate | Locks | Price |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | ---: |
|  | H | W | D |  |  |  |  |
| MBX2315 | 300 | 200 | 150 | 250 | 150 | 1 | $\$ 503.80$ |
| MBX3315 | 300 | 300 | 150 | 250 | 250 | 1 | $\$ 544.50$ |
| MBX3415 | 400 | 300 | 150 | 350 | 250 | 1 | $\$ 656.00$ |
| MBX4320 | 300 | 400 | 200 | 250 | 350 | 1 | $\$ 730.00$ |
| MBX4420 | 400 | 400 | 200 | 350 | 350 | 1 | $\$ 1096.00$ |
| MBX4620 | 600 | 400 | 200 | 550 | 350 | 2 | $\$ 1400.00$ |
| MBX6620 | 600 | 600 | 200 | 550 | 550 | 2 | $\$ 1780.00$ |
| MBX6825 | 800 | 600 | 250 | 750 | 550 | 2 | $\$ 2300.00$ |
| MBX81030 | 1000 | 800 | 300 | 950 | 750 | 2 | $\$ 2,500.00$ |



## Document Holder

| Part No. | Size | Price |
| :--- | :--- | ---: |
| DHA4 | $280 \times 220$ | $\$ 13.20$ |

## Anti-Condensation Heater

| Part No. | Size | Price |
| :--- | :--- | ---: |
| AH100 | 100 Watt 240V Stainless Steel | $\$ 132.00$ |



Hinged Window Kit - IP66

| Part No. | Size | Price |
| :--- | :--- | ---: |
| MCB6W | To suit 6 Poles of MCB's | $\$ 44.00$ |
| MCB12W | To suit 12 Poles of MCB's | $\$ 66.00$ |

## Internal Door Kit to suit Metal Boxes

* Adjustable Height Sub Frame with Hinged Door
* Finish = RAL7032

| Part Number | Suit Metal Box Size |  |  | Price |
| :--- | :---: | :---: | :---: | ---: |
|  | H | W | D |  |
| IDP34 | 400 | 300 | 150 | $\$ 82.50$ |
| IDP44 | 400 | 400 | 200 | $\$ 100.10$ |
| IDP45 | 500 | 400 | 200 | $\$ 123.20$ |
| IDP46 | 600 | 400 | 200 | $\$ 143.00$ |
| IDP55 | 500 | 500 | 200 | $\$ 148.50$ |
| IDP57 | 700 | 500 | 200 | $\$ 165.00$ |
| IDP64 | 400 | 600 | 200 | $\$ 154.00$ |
| IDP66 | 600 | 600 | 200 | $\$ 181.50$ |
| IDP68 | 800 | 600 | 250 | $\$ 192.50$ |



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## Double Sided Tape

Schedule 2

| Part No. | Width | Material | Colour | Thickness | Length per Roll | Price |
| :--- | :--- | :--- | :--- | :--- | ---: | ---: |
| DST60985/6 | 6 mm | Tissue | Clear | 0.10 mm | 50 Mtrs | $\$ 6.04$ |
| DST60985/12 | 12 mm | Tissue | Clear | 0.10 mm | 50 Mtrs | $\$ 11.97$ |
| DST4934/12 | 12 mm | Cloth | Cream | 0.28 mm | 23 Mtrs | $\$ 10.20$ |
| DST4934/18 | 18 mm | Cloth | Cream | 0.28 mm | 23 Mtrs | $\$ 13.60$ |
| DST4934/24 | 24 mm | Cloth | Cream | 0.28 mm | 23 Mtrs | $\$ 17.01$ |
| DST4934/48 | 48 mm | Cloth | Cream | 0.28 mm | 23 Mtrs | $\$ 34.00$ |
| DST4965/12 | 12 mm | Red Film | Clear | 0.21 mm | 50 Mtrs | $\$ 53.99$ |
| DST4965/18 | 18 mm | Red Film | Clear | 0.21 mm | 50 Mtrs | $\$ 71.98$ |
| DST4970/12 | 12 mm | PVC Film | White | 0.23 mm | 33 Mtrs | $\$ 31.68$ |
| DST4970/18 | 18 mm | PVC Film | White | 0.23 mm | 33 Mtrs | $\$ 42.23$ |
| DST4974/12 | 12 mm | Cloth | White | 0.37 mm | 22 Mtrs | $\$ 22.10$ |
| DST4952/12 | 12 mm | Pur-Foam | White | 1.20 mm | 50 Mtrs | $\$ 56.75$ |
| DST4952/18 | 18 mm | Pur-Foam | White | 1.20 mm | 50 Mtrs | $\$ 75.66$ |
| DST4952/24 | 24 mm | Pur-Foam | White | 1.20 mm | 50 Mtrs | $\$ 94.58$ |
| DST62936/18 | 18 mm | Pur-Foam | White | 1.60 mm | 25 Mtrs | $\$ 49.18$ |

## Packing Tape - Brown

| Part No. | Width | Length per Roll | Price |
| :--- | :--- | :--- | :---: |
| PT60653/24 | 24 mm | 75 Mtrs | $\$ 2.30$ |
| PT4262/36 | 36 mm | 75 Mtrs | $\$ 2.59$ |
| PT4262/48 | 48 mm | 75 Mtrs | $\$ 3.51$ |

## Masking Tape - General Purpose - Cream

| Part No. | Width | Length per Roll | Price |
| :--- | :--- | :--- | :---: |
| MT4307/12 | 12 mm | 50 Mtrs | $\$ 2.55$ |
| MT4323/19 | 19 mm | 50 Mtrs | $\$ 2.92$ |
| MT4323/25 | 25 mm | 50 Mtrs | $\$ 3.88$ |
| MT4323/38 | 38 mm | 50 Mtrs | $\$ 5.83$ |
| MT4323/50 | 50 mm | 50 Mtrs | $\$ 7.78$ |

Outdoor Masking Tape
MT4840/50
$50 \mathrm{~mm} \quad 50 \mathrm{Mtrs}$
$\$ 13.72$

## Taptites - Thread Forming Screws - Self Tapping Metric Screws Schedule 1

Minimum Pack Quantity $=1000$

| Part No. | Size | Finish | Drill Size | Price per 1000 |
| :--- | :--- | :--- | :--- | ---: |
| TT36 | M3 X 6 | Zinc 5 | 2.71 mm | $\$ 89.18$ |
| TT410 | M4 X 10 | Zinc 5 | 3.6 mm | $\$ 93.17$ |
| TT513 | M5 X 13 | Zinc 5 | 4.5 mm | $\$ 146.41$ |
| TT613 | M6 X 13 | Zinc 5 | 5.41 mm | $\$ 202.07$ |
| TT616 | M6 X 16 | Zinc 5 | 5.41 mm | $\$ 214.17$ |

## Large Shallow Head

| Part No. | Size | Finish | Drill Size | Price per 1000 |
| :--- | :--- | :--- | :--- | ---: |
| TT510S | M5 X 10 | Zinc 5 | 4.5 mm | $\$ 139.76$ |
| TT515S | M5 x 15 | Zinc | 4.5 mm | $\$ 146.41$ |

## Switchboard Hardware

| Cam Locks | C7 | Rubber Extrusions - Round | C3 |
| :---: | :---: | :---: | :---: |
| Cams for Handles | C5 | Rubber Extrusions - Square | C3 |
| D Handles | C7 | Rubber Extrusions - U Shape | C3 |
| Door Stays | C5 | Self Adhesive Foam Tape - Durafoam | C2 |
| Drop "T" Handles | C10 | Self Adhesive Foam Tape - Multifoam | C2 |
| Eye Bolts | C7 | Stainless Steel Hardware | C13 |
| Flush Locks | C10 | Swing Handles - Chrome Plated | C11-C12 |
| Hinges - Pin Type, Butterfly \& Concealed | C6 | Swing Handles - Mini | C10 |
| Lever \& Padlockable Handles | C4 | Swing Handles - Padlockable | C11 |
| Lever Padlockable Handles | C4 | Taptites | C17 |
| Locking Rods | C5 | Tape - Double Sided, Masking \& Packing | C17 |
| PVC Slide Lock | C10 | Tee Handles - Small | C4 |
| Quarter Turns \& Accessories | C8 | Tee Handles - Large | C4 |
| Quarter Turn Tongue | C9 | Thumb Screws | C5 |
| Rod Guides | C5 | Tools - Bus Bar Bender | C15 |
| Rubber Extrusions - Bullnose | C3 | Tools - Bus Bar Cutter | C15 |
| Rubber Extrusions - Glazing-Window Rubber | C2 | Tools - Hydraulic Pumps | C15+C16 |
| Rubber Extrusions - Pinchweld Rubber | C3 | Tools - Hydraulic Steel Puncher \& Accessories | C16 |
| Rubber Extrusions - Rectangular | C3 | Tools - Power Man Jr Hydraulic Punch | C14 |

DORE ELECTRICS
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## Self Adhesive Foam Tape - Multifoam

Self Adhesive Foam Tape - Dark Grey Polyethylene Closed Cell

| Part No. | Thick <br> mm | Width <br> mm | Length per <br> Roll | Price per Roll | Ctn <br> Qty |
| :--- | :--- | :--- | :--- | :--- | :---: |
| MF7492/39 | 3 | 9 | 25 Mtrs | $\$ 13.53$ | 33 |
| MF7492/312 | 3 | 12 | 25 Mtrs | $\$ 17.18$ | 25 |
| MF7492/315 | 3 | 15 | 25 Mtrs | $\$ 20.56$ | 16 |
| MF7492/318 | 3 | 18 | 25 Mtrs | $\$ 23.94$ | 16 |
| MF7492/324 | 3 | 24 | 25 Mtrs | $\$ 30.69$ | 12 |
| MF7492/336 | 3 | 36 | 25 Mtrs | $\$ 46.02$ | 8 |
| MF7493/612 | 6 | 12 | 15 Mtrs | $\$ 14.03$ | 25 |
| MF7493/618 | 6 | 18 | 15 Mtrs | $\$ 19.55$ | 16 |
| MF7493/621 | 6 | 21 | 15 Mtrs | $\$ 22.29$ | 14 |
| MF7493/624 | 6 | 24 | 15 Mtrs | $\$ 25.05$ | 12 |
| MF7493/636 | 6 | 36 | 15 Mtrs | $\$ 37.58$ | 8 |
| MF7494/1021 | 10 | 21 | 7 Mtrs | $\$ 19.06$ | 14 |
| MF7495/1224 | 12 | 24 | 7 Mtrs | $\$ 24.68$ | 12 |
| MF7492/PV239 | 3 | 9 REV | 25 Mtrs | $\$ 14.93$ | 33 |
| MF7496/PV2512 | 5 | 12 REV | 15 Mtrs | $\$ 13.78$ | 25 |
| MF7496/PV2524 | 5 | 24 REV | 15 Mtrs | $\$ 24.61$ | 12 |

## Self Adhesive Foam Tape - Durafoam

Self Adhesive Foam Tape - Black Natural Rubber Closed Cell

| Part No. | Thick mm | Width mm | Length per Roll | Price per Roll | $\begin{aligned} & \text { Ctn } \\ & \text { Qty } \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| DF61102/312 | 3 | 12 | 25 Mtrs | \$52.12 | 25 |
| DF61102/318 | 3 | 18 | 25 Mtrs | \$69.48 | 16 |
| DF61102/324 | 3 | 24 | 25 Mtrs | \$86.86 | 12 |
| DF61103/4.89 | 4.8 | 9 | 15 Mtrs | \$35.33 | 16 |
| DF61104/612 | 6 | 12 | 15 Mtrs | \$49.01 | 25 |
| DF61104/618 | 6 | 18 | 15 Mtrs | \$65.34 | 16 |
| DF61104/624 | 6 | 24 | 15 Mtrs | \$81.68 | 12 |
| DF61105/9.518 | 9.5 | 18 | 7 Mtrs | \$39.74 | 16 |
| DF61105/9.521 | 9.5 | 21 | 7 Mtrs | \$44.71 | 14 |
| DF50601/318 | 3 | 18 | 9 Mtrs | \$13.44 | 16 |
| DF50601/324 | 3 | 24 | 9 Mtrs | \$16.81 | 12 |
| DF50601/348 | 3 | 48 | 9 Mtrs | \$33.62 | 6 |
| DF50602/618 | 6 | 18 | 9 Mtrs | \$20.00 | 16 |
| DF50602/624 | 6 | 24 | 9 Mtrs | \$25.00 | 12 |
| DF50604/1224 | 12 | 24 | 9 Mtrs | \$39.82 | 12 |

## Rubber Extrusions - Glazing-Window Rubber

Material = EPDM

| Part No. | Bending <br> Radius | Glass Thickness | Length per <br> Roll | Price per <br> Roll |
| :--- | :--- | :--- | :--- | :--- |
| ESGR10 | 30 mm | $3-4 \mathrm{~mm}$ | 30 Mtrs | $\$ 319.44$ |
| ESGR15 | 70 mm | $3-4 \mathrm{~mm}$ | 30 Mtrs | $\$ 319.44$ |
| ESGR20 | 70 mm | $5-6 \mathrm{~mm}$ | 30 Mtrs | $\$ 407.22$ |
| ESGR39 | 40 mm | $4-6 \mathrm{~mm}$ | 30 Mtrs | $\$ 222.42$ |



## Rubber Extrusions

Material = Neoprene Rubber

| Part No. | Shape | Thick mm | Width mm | Length <br> per Roll | Price per <br> Roll |
| :--- | :--- | :--- | :--- | :--- | :--- |
| GSU1 | U Section | U 1.5 -2.0 | 12 | 10 Mtrs | $\$ 21.78$ |
| ESU1 | U Section | U $1.5-2.0$ | 12 | 50 Mtrs | $\$ 106.15$ |
| ESU2 | U Section | U $1.5-2.0$ | 12 | 40 Mtrs | $\$ 116.16$ |
| ESU4 | U - O Section | U $1.5-2.0$ | 15 | 50 Mtrs | $\$ 278.30$ |
| ES612 | Rectangular | 6.0 | 12 | 30 Mtrs | $\$ 87.12$ |
| ES619 | Rectangular | 6.0 | 19 | 30 Mtrs | $\$ 130.68$ |
| ES625B | Bull Nose | 6.0 | 25 | 50 Mtrs | $\$ 175.45$ |
| ES1019 | Rectangular | 10.0 | 19 | 30 Mtrs | $\$ 192.39$ |
| ES1025 | Rectangular | 10.0 | 25 | 30 Mtrs | $\$ 279.51$ |
| ESR19 | Round | $19 \mathrm{~mm} \times$ Dia. |  | 30 Mtrs | $\$ 199.65$ |
| ES1919 | Square | 19 | 19 | 30 Mtrs | $\$ 105.27$ |



ES625B


ES612 \& ES619


ES1019 \& ES1025

Rubber Extrusions - Pinchweld Rubber - Bubble Rubber Material = EPDM

| Part No. | Shape | Thickness mm | Bubble Height mm | Length per Roll | Price per Roll |
| :---: | :---: | :---: | :---: | :---: | :---: |
| ES60-057 | Top Bubble | U 1.0-3.5 | 6 | 50 Mtrs | \$508.20 |
| ES60-051 | Top Bubble | U 1.0-3.5 | 10 | 50 Mtrs | \$508.20 |
| ES60-058 | Side Bubble | U 1.0-3.5 | 7 | 50 Mtrs | \$508.20 |
| ES60-052 | Side Bubble | U 1.0-3.5 | 7 | 50 Mtrs | \$508.20 |
| ES60-053 | Side Bubble | U 1.0-3.6 | 7 | 50 Mtrs | \$508.20 |
| ES66-035 | No Bubble Large | U 1.0-3.5 | - | 50 Mtrs | \$272.25 |
| ES60-059 | No Bubble Small | U 1.0-3.5 | - | 50 Mtrs | \$272.25 |
| ES66-018 | No Bubble Very Large | U3.5-5 | - | 50 Mtrs | \$302.50 |


ES60-057


ES60-053

ES66-035

ES60-059

ES66-018

## Tee Handles

Locking \& Non-Locking - All Tee Handles are suitable for Clockwise or Anti-Clockwise movement Standard Key $=92268$ other Key combinations are available on request $-001,003 \& 604$

Tee Handles - Small - Chrome Plated Finish

| Part No. | Description | Price |
| :--- | :--- | :--- |
| THS7L | Small Tee Handle Universal Locking | $\$ 16.70$ |
| THS7NL | Small Tee Handle Universal Non-Locking | $\$ 15.97$ |
|  |  |  |
| Tee Handles $\boldsymbol{-}$ Large - Chrome Plated Finish |  |  |
| THL7L | Large Tee Handle Universal Locking | $\$ 16.70$ |
| THL7NL | Large Tee Handle Universal Non-Locking | $\$ 15.97$ |
| THL7FNB | Large Tee Handle Universal Locking Front Mount | $\$ 16.70$ |



## Tee Handles - Large - Chrome Plated Finish



Tee Handles - Single Hole - Chrome Plated Finish

| THSQ7L | Small Tee Handle Universal Locking (92268 Key) | $\$ 16.70$ |
| :--- | :--- | :--- |
| THSQ7NL | Small Tee Handle Universal Non-Locking | $\$ 15.97$ |



## Lever \& Padlockable Handles

Locking \& Non-Locking - All "L" Handles are suitable for Clockwise or Anti-Clockwise movement Standard Key $=92268$ other Key combinations are available on request $-001,003 \& 604$

## Lever Handles - Chrome Plated Finish

| Part No. | Description | Price |
| :--- | :--- | :--- |
| LH7L | L Handle Universal Locking | $\$ 20.21$ |
| LH7NL | L Handle Universal Non-Locking | $\$ 19.72$ |
| LH7CPL | Padlockable Clockwise | $\$ 30.61$ |
| LH7ACPL | Padlockable Anti-Clockwise | $\$ 30.61$ |



LH7L


Lever Handles - Single Hole - Chrome Plated Finish

| LHQ7L | Lever Handle Universal Locking (92268Key) | $\$ 20.21$ |  |
| :--- | :--- | :--- | :--- |
| LHQ7NL | Lever Handle Universal Non-Locking | $\$ 19$ |  |
| LHQ7CPL | Padlockable Clockwise | $\$ 19.72$ |  |
| LHQ7ACPL | Padlockable Anti-Clockwise | $\$ 30.61$ |  |
| LHQ7LSS | Lever Handle Universal Locking (333Key) <br> 316 Stainless Steel - w/- Cam H26 | $\$ 30.61$ |  |

## Accessories to suit

| Part No. | Description | Price |  |
| :--- | :--- | :--- | :--- |
|  |  |  |  |
| CAM88 | Cam Die Cast | $\$ 2.90$ |  |
| CAM3PL | Cam Steel - Heavy Duty | $\$ 6.66$ |  |
| HSEAL | GASKET TO SUIT "T" HANDLES | $\$ 0.85$ |  |

## Locking Mechanism

Cams - 3 Point Locking Rods - 3 Point Locking Rods with Rollers

| Part No. | Description | Price |
| :--- | :--- | :--- |
| CAM88 | Cam Die Cast | $\$ 2.90$ |
| CAM2PL | Cam Steel - Heavy Duty | $\$ 6.05$ |
| CAM3PL | Cam Steel - Heavy Duty | $\$ 6.66$ |
| CAM4PL | Cam Steel - Heavy Duty | $\$ 6.66$ |
| RH1 | Rod Holder | $\$ 4.66$ |



Locking Rods - Standard

| TL12 | 1200 mm Locking Rods - Comes <br> with Cam | $\$ 18.39$ |
| :--- | :--- | :--- |
| TL18 | 1800 mm Locking Rods - Comes <br> with Cam | $\$ 21.30$ |
| TL24 | 2400 mm Locking Rods - Comes <br> with Cam | $\$ 23.96$ |



| Locking Rods $\boldsymbol{-}$ w/- Rollers |  |  |
| :--- | :--- | :--- |
| TLR12 | 1200 mm Locking Rods with Rollers <br> - Comes with Cam | $\$ 35.09$ |
| TLR18 | 1800 mm Locking Rods with Rollers <br> - Comes with Cam | $\$ 38.36$ |
| TLR24 | 2400 mm Locking Rods with Rollers <br> - Comes with Cam | $\$ 41.50$ |


| Stainless Steel Locking Rods w/- Rollers |  |  |
| :--- | :---: | :--- | :--- |
| TLR12SS | 1200 mm Locking Rods with Rollers <br> - Comes with Cam - Stainless Steel | $\$ 68.20$ |
| TLR18SS | 1800 mm Locking Rods with Rollers <br> - Comes with Cam - Stainless Steel | $\$ 70.40$ |
| TLR24SS | 2400 mm Locking Rods with Rollers <br> - Comes with Cam - Stainless Steel | $\$ 77.00$ |

Locking Rods - w/- Rollers

Rod Guides

| Part No. | Description | Price |
| :--- | :--- | :--- |
| RG8 | Black 24mm High | $\$ 2.90$ |
| RG8B | Black 30mm High | $\$ 2.90$ |
| RG8BG | Grey 30mm High | $\$ 2.90$ |



Door Stays

| Part No. | Throw | Construction | Price |
| :--- | :--- | :--- | :--- |
| DS3P | LH or RH | Door Stay | $\$ 33.76$ |
| DS4R | RH Stainless Steel | Cover Stay | $\$ 35.94$ |
| DS4L | LH Stainless Steel | Cover Stay | $\$ 35.94$ |
| DS3PSS | LH or RH <br> Stainless Steel | Door Stay | $\$ 39.93$ |



Thumb Screws

| Part No. | Lth. | Diameter | Head | Price |
| :--- | :--- | :--- | :--- | :--- |
| TS25/6S | 25 | 6 | Slotted | $\$ 6.17$ |
| TS32/6S | 32 | 6 | Slotted | $\$ 6.17$ |
| TS38/6S | 38 | 6 | Slotted | $\$ 4.84$ |
| TS38/8S | 38 | 8 | Slotted | $\$ 4.84$ |
| TS38/8U | 38 | 8 | Un-Slotted | $\$ 4.84$ |
| TS50/8S | 50 | 8 | Slotted | $\$ 8.95$ |



Hinges - Pin Type

|  | Body Solid Brass Chrome Plated | Pin Stainless Steel |  |
| :--- | :--- | :--- | :--- |
| Part No. | Length | Construction | Price |
| HI50 | 50 mm | Flat End - Zinc Chrome | $\$ 4.84$ |
| HC50 | 50 mm | Flat End - Brass Chrome | $\$ 5.32$ |
| HI80 | 80 mm | Flat End - Zinc Chrome | $\$ 5.81$ |
| HC80 | 80 mm | Flat End - Brass Chrome | $\$ 5.81$ |
| HN80C | 80 mm | Flat End - Zinc Chrome | $\$ 5.81$ |
| HN80B | 80 mm | Flat End - Zinc Black | $\$ 5.81$ |
| HPL80R2 | 73 mm | Angled Flat End - Brass Chrome | $\$ 7.14$ |
| HLH50/4 | 50 mm | High/Low 4 mm - Brass Chrome | $\$ 7.14$ |
| HLH50/8 | 50 mm | High/Low 8 mm - Brass Chrome | $\$ 7.14$ |
| HLH80/4 | 80 mm | High/Low 4mm - Brass Chrome | $\$ 7.62$ |
| HLH80/8 | 80 mm | High/Low 8mm - Brass Chrome | $\$ 7.62$ |
| HC80SS | 80 mm | 80 mm Stainless Steel | $\$ 22.99$ |



Hinges - Butterfly

| Part No. | Length | Construction | Price |
| :--- | :--- | :--- | :--- |
| HB40 | 40 mm | 4 Hole | $\$ 5.28$ |
| HB50 | 50 mm | 4 Hole | $\$ 7.15$ |
| HB60 | 60 mm | 4 Hole | $\$ 9.35$ |
| HC64FR | 64 mm | Lift Off - Right | $\$ 11.00$ |
| HC64FL | 64 mm | Lift Off - Left | $\$ 11.00$ |



HB40/50/60
Large Hinge - Heavy Duty

| * 220 | Swing | * | Mild Steel Zinc - Silver Plated |  |
| :--- | :--- | :--- | :--- | :---: |
| Part Number | Swing | Construction | Price |  |
| HDH210L | Left | Heavy Duty | $\$ 19.97$ |  |
| HDH210R | Right | Heavy Duty | $\$ 19.97$ |  |

## Hinges - Concealed

- Screw On or Weld On

| Part No. | Length | Construction | Price |
| :--- | :--- | :--- | :--- |
| GE13 | 30 mm | Concealed Weld On | $\$ 6.66$ |
| H231 | 60 mm | Concealed Screw On | $\$ 12.95$ |
| H230 | 60 mm | Concealed Screw On | $\$ 18.15$ |
| H228 | 60 mm | Concealed Screw On | $\$ 15.73$ |
| H220 | 70 mm | Concealed Screw On | $\$ 18.15$ |
| H232 | 60 mm | Concealed Screw On Stainless Steel -304 | $\$ 33.28$ |






## Cam Locks

Fax: $61-7-3849-5344$ Wed, www doreelet comal

| Part No. | Description | Price |
| :--- | :--- | :--- |
| CL8K | Cam Lock H=18 | $\$ 11.37$ |
| CL16 | Cam Lock H=16 | $\$ 11.37$ |
| CL19 | Cam Lock H=19 | $\$ 11.37$ |
| CL616WK | Cam Wing Knob H=16 | $\$ 4.72$ |
| CO9L | Computer Cam Lock H=16 | $\$ 3.99$ |


CL19

## D Handles




CL16

Schedule 3


## Eye Bolts

## - Zinc Plated *Supplied with nuts

| Part No. | Eye Size | Thread | Price |
| :--- | :--- | :--- | :--- |
| *EYER12P | 19 mm | 12 mm | $\$ 13.43$ |
| EYE12SS | 19 mm | 12 mm Stainless Steel | $\$ 41.14$ |
| *EYER16P | 35 mm | 16 mm | $\$ 14.76$ |
| EYE16SS | 24 mm | 16 mm Stainless Steel | $\$ 72.60$ |
| *EYER20P | 26 mm | 20 mm | $\$ 20.81$ |

## Safe Working Loads

SWL Loading per Pair of Eye Bolts

## When used in the correct manner

| Nominal <br> Bolt Size | Axial <br> W.LL | Trunnion <br> MTG. | Perp/Lar <br> Loading | 30 Inc <br> Angle | 60 Inc <br> Angle | 90 Inc <br> Angle |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| $1 / 2$ | 0.32 | 0.08 | 0.16 | 0.40 | 0.20 | 0.16 |
| $5 / 8$ | 0.63 | 0.16 | 0.32 | 0.79 | 0.50 | 0.32 |
| 12 mm | 0.32 | 0.08 | 0.16 | 0.40 | 0.20 | 0.16 |
| 16 mm | 0.63 | 0.16 | 0.32 | 0.79 | 0.50 | 0.32 |
| 20 mm | 1.25 | 0.31 | 0.63 | 1.60 | 1.00 | 0.63 |



## Quarter Turns

| IP66 | $\mathbf{1 8}$ mm Body |  |
| :--- | :--- | :--- |
| Description | Part No. | Price |
| 7 mm Square Solid | SL7S | $\$ 13.31$ |
| 8 mm Square Solid | SL8S | $\$ 13.31$ |
| 8 mm Square Slotted | SL8SS | $\$ 13.31$ |
| 8 mm Triangle | SL8T | $\$ 13.31$ |
| 3 mm Pin Double Bit | SL8D3 | $\$ 13.31$ |
| 5 mm Pin Double Bit | SL8D5 | $\$ 13.31$ |
| 2 mm Enclosed Slot | SL8ES | $\$ 13.31$ |
| Wing Knob Tear Drop | SL8WK | $\$ 16.64$ |
| Key Action 92268 | SL8K | $\$ 13.31$ |
| Key Action 604 | SL8K/604 | $\$ 14.52$ |
| Wing Knob Small w/- Tongue H = 16 | CL616WK | $\$ 4.72$ |
| Square Key to suit | SL8SK | $\$ 4.48$ |
| Double Bit Key to Suit | SL8DK | $\$ 4.48$ |
| Triangle Key to Suit | SL8TK | $\$ 4.48$ |
| Enclosed Slot Key | SL8ESK | $\$ 4.48$ |
| 8mm Square Slotted w/- Sealable Flap | SL8SF | $\$ 15.13$ |

Schedule 3

## 30 mm Body

| SL30S7 | $\$ 21.30$ |
| :--- | :--- |
| SL30S | $\$ 21.30$ |
| SL30SS | $\$ 21.30$ |
| SL30T | $\$ 21.30$ |
| SL30D | $\$ 21.30$ |
|  |  |
| SL30ES | $\$ 21.30$ |
| SL30WK | $\$ 21.30$ |



Purwi prepmation: hols size

$7 \& 8 \mathrm{~mm}$ Square


8 mm Square Slotted


8 mm Triangle

$3 \& 5 \mathrm{~mm}$ Pin Double Bit


2 mm Enclosed Slot


Wing Knob
Tear Drop


Key Action


Square Slotted W/- Flap

## Quarter Turn Accessories

|  |  |  |
| :--- | :--- | :--- |
| Part No. | Description | Price |
| PP406 | Quarter Turn Dust Cover | $\$ 1.33$ |
| NL406 | Quarter Turn Lever | $\$ 1.33$ |

## Stainless Steel Quarter Turn IP66

|  |  |  |
| :--- | :--- | :--- |
| Part No. | Description | Price |
| SLSSSS/H26 | 8 mm Slotted Quarter Turn with Tongue | $\$ 63.80$ |

## Switchboard Key

| Part No. | Description | Trade Price |
| :--- | :--- | :--- | :--- |
| CS4 | Suit $1 / 4$ Turns - Square, Triangle, Double Bit, Slotted \& Phillips | $\$ 16.50$ |

## Tongue to suit Quarter Turn

## All Tongues are priced at \$ 2.12Each

| Single Point Cams |  |  | 3 Point Cams |
| :---: | :---: | :---: | :---: |
| Part No. | $\begin{aligned} & \hline \text { H Length } \\ & \text { To suit SL8 (18mm Body) } \end{aligned}$ | $\begin{array}{\|l\|} \hline \text { H Length } \\ \text { To suit SL30 (30mm Body) } \\ \hline \end{array}$ | $\begin{array}{\|l\|} \hline \text { H Length } \\ \text { To suit SL8 (18mm Body) } \\ \hline \end{array}$ |
| YL14 | 14 mm | 26 mm | Part No. |
| YL18 | 18 mm | 30 mm |  |
| YL18M | 18 mm Medium | 30 mm Medium |  |
| YL20 | 20 mm | 32 mm |  |
| YL20S | 20mm Short | 32mm Short |  |
| YL22 | 22 mm | 34 mm |  |
|  | 24 mm | 36 mm | S3BH24 |
| YL25 | 25 mm | 37 mm |  |
| YL25S | 25 mm Short | 37 mm Short |  |
| YL26 | 26 mm | 38 mm | S3BH26 |
| YL26S | 26 mm Short | 38 mm Short |  |
| YL28 | 28 mm | 40 mm |  |
| YL29S | 29 mm Short | 41 mm Short |  |
| YL32 | 32 mm | 44 mm |  |
| YL38 | 38 mm | 50 mm |  |
| YL39 | 39 mm | 51 mm |  |
| YL40 | 40 mm | 52 mm |  |
| YL44 | 44 mm | 56 mm | S3BH44 |
| YL50 | 50 mm | 62 mm |  |
| YL57 | 57 mm | 69 mm |  |
| YL62 | 62 mm | 74 mm |  |
| YLH18 | 18 mm Hooked | 30 mm Hooked |  |
| CAM2PL Heavy Duty Cam \$6.05 |  |  |  |



SL7 \& SL8


SL30


Trade Price List C-2012

## Swing Handle - Mini

- Vandal Proof
- Aluminium Construction
- IP65

| Part No. | Description | Price |
| :--- | :--- | :--- |
| MSHNL | Mini Swing Handle Non-Locking | $\$ 15.97$ |

Cams to suit:- CAM2PL \& Quarter Turn YL Tongues

## Flush Locks

| Part No. | Description | Price |
| :--- | :--- | :--- |
| FHV8C | Lockable Flush Lock Clockwise - 92268 Key | $\$ 26.02$ |
| FHV8CR | Lockable Flush Lock Clockwise/Random Key | $\$ 26.02$ |
| FHV8AC | Lockable Flush Lock Anti-Clockwise -92268 Key | $\$ 26.02$ |
| FHV8ACR | Lockable Flush Lock Anti-Clockwise/Random Key | $\$ 26.02$ |
| FL601L | Round Flush Lock With Cam H=25 | $\$ 14.64$ |



FHV8C/AC

## Drop "T" Handles

| Part No. | Description | Price |  |
| :--- | :--- | :--- | :--- |
| DT502LSSR | Drop "T" SS Lock With Cam/Random Key | $\$ 38.72$ |  |
| G502 | Gasket to suit DT502LSS | $\$ 1.33$ |  |
| G507 | Gasket to suit DT507LSS | $\$ 1.33$ |  |

## PVC Slide Lock

| Part No. | Length | Construction | Price |
| :--- | :--- | :---: | :--- |
| SL1P | 45 mm | PVC | $\$ 1.10$ |

Trade Price List C-2012
ectrical Switchboard OM Manua

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## Swing Handles - Chrome Plated - Keyed 92268

IP65
Key Locking 92268

Low Profile
Vandal Proof

| MSHK | Key Lockable Satin/Chrome | Size 0 | $\$ 30.00$ |
| :--- | :--- | :--- | :--- |
| SHBC | Key Lockable Satin/Chrome Clockwise | Size 1 | $\$ 79.86$ |
| SHBAC | Key Lockable Satin/Chrome Anti-Clockwise | Size 1 | $\$ 79.86$ |
| SHCC | Key Lockable Chrome Clockwise | Size 1 | $\$ 79.86$ |
| SHCAC | Key Lockable Chrome Anti-Clockwise | Size 1 | $\$ 79.86$ |
| SHAL | Chrome Universal Locking - 92268 | Size 1 | $\$ 79.86$ |

CAN USE SINGLE POINT AND 3 POINT LOCKING MECHANISMS


MSHK


SHBC

## Swing Handles - Removable Din Key Euro Cylinder Barrel

$\begin{array}{ll}\text { IP65 } & \text { Replaceable Key Barrel to Din } 18252 \\ \text { Key Locking } & \end{array}$

| SHCCL | Chrome Universal Locking -92268 | Size 1 | $\$ 79.86$ |
| :--- | :--- | :--- | :--- |
| SHCNL | Chrome Universal Non-Locking | Size 1 | $\$ 71.50$ |
| SHCK | Chrome Universal Locking -92268 | Size 2 | $\$ 79.86$ |
| SHCKNL | Chrome Universal Non - Locking | Size 2 | $\$ 71.50$ |
| SHKSS | Stainless Steel Universal Locking -92268 | Size 2 | $\$ 220.00$ |
| SHSSNL | Stainless Steel Universal Non-Locking | Size 2 | $\$ 198.00$ |
| SHBCL | Black Universal Locking - 92268 | Size 2 | $\$ 79.86$ |
| SHBNL | Black Universal Non-Locking | Size 2 | $\$ 71.50$ |
| CAN USE SINGLE POINT AND 3 POINT LOCKING MECHANISMS |  |  |  |

## Swing Handles - Padlockable

IP65

| SHAPGS | Chrome Padlockable - Short Shaft 38mm | Size 1 | $\$ 58.56$ |
| :--- | :--- | :--- | :--- |
| SHAPG | Chrome Padlockable | Size 1 | $\$ 58.56$ |
| SHCPD | Chrome Pin Padlockable | Size 2 | $\$ 79.86$ |
| SHPSS | Stainless Steel Padlockable -316 | Size 1 | $\$ 151.25$ |
| SHSSPD | Stainless Steel Pin Padlockable -316 | Size 2 | $\$ 210.00$ |

CAN USE SINGLE POINT AND 3 POINT LOCKING MECHANISMS
Schedule 3


SHAPGS


SHAPG


Swing Handles - Polvamide Black - Remorable Din Key Euro Cyinder Barrel
Schedule 3

| Key Lockable w/- Dust Cover <br> Replaceable Key Barrel to Din $\mathbf{1 8 2 5 2}$ <br> IP65 |  |  |
| :--- | :--- | :--- | :--- |

## Accessories

| KB12EBC | Key Barrel Blank Non-Locking suit Din Euro Cylinder | $\$ 19.80$ |
| :--- | :--- | :--- |
| KB12/92268 | Key Barrel Locking 92268 suit Din Euro Cylinder | $\$ 19.80$ |

## Swing Handles \& Accessories

Satin Chrome
Key Locking 92268
IP66
Push Button Release

| Part No. | Description | Price |
| :--- | :--- | :--- |
| SHFL | Mini Swing Handle Chrome - Size 1 | $\$ 79.86$ |
| SHFLCB | Mini Swing Handle Black - Size 1 | $\$ 79.86$ |
| SHFLC | Mini Swing Handle - Size 1 w/- Clockwise Fulcrum | $\$ 98.45$ |
| SHFLAC | Mini Swing Handle - Size 1w/- Anti-Clockwise Fulcrum | $\$ 98.45$ |

Fulcrum

| Part No. | Description | Price |
| :--- | :--- | :--- |
| LKM | Single Locking | $\$ 15.97$ |
| LKFAC | Rod Locking Right/Anti Clockwise | $\$ 18.63$ |
| LKFC | Rod Locking Left/Clockwise | $\$ 18.63$ |

Rods for Rod Locking

| Part No. | Description | Price |
| :--- | :--- | :--- |
| LR6 (2 of) | Rods Set 1200 mm | $\$ 11.75$ |
| LR9 (2 of) | Rods Set 1800 mm | $\$ 14.65$ |
| LR12 (2 of) | Rods Set 2400 mm | $\$ 17.31$ |

Roller Rods \& Adaptors

| Part No. | Description | Price |
| :--- | :--- | :--- |
| LRR6 \& RH1 (2 of) | Rods Set 1200mm | $\$ 28.45$ |
| LRR9 \& RH1 (2 of) | Rods Set 1800 mm | $\$ 31.72$ |
| LRR12 \& RH1 (2 of) | Rods Set 2400 mm | $\$ 34.98$ |

## Rod Guides

| Part No. | Description | Price |
| :--- | :--- | :--- |
| RG8 | Black 24mm High | $\$ 2.90$ |
| RG8B | Black 30mm High | $\$ 2.90$ |
| RG8BG | Grey 30mm High | $\$ 2.90$ |

Heavy Duty Cam

| Part No. | Description | Price |
| :--- | :--- | :--- |
| CAM2PL | Cam | $\$ 6.05$ |



Swing Handle - Compression Type

Black Powdercoat
Adjustable Compression Tongue Push Button Release

Random Keys IP65

Low Profile
Vandal Proof


DORE ELECTRICS
Industrial Electrical Components Suppliers

## Stainless Steel Hardware

Hinges - Pin Type

| Part No. | Length | Construction | Price |
| :--- | :--- | :--- | :--- |
| HC80SS | 80 mm | 80 mm Stainless Steel - 316 | $\$ 22.90$ |



Hinges - Concealed

| Part No. | Length | Construction | Price |
| :--- | :--- | :--- | :--- |
| H232 | 60 mm | Concealed Screw On Stainless Steel - 304 | $\$ 33.28$ |

## "L" Handle - Single Hole

| Part No. | Description | Price |
| :--- | :--- | :--- |
| LHQ7LSS | Lever Handle Universal Locking (1333Key) <br> 316 STAINLESS STEEL - w/- CAM H26 | $\$ 120.00$ |
| LHQ7PDSS | Lever Handle - Padlockable <br> 316 Stainless Steel - w/- Cam H26 | $\$ 120.00$ |



Quarter Turn IP66

| Part No. | Description | Price |
| :--- | :--- | :--- |
| SL8SSS/H26 | 8 mm Slotted Quarter Turn with Tongue | $\$ 63.80$ |



Door Stays

| Part No. | Throw | Construction | Price |
| :--- | :--- | :--- | :--- |
| DS3PSS | LH or RH | Stainless Steel | $\$ 39.93$ |

## Swing Handles

| SHPSS | Stainless Steel Padlockable -316 |  |  |
| :--- | :--- | :--- | :--- |
| SHKSS | Stainless Steel Universal Locking -92268 | Size 1 | $\$ 151.25$ |
| SHSSPD | Stainless Steel Pin Padlockable -316 | Size 2 | $\$ 220.00$ |
|  |  | Size 2 | $\$ 210.00$ |
| CAN USE SINGLE POINT AND 3 POINT LOCKING MECHANISMS |  |  |  |


| Drop ${ }^{66} \mathbf{T " ,}$ |  |  |
| :--- | :--- | :--- |
| Part No. | Description | Price |
| DT502LSS | Drop "T" SS Lock With Cam | $\$ 38.72$ |



## Eye Bolts

| Part No. | Eye Size | Thread | Price |
| :--- | :--- | :--- | :--- |
| EYE12SS | 19 mm | 12 mm Stainless Steel | $\$ 41.14$ |
| EYE16SS | 24 mm | 16 mm Stainless Steel | $\$ 72.60$ |

## Locking Mechanism

Stainless Steel 3 Point Locking Rods with Rollers

| Part No. | Description | Price |
| :--- | :--- | :--- |
| TLR12SS | 1200 mm Locking Rods with Rollers <br> - Comes with Cam | $\$ 68.20$ |
| TLR18SS | 1800 mm Locking Rods with Rollers <br> - Comes with Cam | $\$ 70.40$ |
| TLR24SS | 2400 mm Locking Rods with Rollers <br> - Comes with Cam | $\$ 77.00$ |



LOCKING RODS - W/- Rollers

## Power Man Junior Hydraulic Punch

Schedule 3
Power Man JR Kits

| Part No. | Kit Consist of the following | Price |
| :--- | :--- | :--- |
| HP1K1 | 1 Power Man JR Hydraulic Puncher Body <br> 5 Round Punch \& Dies - 11mm, 16mm,20mm, 25mm \& 32mm <br> 3 Piston Shafts - M6, M10 \& M14 \& 1 Carry Case | $\$ 2202.20$ |
| HP1K2 | 1 Power Man JR Hydraulic Puncher Body <br> 7 Round Punch \& Dies - 16mm, 20mm, 22.5mm, 25mm, 32 <br> 2 Piston Shafts - M10 \& M14 \& 1 Carry Case | 1 Power Man JR Hydraulic Puncher Body <br>  <br> 1 Piston Shafts - M10 \& 1 Carry Case |
| HP1K3 | $\$ 2981.44$ |  |
| HP1 | 1 Power Man JR Hydraulic Punch Body (Body Only) | $\$ 2087.25$ |

## Round Punch \& Die Sets to Suit Power Man JR

| Part No. | Price | Part No. | Price |  | Part No. | Price | Part No. |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| PD11 | $\$ 71.03$ | PD27 | $\$ 130.20$ | PD45 | $\$ 299.84$ | PD63 | $\$ 477.35$ |
| PD11 | $\$ 71.03$ | PD28 | $\$ 130.20$ | PD46 | $\$ 299.84$ | PD64 | $\$ 477.35$ |
| PD12 | $\$ 82.28$ | PD29 | $\$ 130.20$ | PD47 | $\$ 299.84$ | PD65 | $\$ 516.91$ |
| PD13 | $\$ 82.28$ | PD30 | $\$ 170.61$ | PD48 | $\$ 299.84$ | PD66 | $\$ 516.91$ |
| PD14 | $\$ 82.28$ | PD31 | $\$ 170.61$ | PD49 | $\$ 299.84$ | PD67 | $\$ 516.91$ |
| PD15 | $\$ 95.23$ | PD32 | $\$ 170.61$ | PD50 | $\$ 378.73$ | PD68 | $\$ 516.91$ |
| PD16 | $\$ 95.23$ | PD33 | $\$ 170.61$ | PD51 | $\$ 378.73$ | PD69 | $\$ 516.91$ |
| PD17 | $\$ 95.23$ | PD34 | $\$ 170.61$ | PD52 | $\$ 378.73$ | PD70 | $\$ 568.94$ |
| PD18 | $\$ 95.23$ | PD35 | $\$ 215.38$ | PD53 | $\$ 378.73$ | PD71 | $\$ 568.94$ |
| PD19 | $\$ 95.23$ | PD36 | $\$ 215.38$ | PD54 | $\$ 378.73$ | PD72 | $\$ 568.94$ |
| PD20 | $\$ 109.51$ | PD37 | $\$ 215.38$ | PD55 | $\$ 438.02$ | PD73 | $\$ 568.94$ |
| PD21 | $\$ 109.51$ | PD38 | $\$ 215.38$ | PD56 | $\$ 438.02$ | PD74 | $\$ 568.94$ |
| PD22 | $\$ 109.51$ | PD39 | $\$ 215.38$ | PD57 | $\$ 438.02$ | PD75 | $\$ 644.33$ |
| PD22.5 | $\$ 156.09$ | PD40 | $\$ 231.47$ | PD58 | $\$ 438.02$ | PD76 | $\$ 644.33$ |
| PD23 | $\$ 109.51$ | PD41 | $\$ 231.47$ | PD59 | $\$ 438.02$ | PD77 | $\$ 644.33$ |
| PD24 | $\$ 109.51$ | PD42 | $\$ 231.47$ | PD60 | $\$ 477.35$ | PD77 | $\$ 644.33$ |
| PD25 | $\$ 130.20$ | PD43 | $\$ 231.47$ | PD61 | $\$ 477.35$ | PD79 | $\$ 644.33$ |
| PD26 | $\$ 130.20$ | PD44 | $\$ 231.47$ | PD62 | $\$ 477.35$ | PD80 | $\$ 797.39$ |

Piston Shafts to Suit Round Dies

| Part No. | Description |  | Price |
| :---: | :---: | :---: | :---: |
| M6 | To Suit Punch \& D | 0 mm to 13 mm | \$46.59 |
| M10 | To Suit Punch \& D | 4 mm to 30 mm | \$51.18 |
| M14 | To Suit Punch \& D | 1 mm to 80 mm | \$91.48 |
| Square Punch \& Die Sets to Suit Power Man JR |  |  |  |
| Part No. | Price | Part No. | Price |
| PD20x20mm | - \$696.36 | PD40x40mm | \$1,270.50 |
| PD25x25mm | - \$830.91 | PD45x45mm | \$1,547.59 |
| PD30x30mm | - \$983.49 | PD50x50mm | \$1,738.77 |
| PD35x35mm | - \$1,096.62 | * Comes w/- P |  |

## Piston Shafts to Suit Square Dies

| Part No. | Description | Price |
| :--- | :--- | :--- |
| M10 x M14 | To Suit Square Punch \& Dies 20mm to 50mm | $\$ 296.81$ |

## Centre Shafts to Suit Power Man Jr

| Part No. | Description | Price |
| :--- | :--- | :--- |
| NO19S | Small to suit Grey Machine - Fine Tooth | $\$ 308.55$ |
| NO19L | Large to suit Green Machine - Course Tooth | $\$ 308.55$ |

## Hydraulic Pumps

| Part No. | Description | Detail | Pump <br> Release <br> Pressure | Price |
| :--- | :--- | :--- | :--- | :--- |
| CP700 | Hand Pump | 2 Stage Speed Action, with 2 Mtr Hose | $10,000 \mathrm{psi}$ | $\$ 1005.51$ |
| CFP8001 | Foot Pump | 2 Stage Speed Action, with 2 Mtr Hose | $10,000 \mathrm{psi}$ | $\$ 1118.04$ |
| CTE 25A | Motor Driven Pump | 240 V AC Single Phase, 2 Stage Speed Action, <br> with 2 Mtr Hose | $10,000 \mathrm{psi}$ | $\$ 5868.50$ |




## Bus Bar Puncher

| Part No. | Description | Price |
| :--- | :--- | :--- |
| CH60 | Hydraulic Bus Bar Puncher <br> Capacity Thickness 12mm Copper \& 12mm Aluminium <br> Throat Depth 70mm Punch \& Dies 9, 11 \& 13mm | $\$ 4362.05$ |

Spare Punch \& Dies for CH60 - Copper \& Aluminium

| Part No. | Description | Price |
| :--- | :---: | :---: |
| PD7CH | $7 \mathrm{~mm} \mathrm{P/D}$ | $\$ 193.60$ |
| PD9CH | $9 \mathrm{~mm} \mathrm{P/D}$ | $\$ 193.60$ |
| PD11CH | $11 \mathrm{~mm} \mathrm{P/D}$ | $\$ 199.65$ |
| PD13CH | $13 \mathrm{~mm} \mathrm{P/D}$ | $\$ 208.12$ |
| PD16CH | $16 \mathrm{~mm} \mathrm{P/D}$ | $\$ 217.80$ |

Bus Bar Bender

| Part No. | Description |  | Price |
| :--- | :--- | :--- | :--- |
| CB200 | Hydraulic Bus Bar <br> Bender | Suitable for Copper \& Aluminium <br> thickness 13mm - Width 200mm | $\$ 4192.65$ |

## Bus Bar Cutter

| Part No. | Description |  | Price |
| :--- | :--- | :--- | :--- |
| CWC210 | Hydraulic Bus Bar <br> Cutter | Suitable for Copper \& Aluminium <br> thickness 13mm - Width 200mm | $\$ 4477.00$ |



## Hydraulic Steel Puncher - Needs Hydraulic Pump

| Part No. | Consist of: | Price |
| :---: | :---: | :---: |
| CC1041 | 1 Hydraulic Steel Hole Punch - Punch Capacity 3.2mm Mild Steel | \$1470.15 |
|  | 2 Piston - 1 Small \& 1 Large |  |
|  | 6 Punch \& Dies $16 \mathrm{~mm}, 20 \mathrm{~mm}, 23 \mathrm{~mm}, 25 \mathrm{~mm}, 30 \mathrm{~mm}$ \& 50 mm |  |
| DSSCC | Small Draw Stud to suit CC104I | \$48.40 |
| DSLCC | Large Draw Stud to suit CC104I | \$119.79 |
| R7 | Piston to Suit PD90SQ for CC104I | \$179.08 |
| PD16CC | 16mm Round Punch \& Die to suit CC104I | \$159.72 |
| PD20CC | 20mm Round Punch \& Die to suit CC104I | \$159.72 |
| PD23CC | 23mm Round Punch \& Die to suit CC104I | \$169.40 |
| PD25CC | 25 mm Round Punch \& Die to suit CC104I | \$208.12 |
| PD30CC | 30mm Round Punch \& Die to suit CC104I | \$256.52 |
| PD50CC | 50mm Round Punch \& Die to suit CC104I | \$399.30 |
| PD68SQ | $68 \times 68 \mathrm{~mm}$ Square Punch \& Die to suit CC104I | \$1310.43 |
| PD90SQ | $90 \times 90 \mathrm{~mm}$ Square Punch \& Die to suit CC104I | \$1454.42 |
| DSICC | Thread Insert | \$48.40 |

Hydraulic Accessories

| Part No. | Description | Price |
| :--- | :--- | :--- |
| SMV2 | 2 Way Valve | $\$ 1270.50$ |
| SMV3 | 3 Way Valve | $\$ 1875.50$ |
| CH2 | 2 Mtr Hose | $\$ 175.45$ |
| CH3 | 3 Mtr Hose | $\$ 239.58$ |
| CH5 | 5 Mtr Hose | $\$ 367.84$ |

## PX2 Piston Shafts

| Part No. | Description | Price |
| :--- | :--- | :--- |
| PXM1/4 | $3 / 8 \times 1 / 4$ | $\$ 58.08$ |
| PXM3/8 | $3 / 8 \times 3 / 8$ | $\$ 62.92$ |
| PXM3/4 | $3 / 8 \times 3 / 4$ | $\$ 131.89$ |

## Hydraulic Pumps

| Part No. | Description | Detail | Pump <br> Release <br> Pressure | Price |
| :--- | :--- | :--- | :--- | :--- |
| CP700 | Hand Pump | 2 Stage Speed Action, with 2 Mtr Hose | $10,000 \mathrm{psi}$ | $\$ 1005.51$ |
| CFP8001 | Foot Pump | 2 Stage Speed Action, with 2 Mtr Hose | $10,000 \mathrm{psi}$ | $\$ 1118.04$ |
| CTE 25A | Motor Driven Pump | 240 V AC Single Phase, 2 Stage Speed <br> Action, with 2 Mtr Hose | $10,000 \mathrm{psi}$ | $\$ 5868.50$ |
|  |  |  |  |  |
|  |  |  |  |  |
| CP700 |  |  |  |  |

## Double Sided Tape

| Part No. | Width | Material | Colour | Thickness | Length per Roll | Price |
| :--- | :--- | :--- | :--- | :--- | ---: | ---: |
| DST60985/6 | 6 mm | Tissue | Clear | 0.10 mm | 50 Mtrs | $\$ 11.33$ |
| DST60985/12 | 12 mm | Tissue | Clear | 0.10 mm | 50 Mtrs | $\$ 11.97$ |
| DST4934/12 | 12 mm | Cloth | Cream | 0.28 mm | 23 Mtrs | $\$ 10.20$ |
| DST4934/18 | 18 mm | Cloth | Cream | 0.28 mm | 23 Mtrs | $\$ 13.60$ |
| DST4934/24 | 24 mm | Cloth | Cream | 0.28 mm | 23 Mtrs | $\$ 17.01$ |
| DST4934/48 | 48 mm | Cloth | Cream | 0.28 mm | 23 Mtrs | $\$ 34.00$ |
| DST4965/12 | 12 mm | Red Film | Clear | 0.21 mm | 50 Mtrs | $\$ 53.99$ |
| DST4965/18 | 18 mm | Red Film | Clear | 0.21 mm | 50 Mtrs | $\$ 71.98$ |
| DST4970/12 | 12 mm | PVC Film | White | 0.23 mm | 33 Mtrs | $\$ 31.68$ |
| DST4970/18 | 18 mm | PVC Film | White | 0.23 mm | 33 Mtrs | $\$ 42.23$ |
| DST4974/12 | 12 mm | Cloth | White | 0.37 mm | 22 Mtrs | $\$ 22.10$ |
| DST4952/12 | 12 mm | Pur-Foam | White | 1.20 mm | 50 Mtrs | $\$ 56.75$ |
| DST4952/18 | 18 mm | Pur-Foam | White | 1.20 mm | 50 Mtrs | $\$ 75.66$ |
| DST4952/24 | 24 mm | Pur-Foam | White | 1.20 mm | 50 Mtrs | $\$ 94.58$ |
| DST62936/18 | 18 mm | Pur-Foam | White | 1.60 mm | 25 Mtrs | $\$ 49.18$ |

## Packing Tape - Brown

| Part No. | Width | Length per Roll | Price |
| :--- | :--- | :--- | :---: |
| PT60653/24 | 24 mm | 75 Mtrs | $\$ 2.30$ |
| PT4262/36 | 36 mm | 75 Mtrs | $\$ 2.59$ |
| PT4262/48 | 48 mm | 75 Mtrs | $\$ 3.51$ |

## Masking Tape - General Purpose - Cream

| Part No. | Width | Length per Roll | Price |
| :--- | :--- | :--- | :---: |
| MT4307/12 | 12 mm | 50 Mtrs | $\$ 2.55$ |
| MT4323/19 | 19 mm | 50 Mtrs | $\$ 2.92$ |
| MT4323/25 | 25 mm | 50 Mtrs | $\$ 3.88$ |
| MT4323/38 | 38 mm | 50 Mtrs | $\$ 5.83$ |
| MT4323/50 | 50 mm | 50 Mtrs | $\$ 7.78$ |

Outdoor Masking Tape

| MT4840/50 | 50 mm | 50 Mtrs | $\$ 13.72$ |
| :--- | :--- | :--- | :--- |

## Taptites - Thread Forming Screws - Self Tapping Metric Screws Schepule 1

Minimum Pack Quantity = 1000

| Part No. | Size | Finish | Drill Size | Price per 1000 |
| :--- | :--- | :--- | :--- | ---: |
| TT36 | M3 X 6 | Zinc 5 | 2.71 mm | $\$ 89.18$ |
| TT410 | M4 X 10 | Zinc 5 | 3.6 mm | $\$ 93.17$ |
| TT513 | M5 X 13 | Zinc 5 | 4.5 mm | $\$ 146.41$ |
| TT613 | M6 X 13 | Zinc 5 | 5.41 mm | $\$ 202.07$ |
| TT616 | M6 X 16 | Zinc 5 | 5.41 mm | $\$ 214.17$ |

## Large Shallow Head

| Part No. | Size | Finish | Drill Size | Price per 1000 |
| :--- | :--- | :--- | :--- | ---: |
| TT510S | M5 X 10 | Zinc 5 | 4.5 mm | $\$ 139.76$ |
| TT515S | M5 x 15 | Zinc 5 | 4.5 mm | $\$ 146.41$ |

## IP RATINGS CHART



| PROTECTION AGAINST LIQUIDS |  |  |
| :---: | :---: | :---: |
|  | TEST | PROTECTION |
| x | No test applied | No specific protection. |
| 0 | No test applied | Inherent degree of protection. |
| 1 |  | Protected against drops of water falling vertically. |
| 2 |  | Protected against drops of water falling at up to $15^{\prime \prime}$ from the vertical. |
| 3 |  | Protected against spraying water at up to $60^{\circ}$ from the vertical. |
| 4 |  | Protected against splashing water from all directions. |
| 5 |  | Protected against jets of water from all directions. |
| 6 | $2510$ | Protected against jets of water of similar force to heavy seas. |
| 7 |  | Protected against the effects of immersion. |
| 8 |  | Protected against the effects of submersion. |



## Standard Conditions

Unless otherwise agreed by us in writing, these conditions shall apply to the exclusion of all other terms, conditions and warranties, express or implied, to the extent that such other terms, conditions and warranties are inconsistent herewith.

Unless otherwise agreed by us in writing, all prices stated will be subject to adjustment to prices ruling at the date of despatch of the goods. Prices do not include GST and all items supplied will be subject to an additional charge at the appropriate rate to cover the amount imposed by Tax unless a signed statement detailing GST Exemption number is received with the order.

Claims for loss or damage must be made in writing within 10 working days after receipt of goods or despatch advice.

We reserve the right to increase the quantities of any particular item ordered to the unit quantity and to supply in the multiples of the unit quantity and invoice accordingly.

Goods supplied can be returned only if our permission is first obtained in writing. Permission will only be considered if the goods are those which we regularly carry in stock. The amount of credit allowed will be governed by the facts of each individual case.

In lieu of warranty, conditions of liability implied by law, our liability in respect of any defect in or failure of the goods supplied or for any loss, injury or damage attributable hereto is limited to the supply of new goods or the repair of defective goods provided that:-
(a) The goods have been installed and used properly; and
(b) The goods are returned to us at our cost if so requested; and
(c) These conditions shall apply to the repaired or replaced goods; and
(d) The defects arise out of faulty design or the use of faulty materials or poor workmanship on our part which is notified to us within 12 months of the date of despatch to you.

## GOODS RETURN CONDITIONS

1. All returns must be approved by Dore Electrics and a GRA Number issued before goods are returned.
2. All returns must be in original packaging and in re-saleable condition.
3. Any product that has been ordered in as a special request is not returnable.
4. All claims are to state Invoice No. and date of purchase.
5. All claims are to state Part Numbers \& Qty's.
6. Once GRA has been issues you will have 14 days to return goods.
7. Goods returned within 30 days of purchase

Goods returned within 31-60 days of purchase

- No Restocking Fee

Goods returned within 61-90 days of purchase
Goods beyond 90 days of purchase
10\% Restocking Fee
20\% Restocking Fee

- Not Returnable


## If goods are returned without meeting the above criteria they will be returned to you at your expense



# Auto Zero M300 Electromagnetic Flowmetering System Operation and Installation Manual 

(Revision 3: April 2009)

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Rev 3: April 2009
COMBINEDINSTRUMENT SYSTEMS
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## How to Get Further Assistance

If further assistance is required please contact your nearest Goyen office at the following addresses or your local distributor (see our web site for details: www.cleanairsystems.com).


When contacting Combined Instruments always have the following information available:

## M300 Flowmetering System

Instrument Serial Number
Instrument Part Number
Instrument Name and Model
Power supply, voltage and frequency

This information is found on the rating plate of each instrument.

A Product Return Form can be found at the back of this manual.

## General Description

Congratulations on your purchase of your Australian designed and manufactured Emflux M300 Electromagnetic Flowmeter. The M300 Transmitter is a microprocessor based instrument designed for ease of use and configuration. The M300 has been pre-configured and calibrated to your requirements in our calibration laboratories. However re-ranging and setup may be carried out on site using the front panel display and push buttons or by connecting a PC to the communication port. The menu system has been designed to be user friendly for ease of configuration on site.
All Emflux flowmeter heads will be fitted with a tag detailing calibration details to enable configuring of the M300 Transmitter. These details are obtained from wet calibrations carried out in flow laboratory.
In the event of any problem please contact your nearest Combined Instrument Systems representative or, if more convenient, please do not hesitate to consult our head office technical staff.

Always provide the serial number of your particular system which is located on a label mounted on the transmitter. If more accessible, similar information may be obtained from the Flowmeter Detector Head label.

On taking delivery of your M300 Flowmetering System and prior to installation and operation, we ask you to ensure that you are conversant with the facilities available and precaution to be taken by studying the contents of this manual.
Your Emflux M300 Flowmetering System consists of an electromagnetic detector head (flow tube) which is to be located in the pipework and an electronic amplifier (transmitter).
Many auxiliary instruments may be connected to the M300 Amplifier, for example, chart recorders, flow indicators, etc.

## Important Storage and Installation Points

In order to ensure satisfactory operation of your Emflux M300 Flowmetering System and to avoid the possibility of rendering the guarantee null and void, please ensure that you comply with the following points.

- When stored or installed the flowmeter head cable terminations must be adequately sealed to avoid the ingress of moisture which could lead to internal damage. Similar precautions should be taken with the containing case glands of the wall mounted weatherproof amplifier.
- Ensure that the transmitter enclosure is sealed and that the unit is stored in a dry environment if it is not to be put into service immediately upon receipt.
- If the flowmeter head is of the submersible type and the cables are not potted, ensure that the cables entering the head terminal compartment are compatible with the glands provided.
Failure to observe this precaution may lead to poor sealing and the ingress of moisture or, in the worst event, flooding of the head interior.
- Ensure that your power supply is compatible with the M300 flowmetering system.
- Your flowmeter head is provided with an insulating lining which extends over the flange faces. Do not drag or roll the unit on its end flanges.
- The lining of the flowmeter head is provided to resist corrosion and has been selected to suit the media passing through the bore. While calibration of your M300 system will not change for other media, care should be taken to ensure that the particular lining material is compatible with any change of media. If in doubt contact your nearest representative.
- The lining of your flowmeter head is electrically insulating to provide correct operation, it does not act as a gasket. you must provide gaskets between the flowmeter lining and the adjacent pipework.
- Locate your flowmeter head in a position such that it remains full of liquid at all times.
- The screened signal cable to your flowmeter head should preferably be run in a conduit or trunking reserved entirely for its use. Under no circumstances should the signal cable be run in close proximity to power cables.
- The media at either end of your flowmeter head must be adequately earthed either by direct means of the pipework, if this is electrically conducting, or by the use of earth discs or earthing electrodes. Earthing electrodes cannot be added once the head is manufactured.
- Do not lift or support your flowmeter head by its case. Use eye bolts or lift from the tube neck using sling and spreader.
- Your flowmeter head has been designed to carry its own weight from the end flanges and thus the adjacent pipework. If supports are required these should locate on the flanges.
- If the media passing through the flowmeter head is particularly abrasive the use of a contra flange on the upstream flange is recommended to prevent damage to the leading edge of the lining.
- If your flowmeter head is provided with a PTFE lining material the protective flange plates should not be removed until the unit is installed. Upon installation ensure that both flanges are clamped symmetrically to avoid distortion of the lining.


## Installation

## Mechanical Installation of Transmitter

Check the Flow Test certificate supplied with the meter to ensure the Detector Head (Primary) and the Transmitter (Secondary) have the correct serial numbers. The serial number on the Flow Tube and the serial number on the Transmitter will not necessarily be the same.
Careful consideration to the initial mechanical installation of the amplifier will provide many benefits ensuring ease of access to cable terminations and internal controls.
The transmitter may be surface or panel mounted, refer to Appendix 2 for panel cutout details.
The M300 Transmitter is provided with five gland entries. If however, fewer than five glands are used, extreme care should be taken to ensure that the unused entries are adequately sealed.
Always ensure that the Transmitter enclosure is sealed when the unit is unattended.

## Installation of the Detector Head

The detector head may be installed at any angle but it is important to ensure that it is completely filled with liquid whilst in use. It is therefore advisable to place the tube in a position where the pipe line is always full, such as a rising main, or when there is no risk of sedimentation, the bottom of a 'U' bend.

When the detector head is mounted in the horizontal, the termination box must be on top. A flow direction arrow is provided to indicate the direction of flow during calibration and to ensure that the terminations are as per the wiring diagram found at the rear of this manual. If installed in this manner there will be no requirement to reverse wires for correct operation. For correct operation it is essential for the flowing liquid to be earthed at both ends of the detector head. The following methods of earthing are available:
Connection to adjacent metallic pipework is fully acceptable providing such pipework does not contain an electrically insulating lining, for example, bitumen. Earth straps are recommended between the pipework flanges and the flowmeter flanges particularly when flexible self sealing couplings are used. Flange bolts do NOT always provide good electrical earth connections between metallic flanges.

If the adjacent pipework is not electrically conducting or is lined with an electrically insulating material, then earth rings or electrodes must be used. These earth rings must be strapped to the detector head Flanges at either end. In the case of earth electrodes there is no need for further termination as this is carried out at the time of manufacturing.
While your detector head is provided with an Insulating lining extending over the flange faces, this does NOT form a gasket. When installing the detector head, gaskets must be provided between the Flowmeter lining and the adjacent pipework flanges. In the case of earth rings or discs, these should also be installed with a gasket either side.
Particular care should be taken to ensure that entrained air cannot accumulate in the flowmeter or be swept through it from surrounding pipework, manifolds, etc. Wherever possible the flowmeter electrodes should be mounted in the horizontal plane. With abrasive slurries, vertical mounting is recommended to ensure even distribution of wear in the lining material. If the slurry is of a particular abrasive material, the use of a contra flange on the upstream flange is recommended to prevent damage to the leading edge of the lining. This contra flange is also used in place of one earth ring or disc.
In order to obtain a smooth flow profile and remove turbulence or swirling flow at the flow meter head, sharp bends and valves used to control the flow should not be placed closer than five pipe diameters from the upstream flange.

Small disturbances to flow, such as may be caused by straight through valves, minor bends and 'T' junctions carrying less than $20 \%$ of the flow, will have minimal affect on the performance providing they are no closer than three pipe diameters from the upstream flange.


Little affect will be observed by the presence of bends etc on the downstream flange of the detector head. Where reducers are used, steep tapers of greater than $30^{\circ}$ should be avoided.

Valves should not be placed immediately adjacent to the detector head, however for subsequent removal of the detector head, should this ever be necessary, some thought should be given to the manner in which it may be isolated. For dimensions of the detector heads reference should be made to the relevant outline diagram found at the end of this manual.
Note:
Some government authorities have strict requirements for flowmeter installation that may overrule the above advice. Be certain to consult local authorities prior to commencing installation.

Cables between the Detector Head and converter should be run in conduits for protection, and then up the inside of the converter mounting post. Separate conduits are needed for coil supply, signal and accessories.

## Earthing of Detector Head

## IR2060 Only

While your Emflux flow tube detector head is provided with an insulating lining extending over the flange faces, this does NOT form a gasket. When installing the detector head, gaskets must be provided between the flowmeter lining and the adjacent pipework flanges. In the case of earth rings or discs, these should also be installed with a gasket either side.

For correct operation it is essential for the flowing liquid to be earthed at both ends of the detector head. Connection to adjacent metallic pipework is fully acceptable providing such pipework does not contain electrically insulating lining, for example: bitumen. Earth straps are recommended between the pipework flanges and the flowmeter flanges particularly when flexible self sealing couplings are used. Flange bolts do not always provide good electrical earth connections between metallic flanges.


If adjacent pipework is not electrically conducting or is lined with an electrically insulating material, then earth rings or earth electrodes must be used. These earth rings must be strapped to the detector head flanges at either end. In the case of earth electrodes there is no need for further termination as this is carried out at the time of manufacture.


## ABS Plastic Detector Heads and Detector Heads Fitted with Optional Earth Electrodes

For ABS plastic detector heads there is no need for the installation of earth rings or the need to earth the mating pipe flanges as all ABS Plastic detector heads are fitted with earthing electrodes. This is also the case for detector heads that have the optional earth electrodes fitted.

## Submergence/Burial

Note that both the IR2020 and IR2060 are suitable for direct burial of the detector head. Be certain that their location is suitably marked or noted to avoid damage due to subsequent digging or trenching operations.
They may also be submerged under water if required. In the case of the IR2060 this may be up to a depth of 10 metres and for the IR2020 up to 1.5 metres.

## Electrical Installation

The M300 Transmitter will be supplied as either a Mains powered unit (Model M300-M****) which can be powered by either Mains Power $85-265 \mathrm{VAC} @ 50 \mathrm{~Hz}$, or low voltage 24VDC. Alternatively it may have been supplied as a low voltage only unit (Model M300-L****) which can only be powered by a low voltage 24V DC supply. Low voltage units cannot be wired to AC supply. Before connecting the power supply check all documentation to confirm the correct power supply option has been specified for the Transmiiter unit.
To access the terminal strip for the electrical connections, loosen the four screws and remove the dark grey terminal cover. The layout of the terminals are as detailed in the following diagram. Removal of the terminal cover and electrical installation should only be carried out by suitably qualified personnel.

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## M300 Transmitter Terminal Layout



## Transmitter Termination Strip



## Mains Supply Wiring (Optional)

Ensure that all unused glands are sealed to prevent the ingress of moisture.
Connect mains power, if supplied as a mains supply unit, to the mains terminals as detailed below:


Use wiring practices that conform to local codes. The ground terminal grounds the instrument which is mandatory for safe operation.

## 24Volt Supply (Fully Isolated DC)

As an alternative to powering the M300 from the mains, low voltage supply terminals have been provided to enable the use of 24 Volts DC to power the unit. The following diagram details the terminations for the 24 Volt supply.

## 24 Volt Supply Termination



The M300 Transmitter may be powered either by mains power or by 24 Volts DC. Do not connect both.

## Detector Head Wiring

Two cables are to be used for the wiring between the detector head and the M300 Transmitter. One three-core cable having three $14 / 0.2 \mathrm{~mm}$ cores and provided with an overall braided screen must be used for the connection of the detector head Electrodes to the M300 Transmitter. (Note lapped screening is NOT satisfactory), and

One three-core cable from the pulse power supply (located in the M300 Transmitter) to the detector head. This cable is to be $1.5^{2} \mathrm{~mm}$ cable for runs up to 100 Metres. Refer to the wiring diagram below for details of the terminations.
The cables entering the detector head must be made by way of a gland to ensure that there is no ingress of moisture. In the case of submerged or buried meters, the termination box must be fully potted.

## M300 to Detector Head Termination



## Key to wiring diagram

## Coil colours/numbers

6 = yellow/green
7 = red
8 = black
1 = green and shield
2 = red
3 = blue
MT = yellow
Note:
The flow tube head junction box may be fully potted. Alternatively, unpotted meters may require wiring termination at both the the flow tube and transmitter ends.
If the unit has been fitted with a Pipe Not Full Electrode (PNF) - there will be an extra terminal connecter (labelled MT) in addition to the standard 6 way terminal block at the detector junction box.

## Detector Head Terminal Strip



## Detector Head Potted Termination



Pipe Not Full Detection (Optional)
If your flowmeter was ordered with the optional 'Pipe Not Full Detection' option there will be one additional termination between the head and the M300 Transmitter. A conductor must be connected between the 'MT' terminal of the head and the 'MT' terminal of the transmitter.

If the meter has been supplied with cable fitted at the factory, there will be an additional cable (the same cable as the signal cable) with all but the yellow wire tucked back to the end of the outer insulation. This conductor is the pipe-not-full-conductor.
In the case of these meters, the yellow conductor in the pipe-not-full cable must be connected to the 'MT' terminal of the transmitter.

This option is used to detect if the pipe is $100 \%$ full or something less than this value and may be used to determine if the flow signal is of valid value or not. In the majority of applications this option is not necessary as flowmeters are generally installed in locations where the pipe remains full at all times.

## Analogue Outputs 4-20mA

The M300 Transmitter has one $4-20 \mathrm{~mA}$ output as standard and may be fitted with a second $4-20 \mathrm{~mA}$ output. Each of these outputs are capable of driving into loads of up to 1000 ohms. An explanation on configuring these outputs may be found later in this manual. For details on their terminations, refer to the following diagrams.
4-20mA Output No. 1 (Standard)


4-20mA Output No. 2 (Optional)


## Digital Outputs (Open-Collector)

The M300 Transmitter is supplied with two (2) digital outputs. These outputs are isolated opencollector transistors. A 24VDC power supply has been provided on terminals on each side of the terminations for the open-collector transistors. The maximum rating of the open-collector transistors is 100 mA and if an external power supply is used this must not exceed 60VDC.

These outputs have been specifically designed to drive electro-mechanical counters and may also be used as frequency outputs. If these outputs are selected as frequency outputs then the output would have a $50 \%$ duty cycle, if selected as a pulse output, the pulse width would be set to 25 milliseconds.

An example of termination using the internal supply and external supply is detailed in the following sketches.

## Digital Output 1:



Digital Output 2:


## Relay Outputs

Two (2) relay outputs are provided as standard with an option provided an additional two (2) relays. Each relay output provides one (1) voltage free changeover contact. These contacts are identified by the relay number and NO, C and NC identifying the Normally Open, Common and Normally Closed contacts. The diagram below details these terminations.

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## Relays 1 \& 3:



## Relays 2 \& 4:



The contacts are rated as follows:
1 Amp @ 30VDC
0.5 Amps @ 125VAC
0.3 Amps @ 60VDC

These relays may be sourced with the 24VDC supply provided for the digital outputs, identified as $\mathrm{V}+$ and V -, however, this supply is only able to provide a maximum of 1 Amp. Exceeding this value may cause damage to the power supply.
NOTE: The 24VDC power supply provided at terminals $\mathrm{V}+$ and V - has a maximum rating of 1 Amp in total. Please ensure that the Digital Outputs and Relay Outputs combined load does not exceed this value if using this supply. If powered from a 24VDC supply consideration must also be given to the maximum power that this supply can provide.

## Configuration

The M300 is configurable via the three (3) push buttons found on the front display panel. All parameters are pre-configured in our flow laboratory prior to shipping, however parameters such as relay setpoints, etc, may be altered on site to meet your requirements.

To assist in navigating through the menus you will find a flow chart in Appendix A of this manual.

## Keyboard Up Arrow Button

The 'Up Arrow Button' is used to move up through the menu system. It is also used to step through the sub $\neg$ menus and to increment the value currently being displayed once it has been selected.

## Down Arrow Button

As with the Up Arrow Button, the 'Down Arrow Button' allows movement through the menus and sub-menus only in the opposite direction. It also allows the user to decrement the currently displayed value once it has been accepted.

## Tick Button



The 'Tick Button' has several functions. Depressing this button whilst in the display mode will transfer the user to the configuration menu where the user will be asked for a PIN (Personnel Identification Number). Once in the configuration menu the Tick Button is used to enter the displayed menu item or to accept the displayed numerical value. You will note that an asterisk (*) is displayed alongside the currently configured menu selection or value.

TIP: If you have entered into a menu that you do not wish to change, simply move to the item or numerical value, using the Up or Down buttons, that has the asterisk (*) along side it and again depress the Tick Button.

## Exiting the Configuration Menu



To Return to the display menu simply depress both the Up and Down Arrow buttons simultaneously. The M300 will also return to the display menu automatically if no button is depressed for five minutes. For ease of configuration, if the configuration menu is re-entered within the five minutes the user will be returned the last displayed configuration menu item.

## Display Menu

## Forward Flow Display

The display menu enables the operator to view current information relating to the flow and configuration of the flowmeter.
The default display indicates the flow rate on the upper line of the display and the totalised units on the lower line of the display. The flow rate is displayed with the configured units following the actual flow rate (eg, $123.45 \mathrm{l} / \mathrm{sec}$ ). The totalised value is displayed as a numerical value followed by the configured units. The units will also cycle to not only display the units but also the factor and the direction (eg, $12345678 \mathrm{kl}, 12345678 \times 10,12345678$ FWD).

Note that the FWD is only displayed if reverse flow has been configured with the FWD representing the forward flow totaliser.

## Reverse Flow Display

Using the Down Arrow Button will display the next display item. This display would indicate the current flow rate on the upper line as for the above display and the reverse flow totaliser on the lower line. The display method is identical as for the forward flow display with the exception that the totaliser would cycle to indicate a REV representing the reverse flow totaliser. This display is only available if reverse flow has been enabled in the configuration of the M300 Transmitter.

## Nett Totaliser Display

This display is used to display the difference between the forward flow totaliser and the reverse flow totaliser. The upper line of the display will display the words Nett Total with the lower line displaying the numerical value for nett flow. This display is only available if reverse flow and nett flow is enabled in the configuration menu.

## Velocity Display

The velocity display again displays the flow rate on the upper line of the display with the lower line displaying the measured velocity based on the nominal bore of the flowmeter. The velocity is displayed in either $\mathrm{m} / \mathrm{sec}$ (meters per second) or $\mathrm{ft} / \mathrm{sec}$ (feet per second) and is depended on the configured units. ie if a metric value of measurement is used for indicating the flow rate (e.g. l/sec) then the display will be in $\mathrm{m} / \mathrm{sec}$ however if an imperial unit is used (e.g. gpm) then the display will be in $\mathrm{ft} / \mathrm{sec}$.

## Analogue Output Display

This display uses the upper and lower lines to indicate the current value of the analogue outputs. This display is in actual mA.

## Digital Output Display

This screen displays the current value of the digital outputs. If the output has been configured as a frequency output then the current output value is displayed in Hz . However, if Volume/Pulse has been selected then the display simply flashes the word 'Vol/Pulse' for that output. Line one(1) is used to display output 1 whilst line two(2) displays output 2.

## Relay Outputs Display

The flow rate is displayed on the upper line with the current status of the relays displayed on the lower line. The status of the relays is displayed as R\#, with \# representing the relay number, if the relay is currently energised and three (3) dashes if the relay is de-energised. This display is valid for relays that are configured as a status. The following example shows a display with relays one (1) and three (3) energised with relays two (2) and four (4) de-energised:

## Example:

$$
1234.56 \mathrm{I} / \mathrm{sec}
$$

R1 --- R3 ---

## Configuration Menu

To enter the configuration menu simply depress the Tick Button as explained earlier in this manual. Here, the user will be able to use the up and down arrow buttons to scroll through the menu items. These menu items are only accessible once a Personnel Identification Number (PIN) has been entered.

To gain access to the displayed menu item, depress the Tick Button, this will allow the use of the Up and Down Arrow buttons to scroll through the available menu items or to increment or decrement the stored numerical value.
To accept the displayed value, depress the Tick Button again which will place an asterisk (*) along side the selection and enable the Up and Down Arrow buttons to again scroll through the menu items.
To exit the configuration menu depress the Up and Down Arrow buttons simultaneously.
Following is a description of each configuration menu item:

## Enter Access PIN

Use the Up and Down arrow buttons to display the Menu Access PIN. Once displayed accept the value with the tick button. If the correct PIN is entered a brief display of 'Access Granted' will be viewed giving access to the configuration menu otherwise a message of 'Access Denied' will be displayed returning the user to the display menu.

The default PIN is 121.

## Pipe Size Units

This menu item allows the selection of either millimetres or inches and is used in conjunction with selecting the nominal pipe size of the flowmeter.

## Pipe Size

This menu item allows use of the arrow buttons to select the nominal pipe diameter. This diameter may be found on the name plate of the flowmeter detector head.

## Flow Tube Factor

This factor is determined in our flow laboratory under actual flow conditions and is the calibration factor for the particular detector head. This value is stamped on the detector head name plate.

## Flow Tube Zero

This factor is also found on the name plate of the detector head and is a calibration factor.

## Display Units

This menu allows the selection of the flow rate engineering units. The following table lists the available units:

| Units | Description |  | Time Base (t) |  |  |  |
| :--- | :--- | :---: | :---: | :---: | :---: | :---: |
|  |  | Sec | Min | Hr | Day |  |
| I/(t) | Litres per (t) | $\checkmark$ | $\checkmark$ |  |  |  |
| $\mathrm{m}^{3 /(t)}$ | Cubic metres per (t) | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |
| $\mathrm{kL} /(\mathrm{t})$ | Kilolitres per (t) | $\checkmark$ | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |
| $\mathrm{ML} /(\mathrm{t})$ | Megalitres per (t) |  |  |  | $\checkmark$ |  |
| cu ft/(t) | Cubic feet per (t) | $\checkmark$ | $\checkmark$ | $\checkmark$ |  |  |
| Imp G/(t) | Imperial Gallons per (t) |  | $\checkmark$ |  |  |  |
| US G/(t) | US Gallons per (t) |  | $\checkmark$ |  |  |  |
| US MG/(t) | US Megagallons per (t) |  |  |  | $\checkmark$ |  |
| Acre ft/(t) | Acre feet per (t) |  |  |  | $\checkmark$ |  |

## Low Flow Cut Off

This parameter is set as a percentage of full scale and is settable in the range of 0 to $10 \%$ in $0.1 \%$ increments. Flows less than this value are not totalised. The analogue and digital outputs are also set to zero flow.

## Response Time

This parameter sets the damping or response time of the rate indicator and is entered as a numerical value. The higher the value the more damping. The dynamic range of this parameter is 2 to 100 in steps of 1 .

## Coil Frequency

This sets the frequency of the coil excitation. The shipping value for this parameter is 16 Hz and will be suitable for the majority of applications.

## Digital Output 1

Each of the Digital Outputs (Open Collector) may be configured as either a frequency output or a pulse output. Selecting frequency output automatically sets a duty cycle of $50 \%$ for the output. (ie equal on and off time) where as selecting pulse output sets the on time to approximately 25 milliseconds.

## Fullscale Frequency 1

Adjustable range is -1000 to 1000 Hz . Setting this value to a negative number allows the digital output to represent reverse flow. (eg setting this value to -500 would set the output frequency to a range of 0 to 500 Hz when flow is in the range of 0 to fullscale flow in the reverse direction. Flow in the forward direction would set the output to 0 Hz )

## Volume/Pulse 1

This value allows the operator to set the number of totaliser units that each output pulse represents. This method of setting the digital output is useful for a remote electro-mechanical counter. Do not exceed 20 pulses/second.

## Digital Output 2

As per Digital Output 1 but relates to Digital Output 2.

## Fullscale Frequency 2

As per Fullscale Frequency 1 but relates to Digital Output 2.

## Volume/Pulse 2

As per Volume/Pulse1 but relates to Digital Output 2.

## Fullscale 4-20 1

This parameter is used to set the flow rate value that 20 mA is to represent. 4 mA always represents a flow rate of 0 . Setting a negative value will enable the operator to have this output representing reverse flow.

## Fullscale 4-20 2

As per Fullscale 4-20 1 but pertaining to 4-20mA output 2 .

## Display Digits

This menu enable the user to select between having four(4) or five(5) significant digits for the display of flow rate.

## Totaliser Units

Selects the units that the user wishes to display the totaliser. The following units are available:

Litres
$\mathrm{m}^{3}$
kL
ML
cu. ft
Imp Gallons
US Gallons
US MGallons
Acre ft

Litres
Cubic Metres
Kilolitres
Megalitres
Cubic Feet
Imperial Gallons
US Gallons
US Megagallons
Acre Feet

## Totaliser Scaling

This menu item allows the selection of a scaling factor to be applied to the totaliser units. e.g. The user may wish each count of the totaliser to represent 10 kL units. The user would therefore select kL as a totaliser unit and x 10 as a scaling factor. Note that the maximum totaliser frequency must not exceed 20 Hz . The available factors are:
x 10000
x 1000
$\times 100$
$\times 10$
$\times 1$
$\times 0.1$
$\times 0.01$
$\times 0.001$

## Zero Totaliser

This menu enables the operator the facility to reset the totalisers. Selecting 'Yes' from this menu will ask for confirmation. Pressing the Tick button will now reset the totalisers whilst pressing one of the arrow buttons will leave the totalisers unchanged. A brief message will appear on the screen stating whether or not the totalisers were cleared.

## Flow Full Scale

This is a numerically entered value that is displayed in the selected display units. Once selected with the Tick button the user is able to use the Up and Down Arrow buttons to increment and decrement the numeric value until the desired full scale is displayed. Accept this value, as with all menu items, with the Tick button.
NOTE: It is only possible to set the full scale flow rate to a value that is equivalent to a flow velocity of 0.5 to 10 Metres per second.

## Fail Safe Mode

This parameter enables the operator to set the failsafe conditions of the outputs of the M300 Transmitter. i.e. If the M300 detects an error it will set the outputs to the nominated condition. This is true for all outputs with the exception of the system fault (refer to relays) output. This relay output, if selected, will energise on a fault.
The choices for this parameter is either 'Low on Fail' or 'High on Fail'.

## Reverse Flow

Enabling reverse flow will include the display of the Reverse Flow Totaliser when in the display mode. Disabling this function will cause the reverse flow totaliser not to be displayed.

## Nett Flow

This menu item is only displayed if 'Reverse Flow' is enabled and allows the operator to select either enable or disable. Enabling nett flow will enable the Nett Flow Totaliser to be displayed in the display menu. This function is the nett value of the forward flow totaliser less the reverse flow totaliser.

## Relay Setup (1, 2, 3, 4)

This parameter allows the operator to select the function of the relay. The relay is normally de-energised, energising when the condition is true. The operator may select one of the following conditions:

- LoFlow
- HiFlow
- System Fault
- Fwd Totaliser
- Rev Totaliser
- Reverse Flow
- Forward Flow
- Pipe Not Full


## Relay On, Relay Off (1)

These menu items are only displayed if either a LoFlow or HiFlow has been selected for Relay 1 otherwise these items are skipped.
The 'On' and 'Off' values are set in flow rate units.
NOTE: In the case of a 'LoFlow' it is not possible to set the 'Off' value below the 'On' value. ie, if the 'On' value has been set to $20 \mathrm{I} / \mathrm{sec}$, then the 'Off' value must be greater than $20 \mathrm{I} / \mathrm{sec}$. In the case of a 'HiFlow' the 'On' value must be above the 'Off' value.

## Relay On, Relay Off (2, 3, 4)

As per Relay 1 above. Please note that these menu items will only be displayed if either a LoFlow or HiFlow is selected for that corresponding relay.

## Simulation Value

This value is entered as a percentage (\%) of flow full scale. eg, if flow full scale was set to 150 litres/second and the Simulation Value was set to $30 \%$ then the displayed value, totaliser and outputs would drive to a value that is equivalent to 45 litres/second when enabled(refer to the next menu item).

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## Simulation

This parameter is used in conjunction with the above menu item. When enabled the simulation value is used as the flow calculation.

NOTE: When simulation is enabled, the totaliser values are written to memory. When disabled the original totaliser values are restored. This feature allows testing of the instrument without accumulating counts on the totaliser.

## Troubleshooting

The M300 Transmitter and detector head have been tested in our flow laboratory prior to shipment. However if you do experience problems please note the serial number of the instrument prior to contacting either Combined Instrument Systems Pty Ltd. The serial number may be found either on the metal label located on the detector head or on a label between the terminal cover and the display enclosure.

## Display is blank

- Check the supply voltage.
- Check fuse if mains powered M300 Transmitter and replace if necessary.
- If using a 24 V Supply, down power and wait 30 seconds, reapply supply.
- Ensure there are no short circuits across the $\mathrm{V}+$ and V - terminals. Check that there is not a short circuit across the coil terminals 7 and 8 .


## Message 'Coil Open cct' is displayed

This message indicates that there is no current being supplied to the coil. Down power the M300 and check the wiring between the transmitter and the detector head.

## Display is erratic and does not indicate zero

- Detector may not be full of liquid. Ensure pipe is full.
- Check electrode wiring between M300 transmitter and the detector head.


## Display does not respond to flow

- Check that the M300 is not in 'Simulate' mode. Removing the power for 30 seconds will automatically return the instrument to flow monitor mode.
- Check wiring between the transmitter and detector head.
- Check that there is flow in the pipe and that the pipe is full of liquid.


## Flow rate indicates reverse flow

- Check orientation of wiring between M300 and detector head.
- Check flow direction arrow on detector head.
- Reverse wires in the M300 terminals 'Flow' 2 and 3.


## 4-20mA Output 1 or 2 operates but indicates incorrectly

- Check that load does not exceed 1000 ohms.
- Check the configuration to ensure that the output is configured correctly.
(Fullscale $4-20 \mathrm{~mA} 1$ or 2)


## 4-20mA Output 2 reads zero milliamps

The second output is an option. Check to ensure that it was ordered. This option may be added if required.

## Display has no back lighting

The display back lighting automatically turns off after a pre-set time, if no buttons have been depressed. Press either the up or down arrow keys to turn on the back lighting.

## Specification

| Display: | 2 Line $\times 16$ Digit LCD display with software switched back lighting |
| :---: | :---: |
| Power Supply: | $24 \mathrm{VDC} \pm 10 \%$ (fully isolated and regulated DC) 95 to 260 VAC 50 Hz (Optional) |
| Power Consumption: | Less than 25VA |
| Outputs: | $1 \times 4-20 \mathrm{~mA}$ ( $2 \times 4-20 \mathrm{~mA}$ Optional) Isolated $2 \times$ Digital Output (Open Collector) Programmable pulse or frequency <br> $2 \times$ Relay Outputs ( $4 \times$ Relay Outputs Optional) |
| Open Collector Rating: | 100 mA 60VDC |
| Relay Rating: | 1 amp @ 30 VDC <br> 0.5 amps @ 125 VAC <br> 0.3 amps @ 60 VDC |
| 4-20mA Max. Load: | 1000 Ohms |
| Measuring Range: | Up to 10 metres per second. |
| Turndown: | >1000:1 at 10 metres per second |
| Input Resolution: | 18 Bit |
| Linearity: | <0.005\% |
| Repeatability: | <0.05\% |
| Accuracy: | $0.2 \%$ of reading or 0.001 metres per second, whichever is greater. |
| Ambient Temperature: | $-10^{\circ}$ to $55^{\circ} \mathrm{C}$ |
| Temperature Stability: | <0.05\% |
| Supply Voltage Effects: | Negligible |
| M300 to Detector Head Separation: | Maximum 100 metres |

## M300 Menu Flowcharts



## COMBINED

## M300 Menu Flowcharts (continued)



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## COMBINED

INSTAUMENT SVSTEMS

## M300 Menu Flowcharts (continued)



## COMBINED

INSTAUMENT SVSTEMS

## M300 Menu Flowcharts (continued)



## M300 Menu Flowcharts (continued)



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## M300 Menu Flowcharts (continued)



## M300 Transmitter Enclosure Detail



EM Detector Head Dimensions


EM/IR2060 Series Fabricated Steel Welded Submersible Housing


## Equipment Returned for Testing or Repair

Your product has been manufactured and tested with care. It should not present any problems if it is installed, maintained and operated in accordance with the manual provided. However, if you need to return your product for testing or repair, please help us by supplying all the requested information to facilitate the speedy repair and return of your equipment.
Tyco Environmental Systems will only test and repair returned products when all the required information regarding substances that have come into contact with the product, is supplied. This information is required to safeguard the health and safety of our personnel and to comply with environmental legislation.
To ensure that your product is serviced, and particularly if the product was operated with toxic, caustic, flammable, biohazard or water-endangered substances it is required that:

1. You ensure all surfaces do not contain traces of hazardous substances, and that you rinse or neutralise before shipping the product.
2. You include the Product Certificate on the following page with the product, to confirm that it is safe for us to handle and service.

If a quotation is required, an inspection charge may apply. If the quotation is accepted the inspection fee will cover the first hour of labour.
To commence testing or repairs the Product Certificate and a purchase order are required along with your product.
Please contact your local sales or service representative regarding return of goods for repair.

## COMBINED

notument ivrims

## Notes

## Product Certificate

## Company Details

Company: $\qquad$
Address: $\qquad$
$\qquad$
Contact: $\qquad$
Phone: ............................................................. Fax: $\qquad$

## Product Details

Product: $\qquad$
Model No.: Serial No.: $\qquad$
Date Purchased:
Detailed description of fault: $\qquad$
$\qquad$
$\qquad$
$\qquad$

## Safety Checks

This product has been operated with the following liquid and possible contaminants:
$\qquad$
$\qquad$
The liquid is:
$\square$ Water-Hazardous $\square$ Toxic
$\square$ CausticFlammable

We have:
$\square$ Checked that it is free from these substances
$\square$ Flushed out and neutralised all surfaces

## I confirm that there is no risk to humans or environment through any residual contaminant on this product.

Signature:
Date:

## CSE Semaphore Kingfisher Plus+



The Kingfisher Plus+ RTU is an advanced automation technology platform for SCADA applications. Designed as an enabling technology, Kingfisher Plus+ brings only strengths without the technical constraints that have traditionally limited RTU applications.
The high-performance, 32-bit processing platform works with intelligent communications and I/O modules to meet all scanning and throughput requirements. Numerous advanced features include three levels of redundancy - communications, power, and processor - in order to satisfy a range of availability specifications.

A complete array of communication modules and extensive protocols library provide broad network compatibility. In addition, the Kingfisher DNP3 protocol implementation is among the strongest in the industry. It exceeds level 3 and includes such functionality as Secure Authentication master.

Kingfisher's open, programmable automation environment is based on ISaGRAF version 5 and supports all IEC 61131-3 languages as well as IEC 61499 for distributed processing. A rich library provides numerous preengineered function blocks, which project engineers find invaluable.

Kingfisher Plus+ combines the benefits of advanced technologies with proven hardware and software in an easy-to-configure RTU that achieves exceptional performance.

## Kingfisher Plus+ advanced hardware platform

The modular construction of Kingfisher Plus+ allows it to perfectly match the needs of practically any application. Multiple backplanes can be chained together to provide communications and I/O expansion. Kingfisher Plus+ configurations range from 3 to 16 communication ports and 4 to $1024 \mathrm{I} / 0$ points.


## Redundancy

For users who demand reduced risk of systems failures, Kingfisher Plus+ can be ordered with redundant processors, power supply modules, and communications modules. The CP-12 and CP-30 processor modules support hot standby redundancy. A switchover from the primary to the backup processor will occur upon failure of an I/O module scan, communications failure on selected ports, Toolbox command, or a ladder logic command.

High-performance I/O modules
Intelligent I/O modules are designed for applications that require high accuracy and performance. Advanced capabilities include high-speed scanning; input counting up to 10 kHz ; quadrature counting; sequence-of-events (SOE) monitoring on a 1 ms interval; and configurable, fail-safe output settings.

|  | Al-1 | Al-10 | Dl-5 | DI-10 | A0-3 | D0-1 | D0-2 | D0-6 | 10-2 | 10-3/10-5 | 10-4 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| DI Digital inputs |  |  | 16 | 16 |  |  |  |  | 8 | 4 | 8 |
| DO Digital outputs |  |  |  |  |  | 8 | 16 | 16 | 8 | 4 | 2 |
| AI Analog inputs | 8 | 8 |  |  |  |  |  |  |  | 4 | 2 |
| AO Analog outputs |  |  |  |  | 4 |  |  |  |  | 1 |  |
| DESCRIPTIONS | $\begin{gathered} 0-20 \text { or } \\ 4-20 \mathrm{~mA} \\ \text { inputs } \\ \hline \end{gathered}$ | High performance | Dry contact inputs | Sequence-of-events (SOE) | Analog outputs | Relay outputs N.O./N.C. | Relay output N.O. | Open <br> drain <br> FETs | Multi 10 | Multi 10 | Multi 10 |

## Communication option cards

A broad offering of communication options provides connectivity with the intelligent devices and networks that are used throughout today's measurement and control systems. Communication option cards are compatible with Kingfisher Plus+ processor modules and the MC-12 and MC-31 communications modules.

|  | OPT-A3 | OPT-D | OPT-F | OPT-H | OPT-I | OPT-L | OPT-R2/R3/R4 | OPT-T3 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Name | Fiber Ethernet | Dial-up modem | Fibre serial | HART | Isolated | Line \& radio FSK | Spread spectrum | Ethernet |
| DESCRIPTIONS | Optically <br> isolated <br> Ethernet communications | PSTN modem for worldwide phone system V. 34 | Optically isolated serial communications | Communicate using HART protocol | Isolated serial communications RS-232/485/422 | Leased line \& pocket radio interface V. 23 | Wireless license free communications | Communicate over 10/100 Mbit Ethernet RJ-45 |

Users can quickly become familiar with the Outlook-style displays Toolbox Plus+ provides for advanced configuration and diagnostics.


## Communication protocols

For compatibility with a broad range of SCADA networks and intelligent devices, Kingfisher Plus+ supports many protocols. These include Kingfisher, DNP3 (master/slave), Modbus (master/slave), Allen Bradley DF1, and SNMP.

## Toolbox software

CSE Semaphore's Toolbox Plus+ integrated operating environment combines configuration, program development, and maintenance in one simple-to-use package. Systems integrators and end users alike can view, edit, and diagnose a Kingfisher Plus+ solution with a highly intuitive, Outlook-style user interface.
Toolbox Plus+ eliminates the need to open - and switch between - multiple software packages, or engage in complicated programming. Toolbox Plus+ embeds the ISaGRAF IEC-61131-compliant environment and supports all five of the control languages it offers. This is also the first IEC 61499-compliant configuration environment that is intended for RTU products. In addition, the Kingfisher library of preprogrammed function blocks, which includes operations such as AGA flow calculations, simplifies applications development and makes it easy to add new capabilities to a Kingfisher Plus+ RTU solution.

Toolbox Plus+ is used in conjunction with the CP-30 processor module.
Systems using the CP-12 processor module are programmed using Semaphore's Toolbox 32 environment, which supports ladder logic as well as the Kingfisher library of proven function blocks. Toolbox 32 capabilities, including drag \& drop, on-line help, and applications examples, are designed to streamline programming, testing, and startup efforts.

## Applications

The Kingfisher Plus+ RTU brings IP connectivity, powerful processing, advanced I/O capabilities, and open programming to applications in CSE Semaphore's traditional end-user industries. Users in the broadcast/telecom, oil \& gas, power, transportation, and water/wastewater industries will find a Kingfisher Plus+ configuration cost-effective over a broad range of installations.

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| Designation | Industrial-grade remote terminal unit (RTU) |
| :---: | :---: |
| INPUTS \& OUTPUTS |  |
| Maximum I/O points | 1024 |
| Backplanes | Up to $4 \times 12$ slot backplanes and $4 \times 4$ slot backplanes per RTU |
| I/O configuration | Automatic/manual |
| Backplane sizes | 4/6/12 slots |
| Removable I/O connectors | Yes |
| Digital modules | Max. 16 inputs or 16 outputs/module |
| Analog modules | Max. 8 inputs or 4 outputs/module |
| PROCESSOR UNIT |  |
| Type | PC-1: 80C188/IA188ES, 16 MHz |
|  | CP-12: $\times 86,40 \mathrm{MHz}$ |
|  | CP-30: Cirrus ARM9 166 MHz |
| Flash RAM | PC-1: 128 KB |
|  | CP-12: 512 KB |
|  | CP-30: 16 MB |
| RAM | PC-1: 256 KB |
|  | CP-12: 512 KB |
|  | CP-30: 32 MB |
| Real-time clock | Yes |
| Battery backup | RAM/RTC - Lithium >7 years |
| RTU address | 1 to 255 or 1-65535 (protocol-dependent) |
| SCAN RATE |  |
| Digital | $0.5 \mathrm{~ms} /$ module |
| Analog | $1.5 \mathrm{~ms} /$ module |
| PID | 4/s |
| COMMUNICATIONS SUPPORTED |  |
| Total Ports / RTU | 16 |
| Master/slave | Yes |
| Peer-to-peer | Yes |
| Fallback levels | Yes |
| PC link | Yes |
| Protocol | Kingfisher, Modbus, DNP3, SNMP, Allen Bradley, and numerous other protocols available on request |

option cards

| PC-1 | $1 \times$ standard serial port, 1 x option port |
| :---: | :---: |
| CP-12 | 1 x standard serial port, $2 \times$ option ports |
| CP-30 | 1 x standard Ethernet port, 2 x option ports |
| Available options | A3 (fiber Ethernet) |
|  | D (dial-up modem) |
|  | F (fiber serial) |
|  | H (HART) |
|  | 1 (isolated serial) |
|  | L (line \& radio FSK) |
|  | R2 - 900 MHz Australia <br> R3 - 2.4 GHz International <br> R4-900 MHz USA |
|  | T3 (Ethernet) |


| CONFIGURATION |  |
| :---: | :---: |
| Local (portable PC) | Yes |
| Remote via network | Yes |
| IEC 61131-3 (5 languages) | Yes |
| ISaGRAF flow chart (6th language) | Yes |
| Toolbox 32 ladder | Yes |
| IEC 61499 distributed processing | Yes |
| DIAGNOSTICS |  |
| Preprogrammed | Yes |
| I/O modules | LEDs |
| CPU modules | LEDs |
| Power supply modules | LEDs |
| Report via network | Yes |
| Software | Yes |
| Communications analyzer | Yes |
| DEBUG |  |
| Local watchdog timer | Yes |
| Communication status | Yes |
| Configuration display | Yes |
| I/0 status | Yes |
| Debug | Yes |
| POWER |  |
| AC supply | 90 to 260 V |
| DC supply | 20 to 60 V or 96 to 340 V |
| Solar supply | 12 V dc |
| Power down modes | Yes |
| Battery backup | Yes |
| Battery size | Various |
| Battery charging option | Yes |
| ENVIRONMENTAL |  |
| Ambient temperature | $-20^{\circ}$ to $70^{\circ} \mathrm{C}$ |
| Storage temperature | $-40^{\circ}$ to $85^{\circ} \mathrm{C}$ |
| Humidity | 5\% to 98\% RH noncondensing |
| REDUNDANCY LEVELS |  |
| CPUs/RTU | 2 |
| Power supplies/rack | 2 |
| COMPLIANCE STANDARDS |  |
| Safety certifications | CE LVD 2006/95/EC, IEC60950-1:2001; CAN/CSA C22.2 No. 60950-1-07; ANSI/UL 60950-1, 2nd Edition |
| EMC certifications | CE EMC 2004/108/EC, 1995/5/EC R\&TTE and C-Tick EN61326-1, EN61326-1:2006; EN61326:1997, Amdt 1:1998, Amdt 2:2001, Amdt 3:2003; FCC CFR47 Part 15 Sub Part B |
| Above certifications exclude modules or options PC-1, F , and $\mathrm{R} 4 ; 10-2$ and $\mathrm{IO}-4$ excluded from CE only |  |

## CS <br> Semaphore

|  | $\text { Section } 8$ |
| :---: | :---: |
| Relays - Control, general purpose, solid state and |  |
| Arc detecting relay system | Page |
| Electromechanical relays selection guide | 8-2 to 8-3 |
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| Carlo Gavazzi solid state relay range | 8-39 to 8-52 |
| ARC-D-Tect Arc detecting relay system | 8-53 to 8-58 |



## Selection guide <br> Electromechanical relays - control type

## Control relays

| Cat. No. | Description | Page Ref. |
| :--- | :--- | ---: |
| CS 7 / CSS 7 | Control relays and accessories / Safety control relays | $8-4$ to $8-10$ |
| CS 7E | DC operated AC relay-low profile | $8-11$ to 8-12 |
| CS 8 | Control relays miniature and accessories | $8-13$ |

Relay interface module

| Cat. No. | Description | No. of <br> contacts | Switching current <br> (AC 1) Amps | Page Ref. |
| :--- | :--- | :--- | :--- | :--- |

Flat pin relays

| Cat. No. | Description | No. of contacts | Switching cur <br> (AC 1) Amps | Page Ref. |
| :---: | :---: | :---: | :---: | :---: |
| 55.32.0054 | Miniature control relay | $2 \mathrm{C} / 0$ | 10 A | 8-19 |
| 55.32 .0074 | Plug-in or solder connection |  |  |  |
| 55.34 .0054 | Miniature control relay | 4 C/0 | 5 A | 8-19 |
| 55.34.0074 | Plug-in or solder connection |  |  |  |
| 56.32 .0054 | Miniature power relay | $2 \mathrm{C} / 0$ | 12 A | 8-20 |
| 56.32 .0074 | Plug-in (wide pin) or solder connection |  |  |  |
| 56.34 | Miniature power relay | 4 C/0 | 12 A | 8-20 |
|  | Plug-in (wide pin) or solder connection |  |  |  |
| 46.61.0054 | Miniature control relay | $1 \mathrm{C} / 0$ | 16 A | 8-28 |
| 46.61 .0074 | Plug-in or solder connection |  |  |  |
| 46.52 .0054 | Miniature control relay | $2 \mathrm{C} / 0$ | 8 A | 8-28 |
| 46.52.0074 | Plug-in or solder connection |  |  |  |

## Round pin relays

| Cat. No. | Description | No. of <br> contacts | Switching current <br> (AC 1) Amps | Page Ref. |
| :--- | :--- | :--- | :--- | ---: |
| 60.12 | Power relay plug-in | $2 \mathrm{C} / 0$ | 10 A | $8-21$ |
| 60.13 | Power relay plug-in | $3 \mathrm{C} / 0$ | 10 A | $8-21$ |

## Step relays

|  | Description | No. of <br> contacts | Switching current <br> (AC 1) Amps | Page Ref. |
| :--- | :--- | :--- | :--- | ---: |
| $\mathbf{2 6 . 0 1}$ | Step relay screw terminal | $1 \mathrm{~N} / 0$ | 10 A | $8-22$ |
| $\mathbf{2 6 . 0 2}$ | Step relay screw terminal | $2 \mathrm{~N} / 0$ | 10 A | $8-22$ |
| $\mathbf{2 6 . 0 3}$ | Step relay screw terminal | $1 \mathrm{~N} / 0+1 \mathrm{~N} / \mathrm{C}$ | 10 A | $8-22$ |
| $\mathbf{2 0 . 2 2}$ | Step relay screw terminal (DIN rail) | $2 \mathrm{~N} / 0$ | 16 A | $8-22$ |
| $\mathbf{2 0 . 2 3}$ | Step relay screw terminal (DIN rail) | $1 \mathrm{~N} / 0+1 \mathrm{~N} / \mathrm{C}$ | 16 A | $8-22$ |

## Selection guide

## Electromechanical relays - general purpose

## Industrial power relays

| Cat. No. | Description | No. of <br> contacts | Switching current <br> (AC 1) Amps | Page Ref. |  |
| :--- | :--- | :--- | :--- | :--- | ---: |
| $\mathbf{6 2 . 3 2}$ | Plug-in | $2 \mathrm{C} / 0$ | 16 A | $8-23$ |  |
| $\mathbf{6 2 . 3 3}$ | Plug-in | $3 \mathrm{C} / 0$ | 16 A | $8-23$ |  |
| $\mathbf{6 5 . 3 1}$ | Flange mounted | - quick connection | $1 \mathrm{~N} / 0+1 \mathrm{~N} / \mathrm{C}$ | 20 A | $8-24$ |
| $\mathbf{6 5 . 3 1 \mathrm { M }}$ | Flange mounted | - quick connection | $1 \mathrm{~N} / 0$ | 30 A | $8-24$ |
| $\mathbf{6 2 . 8 2}$ | Flange mounted | - quick connection | $2 \mathrm{C} / 0$ | 16 A | $8-25$ |
| $\mathbf{6 2 . 8 3}$ | Flange mounted | - quick connection | $3 \mathrm{C} / 0$ | 16 A | $8-25$ |
| $\mathbf{6 2 . 8 2 . 0 0 0 8}$ | DIN rail mounted | - quick connection | $2 \mathrm{C} / 0$ | 16 A | $8-26$ |
| $\mathbf{6 2 . 8 3 . 0 0 0 8}$ | DIN rail mounted | - quick connection | $3 \mathrm{C} / 0$ | 16 A | $8-26$ |

Printed circuit board relays

| 30.22 | PCB mount | $2 \mathrm{C} / 0$ | 1.25 A | $8-27$ |
| :--- | :--- | :--- | :--- | :--- |
| 34.51 | PCB mount or plug-in | $1 \mathrm{C} / 0$ | 6 A | $8-27$ |
| 40.51 | PCB mount or plug-in | $1 \mathrm{C} / 0$ | 10 A | $8-29$ |
| 40.52 | PCB mount or plug-in | $2 \mathrm{C} / 0$ | 5 A | $8-29$ |
| 40.61 | PCB mount or plug-in | $1 \mathrm{C} / 0$ | 16 A | $8-30$ |
| 44.62 | PCB mount or plug-in | $2 \mathrm{C} / 0$ | 10 A | $8-30$ |

Accessories
Relay bases, LED and diode modules and mounting clips
8-31 to 8-35

Relay dimensions
Relay and relay base dimensions $\quad 8$ - 36 to 8-38

Solid state relays

| Carlo Gavazzi range | DIN rail mounting - Selection guide | Solid state | 10 to 100 A | $8-41$ to $8-42$ |
| :--- | :--- | :--- | :--- | :--- |

ARC detecting relays

| ARC-D-Tect $\quad$ Arc fault protection of switchboards | Detector cells | - | 8 to 8-58 |
| :--- | :--- | :--- | :--- |

## CS 7 Control relays

## Heavy-duty - 690 volt

## Features



CS 7-31E


CS 7-40E


CS 7C-22E


Auxiliary contact 2 pole top mount

Auxiliary contact 4 pole top mount

■ Complies with IEC 60947

- High contact reliability
- Basic 4 pole relay can be increased to 6,8 or 12 pole by using optional clip-on contacts
- Choice of front mount or side mount additional clip-on contacts
- Electronic compatible contacts
- Mechanically linked contacts

Control relay CS 7 with AC control ${ }^{1}$ )

| AC 15 amps <br> @240 V | AC 15 amps @415 V | AC 12 <br> amps $40^{\circ} \mathrm{C} / 60^{\circ} \mathrm{C}$ | Diagram | Auxiliary contacts |  | Cat. No. | Price \$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | N/O | N/C |  |  |
| 10 | 6 | 20 |  | 2 | 2 | CS 7-22E...V | 174.00 |
| 10 | 6 | 20 |  | 3 | 1 | CS 7-31E...V | 174.00 |
| 10 | 6 | 20 |  | 4 | 0 | CS 7-40E...V | 174.00 |
| 10 | 6 | 20 |  | 0 | 4 | CS 7-04E...V | 174.00 |

Control relay CS 7C with DC control ${ }^{2}$ )

| 10 | 6 | 20 | $\left.\left.{ }_{k 1} 1{\underset{A 1}{A 1}}_{A_{2}}^{L_{12}^{11}} \dot{12}_{22}^{21}\right\|_{32} ^{31}\right\|_{42} ^{41}$ | 0 | 4 | CS 7C-04E...V | 340.00 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 10 | 6 | 20 | $\left.\left.\left.\left.{ }_{k 1} \square_{\mid A 2}^{\mid A 1}\right\|_{13} ^{13}\right\|_{22} ^{121}\right\|_{32} ^{31}\right\|_{42} ^{41}$ | 1 | 3 | CS 7C-13E...V | 340.00 |
| 10 | 6 | 20 | $\left.\left.\left.\left.\left.\left.{ }_{k 1} 1\right\|_{A 2} ^{A 1}\right\|_{14} ^{13}\right\|_{22} ^{12}\right\|_{32} ^{21}\right\|_{44} ^{31}\right\|_{43} ^{43}$ | 2 | 2 | CS 7C-22E...V | 340.00 |
| 10 | 6 | 20 |  | 3 | 1 | CS 7C-31E...V | 340.00 |
| 10 | 6 | 20 |  | 4 | 0 | CS 7C-40E...V | 340.00 |

Top mounting auxiliary contact blocks (suits all cs 7 relays) ${ }^{3}$ )

| N/O | N/C | Reference | Diagram |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 1 | 11 | $\left.\left.\right\|_{54} ^{53}\right\|_{62} ^{61}$ | CS 7-PV-11 | 52.00 |
| 0 | 2 | 02 | $\left.t_{52}^{51}\right\|_{62} ^{61}$ | CS 7-PV-02 | 52.00 |
| 2 | 0 | 20 | $\left.\left.\right\|_{54} ^{53}\right)_{64}^{53}$ | CS 7-PV-20 | 52.00 |
| 1+1EM | 1+1LB | L22 |  | CS 7-PV-L22 | 73.00 |
| 3 | 1 | 31 | $\left.\left.\left.\left.\right\|_{54} ^{53}\right\|_{62} ^{51}\right\|_{74} ^{61}\right\|_{84} ^{73}$ | CS 7-PV-31 | 73.00 |
| 4 | 0 | 40 | $\left.\left.\left.\left.\left.\right\|_{54} ^{53}\right\|_{64}\right\|_{64} ^{63}\right\|_{74} ^{73}\right\|_{84} ^{83}$ | CS 7-PV-40 | 73.00 |

[^5]Price Schedule ' $A A^{\prime}$
240/415 V rated coils are suitable for use on 230/400 V in accordance with AS 60038:2000.
sprecher+ schuh

## CSS 7 Safety control relay

## Heavy-duty - 690 volt

## Features



- AC/DC control
- Mechanically linked contacts according to IEC 60947-5-1
- Fixed coupling of relay and auxiliary contact block
- Protection against unintended actuation
- Auxiliary contacts are electronic compatible
- High contact reliability
- Red contact housing for easy identification

Available in $A C$ and $D C$ control voltages, the Sprecher + Schuh CSS 7 range of safety relays are ideal for use in feedback circuits found in today's modern applications. The safety relays have a distinctive red coloured housing which is permanently fixed to the front of the relay to prevent manual operation. It also features $N / C$ mechanically linked contacts which ensure that $N / O$ and $N / C$ contacts cannot occupy the same state simultaneously - even in the event of welded contacts. This is a crucial safety requirement to protect equipment and personnel. Replacement coil is same as CA 7 9/12/16.

## Safety relay CSS 7 with AC control ${ }^{2}$ )



CSS 7


CSS 7D

| AC 15 amps ${ }^{1}$ ) |  |  | AC $12{ }^{1}$ ) amps $40^{\circ} \mathrm{C}$ | Contact diagram | Auxiliary contacts |  |  | Price \$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 110 V | 240 V | 415 V |  |  | N/0 | N/C | Cat. No. |  |
| 3 | 3 | 3 | $10$ |  | 6 | 2 | CSS 7-62EC...VAC | 245.00 |
| 3 | 3 | 3 | $10$ |  | 5 | 3 | CSS 7-53EC...VAC | 245.00 |
| 3 | 3 | 3 |  | $\left.\right\|_{44} ^{43}$ | 4 | 4 | CSS 7-44EC...VAC | 245.00 |
| 3 | 3 | 3 |  | $\left.\right\|_{44} ^{43}-1+t_{5}^{5}$ | 3 | 5 | CSS 7-35EC...VAC | 245.00 |

Safety relay CSS 7C with DC control ${ }^{3}$ )

| 3 | 3 | 3 |  |  | 6 | 2 | CSS 7D-62EC...VDC | 435.00 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 3 | 3 | 3 |  |  | 5 | 3 | CSS 7D-53EC...VDC | 435.00 |
| 3 | 3 | 3 |  |  | 4 | 4 | CSS 7D-44EC...VDC | 435.00 |
| 3 | 3 | 3 |  |  | 3 | 5 | CSS 7D-35EC...VDC | 435.00 |

[^6]240/415 V rated coils are suitable for use on 230/400 V in accordance with AS 60038:2000.

AES

## Accessories for CS 7 relays

## Auxiliary blocks - timers - mechanical interlocks

Side mounting auxiliary contact blocks (suit CA 7, CS 7 relays)


| N/O | N/C | Diagram | Reference | Cat. No. $\left.{ }^{1}\right)^{3}$ ) | Price \$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| 0 | 1 |  | 01 | CA 7-PA-01 | 52.00 |
| 1 | 0 | $\int_{\frac{19}{19}}^{196}$ | 10 | CA 7-PA-10 | 52.00 |
| 0 | 2 |  | 02 | CA 7-PA-02 | 62.00 |
| 1 | 1 |  | 11 | CA 7-PA-11 | 62.00 |
| 2 | 0 |  | 20 | CA 7-PA-20 | 62.00 |
| 1EM | 1LB | $\left.\right\|_{1840} ^{1080}$ | L11 | CA 7-PA-L11 | 63.00 |

## Accessories for CS 7 relays ${ }^{2}$ )



CZ pneumatic timer
Function/Description

| Pneumatic timer ${ }^{67} L^{55}$ | On-delay 0.3-30 s | CZE 7-30 | 250.00 |
| :---: | :---: | :---: | :---: |
| On delay/Off delay $\left.{ }_{68}\right\|_{56}$ | On-delay 1.8-180 s | CZE 7-180 | 260.00 |
| $\left.65\right\|^{57}$ | Off-delay 0.3-30 s | CZA 7-30 | 260.00 |
|  | Off-delay 1.8-180 s | CZA 7-180 | 270.00 |

Electronic timer on-delay for in-line connection. (clips onto CS 7 coil).



CRZA 7 timer off-delay

| Time range $0.1 \ldots 3 \mathrm{~s}$ | CRZE 7-3 | 175.00 |
| :--- | :--- | :--- |
|  | Time range $1 \ldots 30 \mathrm{~s}$ |  |
|  | Time range $10 \ldots 180 \mathrm{~s}$ | CRZE 7-30 |

Electronic timer off-delay for in-line connection. (clips onto CS 7 coil).
Operating voltage 110... $240 \mathrm{~V} 50 / 60 \mathrm{~Hz}$

|  | Time range 0.1... 3 s | CRZA 7-3 | 245.00 |
| :---: | :---: | :---: | :---: |
|  | Time range $1 . . .30 \mathrm{~s}$ | CRZA 7-30 | 245.00 |
|  | Time range 10...180 s | CRZA 7-180 | 260.00 |

Mechanical interlock for all CS 7 relays.
Standard version or version with integrated $\mathrm{N} / \mathrm{C}$ contacts for electrical interlocking.
Adds 9 mm to width (includes connecting dovetail).

| $\cdots \nabla \cdots$ | Interlock only | CM 7 | 58.00 |
| :---: | :---: | :---: | :---: |
| $\left.\left.\right\|_{0} ^{21}\right\|_{-} ^{21}$ | Interlock with | CM 7-02 | 90.00 |
| 22 | $2 \times \mathrm{N} / \mathrm{C}$ contacts |  |  |

Notes: ${ }^{1}$ ) Can be fitted to either side of relay or to both sides - 1 level only.
${ }^{2}$ ) Accessories are also suitable for all CA 7 contactors.
${ }^{3}$ ) Other contact blocks type CA 7-P can be used providing terminal numbers are acceptable (refer CA 7 contactor auxiliaries Section 1).
Price Schedule 'AA'
240/415 V rated coils are suitable for use on $230 / 400 \mathrm{~V}$ in accordance with AS $60038: 2000$.

## Accessories for CS 7 relays

## Latch - interface - suppressor

## Mechanical latch



CV 7 mechanical latch


CRI 7E interface


Suppressor module

| Function/Description | Cat. No. | Price \$ |
| :---: | :---: | :---: |
| Mechanical latch. Clips onto top of CS 7 relays. Latch includes N/0 and $N / C$ contact. Suggested circuit shows on and off button with interlock circuit. The contactor stays latched 'on' until electrically released by the stop button. E.g. contact stays closed without power to the coil. | CV 7-11...V ${ }^{1}$ ) | 250.00 |
| Interface (electronic). Clips onto CS 7 coil. Ideal for PLC interface. $18 . . .30 \mathrm{~V}$ DC ( $10 \mathrm{~mA} . . .15 \mathrm{~mA}$ ) input. 200 VA switching capacity. Suitable for coil voltage 110... 240 V AC. Includes in-built suppressor and LED status indicator. <br> Alt. coil voltage 48 V DC | CRI 7E <br> CRI 7E-48M | 159.00 159.00 |

Suppressor module R-C (resistor capacitor) for limiting switching overvoltages of the coil circuit.
Clips onto all CS 7 relay coils.


Suppressor module - Varistor for limiting switching overvoltages of the coil circuit (surge protection). Clips onto CS 7 relay for AC or DC coil circuits.


| Coil voltage 12... 55 V AC, 12... 77 V DC | CRV 7-55 | 76.00 |
| :---: | :---: | :---: |
| Coil voltage 56... 136 V AC, 78... 180 V DC | CRV 7-136 | 76.00 |
| Coil voltage 137... 277 V AC, 181... 350 V DC | CRV 7-277 | 76.00 |
| Coil voltage 278... 575 V AC | CRV 7-575 | 76.50 |

CA7-SF47 Modules meet the semi 47 voltage sag immunity requirement to $50 \%$ voltage for 200 mS .
For CA 7/CS 7 DC

| controlled devices | Control voltage | Cat. No. | Price \$ |
| :--- | :--- | :--- | :--- |
| $24-250$ V DC | $24-250$ V AC | CA 7-SF47 | 250.00 |
| $110-250$ V DC | $110-250$ V AC | CA 7-SF47A | 335.00 |

Dovetail adaptors for joining contactor assemblies together in reversing/star-delta or similar contactor combinations.

| 0 mm spacing | CA 7-S0 | 4.40 |
| :--- | :--- | :--- |
| 9 mm spacing | CA 7-S9 | 6.40 |

Notes: $\quad{ }^{1}$ ) Add standard voltage $24,110,240 \mathrm{~V} 50 / 60 \mathrm{~Hz}$ (other voltages available).
$240 / 415 \mathrm{~V}$ rated coils are suitable for use on $230 / 400 \mathrm{~V}$ in accordance with AS 60038 : 2000.

CS 7 Control relay

## Technical information

## Ratings to IEC 60947

Relay
CS 7 （CSS 7）
Auxiliaries
AC 12 resistive load
switching $3 \emptyset$
Ambient temperature $40^{\circ} \mathrm{C}$

| $I_{e}$ | $(\mathrm{~A})$ | 20 | 10 |
| :--- | :--- | :--- | :--- |
| $230 / 240 \mathrm{~V}$ | $(\mathrm{~kW})$ | 10 | - |
| $400 / 415 \mathrm{~V}$ | $(\mathrm{~kW})$ | 17 | - |
| 690 V | $(\mathrm{~kW})$ | 30 | - |
| Ambient temperature $60^{\circ} \mathrm{C}$ |  |  |  |
| Ie | $(\mathrm{A})$ | 20 | 6 |
| $230 / 240 \mathrm{~V}$ | $(\mathrm{~kW})$ | 8 | - |
| $400 / 415 \mathrm{~V}$ | $(\mathrm{~kW})$ | 14 | - |
| 690 V | $(\mathrm{~kW})$ | 24 | - |

AC motor switching AC 2，AC 3，AC 4

| $230 / 240 \mathrm{~V}$ | （A） | 11.5 | - |
| :--- | :--- | :--- | :--- |
| $400 / 415 \mathrm{~V}$ | （A） | 9 | - |
| 690 V | （A） | 5 | - |
| $230 / 240 \mathrm{~V}$ | $(\mathrm{~kW})$ | 3 | - |
| $400 / 415 \mathrm{~V}$ | $(\mathrm{~kW})$ | 4 | - |
| 690 V | $(\mathrm{~kW})$ | 4 | - |

AC switching of electromagnetic loads
AC 15 at rated voltage

| 24 V | （A） | 10 | 6 |
| :--- | :--- | :--- | :--- |
| 48 V | （A） | 10 | 6 |
| 110 V | （A） | 10 | 6 |
| $230 / 240 \mathrm{~V}$ | （A） | 10 | 3 |
| $400 / 415 \mathrm{~V}$ | （A） | 6 | 2 |
| 500 V | （A） | 2.5 | 1.5 |
| 690 V | （A） | 1 | 1 |
| Short circuit protection <br> co－ordination type＇2＇ | Fuse gG |  |  |

Number of switching operations

| Mechanical | （Mill） | 15 | 15 |
| :---: | :---: | :---: | :---: |
| AC 15 （230／240 V， 3 A） | （Mill） | 1.5 | 1.5 |
| Weight with AC coil | （kg） | 0.39 | － |
| Terminals for auxiliary conta |  | 岱 | $\stackrel{\text { 呙 }}{\substack{4 \\ \hline}}$ |
| Terminal size to IEC 60947－1 |  | $2 \times$ A4 | $2 \times$ A4 |
| Flexible wire with sleeve | 1 wire（ $\mathrm{mm}^{2}$ ） | 1．．． 4 | 0．5．．．2．5 |
| 身 | 2 wire（ $\mathrm{mm}^{2}$ ） | 1．．． 4 | 0．75．．．2．5 |
| Stranded／solid core | 1 wire（ $\mathrm{mm}^{2}$ ） | 1．5．．． 6 | 0．5．．．2．5 |
| $\pm-\square$ | 2 wire（ $\mathrm{mm}^{2}$ ） | 1．5．．． 6 | 0．75．．．2．5 |
| Tightening torque | （Nm） | 1．．．2．5 | 1．．．1．5 |

Note：$\quad 240 / 415 \mathrm{~V}$ rated coils are suitable for use on $230 / 400 \mathrm{~V}$ in accordance with AS $60038: 2000$.

## CS 7 Control relay

## Technical information

| Control circuit |  | CS 7 ( $\operatorname{CSS} 7)$ |
| :---: | :---: | :---: |
| Operating limits |  |  |
| AC $50 / 60 \mathrm{~Hz}$ | Pick-up ( $\mathrm{xU}_{\mathrm{s}}$ ) | 0.85...1.1 |
|  | Drop-out ( $\mathrm{xU}_{5}$ ) | 0.3...0.6 |
| Pick-up and hold power |  |  |
| AC 50/60 Hz | Pick-up (VA/W) | 70/50 |
|  | Hold (VA/W) | 8/2.6 |
| Operating times |  |  |
| AC $50 / 60 \mathrm{~Hz}$ | Make (ms) | 15... 30 |
|  | Break (ms) | 10... 60 |


| General data | CS 7 (CSS 7) |
| :---: | :---: |
| Rated insulation voltage $\mathrm{U}_{i}$ |  |
| IEC | 690 V |
| UL, CSA | 600 V |
| Rated impulse voltage withstand $\mathrm{U}_{\text {imp }}$ | 8 kV |
| Test voltage |  |
| 1 minute (to IEC 947-4) | 2500 V |
| Rated voltage $\mathrm{U}_{e}$ |  |
| AC | 110, 230/240, 400/415, 500, 690 V |
| DC | 24, 48, 110, 220, 440 V |
| Rated frequency of coil | $50 / 60 \mathrm{~Hz}$, DC |
| Ambient temperature |  |
| Storage | $-55 \ldots+80^{\circ} \mathrm{C} \quad\left(-67 \ldots+176{ }^{\circ} \mathrm{F}\right)$ |
| Operation at nominal current | $-25 \ldots+60^{\circ} \mathrm{C} \quad\left(-13 \ldots+140^{\circ} \mathrm{F}\right)$ |
| Maximum with 15 \% AC 1 current reduction $>60^{\circ} \mathrm{C}$ | $-25 \ldots+70{ }^{\circ} \mathrm{C} \quad\left(-13 \ldots+158{ }^{\circ} \mathrm{F}\right)$ |
| Climatic withstand | Cyclicly changing humid atmosphere to IEC 68-2-30 and DIN 50 016, 56 |
| Maximum altitude | 2000 m NN, to IEC 947-4 |
| Protection class | IP 2LX (IEC 529 and DIN 40050) |
|  | In connected condition |
| Protection against contact | Finger and back of hand to VDE 0106, Part 100 |

Note: $\quad 240 / 415 \mathrm{~V}$ rated coils are suitable for use on $230 / 400 \mathrm{~V}$ in accordance with AS 60038 : 2000.
schuh

## CS 7 Control relay

## Dimensions in mm

CS $\left.7(\mathrm{AC})^{2}\right)$


CS 7C (DC) ${ }^{2}$ )


Accessories

| Contactor with |  | (mm) |
| :--- | :--- | ---: |
| Front mounting auxiliary contact | 2 or 4 pole | $\mathrm{c} / \mathrm{c} 1+39$ |
| Side mounting auxiliary contact | 1 or 2 pole | $\mathrm{a}+9$ |
| Pneumatic timing module |  | $\mathrm{c} / \mathrm{c} 1+58$ |
| Electronic timing module | Coil mounting | $\mathrm{b}+24$ |
| Mechanical interlock | Mounts between contactors | $\mathrm{a}+9$ |
|  |  | $\mathrm{c} / \mathrm{c} 1+61$ |
| Interface | Coil mounting | $\mathrm{b}+9$ |
| Suppressor | Coil mounting | $\mathrm{b}+3$ |
| With inscriptions | Labels | +0 |
|  | Label support system V 7 | +5.5 |

## Mounting position



CS 7 (AC), CS 7E, CSS 7 (AC)


CS 7C (DC), CSS 7D (DC)
${ }^{2}$ ) CSS 7 dimensions as per above diagrams with front mounting auxiliary contacts.

## CS 7E DC operated AC relay low profile

## 4 pole open type

Low profile, low consumption 24 V DC control CS 7E relays with unmatched low holding power
Sprecher + Schuh has expanded it's successful range of CS 7 industrial control relays with a new low consumption electronic coil. The 24 V DC coil with low power consumption is integrated in a small relay body and draws less than $1.5 \mathrm{~W} / 60 \mathrm{~mA}$ holding power. The new design results in a shorter and more energy efficient relay, eases wiring and promotes a uniform panel appearance.

## Direct control from PLC

The low power consumption relay designed to control motors and other loads is especially aligned to the specific requirement of electronic control circuits. The low power consumption allows direct control through PLCs without the need for interposing relays. This means smaller power supplies which reduce panel space and cost.

## Features

- Low consumption 24 V DC electronic coil
- Low relay depth, same as AC devices
- Meets IEC, UL and CSA standards
- Common accessories for AC \& DC contactors (except electronic timers)
- Reversible coil terminations (line or load side)
- PLC control without need for interposing relay
- Reduced heat dissipation

CS 7E...E-24 V DC relays with 24 V DC electronic coil

Some size as
AC coll relays


## CS 7E DC operated AC relay low profile

4 pole open type
Low profile, low consumption 24 V DC control

| Contact arrangement and numbering | Contact |  | Latch |  |
| :---: | :---: | :---: | :---: | :---: |
|  | N/0 | N/C | Cat. No. | Price \$ |
|  | 2 | 2 | CS 7E-22E-24 VDC | 330.00 |
|  | 3 | 1 | CS 7E-31E-24 VDC | 330.00 |
|  | 4 | 0 | CS 7E-40E-24 VDC | 330.00 |



Dimension comparison to True DC relays (mm)

Electronic DC


True DC

|  | a | b | c | c1 | c2 | ød | d1 | d2 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 24 V DC | 45 | 81 | 80.5 | 75.5 | 6 | 2 screws <br> 4.5 | 60 | 35 |
| Electronic relay | 45 | 81 | 106.5 | 101.5 | 6 | 2 screws <br> 4.5 | 60 | 35 |

Coil consumption data comparison

|  | Electronic DC coil <br> CS 7E | True DC coil <br> CS 7E | Two winding DC coil <br> CS 7D |
| :--- | :--- | :--- | :--- |
| Pick-up (W) | 10 | 6.5 | 120 |
| Hold-in (W) | 1.5 | 6.5 | 1.1 |

CS 8 Control relay ${ }^{3}$ )
AC or DC 4 pole

Technical data
Rated thermal current (AC 12)
Auxiliary contact blocks

> AC $15 @ 230 / 240 \mathrm{~V}$ $400 / 415 \mathrm{~V}$

Mechanical service life
Coil consumption

| $40^{\circ} \mathrm{C}$ | 10 amp |
| :--- | :--- |
| $60^{\circ} \mathrm{C}$ | 6 amp |
| $40^{\circ} \mathrm{C}$ | 10 amp |
| $60^{\circ} \mathrm{C}$ | 6 amp |
| 2 amp | $(2 \mathrm{amp}$ for add-on blocks) |
| $1 \mathrm{amp}(1 \mathrm{amp}$ for add-on blocks) |  |
| 15 million ops (AC 35 coil) |  |
| AC | Pick up 35 VA ; hold 5 VA |
| DC | Pick up and hold 3 W |



CS8-40E 240VAC


CS8C-22Z 24VDC


CS8-P-11E

Basic relay - 4 pole AC
Contacts

| N/0 | N/C | AC or DC | Cat. No. ${ }^{1}$ ) | Price \$ |
| :--- | :--- | :--- | :--- | :--- | :--- |
| 4 | - | AC | CS 8-40E...V AC | 136.00 |
| 3 | 1 | AC | CS 8-31Z...V AC | 136.00 |
| 2 | 2 | AC | CS 8-222...V AC | 136.00 |
| $1+1$ EM | $1+1$ LB | AC | i CS 8-L22Z...V AC | 136.00 |

Basic relay - 4 pole DC

| Contacts $\mathrm{N} / 0$ | N/C | AC or DC | Cat. No. ${ }^{1}$ ) | Price \$ |
| :---: | :---: | :---: | :---: | :---: |
| 4 | - | DC | CS 8C-40E...V DC | 230.00 |
| 3 | 1 | DC | CS 8C-312...V DC | 230.00 |
| 2 | 2 | DC | CS 8C-22Z...V DC | 230.00 |
| 1+1EM | 1+1LB | DC | i]CS 8C-L22Z...V DC | 230.00 |

## Auxiliary contact blocks

Eight types of auxiliary contact blocks can be added to the basic relay. For the 40 E version any type of block can be used. The auxiliary blocks have a special contact configuration making them particularly suitable for switching low voltages such as PLC inputs.

| Contacts |  |  |  |
| :--- | :--- | :--- | :--- |
| N/C $/ \mathbf{C}$ | Cat. No. ${ }^{2}$ ) | Price \$ |  |
| - | 2 | CS 8-P-02E | 44.50 |
| 1 | 1 | CS 8-P-11E | 44.50 |
| 2 | - | CS 8-P-20E | 44.50 |
| - | - | CS 8-P-04E | 64.50 |
| 4 | 3 | CS 8-P-40E | 64.50 |
| 1 | 1 | CS 8-P-13E | 64.50 |
| 3 | 2 | CS 8-P-31Z | 64.50 |
| 2 |  | CS 8-P-22Z | 64.50 |

## Notes: ${ }^{1}$ ) Add coil voltage AC 24, 32, 110, 415 V 50 Hz to Cat. No. when ordering.

Add coil voltage DC 24, 48 or 110 V to Cat. No. when ordering. 12, 125 and 220 V DC available on indent.
${ }^{2}$ ) The same accessories used for the contactors CA 8 can be used with the control relays CS 8, e.g. interlocks, timing elements etc. Refer page 1-25 for details.
${ }^{3}$ ) Refer section 4 for technical data information and dimensions.
i Available on indent only.


## THINK SALES SERVICE AND SUPPORT. THINK NHP.

NHP has the largest product management, technical and engineering support and sales team in the Australasian electrical industry available 24 hours a day, 7 days a week, 365 days a year.

## Service Team

[^7]Refer catalogue F1

## Relay interface module



| Contact configuration | $1 \mathrm{C} / 0$ |
| :---: | :---: |
| Rated current / Maximum peak current | $6 \mathrm{~A} / 10 \mathrm{~A}$ |
| Rated voltage / Maximum switching voltage | 250 V AC / 400 V AC |
| Rated load in AC 1 | 1,500 VA |
| Rated load in AC 15 (230 V AC) | 300 VA |
| Breaking capacity in DC $1: 30 / 110 / 220 \mathrm{~V}$ | 6/0.2/0.15 A |
| Minimum switching load | 500 mW |
| Coil specifications ${ }^{1}$ ) |  |
| Nominal voltage ( $\mathrm{U}_{\mathrm{N}}$ ) $(50 / 60 \mathrm{~Hz}) \mathrm{AC} / \mathrm{DC}$ | $6,12,48,60$ 12 i., 48 <br> $24,110,240$ 24,240 |
| Rated power AC/DC (50/60 Hz) AC/DC | (0.2...0.9)W |
| DC | (0.2...0.4)W |
| Operation range $\quad(50 / 60 \mathrm{~Hz}) \mathrm{AC} / \mathrm{DC}$ | (0.8...1.1) UN |
| DC | (0.8...1.2) $U_{N}$ |
| Holding voltage AC/DC | $0.6 \mathrm{U}_{\mathrm{N}} / 0.6 \mathrm{U}_{\mathrm{N}}$ |
| Must drop-out voltage AC/DC | $0.1 \mathrm{U}_{\mathrm{N}} / 0.05 \mathrm{U}^{\text {N }}$ |
| Technical data |  |
| Mechanical life | $10.10^{6}$ |
| Electrical life @ rated load AC 1 | $60.10^{3}$ |
| Insulation between coil and contacts | 6 kV |
| Ambient temperature range | $-40^{\circ} \mathrm{C} \ldots+70{ }^{\circ} \mathrm{C}$ |
| Protection rating | IP 20 |
| Connection diagram |  |
| Dimensions | Refer page 8-36 |
| Accessories | 93.01 Isolating plate <br> 93.20 Jumperlink 20 way <br> 93.64 Identification labels <br> For more details refer page 8-18 |
| Replacement relays for 38.51 and 38.61 relays | $6 \mathrm{~V} \mathrm{DC}: 34.51 .5 \mathrm{VDC}$ $48 \mathrm{~V} \mathrm{AC} / \mathrm{DC}: 34.51 .48 \mathrm{~V} \mathrm{DC}$ <br> $12 \mathrm{~V} \mathrm{DC:} 34.51 .12 \mathrm{VDC}$ $60 \mathrm{VDC}, 110 \& 240 \mathrm{VAC} / \mathrm{DC}:$ <br> $24 \mathrm{~V} \mathrm{AC} / \mathrm{DC}: 34.51 .24 \mathrm{VDC}$ 34.51 .60 V DC |

Notes: $\quad{ }^{1}$ ) Add coil voltage to Cat. No. when ordering.
i) Available on indent only.

The equipment on this page is rated 230/400 V and is suitable for use on 240/415 V systems as per AS 60038:2000.
Price Schedule ' $B 2$ '

## Relay interface module

## DIN rail mount

- Integrated leakage current suppressor (LCS) and LED
- Ultra-slim profile, only 6.2 mm wide
- Simple removal of relay for replacement
- DIN rail mounting


Cat. No.
38.51125VACDCLCS $67.50 \quad 38.51240$ VACLCS


Price \$ 68.50

## Contact specifications

| Contact configuration | $1 \mathrm{C} / 0$ |
| :--- | :---: |
| Rated current | 6 A |
| Rated voltage | 250 V AC |
| Rated load in AC 1 | $1,500 \mathrm{VA}$ |
| Rated load in AC 15 (230 V AC) | 300 VA |
| Breaking capacity in DC 1:30/110/220 V | $6 / 0.2 / 0.15 \mathrm{~A}$ |
| Maximum peak current | 10 A |
| Maximum switching voltage | 400 V AC |
| Minimum switching load | 500 mW |

## Coil specifications

| Nominal voltage $\left(U_{N}\right) @ 50 / 60 \mathrm{~Hz}$ | $125 \mathrm{~V} \mathrm{AC} / \mathrm{DC}$ | 240 V AC |
| :--- | :--- | :--- |
| Rated power $\left(\mathrm{U}_{\mathrm{N}}\right)$ | 1 W | 0.5 W |
| Operation range | 94 V min. -138 V max. (AC/DC) | 184 V min. -264 V max. (AC) |
| Holding voltage | $0.6 \mathrm{U}_{\mathrm{N}}(\mathrm{AC} / \mathrm{DC})$ | $0.6 \mathrm{U}_{\mathrm{N}}(\mathrm{AC})$ |
| Must drop-out voltage | $44 \mathrm{~V}(\mathrm{AC} / \mathrm{DC})$ | $72 \mathrm{~V}(\mathrm{AC})$ |

## Technical data

| Mechanical life AC/DC | $10.10^{6}$ |
| :---: | :---: |
| Electrical life @ rated load AC 1 | $60.10^{3}$ |
| Insulation between coil and contacts | 6 kV |
| Ambient temperature range | $-40^{\circ} \mathrm{C} . . .+55^{\circ} \mathrm{C}$ |
| Protection rating | IP 20 |
| Connection diagram | $\left.\left.\right\|_{11} ^{12}\right\|_{A_{1}} ^{14}$ |
| Dimensions | Refer page 8-36 |
| Accessories | 93.01 Isolating plate <br> 93.20 Jumperlink 20 way <br> 93.64 Identification labels <br> For more details refer page 8-18 |
| Replacement relays | 34.51.60 V DC 34.51.60 V DC |

Note: $\quad$ The equipment on this page is rated $230 / 400 \mathrm{~V}$ and is suitable for use on 240/415 V systems as per AS 60038:2000.

Refer catalogue F1

## Relay interface module

DIN rail mount

| 38.52 |  |
| :--- | :--- |
| $\square$ | Pole 8 Amp screw terminal |
| Narrow profile of 14 mm |  |
| Ideal PLC interface relay |  |
| Integrated LED and diode |  |
| Simple removal of relay for |  |
| replacement |  |
| DIN rail mountable |  |



Cat. No.
38.5224 V DC
68.00
38.81

- Single output SSR interface module
- Ultra slim 6.2 mm wide profile
- Ideal PLC interface
- Integrated LED and diode
- High speed switching
- Long life solid state


Contact specifications

| Contact specifications |  | Contact specifications |  |
| :---: | :---: | :---: | :---: |
| Contact configuration | $2 \mathrm{C} / 0$ (DPDT) | Contact configuration $1 \mathrm{~N} / 0$ (S | PST-NO) |
| Rated current | 8 A | Rated current 2 | 2 A |
| Rated voltage | 250 V AC | Rated voltage 24 V DC | 240 V AC |
| Rated load AC 1 | 2,000 VA | Maximum peak current (10 ms) 20 A | 40 A |
| Rated load AC 15 | 400 VA | Maximum blocking voltage 33 V DC | 275 V AC |
| Single phase motor rating (230 V AC) | 0.3 kW | Switching voltage range $\quad 1.5$ to 24 V DC | 12 to 240 V AC |
| Breaking capacity DC 1: 30/110/220 V | 8/0.3/0.12 A | Minimum switching current 1 mA | 22 mA |
| Maximum switching voltage | 400 V AC | Maximum "OFF-state" leakage current 0.001 mA | 1.5 mA |
| Minimum switching load | 300 mW | Maximum "0 N -state" voltage drop 0.12 V | 1.6 V |
| Coil specifications |  | Input circuit (38.81 series) ${ }^{1}$ ) |  |
| Nominal voltage (Un) V DC | 24 | Nominal voltage 24 V | 24 V DC |
| Rated power DC | $0.5 \mathrm{~W}(50 \mathrm{~Hz})$ | Rated power 0.3 | 0.3 W |
| Operating range DC | (0.8 to 1.2) Un | Control current 10.5 | 10.5 mA |
| Holding voltage DC | 0.6 Un | Release voltage 10 V | 10 V DC |
| Must drop out voltage DC | 0.05 Un |  |  |
| Technical data |  | Technical data |  |
| Ambient temperature range | $-40 \ldots+70^{\circ} \mathrm{C}$ | Operate / release time 0.2/0. | 0.2/0.6 ms |
| Protection rating | IP 20 | Dielectric strength between input / output 2,500 | / output 2,500 V |
| Mechanical life cycles | $30.10^{6}$ | Ambient temperature range -20... | $-20 \ldots+55^{\circ} \mathrm{C}$ |
| Electrical life at rated load AC 1 cycles | $80.10^{3}$ | Protection rating IP | IP 20 |
| Insulation between coil \& contacts | 6 kV ( 8 mm ) |  |  |
| Dielectric strength between open contacts | $1,000 \mathrm{~V} \mathrm{AC}$ |  |  |

Connection diagram


| Dimensions | Refer page 8-36 | Dimensions | Refer page 8-36 |
| :---: | :---: | :---: | :---: |
| Accessories | Refer page 8-18 | Accessories | Refer page 8-18 |
|  | 93.01 Isolating plate |  | 93.01 Isolating plate |
|  | 93.08 jumper link 8 way |  | 93.20 Jumper link 20 way |
|  | 93.64 Identification labels |  | 93.64 Identification labels |
| Replacement relays | i 41.52.24 V DC | Replacement relays | i] 34.81.9024.24 V DC, 24 V DC input voltage: |

Notes: $\quad{ }^{1}$ ) Add coil voltage to Cat. No. when ordering.
i Available on indent only.

Price Schedule 'B2'

## Relay interface module

## Accessories

|  | Isolates varying voltages mounted in the same row. One isolating plate every four relays is recommended | ตT1Tบ1Tา <br> Reduced wiring and installation costs | Reduced wiring and installation costs | [IIUHİயITITI <br> Easy identification for maintenance |
| :---: | :---: | :---: | :---: | :---: |
| Cat. No. | 93.01 | 93.20 | (i) 93.08 | 93.64 |
| Price \$ | 3.10 | 12.40 | 15.00 | 47.50 |
| Description | Isolating plate | Jumper link 20 way 36 A, 250 V rating | Jumper link 8 way $10 \mathrm{~A}, 250 \mathrm{~V}$ rating | Identification labels <br> (64 tags in a pack) |
| Relay to suit | 38.51, 38.52, 38.61, 38.81 | 38.51, 38.61, 38.81 | 38.52 | 38.51, 38.52, 38.61, 38.81 |

Finder Series 46, 55, 56, 60 \& 62

## Features

NHP offers an extensive range of Finder general purpose PLC interface modules, industrial, miniature and PCB mounted relays, with the latest bases and accessories available on the market.

## Lockable test button

One of Finder relays main standard features is the lockable test button. The dual purpose test button can be used in two ways.
Option 1: To use as a momentary test button simply depress the button to operate the contacts. Releasing the button will return contacts to normal state.
Option 2: To use as a lockable test button first remove (break/cut-off) the plastic pip. Once removed, simply push and rotate the button anti-clockwise to lock the test button in place. The contacts will remain latched in the operation mode until the test button is rotated back to its normal position.

Note: In both cases test button actuation should be swift and decisive.

Finder design and manufacture general purpose and power relays to suit hundreds of commercial and industrial switching requirements. Contact NHP for further information.

[^8]Refer catolosu $\mathrm{F} 1 \quad$ Miniature general purpose relays

## Flat pin



## Contact specifications



Cat. No. ${ }^{1}$ )
Price \$
Cat. No. ${ }^{1}$ )
Price \$

| 55.32.0054...V AC | 21.60 | 55.34.0054...V AC | 27.80 |
| :---: | :---: | :---: | :---: |
| 55.32.0074...V DC | 21.60 | 55.34.0074...V DC | 27.80 |
| 55.32.5054...V AC ${ }^{4}$ ) | 37.00 | 55.34.5054...V AC ${ }^{4}$ ) | 46.00 |
| 55.32.5074...V DC ${ }^{4}$ ) | 40.00 | 55.34.5074...V DC 4) | 38.00 |


| Contact configuration | $2 \mathrm{C} / 0$ | $4 \mathrm{C} / 0$ |
| :---: | :---: | :---: |
| Rated current | 10 A | 7 A |
| Rated voltage | 250 V AC |  |
| Rated load in AC 1 | 2,500 VA | 1750 VA |
| Rated load in AC 15 (230 V AC) | 500 VA | 350 VA |
| Single phase motor rating ( $230 \mathrm{VAC} \mathrm{)}$ | 0.37 kW | 0.125 kW |
| Breaking capacity in DC 1:30/110/220 V | 10/0.25/0.12 A | 7/0.25/0.12 A |
| Maximum peak current | 20 A | 15 A |
| Maximum switching voltage | 400 V AC | 250 V AC |
| Minimum switching load _ $\mathrm{AgNi}^{3}$ ) | 300 mW |  |
| $\mathrm{AgNi}+\mathrm{Au}^{4}$ ) | $50 \mathrm{~mW}(5 \mathrm{~V}, 2 \mathrm{~mA})$ |  |
| Coil specifications ${ }^{1}$ ) ${ }^{\text {) }}$ |  |  |


| Nominal voltage ( $\mathrm{U}_{\mathrm{N}}$ ) $\mathrm{AgNi}^{3}$ ) $(50 / 60 \mathrm{~Hz}) \mathrm{AC}$ | 12, 24, 32, 48, 110, 240 | 12, 24, 32, 48, 110, 240 |
| :---: | :---: | :---: |
| DC | 12, 24, 32, 48, 110 | 12, 24, 32, 48, 110 |
| AgNi+Au ${ }^{4}$ ) ( $50 / 60 \mathrm{~Hz}$ ) AC | 240 | 24, 110, 240 |
| DC | 24 | 24 |
| Rated power AC/DC |  | /1W |
| Operation range ( 50 Hz ) AC |  | 1) $U_{N}$ |
| DC |  | 1) $U_{N}$ |
| Holding voltage AC/DC |  | $0.5 \mathrm{U}_{\mathrm{N}}$ |
| Must drop-out voltage AC/DC |  | 0.1 $\mathrm{U}_{\mathrm{N}}$ |
| Technical data |  |  |
| Mechanical life AC/DC |  | $10^{6}$ cycles |
| Electrical life @ rated load AC 1 | $200.10^{3}$ cycles | $150.10^{3}$ cycles |
| Insulation between coil and contacts | 4 kV | 4 kV |
| Ambient temperature range |  | $+85^{\circ} \mathrm{C}$ |
| Protection rating |  |  |
| Connection diagram <br> Note: New DC relays are non-polarised <br> 55.32... <br> 55.34... |  |  |
| Dimensions |  | e 8-36 |
| Recommended base and accessories | 94.02 Screw terminal base c/w metal retaining clip | 94.04 Screw terminal base c/w plastic clip/lever |
|  | For more information and $94.06$ | bases available refer page 8-33 jumper link |

Notes: ${ }^{1}$ ) Add coil voltage to Cat. No. when ordering.
${ }^{2}$ ) Please contact NHP for other voltages.
${ }^{3}$ ) Silver nickel.
${ }^{4}$ ) Silver nickel, gold plated.
The equipment on this page is rated 230/400 V and is suitable for use on 240/415 V systems as per AS 60038:2000.
Price Schedule ' $B 2$ '

## Miniature power relays

## Flat pin

- Lockable test button, mechanical flag indicator, LED for 2 pole relay only

|  | Cat. No. ${ }^{1}$ ) | Price \$ | Cat. No. ${ }^{1}$ ) | Price \$ |
| :---: | :---: | :---: | :---: | :---: |
|  | 56.32.0054...V AC | 31.50 | 56.34...V AC | 58.00 |
|  | 56.32.0074...V DC | 31.50 | 56.34...V DC | 58.00 |


| Contact configuration | $2 \mathrm{C} / 0$ | $4 \mathrm{C} / 0$ |
| :--- | :---: | :---: |
| Rated current | 12 A |  |
| Rated voltage | 250 V AC |  |
| Rated load in AC 1 | $3,000 \mathrm{VA}$ |  |
| Rated load in AC 15 (230 V AC) | 700 VA |  |
| Single phase motor rating (230 V AC) | 0.55 kW |  |
| Breaking capacity in DC 1:30/110/220 V | $12 / 0.5 / 0.25 \mathrm{~A}$ |  |
| Maximum peak current | 20 A |  |
| Maximum switching voltage | 400 V AC |  |
| Minimum switching load | 500 mW |  |

Coil specifications ${ }^{1}$ )

| Nominal voltage ( $\left.\mathrm{U}_{\mathrm{N}}\right)^{2}$ ) | $\begin{array}{r} (50 / 60 \mathrm{~Hz}) \mathrm{AC} \\ \mathrm{DC} \end{array}$ | $\begin{aligned} & 12,24,48,110,240 \\ & 6 \text { i , 12, 24, 48, 110 } \end{aligned}$ | $\begin{gathered} 6 \text { i] } 12,24,48 \text { i }, 110,240 \\ 12,24,48,110 \end{gathered}$ |
| :---: | :---: | :---: | :---: |
| Rated power AC/DC |  | $1.5 \mathrm{VA} / 1 \mathrm{~W}$ | $2 \mathrm{VA} / 1.3 \mathrm{~W}$ |
| Operation range | (50 Hz) AC | (0.8...1.1) $\mathrm{U}_{\mathrm{N}}$ |  |
|  | DC | (0.8...1.1) $\mathrm{U}_{\mathrm{N}}$ | (0.85...1.1) $\mathrm{U}_{\mathrm{N}}$ |
| Holding voltage AC/DC |  | $0.8 \mathrm{U}_{\mathrm{N}} / 0.6 \mathrm{U}_{\mathrm{N}}$ |  |
| Must drop-out voltage |  | $0.2 \mathrm{U}_{\mathrm{N} / 0.1} \mathrm{U}^{\mathrm{N}}$ |  |

## Technical data

| Mechanical life AC/DC | 20.10 $/ 50.10^{6}$ cycles |  |
| :---: | :---: | :---: |
| Electrical life @ rated load AC 1 | $100.10^{3}$ cycles |  |
| Insulation between coil and contacts | $4 \mathrm{kV} / 5 \mathrm{kV}$ |  |
| Ambient temperature range | $-40^{\circ} \mathrm{C} \ldots+70^{\circ} \mathrm{C}$ |  |
| Protection rating | IP 50 |  |
| Connection diagram <br> Note: New DC relays are non-polarised. <br> * Polarity for DC supply when using plug-in LED/diode modules. <br> 56.32... <br> 56.34... |  |  |
| Dimensions | refer page 8-36 |  |
| Recommended base and accessories <br> For more details refer to pages 8-32 and 8-34. | 96.02 screw terminal base | 96.04 screw terminal base |
|  | $\begin{array}{r} 96.01 \\ 99.013000 \\ 99.010 \ldots \text { LED } \end{array}$ | dule <br> ple plug-in dule plug-in |

Notes: $\quad{ }^{1}$ ) Add coil voltage to Cat. No. when ordering.
${ }^{2}$ ) Please contact NHP for other voltages.
i) Available on indent only.

The equipment on this page is rated 230/400 V and is suitable for use on 240/415 V systems as per AS 60038:2000.
Price Schedule ' $\mathrm{B}^{\prime}$ '

Refer catalogue $\mathrm{F} 1 \quad$ General purpose relays

## Round pin

- Lockable test button and mechanical flag
- 8 and 11 round pin plug-in versions

■ Used with 90 series bases

## Contact specifications

Contact configuration

| Contact configuration | $2 \mathrm{C} / 0$ | $3 \mathrm{C} / 0$ |
| :--- | :---: | :---: |
| Rated current | 10 A |  |
| Rated voltage | 250 V AC |  |
| Rated load in AC 1 | $2,500 \mathrm{VA}$ |  |
| Rated load in AC 15 (230 V AC) | 500 VA |  |
| Single phase motor rating (230 V AC) | 0.37 kW |  |
| Breaking capacity in DC 1:30/110/220 V | $10 / 0.4 / 0.15 \mathrm{~A}$ |  |
| Maximum peak current | 20 A |  |
| Maximum switching voltage | 400 V AC |  |
| Minimum switching load | 500 mW |  |

## Coil specifications ${ }^{1}$ )

| Nominal voltage ( $\mathrm{U}_{\mathrm{N}}$ ) | $\begin{array}{r} (50 / 60 \mathrm{~Hz}) \mathrm{AC} \\ \mathrm{DC} \end{array}$ | $\begin{aligned} & 6,12,24,32,48,60 \text { i }, 110,240 \\ & 6 \text { i }, 12,24,32,48,60[i], 110 \end{aligned}$ | $\begin{aligned} & 6 \text { i }, 12,24,32,48,60 \text { i }, 110,240 \\ & 6 \text { i }, 12,24,32 \text { i }, 48,110,125,220 \text { i } \end{aligned}$ |
| :---: | :---: | :---: | :---: |
| Rated power AC/DC |  | $2.2 \mathrm{VA} / 1.3 \mathrm{~W}$ |  |
| Operation range | $(50 \mathrm{~Hz}) \mathrm{AC}$ | (0.8...1.1) $U_{N}$ |  |
|  | DC | (0.8...1.1) $U_{N}$ |  |
| Holding voltage AC/DC |  | $0.8 U_{N} / 0.5 U_{N}$ |  |
| Must drop-out voltage |  | 0.2 UN/0.1 UN |  |

## Technical data



Notes: ${ }^{1}$ ) Add coil voltage to Cat. No. when ordering.
i Available on indent only.
The equipment on this page is rated 230/400 V and is suitable for use on 240/415 V systems as per AS 60038:2000.
Price Schedule ' B 2 '

## Step relays

## DIN rail and panel mount

20 series
One module wide ( 17.5 mm )
Integral ID label
$\square$
Test button with mechanical indicator

26 series

- Screw terminal connection
- Panel mountable
- Silent operation


## Contact specifications

Contact configuration
Rated current
Rated voltage
Rated load in AC 1
Rated load in AC 15 (230 V AC)
Nominal lamp rating: incandescent

| Compensated fluorescent |
| :--- |
| Uncompensated fluorescent |
| Halogen lamps |

Maximum peak current (230 V)

| Maximum switching voltage |
| :--- |
| Minimum switching load |

Coil specifications ${ }^{1}$ )

| Coil specifications ${ }^{1}$ ) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Nominal voltage ( $\mathrm{UN}_{\text {) }}$ ) | 24, 110, 240 | $\begin{aligned} & 24,48 \text { i }, 110, \\ & 240 \end{aligned}$ | $\begin{aligned} & 12 \text { i , 24, } \\ & 240 \end{aligned}$ | 12 i , 24, 48 i <br> 110 i , 240 | $\begin{aligned} & 12 \text { i }, 24, \\ & 48 \text { i }, 240 \end{aligned}$ |
|  | 12, 24 | 12, 24 | - | - | - |
| Rated power AC/DC | 6.5 VA/5 W |  | 4.5 VA |  |  |
| Operation range | (0.85...1.1) $\mathrm{U}_{\mathrm{N}}$ |  | (0.8...1.1) UN |  |  |
|  | (0.9...1.1) $U_{N}$ |  | - |  |  |
| Maximum pulse duration (EN 60669) | 1 hour |  |  |  |  |
| Technical data |  |  |  |  |  |
| Mechanical life AC/DC | $300.10^{3}$ cycles |  | $300.10^{3}$ cycles |  |  |
| Electrical life @ rated load AC 1 | $100.10^{3}$ cycles |  | $100.10^{3}$ cycles |  |  |
| Insulation between coil and contacts | 4 kV |  | 4 kV |  |  |
| Ambient temperature range | $-40^{\circ} \mathrm{C} . . .+40^{\circ} \mathrm{C}$ |  | $-40^{\circ} \mathrm{C} . . .+40^{\circ} \mathrm{C}$ |  |  |
| Protection rating | IP 20 |  | IP 20 |  |  |
| Connection diagram | $\begin{array}{cc:c} A 1 & 1 & 3 \\ & 0 & 0 \\ & 0 & 0 \\ 0 & 0 & 6 \\ 0 & 0 & 0 \\ A 2 & 2 & 4 \\ 20.22 \end{array}$ |  |  |  | $\begin{gathered} A! \\ a_{1}^{1} \\ 0 \end{gathered} 0_{0}^{3}$ |
| Dimensions | Refer page 8-36 |  |  |  |  |
| Operation | On receipt of to the op | tage signal to th site position. Id | lay coil, th for two wa | contacts chan <br> light switchin | e state |

Notes: ${ }^{1}$ ) Add coil voltage to Cat. No. when ordering.
i Available on indent only.
The equipment on this page is rated 230/400 V and is suitable for use on 240/415 V systems as per AS 60038:2000.

Industrial power relays

## Plug-in

- Space saving
- Suitable for high power switching
- Integral test button
- 16 A rated base now available

| Contact specifications | Cat. No. ${ }^{1}$ ) | Price \$ | Cat. No. ${ }^{1}$ ) | Price \$ |
| :---: | :---: | :---: | :---: | :---: |
|  | 62.32...V AC | 43.00 | 62.33...V AC | 48.50 |
|  | 62.32...V DC | 46.00 | 62.33...V DC | 48.50 |
|  |  |  |  |  |
| Contact configuration | $2 \mathrm{C} / 0$ |  |  |  |
| Rated current | 16 A |  |  |  |
| Rated voltage | 250 V AC |  |  |  |
| Rated load in AC 1 | 4,000 VA |  |  |  |
| Rated load in AC 15 (230 V AC) | 750 VA |  |  |  |
| Single phase motor rating (230 V AC) | 0.8 kW |  |  |  |
| Breaking capacity in DC $1: 30 / 110 / 220 \mathrm{~V}$ | 16/0.6/0.4 A |  |  |  |
| Maximum peak current | 30 A |  |  |  |
| Maximum switching voltage | 400 V AC |  |  |  |
| Minimum switching load | 1,000 mW |  |  |  |

Coil specifications ${ }^{1}$ )


## Technical data



Note: $\quad{ }^{1}$ ) Add coil voltage to Cat. No. when ordering.
The equipment on this page is rated $230 / 400 \mathrm{~V}$ and is suitable for use on 240/415 V systems as per AS 60038:2000.

## Industrial power relays

## Quick connect



## Contact specifications

| Contact configuration | $1 \mathrm{~N} / 0+1 \mathrm{~N} / \mathrm{C}(\mathrm{DPST})$ | $1 \mathrm{~N} / 0$ (SPST) |
| :--- | :---: | :---: |
| Rated current | 20 A | 30 A |
| Rated voltage | 250 V AC |  |
| Rated load in AC 1 | $5,000 \mathrm{VA}$ | $7,500 \mathrm{VA}$ |
| Rated load in AC $15(230 \mathrm{~V} \mathrm{AC})$ | 1000 VA | 1250 VA |
| Single phase motor rating (230 V AC) | 1.1 kW | 1.5 kW |
| Breaking capacity in DC $1: 30 / 110 / 220 \mathrm{~V}$ | $20 / 0.8 / 0.5 \mathrm{~A}$ | $30 / 1.1 / 0.7 \mathrm{~A}$ |
| Maximum peak current | 40 A | 50 A |
| Maximum switching voltage |  | 400 V AC |
| Minimum switching load | $1,000 \mathrm{~mW}$ |  |

Coil specifications ${ }^{1}$ )

| Nominal voltage ( $\mathrm{U}_{\mathrm{N}}$ ) | ( $50 / 60 \mathrm{~Hz}$ ) AC | 6 i , 12, 24, 60 i , 240 | 24, 110 i], 240 |
| :---: | :---: | :---: | :---: |
|  | DC | 6ix, 12, 24, 48, 60 i , 110 i | 12], 24i |
| Rated power AC/DC |  | 2.2 VA/1.3 W |  |
| Operation range | ( 50 Hz ) AC | (0.8...1.1) $\mathrm{U}_{\mathrm{N}}$ |  |
|  | DC | (0.85...1.1) $U_{N}$ |  |
| Holding voltage $\mathrm{AC} / \mathrm{DC}$ |  | $0.8 \mathrm{U}_{\mathrm{N}} / 0.6 \mathrm{U}_{\mathrm{N}}$ |  |
| Must drop-out voltage |  | $0.2 \mathrm{U}_{\mathrm{N}} / 0.1 \mathrm{U}_{\mathrm{N}}$ |  |

Technical data

| Mechanical life AC/DC | $10.10^{6} / 30.10^{6}$ cycles |  |
| :---: | :---: | :---: |
| Electrical life @ rated load AC 1 | $80.10^{3}$ cycles | $50.10^{3}$ cycles |
| Insulation between coil and contacts | 4 kV |  |
| Ambient temperature range | $-40^{\circ} \mathrm{C}$... $+75^{\circ} \mathrm{C}$ |  |
| Protection rating | IP 50 |  |
|  |  |  |
| Dimensions | Refer page 8-36 |  |
| Bases | Not applicable |  |

Notes: $\quad{ }^{1}$ ) Add coil voltage to Cat. No. when ordering.
i Available on indent only.
The equipment on this page is rated $230 / 400 \mathrm{~V}$ and is suitable for use on $240 / 415 \mathrm{~V}$ systems as per AS 60038:2000.

Refer catalogue F1

## Industrial power relays

## Quick connect

- Compact
- Easy to install
- Suitable for high power switching
- Lockable test button
- Terminals suit 6.3 mm Faston lugs



## Contact specifications

| Contact configuration | $2 \mathrm{C} / 0$ | $3 \mathrm{C} / 0$ |
| :--- | :---: | :---: |
| Rated current |  | 16 A |
| Rated voltage | 250 V AC |  |
| Rated load in AC 1 | $4,000 \mathrm{VA}$ |  |
| Rated load in AC $15(230 \mathrm{~V} \mathrm{AC})$ | 750 VA |  |
| Single phase motor rating (230 V AC) | 0.8 kW |  |
| Breaking capacity in DC $1: 30 / 110 / 220 \mathrm{~V}$ | $16 / 0.6 / 0.4 \mathrm{~A}$ |  |
| Maximum peak current | 30 A |  |
| Maximum switching voltage | 400 V AC |  |
| Minimum switching load | $1,000 \mathrm{~mW}$ |  |

Coil specifications ${ }^{1}$ )

| Nominal voltage ( $\mathrm{U}_{\mathrm{N}}$ ) | (50/60 Hz) AC | 24i, 240 | 240 |
| :---: | :---: | :---: | :---: |
|  | DC | 12i, 24, 110 i | 12, 24i, 110 |
| Rated power AC/DC |  | 2.2 VA/1.3 W |  |
| Operation range | ( 50 Hz ) AC | (0.8...1.1) UN |  |
|  | DC | (0.8...1.1) $U_{N}$ |  |
| Holding voltage $\mathrm{AC} / \mathrm{DC}$ |  | $0.8 \mathrm{U}^{\mathrm{N}} / 0.6 \mathrm{U}_{\mathrm{N}}$ |  |
| Must drop-out voltage |  | $0.2 \mathrm{U}_{\mathrm{N}} / 0.1 \mathrm{U}_{\mathrm{N}}$ |  |

## Technical data

| Mechanical life AC/DC | $10.10^{6} / 30.10^{6}$ cycles |  |
| :---: | :---: | :---: |
| Electrical life @ rated load AC 1 | $100.10^{3}$ cycles |  |
| Insulation between coil and contacts | 6 kV |  |
| Ambient temperature range | $-40^{\circ} \mathrm{C} . . .+70{ }^{\circ} \mathrm{C}$ |  |
| Protection rating | IP 50 |  |
| Connection diagram <br> 62.82... |  |  |
| Dimensions | Refer page 8-36 |  |
| Bases | Not applicable |  |

Notes: $\quad{ }^{1}$ ) Add coil voltage to Cat. No. when ordering.
i Available on indent only.
The equipment on this page is rated $230 / 400 \mathrm{~V}$ and is suitable for use on 240/415 V systems as per AS 60038:2000.

Industrial power relays

## Quick connect



| Contact specifications |  |  |
| :--- | :---: | :---: |
| Contact configuration | $2 \mathrm{C} / 0$ | $3 \mathrm{C} / 0$ |
| Rated current | 16 A |  |
| Rated voltage | 250 V AC |  |
| Rated load in AC 1 | $4,000 \mathrm{VA}$ |  |
| Rated load in AC 15 (230 V AC) | 750 VA |  |
| Single phase motor rating (230 V AC) | 0.8 kW |  |
| Breaking capacity in DC 1:30/110/220 V | $16 / 0.6 / 0.4 \mathrm{~A}$ |  |
| Maximum peak current | 30 A |  |
| Maximum switching voltage | 400 V AC |  |
| Minimum switching load | $1,000 \mathrm{~mW}$ |  |

Coil specifications ${ }^{1}$ )

| Nominal voltage ( $\mathrm{U}_{\mathrm{N}}$ ) | ( $50 / 60 \mathrm{~Hz}$ ) AC | 240 | 240 |
| :---: | :---: | :---: | :---: |
|  | DC | 12 i , 24 i , 110 | 12 i , 24 i , 110 i |
| Rated power AC/DC |  | 2.2 VA/1.3 W |  |
| Operation range | ( 50 Hz ) AC | (0.8...1.1) $\mathrm{U}_{\mathrm{N}}$ |  |
|  | DC | (0.8...1.1) $\mathrm{U}_{\mathrm{N}}$ |  |
| Holding voltage AC/DC |  | $0.8 \mathrm{U}_{\mathrm{N}} / 0.6 \mathrm{U}^{\text {N }}$ |  |
| Must drop-out voltage |  | 0.2 $\mathrm{U}_{\mathrm{N} / 0.1} \mathrm{U}_{\mathrm{N}}$ |  |

Technical data

| Mechanical life AC/DC | $10.10^{6} / 30.10^{6}$ cycles |  |
| :---: | :---: | :---: |
| Electrical life @ rated load AC 1 | $100.10^{3}$ cycles |  |
| Insulation between coil and contacts | 6 kV |  |
| Ambient temperature range | $-40^{\circ} \mathrm{C} . . .+70{ }^{\circ} \mathrm{C}$ |  |
| Protection rating | IP 50 |  |
| Connection diagram <br> 62.82... <br> 62.83... |  |  |
| Dimensions | Refer page 8-36 |  |
| Bases | Not applicable |  |

Notes: $\quad{ }^{1}$ ) Add coil voltage to Cat. No. when ordering.
i Available on indent only.
The equipment on this page is rated 230/400 V and is suitable for use on 240/415 V systems as per AS 60038:2000.

Refer catalogue F1

## Miniature relays

PCB mount or plug-in


Cat. No.
Price \$
Cat. No.
Price \$
30.22...V DC ${ }^{1}$ ) $\quad 14.80 \quad 34.51 \ldots$ DC $^{1}$ )
35.50

## Contact specifications

| Contact configuration | $2 \mathrm{C} / 0$ | $1 \mathrm{C} / 0$ |
| :--- | :---: | :---: |
| Rated current | 2 A | 6 A |
| Rated voltage | 125 V AC | 250 V AC |
| Rated load in AC 1 | 125 VA | $1,500 \mathrm{VA}$ |
| Rated load in AC $15(230 \mathrm{~V} \mathrm{AC)}$ | 25 VA | 300 VA |
| Breaking capacity in DC $1: 30 / 110 / 220 \mathrm{~V}$ | $2 / 0.3 /-\mathrm{A}$ | $6 / 0.2 / 0.12 \mathrm{~A}$ |
| Maximum peak current | 3 A | 10 A |
| Maximum switching voltage | 250 V AC | 400 V AC |
| Minimum switching load | 10 mW | 500 mW |

Coil specifications ${ }^{1}$ )

| Nominal voltage (UN) | DC | 12,24 | $\left.5^{2}\right)[i, 12,24,60$ |
| :--- | :---: | :---: | :---: |
| Rated power | DC | 0.2 W | 0.17 W |
| Operation range | DC | $(0.7 \ldots 1.9) \mathrm{U}_{N}$ | $(0.7 \ldots 1.5) \mathrm{U}_{N}$ |
| Holding voltage | DC | $0.35 \mathrm{U}_{N}$ | $0.4 \mathrm{U}_{N}$ |
| Must drop-out voltage | DC | $0.05 \mathrm{U}_{N}$ | $0.05 \mathrm{U}_{N}$ |

Technical data

| Mechanical life DC | $10.10^{6}$ cycles | $10.10^{6}$ cycles |
| :---: | :---: | :---: |
| Electrical life @ rated load AC 1 | $100.10^{3}$ cycles | $60.10^{3}$ cycles |
| Insulation between coil and contacts | 1.5 kV | 6 kV |
| Ambient temperature range | $-40^{\circ} \mathrm{C} . . .885^{\circ} \mathrm{C}$ | $-40^{\circ} \mathrm{C} . . .885^{\circ} \mathrm{C}$ |
| Protection rating | IP 67 | IP 50 |
|  |  |  |
| Dimensions | Refer page 8-36 | Refer page 8-36 |
| Bases | Not applicable | Refer to 38.51 relay interface module page 8-15 for complete unit and base ordering |

Notes: ${ }^{1}$ ) Add coil voltage to Cat. No. when ordering.
${ }^{2}$ ) 5 V version min order in qty. of 10 .
i Available on indent only.
The equipment on this page is rated 230/400 V and is suitable for use on 240/415 V systems as per AS 60038:2000.
Price Schedule ' $B 2$ '

## Miniature relays

## Faston connection or plug-in

- Compact
- High load switching up to 16 A
- Lockable test button and mechanical flag Indicator with LED
- Built-in suppression (DC version only)


Cat. No. ${ }^{1}$ ) 46.61.0054 240 V AC
30.50
15.20
46.61.0054... V AC
46.61.0074... V DC

Price \$

| 30.50 | 46.52 .0054 240 V AC | 31.00 |
| :--- | :--- | :--- |
| 17.80 | $46.52 .0054 \ldots$ V AC | 20.60 |
| 15.20 | $46.52 .0074 \ldots$ V DC | 17.60 |

Contact specifications

| Contact configuration | $1 \mathrm{C} / 0$ | $2 \mathrm{C} / 0$ |
| :---: | :---: | :---: |
| Rated current/maximum peak current A | 16/25 | 8/15 |
| Rated voltage/maximum switching voltage V AC | 250/440 |  |
| Rated load AC 1 VA | 4000 | 2000 |
| Rated load AC 15 (230 V AC) VA | 750 | 350 |
| Single phase motor rating (230 V AC) kW | 0.55 | 0.37 |
| Breaking capacity DC 1: 30/110/220 V A | 12/0.5/0.15 | 6/0.5/0.15 |
| Minimum switching load mW (V/mA) | 300 (5/5) |  |

Coil specifications ${ }^{1}$ )

| Nominal voltage (UN) | $(50 / 60 \mathrm{~Hz}) \mathrm{V} \mathrm{AC}$ | $12,24,48,110,240$ | $12,24,48,110,240$ |
| :--- | ---: | :---: | :---: |
|  | V DC | $12,24,48,110$ | $12,24,48,110$ |
| Rated power | $\mathrm{VA} / \mathrm{W}$ |  | $1.2 / 0.5$ |
| Operation range | AC | $(0.8 \ldots 1.1) U_{N}$ |  |
|  | DC | $(0.73 \ldots 1.1) U_{N}$ |  |
| Holding voltage | $\mathrm{AC} / \mathrm{DC}$ | $0.8 U_{N} / 0.4 U_{N}$ |  |
| Must drop-out voltage | $\mathrm{AC} / \mathrm{DC}$ | $0.2 U_{N} / 0.1 U_{N}$ |  |

Technical data

| Mechanical life AC/DC cycles | $10.10^{6}$ |
| :---: | :---: |
| Electrical life at rated load AC 1 cycles | $100.10^{3}$ |
| Operate/release time ms | 15/5 10/3 |
| Insulation between coil and contacts (1.2/50 $\mu$ s) | $6 \mathrm{kV}(8 \mathrm{~mm})$ |
| Ambient temperature range | $-40 \ldots+70^{\circ} \mathrm{C}$ |
| Protection rating | IP 50 |
| Connection Diagram Note: DC relays are non-polarised |  |
| Dimensions | Refer page 8-37 |
| Recommended base and accessories | 97.01 Screw terminal base ${ }^{\text {97.02 Screw terminal base }}$ |
| Refer page 8-31 | 046.05 Flange mount adaptor |
|  | 046.07 DIN rail adaptor |

Notes: $\quad{ }^{1}$ ) Add coil voltage to Cat. No. when ordering.
The equipment on this page is rated 230/400 V and is suitable for use on 240/415 V systems as per AS 60038:2000.
Price Schedule 'B2'

Refer catalogue F1
Miniature relays
PCB mount or plug-in


Coil specifications ${ }^{1}$ )

| Nominal voltage ( $\mathrm{U}_{\mathrm{N}}$ ) | $\begin{aligned} & \mathrm{AC} \\ & \mathrm{DC} \end{aligned}$ | $\begin{aligned} & 12,24,110,240 \\ & \left.5^{2}\right) \text { i , 12, 24, } 48 \end{aligned}$ | $\begin{gathered} 12,24,110,240 \\ 6,12,24,48,110 \end{gathered}$ |
| :---: | :---: | :---: | :---: |
| Rated power AC/DC |  | 1.2 VA/0.65 W |  |
| Operation range | $(50 \mathrm{~Hz}) \mathrm{AC}$ | (0.8...1.1) UN |  |
|  | DC | (0.73..1.5) $U_{N}$ |  |
| Holding voltage AC/DC |  | $0.8 \mathrm{U}_{\mathrm{N}} / 0.4 \mathrm{U}_{\mathrm{N}}$ |  |
| Must drop-out voltage |  | 0.2 UN/0.1 $\mathrm{U}_{\mathrm{N}}$ |  |

Technical data

| Mechanical life AC/DC | $10.10^{6} / 20.10^{6}$ cycles |  |
| :---: | :---: | :---: |
| Electrical life @ rated load AC 1 | $200.10^{3}$ cycles | $100.10^{3}$ cycles |
| Insulation between coil and contacts | 6 kV |  |
| Ambient temperature range | $-40^{\circ} \mathrm{C} . . .885^{\circ} \mathrm{C}$ |  |
| Protection rating | IP 50 |  |
| Connection diagram |  |  |
| Dimensions | Refer page 8-36 |  |
| Recommended bases <br> For compatible screwless terminal base refer part $B$, section $10-47$ | $\begin{array}{r} 95.0 \\ 95 \\ 99.0 \\ 99.0 \\ 99.029 \mathrm{~L} \\ \text { For mol } \end{array}$ | s <br> in <br> plug-in <br> - 32 |

Notes: $\quad{ }^{1}$ ) Add coil voltage to Cat. No. when ordering.
${ }^{2}$ ) 5 V version minimum order in quantity of 10.
i Available on indent only.
The equipment on this page is rated $230 / 400 \mathrm{~V}$ and is suitable for use on $240 / 415 \mathrm{~V}$ systems as per AS 60038:2000.
Price Schedule ' B 2 '

## Miniature relays

## PCB mount or plug-in

Compact
Suitable for high power switching
High surge withstand capability
Operates reliably in high temperatures
5 mm pinning


| Cat. No. ${ }^{1}$ ) | Price \$ | Cat. No. ${ }^{1}$ ) | Price \$ |
| :--- | :--- | :--- | ---: |
| $40.61 \ldots$ V AC | 17.20 | $44.62 \ldots$ V DC | 16.60 |
| $40.61 \ldots$ V DC | 16.20 | - | - |

Contact specifications

|  | $1 \mathrm{C} / 0$ | $2 \mathrm{C} / 0$ |
| :---: | :---: | :---: |
|  | 16 A | 10 A |
|  | $4,000 \mathrm{VA}$ | $2,500 \mathrm{VA}$ |
| 750 VA | 500 VA |  |
|  | 0.55 kW | 0.37 kW |
|  | $16 / 0.3 / 0.12 \mathrm{~A}$ | $10 / 0.3 / 0.13 \mathrm{~A}$ |
|  | 30 A | 20 A |

Coil specifications ${ }^{1}$ )

| Nominal voltage ( $\mathrm{U}_{\mathrm{N}}$ ) | ( $50 / 60 \mathrm{~Hz}$ ) AC | 240 V AC | - |
| :---: | :---: | :---: | :---: |
|  | DC | 12, 24 | 12, $24, \mathrm{i} 110^{2}$ ) |
| Rated power AC/DC |  | 0.65 W |  |
| Operation range | $(50 \mathrm{~Hz}) \mathrm{AC}$ | (0.8...1.1) $\mathrm{U}_{\mathrm{N}}$ | - |
|  | DC | (0.73..1.5) $U_{N}$ |  |
| Holding voltage AC/DC |  | $0.8 \mathrm{U}_{\mathrm{N}} / 0.4 \mathrm{U}^{\text {N }}$ | - / $0.4 \mathrm{U}_{\mathrm{N}}$ |
| Must drop-out voltage |  | $0.2 \mathrm{U}_{\mathrm{N}} / 0.1 \mathrm{U}_{\mathrm{N}}$ | - / 0.1 UN |

Technical data

| Mechanical life AC/DC | 10.10 $/ 20.10^{6}$ cycles | -/20.10 ${ }^{6}$ cycles |
| :---: | :---: | :---: |
| Electrical life @ rated load AC 1 | $100.10^{3}$ cycles |  |
| Insulation between coil and contacts | 6 kV |  |
| Ambient temperature range | $-40^{\circ} \mathrm{C} . . .885^{\circ} \mathrm{C}$ |  |
| Protection rating | IP 50 |  |
| Connection diagram |  |  |
| Dimensions | Refer page 8-36 |  |
| Recommended bases <br> For compatible screwless terminal base refer part $B_{1}$ section $10-47$ | 95.05 Screw terminal bases 95.15 PCB mount base 99.02 LED module plug-in 95.188 way jumper link <br> For more details refer page 8-31 |  |

Notes: $\quad{ }^{1}$ ) Add coil voltage to Cat. No. when ordering.
$\left.{ }^{2}\right) 110 \mathrm{~V} D C$ version minimum order quantity 10 pcs.
i Available on indent only.
The equipment on this page is rated $230 / 400 \mathrm{~V}$ and is suitable for use on $240 / 415 \mathrm{~V}$ systems as per AS 60038:2000.

## Relay bases and accessories

Bases for series 40, 44 \& 46 relays

| (Refer to page 8-37 to 8-38 for relay base dimensions). |  |  | $T \mathrm{~T} T \mathrm{~T} T$ |
| :---: | :---: | :---: | :---: |
| Cat. No. Price \$ | 95.05 18.60 | 95.15 | 95.18 7.30 |
| Description | DIN rail mounting screw terminal base. <br> Separate coil \& contact terminals. <br> Accepts 99-02 series modules. | PCB mounting base. | Jumper 8 way for parallelling 95.05, 97.01 and 97.02 base terminals. <br> Maximum $10 \mathrm{~A}, 250 \mathrm{~V}$. |
| Relay to suit | $\begin{aligned} & \text { PCB relay } 40.51,40.52,40.61 \\ & \text { and } 44.62 \end{aligned}$ | $\begin{aligned} & \text { PCB relay, 40.51, 40.52, 40.61, } \\ & 44.62 \end{aligned}$ | 40 and 44 series |
| Retaining clip | Supplied with base | N/A | N/A |
|  |  |  |  |
| Cat. No. Price \$ | 95.85 | 95.75 16.20 | 95.08 8.00 |
| Description | DIN rail mounting. <br> In-built retaining and extractor mechanism. <br> Accepts 99.8 series modules. | DIN rail mounting base shrouded terminals. Accepts 99.01 series modules. | Common link - 8 way for parallelling 95.75 and 95.85 base terminals. <br> Maximum $10 \mathrm{~A}, 250 \mathrm{~V}$. |
| Relay to suit | $\begin{aligned} & \text { PCB relay, 40.51, 40.52, 40.61, } \\ & 44.62 \end{aligned}$ | PCB relay, 40.51, 40.52, 40.61, 44.62 | 40 and 44 series. |
| Retaining clip | Supplied with base | Supplied with base | N/A |

Bases and adaptors for series 46 relays

|  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Cat. No. | Price \$ | 97.01 | 12.80 | 97.02 | 17.00 | 046.05 i | 5.40 | 046.07 | 5.40 |
| Description |  | DIN rail mounting base open terminals |  |  |  | Faston flange mount adaptor |  | Faston DIN rail adaptor |  |
| Relay to suit |  | Flat pin $1 \mathrm{C} / 0$ Flat pin $2 \mathrm{C} / 0$ <br> $46.61 \ldots$ $46.52 \ldots$ |  |  |  | Flat pin 1 C/0 46.61... <br> Flat pin 2 C/0 46.52... |  |  |  |

Notes: $\qquad$ Available on indent only.

## Relay bases and accessories



Notes: i Available on indent only.

## Relay bases and accessories

## Bases for series 55 relays



|  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Cat. No. | Price \$ | 94.72 | 16.20 | 94.74 | 19.20 | 94.06 | 7.00 |
| Description |  | DIN rail mounting base open terminals. Accepts 99-01 series LED modules. |  | DIN rail mounting base open terminals. Accepts 99-01 series LED modules. |  | Jumper link 6 way maximum $10 \mathrm{~A}, 250 \mathrm{~V}$. |  |
|  | Relay to suit | Flat pin 2 C/0 (8 pin) 55.32... |  | $\begin{aligned} & \text { Flat pin } 4 \text { C/0 (14 pin) } \\ & 55.34 \ldots \end{aligned}$ |  | $\begin{aligned} & 94.02,94.04 \\ & 55.34 \ldots \end{aligned}$ |  |
| Retaining clip | Price \$ | 94.71 | 2.00 | 94.71 | 2.00 | N/A |  |


|  |  |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |

Notes: Please refer to page 8-32 for recommended LED and diode plug-in modules. Refer page 8-38 for relay base dimensions.

## Relay bases and accessories

## Bases for series 56 relays

|  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Cat. No. | Price \$ | 96.02 | 16.20 | 96.04 | 21.20 |
| Description |  | DIN rail mounting base open terminals. Accepts 99-01 series LED modules. |  | DIN rail mounting base open terminals. Accepts 99-01 series LED modules. |  |
| Relay to suit |  | Flat pin $2 \mathrm{C} / 0$ (8 pin) 56.32... |  | Flat pin 4 C/0 (14 pin) 56.34... |  |
| Retaining clip | Price \$ | 94.71 | 2.00 | 96.71 | 2.00 |



## Bases for series 62 relays

|  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Cat. No. | Price \$ | 92.03 |  | 23.40 | 92.43 | 20.60 |
| Description |  | Screw terminal base Rated at 16 Amps |  |  | DIN rail mounting base open terminals |  |
| Relay to suit |  | Flat pin $2 \mathrm{C} / 0$ \& $3 \mathrm{C} / 0$ (11 pin) 62.32... 62.33... |  |  | $\begin{array}{ll} \text { Flat pin } 3 \text { C/0 } & (11 \mathrm{pin}) \\ 62.32 \ldots & 62.33 \ldots \end{array}$ |  |
| Retaining clip | Price \$ | 92.71 |  | 2.00 | 92.53 | 1.90 |

Notes: Please refer to page 8-32 for recommended LED and diode plug-in modules.
Refer to page 8-38 for relay base dimensions.
i Available on indent only.

Relay bases and accessories
Bases for series 60 round pin relays/Timer modules

|  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Cat. No. | Price \$ | 90.20 | 14.60 | 90.21 | 17.00 | 90.03 | 24.20 |
| Description |  | DIN rail mounting base shrouded terminals. Accepts 99-01 series LED modules. |  | DIN rail mounting base shrouded terminals. Accepts 99-01 series LED modules. |  | DIN rail mounting base shrouded terminals. |  |
| Relay to suit |  | Round pin 2 C/0 (8 pin) 60.12... |  | Round pin 3 C/0 (11 pin) 60.13... |  | Accepts 60.13... (11 pin) relay and 86.00 series timing module. |  |
| Retaining clip | Price \$ | 90.33 | 2.80 | 90.33 | 2.80 | 90.33 | 2.80 |
|  |  |  |  |  |  |  |  |
| Cat. No. | Price \$ | 90.28 | 19.20 | 90.27 | 15.60 | 86.00 | 173.00 |
| Description |  | DIN rail mounting base shrouded terminals. |  | DIN rail mounting base shrouded terminals. |  | Multifunction, True multivoltage -$12-240 \mathrm{~V} \mathrm{AC} / \mathrm{DC}$ |  |
| Relay to suit |  | $\begin{aligned} & \text { Round pin } 2 \text { C/0 (8 pin) } \\ & 60.12 \ldots \end{aligned}$ |  | Round pin 3 C/0 (11 pin) 60.13... |  | Timing module. Suits 90.03 <br> Base. Round pin 3 C/0 <br> (11 pin) and 60.13... relay |  |
| Retaining clip | Price \$ | 90.33 2.80 |  | 90.33 2.80 |  | N/A | - |
|  |  |  |  |  |  |  |  |
| Cat. No. | Price \$ | 90.26 | 13.40 | 90.29 | 21.20 | 86.30240 V AC | 85.50 |
| Description |  | DIN rail mounting base shrouded terminals 8 pin |  | DIN rail mounting base shrouded terminals. |  | 86.3024 V AC DC | 85.50 |
|  |  |  |  | On delay/on pulse time module |
| Relay to suit |  | Round pin 2 C/0 (8 pin)$60.12 \ldots$ |  |  |  | Round pin 3 C/0 (11 pin) 60.13... |  | Suits $40,44,46,55,56$, 60, 62 series relays |  |
| Retaining clip | Price \$ | 90.33 | 2.80 | 90.33 | 2.80 |  |  |


|  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Cat. No. | Price \$ | 90.12 | 6.20 | 90.13 | 6.80 |
| Description |  | Rear <br> socke |  | Rear con <br> socket |  |
| Relay to suit |  | $\begin{aligned} & \hline \text { Round } \\ & 60.12 . \\ & \hline \end{aligned}$ |  | Round 60.13. |  |

## Relay dimensions (mm)

20 Series
Cat. No. 20.22, 20.33


26 Series
Cat. No. 26.01, 26.02, 26.03


30 Series
Cat. No. 30.22

## 40 \& 44 Series

Cat. No. 40.51, 40.52, 40.61, 44.62


56 Series
Cat. No. 56.34


62 Series
(DIN rail mount)
Cat. No. 62.82.0008
62.83.0008


65 Series
Cat. No. 65.31, 65.31M


## Relay dimensions (mm)

## 46 Series

Cat No. 46.61, 46.52


Relay base dimensions (mm)
46 Series
Cat No. 97.01, 97.02, 046.05, 046.07

046.05


40 Series
Cat No. 95.05


55 Series
Cat No. 94.12

046.07


55 Series
Cat No. 94.02, 94.04


55 Series
Cat No. 94.14


## Relay base dimensions (mm)

55 Series
Cat No. 94.34


55 Series
Cat No. 94.74


55 Series
Cat No. 96.12


56 Series
Cat No. 96.02


## 60 Series

Cat No. 90.20, 90.21


55 Series
Cat No. 94.72


55 Series
Cat No. 94.82


## 55 Series

Cat No. 96.16


56 Series
Cat No. 96.04


62 Series (plug-in)
Cat No. 92.03


60 Series
Cat No. 90.03


## SELCO

## Solid state relays and ARC-D-tect relay system

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RS series 10 A - single phase industrial ..... 8-43
RM series 25-100 A - single phase industrial ..... 8-44
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# Carlo Gavazzi Solid state relays <br> Introduction - Catalogue Number construction 

## Solid State Solutions that outperform and outlast... to the extreme

Carlo Gavazzi is a pioneer in solid state technology. Their many years of experience and focus is concentrated into specific solid state solutions for many applications - whatever your industry or application.

## Applications

- Heating systems
- Soldering systems
- Electric ovens
- Plastic processing plants
- Galvanic systems
- Packaging machinery
- Rubber manufacturing
- Lighting equipment
- Building management systems
- Vending Machines


## Range

- Industrial single phase
- Industrial three phase
- Miniature PCB \& DIN rail mount
- Single phase with built-in heatsink
- Zero switching
- Instantaneous switching
- $5 \mathrm{~A}-100 \mathrm{~A}$ selection (125 A available on request)
- $230 \mathrm{~V} \mathrm{AC}-600 \mathrm{~V} \mathrm{AC}$ selection

A complete range of heatsinks and accessories is offered to suit all industrial relays. All Carlo Gavazzi heatsinks come complete with DIN rail adaptor, thermal paste and mounting hardware. For a guide to heatsink selection please refer to page 8-45.

## Carlo Gavazzi has the answer with their complete range of industrial and general purpose solid state relays.

## Catalogue Number construction

| Solid state relays |  |
| :---: | :---: |
| RS | Single phase |
| RM | Single phase |
| RP | Miniature PC |
| RZ | Three phase, |
| RJ | Solitron, so |
| No. of poles |  |
| 1 | 1 pole |
| 2 | 2 pole |
| 3 | 3 pole |
| Switching mode |  |
| A | Zero |


| RM |
| :--- |

Rated operational voltage
23230 V AC
40400 V AC
60600 V AC

## Carlo Gavazzi Solid state relays

Selection guide


RS1A...

RM1A...
Single phase, industrial


| Load current | Switching voltage | Control input range | Cat. No. | Page ref. |
| :---: | :---: | :---: | :---: | :---: |
| 10 A | 230 V AC | 18-36 V AC/DC | RS1A23LA10 | 8-43 |
| 10 A | 230 V AC | 3-32 V DC | RS1A23D10 | 8-43 |
| 10 A | 480 V AC | 18-36 V AC/DC | RS1A48LA10 | 8-43 |
| 10 A | 480 V AC | 4-32 V DC | RS1A48D10 | 8-43 |
| 25 A | 230 V AC | 20-280 V AC / 22-48V DC | RM1A23A25 | 8-44 |
| 25 A | 230 V AC | 3-32 V DC | RM1A23D25 | 8-44 |
| 25 A | 600 V AC | 20-280 V AC / 22-48V DC | RM1A60A25 | 8-44 |
| 25 A | 600 V AC | 4-32 V DC | RM1A60D25 | 8-44 |
| 50 A | 230 V AC | 20-280 V AC / 22-48V DC | RM1A23A50 | 8-44 |
| 50 A | 230 V AC | 3-32 V DC | RM1A23D50 | 8-44 |
| 50 A | 600 V AC | 20-280 V AC / 22-48V DC | RM1A60A50 | 8-44 |
| 50 A | 600 V AC | 4-32 V DC | RM1A60D50 | 8-44 |
| 75 A | 230 V AC | 20-280 V AC / 22-48V DC | RM1A23A75 | 8-44 |
| 75 A | 230 V AC | 3-32 V DC | RM1A23D75 | 8-44 |
| 75 A | 600 V AC | 20-280 V AC / 22-48V DC | RM1A60A75 | 8-44 |
| 75 A | 600 V AC | 4-32 V DC | RM1A60D75 | 8-44 |
| 100 A | 230 V AC | 20-280 V AC / 22-48V DC | RM1A23A100 | 8-44 |
| 100 A | 230 V AC | 3-32 V DC | RM1A23D100 | 8-44 |
| 100 A | 600 V AC | 20-280 V AC / 22-48V DC | RM1A60A100 | 8-44 |
| 100 A | 600 V AC | 4-32 V DC | RM1A60D100 | 8-44 |

Three phase, industrial


| 25 A | 600 V AC | 4-32 V DC | RZ3A60D25 | 8-45 |
| :---: | :---: | :---: | :---: | :---: |
| 25 A | 600 V AC | 24-275V AC/24-50 V DC | RZ3A60A25 | 8-45 |
| 40 A | 600 V AC | 4-32VDC | RZ3A60D40 | 8-45 |
| 40 A | 600 V AC | 24-275V AC/24-50 V DC | RZ3A60A40 | 8-45 |
| 55 A | 600 V AC | 4-32 V DC | RZ3A60D55 | 8-45 |
| 55 A | 600 V AC | 24-275V AC/24-50 V DC | RZ3A60A55 | 8-45 |
| 75 A | 600 V AC | 4-32 V DC | RZ3A60D75 | 8-45 |
| 75 A | 600 V AC | 24-275V AC/24-50 V DC | RZ3A60A75 | 8-45 |

Miniature PCB/DIN rail mount


RPIA23D5

| 5 A | 230 V AC | 3-32VDC | RP1A23D5 | 8-49 |
| :---: | :---: | :---: | :---: | :---: |
| 5 A | 400 V AC | 3-32VDC | RP1A40D5 | 8-49 |
| 5 A | 230 V AC | 3-32VDC | RP1B23D5 | 8-49 |
| 5 A | 400 V AC | 4-32VDC | RP1B40D5 | 8-49 |
| 5 A | 230 V AC | 5-34VDC | RP1A23D5M1 | 8-50 |
| 5 A | 230 V AC | 5-34VDC | RP1B23D5M1 | 8-50 |

## CARLO GAVAZZI PROVIDES YOU WITH COMPLETE SOLUTIONS

## Solid state relays

## Selection guide



RJIA23D50


RJIA60D70

Solitron solid state contactors with built-in heatsink

| Load current | Switching voltage | Control input range | Cat. No. | Page. No. |
| :---: | :---: | :---: | :---: | :---: |
| 20 A | 230 V AC | 24-275V AC/24-48V DC | RJ1A23A20 | 8-51 |
| 20 A | 230 V AC | 4-32V DC | RJ1A23D20 | 8-51 |
| 20 A | 600 V AC | 24-275V AC/24-48V DC | RJ1A60A20 | 8-51 |
| 20 A | 600 V AC | 4-32 V DC | RJ1A60D20 | 8-51 |
| 30 A | 230 V AC | 24-275V AC/24-48V DC | RJ1A23A30 | 8-51 |
| 30 A | 230 V AC | 4-32 V DC | RJ1A23D30 | 8-51 |
| 30 A | 600 V AC | 24-275V AC/24-48V DC | RJ1A60A30 | 8-51 |
| 30 A | 600 V AC | 4-32 V DC | RJ1A60D30 | 8-51 |
| 50 A | 230 V AC | 24-275V AC/24-48V DC | RJ1A23A50 | 8-51 |
| 50 A | 230 V AC | 4-32V DC | RJ1A23D50 | 8-51 |
| 50 A | 600 V AC | 24-275V AC/24-48V DC | RJ1A60A50 | 8-51 |
| 50 A | 600 V AC | 4-32V DC | RJ1A60D50 | 8-51 |
| 63 A | 230 V AC | 24-275V AC/24-48V DC | RJ1A23A70 | 8-51 |
| 63 A | 230 V AC | 4-32V DC | RJ1A23D70 | 8-51 |
| 63 A | 600 V AC | 24-275V AC/24-48V DC | RJ1A60A70 | 8-51 |
| 63 A | 600 V AC | 4-32 V DC | RJ1A60D70 | 8-51 |

Heatsinks and accessories

| Description | Cat. No | Page No. |
| :--- | :--- | ---: |
| Heatsink 3 kW with thermal paste, DIN clip \& mounting hardware | RHS100 | $\mathbf{8 - 4 6}$ |
| Heatsink 0.8 kW with thermal paste, DIN clip \& mounting hardware | RHS301 | $\mathbf{8 - 4 6}$ |
| Heatsink 2 kW with thermal paste, DIN clip \& mounting hardware | RHS45B | $\mathbf{8 - 4 6}$ |
| Heatsink with fan 0.25 kW with thermal paste, DIN clip \& mounting hardware | RHS301F230C | $\mathbf{8 - 4 6}$ |
| IP 20 Touchproof covers for RS and RM series relays | RMIP20 | $\mathbf{8 - 4 6}$ |
| DIN clip | RHS00 | $\mathbf{8 - 4 6}$ |


RS1A...

RM1A...

RP1A...

RJ1A...

RHS100

RHS45B

RHS301

RHS301F230C

## Refer Cat. CG-SSC <br> Solid state relays <br> RS series single phase industrial 10 A

| - Zero switching <br> - Single phase industrial relay <br> - LED output indication <br> - IP 20 touchproof terminals <br> - Up to 50 \% lighter than competitor relays | ${ }^{A C}$ \& $D C$ Control |  |  | DC Control |
| :---: | :---: | :---: | :---: | :---: |
| Cat. No. | RS1A23LA10 | (i) RS1A48LA10 | RS1A23D10 | (i) RS1A48D10 |
| Price \$ | 80.00 | 89.50 | 64.00 | 76.00 |

Input specifications

| Control input range | $18-36 \mathrm{~V} \mathrm{AC} / \mathrm{DC}$ | $4-32 \mathrm{~V} \mathrm{DC}$ |
| :--- | :--- | :--- |
| Max. input current | 15 mA | 12 mA |

Output specifications

| Rated operational current |  |  |
| :--- | :--- | :--- |
| AC 1 @ Ta=25 ${ }^{\circ} \mathrm{C}$ | 10 A | 10 A |
| Min. operational current | 150 mA | 150 mA |
| Non rep. surge current (t=10 ms) | 100 A pk | 100 A pk |
| Off-state leak current | $<3 \mathrm{~mA}$ | $<3 \mathrm{~mA}$ |
| $\mathrm{I}^{2} \mathrm{t}$ for fusing (t=10 ms) | $\leq 50 \mathrm{~A}^{2} \mathrm{~s}$ | $\leq 50 \mathrm{~A}^{2} \mathrm{~s}$ |
| Critical dv/dt off-state | $>250 \mathrm{~V} / \mathrm{\mu s}$ | $>250 \mathrm{~V} / \mathrm{\mu s}$ |

General specifications

| Switching voltage range | 42-265 V AC | [RS1A23...] | $42-265$ V AC | [RS1A23...] |
| :---: | :---: | :---: | :---: | :---: |
|  | 42-530 V AC | [RS1A48...] | $42-530 \mathrm{~V} \mathrm{AC}$ | [RS1A48...] |
| Non rep. peak voltage | $\geq 650 \mathrm{Vpk}$ | [RS1A23...] | $\geq 650 \mathrm{Vpk}$ | [RS1A23...] |
|  | $\geq 1000 \mathrm{Vpk}$ | [RS1A48...] | $\geq 1000$ Vpk | [RS1A48...] |
| Rated insulation voltage | $\geq 4000$ V RMS |  | $\geq 4000$ V RMS |  |
| Frequency range | $45-65 \mathrm{~Hz}$ |  | $45-65 \mathrm{~Hz}$ |  |
| Power factor | $\geq 0.95$ |  | $\geq 0.95$ |  |
| Operating temperature | $-20^{\circ} \mathrm{C}$ to $+70^{\circ} \mathrm{C}$ |  | $-20{ }^{\circ} \mathrm{C}$ to $+70^{\circ} \mathrm{C}$ |  |
| Terminals | Screw type with clamp |  | Screw type with clamp |  |
| Approvals | CE - UL - CSA |  | CE - UL - CSA |  |
| Dimensions $\mathrm{H} \times \mathrm{W} \times \mathrm{D}(\mathrm{mm})$ | $58.2 \times 44.8 \times 28.8$ <br> Refer page 8 - 52 |  | $\begin{aligned} & 58.2 \times 44.8 \times 28.8 \\ & \text { Refer page } 8-52 \end{aligned}$ |  |
| Heatsinks \& accessories | Refer page 8-46 to 8-48 for correct heatsink selection and accessories. |  | Refer page 8-46 to 8-48 for correct heatsink selection and accessories. |  |

Note: i Available on indent only.
Price Schedule 'B3'

## Solid state relays

## RM series single phase industrial

- Zero switching
- IP 20 touchproof terminals
- LED indication for output status
- Built-in overvoltage protection



## AC/DC Control

| Description | Switching voltage range | Peak voltage non rep. | Max. Switching current AC $51{ }^{1}$ ) | Max. Switching current AC 53a ${ }^{1}$ ) |  | Cat. No. | Price \$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| RM1A 25 A | 24-265 V AC | <650 Vpk | 25 A | 5 A |  | RM1A23A25 | 88.00 |
| RM1A 25 A | 42-660 V AC | <1400 Vpk | 25 A | 5 A |  | RM1A60A25 | 125.00 |
| RM1A 50 A | 24-265 V AC | <650 Vpk | 50 A | 15 A |  | RM1A23A50 | 134.00 |
| RM1A 50 A | 42-660 V AC | <1400 Vpk | 50 A | 15 A |  | RM1A60A50 | 147.00 |
| RM1A 75 A | 24-265 V AC | <650 Vpk | 75 A | 20 A |  | RM1A23A75 | 225.00 |
| RM1A 75 A | 42-660 V AC | <1400 Vpk | 75 A | 20 A |  | RM1A60A75 | 250.00 |
| RM1A 100 A | 24-265 V AC | <650 Vpk | 100 A | 30 A |  | i RM1A23A100 | 255.00 |
| RM1A 100 A | 42-660 V AC | <1400 Vpk | 100 A | 30 A |  | RM1A60A100 | 290.00 |
| DC Control <br> Description | Switching voltage range | Peak voltage non rep. | Max. Switching current AC $51{ }^{1}$ ) | Max. Switching current AC 53a ${ }^{1}$ ) |  | Cat. No. | Price \$ |
| RM1A 25 A | 24-265 V AC | <650 Vpk | 25 A | 5 A |  | RM1A23D25 | 72.50 |
| RM1A 25 A | 42-660 V AC | <1400 Vpk | 25 A | 5 A |  | RM1A60D25 | 116.00 |
| RM1A 50 A | 24-265 V AC | <650 Vpk | 50 A | 15 A |  | RM1A23D50 | 119.00 |
| RM1A 50 A | 42-660 V AC | <1400 Vpk | 50 A | 15 A |  | RM1A60D50 | 146.00 |
| RM1A 75 A | 24-265 V AC | <650 Vpk | 75 A | 20 A |  | RM1A23D75 | 210.00 |
| RM1A 75 A | 42-660 V AC | <1400 Vpk | 75 A | 20 A |  | RM1A60D75 | 230.00 |
| RM1A 100 A | 24-265 V AC | <650 Vpk | 100 A | 30 A |  | RM1A23D100 | 235.00 |
| RM1A 100 A | 42-660 V AC | <1400 Vpk | 100 A | 30 A |  | RM1A60D100 | 285.00 |
| Input specifications |  | AC/DC Control [RM1A..A..] |  |  | DC Control [RM1A..D..] |  |  |
| Control input |  | 20-280 V AC, $22-48$ V DC |  |  | 3-32 V DC [RM1A23..], 4-32 V DC [RM1A60] |  |  |
| Max. input c |  | $\leq 20 \mathrm{~mA}$ |  | $\leq 12 \mathrm{~mA}$ |  |  |  |

Output specifications

Non rep surge current
( $\mathrm{t}=1-10 \mathrm{~ms}$ )
Min. operational current
Off-state leak current
$\mathrm{I}^{2} \mathrm{t}$ for fusing $\quad<450 \mathrm{~A}^{2} \mathrm{~S}$ [RM1..25]<1680 A S [RM1..50]
( $\mathrm{t}=1-10 \mathrm{~ms}$ )
Critical dv/dt off-state
General specifications

| Rated insulation voltage | $\geq 4000 \mathrm{~V} \mathrm{RMS}$ |
| :--- | :---: |
| Frequency range | $45-65 \mathrm{~Hz}$ |
| Power factor | $>0.5 @ 230 \mathrm{~V} \mathrm{AC} \mathrm{sms}$ |
| Operating temperature | $-20^{\circ} \mathrm{C}$ to $+70^{\circ} \mathrm{C}$ |
| Terminals | Screw type with clamp |
| Approvals | $\mathrm{UL}, \mathrm{CUL}, \mathrm{CSA}, \mathrm{CE}$ |
| Dimensions $\mathrm{H} \times \mathrm{W} \times \mathrm{D}(\mathrm{mm})$ | $58.2 \times 44.8 \times 28.8$ |
|  | Refer page $8-52$ |

Heatsinks \& accessories
$<6600 \mathrm{~A}^{2} \mathrm{~S}$ [RM1..75] < $18000 \mathrm{~A}^{2} \mathrm{~S}$ [RM1..100] $1000 \mathrm{~V} / \mu \mathrm{S}$
300 Apk [RM1..25] 580 Apk [RM1..50]
1150 Apk [RM1..75] 1900 Apk [RM1..100]
150 mA
$<3 \mathrm{~mA}$
$\geq 4000$ V RMS
0.5 @ 230 V AC sms
$-20^{\circ} \mathrm{C}$ to $+70^{\circ} \mathrm{C}$
Screw type with clamp
UL, CUL, CSA, CE

Refer page $8-52$
Refer page 8-46 to 8-48 for correct heatsink selection and accessories.

Note: ${ }^{1}$ ) Max. switching current @ $\mathrm{Ta}=25^{\circ} \mathrm{C}$
Price Schedule ' $B 3$ '

## Solid state relays

## RZ series three phase industrial

- Zero switching
- LED indication of control input
- IP 10 back of hand protection
- Choice of (AC/DC) or (DC) control


## Improved specs and switching capabilities



AC/DC Control

| Description | Max. Switching current AC $51{ }^{1}$ ) | Max. Switching current AC 53a ${ }^{1}$ ) | Cat. No. | Price \$ |
| :---: | :---: | :---: | :---: | :---: |
| RZ3 25 A | 25 A | 5 A | RZ3A60A25 | 390.00 |
| RZ3 40 A | 40 A | 8 A | i) RZ3A60A40 | 415.00 |
| RZ3 55 A | 55 A | 15 A | RZ3A60A55 | 500.00 |
| RZ3 75 A | 75 A | 20 A | i RZ3A60A75 | 600.00 |

RZ3A60A25

| Description | Max. Switching current AC $51{ }^{1}$ ) | Max. Switching current AC 53a ${ }^{1}$ ) | Cat. No. | Price \$ |
| :---: | :---: | :---: | :---: | :---: |
| RZ3 25 A | 25 A | 5 A | RZ3A60D25 | 385.00 |
| RZ3 40 A | 40 A | 8 A | RZ3A60D40 | 410.00 |
| RZ3 55 A | 55 A | 15 A | RZ3A60D55 | 510.00 |
| RZ3 75 A | 75 A | 20 A | i) RZ3A60D75P | 610.00 |


| Input specifications | $\mathrm{AC} / \mathrm{DC}$ Control $\quad$ [RZ3A..A..] | DC Control $\quad$ [RZ3A..D..] |
| :--- | :--- | :--- | :--- |
| Control input range | $24-275 \mathrm{~V} \mathrm{AC} / 24-50 \mathrm{~V} \mathrm{DC}$ | $4-32 \mathrm{~V} \mathrm{DC}$ |
| Max. input current | $\leq 15 \mathrm{~m} \mathrm{~A}$ | $\leq 23 \mathrm{~m} \mathrm{~A}$ |

## Output specifications

| Non rep. surge current ( $\mathrm{t}=10 \mathrm{~ms}$ ) | $300 \mathrm{~A}_{\text {pk }}$ [RZ3A..25..] | 390 Apk [RZ3A..40..] |
| :---: | :---: | :---: |
|  | $580 \mathrm{~A}_{\mathrm{p} k}$ [RZ3A..55..] | $1150 \mathrm{~A}_{\text {pk }}$ [RZ3A..75..] |
| Off-state leak current | <3 mA |  |
| $I^{2} \mathrm{t}$ for fusing ( $\mathrm{t}=10 \mathrm{~ms}$ ) | <450 A ${ }^{2}$ S [RZ3A..25..] | $<760 \mathrm{~A}^{2}$ S [RZ3A..40..] |
|  | <1680 A ${ }^{2}$ S [RZ3A..55..] | <6600 A ${ }^{2}$ S [RZ3A..75..] |

## General specifications

| Operational voltage range | $42-660 \mathrm{~V} \mathrm{AC}$ |
| :--- | :---: |
| Non rep. peak voltage | $\leq 1200 \mathrm{~V} \mathrm{p}$ |
| Rated insulation voltage | $\geq 4000 \mathrm{~V} \mathrm{RMS}$ |
| Frequency range | $45-65 \mathrm{~Hz}$ |
| Operating temperature | $-40^{\circ} \mathrm{C}$ to $+100^{\circ} \mathrm{C}-30^{\circ} \mathrm{C}$ to $+80^{\circ} \mathrm{C}$ |
| Terminals | Screw type with clamp |
| Approvals | $\mathrm{UL}, \mathrm{cUL}, \mathrm{CSA}, \mathrm{CE}$ |
| Dimensions (mm) H x W x D | $73.5 \times 103 \times 41$ |
|  | Refer page $8-52$ |
| Heatsink selection and accessories | Refer page 8-46 to 8-48 for correct heatsink selection |
|  | and accessories |

Note: ${ }^{1}$ ) Max. switching current @ $\mathrm{Ta}=25^{\circ} \mathrm{C}$
i Available on indent only.
Price Schedule ' $B 3$ '

## Solid state relays

## Heatsinks and accessories



Heatsink assembly



Heatsink assembly

Heatsink assembly


Cat. No.
Price \$
Thermal resistance
Description

|  | RHS 45B |
| :--- | :--- |
|  | 2 kW |
|  | Heatsink assembly complete <br> with thermal paste, DIN rail <br> adaptor and mounting hardware. <br> Suitable for RS \& RM series. | | and |
| :--- |

Dimensions (mm)

| Dimensions (mm) |  |  |
| :--- | :--- | :--- |
| $\mathbf{H \times W \times D}$ | $82 \times 45 \times 75$ | 103 |



|  | Heatsink assembly | D |
| :--- | :---: | :---: |
| Cat. No. | i RHS 301 F 230C |  |
| Price \$ | 350.00 |  |


| Thermal resistance | 0.25 kW |
| :--- | :--- |
| Description | Heatsink assembly complete |



## Solid state relays

## Choosing the right heatsink

Please read carefully to ensure the correct heatsink is selected for your application
Ambient temperature and load current play a vital role in selecting the right heatsink.
The maximum thermal resistance from the back-plate of the SSR to ambient ( $\mathrm{R}_{\text {thsa }}$ ) is calculated for different current levels and different ambient temperature values.
To determine the best solution, please see the example below.

## Example

Load current $=20 \mathrm{~A}$ resistive load
Ambient Temp $=50^{\circ} \mathrm{C}$
(measured in the panel when the system is operating)
Selected relay = RM1A23D25
In chart (Fig.1) using the information provided from the application an alphabetical letter is chosen.
Using the heatsink reference table A (Fig.2) heatsink part no. is assigned to the letter, automatically providing the recommended heatsink size.

Selection charts for RS, RM and RZ
RM.... 25

| Load current (A) |  |  |  |  |  | Power <br> dissipation (W) |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 25.0 | B | B | C | C | C | C | 28 |
| 22.5 | A | B | B | C | C | C | 24 |
| 20.0 | A | A | B | B | C | C | 21 |
| 17.5 | A | A | A | B | B | C | 18 |
| 15.0 | - | A | A | A | B | C | 15 |
| 12.5 | - | - | A | A | A | B | 12 |
| 10.0 | - | - | - | - | A | B | 9 |
| 7.5 | - | - | - | - | - | A | 7 |
| 5.0 | - | - | - | - | - | - | 4 |
| 2.5 | - | - | - | - | - | - | 2 |
|  | 20 | 30 | 40 | 50 | 60 | 70 |  |

Fig. 1 Heatsink thermal resistance chart relays are provided making it quick and easy to select the right Carlo Gavazzi heatsink. Refer pages 8-47 and 8-48.

## Heatsink selection charts

| Heatsink ${ }^{1}$ ) | Reference |
| :--- | :--- |
| No heatsink required | - |
| RHS 100 | A |
| RHS 45B | B |
| RHS 301 | C |
| RHS 301 plus fan | D |
| No operation | X |

Fig. 2 Heatsink selection table


Heatsink sold separately

| RS... 10 RM.. |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\begin{aligned} & \text { Load } \\ & \text { current (A) } \end{aligned}$ |  |  |  |  |  | Power <br> dissipation (W) |  | Load <br> current (A) |  | B | C | C | C | Power dissipation (W) |  |
| 10.0 | A | B | C | C | X | X | 14 | 25.0 | B |  |  |  |  | C | 28 |
| 9.0 | A | A | B | C | D | X | 12 | 22.5 | A | B | B | C | C | C | 24 |
| 8.0 | - | A | A | B | C | X | 11 | 20.0 | A | A | B | B | C | C | 21 |
| 7.0 | - | - | A | A | C | D | 9 | 17.5 | A | A | A | B | B | C | 18 |
| 6.0 | - | - | - | A | B | C | 7 | 15.0 | - | A | A | A | B | C | 15 |
| 5.0 | - | - | - | - | A | B | 6 | 12.5 | - | - | A | A | A | B | 12 |
| 4.0 | - | - | - | - | - | A | 5 | 10.0 | - | - | - | - | A | B | 9 |
| 3.0 | - | - | - | - | - | - | 3 | 7.5 | - | - | - | - | - | A | 7 |
| 2.0 | - | - | - | - | - | - | 2 | 5.0 | - | - | - | - | - | - | 4 |
| 1.0 | - | - | - | - | - | - | 1 | 2.5 | - | - | - | - | - | - | 2 |
|  | 20 | 30 | 40 | 50 | 60 |  | ient temp. |  | 20 | 30 | 40 | 50 | 60 | $\begin{gathered} 70 \\ \text { Am } \end{gathered}$ | ient temp. |

Note: ${ }^{1}$ ) See accessories page, 8-46.

## Solid state relays

## Heatsink selection charts

## RM... 50



RM... 100


RM... 75


RZ3 .. 25


| Heatsink ${ }^{1}$ ) | Reference |
| :--- | :--- |
| No heatsink required | - |
| RHS 100 | A |
| RHS 45B | B |
| RHS 301 | C |
| RHS 301 plus fan | D |
| No operation | X |

Fig. 2 Heatsink selection table

RZ3 .. 40

RZ3 .. 55

| $\begin{aligned} & \text { Load } \\ & \text { courrent (A) } \end{aligned}$ |  | Thermalresistance (K/W) |  |  |  |  | Power <br> dissipation (W) |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 55.0 | D | X | X | X | X | X | X | 164 |
| 50.0 | D | D | X | X | X | X | X | 148 |
| 45.0 | D | D | D | X | X | X | X | 133 |
| 40.0 | D | D | D | D | X | X | X | 118 |
| 35.0 | D | D | D | D | D | X | X | 103 |
| 30.0 | C | D | D | D | D | D | X | 87 |
| 25.0 | C | C | C | D | D | D | D | 73 |
| 20.0 | C | C | C | C | D | D | D | 58 |
| 15.0 | C | C | C | C | C | D | D | 43 |
| 10.0 | C | C | C | C | C | C | D | 29 |
| 5.0 | - | C | C | C | C | C | C | 14 |
| 2.5 | - | - | - | - | - | C | C | 7 |
|  | 20 | 30 | 40 | 50 | 60 | 70 |  | $\mathrm{T}_{\text {A }}$ |

RZ3 .. 75


Note: $\left.{ }^{1}\right)$ See accessories page, 8-46.

## Solid state relays

## Miniature PCB mount 5 A

Miniature in size
10 mm footprint
Flexible encapsulation for longer
component life
Ideal for solenoid and lighting
control

Input specifications

| Control input range | $3-32 \mathrm{~V} \mathrm{DC}$ | $3-32 \mathrm{~V} \mathrm{DC}$ |
| :--- | :--- | :--- |
| Maximum input current | 10 mA DC | 15 mA DC |

## Output specifications

| Rated operational current |  |
| :--- | :---: |
| AC 51 @ $\mathrm{Ta}=25^{\circ} \mathrm{C}$ | 5 A |
| AC 53a @ Ta=25 ${ }^{\circ} \mathrm{C}$ | 3 A |
| Minimum operational current | 20 mA |
| Non rep. surge current $(\mathrm{t}=20 \mathrm{~ms})$ | 80 A pk |
| Off-state leak current | $<1 \mathrm{~mA}$ |
| $\mathrm{I}^{2} \mathrm{t}$ for fusing (t=10 ms) | $50 \mathrm{~A}^{2} \mathrm{~s}$ |
| Critical dv/dt off-state | $500 \mathrm{~V} / \mu \mathrm{s}$ |

General specifications

| Operational voltage range | 12-265 V AC rms | [RP1A23...] | $12-265 \mathrm{~V} \mathrm{AC} \mathrm{rms}$ | [RP1B23...] |
| :---: | :---: | :---: | :---: | :---: |
|  | 20-440 V AC rms | [RP1A40...] | $12-440$ V AC rms | [RP1B40...] |
| Non-repetitive peak voltage | 650 V pk | [RP1...23...] |  |  |
|  | 850 V pk | [RP1...40...] |  |  |
| Rated insulation voltage | $\geq 4000 \mathrm{~V}$ RMS |  |  |  |
| Frequency range | $45-65 \mathrm{~Hz}$ |  |  |  |
| Power factor | $>0.5$ |  |  |  |
| Operating temperature | $-20^{\circ} \mathrm{C}$ to $+70^{\circ} \mathrm{C}$ |  |  |  |
| Terminals | 4 pins $\times 0.1 \mathrm{~mm}$ |  |  |  |
| Approvals | UL - CUL - VDE, CE |  |  |  |
| Dimensions H $\times$ W $\times$ D (mm) | $25.4 \times 43 \times 10.5$ |  |  |  |

Note: i Available on indent only.
Price Schedule 'B3'

## Solid state relays

## Miniature DIN rail mount 5 A

Miniature in size
10 mm footprint
Flexible encapsulation for longer
component life
Ideal for solenoid and lighting
control
DIN rail mounting relay socket

Input specifications

| Control input range | $3-32 \mathrm{~V} \mathrm{DC}$ | $3-32 \mathrm{~V} \mathrm{DC}$ |
| :--- | :--- | :--- |
| Maximum input current | 10 mA DC | 15 mA DC |

## Output specifications

| Rated operational current |  |
| :--- | :---: |
| AC 51 @ $\mathrm{Ta}=25^{\circ} \mathrm{C}$ | 5 A |
| AC 53a @ Ta $=25^{\circ} \mathrm{C}$ | 3 A |
| Minimum operational current | 20 mA |
| Non rep. surge current (t=20 ms) | 80 A pk |
| Off-state leak current | $<1 \mathrm{~mA}$ |
| $1^{2} \mathrm{t}$ for fusing (t=10 ms) | $50 \mathrm{~A}^{2} \mathrm{~s}$ |
| Critical dv/dt off-state | $500 \mathrm{~V} / \mu \mathrm{s}$ |


| General specifications |  |
| :--- | :---: |
| Operational voltage range | $12-265 \mathrm{~V} \mathrm{AC} \mathrm{rms}$ |
| Non-repetitive peak voltage | 650 V pk |
| Rated insulation voltage | $\geq 4000 \mathrm{~V} \mathrm{RMS}$ |
| Frequency range | $45-65 \mathrm{~Hz}$ |
| Power factor | 0.5 |
| Operating temperature | $-20^{\circ} \mathrm{C} \mathrm{to}+70^{\circ} \mathrm{C}$ |
| Approvals | $\mathrm{UL}-\mathrm{CUL}-\mathrm{VDE}, \mathrm{CE}$ |
| Dimensions H $\times \mathrm{W} \times \mathrm{D}(\mathrm{mm})-$ Relay |  |
|  | Refer page $8-52$ |
|  | $40 \times 85 \times 14$ |

## Solitron solid state contactor

## with built-in heatsink

|  |  |
| :--- | :--- | :--- |
| Zero switching | Self-lifting terminals |
| Direct copper bonding technology | $\square$ Opto isolation 4000 V AC RMS |
| LED Indication |  |
| IP 20 touchproof terminals |  |

## AC/DC Control ${ }^{1}$ )

|  | Switching <br> range | Peak voltage <br> non-repetitive | Max. Switching <br> current AC 51 ${ }^{2}$ ) | Max. Switching <br> current AC 53a ${ }^{2}$ ) | Cat. No. |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |

## DC Control

|  | Switching <br> range | Peak voltage <br> non-repetitive | Max. Switching <br> current AC 51 ${ }^{2}$ ) | Max. Switching <br> current AC 53a ${ }^{2}$ ) | Cat. No. |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |


| Input specifications | AC/DC control |  | DC control |  |
| :---: | :---: | :---: | :---: | :---: |
| Control input range | 24-275 V AC/24-48V DC |  | 4 -32 V DC |  |
| Maximum input current | 17 mA |  | 12 mA |  |
| Output specifications | RJ. 20 | RJ. 30 | RJ.. 50 | RJ. 70 |
|  | 350 mA AC rms | 150 mA AC rms | 150 mA AC rms | 100 mA AC rms |
| Non-rep. surge current (t=20 ms) | 300 A pk | 580 Apk | 1900 A pk | 1900 A pk |
| Off-state leak current |  | <3 m |  |  |
| $\mathrm{I}^{2} \mathrm{t}$ for fusing ( $\mathrm{t}=10 \mathrm{~ms}$ ) | $450 \mathrm{~A}^{2} \mathrm{~s}$ | $1680 \mathrm{~A}^{2} \mathrm{~s}$ | $18000 \mathrm{~A}^{2} \mathrm{~S}$ | $18000 \mathrm{~A}^{2} \mathrm{~S}$ |

## General specifications

| Rated insulation voltage | $\geq 4000 \mathrm{~V} \mathrm{RMS}$ |
| :--- | :---: |
| Frequency range | $45-65 \mathrm{~Hz}$ |
| Power factor | $\geq 0.5 @ 230 \mathrm{~V} \mathrm{AC} \mathrm{rms}$ |
| Operating temperature | $-30^{\circ} \mathrm{C}$ to $+70^{\circ} \mathrm{C}$ |
| Terminals | Screw captive wire clamp |
| Approvals | UL, CUL, CSA, CE |
| Dimensions $(\mathrm{mm}) \mathrm{H} \times \mathrm{W} \times \mathrm{D}$ | Refer page $8-52$ |

Note: $\left.\quad{ }^{1}\right) \quad 90 \mathrm{~A}$ version available on indent (POWER frame size).
${ }^{2}$ ) Max. switching current @ $\mathrm{Ta}=25^{\circ} \mathrm{C}$
i) Available on indent only

Price Schedule ' $B 3$ '

## Solid state relays

Dimensions (mm)

RS \& RM series


RZ series


## RP series



## RJ series Solitron



RJ MIDI


RJ POWER


## Arc D-Tect <br> D1000 Arc-Fault Protection system

Efficient protection of high, medium and low voltage switchgear
A continuous supply of power is important in modern energy infrastructure and most production facilities. Wherever electrical energy is generated and distributed, arc flash faults and accidents are likely to occur. An arc protection system is an efficient way to maximise the safety and minimise the damages. SELCO's D1000 arc protection system is designed to dramatically reduce the effects of arc flash faults in high, medium and low voltage switchgear.

Fast protection is essential
An arc-fault in a switchboard or control gear develops within milliseconds and leads to the discharge of enormous amounts of energy. An arc fault is the result of a rapid release of energy due to an arcing fault between phase bus bars. If the arc flash is allowed to develop the result is that the massive energy discharge burns the bus bars, vaporising the copper and thus causing an explosion. Finally this may cause extensive material damage and jeopardise the safety of operational personnel.
An arc protection system operates much faster than conventional protection relays and thus damages caused by an arc flash fault can be kept at a minimum level. As a general guideline, an arc will not cause any damage if it is eliminated within 35 ms . If the arc is allowed to continue and last 100 ms some damage will occur. An arc fault lasting 500 ms may cause severe damage to the installation and will require extensive repair.
A short arc time is critical in order to avoid damage to personnel and material. It is therefore of vital importance that the source leading to the arc flash time is minimised and the power is disconnected as fast as possible - SELCO's D1000 arc protection system is the solution to this problem.

## Arc D-Tect

## Arc detecting relay system



## D1000 Functionality

The D1000 arc protection system is an advanced and fast arc protection system, offering the following features and functionality:

Compact unit - arc fault and overcurrent protection

- High speed arc fault detection less than 1 ms
- Over-current protection with detection within 1ms
- Combines optical fibre and point sensors
- Real-time event logging
- Self-supervision of sensors and protection unit
- Easy installation and configuration via USB


## D1000 Arc flash protection unit

The D1000 is a stand-alone and high speed arc protection unit for electrical power distribution systems. D1000 supports both point and fibre sensor technologies for arc flash detection and supports up to six sensors. The sensors can be combined in any combination, depending on the application and requirements.

## Easy configuration

The D1000 is easy to install and set-up and in case any changes are needed this is easily done via the USB interface accessible from the front. The built-in user-friendly menu system is embedded in the D1000 unit and activates automatically when the unit is connected to a PC.
The built-in light sensor on the front makes it easy to adjust and verify that all sensors are correctly installed and equally sensitive. With the TRIP LEVEL adjustment on the front plate the sensitivity to light can be adjusted. The light range is $10-25,000$ lux enabling use of sensors under different light conditions, indoor light, sunlight etc.


In small installations, the calibration TEST sensor can be used as a single arc detecting sensor, providing additional protection without added cost. Setup of the overcurrent detection, is easily done through the USB interface.

## Arc D-Tect

## Arc detecting relay system

## Easy installation

The D1000 system is easy to install and made to implement in new switchgear installations as well as retrofit projects. Both the D1000 unit and sensors are quick and easy to install. A general guideline is to mount 1-2 sensors per cubicle or chamber. It is important to cover all horizontal/vertical busbars (1) as well as breaker compartments (2) and drawers. Example is shown below: D1000 relays can be linked (up to 4 relays) to provide expanded installation and sensing requirements.


## Flexible and efficient sensors

## A1000 point sensor

The point sensor is a light-sensitive element based on phototransistor technology. It detects visible light radiation which is captured at the cylindrical top. The A1000 point sensor has a detection area of up to 2 $m$ with a characteristic of $180^{\circ} \times 360^{\circ}$. The A1000 supports self supervision, and a clear blinking built-in LED indicates that the sensor is active. If the sensor reaches the trigger level the LED will light up constantly. The A1000 sensor is supplied with a 10 m shielded cable.


## A2000 fibre sensor

The A2000 fibre sensor is a light sensitive element based on optical fibre technology. The A2000 fibre sensor is a fully flexible fibre with a detection angle of $360^{\circ}$ throughout the 8 metre length of the fibre. The detection radius is up 2 meters. The fibre sensor is ideal to install in electrical cabinets with drawer sections. Allows the same coverage as approximately $6 \times \mathrm{A} 1000$ point sensors. It is also possible to add 8 m lengths of sensor together.


## Arc D-Tect

## Arc detecting relay system

D1000 - wiring and installation


Point Sensor w. Cable Check

## Point Sensor

 w. Cable CheckArc D-Tect

## Arc detecting relay system

| D1000 Arc Protection Unit | D1000.0010 |
| :---: | :---: |
| Voltage Supply | $85-240$ V AC |
|  | $100-250$ V DC |
|  | 24 V Battery - Lead acid gel cell |
| Trip coil output | IGBT switch, $200 \mu$ s on-time, |
|  | 2s pulsed (configurable) |
| Trip coil voltage range | $24-600 \mathrm{~V}$ DC |
|  | 24-440 V DC |
| Signal contacts | Online, Service, Tripped |
| Sensitivity | 10-25000 lux, Trip level adj. 1-9 |
| Current inputs | 3 -phase 5 A ( $75 \mathrm{~A} / 1 \mathrm{sec}$ ) |
| Burden | $<0.25 \mathrm{VA} /$ inputs at 5 A |
| Current range | $1.5-3.0 \times \ln (7.5-15 \mathrm{~A})$ |
| Response time | Less than 1ms (arc fault) |
|  | Less than 1ms (overcurrent) |
| Number of detectors | Up to 6 |
| System expansion | Up to $4 \times$ D1000 units via Link |
|  | connection |
| Interface | USB |
| Power consumption | <3W |
| Ambient temperature | -25 to $+70{ }^{\circ} \mathrm{C}$ |
| Dimensions (WxHxD) | $200 \times 130 \times 52 \mathrm{~mm}$ |
| Mounting | 35 mm DIN Rail or screw-in |
| A1000 Sensor | A1000.0010 |
| Type | Point sensor |
| Detection area | $180 \times 360^{\circ}-2 \mathrm{~m}$ |
| Length | 10 m shielded cable |
| Circuit check | Built-in - LED for visual feedback |


| A2000 Sensor | A2000.0010 |
| :--- | :--- |
| Type | Fibre optical sensor |
| Detection area | $360^{\circ}$ |
| Length | 8 m flexible fibre |
| Circuit check | Built-in - LED for visual feedback |
| Dimensions $(W \times H \times D)$ | $32 \times 52 \times 21 \mathrm{~mm}$ |

## Approvals/standards

| EMC standards | EN60255-26 |
| :--- | :--- |
| Enclosure | IP 20 |

## Arc D-Tect

## D1000 Arc-fault protection system

Catalogue Numbers and ordering

| Description | Cat. No. | Price \$ |
| :--- | :--- | ---: |
| D1000 Arc protection unit | D1000 0010 | 5410.00 |
| A1000 Arc Point sensor 10 m | A1000 0010 | 530.00 |
| A2000 Arc fibre cable sensor 8 m | A2000 0010 | 2920.00 |
| D1000 Din Rail mounting clips | D1000 DINCLIPS | $\mathbf{1 1 . 0 0}$ |



Built-in overcurrent protection


Extended coverage with links input


Efficient self-supervision

Notes: Old sensor types ADR/ A0200/ A0300 can be used with the new D1000 relay. Refer NHP for connection details.

## LC-R127R2P



## Specifications

| Nominal Voltage |  | 12 V |
| :---: | :---: | :---: |
| Rated Capacity (20 hour rate) |  |  |
| Dimensions | Length | 7.2 Ah |
|  | Width | 2.945 inches $(151.0 \mathrm{~mm})$ |
|  | Height | 3.702 inches $(94.0 \mathrm{~mm})$ |
|  | Total Height* | 3.937 inches $(100.0 \mathrm{~mm})$ |
| Approx. mass |  | $5.45 \mathrm{lbs} .(2.47 \mathrm{~kg})$ |
| Standard Terminals <br> and Resin | UL94HB Faston 187 | LC-R127R2P |
|  | UL94HB Faston 250 | LC-R127R2P1 |

* The total height with \#250 terminal is 101.5 mm .

Characteristics

| $\begin{aligned} & \text { Capacity (note) } \\ & 77^{\circ} \mathrm{F}\left(25^{\circ} \mathrm{C}\right) \end{aligned}$ |  | 20 hour rate ( 360 mA ) <br> 10 hour rate $(680 \mathrm{~mA})$ <br> 5 hour rate ( 1260 mA ) <br> 1 hour rate ( 4900 mA ) | $\begin{aligned} & \text { 7.2Ah } \\ & \text { 6.8Ah } \\ & \text { 6.3Ah } \\ & \text { 4.9Ah } \end{aligned}$ |
| :---: | :---: | :---: | :---: |
|  |  | 1.5 hour rate discharge Cut-off voltage 10.5 V | 3.5A |
| Internal Resistance |  | Fully charged battery $77^{\circ} \mathrm{F}\left(25^{\circ} \mathrm{C}\right)$ | Approx. $40 \mathrm{~m} \Omega$ |
| Temperature dependency of capacity (20 hour rate) |  | $\begin{gathered} 104^{\circ} \mathrm{F}\left(40^{\circ} \mathrm{C}\right) \\ 77^{\circ} \mathrm{F}\left(25^{\circ} \mathrm{C}\right) \\ 32^{\circ} \mathrm{F}\left(0^{\circ} \mathrm{C}\right) \\ 5^{\circ} \mathrm{F}\left(-15^{\circ} \mathrm{C}\right) \\ \hline \end{gathered}$ | $\begin{array}{r} \hline 102 \% \\ 100 \% \\ 85 \% \\ 65 \% \end{array}$ |
| Self discharge$77^{\circ} \mathrm{F}\left(25^{\circ} \mathrm{C}\right)$ |  | Residual capacity after standing 3 months <br> Residual capacity after standing 6 months <br> Residual capacity <br> after standing 12 months | $\begin{aligned} & 91 \% \\ & 82 \% \\ & 64 \% \end{aligned}$ |
| Charge Method (Constant Voltage) | Cycle use (Repeating use) | Initial current | 2.88 A or smaller |
|  |  | Control voltage | $\begin{gathered} 14.5 \mathrm{~V} \text { to } 14.9 \mathrm{~V} \\ \left(\text { per } 12 \mathrm{~V} \text { cell } 25^{\circ} \mathrm{C}\right) \end{gathered}$ |
|  | Trickle use | Initial current | 1.08 A or smaller |
|  |  | Control voltage | $\begin{array}{\|c\|} \hline 13.6 \mathrm{~V} \text { to } 13.8 \mathrm{~V} \\ \left(\text { per } 12 \mathrm{~V} \text { cell } 25^{\circ} \mathrm{C}\right) \end{array}$ |

(Note) The above characteristics data are average values obtained within three charge/discharge. Cycles not the minimum values.

For main and standby power supplies.
Expected trickle life: $3-5$ years at $25^{\circ} \mathrm{C}$, Approx. 5 years at $20^{\circ} \mathrm{C}$.

## Dimensions (mm)

Terminal type: Faston 187 or Faston 250
 Battery case resin: Standard (UL94HB) Color is black.

Discharge characteristics $77^{\circ} \mathrm{F}\left(25^{\circ} \mathrm{C}\right)^{(\text {Note })}$


Duration of discharge vs. Discharge current ${ }^{(\text {Note) }}$


|  | Information on this item |  |
| :--- | :--- | :--- |
|  | Item homepage <br> Certificates / Approvals <br> Classification | Catalog Extract (PDF) <br> Downloads |

Show comparison

Item homepage

## Item description

End cover, Length: 42.5 mm , Width: 1.8 mm , Height: 35.9 mm , Color: gray

## Requested quantity

Quantity (in pcs.)l: $\quad \square 50$ Enquire $\quad$ Add to comparison

## Commercial data

| Order No.: | 3003020 |
| :--- | :--- |
| Type | D-UK 4/10 |
| EAN | 4017918090425 |
| Catalog page information | Page 493 (CAT-3-2013) |
| Packing unit | 50 pcs. |
| Customs tariff number | 85389099 |
| Gross weight per piece (inclusive packing) | 0.002033 KG |
| Net weight per piece (exclusive packing) | 0.002033 KG |

## SP PHCENIX

## Extract from the online catalog

## E/UK

Order No.: 1201442
http://catalog.phoenixcontact.net/phoenix/treeViewClick.do?UID=1201442


End clamp, for assembly on NS 32 or NS 35/7.5 DIN rail

|  |  | Product notes |
| :---: | :---: | :---: |
| Commercial data |  | WEEE/RoHS-compliant since:$07 / 01 / 2005$ |
| EAN |  |  |
| sales group | B220 |  |
| Pack | 50 Pcs. |  |
| Customs tariff | 39269097 | http:// <br> www.download.phoenixcontact.com Please note that the data given here has been taken from the online catalog. For comprehensive information and data, please refer to the user documentation. The General Terms and Conditions of Use apply to Internet downloads. |
| Gross weight in pieces | 0.009441 KG |  |
| Net weight per piece | 0.0093 KG |  |
| Catalog page information | Page 498 (CAT-5-2013) |  |
|  |  |  |

Technical data

## Dimensions

| Length (b) | 50.5 mm |
| :--- | :--- |
| Height | 35.3 mm |
| Width (a) | 9.5 mm |

## General

| Color | gray |
| :--- | :--- |
| Inflammability class according to UL 94 | V2 |

E/UK Order No.: 1201442
http://catalog.phoenixcontact.net/phoenix/treeViewClick.do?UID=1201442

Material PA

## Certificates / Approvals

## Certification

Certifications applied for:
Certification Ex:

| Accessories |  |  |
| :---: | :---: | :---: |
| Item | Designation | Description |
| Assembly |  |  |
| 1201002 | NS 32 PERF 2000MM | G-profile DIN rail, material: Steel, perforated, height 15 mm , width 32 mm , length 2 m |
| 1201015 | NS 32 UNPERF 2000MM | G-profile DIN rail, material: Steel, unperforated, height 15 mm , width 32 mm , length 2 m |
| 0801704 | NS 35/ 7,5 AL UNPERF 2000MM | DIN rail, unperforated, Width: 35 mm , Height: 7.5 mm , Length: 2000 mm, Color: silver |
| 1206560 | NS 35/ 7,5 CAP | DIN rail end piece, for DIN rail NS 35/7.5 |
| 0801762 | NS 35/7,5 CU UNPERF 2000MM | DIN rail, material: Copper, unperforated, height 7.5 mm , width 35 mm , length: 2 m |
| 0801733 | NS 35/ 7,5 PERF 2000MM | DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 7.5 mm , width 35 mm , length: 2000 mm |
| 0801681 | NS 35/ 7,5 UNPERF 2000MM | DIN rail, material: Steel, unperforated, height 7.5 mm , width 35 mm , length: 2 m |
| 1204119 | NS 35/ 7,5 WH PERF 2000MM | DIN rail 35 mm (NS 35) |
| 1204122 | NS 35/ 7,5 WH UNPERF 2000MM | DIN rail 35 mm (NS 35) |
| 1206421 | NS 35/ 7,5 ZN PERF 2000MM | DIN rail, material: Galvanized, perforated, height 7.5 mm , width 35 mm , length: 2 m |
| 1206434 | NS 35/ 7,5 ZN UNPERF 2000MM | DIN rail, material: Galvanized, unperforated, height 7.5 mm , width 35 mm , length: 2 m |
| 1201756 | NS 35/15 AL UNPERF 2000MM | DIN rail, deep drawn, high profile, unperforated, 1.5 mm thick, material: aluminum, height 15 mm , width 35 mm , length 2000 mm |
| 1206573 | NS 35/15 CAP | DIN rail end piece, for DIN rail NS 35/15 |
| 1201895 | NS 35/15 CU UNPERF 2000MM | DIN rail, material: Copper, unperforated, 1.5 mm thick, height 15 mm , width 35 mm , length: 2 m |
| 1201730 | NS 35/15 PERF 2000MM | DIN rail, material: steel galvanized and passivated with a thick layer, perforated, height 15 mm , width 35 mm , length: 2000 mm |

E/UK Order No.: 1201442
http://catalog.phoenixcontact.net/phoenix/treeViewClick.do?UID=1201442
$\left.\begin{array}{l|l|l}\hline 1201714 & \text { NS 35/15 UNPERF 2000MM } & \begin{array}{l}\text { DIN rail, material: Steel, unperforated, height } 15 \mathrm{~mm}, \text { width } 35 \\ \text { mm, length: } 2 \mathrm{~m}\end{array} \\ \hline 0806602 & \text { NS 35/15 WH PERF 2000MM } & \text { DIN rail } 35 \mathrm{~mm} \text { (NS 35) } \\ \hline 1204135 & \text { NS 35/15 WH UNPERF 2000MM } & \text { DIN rail } 35 \mathrm{~mm} \text { (NS 35) } \\ \hline 1206599 & \text { NS 35/15 ZN PERF 2000MM } & \begin{array}{l}\text { DIN rail, material: Galvanized, perforated, height } 15 \mathrm{~mm}, \text { width 35 } \\ \text { mm, length: } 2 \mathrm{~m}\end{array} \\ \hline 1206586 & \text { NS 35/15 ZN UNPERF 2000MM } & \begin{array}{l}\text { DIN rail, material: Galvanized, unperforated, height } 15 \mathrm{~mm}, \text { width } \\ 35 \text { mm, length: } 2 \mathrm{~m}\end{array} \\ \hline 1201798 & \text { NS 35/15-2,3 UNPERF 2000MM } & \begin{array}{l}\text { DIN rail, material: Steel, unperforated, } 2.3 \text { mm thick, height } 15 \\ \text { mm, width } 35 \text { mm, length: } 2 \mathrm{~m}\end{array} \\ \hline \text { Marking } & \text { UBE + ES/KMK 3 } & \begin{array}{l}\text { Marker carrier, color: Gray for marking groups of terminals, for end } \\ \text { clamp E/UK or end clamp E/U, with perforated insert strips, 40 } \mathrm{x}\end{array} \\ \hline 1004089 & \text { UC-TM 6 mm, can be labeled with CMS system }\end{array}\right\}$

E/UK Order No.: 1201442 http://catalog.phoenixcontact.net/phoenix/treeViewClick.do?UID=1201442

## Drawings

## Dimensioned drawing



E/UK Order No.: 1201442
http://catalog.phoenixcontact.net/phoenix/treeViewClick.do?UID=1201442

## Address

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130-140 Parraweena Road

Miranda NSW 2228,Australia
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## Terminal Block UK

| Article description | UK 5 N * |  |
| :---: | :---: | :---: |
| Article no. | 3004362 * | - |
| EC-TYPE EXAMINATION CERTIFICATE IECEX-CERTIFICATE | KEMA 98ATEX1651 U * <br> IECEX KEM 06.0034 U * | 5 - |
| Marking |  <br> Ex eb IIC <br> KEMA 98ATEX1651 U <br> IECEx KEM 06.0034 U |  |
| Assembly on mounting rails | NS 32 acc. to EN 60715-G 32 NS 35 acc. to $60715-T H 35$ | the |
| Stripping length | 8 mm | 1 |
| Torque | 0,6-0,8 Nm |  |
| Assembly instructions | See page 2 |  |
| Operating temperature range | $-60^{\circ} \mathrm{C} \ldots+110^{\circ} \mathrm{C}$ |  |
| Technical data according to IEC/EN 60079-7 (increased safety „e") |  |  |
| Rated insulation voltage Rated voltage | $\begin{array}{ll}630 \mathrm{~V} / \mathrm{NS} 35 & 500 \mathrm{~V} / \mathrm{NS} 32 \\ 690 \mathrm{~V} / \mathrm{NS} 35 & 550 \mathrm{~V} / \mathrm{NS} 32\end{array}$ |  |
| Nominal current | $32 \mathrm{~A}(\triangle \mathrm{~T} 40 \mathrm{~K})$ | 32,0 A ( $\Delta \mathrm{T} 45 \mathrm{~K}$ ) |
| Max. rated current | $33 \mathrm{~A}(\Delta \mathrm{~T} 40 \mathrm{~K})$ | 37,0 A ( $\Delta \mathrm{T} 45 \mathrm{~K}$ ) |
|  | $33 \mathrm{~K}\left(32 \mathrm{~A} / 4 \mathrm{~mm}^{2}\right)$ |  |
|  | $0,37 \mathrm{~m} \Omega$ |  |
| Connection capacity |  |  |
| Rated cross-section | $4 \mathrm{~mm}^{2}$ | AWG 12 |
| Max. conductor cross-section | $6 \mathrm{~mm}^{2}$ | AWG 10 |
| Connectable conductor cross-section | $\begin{array}{ll}0,2-6 \mathrm{~mm}^{2} & \text { starr } \\ 0,2-4 \mathrm{~mm}^{2} & \text { flexibel }\end{array}$ | AWG 24-10 <br> AWG 24-12 |
| Multi-conductor connection (2 conductors of the same cross-section and conductor type) |  |  |
| rigid / flexible | 0,2-1,5 $\mathrm{mm}^{2}$ | AWG 24-16 |
| Data of insulation material |  |  |
| Description | PA 6.6 |  |
| Creep resistance acc. to IEC 60112 / material group | CTI 600 / 1 |  |

[^9]| Accessories | Description | Article no. |
| :--- | :--- | :--- |
| Cover | D-UK 4/10 | 3003020 |
| Coverl | D-UK 16 | 3006027 |
| Partition plate | ATP-UK | 3003224 |
|  | FB 2-6-EX | 0201456 |
| Fixed bridge bar | FB 3-6-EX | 0201469 |
|  | FB 10-6-EX | 0203519 |
| Fixed bridge bar | FBI 10-6-EX | 0203519 |
|  |  |  |
| Chain bridge | KB-6-EX | 0201485 |
|  |  | 0711849 |
| Chain bridge | KBI-6-EX | 070 |
| Bridge rail with Distance piece | FB-150 / ZSR-EX | 0201595 / |
|  |  | 0200017 |

## Important assembly instructions - increased safety „e"

The Terminal Blocks are suitable for use in enclosures in atmospheres with flammable gases or combustible dust. For flammable gases these enclosures must satisfy the requirements according to IEC/EN 60079-0 and IEC/EN 60079-7. For combustible dust these enclosures must satisfy the requirements according to IEC/EN 60079-31.

When assembling with other certified series and sizes of terminal blocks and using accessories designed for the purpose, the required creepage distances and clearances have to be observed.

When using the bridge rail to achieve a skipped bridging the rated voltage is reduced to 176 V .
If conductors with smaller cross section than the rated cross section are used, the assigned lower current has to be specified in the EC-Type Examination Certificate of the complete apparatus.

The Terminal Blocks may be used, based on the self-heating when used at the nominal current and at ambient temperatures of $-60^{\circ} \mathrm{C}$ to $+40^{\circ} \mathrm{C}$ at the mounting position in electrical apparatus, e.g. junction and connection boxes, for temperature class T6. When the Terminal Blocks are used in electrical apparatus of temperature classes T1 up to T5, the highest temperature of the insulating material shall not exceed the maximum value of the operating temperature range.

The Terminal Blocks and their appropriate accessories have to be assembled as specified below.

Page 2 of 5


## Operational instructions - Intrinsic safety "i"

IEC/EN 60079-14 Clause 12 describes modular terminal blocks as simple apparatus when used in intrinsically-safe circuits. Testing by a notified body and marking is not required. If terminal blocks be identifiable as part of an intrinsically circuit are marked by a colour, the colour used shall be light blue.

Testing for compliance to intrinsically safe requirements including clearance, creepage, and solid insulation distances specified in IEC/EN 60079-0 and IEC/EN 60079-11 have been performed for circuits up to 60 V .

Compliance with distance requirements of IEC/EN 60079-14 Clause 12.2.3 for the connection of separated intrinsically-safe circuit accessories is met. A minimum distance of 50 mm to separate clamping units of intrinsically-safe and non intrinsically-safe circuits is required through the use of a separating plate or similar device.

## Attestation of Conformity

The above mentioned product is in line with the provisions of the below marked directive and their modification directive(s):

94/9/EC ATEX Directive
Compliance with Essential Health and Safety Requirements has been assured by compliance with:
EN 60079-0:2009
EN 60079-7:2007
IEC 60079-0:2011
IEC 60079-7:2006

The conformity with the provisions of the ATEX directive were certified by

Notified Body:
Address:
Certificate:
(No., Date)

DEKRA Certification B.V.
Utrechtseweg 310, NL-6812 AR Arnhem, The Netherlands [Ident.-No.: 0344]
KEMA 98ATEX1651 U, 2012-07-23

Blomberg, 2012-09-13


This attestation certifies the conformity with the indicated directive, it does not, however, covenant any characteristics.
The instructions for safety and installation have to be observed.

## Technical data/requirements acc. to UL and CSA standards

USR: UL 60079-0, 4. Edition UL 60079-7, 2. Edition
CNR: CAN/CSA E60079-0:02
CAN/CSA E60079-7:03

Voltage rating
Current rating
Wire range

Type wiring
Torque value

600 V
30 A
AWG 30-10*) solid and stranded *) use copper wire only $0,05-5,3 \mathrm{~mm}^{2}$
Factory and field wiring
5-7 lb.-in.
$0,56-0,79 \mathrm{Nm}$

## Markings

USR: Class I, Zone I, AEx e II
CNR: Exell
Conditions of Acceptability

1. The suitability of the mounting means shall be determined in the end-use applications.
2. Leads connected to the terminals shall be insulated for the appropriate voltage and this insulation shall extend to within 1 mm of the metal of the terminal throat.
3. The terminal blocks were tested for a minimum user temperature (service temperature) of $-20^{\circ} \mathrm{C}$ and for a maximum user temperature (service temperature) of $+85^{\circ} \mathrm{C}$. They shall not be used in an ambient temperature lower than $-20^{\circ} \mathrm{C}$ and they shall not heat up to more than $+85^{\circ} \mathrm{C}$ when used in service.
4. The terminal block was investigated for use in an enclosure with a minimum rating of IP54. The suitability of the end-use application enclosure as an increased safety enclosure shall be considered.
5. The field wiring terminals of these terminal blocks have been evaluated using ANSI/UL 486E, "Equipment Wiring Terminals for Use with Aluminum and/or Copper Conductors." The suitability of these terminals shall be determined in the end-use investigation.

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Flachsmarktstraße 8
32825 Blomberg
Germany
管 $+49-(0) 5235-3-00$
$+49-(0) 5235-3-41200$
www.phoenixcontact.com

## S) PHONIX

## Extract from the online catalog

## UK 5-HESI

Order No.: 3004100
http://catalog.phoenixcontact.net/phoenix/treeViewClick.do?UID=3004100


Fuse terminal block for cartridge fuse insert, cross section: 0.2-4 mm², AWG: 26-10, width: 8.2 mm, color: black

|  |  | Product notes |
| :---: | :---: | :---: |
| Commercial data |  | WEEE/RoHS-compliant since: 01/01/2003 |
| EAN |  |  |
| sales group | A040 |  |
| Pack | 50 Pcs. |  |
| Customs tariff | 85369085 | http:// |
| Gross weight in pieces | 0.018918 KG | Please note that the data given |
| Net weight per piece | 0.018316 KG | online catalog. For comprehensive |
| Catalog page information | Page 526 (CAT-3-2013) | information and data, please refer |
| Technical data |  |  |
| General |  |  |
| Number of levels | 1 |  |
| Number of connections | 2 |  |
| Color | black |  |
| Insulating material | PA |  |
| Inflammability class according to UL 94 | V2 |  |

UK 5-HESI Order No.: 3004100
http://catalog.phoenixcontact.net/phoenix/treeViewClick.do?UID=3004100

## Dimensions

| Width | 8.2 mm |
| :--- | :--- |
| Length | 72.5 mm |
| Height NS 35/7,5 | 56.5 mm |
| Height NS 35/15 | 64 mm |
| Height NS 32 | 61.5 mm |

## General

| Fuse | G/5 $\times 20 / 5 \times 25 / 5 \times 30$ |
| :--- | :--- |
| Fuse type | Glass |
| Rated surge voltage | 6 kV |
| Pollution degree | 3 |
| Surge voltage category | III |
| Insulating material group | I |
| Connection in acc. with standard | IEC $60947-7-3$ |
| Nominal current $I_{N}$ | 6.3 A |
| Nominal voltage $U_{N}$ | 500 V (As a fuse terminal block) |
| Open side panel | nein |
| Number of positions | 1 |

## Connection data

| Conductor cross section solid min. | $0.2 \mathrm{~mm}^{2}$ |
| :--- | :--- |
| Conductor cross section solid max. | $4 \mathrm{~mm}^{2}$ |
| Conductor cross section stranded min. | $0.2 \mathrm{~mm}^{2}$ |
| Conductor cross section stranded max. | $4 \mathrm{~mm}^{2}$ |
| Conductor cross section AWG/kcmil min. | 24 |
| Conductor cross section AWG/kcmil max | 12 |
| Conductor cross section stranded, with ferrule <br> without plastic sleeve min. | $0.25 \mathrm{~mm}^{2}$ |
| Conductor cross section stranded, with ferrule <br> without plastic sleeve max. | $4 \mathrm{~mm}^{2}$ |
| Conductor cross section stranded, with ferrule <br> with plastic sleeve min. | $0.25 \mathrm{~mm}^{2}$ |
| Conductor cross section stranded, with ferrule <br> with plastic sleeve max. | $4 \mathrm{~mm}^{2}$ |
| 2 conductors with same cross section, solid min. | $0.2 \mathrm{~mm}^{2}$ |
| 2 conductors with same cross section, solid max. | $1.5 \mathrm{~mm}^{2}$ |

UK 5-HESI Order No.: 3004100
http://catalog.phoenixcontact.net/phoenix/treeViewClick.do?UID=3004100

| 2 conductors with same cross section, stranded <br> min. | $0.2 \mathrm{~mm}^{2}$ |
| :--- | :--- |
| 2 conductors with same cross section, stranded <br> max. | $1.5 \mathrm{~mm}^{2}$ |
| 2 conductors with same cross section, stranded, <br> ferrules without plastic sleeve, min. | $0.25 \mathrm{~mm}^{2}$ |
| 2 conductors with same cross section, stranded, <br> ferrules without plastic sleeve, max. | $1.5 \mathrm{~mm}^{2}$ |
| 2 conductors with same cross section, stranded, <br> TWIN ferrules with plastic sleeve, min. | $0.5 \mathrm{~mm}^{2}$ |
| 2 conductors with same cross section, stranded, | $1.5 \mathrm{~mm}^{2}$ |
| TWIN ferrules with plastic sleeve, max. | $4 \mathrm{~mm}^{2}$ |
| Cross section with insertion bridge, solid max. | $4 \mathrm{~mm}^{2}$ |
| Cross section with insertion bridge, stranded max. | Screw connection |
| Connection method | 8 mm |
| Stripping length | A 4 |
| Internal cylindrical gage | M 3 |
| Screw thread | 0.5 Nm |
| Tightening torque, min | 0.8 Nm |
| Tightening torque max |  |

## Certificates / Approvals

## (1) ग】 ® © ®

Certification
CSA, cULus Recognized, GOST, ABS, BV, GL, LR, PRS, RS

Certifications applied for:
Certification Ex:

## Accessories

Item Designation Description

## Assembly

| 3022218 | CLIPFIX 35 | Quick mounting end clamp for NS $35 / 7,5$ DIN rail or NS $35 / 15$ DIN <br> rail, with marking option, width: 9.5 mm, color: gray |
| :--- | :--- | :--- |

UK 5-HESI Order No.: 3004100
http://catalog.phoenixcontact.net/phoenix/treeViewClick.do?UID=3004100

| 3022276 | CLIPFIX 35-5 | Quick mounting end clamp for NS 35/7,5 DIN rail or NS 35/15 DIN <br> rail, with marking option, with parking option for FBS...5, FBS...6, <br> KSS 5, KSS 6, width: 5.15 mm , color: gray |
| :--- | :--- | :--- |
| 0800886 | E/NS 35 N | End clamp, width: 9.5 mm, color: gray |, | End clamp, for assembly on NS 32 or NS $35 / 7.5$ DIN rail |
| :--- |
| 1201442 |
| 1201413 |
| E/UK |
| 1201002 |

UK 5-HESI Order No.: 3004100
http://catalog.phoenixcontact.net/phoenix/treeViewClick.do?UID=3004100

| 1201798 | NS 35/15-2,3 UNPERF 2000MM | DIN rail, material: Steel, unperforated, 2.3 mm thick, height 15 <br> mm, width 35 mm , length: 2 m |
| :--- | :--- | :--- |
| 3004207 | VS | Connection pin, Length: 1000 mm , Color: gray |
| Bridges |  |  |
| 3118151 | EBS 2-8 | Insertion bridge, Number of positions: 2, Color: gray |
| 3118148 | EBS 3-8 | Insertion bridge, Number of positions: 3, Color: gray |
| 3118135 | EBS 10-8 | Insertion bridge, Number of positions: 10, Color: gray |
| General |  |  |
| 3032075 | DMET 5X20 | Feed-through metal in the shape of a $5 \times 20$ mm glass tube fuse <br> insert for use in fuse terminal blocks. |


| Marking |  |  |
| :---: | :---: | :---: |
| 1007235 | SBS 8:UNBEDRUCKT | Marker cards, Card, white, Unlabeled, Can be labeled with: Plotter, Mounting type: Snap into tall marker groove, Snap into flat marker groove, For terminal block width: 8.2 mm , Lettering field: 6 $\times 8.1 \mathrm{~mm}$ |
| 0818072 | UC-TM 8 | Marker for terminal blocks, Sheet, white, Unlabeled, Can be labeled with: BLUEMARK CLED, BLUEMARK LED, Plotter, Mounting type: Snap into tall marker groove, For terminal block width: 8.2 mm , Lettering field: $7.6 \times 10.5 \mathrm{~mm}$ |
| 0824597 | UC-TM 8 CUS | Marker for terminal blocks, Can be ordered: By sheet, white, Labeled according to customer specifications, Mounting type: Snap into tall marker groove, For terminal block width: 8.2 mm , Lettering field: $7.6 \times 10.5 \mathrm{~mm}$ |
| 0828740 | UCT-TM 8 | Marker for terminal blocks, Sheet, white, Unlabeled, Can be labeled with: THERMOMARK CARD PLUS, THERMOMARK CARD, BLUEMARK CLED, BLUEMARK LED, Mounting type: Snap into tall marker groove, For terminal block width: 8.2 mm , Lettering field: $7.6 \times 10.5 \mathrm{~mm}$ |
| 0829616 | UCT-TM 8 CUS | Marker for terminal blocks, Can be ordered: By sheet, white, Labeled according to customer specifications, Mounting type: Snap into tall marker groove, For terminal block width: 8.2 mm , Lettering field: $7.6 \times 10.5 \mathrm{~mm}$ |
| 0825011 | ZB 8 CUS | Zack marker strip, Can be ordered: Strip, white, Labeled according to customer specifications, Mounting type: Snap into tall marker groove, For terminal block width: 8.2 mm , Lettering field: $10.5 \times 8.15 \mathrm{~mm}$ |
| 1052002 | ZB 8:UNBEDRUCKT | Zack marker strip, Strip, white, Unlabeled, Can be labeled with: Plotter, Mounting type: Snap into tall marker groove, For terminal block width: 8.2 mm , Lettering field: $10.5 \times 8.15 \mathrm{~mm}$ |

## Tools

| 1205053 | SZS 0,6X3,5 | Actuation tool, for ST terminal blocks, insulated, also suitable <br> for use as a bladed screwdriver, size: $0.6 \times 3.5 \times 100 \mathrm{~mm}, 2-$ <br> component grip, with non-slip grip |
| :--- | :--- | :--- |

## Drawings

Application drawing


Fuse terminal blocks in interconnected arrangement, block consisting of 5 fuse terminal blocks


Fuse terminal block in single arrangement, block consisting of one fuse terminal block and 4 feed-through terminal blocks

## Circuit diagram



UK 5-HESI Order No.: 3004100
http://catalog.phoenixcontact.net/phoenix/treeViewClick.do?UID=3004100

## Address

Phoenix Contact Pty. Ltd.
130-140 Parraweena Road

Miranda NSW 2228,Australia
Phone 1300786411
Fax +61/2/9525-2888
http://www.phoenixcontact.com.au
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## PBDRN60 Series

```
60 WATTS - AC/DC DIN RAIL MOUNTABLE - INDUSTRIAL CONTROL
```


## FEATURES

- AC/DC power module
- Universal input 85-264VAC
- DC input voltage $90-375 \mathrm{Vdc}$
- Compact and robust design with easy mounting on TS35 Din-Rail
- DC OK relay contact
- High efficiency up to $89 \%$
- Short circuit protection
- Internal input filter
- Operational temperature between to -10 to $+61^{\circ} \mathrm{C}$

- Local and international Approvals; C-Tick, CE, UL, cUL, TUV


## SPECIFICATIONS

| INPUT |  |
| :---: | :---: |
| Input voltage range | 85-264VAC |
| Input current | Vi: 115 / 230VAC, 1060/590mA |
| Line frequency | Vi nom, lo nom 47-63Hz |
| Inrush current | Vi: 115/230VAC, I nom 20/40A |
| Power disipation | Vi: 230VAc, lo nom 5V 12.5W, 12V 9.06W, 24V 8.8W and 48V 7.8W |
| Leakage current | Input-Output 0.25 mA Input-FG 3.5mA |
| OUTPUT |  |
| Voltage range | For 5V, up to $110 \%$ of Vi nom. Other units, up to $115 \%$ ov Vi nom |
| Hold-up time | Vi: 115/230VAC, 20/30ms |
| Ripple and noise | $\mathrm{BW}=20 \mathrm{MHz}, 50 \mathrm{mV}$ |
| Capacitor load | 7000 $\mu \mathrm{f}$ |
| ENVIRONMENTAL |  |
| Storage temperature | Non operational -25 to $+85^{\circ} \mathrm{C}$ |
| Relative humidity | 20-95\% |
| Isolation voltage | Input-Output at 3000 VAC Input-FG 1500VAC |
| Ambient temperature | -10 to $+71^{\circ} \mathrm{C}$ |
| Derating | From $+61^{\circ} \mathrm{C}$ to $+71^{\circ} \mathrm{C}, 2.5 \%$ per ${ }^{\circ} \mathrm{C}$ |
| Temperature coefficient | $\pm 0.03 \%{ }^{\circ} \mathrm{C}$ |


| Cooling | Free air convection |
| :--- | :--- |
| Dimensions | $90 \times 40.5 \times 115 \mathrm{~mm}$ |
| GENERAL |  |
| Efficiency | $79 \%-89 \%$ typical, model dependant |
| Switching frequency | $55-90 \mathrm{KHz}$ |
| Weight | 340 g |
| STANDARDS |  |
| Safety standards | UL508 Listed, UL60950-1, UL1310 Class 2 |
|  | Power (5V, 12V models only) Recognised ISA |
|  | 12.12 .01 (Class 1, Division 2, Groups A,B,C |
|  | and D) |
| C tick | AS/NZ CISPR11 Group 1, Class A |
| EMI standards | EN 61000-6-3 |
|  | EN 55022 Class B |
|  | EN 61000-3-2, EN 61000-3-3 |

## SELECTION TABLE

| MODEL NUMBER | OUTPUT |  | POWER |
| :--- | :---: | :---: | :---: |
| PBDRN60S05-A* | +5 V | 10000 mA | 50 W |
| PBDRN60S12-A* | +12 V | 5000 mA | 60 W |
| PBDRN60S24-A* | +24 V | 2500 mA | 60 W |
| PBDRN60S48-A* | +48 V | 1250 mA | 60 W |

* Non indent item


## MECHANICAL \& PIN CONFIGURATION



| REVISIONS |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| REV LTR | DATE | ENG | MKTG | Q.A. |
| D | $01 / 11 / 01_{\text {IB }}$ | KCB | PH | RM |
| E | $11 / 12 / 0$ SH $^{\text {SH }}$ | LC | SD | LJ |




Q-Pulse Id: TIVS1150


## DATA SHEET

Coax Cable Connector


## Description

Straight Cable Plug Crimp
Suits Cables: LMR400, CNT400, BELDEN 9913

## Technical Data

Electrical

| Impedance | 50 Ohm |
| :--- | :--- |
| Max Frequency | 11 GHz |

## Mechanical \& Environmental Data

| Centre contact | Spring Finger |
| :--- | :--- |
| Outer Contact | Crimp |
| Mating | $5 / 8^{\prime \prime}-24$ threaded coupling |
| Durability | 500 matings |
| Coupling nut retention | 100 lbs Max |
| Cable Retention | 40 lbs min |
| Tempreture Range | $-65^{\circ}$ to $165^{\circ}$ C |
| Vibration | MIL-STD-202 Test Cond B |
| Salt Spray | MIL-STD-101 Test Cond B |
| Thermal Shock | MIL-STD-107 Test Cond B |
|  |  |
| Material Data |  |
| Parts Material <br> Connector Body Brass <br> Centre contact Berylium Copper <br> Insulation Teflon <br> Gasket Silicone Rubber$\quad$Gold <br> Crimp Ferrule | Anneald Copper |
|  |  |

The YB Series are high gain yagi antennas which will provide excellent point to point communication in RF control, short or long haul link and other applications calling for highly directional antennas. YB Series antennas exhibit narrow beamwidths and high front to back ratios to help minimise potential interference to and from other systems.

The feed element of each antenna is of full folded dipole construction thus offering maximum bandwidth and reliability. The dipole element is welded to the boom to ensure low intermodulation performance and maximum durability. The passive elements are through mounted to the circular boom section and welded at each side to further minimise the potential for both corrosion and generation of intermodulation products.

For extreme climatic or corrosive applications, the stainless steel YBSS Series or black ruggedised RDA Series yagis should be considered.

Features:

- All welded construction for maximum and reliable performance
- Narrow beamwidths \& high front to back ratios effective in reducing interference
- Alodine finish provides an excellent conductive surface for earthing
- Can be configured in stacks or bays for higher gain applications using PH and PHE series phasing harnesses

- DC grounding on all elements for the ultimate in lightning protection and dissipation of static noise


Electrical

| Model Number | YB9-65 | YB9-61 | YB9-62 | YB9-99 |
| :---: | :---: | :---: | :---: | :---: |
| Nominal Gain dBi (dBd) | 13 (11) |  |  |  |
| Frequency MHz | 400-420 | 450-480 | 480-520 | 400-600 |
| Tuned Bandwidth |  | Full band |  | 5.0\% |
| VSWR (Return Loss) | $<1.5$ :1 (14dB) |  |  |  |
| Nominal Impedance $\Omega$ | 50 |  |  |  |
| Vertical Beamwidth ${ }^{\circ}$ |  | 46 |  | 42 |
| Horizontal Beamwidth ${ }^{\circ}$ |  | 54 |  | 48 |
| Front / Back Ratio dB | 18 (Typical) |  |  |  |
| Input Power W | 100 |  |  |  |

Mechanical

| Model Number |  | YB9-65 | YB9-61 | YB9-62 | YB9-99 |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Construction |  | All welded aluminium with alodined finish |  |  |  |
| Length $m$ |  | 2.0 | 1.8 | 1.6 | 2.0 |
| Weight kg |  | 1.2 | 1.0 | 1.0 | 1.2 |
| Termination |  | N female with short 9008 cable tail |  |  |  |
| Mounting Area |  | $100 \mathrm{~mm} \times 25 \mathrm{~mm}$ diam. alodined aluminium |  |  |  |
| Suggested Clamps |  | 1 X UCR1 |  |  |  |
| Projected Area cm ${ }^{2}$ | No ice | 859 | 771 | 694 | 859 |
|  | With ice | 2078 | 1842 | 1640 | 2078 |
| Wind Load (Thrust) @ 160km/h N |  | 102 | 91 | 82 | 102 |
| Wind Gust Rating km/h |  | 207 | 220 | 240 | 207 |
| Torque @160 km/h Nm |  | 92 | 75 | 60 | 92 |



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S095 Harrisville Flowmeter Site Flowmeter - C1011-045 - Electrical Switchboard OM Manual

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# E-Series Data Radio User Manual 

ER450 Remote Data Radio EB450 Base Station<br>EH450 Hot Standby Base Station



## Schneider <br> SElectric

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## SECTION 1

## Part A - Preface

## Part B - E Series Overview

## Part C - Applications

## Part D - System Planning and Design

## Part E-Getting Started

## Part F - Operational Features

## Part G - Commissioning

## Part H - Maintenance

## Part A - Preface

## Warranty

All equipment supplied by Trio Datacom Pty Ltd (As of 1 January 2009) is covered by warranty for faulty workmanship and parts for a period of three (3) years from the date of delivery to the customer. During the warranty period Trio Datacom Pty Ltd shall, at its option, repair or replace faulty parts or equipment provided the fault has not been caused by misuse, accident, deliberate damage, abnormal atmosphere, liquid immersion or lightning discharge; or where attempts have been made by unauthorised persons to repair or modify the equipment.

The warranty does not cover modifications to software. All equipment for repair under warranty must be returned freight paid to Trio Datacom Pty Ltd or to such other place as Trio Datacom Pty Ltd shall nominate. Following repair or replacement the equipment shall be returned to the customer freight forward. If it is not possible due to the nature of the equipment for it to be returned to Trio Datacom Pty Ltd, then such expenses as may be incurred by Trio Datacom Pty Ltd in servicing the equipment in situ shall be chargeable to the customer.

When equipment for repair does not qualify for repair or replacement under warranty, repairs shall be performed at the prevailing costs for parts and labour. Under no circumstances shall Trio Datacom Pty Ltd's liability extend beyond the above nor shall Trio Datacom Pty Ltd, its principals, servants or agents be liable for the consequential damages caused by the failure or malfunction of any equipment.

## Important Notice

© Copyright 2011 Trio Datacom Pty Ltd All Rights Reserved

This manual covers the operation of the E Series of Digital Data Radios. Specifications described are typical only and are subject to normal manufacturing and service tolerances.

Trio Datacom Pty Ltd reserves the right to modify the equipment, its specification or this manual without prior notice, in the interest of improving performance, reliability or servicing. At the time of publication all data is correct for the operation of the equipment at the voltage and/or temperature referred to. Performance data indicates typical values related to the particular product.

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## Safety Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.


The addition of this symbol to a Danger or Warning safety label indicates that an electrical hazard exists, which will result in personal injury if the instructions are not followed.

$\triangle$This is the safety alert symbol. It is used to alert you to a potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

## A WARNING

WARNING indicates a poentialy hazardous situation which, if not avoided, can result in death or serious injury.

## A CAUTION

CAUTION indicates a potentially haradous situation which, if not avoided, can result in minor or moderate injury.

## CAUTION

CAUTION, used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, can result in equipment damage.

## PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Trio Datacom for any consequences arising out of the use of this material.

## Comoliance Information

## ! Warning - RF Exposure

The radio equipment described in this user manual emits low level radio frequency energy. The concentrated energy may pose a health hazard depending on the type of antenna used. In the case of:

Non-directional antenna - DO NOT allow people to come within 0.5 metres ( 20 inches) of the antenna when the transmitter is operating

Directional antenna - DO NOT allow people to come within 6 metres ( 20 feet) of the antenna when the transmitter is operating.

## FCC Notice (Hot Standby Controller Only)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction, equipment may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Re-orient to relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different to that which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for assistance.


## IC Notice (Hot Standby Controller Only)

This Class B digital apparatus complies with Canadian ICES-003. Cet appariel numerique de la class B est conforme a la norme NBM-003 du Canada. R\&TTE Notice (Europe) Applies to models Ex450-xxExx-xxx
In order to comply with the R\&TTE (Radio \& Telecommunications Terminal Equipment) directive 1999/5/EC Article 3 (Low Voltage Directive 73/23/EEC), all radio modem installations must include an external in-line lightning arrestor or equivalent device that complies with the following specifications:

- DC Blocking Capability - 1.5 kV impulse (Rise Time 10 mS , Fall Time 700 ms ) (Repetition 10 Times) or 1.0 kV rms 50 Hz sine wave for 1 minute.

Schneider Electric declares that the E Series radio modem is in compliance with the essential requirements and other relevant provisions of the Directive 1999/5/EC. Therefore Schneider Electric E Series equipment is labelled with the following CE-marking
( 60889 (1)

Important Notices for Class I, Division 2, Groups A, B, C \&
D Hazardous Locations

Applies to models ER450-xxxxx-x $-\times$ (CSA Marked)
This product is available for use in Class I, Division 2, Groups A, B, C \& D Hazardous Locations. Such locations are defined in Article 500 of the US National Fire Protection Association (NFPA) publication NFPA 70, otherwise known as the National Electrical Code and in Section 18 of the Canadian Standards Association C22.1 (Canadian Electrical Code).
The transceiver has been recognised for use in these hazardous locations by the Canadian Standards Association (CSA) International. CSA certification is in accordance with CSA Standard C22.2 No. 213M1987 and UL Standard 1604 subject to the following conditions of approval:

1. The radio modem must be mounted in a suitable enclosure so that a tool is required to gain access for disconnection of antenna, power and communication cables.
2. The antenna, DC power and interface cables must be routed through conduit in accordance with the National Electrical Codes.
3. Installation, operation and maintenance of the radio modem should be in accordance with the radio modem's user manual and the National Electrical Codes.
4. Tampering or replacement with non-factory components may adversely affect the safe use of the radio modem in hazardous locations and may void the approval.
5. A power connector retainer with thumbwheel screw as supplied by Schneider Electric MUST be used.
[^10]
## WEEE Notice (Europe)



This symbol on the product or its packaging indicates that this product must not be disposed of with other waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact the dealer from whom you originally purchased the product.
Dieses Symbol auf dem Produkt oder seinem Verpacken zeigt an, daß dieses Produkt nicht mit anderer Vergeudung entledigt werden darf. Stattdessen ist es Ihre Verantwortlichkeit, sich Ihre überschüssige Ausrüstung zu entledigen, indem es rüber sie zu einem gekennzeichneten Ansammlungspunkt für die Abfallverwertung elektrische und elektronische Ausrüstung übergibt. Die unterschiedliche Ansammlung und die Wiederverwertung Ihrer überschüssigen Ausrüstung zu der Zeit der Beseitigung helfen, Naturresourcen zu konservieren und sicherzugehen, daß es in gewissem Sinne aufbereitet wird, daß menschliche Gesundheit und das Klima schützt. Zu mehr Information ungefähr, wo Sie weg von Ihrer überschüssigen Ausrüstung für die Wiederverwertung fallen können, treten Sie bitte mit dem Händler in Verbindung, von dem Sie ursprünglich das Produkt kauften.

## Related Products

ER450 Remote Data Radio
MR450 Remote Data Radio
EB450 Base/Repeater Station
EH450 Hot Standby Base Station

## Other Related Documentation and Products

E Series Quick Start Guides
TVIEW+ Management Suite
Digital Orderwire Voice Module (EDOVM)
Multiplexer Stream Router (MSR)

## Revision History

Issue 5 Feb 2004 Additional radio and Programmer information
Issue 6 Feb 2005 Additional information for Hazardous Locations.

Issue 7 May 2005
Various Updates
Issue 8 Jan 2006
WEEE Updates
Issue 9 Mar 2006
E Series Gen II Updates
Issue 10 Mar 2007
Order Matrix Updated
Issue 11 Jun 2009 Minor Fixes.
Issue 12 Jun 2011 Converted to Sncheider Format

## Part B - E Series Overview

## Definition of E Series Data Radio

The E Series is a range of wireless modems designed for the transmission of data communications for SCADA, telemetry and any other information and control applications that utilise ASCII messaging techniques. The E Series uses advanced "digital" modulation and signal processing techniques to achieve exceptionally high data throughput efficiency using traditional licensed narrow band radio channels.

These products are available in many frequency band and regulatory formats, to suit spectrum bandplans, in various continental regions. The range is designed for both fixed point to point (PTP), and multiple address (MAS) or point to multipoint (PMP) systems

## E Series Product Range

The E Series range consists of the basic half duplex "Remote" radio modem, an extended feature full duplex Remote radio modem, and ruggedised Base Station variants, including an optional Hot Standby controller to control two base station units in a redundant configuration.

Frequency band variants are indicated by the band prefix and model numbering. (See Model Number Codes)


EB450 Base / Repeater Station


EH450 Hot Standby Base Station

## E Series - Features and Benefits

Common Features and Benefits of the E Series Data Radio (Generation II)

- Up to $19200 b p s$ over-air data rates using programmable DSP based advanced modulation schemes.
- Designed to various International regulatory requirements including FCC, ETSI and ACA.
- Superior receiver sensitivity
- Fast data turnaround time $<10 m S$.
- 128-bit AES encryption.
- Flash upgrade-able firmware - insurance against obsolescence.
- Multi-function bi-colour Tx/Rx data LEDs showing Port activity (breakout box style), as well as LEDs indicating Tx, Rx, RF Signal, Data Synchronisation and DC Power status of the radio.
- Rugged N type antenna connectors on all equipment.
- High temperature transmitter foldback protection.
- Two independent configurable data ports and separate system port.
- Higher port speeds to support increased air-rate (up to 57600bps on Port A and 38400bps on Port B).
- Compatible with most industry standard data protocols. eg: MODBUS, DNP-3, IEC 870, SEL Mirrored Bits, etc
- Independent system port for interruption free programming and diagnostics (in addition to two (2) user ports).
- $9600 b p s$ in 12.5 kHz radio channels with ETSI specifications.
- Compatible with legacy systems (Non Packet Digital and Bell 202 Modes)
- Remote over-the-air configuration of any radio from any location.
- Multistream ${ }^{\text {TM }}$ simultaneous data streams allows for multiple vendor devices / protocols to be transported on the one radio network.
- Flexible data stream routing and steering providing optimum radio channel efficiency - complex data radio systems can be implemented with fewer radio channels.
- The ability to duplicate data streams - that is, decode the same off-air data to two separate ports.
- Multi-function radio capable of dropping off one stream to a port and forward on or repeat (store and forward) the same or other data.
- Stand-alone internal store and forward operation buffered store and forward operation even in the ER remote units.
- Unique integrated C/DSMA collision avoidance technology permits simultaneous polling and spontaneous reporting operation in the same system.
- Digital receiver frequency tracking for long term data reliability.
- Network wide non intrusive diagnostics which runs simultaneously with the application.
- Network wide diagnostics interrogation which can be performed from anywhere in the system including any remote site.
- Diagnostics will route its way to any remote or base / repeater site regardless of how many base / repeater stations are interconnected.
- Full range of advanced features available within Network Management and Remote Diagnostics package - BER testing, trending, channel occupancy, client / server operation, etc.
- On board memory for improving user data latency - increased user interface speeds.
- Full CRC error checked data - no erroneous data due to squelch tails or headers.
- Radio utilises world standard HDLC as its transportation protocol.
- Various flow control and PTT control mechanisms.
- Configurable backward compatibility with existing D Series modulation scheme for use within existing networks.
- Digital plug in order wire option for commissioning and occasional voice communications without the need to inhibit users application data.


## Features and Benefits of ER450 Remote Data Radio

- Optional full duplex capable remote - separate TX and Rx ports for connection to an external duplexer.
- New compact and rugged die cast case with inbuilt heatsink.
- Low power consumption with use of external shutdown control.
- Rugged N type antenna connectors.
- Data Port "breakout box" style flow LEDs for easier troubleshooting.


## Features and Benefits of EB450 Standard Base / Repeater Station

- Competitively priced high performance base.
- Incorporates a rugged 5W power amplifier module.

Features and Benefits of EH450 Hot Standby Base / Repeater Station

- Individual and identical base stations with separate control logic changeover panel.
- ALL modules are hot swapable without any user downtime.
- Flexible antenna options - single, separate $T x \& R x$, two Tx and two Rx.
- Both on-line and off-line units monitored regardless of active status.


## Model Number Codes

D，E \＆M Series Data Radios－Part Number Matrix＝Tyxxx－aabbb－cdef


No Options
ions
Hazardous Environment Class 1，Div 2 and Diagnostics

$=$ Diagnostics and Encryption - ［DIAGS
$=$ Full Duplex Operation and Diagnostics（ E －Series Remotes only）
＝Full Duplex Operation，Diagnostics and Encryption［ERFD450 \＆DIAGS／E］（E－Series Remotes only）⿻上丨．
＝Fileep Mode Module + Diagnostics（MR450 only）
$=$ Slice
$D=$ Diagnostics

RF Channel Data Rate \＆Bandwidth（Intern：E Series

$\begin{array}{ll}\text { AO2 } & =\text { ACA } 9600 \mathrm{bp} 52.5 \mathrm{kHz} \\ \text { F01 }\end{array}$
$02=$ ACA 9600bps 25kHz
O1
$=$ FCC 9600 pos 12.5 kHz

Geries～
000 ＝Analog Only 12.5 kHz （LOcal Dias included－No Additional Charge）

003
00 FCC 96000 ps 12.5 KHz
004
$=$ ETSI 48000 ps 12.5 KHz
$=2400 b p s$
12.5 KHz
（S Series
［24SRR］．Compatible）cww Local Diags



```
\(M\) Series（400MHz）
\(\begin{aligned} & M \\ & H\end{aligned}=400\) to 470 MHz （Tx \＆Rx）（M Series Only）
M
```

M

```
．Additional charges apply．Mus
Export restrictions may apply
Provides compatibility with D andor \(M\) Series radios
M Series Compatible EB／EH450 Base Stations are Type A01 or Fet

FCC－Federal Communications Commission
ETSI－European Telecommunication Standards Institute

The example shown specifies：E Series，Remote Radio，generic 450 MHz band，with a specific frequency of 450 MHz lo 465 MHz ，a \(9600 / 192200\) bps modem，with a bandwidth of 25 kHz ，diagnostics and Class 1 ，Div 2 Hazardous Approval（standard）．

Dwg／Ver：184－56－0001－H

Example：


\section*{Part C - Applications}

\section*{Generic Connectivity}

The E Series has been designed for SCADA and telemetry applications, and any other applications that use an ASCII communications protocol, and which connect physically using the RS232 interface standard (although converters can be used to adapt other interfaces such as RS422/485, RS530/V35, G703 etc).
Any protocol that can be displayed using a PC based terminal program operating via a serial communications port is suitable for transmission by the E Series radio modems.

An ASCll protocol is any that consists of message strings formed from ASCII characters, that being defined as a 10 or 11 bit block including start and stop bits, 7 or 8 data bits and optional parity bit(s). Port set-up dialogue that includes the expressions " \(\mathrm{N}, 8,1\) ", or \(\mathrm{E}, 7,2^{\prime \prime}\) or similar indicate an ASCII protocol.

Most of the dominant telemetry industry suppliers utilise proprietary ASCII protocols, and also common 'open standard" industry protocols such as DNP3, MODBUS, TCP/IP, and PPP. These are all ASCll based protocols.

\section*{Industries and Applications}

The E Series products are widely used in point-to-point and point-to-multipoint (multiple access) applications for remote interconnection of PLCs, RTUs, dataloggers, and other data monitoring and control devices - including specialist utility devices (such as powerline ACRs). In addition, other applications such as area wide security and alarm systems, public information systems (traffic
flow and public signage systems) and environmental monitoring systems.

\section*{Application Detail}

\section*{SCADA Systems}

This is where one or more centralised control sites are used to monitor and control remote field devices over wide areas. Examples include regional utilities monitoring and controlling networks over entire shires or a greater city metropolis. Industry sectors include energy utilities (gas and electricity distribution), water and sewerage utilities, catchment and environment groups (rivers, dams and catchment management authorities).

\section*{Telemetry Systems}

Dedicated telemetry control systems interconnecting sequential devices either where cabling is not practical or distances are considerable.
Examples include:
- Ore conveyor or slurry pipeline systems
- Water systems (pump and reservoir interlinking)
- broadcast industry (linking studio to transmitter) etc.

\section*{Systems Architecture}

\section*{Point-to-Point}

This simple system architecture provides a virtual connection between the two points, similar to a cable. Dependent of the hardware chosen, it is possible to provide a full duplex connection (i.e. data transfer in both directions simultaneously) if required.


\section*{Point-to-Multipoint Systems}

In a multiple access radio system, messages can be broadcast from one (master) site to all others, either using a half duplex radio system or from any site to all others, using a simplex radio channel.

Half duplex systems often utilise a full duplex master, to make the system simpler and for faster operation.

In either case, it will be necessary for the application to support an addressing system, since the master needs to be able to select which remote device it with which it wishes to communicate. Normally, the radio system is allowed to operate "transparently", allowing the application's protocol to provide the addressing, and thus control the traffic. Where the application layer does not provide the addressing, the E Series can provide it using SID codes \(^{\text {TM }}\). (See Part F Operational Features)


\section*{Digipeater Systems}

This configuration is used where all sites are required to communicate via a repeater site. A repeater site is used because it has a position and/or height advantage and thus provides superior or extended RF coverage. The radio modem at the repeater does not have to be physically connected to the application's master site. Information from the application's master is transmitted to the repeater via radio, and the repeater then relays this information to the other field sites. In this scenario, the repeater is the master from an RF point of view, and the application master is effectively a "remote" from an RF point of view, even though it is controlling the data transfer on the system.

\section*{Backbone Store and Forward Systems}

Store and forward is used as a way of extending RF coverage by repeating data messages from one site to another.

This can be done globally using the inbuilt data repeating functions, or selectively using intelligent address based routing features available in some PLC/RTU protocols.

In this case it is necessary for all units on the system to operate in half duplex mode (only key-up when transmitting data), so that each site is free to hear received signals from more than one source.

Digipeater System


\section*{Backbone Store and Forward System}


\section*{Repeat and Translate}

This configuration is used where there are multiple repeaters in series required to reach great distances. The use of the translate function in this scenario is effectively avoiding messages being sent back and forth between series of repeater units. The translate function essentially gives a form of message direction.


The repeat/translate function works by identifying the Stream ID (SID) code at the start of each received message and determines whether to change the SID code, ignore the message or repeat the message as is, as defined by the user in the repeat/translate table.
\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline \multicolumn{8}{|l|}{Translate and Repeat Streams} \\
\hline Type & & From & To & Type & & From & To \\
\hline Disabled & \(\cdots\) & 0 & 0 & Disabled & \(\checkmark\) & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & \(\checkmark\) & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & \(\checkmark\) & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & \(\checkmark\) & 0 & 0 \\
\hline Disabled & - & 0 & 0 & Disabled & \(\checkmark\) & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & \(\checkmark\) & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & - & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & & 0 & 0 \\
\hline \multicolumn{8}{|l|}{\begin{tabular}{l}
Tip \\
Disable both data ports to allow up to 2 repeat stream entries.
\end{tabular}} \\
\hline & & & OK & Cancel & & & \\
\hline
\end{tabular}

\section*{Part D - System Planning and Design}

\section*{Selecting Antennas}

\section*{Understanding RF Path Requirements}

A radio modem needs a minimum amount of received RF signal to operate reliably and provide adequate data throughput.

In most cases, spectrum regulatory authorities will also define or limit the amount of signal that can be transmitted, and the transmitted power will decay with distance and other factors, as it moves away from the transmitting antenna.

It follows, therefore, that for a given transmission level, there will be a finite distance at which a receiver can operate reliably with respect to the transmitter.
Apart from signal loss due to distance, other factors that will decay a signal include obstructions (hills, buildings, foliage), horizon (effectively the bulge between two points on the earth), and (to a minimal extent at UHF frequencies) factors such as fog, heavy rain-bursts, dust storms, etc.

In order to ascertain the available RF coverage from a transmitting station, it will be necessary to consider these factors. This can be done in a number of ways, including
(a) using basic formulas to calculate the theoretically available signal - allowing only for free space loss due to distance,
(b) using sophisticated software to build earth terrain models and apply other correction factors such as earth curvature and the effects of obstructions, and
(c) by actual field strength testing.

It is good design practice to consider the results of at least two of these models to design a radio path.

\section*{Examples of Predictive Path Modelling}

\section*{Clear line of site}

Radio path with good signal levels, attenuated only by free space loss.

\begin{tabular}{|c|c|c|}
\hline goodpath.pl3 & Major Repeater Site & Field Site \\
\hline Elevation (m) & 756.69 & 309.67 \\
\hline Latitude & 0310437.49 S & 0305624.00 S \\
\hline Longitude & 1505726.34 E & 1503848.00 E \\
\hline Azimuth & 297.05 & 117.21 \\
\hline Antenna Type & ANT450/60M & ANT450/9AL \\
\hline Antenna Height (m) & 40.00 & 5.00 \\
\hline Antenna Gain (dBi) & 8.15 & 11.15 \\
\hline Antenna Gain (dBd) & 6.00 & 9.00 \\
\hline TX Line Type & LDF4-50 & LDF4-50 \\
\hline TX Line Length (m) & 40.00 & 5.00 \\
\hline TX Line Unit Loss (dB/100 m) & 6.79 & 6.79 \\
\hline TX Line Loss (dB) & 2.72 & 0.34 \\
\hline Connector Loss (dB) & 2.00 & 2.00 \\
\hline Frequency (MHz) & \multicolumn{2}{|l|}{450.00} \\
\hline Path Length (km) & \multicolumn{2}{|l|}{33.33} \\
\hline Free Space Loss (dB) & \multicolumn{2}{|l|}{115.99} \\
\hline Diffraction Loss (dB) & \multicolumn{2}{|c|}{0.00} \\
\hline Net Path Loss (dB) & 103.75 & 103.75 \\
\hline Radio Type Model & EB450 & ER450 \\
\hline TX Power (watts) & 5.00 & 1.00 \\
\hline TX Power (dBW) & 6.99 & 0.00 \\
\hline Effective Radiated Power (watts) & 6.71 & 4.63 \\
\hline Effective Radiated Power (dBW) & 8.27 & 6.66 \\
\hline RX Sensitivity Level (uv) & 0.71 & 1.26 \\
\hline RX Sensitivity Level (dBW) & -140.00 & -135.00 \\
\hline RX Signal (uv) & 45.93 & 102.70 \\
\hline RX Signal (dBW) & -103.75 & -96.76 \\
\hline RX Field Strength (uv/m) & 453.14 & 545.42 \\
\hline Fade Margin (dB) & 36.25 & 38.24 \\
\hline Raleigh Service Probability (\%) & 99.976 & 99.985 \\
\hline
\end{tabular}

\section*{Obstructed Radio Path}

This path has an obstruction that will seriously degrade the signal arriving at the field site.

\begin{tabular}{|c|c|c|}
\hline obstpath.pl3 & Major Repeater Site & Field Site \\
\hline Elevation (m) Latitude Longitude Azimuth & 703.83
0304355.92 S
1503849.51 E
180.10 & \[
\begin{array}{r}
309.67 \\
0305624.00 \mathrm{~S} \\
1503848.00 \mathrm{E} \\
0.10
\end{array}
\] \\
\hline \begin{tabular}{l}
Antenna Type \\
Antenna Height (m) \\
Antenna Gain (dBi) \\
Antenna Gain (dBd)
\end{tabular} & \[
\begin{array}{r}
\text { ANT450/6OM } \\
40.00 \\
8.15 \\
6.00
\end{array}
\] & ANT450/9AL
5.00
11.15
9.00 \\
\hline TX Line Type TX Line Length (m) TX Line Unit Loss ( \(\mathrm{dB} / 100 \mathrm{~m}\) ) TX Line Loss (dB) Connector Loss (dB) & LDF4-50
40.00
6.79
2.72
2.00 & \[
\begin{array}{r}
\text { LDF4-50 } \\
5.00 \\
6.79 \\
0.34 \\
2.00
\end{array}
\] \\
\hline \begin{tabular}{l}
Frequency (MHz) \\
Path Length (km) \\
Free Space Loss (dB) Diffraction Loss (dB) \\
Net Path Loss (dB)
\end{tabular} & \[
\begin{array}{r}
450 \\
23 \\
112 \\
16 \\
117.25
\end{array}
\] & 117.25 \\
\hline Effective Radiated Power (watts) Effective Radiated Power (dBW) RX Sensitivity Level (uv) RX Sensitivity Level (dBW) & \[
\begin{array}{r}
\text { EB450 } \\
5.00 \\
6.99 \\
6.71 \\
8.27 \\
0.71 \\
-140.00
\end{array}
\] & \[
\begin{array}{r}
\text { ER450 } \\
1.00 \\
0.00 \\
4.63 \\
6.66 \\
1.26 \\
-135.00
\end{array}
\] \\
\hline \[
\begin{array}{r}
\text { RX Signal (uv) } \\
\text { RX Signal (dBW) } \\
\text { RX Field Strength (uv/m) } \\
\text { Fade Margin (dB) } \\
\text { Raleigh Service Probability (\%) }
\end{array}
\] & \[
\begin{array}{r}
9.70 \\
-117.25 \\
95.74 \\
22.75 \\
99.470
\end{array}
\] & \[
\begin{array}{r}
21.70 \\
-110.26 \\
115.23 \\
24.74 \\
99.665
\end{array}
\] \\
\hline
\end{tabular}

\section*{Effect of Earth Curvature on Long Paths}
\(\qquad\)
This path requires greater mast height to offset the earth curvature experienced at such a distance ( 73 km ).

\begin{tabular}{|c|c|c|}
\hline longpath.pl3 & Repeater Site & Far Field Site \\
\hline \begin{tabular}{l}
Elevation (m) \\
Latitude Longitude Azimuth
\end{tabular} & \[
\begin{array}{r}
221.26 \\
0320121.63 \mathrm{~S} \\
1421519.26 \mathrm{E} \\
217.12
\end{array}
\] & \[
\begin{gathered}
\\
\\
032.58 \\
03200.00 \mathrm{~S} \\
14147 \\
\\
00.00 \mathrm{E} \\
37.37
\end{gathered}
\] \\
\hline \begin{tabular}{l}
Antenna Type \\
Antenna Height (m) \\
Antenna Gain (dBi) \\
Antenna Gain (dBd)
\end{tabular} & \[
\begin{array}{r}
\text { ANT450/6OM } \\
40.00 \\
8.15 \\
6.00
\end{array}
\] & \[
\begin{array}{r}
\text { ANT450/9AL } \\
5.00 \\
11.15 \\
9.00
\end{array}
\] \\
\hline \begin{tabular}{l}
TX Line Type \\
TX Line Length (m) \\
TX Line Loss (dB) Connector Loss (dB)
\end{tabular} & \[
\begin{array}{r}
\text { LDF4-50 } \\
40.00 \\
6.79 \\
2.72 \\
2.00
\end{array}
\] & \[
\begin{gathered}
\text { LDF4-50 } \\
5.00 \\
6.79 \\
0.34 \\
2.00
\end{gathered}
\] \\
\hline \begin{tabular}{l}
Frequency (MHz) \\
Path Length (km) \\
Free Space Loss (dB) Diffraction Loss (dB) Net Path Loss (dB)
\end{tabular} & \[
\begin{array}{r}
450 . \\
73 . \\
122.8 \\
22 . \\
133.55
\end{array}
\] & \[
133.55
\] \\
\hline \begin{tabular}{l}
Radio Type Model TX Power (watts) TX Power (dBW) \\
Effective Radiated Power (watts) Effective Radiated Power (dBW) \\
RX Sensitivity Level (uv) RX Sensitivity Level (dBW)
\end{tabular} & EB450
5.00
6.99
6.72
8.27
0.71
-140.00 & ER450
1.00
0.00
4.64
6.66
1.26
-135.00 \\
\hline RX Signal (uv)
RX Signal (dBW)
RX Field Strength (uv/m)
Fade Margin (dB)
Raleigh Service Probability (\%) & \[
\begin{array}{r}
1.49 \\
-133.55 \\
14.65 \\
6.45 \\
79.735
\end{array}
\] & \[
\begin{array}{r}
3.32 \\
-126.56 \\
17.64 \\
8.44 \\
86.656
\end{array}
\] \\
\hline
\end{tabular}

There are basically two types of antennas - omni-directional and directional.

Omnidirectional antennas are designed to radiate signal in a 360 degrees segment around the antenna. Basic short range antennas such as folded dipoles and ground independent whips are used to radiate the signal in a "ball" shaped pattern. High gain omni antennas such as the "colinear" compress the sphere of energy into the horizontal plane, providing a relatively flat "disc" shaped pattern which goes further because all of the energy is radiated in the horizontal plane.

Directional antennas are designed to concentrate the signal into "beam" of energy for transmission in a single direction (i.e. for point-to-point or remote to base applications).

Beamwidths vary according to the antenna type, and so can be selected to suit design requirements. The most common UHF directional antenna is the yagi, which offers useable beam widths of 30-50 degrees. Even higher "gain" is available using parabolic "dish" type antennas such as gridpacks.

\section*{Antenna Gain}


Onmi directional 360 degree signal


Directional Concentrated beam

By compressing the transmission energy into a disc or beam, the antenna provides more energy (a stronger signal) in that direction, and thus is said to have a performance "gain" over a basic omni antenna. Gain is usually expressed in dBd , which is referenced to a standard folded dipole. Gain can also be expressed in dBi, which is referenced to a theoretical "isotropic" radiator. Either way, if you intend to send and receive signals from a single direction, there is advantage in using a directional antenna - both due to the increased signal in the wanted direction, and the relatively decreased signal in the unwanted direction (i.e. "interference rejection" properties).

\section*{Iuning the Antenna}

Many antennas are manufactured for use over a wide frequency range. Typical fixed use antennas such as folded dipoles and yagis are generally supplied with the quoted gain available over the entire specified band range, and do not require tuning. Co-linear antennas are normally built to a specific frequency specified when ordering.

With mobile "whip" type antennas, it is sometimes necessary to "tune" the antenna for the best performance on the required frequency. This is usually done by trimming an antenna element whilst measuring VSWR, or simply trimming to a manufacturer supplied chart showing length vs frequency. These antennas would normally be supplied with the tuning information provided.

\section*{Antenna Placement}

When mounting the antenna, it is necessary to consider the following criteria:

The mounting structure will need to be solid enough to withstand additional loading on the antenna mount due to extreme wind, ice or snow (and in some cases, large birds).

For omni directional antennas, it is necessary to consider the effect of the mounting structure (tower mast or building) on the radiation pattern. Close in structures, particularly steel structures, can alter the radiation pattern of the antenna. Where possible, omni antennas should always be mounted on the top of the mast or pole to minimise this effect. If this is not possible, mount the antenna on a horizontal outrigger to get it at least 1-2m away from the structure. When mounting on buildings, a small mast or pole (2-4m) can significantly improve the radiation pattern by providing clearance from the building structure.

For directional antennas, it is generally only necessary to consider the structure in relation to the forward radiation pattern of the antenna, unless the structure is metallic, and of a solid nature. In this case it is also prudent to position the antenna as far away from the structure as is practical. With directional antennas, it is also necessary to ensure that the antenna cannot move in such a way that the directional beamwidth will be affected. For long yagi antennas, it is often necessary to install a fibreglass strut to stablilise the antenna under windy conditions.

\section*{Alignment of Directional Antennas}

This is generally performed by altering the alignment of the antenna whilst measuring the received signal strength. If the signal is weak, it may be necessary to pre-align the antenna using a compass, GPS, or visual or map guidance in order to "find" the wanted signal. Yagi antennas have a number of lower gain "lobes" centred around the primary lobe. When aligning for best signal strength, it is important to scan the antenna through at least 90 degrees, to ensure that the centre (strongest) lobe is identified.

When aligning a directional antenna, avoid placing your hands or body in the vicinity of the radiating element or the forward beam pattern, as this will affect the performance of the antenna.

\section*{RF Feeders and Protection}

The antenna is connected to the radio modem by way of an RF feeder. In choosing the feeder type, one must compromise between the loss caused by the feeder, and the cost, flexibility, and bulk of lower loss feeders. To do this, it is often prudent to perform path analysis first, in order to determine how much "spare" signal can be allowed to be lost in the feeder. The feeder is also a critical part of the lightning protection system.
All elevated antennas may be exposed to induced or direct lightning strikes, and correct grounding of the feeder and mast are an essential part of this process. Gas discharge lightning arresters should also be fitted to all sites.

Note: All ETSI installations require the use of a lightning surge arrestor in order to meet EN6095. See Part A Preface for lightning arrestor specifications.
\begin{tabular}{|l|c|c|}
\hline \begin{tabular}{l} 
Common Cable Types \\
\(@ 450 \mathrm{MHz}\)
\end{tabular} & \begin{tabular}{c} 
Loss per meter \\
\(@ 450 \mathrm{MHz}\)
\end{tabular} & Loss per 1 Om \\
RG58C/U & 0.4426 dB & 4.4 dB \\
RG213/U & 0.1639 dB & 1.6 dB \\
FSJ1-50 ([" superflex) & 0.1475 dB & 1.5 dB \\
LDF4-50 (1/2" heliax) & 0.0525 dB & 0.52 dB \\
LDF5-50 (7/8" heliax) & 0.0262 dB & 0.3 dB \\
\hline
\end{tabular}


\section*{Data Connectivity}

\section*{The V24 Standard}

The E Series radio modems provide two asynchronous V24 compliant RS232 ports for connection to serial data devices.

There are two types of RS232 interfaces - DTE and DCE.
DTE stands for data terminal equipment and is generally applied to any intelligent device that has a need to communicate to another device via RS232. For example: P.C. Comm ports are always DTE, as are most PLC and RTU serial ports.
DCE stands for data communication equipment and is generally applied to a device used for sending data over some medium (wires, radio, fibre etc), i.e. any MODEM.

The standard interface between a DTE and DCE device (using the same connector type) is a straight through cable (i.e. each pin connects to the same numbered corresponding pin at the other end of the cable).

The "V24" definition originally specified the DB25 connector standard, but this has been complicated by the emergence of the DB9 (pseudo) standard for asynch devices, and this connector standard has different pin assignments.

The wiring standard is "unbalanced", and provides for three basic data transfer wires (TXD, RXD, and SG - signal ground).

\section*{Hardware Handshaking}

Hardware handshake lines are also employed to provide flow control, however (in the telemetry industry) many devices do not always support all (or any) flow control lines.
For this reason, the E Series modems can be configured for full hardware flow control, or no flow control at all (simple 3 wire interface).

Note: that when connecting devices together with differing handshake implementations, it is sometimes necessary to "loop" handshake pins in order to fool the devices handshaking requirements.

In telemetry applications (particularly where port speeds can be set to the same rate as the radio systems over-air rate) then flow control, and therefore handshaking, is usually NOT required. It follows that any devices that CAN be configured for "no flow control" should be used in this mode to simplify cabling requirements.

Handshaking lines can generally be looped as follows:
DTE (terminal) - loop RTS to CTS, and DTR to DSR and DCE.
DCE (modem) - loop DSR to DTR and RTS (note-not required for E Series modem when set for no handshaking).



RS232 Connector Pin outs (DCE)
Port A and B, Female DB9


\section*{Power Supply and Environmental Considerations}

\section*{General}

When mounting the equipment, consideration should be given to the environmental aspects of the site. The cabinet should be positioned so that it is shaded from hot afternoon sun, or icy cold wind. Whilst the radios are designed for harsh temperature extremes, they will give a longer service life if operated in a more stable temperature environment. In an industrial environment, the radio modems should be isolated from excessive vibration, which can destroy electronic components, joints, and crystals.

The cabinet should provide full protection from moisture, dust, corrosive atmospheres, and residues from ants and small vermin (which can be corrosive or conductive). The radio modem will radiate heat from the in-built heatsink, and the higher the transmitter duty cycle, the more heat will be radiated from the heatsink. Ensure there is sufficient ventilation in the form of passive or forced air circulation to ensure that the radio is able to maintain quoted temperature limits.

\section*{Power Supply}

The power supply should provide a clean, filtered DC source. The radio modem is designed and calibrated to operate from a 13.8 VDC regulated supply, but will operate from 10-16 volts (filtered) DC.

The power supply must be able to supply sufficient current to provide clean filtered DC under the full current conditions of the radio modem (i.e. when transmitting full RF power). See Section L - Specifications for more details of the power supply requirements.


\section*{Solar Applications}

In solar or battery-backed installations, a battery management unit should be fitted to cut off power to the radio when battery levels fall below the minimum voltage specification of the radio. In solar applications, a solar regulation unit MUST ALSO be fitted to ensure that the radio (and battery) is protected from excessive voltage under full sun conditions.

When calculating solar and battery capacity requirements, the constant current consumption will be approximately equal to the transmit current multiplied by the duty cycle of the transmitter, plus the receive current multiplied by the (remaining) duty cycle of the receiver.

The \(T x / R x\) duty cycle will be entirely dependent on the amount of data being transmitted by the radio modem, unless the device has been configured for continuous transmit, in which case the constant current consumption will be equal to the transmit current only (at 100\% duty cycle).

Note: Operation below the minimum specified supply voltages could result in poor radio performance. If the supply voltage falls below 7.2 Vdc the radio will shut down. Normal radio startup will not occur until 10 Vdc is supplied.

\section*{Site Earthing}

\section*{CAUTION}

Ensure that the chassis mounting plate, power supply (-) earth, RTU terminal device, and lightning arrester are all securely earthed to a common ground point to which an earth stake is attached. Pay particular attention to 24 Vdc PLC systems using DC-DC converters to supply

\section*{CAUTION}

Caution: There is NO readily serviceable internal fuse, and therefore the radio modem MUST be externally fused with a fuse and fuse holder (ER450: 3 amp fast-blow fuse, EB450: 5 amp fast-blow fuse, EB450(20W): 8 amp fast blow fuse, EH450: 1 amp slow blow fuse).

Physical Dimensions - Remote Data Radio - ER450


\section*{Physical Dimensions - ER450 Mounting Cradle/Din Rail Mount (Optional)}


\section*{ER450 Mounting Cradle}

The ER450 mounting cradle comes standard with the \(\times 4\) mounting posts. If you want to purchase a new unit equipt with the Din Rail mount, you can either request to have the units sent with the Din Rail mount already screwed onto the mounting cradel or have the Din Rail mount supplied seperately along with \(\times 4\) screws and \(x 4\) washers (srews: \(3 \times 8\) Pan head, Washers: 3 mm Sping washers). In the case of attaching the Din rail mounts to older radios, please ensure that you radio's mounting cradle has the \(\times 4\) mounting posts.

\section*{Din Rail Mount (Optional)}


\section*{Din Rail Mount}

The Din Rail Mount is an optional feature. The Mount is screwed onto the Bottom of an ER450 Mounting Cradle giving the unit the ability to be simply 'clipped' and Locked onto 35 mm Din Rail.


Physical Dimensions - Hot Standby Base Station - EH450


\section*{Part E - Getting Started}

\section*{ER450 Quick Start Guide}

\section*{Introduction}

Welcome to the ER450 Quick Start Guide. This guide provides step-by-step instructions, with simple explanations to get you up-and-running.


\section*{Mounting and Environmental Considerations}

The ER450 radio comes complete with a mounting cradle and is attached to a panel or tray by means of screws or bolts, using the hole slots provided.

Note: In high power or high temperature applications, it is desirable to mount the radio with the heatsink uppermost to allow ventilation for the heatsink.

The radio should be mounted in a clean and dry location, protected from water, excessive dust, corrosive fumes, extremes of temperature and direct sunlight. Please allow sufficient passive or active ventilation to allow the radio modem's heatsink to operate efficiently.

\section*{ER450 Connections Layout}
RS232 (RJ45)
\(N\) Type Female


Omni-Directional or Direction Yagi Antenna

Lightning
Arrestor


RS232 Serial Device (RTU/ PLC) Connected to port A and/or port B

\section*{E-Series Remote}

Laptop/PC running TView+ Diagnostics Connected to System Port




\section*{Connecting Antennas and RF Feeders}

The RF antenna system should be installed in accordance with the manufacturers notes

The RF connector used on the E Series radios are N Type female connectors. Always use good quality low loss feeder cable, selected according to the length of the cable run. Ensure all external connections are waterproofed using amalgamating tape.

Preset directional antennas in the required direction using a compass, GPS, or visual alignment and ensure correct polarisation (vertical or horizontal).


\section*{Communications Ports}

\section*{System Port - RJ45}

The System Port (available front and rear on \(E B / E H 450\) ) is a multi-function interface used for:
- Programming / Configuration of the radio
- Remote Diagnostics connections

To access these functions use the TVIEW+ Cable assembly (RJ45 Cable and RJ45 to DB9 Adaptor).

The TVIEW+ Cable is a standard CAT 5 RJ-45 (Male) to RJ-45 (Male) patch cable. It is intended for RS232 serial communications only and should not be connected directly into an Ethernet port of a PC. The Cable must be used in conjunction with the RJ-45 to DB9 Adaptor.


TVIEW+ Adaptor Configuration:
\begin{tabular}{|l|l|l|}
\hline \begin{tabular}{l} 
System \\
Port
\end{tabular} & Description & DB9 Female \\
\hline Pin 1 & System port data out (RS232) & Pin 2 \\
\hline Pin & System port data in (RS232) & Pin 3 \\
\hline Pin 3 & Factory Use Only - Do not connect & No Connection \\
\hline Pin 4 & Shutdown & No Connection \\
\hline Pin 5 & Programming Use Only (Grounded) & Pin 5 \\
\hline Pin 6 & Factory Use Only - Do not connect & No Connection \\
\hline Pin 7 & Ground & Pin 5 \\
\hline Pin 8 & External PTT & No Connection \\
\hline
\end{tabular}

Special user pinouts:
- \(\quad\) Shutdown (Pin 4) - Active low for power save function In order to put the radio into Shutdown mode, tie pin 4 to a digital output on a SCADA Pack, RTU or similar device. When it is desired to turn the radio off, switching this digital output must connect the radio's pin 4 to ground. The (earth) ground of both devices would also need to be tied together as a common reference. (pin 7 on the radio's System port) A 2 wire cable between SCADA Pack and radio system port is all that's required, with an RJ-45 connector on the radio end. The Shutdown pin may be left floating for the radio to remain powered.
- External PTT (Pin 8) - Provides a manual PTT override facility for enabling the transmitter. For testing this can be activated by connecting PTT (Pin 8 ) to Gnd (Pin 7).


\section*{Cross Over cable (Trunking System Port to Sytem Port)}

Some circumstances require a user to trunk the system ports of two units using an RJ45 cross over cable. Follow the diagram below to create the cross over cable.


\section*{User Interfaces - Ports A \& B}

Each user port (A \& B) is wired as a RS232 DCE, configurable for no handshaking (3-wire) interface, or for hardware or software (X-on/X-off) flow control. In most systems flow control is not required, in which case only 3 wires need to be connected between the radio and the application device.

\section*{Typical pins used:}
- Pin \(2(R \times D)\) - data output from the radio modem,
- Pin 3 (TxD) - data input to the radio modem,
- Pin 5 (SG) - signal ground.

See Part D - System Planning and Design - Data
Connectivity, for further details of other cable configurations.

\section*{RS232 Connector Pin outs (DCE)}

Port A and B, Female DB9


\section*{Activating the Transmitter}

In most systems, the transmitter by default is controlled automatically by the radio when it has data to transmit.

In some systems, such as full duplex point-to-point links or full duplex point-to-multipoint base stations, it is desirable to run the transmitter all the time (hot keyed).

Two mechanisms are provided to do this:
- The radio modem can be configured to transmit continuously whenever powered, or
- The radio modem can be configured to transmit whenever an external RTS signal (Pin 7) is applied to one (or either) user ports. (To simulate an external RTS input, loop pins 6 to 7).

To operate in these modes, the radio must be configured via the programming software.

\section*{Power Supply Requirements}

The E Series radio modem is designed and calibrated to operate from a filtered 13.8 Vdc regulated supply, but will operate from a 10-16Vdc (11-16Vdc for EB450 \& EH450) range. See Section L - Specifications for more details on power supply requirements

\section*{CAUTION}

Caution: There is NO readily serviceable internal fuse, and therefore the radio modem MUST be externally fused with a fuse and fuse holder (ER450: 3 amp fast-blow fuse, EB450: 5 amp fast-blow fuse, EB450(20W): 8 amp fast blow fuse, EH450: 1 amp slow blow fuse).


Mandatory for Hazardous Locations


The radio is designed to self protect from permanent damage if the voltage exceeds 16 Vdc or if reverse polarity is applied. The radio may need to be returned for service if this occurs.

The radio modem can also be damaged if there is any potential difference between the chassis-ground, RS232 signal ground, power (-) input, or antenna coaxial shield. Before connecting any wiring, ensure all components are earthed to a common ground point (please pay particular attention to 24 V PLC power systems where converters are used).

Connect the antenna and RS 232 plugs BEFORE applying power to the unit.

Lastly, before inserting the power plug, please re-check that the polarity and voltage on the power plug is correct using a multimeter.

\section*{TVIEW+ Management Suite}

\section*{Radio Configuration}

This TVIEW+ Management Suite allows a number of features including: Configuration (Local - serial, or Remote - over-the-air), Remote Diagnostics Facilities and Firmware Upgrades.
The configuration wizard can be used to provide Quick Start generic templates for the types of systems architecture you wish to employ.

Example: Local configuration session -
1 Attach the programming cable from the PC to the System Port of the radio

2 Launch TVIEW+ \& Select "Programmer"
3 Select "Read" the radio
4 Change the configuration as required
5 Select "Write" the parameters back to the radio Refer to Parts I \& J - TVIEW+ Management Suite for detailed operation of advanced features.


\section*{Optimising the Antenna for best RX signal}

Once the unit is operational, it is important to optimise the antenna tuning.

In the case of a directional antenna, it will be necessary to align the antenna for the best received signal.

This can be done by using the ( \(0-5 \mathrm{Vdc}\) ) output on Pin 9 of Port B to indicate signal strength (RSSI). This voltage can be converted to dBm using the chart below.



LED Indicators \& Test Outputs
LED Legend

\section*{Radio is Powered}

If all the LEDs are off, no power is reaching the radio modem.

Successful power-up is indicated by the "PWR" LED indicating a continuous (healthy) GREEN state. Note that this LED is turned RED when the transmitter is active.


\section*{Radio Errors}

Internal radio management software monitors many aspects of the radio hardware. Under certain circumstances radio faults may prevent normal operation. In the event that these fault conditions occur, the radio will enter an ERROR state and this will be indicated by flashing ALL LEDs RED, then flashing a pattern of GREEN LEDs. The pattern of all GREEN LEDs represents the specific type of error that has occurred. See Table below.
\begin{tabular}{|l|l|l|l|l|}
\hline Port A & Port B & \begin{tabular}{l} 
Synch/ \\
RXSig
\end{tabular} & Pwr/TX & Error Diagnosis \\
\hline OFF & OFF & OFF & ON & \begin{tabular}{l} 
External Supply Voltage \\
out of spec. (1)
\end{tabular} \\
\hline ON & OFF & ON & OFF & RXVCO Out of Lock. (2) \\
\hline ON & OFF & OFF & ON & TXVCO Out of Lock. (3) \\
\hline
\end{tabular}

All other patterns indicate serious hardware errors. Please record this pattern and return the result with the service return information.

Note (1): If external voltage is too high ( \(>16 \mathrm{Vdc}\) ) radio damage may occur. If the external voltage is too low ( \(<1\) OVdc) the radio may not operate within specifications.

Note (2) and (3): If the radio receiver or transmitter frequencies are programmed outside the specified frequency ranges (model type dependent), then normal radio operation may not be possible. In this case, use TVIEW+ to set the receiver and/or transmitter frequencies to be within the specified range. If this error occurs and the frequencies are within the specified frequency ranges (model type dependent), the radio will need to be returned for service.

\section*{Received Signal Indicator}


The "RX/SYNC" LED is used to indicate the state of the receiver.

If the LED is off, no signal is being received.
A RED indication shows that an RF carrier is being received, but no data stream can be decoded. This will briefly happen at the very start of every valid received transmission or may indicate the presence of interference, or another user on the channel.

A continuous GREEN indication shows that the modem is locked and synchronised to the incoming signal, and has excellent Bit Error Rate (BER). Any losses of synchronisation (BER errors) are shown as a visible RED flicker of the LED.

Note: This might only be apparent on a PTMP slave when only receiving.


\section*{Data Flow "breakout" LEDs}

There are also two LEDs to indicate data flow into and out of the two user ports.

Input data to be transmitted is shown as a RED flash, and received data to be output to the port is shown as a GREEN flash.

If data is alternately flowing in and out quickly, then the indicator appears orange.

\section*{Verifying Operational Health}

It is possible to verify the operation of the radio modem using the indicators provided by the unit. The state of the transmitter and receiver, and data flow can be interpreted by the indicator LEDs (see below).

Note: Port A and Port B's RxD and TxD will be Active on Data Flow

Full Duplex - PTP Master or Slave


Full Duplex - PTMP Master Tx


Half Duplex - PTMP Slave Rx


Half Duplex - Master or Slave (Tx)


Half Duplex - Master or Slave (Rx)


\section*{EB450 Quick Start Guide}

\section*{Introduction}

Welcome to the Quick Start Guide for the EB450 Base / Repeater Data Radio. This guide provides step-by-step instructions, with simple explanations to get you up-andrunning.

\section*{20W Power Amplifier option}

The 20W power amplifier is primarily used for the purpose of overcoming Tx combiner losses. In such cases of a 20W power amplifier being required, an Rx preamp may also be required.

Note: 20W power amplifier options may not be available in all Countrys. please contact the factory to confirm availability.


\section*{Mounting and Environmental Considerations}

The EB450 Base Station is housed in a 2 RU 19" rack enclosure. The 4 mounting holes on the front panel should be used to secure the unit to the rack.

The radio should be mounted in a clean and dry location, protected from water, excessive dust, corrosive fumes, extremes of temperature and direct sunlight. Please allow sufficient passive or active ventilation to allow the radio modem's heatsink to operate efficiently.

All permanent connections are made at the rear of the unit. This includes: Power, Antenna, Communications Ports, Digital I/O and System Port. The front panel has an additional System Port connection point for easy access.

\section*{Full Duplex Considerations}

The EB450 is designed for continuous full duplex transmission. An automatic thermostatically controlled fan will operate whenever the internal temperature exceeds 40 degrees Celsius and turn off again when the temperature goes below 35 degrees Celsius.

\section*{External Duplexer Considerations}

The EB450 is normally supplied with separate Tx and Rx ports for connection to an external duplexing system.

Depending on the frequency band of operation and the \(T x / R x\) frequency split, internal band reject duplexers are available.

\section*{Connecting Antennas and RF Feeders}

See ER450 Quick Start Guide

\section*{Communications Ports}

See ER450 Quick Start Guide Section

\section*{Power Supply and Protection}

See ER450 Quick Start Guide Section
TVIEW+ Management Suite - Radio Configuration
See ER450 Quick Start Guide Section
Optimising the Antenna for VSWR and best RX signal

See ER450 Quick Start Guide Section


\section*{Diaital Inputs and Outputs}

The EB450 provides a facility for two channels of digital user inputs and outputs (Digital User I/O). Information on how to control and monitor this I/O using TVIEW+ Diagnostics can be found in Part J - TVIEW+ Management Suite - Remote Diagnostics \& Network
Controller.
All user I/O is optocoupled for isolation between the EB450 and uses equipment. When using the I/O facility the I/O electrical characteristics and ratings must be observed. Failure to observe these ratings may result in equipment damage.

\section*{Inputs}

Two User Inputs are available. They have identical interface characteristics. Each input has an internal resistance of 470 Ohms. Some form of switching contact (ie: switch, relay) is normally used to change the state of the input. Both an isolated and non-isolated input configuration is possible.


TVIEW+ Diagnostics will recognise an input as being ON when the switch is closed. If the switch is open (or not connected) TVIEW+ diagnostics will recognise the inputs as being OFF.

\section*{Outputs}

Two User Outputs (Open Collector) are available. They have identical interface characteristics. The maximum current allowed through each output is 20 ma . External resistors must be used keep the current below this value.

Each output has an internal resistance of 100 Ohms. Ohms law can be used to calculate the resistance required for a specific voltage (keeping the current below 20mA). Nominally 1 k Ohm is used for \(a+13 \mathrm{v} 8\) supply and 330 Ohms for \(a+5 v\) supply.

When the OUTPUT is OFF, \(V=\mathrm{Vs}\). No current will flow when output is off.

When the OUTPUT is ON, \(V=\) nominally 2.3 volts. Current is set by resistor.


\section*{LED Indicators \& Test outputs}

\section*{Radio is Powered}

If all the LEDs are off, no power is reaching the radio modem.

Successful power-up is indicated by the "PWR" LED indicating a continuous (healthy) GREEN state. Note that this LED is turned RED when the transmitter is active.


\section*{Hardware Error}

A hardware error is indicated on the status LEDs by all LEDs flashing RED at a rate of 1 Hz . This indicates internal communications to the exciter inside the basestation has been lost and the base station needs to be returned to repair.

\section*{Received Signal Indicator}

The "RX/SYNC" LED indicates the state of the receiver. If the LED is off, no signal is being received.

A RED indication shows that an RF carrier is being received, but no data stream can be decoded. This will briefly happen at the very start of every valid received transmission or may indicate the presence of interference, or another user on the channel.

A continuous GREEN indication shows that the modem is locked and synchronised to the incoming signal, and has excellent Bit Error Rate (BER). Any losses of synchronisation (BER errors) are shown as a visible RED flicker of the LED.

Note: This might only be apparent on a PTMP slave when only receiving.

\begin{tabular}{|c|c|}
\hline \multicolumn{2}{|l|}{Status} \\
\hline OC Power & TX \\
\hline 5ynch & Rerlip \\
\hline [Port A ] RxD 0 & \\
\hline (Port a) PxD 0 & TxO \\
\hline crm & Ad \\
\hline
\end{tabular}

\section*{Data Flow "breakout" LEDs}

There are also two LEDs to indicate data flow into and out of the two user ports.

Input data to be transmitted is shown as a RED flash, and received data to be output to the port is shown as a GREEN flash.

If data is alternately flowing in and out quickly, then the indicator appears Orange.

\section*{Bar Graph Indicators}

The bar graph indicators on the front panel provide variable information regarding the performance of the Base Station. To enable / disable the bar graph display depress the Display ON / OFF button. The display will turn off automatically after 5 minutes.

DC Supply:
Indicates the supply input voltage at the exciter module. Typically 13.8 Vdc .

Indication: <1 OVdc no LED's on, 10-1 0.9Vdc LED's RED, \(11-15.6 \mathrm{Vdc}\) All LED's GREEN, \(>=15.7 \mathrm{Vdc}\) last LED RED.

Tx Power:
Indicates forward RF power output as measured at the TX antenna port. Typically +37 dBm or +43 dBm for a 20W version.

Indication: <20dBm no LED's on, 20-40.6dBm (11.5W) LED's GREEN, >=40.7dBm last LED RED.

Tx Drive:
Indicates exciter drive level. Typically +20 dBm .
Indication: <1 OdBm no LED's on, 10.0-25.9dBm LED's GREEN, >=26.0dBm last LED RED.

Rx Sig:
Indicates receive signal strength. Typically -85 to -65 dBm .

Indication: <-1 20dBm no LED's on, -1 20 to -11 0.1dBm LED's RED, >=-1 10 dBm LED's GREEN.

RxFreq. Offset:
Indicates offset of receiver AFC - useful in determining frequency drift. Typically 0 kHz .

Indication: Single GREEN LED to indicate current value, \(<-3.6 \mathrm{kHz}\) or \(>+3.6 \mathrm{kHz}\) LED is RED. No signal, all LED's OFF
Note: 5 second peak hold circuitry.


\section*{Test Mode}

The Bar Graph indicators have a Test Mode, which cycles all LED's for correct operation (before returning to their normal operation). To activate this mode, simply depress the ON / OFF button while applying power to the unit.

\section*{EH450 Quick Start Guide}

\section*{Introduction}

Welcome to the Quick Start Guide for the EH450 Hot Standby Base / Repeater Station. This section provides additional step-by-step instructions to install, commission and operate the EH450 Hot Standby Base Station. This document should be read in conjunction with the EB450 Base Station Quick Start Guide.

The EH450 is a fully redundant, hot standby digital data radio base / repeater station providing automatic changeover facilities.

The EH450 is designed as a modular solution, comprising 2 identical EB450 base station units (standard) linked to a central, fail-safe monitoring and changeover controller (Hot Standby Controller) Either base station may be taken out for maintenance without the need for any system down time. The


Base / Repeater Unit
automatic changeover is triggered by out of tolerance (alarm) conditions based on either RF and/or user data throughput parameters.

\section*{Features and Benefits}
- Individual and identical base stations with separate control logic changeover panel
- Modules are hot swapable without user downtime
- Flexible antenna options - single, separate \(T x \& R x\), two Tx and two Rx
- Both on-line and off-line units monitored regardless of active status
- Also refer to the common Features and Benefits list of the E Series Data Radio



Hot Standby Controller Unit


\section*{Operational Description}

The Hot Standby Controller (HSC) unit is a 1 RU rack mounted module that interfaces to two physically separate base stations (each \(2 R U\) rack mounted modules) via a number of RF and data cables.

Both base stations are operating simultaneously and both units are constantly receiving signals, however only data from one base station, the "online" base station is directed to the user equipment. The online base station is the only base station transmitting at any time. The Hot Standby Controller has the following functions:
- Diplex the transmit and receive paths (Assuming internal duplexer fitted), TX Only.
- Amplify and split the incoming signal two ways so both base stations receive at once.
- Monitor status reports from both base stations to identify faults and swap over the online base station if required.
- Switch the antenna via internal coaxial relay duplexer to the online base station transmitter and inhibit the offline base station from transmitting.
- \(\quad\) Switch the User A and B data ports through to the online base station.

An optocoupler based switch in the base station controller directs data to and from ports \(A\) and \(B\) on the rear panel directly to ports \(A\) and \(B\) on the on-line base station without any involvement from the Hot Standby controller microcontrollers (apart from selecting the online base). This provides protection of the system from failure of the microcontroller.

As well as ports \(A\) and \(B\), each base has a system port. The system port of each base station is interfaced to the microcontroller on the Hot Standby controller. This allows the microcontroller in charge of selecting the base station to receive diagnostic messages from each base station to decide their health.
The base station has it's own system port on the rear panel and this is interfaced to the Hot Standby Controller Module. The HSC will route diagnostics at the rear panel system port to and from the system ports of the base stations.

\section*{Warning}

The base station front panel system port has priority over the rear panel port, which is used for communication between the base station and the Hot Standby Controller. This is to permit service personnel to reconfigure the base station module without disconnection from the Hot Standby Controller. It should be noted however, that when the front panel port is accessed, a changeover event will occur due to lost communications with the Hot Standby Controller.

\section*{Mounting and Environmental Considerations}

The EH450 Hot Standby Base Station is housed as a 5RU 19" rack mounted set, encompassing \(2 \times 2\) RU Base Station units and \(1 \times 1\) RU Hot Standby Controller unit. The mounting holes on the front panels should be used to secure the units to the rack.

The unit should be mounted in a clean and dry location, protected from water, excessive dust, corrosive fumes, extremes of temperature and direct sunlight. Please allow sufficient passive or active ventilation to allow the radio modem's heatsink to operate efficiently.

All permanent connections are made at the rear of the unit. This includes: Power, Antenna, Communications Ports, Digital I/O and System Port. The front panel has an additional System Port connection point for easy access.

The Base Station front panel system ports must not be used while in this configuration.

\section*{Communications Ports}

The A \& B Data Ports and System Ports of each Base Station connect directly to the Hot Standby Controller units corresponding ports with the cables provided. Ensure all clamping screws on the Data Port cables are firmly secured and the System Port cables are clipped in correctly. See figure below for further details.

Note: Only the front or rear User System Port can be used at any one time on the Hot Standby Controller.


The EH450 has facilities for dual power supplies to provide for a redundant system. A separate power supply should be used for each of the Base Station units. The Hot Standby Controller unit has connections for dual power supplies and it is recommended that the power supplies from each of the Base Stations also be used to power the Hot Standby Controller unit. See Figure below for further details. See ER450 Quick Start Guide Section for detailed wiring information.


\section*{Connecting Antennas and RF Feeders}

There are 3 primary antenna connection options. All connectors used are standard N Type sockets. See figures below for further details

See ER450 Quick Start Guide for detailed wiring information. \(\qquad\)


Opion 2: Single Antenna working (internal band reject duplexer).
Use Tx [ANT] connection of Controller module


Option 3: Dual redundant antennas ( \(T x \& R x\) ) working
Option 3: Dual redundant antennas ( \(T \times \& R x\) ) working
Note this option does not use the RF connections between the
 Base stations and Controller modules. No Rx low noise amplifie Individual Tx \& Rx ports for connection to


\section*{Trio HSC \\ }

\section*{Switches}

\section*{Select Switch}

The 3 position switch (1/Auto / 2) on the front panel provides the following functionality:
- Position 1: base station 1 is forced into operation
- Position Auto: changeover hardware will select the online base station
- Position 2: base station 2 is forced into operation

The select switch is also used to identify the target base station for configuration programming.

Adjacent to the select switch are two LEDs: These LEDs indicate the current active base station.

Select LEDs
- Green - Auto Mode
- Red - Remote Force
- Amber - Local Force

2 Green Firmware Download
2 Amber Test Mode
2 Red Fatal Error - refer User Manual

\section*{Reset Switch}

This is a momentary close switch which when depressed will reset all LED alarm indications.

\section*{System Port}

There are two system port connection points, one on the rear panel and one on the front panel. Both have the same functionality and can be used for local diagnostics, firmware front panel downloads and hot standby controller testing. To access the system port use the diagnostic/programming cable supplied.
Note: When connection is made to front panel system rear system port is disabled.

\section*{Alarm Status LEDs}

There are 10 alarm LEDs on the front panel, five for base 1 and five for base 2. These LEDs provide a general indication of base station status. More detailed base station status information is available by using the diagnostic utility software.

The indicated alarms for each base station are:
\begin{tabular}{lll} 
Freq. & => & Frequency Error \\
RxSig & => & Receive Signal (RF) Error \\
Data & => & Receive Data Error \\
TxPower & => & Transmit Power (RF) Error \\
Supply & => & DC Voltage Error
\end{tabular}

The status of each alarm is represented as follows:
\begin{tabular}{lll} 
OFF & => & Unknown \\
Green & \(=>\) & No Error \\
Red & & => \(\quad\) Current (active) \\
R condition & & \\
Amber & \(=>\) & Recovered Error condition
\end{tabular}

Any active or recovered error LEDs will turn to green after the reset alarms switch has been pushed or remotely reset.

\section*{Part F - Operational Features}

\section*{Multistream functionality (SID codes)}

The E Series sends data messages in packets. A feature of the \(E\) Series is that an address can be embedded in each packet. This address is called the stream identifier code (SID).

By configuring a user serial port for a specific SID code, it is possible to steer messages to similarly configured ports between radio modems. In effect, it is possible to use the multiple serial ports available on the E Series, to enable multiple protocols to share the same RF channel. The SID codes also facilitate the use of other features such as TView diagnostics. Unique selective routing, repeating, and data splitting functions available in the radio modems configuration allow data steering and bandwidth management in complex systems.

See Part I - TView+ Management Suite - Programmer and Part J - TView Remote Diagnostics and Network Controller for details.

\section*{Collision Avoidance (digital and RFCD based)}

Where multiple "unsynchronised" protocols coexist on a common "multiple access" radio channel, there is always a possibility that both "hosts" may poll different "remote" devices at the same time. If both devices attempt to answer back to the single master radio at the same time, it follows that a collision could occur on the radio channel.

To facilitate the operation of multiple protocol operation on the radio channel, a transparent collision management system has been implemented : See Part I - TView+ Management Suite - Programmer for details.

\section*{Digital Collision Avoidance System}

If the "multiple access master" has been configured for full duplex operation, it is possible to use the inbuilt collision avoidance signalling system.

Once the master radio receives a valid incoming data stream from a remote, a flag within the "outbound" data stream is used to alert all other remote devices that the channel has become busy. Remote devices wishing to send data will buffer the message until the channel status flag indicates that the channel is clear. A pseudorandom timing value is added to the retry facility to ensure that waiting remotes do not retry at the same time.

\section*{RF Carrier Detect RSSI based Collision Avoidance}

In half duplex systems, the receiver's RF carrier detect is used to inhibit the transmitter whilst a signal is being received.

\section*{Digipeater Operation}

A feature of the E Series radio modems is the ability to internally repeat data packets to provide stand alone repeater facilities without the need for external intelligence.

This is done by programming "SID Codes" to "Repeat" a stream or range of streams. Wizard templates can be used to simplify setup of this and other features.

See Part I - TVIEW+ Management Suite for details.

\section*{TVIEW+ Diagnostics}

The E Series has an inbuilt remote configuration and diagnostics utility.

This facility allows transparent remote access to the key configuration and operating parameters of the radio.

See the TView+ Diagnostics User Manual for more information.

\section*{Poor VSWR Sensing}

To protect the transmitter, forward and reverse power are measured on each transmission.

If a VSWR of 3:1 or greater is measured, transmitter output power is reduced to +31 dBm . (ER only)

\section*{Part G - Commissioning}

Check DC power connector for correct voltage (1016VDC) and polarity, BEFORE plugging in the power connector.

\section*{Power-up}

Upon power up, the radio will self test and shortly after the green power LED will be displayed.

Failure of the power LED to light indicates no power, or failure of the fuse due to incorrect polarity or overvoltage.

Other failure such as fatal internal errors will initiate error modes as detailed in Part E-Getting Started: LED Indicators and Test Outputs.

\section*{LED Indicators}

Will depend on the system architecture. If the device is a remote site receiving a base station with a constant carrier, then the RXSIG/SYNC LED should be green to indicate healthy reception of the wanted signal.

If the site has been configured as a constantly transmitting base station, then the PWR/TX LED should show red.

In other types of systems, TX and RX bursts would be indicated by the RX or TX LED's as above.

Data flow to and from the user ports is indicated by the TXD/RXD LEDs for each port.
(See Part E - Getting Started: LED Indicators and Test Outputs.)

\section*{Data Transfer Indications}

Bi-colour LEDs are provided to indicate RS232 data being transmitted and received on each data port. A RED flash indicates a byte (or bytes) of incoming data from the serial line which will be transmitted to air, and a green flash indicates a byte of data received "off air" being released onto the serial line.
If data is being sent to the radio modem and the Data LED does not flash RED, this may indicate a wiring or configuration problem. Check that the TX and RX data lines are correctly wired (see Part E - Getting Started: LED Indicators and Test Outputs).

Also check that character set and parity settings (i.e. \(\mathrm{N}, 8,1 \mathrm{etc}\) ) are set identically at the terminal and the radio modem. Note that some incorrect settings of the character set parameter can still produce transmittable data, even though the data will not be understood by the application.

\section*{Antenna Alignment and RSSI Testing}

Once the RXSIG LED is lit, it is possible to confirm RX signal strength and align a directional antenna by monitoring the RSSI output.

This DC voltage appears at Pin 9 of Port B.
A ground reference can be obtained from chassis ground or Pin 5 of Port A or B.

The chart below shows Pin 9 voltage as it relates to signal strength.


Once communications has been established, it is possible to confirm the packet error rate performance of the radio path, and thus estimate the BER figure.

There are a number of tools provided to do this. The easiest is to use the "indicative packet error test" provided within the TVIEW+ Diagnostics under "statistical performance tools". Alternatively, it is possible to use hyper terminal, or other packet test instruments or PC programs to run end to end or perform "loopback" testing.
Please note that when using a "loopback plug" some understanding of the packetising process is necessary, since each "test message' must be carried in a single packet for meaningful results to be obtained.

Note also that in PTMP systems, allowance must be made for collision potential if other data is being exchanged on the system.

\section*{VSWR Testing}

VSWR testing is achieved using specialized VSWR testing equipment, or a "Thruline" power meter that measures forward and reverse power.

VSWR is the ratio between forward and reflected transmitter power, and indicates the health and tuning of the antenna and feeder system.

VSWR should be better than 2 to 1, or expressed as a power ratio, \(<6 \mathrm{~dB}\) or no more than \(25 \%\). To activate the radio's transmitter for VSWR testing, use:
a) An RTS loop
b) A system port PTT plug with pins \(7 \& 8\) shorted.

\section*{Part H - Maintenance}

\section*{Routine Maintenance Considerations}

The E Series hardware itself does not require routine maintenance. However all radio products contain crystal frequency references, and the stability of these crystals changes with time. The effect of this is that the product will slowly drift off frequency, and eventually it will require re-calibration. E Series radios are designed with high quality, low drift specification references, to ensure a long maintenance free lifespan. The length of this lifespan will depend on the severity of temperature extremes in the operating environment, but is normally 3-5 years. Extended frequency drift can be detected using TVIEW+ Diagnostics "Freq error" parameter.

Generally, re-calibration is achieved by replacing the radio in the field with a spare, and returning the radio to a service centre for re-calibration and specification testing at moderate cost.

Routine maintenance should be performed on external equipment subject to greater environmental stresses including antennas, RF feeder cables, backup batteries and cooling fans (if required). This maintenance should include testing of site commissioning figures such as received signal strength, VSWR, P/S voltage etc.

\section*{Part I - TVIEW+ Management Suite - Programmer}

\section*{Introduction}

This manual covers the installation and operation of the E Series TVIEW+ Management Suite which incorporates 3 utilities:
- Programmer for configuration of the radio RF parameters, system parameters and data ports
- Diagnostics* for real-time monitoring and logging of radio performance parameters
- Firmware Update for loading new firmware releases into the radio data modem

All utilities can be run on any IBM compatible computer running Windows 2000® and above. This section describes use of the programmer and firmware Update utilities in detail. Users should refer to the separate WinDiags User Manual for information about this utility.

The programmer is used to set configuration parameters within the ER450 data radio modem and EB450 base station. The utility permits configuration of modems connected directly to the PC as well as over the air to a remote unit. Configuration parameters can be saved to a disk file for later retrieval, or used for clone programming of other modems.

All configuration parameters are held in non-volatile memory (NVRAM) on the Data Radio Modem
Configuration is fully programmable via the Systems Port using the programming adaptor and cable supplied. Disassembly of the unit is not required for any reason other than for servicing

The diagnostics utility permits monitoring and logging of radio performance parameters for both E Series* as well as M Series* data radio modems and base stations. It supports homogeneous systems of radios as well as mixed systems of both \(E\) and \(M\) series radios.

The firmware update utility permits field upgrade of the firmware in an ER450 data radio modem, EB450 base station and EH450 hot standby unit connected directly to the PC. A special serial adaptor cable is required to be connected to Port B to load firmware into the unit.
* Requires the optional DIAGS Network Management and Remote Diagnostic Facility to be installed - per radio.

\section*{Installation}

Unit Connection

\section*{Programmer and Diagnostics Utilities}

The unit is connected to the PC using the supplied DB9-RJ45 adaptor cable (part no. TVIEW+ Cable) for local configuration changes or diagnostic monitoring. The cable should be connected to the RJ45 System Port of the unit and a valid PC serial port (e.g. COM 1) DB9 connector.
(See Part E - Getting Started: Communications Ports)

\section*{Firmware Update Utility}

The unit to be updated with firmware connects to the PC using the DB9-DB9 adaptor (part no. DRPROG). The cable should be connected to the DB9 Port B connector on the unit and a valid PC serial port (See Appendix C for details) DB9 connector.

\section*{Software}

Please take a moment to read this important information before you install the software.

The installation of this Software Suite is a 2 step process.
Step 1 completes the typical installation of the TVIEW+ Management Suite and will install the Programming Software together with the E Series Documentation.

Step 2 installs the Diagnostic Software and is optional. This step is only required if your radios have Remote Diagnostics enabled.

STEP 1: Installation - TVIEW+ Management Suite
Note: If a previous version of the TVIEW+ Management Suite has been installed on your PC, you must uninstall it via Control Panel "Add/Remove Programs".
- Close down all other programs currently running.
- Place the CD-ROM in the drive on the PC.
- Using Windows Explorer locate the files on the CDROM.
- In Windows Explorer double click on the file called TVIEW+_(Version\#)_install.exe
- After the installer starts follow directions.

STEP 2: Installation - TView Diagnostic Software (Optional)

Note: If a previous version of the "TView WinDiags" software has been installed on your PC, you must uninstall it via Control Panel "Add/Remove Programs".
- Close down all other programs currently running.
- Place the CD-ROM in the drive on the PC.
- Using Windows Explorer open the "Diagnostics" directory on the CR-ROM.
- Double click on the file called setup.exe
- After the installer starts follow directions.

\section*{Other:}

The current E Series Manuals are supplied and installed as part of the TVIEW+ Management Suite installation in Adobe Acrobat format.

Adobe Acrobat Reader is provided on the CD-ROM for installation if required.

\section*{TVIEW+ Front Panel}

When started the TVIEW+ front panel appears. The larger buttons permit each of the five utilities to be started. The diagnostics button may be greyed out if this utility has not been installed or found in the correct file directory. Access to Advanced Set-up Parameters and an exit facility are provided by the remaining 2 buttons.


\section*{Programmer - Main Window}

When first started the programmer is in file mode as indicated by the mode field at the bottom right of the panel shown below. In this mode it is possible to open a previously saved configuration file, or configure various programming options and save the configuration to a file.

Note: Modulation type is not available in this mode
To commence programming a unit (radio remote or base station) a session must first be established by using the "READ" function. If you have a Hot Standby Set-up and are locally connected to the Hot Standby Controller, The programmer will read the currently 'active' Base. To select which base you want 'active' there is a switch on the front panel of the Hot Standby Controller that controls active base toggling.

The READ function reads the current configuration from the unit and displays it in the main window. The "mode" displays changes to local or remote depending on the type of session selected at the read function. Several options in the main window may be blanked out until a session has been established with a unit.

Note: Changing any item on the menu will in general not take effect until data is written back to the unit using the "WRITE" function.

The procedure to follow for normal programming of unit is:
- Read unit
- Configure parameters (or Open a previously saved configuration file)
- Write unit

Several modems of the same radio type can be programmed with the same configuration using the clone facility described in Clone Mode. It is important to note that when using this facility the cloned radio should be of the same type to ensure it does not operate outside its capability.


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\section*{Pull Down Menus and Toolbar Buttons}

The items on the pull-down menus can be selected either directly with a mouse or using the ALT key in combination with a HOT KEY (e.g. ALT-F to select the file menu). Several of the functions within each menu are also available on the toolbar (click once to select).


\section*{File Menu}

The file menu allows the user to load (open) or save configuration data as well as to quit the program. The files are saved with an ".cfg" file extension
Open (also available on the toolbar)
This function is used to load an existing configuration file that can be used to directly program the radio or to use as a starting point to edit configuration parameters. Note that a session must be established with the unit by initially reading the configuration parameters from the unit prior to being written to a unit.

If in file mode the modulation type will not be displayed. If in local/remote mode and a file that was saved from local/ remote mode is opened, then modulation type will be imported and used, but only if it is valid for the connected hardware. If not, then the unit's read modulation type will be used.

Save (also available on the toolbar)
This function is used to save the current configuration parameters to a file for future recall.

If in "file mode" only basic RF, Port and System parameters are saved and re called. If in local/remote mode then modulation type is saved and re called.
Print (also available on the toolbar)
This function prints out the configuration data to the default printer in a standard format. There are no options for this item.

This should be used if a complete record is required for site/unit configuration. Firmware/Modulation/Diags/ Hardware type are all printed.

Exit (also available on the toolbar)


This function terminates the program. The user is requested to confirm this selection before exiting the application.

\section*{Modem Menu}

This radio menu allows configuration data to be read from and written to the unit (remote radio or base station) using the selected PC serial port connection (see Settings menu). The action of reading the configuration establishes a session with the unit. Communications is maintained with the unit to ensure that the session remains open. If the session has been lost due to data transmission errors or disconnection of the programming cable it will need to be re-established to ensure any updated configuration is written successfully to the unit.

\section*{Read (also available on the toolbar)}

This function establishes a session with the unit, reads configuration data from the unit and displays it in the programmer main window. When selected a dialogue window appears prompting the user to choose whether the unit to read is local (connected directly to the serial port or remote (connected over the air to the unit connected to serial port). Unit no. (Serial no.) must be entered and the stream SID code is "on" (default =0)). After configuration data is read from the unit it is available for editing and writing back to the unit or saving to a file. The progress of data transfer to or from the unit is indicated by a message window as well as a rotating indicator in the bottom right hand corner of the main window.


Write (also available on the toolbar)
This function writes configuration data displayed in the main window to the unit and reboots the unit. When selected a dialogue window appears prompting the user to confirm whether to proceed. A progress indicator in the bottom right hand corner of the main window is displayed while data is being read. This selection is only available if a session has been previously established and maintained with the unit.

This dialogue provides a facility for reversing any remote configuration changes that cause unexpected results resulting in the device reverting to previous configuration if contact is lost.

Choose "Make changes and resume contact" to safeguard changes. Some parameter changes (such as frequency change) will, by definition, automatically result in lost contact.


Choose "Make changes anyway and finish" to complete intentional changes which will result in lost contact.

After configuration data has been written, the session with the unit is closed and the programmer reverts to file mode.

Note: In general, any change made on the programmer screen must be written to the unit (using the write function) to become permanently stored. However, changes to Power adjust, Mute adjust and Tx/Rx trim take

immediate effect to allow test and adjustment prior to permanent storage via the write function.

Cancel Session (also available on the toolbar)
This function closes the session with unit and puts the programmer back into file mode. All configuration changes are discarded including changes to Power Adjust, Mute Adjust and Tx/Rx Trim.

Wizard (also available on toolbar)
This function permits the user to select standard configurations after the configuration from a unit has been read or a file opened.

The user is prompted via a series of dialogue windows to select the desired configuration that can then be written to the unit (remote radio or base station)

Clone Mode
\begin{tabular}{|c|}
\hline Wizard : Configuration Wizard \\
Configuration Wizard \\
Modem Configuration Wizard
\end{tabular}\(\quad\) ( \begin{tabular}{c|}
\hline (1) Point to Point Full Duplex Link (Permanent TX) \\
\hline (2) Point to Point Half Duplex Link (TX on data only) \\
\hline (3) Point to Multipoint System (Master permanent TX) \\
\hline (4) Point to Multipoint System (Master TX on data only) \\
\hline (5) Multipoint Repeater System (Repeater permanent TX) \\
\hline (6) Multipoint Repeater System (Repeater TX on data only) \\
\hline (7) Point to Point via Back to Back Repeater (Permanent TX) \\
\hline (8) E Series configured for M Series Compatibility \\
\hline
\end{tabular}

This function permits writing of the same configuration data to several units. This feature is normally used for configuring data radio modems connected locally.


The procedure is:
- Read the configuration from the first unit.
- Configure the parameters (or open a previously saved configuration file).
- \(\quad\) Select Clone Mode (Modem menu).
- Write the configuration to the first unit.
- Connect the next unit
- Write the next unit which establishes a session and recognises the unit serial number and type, which then configures the unit
- Repeat the last 2 steps for the remaining units.

Settings
This menu permits selection of the PC serial port (COM1 to COM99 if available) to be used for communications with the unit. COM1 is the default selection and if a different port is to be used it must be set before establishing a session by reading the configuration from a unit. Whilst a session is established with a unit this menu can not be accessed.

Help
This menu permits selection of help information using the Contents key. Warnings regarding use of the programmer software using the Warnings key and version detail using the About key.

\section*{Port A and Port B Configuration}

Data from these two user ports is multiplexed for transmission over the air. Each port can be configured separately for the Character layer (Data speed, number of data bits, number of stop bits, parity), Packet layer and Handshaking (flow control). Port B must be enabled if required by setting the check box at the top of its configuration section.
\begin{tabular}{|c|c|c|c|c|c|}
\hline \multicolumn{3}{|l|}{Port A Configuration} & \multirow[t]{6}{*}{} & \multicolumn{2}{|l|}{Port B Configuration} \\
\hline Character Laye & Packet Layer & Handshaking & & Packet Layer & Handshaking \\
\hline C. 9600, \(\mathrm{N}, 8,1\) & - Standard & C None & & - Standard & c None \\
\hline C \(4800, N, 8,1\) & C modeus & C Hardware & & \(C\) modeus & C Hardware \\
\hline \(C\) Custom & Custom & XonSXoff & & C Custom & C Xon/Xoff \\
\hline \(9600, N, 8,1\) & AES Encryption: 0 ff & Advanced & & ption: 0 ff & Advanced \\
\hline
\end{tabular}

The following description is common to both ports.

\section*{Character Layer}

There are two standard formats and a custom format that can be selected by checking the appropriate control button to the left of the description. The standard formats are:
- 9600,N,8,1 (data speed \(=9600\) bps, no parity, 8 data bits, 1 stop bit)
- 4800,N,8,1 (data speed \(=4800\) bps, no parity, 8 data bits, 1 stop bit)

A non-standard format can be selected via the Custom button that displays a dialogue box to permit selection of data speed, parity, number of data bits and stop bits. Once selected the OK button should be used to complete the selection. The custom selection is also displayed in the main window below the Custom button.
\begin{tabular}{|c|c|c|}
\hline - IP Port A Configurat & & X \\
\hline Speed & 9600 & \\
\hline Parity & None \(*\) & \\
\hline Data Bits & \(8 \quad 7\) & \\
\hline Stop Eits & 1 - & \\
\hline OK & Cancel & \\
\hline
\end{tabular}

\section*{Packet Layer (Packet Modes Only)}

There are two standard configurations and a custom configuration which can be selected by checking the appropriate control button to the left of the description. There are essentially two basic modes of operation for the packet assembler and disassembler (PAD).

The first is where the PAD operates in a standard mode with data received at the port being immediately sent over the radio channel.

The second is a store and forward or delayed mode where whole data packets are received from the port before being sent over the radio channel.

In both cases data is sent over the radio channel in variable length frames and delineation of these frames is dependent on the configuration selected as well as the characteristics of the data stream received at the data port.

The packet layer configuration options that can be selected are:

Standard (live framing)
With standard live framing data received from the host by the modem is immediately placed into a frame and transferred onto the radio channel. This minimises "store and forward" delays in the data transmission.

If a stream of characters is received by the modem, then several characters at a time may be placed into the same frame. The number of characters in the frame depends mainly on the respective baud rates of the user port and the primary channel baud rate of the modem, as well as the level of overheads experienced on the radio channel and the user data stream.

The number of data bits associated with the user data stream will also have an effect on the average size of a frame. For instance the number of stop bits, and number of data bits per character.

The system designer must choose the best compromise of all the above items to ensure the most efficient method of data transmission.

Note: The first few characters are always packetised and sent by itself regardless of all the above variables.

\section*{Modbus}

This selection configures the PAD driver with options automatically set to implement the MODBUS protocol, e.g. 5 mSec timer.

\section*{Custom}

Other configurations of the PAD driver can be selected via the Custom button which displays a dialogue box to permit selection of several configuration options as follows:

\section*{SLIP / DIAGNOSTICS}

SLIP is a well known protocol for transferring binary data packets over a data link. Each data packet is delineated by <FEND> characters, and a substitution mechanism exists that allows these characters to be included in the data packet. Appendix B describes the SLIP protocol which is used extensively in UNIX \({ }^{\text {TM }}\) based systems, and is closely associated with TCP/IP networks.


The diagnostics controller package uses the SLIP protocol to communicate between base station and remote modems.

\section*{DNP-3 / IEC870}

This selection configures the PAD driver to implement the DNP-3 Protocol and IEC870 Protocol.

\section*{Pull Down Menu Selection}

The PAD driver can be configured for a number of vendor specific protocols by selecting the desired option.

\section*{Custom Format}

This selection permits PAD driver to be configured in a variety of ways and requires a greater understanding of the system design.

For the modem to successfully transmit its packets (or frames) of data over the radio channel, it must be told on what basis to delineate data packets received at the data port. Once the end of a data packet has been received at the port the data frame is closed and transmission over the radio channel commences. Delineation of data packets can be configured to occur via any combination of:
- A pre-defined minimum time delay between packets received at the port. Typically the time delay would reflect the absence of a couple of characters in the data stream at the specified user port baud rate.
- Limiting the maximum number of characters which can be put in the data frame sent over the radio channel.
- Receipt of a selected end of message (EOM) character at the port. An ASCII carriage return (character 13) is often used for this purpose.

As each data frame to be transmitted over the radio channel has overhead data consisting of checksums and SID codes. The system designer must determine the best compromise between the ratio of overhead versus user data which depends on packet size and user data packet transmission latency.

The fields which can be configured are:
- Character Input timer: Set the input timer value in ms or enter zero to disable. Range 0-255.
- Maximum Frame Size: Set the maximum number of characters or enter zero to disable. Range 0 4095.
- Minimum Frame Size: Set the maximum number of characters or enter zero to disable. Range 1 255. Only available when AES Encryption is on.
- EOM Character: Select the check box to the left of the description to enable and enter the EOM character as a decimal value. Range 0-255.
- LIVE Framing: Select the check box to the left of the description to enable live framing mode.

Note: When AES encryption has been turned ON, the packet layer is modified to suit the fixed format requirements of AES encryption. This may result in changes to the data latency and throughput in some modes.

\section*{Handshaking (Packet Modes Only)}

If the standard PAD is selected (i.e. any settings apart from SLIP/Diagnostics), then flow control can be either hardware handshaking, XON/XOFF protocol or none.

Note: Handshaking is not supported when using Bell 202 modes. The XON/XOFF flow control is not supported when using the SLIP/Diagnostics protocol.

The Handshaking section of the screen allows the selection of either of the handshaking methods as well as allowing handshaking to be disabled.

Details of the two handshaking methods are given below. Hardware

The modem acts as Data Communications Equipment (DCE) and supplies to the host controller the following interface signals:
\begin{tabular}{ll} 
Data Set Ready & (DSR) \\
Data Carrier Detect & (DCD) \\
Clear To Send & (CTS) \\
Receive Data Output & (RXD)
\end{tabular}

The host controller must act as Data Terminal Equipment (DTE) and supplies to the modem the following interface signals:
\[
\begin{align*}
& \text { Data Terminal Ready }  \tag{DTR}\\
& \text { Request To Send } \\
& \text { Transmit Data Input }
\end{align*}
\]

\section*{- DCD}

DCD has several modes of operation. It is set to TRUE when data is being transferred from the modem to the host - RXD line active. The signal is asserted approximately 500 ms before the start bit of the first character in the data stream and remains for approximately 1 character after the last bit in the data stream. The other modes of operation are dependent on the advanced settings.
- DSR

DSR is permanently set to TRUE.
- CTS

The CTS is a signal from the modem to the host informing the host that the modem is able to accept incoming data on the TXD line. It responds to the actions of the RTS line similar to the operation of a "standard" line modem.
The CTS is FALSE if the RTS line is FALSE. Once the RTS line is set to TRUE (signalling that the host wants to send some data to the modem on the TXD line), then the CTS will be set TRUE within 1 ms , if the modem is capable of accepting more data.
The CTS line will be set to FALSE if the transmit buffer in the modem exceeds 4075 bytes, or the number of queued frames exceeds 29 to ensure that no overflow condition can occur.

\section*{- RTS}

The RTS line is used for two reasons. The first is to assert the CTS line in response to RTS. The RTS line can also be used to key up the transmitter stage of the modem.
- DTR

The DTR line is used for flow control of data being sent from the modem to the host controller. When the host is able to accept data it sets this line to TRUE, and if data is available within the modem, it will be sent to the host. If the host cannot accept any more data, then it sets the DTR to FALSE, and the modem will stop all transmissions to the host.
- Xon/Xoff

If the flow control mechanism is XON/XOFF then the modem uses the standard ASCII control codes of DC1 \{^Q=11(Hex)=17(Dec)\} for XON and DC3 \(\left\{^{\wedge} \mathrm{S}=13(\mathrm{Hex})=19\right.\) (Dec) \(\}\) for XOFF. The DTR input line is totally ignored.
Note: There is no substitution mechanism employed in the XON/XOFF protocol, so care must be taken when transferring binary data to ensure that invalid flow control characters are not generated.

\section*{Advanced}

This button provides access to the advanced features of the port configuration. When selected a dialogue box appears which permits selection of the source for the port DCD output signal.

\section*{IPort A DCD Function}

\section*{C Disabled}
© RF Carrier Detect
C Data Detect (RS485 Flow Control)


\section*{Disabled}

This selection disables the DCD output on the port. This selection is not permissible if hardware based flow control has been selected.
RF Carrier Detect
This selection causes DCD to be asserted at the onset of a an RF signal that is higher than the mute setting. This will generally occur several milliseconds before data is transmitted from the port.
Data Detect (RS485 Flow Control)
This selection causes DCD to be asserted when data is about to be transmitted from the port. This option is not available if handshaking is set to "None" or "Xon/Xoff".

\section*{RF Parameters}

This section of the main window permits adjustment of transmitter and receiver, radio channel modulation scheme, frequency trim and advanced features.

\section*{RF Parameters}
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{3}{|l|}{\multirow[t]{2}{*}{\begin{tabular}{l}
Transmitter \\
Frequency \\
Power Adjust
\end{tabular}}} & \multicolumn{2}{|l|}{\multirow[t]{2}{*}{\begin{tabular}{l}
Tx/Rx Trim \\
Adjust
\end{tabular}}} \\
\hline & & & & \\
\hline 460.0 & MHz 20.0 & dBm & 0 & \\
\hline \multicolumn{5}{|l|}{Receiver} \\
\hline Frequency & & djust & & \\
\hline 450.0 & \(\mathrm{MHz}-100\) & dBm & & \\
\hline
\end{tabular}

\section*{Transmitter}

The transmitter can be configured for transmit frequency and power level.
Frequency
The required transmit frequency in MHz can be entered in the display field. The programmer checks that the selected frequency is in the range for the particular model of radio and provides warnings if it is not.

Power Adjust
The currently selected transmit power is displayed below the button in dBm. The power level can be adjusted by selecting this button which displays a dialogue box. The up/down keys, or a typed in value, can be used to select the required power level in dBm steps. There are two methods for setting the power.


\section*{- Using Factory Calibration}

To use the factory calibration of the radio the desired power is set immediately using the OK button in the dialogue box. This method permits the transmit power to be set without energising the transmitter. Note that although the transmit power has been adjusted it must be written to NVRAM using the modem "Write" function to ensure it is retained after a power on reset.
- Using a Power Meter

To overcome manufacturing variations in the power setting a more accurate setting of power can be achieved by the selecting the "Test With Meter" button in the dialogue box. This displays another dialogue box warning the user that the transmitter is about to be energised and that the power meter used should be able to handle at least 10 Watts from the modem.

Selecting OK in this warning dialogue box will energise the transmitter which will also be indicated by the red transmit LED on the unit. The power is adjusted using the up/down keys until the required power level is obtained. Selecting OK will retain the power setting and turn the transmitter off.

Note: Although the transmit power has been adjusted it must be written to NVRAM using the modem "Write" function to ensure it is retained after the modem is rebooted.

Selecting "stop test" will stop and leave you in power adjust box. "Cancel" will stop test and take you back to the main window.

\section*{Receiver}

The receiver can be configured for receive frequency and mute level.

\section*{Frequency}

The required receive frequency in MHz can be entered in the display field. The programmer checks that the selected frequency is in the range for the particular model of radio and provides warnings if not.

\section*{Mute Adjust}

The currently selected mute level is displayed in the main window below the button in dBm. The mute level can be adjusted by selecting this button which displays
a dialogue box. The up/down keys, or a typed in value, can be used to select the required mute level in dBm steps. Whilst a session is in progress with a unit the mute level adjustment is live. Selecting OK will retain the mute level setting. Note that although the mute level has been adjusted it must be written to NVRAM using the modem "Write" function to ensure it is retained after the modem is rebooted.

Whilst the modem is capable of receiving extremely weak radio signals, and successfully extracting the data content from the waveforms the mute level should be set to assist the modem in filtering out unwanted signals. Unwanted signals can be the result of background noise or interference. The mute level should be set at a level above these unwanted signals and at a level low enough to detect the wanted signal. Detection of a received signal above the mute level is indicated by the "RxSig" LED on the unit.

\section*{Modulation}

The radio modem utilises a DSP to control the modulation of transmit signals and demodulation of received signals. This provides greater flexibility in the ability of the radio modem to support new modulation schemes whilst maintaining compatibility with existing modulation schemes.

The currently selected modulation scheme is displayed in the main window below the select button. The modulation scheme can be adjusted by selecting this button which displays a dialogue box. The desired modulation scheme can then be selected from the pulldown menu in the dialogue box and retained using the OK button.


The type of modulation available for selection is dependent on the model of radio. Modulation types are sorted using the following criteria : Country of Approval (FCC, ETSI, ACA), Radio Channel Bandwidth \((12.5 \mathrm{kHz}\) or 25 kHz ), Radio Mode (E Series, M Series, D Series or Legacy) and over the air speed (2400bps, 4800bps, 9600bps, 19k2bps).

Only modulation schemes suitable for the radio model in use are available for selection. Please consider the following notes when choosing a modulation:

Country of Approval :
FCC : for use in North America and other countries who use FCC approved radios.

ACA : for use in Australia only.
ETSI : for use in Europe and other countries who use ETSI approved radios.

Legacy Modulation Schemes: Some modulation types are specifically for backwards compatibility. These include Bell 202 modes and D Series compatibility modes. These legacy modes should only be chosen when backward compatibility is required as their performance is inferior to the generic modulation schemes (bandwidth and RF sensitivity).

\section*{Tx/Rx (Frequency) Trim}

The currently selected frequency trim, which is common to both transmitter and receiver, is displayed in the main window below the button in Hz . The frequency trim can be adjusted live by selecting this button which displays a dialogue box. The up/down keys can be used to select the required frequency offset in steps pre-determined by the radio modem. Selecting OK will retain the frequency trim setting. Note that although the frequency trim has been adjusted it must be written to NVRAM using the modem "Write" function to ensure it is retained after the modem is rebooted.


This facility permits correction for drifts in the frequency reference caused by component aging. For example, a standard crystal may vary in fundamental frequency operation over 1 year by one part per million. An adjustment range of 110 ppm , displayed in Hz , has been allowed for and if this is insufficient the unit should be returned to the dealer/factory for re-calibration.

\section*{Advanced}


This button permits setting of advanced features. When selected a dialogue box appears which permits configuration of various parameters.

Non-Packet Mode Setup (Non-Packet and Bell 202 Mode Only)
CTS Delay : the amount of time between RTS enabled to CTS active.

PTT Hold : the amount of time the transmitter will remain enabled after RTS is disabled.

Note: When replacing an MDS4710 radio operating in Bell 202 mode, the E Series radio needs to have PTT Hold set to 10 mS to account for the extra delay in the radio when compared to an MDS radio.

PTT Delay : the amount of time between RTS enabled and the transmitter becoming active.

Transmit Tail Suppression : Minimises garbage characters at end of transmission. (Available in Bell 202 Mode only.)

\section*{Receiver Full Duplex}

This check box should only be ticked when the radio is operating in "full duplex" mode and with a "full duplex" hardware platform. For standard half-duplex remotes this option should not be ticked. For other modes please consult the factory for further information.

Note: This parameter is set in the factory to the correct state and should not be altered without factory consultation.

\section*{System Parameters}

This section of the main window configures the PTT control, collision avoidance, stream setup for routing of data, advanced features and provides unit information.

\section*{PTT (Press To Transmit) Control (Packet Modes Only)}

RF transmission can be configured to occur permanently, automatically on data received at Port A or Port B, or RTS being asserted on Port A or Port B. A PTT timeout facility can be configured to limit the period for which the transmitter is enabled. Each option is selected by setting the control to the left of the description on the main window. When PTT is active the "Tx" LED on the unit is illuminated and RF power is being fed to the antenna.

Permanent Tx
This will cause the transmitter to be permanently enabled (keyed) and displays another dialogue box warning the user that the transmitter will be energised immediately after the configuration is written to the unit. Selecting OK confirms this setting. The other PTT selections are disabled when this option is selected.

Note: This option is only available for full duplex units when being programmed locally.

Auto On Data
This will cause the transmitter to be enabled (keyed) automatically on data received at Port A or Port B and included in a complete frame for transmission over the radio channel. The maximum period for which the transmitter will be enabled is limited by the PTT timeout setting.

\section*{From Port A RTS}

This will cause the transmitter to be enabled (keyed) on Port A RTS being asserted. The maximum period for which the transmitter will be enabled is limited by the PTT timeout setting. Applications which rely on establishing a link ahead of data being transferred require this method of activation.

\section*{From Port B RTS}

This will cause the transmitter to be enabled (keyed) on Port B RTS being asserted. The maximum period for which the transmitter will be enabled is limited by the PTT timeout setting. Applications which rely on establishing a link ahead of data being transferred require this method of activation.

\section*{PTT Timeout}

The PTT timeout facility is used to disable the transmitter if it exceeds the designated time. The timeout value can range from 1 to 255 seconds and the facility is disabled by setting a zero value.

The timeout value chosen for this should be set according to system requirements which may include:
- Prevention of a remote unit remaining keyed up and locking out all other remote units in a point to multipoint system.
- Limiting the period a remote unit remains keyed up to prevent battery drain in a low power application.

Note: If a PTT timeout occurs before completion of a data transmission data will be lost.

Stream Setup (E\&M Modes Only)
This button brings up a dialogue box to permit editing of Stream IDentifier (SID) codes which are used by the modem as the addressing mechanism for data stream routing. A SID code can be placed at the start of each data frame as it is sent over the radio channel. The receiving modems use this code to determine how to route the data message. The modem supports simultaneous operation of both Port "A" and Port "B" over the one radio link, along with the inclusion of a diagnostics data stream.

Each port is independent and supports multiple options which are described in the following sections.

The following diagram illustrates the structure of the stream routing function for each data port.

\section*{User Port}

This option is selected by clicking on the User Port button and filling in the RXSID and TXSID fields to the right. The radio comes preconfigured with default values.

In User Port mode all SID code operations are performed transparently to the user data. Data placed into a user port which has been assigned a specified SID code, will only be received by a modem at the other end of the radio link that has a user port assigned with the same SID code. The SID code is added by the radio modem to the user data stream and removed by the radio modem when user data is outputted to a data port.

In this way, Port " A " and Port " B " can be assigned different SID codes, thereby separating the data streams.

Two SID codes values are available for each user port RXSID and TXSID. The RXSID codes apply to the data being received by the modem, and the TXSID codes apply to the data being transmitted by the modem. This allows for different transmit and receive codes if required, but generally they would be both the same.

A situation where \(T x\) and \(R \times\) SID codes may be different is in a repeater configuration. In this type of application all data messages sent to the repeater will be "repeated". Thus by having different Tx and Rx codes, a control unit will not "hear" its own transmission, and remotes will not hear the reply from any other remote. For more information please consult the Schneider Electric Trio E Series training material available as a power point slide from our website at www.trio.com.au

The diagnostics facility (when installed) also uses SID codes. The diagnostics data simply uses a different data stream to the user data, but is processed internally by the modem. If access to the diagnostics facility is required, similar to when the diagnostics utility is used with the modem, then the data port concerned and the diagnostics stream, must have the same SID codes assigned to them. Alternatively the System port can be used, which is 19.2K, Slip.

\section*{Trunk Streams}

In the Trunk Streams mode, data that is inputted into the modem for transmission must have a SID code appended to the start of the data packet. This mode requires the use of a "SLIP" interface as configured using the packet layer.

Trunk Steam mode is normally used in conjunction with TView Diagnostics software, when connection to a MSR Stream Router or when connecting radios together such as a back-to-back connections as used in multiple point to point links.

In Trunk Stream mode a range of SID codes can be transmitted and received via a data port. This range is specified when this mode is selected. In a typical application, such as a back to back connection as used in a multiple point to point links, where all data (including diagnostics) from one radio needs to be "trunked" through to the other radio, the range used is 0 to 255 . Trunked mode allows a configurable selection of data streams to be "trunked" to other equipment yet the data remains separated as the SID codes are appended to each packet of data outputted.

\begin{tabular}{|c|c|c|c|c|c|c|c|}
\hline \multicolumn{8}{|l|}{Translate and Repeat Streams} \\
\hline Type & & From & To & Type & & From & To \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & \(\checkmark\) & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & \(\checkmark\) & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & \(\checkmark\) & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & \(\checkmark\) & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & \(\checkmark\) & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & \(\checkmark\) & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & \(\checkmark\) & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & \(\checkmark\) & 0 & 0 \\
\hline Disabled & \(\checkmark\) & 0 & 0 & Disabled & & 0 & 1 \\
\hline \multicolumn{8}{|l|}{\begin{tabular}{l}
Tip \\
Disable both data ports to allow up to 2 repeat stream entries
\end{tabular}} \\
\hline & & & OK & Cancel & & & \\
\hline
\end{tabular}

Repeat/Translate Configuration
The modem is capable of operating in a repeater mode. Each user port can be configured as a separate repeater. The associated user ports are effectively disconnected from the "outside world" when in repeater mode. Data received from the radio channel is passed directly to the transmitter, and placed back onto the radio channel. This feature requires a firmware revision of R2.12.1 or later.

The repeater must receive a complete frame of data before it is retransmitted. In some systems this store and forward delay may be significant, and careful selection of maximum frame sizes configured at the source unit must be considered to minimise the delay.

To enable the mode select "Repeat Range" in the Type field and specify the range of SID codes for which will be repeated.

Maximum of 2 repeat ranges can be used, ensure there is no overlap of SID ranges.

\section*{Translate Streams}

This function is similar to repeat streams however it also translates the SID code from one value to another as the repeating function occurs.

This mode can be used to controlled data repeating in systems where more than one repeater is required, such as store and forward system or pipe-lines. If translate is not used then a 'Ping Pong' effect would occur between to adjacent sites.

Maximum of 16 translates can be used. Do not translate from the same SID more than once.

Diagnostics SID codes can also be translated. You must configure each radio in TView+ Diagnostics to operate using the SID code you want.

\section*{Diagnostics Setup (Packet Modes Only)}

Polled Diagnostics
The Diagnostics Processor can be configured to listen for diagnostics on a range of SID codes. The factory default is SID code 0 (From Stream O To Stream O). The diagnostics responses are sent back over the same stream as the questions.
Diagnostics Repeat
This option can be toggled on and off by clicking the button. Some applications will require that a repeater unit in a point to multipoint system repeats diagnostics frames only.
This will be the case when the system diagnostics controller is connected to a remote unit in the system, and it polls the system population from this point. The master unit must retransmit any diagnostic frames that are not addressed to itself onto the remainder of the population.
Automatic Diagnostic Reports
This option allows the configuration of automatic diagnostics. This feature requires a firmware revision of R2.12.1 or later. This option automatically appends diagnostics messages when user data is transmitted. This option can be toggled on and off by clicking the "Enable" button.

Minimum Report Interval : Specifies the amount of time before a diagnostics message is appended to the next user data message.

Diagnostic Stream: Specifies the SID code used for the automatic diagnostics message.

Controller Destination Address: Specifies the address of the Diagnostics Controller Software that is receiving the automatic messages and displaying them. This value must match that specified in the TVIEW diagnostics software configuration.

\section*{Advanced}

The Advanced button can be used to install diagnostics into the E-Series radio if it was not purchased with the original order. Enter the 8 digit key-code supplied by Schneider Electric to enable diagnostics. If diagnostics is already installed this option will be "greyed out".

SID Translation Example
Tx: \(10 \quad\) Translate: 10 to 20
Translate: 20 to 30
Tx: 30
Rx: 10
Translate: 20 to 10
Translate: 30 to 20
Rx: 30


\section*{Encryption Setup (Packet Modes Only)}


128 bit AES Encryption can be enabled in the radio. AES Encryption is a feature available in the E Series Generation II product (firmware pack 4.x.x and above) Radios that have 128 -bit AES encryption enabled can only communicate with other radios that have AES encryption enabled and use the same encryption key.

AES Encryption is enabled by selecting the Enabled button and entering an "Encryption key". The "Encryption key" must be between 8 and 16 characters long. The key can contain ASCII or hexadecimal characters. When entering hexadecimal characters, the format must be "OxDD" where DD is a sequence of hexadecimal digits. (0-9,A-F).

When a radio configuration is read from a radio that already has AES encryption enabled, the encryption key will be shown as "**************" in the programmer to indicated encryption is enabled. Since there is no mechanism to see the encryption in plain text you must ensure the encryption key is recorded in a safe and secure place for future reference.

Note : When AES encryption is enabled in the radio, both Port A \& B packet layer settings may be modified to ensure compatibility with AES encryption mode.

Note : AES encryption is subject to export restrictions and may not be available in all countries

\section*{Collision Avoidance (Packet Modes Only)}
\begin{tabular}{|c|c|c|c|}
\hline \multicolumn{4}{|l|}{- I Collision Avoidance} \\
\hline \multirow[t]{3}{*}{\begin{tabular}{l}
- Mode \\
\(C\) Master \\
c Remote
\end{tabular}} & \multicolumn{3}{|l|}{\multirow[t]{3}{*}{\begin{tabular}{l}
Backoff Method \\
- Retry after Tx attempt \\
Delay before Tx attempt
\end{tabular}}} \\
\hline & & & \\
\hline & & & \\
\hline \multicolumn{4}{|l|}{Backoff Timing} \\
\hline \multicolumn{4}{|c|}{Max. Slot(s) 16} \\
\hline \multicolumn{4}{|c|}{Time Per Slot 20} \\
\hline \multicolumn{2}{|r|}{QK} & Cancel & \\
\hline
\end{tabular}

In a point to multipoint system the master unit (usually a base station) can transmit at any time and the remotes will all receive the broadcast signal. However, if more than one remote unit transmits at a time, then a collision will occur during the multiple transmissions, resulting in a loss of data from one or more units.

Two collision avoidance mechanisms have been included in the modem. The standard (Digital) method utilises a signalling channel which is embedded in overhead data transmitted over the radio channel. The second method utilises detection of a carrier signal to postpone transmission of data. Both methods require configuration of several options for successful operation.

The desired option for collision avoidance is selected by checking the control button to the left of the description on the main window.

\section*{None}

When selected this turns off all collision avoidance mechanisms. This should only be used in point to point applications.

Digital
This is the standard method of collision avoidance and utilises a channel busy indication bit in the signalling channel transmitted to all remotes for control. When selected a dialogue box appears and several options must be configured:
. Mode - "Master" or "Remote". When the master unit receives a valid transmission from a remote unit it sets the channel busy indication bit. This busy bit is interpreted by the other remotes to not transmit. Once the transmission from the first remote ends the master unit resets the busy bit to indicate the channel is now clear to transmit on. The master unit, which is normally a base station, takes about 5 ms to detect a transmission from a remote unit and set the channel busy indication bit on the radio channel. During this period collision of remote transmissions can still occur and is unavoidable.
Note: The master must be permanently keyed.
- Backoff Method - "Retry after Tx Attempt" or "Delay before Tx Attempt". The method chosen is system dependent and can only be configured if the mode is "remote". The former is best used when data responses from remotes are largely asynchronous. The latter is best used when this is not the case.
- Backoff Timing - "Maximum Slots", "Time per Slot". This can only be configured if the mode is "remote". When a remote is ready to transmit data but it finds the busy bit from the master set it holds back its transmission for a random "backoff" time after which it tries to transmit data again. This ensures that modems waiting to be allowed to transmit do not re-attempt to do so at the same time. The "Maximum Slots" ( 1 to 16) and the "Time per Slot" ( 1 to 255 ms ) are used to calculate the backoff time by multiplying the slot time by a random number between 1 and the maximum slot number. For example if the time per slot is 30 ms and the maximum slots is 4 , the random backoff times can be \(30,60,90\) or 120 ms .

As the channel busy indication bit is critical for reliable operation default interpretation of this bit is defined in the remote units. If the master modem stops transmission (or has not yet started) the remote will interpret that the channel is busy and will not transmit until the master comes on line.

\section*{Carrier Detect}

This method of collision avoidance utilises a carrier transmitted to all remotes to indicate that the radio channel is busy. When selected a dialogue box appears and several options must be configured:
- Mode - "Master" or "Remote". When the master unit receives a valid transmission from a remote unit it transmits a carrier signal to indicate busy. Of course the master will also initiate a transmission if it has data to send. The transmitted carrier is interpreted by the other remotes to not transmit. Once the transmission from the first remote ends the master unit stops transmission to indicate the channel is now clear to transmit on. The master unit, which is normally a base station, takes about 5 ms to detect a transmission from a remote unit and transmit a carrier signal. During this period collision of remote transmissions can still occur and is unavoidable.

Note: The master can only be a full duplex unit and cannot be permanently transmitting. For half duplex and simplex systems all units should be set as "Remote" (no Master)
- Backoff Timing - "Maximum Slots", "Time per Slot". This can only be configured if the mode is "remote". When a remote is ready to transmit data but it detects a carrier signal from the master set it holds back its transmission for a random "backoff" time after which it tries to transmit data again. This ensures that modems waiting to be allowed to transmit do not re-attempt to do so at the same time. The "Maximum Slots" (1 to 16) and the "Time per Slot" (1 to 255ms) are used to calculate the backoff time by multiplying the slot time by a random number between 1 and the maximum slot number. For example if the time per slot is 30 ms and the maximum slots is 4 , the random backoff times can be \(30,60,90\) or 120 ms .

\section*{Unit Information}


The information displayed is intended to assist the user to identify the radio modem as well as support should their services be needed.

Radio Model refers to the type of unit. The ER450 is a remote unit and the EE450 is a exciter inside a base station unit. Gen II will be noted where Gen II hardware is detected.

Radio Type refers to the frequency band supported by the radio as well as the channel bandwidth. For example 51 AO 2 is a type 51 band with a 25 kHz channel.

Diags Installed is set to yes or no depending on whether the diagnostics key has been set in the unit.

Serial Number is unique to each unit and is set within the unit at time of production as well as included on the label fixed to the unit.

Firmware Pack refers to the firmware package version installed in the radio. There are several components associated with microcontroller and DSP firmware installed and a single version number is used to identify them.

\section*{Unit Information - Details}

More detailed information is also available to assist in identifying components installed in the unit (remote, base station or hot standby).

The additional information provided is:
- Controller Rev refers to the microcontroller firmware component version for the radio.
- DSP Code Rev refers to the DSP firmware component version for the radio.
- Processor Board ID refers to the processor board identification number and hardware revision information for the radio.
- RF Deck ID refers to the RF deck board identification number and hardware revision information inside the radio.
- Production Build Code refers to the automated production test and calibration sequence used during manufacture of the radio.
- Hardware indicates whether the radio is half or full duplex.
- Unit Type indicates whether the unit is recognised as a remote or base station.
- \(\quad\) Tx and RX Frequency Range indicates the frequency range for which the radio is capable of being operated in.

In the case of a base station unit the following additional information is provided:
- Base Firmware Pack refers to the firmware package version installed in the base station (front panel) controller which is separate to the radio installed. There are several components associated with this firmware package and a single version number is used to identify them.
- Base Controller Rev refers to the microcontroller firmware component version for the base station.

\section*{Messages}

The message window provides a log of error messages occurring during use of the programmer utility. Several error messages may occur as a result of a selection.

\section*{Status Bar}

The status bar is located at the bottom of the main window and provides information regarding communication actions occurring with the radio data modem.

Additional fields located on the status bar include:
- Unit ID refers to the identification label used by the diagnostics utility. This is currently the same as the unit's serial number.
- Mode refers to the type of session established. It can be a File, Local indicating a local port connection to the unit or Remote indicating communications is via a radio channel.

\section*{Configuring E-Series for use with M-Series}

Connect the E Series Master radio to the computer using the TView+ Programming and Diagnostics cable Described in the previous section.

Read the E-Series unit. Using the Wizard facility is the quickest way to confgure the bulk of the radio confguration parameters. Click on the Wizard button to activate the Wizard menu. Click on Wizard Button number 8: "E Series Confgured for M Series compatibility."

\section*{Wizard : Configuration Wizard}

\section*{Configuration Wizard}

Modem Configuration Wizaro
(1) Point to Point Full Duplex Link (Permanent TX)
(2) Point to Point Half Duplex Link (TX on data only)
(3) Point to Multipoint System (Master permanent TX)
(4) Point to Multipoint System (Master TX on data only)
(5) Multipoint Repeater System (Repeater permanent TX)
(6) Multipoint Repeater System (Repeater TX on data only)
(7) Point to Point via Back to Back Repeater (Permanent TX)
(8) E Series configured for M Series Compatibility
(9) Multipoint Repeater System (Non Packet Mode LCR)

Cancel

Select Master by clicking on the "Master" button. This will pre-confgure the radio to a known working confguration suitable for communication with the M Series.


The screen then returns to the normal E Series confguration screen.

Frequencies, TX Power and Modulation Type can now be confgured. The following menu will be shown.
(a) Enter an appropriate TX frequency.
(b) Enter an appropriate \(R X\) frequency.

Note : If using half duplex (ie:different) TX \& RX frequencies the Remote M Series radio must have the opposite frequency settings with respect to the Master.
(c) Change the TX power to 20 dBm .
(d) Select the appropriate modulation - Normally "9600 12.5kHz M-Series"

Note : The modulation setting must be identical in both E Series

Master and M Series Remote radios for correct operation to occur.

This now completes the E Series confguration programming

\section*{Part J - Appendices}

\section*{Appendix A - Firmware Updates} Firmware Update Overview

Firmware updates are performed on a unit connected locally to the PC. It is recommended that all cabling to the unit be disconnected prior to commencing firmware update to minimise any interruption to the process or disturbances of signals on cables still connected. All other TView+ Management Suite utilities should also be exited during the firmware update process.

The procedure to update the firmware is different for both \(E\) Series Generation I and Generation II radios. Please ensure you have the latest release of the TView+ Management Suite before you attempt a firmware upgrade. This can be obtained from the Trio website at http://www.triodatacom.com/scada_supp.php

Firmware Update for E Series Remote Radios Gen II (Serial No 56000 or above)
1. Click on the "E Series Firmware Update" Start the firmware update utility from the TView+ front panel.
2. Connect the TView+ E Series diagnostics/programming cable from the PC Serial (COM) port to the systems port on the radio as shown below. Select the appropriate COM Port if required.

3. Select the "Device Type" as "Radio - E Series Gen II" from the options on the top right of the firmware update main window.
4. Select the file containing the firmware update package using the "Open Firmware Package" button at the bottom of the main window. After opening the file, the browse window will close and a description of the firmware package will appear in the main window.
5. Initiate the firmware updating process using the "Write" button at the bottom of the main window. Another information window will appear. Wait until the firmware update process indicates the firmware update is "Done". The radio is now ready to use.
\begin{tabular}{|c|c|c|c|c|}
\hline \multicolumn{4}{|l|}{-8 TVIEF- Mangerment Suite - Firmmere UpAte Toel} & \\
\hline \multicolumn{5}{|l|}{Ele Hep} \\
\hline \multicolumn{5}{|l|}{} \\
\hline \multirow[t]{6}{*}{Senupgrt COM -} & \multicolumn{3}{|l|}{Dence Tire} & \\
\hline & \multicolumn{3}{|l|}{CRyselErmer-ESeret Oinl} & \\
\hline & \multicolumn{3}{|l|}{2\% Easo-E Series Oent} & \\
\hline & \multicolumn{3}{|l|}{\(\bigcirc\) Exher-ESeses Oenll} & \\
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\hline \multicolumn{4}{|l|}{Destriotion} & \\
\hline \multicolumn{4}{|l|}{} & + \\
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\hline
\end{tabular}

\section*{Firmware Update for E Series Base Station Exciters - Gen II (Serial No 56000 or above)}
1. Click on the "E Series Firmware Update" Start the firmware update utility from the TView+ front panel.
2. Connect the TView+ E Series diagnostics/programming cable from the PC Serial (COM) port to the systems port on the base station front panel. Select the appropriate COM Port if required.
3. Select the "Device Type" as "Exciter - E Series Gen II" from the options on the top right of the firmware update main window.
4. Select the file containing the firmware update package using the "Open Firmware Package" button at the bottom of the main window. After opening the file, the browse window will close and a description of the firmware package will appear in the main window.
5. Initiate the firmware updating process using the "Write" button at the bottom of the main window.
6. Depress the Base Station F/W Update switch on the Front Panel of the Base Station using a suitable probe. This switch is located below the "Display ON/OFF" button and to the left of the Systems Port. In order to depress the switch a small object such as a paperclip is required.

Note: The base station will display all LEDs as AMBER indicating the firmware update is in progress.
7. Another information window will appear. Wait until the firmware update process indicates the firmware update is "Done".
8. Remove DC power to the base station and re-apply power to ensure the base station returns to normal operating mode.

Firmware Update for E Series Remote Radios and Base Station Exciters - Gen I (Serial No 56000 or below)
1. Start the firmware update utility from the TView+ front panel.
2. Disconnect power from the unit by turning off the power supply or removing the power connector to the unit.
3. Connect an E Series Gen I Firmware Update cable from the PC serial (COM) Port to Port B on the radio as shown below.

4. Select the unit type from the options on the top right of the firmware update main window. Please note that "Exciter" refers to the radio contained inside the base station.

Note: The firmware update of a base station exciter will result in the base station flashing all LEDs RED with the fan on. This error condition will only occur whilst the firmware update is in progress.
5. Select the file containing the firmware update package using the "Open Firmware Package" button at the bottom of the main window. After opening the file, the browse window will close and a description of the firmware package will appear in the main window.
6. Initiate the firmware updating process using the "Write" button at the bottom of the main window. Another logging window will appear.
7. Reconnect power to the unit when prompted in the logging window. The status LEDs on the unit including power should all be extinguished and the transfer of firmware should commence. If this does not occur steps 6 \& 7 should be repeated.

Note: Remote radio status LEDs including power will all be off.
8. The logging window will display the progress of each firmware block transferred and when complete a success dialogue box appears. Type OK to close this dialogue box and type "Exit" in the main window to exit the firmware update utility.
9. Disconnect the cable from Port B and re power the unit to enable the new firmware.

\section*{Base Station Display Firmware Update}

\section*{Installation Instructions:}
1. Update of the front panel firmware uses the firmware update utility supplied with the TView+ Management Suite.
2. Start the firmware update utility from the TView+ front panel.
3. In the firmware update utility select device type as "Base Station Front Panel"
4. Select the file containing the firmware update package using the "Open Firmware Package" button at the bottom of the main window. After opening the file the browse window will close and a description of the firmware package will appear in the main window.
5. Ensure that the base station is powered.
6. Connect the "TView+ cable" to the front or rear system port of the base station.
7. On the base station front panel depress and hold the "Display On/Off" button, then momentarily depress the firmware update switch using a suitable probe before releasing the "Display On/Off" button. The firmware update switch is located behind the small hole (not labelled) in the front panel below the "Display On/Off" button.

Note: Display Status LEDs will be lit in this Mode.
8. Initiate the firmware update process using the "Write" button at the bottom of the main window. Another logging window will appear.
9. The logging window will display the progress of each firmware block transferred and when complete a success dialogue box appears. Click OK to close this dialogue box and click "Exit" in the main window to exit the firmware update utility.

Note: If a mismatch occurs between selected file and device type, an error message will appear.
10. Re power the base station to enable the new firmware.

\section*{Hot Standby Controller Firmware Update}

\section*{Installation Instructions:}
1. Update of the hot standby firmware uses the firmware update utility supplied with the TView+ Management Suite.
2. Start the firmware update utility from the TView+ front panel.
3. In the firmware update utility select device type as "Hot Standby Controller".
4. Select the file containing the firmware update package using the "Open Firmware Package" button at the bottom of the main window. After opening the file the browse window will close and a description of the firmware package will appear in the main window.

5. Ensure that the hot standby controller is powered.
6. Connect the "TView+ cable" to the front or rear system port of the hot standby controller.
7. On the hot standby controller front panel, depress and hold the "Reset Alarms" button, then momentarily depress the firmware update switch using a suitable thin probe. Now release the "Reset Alarms" button. The two LEDs either side of the "Select" switch should turn green indicating the hot standby controller is in firmware updating mode.

Note : The firmware update switch is located behind the small hole (not labelled) in the front panel to left of "Reset Alarm" button.
8. Initiate the firmware update process using the "Write" button at the bottom of the main window. Another logging window will appear.
9. The logging window will display the progress of each firmware block transferred and when complete a success dialogue box appears. Click OK to close this dialogue box and click "Exit" in the main window to exit the firmware update utility

Note: If a mismatch occurs between selected file and device type, an error message will appear.
10. Repower the hot standby controller to enable the new firmware.

\section*{Part K - Support Options}

\section*{E-mail Technical Support}

When e-mailing questions to our support staff, make sure you tell us the exact model number (and serial number if possible) of the Trio equipment you are working with. Include as much detail as possible about the situation, and any tests that you have done which may help us to better understand the issue. If possible, please include your telephone contact information should we wish to further clarify any issues.

\section*{Technical Support: Europe, Africa, Middle East}

Available: Monday to Friday 8:30am - 5:30pm
Central Europe Standard Time
Direct Worldwide: +31 (71) 5791655
Email: euro-support@controlmicrosystems.com

\section*{Technical Support: The Americas}

Available: Monday to Friday 8:00am - 6:30pm
Eastern Standard Time
Toll free within North America: 1-888-226-6876
Direct Worldwide: +1 (613) 591-1943
Email: technicalsupport@controlmicrosystems.com

\section*{Technical Support: Asia Pacific}

Available: Monday to Friday 8:30am - 5:30pm
Australian Eastern Standard Time
Direct Worldwide: +61 387730100
Email: support@triodatacom.com

\section*{Schneider \\ Electric}

\section*{Lend Lease}

\title{
SECTION 8
}

\section*{S095 Harrisville Flow Meter}

\section*{Flow Meter Data Sheets}
- CIS Harrisville flowmeter service report
- Combined_m300_manual_REV3April2009
- M300 Service, Calibration report


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Campbell
Instrument

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\title{
Auto Zero M300 Electromagnetic Flowmetering System Operation and Installation Manual
}
(Revision 3: April 2009)
\[
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\]
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Rev 3: April 2009
COMBINEDINSTRUMENT SYSTEMS
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\section*{How to Get Further Assistance}

If further assistance is required please contact your nearest Goyen office at the following addresses or your local distributor (see our web site for details: www.cleanairsystems.com).


When contacting Combined Instruments always have the following information available:

\section*{M300 Flowmetering System}

Instrument Serial Number
Instrument Part Number
Instrument Name and Model
Power supply, voltage and frequency

This information is found on the rating plate of each instrument.

A Product Return Form can be found at the back of this manual.

\section*{General Description}

Congratulations on your purchase of your Australian designed and manufactured Emflux M300 Electromagnetic Flowmeter. The M300 Transmitter is a microprocessor based instrument designed for ease of use and configuration. The M300 has been pre-configured and calibrated to your requirements in our calibration laboratories. However re-ranging and setup may be carried out on site using the front panel display and push buttons or by connecting a PC to the communication port. The menu system has been designed to be user friendly for ease of configuration on site.
All Emflux flowmeter heads will be fitted with a tag detailing calibration details to enable configuring of the M300 Transmitter. These details are obtained from wet calibrations carried out in flow laboratory.
In the event of any problem please contact your nearest Combined Instrument Systems representative or, if more convenient, please do not hesitate to consult our head office technical staff.

Always provide the serial number of your particular system which is located on a label mounted on the transmitter. If more accessible, similar information may be obtained from the Flowmeter Detector Head label.

On taking delivery of your M300 Flowmetering System and prior to installation and operation, we ask you to ensure that you are conversant with the facilities available and precaution to be taken by studying the contents of this manual.
Your Emflux M300 Flowmetering System consists of an electromagnetic detector head (flow tube) which is to be located in the pipework and an electronic amplifier (transmitter).
Many auxiliary instruments may be connected to the M300 Amplifier, for example, chart recorders, flow indicators, etc.

\section*{Important Storage and Installation Points}

In order to ensure satisfactory operation of your Emflux M300 Flowmetering System and to avoid the possibility of rendering the guarantee null and void, please ensure that you comply with the following points.
- When stored or installed the flowmeter head cable terminations must be adequately sealed to avoid the ingress of moisture which could lead to internal damage. Similar precautions should be taken with the containing case glands of the wall mounted weatherproof amplifier.
- Ensure that the transmitter enclosure is sealed and that the unit is stored in a dry environment if it is not to be put into service immediately upon receipt.
- If the flowmeter head is of the submersible type and the cables are not potted, ensure that the cables entering the head terminal compartment are compatible with the glands provided.
Failure to observe this precaution may lead to poor sealing and the ingress of moisture or, in the worst event, flooding of the head interior.
- Ensure that your power supply is compatible with the M300 flowmetering system.
- Your flowmeter head is provided with an insulating lining which extends over the flange faces. Do not drag or roll the unit on its end flanges.
- The lining of the flowmeter head is provided to resist corrosion and has been selected to suit the media passing through the bore. While calibration of your M300 system will not change for other media, care should be taken to ensure that the particular lining material is compatible with any change of media. If in doubt contact your nearest representative.
- The lining of your flowmeter head is electrically insulating to provide correct operation, it does not act as a gasket. you must provide gaskets between the flowmeter lining and the adjacent pipework.
- Locate your flowmeter head in a position such that it remains full of liquid at all times.
- The screened signal cable to your flowmeter head should preferably be run in a conduit or trunking reserved entirely for its use. Under no circumstances should the signal cable be run in close proximity to power cables.
- The media at either end of your flowmeter head must be adequately earthed either by direct means of the pipework, if this is electrically conducting, or by the use of earth discs or earthing electrodes. Earthing electrodes cannot be added once the head is manufactured.
- Do not lift or support your flowmeter head by its case. Use eye bolts or lift from the tube neck using sling and spreader.
- Your flowmeter head has been designed to carry its own weight from the end flanges and thus the adjacent pipework. If supports are required these should locate on the flanges.
- If the media passing through the flowmeter head is particularly abrasive the use of a contra flange on the upstream flange is recommended to prevent damage to the leading edge of the lining.
- If your flowmeter head is provided with a PTFE lining material the protective flange plates should not be removed until the unit is installed. Upon installation ensure that both flanges are clamped symmetrically to avoid distortion of the lining.

\section*{Installation}

\section*{Mechanical Installation of Transmitter}

Check the Flow Test certificate supplied with the meter to ensure the Detector Head (Primary) and the Transmitter (Secondary) have the correct serial numbers. The serial number on the Flow Tube and the serial number on the Transmitter will not necessarily be the same.
Careful consideration to the initial mechanical installation of the amplifier will provide many benefits ensuring ease of access to cable terminations and internal controls.
The transmitter may be surface or panel mounted, refer to Appendix 2 for panel cutout details.
The M300 Transmitter is provided with five gland entries. If however, fewer than five glands are used, extreme care should be taken to ensure that the unused entries are adequately sealed.
Always ensure that the Transmitter enclosure is sealed when the unit is unattended.

\section*{Installation of the Detector Head}

The detector head may be installed at any angle but it is important to ensure that it is completely filled with liquid whilst in use. It is therefore advisable to place the tube in a position where the pipe line is always full, such as a rising main, or when there is no risk of sedimentation, the bottom of a 'U' bend.

When the detector head is mounted in the horizontal, the termination box must be on top. A flow direction arrow is provided to indicate the direction of flow during calibration and to ensure that the terminations are as per the wiring diagram found at the rear of this manual. If installed in this manner there will be no requirement to reverse wires for correct operation. For correct operation it is essential for the flowing liquid to be earthed at both ends of the detector head. The following methods of earthing are available:
Connection to adjacent metallic pipework is fully acceptable providing such pipework does not contain an electrically insulating lining, for example, bitumen. Earth straps are recommended between the pipework flanges and the flowmeter flanges particularly when flexible self sealing couplings are used. Flange bolts do NOT always provide good electrical earth connections between metallic flanges.

If the adjacent pipework is not electrically conducting or is lined with an electrically insulating material, then earth rings or electrodes must be used. These earth rings must be strapped to the detector head Flanges at either end. In the case of earth electrodes there is no need for further termination as this is carried out at the time of manufacturing.
While your detector head is provided with an Insulating lining extending over the flange faces, this does NOT form a gasket. When installing the detector head, gaskets must be provided between the Flowmeter lining and the adjacent pipework flanges. In the case of earth rings or discs, these should also be installed with a gasket either side.
Particular care should be taken to ensure that entrained air cannot accumulate in the flowmeter or be swept through it from surrounding pipework, manifolds, etc. Wherever possible the flowmeter electrodes should be mounted in the horizontal plane. With abrasive slurries, vertical mounting is recommended to ensure even distribution of wear in the lining material. If the slurry is of a particular abrasive material, the use of a contra flange on the upstream flange is recommended to prevent damage to the leading edge of the lining. This contra flange is also used in place of one earth ring or disc.
In order to obtain a smooth flow profile and remove turbulence or swirling flow at the flow meter head, sharp bends and valves used to control the flow should not be placed closer than five pipe diameters from the upstream flange.

Small disturbances to flow, such as may be caused by straight through valves, minor bends and 'T' junctions carrying less than \(20 \%\) of the flow, will have minimal affect on the performance providing they are no closer than three pipe diameters from the upstream flange.


Little affect will be observed by the presence of bends etc on the downstream flange of the detector head. Where reducers are used, steep tapers of greater than \(30^{\circ}\) should be avoided.

Valves should not be placed immediately adjacent to the detector head, however for subsequent removal of the detector head, should this ever be necessary, some thought should be given to the manner in which it may be isolated. For dimensions of the detector heads reference should be made to the relevant outline diagram found at the end of this manual.
Note:
Some government authorities have strict requirements for flowmeter installation that may overrule the above advice. Be certain to consult local authorities prior to commencing installation.

Cables between the Detector Head and converter should be run in conduits for protection, and then up the inside of the converter mounting post. Separate conduits are needed for coil supply, signal and accessories.

\section*{Earthing of Detector Head}

\section*{IR2060 Only}

While your Emflux flow tube detector head is provided with an insulating lining extending over the flange faces, this does NOT form a gasket. When installing the detector head, gaskets must be provided between the flowmeter lining and the adjacent pipework flanges. In the case of earth rings or discs, these should also be installed with a gasket either side.

For correct operation it is essential for the flowing liquid to be earthed at both ends of the detector head. Connection to adjacent metallic pipework is fully acceptable providing such pipework does not contain electrically insulating lining, for example: bitumen. Earth straps are recommended between the pipework flanges and the flowmeter flanges particularly when flexible self sealing couplings are used. Flange bolts do not always provide good electrical earth connections between metallic flanges.


If adjacent pipework is not electrically conducting or is lined with an electrically insulating material, then earth rings or earth electrodes must be used. These earth rings must be strapped to the detector head flanges at either end. In the case of earth electrodes there is no need for further termination as this is carried out at the time of manufacture.


\section*{ABS Plastic Detector Heads and Detector Heads Fitted with Optional Earth Electrodes}

For ABS plastic detector heads there is no need for the installation of earth rings or the need to earth the mating pipe flanges as all ABS Plastic detector heads are fitted with earthing electrodes. This is also the case for detector heads that have the optional earth electrodes fitted.

\section*{Submergence/Burial}

Note that both the IR2020 and IR2060 are suitable for direct burial of the detector head. Be certain that their location is suitably marked or noted to avoid damage due to subsequent digging or trenching operations.
They may also be submerged under water if required. In the case of the IR2060 this may be up to a depth of 10 metres and for the IR2020 up to 1.5 metres.

\section*{Electrical Installation}

The M300 Transmitter will be supplied as either a Mains powered unit (Model M300-M****) which can be powered by either Mains Power \(85-265 \mathrm{VAC} @ 50 \mathrm{~Hz}\), or low voltage 24VDC. Alternatively it may have been supplied as a low voltage only unit (Model M300-L****) which can only be powered by a low voltage 24V DC supply. Low voltage units cannot be wired to AC supply. Before connecting the power supply check all documentation to confirm the correct power supply option has been specified for the Transmiiter unit.
To access the terminal strip for the electrical connections, loosen the four screws and remove the dark grey terminal cover. The layout of the terminals are as detailed in the following diagram. Removal of the terminal cover and electrical installation should only be carried out by suitably qualified personnel.

\footnotetext{
Note: ***** denotes other part number details as per Ordering Details in the Spec Sheet
}

\section*{COMBINED}

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\section*{M300 Transmitter Terminal Layout}


\section*{Transmitter Termination Strip}


\section*{Mains Supply Wiring (Optional)}

Ensure that all unused glands are sealed to prevent the ingress of moisture.
Connect mains power, if supplied as a mains supply unit, to the mains terminals as detailed below:


Use wiring practices that conform to local codes. The ground terminal grounds the instrument which is mandatory for safe operation.

\section*{24Volt Supply (Fully Isolated DC)}

As an alternative to powering the M300 from the mains, low voltage supply terminals have been provided to enable the use of 24 Volts DC to power the unit. The following diagram details the terminations for the 24 Volt supply.

\section*{24 Volt Supply Termination}


The M300 Transmitter may be powered either by mains power or by 24 Volts DC. Do not connect both.

\section*{Detector Head Wiring}

Two cables are to be used for the wiring between the detector head and the M300 Transmitter. One three-core cable having three \(14 / 0.2 \mathrm{~mm}\) cores and provided with an overall braided screen must be used for the connection of the detector head Electrodes to the M300 Transmitter. (Note lapped screening is NOT satisfactory), and

One three-core cable from the pulse power supply (located in the M300 Transmitter) to the detector head. This cable is to be \(1.5^{2} \mathrm{~mm}\) cable for runs up to 100 Metres. Refer to the wiring diagram below for details of the terminations.
The cables entering the detector head must be made by way of a gland to ensure that there is no ingress of moisture. In the case of submerged or buried meters, the termination box must be fully potted.

\section*{M300 to Detector Head Termination}


\section*{Key to wiring diagram}

\section*{Coil colours/numbers}

6 = yellow/green
7 = red
8 = black
1 = green and shield
2 = red
3 = blue
MT = yellow
Note:
The flow tube head junction box may be fully potted. Alternatively, unpotted meters may require wiring termination at both the the flow tube and transmitter ends.
If the unit has been fitted with a Pipe Not Full Electrode (PNF) - there will be an extra terminal connecter (labelled MT) in addition to the standard 6 way terminal block at the detector junction box.

\section*{Detector Head Terminal Strip}


\section*{Detector Head Potted Termination}


Pipe Not Full Detection (Optional)
If your flowmeter was ordered with the optional 'Pipe Not Full Detection' option there will be one additional termination between the head and the M300 Transmitter. A conductor must be connected between the 'MT' terminal of the head and the 'MT' terminal of the transmitter.

If the meter has been supplied with cable fitted at the factory, there will be an additional cable (the same cable as the signal cable) with all but the yellow wire tucked back to the end of the outer insulation. This conductor is the pipe-not-full-conductor.
In the case of these meters, the yellow conductor in the pipe-not-full cable must be connected to the 'MT' terminal of the transmitter.

This option is used to detect if the pipe is \(100 \%\) full or something less than this value and may be used to determine if the flow signal is of valid value or not. In the majority of applications this option is not necessary as flowmeters are generally installed in locations where the pipe remains full at all times.

\section*{Analogue Outputs 4-20mA}

The M300 Transmitter has one \(4-20 \mathrm{~mA}\) output as standard and may be fitted with a second \(4-20 \mathrm{~mA}\) output. Each of these outputs are capable of driving into loads of up to 1000 ohms. An explanation on configuring these outputs may be found later in this manual. For details on their terminations, refer to the following diagrams.
4-20mA Output No. 1 (Standard)


4-20mA Output No. 2 (Optional)


\section*{Digital Outputs (Open-Collector)}

The M300 Transmitter is supplied with two (2) digital outputs. These outputs are isolated opencollector transistors. A 24VDC power supply has been provided on terminals on each side of the terminations for the open-collector transistors. The maximum rating of the open-collector transistors is 100 mA and if an external power supply is used this must not exceed 60VDC.

These outputs have been specifically designed to drive electro-mechanical counters and may also be used as frequency outputs. If these outputs are selected as frequency outputs then the output would have a \(50 \%\) duty cycle, if selected as a pulse output, the pulse width would be set to 25 milliseconds.

An example of termination using the internal supply and external supply is detailed in the following sketches.

\section*{Digital Output 1:}


Digital Output 2:


\section*{Relay Outputs}

Two (2) relay outputs are provided as standard with an option provided an additional two (2) relays. Each relay output provides one (1) voltage free changeover contact. These contacts are identified by the relay number and NO, C and NC identifying the Normally Open, Common and Normally Closed contacts. The diagram below details these terminations.

\section*{COMBINED}

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\section*{Relays 1 \& 3:}


\section*{Relays 2 \& 4:}


The contacts are rated as follows:
1 Amp @ 30VDC
0.5 Amps @ 125VAC
0.3 Amps @ 60VDC

These relays may be sourced with the 24VDC supply provided for the digital outputs, identified as \(\mathrm{V}+\) and V -, however, this supply is only able to provide a maximum of 1 Amp. Exceeding this value may cause damage to the power supply.
NOTE: The 24VDC power supply provided at terminals \(\mathrm{V}+\) and V - has a maximum rating of 1 Amp in total. Please ensure that the Digital Outputs and Relay Outputs combined load does not exceed this value if using this supply. If powered from a 24VDC supply consideration must also be given to the maximum power that this supply can provide.

\section*{Configuration}

The M300 is configurable via the three (3) push buttons found on the front display panel. All parameters are pre-configured in our flow laboratory prior to shipping, however parameters such as relay setpoints, etc, may be altered on site to meet your requirements.

To assist in navigating through the menus you will find a flow chart in Appendix A of this manual.

\section*{Keyboard Up Arrow Button}

The 'Up Arrow Button' is used to move up through the menu system. It is also used to step through the sub \(\neg\) menus and to increment the value currently being displayed once it has been selected.

\section*{Down Arrow Button}

As with the Up Arrow Button, the 'Down Arrow Button' allows movement through the menus and sub-menus only in the opposite direction. It also allows the user to decrement the currently displayed value once it has been accepted.

\section*{Tick Button}


The 'Tick Button' has several functions. Depressing this button whilst in the display mode will transfer the user to the configuration menu where the user will be asked for a PIN (Personnel Identification Number). Once in the configuration menu the Tick Button is used to enter the displayed menu item or to accept the displayed numerical value. You will note that an asterisk (*) is displayed alongside the currently configured menu selection or value.

TIP: If you have entered into a menu that you do not wish to change, simply move to the item or numerical value, using the Up or Down buttons, that has the asterisk (*) along side it and again depress the Tick Button.

\section*{Exiting the Configuration Menu}


To Return to the display menu simply depress both the Up and Down Arrow buttons simultaneously. The M300 will also return to the display menu automatically if no button is depressed for five minutes. For ease of configuration, if the configuration menu is re-entered within the five minutes the user will be returned the last displayed configuration menu item.

\section*{Display Menu}

\section*{Forward Flow Display}

The display menu enables the operator to view current information relating to the flow and configuration of the flowmeter.
The default display indicates the flow rate on the upper line of the display and the totalised units on the lower line of the display. The flow rate is displayed with the configured units following the actual flow rate (eg, \(123.45 \mathrm{l} / \mathrm{sec}\) ). The totalised value is displayed as a numerical value followed by the configured units. The units will also cycle to not only display the units but also the factor and the direction (eg, \(12345678 \mathrm{kl}, 12345678 \times 10,12345678\) FWD).

Note that the FWD is only displayed if reverse flow has been configured with the FWD representing the forward flow totaliser.

\section*{Reverse Flow Display}

Using the Down Arrow Button will display the next display item. This display would indicate the current flow rate on the upper line as for the above display and the reverse flow totaliser on the lower line. The display method is identical as for the forward flow display with the exception that the totaliser would cycle to indicate a REV representing the reverse flow totaliser. This display is only available if reverse flow has been enabled in the configuration of the M300 Transmitter.

\section*{Nett Totaliser Display}

This display is used to display the difference between the forward flow totaliser and the reverse flow totaliser. The upper line of the display will display the words Nett Total with the lower line displaying the numerical value for nett flow. This display is only available if reverse flow and nett flow is enabled in the configuration menu.

\section*{Velocity Display}

The velocity display again displays the flow rate on the upper line of the display with the lower line displaying the measured velocity based on the nominal bore of the flowmeter. The velocity is displayed in either \(\mathrm{m} / \mathrm{sec}\) (meters per second) or \(\mathrm{ft} / \mathrm{sec}\) (feet per second) and is depended on the configured units. ie if a metric value of measurement is used for indicating the flow rate (e.g. l/sec) then the display will be in \(\mathrm{m} / \mathrm{sec}\) however if an imperial unit is used (e.g. gpm) then the display will be in \(\mathrm{ft} / \mathrm{sec}\).

\section*{Analogue Output Display}

This display uses the upper and lower lines to indicate the current value of the analogue outputs. This display is in actual mA.

\section*{Digital Output Display}

This screen displays the current value of the digital outputs. If the output has been configured as a frequency output then the current output value is displayed in Hz . However, if Volume/Pulse has been selected then the display simply flashes the word 'Vol/Pulse' for that output. Line one(1) is used to display output 1 whilst line two(2) displays output 2.

\section*{Relay Outputs Display}

The flow rate is displayed on the upper line with the current status of the relays displayed on the lower line. The status of the relays is displayed as R\#, with \# representing the relay number, if the relay is currently energised and three (3) dashes if the relay is de-energised. This display is valid for relays that are configured as a status. The following example shows a display with relays one (1) and three (3) energised with relays two (2) and four (4) de-energised:

\section*{Example:}
\[
1234.56 \mathrm{I} / \mathrm{sec}
\]
R1 --- R3 ---

\section*{Configuration Menu}

To enter the configuration menu simply depress the Tick Button as explained earlier in this manual. Here, the user will be able to use the up and down arrow buttons to scroll through the menu items. These menu items are only accessible once a Personnel Identification Number (PIN) has been entered.

To gain access to the displayed menu item, depress the Tick Button, this will allow the use of the Up and Down Arrow buttons to scroll through the available menu items or to increment or decrement the stored numerical value.
To accept the displayed value, depress the Tick Button again which will place an asterisk (*) along side the selection and enable the Up and Down Arrow buttons to again scroll through the menu items.
To exit the configuration menu depress the Up and Down Arrow buttons simultaneously.
Following is a description of each configuration menu item:

\section*{Enter Access PIN}

Use the Up and Down arrow buttons to display the Menu Access PIN. Once displayed accept the value with the tick button. If the correct PIN is entered a brief display of 'Access Granted' will be viewed giving access to the configuration menu otherwise a message of 'Access Denied' will be displayed returning the user to the display menu.

The default PIN is 121.

\section*{Pipe Size Units}

This menu item allows the selection of either millimetres or inches and is used in conjunction with selecting the nominal pipe size of the flowmeter.

\section*{Pipe Size}

This menu item allows use of the arrow buttons to select the nominal pipe diameter. This diameter may be found on the name plate of the flowmeter detector head.

\section*{Flow Tube Factor}

This factor is determined in our flow laboratory under actual flow conditions and is the calibration factor for the particular detector head. This value is stamped on the detector head name plate.

\section*{Flow Tube Zero}

This factor is also found on the name plate of the detector head and is a calibration factor.

\section*{Display Units}

This menu allows the selection of the flow rate engineering units. The following table lists the available units:
\begin{tabular}{|l|l|c|c|c|c|}
\hline \multirow{2}{*}{ Units } & \multicolumn{2}{|c|}{ Description } & \multicolumn{4}{|c|}{ Time Base (t) } \\
\hline & & Sec & Min & Hr & Day \\
\hline I/(t) & Litres per (t) & \(\checkmark\) & \(\checkmark\) & & \\
\hline \(\mathrm{m}^{3 /(t)}\) & Cubic metres per (t) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) \\
\hline \(\mathrm{kL} /(\mathrm{t})\) & Kilolitres per (t) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) \\
\hline \(\mathrm{ML} /(\mathrm{t})\) & Megalitres per (t) & & & & \(\checkmark\) \\
\hline \(\mathrm{cu} \mathrm{ft/(t)}\) & Cubic feet per (t) & \(\checkmark\) & \(\checkmark\) & \(\checkmark\) & \\
\hline Imp G/(t) & Imperial Gallons per (t) & & \(\checkmark\) & & \\
\hline US G/(t) & US Gallons per (t) & & \(\checkmark\) & & \\
\hline US MG/(t) & US Megagallons per (t) & & & & \(\checkmark\) \\
\hline Acre ft/(t) & Acre feet per (t) & & & & \(\checkmark\) \\
\hline
\end{tabular}

\section*{Low Flow Cut Off}

This parameter is set as a percentage of full scale and is settable in the range of 0 to \(10 \%\) in \(0.1 \%\) increments. Flows less than this value are not totalised. The analogue and digital outputs are also set to zero flow.

\section*{Response Time}

This parameter sets the damping or response time of the rate indicator and is entered as a numerical value. The higher the value the more damping. The dynamic range of this parameter is 2 to 100 in steps of 1 .

\section*{Coil Frequency}

This sets the frequency of the coil excitation. The shipping value for this parameter is 16 Hz and will be suitable for the majority of applications.

\section*{Digital Output 1}

Each of the Digital Outputs (Open Collector) may be configured as either a frequency output or a pulse output. Selecting frequency output automatically sets a duty cycle of \(50 \%\) for the output. (ie equal on and off time) where as selecting pulse output sets the on time to approximately 25 milliseconds.

\section*{Fullscale Frequency 1}

Adjustable range is -1000 to 1000 Hz . Setting this value to a negative number allows the digital output to represent reverse flow. (eg setting this value to -500 would set the output frequency to a range of 0 to 500 Hz when flow is in the range of 0 to fullscale flow in the reverse direction. Flow in the forward direction would set the output to 0 Hz )

\section*{Volume/Pulse 1}

This value allows the operator to set the number of totaliser units that each output pulse represents. This method of setting the digital output is useful for a remote electro-mechanical counter. Do not exceed 20 pulses/second.

\section*{Digital Output 2}

As per Digital Output 1 but relates to Digital Output 2.

\section*{Fullscale Frequency 2}

As per Fullscale Frequency 1 but relates to Digital Output 2.

\section*{Volume/Pulse 2}

As per Volume/Pulse1 but relates to Digital Output 2.

\section*{Fullscale 4-20 1}

This parameter is used to set the flow rate value that 20 mA is to represent. 4 mA always represents a flow rate of 0 . Setting a negative value will enable the operator to have this output representing reverse flow.

\section*{Fullscale 4-20 2}

As per Fullscale 4-20 1 but pertaining to 4-20mA output 2 .

\section*{Display Digits}

This menu enable the user to select between having four(4) or five(5) significant digits for the display of flow rate.

\section*{Totaliser Units}

Selects the units that the user wishes to display the totaliser. The following units are available:

Litres
\(\mathrm{m}^{3}\)
kL
ML
cu. ft
Imp Gallons
US Gallons
US MGallons
Acre ft

Litres
Cubic Metres
Kilolitres
Megalitres
Cubic Feet
Imperial Gallons
US Gallons
US Megagallons
Acre Feet

\section*{Totaliser Scaling}

This menu item allows the selection of a scaling factor to be applied to the totaliser units. e.g. The user may wish each count of the totaliser to represent 10 kL units. The user would therefore select kL as a totaliser unit and x 10 as a scaling factor. Note that the maximum totaliser frequency must not exceed 20 Hz . The available factors are:
x 10000
x 1000
\(\times 100\)
\(\times 10\)
\(\times 1\)
\(\times 0.1\)
\(\times 0.01\)
\(\times 0.001\)

\section*{Zero Totaliser}

This menu enables the operator the facility to reset the totalisers. Selecting 'Yes' from this menu will ask for confirmation. Pressing the Tick button will now reset the totalisers whilst pressing one of the arrow buttons will leave the totalisers unchanged. A brief message will appear on the screen stating whether or not the totalisers were cleared.

\section*{Flow Full Scale}

This is a numerically entered value that is displayed in the selected display units. Once selected with the Tick button the user is able to use the Up and Down Arrow buttons to increment and decrement the numeric value until the desired full scale is displayed. Accept this value, as with all menu items, with the Tick button.
NOTE: It is only possible to set the full scale flow rate to a value that is equivalent to a flow velocity of 0.5 to 10 Metres per second.

\section*{Fail Safe Mode}

This parameter enables the operator to set the failsafe conditions of the outputs of the M300 Transmitter. i.e. If the M300 detects an error it will set the outputs to the nominated condition. This is true for all outputs with the exception of the system fault (refer to relays) output. This relay output, if selected, will energise on a fault.
The choices for this parameter is either 'Low on Fail' or 'High on Fail'.

\section*{Reverse Flow}

Enabling reverse flow will include the display of the Reverse Flow Totaliser when in the display mode. Disabling this function will cause the reverse flow totaliser not to be displayed.

\section*{Nett Flow}

This menu item is only displayed if 'Reverse Flow' is enabled and allows the operator to select either enable or disable. Enabling nett flow will enable the Nett Flow Totaliser to be displayed in the display menu. This function is the nett value of the forward flow totaliser less the reverse flow totaliser.

\section*{Relay Setup (1, 2, 3, 4)}

This parameter allows the operator to select the function of the relay. The relay is normally de-energised, energising when the condition is true. The operator may select one of the following conditions:
- LoFlow
- HiFlow
- System Fault
- Fwd Totaliser
- Rev Totaliser
- Reverse Flow
- Forward Flow
- Pipe Not Full

\section*{Relay On, Relay Off (1)}

These menu items are only displayed if either a LoFlow or HiFlow has been selected for Relay 1 otherwise these items are skipped.
The 'On' and 'Off' values are set in flow rate units.
NOTE: In the case of a 'LoFlow' it is not possible to set the 'Off' value below the 'On' value. ie, if the 'On' value has been set to \(20 \mathrm{I} / \mathrm{sec}\), then the 'Off' value must be greater than \(20 \mathrm{I} / \mathrm{sec}\). In the case of a 'HiFlow' the 'On' value must be above the 'Off' value.

\section*{Relay On, Relay Off (2, 3, 4)}

As per Relay 1 above. Please note that these menu items will only be displayed if either a LoFlow or HiFlow is selected for that corresponding relay.

\section*{Simulation Value}

This value is entered as a percentage (\%) of flow full scale. eg, if flow full scale was set to 150 litres/second and the Simulation Value was set to \(30 \%\) then the displayed value, totaliser and outputs would drive to a value that is equivalent to 45 litres/second when enabled(refer to the next menu item).

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\section*{Simulation}

This parameter is used in conjunction with the above menu item. When enabled the simulation value is used as the flow calculation.

NOTE: When simulation is enabled, the totaliser values are written to memory. When disabled the original totaliser values are restored. This feature allows testing of the instrument without accumulating counts on the totaliser.

\section*{Troubleshooting}

The M300 Transmitter and detector head have been tested in our flow laboratory prior to shipment. However if you do experience problems please note the serial number of the instrument prior to contacting either Combined Instrument Systems Pty Ltd. The serial number may be found either on the metal label located on the detector head or on a label between the terminal cover and the display enclosure.

\section*{Display is blank}
- Check the supply voltage.
- Check fuse if mains powered M300 Transmitter and replace if necessary.
- If using a 24 V Supply, down power and wait 30 seconds, reapply supply.
- Ensure there are no short circuits across the \(\mathrm{V}+\) and V - terminals. Check that there is not a short circuit across the coil terminals 7 and 8 .

\section*{Message 'Coil Open cct' is displayed}

This message indicates that there is no current being supplied to the coil. Down power the M300 and check the wiring between the transmitter and the detector head.

\section*{Display is erratic and does not indicate zero}
- Detector may not be full of liquid. Ensure pipe is full.
- Check electrode wiring between M300 transmitter and the detector head.

\section*{Display does not respond to flow}
- Check that the M300 is not in 'Simulate' mode. Removing the power for 30 seconds will automatically return the instrument to flow monitor mode.
- Check wiring between the transmitter and detector head.
- Check that there is flow in the pipe and that the pipe is full of liquid.

\section*{Flow rate indicates reverse flow}
- Check orientation of wiring between M300 and detector head.
- Check flow direction arrow on detector head.
- Reverse wires in the M300 terminals 'Flow' 2 and 3.

\section*{4-20mA Output 1 or 2 operates but indicates incorrectly}
- Check that load does not exceed 1000 ohms.
- Check the configuration to ensure that the output is configured correctly.
(Fullscale \(4-20 \mathrm{~mA} 1\) or 2)

\section*{4-20mA Output 2 reads zero milliamps}

The second output is an option. Check to ensure that it was ordered. This option may be added if required.

\section*{Display has no back lighting}

The display back lighting automatically turns off after a pre-set time, if no buttons have been depressed. Press either the up or down arrow keys to turn on the back lighting.

\section*{Specification}
\begin{tabular}{|c|c|}
\hline Display: & 2 Line \(\times 16\) Digit LCD display with software switched back lighting \\
\hline Power Supply: & \(24 \mathrm{VDC} \pm 10 \%\) (fully isolated and regulated DC) 95 to 260 VAC 50 Hz (Optional) \\
\hline Power Consumption: & Less than 25VA \\
\hline Outputs: & \begin{tabular}{l}
\(1 \times 4-20 \mathrm{~mA}\) ( \(2 \times 4-20 \mathrm{~mA}\) Optional) Isolated \(2 \times\) Digital Output (Open Collector) Programmable pulse or frequency \\
\(2 \times\) Relay Outputs ( \(4 \times\) Relay Outputs Optional)
\end{tabular} \\
\hline Open Collector Rating: & 100 mA 60VDC \\
\hline Relay Rating: & \begin{tabular}{l}
1 amp @ 30 VDC \\
0.5 amps @ 125 VAC \\
0.3 amps @ 60 VDC
\end{tabular} \\
\hline 4-20mA Max. Load: & 1000 Ohms \\
\hline Measuring Range: & Up to 10 metres per second. \\
\hline Turndown: & >1000:1 at 10 metres per second \\
\hline Input Resolution: & 18 Bit \\
\hline Linearity: & <0.005\% \\
\hline Repeatability: & <0.05\% \\
\hline Accuracy: & \(0.2 \%\) of reading or 0.001 metres per second, whichever is greater. \\
\hline Ambient Temperature: & \(-10^{\circ}\) to \(55^{\circ} \mathrm{C}\) \\
\hline Temperature Stability: & <0.05\% \\
\hline Supply Voltage Effects: & Negligible \\
\hline M300 to Detector Head Separation: & Maximum 100 metres \\
\hline
\end{tabular}

\section*{M300 Menu Flowcharts}


\section*{COMBINED}

\section*{M300 Menu Flowcharts (continued)}


2

\section*{COMBINED}

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\section*{M300 Menu Flowcharts (continued)}


\section*{COMBINED}

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\section*{M300 Menu Flowcharts (continued)}


\section*{COMBINED}

INSTRUMENT SYSTEMS

\section*{M300 Menu Flowcharts (continued)}


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\section*{M300 Menu Flowcharts (continued)}


\section*{M300 Transmitter Enclosure Detail}


EM Detector Head Dimensions


EM/IR2060 Series Fabricated Steel Welded Submersible Housing


\section*{Equipment Returned for Testing or Repair}

Your product has been manufactured and tested with care. It should not present any problems if it is installed, maintained and operated in accordance with the manual provided. However, if you need to return your product for testing or repair, please help us by supplying all the requested information to facilitate the speedy repair and return of your equipment.
Tyco Environmental Systems will only test and repair returned products when all the required information regarding substances that have come into contact with the product, is supplied. This information is required to safeguard the health and safety of our personnel and to comply with environmental legislation.
To ensure that your product is serviced, and particularly if the product was operated with toxic, caustic, flammable, biohazard or water-endangered substances it is required that:
1. You ensure all surfaces do not contain traces of hazardous substances, and that you rinse or neutralise before shipping the product.
2. You include the Product Certificate on the following page with the product, to confirm that it is safe for us to handle and service.

If a quotation is required, an inspection charge may apply. If the quotation is accepted the inspection fee will cover the first hour of labour.
To commence testing or repairs the Product Certificate and a purchase order are required along with your product.
Please contact your local sales or service representative regarding return of goods for repair.

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\section*{Notes}

\section*{Product Certificate}

\section*{Company Details}

Company: \(\qquad\)
Address: \(\qquad\)
\(\qquad\)
Contact: \(\qquad\)
Phone: ............................................................. Fax: \(\qquad\)

\section*{Product Details}

Product: \(\qquad\)
Model No.: Serial No.: \(\qquad\)
Date Purchased:
Detailed description of fault: \(\qquad\)
\(\qquad\)
\(\qquad\)
\(\qquad\)

\section*{Safety Checks}

This product has been operated with the following liquid and possible contaminants:
\(\qquad\)
\(\qquad\)
The liquid is:

We have:
\(\square\) Checked that it is free from these substances
\(\square\) Flushed out and neutralised all surfaces

\section*{I confirm that there is no risk to humans or environment through any residual contaminant on this product.}

Signature:
Date:

\section*{Service/ Callibration Report 8616}

Service - Workshop
22 Palmerin Street, Warwick. QLD. 4370
Email: Robert, Briggs (@pentalr.com
Service - Victoria
295 Benalla Road, Shepparton, VIC. 3630
Mob: 0400049483
Email: Ryan.Lindsay@@pentair.com

Customer / Service Details

Lend Lease Infrastructure Services-Rocklea
39 Suscatand Street
Rocklea
QLD
Tim Bowman
Quotation:
Drder Number

GRA 3922 M300 S/N 09856
Date of Manufacture/Last Service: 01-Sep-97
Date Received: 02-Jul-13
Type Of Service: Service
Status: Dispatched
Dispatch Date: 15-Jul-13
PCB \#: EC108980
Exchange PCB\#:
Display PCB \#: EC121644
Display PCB Exchange\#:

Fault Found

Faulty Analog Output
Reading approx 140 mA
Faulty shorted transistor ón Analog board Check Calibration
Faulty \(4-20 \mathrm{~mA}\) output
NOTE: ENSURE EQUIPMENT THAT THE 4-20mA LOOP
IS CONNECTED TO IS NOT SOURCING LOOP POWER
AS THIS MAY DAMAGE CURRENT OUTPUT.
M300 4-20mA OUTPUT SOURCES OWN POWER.

\section*{Repair Action}

Replace faulty transistor Q1, BC337A
on \(4-20 \mathrm{~mA}\) Analogue Output board
Check ADC reference voltage
Calibrate and check on all functions
Set coil current
Test \(4-20 \mathrm{~mA}\)
Test Relays
Test Pipe Not Full

Calibration Detalls
\begin{tabular}{ll} 
ADC Ref: & 9.913 \\
Coil Current: & 500 \\
5ignal Input: & PASS \\
4-20mA \#1 O/P: & PASS \\
4-20mA \#2 O/P: & N/A \\
Digital \#1 O/P: & PASS \\
Digital \#2 O/P: & N/A \\
Relay \#1 O/P: & PASS \\
Relay \#2 O/P: & PASS \\
Relay \#3 O/P: & N/A \\
Relay \#4 O/P: & N/A \\
Flow Sim mV: & 6.3028
\end{tabular}

\section*{Calbration Equipment}

EQ-0442 / Agilent U1252A \# TW48160186 / CAL N/A
EQ-0427 / SEW Megger \# 9652093 / CAL - NA
EQ-0439 / TES Flow 5IM \# 1004 / CAL \# NA / CAL Due 2.11.2013

\section*{M300 PARAMETER LIST}
\begin{tabular}{ll} 
Serial No: & 9856 \\
Model No: & M300-M-1A-2R-F-R
\end{tabular}

CIS Ref No:
\begin{tabular}{llll} 
PARAMETER & SELECTION & PARAMETER & SELECTION \\
& & & \\
PIN: & 121 & Pipe Size Units: & mm \\
Pipe Size: & 150 & Flow Tube Factor: & 9.119 \\
Flow Tube Zero: & -0.0007 & Display Units: & l/sec \\
Display Digits: & 4 & Totaliser Units: & kL \\
Totaliser Scaling: & x1 & Totaliser Zeroed: & No \\
Flow Full Scale: & 100 & Low Flow Cut Off: & 0.5 \\
Response Time: & 15 & Coil Frequency: & 16.0 \\
Digital Output 1: & Volume/Pulse & Digital Output 1 fsd: & 1 \\
Digital Output 2: & Volume/Pulse & Digital Output 2 fsd: & 1 \\
Pulse Width: & 100 & & \\
Fullscale 4-20 1: & 100 & & - \\
Fail Safe Mode: & Low & Cullscale 4-20 2: & - \\
Coil Off Time: & - & Reverse Flow: & Disabled \\
Nett Flow: & - & & \\
Relay 1 Setup: & System Fault & Relay 2 Setup: & System Fault \\
Relay 3 Setup: & - & Relay 4 Setup: & - \\
Relay 1 On: & - & Relay 2 On: & - \\
Relay 1 Off: & - & Relay 2 Off: & - \\
Relay 3 On: & - & Relay 4 On: & - \\
Relay 3 Off: & - & Relay 4 Off: & - \\
Simulation Value: & & Simulation: & Disabled
\end{tabular}

\section*{M300 FACTORY CALIBRATION PARAMETER LIST}
\begin{tabular}{ll} 
Serial No: & 9856 \\
Model No: & M300-M-1A-2R-F-R
\end{tabular}

M300-M-1A-2R-F-R

\section*{SELECTION PARAMETER}

3275
Calibrate 4-20 1:
9.913

Empty Pipe Detect:
Field Comp. 100\%:
Relays Fitted:
Enable Tot. Zero:
Median Filter:

Disabled
0
2
No
Off

Calibrate 4-20 2:
Cleaning Signal:
Set Coil Current:
Field Comp. 50\%:
4-20 Fitted:
Mains Frequency:

\section*{SELECTION}
-

Enabled 1435
0
1
50 Hz

> Switch \(1=\mathrm{Off}\)
> Switat \(2=\mathrm{O}\)
> Switch \(3=\mathrm{Off}\)
> Switch \(4=\mathrm{Off}\)```


[^0]:    3 3S0016 - Harrisville Flowmeter Functional Specification.Docx

[^1]:    3S0016-CONTROL 5YSTEM FAT - S095 HARRISVILLEx

[^2]:    | QUU CONTROL SYSTEM SAT | Lend Lease Job: 3S0016 | Page 3 of 12 |
    | :--- | :--- | :--- |

[^3]:    * Items with 4 screw cover - not hinged

[^4]:    Note: ***** denotes other part number details as per Ordering Details in the Spec Sheet

[^5]:    Notes: $\left.\quad{ }^{1}\right)$ Add coil voltage, standard voltages AC 24, 32, 110, 240, 415 V 50 Hz .
    $\left.{ }^{2}\right)$ Add coil voltage, standard voltages DC 24, 36, 48, 110 and 240 V DC.
    ${ }^{3}$ ) Other contact blocks type CA 7-P can be used providing terminal numbers are acceptable (refer CA 7 contactor auxiliaries Section 1).

[^6]:    Notes: $\quad{ }^{1}$ ) Auxiliary contact ratings only. For base relay ratings refer to CS 7 rating on page 8-4.
    ${ }^{2}$ ) Add coil voltage, standard voltages 24, 110, 240 V 50 Hz .
    ${ }^{3}$ ) Add coil voltage, standard voltage 24 V DC. Other voltages available on request.

[^7]:    Our dedicated Service Team are on call, easy
    to access, and are importantly experts in their own right, able to understand the challenges which need to be worked through to compete and be successful in the global market.

    Take the guesswork out of your project.
    Think Sales Service and Support. Think NHP.

[^8]:    Notes: i Available on indent only.

[^9]:    * valid for colour variants

[^10]:    A WARNING
    Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous. Substitution of components may impair suitability for Class I, Division 2. Refer to Articles 500 through 502 of the National Electrical Code (NFPA 70) and Section 18 of CSA C22.1 for further information on hazardous locations and approved Division 2 wiring methods.

