

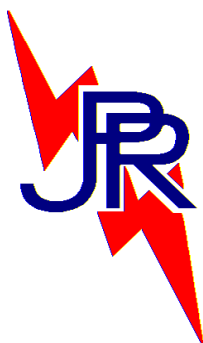
# **QUEENSLAND URBAN UTILITIES**

## **LUGGAGE POINT WASTEWATER TREATMENT PLANT PST No.6**

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### **ELECTRICAL SWITCHBOARD OPERATION AND MAINTENANCE MANUAL**

**Developed by:**



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## 1 PLC

- GE Fanuc – **RX3i-IC695CPU310CA** – CPU
- GE Fanuc – **RX3i-IC695PSD140CA** – 24VDC PLC Power Supply
- GE Fanuc – **RX3i-IC695CHS012CA** – 12 Slot Backplane
- GE Fanuc – **RX3i-IC694MDL645CA** – 16pt Digital Input Module
- GE Fanuc – **RX3i-IC694MDL940CA** – 16pt Digital Output Module



## PACSystems™ RX3i Controller

The new PACSystems™ RX3i controller is the latest addition to the innovative PACSystems family of programmable automation controllers (PACs). Like the rest of the family, the PACSystems RX3i features a single control engine and universal programming environment to provide application portability across multiple hardware platforms and deliver a true convergence of control choices. Using the same control engine as the PACSystems RX7i, the new PACSystems RX3i offers a high level of automation functionality in a compact, cost-effective package. The PACSystems portable control engine provides high performance on several different platforms, allowing OEMs and end users with application variability to choose the exact control system hardware that best suits their needs.

### PACSystems RX3i Benefits:

The innovative technology of the PACSystems RX3i enables users to:

- Address major engineering and business issues, such as higher productivity and tighter cost control
- Boost the overall performance of their automation systems
- Reduce engineering and commissioning costs
- Easily integrate new technology into installed base systems
- Significantly decrease concerns regarding short- and long-term migration and platform longevity

### PACSystems RX3i Features:

- High-speed processor and patented technology for faster throughput without information bottlenecks
- Dual backplane bus support per module slot:
  - High-speed, PCI-based for fast throughput of new advanced I/O
  - Serial backplane for easy migration of existing Series 90-30 I/O
- Intel 300 MHz CPU for advanced programming and performance with 10Mbytes memory
- Memory for ladder logic documentation and machine documentation (Word, Excel, PDF, CAD and other files) in the controller to reduce downtime and improve trouble shooting.
- Open communications support including Ethernet, GENIUS®, Profibus™, DeviceNet™ and serial
- Supports high density discrete I/O, universal analog (TC, RTD, Strain Gauge, Voltage and Current configurable per channel), isolated analog, high-density analog, high-speed counter, and motion modules

- Expanded I/O offering with extended features for faster processing, advanced diagnostics and a variety of configurable interrupts
- Hot insertion for both new and migrated modules
- Isolated 24 VDC terminal for I/O modules and a grounding bar that reduces user wiring

### Protecting Users' Installed Investment:

Like the rest of the PACSystems family, the PACSystems RX3i is designed for easy integration with installed hardware systems

- Seamless migration path for GE Fanuc customers
- Protection for each user's investment in both I/O and applications development
- Power for users of all control systems to leverage as much of their installed automation investment as possible

### Universal Development Environment:

The common software platform across all of GE Fanuc controllers, award-winning Proficy™ Machine Edition™ software provides the universal engineering development environment for programming, configuration and diagnostics for the entire PACSystems family.

- Programming tools such as tag-based programming, a library of reusable code and a test edit mode for improved online troubleshooting
- User-friendly environment that can increase design flexibility and improve engineering efficiency and productivity





## Ordering Information

	Part Number	Description	Part Number	Description
Controllers	IC695CPU310*	300Mhz CPU, 10Mbytes of memory, two serial ports (requires 2 slots)	IC695CMU310	Redundant High Availability 300Mhz CPU, 10Mbytes of memory, two serial ports
Universal Controller and I/O Base	IC695CHS012	Universal Backplane, 12 Universal Slots	IC695CHS016	Universal Backplane, 16 Universal Slots
Expansion Bases	IC693CHS393	Base, Remote Expansion, 10 Slots (700 ft.)	IC694CHS398	Base, Expansion, 5 Slots
	IC694CHS392	Base, Expansion, 10 Slots	IC693CHS399	Base, Remote Expansion, 5 Slots (700 ft.)
Universal Base Power Supplies	IC695PSA140	Multipurpose Power Supply, 120/240 VAC, 40 watts	IC695PSD140	Multipurpose Power Supply, 24 VDC, 40 watts
	IC695PSA040*	Power Supply, AC, 40 Watts (requires 2 slots)	IC695PSD040*	Power Supply, 24 VDC, 40 Watts (requires 1 slot)
Remote Base Power Supplies	IC693PWR332	Power Supply, 12 VDC, Standard, 30 Watts (Use with Expansion Base)	IC693PWR328	Power Supply, 48 VDC, Standard, 30 Watts (Use with Expansion Base)
Expansion Power Supplies	IC694PWR321	Power Supply, 120/240 VAC, 125 VDC, Standard, 30 Watts (Use with Expansion Base)	IC693ACC340	Redundant Power Supply Base (RPSB) with 0.1 meter cable to connect to Power Supply Adapter Module (Use with Expansion Base)
	IC694PWR330	Power Supply, 120/240 VAC, 125 VDC, High Capacity, 30 Watts (Use with Expansion Base)	IC693ACC341	Redundant Power Supply Base with 0.5 meter cable to connect to Power Supply Adapter Module (Use with Expansion Base)
	IC694PWR331	Power Supply, 24 VDC, High Capacity, 30 Watts (Use with Expansion Base)	IC693ACC350	Redundant Power Supply Adapter (RPSA) Module. The RPSA replaces the power supply on a CPU base or expansion base and connects to a Redundant Power Supply Base. (Use with Expansion Base)
Discrete Input Modules	IC694MDL230	120 VAC Isolated Input (8 Points)	IC694MDL634	24 VDC Input, Neg/Pos Logic (8 Points)
	IC694MDL231	240 VAC Isolated Input (8 Points)	IC694MDL645	24 VDC Input, Neg/Pos Logic (16 Points)
	IC694MDL240	120 VAC Input (16 Points)	IC694MDL646	24 VDC Input, Neg/Pos Logic, 1 msec Filter (16 Points)
	IC694MDL241	24 VAC/VDC Input (16 Points)	IC694MDL654	5/12 VDC (TTL) Input, Neg/Pos Logic, (32 Points)
	IC694MDL250	120 VAC Isolated Input (16 Points)	IC694MDL655	24 VDC Input, Neg/Pos Logic, 1 ms, (32 Points)
	IC694MDL260	120 VAC Input (32 Points)**	IC694MDL660	24 VDC Input (32 Points)**
	IC694MDL632	125 VDC Input (8 Points)	IC694ACC300	Input Simulator Module (8 Points)
Discrete Output Modules	IC694MDL310	120 VAC Output, 0.5 Amp (12 Points)	IC694MDL740	12/24 VDC Output, 0.5 Amp, Positive Logic (16 Points)
	IC694MDL330	120/240 VAC Output, 2 Amp (8 Points)	IC694MDL741	12/24 VDC Output, 0.5 Amp, Negative Logic (16 Points)
	IC694MDL340	120 VAC Output, 0.5 Amp (16 Points)	IC694MDL742	12/24 VDC Output, 1 Amp, Positive Logic (16 Points), Fused
	IC694MDL350	120/240 VAC Output, 2 Amp (16 Points)	IC694MDL752	5/12/24 VDC (TTL) Output, Negative Logic, (32 Points)
	IC694MDL390	120/240 VAC Isolated Output, 2 Amp (5 Points)	IC694MDL753	12/24 VDC Output, Positive Logic (32 Points)
	IC694MDL732	12/24 VDC Output, 0.5 Amp, Positive Logic (8 Points)	IC694MDL754	24 VDC Output w/ ESCP, 0.75 Amp (32 Points)**
	IC694MDL734	125 VDC Output (6 Points)		
Relay Output Modules	IC694MDL930	Relay Output, Isolated, 4 Amp (8 Points)	IC694MDL940	Relay Output, 2 Amp (16 Points)
Analog Input Modules	IC694MDL931	Relay Output, 8 Amp Form B/C contacts, Isolated in 2 Groups of 4 (8 Points)		
	IC694ALG200	Analog Input, Voltage/Current, 4 Channels	IC695ALG608	Analog Input, Voltage/Current, Configurable, 8 Channels
	IC694ALG221	Analog Input, Current, 4 Channels	IC695ALG616	Analog Input, Voltage/Current, Configurable, 16 Channels
	IC694ALG222	Analog Input, Voltage 16 Single/8 Differential Channels	IC695ALG628	Analog Input with HART Communications, Voltage/Current, Configurable, 8 Channels
	IC694ALG223	Analog Input, Current, 16 Single Channels	IC695ALG626	Analog Input with HART Communications, Voltage/Current, Configurable, 16 Channels
Analog Output Modules	IC695ALG600**	Analog Input, Universal, Voltage/Current/RTD/TC/Strain Gauge, 8 Channels*		
	IC694ALG390	Analog Output, Voltage (2 Channels)	IC695ALG704	Analog Output, Voltage/Current (4 Channels)
	IC694ALG391	Analog Output, Current (2 Channels)	IC695ALG708	Analog Output, Voltage/Current (8 Channels)
	IC694ALG392	High Density Analog Output (8 Channels)	IC695ALG728	Analog Output with HART Communications, Voltage/Current (8 Channels)
Mixed Analog Modules	IC694ALG442	Analog Combo Module (4IN/2OUT)		
Motion Modules	IC693APU305	I/O Processor Module	IC694DSM314	Digital Servo Motion Controller, 1-2 Axis of Digital Servo or 1-4 Axis Analog Servo
	IC694APU300	High Speed Counter (HSC)	IC694DSM324	Digital Servo Motion Controller, 4-Axis (Fiber Optic Interface to Amplifiers)
Communications Modules	IC694BEM331	Genius Bus Controller (Supports I/O and Datagrams)	IC695PBS301*	Profibus Slave Module
	IC694DNM200	DeviceNet Master Module	IC695ETM001*	Ethernet Module, 10/100 base T/TX ports (requires 1 slot)
	IC695PBM300*	Profibus Master Module		
Expansion Modules	IC695LRE001*	Local Expansion Module (requires no universal slots)	IC693NIU004	Ethernet Remote I/O Interface for IC694CHSxxx Expansion Racks
	IC695NKT001	Ethernet Remote I/O Expansion Kit		
Terminal Blocks	IC694TBB032	High Density Terminal Block Box Style (36 Terminals)	IC694TBS032	High Density Terminal Block Spring Style (36 Terminals)
Accessories	IC693ACC302	High Capacity Battery Pack (mounts externally)	IC693CBL312	Rack to Rack Expansion Cable, 0.15 Meters, Shielded
	IC693CBL300	Rack to Rack Expansion Cable, 1 Meter	IC693CBL313	Rack to Rack Expansion Cable, 8 Meters
	IC693CBL301	Rack to Rack Expansion Cable, 2 Meters	IC693CBL314	Rack to Rack Expansion Cable, 15 Meters, Shielded
	IC693CBL302	Rack to Rack Expansion Cable, 15 Meters	IC694ACC310	Blank Filler Module
Programming and Troubleshooting Tools	IC646MPP001	Logic Developer - PLC Professional	IC646MPH101	Logic Developer PDA Software Tool with Cable Adapter

Availability varies per module, please check with your GE Fanuc representative for release dates and availability.

\*Compatible with IC695CHS 012/016 base only.

\*\*Requires either Box Style (IC694TBB032) or Spring Clamp (IC694TBS032) high density terminal block.

### GE Fanuc Automation Information Centers

Americas:  
1 800 GE FANUC or 434 978 5100

Asia Pacific:  
86 21 3222 4555

Europe, Middle East and Africa:  
800 1 GE FANUC or 800 1 4332682  
or 1 780 401 7717

Europe, Middle East and Africa (CNC):  
352 727979 1

### Additional Resources

For more information, please visit  
the GE Fanuc web site at:

[www.gefanuc.com](http://www.gefanuc.com)



# Chapter *Introduction*

## 1

This manual contains general information about PACSystems CPU operation and program content. It also provides detailed descriptions of specific programming requirements.

Chapter 1 provides a **general introduction** to the PACSystems family of products, including new features, product overviews, and a list of related documentation.

**CPU hardware features and specifications** are provided in chapter 2.

**Installation procedures** are described in the *PACSystems RX7i Installation Manual*, GFK-2223 and the *PACSystems RX3i Installation Manual*, GFK-2314.

**CPU Configuration** is described in chapter 3. Configuration using the programming software determines characteristics of module operation and establishes the program references used by each module in the system.

**Ethernet Configuration** for the embedded RX7i Ethernet interface is described in chapter 4. (For details on PACSystems Ethernet communications and configuration of the RX7i and RX3i Ethernet Interface modules, refer to *TCP/IP Ethernet Communications for PACSystems*, GFK-2224.)

**CPU Operation** is described in chapter 5.

**Programming Features** are described in chapters 6 through 10 and Appendix A.

- Elements of an Application Program: chapter 6
- Program Data: chapter 7
- Ladder Diagram instruction set reference: chapter 8
- Function Block Diagram instruction set reference: chapter 9
- The Service Request Function: chapter 10
- The PID Function: chapter 11
- Structured Text: chapter 12

**Ethernet and Serial Communications** are described in chapter 13.

**Serial I/O, SNP, and RTU Protocols** are described in chapter 14.

**Fault Handling** is described in chapter 15.

**Instruction Timing** is provided in appendix A.

**User Memory Allocation** is described in Appendix B.

**Converting Applications from Series 90 to PACSystems** is discussed in appendix C, which also summarizes operational differences between the PACSystems and Series 90 control systems.

## New Features

**Note:** A given feature may not be implemented on all PACSystems CPUs. To determine whether a feature is available on a given CPU model and firmware version, please refer to the *Important Product Information* (IPI) document provided with the CPU.

### *New RX7i CPUs*

Two new hot standby (HSB) redundancy CPUs, IC698CRE030 and IC698CRE040, with Pentium-M microprocessors and embedded Ethernet interface modules are available. For features and specifications, refer to chapter 2.

### *Production of EGD Exchanges in Backup Mode (HSB Redundancy Systems)*

If the Redundant IP feature is enabled, both the primary and secondary controllers can produce selected Ethernet Global Data (EGD) exchanges in either active or backup mode. The primary and secondary controllers produce the selected exchanges simultaneously, but with unique exchange IDs. This feature is intended for use with ENIU-controlled remote I/O stations, which can simultaneously consume EGD exchanges from two controllers.

## PACSystems Control System Overview

The PACSystems controller environment combines performance, productivity, openness and flexibility. The PACSystems control system integrates advanced technology with GE Fanuc's existing systems. The result is seamless migration that protects your investment in I/O and application development.

Machine Edition programming software provides a universal engineering development environment for all programming, configuration and diagnostics of PACSystems. A PACSystems CPU is programmed and configured using the programming software to perform real time control of machines, processes, and material handling systems. The CPU communicates with I/O and smart option modules through a rack-mounted backplane. It communicates with the programmer and/or HMI devices via the Ethernet ports (may be embedded for RX7i) or via the serial ports 1 and 2 using GE Fanuc SNP-X, Serial I/O, or Modbus RTU slave protocols.

*PACSystems CPU Models*

<b>Family</b>	<b>Catalog Number</b>	<b>Description</b>
RX3i CPUs	IC695CPU310	300MHz Celeron CPU, 10 MB user memory
	IC695NIU001	300MHz Celeron NIU. For information, see the <i>PACSystems RX3i Ethernet NIU User's Manual</i> , GFK-2439
RX7i CPUs with embedded Ethernet Interface	IC698CPE010	300MHz, Celeron CPU, 10MB user memory
	IC698CPE020	700MHz, Pentium CPU, 10 MB user memory,
	IC698CPE030	600MHz, Pentium-M CPU, 64MB user memory
	IC698CPE040	1800MHz, Pentium-M CPU, 64MB user memory
RX7i Redundancy CPUs with embedded Ethernet Interface	IC698CRE020	700MHz, Pentium CPU, 10 MB user memory
	IC698CRE030	600MHz, Pentium-M CPU, 64MB user memory
	IC698CRE040	1800MHz, Pentium-M CPU, 64MB user memory

PACSystems CPU models have the following features in common:

- Programming in Ladder Diagram and C.
- Floating point (real) data functions.
- Configurable data and program memory.
- Battery-backed RAM for user data (program, configuration, register data, and symbolic variable) storage
- Non-volatile built-in flash memory for user data (program, configuration, register data, and symbolic variable) storage. Use of this flash memory is optional.
- Battery backup for program, data, and time of day clock.
- Configurable Run/Stop mode switch.
- Embedded RS-232 and RS-485 communications.
- Up to 512 program blocks. Maximum size for a block is 128KB.
- Auto Located Symbolic Variables, which allows you to create a variable without specifying a reference address.
- Bulk memory area accessed via reference table %W. The upper limit of this memory area can be configured to the maximum available user RAM.
- Larger reference table sizes, compared to Series 90 CPUs: 32Kbits for discrete %I and %Q and up to 32K words each for analog %AI and %AQ.
- Online Editing mode that allows you to easily test modifications to a running program. (For details on using this feature, refer to the programming software online help and *Proficy™ Logic Developer – PLC Getting Started*, GFK-1918.)
- Bit in word referencing that allows you to specify individual bits in a WORD reference in retentive memory as inputs and outputs of Boolean expressions, function blocks, and calls that accept bit parameters.
- In-system upgradeable firmware.

## *RX3i Overview*

The RX3i control system hardware consists of an RX3i universal backplane and up to seven Series 90-30 expansion or remote racks. The CPU can be in any slot in the universal backplane except the last slot, which is reserved for the serial bus transmitter, IC695LRE001.

The RX3i supports user defined Function Blocks (LD logic only) and Structured Text programming.

The RX3i universal backplane uses a dual bus that provides both:

- High-speed, PCI for fast throughput of new advanced I/O.
- Serial backplane for easy migration of existing Series 90-30 I/O

The RX3i universal backplane and Series 90-30 expansion/remote racks support the Series 90-30 Genius Bus Controller and Motion Control modules, and most Series 90-30/RX3i discrete and analog I/O with catalog prefixes IC693 and IC694. RX3i modules with catalog prefixes IC695, including the Ethernet and other communications modules can only be installed in the universal backplane. See the *PACSystems RX3i System Manual*, GFK-2314 for a list of supported modules.

RX3i communications features include:

- Open communications support includes Ethernet, and serial protocols. The Ethernet Interface (resides in a backplane slot) has dual RJ-45 ports connected through an auto-sensing switch. This eliminates the need for rack-to-rack switches or hubs. The Ethernet Interface supports upload, download and online monitoring, and provides 32 SRTP channels and allows a maximum of 48 simultaneous SRTP server connections. For details on Ethernet Interface capabilities, refer to *TCP/IP Ethernet Communications for PACSystems*, GFK-2224.
- The RX3i supports PROFIBUS communications via the PROFIBUS Master module. For details, refer to the *PACSystems RX3i PROFIBUS Modules User's Manual*, GFK-2301.
- Two serial ports, one RS-232 and one RS-485.

## *RX7i Overview*

The RX7i control system hardware consists of an RX7i rack and up to seven Series 90-70 expansion racks. The CPU resides in slot 1 of the main rack. RX7i racks use a VME64 backplane that provides up to four times the bandwidth of existing VME based systems, including the current Series 90-70 systems for faster I/O throughput. The VME64 base supports all standard VME modules including Series 90-70 I/O and VMIC modules.

Expansion racks support Series 90-70 discrete and analog I/O, the Genius Bus Controller, and the High Speed Counter. The CPU provides an embedded auto-sensing 10/100 Mbps half/full duplex Ethernet interface.

RX7i supports hot standby (HSB) CPU redundancy, which allows a critical application or process to continue operating if a failure occurs in any single component. A CPU redundancy system consists of an active unit that actively controls the process and a backup unit that is synchronized with the active unit and can take over the process should it become necessary. Each unit must have a redundancy CPU, (IC698CRE020, CRE030 or CRE040). The redundancy communication path is provided by

IC698RMX016 Redundancy Memory Xchange (RMX) modules set up as redundancy links. For details on the operation of an RX7i redundancy system, refer to the *PACSystems Hot Standby CPU Redundancy User's Guide*, GFK-2308.

**Note:** Extended operation with dissimilar CPU types is *not allowed*. During normal operation, the primary and secondary units in an HSB redundancy system must have the same CPU model type.

The primary and secondary units of an HSB redundancy system can have dissimilar model types for a limited time, for the purpose of system upgrade only. Fail wait times for the higher performance CPU in a dissimilar redundant pair may need to be increased to allow synchronization.

RX7i communications features include:

- Open communications support includes Ethernet, Genius, and serial protocols.
- A built-in 10/100mb Ethernet interface that has dual RJ-45 ports connected through an auto-sensing switch for upload, download and online monitoring. This eliminates the need for rack-to-rack switches or hubs. The CPU Ethernet Interface provides basic remote control system monitoring from a web browser and allows a combined total of up to 16 web server and FTP connections. For details on Ethernet Interface capabilities, refer to *TCP/IP Ethernet Communications for PACSystems*, GFK-2224.
- Two serial ports, one RS-232 and one RS-485.
- An RS-232 isolated Ethernet station manager serial port.

## *Migrating to PACSystems*

The PACSystems control system provides cost-effective expansion of existing systems. Support for existing Series 90 modules, expansion racks and remote racks protects your hardware investment. You can upgrade on your timetable without disturbing panel wiring.

- The RX3i supports most Series 90-30 modules, expansion racks, and remote racks. For a list of supported I/O, Communications, Motion, and Intelligent modules, see the *PACSystems RX3i Installation Manual*, GFK-2314.
- The RX7i supports most existing Series 90-70 modules, expansion racks and Genius networks. For a list of supported I/O, Communications, and Intelligent modules, see the *PACSystems RX7i Installation Manual*, GFK-2223.
- Conversion of Series 90-70 and Series 90-30 programs preserves existing development effort.
- Conversion of VersaPro and Logicmaster applications to Machine Edition allows smooth transition to PACSystems.

## *Getting Help*

If you need technical help, technical support can be reached as described below.

### *Technical Support for Control System Components Described in this Manual*

If you purchased this product through a GE Fanuc Authorized Channel Partner, please contact them directly. Otherwise, contact GE Fanuc Customer Care at:

Customer Care Hotline Toll free: 800-GE FANUC (800-433-2682)

International Americas direct dial: 780-401-7700

Other International contact info: [www.gefanuc.com](http://www.gefanuc.com)

Technical Support Email: [support@gefanuc.com](mailto:support@gefanuc.com)

Customer Care Email: [customer.care@gefanuc.com](mailto:customer.care@gefanuc.com)

Web Support [www.gefanuc.com](http://www.gefanuc.com)

## *PACSystems Documentation*

### *PACSystems Manuals*

*PACSystems CPU Reference Manual, GFK-2222*  
*TCP/IP Ethernet Communications for PACSystems, GFK-2224*  
*Station Manager for PACSystems, GFK-2225*  
*PACSystems C Toolkit User's Guide, GFK-2259*  
*Proficy Machine Edition Logic Developer-PLC Getting Started, GFK-1918*

### *RX3i Manuals*

*PACSystems RX3i Hardware and Installation Manual, GFK-2314*  
*DSM324i Motion Controller for PACSystems RX3i and Series 90-30, GFK-2347*  
*PACSystems RX3i PROFIBUS Modules User's Manual, GFK-2301*  
*PACSystems RX3i MAXON Software User's Manual, GFK-2409*  
*PACSystems RX3i Ethernet NIU User's Manual, GFK-2439*

### *RX7i Manuals*

*PACSystems RX7i Hardware and Installation Manual, GFK-2223*  
*PACSystems RX7i User's Guide to Integration of VME Modules, GFK-2235*  
*PACSystems RX7i Memory Xchange Modules User's Manual, GFK-2300*  
*PACSystems CPU Redundancy Manual, GFK-2308*  
*Genius Bus Controller User's Manual, GFK-2017*  
*Analog Input, 64 Channel, 16bit IC697VAL264 Module User's Guide, GFK-2056*  
*Analog Output, 32 Channel, 12bit IC697VAL301 Module User's Guide, GFK-2058*  
*Analog Input, Isolated, 16 Channel IC697VAL132 Module User's Guide, GFK-2060*  
*Digital Input IC697VDD100 Module User's Guide, GFK-2062*  
*Relay Output, 64 Point IC697VDR151 Module User's Guide, GFK-2063*  
*Digital Output, 64 Point IC697VDQ120 Module User's Guide, GFK-2066*  
*Eight Channel RTD/Strain Gauge IC697VRD008 Module User's Guide, GFK-2098*

### *Series 90 Manuals*

*Series 90 Programmable Coprocessor Module and Support Software, GFK-0255*  
*Series 90 PLC Serial Communications Driver User's Manual, GFK-0582*  
*C Programmer's Toolkit for Series 90 PLCs User's Manual, GFK-0646*  
*Installation Requirements for Conformance to Standards, GFK-1179*  
*TCP/IP Ethernet Communications for the Series 90 PLC Station Manager Manual, GFK-1186*  
*Series 90-70 Programmable Controller Installation Manual, GFK-0262*  
*Series 90-70 CPU Instruction Set Reference Manual, GFK-0265*  
*Series 90-30 Genius Bus Controller, GFK-1034*  
*Series 90-30 CPU Instruction Set Reference Manual, GFK-0467*  
*Ethernet NIU User's Manual, GFK-2296*  
*Genius I/O System User's Manual, GEK-90486-1*  
*Genius I/O Analog and Discrete Blocks User's Manual, GEK-90486-2*

In addition to these manuals, datasheets and product update documents describe individual modules and product revisions. The most recent PACSystems documentation is available on the GE Fanuc website: <http://www.gefanuc.com/>.



*Chapter**2**CPU Features and Specifications*


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This chapter provides details on the hardware features of the PACSystems CPUs and their specifications.

*Common CPU Features**Firmware Storage in Flash Memory*

The CPU uses non-volatile flash memory for storing the operating system firmware. This allows firmware to be updated without disassembling the module or replacing EPROMs. The operating system firmware is updated by connecting a PC compatible computer to the module's serial port and running the software included with the firmware upgrade kit.

*Operation, Protection, and Module Status*

Operation of the CPU can be controlled by the three-position Run/Stop switch or remotely by an attached programmer and programming software. Program and configuration data can be locked through software passwords. The status of the CPU is indicated by the CPU LEDs on the front of the module. (On the RX7i CPUs, seven LEDs indicate the status of the Ethernet interface.) For details, see "Indicators" for each PACSystems family.

**Note:** The RESET pushbutton is provided to support future features and has no effect on CPU operation in the current version.

*Ethernet Global Data*

Each PACSystems CPU supports up to 255 simultaneous EGD pages across all Ethernet interfaces in the PLC. EGD pages must be configured in the programming software and stored into the CPU. The EGD configuration can also be loaded from the CPU into the programming software. Both produced and consumed pages can be configured. PACSystems CPUs support the use of only part of a consumed EGD page, and EGD page production and consumption to the broadcast IP address of the local subnet.

The PACSystems CPU supports 2msec EGD page production and timeout resolution. EGD pages can be configured for a production period of 0, indicating the page is to be produced every output scan. The minimum period for these "as fast as possible" pages is 2msec.

During EGD configuration, PACSystems Ethernet interfaces are identified by their Rack/Slot location.

## RX3i Features and Specifications

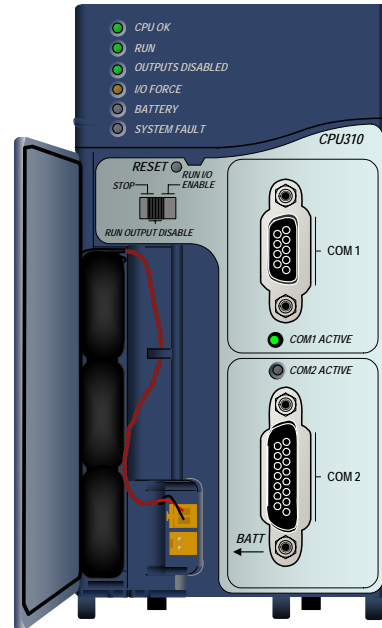
- IC695CPU310: 300 MHz CPU microprocessor

### Serial Ports

The CPU has two independent, on-board serial ports, accessed by connectors on the front of the module. Ports 1 and 2 provide serial interfaces to external devices. Either port can be used for firmware upgrades. For serial port pin assignments and details on serial communications, refer to chapter 12.

### Indicators

The eight CPU LEDs indicate the operating status of various CPU functions. LED operation is described in the following table.



*CPU LED Operation*

<b>LED State</b>			<b>CPU Operating State</b>
● On	✚ Blinking	○ Off	
●	<b>CPU OK</b>	On	CPU has passed its powerup diagnostics and is functioning properly.
○	<b>CPU OK</b>	Off	CPU problem. RUN and OUTPUTS ENABLED LEDs may be blinking in an error code pattern, which can be used by technical support for troubleshooting. This condition and any error codes should be reported to your technical support representative.
✚	<b>CPU OK, OUTPUTS ENABLED, RUN</b>	Blinking in unison	CPU is in boot mode and is waiting for a firmware update through a serial port.
●	<b>RUN</b>	On	CPU is in Run mode
○	<b>RUN</b>	Off	CPU is in Stop mode.
●	<b>OUTPUTS ENABLED</b>	On	Output scan is enabled.
○	<b>OUTPUTS ENABLED</b>	Off	Output scan is disabled.
●	<b>I/O FORCE</b>	On	Override is active on a bit reference.
✚	<b>BATTERY</b>	Blinking	Battery is low. For estimated battery life under various conditions, refer to page 2-13.
●	<b>BATTERY</b>	On	Battery is dead or not attached.
●	<b>SYSTEM FAULT</b>	On	CPU is in Stop/Faulted mode because a fatal fault has occurred.
✚	<b>COM1</b>	Blinking	Signal activity on port.
	<b>COM2</b>	Blinking	

\*After initialization sequence is complete.

## Specifications – CPU310

For environmental specifications, see Appendix A of the *PACSystems RX3i System Manual*, GFK-2314.

Battery: Memory retention	For estimated battery life under various conditions, see “Battery Life Estimates.”
Program storage	Up to 10 Mbytes of battery-backed RAM 10Mbyte of non-volatile flash user memory
Power requirements	+3.3 VDC: 1.25 Amps nominal +5 VDC: 1.0 Amps nominal
Operating Temperature	0 to 60°C (32°F to 140°F)
Floating point	Yes
Boolean execution speed, typical	0.195ms per 1000 Boolean contacts/coils
Time of Day Clock accuracy	Maximum drift of $\pm 2$ seconds per day
Elapsed Time Clock (internal timing) accuracy	$\pm 0.01\%$ maximum
Embedded communications	RS-232, RS-485
Serial Protocols supported	Modbus RTU Slave, SNP, Serial I/O
Backplane	Dual backplane bus support: RX3i PCI and 90-30-style serial
PCI compatibility	System designed to be electrically compliant with PCI 2.2 standard
Program blocks	Up to 512 program blocks. Maximum size for a block is 128KB.
Memory (For a detailed listing of memory areas, refer to chapter 7.)	%I and %Q: 32Kbits for discrete %AI and %AQ: configurable up to 32Kwords %W: configurable up to the maximum available user RAM Managed memory ( <i>Symbolic and I/O variables combined</i> ): configurable up to 10 Mbytes

## Battery Life Estimates

To avoid loss of RAM memory contents, routine maintenance procedures should include scheduled replacement of the CPU's lithium battery pack. The following table lists estimates of battery life that can be used to develop a battery replacement schedule.

### Nominal IC698ACC701 Battery Pack Installed Life

Controller	Average Temperature	Nominal Life with Applied Power On:	
		100% of the Time	0% of the Time
IC695CPU310	20°C (68°F)	5 years	40 days

The IC698ACC701 battery pack has a nominal shelf life of 5 years when stored at an average temperature of 20°C (68°F).

**Note:** An external Auxiliary Battery Module, IC693ACC302, can be used to provide long-term battery backup for any PACSystems CPU. For details, refer to the datasheet for the Auxiliary Battery Module, GFK-2124.

GE Fanuc Automation  
**Programmable Control Products**

# PACSystems™ RX3i

System Manual

GFK-2314C

October 2005



## Warnings, Cautions, and Notes as Used in this Publication

### Warning

Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use.

In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

### Caution

Caution notices are used where equipment might be damaged if care is not taken.

### Note

Notes merely call attention to information that is especially significant to understanding and operating the equipment.

This document is based on information available at the time of its publication. While efforts have been made to be accurate, the information contained herein does not purport to cover all details or variations in hardware or software, nor to provide for every possible contingency in connection with installation, operation, or maintenance. Features may be described herein which are not present in all hardware and software systems. GE Fanuc Automation assumes no obligation of notice to holders of this document with respect to changes subsequently made.

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# Chapter *Introduction*

## 1

This chapter is an overview of PACSystems™ RX3i products and features. The rest of the manual describes PACSystems RX3i products in detail, and explains installation procedures.

**Chapter 2, Installation** explains how to set up and install RX3i equipment.

**Chapter 3, Backplanes** describes RX3i Universal and Serial Expansion Backplanes.

**Chapter 4, Power Supplies** describes RX3i Power Supplies for use in Universal and Serial Expansion Backplanes.

**Chapter 5, Serial Bus Transmitter Module and Expansion Cables** describes the module and cables used to connect a Universal Backplane with Expansion or Remote Backplanes.

Chapters 6 to 12 provide detailed descriptions, specifications, and wiring diagrams for modules that can be used in RX3i systems:

**Chapter 6, Discrete Input Modules**

**Chapter 7, Discrete Output Modules**

**Chapter 8, Discrete Mixed Modules**

**Chapter 9, Analog Input Modules**

**Chapter 10, Analog Output Modules**

**Chapter 11, Analog Modules with HART Communications**

**Chapter 12, Analog Mixed Modules**

**Chapter 13, Universal Analog Module**

**Chapter 14, Special-Purpose Modules**

**Chapter 15, High-density Terminal Blocks**

Additional information is provided in these appendixes:

**Appendix A, Introduction**

**Appendix B, I/O Cables for 32-Point Modules**

**Appendix C, Calculating Heat Dissipation**

**Appendix D, Cable Shield Clamping Assembly**

For more information about RX3i products, please refer to the manuals listed below.

GFK-2222B	PACSystems CPU Reference Manual
GFK-2224A	TCP/IP Ethernet Communications for PACSystems
GFK-2225A	PACSystems Station Manager User's Manual

## *PACSystems RX3i*

The PACSystems™ RX3i controller is a member of the PACSystems family of programmable automation controllers (PACs). Like the rest of the PACSystems family, the RX3i features a single control engine and universal programming environment to provide application portability across multiple hardware platforms.

### ***PACSystems RX3i Features***

- High-speed processor and patented technology for faster throughput
- A Universal backplane that supports 2 different backplane busses per module slot:
  - High-speed, PCI-based for fast throughput of new advanced I/O
  - Serial backplane for RX3i serial modules and easy migration of Series 90-30 I/O
- Celeron (Pentium® III) 300 MHz CPU for advanced programming and performance with 10 Megabytes of memory
- Memory for ladder logic documentation and machine documentation in the controller to reduce downtime and improve troubleshooting.
- Open communications support
- Variety of discrete, analog, and special-purpose modules.
- Hot insertion in both the PCI Backplane and Serial Backplane for both new and migrated I/O modules
- Isolated 24 VDC terminal for I/O modules and a grounding bar that reduces user wiring

### ***Programming and Configuration***

PACSystems equipment is configured and programmed using Machine Edition software, Machine Edition features a common user interface across product families and drag-and-drop editing. Machine Edition also includes a built-in Web server for real-time data delivery during system operation. For more information about programming and configuration, see the *PACSystems CPU Reference Manual*, GFK-2222.

### ***Migration from Series 90-30 to PACSystems RX3i***

PACSystems RX3i is designed to facilitate migration of Series 90-30 PLC systems and equipment. System migration is discussed in detail in Appendix C of the *PACSystems CPU Reference Manual* GFK-2222, revision B or later.

## *Modules for RX3i Systems*

The tables in this section list the types of modules that can be included in an RX3i system:

- RX3i Modules (IC695)
- RX3i Modules (IC694)
- Series 90-30 Modules (IC693)

### ***RX3i Modules (IC695)***

These modules must be installed in a Universal (IC695) Backplane.

<b>Description</b>	<b>Catalog Number</b>
<b>CPU, Ethernet, Expansion</b>	
RX3i CPU, 300 MHz, 10 Megabytes of Memory	IC695CPU310
RX3i Power Supply, 120/240 VAC, 125VDC 40 Watts	IC695PSA040
RX3i Power Supply, 24 VDC, 40 Watts	IC695PSD040
RX3i Power Supply, 24 VDC, 40 Watts, Multi-purpose	IC695PSD140
RX3i 120/240 VAC, 125 VDC, 40 Watt, Multi-Purpose Power Supply	IC695PSA140
RX3i Serial Bus Transmitter Module	IC695LRE001
RX3i Ethernet Module	IC695ETM001
RX3i Universal Analog Input Module, 8 Channels	IC695ALG600
RX3i 8-Channel Non-isolated, 4-Channel Differential Analog Input Module	IC695ALG608
RX3i 16-Channel Non-isolated, 8-Channel Differential Analog Input Module	IC695ALG616
RX3i Analog Input Module, 16 Channel Non-Isolated / 8 Channel Differential, HART Communications	IC695ALG626
Analog Input Module, 8 Channel Non-Isolated / 4 Channel Differential, HART Communications	IC695ALG628
RX3i 4-Channel Non-isolated Analog Output Module	IC695ALG704
RX3i 8-Channel Non-isolated Analog Output Module	IC695ALG708
RX3i Output Analog Current/Voltage 8 Channels, HART Communications	IC695ALG728
RX3i Profibus Master Module	IC695PBM300

## ***RX3i Modules (IC694)***

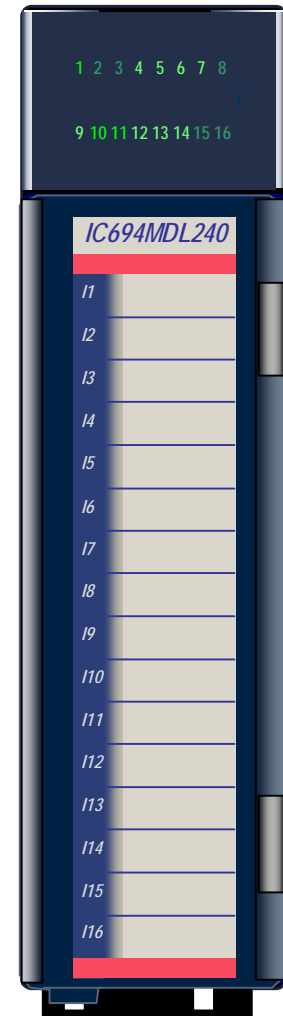
IC694 modules are compatible with the RX3i serial bus in Universal Backplanes and RX3i Serial Expansion Backplanes. A wide range of discrete, analog, and special-purpose IC694 modules is available. A typical RX3i I/O module is shown at below.

Most I/O modules feature point LEDs, a removable terminal strip, and a fully-hinged door with an insertable label. The module's wiring diagram is printed on the back of the label. Field wiring can be secured at the bottom of the module using tie-downs.

Some high-density modules have connectors on the front instead of removable terminals.

Descriptions and specifications for the RX3i modules are provided in this manual.

<b>Description</b>	<b>Catalog Number</b>
<b>Discrete Input Modules</b>	
RX3i Input Simulator Module	IC694ACC300
RX3i Input 120 VAC 8 Point Isolated	IC694MDL230
RX3i Input 240 VAC 8 Point Isolated	IC694MDL231
RX3i Input 120 VAC 16 Point	IC694MDL240
RX3i Input 24 VAC 16 Point	IC694MDL241
RX3i Input 120 VAC 16 Point Isolated	IC694MDL250
RX3i Input 120 VAC 32 Point Grouped	IC694MDL260
RX3i Input 125 VDC 8 Point Pos/Neg Logic	IC694MDL632
RX3i Input 24 VDC 8 Point Pos/Neg Logic	IC694MDL634
RX3i Input 24 VDC 16 Point Pos/Neg Logic	IC694MDL645
RX3i Input 24 VDC 16 Point Pos/Neg Fast	IC694MDL646
RX3i Input 5/12 VDC (TTL) 32 Point Pos/Neg	IC694MDL654
RX3i Input 24 VDC 32 Point Pos/Neg	IC694MDL655
RX3i Input High-density 24VDC 32 Point	IC694MDL660



*continued*

***RX3i Modules (IC694)****continued*

<b>Description</b>	<b>Catalog Number</b>
<b><i>Discrete Output Modules</i></b>	
RX3i Output 120 VAC 0.5 A 12 Point	IC694MDL310
RX3i Output 120/240 VAC 2 A 8 Point	IC694MDL330
RX3i Output 120 VAC 0.5 A 16 Point	IC694MDL340
RX3i Output 124/240 VAC Isolated 16 Point	IC694MDL350
RX3i Output 120/240 VAC 2 A 5 Point Isolated	IC694MDL390
RX3i Output 12/24 VDC 0.5 A 8 Point Positive Logic	IC694MDL732
RX3i Output 125 VDC 1 A 6 Point Isolated Pos/Neg	IC694MDL734
RX3i Output 12/24 VDC 0.5 A 16 Point Positive Logic	IC694MDL740
RX3i Output 12/24 VDC 0.5 A 16 Point Negative Logic	IC694MDL741
RX3i Output 12/24 VDC 1 A 16 Point Positive Logic ESCP	IC694MDL742
RX3i Output 5/24 VDC (TTL) 0.5 A 32 Point Negative Logic	IC694MDL752
RX3i Output 12/24 VDC 0.5 A 32 Point Positive Logic	IC694MDL753
RX3i Output High-density 24VDC 32 Point	IC694MDL754
RX3i Output Relay N.O. 4 A 8 Point Isolated	IC694MDL930
RX3i Output Relay N.C. and Form C 3 A 8 Point Isolated	IC694MDL931
RX3i Output Relay N.O. 2 A 16 Point	IC694MDL940
<b><i>Discrete Mixed Modules</i></b>	
RX3i High Speed Counter Module GFK-0293	IC694APU300

***RX3i Modules (IC694)****continued*

<b>Description</b>	<b>Catalog Number</b>
<b>Analog Input Modules</b>	
RX3i Input Analog 4pt Voltage	IC694ALG220
RX3i Input Analog 4pt Current	IC694ALG221
RX3i Input Analog 16sgl/8diff Voltage	IC694ALG222
RX3i Input Analog 16sgl Current	IC694ALG223
<b>Analog Output Modules</b>	
RX3i Output Analog 2pt Voltage	IC694ALG390
RX3i Output Analog 2pt Current	IC694ALG391
RX3i Output Analog Current/Voltage 8pt	IC694ALG392
<b>Analog Mixed I/O Modules</b>	
RX3i Analog Combination Current/Voltage 4in/2out	IC694ALG442
<b>Special Purpose Modules</b>	
RX3i Special I/O Processor	IC694APU305
RX3i I/O Link Interface Module	IC694BEM320
RX3i I/O Link Master Module	IC694BEM321
RX3i FIP Bus Controller 1M	IC694BEM340
RX3i FIP Bus Controller 2.5M	IC694BEM341
RX3i DeviceNet Master Module	IC694DNM200
RX3i DSM314 Motion Controller	IC694DSM314
RX3i DSM324 Motion Controller	IC694DSM324

## Series 90-30 (IC693) Modules for RX3i Systems

The following 90-30 modules are compatible with the RX3i serial bus in Universal Backplanes and RX3i Serial Expansion Backplanes and 90-30 Expansion Backplanes.

<i>Description</i>	<i>Catalog Number</i>	<i>Minimum Revision Supported</i>	<i>CE Mark Approved</i>
<b>Discrete Input Modules</b>			
Series 90-30 Input Simulator Module	IC693ACC300	A	D
Series 90-30 Input 120 VAC 8 Point Isolated	IC693MDL230	A	C
Series 90-30 Input 240 VAC 8 Point Isolated	IC693MDL231	A	E
Series 90-30 Input 120 VAC 16 Point	IC693MDL240	A	E
Series 90-30 Input 120 VAC 16 Point Isolated	IC693MDL250	A	
Series 90-30 Input 120 VAC 32 Point Grouped	IC693MDL260	A	
Series 90-30 Input 24 VAC 16 Point	IC693MDL241	A	D
Series 90-30 Input 125 VDC 8 Point Pos/Neg Logic	IC693MDL632	A	D
Series 90-30 Input 24 VDC 8 Point Pos/Neg Logic	IC693MDL634	A	C
Series 90-30 Input 24 VDC 16 Point Pos/Neg Logic	IC693MDL645	A	D
Series 90-30 Input 24 VDC 16 Point Pos/Neg Fast	IC693MDL646	A	C
Series 90-30 Input 48 VDC 16 Point Pos/Neg Fast	IC693MDL648	A	B
Series 90-30 Input 5/12 VDC (TTL) 32 Point Pos/Neg	IC693MDL654	A	E
Series 90-30 Input 24 VDC 32 Point Pos/Neg	IC693MDL655	A	E
Series 90-30 Input High-density 24VDC 32 Point	IC693MDL660		
Series 90-30 Output 120 VAC 0.5 A 12 Point	IC693MDL310	A	D
Series 90-30 Output 120/240 VAC 2 A 8 Point	IC693MDL330	A	F
Series 90-30 Output 120 VAC 0.5 A 16 Point	IC693MDL340	A	D
Series 90-30 Output 124/240 VAC Isolated 16 Point	IC693MDL350	A	
Series 90-30 Output 120/240 VAC 2 A 5 Point Isolated	IC693MDL390	A	E
Series 90-30 Output 12/24 VDC 2 A 8 Point Positive Logic	IC693MDL730	A	E
Series 90-30 Output 12/24 VDC 2 A 8 Point Negative Logic	IC693MDL731	A	E
Series 90-30 Output 12/24 VDC 0.5 A 8 Point Positive Logic	IC693MDL732	A	C
Series 90-30 Output 12/24 VDC 0.5 A 8 Point Negative Logic	IC693MDL733	A	C

*continued*



## Series 90-30 (IC693) Modules for RX3i PACSystems

The following Series 90-30 modules are compatible with the RX3i serial bus in Universal Backplanes and RX3i Serial Expansion Backplanes and 90-30 Expansion Backplanes.

<b>Description</b>	<b>Catalog Number</b>	<b>Minimum Revision Supported</b>	<b>CE Mark Approved</b>
<b>Discrete Output Modules, continued</b>			
Series 90-30 Output 125 VDC 1A 6 Point Isolated Pos/Neg	IC693MDL734	A	D
Series 90-30 Output 12/24 VDC 0.5 A 16 Point Positive Logic	IC693MDL740	A	E
Series 90-30 Output 12/24 VDC 0.5 A 16 Point Negative Logic	IC693MDL741	A	E
Series 90-30 Output 12/24 VDC 1 A 16 Point Positive Logic ESCP	IC693MDL742	A	D
Series 90-30 Output 48 VDC 0.5 A 8 Point Positive Logic	IC693MDL748	A	B
Series 90-30 Output 5/24 VDC (TTL) 0.5 A 32 Point Negative Logic	IC693MDL752	A	D
Series 90-30 Output 12/24 VDC 0.5 A 32 Point Positive Logic	IC693MDL753	A	D
Series 90-30 Output High-density 24VDC 32 Point	IC693MDL754		
Series 90-30 Solenoid Out 11 Pt/24 VDC Out 5 Point Positive Logic	IC693MDL760	A	B
Series 90-30 Output Relay N.O. 4 A 8 Point Isolated	IC693MDL930	A	D
Series 90-30 Output Relay N.C. and Form C 3 A 8 Point Isolated	IC693MDL931	A	D
Series 90-30 Output Relay N.O. 2 A 16 Point	IC693MDL940	A	D
<b>Discrete Mixed Modules</b>			
Series 90-30 High Speed Counter Module GFK-0293	IC694APU300	D	H
Series 90-30 Mixed I/O 8 Point 120 VAC In / 8 Point Relay Out	IC693MAR590	A	C
Series 90-30 Mixed I/O 8 Point 24 VDC In / 8 Point Relay Out	IC693MDR390	A	C
<b>Analog Input Modules</b>			
Series 90-30 Input Analog 4 Point Voltage	IC693ALG220	A	G and H
Series 90-30 Input Analog 4 Point Current	IC693ALG221	A	G and H
Series 90-30 Input Analog 16 sgl/8 diff Voltage	IC693ALG222	A	C and D
Series 90-30 Input Analog 16 sgl/8 diff Current	IC693ALG223	A	C

Continued ...

## Series 90-30 (IC693) Modules for RX3i PACSystems

Continued...

<b>Description</b>	<b>Catalog Number</b>	<b>Minimum Revision Supported</b>	<b>CE Mark Approved</b>
<b>Analog Output Modules</b>			
Series 90-30 Output Analog 2 Point Voltage	IC693ALG390	A	F
Series 90-30 Output Analog 2 Point Current	IC693ALG391	A	E
Series 90-30 Output Analog Current/Voltage 8 Point	IC693ALG392	A	B
<b>Analog Mixed I/O Modules</b>			
Series 90-30 Analog Combination Current/Voltage 4 in/2 out	IC693ALG442	B	B
<b>Communication Modules</b>			
Series 90-30 Fanuc I/O Link Module (Master)	IC693BEM321	C	F
Series 90-30 Genius Bus Controller	IC693BEM331	K	
Series 90-30 FIP Bus Controller	IC693BEM340		
<b>Special Purpose Modules</b>			
Series 90-30 Special I/O Processor	IC693APU305	C	
Series 90-30 I/O Link Interface Module	IC693BEM320		
Series 90-30 I/O Link Master Module	IC693BEM321		
Series 90-30 DeviceNet Master Module	IC693DNM200	AA	
Series 90-30 DeviceNet Slave Module	IC693DNS301	AA	
Series 90-30 DSM314 Motion Controller	IC693DSM314	AC	AA
Series 90-30 DSM324i Motion Controller	IC603DSM324		
Series 90-30 Temperature Controller Module	IC693TCM302	*	
Series 90-30 Temperature Controller Module Extended Range	IC693TCM303	*	
Series 90-30 Power Transducer Module	IC693PTM100	A	
Series 90-30 Power Transducer Module	IC693PTM101	A	

### *Series 90-30 Modules that Cannot Be Used in an RX3i System*

The Series 90-30 modules listed below cannot presently be included in a Universal Backplane or in any Expansion or Remote Backplane in an RX3i system. Future firmware releases may enable the RX3i to their functions, check with your GE Fanuc representative on the status.

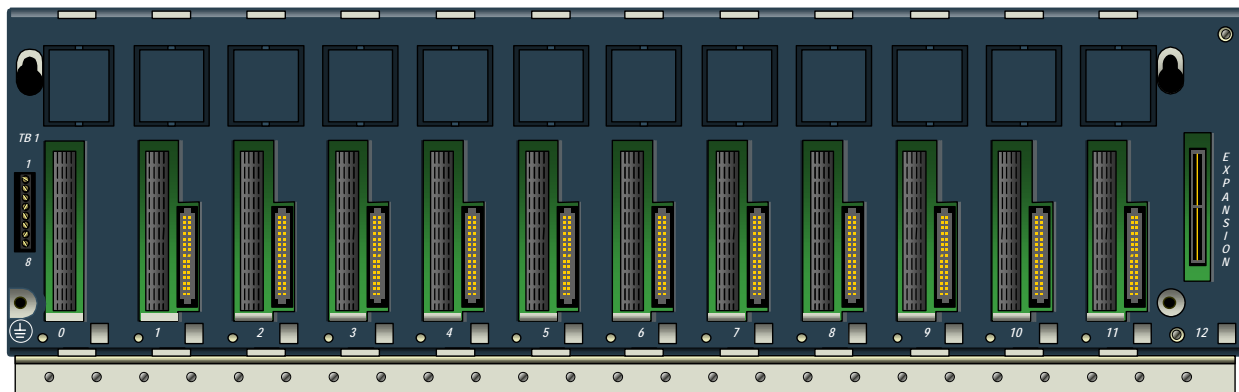
For information about whether another company's Series 90-30-compatible module may be suitable for PACSystems RX3i applications, please contact the manufacturer of the module. That includes Series 90-30 modules that have catalog numbers beginning with HE693.

<b>Description</b>	<b>Catalog Number</b>
CIMPLICITY 90-ADS 9030 Module	IC693ADC311
CIMPLICITY 90-ADS 9030 System	IC693ADS301
Axis Position Module (1-Axis)	IC693APU301
Axis Position Module (2-Axis)	IC693APU302
Series 90-30 SDS Bus Interface	IC693BEM310
Remote FIP Interface Module	IC693BEM330
FIP Remote I/O 2.5mhz	IC693BEM332
Remote FIP Interface	IC693BEM333
Genius Bus Controller	IC693BEM334
FIP Remote I/O 2.5mhz	IC693BEM335
Ethernet Network Interface Unit	IC693BEM350
Cscan Interface Module	IC693CDC200
Genius Communications Module	IC693CMM301
Enhanced Genius Communications Module	IC693CMM302
Alspa N80 Communication Module	IC693CMM304
Alspa Enhanced N80 Comm Module	IC693CMM305
Communication Control Module	IC693CMM311
Ethernet Interface Module 3.10	IC693CMM321
Series 90-30 DeviceNet Master	IC693DNM200
Digital Servo Module (2-Axis)	IC693DSM302
Digital Valve Driver Module	IC693DVM300
Power Mate "J" Interface Module	IC693MCM001
Power Mate "J" Interface 2 Axis	IC693MCM002
PM-J 1-Axis International Only	IC693MCS001
PM-J 2-Axis International Only	IC693MCS001

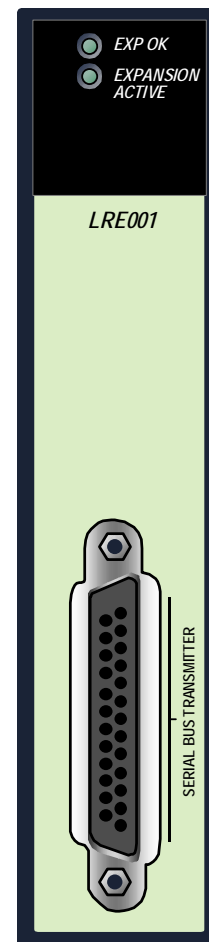
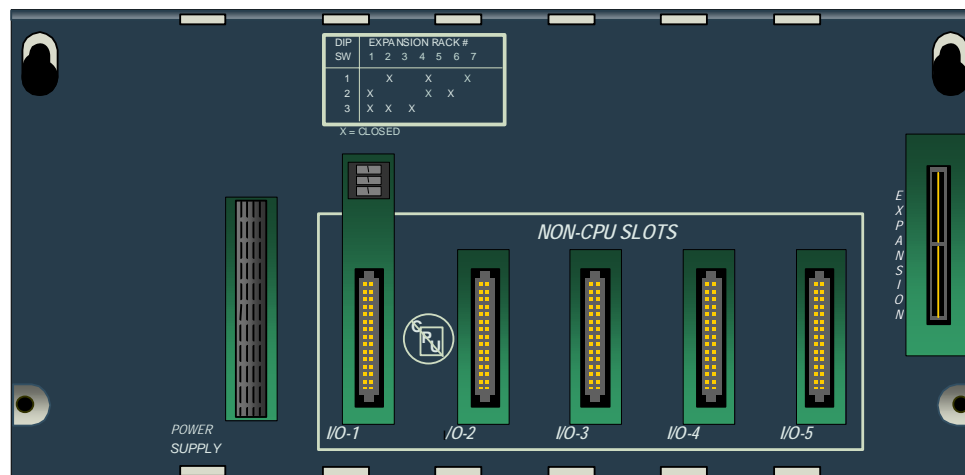
<b>Description</b>	<b>Catalog Number</b>
Input 120/240 VAC 8 Point Isolated	IC693MDL232
Input 24 VDC 8 Point Pos Logic	IC693MDL630
Input 24 VDC 8 Point Neg Logic	IC693MDL631
Input 24 VDC 8 Point Neg Logic	IC693MDL633
Input 24 VDC 16 Point Pos Logic	IC693MDL640
Input 24 VDC 16 Point Neg Logic	IC693MDL641
Input 24 VDC 16 Point Pos Logic Fast (1ms)	IC693MDL643
Input 24 VDC 16 Point Neg Logic Fast (1ms)	IC693MDL644
Fanuc Input 24 VDC 32 Point Pos/Neg	IC693MDL652
Fanuc Input 24 VDC 32 Point Pos/Neg Fast	IC693MDL653
Fanuc Output 12/24 VDC 0.3 A 32 Point Neg	IC693MDL750
Fanuc Output 12/24 VDC 0.3 A 32 Point Pos	IC693MDL751
Profibus-DP Master	IC693PBM200
Profibus-DP Slave	IC693PBS201
Programmable Coprocessor W/Epr	IC693PCM30
Programmable Coprocessor Module	IC693PCM300
Programmable Coprocessor Module (64k)	IC693PCM301
Programmable Coprocessor Module (640k)	IC693PCM311
Clamp Pos Module	IC693PMC801
Injection Pos Module	IC693PMI800

## Backplanes and Power Supplies

The RX3i system must include either a 12-slot Universal Backplane IC695CHS012 (shown below) or 16-slot Universal Backplane (IC695CHS016).



If additional modules are required than the Universal Backplane can accommodate, or if some modules must be installed in another location, an RX3i Serial Bus Transmitter Module (IC695LRE001) must be installed in the last slot of the Universal Backplane. A cable from the Bus Transmitter module can link additional Serial Expansion (5-slot version IC694CHS098 shown below) and Remote backplanes to the RX3i system.



Use of Expansion and Remote Backplanes is summarized on the following pages.

For more information about the Serial Bus Transmitter module and cables, refer to chapter 5.

## ***Backplanes for the RX3i System***

Universal and Expansion Backplanes that are compatible with RX3i systems are listed below. See chapter 3 of this manual for descriptions and specifications of the RX3i Backplanes. For information about Series 90-30 Expansion Backplanes, refer to the *Series 90-30 I/O Modules Specifications Manual*, GFK-0898.

<b><i>Backplanes</i></b>	
RX3i 16-Slot Universal Backplane	IC695CHS016
RX3i 12-Slot Universal Backplane	IC695CHS012
RX3i 10-Slot Serial Expansion Backplane	IC694CHS392
RX3i 5-Slot Serial Expansion Backplane	IC694CHS398
Series 90-30 10-Slot Expansion Backplane	IC693CHS392
Series 90-30 5-Slot Expansion Backplane	IC693CHS398
Series 90-30 10-Slot Remote Expansion Backplane	IC693CHS393
Series 90-30 5-Slot Remote Expansion Backplane	IC693CHS399

## Power Supplies for RX3i Systems

Power Supplies for Universal and Serial Expansion Backplanes are listed below. See chapter 4 of this manual for descriptions and specifications of the RX3i Power Supplies. For information about Series 90-30 Power Supplies, refer to the *Series 90-30 I/O Modules Specifications Manual*, GFK-0898.

<i>Description</i>	<i>Catalog Number</i>	<i>Installed in Universal Backplane</i>	<i>Installed in Serial Expansion Backplane</i>
<b>Power Supplies</b>			
RX3i Power Supply, 120/240 VAC, 125VDC, 40 Watts	IC695PSA040	■	
RX3i Power Supplies, 24 VDC, 40 Watts	IC695PSD040, IC695PSD140	■	
RX3i Serial Expansion Power Supply, 120/240 VAC, 125 VDC	IC694PWR321		■
RX3i Serial Expansion Power Supply, 120/240 VAC, 125 VDC, High Capacity	IC694PWR330		■
RX3i Serial Expansion Power Supply, 24 VDC, High Capacity	IC694PWR331		■
Series 90-30 Power Supply for Expansion Backplane, 120/240 VAC, 125 VDC	IC693PWR321		■
Series 90-30 Power Supply for Expansion Backplane, 120/240 VAC, 125 VDC, High Capacity	IC693PWR330		■
Series 90-30 Power Supply for Expansion Backplane, 24 VDC, High Capacity	IC693PWR331		■



## Expansion Systems

The PACSystems R3i can include a combination of up to seven Serial Expansion and/or Remote Backplanes. The Expansion Backplanes can be any of the RX3i or Series 90-30 models listed earlier. The Remote Backplanes can be any of the Series 90-30 Remote Backplanes listed in the *Series 90-30 I/O Module Specifications Manual*, GEK-0898.

- If the system includes only Expansion Backplanes, the total distance from the CPU to the last backplane cannot be more than 15 meters (50 feet)
- If the system includes any Remote Backplanes, the total distance from the CPU to the last backplane cannot be more than 213 meters (700 feet).

Remote Backplanes provide the same functionality as Expansion Backplanes over a much greater distance. Remote Backplanes have extra isolation circuitry that lessens the effect of unbalanced ground conditions that can occur when backplanes are located long distances from each other and do not share the same ground system. Communications between the CPU and a Remote Backplane may take slightly longer than communications between the CPU and an Expansion Backplane. This delay is usually small compared to the total CPU scan time.

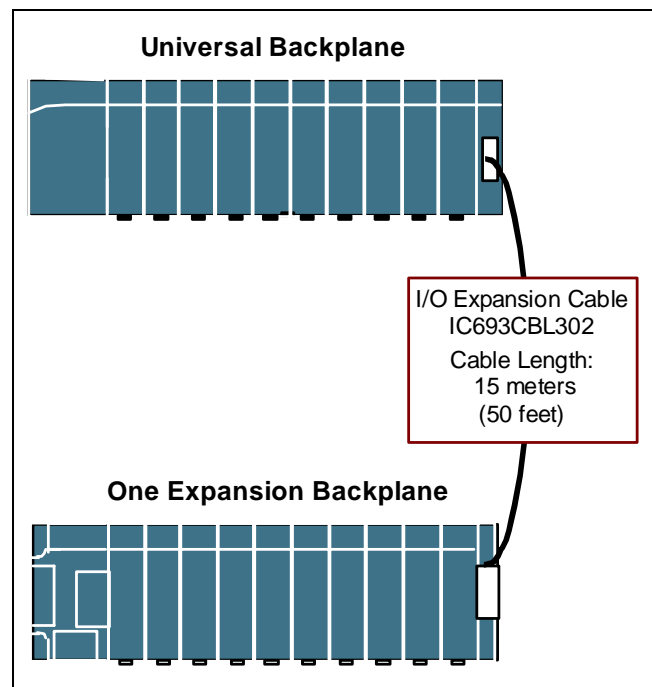
### Expansion System with One Expansion or Remote Backplane

An Expansion system can consist of a Universal Backplane with just one Expansion or Remote Backplane

This example includes one Universal Backplane IC695CHS012 and one Expansion Backplane, IC694CHS392. Each Backplane in this example has a DC Power Supply. Together, they accommodate 19 discrete, analog, and special-function modules.

These backplanes are located 15 meters (50 feet) apart. They are connected by Expansion Cable IC693CBL302, which has a built-in terminating resistor.

If it were necessary to locate the second backplane more than 15 meters (50 Feet) from the Universal Backplane, a Series 90-30 Remote Backplane could be used with a custom-length cable and external terminating resistor.

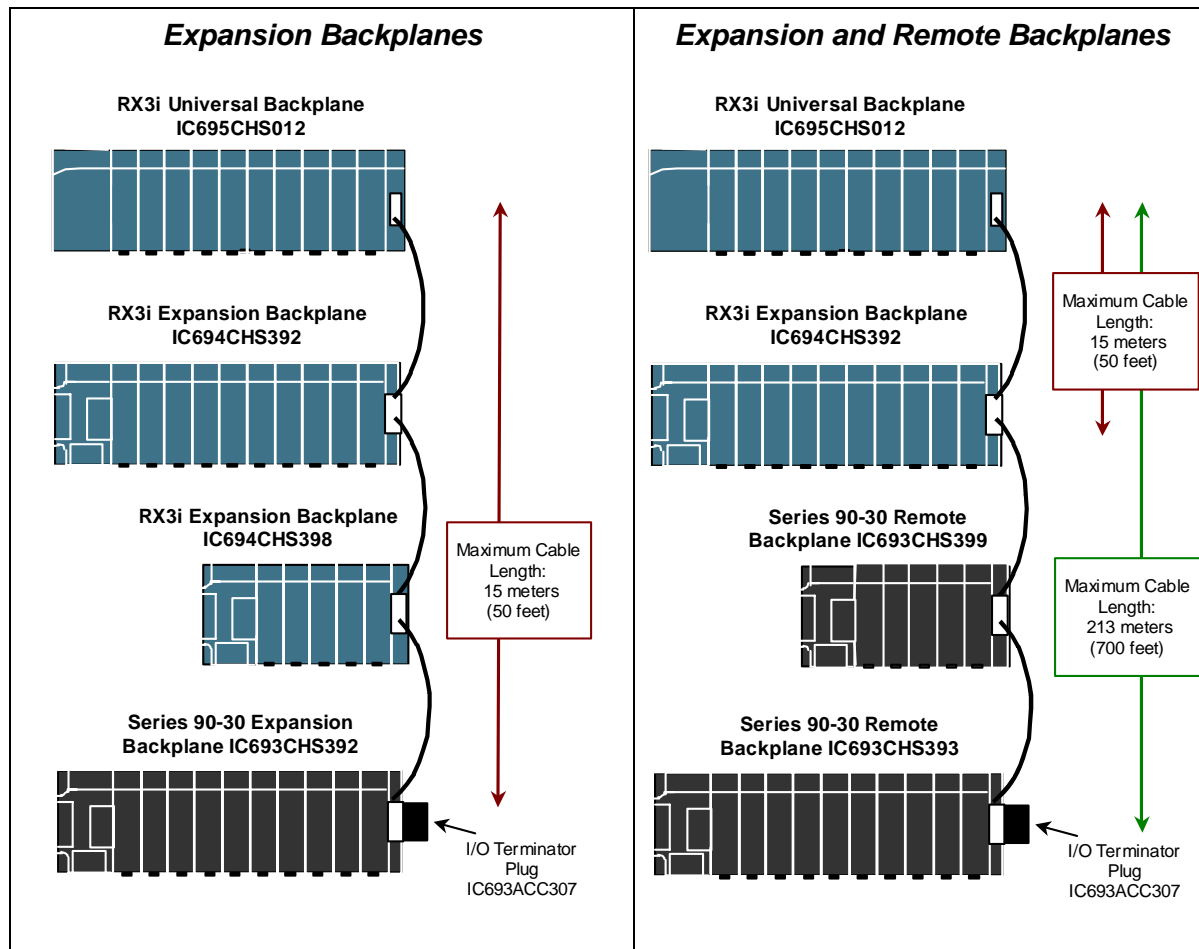




## Using Multiple Expansion and Remote Backplanes

The next two example systems are similar to each other except for the distance between the backplanes. The example on the left includes two RX3i Expansion Backplanes and a Series 90-30 Expansion Backplane. The Expansion Backplanes can be any combination of RX3i (IC694) and Series 90-30 (IC693) Expansion Backplanes. I/O modules in the system can be any combination of RX3i and Series 90-30 modules.

In the example on the right, two of the backplanes must be installed beyond the 15-meter (50-foot) limit of an Expansion system. Two Series 90-30 Remote Backplanes are used in those locations. All other features of the two example systems are the same, including their I/O modules.



## Chapter 2 *Installation*

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This chapter provides general instructions for installing PACSystems RX3i equipment.

- Pre-Installation Check
- System Layout Guidelines
- Enclosures
- System Wiring
- System Grounding
- System Installation

For additional information about system installation, also see:

- Chapter 3, Backplanes, for backplane dimension diagrams
- Chapter 4, Power Supplies, for power supply specifications and wiring diagrams
- Chapters 5 through 14 for module wiring diagrams and specifications
- Chapter 15 for information about 36-pin terminal blocks for some higher-density modules
- Appendix A for general standards information
- Appendix B for information about cables and terminal strips for 32-point modules with front-mounted connectors.
- Appendix C for information about calculating heat dissipation
- Appendix D for information about the Cable Clamping Assembly

## *Pre-Installation Check*

Upon receiving your RX3i equipment, carefully inspect all shipping containers for damage. If any part of the system is damaged, notify the carrier immediately. The damaged shipping container should be saved as evidence for inspection by the carrier.

As the consignee, it is your responsibility to register a claim with the carrier for damage incurred during shipment. However, GE Fanuc will fully cooperate with you, should such action be necessary.

After unpacking the RX3i equipment, **record all serial numbers**. Serial numbers are required if you should need to contact Customer Care during the warranty period. All shipping containers and all packing material should be saved should it be necessary to transport or ship any part of the system.

Verify that all components of the system have been received and that they agree with your order. If the system received does not agree with your order, contact customer service.

If you need technical help, technical support can be reached as listed below:

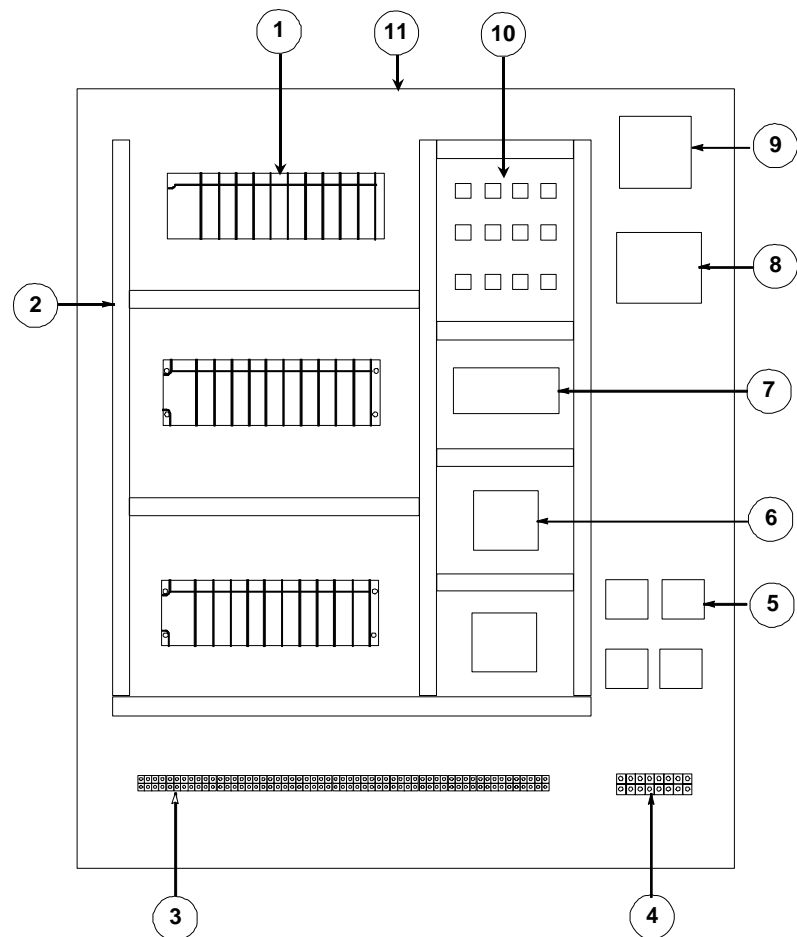
### **Technical support for control system components described in this manual:**

Customer Care Hotline	Toll free: 800-GE FANUC (800-433-2682) International direct dial: 780-420-2197
Internet address	plchotline@cho.ge.com
Fax number	780-420-2197
Web Support	www.gefanuc.com

## System Layout Guidelines

A good layout helps minimize the chance of electrical shock to personnel working on the system. It lets maintenance technicians easily access the unit to make measurements, load software, check indicator lights, remove and replace modules, etc. It also makes it easier to trace wiring and locate components while troubleshooting. In addition, proper system layout promotes good heat dissipation and helps eliminate electrical noise from the system. Excess heat and noise are two major causes of electronic component failure.

- Locate RX3i equipment away from other components that generate a lot of heat, such as transformers, power supplies, or power resistors.
- Locate RX3i equipment away from components that generate electrical noise such as relays and contacts.
- Locate RX3i equipment away from high-voltage components and wiring, such as circuit breakers and fusible disconnects, transformers, motor wiring, etc.
- Locate equipment at a convenient level that allows technicians reasonable access for maintaining the system.
- Route sensitive input wires away from electrically-noisy wires such as discrete output and AC wiring. This can be facilitated by grouping I/O modules to keep output modules separated from sensitive input modules.



- |   |  |
|---|--|
| 6. RX3i                                   | 1. Power supply                          |
| 7. Wireway (Wire Duct)                    | 2. Control transformer                   |
| 8. Field device connection terminal block | 3. Fusible disconnect or circuit breaker |
| 9. Motor connection terminal block        | 4. Control relays                        |
| 10. Motor starters                        | 5. Protected enclosure                   |
| 11. Circuit board                         |  |

- Allow a 4" clearance space on all four sides of each RX3i backplane for ventilation/cooling.
- Use shielded cable connections with the shield grounded at one end (at source) for all analog modules, including RTD and Thermocouple modules.

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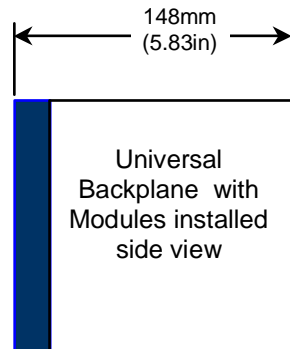
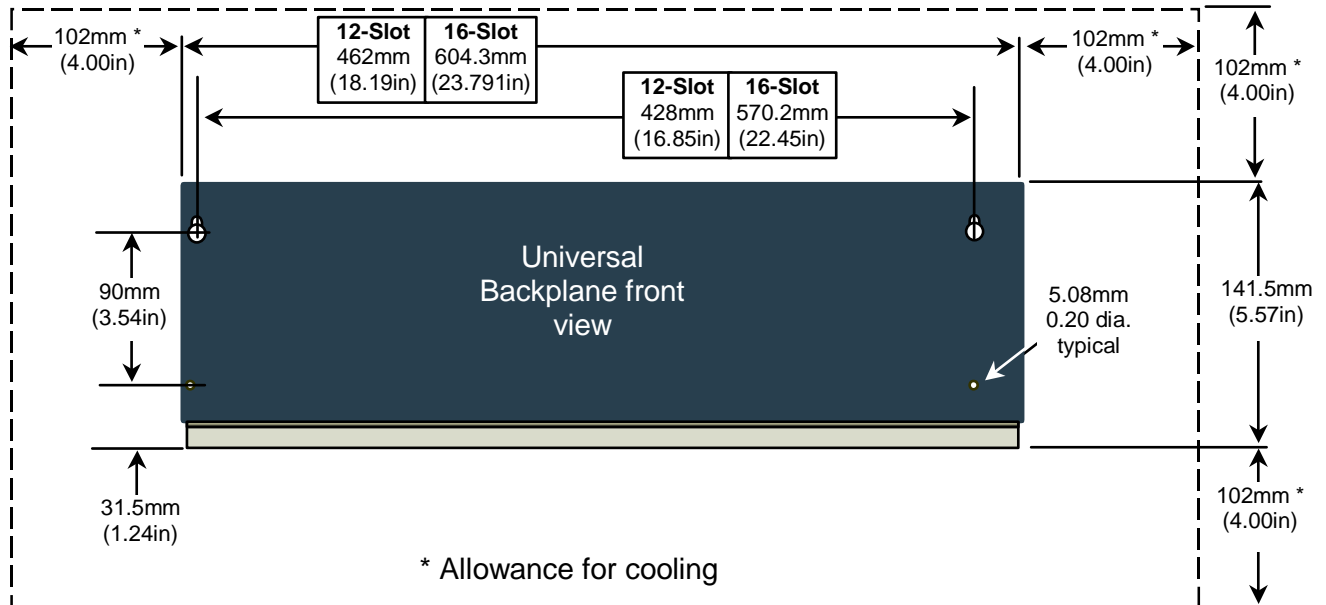
## *Enclosures*

The RX3i system and its components are considered open equipment [having live electrical parts that may be accessible to users] and must be installed in a protective enclosure or incorporated into other assemblies manufactured to provide safety. As a minimum, the enclosure or assemblies shall provide a degree of protection against solid objects up to 12mm (e.g. fingers). This equates to a NEMA/UL Type 1 enclosure or an IP20 rating (IEC60529).

When a RX3i system is installed into an area designated as Class 1 Zone 2 in Europe, compliance with the ATEX Directive requires an enclosure with a higher degree of protection. Refer to “ATEX Class 1 Zone 2 Hazardous Location Requirements” located in Appendix A for specifications.

The enclosure must be able to adequately dissipate the heat generated by all of the components mounted inside so that no components overheat. Heat dissipation is also a factor in determining the need for enclosure cooling options such as fans and air conditioning. A minimum space of at least 102mm (4 inches) is required on all sides of the RX3i backplane for cooling. Additional space may be required, depending on the amount of heat generated by the equipment during operation. Appendix C explains how to calculate heat dissipation for RX3i modules and field devices in an enclosure.

### ***RX3i Universal Backplane Dimensions and Spacing***



Side dimension is for standard modules with doors closed.

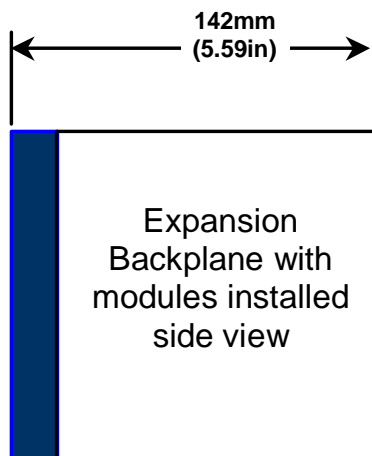
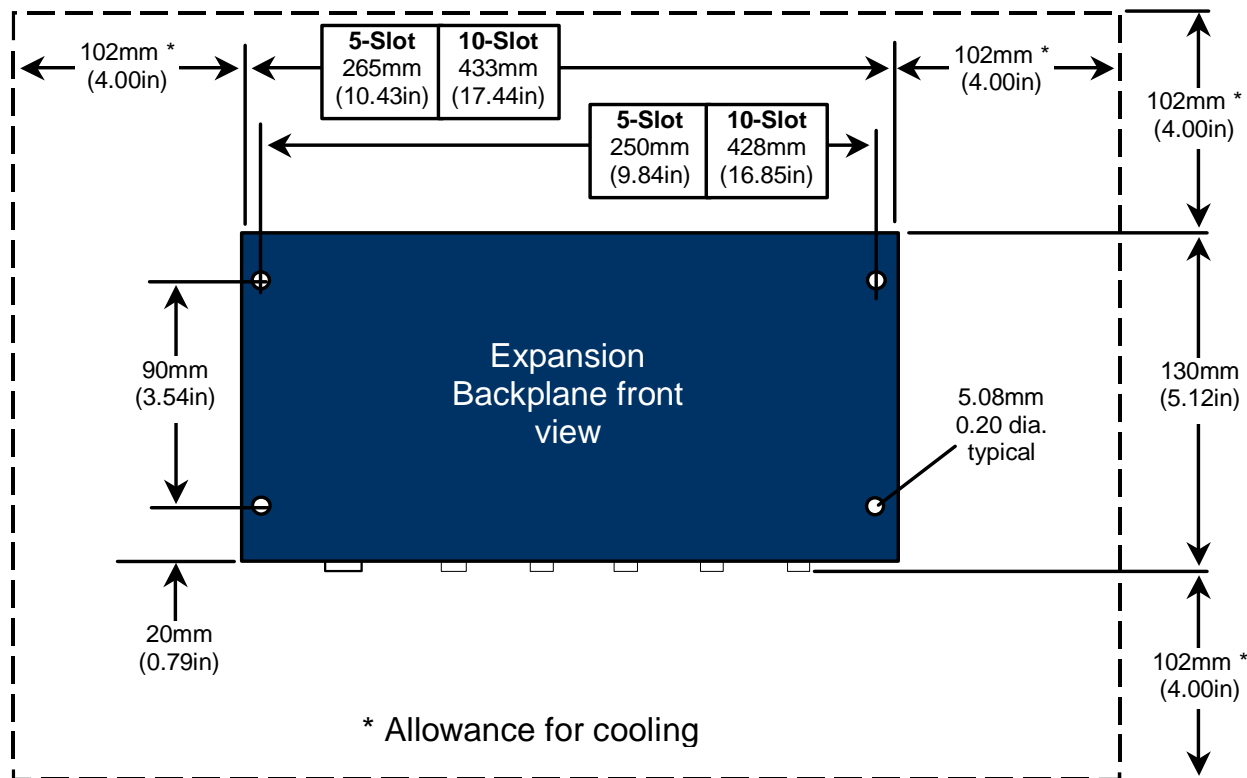
Side dimension does not include extra depth required for cables and connectors.

Modules with Extended High-Density Terminal Blocks (such as Terminal Block IC694TBB132) are approximately ½-inch (13mm) deeper overall.

The mounting holes for the 12 slot RX3i Universal Backplane match the 10-slot Series 90-30 Backplane exactly, for easy upgrades.

## RX3i Serial Expansion Backplane Dimensions and Spacing

Each backplane has standard attachment flanges for mounting on an electrical panel.



Side dimension is for modules with doors closed.

Side dimension does not include extra depth required for cables and connectors.

Modules with Extended High-Density Terminal Blocks (such as Terminal Block IC694TBB132) are approximately ½-inch (13mm) deeper overall.

## *System Wiring*

### **General Wiring Information**

To avoid possible misrouting of wiring to I/O modules, the following is recommended:

- Label all wires to and from I/O devices. Record circuit identification numbers or other pertinent data on the inserts that go in the module's faceplate door.
- Wires should be dressed so that each field I/O connector is fixed relative to its respective module.

#### **Warning**

**In addition to information provided here, always follow all wiring and safety codes that apply to your area or your type of equipment. For example, in the United States, most areas have adopted the National Electrical Code standard and specify that all wiring conform to its requirements. In other countries, different codes will apply. For maximum safety to personnel and property you must follow these codes. Failure to do so can lead to personal injury or death, property damage or destruction, or both.**

### **Color Coding Wires**

These color codes are commonly used in industrial equipment manufactured in the United States. Where they differ from codes that apply to your area or your type of equipment, follow your applicable codes instead. Besides satisfying code requirements, wire color coding makes testing and troubleshooting safer, faster, and easier.

- Green or green with stripe- Ground
- Black - Primary AC
- Red - Secondary AC
- Blue - DC
- White - Common or neutral
- Yellow - Secondary power source not controlled by the main disconnect. Alerts maintenance personnel that there may be power present (from an external source) even if the equipment is disconnected from its main power source.



## **Wire Routing**

To reduce noise-coupling among PLC wires, electrically-noisy wiring such as AC power wiring and discrete output module wiring should be separated from low-level signal wiring such as DC and analog input module wiring or communications cables. Where practical, group separately the following types of wiring:

- **AC power wiring.** This includes the AC input to the PLC power supply, as well as other AC devices in the control cabinet.
- **Analog Input or Output Module wiring.** This should be shielded to further reduce noise coupling.
- **Discrete Output Module wiring.** These often switch inductive loads that produce noise spikes when switched off.
- **DC Input Module wiring.** Although suppressed internally, these low-level inputs should be further protected against noise coupling by observing these wiring practices.
- **Communications Cables.** Wiring such as Genius bus or serial cables should be kept away from noise-producing wiring.

Where AC or Output wiring bundles must pass near noise-sensitive signal wiring bundles, avoid running them beside each other. If they have to cross, route them a right angle to minimize coupling between them.

## **Grouping Modules to Keep Wires Segregated**

If practical, grouping similar modules together on the backplanes can help keep wiring segregated. For example, one backplane could contain only AC modules, and another only DC modules, with further grouping by input and output types.

## System Grounding

All components of a control system and the devices it is controlling must be properly grounded. This is particularly important for the reasons listed below.

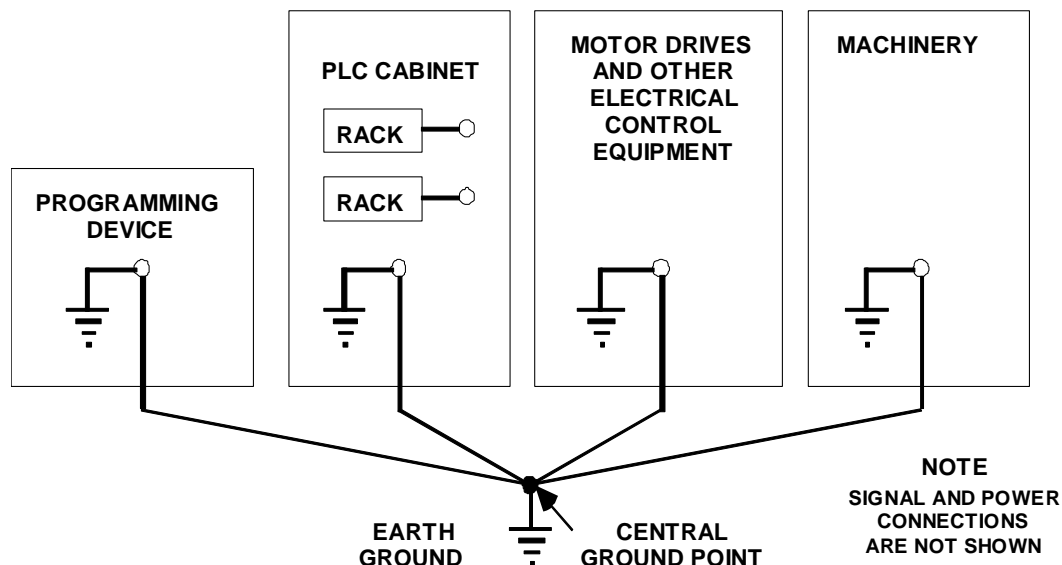
- A low resistance path from all parts of a system to earth minimizes exposure to shock in the event of short circuits or equipment malfunction.
- The RX3i system requires proper grounding for correct operation.
- All backplanes grouped together in the PLC system must have a common ground connection. This is especially important for backplanes that are not mounted in the same control cabinet.

### Warning

**In addition to observing the grounding procedures described here, it is important to follow local grounding codes. In the United States, most areas have adopted the National Electrical Code standard and specify that all wiring conform to its requirements. In other countries, different codes apply. For maximum safety to personnel and property, follow these codes. Failure to do so can mean injury or death to personnel, damage to property, or both.**

In addition to observing the system grounding procedures, periodic inspections of the ground connections should be performed to ensure that the system remains properly grounded.

The PLC equipment, other control equipment, and the machine should be interconnected to maintain a common earth ground reference, also called the machine chassis ground.



## Ground Conductors

Ground conductors should be connected in a tree fashion with branches routed to a central earth ground point, as shown on the previous page. This ensures that no ground conductor carries current from any other branch.

A low inductance path from all parts of a system to earth minimizes emissions and increases immunity to electrical interferences. Ground conductors should be as short and as large in size as possible. Braided straps (maximum 10:1 length to width ratio recommended) or ground cables (typically green insulation with a yellow tracer - AWG #12 (3.3 mm<sup>2</sup>) or larger) can be used to minimize resistance. Conductors must always be large enough to carry the maximum short circuit current of the path being considered.

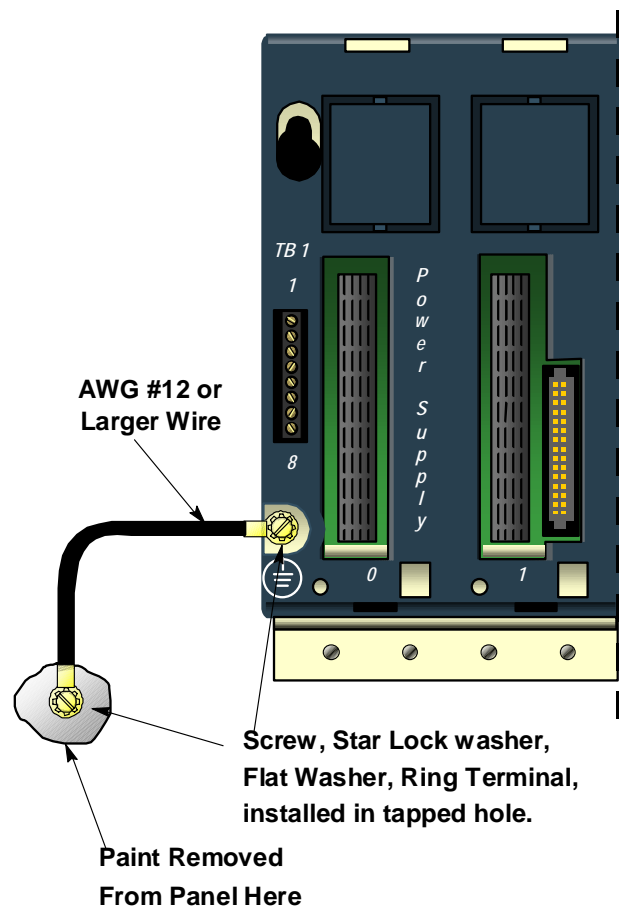
## Backplane Safety and EMC Reference Grounding

The backplane's metal back must be grounded using a separate conductor; the backplane mounting screws alone do not provide an adequate ground connection. Use a minimum AWG #12 (3.3 mm<sup>2</sup>) wire with a ring terminal and star lock washer. Connect the other end of this ground wire to a tapped hole in the mounting panel using a machine screw, star lock washer, and flat washer. Alternately, if the panel has a ground stud, use a nut and star lock washer for each wire on the ground stud to ensure adequate grounding. Where connections are made to a painted panel, the paint should be removed so clean, bare metal is exposed at the connection point. Terminals and hardware used should be rated to work with the aluminum backplane material.

### Warning

All backplanes must be grounded to minimize electrical shock hazard. Failure to do so can result in severe personal injury.

All backplanes grouped together in the PLC system must have a common ground connection. This is especially important for backplanes that are not mounted in the same control cabinet.



**Power Supply Grounding** See the information on Power Supply Field Wiring later in this chapter.

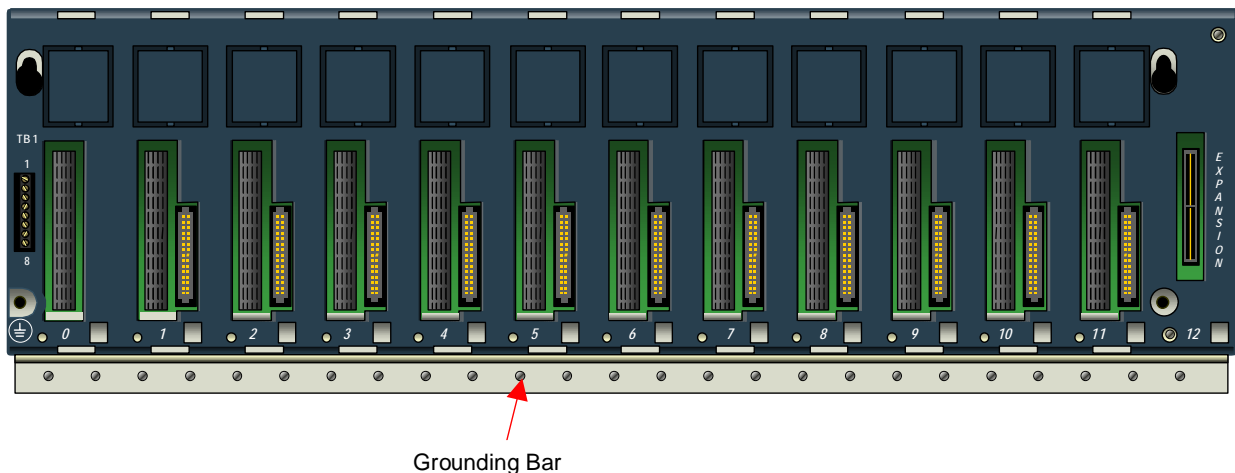
### **Programmer Grounding**

For proper operation, the computer (programmer) running the PLC software must have a ground connection in common with the CPU. Normally, this common ground connection is provided by connecting the programmer's power cord to the same power source (with the same ground reference point) as the backplane. If the programmer ground is at a different potential than the PLC ground, a shock hazard could exist. Also, damage to the ports could occur when the programmer serial cable is connected between the two.

### **Shield Grounding**

In general, the aluminum PLC backplane is used for module shield grounding. On some modules, shield connections to the user terminal connector on the module are routed to the backplane through the module's backplane connector. Other modules, such as the DSM314 require a separate shield ground, as shown in the module descriptions in this manual.

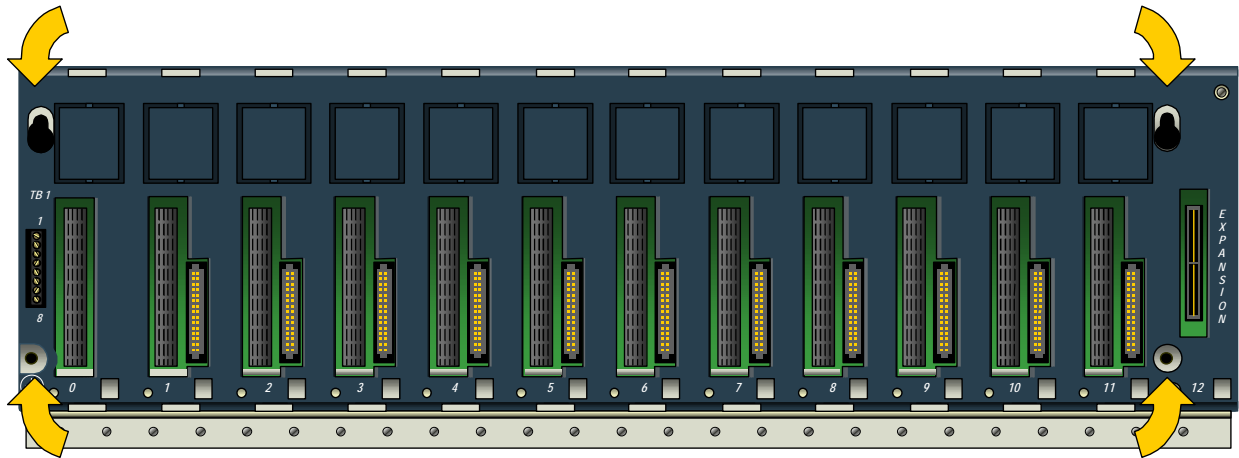
For modules installed in a Universal Backplane, shield grounds can be connected to the Grounding Bar at the bottom of the Backplane using size M3 screws. The recommended torque is 4 in/lb maximum.



## System Installation

### Universal Backplanes

Mount a Universal Backplane using four good-quality 8-32 x 1/2 (4 x 12mm) machine screws, lock washers and flat washers. Install the screws in the four tapped holes.



The dimensions and mounting clearances for each type of backplane were shown in the previous pages. Vertical mounting is preferred for maximum heat dissipation.

- IC695 Power Supply modules may be installed in any slot. DC Power Supplies IC695PSD040 and IC695PSD140 occupy 1 slot. AC Power Supply IC695PSA040 occupies 2 slots. RX3i (IC694) and Series 90-30 (IC693) Power Supplies cannot be installed in Universal Backplanes.
- An RX3i CPU module can be installed anywhere in the backplane except the Expansion slot. CPU modules occupy 2 slots.
- I/O and option modules can be installed in any available slot except slot 0, which can only accept IC695 Power Supplies, and the Expansion slot. Each I/O slot has two connectors, so either an RX3i PCI-based module or a serial module can be installed in any I/O slot.
- The rightmost slot is the expansion slot. It can only be used for optional Serial Bus Transmitter module IC695LRE001.

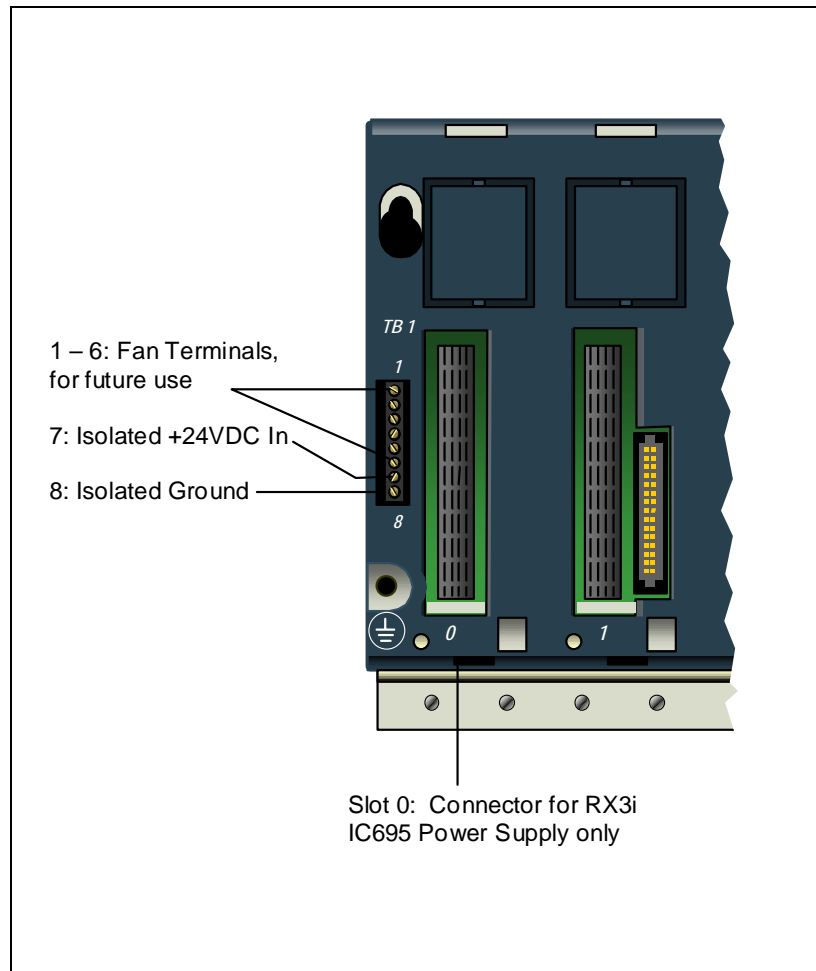
### Universal Backplane Terminals (TB1)

Terminals 1 through 6 on the left end of the Universal Backplane are reserved for external fan control (available in future systems).

The RX3i PCI Power Supplies do not provide Isolated +24V output power over the backplane. Terminals 7 and 8 can be used to connect an optional external source of Isolated +24VDC, which is required for some IC693 and IC694 modules as listed in the table of Module Load Requirements in chapter 4.

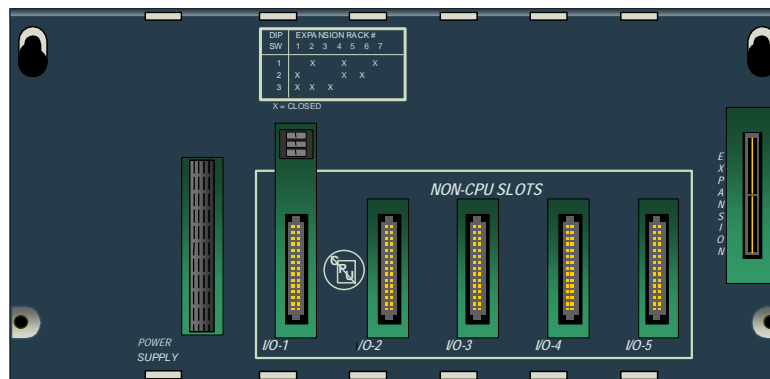
These terminals accept individual wires from 14 to 22 AWG.

If modules that require Isolated +24VDC are installed in an Expansion Backplane instead, an external Isolated +24V power supply is not required.



## Expansion Backplanes

To mount an Expansion Backplane on a panel, use four good-quality 8-32 x 1/2 (4 x 12mm) machine screws, lock washers and flat washers. Install the screws in the four tapped holes.



An Expansion Backplane can also be mounted in a 19-inch rack using a mounting bracket as described in this section.

## Setting the Rack Number DIP Switch

Each backplane is identified with a unique number called a “Rack Number.” Rack number 0 is always automatically assigned to the backplane with the CPU. Rack numbers must not be duplicated in a system. Backplanes do not need to be sequentially numbered, although for consistency, rack numbers should not be skipped.

Rack Numbers for Expansion and Remote backplanes are set using a DIP switch on the backplane. The following table shows the DIP switch positions for rack number selection.

	Rack Number						
DIP Switch	1	2	3	4	5	6	7
1	open	closed	open	closed	open	closed	open
2	closed	open	open	closed	closed	open	open
3	closed	closed	closed	open	open	open	open

For example, these switch settings select rack number 2:

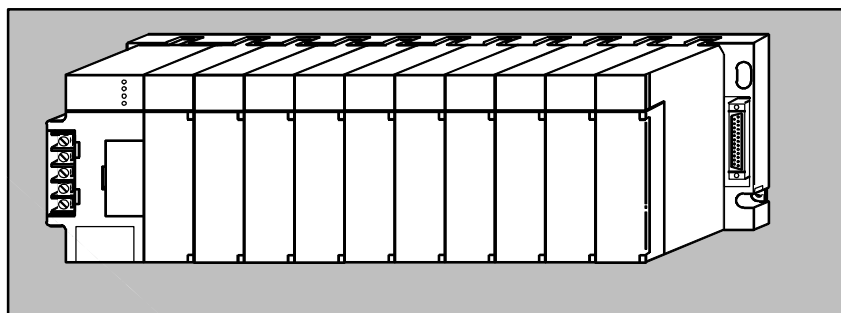


Do not use a pencil to set the DIP switches. Graphite from the pencil can damage the switch.

### ***Recommended Mounting Orientation for Expansion Backplanes***

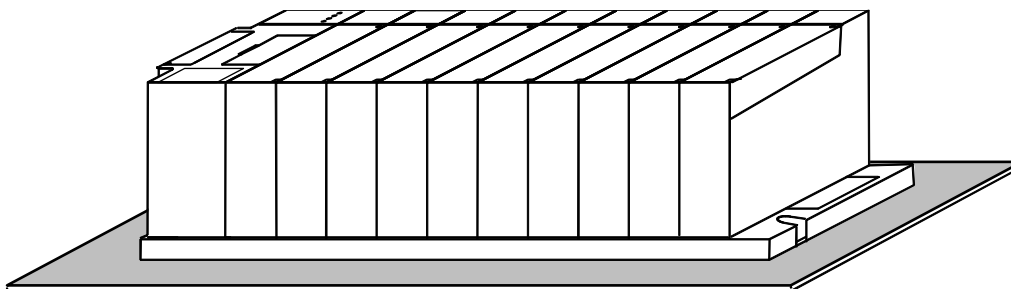
For Expansion and Remote Backplanes, power supply load rating depends on the mounting position of the backplane and the ambient temperature.

The load rating with the Expansion Backplane mounted upright on a panel is 100% at 60°C (140°F)



Power supply load ratings with the backplane mounted horizontally are:

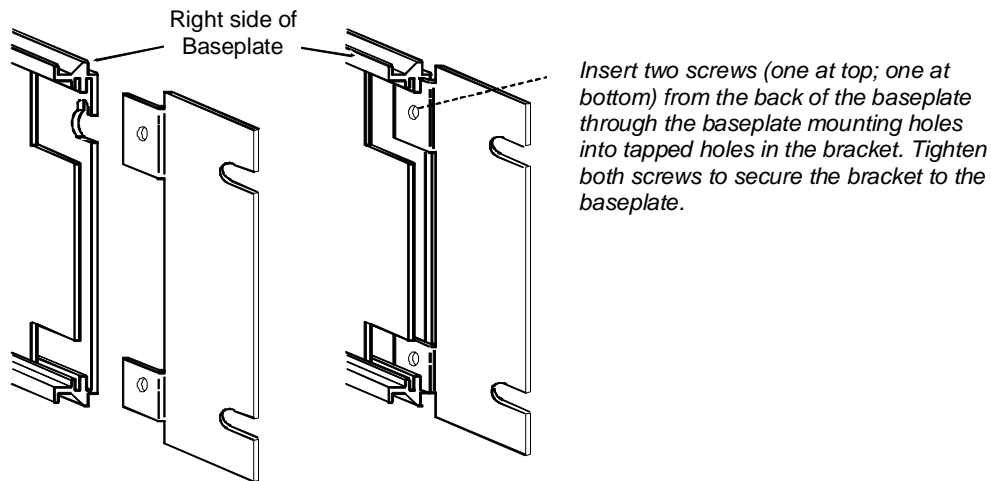
- Temperature at 25°C (77°F) – full load
- Temperature at 60°C (140°F) – 50% of full load



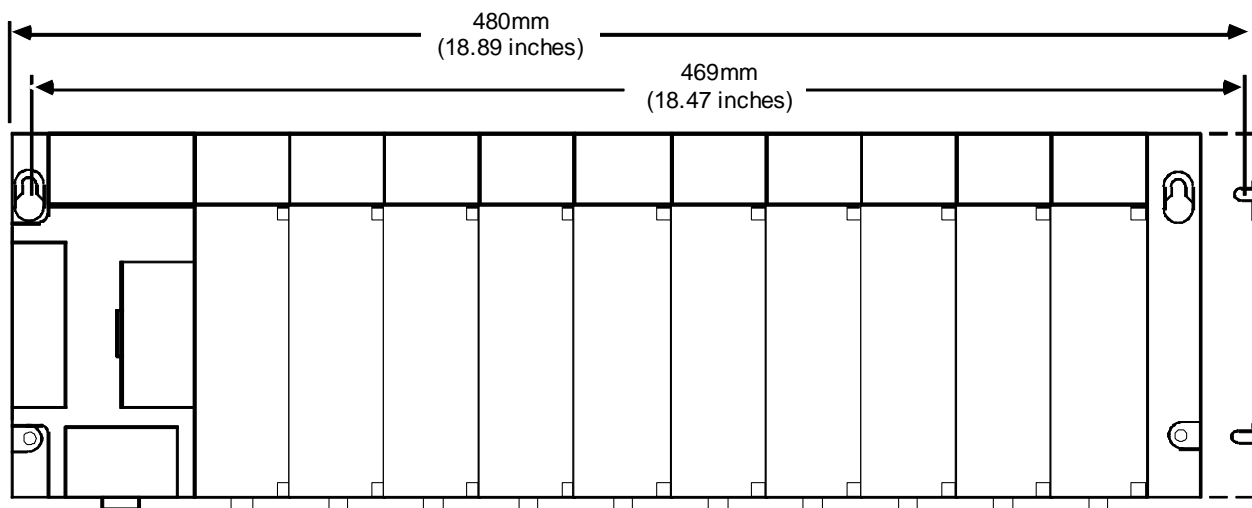


## Mounting a Backplane in a 19-Inch Rack

The **IC693ACC308 Front Mount Adapter Bracket** can be used to mount a 12-Slot Universal Backplane (IC695CHS012) or a 10-Slot Expansion Backplane (IC694CHS392) to the front face of a 19" rack. Install the adapter bracket by inserting the tabs at the top and bottom of the adapter bracket into the corresponding slots at the top and bottom of the plastic backplane cover. It is not necessary to remove the cover to install the bracket. With the bracket in place, insert and tighten the two screws (included with the bracket) through the back of the backplane holes into the threaded holes in the bracket. With the bracket in place, insert and tighten the two screws (included with the bracket) through the back of the backplane holes into the threaded holes in the bracket.

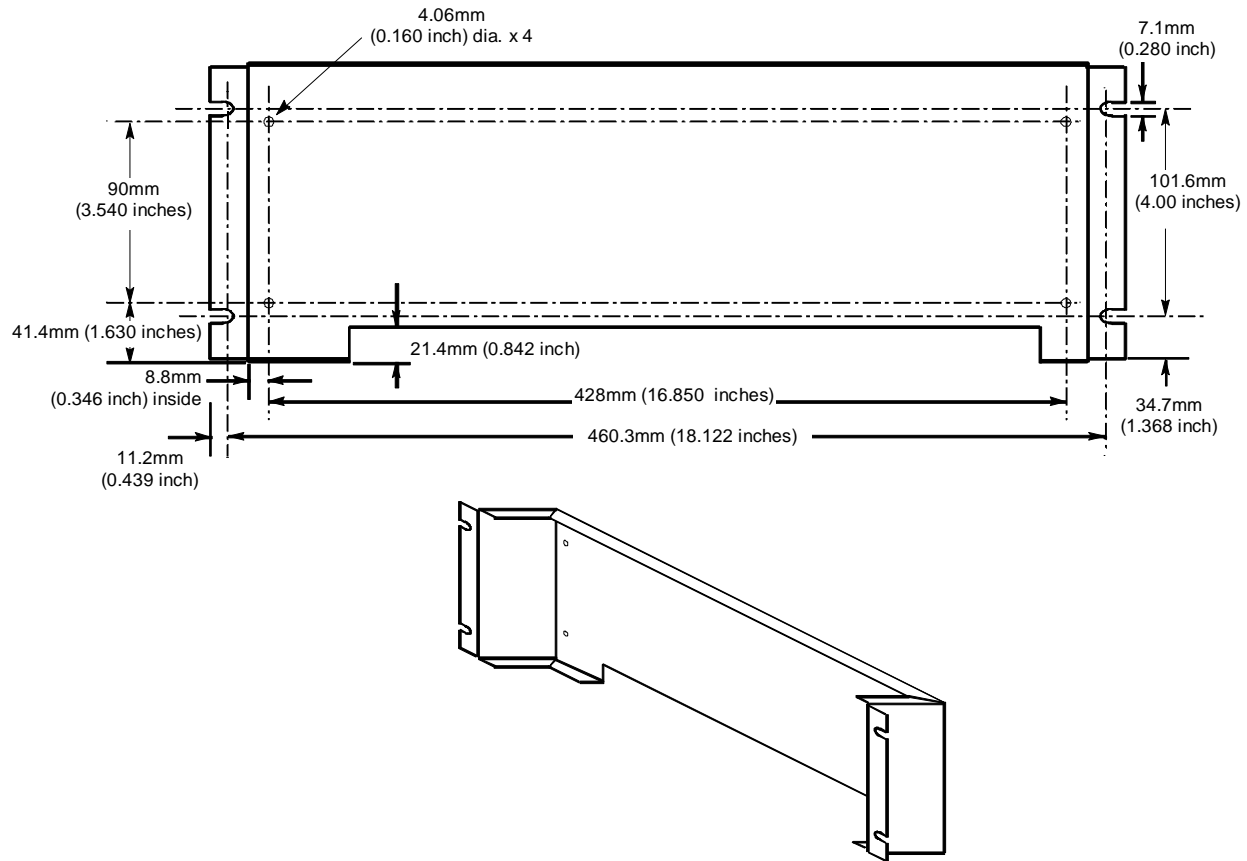


Dimensions for rack mounting a backplane with the IC693ACC308 Front Mount Adapter Bracket are shown below.



The **IC693ACC313 Recessed Mount Adapter Bracket** can be used to recess-mount a 10-Slot Expansion Backplane (IC694CHS392) inside a 19" rack. This bracket cannot be used with a Universal Backplane.

An Expansion Backplane mounts on the rear panel of this adapter bracket using four 8-32 (4mm) screws, nuts, lock washers, and flat washers. The Adapter Bracket bolts through its four slotted holes to the face of the 19" rack using applicable hardware (lock washers recommended).



### **Grounding Rack-Mounted Expansion Backplanes**

If an Expansion Backplane is mounted in a 19-inch rack using an Adapter bracket, the rack must be properly grounded as described in "System Grounding Procedures". In addition, the backplane should be grounded according to the guidelines in the "Backplane Safety Grounding" section, using a separate ground wire from the PLC backplane.

- For a Recessed Mount Adapter Bracket (IC693ACC313), the ground wire can be installed with the ground attached to the Recessed Mount Adapter Bracket. An additional ground wire should be installed that connects the Adapter Bracket to a solid chassis ground.
- For a Surface Mount Adapter Bracket (IC693ACC308), the ground wire should be run from the backplane to a solid chassis ground on the rack.

## **Modules**

### **Hot Insertion and Removal**

Modules in a Universal Backplane (IC695CHS012 or CHS016) can be installed or removed while power is applied to the system. This includes backplane power and field power supplied to the module.

NOTE: For products that support hot insertion, the module must be properly seated on the carrier with the latch engaged and all pins connected within 2 seconds. For removal, the module must be completely disengaged from the carrier within 2 seconds. It is important that the module not remain partially inserted during the insertion or removal process. There must be at a minimum of two seconds between the removal and insertion of modules.

NOTE: The CPU, IC695CPU310, cannot be installed or removed from a Universal Backplane while power is applied to system. System power must be removed before installing or removing the CPU.

The following warnings must be observed.

#### **Warning**

Inserting or removing a module with power applied to the system may cause an electrical arc. This can result in unexpected and potentially dangerous action by field devices. Arcing is an explosion risk in hazardous locations. Be sure that the area is non hazardous or remove system power before removing or inserting a module.

#### **Warning**

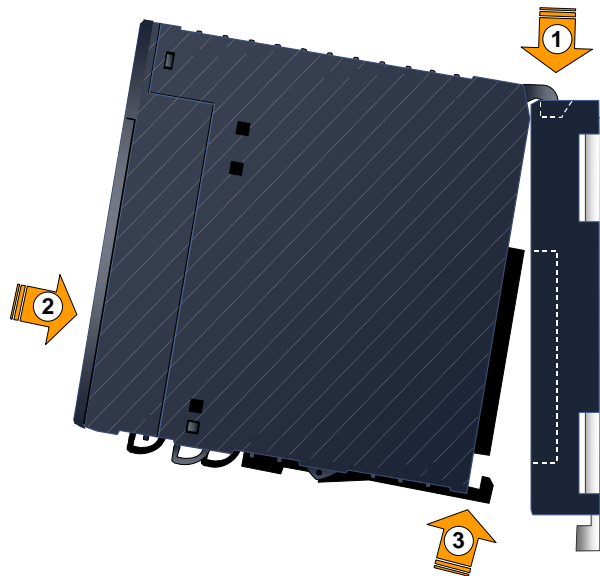
Do not insert or remove modules in RX3i Serial Expansion Backplanes or Series 90-30 Expansion Backplanes with power applied to the backplane. This could cause the PLC to stop or malfunction. Injury to personnel and damage to the module or backplane may result. If the PLC is in RUN mode, I/O data to/from this backplane will not be updated while power is removed.

## Installing Modules

### WARNING

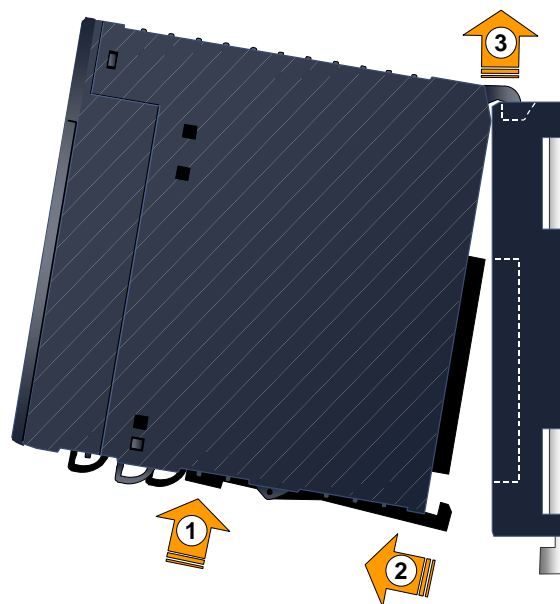
Potentially dangerous voltages may be present on a module's screw terminals even though power to the backplane is turned off. Always be careful handling the module's removable terminal board and any wires connected to it.

- Be sure the module catalog number matches the intended slot configuration.
- Holding the module firmly, align the module with the correct slot and connector.
- Engage the module's rear pivot hook(s) in the notch(es) on the top of the backplane (1).
- Swing the module down (2) until the module's connector engages the backplane's backplane connector, and the release lever(s) on the bottom of the module snaps into place in the bottom module retainer (3).
- Visually inspect the module to be sure it is properly seated.



## Removing Modules

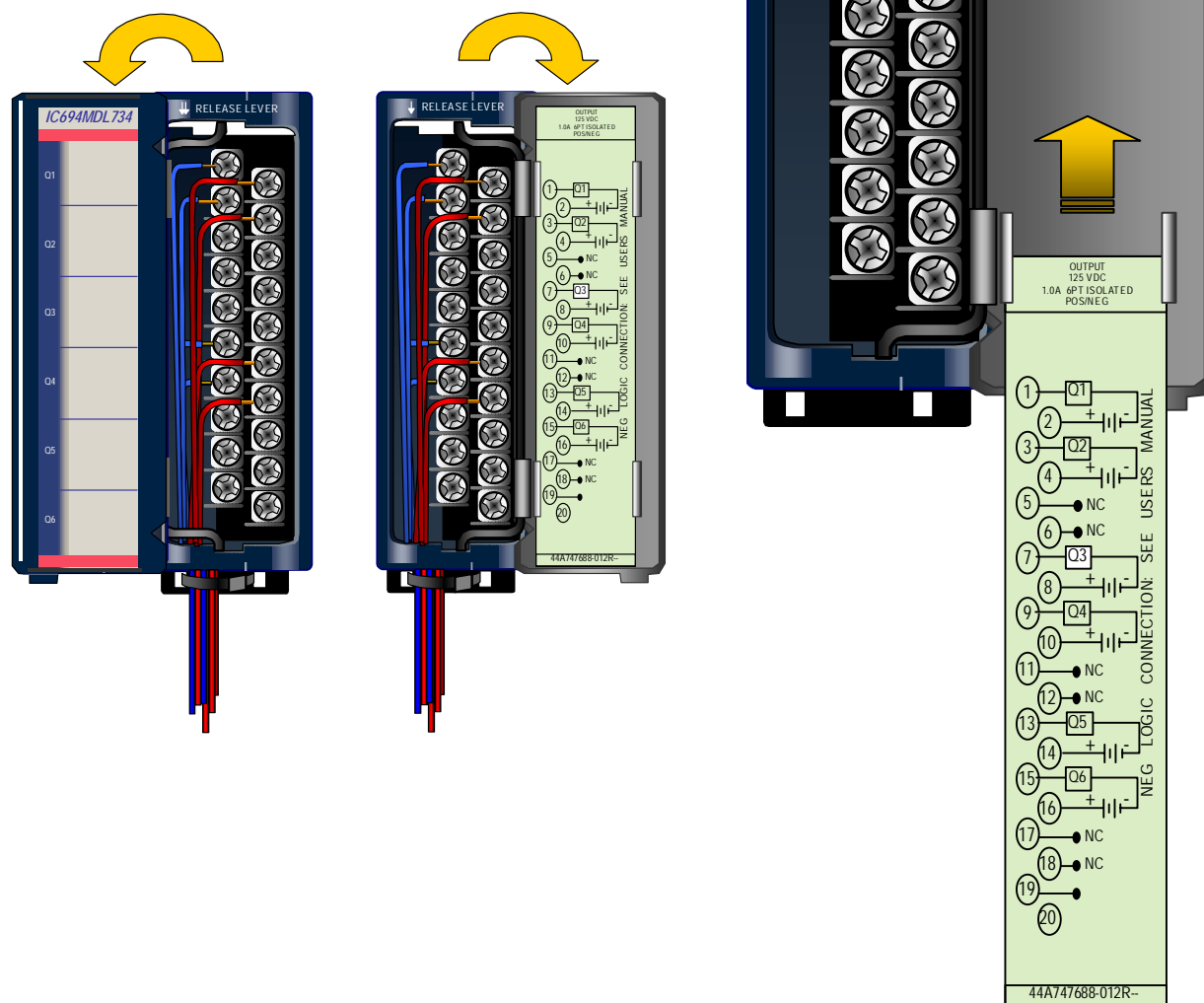
- If the module has a removable terminal board, remove it as described later in this section.
- Locate the release lever(s) at the bottom of the module and firmly press upward (1), toward the module. Wider modules have two release levers that must both be pressed up at the same time.
- While holding the module firmly and fully depressing the release lever(s), pivot the module upward until its connector is out of the backplate (2).
- Lift the module up and away from the backplane to disengage the pivot hook.



## I/O Module Terminal Block Assemblies

Most PACSystems RX3i I/O modules have removable front terminal block assemblies. Each module of this type has an insertable door label with a wiring diagram printed on the back. The front of the label has color bands that indicate the module type, and space to record identifying information about the module's inputs or outputs.

The terminal blocks have fully-hinged doors that can be opened to either the left or right to access wiring.



## I/O Module Connections

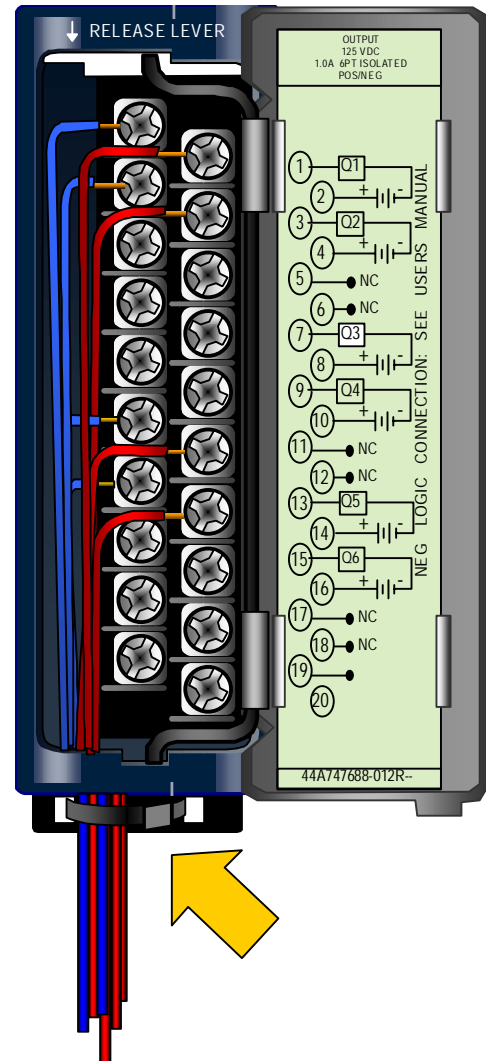
For most RX3i I/O modules, connections are made to the module's removable terminal board. Specific wiring information for each module is printed on the door insert and also shown in the module description in this manual.

This section describes the 20-pin removable terminal block, which is used by most RX3i I/O modules. Higher-density modules use other connection methods.

- See chapter 14 for information about 36-pin removable terminal blocks used for most higher-density modules.
- See appendix B for information about connections to I/O modules that have two 20-pin connectors on the front of the module.

Screw terminals on a 20-pin terminal block accept from two AWG #22 (0.36 mm<sup>2</sup>) to two AWG #16 (1.3 mm<sup>2</sup>), or one AWG #14 (2.1 mm<sup>2</sup>) copper 90°C (194°F) wire(s). Each terminal can accept solid or stranded wires, but the wires into any given terminal should be the same type (both solid or both stranded) to ensure a good connection. Wires are routed to and from the terminals out of the bottom of the terminal board cavity. The suggested torque for the I/O terminal board connection screws is from 9.6 in-lbs to 11.5 in-lbs (1.1 to 1.3 Newton-meters).

After the wiring is completed, wires should be bundled and fastened at the bottom of the module as shown at right.



## Installing or Removing a 20-Pin Terminal Block Assembly

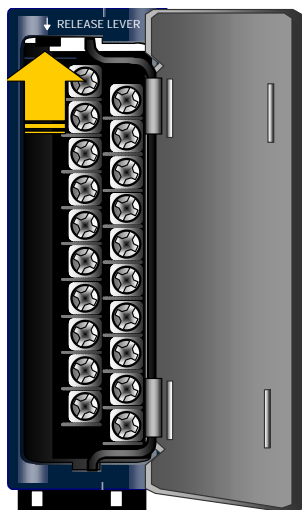
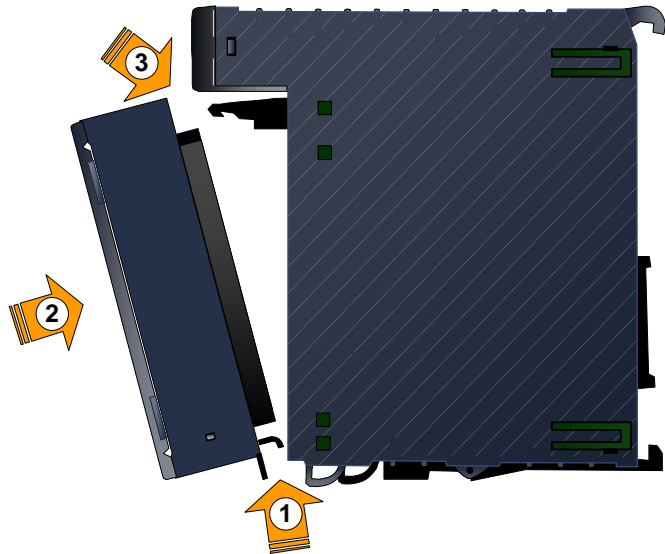
(See chapter 14 for instructions for installing or removing a 36-pin terminal assembly). Compare the module catalog number on the label on the terminal assembly door and the label on the side of the to be sure they match. If a wired terminal block is installed on the wrong module type, the module may be damaged when the system is powered up.

### Warning

**Field power must be turned off when installing or removing a Terminal Block assembly.**

### Installing a Terminal Block

1. Insert the pivot hook on the bottom of the terminal block assembly into the slot on the bottom of the module.
2. Pivot the terminal block assembly upward to engage the connector.
3. Press the terminal block assembly toward the module until the release lever latch snaps into place. Check to be sure the terminal block is firmly seated.



### Removing a Terminal Block

1. Open the terminal block door.
2. Push up the release lever to unlock the terminal block.
3. Pull the terminal block away from the module until the contacts have separated and the bottom pivot hook has disengaged.

## ***Installing or Removing a Terminal Block Cover***

The terminal block assembly cover can be removed for easier access to the terminals.

### **Warning**

Potentially dangerous voltages from user devices may be present on a module's screw terminals even though power to the backplane is turned off. Always be careful handling the module's removable terminal block assembly and any wires connected to it.



### ***Removing a Terminal Block from its Cover***

To remove a Terminal Block from its cover:

1. Grasp the sides of the Terminal Block cover.
2. Pull down on the bottom of the Terminal Block as shown at left.

### ***Inserting a Terminal Block in its Cover***

To re-insert a Terminal Block in its cover:

1. Align the top of the Terminal Block with the bottom of the cover, making sure that the notches in the Terminal Block match up with the grooves in the cover.
2. Slide the Terminal Block upward until it clicks into place.



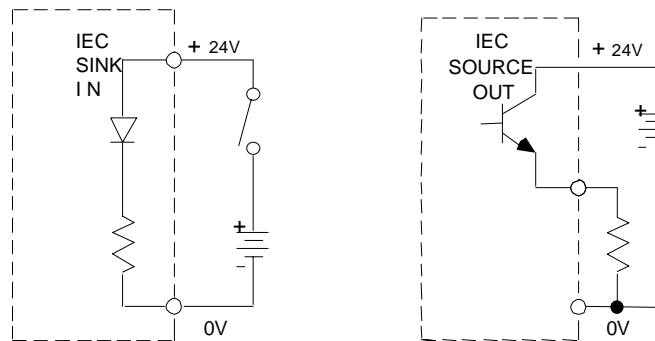
## Positive and Negative Logic Connections to Discrete Modules

The IEC definitions for positive logic and negative logic for PACSystems RX3i modules are described below.

### Positive Logic

Positive logic input modules sink current from the input device to the user common or negative power bus (left). The input device is connected between the positive power bus and the input terminal.

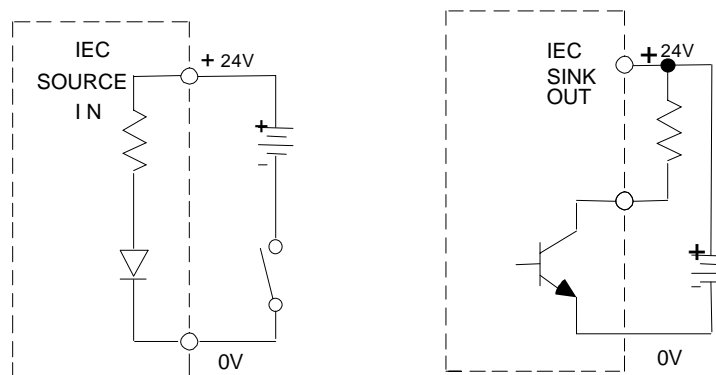
Positive logic output modules (right) source current to the loads from the user common or positive power bus. The load is connected between the negative power bus and the module output.



### Negative Logic

Negative logic input modules (left) source current through the input device to the user common or positive power bus. The input device is connected between the negative power bus and the input terminal.

Negative logic output modules (right) sink current from the loads to the user common or negative power bus. The load is connected between the positive power bus and the output terminal.



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### ***Wiring for Analog Modules***

Twisted, shielded instrumentation cable is strongly recommended for analog module input or output signal connections. Proper grounding of the shield is also important. For maximum electrical noise suppression, the cable shield should only be grounded at one end of the cable.

It is generally best to ground the cable shield as close to the source of the noise as possible. For Analog Input modules, ground the end that is in the noisiest environment (usually the field device end). Cut the shield off at the module end of cable and insulate with shrink tubing. For Analog Output modules, ground at the module end. Cut the shield off at device end of cable and insulate with shrink tubing.

It is best to keep the length of stripped cable leads as short as possible to minimize the length of unshielded conductors exposed to the noisy environment.

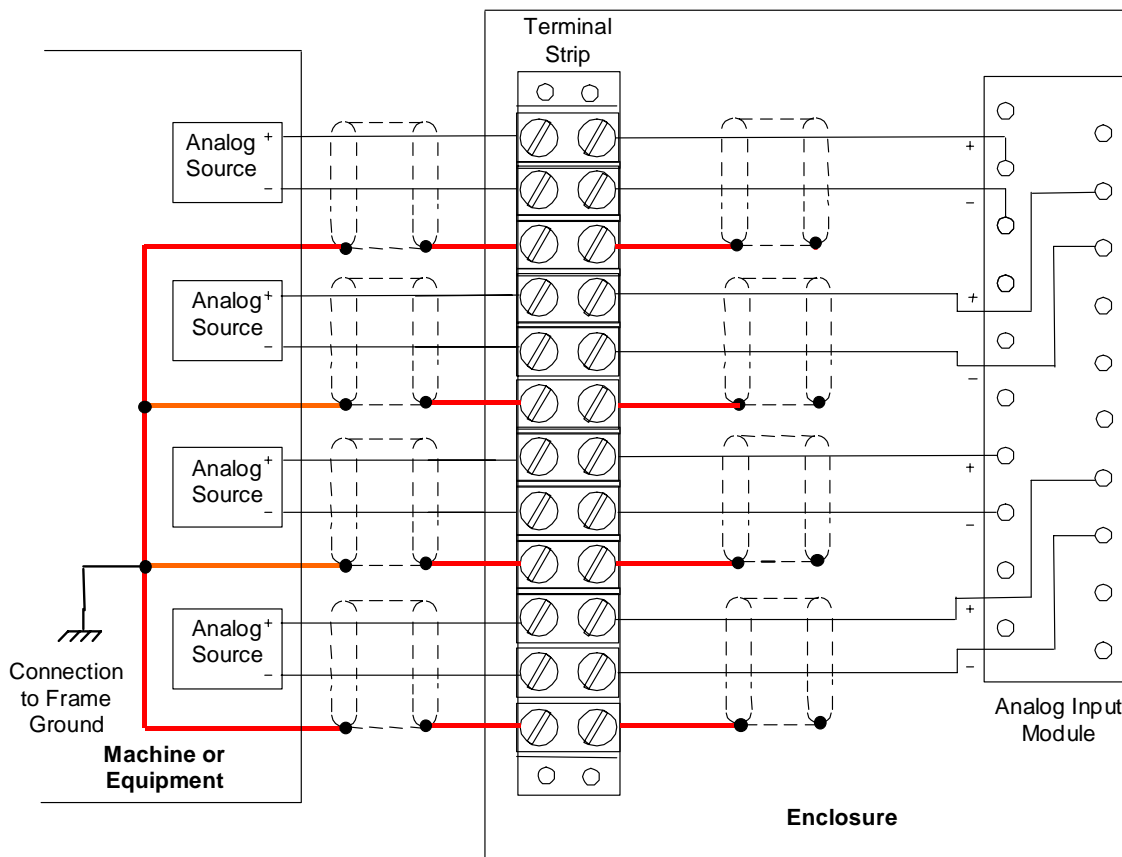
Connections can be made directly to the module terminals, or via an intermediate terminal block. The diagrams in this section show wiring for various types of analog input and analog output installations.

## Shielding for Analog Input Modules

Generally, the shield for analog input cables should be grounded at the analog source. However, ground connections for each channel, labeled COM and GND, can be used to connect shields at the analog input module if appropriate. An analog input module's COM terminals connect to the analog circuit common in the module. The GND terminals connect to the backplane (frame ground). Shields may be connected to either COM or GND. This section shows four shield grounding examples for analog input modules.

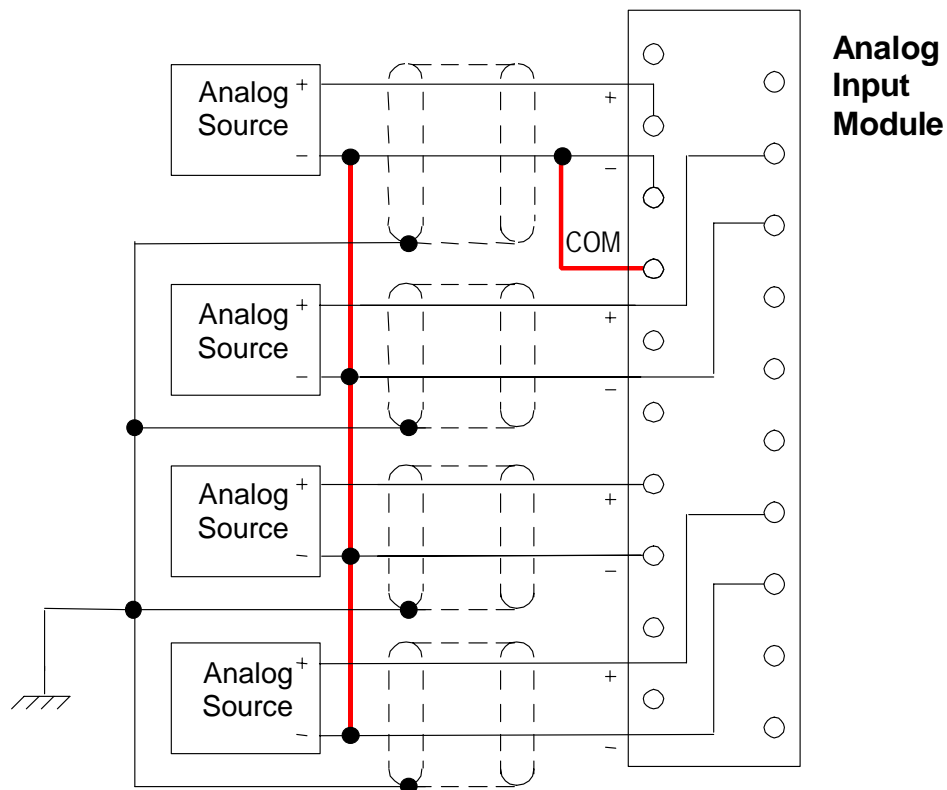
### Analog Input Shield Grounding with a Terminal Strip

For an unbalanced source, the ground shield should be connected to the source common or ground at the source end. If all source inputs to the module come from the same location and are referenced to the same common, all shield grounds should be connected to the same ground point. If there is an additional terminal strip between the analog input module and the field devices (analog sources), use the method shown below to continue each cable shield using a terminal on the terminal strip. Each cable is only grounded at one end - the end closer to the field devices (analog sources). Shield connections are shown in red (bold).



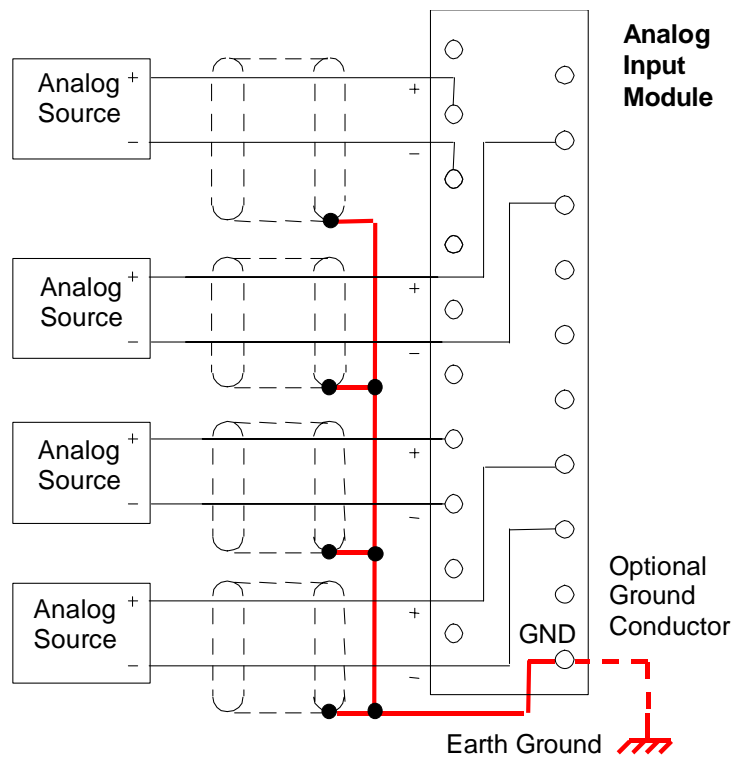
### **Analog Input Shield Grounding to Common Connections**

In some applications, noise rejection can be improved by connecting the source common points together at the source end, then connecting a common line to the module at only one module COM terminal. That will eliminate multiple grounding or ground loops that could cause false input data. The common connections here are shown in red (bold).



### **Analog Input Shields Connected to Module Terminal Board**

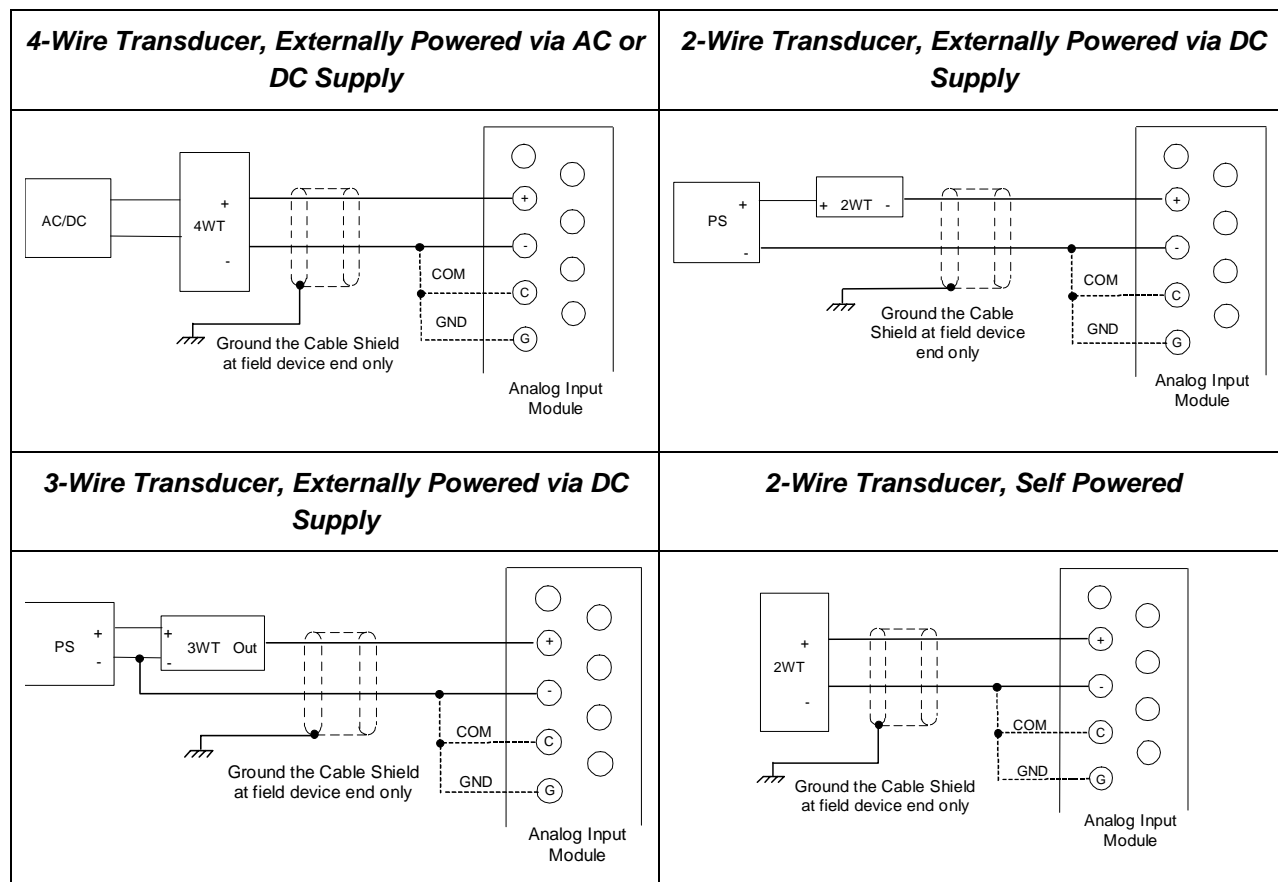
It is usually preferable to ground cable shields at the source end. If that is difficult, or if electrical noise is not a concern, it may be acceptable to ground cable shields at the analog input module end. They can be connected to one of the module's GND terminals (which is connected to frame ground through an internal path) as shown left below. If necessary to improve noise immunity, a conductor can be used to connect a ground terminal on the module to earth ground as shown below. This will bypass noise around the module.



### Wiring for Current Transducers

For all of the examples shown below, connect the (-) conductor to the Analog Input module COM terminal, if the source is floating, to limit common-mode voltages. Common mode voltage is limited to 11 volts.

If noise causes inaccurate readings, the ( - ) conductor can also be connected to the Analog Input module GND terminal.

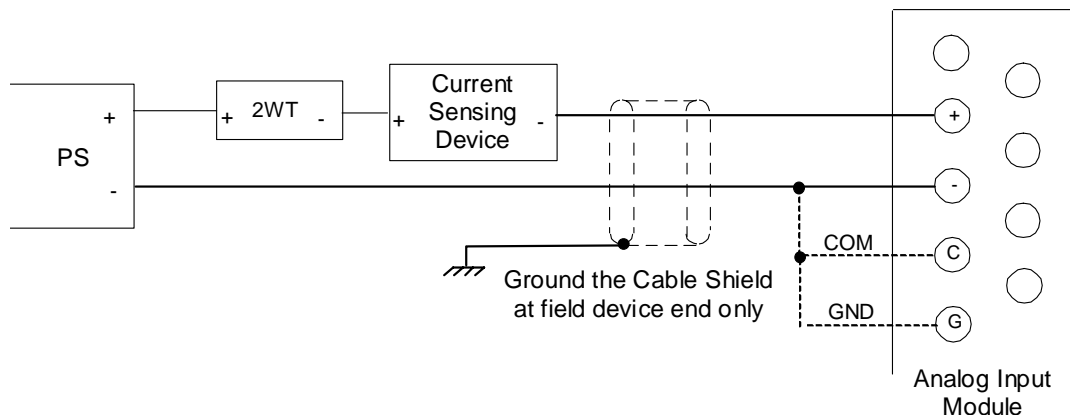


### 2-Wire Transducer Connected to Two Measuring Devices

Connect the (-) conductor to the Analog Input module COM terminal, if the source is floating, to limit common-mode voltages. Common mode voltage is limited to 11 volts.

If noise causes inaccurate readings, the ( - ) conductor can also be connected to the Analog Input module GND terminal.

The analog module must be the last device on the circuit. When grounding the ( - ) return side of the Analog Input Module, the other current-sensing device must be floating and able to withstand a common mode voltage of at least 20 volts, including the noise level.



### Verifying Analog Input Current

RX3i Analog Current Input Modules have an internal 250 ohm resistor across the input terminals. You can measure the voltage across the input terminals using a volt meter, then use Ohm's Law to determine the input current:

$$\text{Input Current (in Amps)} = \text{Volts} / 250$$

For example, if you measured 3 volts across the input terminals:

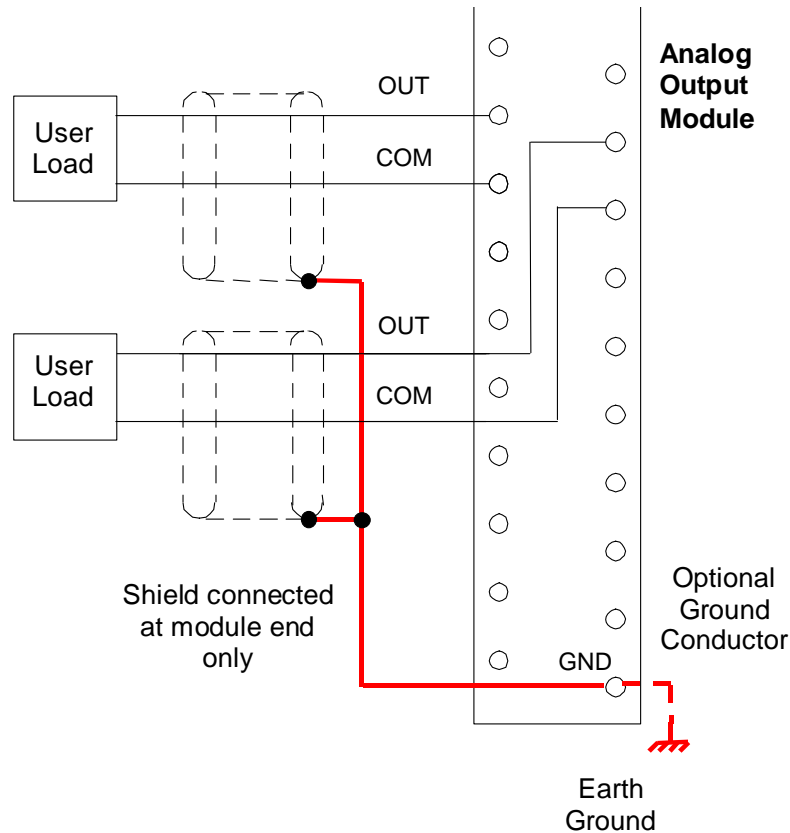
$$\text{Input Current (in Amps)} = \text{Volts} / 250$$

$$\text{Input Current (in Amps)} = 3/250$$

$$\text{Input Current (in Amps)} = .012 \text{ (which equals 12 mA)}$$

### Shield Connections for Analog Output Modules

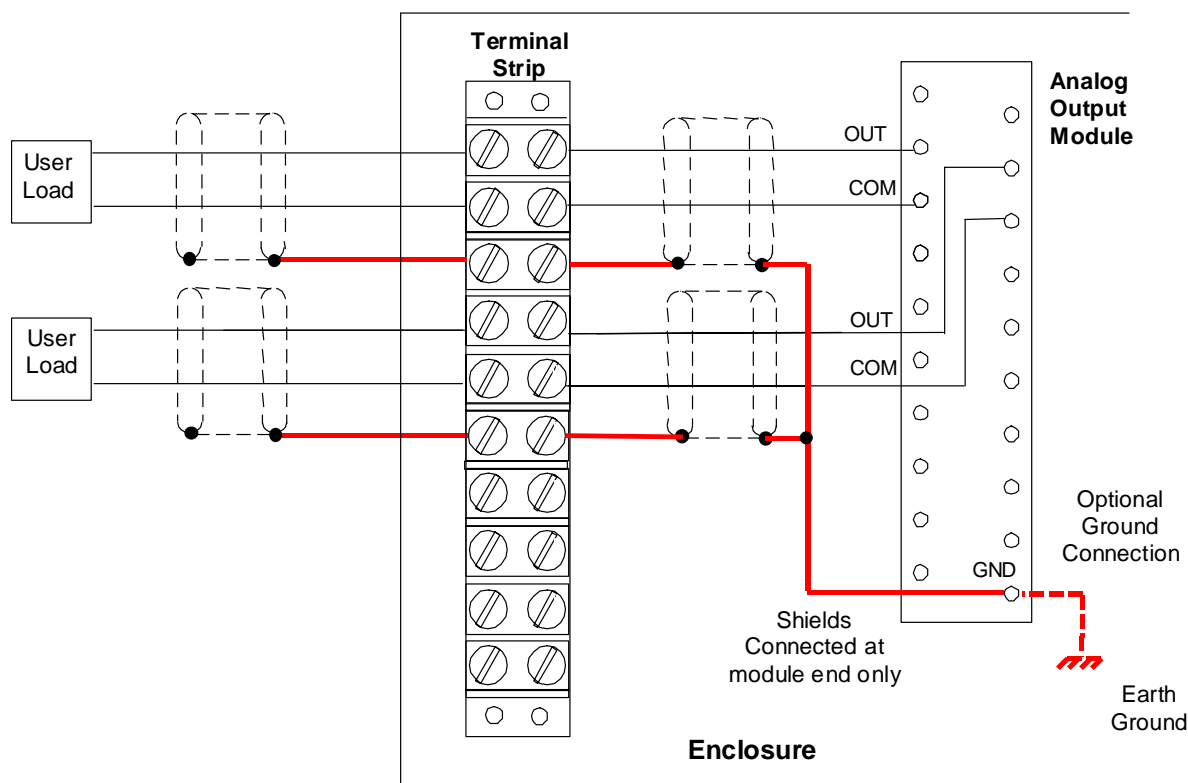
For analog output modules, the shield is normally grounded at only the source end (the module). The GND connection provides access to the backplane (frame ground) resulting in superior rejection of noise caused by any shield drain currents. In extreme-noise environments, you can connect an optional ground braid from the GND terminal to an external earth ground to bypass noise around the module.





### **Analog Output Shield Grounding with a Terminal Strip**

If there is a terminal strip between the analog output module and the field devices (user loads), use the method in the following figure for grounding the cable shields. Each cable is only grounded at one end - the end closer to the Analog Output Module. An optional external ground connection to the output module's GND terminal is shown for installations that require extra noise suppression.



**Module Fuse List****Warning**

**Replace fuse only with the correct size and type. Using an incorrect fuse can result in harm to personnel, damage to equipment, or both.**

<b>Module Catalog Number</b>	<b>Module Type</b>	<b>Current Rating</b>	<b>Quantity on Module</b>	<b>GE Fanuc Fuse Part Number</b>	<b>Other Sources and Part Numbers</b>
IC694MDL310	120 VAC, 0.5A	3A	2	44A724627-111 (1)	Bussman – GMC-3 Littlefuse – 239003
IC694MDL330	120/240 VAC, 1A	5A	2	44A724627-114 (1)	Bussman – GDC-5 Bussman S506-5
IC694MDL340	120 VAC, 0.5A	3A	2	44A724627-111 (1)	Bussman – GMC-3 Littlefuse – 239003
IC694MDL390	120/240 VAC, 2A	3A	5	44A724627-111 (1)	Bussman – GMC-3 Littlefuse – 239003
IC694PWR321 and IC694PWR330	120/240 VAC or 125 VDC Input, 30 Watt Power Supply	2A	1	44A724627-109 (2)	Bussman – 215-002 (GDC-2 or GMC-2) Littlefuse – 239-002
IC694PWR331	24 VDC Input, 30 Watt Power Supply	5A	1	44A724627-114 (2)	Bussman – MDL-5 Littlefuse – 313005

- (1) Mounted in clip. Accessible by removing circuit board from module housing.  
 (2) Line fuse. Mounted in clip – accessible by removing module front.

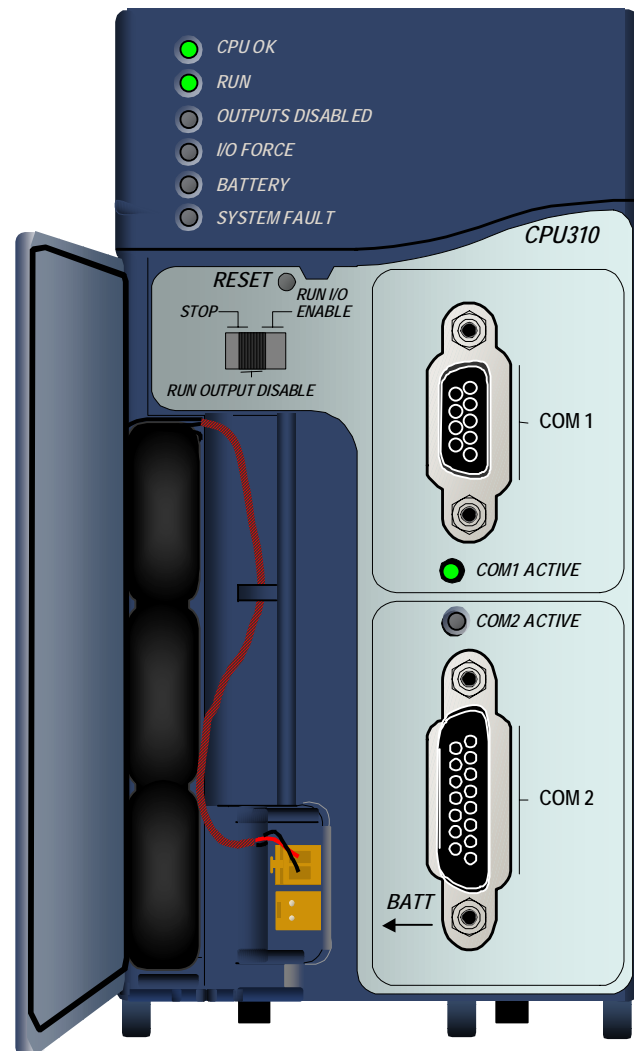
## CPU

1. Make sure that rack power is off.
2. Install the CPU module in the appropriate slot. The CPU requires two slots and can use any slots except the highest numbered (rightmost) slot.
3. Turn on power. The module should power up. When the CPU has successfully completed initialization, the OK LED stays on and the RUN and EN LEDs are off. The CPU is now ready to be programmed.
4. Connect the battery to either of the battery connectors on the module. (You can connect the battery at any step in the installation process but it will begin to drain immediately unless power is applied. To maximize battery life, install it after power has been turned on).
5. If appropriate, communications cables can be secured to the tie-downs on the bottom of the module.

After the program has been verified, the mode switch can be moved to the appropriate operation mode position: RUN I/O ENABLED, RUN OUTPUT DISABLE, or STOP. The LEDs indicate the position of the mode switch and status of serial port activity.

### Caution

This module may NOT be hot-inserted in the backplane; power must be removed before installing or removing the CPU.

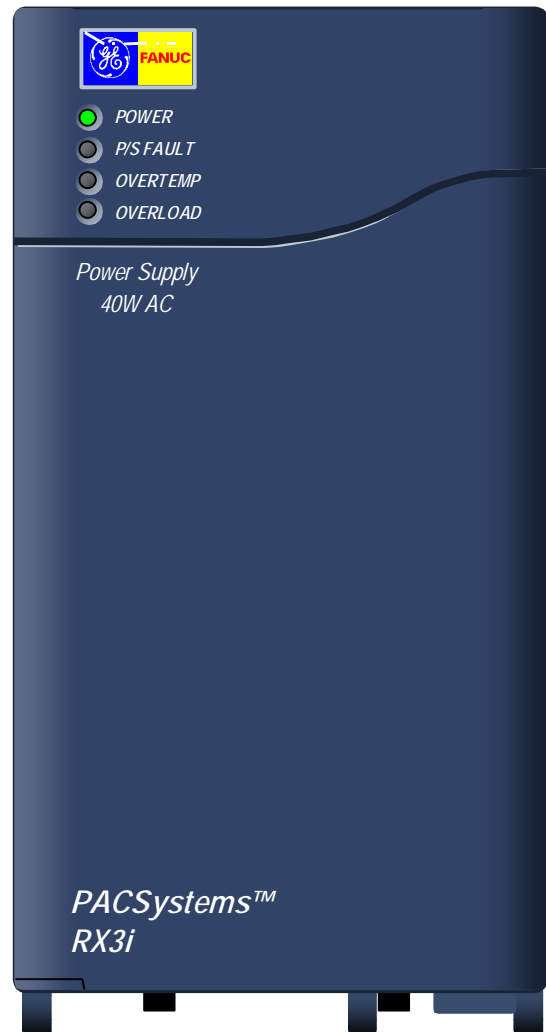


## Power Supplies

1. Install the Power Supply module in the appropriate slot(s).
2. Universal Power Supplies (IC695) can be installed in any slots except the highest numbered (rightmost) slot in a Universal Backplane. Expansion Power Supplies (IC694) must be installed in the Power Supply (leftmost) slot in an Expansion Backplane, See chapter 3, Backplanes, for more information about module locations.
3. Connect wiring to the Power Supply as described below.
4. Use the three wiring tie-downs on the bottom of the module to secure the power and ground wires after installation.

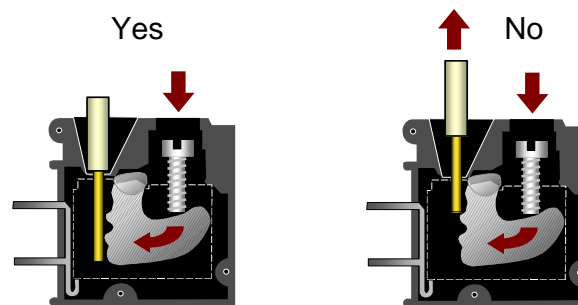
### Warning

**For all Power Supplies, if the same input power source is used to provide power to two or more power supplies in the system, connection polarity must be identical at each power supply. A resulting difference in potential can injure personnel or cause damage to equipment. Also, each backplane must be connected to a common system ground.**

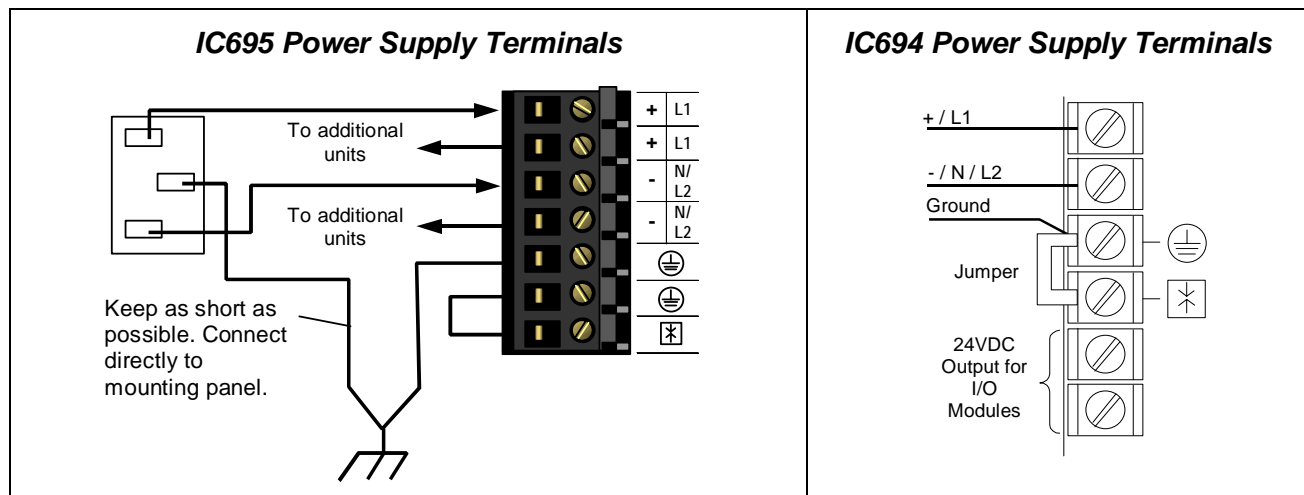


### Power Supply Field Wiring

- For IC695 Power Supplies, each terminal accepts one AWG #14 to AWG #22 wire. The diagram below is a cross-section of one of the terminals on an IC695 Power Supply. The end of each wire should be stripped at least 3/8-inch (9mm). The terminal can accept a wire that is stripped up to 11 mm (.433 in) while providing full seating of the insulator. The wire must be fully-inserted into the terminal block as shown at left, so that the insulation meets the insulation stop position inside the terminal. Tightening the terminal screw pivots the clamp firmly against the stripped end of the wire, holding it in place. If the wire is not fully inserted, as shown on the right, tightening the clamp may push the wire upward, so that it is not connected.



- For IC694 Power Supplies, each terminal accepts one AWG #14 (2.1mm<sup>2</sup>) or two AWG #16 (1.3mm<sup>2</sup>) copper 75°C (167°F) wires. The suggested torque for the Power Supply terminals is 12 in-lbs (1.36 Newton-meters). Each terminal can accept solid or stranded wires. Both the wires in any terminal should be the same type.



For Expansion (IC694) Power Supplies only, the bottom terminals provide access to the Expansion Backplane's Isolated +24V DC output, which can be used to power input circuits for certain IC694 modules. See the table of module load requirements in chapter 4 for information.

#### Caution

If the Isolated 24 VDC supply is overloaded or shorted, the PLC will stop operation.

## AC Power Source Connections

Connect the hot and neutral wires or lines L1 and L2 to the appropriate Power Supply terminals.

## DC Power Source Connections

All RX3i Power Supplies have DC input capabilities. Connect the + and - wires from the DC source to the appropriate terminals. These connections are polarity-sensitive DC-only supplies.

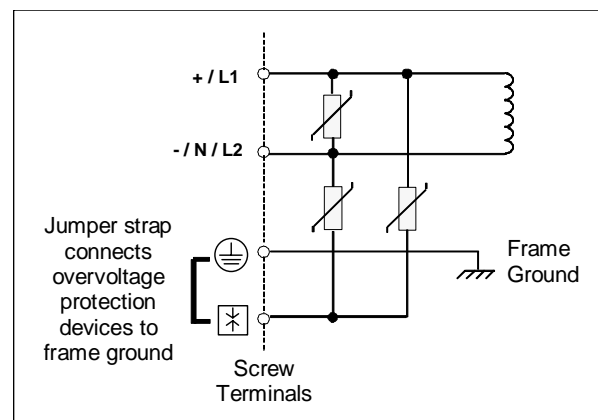
## Ground Connection

Connect the safety ground wire to the terminal marked with a ground symbol.

## External Overvoltage Protection

The Ground and MOV terminals on a Power Supply module are normally connected to frame ground with a user-installed jumper as shown at right. If overvoltage protection is not required or is supplied upstream, no jumper is needed.

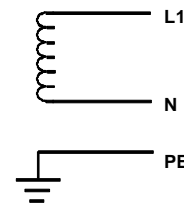
In systems with a floating neutral input (the neutral line is not referenced to Protective Earth Ground), this jumper must NOT be installed. In addition, in a floating neutral system, voltage surge protection devices such as MOVs **must** be installed from L1 to earth ground, and from L2 (Neutral) to earth ground.



## AC Power Supply Connections for Floating Neutral (IT) Systems

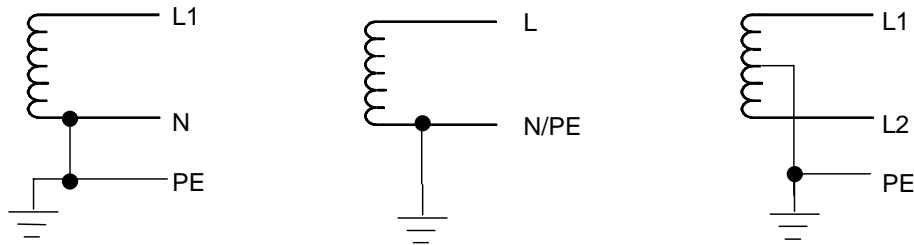
If an AC input power supply is installed in a system where the Neutral line is not referenced to Protective Earth Ground, special installation instructions must be followed to prevent damage to the power supply.

A *Floating Neutral System* is a system of power distribution wiring where Neutral and Protective Earth Ground are not tied together by a negligible impedance. In Europe this is referred to as an IT system (see IEC950). In a *Floating Neutral System*, voltages measured from input terminals to protective earth ground may exceed the 264 Volts AC maximum input voltage power supply specification.



### **Non-Floating Neutral System**

Systems where one leg of the power distribution wiring is tied to Protective Earth or a tap between two legs of the power distribution wiring is tied to Protective Earth are not *Floating Neutral Systems*. Non-floating neutral systems **do not** require special installation procedures.



### **Instructions for Floating Neutral Systems**

1. The input power terminals should be wired as shown previously.
2. No jumper may be installed jumper between terminals 3 and 4 of the Power Supply module.
3. Voltage surge protection devices such as MOVs must be installed:
  - From L1 to earth ground
  - From L2 (Neutral) to earth ground

The voltage surge devices must be rated such that the system is protected from power line transients that exceed  $Line\ voltage + 100V + (N-PE)_{MAX}$ . The expression  $N-PE$  refers to the voltage potential between neutral and Protective Earth (PE) ground.

For example, in a 240 Volt AC system with neutral floating 50V above earth ground, the transient protection should be rated at:  $240V + 100V + 50V = 390V$

## Serial Bus Transmitter Module

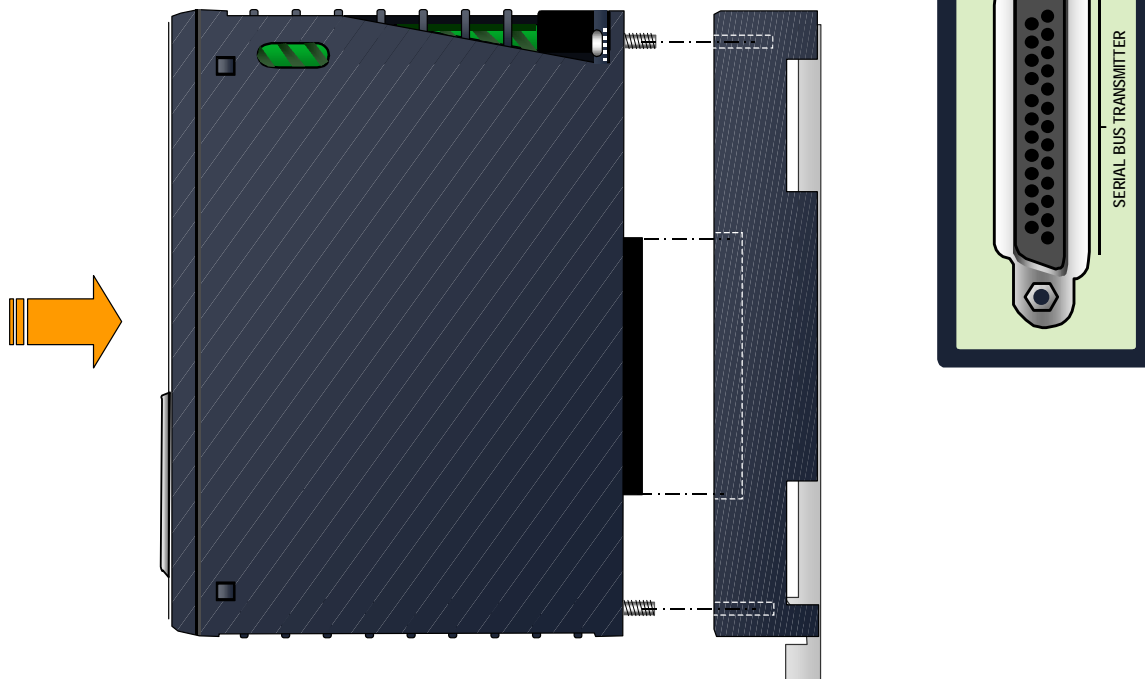
The RX3i Serial Bus Transmitter Module, IC695LRE001, provides communications between a PACSystems RX3i Universal Backplane (IC695-model number), and serial expansion and remote backplanes (IC694- or IC693-model numbers). It must reside in the expansion connector on the right end of a Universal Backplane.

### Module Installation

This module may NOT be hot-inserted in the backplane; power must be removed before installing or removing the Bus Transmitter Module.

Insert the Serial Bus Transmitter Module straight into its slot as shown below. This module does not have the same pivoting and latching mechanisms as other RX3i modules.

Tighten the two captive screws in the corners of the module. Recommended torque is 4.4 in/lb maximum.\*



### Expansion Cable Installation

Subsequent backplanes in the system are linked by expansion cables as described in chapter 5. The expansion cable may not be attached or removed if the expansion rack has power applied.





# Chapter 3

## Backplanes

This section describes the following RX3i backplanes for PACSystems:

- 16 Slot RX3i Universal Backplane, IC695CHS016
- 12 Slot RX3i Universal Backplane, IC695CHS012
- 5 Slot RX3i Serial Expansion Backplane, IC694CHS398
- 10 Slot RX3i Serial Expansion Backplane, IC694CHS392

### Backplane Types

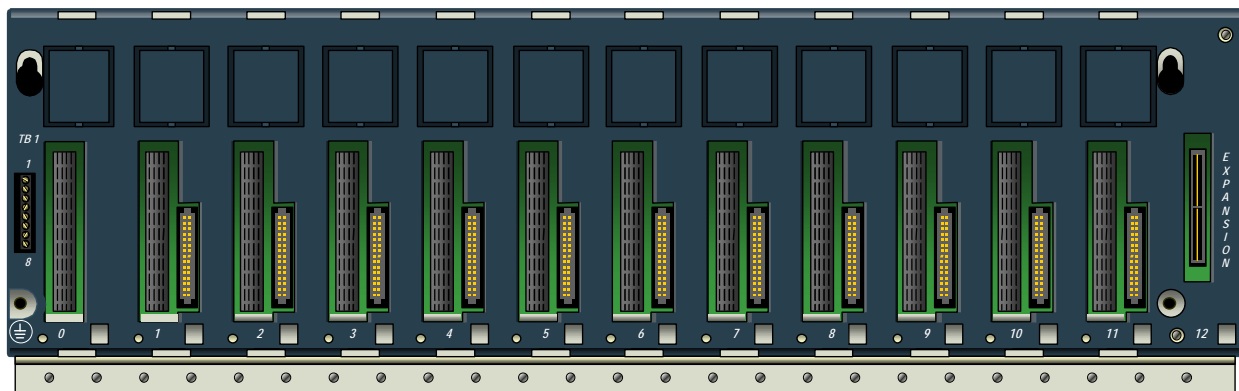
The following types of backplanes can be included in an RX3i system:

<b>Backplane Type</b>	<b>Catalog Number</b>
16 Slot RX3i Universal Backplane	IC695CHS016
12 Slot RX3i Universal Backplane	IC695CHS012
5 Slot RX3i Serial Expansion Backplane	IC694CHS398
10 Slot RX3i Serial Expansion Backplane	IC694CHS392
5 Slot Series 90-30 Expansion Backplane	IC693CHS398
10 Slot Series 90-30 Expansion Backplane	IC693CHS392
5 Slot Series 90-30 Remote Backplane	IC693CHS399
10 Slots Series 90-30 Remote Backplane	IC693CHS393

For information about Series 90-30 Expansion and Remote Backplanes, see GFK-0898, the *Series 90-30 PLC Installation Manual*.

### *RX3i Universal Backplanes: IC695CHS012, IC695CHS016*

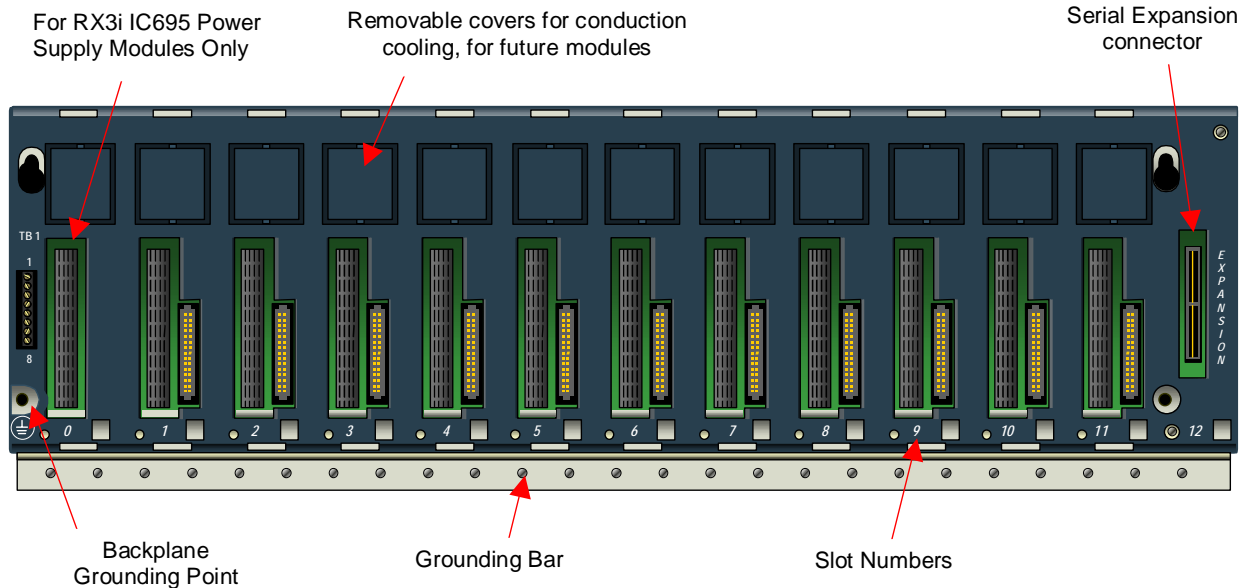
Two Universal Backplanes are available for RX3i PACSystems: the 16-slot Universal Backplane (IC695CHS016), and the 12-slot Universal Backplane (IC695CHS012), shown below.



The RX3i Universal Backplane supports both PCI (IC695) and serial (IC694) I/O and option modules with its dual-bus backplane. The RX3i Universal Backplane also supports 90-30 IO and option modules. See Chapter 1 for lists of supported modules.

RX3i modules (IC695 catalog numbers) communicate over the backplane's PCI bus. RX3i modules (IC694 catalog numbers) and Series 90-30 modules (IC693) communicate over the backplane's serial bus.

## Universal Backplane Features



Features of the Universal Backplane include:

- Terminal Strip on the left end for future fan connection and Isolated +24V input
- Backplane grounding point as described in chapter 2
- An integral grounding bar for connecting module/shield grounds as described in chapter 2
- Removable covers that provide access for module conduction cooling (for future use).
- Serial Expansion connector for connection to Serial Expansion and Remote Backplanes
- Slot numbers are printed on the backplane and are used for reference for configuration in Machine Edition. Slots and connectors are described on the following pages. Most modules occupy one slot. Some, such as CPU modules and AC Power Supplies, are twice as wide, and occupy two slots.

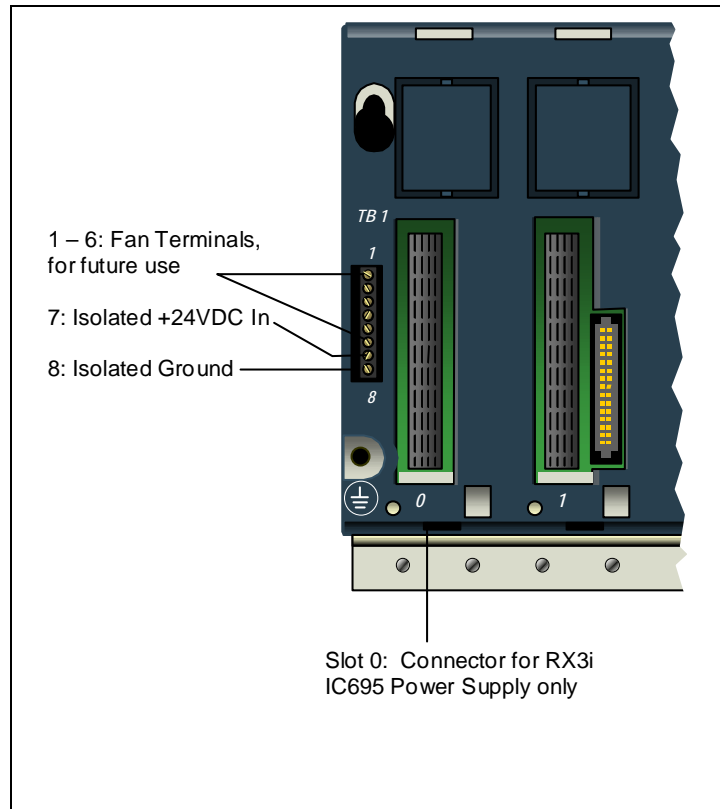
## Universal Backplane TB1 Input Terminals

Terminals 1 through 6 on the left end of the Universal Backplane are reserved for external fan control (available in future systems).

The RX3i IC695 Power Supplies do not provide Isolated +24V output power over the backplane. Terminals 7 and 8 can be used to connect an optional external source of Isolated +24VDC, which is required for some IC693 and IC694 modules as listed in the table of Module Load Requirements in chapter 4.

These terminals accept individual wires from 14 to 22 AWG.

If modules that require Isolated +24VDC are installed in an Expansion Backplane instead, an external Isolated +24V power supply is not required.



## Slot 0

The leftmost slot in a Universal Backplane is slot 0. Only the backplane connector of IC695 Power Supplies can be installed in slot 0 (note: IC695 Power Supplies can be installed any slot). However two-slot wide modules that have right-justified connectors, like the CPU310 for example, can be plugged into slot 1 and also cover slot 0.

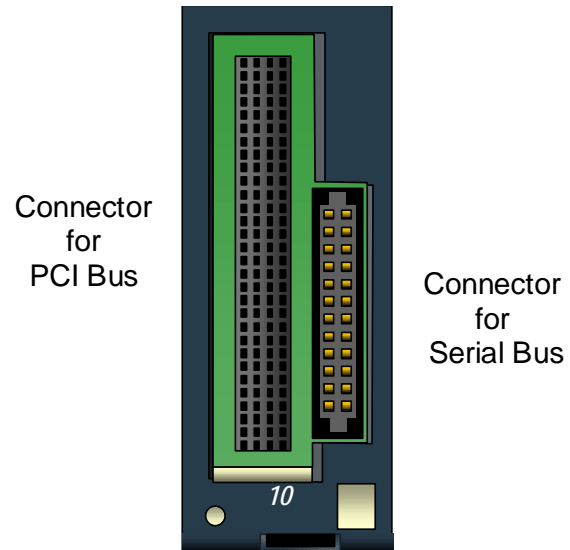
The CPU is referenced for configuration and application logic by the leftmost slot occupied by the entire module, not by the slot the physical connector is located in. For example, if the CPU has its physical connector inserted in slot 3, the module occupies slots 2 and 3 and the CPU is referenced as being located in slot 2. The CPU may be located in slot 0 with its connector in slot 1.

### Slot 1 to Slot 11 or 15

Slots 1 through 11 or 15 have two connectors as shown at right, a connector for the RX3i PCI bus and connector for the RX3i serial bus.

Each of these slots can accept any type of compatible module: IC695 Power Supply, IC695 CPU, or IC695, IC694 and IC693 I/O or option modules.

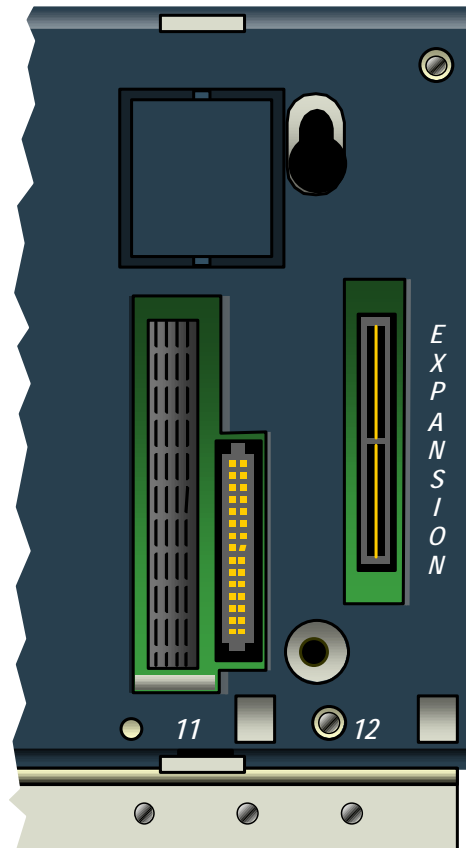
Provided the Hot Installation procedure described in chapter 2 is carefully followed, I/O and option modules in a Universal Backplane may be removed and replaced without powering-down.



### Expansion Slot (Slot 12 or 16)

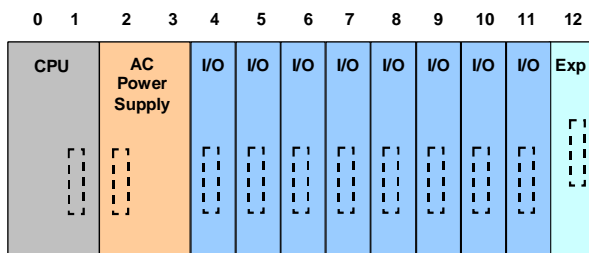
The rightmost slot in a Universal Backplane has a different connector than the other slots. It can only be used for an RX3i Serial Expansion Module (IC695LRE001).

An RX3i two-slot module cannot occupy this expansion slot.

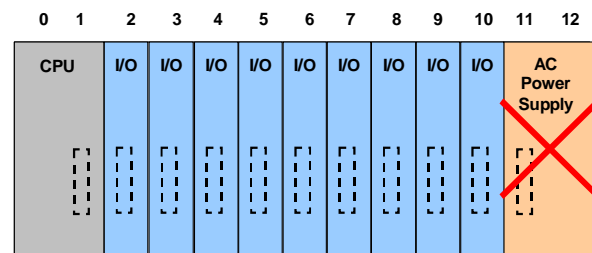


### Module Locations in a Universal Backplane

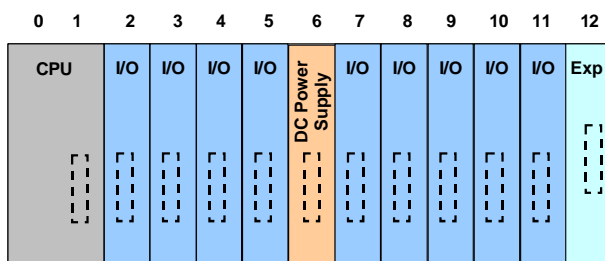
- IC695 Power Supply modules may be installed in any slot. DC Power Supplies IC695PSDx40 occupy 1 slot. AC Power Supplies IC695PSAx40 occupy 2 slots. RX3i (IC694) and Series 90-30 (IC693) Power Supplies cannot be installed in Universal Backplanes.
- An RX3i CPU module can be installed anywhere in the backplane except the Expansion slot. CPU modules occupy 2 slots.
- I/O and option modules can be installed in any available slot except slot 0, which can only accept IC695 Power Supplies, and the Expansion slot. Each I/O slot has two connectors, so either an RX3i PCI-based module or a serial module can be installed in any I/O slot.
- The rightmost slot is the expansion slot. It can only be used for optional serial expansion module IC695LRE001. See chapter 5 for information about the LRE001 Serial Expansion Module and expansion cables.



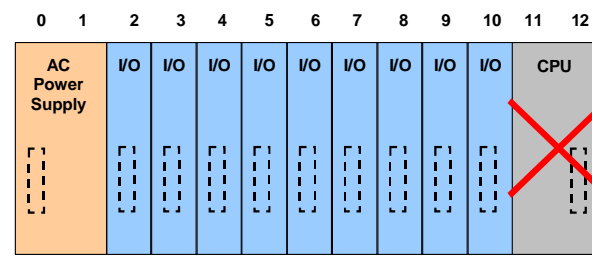
Configured as CPU in slot 0, Power Supply in slot 2



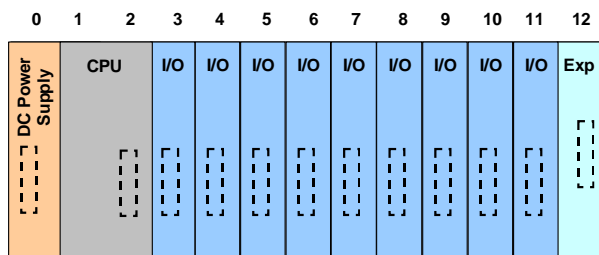
Invalid: AC Power Supply cannot be in Slot 11.



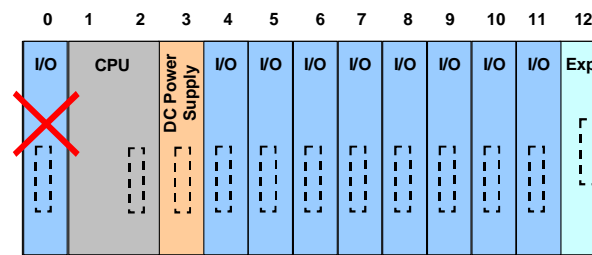
Configured as CPU in slot 0, Power Supply in slot 6



Invalid: CPU cannot be configured in slot 11



Configured as Power Supply in slot 0, CPU in slot 1



Invalid: Only a Power Supply can be installed in slot 0.

### ***Locating the CPU in Slot 1***

Installing the CPU in slot 1 means that only a singlewide power supply may be used in slot 0. Either DC power supply can be used (IC695PSD040 or IC695PSD140). If the application must maintain a slot 1 CPU and uses an AC power-supply, the RX3i AC power-supply must be located in a slot to the right of the RX3i CPU in slot 1.

### ***Locating the CPU in a Slot Other than 1***

Before deciding to place the CPU in a slot other than slot 1, it is important to consider possible issues that could arise, as explained below.

**Communications:** For Service Request #15 (Read Last-Logged Fault Table Entry) and Service Request #20 (Read Fault Tables), the location of CPU faults is not the standard 0.1 location, but the slot the CPU is located in. Logic that decodes fault table entries retrieved by these service requests may need updating.

COMMREQs directed to the CPU (e.g. those directed to the serial ports of the CPU) will need to be updated with the correct CPU slot reference.

**Hardware Configuration:** The slot location of the CPU must be updated in the hardware configuration to reflect the CPU's true location.

**Fault Tables:** Faults logged for the CPU in the fault table will reflect the CPU's actual slot.

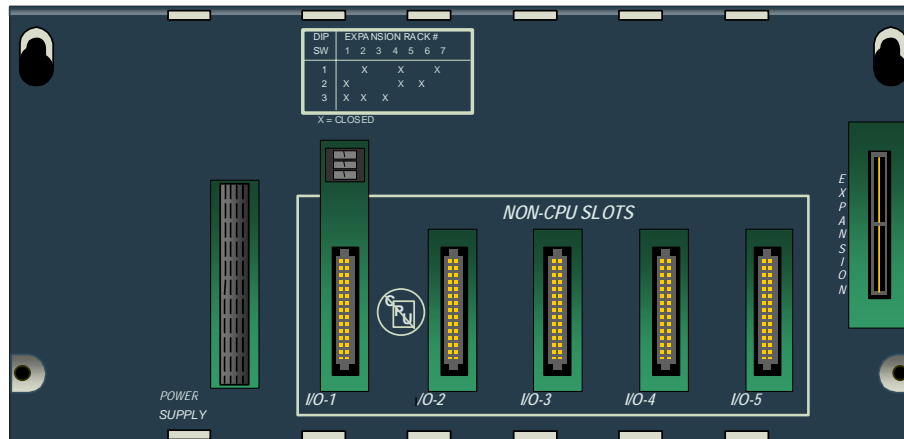
**Remote Series 90 PLCs that use SRTP Channels COMMREQs** expect the CPU to be in slot 1 or slot 2. To support communications with Series 90 SRTP clients such as Series 90 PLCs using SRTP Channels, the RX3i internally redirects incoming SRTP requests destined for {backplane 0, slot 1} to {backplane 0, slot 2}, provided that the CPU is located in backplane 0 slot 2 (and the remote client has not issued an SRTP Destination service on the connection to discover the backplane and slot of the CPU). This special redirection permits Series 90-30 applications that expect the power supply to be located leftmost and the CPU to be located to the right of the power supply to function. Attempts to establish channels with CPUs in slots other than 1 or 2 will fail if initiated from Series 90 PLCs.

**All external communication devices that interact with the CPU** should be checked for compatibility with CPU slot locations other than slot 1. Problems may arise with, but are not limited to, initial connection sequences and fault reporting. Machine Edition View users should select "GE SRTP" as their communications driver – it can communicate with a CPU in any slot.

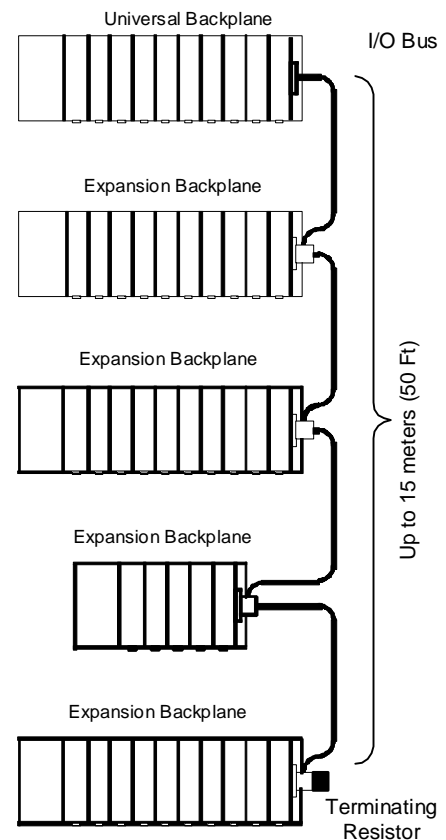


## Serial Expansion Backplanes: IC694CHS392, IC694CHS398

The system can include any combination of up to seven RX3i Serial Expansion backplane and/or Series 90-30 Expansion/Remote Backplanes. RX3i Serial Expansion Backplanes are available with either 5 I/O slots (IC694CHS398, shown below) or 10 I/O slots (IC694CHS392).



- The leftmost module in an RX3i Serial Expansion Backplane must be a Serial Expansion Power Supply:
  - IC694PWR321: Serial Expansion Power Supply, 120/240VAC, 125VDC
  - IC694PWR330: Serial Expansion Power Supply, 120/240VAC, 125VDC, High Capacity
  - IC694PWR331: Serial Expansion Power Supply, 24VDC, High Capacity
- Module Hot Installation and Removal are NOT permitted on Expansion Backplanes.
- Each Expansion Backplane has a Rack Number Selection DIP switch that must be set before module installation. See chapter 2 for details.
- Each Expansion Backplane has a Bus Expansion connector at its right end for attaching an optional expansion cable. There can be no more than 50 feet (15 meters) of cable interconnecting Expansion backplanes with the Universal Backplane. If the system includes Series 90-30 Remote Backplanes, the additional requirements summarized in chapter 1 must also be observed.



# Chapter *Power Supplies*

## 4

This chapter describes Power Supplies for RX3i PACSystems:

<b><i>Power Supply Type</i></b>	<b><i>Catalog Number</i></b>
120/240 VAC, 125 VDC, 40 Watt Power Supply	IC695PSA040
120/240 VAC, 125 VDC, 40 Watt, Multi-Purpose Power Supply	IC695PSA140
24 VDC, 40 Watt Power Supply	IC695PSD040
24 VDC, 40 Watt Multipurpose Power Supply	IC695PSD140
120/240 VAC, 125 VDC, Serial Expansion Power Supply	IC694PWR321
120/240 VAC, 125 VDC, High Capacity Serial Expansion Power Supply	IC694PWR330
24 VDC, High Capacity Serial Expansion Power Supply	IC694PWR331

## Power Supply Overview

This section provides a general description of the IC695 Power Supplies, which must be used in RX3i (IC695) Universal Backplanes, and IC694 Power Supplies, which must be used in RX3i Serial Expansion (IC694) Backplanes. Individual Power Supply specifications are listed in the sections that follow.

The IC695 Power Supplies provide up to 40 Watts each. The IC694 (Expansion) Power Supplies provide up to 30 Watts each. However, IC694PWR321 is limited to 15 Watts on the +5 VDC output.

The total of all outputs combined cannot exceed the stated load capacity in Watts. Machine Edition will automatically calculate the power consumption of modules as they are added to the system configuration. Power requirements of system modules are shown in this section, for reference when planning the system.

The maximum load for each type of Power Supply is shown below.

<b>Catalog Number</b>	<b>Can be Located In</b>	<b>Nominal Input</b>	<b>Load Capacity*</b>	<b>Load Sharing, Redundancy</b>	<b>Maximum +3.3 VDC</b>	<b>Maximum +5 VDC</b>	<b>Maximum +24 VDC Isolated</b>	<b>Maximum +24 VDC Relay</b>
IC695PSA040	Universal Backplane	120/240 VAC or 125 VDC	40 Watts	No	30 Watts	30 Watts	--	40 Watts
IC695PSA140	Universal Backplane	120/240 VAC or 125 VDC	40 Watts	Yes	30 Watts	30 Watts	--	40 Watts
IC695PSD040	Universal Backplane	24 VDC	40 Watts	No	30 Watts	30 Watts	--	40 Watts
IC695PSD140	Universal Backplane	24 VDC	40 Watts	Yes	30 Watts	30 Watts	--	40 Watts
IC694PWR321	Serial Expansion Backplane	100/240 VAC or 125 VDC	30 Watts	No	--	15 Watts	20 Watts	15 Watts
IC694PRW330	Serial Expansion Backplane	100/240 VAC or 125 VDC	30 Watts	No	--	30 Watts	20 Watts	15 Watts
IC694PRW331	Serial Expansion Backplane	24 VDC	30 Watts	No	--	30 Watts	20 Watts	15 Watts

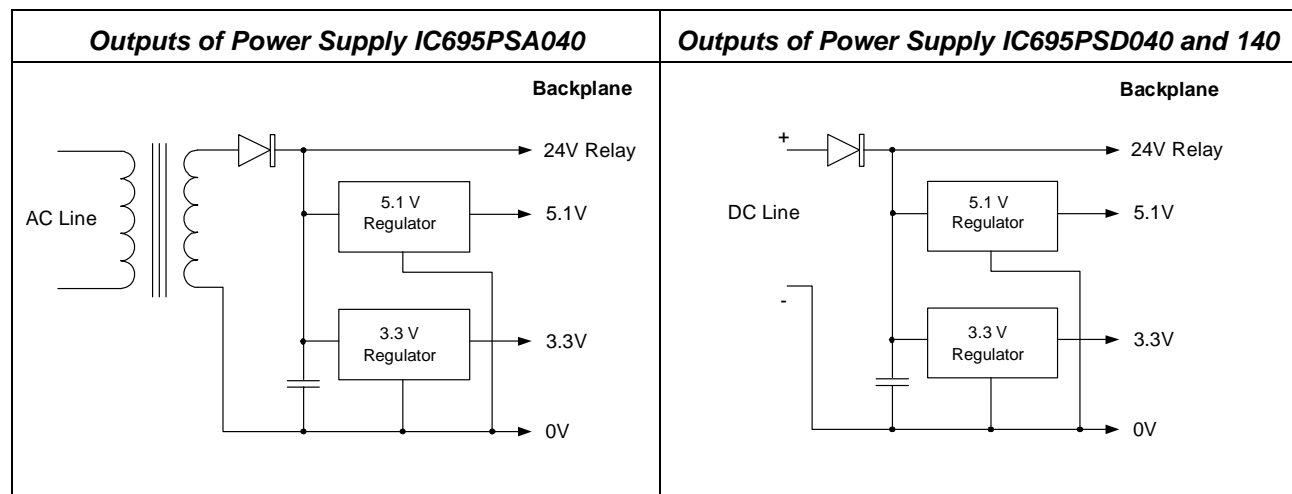
A power supply must be able to provide the total of the internal and external loads that may be placed upon it by all the hardware components in the backplane as well as the loads that may be connected to the Isolated +24 VDC supply on an expansion backplane.

## 24 VDC Isolated Power

The IC695 Power Supplies do not have Isolated +24 VDC output terminals. The RX3i Universal Backplane provides external input terminals (TB1) for connecting an optional Isolated +24 VDC external supply. Modules that draw +24 VDC from the backplane are listed in the table of Module Load Requirements that follows. (See Chapter 3 for more details on how to wire to TB1).

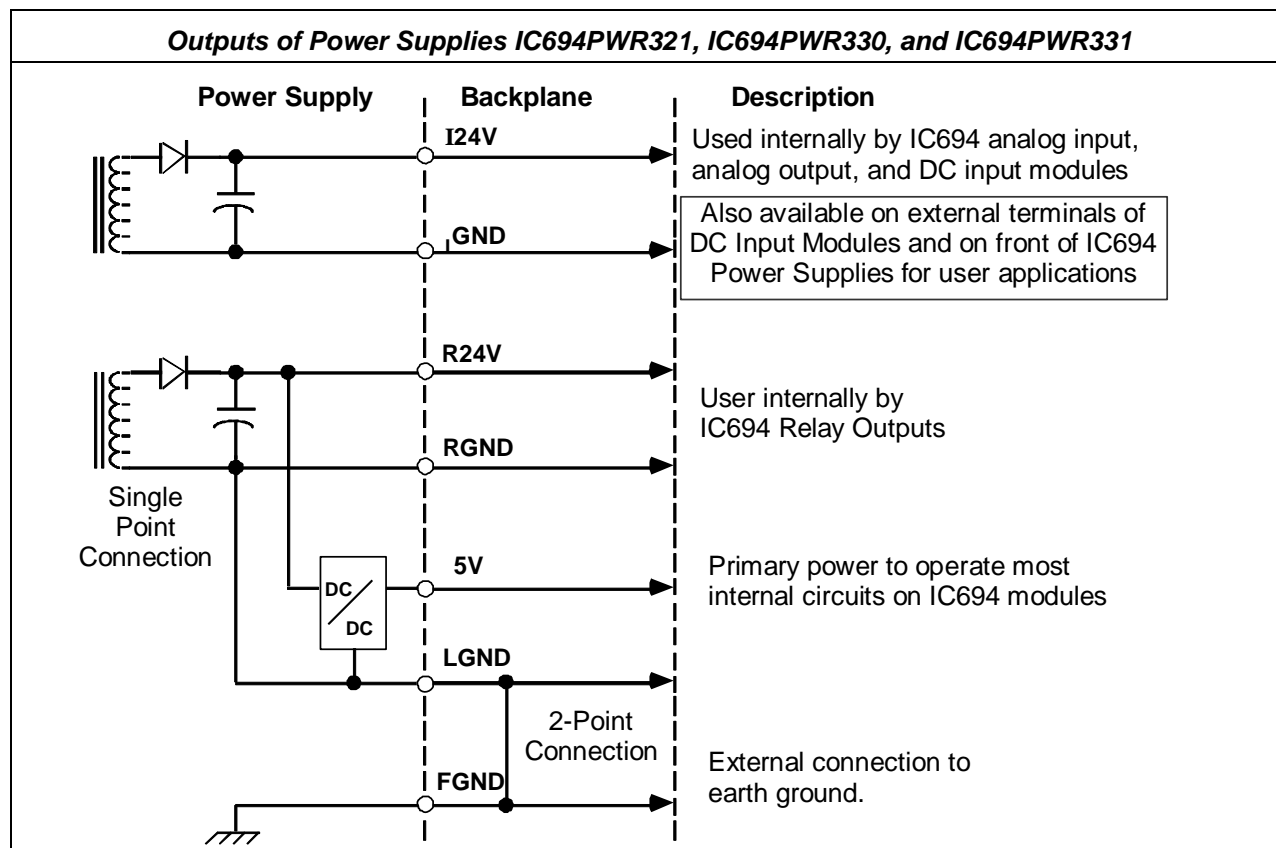
## RX3i IC695 Power Supply Outputs

The IC695 power supplies have +5.1 VDC, +24 VDC Relay, and 3.3 VDC outputs that are connected internally on the backplane. The voltage and power required by modules installed on the backplane is supplied through the backplane connectors.



## Expansion Power Supply Outputs

The IC694 power supplies have +5 VDC, Relay +24 VDC and Isolated +24 VDC outputs that are connected internally on the backplane. The voltage and power required by modules installed on the backplane is supplied through the backplane connectors.



## Module Load Requirements

The table below summarizes the maximum load requirements in milliamps and Watts for RX3i modules. For I/O modules, the actual load may depend on the number of points on at the same time.

Catalog Number	Module	+3.3 VDC		+5 VDC		+24 VDC Relay		+24 VDC Isolated	
		mA	Watts	mA	Watts	mA	Watts	mA	Watts
IC695CHS012	Universal Backplane, 12-Slot	600	1.98	240	1.20	--	--	--	--
IC695CHS016	Universal Backplane, 16-Slot	600	1.98	240	1.20	--	--	--	--
IC695CPU310	300MHz CPU 10 Meg memory	1250	4.125	1000	5.00	--	--	--	--
IC695ETM001	Ethernet Module	840	2.772	614	3.07	--	--	--	--
IC695LRE001	Expansion Module	--	--	132	1.60	--	--	--	--
IC694ACC300	Input Simulator	--	--	120	0.60	--	--	--	--
IC694ACC307	Expansion Bus Termination Plug	--	--	72	0.36	--	--	--	--
IC694ALG220	Analog Input, Voltage, 4 Ch.	--	--	27	0.135	--	--	98	2.352
IC694ALG221	Analog Input, Current, 4 Ch	--	--	25	0.125	--	--	100	2.4
IC694ALG222	Analog Input, 8/16 Ch Voltage	--	--	112	0.56	--	--	41	0.984
IC694ALG223	Analog Input, 8/16 Ch, Current	--	--	120	0.60	--	--	--	--
IC694ALG390	Analog Output 2 Ch Voltage	--	--	32	0.16	--	--	120	2.88
IC694ALG391	Analog Output 2 Ch Current	--	--	30	0.15	--	--	215	5.16
IC694ALG392	Analog Output 8 Ch Current/Voltage	--	--	110	0.55	--	--		
IC694ALG442	Analog Current/Voltage 4 Ch In / 2 Ch Out	--	--	95	0.475	--	--	129	3.096
IC695ALG600	Universal Analog Input Module	350	1.155	400	2.00	--	--	--	--
IC695ALG608	Analog Input 8/4 Ch. Voltage/Current	330	1.089	600	3.00	--	--	--	--
IC695ALG616	Analog Input 16/8 Ch. Voltage/Current	450	1.485	600	3.00	--	--	--	--
IC695ALG626	Analog Input 4 Ch. Voltage/Current with HART Communications	625	2.063	600	3.00	--	--	--	--
IC695ALG628	Analog Input 8 Ch. Voltage/Current with HART Communications	625	2.063	450	2.25	--	--	--	--
IC695ALG704	Analog Output, 4 Ch. Voltage/Current	375	1.238	--	--	--	--	--	--
IC695ALG708	Analog Output, 8 Ch. Voltage/Current	375	1.238	--	--	--	--	--	--
IC695ALG728	Analog Output, 8 Ch Voltage/Current with HART Communications enabled	380	1.255						
IC694APU300	High-Speed Counter	--	--	250	1.25	--	--	--	--
IC694APU305	Special I/O Processor (module only, +10mA per output on	--	--	360	1.80	--	--	--	--
IC694BEM320	I/O Link Interface Module with Optical Adapter	--	--	205 405	1.025 2.025	--	--	--	--
IC694BEM321	IO Link Master Module With Optical Adapter	--	--	415 615	2.075 3.075	--	--	--	--
IC694CHS392	Expansion/Remote Backplane, 10 Slot	--	--	150	0.75	--	--	--	--
IC694CHS398	Expansion/Remote Backplane, 5 Slot	--	--	170	0.85	--	--	--	--
IC694DSM314	Motion Controller	--	--	1300	6.50	--	--	--	--
IC694DSM324	Motion Controller (+ external encoder, if used)	--	--	860 +500	4.30 +2.50	--	--	--	--
IC694MDL230	120VAC Isolated, 8 Pt Input	--	--	60	0.30	--	--	--	--
IC694MDL231	240VAC Isolated 8 Pt Input	--	--	60	0.30	--	--	--	--

Catalog Number	Module	+3.3 VDC		+5 VDC		+24 VDC Relay		+24 VDC Isolated	
		mA	Watts	mA	Watts	mA	Watts	mA	Watts
IC694MDL240	120VAC 16 Pt Input	--	--	90	0.45	--	--	--	--
IC694MDL241	24VAC/DC Pos/Neg Logic 16 Pts	--	--	80	0.40	--	--	125	3.00
IC694MDL250	120VAC 16 Pt Isolated Input (all inputs on)			220	1.10				
IC694MDL260	120VAC 32 Pt Isolated Input (all inputs on)			220	1.10				
IC694MDL310	120VAC 0.5A 12 Pt Output (all outputs on)	--	--	210	1.05	--	--	--	--
IC694MDL330	120/240VAC 0.5A 16 Pt Output (all outputs on)	--	--	160	0.80	--	--	--	--
IC694MDL340	120VAC 0.5A 16 Pt Output (all outputs on)	--	--	315	1.575	--	--	--	--
IC694MDL350	124/240 VAC Isolated 16 Point Output (all outputs on)			315	1.575				
IC694MDL390	124/240VAC Isolated 2A 5Pt Out. (all outputs on)	--	--	110	0.55	--	--	--	--
IC694MDL632	125VDC Pos/Neg Logic 8 Pt Input	--	--	40	0.20	--	--	--	--
IC694MDL634	24VDC Pos/Neg Logic 8 Pt Input	--	--	45	0.225	--	--	62	1.488
IC694MDL645	24VDC Pos/Neg Logic 16 Pt Input	--	--	80	0.40	--	--	125	3.00
IC694MDL646	24VDC Pos/Neg Logic FAST 16 Pt	--	--	80	0.40	--	--	125	3.00
IC694MDL654	5/12VDC (TTL) Pos/Neg 32 Pts 195 = (29mA + 0.5mA/point ON + 4.7mA/LED ON) 440mA (maximum) from +5V bus on backplane (if module isolated +5V supply used to power inputs and all 32 inputs ON)	--	--	195/40	0.975 / 2.20	--	--	--	--
IC694MDL655	24VDC Pos/Neg 32 Pt Input (29mA +0.5mA/point ON +4.7mA/LED ON)	--	--	195	0.975	--	--	224 (typ)	5.376
IC694MDL660	24VDC Input 32 Pts Pos/Neg	--	--	300	1.50	--	--	--	--
IC694MDL732	12/24VDC Pos Logic 0.5A 8 Pt Out	--	--	50	0.25	--	--	--	--
IC694MDL734	125VDC Pos/Neg Logic 6 Pt Out. (all outputs on)	--	--	90	0.45	--	--	--	--
IC694MDL740	12/24 VDC Pos Logic 0.5A 16 Pt Out (all outputs on)	--	--	110	0.55	--	--	--	--
IC694MDL741	12/24VDC Neg Logic 0.5A 16 Pt Out.(all outputs on)	--	--	110	0.55	--	--	--	--
IC694MDL742	12/24VDC Pos Logic ESCP 1A 16 Pt Out.(all outputs on)	--	--	130	0.65	--	--	--	--
IC694MDL752	5/24VDC (TTL) Neg Logic 0.5A 32 Pt Output (13mA + 3 mA/point ON + 4.7 mA/LED)	--	--	260	1.30	--	--	--	--
IC694MDL753	12/24VDC Pos Logic 0.5A 32 Pt Output (13mA + 3mA/point ON + 4.7mA/LED)	--	--	260	1.3	--	--	--	--
IC694MDL754	24VDC High-density Output 32 Pt	--	--	300	1.50	--	--	--	--
IC694MDL930	Relay NO 4A Isolated 8 Pt Output (all outputs on)	--	--	6	0.03	70	1.68	--	--
IC694MDL931	Relay NC and Form C 8 A Isolated 8 Pt Output (all outputs on)	--	--	6	0.03	110	2.64	--	--
IC694MDL940	Relay NO 2A 16 Pt Output (all outputs on)	--	--	7	0.035	135	3.24	--	--

## Power Supply Loading Example

To determine the total load placed on a Power Supply, add the current requirements of each module and the backplane.

For example:

<b>Catalog Number</b>	<b>Module</b>	<b>+3.3 VDC</b>	<b>+5.1 VDC</b>	<b>+24 VDC Relay</b>	<b>+24 VDC Isolated*</b>
IC695CPU310	300MHz CPU 10 Meg memory	1250	1000	--	--
IC695CHS012	Universal Backplane, 12-Slot	600	240	-	-
IC695ETM001	Ethernet Module	840	614	--	--
IC695LRE001	Expansion Module	--	132	-	-
IC694ALG220	Analog Input, Voltage, 4 Ch.		27	-	98*
IC694ALG390	Analog Output 2 Ch Voltage		32	-	120*
IC694ALG442	Analog Current/Voltage 4 Ch In / 2 Ch Out	--	95		
IC694APU300	High-Speed Counter	-	250	-	-
IC694MDL340	120VAC 0.5A 16 Pt Output	-	315	-	-
IC694MDL230	120VAC Isolated, 8 Pt Input	--	60		
IC694MDL240	120VAC 16 Pt Input	--	90		
IC694MDL930	Relay NO 4A Isolated 8 Pt Output (all outputs on)	--	6	70	
IC694MDL931	Relay NC and Form C 8 A Isolated 8 Pt Output (all outputs on)	--	6	110	
	Total Amps	2.690	2.867	0.180	
	Converted to Watts	(x3.3V)	(x5.1V)	(x24V)	
	Power Consumption from Power Supply	=8.877W	=14.622W	=4.32W	
Total Power Consumption from Power Supply		8.877 + 14.622 + 4.32 = 27.817			

At ambient temperatures up to 32°C, Power Supply IC695PSA040 provides the following power outputs:

- 40 Watts maximum total
- 5.1VDC = 30 Watts maximum
- 3.3VDC = 30 Watts maximum

In this example, all of the module power requirements are met by Power Supply PSA040. Because the Universal Backplane and IC695 power supply do not provide +24 VDC Isolated power, an external +24 VDC supply will be required for analog modules ALG220, ALG221 and ALG222.



## Load Sharing / Redundancy

To meet the power needs of the application, as many as four Multipurpose Power Supplies can be installed in a Universal Backplane. These Power Supplies can be combined to provide:

- Load Sharing
- Power Supply Module Redundancy
- Power Source Redundancy

No other types of RX3i power supply can be included in these applications.

### Load Sharing

Multi-Purpose Power Supplies can be combined into load sharing applications, The following rules must be observed:

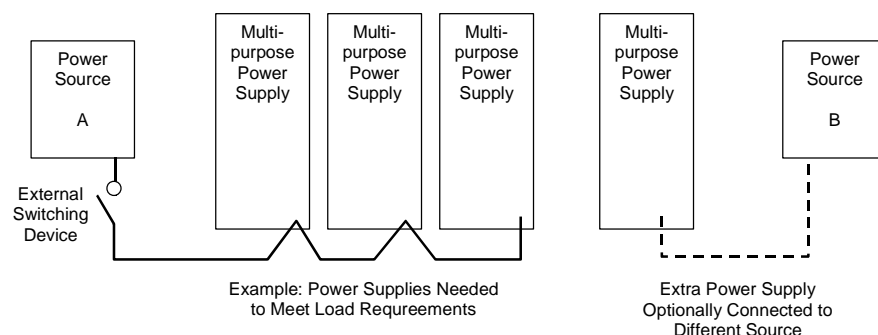
If multiple power supplies are required to meet the system load requirements, Multipurpose Power Supplies must be wired to the same power source in such a way that they all can be powered up or powered down simultaneously. The On/Off front panel switch on each of the power supplies must be left in the On position.

#### Caution

**In a load-sharing application, it is important to ensure that the load-sharing power supply modules' On/Off switches cannot be inadvertently used. The minimum number of power supplies needed to meet the system power requirements **MUST** have their switches always kept in the On position. Also, the load-sharing power supplies must be connected to the system power source through the same external switch. The system must be powered up and powered down only from the external switch. If individual power supplies are powered up or powered down using their On/Off switches *or separate external switches*, resulting in insufficient power capacity, equipment damage may result. It may be necessary to re-load the PLC operating system to resume operation.**

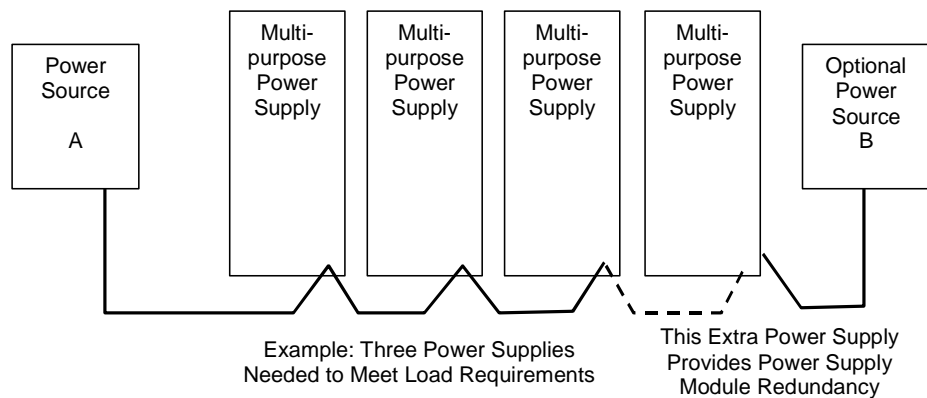
### Connections for Load Sharing

In load-sharing installations, additional Multipurpose Power Supplies above the minimum required for the system load may be wired to the same power source, or a different source.



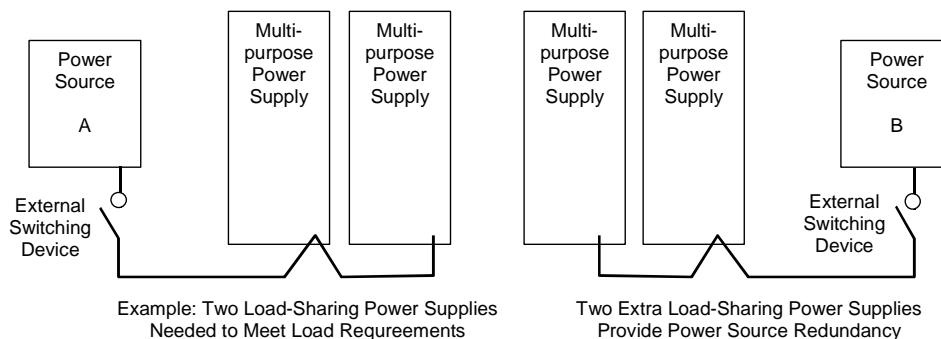
### Connections for Power Supply Module Redundancy

Power Supply module redundancy can be provided by using one additional Multipurpose Power Supply above the minimum required for the system power load. In this type of installation, all Multipurpose Power Supplies contribute a share of the backplane power and run at a correspondingly reduced load. This results in longer life for the individual power supplies. In addition, should one power supply module fail, system operation is not interrupted. The front panel switch can be used to remove a redundant unit. Note that this type of system does not provide protection against loss of the input power source. If more than one power supply is switched off, the remaining power supplies may become overloaded and shut down. An External switching device must be used to remove power from more than one power supply at a time in the Power Supply Redundancy mode.



### Power Source Redundancy

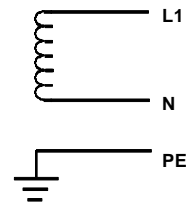
If the overall power needs of the system can be met using either one or two Multipurpose Power Supplies, then power source redundancy can be provided. This requires using twice the minimum number of Multipurpose Power Supplies required to meet the system load requirements. In this type of system, half of the Multipurpose Power Supplies must be connected to one power source and the other half must be connected to a separate source. This arrangement provides all the advantage of a Basic Redundancy system, as described above, plus power source redundancy. The front panel switch may be used to remove an individual power supply as long as the minimum number of units remain powered up.



## AC Power Supply Connections for Floating Neutral (IT) Systems

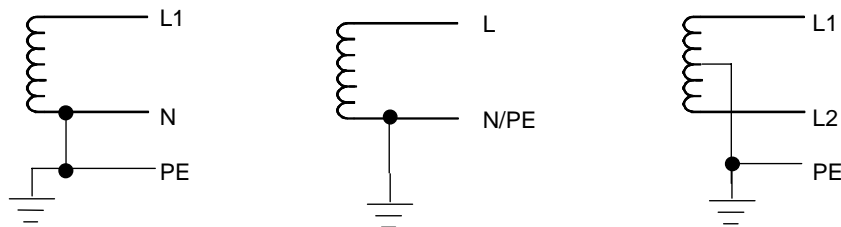
If an AC input power supply is installed in a system where the Neutral line is not referenced to Protective Earth Ground, special installation instructions must be followed to prevent damage to the power supply.

A *Floating Neutral System* is a system of power distribution wiring where Neutral and Protective Earth Ground are not tied together by negligible impedance. In Europe this is referred to as an IT system (see IEC950). In a *Floating Neutral System*, voltages measured from input terminals to protective earth ground may exceed the 264 Volts AC maximum input voltage power supply specification.



### Non-Floating Neutral System

Systems where one leg of the power distribution wiring is tied to Protective Earth or a tap between two legs of the power distribution wiring is tied to Protective Earth are not *Floating Neutral Systems*. Non-floating neutral systems **do not** require special installation procedures.



### **Instructions for Floating Neutral Systems**

1. The input power terminals should be wired according to the instructions in this chapter.
2. For IC695 Power Supplies, no jumper may be installed between terminal 5 or 6 and terminal 7. For IC694 or IC693 Power Supplies, no jumper may be installed between terminals 3 and 4 of the Power Supply module.
3. Voltage surge protection devices such as MOVs must be installed:
  - From L1 to earth ground
  - From L2 (Neutral) to earth ground

The voltage surge devices must be rated such that the system is protected from power line transients that exceed  $\text{Line voltage} + 100\text{V} + (N-PE)_{\text{MAX}}$ . The expression  $N-PE$  refers to the voltage potential between neutral and Protective Earth (PE) ground.

For example, in a 240 Volt AC system with neutral floating 50V above earth ground, the transient protection should be rated at:  $240\text{V} + 100\text{V} + 50\text{V} = 390\text{V}$

### *Multi-Purpose Power Supply, 24 VDC, 40 Watt: IC695PSD140*

Power Supply IC695PSD140 is a multi-purpose 40-Watt supply that operates from an input voltage source in the range of 18 VDC to 30 VDC.

This power supply provides three outputs:

- +5.1 VDC output
- +24 VDC relay output that can be used to power circuits on Output Relay modules
- +3.3 VDC. This output is used internally by RX3i modules with IC695 catalog numbers

Multipurpose Power Supply IC695PSD140 is suitable for use in load-sharing and redundancy application. It must be installed in a PACSystems RX3i (IC695 catalog number) Universal Backplane. It can be used as the only power supply in the backplane, or combined with up to three additional Multipurpose Power Supplies.

#### **Caution**

***This Power Supply cannot be used with RX3i IC695PSD040 or IC695PSA040 Power Supplies in redundant or increased capacity modes. Damage to equipment may result.***

The Power Supply indicates when an internal fault occurs so the CPU can detect loss of power or log the appropriate fault code.



## LEDs

Four LEDs on the Power Supply indicate:

- Power (Green/Amber). When this LED is green, it indicates power is being supplied to the backplane. When this LED is amber, power is applied to the Power Supply but the Power Supply switch is off.
- P/S Fault (Red). When this LED is lit, it indicates the Power Supply has failed and is no longer supplying sufficient voltage to the backplane.
- Over Temperature (Amber). When this LED is lit, it indicates the Power Supply is near or exceeding its maximum operating temperature.
- Overload (Amber). When this LED is lit, it indicates the Power Supply is near or exceeding its maximum output capability on at least one of its outputs.

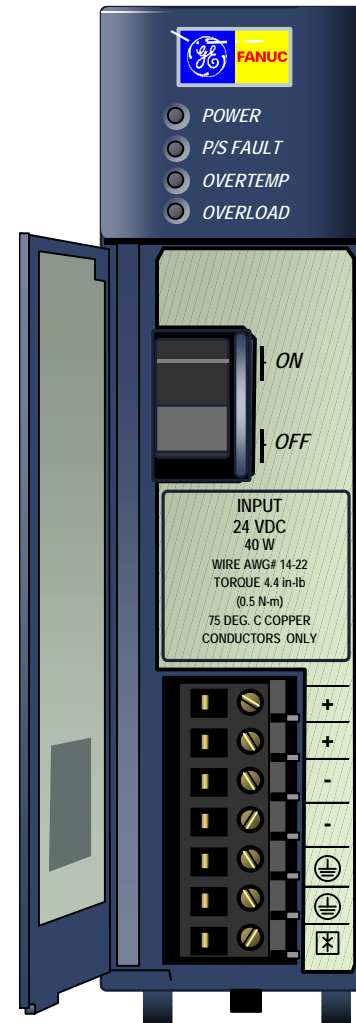
If the red P/S FAULT LED is lit, the Power Supply has failed and is no longer supplying sufficient voltage to the backplane .

The amber OVERTEMP and OVERLOAD LEDs light to warn of high temperature or high load conditions.

The CPU Fault Table shows a fault if any Overtemperature, Overload, or P/S Fault occurs.

## Wiring Terminals

Terminals for +24V and –24V power, ground, and MOV disconnect accept individual 14 to 22 AWG wires.



## On/Off Switch

The ON/OFF switch is located behind the door on the front of the module. The switch controls the operation of the outputs of the supply. It does NOT interrupt line power. A projecting tab next to the switch helps prevent accidentally turning it on or off.

**Specifications: IC695PSD140**

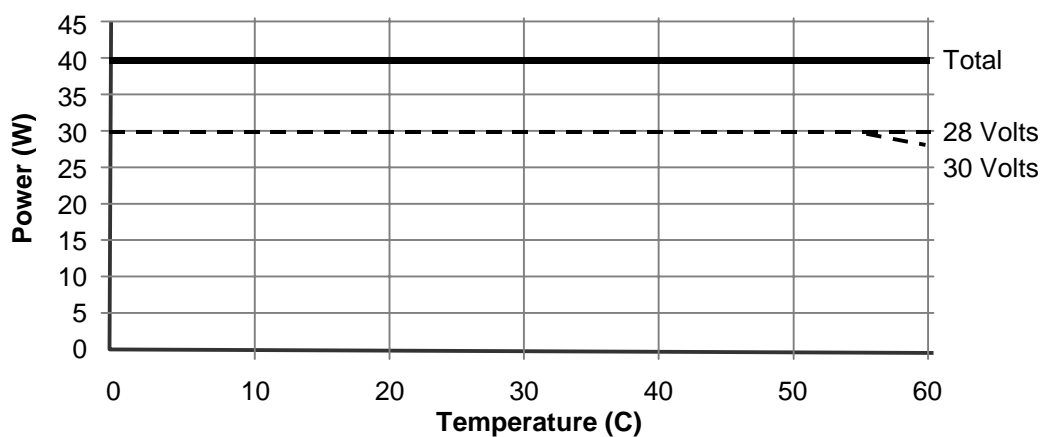
<b>Nominal Rated Voltage</b>	24 VDC
<b>Input Voltage Range</b>	18 to 30 VDC
<b>Input Power</b>	60 Watts maximum at full load
<b>Inrush Current</b>	4 Amps, 100 milliseconds maximum *
<b>Output Power</b>	40 Watts maximum total of both outputs. 5.1 VDC = 30 Watts maximum 3.3 VDC = 30 Watts maximum Maximum output power depends on ambient temperature, as shown.
<b>Output Voltage</b>	5.1 VDC: 5.0 VDC to 5.2 VDC (5.1 VDC nominal) 3.3 VDC: 3.1 VDC to 3.5 VDC (3.3 VDC nominal)
<b>Output Current</b>	5.1 VDC: 0 to 6 Amps 3.3 VDC: 0 to 9 Amps
<b>Isolation</b>	NONE
<b>Ripple (all outputs)</b>	50 mV
<b>Noise (all outputs)</b>	50 mV
<b>Ride-through time</b>	10 ms This is the length of time the Power Supply maintains valid outputs if the power source is interrupted. If this Power Supply is used with IC694 and IC693 modules that have relay outputs, special precautions should be taken because dropouts in the source voltage will be seen by the module and may cause relay dropouts.
<b>Wiring Terminals</b>	Each terminal accepts one 14 AWG to 24 AWG wire.
<b>Terminal Current</b>	6 Amps
<b>Number of Daisy-Chained PSD140 Supplies</b>	Up to 4
<b>Number of PSD140 Supplies in Universal Backplane</b>	Up to 4

\* The Inrush Current specification is given as a guide for sizing the external power source for the IC695PSD140. Peak inrush current may be higher for shorter durations.

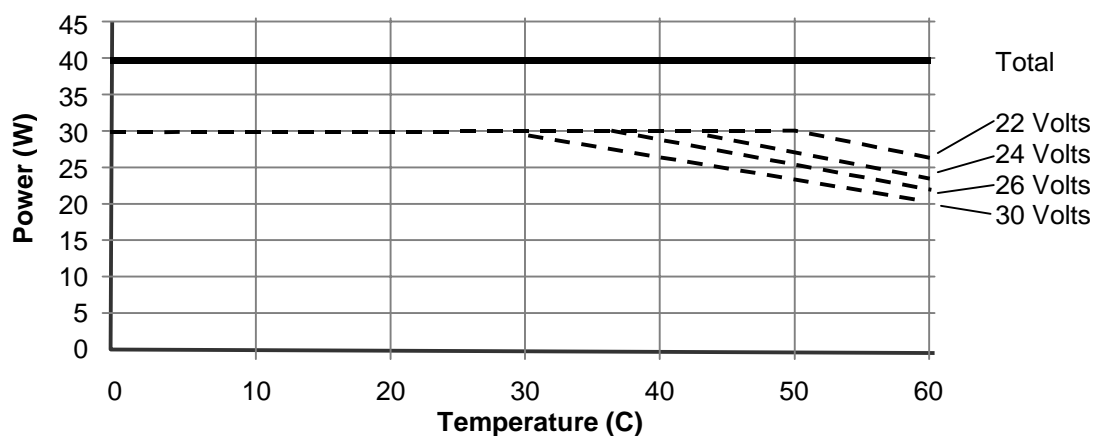
### Thermal Deratings: PSD140

The maximum output power for Power Supply PSD140 depends on the ambient temperature, as shown below. Full output power is available up to at least 40°C (89.6°F).

#### 5.1 Volt Fully-Loaded



#### 3.3 Volt Fully Loaded

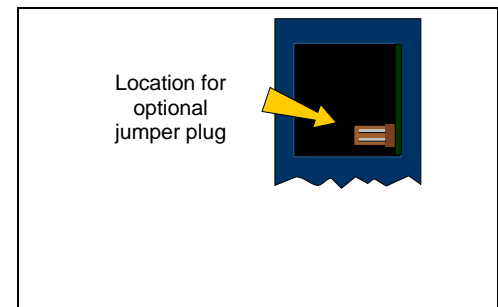


## Overcurrent Protection

The 5.1 VDC output is electronically limited to 7 Amps. The 3.3 VDC output is limited to 10 Amps. If an overload (including short circuits) occurs, it is sensed internally and the Power Supply shuts down. Because it is designed for redundancy applications, this Power Supply latches “OFF” in fault conditions and will not automatically try to restart. Input power must be cycled to clear a latched fault.

An internal fusible link in the input line is provided as a backup. The Power Supply usually shuts down before the fusible link blows. The fusible link also protects against internal supply faults. The CPU Fault Table shows a fault if any Overtemperature, Overload, or P/S Fault occurs. There is no additional indication if the Power Supply fusible link blows.

In a non-redundancy application, where automatic restarting may be appropriate, a shunt can be installed on back of the module as shown at left. The shunt must have 0.100 inch spacing on center and accommodate 0.25 inch pins. Example parts are Radio Shack DIP Programming Shunt #276-1512 and DIGI-Key #59000-ND. The module must be removed from the backplane to install the shunt.





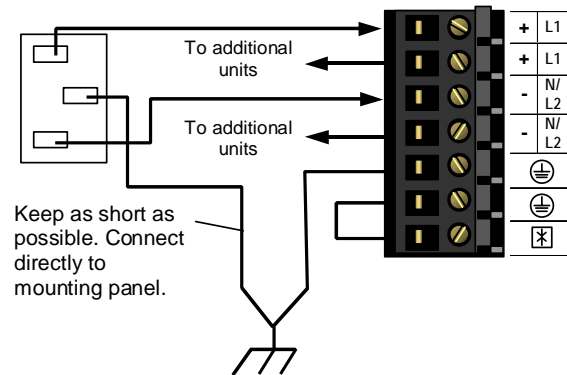
## Field Wiring: IC695PSD140

### Power Source and Ground Connections

The wires from the power source and ground connect to the terminals on the Power Supply as shown at right. Each terminal accepts one AWG 14 to AWG 24 wire.

#### Warning

If the same external DC power source is used to provide power to two or more power supplies in the system, connection polarity must be identical at each RX3i power supply. A resulting difference in potential can injure personnel or cause damage to equipment. Also, each backplane must be connected to a common system ground.



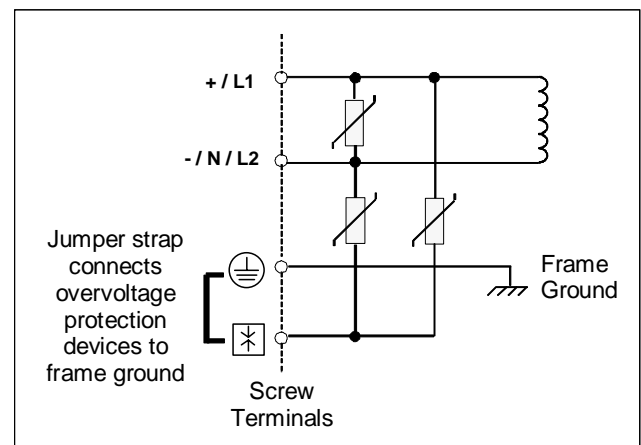
### Input Overvoltage Protection

The bottom terminal is normally connected to frame ground with a user-installed jumper as shown at lower right. If overvoltage protection is not required or is supplied upstream, no jumper is required.

To Hi-pot test this supply, overvoltage protection must be disabled during the test by removing the jumper. Re-enable overvoltage protection after testing by reinstalling the jumper.

#### Warning

This power supply is not isolated and is therefore not compatible with floating or positive grounded systems.



# Chapter 6

## Discrete Input Modules

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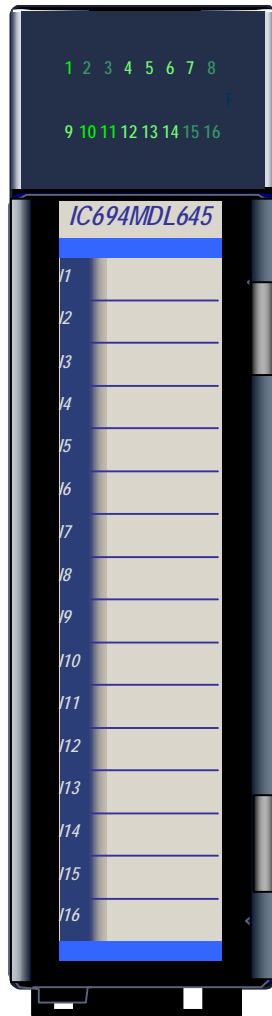


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This chapter describes discrete input modules for PACSystems RX3i systems.

<b><i>Discrete Input Module</i></b>	<b><i>Catalog Number</i></b>
Input 120 VAC 8 Point Isolated	IC694MDL230
Input 240 VAC 8 Point Isolated	IC694MDL231
Input 120 VAC 16 Point	IC694MDL240
Input 24 VAC/VDC 16 Point Pos/Neg Logic	IC694MDL241
Input 120 VAC 16 Point Isolated	IC694MDL250
Input 120 VAC 32 Point Grouped	IC694MDL260
Input 125 VDC 8 Point Pos/Neg Logic	IC694MDL632
Input 24 VDC 8 Point Pos/Neg Logic	IC694MDL634
Input 24 VDC 16 Point Pos/Neg Logic	IC694MDL645
Input 24 VDC 16 Point Pos/Neg Logic Fast	IC694MDL646
Input 5/12 VDC (TTL) 32 Point Pos/Neg Logic	IC694MDL654
Input 24 VDC 32 point Pos/Neg Logic	IC694MDL655
Input 24 VDC 32 Point Pos/Neg Logic	IC694MDL660
Input Simulator Module	IC694ACC300

## Input Module, 24 Volt DC Pos/Neg, 16 Point: IC694MDL645



The **24 volt DC Positive/Negative Logic Input** module, IC694MDL645, provides 16 input points in one group with a common power input terminal. This input module can be wired for either positive logic or negative logic. Input characteristics are compatible with a wide range of input devices, such as pushbuttons, limit switches, and electronic proximity switches. Current into an input point results in a logic 1 in the input status table (%I). Field devices can be powered from an external supply. Depending on their requirements, some input devices can be powered from the module's +24V OUT and 0V OUT terminals.

Sixteen green LEDs indicate the ON/OFF status of points 1 through 16. The blue bands on the label show that MDL645 is a low-voltage module.

This module can be installed in any I/O slot in an RX3i system.

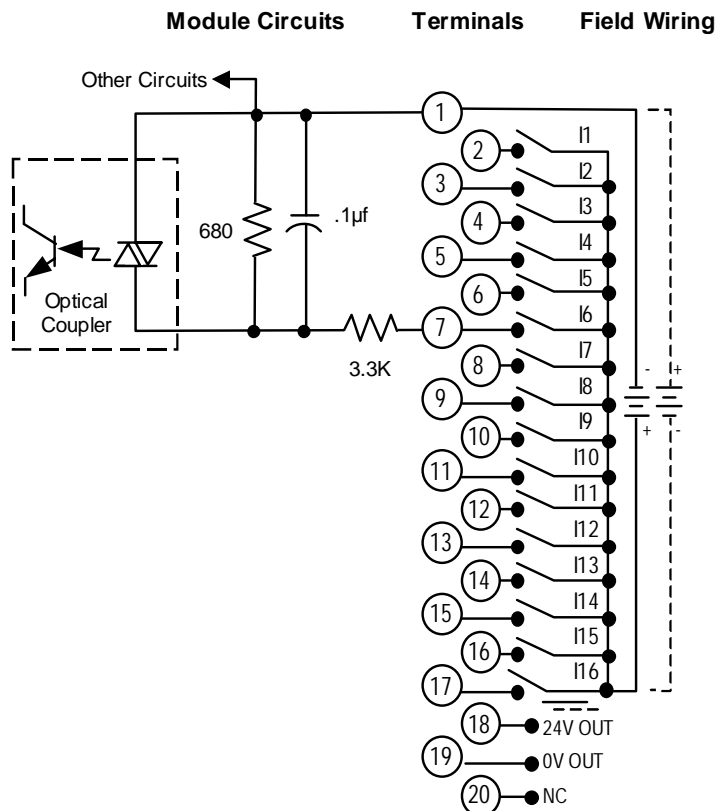
### Specifications: MDL645

<b>Rated Voltage</b>	24 volts DC
<b>Input Voltage Range</b>	0 to +30 volts DC
<b>Inputs per Module</b>	16 (one group with a single common)
<b>Isolation: Field to Backplane (optical) and to frame ground</b>	250 VAC continuous; 1500 VAC for one minute
<b>Input Current</b>	7mA (typical) at rated voltage
<b>Input Characteristics</b>	
<b>On-state Voltage</b>	11.5 to 30 volts DC
<b>Off-state Voltage</b>	0 to +5 volts DC
<b>On-state Current</b>	3.2mA minimum
<b>Off-state Current</b>	1.1mA maximum
<b>On response Time</b>	7ms typical
<b>Off response Time</b>	7ms typical
<b>Power Consumption: 5V</b>	80mA (all inputs on) from 5 volt bus on backplane
<b>Power Consumption: 24V</b>	125mA from the Isolated 24 volt backplane bus or from user supplied power

Refer to Appendix A for product standards and general specifications.

## Field Wiring: MDL645

Terminals	Connections
1	Inputs 1-16 Common
2	Input 1
3	Input 2
4	Input 3
5	Input 4
6	Input 5
7	Input 6
8	Input 7
9	Input 8
10	Input 9
11	Input 10
12	Input 11
13	Input 12
14	Input 13
15	Input 14
16	Input 15
17	Input 16
18	24VDC for input devices
19	0V for input devices
20	No connection



Note: If the 24V OUT pin is used to connect to input devices in the field, the isolation specification for this module changes to:

**Field to Backplane (optical) and to frame ground:** 50 VAC continuous; 500 VAC for 1 minute

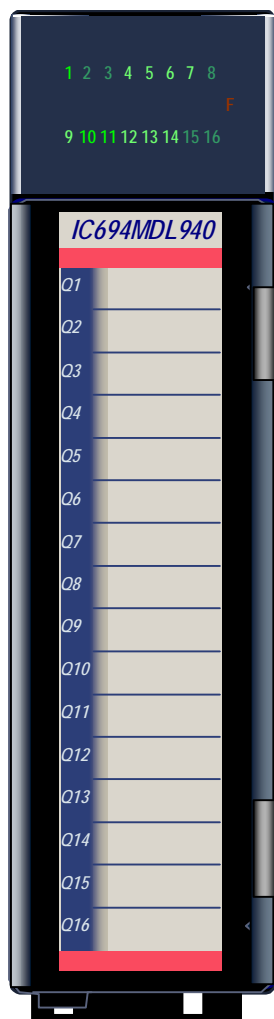
# Chapter 7

## Discrete Output Modules

This chapter describes discrete output modules for PACSystems RX3i controllers.

<b>Discrete Output Module</b>	<b>Catalog Number</b>
Output 120 VAC 0.5 A 12 Point	IC694MDL310
Output 120/240 VAC 2 A 8 Point	IC694MDL330
Output 120 VAC 0.5 A 16 Point	IC694MDL340
RX3i Output 124/240 VAC Isolated 16 Point	IC694MDL350
Output 120/240 VAC 2 A 5 Point Isolated	IC694MDL390
Output 12/24 VDC 0.5 A 8 Point Positive Logic	IC694MDL732
Output 125 VDC 1 A 6 Point Isolated Pos/Neg Logic	IC694MDL734
Output 12/24 VDC 0.5 A 16 Point Positive Logic	IC694MDL740
Output 12/24 VDC 0.5 A 16 Point Negative Logic	IC694MDL741
Output 12/24 VDC 1 A 16 Point Positive Logic ESCP	IC694MDL742
Output 5/24 VDC (TTL) 0.5 A 32 Point Negative Logic	IC694MDL752
Output 12/24 VDC 0.5 A 32 Point Positive Logic	IC694MDL753
Output 12/24VDC ESCP 0.75A 32 Point Grouped, Pos.	IC694MDL754
Output Isolated Relay N.O. 4 A 8 Point	IC694MDL930
Output Isolated Relay N.C. and Form C 3 A 8 Point	IC694MDL931
Output Relay N.O. 2 A 16 Point	IC694MDL940

## Output Module, Relay Output, N.O., 2 Amp, 16 Point: IC694MDL940



The **2 Amp Relay Output** module, IC694MDL940, provides 16 normally-open relay circuits for controlling output loads. The output switching capacity of each output is 2 Amps. The output points are in four groups of four points each. Each group has a common power output terminal. The relay outputs can control a wide range of load devices, such as: motor starters, solenoids, and indicators. Power for the internal relay circuits is provided by the +24 volt DC bus on the backplane. The user must supply the AC or DC power to operate field devices.

Individual numbered LEDs show the ON/OFF status of each output point. There are no fuses on this module. The red bands on the label show that MDL940 is a high-voltage module.

This module can be installed in any I/O slot in an RX3i system.

### Specifications: MDL940

<b>Rated Voltage</b>	24 volts DC, 120/240 volts AC (nominal - see the following table for exceptions)
<b>Operating Voltage</b>	5 to 30 volts DC 5 to 250 volts AC, 50/60 Hz
<b>Outputs per Module</b>	16 (four groups of four outputs each)
<b>Isolation:</b>	
<b>Field to Backplane and to Frame Ground</b>	250 VAC continuous; 1500 VAC for 1 minute
<b>Point to Point</b>	250 VAC continuous; 1500 VAC for 1 minute
<b>Maximum Load</b>	2 Amps pilot duty maximum per output 4 Amps maximum per common
<b>Minimum Load</b>	10mA
<b>Maximum Inrush</b>	5 Amps
<b>On Response Time</b>	15ms maximum*
<b>Off Response Time</b>	15ms maximum*
<b>Power Consumption, all outputs on</b>	7mA from 5 volt bus on backplane 135mA from relay 24V bus on backplane

Refer to Appendix A for product standards and general specifications.

\* When this module is used with DC power supply IC695PSD040 or PSD140, special precautions should be taken because dropouts in the source voltage will be seen by this module and may cause relay dropouts.

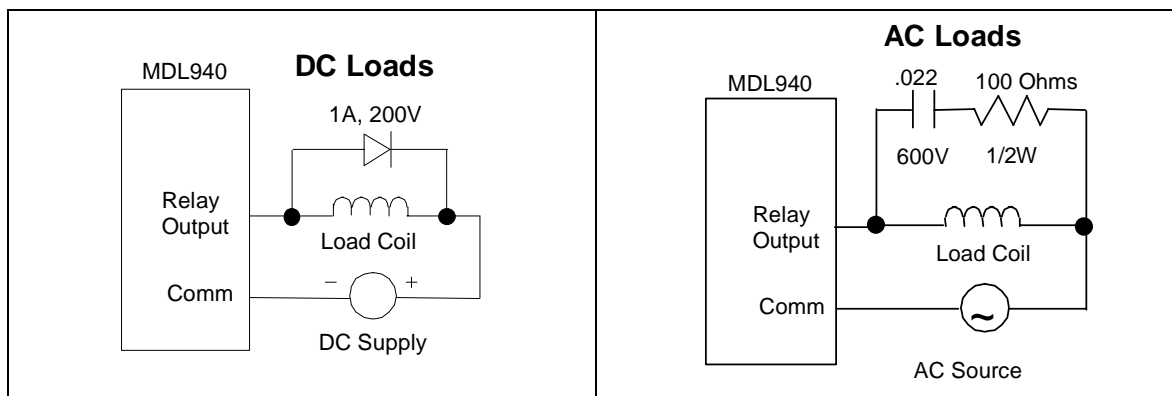
### Load Current Limitations: MDL940

Operating Voltage	Maximum Current for Load Type		Typical Contact Life (Number of Operations)
	Resistive	Lamp or Solenoid *	
24 to 120 VAC	2 Amps	1 Amp	300,000
24 to 120 VAC	1 Amp	0.5 Amp	500,000
24 to 120 VAC	0.1 Amp	0.05 Amp	1,000,000
240 VAC	2 Amps	1 Amp	150,000
240 VAC	1 Amp	0.5 Amp	200,000
240 VAC	0.1 Amp	0.05 Amp	500,000
24 VDC	–	2 Amps	100,000
24 VDC	2 Amps	1 Amp	300,000
24 VDC	1 Amp	0.5 Amp	500,000
24 VDC	0.1 Amp	0.05 Amp	1,000,000
125 VDC	0.2 Amp	0.1 Amp	300,000

\* Assumes a 7 ms time constant

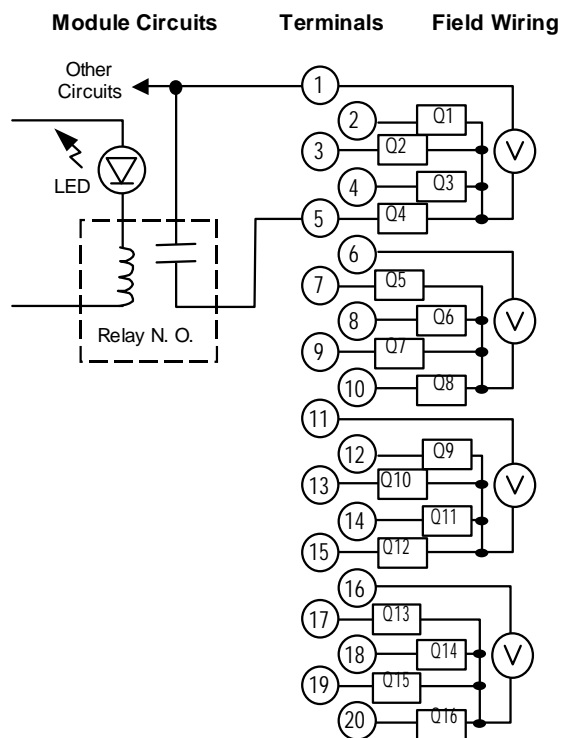
Relay contact life, when switching inductive loads, will approach resistive load contact life if suppression circuits are used. The following figures are examples of typical suppression circuits for AC and DC loads. The 1A, 200V diode shown in the DC load suppression circuit is an industry standard 1N4935. The resistor and capacitor shown for AC load suppression are standard components.

### Load Suppression Examples for Output Module IC694MDL940



**Field Wiring: MDL940**

<b>Terminal</b>	<b>Connection</b>
1	Outputs 1 – 4 common (return)
2	Output 1
3	Output 2
4	Output 3
5	Output 4
6	Outputs 5 -8 common (return)
7	Output 5
8	Output 6
9	Output 7
10	Output 8
11	Outputs 9 - 12 common (return)
12	Output 9
13	Output 10
14	Output 11
15	Output 12
16	Outputs 13 – 16 common (return)
17	Output 13
18	Output 14
19	Output 15
20	Output 16





## **2 JPR ELECTRICAL EQUIPMENT TECHNICAL INFORMATION**

- 2.1 CIRCUIT BREAKERS
- 2.2 CONTACTORS & OVERLOADS
- 2.3 CONTROL DEVICES
- 2.4 SURGE, POWER SUPPLY, CT & FUSES
- 2.5 GPO & LIGHTS
- 2.6 SWITCHES, PUSHBUTTONS & INDICATORS
- 2.7 LINKS & TERMINALS
- 2.8 CONDUCTIX WAMPFLER

## 2.1 CIRCUIT BREAKERS

- Socomec – **SSF BS63 3P c/w 3 x 3629 9006** – 63A 3P Isolator
- Terasaki – **DTCB10104C** – 1P 4A Circuit Breaker
- Terasaki – **DTCB10110C** – 1P 10A Circuit Breaker
- Terasaki – **DTCB10116C** – 1P 16A Circuit Breaker
- Terasaki – **DTCB10304C** – 3P 4A Circuit Breaker
- Terasaki – **DTCB10306C** – 3P 6A Circuit Breaker
- Terasaki – **DTCB10316C** – 3P 16A Circuit Breaker
- Terasaki – **DTAUXAL** – Auxillary Circuit Breaker
- Terasaki – **DSRCBH-06-30A** – 1P 6A RCBO
- Terasaki – **IBC108P**-Busbar Comb

## SSF Standard switch-fuses

### FUSERBLOC BS88 20 to 800 A

**New Range**

SSF Standard switch-fuses boast IP 30 protection on all fuse terminals in a compact yet effective design. These switch-fuses feature a test position and double-break contacts per phase, allowing the safe isolation of AC and DC circuits as well as the added short circuit protection offered by HRC fuses.

### Front operated base mount (Supplied with external handle and shaft)



SSF BS

**20 A**

**32 A**

Compact

**32 A**

**63 A**

**100 A**

**160 A**

**200 A**

**250 A**














**315 A**


**400 A**

**630 A**

**800 A**

**1250 A**

Fuse size	AC 22 415 V (A)	AC 23 415 V (A)	AC 23 415 V (kW)	No. of poles	Cat. No.
A1	20	20	9	3	SSF BS20 3P
				3+N (switched)	 SSF BS20 3PN
A1	32	32	15	3	SSF BS32C 3P
				3+N (switched)	 SSF BS32C 3PN
A1	32	32	15	3	SSF BS32 3P
				4	 SSF BS32 4P
A2 - A3	63	63	30	3	SSF BS63 3P
				4	 SSF BS63 4P
A4	100	100	51	3	SSF BS100 3P
				4	 SSF BS100 4P
A3 - A4	160	160	80	3	SSF BS160 3P
				4	 SSF BS160 4P
B1 - B2	200	200	100	3	SSF BS200 3P
				4	 SSF BS200 4P
B1 - B2 - B3	250	250	132	3	SSF BS250 3P
				4	 SSF BS250 4P
B1 - B2 - B3	315	315	160	3	SSF BS315 3P
				4	 SSF BS315 4P
B1 - B2 - B3 - B4	400	400	220	3	SSF BS 400 3P
				4	 SSF BS400 4P
C1 - C2	630	630	355	3	SSF BS630 3P
				4	 SSF BS630 4P
C1 - C2 - C3	800	800	450	3	SSF BS800 3P
				4	 SSF BS800 4P
D1	1250	1000	560	3	SSF BS1250 3P
				4	 SSF BS1250 4P

Notes:  Available on indent only.  
For plug-in solutions. Refer NHP.  
For enclosed options. Refer NHP.

## SSF Standard switch-fuses

### FUSERBLOC DIN 63 to 800 A

**New Range**



SSF DN

**63 A**

**125 A**

**160 A**

**250 A**

**400 A**

**630 A**

**800 A**

### Front operated base mount

(Supplied with external handle and shaft - refer table below)

Fuse size	AC 22 415 V (A)	AC 23 415 V (A)	AC 23 415 V (kW)	No. of poles	Cat. No.
00	63	63	30	3	SSF DN63 3P
				4	SSF DN63 4P
00	125	125	63	3	SSF DN100 3P
				4	SSF DN100 4P
00	160	160	80	3	SSF DN160 3P
				4	SSF DN160 4P
1	250	250	132	3	SSF DN250 3P
				4	SSF DN250 4P
2	400	400	220	3	SSF DN400 3P
				4	SSF DN400 4P
3	630	630	355	3	SSF DN630 3P
				4	SSF DN630 4P
3	800	800	450	3	SSF DN800 3P
				4	SSF DN800 4P

Notes: Available on indent only.  
For plug-in solutions. Refer NHP.  
For enclosed options. Refer NHP.

### Shaft table (Standard shaft supplied with switch and handle)



SSF DN

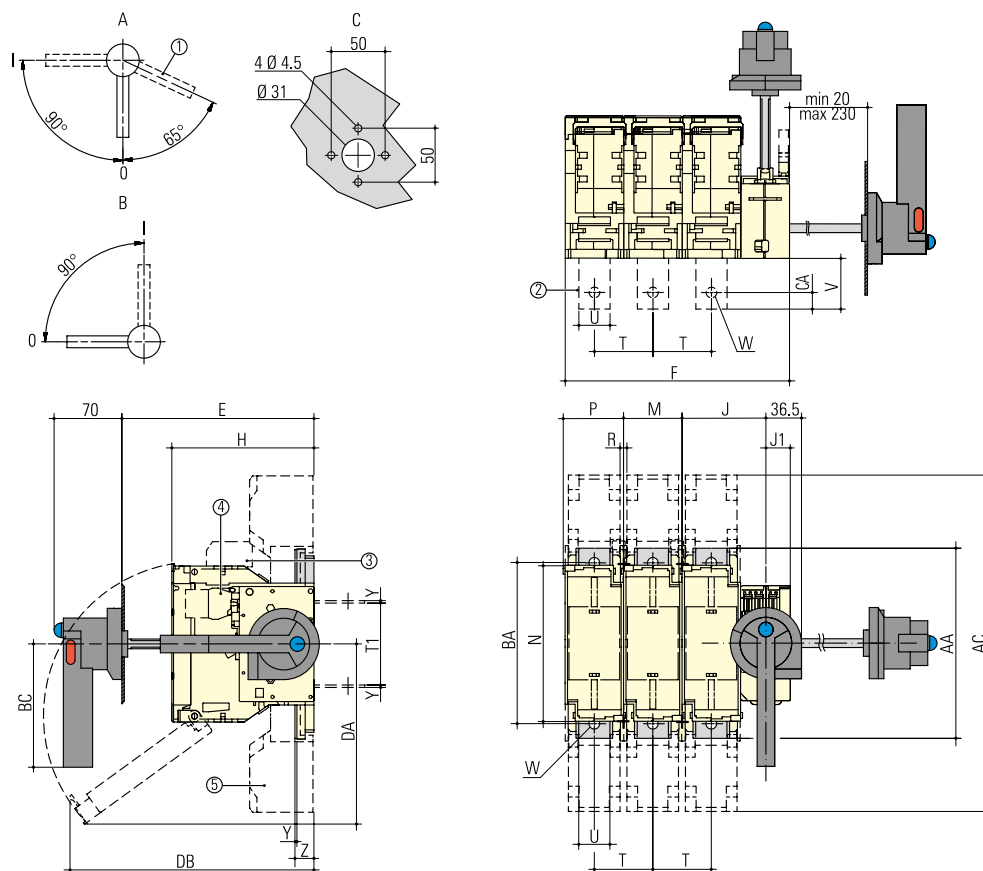
To suit	Shaft	Max back-plate to door
<b>BS88</b>		
SSF BS 20...32C	SSF S200C	248 mm
SSF BS 32...63	SSF S120	150 mm
SSF BS 100...400	SSF S200-1	230 mm
<b>DIN</b>		
SSF DN63	SSF 120	150 mm
SSF DN 125...400	SSF S200-1	230 mm
<b>BS88 and DIN</b>		
SSF 630...800	SSF S320-1	495 mm



## Technical data and dimensions (mm)

### FUSERBLOC SSF DIN 63 to 400 A

#### FUSERBLOC 63 to 400 A



Rating (A)	Fuse size	Frame size	Overall dimensions		Terminal shrouds		Switch body					Switch mounting							Connection terminals									
			E min	E max	AC	F 3p	F 4p	H	J	J1	BC	DA	DB	M	N	P	R	T	T1	U	V	W	Y	Z	AA	BA	CA	
CD 63	00C	12	124	145	-	136	168	116.5	50	18	70.5	159	145	32	106	36	5.4	32	59	12	15	-	2	-	118	-	6	
CD 125	00	13	134	145	268	148	184	126.5	54	18	126.5	141	189	36	127	40	5.4	36	62	20	41	8.5	2.5	19.5	162	141	8	
CD 160	0	14	145	225	268	190	240	136.5	64	18	126.5	174	229	50	140	54	5.4	50	62	20	41	8.5	2.5	19.5	162	141	8	
CD 250	1	15	154	225	345	234	294	146	86	25	126.5	185	251	60	162	64	6.4	60	84	32	52	11	2.5	19.5	195	166	17	
CD 400	2	16	157	225	355	252	318	149	91	25	126.5	200	260	66	172	70	6.4	66	84	50	54	11	3	20	205	175	1x4.5	

A. Front operation  
B. Side operation  
C. Door drilling

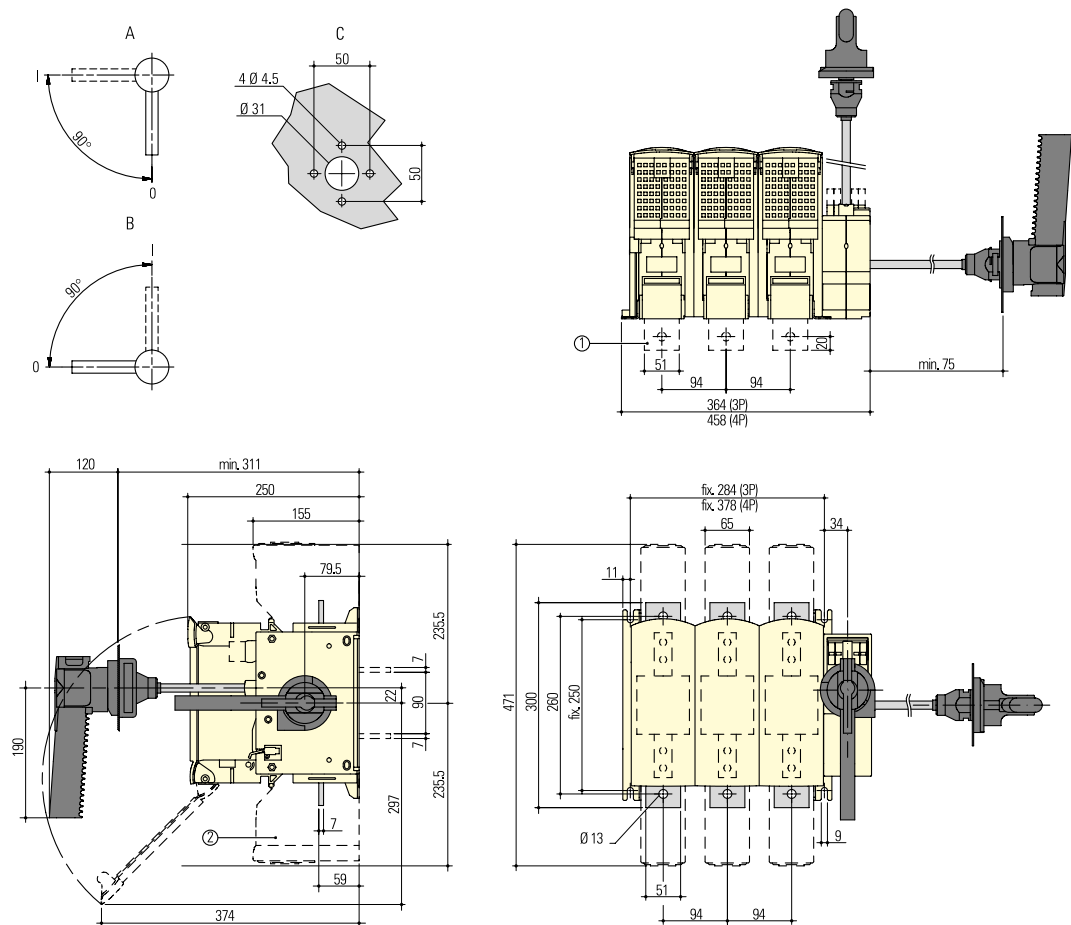
1. Test position  
2. Rear connections (Option)  
3. 1 or 2 fuse blown indication

4. 1 to 8 N/O / N/C Aux for pre-break and signalling  
5. Terminal shrouds

## Technical data and dimensions (mm)

### FUSERBLOC SSF BS and DIN 630 to 800 A

#### FUSERBLOC 630 to 800 A



- A. Front operation  
B. Side operation  
C. Door drilling

1. Rear connections (Option)  
2. Terminal shrouds

**Note:** FUSERBLOC BS 1250 A, Refer NHP

## Technical data and ratings chart

### FUSERBLOC SSF 20 to 1250 A

### Ratings to AS 3947-3 and IEC 60947-3

			20 A	32C A	32 A	63 A	100 A	125 A	160 A (BS)	160 A DIN)
Rated insulation voltage	V		800	800	750	750	750	750	750	750
Rated impulse withstand voltage	kV		8	8	8	8	8	8	8	8
Rated operational current										
AC 21A	400 V	A	-	-	-	-	-	-	-	-
	690 V	A	-	-	-	-	-	-	-	-
AC 22A	400 V	A	20	32	32	63	100	125	160	160
	690 V	A	20	32	32	63	100 <sup>1)</sup>	125 <sup>1)</sup>	160 <sup>1)</sup>	160 <sup>1)</sup>
AC 23A	400 V	A	20	32	32	63	100	125	160	160
	690 V	A	20	32	32	63	100 <sup>1)</sup>	100 <sup>1)</sup>	125 <sup>1)</sup>	125 <sup>1)</sup>
Rated operational current/poles in series										
DC 21A	220 V	A	-	-	-	-	-	-	-	-
	440 V	A	-	-	-	-	-	-	-	-
DC 22A	220 V	A	-	-	32	63	100	125	160	160
	440 V	A	-	-	32/2	63/2	100/2	125/2	160/2	160/2
DC 23A	220 V	A	-	-	32	40	100	100	125	125
	440 V	A	-	-	32/2	40/2	100/2	100/2	160/2	125/2
Operational power										
At 400 V without pre-break AC	kW		9	15	15	30	51	63	80	80
At 690 V without pre-break AC	kW		15	25	25	55	90	90	110	110
Short-circuit capacity										
Switch fuse cut-off current (kA peak)	400 V	kA	5.5	5.5	9	10.6	20	20	20	22.7
Fuse protected short circuit withstand AC BS88/DIN (kA RMS prospective)	400 V	kA	80	80	80	80	80	-	50	80
Fuse types, IEC 269-2	Fuse	A	20	32	32	63	100	-	160	160
	DIN 43620		-	-	-	00C	-	00	-	0
	BS 88		A1	A1	A1	A2-A3	A4	-	A3-A4	-
Rated capacitor power	kVAr		8	15	15	28	45	55	70	75
Mechanical endurance	Ops		20000	20000	10000	10000	10000	10000	10000	10000
Weight (3 pole)	Kg		0.48	0.5	0.8	1	1.5	1.5	1.8	1.8
Connection cable size	mm <sup>2</sup>		2.5/16	2.5/16	6/25	10/25	25/95	35/95	35/95	50/95

**Notes:** <sup>1)</sup> With terminal shrouds/screen.  
**240/415 V ratings suitable for use on 230/400 V in accordance with AS 60038 : 2000.**





## Technical data and ratings chart

### FUSERBLOC SSF 20 to 1250 A

### Ratings to AS 3947-3 and IEC 60947-3

			200 A	250 A	315 A	400 A	630 A	800 A	1250 A
Rated insulation voltage	V		750	750	800	8000	1000	1000	1000
Rated impulse withstand voltage	kV		8	8	8	8	12	12	12
Rated operational current									
AC 21A	400 V	A	-	-	-	-	-	-	-
	690 V	A	-	-	-	-	-	-	-
AC 22A	400 V	A	200	250	315	400	630	800	1250
	690 V	A	200	315 <sup>1)</sup>	315 <sup>1)</sup>	315	500	800	800/2
AC 23A	400 V	A	200	250	315	400	630	800	1000
	690 V	A	200 <sup>1)</sup>	250 <sup>1)</sup>	250 <sup>1)</sup>	250	315	630	630
Rated operational current/poles in series									
DC 21A	220 V	A	-	-	-	-	-	-	-
	440 V	A	-	-	-	-	-	-	-
DC 22A	220 V	A	200	250	250	315	315	800	800
	440 V	A	250/2	250/2	325/2	315	315	800/2	800/2
DC 23A	220 V	A	200/2	200	200	200	400	800	800
	440 V	A	200/2	200/2	200/2	250	400	800/2	800/2
Operational power									
At 400 V without pre-break AC	kW		100	132	160	220	355	450	560
At 690 V without pre-break AC	kW		150	220	222	220	295	400	500
Short-circuit capacity									
Switch fuse cut-off current (kA peak)	400 V	kA	32.5	32.5	40	40	70	80	80
Fuse protected short circuit withstand AC BS88/DIN (kA RMS prospective)	400 V	kA	80	80	80	80	80	80	80
Fuse types, IEC 269-2	Fuse	A	200	250	-	-	-	-	1250
	DIN 43620		-	1	-	2	3	3	4
	BS 88		B1-B2	B1-B2-B3	B1-B2-B3	B1-B2-B3-B4	C1-C2	C1-C2-C4	D1
Rated capacitor power	kVAr		90	115	145	185	290	365	575
Mechanical endurance	Ops		10000	10000	10000	10000	8000	8000	5000
Weight (3 pole)	Kg		3.2	3.2	4.8	4.8	16	1.8	28.0
Connection cable size	mm <sup>2</sup>		95/240	95/240	185/240	185/240	2 x 150/2 x 300	2 x 185/2 x 300	4 x 185

**Notes:** <sup>1)</sup> With terminal shrouds/screen.

**240/415 V ratings suitable for use on 230/400 V in accordance with AS 60038 : 2000.**



## Accessories

### Solid neutral module



acc08 139 a

#### Use

Unswitched fourth pole with neutral link and fuse cover.

#### References

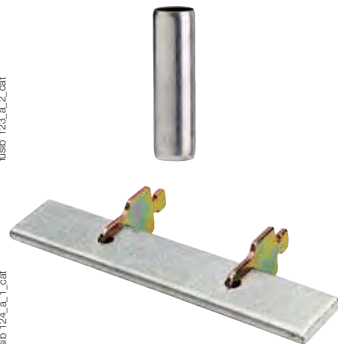
##### **BS88 switches with external front operation**

Rating (A)	Frame size	$I_{max}$ (A)	Distance between centre (mm)	References
32	11	32	27	3629 <b>9227</b>
63	12	63	32	3629 <b>9232</b>
100	13	100	36	3629 <b>9236</b>
CD 160 ... CD 200	13a	200	36	3629 <b>9237</b>
160	14	160	50	3629 <b>9250</b>
200 ... 250	15	250	60	3629 <b>9260</b>
315 ... 400	16	400	66	3629 <b>9266</b>
630 ... 800	17	800	94	3629 <b>9294</b>
1250	18	1250	120	3629 <b>9212</b>

##### **NFC and DIN switches with external front operation**

Rating (A)	Frame size	$I_{max}$ (A)	Distance between centre (mm)	References
50	11	50	27	3629 <b>9227</b>
63	12	63	32	3629 <b>9232</b>
100 ... 160	13	160	36	3629 <b>9236</b>
160	14	160	50	3629 <b>9250</b>
250	15	250	60	3629 <b>9260</b>
400	16	400	66	3629 <b>9266</b>
630 ... 800	17	800	94	3629 <b>9294</b>
800 ... 1250	18	1250	120	3629 <b>9212</b>

### Solid links



fus0 123 a\_2 cat

fus0 124 a\_1 cat

#### References

##### **BS88 switches**

Rating (A)	Frame size	Fuse size	$I_{max}$ (A)	References
32	11	A1	32	3629 <b>9003</b>
63	12	A2-A3	63	3629 <b>9006</b>
100	13	A4	160	3629 <b>9010</b>
CD 160	13a	A3-A4	160	3629 <b>9010</b>
160	14	A4	160	3629 <b>9010</b>
160	14	B1-B2	200	3629 <b>9016</b>
CD 200	13a	A3-A4	160	3629 <b>9010</b>
200	15	B1-B2	200	3629 <b>9016</b>
250	15	B1-B2-B3	315	3629 <b>9025</b>
315	16	B1-B2-B3	315	3629 <b>9025</b>
400	16	B1-B2-B3-B4	400	3629 <b>9040</b>
630 ... 800	17	C1-C3	800	3629 <b>9063</b>
1250	18	D1	1250	3629 <b>9120</b>

##### **NFC and DIN switches**

Rating (A)	Frame size	Fuse size	$I_{max}$ (A)	References
50	11	14 x 51	50	6029 <b>0000</b>
63	12	00C	160	6420 <b>0000</b>
100 ... 125	13	22 x 58	125	6039 <b>0000</b>
125 ... 160	13	00	160	6420 <b>0000</b>
160	14	0	160	6421 <b>0000</b>
250	15	1	250	6421 <b>0001</b>
400	16	2	400	6421 <b>0002</b>
630 ... 800	17	3	630	6421 <b>0003</b>
800 ... 1250	18	4	1250	6441 <b>0005</b>

## Miniature circuit breakers Safe-T & Din-T



### Miniature Circuit Breakers

	Safe-T	DIN-T6	Din-T10
Standard <sup>1)</sup>	AS 3111 / AS 2184	AS/NZS 60898	AS/NZS 60947-2
No. poles & module width	1P - 25 mm	1P - 18 mm	1P - 18 mm
	2P - 50 mm	2P - 36 mm	2P - 36 mm
	3P - 75 mm	3P - 54 mm	3P - 54 mm
	4P - 100 mm		4P - 72 mm
Mounting	Clip tray	DIN rail	DIN rail
Current ratings	6 A - 100 A	2 A - 63 A	0.5 A - 63 A
Short circuit rating (kA)	6 kA	6 kA	10 kA
Curve types	General	C & D	B, C & D
Rated AC voltage 1P/2,3,4P	240/415 V	240/415 V	240/415 V
Rated DC voltage	250 V -2P 5 kA	48 V 1P	48 V 1P
		110 V 2P series	110 V 2P series
Sealable in ON-Off position	No	Yes	Yes
Trip-free mechanism	Yes	Yes	Yes
Centre trip position	Yes	No	No
Padlock facility- non captive	Yes	Yes	Yes
Padlock facility- captive	Yes	Yes	Yes
Busbar connection- On-top	Fork	Pin	Pin
Busbar connection- OFF-bottom	Fork	Fork/Pin	Fork/Pin
Terminal size- On-top	-	35 mm <sup>2</sup>	35 mm <sup>2</sup>
Terminal size- OFF-bottom	-	35 mm <sup>2</sup>	35 mm <sup>2</sup>

**Notes:** <sup>1)</sup> UL listed MCB refer to NHP.

**Din-T15****Din-T10H****Din-T 2-in-1****Din-T DC****Din-T Easy-Fit**

AS/NZS 60947-2	AS/NZS 60947-2	AS/NZS 60898	AS/NZS 60898	AS/NZS 60898
1P - 18 mm	1P - 27 mm	1P + 1P - 18 mm	1P- 18 mm	1P- 18 mm
2P - 36 mm	2P - 54 mm	2P - 18 mm	2P- 36 mm	3P- 54 mm
3P - 54 mm	3P - 81 mm	3P - 36 mm	4P- 81 mm	
4P - 72 mm	4P - 108 mm	4P - 36 mm		
DIN rail	DIN rail	DIN rail	DIN rail	DIN rail
0.5 A - 63 A	80 A-125 A	2A-40 A	0.5A-63 A	6A-63 A
15k A - 50 kA	10 kA	6 kA	6 kA T15	6 kA
C	C & D	C	B & C	C
240/415 V	240/415 V	240/415 V	240/415 V	240/415 V
48 V 1P	125 V 2P series	-	250 V 1P	-
110 V 2P series	250 V 4P series		500 V 2P	
			880 V 4P series	
Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes
No	No	No	No	No
Yes	Yes	Yes	Yes	Yes
Yes	Yes	No	Yes	No
Pin	Pin	Pin	Fork/Pin	-
Fork/Pin	Pin	Pin	Fork/Pin	Pin
35 mm <sup>2</sup>	70 mm <sup>2</sup>	16 mm <sup>2</sup>	35 mm <sup>2</sup>	4 mm <sup>2</sup> 6 A-20 A 35 mm <sup>2</sup> 25A - 63 A mm <sup>2</sup>
35 mm <sup>2</sup>	70 mm <sup>2</sup>	16 mm <sup>2</sup>	35 mm <sup>2</sup>	35 mm <sup>2</sup>

## Miniature circuit breakers Safe-T & Din-T



**Safe-T SRCB**



**Din-Safe DSRCD**



**Din-Safe DSRCBS**

### Residual Current Devices

Standard <sup>1)</sup>	AS3111 / AS3190	AS/NZS 61008	AS/NZS 61009
No. poles & module width	1P + N - 25 mm	2P - 36 mm, 4P - 72 mm	1P + N - 18 mm
Mounting	Clip tray	DIN rail	DIN rail
Current ratings	10 A, 16 A, 20 A	40 A, 63 A, 80 A, 100 A & 125 A	6 A, 10 A, 16 A, 20 A, 25 A & 32 A
Trip sensitivity	10 mA & 30 mA	30 mA, 100 mA 300 mA, 500 mA	30 mA
Sensitivity type	AC	AC, A, AI, S & B	AC & A
Short circuit rating (kA)	6 kA	Inc -10 kA MCB or fuse backup	6 kA
Curve types	General	-	B & C
Rated AC voltage	240 V	240 V/415 V	240 V
Sealable in ON-Off position	No	Yes	Yes
Trip-free mechanism	Yes	Yes	Yes
Centre trip position	Yes	No	No
Padlock- non captive	No	Yes	Yes
Padlock- captive	Yes	No	No
Busbar connection- On-top	Fork	Pin	-
Busbar connection- OFF-bottom	Fork	Fork/Pin	Pin
Terminal size- On-top	-	50 mm <sup>2</sup>	16 mm <sup>2</sup>
Terminal size- OFF-bottom	-	50 mm <sup>2</sup>	35 mm <sup>2</sup>

**Notes:** <sup>1)</sup> UL listed MCB refer to NHP.


**Din-Safe  
DSRCBH**

**Din-Safe  
DSRCB**

**Din-Safe  
DSRCB-P**

**Din-Safe  
DSRCM**

**Din-Safe Easy-fit**

AS/NZS 61009	AS/NZS 61009	AS/NZS 61009	AS 3190	AS/NZS 61008
1P + N - 18 mm	2P - 36 mm	2P - 36 mm	1P + N, 3P & 3P + N	2P - 36 mm, 4P - 72 mm
DIN rail	DIN rail	DIN rail	DIN rail	DIN rail
6 A, 10 A, 16 A, 20 A, 25 A, 32 A & 40 A	6 A, 10 A, 16 A, 20 A, 25 A, 32 A & 40 A	6 A, 10 A, 16 A, 20 A, 25 A, 32 A & 40 A	32 A, 63 A	40 A, 63 A
10 mA & 30 mA	10 mA & 30 mA	10 mA & 30 mA	30 mA, 100 mA & 300 mA	30 mA
A	AC & A	AC & A	AC & A	AC
10 kA	10 kA	10 kA	-	Inc - 10 kA MCB or fuse backup
C	C	C	-	-
240 V	110 V/240 V	110 V/240 V	240 V/415 V	240 V/415 V
Yes	Yes	Yes	No	Yes
Yes	Yes	Yes	Yes	Yes
No	No	No	No	No
Yes	Yes	Yes	No	Yes
Yes	Yes	Yes	No	No
-	Pin	-	-	-
Fork/Pin	Fork/Pin	Fork/Pin	-	Pin
25 mm <sup>2</sup>	25 mm <sup>2</sup>	25 mm <sup>2</sup>	32 A- 16 mm <sup>2</sup> 63 A- 25 mm <sup>2</sup>	50 mm <sup>2</sup>
35 mm <sup>2</sup>	35 mm <sup>2</sup>	35 mm <sup>2</sup>	-	50 mm <sup>2</sup>

## Miniature circuit breakers

The range of miniature circuit breakers stocked by NHP fall into two categories.

Safe-T range which is the NEMA style zero point extinguishing circuit breaker. This range covers 6 to 100 A in 1, 2, 3 and 4 pole configurations with a short circuit rating of 6 kA. Being a zero point extinguishing circuit breaker minimal current limiting is experienced during a short circuit. This situation in the past has been acceptable and was compensated for by designing a system to cope with the high currents.

However as systems became more detailed and sophisticated there was a need to find an alternative which would have features allowing greater control than using fuses or zero point extinguishing circuit breakers. This alternative was the Din-T range of miniature circuit breakers.

Din-T miniature circuit breakers are a current limiting type device with a wide range of short circuit capacities, current ratings and curve types to choose from. Din-T circuit breakers are available in 6, 10 and 15 kA from 0.5 to 125 A in 1, 2, 3, and 4 pole configurations.

As a brief comparison of the current limiting abilities of the Safe-T and Din-T circuit breakers, consider the graphs below.

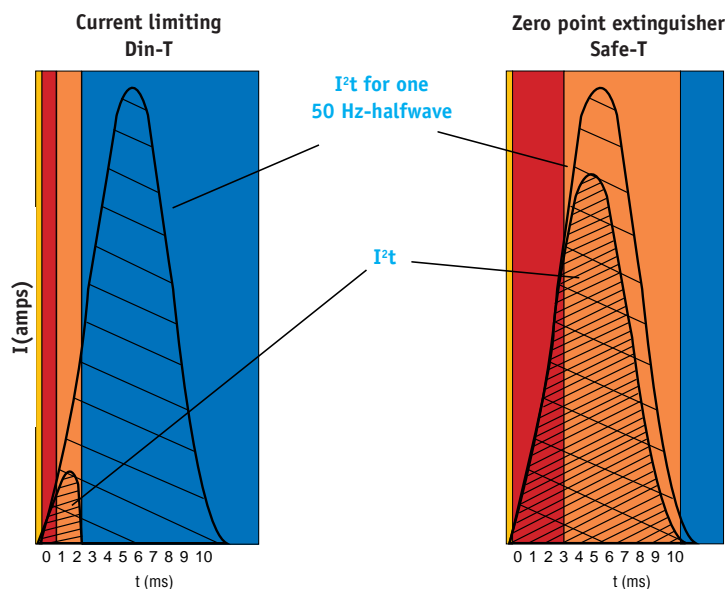
Prior to miniature circuit breakers the most common device for overcurrent and short circuit protection was a fuse.

Fuses however have major disadvantages such as:

- After overcurrent or short circuit the fuse had to be replaced. In the case of a circuit breaker a reset only is required.
- Fuses could be replaced with different current ratings quite easily to overcome apparent problems.
- During overloads in three phase systems "single phasing" can occur when just one fuse blows. Especially for motor loads, this is a great disadvantage.
- Fuses deteriorate with age.
- Fuses have higher wattage losses.

The introduction of circuit breakers brought advantages such as:

- Less downtime – quick reset.
- High circuit integrity due to different curve types and difficulty in interchanging different MCBs versus fuse cartridges.
- Increased personal safety through lower risk of contact with live parts.
- Simultaneous trip of all phases in a three phase system.
- No deterioration with age.
- Lower watts loss than a fuse.



These graphs indicate the three stages of arc formation, arc extinction and  $I^2t$  let through values.

1. Instantaneous trip time (yellow stage) indicates fault current levels just prior to magnetic trip mechanism response. (7-10 In).
2. Magnetic response time (red stage) from time of magnetic trip operation to time of arc being formed. Din-T style 1 millisecond, Safe-T style 3 milliseconds.

3. Arc extinction time (orange stage) from arc formation to complete arc extinction. Din-T style 2 milliseconds, Safe-T style 10 milliseconds.

Because total operating time of Din-T is much faster than Safe-T style MCB, the level of let-through energy in MCB is dramatically reduced. This is demonstrated by the difference in the  $I^2t$  areas detailed above.

## Miniature circuit breakers (cont.)

The NHP range of miniature circuit breakers features a complete range of quality products for the protection of an electrical installation against overcurrent, short circuit and earth leakage.

The choice of miniature circuit breakers is influenced by:

- (i) the magnitude of the prospective short circuit current determined by
  - the size of conductors,
  - the capacity of the supply transformer,
  - the distance between the transformer and the short circuit point.
- (ii) The required selectivity or association of the upstream circuit breaker or fuses and the downstream devices.
- (iii) The earthing system and the maximum cable length.
- (iv) The maximum nominal current required by the circuit.
- (v) The expected initial current determined by the type of load.
- (vi) The application area and the specified standard.

Din-T miniature circuit breakers can offer an application solution in every area.

Supporting the Din-T series of circuit breakers are an assortment of accessories which complete the range, they include:

- Auxiliary and alarm switches
- Earth leakage modules type Din-Safe-M
- Earth leakage circuit breakers type Din-Safe-MCB
- Earth leakage safety switches type Din-Safe
- Earth leakage relays RD series
- Surge diverters
- Time switches
- DIN rail mountable meters
- Main switches
- Changeover switches
- Impulse relays
- Hour run meters
- DIN rail mount contactors
- Pilot lights
- Pushbuttons
- Busbar combinations and lugs
- Insulated and metal enclosures
- Shunt trips
- Undervoltage trips










## Miniature circuit breakers








### Din-T10 series 10 kA MCB

- Standard AS/NZS 60898 <sup>1)</sup>
- Approval No. N17481
- Current range 0.5 - 63 Amps 1, 2, 3 and 4 pole
- Sealable and lockable handle
- Modular design
- Available in curve type B, C and D
- Mounts on NC or CD chassis

#### 1 pole 1 module

In (A)	B – Curve 3-5 In Cat. No.	C – Curve <sup>1)</sup> 5-10 In Cat. No.	D – Curve 10-20 In Cat. No.
0.5	-	DTCB10105C	 DTCB10105D
1	-	DTCB10101C	DTCB10101D
2	-	DTCB10102C	DTCB10102D
3	-	DTCB10103C	-
4	-	DTCB10104C	DTCB10104D
6	DTCB10106B	DTCB10106C	DTCB10106D
10	DTCB10110B	DTCB10110C	DTCB10110D
13	 DTCB10113B	 DTCB10113C	 DTCB10113D
16	DTCB10116B	DTCB10116C	DTCB10116D
20	DTCB10120B	DTCB10120C	DTCB10120D
25	DTCB10125B	DTCB10125C	DTCB10125D
32	DTCB10132B	DTCB10132C	DTCB10132D
40	DTCB10140B	DTCB10140C	DTCB10140D
50	 DTCB10150B	DTCB10150C	DTCB10150D
63	DTCB10163B	DTCB10163C	DTCB10163D


#### 2 pole 2 modules

0.5	-	 DTCB10205C	 DTCB10205D
1	-	DTCB10201C	DTCB10201D
2	-	DTCB10202C	DTCB10202D
4	-	DTCB10204C	DTCB10204D
6	DTCB10206B	DTCB10206C	DTCB10206D
10	DTCB10210B	DTCB10210C	DTCB10210D
13	 DTCB10213B	 DTCB10213C	 DTCB10213D
16	DTCB10216B	DTCB10216C	DTCB10216D
20	DTCB10220B	DTCB10220C	DTCB10220D
25	DTCB10225B	DTCB10225C	DTCB10225D
32	DTCB10232B	DTCB10232C	DTCB10232D
40	DTCB10240B	DTCB10240C	DTCB10240D
50	 DTCB10250B	DTCB10250C	DTCB10250D
63	 DTCB10263B	DTCB10263C	DTCB10263D

**Notes:** <sup>1)</sup> A range of UL standard MCBs is available on indent. (ref DTCBUL10\_ \_ \_ C).

<sup>2)</sup> 2 pole MCB connected in series.

The line side is the "OFF" (bottom) side of the MCB, and connects to NC or CD chassis tee-offs.

 Available on indent only.



DTCB10  
1 pole

#### Short circuit capacity 10 kA

In (A)	0.5 - 63
1 P	240 V AC
2 P	240/415 V AC
3 P	240/415 V AC
4 P	240/415 V AC

#### Use at DC

	1 P	2 P <sup>2)</sup>
Short circuit	25 kA	30 kA
Max voltage	48 V DC	110 V DC

#### Accessories

#### Page

Add on RCD	1 - 28 to 29
Shunt trip	1 - 36 to 38
UVT	1 - 39 to 40
Auxiliary/alarm	1 - 32 to 35
Padlock bracket	1 - 45
Link bars & terminals	1 - 44 to 1 - 45
Enclosures	Section 2
Busbar chassis	2 - 52

#### Technical data









#### Page

Technical data	Section 3
Tripping characteristics	3 - 6, 3 - 8
Dimensions	3 - 24

## Miniature circuit breakers



















### Din-T10 series 10 kA MCB (cont.)

#### 3 pole 3 modules

In (A)	B – Curve 3-5 In Cat. No.	C – Curve 5-10 In Cat. No.	D – Curve 10-20 In Cat. No.
0.5	–	DTCB10305C	 DTCB10305D
1	–	DTCB10301C	 DTCB10301D
2	–	DTCB10302C	 DTCB10302D
4	–	DTCB10304C	DTCB10304D
6	 DTCB10306B	DTCB10306C	DTCB10306D
10	DTCB10310B	DTCB10310C	DTCB10310D
13	 DTCB10313B	 DTCB10313C	 DTCB10313D
16	DTCB10316B	DTCB10316C	DTCB10316D
20	DTCB10320B	DTCB10320C	DTCB10320D
25	DTCB10325B	DTCB10325C	DTCB10325D
32	DTCB10332B	DTCB10332C	DTCB10332D
40	DTCB10340B	DTCB10340C	DTCB10340D
50	 DTCB10350B	DTCB10350C	DTCB10350D
63	DTCB10363B	DTCB10363C	DTCB10363D



#### 4 pole 4 modules <sup>1)</sup>

6	 DTCB10406B	DTCB10406C	 DTCB10406D
10	 DTCB10410B	DTCB10410C	 DTCB10410D
13	 DTCB10413B	 DTCB10413C	 DTCB10413D
16	 DTCB10416B	DTCB10416C	 DTCB10416D
20	 DTCB10420B	DTCB10420C	DTCB10420D
25	 DTCB10425B	DTCB10425C	DTCB10425D
32	 DTCB10432B	DTCB10432C	DTCB10432D
40	 DTCB10440B	DTCB10440C	 DTCB10440D
50	 DTCB10450B	DTCB10450C	 DTCB10450D
63	 DTCB10463B	DTCB10463C	 DTCB10463D

#### Accessories


#### Page

Add-on RCD	1 - 28 to 1 - 29
Shunt trip	1 - 36 to 1 - 38
UVT	1 - 39 to 1 - 40
Auxiliary/alarm	1 - 32 to 1 - 35
Padlock bracket	1 - 45
Link bars and terminals	1 - 44 to 1 - 45
Enclosures	Section 2
Busbar chassis	2 - 52

#### Technical data

#### Page

Technical data	Section 3
Tripping characteristics	3 - 6, 3 - 8
Dimensions	3 - 24

**Notes:** <sup>1)</sup> All poles include overcurrent and short circuit protection.  
 Available on indent only.

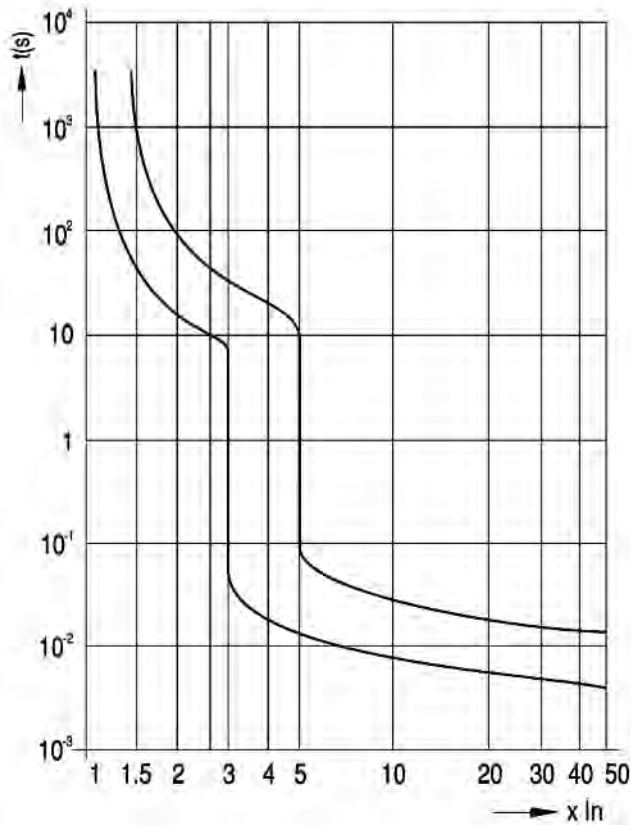
## Din-T MCBs + RCDs Technical data

### Tripping curves according to AS/NZS 60898

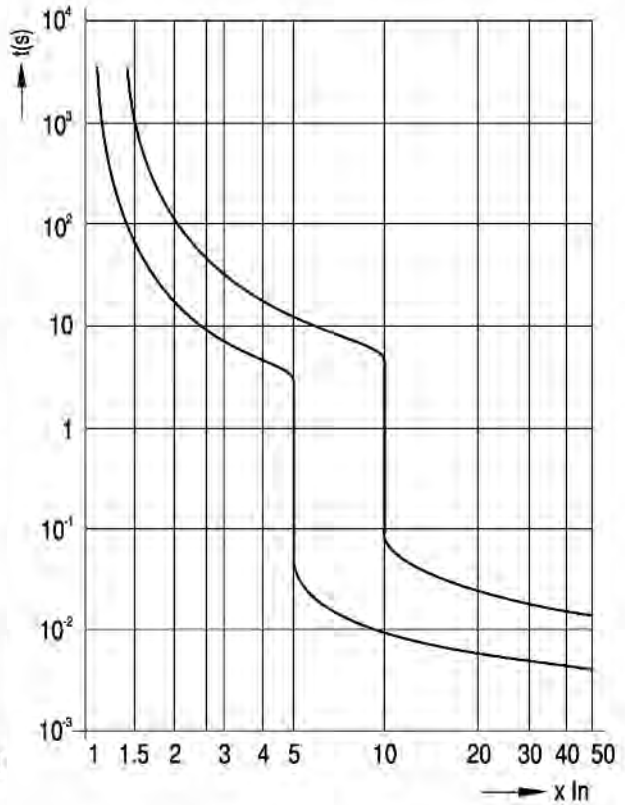
The following tables show the average tripping curves of the Terasaki Din-T MCBs based on the thermal and magnetic characteristics.

3

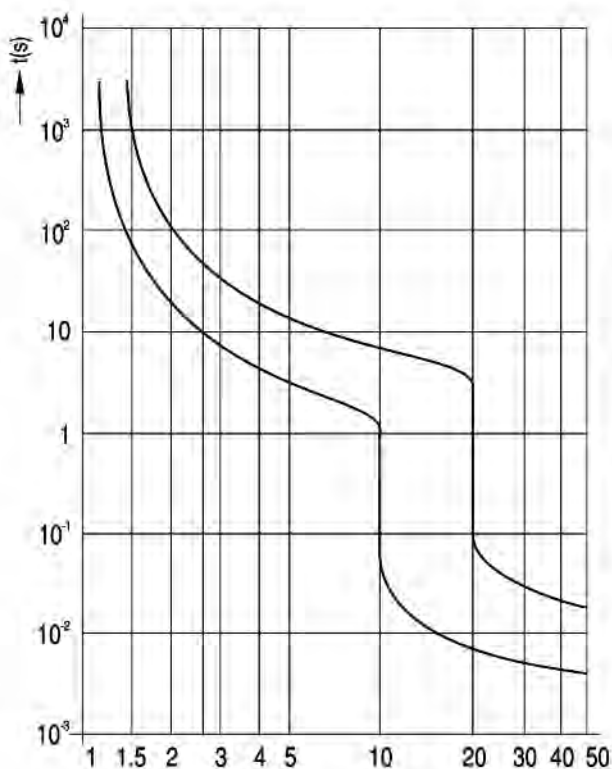
Curve B



Curve C



Curve D



## Din-T MCBs + RCDs Technical data

### Definitions related to circuit breakers

**MCB = Miniature Circuit Breaker**

#### Short-circuit (making and breaking) capacity

Alternating component of the prospective current, expressed by its RMS value, which the circuit breaker is designed to make, to carry for its opening time and to break under specified conditions.

#### Ultimate or rated short-circuit breaking capacity ( $I_{cn}$ - AS/NZS 60898)

A breaking capacity for which the prescribed conditions, according to a specified test sequence, do not include the capability of the MCB to carry 0.96 times its rated current for the conventional time.

#### Ultimate short-circuit breaking capacity ( $I_{cu}$ - AS/NZS 60947-2)

A breaking capacity for which the prescribed conditions, according to a specified test sequence, do not include the capability of the MCB to carry its rated current for the conventional time.

#### Service short-circuit breaking capacity ( $I_{cs}$ - AS/NZS 60898)

A breaking capacity for which the prescribed conditions, according to a specified test sequence, include the capability of the MCB to carry 0.96 times its rated current for the conventional time.

#### Prospective current

The current that would flow in the circuit, if each main current path of the MCB were replaced by a conductor of negligible impedance.

#### Conventional non-tripping current ( $I_{nt}$ )

A specified value of current which the circuit breaker is capable of carrying for a specified time without tripping.

#### Open position

The position in which the predetermined clearance between open contacts in the main circuit of the MCB is secured.

#### Closed position

The position in which the predetermined continuity of the main circuit of the MCB is secured.

#### Maximum prospective peak current ( $I_p$ )

The prospective peak current when the initiation of the current takes place at the instant which leads to the highest possible value.

3

## Din-T MCBs + RCDs Technical data

### Influence of ambient air temperature on the rated current

3

The maximum value of the current which can flow through an MCB depends on the nominal current of the MCB, the conductor cross-section and the ambient air temperature.

The values shown in the table below are for devices in free air. For devices installed with other modular devices in the same switchboard, a correction factor (K) shall be applied relative to the mounting situation of the MCB, the ambient temperature and the number of main circuits in the installation.

No of devices	K <sup>1)</sup>
2 or 3	0.9
4 or 5	0.8
6 or 9	0.7
> 10	0.6

#### Calculation example

Within a distribution board consisting of eight 2 Pole, 16 A, 'C' curve type MCBs, with an operating ambient temperature of 45 °C, which is the highest temperature the MCB can operate at without unwanted tripping?

#### Calculation

The correction factor  $K = 0.7$ , for use in an eight circuit installation:  $16 \text{ A} \times 0.7 = 11.2 \text{ A}$

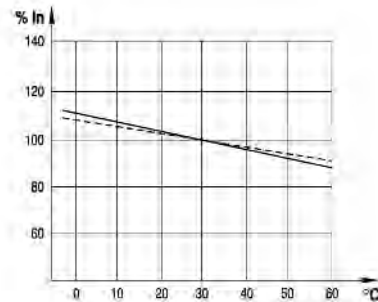
As the MCB is working at 45 °C it shall be given another factor (90 % = 0.9):

In at 45 °C = In at 30 °C  $\times 0.9 = 11.2 \text{ A} \times 0.9 = 10.1 \text{ A}$ .

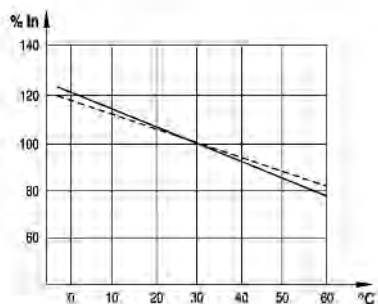
**Note:** <sup>1)</sup> Applicable for MCBs working at maximum rated currents.

The thermal calibration of the MCBs was carried out at an ambient temperature of 30 °C. Ambient temperatures different from 30 °C influence the bimetal and this results in earlier or later thermal tripping.

#### 0.5 - 6 A



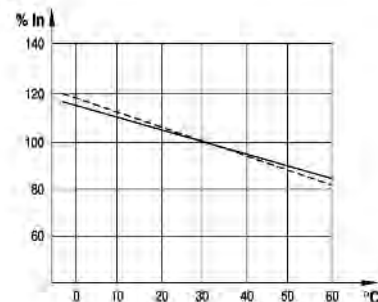
#### 10 A



#### 16 - 40 A



#### 50 - 63 A



———— : 1P (single pole)

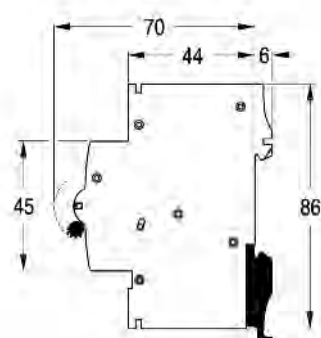
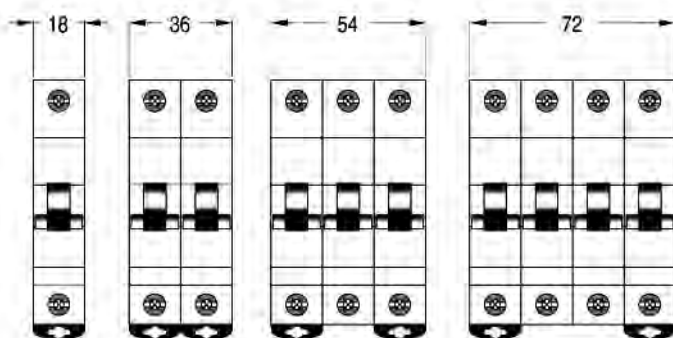
----- : mP (multi-pole)

## Din-T MCBs + RCDs Technical data

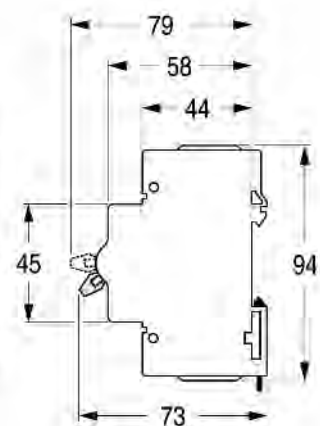
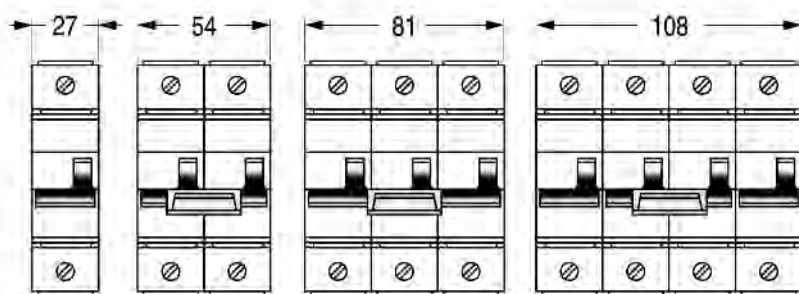
### Miniature circuit breakers - Din-T 6, 10, 15 / Easy-fit

Dimensions in mm.

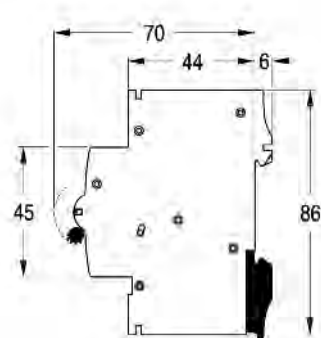
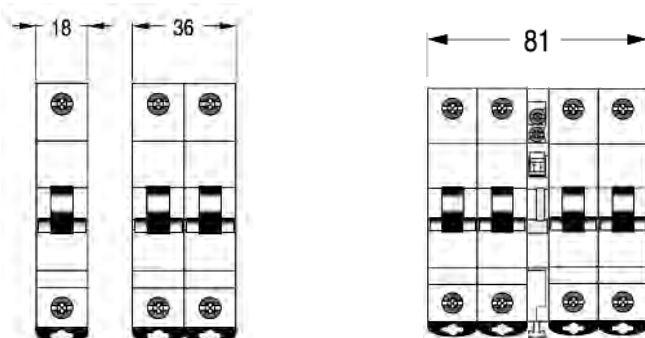
3



### Miniature circuit breakers - Din-T 10H



### Miniature circuit breakers - Din-T DC





## Miniature circuit breakers

### Din-T auxiliary contacts for MCBs



**DTAUXAL**  
alarm/auxiliary switch



**Auxiliary fitted to an MCB**

- Auxiliary contacts are supplied as a kit for fitting to MCBs
- Field fittable. Stack up to 4 units on left or right side
- Suitable for Din-T6, 10, 15 MCBs (not Din-T10H)
- Din-T auxiliary contacts indicate main contact position of the associated main device
- Includes busbar cavity for chassis mounting
- Current rating 5 A
- Version with gold contacts available for very low current < 200 mA and voltage < 24 V applications

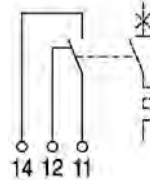
Field convertible  
left or right  
side mounting,  
auxiliary or alarm  
functions selection  
all in one

#### Ordering Details <sup>1)</sup>

Contact function	Contact	No. of modules wide	Cat. No. <sup>1)</sup>
H or S	Silver	0.5	<b>DTAUXAL</b>
H or S	Gold	0.5	<b>DTAUXALG</b>

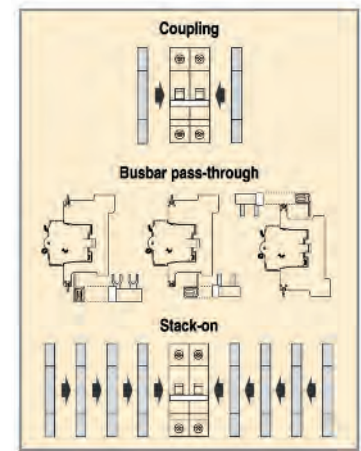
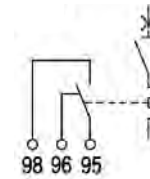
#### Function H (Aux)

The function H (changeover contact) is intended to provide signalisation of the real status of the associated main device (ON/OFF).



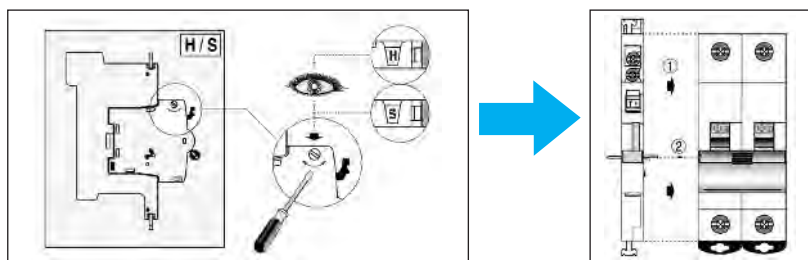
#### Function S (Alarm)

The function S (changeover contact) is intended to provide signalisation of the real status of the associated main device in case it releases automatically only. The contacts do not change position during manual operation.

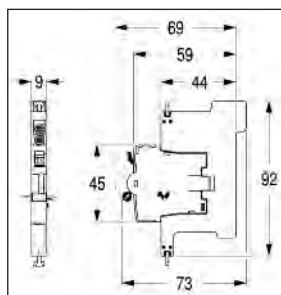


#### How to change the function S or H

Can be easily done before coupling it to the main device. Use a screwdriver to rotate the screw placed at the left-hand side of the auxiliary. An indication of the function appears in the window located in the upper shoulder.



#### Auxiliary contacts - series DTAUXAL/G





**Notes:** <sup>1)</sup> Refer 1 - 21 for auxiliaries to suit Din-T10H.  
 Refer 1 - 24 for auxiliaries to suit DSRCBS.  
 H = Auxiliary switch - indicates MCB status ON or OFF.  
 S = Alarm switch - indicates tripped position.

## Miniature circuit breakers

### Din-T auxiliary contacts for MCBs

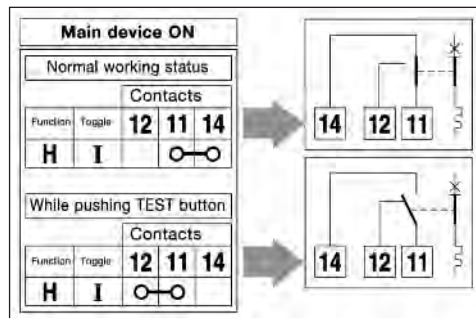
#### Display contacts

Display contacts				(Standard) DTAUXAL Silver	(Micro current) DTAUXALG Gold
Contacts					
Maximum current	AC 14	240 V	A	5	5
	DC 12	60 V	A	1	1
		48 V	 A	2	2
		24 V	 A	4	4
Minimum application voltage	AC/DC		V	24	12
Minimum application current	AC		mA	10	2
	DC		mA	200	25
Short-circuit resistance					
Protected by fuses 6 A gG			A	1000	1000
Protected by MCB Din-T 6			A	1000	1000
Electrical endurance	(operations)		ops	10000	10000
Terminal capacity	rigid cable		mm <sup>2</sup>	1 - 2.5	1 - 2.5
	flexible		mm <sup>2</sup>	0.75 - 2.5	0.75 - 2.5
Terminal capacity for 2 rigid cables			mm <sup>2</sup>	2 x 1.5	2 x 1.5
Torque			Nm	2	2

#### Function (H) auxiliary

When function H has been selected it is possible to know the real contact position of the associated device.

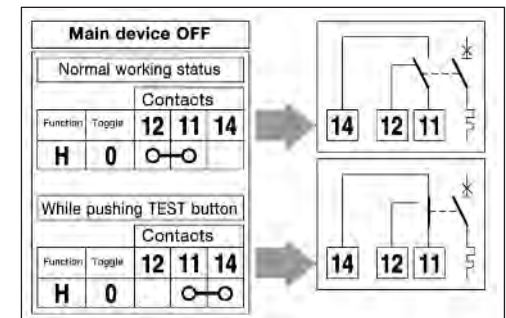
#### MCB ON



While both devices are in the ON position there is continuity between terminals 11-14. By pressing the display contact test button, the continuity changes over to terminals 11-12.

When released, the contacts changeover to the previous position 11-14.

#### MCB OFF



While both devices are in the OFF position there is continuity between terminals 11-12. By pressing the display contact test button, the continuity changes over to terminals 11-14.

When released, the contacts changeover to the previous position 11-12.



## Miniature circuit breakers

### Din-T auxiliary contacts for MCBs

#### Function S (Alarm)

The function S has been selected it as possible to know if the associated device has been tripped or not. Device will not switch when associated device is manually operated.

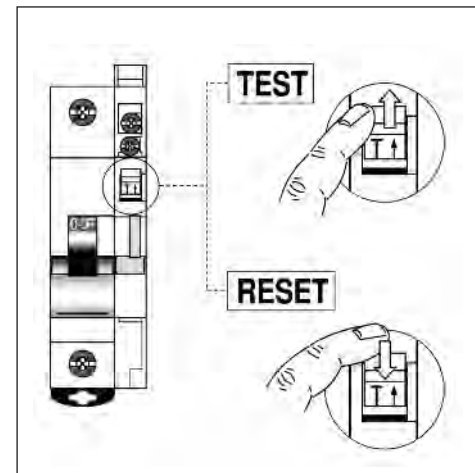
#### Test and reset function

##### Test function

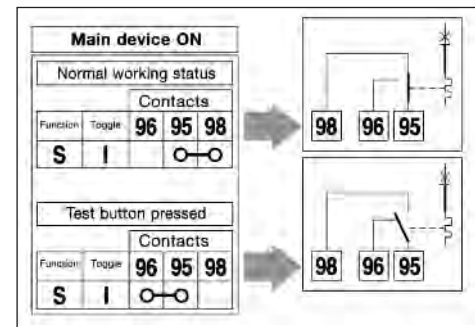
Allows testing of the control circuit by moving the test button up or down, without affecting the electrical status (ON/OFF) of the main device.

##### Reset function

If the main device electrically operates (due to overload, short-circuit or earth fault current), the changeover contact switches: a red line appears on the front of the test/reset button (visible indication of electrical fault in the installation). The changeover contact can be reset by pushing the test button down without changing the electrical status (ON/OFF) of the main device.

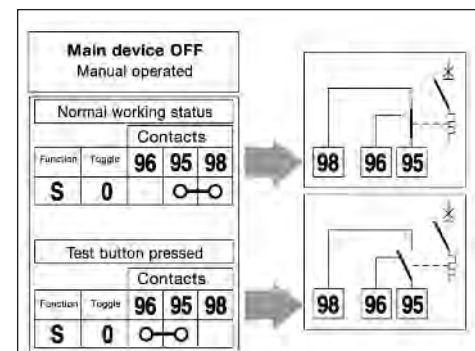


While both devices are in the ON position there is continuity between terminals 95-98. By pressing the display contact test button, the continuity changes over to terminals 95-96. When released, the contacts changeover to the previous position, 95-98.



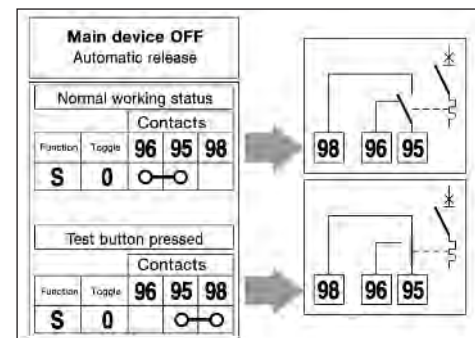
#### Manual operation

The contact position of the display contact test button has not changed. There is continuity between terminals 95-98. When pressing the display contact test button, the continuity switches over to terminals 95-96. When released, the contacts changeover to the previous position 95-98.



#### Automatic release

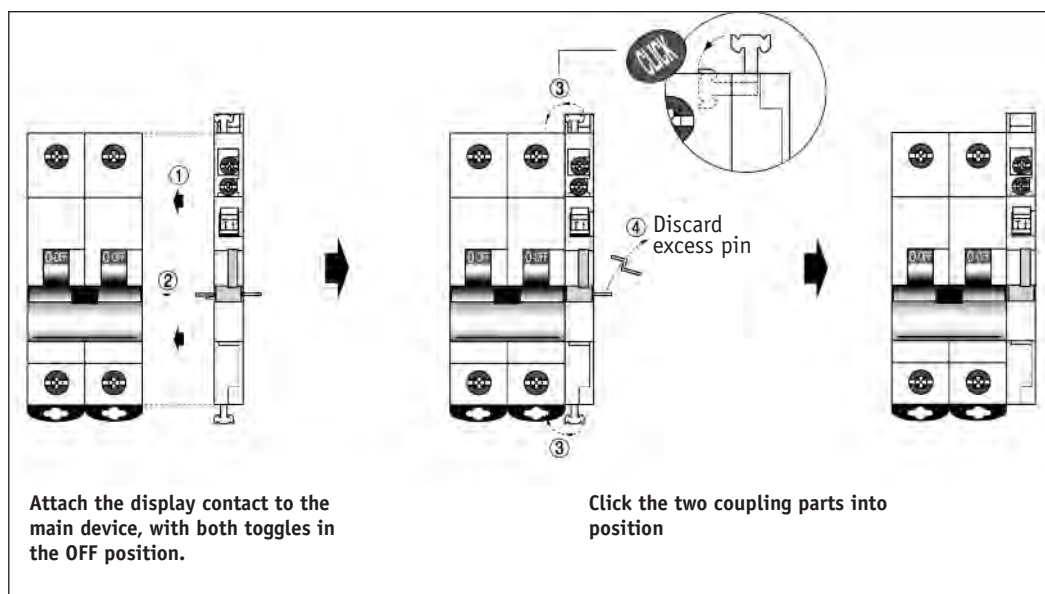
The contact position of the display contact test/reset button has changed. There is continuity between terminals 95-96. When the display contact reset button is operated the continuity switches over to terminals 95-98, and remains in that position even when the reset button is released.



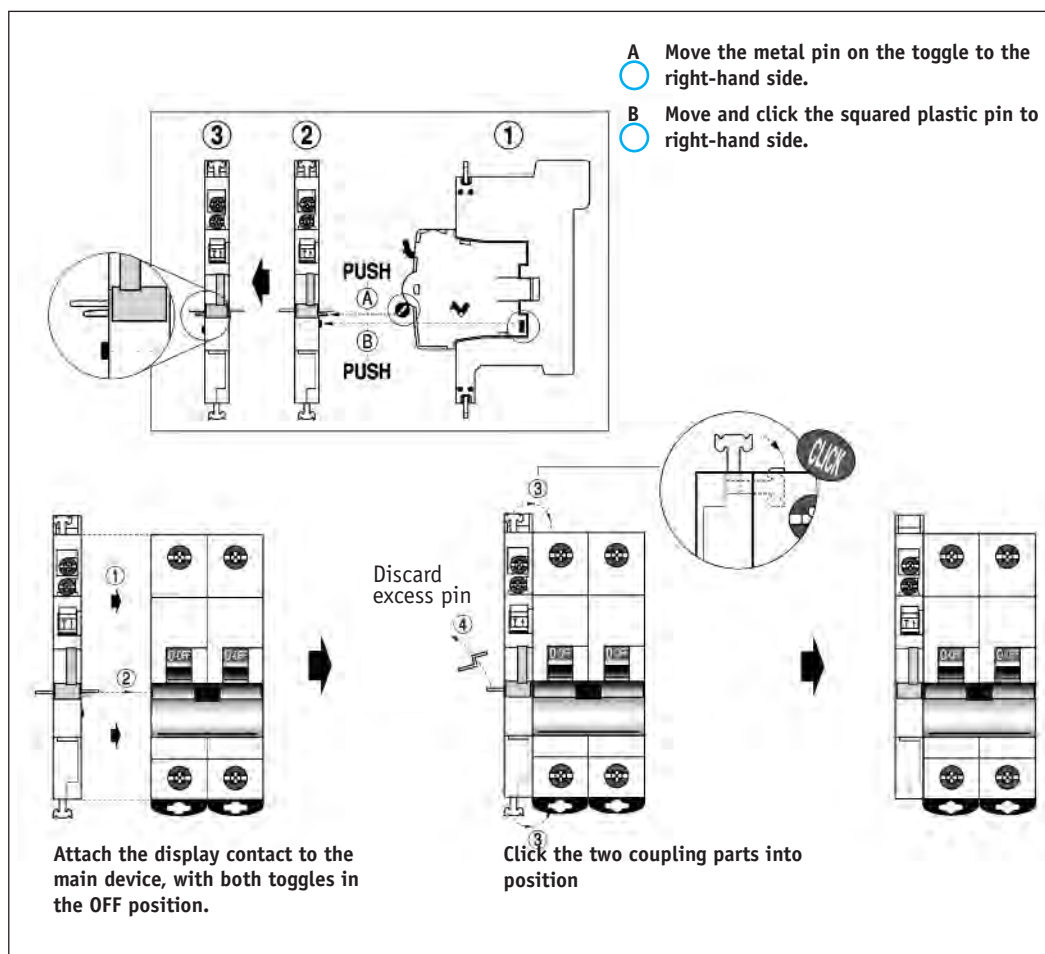
## Miniature circuit breakers

### Din-T auxiliary contacts for MCBs

The display contact DTAUXAL/G can easily be coupled to the right or left-hand side of the main device.<sup>1)</sup>  
**The display contacts are delivered as standard for coupling to the *right-hand side* of the main device.**



Coupling to the *left-hand side* of any device can be easily done by following the instructions below.







**Note:** <sup>1)</sup> DTAUXAL type contact fits to right side only on 2 P RCBO and 2/4 P RCCB.

## Miniature circuit breakers

### Din-Safe single pole width residual current circuit breaker (RCBO) 10 kA

- Standards AS/NZS 61009
- Approval N17482
- One module wide (18 mm)
- Short circuit, overcurrent and earth leakage protection
- Short circuit protection, 10 kA
- Sensitivity 30 mA, 10 mA
- DIN rail mount
- Suits NC or CD chassis
- Type 'A' residual current device
- 240 V AC



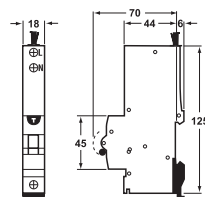
Trip sensitivity	Amp rating (A)	Cat. No <sup>1)2)</sup>
10 mA	6	 <b>DSRCBH0610A</b>
	10	<b>DSRCBH1010A</b>
	16	<b>DSRCBH1610A</b>
	20	<b>DSRCBH2010A</b>
	25	 <b>DSRCBH2510A</b>
	32	 <b>DSRCBH3210A</b>
	40	 <b>DSRCBH4010A</b>
30 mA	6	<b>DSRCBH0630A</b>
	10	<b>DSRCBH1030A</b>
	16	<b>DSRCBH1630A</b>
	20	<b>DSRCBH2030A</b>
	25	<b>DSRCBH2530A</b>
	32	<b>DSRCBH3230A</b>
	40	<b>DSRCBH4030A</b>

#### Operation

This unit combines the overload and short circuit protection of an MCB with earth leakage protection of an RCD. The unit occupies one, sub- circuit (one pole) of the distribution board and provides single phase protection against overload, short circuit and earth leakage current.

- The MCB element provides thermal and magnetic tripping protection which is rated to 6 kA prospective fault current.
- The RCD element of the device provides core-balance detection of the difference between the active and neutral currents and amplification to provide high sensitivity. The rated residual operating current ( $I_{\Delta n}$ ) is 30 mA.
- The white earth reference cable, in case of loss of supply neutral, ensures the device will continue to provide earth leakage protection and will operate normally upon detection of an earth leakage current.

#### Dimensions (mm)




**Notes:** <sup>1)</sup> Neutral not switched.

<sup>2)</sup> Will not accept Din-T side mounting accessories.

30 mA tripping characteristics:  $0.5 \times I_{\Delta n} = \text{no tripping}$ ,  $1 \times I_{\Delta n} = T \leq 300 \text{ ms}$

$2 \times I_{\Delta n} = T \leq 150 \text{ ms}$ ,  $5 \times I_{\Delta n} = T \leq 40 \text{ ms}$

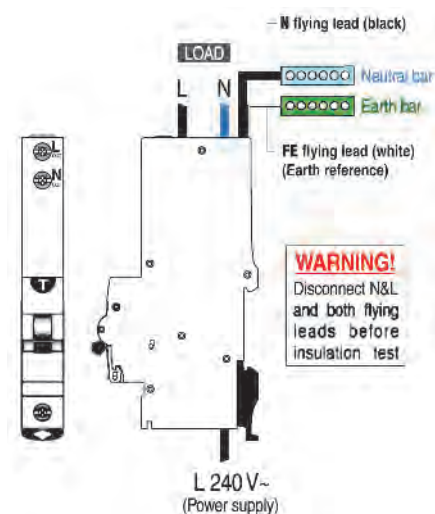
Nuisance tripping may be experienced in VFD and motor starting applications refer NHP.

 Available on indent only.

#### Application

The Din-Safe single pole width residual current circuit breaker will fit the standard Din-T chassis for use in NHP panelboards. The design makes it possible to provide an MCB complete with earth leakage protection in an 18 mm wide module, which allows a greater number of devices to be fitted into a distribution board.

#### Connection diagram



#### Accessories

#### Page

Padlock bracket	1 - 45
Link bars and terminals	1 - 44 to 1 - 45
Enclosures	Section 2

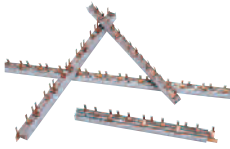
#### Technical data

#### Page

Tripping characteristics	Section 3
Technical data / wiring	Section 3

## Miniature circuit breakers

### ICL busbars – busbar combs



ICL123

No. of Poles	1 Phase <sup>1)</sup> Cat. No.	3 Phase Cat. No.
8 Way	IBC108P	-
12 Way	IBC112P	ICL123
15 Way	IBC115P	ICL153
18 Way	IBC118P	ICL183
21 Way	IBC121P	ICL213
55 Way	IBC155P	-
57 Way	-	ICL573

#### Pin type busbar

No. of Poles	Cat. No.
IP+N 6 way pin type busbar comb	ICL62
IP+N 10 way pin type busbar comb	ICL102
IP+N 56 way pin type busbar comb	ICL562
3P+Aux 56 way pin type busbar comb	ICL563A <sup>2)</sup>
3P+N 56 way pin type busbar comb	ICL564

#### Fork type busbar

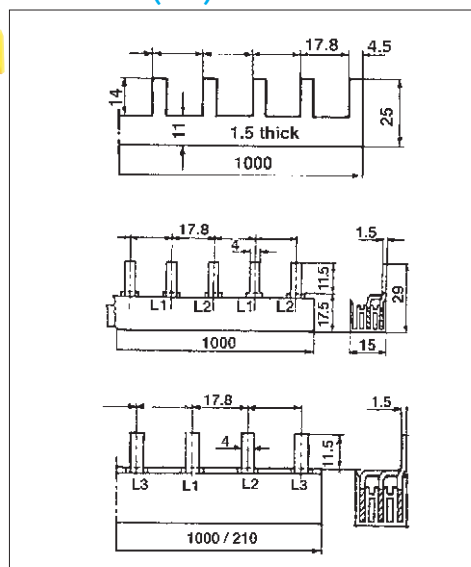
No. of Poles	Cat. No.
56 way 1 phase fork type busbar comb	ICL561F
57 way 3 phase fork type busbar comb	ICL573F

#### End caps

No. of Poles	Cat. No.
1P end cap to suit IBC style buscomb	IBCEC1
2P and 3P end cap to suit ICL style buscomb	ICLEC23 <sup>3)</sup>
3P+N end cap to suit ICL style buscomb	ICLEC4 <sup>3)</sup>

ICL573F

#### Dimensions (mm)



**Notes:** <sup>1)</sup> IBC busbar combs come complete with endcaps

<sup>2)</sup> 16 x 3 MCB connections and 16 x 9 mm spaces (AUXs)

<sup>3)</sup> ICL end caps do not suit IBC busbar combs

#### Technical data

Material of busbar	SF-CU
Insulation Material	Plastic material, high temperature resistant, self-extinguishing
Disruptive strength	DIN 53481/11.2 (36 kV/mm)
Short circuit strength	≤ 25 kA 0.1 sec (100 A fuse backup) 50 kA ⇔ 250 A gl
Climatic stability	according to DIN 40046 resp. IEC 68-2
Leakage current	IEC 112/VDE 0303/1 (600 V)
PGroup Isolation	according to VDE 0110, Group C: 380 V AC, 480 V AC
Regulations for terminal material	Din 57606/VDE 0606
Current rating	80 A end fed 130 A center fed



ICLTOC  
T-off cap (strip of 5)  
(Refer page 1 - 45)

## 2.2 CONTACTORS & OVERLOADS

- Sprecher & Schuh – **CA7-9-10 24VDC** – Contactor
- Sprecher & Schuh – **CS7-PV-22** – Auxillary
- Sprecher & Schuh – **CT7N-23-B20** – Thermal Overload
- Sprecher & Schuh – **CT7N-23-B63** – Thermal Overload
- Sprecher & Schuh – **CM7** – Mechanical Interlock



# CONTACTORS, OVERLOADS AND DOL STARTERS

Easy Selection Guide

MOTOR CONTROL





Follow the “3 Easy Steps” to select the right contactor for your application.

# step 1

## STEP 1: Select Your Current Rating

Contactor are most commonly used in motor applications. Motor ratings are referred to as *AC3 Motor Amps* or *Motor Full Load Current* (page 6).

### What is the Motor Full Load Current?

This rating can be obtained from the nameplate of the motor or from the motor manufacturer. When selecting a CA 7 contactor for the motor, be sure to refer to the column labelled as *AC3 Motor Amps*.

There may be occasions where only the motor size (in kW) is supplied. Please use the table below to estimate the *AC3 Motor Amps* rating.

Typical ratings for 3-phase motor	
Motor size (kW)	Approx. full load current @ 415 V (AC 3 amps)
0.06	0.3
0.09	0.4
0.12	0.5
0.18	0.6
0.25	0.8
0.37	1.1
0.55	1.5
0.75	1.8
1.1	2.6
1.5	3.4
2.2	4.8
3.7	7.6
4	8.2
5.5	11
7.5	14
11	21
15	28
18.5	34
22	40
30	55
37	66
45	80
55	95

# Or

While contactors are most commonly used in motor applications, they can also be used with resistive loads such as a water heater. The ratings of these loads are referred to as *nominal current*. These ratings are supplied by the manufacturer of the load. When selecting a CA 7 contactor for resistive loads, be sure to refer to the column labelled *AC 1 amps* (page 6).

# step 2

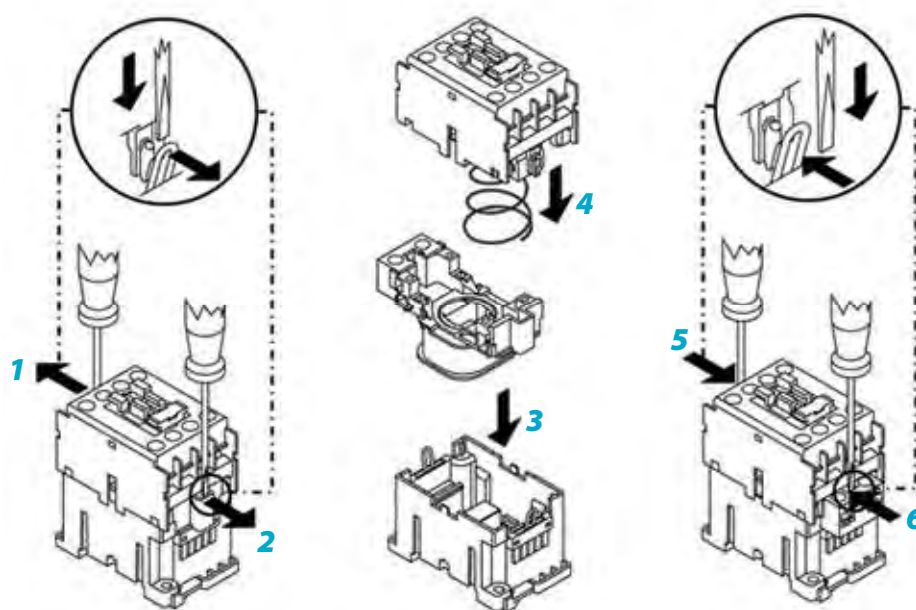
## STEP 2: Select Your Coil Voltage

CA 7 contactors are most commonly supplied with a 240 V AC rated coil. However, they can be ordered complete with other coil voltages.

Coils are easily interchangeable for alternative coil voltages.

Select from 24, 110 and 415 V AC coils from the table labelled *Spare Coils* (page 7), and then follow the three easy steps to change from a standard 240 V AC coil to the alternative chosen.

### Change your coil in three easy steps:



- 1.** Place two “flat-head” screw drivers in position **1 & 2**.  
Unclip top half by pulling the clips back (away from the contactor).
- 2.** Top half will spring off.  
Pull old coil out, and place spare in position **3**.  
Ensure spring is in place to mount top half above the new coil **4**.
- 3.** Place the two screw drivers in positions **5 & 6**.  
Push clips back into their original position.  
Top half is now securely mounted and contactor is ready for use.



## step 3

**STEP 3: Select Auxiliary Contacts (Optional)**

As an additional option, CA 7 contactors have auxiliary contacts.

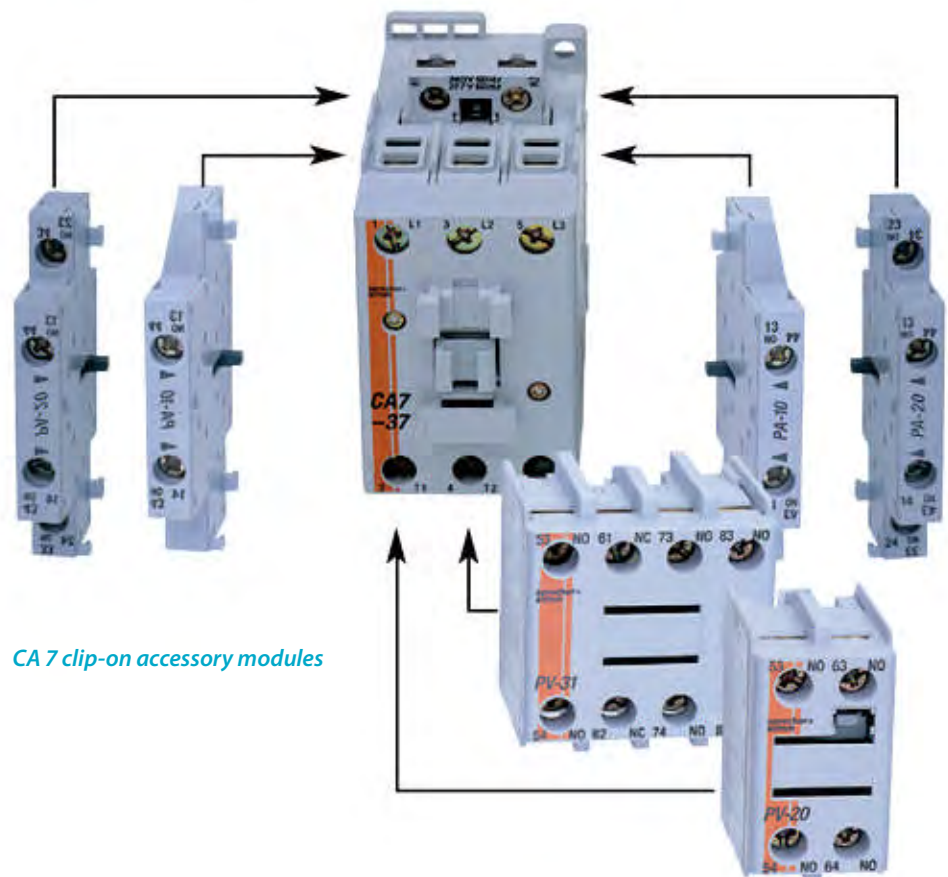
CA 7-9 to CA 7-23 have either 1 x N/O or 1 x N/C auxiliary contact in-built.

CA 7-30 to CA 7-97 do not have in-built auxiliary contacts, therefore may require auxiliary contact blocks to be externally mounted.

These can be mounted on the top or side of the CA 7 contactors.

When selecting an auxiliary contact block, please refer to the

*Auxiliary Contacts Blocks Table (page 6)*. These can be supplied separately.



CA 7 clip-on accessory modules

An Electrical fitter requires an AC contactor for a motor with full load current of 11 amps, a 230 V AC rated coil and 1 x N/C contact.

AC 3	AC 3	AC 1	Auxiliary contacts		Cat. No. <sup>1)</sup>
Motor amps	Motor size (kW)	Amps	N/O	N/C	
9	4	32	1	0	CA7-9-10-240V-AC
			0	1	CA7-9-01-240V-AC
12	5.5	3	1	0	CA7-12-10-240V-AC
			0	1	CA7-12-01-240V-AC
16	7.5	32	1	0	CA7-16-10-240V-AC
			0	1	CA7-16-01-240V-AC
23	11	32	1	0	CA7-23-10-240V-AC
			0	1	CA7-23-01-240V-AC
30	15	65	0	0	CA7-30-00-240V-AC
37	18.5	65	0	0	CA7-37-00-240V-AC
43	22	85	0	0	CA7-43-00-240V-AC
60	32	100	0	0	CA7-60-00-240V-AC
72	40	100	0	0	CA7-72-00-240V-AC
85	45	100	0	0	CA7-85-00-240V-AC
97	55	130	0	0	CA7-97-00-240V-AC

Select contactor rated up to 12 amps

230 V AC coil standard with CA 7 contactors

Select contactor with 1 x N/C auxiliary contact

The fitter also requires an AC contactor for a motor with Full Load Current of 40 amps, a 24 V AC rated coil and 2 x N/O contacts.

AC 3	AC 3	AC 1	Auxiliary contacts		Cat. No. <sup>1)</sup>
Motor amps	Motor size (kW)	Amps	N/O	N/C	
9	4	32	1	0	CA7-9-10-240V-AC
			0	1	CA7-9-01-240V-AC
12	5.5	3	1	0	CA7-12-10-240V-AC
			0	1	CA7-12-01-240V-AC
16	7.5	32	1	0	CA7-16-10-240V-AC
			0	1	CA7-16-01-240V-AC
23	11	32	1	0	CA7-23-10-240V-AC
			0	1	CA7-23-01-240V-AC
30	15	65	0	0	CA7-30-00-240V-AC
37	18.5	65	0	0	CA7-37-00-240V-AC
43	22	85	0	0	CA7-43-00-240V-AC
60	32	100	0	0	CA7-60-00-240V-AC
72	40	100	0	0	CA7-72-00-240V-AC
85	45	100	0	0	CA7-85-00-240V-AC
97	55	130	0	0	CA7-97-00-240V-AC

Select contactor rated up to 43 amps

Take 230 V AC coil out and select the following

Coils with alternative voltages for AC contactors	To suit	Cat. No.
24 V AC	CA7-9 to CA-16	CAC7-16-24V-AC
	CA7-23 to CA7-37	CAC7-37-24V-AC
	CA7-43	CAC7-43-24V-AC
	CA7-60 to CA7-85	CAC7-85-24V-AC
	CA7-97	CAC7-97-24V-AC
110 V AC	CA7-9 to CA-16	CAC7-16-110V-AC
	CA7-23 to CA7-37	CAC7-37-110V-AC
	CA7-43	CAC7-43-110V-AC
	CA7-60 to CA7-85	CAC7-85-110V-AC
240 V AC	CA7-9 to CA-16	CAC7-16-240V-AC
	CA7-23 to CA7-37	CAC7-37-240V-AC
	CA7-43	CAC7-43-240V-AC
	CA7-60 to CA7-85	CAC7-85-240V-AC
	CA7-97	CAC7-97-240V-AC
415 V AC	CA7-9 to CA-16	CAC7-16-415V-AC
	CA7-23 to CA7-37	CAC7-37-415V-AC
	CA7-43	CAC7-43-415V-AC
	CA7-60 to CA7-85	CAC7-85-415V-AC
	CA7-97	CAC7-97-415V-AC

Fit new coil in contactor

Since no aux contacts with CA 7-43, select the following aux contact block

No. of poles	Auxiliary contacts		Cat. No.
	N/O	N/C	
1	0	1	CA7-PA-01
1	1	0	CA7-PA-10
2	1	1	CS7-PA-11
2	2	0	CA7-PA-20

Supply aux contact block with CA 7 contactor

For extended  
range refer to NHP  
Part A catalogue



### CA 7 Contactors 4-45 kW with AC Coil

AC 3	AC 3	AC 1	Auxiliary contacts		Cat. No. <sup>1)</sup>
Motor amps	Motor size (kW)	Amps	N/O	N/C	
9	4	32	1	0	CA 7-9-10-240V-AC
			0	1	CA 7-9-01-240V-AC
12	5.5	32	1	0	CA 7-12-10-240V-AC
			0	1	CA 7-12-01-240V-AC
16	7.5	32	1	0	CA 7-16-10-240V-AC
			0	1	CA 7-16-01-240V-AC
23	11	32	1	0	CA 7-23-10-240V-AC
			0	1	CA 7-23-01-240V-AC
30	15	65	0	0	CA 7-30-00-240V-AC
37	18.5	65	0	0	CA 7-37-00-240V-AC
43	22	85	0	0	CA 7-43-00-240V-AC
60	32	100	0	0	CA 7-60-00-240V-AC
72	40	100	0	0	CA 7-72-00-240V-AC
85	45	100	0	0	CA 7-85-00-240V-AC
97	55	130	0	0	CA 7-97-00-240V-AC

<sup>1)</sup> Contactors can be ordered complete with alternative coils.  
Replace 240 with 24, 32, 110 & 415.

For extended  
range refer to NHP  
Part A catalogue

### Auxiliary Contact Blocks (Top Mounting) <sup>2)</sup>

No. of poles	Auxiliary contacts		Suit CA 7 <sup>3)</sup>	Cat. No.
	N/O	N/C		
2	1	1	CA 7-9 to CA 7-23	CA 7-PV-S11
2	1	1	CA 7-30 to CA 7-97	CA 7-PV-11
2	1	1	All	CS 7-PV-11
4	2	2	CA 7-9 to CA 7-23	CA 7-PV-S22
4	2	2	CA 7-30 to CA 7-97	CA 7-PV-22
4	4	0	All	CS 7-PV-40

<sup>2)</sup> One top-mount auxiliary per contactor only.

<sup>3)</sup> Recommendation only. All auxiliary contacts will fit any CA 7 contactor.



### Auxiliary Contact Blocks (Side Mounting) <sup>4)</sup>

No. of poles	Auxiliary contacts		Cat. No.
	N/O	N/C	
1	0	1	CA 7-PA-01
1	1	0	CA 7-PA-10
2	1	1	CS 7-PA-11
2	2	0	CA 7-PA-20

<sup>4)</sup> Two side-mount auxiliaries per contactor only (one on each side).  
Side & top auxiliary contact blocks can be utilised together.



### Spare Coils



Coil voltages	To suit	Cat. No.
24 V AC	CA 7-9 to CA-16	CA C7-16-24V-AC
	CA 7-23 to CA 7-37	CA C7-37-24V-AC
	CA 7-43	CA C7-43-24V-AC
	CA 7-60 to CA 7-85	CA C7-85-24V-AC
	CA7-97	CAC7-97-24V-AC
110 V AC	CA 7-9 to CA -16	CA C7-16-110V-AC
	CA 7-23 to CA 7-37	CA C7-37-110V-AC
	CA 7-43	CA C7-43-110V-AC
	CA 7-60 to CA 7-85	CA C7-85-110V-AC
	CA7-97	CAC7-97-110V-AC
240 V AC	CA 7-9 to CA -16	CA C7-16-240V-AC
	CA 7-23 to CA 7-37	CA C7-37-240V-AC
	CA 7-43	CA C7-43-240V-AC
	CA 7-60 to CA 7-85	CA C7-85-240V-AC
	CA7-97	CAC7-97-240V-AC
415 V AC	CA 7-9 to CA-16	CA C7-16-415V-AC
	CA 7-23 to CA 7-37	CA C7-37-415V-AC
	CA 7-43	CA C7-43-415V-AC
	CA 7-60 to CA 7-85	CA C7-85-415V-AC
	CA7-97	CAC7-97-415V-AC

For extended  
range refer to NHP  
Part A catalogue



### CA 7 Contactors – Accessories & Spares

Function	Description	Cat. No.
pneumatic on-delay timer	time range	
	0.3 - 30 seconds	CZ E-7-30
	1.8 - 180 seconds	CZ E-7-180
pneumatic off-delay timer	Time range	
	0.3 - 30 seconds	CZA-7-30
	1.8 - 180 seconds	CZA-7-180
mechanical interlock	interlock only	CM7
	Interlock with 2 x N/C	CM7-02
electronic PLC interface <sup>1)</sup>	Digital input	
	18 - 30 V DC (10 - 15mA)	CRI-7E

<sup>1)</sup> Suitable for control voltages between 110 and 240 V AC.



### Bi-Metal Thermal Overloads

To choose your Bi-Metal Thermal Overload, check the motor name plate for the **full load current** and match it to the "Motor Current Range (A)". Also ensure the overload selected suits the CA 7 contactor.



#### CT 7N

- Bi-Metal thermal overload for standard motors up to 95 kW
- Manual reset
- Standard trip class 10 overload curve
- Suitable for single phase and 3-phase applications.

Approx. motor size (kW)	Motor current range (A)	To suit contactor	Cat. No.
-	0.1 to 0.16	CA 7-9 to CA 7-23	CT 7N-23-A16
-	0.16 to 0.25	CA 7-9 to CA 7-23	CT 7N-23-A25
0.06 or 0.09	0.25 to 0.40	CA 7-9 to CA 7-23	CT 7N-23-A40
0.09 or 0.12	0.35 to 0.50	CA 7-9 to CA 7-23	CT 7N-23-A50
0.18	0.45 to 0.63	CA 7-9 to CA 7-23	CT 7N-23-A63
0.18 or 0.25	0.55 to 0.80	CA 7-9 to CA 7-23	CT 7N-23-A80
0.25	0.75 to 1.0	CA 7-9 to CA 7-23	CT 7N-23-B10
0.37	0.9 to 1.3	CA 7-9 to CA 7-23	CT 7N-23-B13
0.55	1.1 to 1.6	CA 7-9 to CA 7-23	CT 7N-23-B16
0.55 or 0.75	1.4 to 2.0	CA 7-9 to CA 7-23	CT 7N-23-B20
0.72 or 1.1	1.8 to 2.5	CA 7-9 to CA 7-23	CT 7N-23-B25
1.1	2.3 to 3.2	CA 7-9 to CA 7-23	CT 7N-23-B32
1.5	2.9 to 4.0	CA 7-9 to CA 7-23	CT 7N-23-B40
2.2	3.5 to 4.8	CA 7-9 to CA 7-23	CT 7N-23-B48
2.2	4.5 to 6.3	CA 7-9 to CA 7-23	CT 7N-23-B63
-	5.5 to 7.5	CA 7-9 to CA 7-23	CT 7N-23-B75
3.7	7.2 to 10	CA 7-9 to CA 7-23	CT 7N-23-C10
5.5	9 to 12.5	CA 7-12 to CA 7-23	CT 7N-23-C12
5.5	11.3 to 16	CA 7-16 to CA 7-23	CT 7N-23-C16
7.5	15 to 20	CA 7-16 to CA 7-23	CT 7N-23-C20
-	17.5 to 21.5	CA 7-16 to CA 7-23	CT 7N-23-C21
11	21 to 25	CA 7-16 to CA 7-23	CT 7N-23-C25
7.5	15 to 20	CA 7-30 to CA 7-37	CT 7N-37-C20
11	17.5 to 21.5	CA 7-30 to CA 7-37	CT 7N-37-C21
11	21 to 25	CA 7-30 to CA 7-37	CT 7N-37-C25
15	24.5 to 30	CA 7-30 to CA 7-37	CT 7N-37-C30
18.5	29 to 36	CA 7-30 to CA 7-37	CT 7N-37-C36
18.5	33 to 38	CA 7-30 to CA 7-37	CT 7N-37-C38
11	17 to 25	CA 7-43	CT 7N-43-C25
15 or 18.5	24.5 to 36	CA 7-43	CT 7N-43-C36
18.5 or 22	35 to 47	CA 7-43	CT 7N-43-C47
18.5 or 22	35 to 47	CA 7-60 to CA 7-97	CT 7N-85-C47
30	45 to 60	CA 7-60 to CA 7-97	CT 7N-85-C60
37	58 to 75	CA 7-60 to CA 7-97	CT 7N-85-C75
45	72 to 90	CA 7-60 to CA 7-97	CT 7N-85-C90

### Electronic Overloads for 3-Phase motors

#### CEP 7-ED

- Standard overload for motors up to 15 kW
- Also suits CAT 7N DOL starters
- Reduced power consumption and heat output
- Manual reset button
- Reduces stock levels due to wide current range
- Trip class 10 overload curve for standard motors.



Approx. motor kW range	Motor current range (A)	To suit contactor	Cat. No.
0.02 to 0.12	0.1 to 0.5	CA 7-9 to CA 7-23	CEP7-ED1AB
0.06 to 0.25	0.2 to 1	CA 7-9 to CA 7-23	CEP7-ED1BB
0.25 to 2.2	1 to 5	CA 7-9 to CA 7-23	CEP7-ED1CB
1.5 to 7.5	3.2 to 16	CA 7-9 to CA 7-23	CEP7-ED1DB
2.2 to 15	5.4 to 27	CA 7-9 to CA 7-23	CEP7-ED1EB

### Electronic Overloads for 3-Phase Motors

#### CEP 7-EE

- Enhanced overload for motors up to 45 kW
- Accepts side mount modules
- Reduced power consumption and heat output
- Ideal for motors with longer run up times
- Automatic & manual reset button
- Adjustable trip classes - 10, 15, 20, 30 (dip switches).



Approx. motor kW range <sup>1)</sup>	Motor current range (A)	To suit contactor	Cat. No.
0.02 to 0.12	0.1 to 0.5	CA 7-9 to CA 7-23	CEP7-EEAB
0.06 to 0.25	0.2 to 1	CA 7-9 to CA 7-23	CEP7-EEBB
0.25 to 2.2	1 to 5	CA 7-9 to CA 7-23	CEP7-EECB
1.5 to 7.5	3.2 to 16	CA 7-9 to CA 7-23	CEP7-EEDB
2.2 to 15	5.4 to 27	CA 7-9 to CA 7-23	CEP7-EEEB
2.2 to 15	5.4 to 27	CA 7-30 to CA 7-43	CEP7-EEED
4 to 22	9 to 45	CA 7-30 to CA 7-43	CEP7-EEFD
11 to 45	18 to 90	CA 7-60 to CA 7-97	CEP7-EEGE
22 to 55	60 to 120	CA 7-30 to CA 7-97	CEP7-EEVE

<sup>1)</sup> Refer to NHP Part A for higher kW ratings.

For extended range refer to NHP Part A catalogue

### Overload Accessories



CT7N  
Front Mount  
Accessory



CEP7-ERR  
Side Mount  
Accessory

Function	Description	To suit overload	Cat. No.
Remote reset module	For remote reset after an overload trip	CT 7N Range	CMR7N240VAC <sup>1)</sup>
Remote reset module	For remote reset after an overload trip	CEP 7-EE Range	CEP7-ERR

<sup>1)</sup> Change control voltage to Cat. no., when ordering 24, 110 AC or 24, 48 DC.



### 1. Select Enclosure Type with CA 7 Contactor

To choose your bi-metal thermal overload, check the motor name plate for the **full load current** and match it to the "motor current range (A)". Also ensure the overload selected suits the CA 7 contactor.

Approx. motor kW range	Contactor type	DOL setting range	Cat. No. <sup>1)</sup>
<b>Insulated enclosure with green start and red stop button</b>			
5.5	CA 7-12	0.1 to 16	CAT7N-5.5P-240-V-AC
7.5	CA 7-16	3.2 to 17.5	CAT7N-7.5P-240V-AC
<b>Insulated enclosure with blue reset button only</b>			
5.5	CA 7-12	0.1 to 16	CAT7N-5.5R-240-V-AC
7.5	CA 7-16	3.2 to 17.5	CAT7N-7.5R-240V-AC
<b>Insulated enclosure with green start and red mushroom stop button</b>			
5.5	CA 7-12	0.1 to 16	CAT7N-5.5PM-240-V-AC

<sup>1)</sup> For 3-phase voltage, add 415 in place of 240.

### 2A. Select Electronic Overload to Suit

For more flexibility (large kW ranges) select electronic overload.

Approx. motor kW range	Motor current range (A)	Cat. No.
0.02 to 0.12	0.1 to 0.5	CEP7-ED1AB
0.06 to 0.25	0.2 to 1	CEP7-ED1BB
0.25 to 2.2	1 to 5	CEP7-ED1CB
1.5 to 7.5	3.2 to 16	CEP7-ED1DB
2.2 to 15	5.4 to 27	CEP7-ED1EB

### 2B. Select Thermal Bi-Metal Overload

For typical motor applications with standard motor size select Thermal Bi-Metal Overload.

Approx. motor kW range	Motor current range (A)	Cat. No.
-	0.1 to 0.16	CT7N-23-A16
-	0.16 to 0.25	CT7N-23-A25
-	0.25 to 0.40	CT7N-23-A40
-	0.35 to 0.50	CT7N-23-A50
0.13 to 0.18	0.45 to 0.63	CT7N-23-A63
0.15 to 0.25	0.55 to 0.80	CT7N-23-A80
0.23 to 0.34	0.75 to 1.0	CT7N-23-B10
0.3 to 0.48	0.9 to 1.3	CT7N-23-B13
0.38 to 0.65	1.1 to 1.6	CT7N-23-B16
0.52 to 0.8	1.4 to 2.0	CT7N-23-B20
0.72 to 1.1	1.8 to 2.5	CT7N-23-B25
1 to 1.4	2.3 to 3.2	CT7N-23-B32
1.3 to 1.7	2.9 to 4.0	CT7N-23-B40
1.6 to 2.2	3.5 to 4.8	CT7N-23-B48
2 to 2.8	4.5 to 6.3	CT7N-23-B63
2.5 to 3.5	5.5 to 7.5	CT7N-23-B75
3.3 to 5	7.2 to 10	CT7N-23-C10
4.3 to 6	9 to 12.5	CT7N-23-C12
5.2 to 8	11.3 to 16	CT7N-23-C16



## EASY SELECTION GUIDE:

# Sprecher + Schuh Rating Chart and Sprecher Wheel

**NHP**

NHP have developed a brochure and a ratings chart to ensure your industrial control needs are met promptly and effortlessly.

**CONTACTOR RATINGS CHART**

The chart displays a comprehensive table of contactor ratings for various models, including current ratings, motor starter ratings, and other technical specifications. It is organized into columns for different voltage ranges and current ratings.

### Ratings Chart includes:

- Clear pictures of entire Sprecher + Schuh contactor range
- Easy look-up table for overloads matching corresponding contactor chosen
- Complete ratings (current & motor starter ratings, capacitor switching and mechanical, electrical and coil data)
- Keep the chart handy to make your selection process quick and easy.

## Sprecher Wheel:

- Product selection guide for three phase motor control and protection
- Follow the simple instructions on the front of the wheel and notice how easy it is to use
- Put it in your toolbox and take it where ever you go.



## CONTACTOR SELECT IPHONE APP

If you like the Sprecher Wheel, make sure you download the NHP iPhone App called 'Contactor Select' which is the digital version with added bonuses such as 'one click' ordering and service support.

**NOW AVAILABLE ON THE ITUNES APP STORE  
NOW OR AT NHP.COM.AU.**



**sprecher+schuh**





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## 2.3 CONTROL DEVICES

- IDEC – **RH2B-ULD-DC24V c/w SH2B-05** – 24VDC Relays
- IDEC – **RH4B-ULD-DC24V c/w SH4B-05** – 24VDC Relays
- Sprecher & Schuh – **RZ7-FSD3C U23** – Power on Reset Timer



## Sockets (for Blade Terminal Models)

Relays	Standard DIN Rail Mount <sup>1</sup>	Finger-safe DIN Rail Mount <sup>1</sup>	Through Panel Mount	PCB Mount
RH1B	SH1B-05	SH1B-05C	SH1B-51	SH1B-62
RH2B	SH2B-05	SH2B-05C	SH2B-51	SH2B-62
RH3B	SH3B-05	SH3B-05C	SH3B-51	SH3B-62
RH4B	SH4B-05	SH4B-05C	SH4B-51	SH4B-62



1. DIN Rail mount socket comes with two horseshoe clips. Do not use unless you plan to insert pullover wire spring. Replacement horseshoe clip part number is Y778-011.

## Hold Down Springs &amp; Clips

Appearance	Description	Relay	For DIN Mount Socket	For Through Panel & PCB Mount Socket	Min Order Qty
	Pullover Wire Spring	RH1B	SY2S-02F1 <sup>2</sup>	SY4S-51F1	10
		RH2B	SY4S-02F1 <sup>2</sup>		
		RH3B	SH3B-05F1 <sup>2</sup>		
		RH4B	SH4B-02F1 <sup>2</sup>		
	Leaf Spring (side latch)	RH1B, RH2B, RH3B, RH4B	SFA-202 <sup>3</sup>	SFA-302 <sup>3</sup>	20
	Leaf Spring (top latch)	RH1B, RH2B, RH3B, RH4B	SFA-101 <sup>3</sup>	SFA-301 <sup>3</sup>	



2. Must use horseshoe clip when mounting in DIN mount socket. Replacement horseshoe clip part number is Y778-011.
3. Two required per relay.

## AC Coil Ratings

Voltage (V)	Rated Current (mA) $\pm 15\%$ at 20°C								Coil Resistance ( $\Omega$ ) $\pm 10\%$ at 20°C				Operation Characteristics (against rated values at 20°C)		
	AC 50Hz				AC 60Hz				SPDT	DPDT	3PDT	4PDT	Max. Continuous Applied Voltage	Pickup Voltage	Dropout Voltage
	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT							
6	170	240	330	387	150	200	280	330	330	9.4	6.4	5.4	110%	80% maximum	30% minimum
12	86	121	165	196	75	100	140	165	165	39.3	25.3	21.2			
<b>24</b>	42	60.5	81	98	37	50	70	83	83	153	103	84.5			
110	9.6	—	18.1	21.6	8.4	—	15.5	18.2	18.2	—	2,200	1,800			
<b>110-120</b>	—	9.4-10.8	—	—	—	8.0-9.2	—	—	—	—	—	—			
<b>120</b>	8.6	—	16.4	19.5	7.5	—	14.2	16.5	16.5	—	10,800	7,360			
220	4.7	—	8.8	10.7	4.1	—	7.7	9.1	9.1	—	10,800	7,360			
<b>220-240</b>	—	4.7-5.4	—	—	—	4.0-4.6	—	—	—	18,820	—	—			
<b>240</b>	4.9	—	8.2	9.8	4.3	—	7.1	8.3	8.3	—	12,100	9,120			

## DC Coil Ratings

Voltage (V)	Rated Current (mA) $\pm 15\%$ at 20°C				Coil Resistance ( $\Omega$ ) $\pm 10\%$ at 20°C				Operation Characteristics (against rated values at 20°C)		
	SPDT	DPDT	3PDT	4PDT	SPDT	DPDT	3PDT	4PDT	Max. Continuous Applied Voltage	Pickup Voltage	Dropout Voltage
6	128	150	240	250	47	40	25	24	110%	80% maximum	10% minimum
12	64	75	120	125	188	160	100	96			
<b>24</b>	32	36.9	60	62	750	650	400	388			
48	18	18.5	30	31	2,660	2,600	1,600	1,550			
100-110	—	8.2-9.0	—	—	—	12,250	—	—			
110	8	—	12.8	15	13,800	—	8,600	7,340			



Standard coil voltages are in **BOLD**.



# Electronic Timing Relays with Adjustable Modes

## RZ7 Standard, Economy and EX

### Full Featured Functionality

### Easy to Use & Install

### DIN Rail or Panel Mountable

### Hazardous Location Models

### RZ7-FS High-Performance Model

#### Multiple Voltage Ranges

Standard supply voltage ranges from 24...48V DC & 24...240V AC.

#### Functional Choices

Single, Multi- or Special Function models address most industrial timing needs.

#### Adjustable Timing Ranges from 0.5s up to 60 hours

Adjustment dial for 0 to 100% of timing adjustment range on both models means less inventory to stock.

#### LED Output indicator

Both FS and FE models have LED indicators for output status conditions.

#### Multiple Mounting Options

The RZ7 are surface or DIN-Rail mountable for easy installation.

#### Special Hazardous Location Models Available

The RZ7-FS\_EX models are approved for use in hazardous location areas such as in the oil & gas industries.

- UL Class 1, Div. 2, Groups A,B,C,D  
UL Class 1, Zn 2, Group IIC
- Ex II 3 G, EEx nL IIC T4  
2A 32VDC max. Ta 70°C
- cULus E317176



### RZ7-FE Economy Model

#### Solid State Accuracy & Reliability

Solid state electronics and microprocessor control means accuracy within 0.2% for FS, and 0.1% for FE models.

#### One Tool Installation

Same size screw driver installs and adjusts functions and timing ranges. No need for multiple tools.

#### Safety & Convenience Features

- IP40 finger & hand protection
- Open, captive terminals for fast connections
- All functions accessible from front of unit
- Open screw terminals with dual chamber system for control wires

#### Standard Model Approvals

- cULus E14840
- CE Marked



RZ7\_EX model only


**sprecher+schuh**

RZ7

# RZ7 Adjustable Electronic Timing Relays



## QUICK SELECTION GUIDE



# QUICK SELECTION GUIDE

		RZ7-FS													RZ7-FE										
		RZ7-FSA	RZ7-FSB	RZ7-FSC	RZ7-FSD	RZ7-FSE	RZ7-FSF	RZ7-FSG	RZ7-FSI	RZ7-FSJ	RZ7-FSK	RZ7-FSL	RZ7-FSQ	RZ7-FSM	RZ7-FSH	RZ7-FSY	RZ7-FEA	RZ7-FEB	RZ7-FED	RZ7-FEE	RZ7-FEF	RZ7-FEL	RZ7-FEM	RZ7-FEY	
Dims/Mounting	78.8x22.5x101 mm DIN or Panel	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•									
	80x17.5x70 mm DIN or Panel																•	•	•	•	•	•	•	•	
Outputs	1 normally open contact																•	•	•	•					
	2 normally open contacts (1 side common)														•	•								•	
	1 single pole double contacts	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•			
	2 single pole double contacts	•	•	•	•	•	•	•	•	•	•	•	•	•											
Functions	ON-DELAY	•															•								
	OFF-DELAY		•															•							
	ON and OFF Delay			•																					
	ONE-SHOT/WATCHDOG				•														•						
	Fleeting OFF-DELAY					•														•					
	Symmetric flasher starting with a pulse						•														•				
	Symmetric flasher starting with a pause							•																	
	Repeat cycle timer (flasher)														•										
	ON-DELAY pulse generator								•																
	ON-DELAY (pulse controlled)									•															
	ONE-SHOT/WATCHDOG (pulse controlled)										•														
	Impulse converter											•										•			
	Multi-function (A, B, C, D, E, F)													•									①		
	OFF-DELAY without supply voltage													•											
	Wye-Delta timing relay															•								•	
	Time Ranges	4 time ranges, 0.15 s to 10 min												•											•
		5 time ranges, 0.05 s to 10 hr															•	•	•	•	•	•	•	•	
10 time ranges, 0.05 s to 60 hr														•	•										
12 time ranges, 0.05 s to 60 hr		•	•	•	•	•	•	•	•	•	•	•													
Supply Voltage	24...48 VDC and 24...240 VAC	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	
	24 VAC/DC OR 110...240 VAC																•	•	•	•			•		
	24...240 VAC/DC												•												
Hazardous Location Certified (suffix -EX only)											•			•											

## Functional, Reliable Timing Relays

Sprecher + Schuh's RZ7 Series of electronic timing relays is a highly functional and reliable package. This series is especially designed for applications where a high quality timing relay is required.

It includes popular output functions in a versatile, compact package. This series is especially designed for applications where a high quality timing relay is required. It includes ON-delay, OFF-delay, Wye-Delta and many other choices. All models are easily installed and adjusted for set and forget its usability.

Contact your local Sprecher + Schuh representative for more details.

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Tel: (281) 442-9000; Fax: (800) 739-7370  
www.sprecherschuh.com

① Multi-function (A, B, C, D, F)

**sprecher+**  
**schuh**

## 2.4 SURGE, POWER SUPPLY, CT & FUSES

- Critec – **TDS1100 -2SR-277** – Surge Diverter
- Novaris – **SFD1- 20-50-275-A** – 1P Surge Reduction Filter
- Siemens – **6EP1334 - 2AA01-0AB0** – 240V 24VDC 10A Power Supply
- Emotron – **ELF1- M20 c/w CTM010** – Electronic Shear Pin Unit c/w CT
- Wohner – **31182** – 2A Fuse
- Wohner – **31189** – 32A Fuse
- Wohner – **3113** – Fuse Holder



**ERITECH®****Features**

- CRITEC® TD Technology with thermal disconnect protection
- Compact design fits into DIN distribution panel boards and motor control centers
- 35 mm DIN rail mount – DIN 43 880 profile matches common circuit breakers
- Indication flag and voltage-free contacts provide remote status monitoring
- Separate plug and base design facilitates replacement of a failed surge module
- 100kA 8/20 maximum surge rating provides protection suitable for sub-distribution panels and a long operational life
- Available in various operating voltages to suit most common power distribution systems

# CRITEC® TDS1100

## TDS Surge Diverter

### TDS1100 Series



Surges and voltage transients are a major cause of expensive electronic equipment failure and business disruption. Damage may result in the loss of capital outlays, such as computers and communications equipment, as well as consequential loss of revenue and profits due to unscheduled system down-time.

The TDS1100 series of surge suppressors provide economical and reliable protection from voltage transients on power distribution systems. They are conveniently packaged for easy installation on 35 mm DIN rail within main distribution panelboards.

CRITEC® TD technology helps ensure reliable and continued operation during sustained and abnormal over-voltage events. Internal thermal disconnect devices help ensure safe or at end-of-life. A visual indicator flag provides user-feedback in the event of such operation. As standard, the TDS1100 provides a set of voltage-free contacts for remote signaling that maintenance is due.

The convenient plug-in module, and separate base design, facilitates replacement of a failed surge module without needing to undo installation wiring.

**ERICO®**





# CRITEC® TDS1100

## TDS Surge Diverter

### TDS1100 Series

Model	TDS11002SR150	TDS11002SR240	TDS11002SR277	TDS11002SR560
Nominal Voltage $U_n$	120-150V~	220-240V~	240-277V~	480-560V~
Max. Cont. Operating Voltage $U_c$	170V~	275V~	320V~	610V~
Stand off Voltage	240V~	440V~	480V~	700V~
Frequency	0 - 100Hz			
Short Circuit Current Rating $I_{sc}$	25kAIC			
Required Back-up Fuse	125AgL, if supply > 100A			
Technology Used	TD with thermal disconnect			
Protection				
Maximum Discharge Current $I_{max}$	100kA 8/20 $\mu$ s			
Nominal Discharge Current $I_n$	50kA 8/20 $\mu$ s	40kA 8/20 $\mu$ s	40kA 8/20 $\mu$ s	40kA 8/20 $\mu$ s
Protection Modes	Single mode (L-G, L-N or N-G)			
Voltage Protection Level Up @ 3kA	< 400V	< 700V	< 800V	< 1.6kV
Voltage Protection Level Up @ 20kA	< 650	< 1000	< 1.1kV	< 2kV
Alarms and Indicators				
Status Indication	Mechanical flag / remote contacts Change-over, 250V~ / 0.5A, max 1.5 mm <sup>2</sup> (#14AWG) terminals			
Physical Data				
Dimensions	2 modules wide, 90 mm x 68 mm x 35 mm			
Weight	0.24 kg approx.			
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)			
Connection	$\leq 35$ mm <sup>2</sup> (#2AWG) solid $\leq 25$ mm <sup>2</sup> (#4AWG) stranded			
Mounting	35 mm top hat DIN rail			
Temperature	-40°C to +80°C (-40°F to +176°F)			
Humidity	0 to 90%			
Test Standards				
Approvals	CE, IEC™ 61643-1, UL® 1449 Pending			
Surge Rated to Meet	IEC 61643-1 Class I and II ANSI/IEEE C62.41-1991 Cat A, Cat B, Cat C			

### Ordering Information

PART NUMBER	DESCRIPTION
TDS1102SR150	TDS Surge Diverter, $U_c$ 170V, $I_n$ 50kA, $I_{max}$ 100kA, Remote
TDS1102SR240	TDS Surge Diverter, $U_c$ 275V, $I_n$ 40kA, $I_{max}$ 100kA, Remote
TDS1102SR277	TDS Surge Diverter, $U_c$ 320V, $I_n$ 40kA, $I_{max}$ 100kA, Remote
TDS1102SR560	TDS Surge Diverter, $U_c$ 610V, $I_n$ 40kA, $I_{max}$ 100kA, Remote
TDS150150M	150V Replacement Surge Module
TDS150240M	240V Replacement Surge Module
TDS150277M	277V Replacement Surge Module
TDS150560M	560V Replacement Surge Module

Due to a policy of continual product development, specifications are subject to change without notice.

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## The Ultimate High Voltage

Photographer: Renee Doyle

### Q1 Building - Gold Coast, Queensland AUSTRALIA

Lightning Protection Consultants:

Powercom Consultants Pty Ltd

Surge Protection Design and Manufacture:

Novaris Pty Ltd

This was the ultimate high voltage test of

**The Novaris Systematic Approach**

to lightning and surge protection.

Lightning strikes are an unpredictable natural phenomenon. However the way equipment can be protected from lightning strikes is predictable. The 'Novaris Systematic Approach' is a step-by-step solution to lightning and surge protection that can be applied to any application.

1

**Define Boundaries**

Boundaries divide areas of different potential.

2

**Protect Structure**

Novaris supports conventional lightning protection methods.

3

**Install Bonded Earthing System**

A single bonded earthing system within each boundary is essential.

4

**Protect Power Lines**

Protect all power lines crossing protection boundaries.

5

**Protect Signal/Data Lines**

Protect all signal/data lines crossing protection boundaries.

**Novaris offers:****Investigation and Analysis**

- Novaris offers a complete package from analysis of your existing lightning and surge protection system to providing complete recommendations based on site surveys and technical analysis.

**Structural Lightning Protection and Earthing Systems**

- design and advice on lightning protection systems for all structures in accordance with recognised world standards.
- supply of structural lightning protection and earthing components.

**A Comprehensive range of Surge Protection Products to suit any application**

- ranging from main switchboard and distribution board surge protection, PLC and control system protection, to RF coaxial protection.

**Custom Product Design**

- our innovative R&D team can engineer a surge protection solution for even the most demanding of applications.

**Project Management & Installation**

- Novaris actively seeks consultancy, project management and installation work. Our experience extends from Australia to the Pacific, Asia, Africa and the Middle East.

**IEC Compliant**

Compliant with the relevant IEC lightning and surge protection standards, in particular IEC 62305 and IEC 61643.

**All Mode Protection**

Novaris models featuring all mode protection provide protection for all combinations of lines (L-N, L-E, N-E) ensuring the maximum level of protection is achieved at all times. They have been designed for installation in any wiring system worldwide.

**Multistage Transient Protection**

Models featuring multistage transient protection deliver greater levels of protection through a staged approach. The primary stage absorbs the majority of the surge energy. The remaining stages provide accurate clamping and a degree of redundancy.

**Redundant Segments**

Models featuring redundant segments have a parallel redundant arrangement of high energy metal oxide varistors (MOVs), thus promoting long life and exceptional surge handling capacity.

**Thermal Sensing**

Sustained overvoltages can cause components to overheat and degrade. Thermal sensing warns of this condition without disconnecting the protection.

**Percentage Active Display**

A digital display confirms the device rating upon switch on, then displays percentage active. The display indicates segment status and thermal overload.

**LED Status Display**

LED indicators are provided to indicate operating status.

**SIP and External Alarms**

The Novaris Surge Indicator Panel (SIP) allows remote monitoring of any Novaris product featuring external alarms. Models featuring external alarms have voltage free changeover contacts (SPDT) for remote status indication.

**DIN 43880 Compliant**

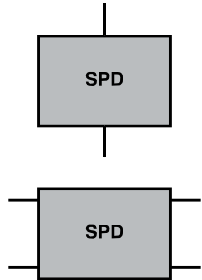
Protection devices housed in DIN 43880 compliant enclosures allow for convenient installation on DIN rail fittings commonly used in switchboards worldwide.

**Safe Metal Enclosure**

Novaris surge protection products are housed in safe, all metal enclosures. In the event of a prolonged overvoltage they will not catch fire or explode.

**Power line surge protection must:**

1. Provide adequate protection for all equipment.
2. Achieve a long working life.
3. Optimise the cost and size of the surge protection devices (SPDs).

**Options for Surge Protection Devices**

There are two common configurations of SPDs:

**One port SPDs** are parallel or shunt connected across the line. These include the Novaris SD, SG and HSG products.

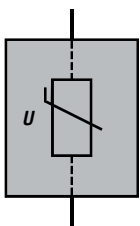
**Two port SPDs** are connected in series with the line. These include the Novaris SSP, SF and PP products.

There are two classes of SPD components:

**Voltage limiting SPDs** include metal oxide varistors and suppressor diodes. These have a high impedance when no surge is present but can reduce impedance continuously with increased surge current and voltage. These are also called “clamping devices”. Novaris SD, SSP, SF and PP products are voltage clamping SPDs.

**Voltage switching SPDs** include spark gaps, gas discharge tubes, thyristors and triacs. These have a high impedance when no surge is present but can have a sudden change to a low impedance in response to a voltage surge. These are also called “crowbar devices”. The Novaris SG products are voltage switching SPDs.

Sometimes a combination of these components may be used. The Novaris HSG is an example of a combination SPD.

**Selection of Surge Protection Devices****1. Surge Diverters, SD**

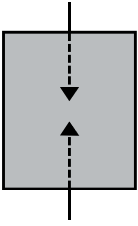
All Novaris surge diverters with initial product code SD employ metal oxide varistor (MOV) voltage limiting components. These can be used for main switchboard primary protection, distribution board and final circuit protection. As voltage limiting components there is no follow on current, and with suitable fusing these are easy to install and operate.

SD products are suitable for all applications except where extreme voltage fluctuations may be experienced. Excessive overvoltage can damage MOV based SPDs although all Novaris surge diverters are housed in metal enclosures and meet the fail-safe requirements of UL1449 - specifically package rupture and the effects of excessive heating.

Novaris manufactures surge diverters to suit all applications from high exposure environments to final circuit protection with ratings of  $I_{\max}$  up to 250kA (8/20 $\mu$ s) or  $I_{\text{imp}}$  of 25kA (10/350 $\mu$ s)\*.

Like all one port shunt connected SPDs, performance can be compromised by the presence of long connecting leads, particularly in physically large main switchboards. For this reason primary SPDs on main switchboards would be followed by secondary protection on distribution boards and final circuits.

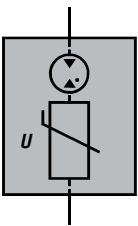




## 2. Spark Gaps, SG

Spark gaps have high surge ratings and are suitable for point of entry protection in installations with highly exposed overhead LV power lines with no local transformer in high lightning areas. As voltage switching SPDs, spark gaps have a crowbar effect and effectively place a short circuit across the line once fired. Thus high levels of AC follow on current will flow. Unless properly configured to be compatible with the AC fault rating of the supply and suitably fused, spark gaps can cause nuisance tripping of supply circuit breakers and extreme voltage disturbances whilst the follow on current flows.

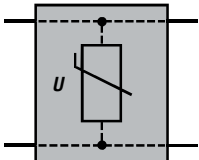
Novaris spark gap SPDs have surge ratings ( $I_{imp}$ ) of up to 110kA (10/350 $\mu$ s). Triggered spark gaps must be followed by secondary protection further downstream in the distribution network because they have a high impulse firing voltage.



## 3. Hybrid Spark Gaps, HSG

Hybrid spark gaps combine the best qualities of voltage switching and voltage limiting components. Novaris HSG hybrid spark gaps are suitable for all high exposure installations and meet the recommendations of IEC61643-12 in relation to surge ratings with  $I_{max}$  of 250kA (8/20 $\mu$ s) or  $I_{imp}$  of 25kA (10/350 $\mu$ s)\*. The spark gap in the HSG is a high energy gas discharge tube with a clearly defined impulse firing voltage, its let through voltage closely approaches that of an MOV based surge diverter.

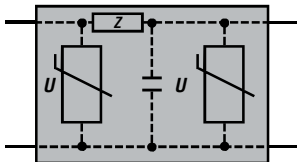
The hybrid combination ensures that there is no follow on current and the HSG may be as easily deployed as our SD range. The HSG is able to tolerate excessive temporary overvoltages (TOV) and is ideal for applications where mains voltages fluctuations are significant.



## 4. Series Surge Protector, SSP

All shunt connected SPDs are compromised in performance by the presence of their interconnecting leads. Typically voltage drops of 500V per meter of connecting lead can be expected. Such lead lengths are often unavoidable in physically large main switchboards. Nevertheless one port SPDs provide effective protection for the main switchboard.

For circuits that are more sensitive the SSP provides a means of eliminating the shunt connected leads and places the SPD directly across the line. Such applications might include UPS inputs, rectifiers, VSDs and motors.



## 5. Surge Filters, SF

The surge filter is a true two port SPD offering an extremely low let through voltage capable of protecting the most sensitive of electronic circuits. The Novaris range of surge filters is extensive: from 2A DIN rail mount units designed to protect sensitive PLCs and process equipment; plug in units for final circuit outlets; to 2000A per phase filters designed to protect major data centres.

Surge ratings up to 250kA (8/20 $\mu$ s) are available making surge filters suitable for providing primary and secondary protection in one package as may be required at a cellular basestations, process plant control rooms or data centres. As surge filters are series connected they must have a current rating  $I_L$  equal to or greater than the protected circuit.

**\*Surge Ratings:** tests conducted by some manufacturers and informally reported to the IEEE have indicated that the stress imposed on an MOV based SPD by a 10/350 $\mu$ s impulse might be equivalent to the stress imposed by a standard 8/20 $\mu$ s impulse, with a scaling factor of 10. Thus an SPD with  $I_{imp}=25kA$  could be equivalent to  $I_{max}=250kA$ . From IEEE Std C62.41.2-2002.

## SFD Surge Filters 20A

Novaris SFD surge filters provide the highest level of protection for critical and essential equipment up to 20A per phase.



SFD 3 - 20 - 13 - 275 - P

Product Series

Phase

Options

 $U_c$  $I_{max}$ 

SFD1-20-13-275-A

SFD1-20-50-275-A

SFD3-20-13-275-A

SFD3-20-50-275-A



## Electrical Specifications

Connection type		Series			
Modes of protection		All mode (L-N, L-PE, N-PE)			
Nominal voltage	$U_0$	230V / 50Hz			
Maximum continuous voltage	$U_c$	275V / 50Hz			
Phases		1		3	
Maximum discharge current (8/20 $\mu$ s)	$I_{max}$	13kA	50kA	13kA	50kA
Maximum load current	$I_L$	20A			
Protection stages		Metal oxide varistor / LC filter / metal oxide varistor			
Voltage protection level @ 3kA (8/20 $\mu$ s)	$U_p$	<700V			
Response time	$t_A$	Instantaneous			
Earth leakage current		<500 $\mu$ A			
Maximum voltage drop (% of $U_0$ )	$\Delta U$	<1%			
Displays (optional)		LED power and status			
Alarms (optional)		Overcurrent / thermal, SPDT contact			
Alarm isolation to active circuitry		4kV			

## Mechanical Specifications

Operating temperature / humidity	-40 to +40°C / 0 to 90% non-condensing				
Terminal capacity - power	16mm <sup>2</sup>				
Terminal capacity - alarm	2.5mm <sup>2</sup>				
Terminal screw torque - power	1.0Nm				
Terminal screw torque - alarm	0.5Nm				
Environmental	IP 20				
Mounting	TS35 DIN rail				
Weight	1.05kg		1.55kg		

## Dimensions

Width	118mm	180mm
Height	95mm	
Depth	78mm	

## Options

LED indication and external alarm	Standard				
LED indication only	L				
Polycarbonate enclosure	P				
Voltage variation	$U_c$	50V / 130V	130V	50V / 130V	130V

## Standards Compliance

IEC 61643-1 class II, III
AS/NZS 1768 categories A, B
IEEE C62.41 categories A, B
BS 6651 categories A, B
CP 33 categories A, B
IEC 1000-4-5
UL1449 third edition

# Reliability in a compact design. The new SITOP smart universal power supply.



# sitop

## SMART

One third smaller, but with even more power: the new SITOP smart is one of the narrowest DIN rail-mounted power supply units and exhibits an impressive overload behavior. Even high loads can be switched on without any problems. Nominal outputs of continuous 120 percent position the new power supplies as the most reliable of their class. Numerous certifications simplify their universal and worldwide use, as well as their deployment under hazardous conditions.

### The advantages at a glance

- Complete range of performance from 60 to 240 W for universal use
- Compact design with widths of only 32.5, 50 and 70 mm requiring minimum mounting surface
- Simple DIN rail mounting
- Trouble-free energizing of loads with high starting current such as DC/DC converters and motors
- Increased output due to continuous 120 % of the nominal output up to 45 °C
- Increased adjustment range of the output voltage up to 28 VDC adjustable with potentiometer from the front side
- Parallel connection possible for increased performance
- Extensive certification according to UL, CSA, GL (German Lloyd) and ATEX guidelines (Atmosphère Explosible)
- Universal use worldwide – in industrial or residential applications
- Can be combined with SITOP add-ons: Redundancy module, DC-UPS and battery modules, SITOP select diagnostic module
- Attractive design, matching SITOP modular

Power Supplies April 2005

# SIEMENS






# SITOP smart – your plant will run and run and run ...

Maximum quality and reliability in combination with high functionality reduce downtimes to a minimum. If required, the output voltage can now be increased to 28 VDC. This is done conveniently by adjusting the potentiometer from the front of the unit. Expansion with perfectly coordinated SITOP add-on modules provides

additional flexibility. For example, SITOP smart can quite easily be upgraded into an uninterruptible power supply by adding a DC-UPS module and a battery. The redundancy module and a second power supply of the same type enable redundant operation. In combination with the SITOP select diagnostic

module, individual 24 VDC load circuits can be reliably protected. SITOP smart thus becomes the ideal 24 VDC power supply solution – providing excellent protection for a wide range of applications.

## SITOP smart power supplies

			
<b>SITOP</b>	<b>24 VDC/2.5 A</b>	<b>24 VDC/5 A</b>	<b>24 VDC/10 A</b>
Order No.	6EP1332-2BA10	6EP1333-2AA01	6EP1334-2AA01
Nominal input voltage	120/230 VAC	120/230 VAC	120/230 VAC
Range	85 ... 132/170 ... 264 VAC	85 ... 132/170 ... 264 VAC	85 ... 132/170 ... 264 VAC
Power loss ride-through	> 20 ms (at 93/187 VAC)	> 20 ms (at 93/187 VAC)	> 20 ms (at 93/187 VAC)
Rated supply frequency	50/60 Hz	50/60 Hz	50/60 Hz
Nominal input current	1.1/0.65 A	2.1/1.15 A	4.1/2.4 A
Starting current (25 °C)	< 14 A	< 32 A	< 65 A
Recommended m.c.b.	3 A characteristic C	6 A characteristic C	10 A characteristic C
Nominal output voltage	24 VDC	24 VDC	24 VDC
Tolerance	± 3 %	± 3 %	± 3 %
Adjustment range	22.8–28 DCV	22.8–28 DCV	22.8–28 DCV
Nominal output current	2.5 A (3 A up to +45°C)	5 A (6 A up to +45°C)	10 A (12 A up to +45°C)
Efficiency at nominal values, approx.	85 %	87 %	91 %
Parallel connection option for increased output	Yes	Yes	Yes
Electronic short-circuit protection	Yes, constant current approx. 1.3 x nominal output current		
Radio interference level (EN 55022)	Class B	Class B	Class B
Supply harmonics meets EN 61000-3-2	Not applicable	No	No
Degree of protection according to EN 60529	IP 20	IP 20	IP 20
Ambient temperature	0 to +60°C	0 to +60°C	0 to +60°C
Dimensions (WxHxD) in mm	32.5x125x125	50x125x125	70x125x125
Weight approx.	0.4 kg	0.5 kg	0.75 kg
Certifications	CE, UL, CSA, GL, ATEX	CE, UL, CSA, GL, ATEX	CE, UL, CSA, GL, ATEX

*The information provided in this brochure contains merely general descriptions or characteristics of performance which in actual case of use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms of contract.*



## Emotron EL-FI Motor load monitors

The Emotron EL-FI range of Digital overload and underload protection monitors are now available from EMSBY

ENGINEERING ELECTRICAL EFFICIENCY

## PROTECT YOUR EQUIPMENT AND PROCESSES AGAINST OVERLOAD AND UNDERLOAD FAILURES

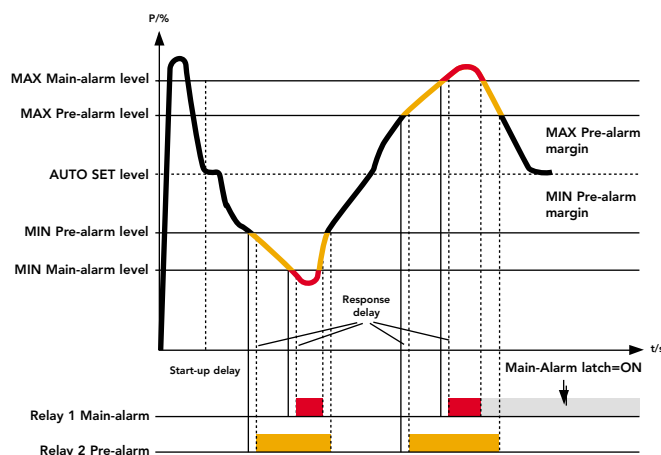
### The Emotron EL-FI range of Digital Load Monitors' provides the latest in machine, pump and process protection and control.

EL-FI's unique "VIP" (Voltage Current Power) measuring system uses the motor as a sensor to calculate the power transmitted by the motor shaft to the driven load. No external transmitters or switches are needed.

The VIP system monitors the electric motor shaft output power not just the motor input current. True underload or overload conditions can therefore be accurately and reliably detected.

EL-FI load monitors' incorporate the latest microprocessor based technology. Unique algorithms are used to calculate motor power losses for various sizes of motor. These losses are subtracted from the measured input power to obtain the actual output shaft power being transmitted to the load.

Another unique EL-FI feature is the "Autoset" function that 'learns' the normal operating load then automatically selects the appropriate alarm settings. All within three seconds and with just one push of a button!



M20 - FOUR ALARM LEVELS

### Emotron EL-Fi Motor load monitors - Protecting your investment

#### DCM

The **EL-FI DCM** monitors and controls the start stop sequence of submersible pumps. It automatically optimises the start-stop frequency of the pumps. The **DCM** features:

- \* Phase sequence monitoring
- \* Motor PTC input
- \* Under/over volts monitoring
- \* Autoset function
- \* Pump Run-Stop durations
- \* Remote reset
- \* Alarm relay output
- \* LED display
- \* Master-Slave operation for two pumps.



#### M20

The **EL-FI M20** monitor is an advanced programmable shaft power load monitor. It incorporates an analogue output that can be configured for the control of a wide range of equipment including conveyors, feeders, crushers etc. The **M20** features:

- \* Autoset function.
- \* Analogue Output.
- \* Digital Input-Remote Reset.
- \* Alarm Relay Outputs.
- \* LED display
- \* Pre-Alarm Relay Outputs.



#### M10

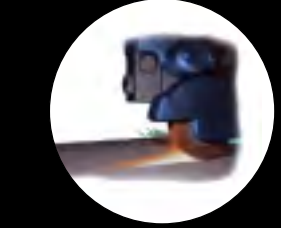
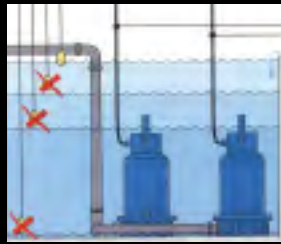
The **EL-FI M10** monitor is a base model shaft power monitor that uses the same sensing technology as the M20 monitor but with reduced features. The **M10** incorporates:

- \* Autoset function.
- \* Remote Reset.
- \* Alarm Relay Outputs.





## EL-FI MOTOR LOAD MONITORS FROM EMOTRON



Applications	Problems	Solution
Submersible pump control and protection	Dry running Pump cavitating Float Switch Failure Pipe and valve blockages	<b>EL-FI DCM</b> can be programmed to pump different wet well water levels. Automatically calculates the required pump run and pause periods without the need for float switches. Detects dry running and cavitating pump.
Centrifugal Pumps Slurry pumps Positive displacement pumps Screw pumps Magnetic pumps	Dry running Cavitation Operating against closed valve Locked impeller Flow variation	<b>EL-FI M10</b> or <b>M20</b> will detect underload on dry running or overload on locked impeller. Activates alarm contact and stops pump before damage occurs. M20 analogue output can remotely indicate pump operating load.
Belt conveyors Screw conveyors Bucket elevators Vibrating feeders	Product overload Jamming Unnecessary idling Broken belt, axle, chain	<b>EL-FI M10</b> or <b>M20</b> detects underload on belt or chain breakage and overload on jam up. Activates alarm contact and stops motor before damage occurs. M20 analogue output can remotely control product feeder.
Mixers Agitators Blenders Fans	Material Viscosity Missing or damaged blades Shaft oscillation Broken Belts	<b>EL-FI M10</b> or <b>M20</b> detects underload caused by broken belts or overload from high viscosity. Activates alarm contact and stops motor before damage occurs. M20 analogue output can remotely control product mix and viscosity.
Ore, coal or stone crushers	Shutdown on overload Running with no material Unnecessary idling	<b>EL-FI M10</b> or <b>M20</b> detects overload occurring on crusher and can trip feed conveyor before crusher trips out. Detects underload and can shutdown crusher on lack of material to avoid idling for long periods. M20 analogue output can be used to control speed of VSD on feed conveyor.
Sludge scrapers	Jam up of blades Missing blades Chain or belt breakage	<b>EL-FI M10</b> or <b>M20</b> detects overload occurring and can initiate an alarm and shutdown motor. Detects underload and can shutdown motor on chain or belt breakage.
Machine tools	Tool failure Blunt or broken tool	<b>EL-FI M20</b> stops the machine and activates an alarm in the event of a tool failure or non-completion of an operation (min alarm) or if a tool becomes blunt (max alarm).

**Please contact our offices for more information:**

**BRISBANE** (07) 3274 2566 **MELBOURNE** (03) 9753 3300 **PERTH** (08) 9309 1864 Email: [emsby@emsby.com](mailto:emsby@emsby.com)



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**ENGINEERING ELECTRICAL EFFICIENCY**



# Emotron M20 Shaft Power Monitor



Data Sheet  
English

The M20 provides complete flexibility in terms of the type of protection required for your application. You may select either overload and underload protection or simply overload with pre-alarm or underload with pre-alarm. Independent response delays are selectable for both overload and underload protection. Additional flexibility is provided in the form of programmable output relays, number of start attempts, number of reversing attempts etc.

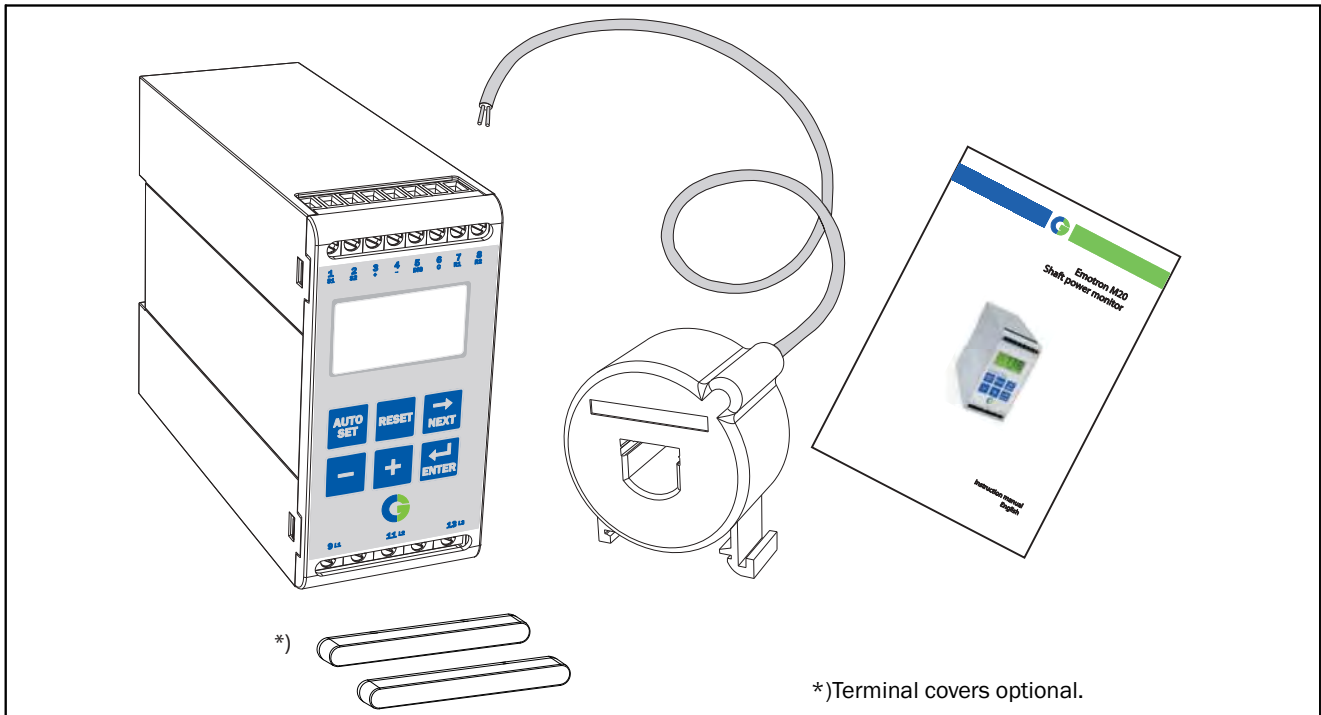


Fig. 1 Emotron M20 and current transformer (CT), both for mounting on standard DIN rail 35mm.

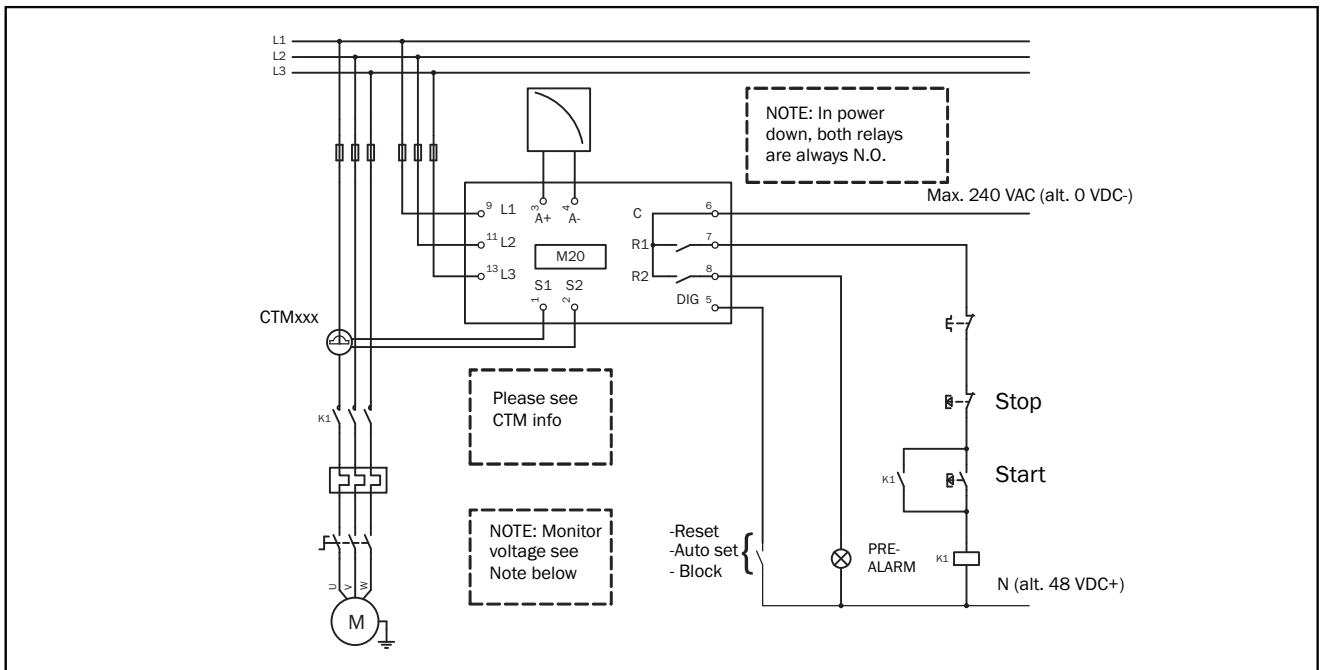


Fig. 2 Connection example

**NOTE: Make sure that the monitor voltage range e.g. 3x380-500 VAC matches the connected motor/line voltage, e.g. 3x 400 V.**

Table 1 Motor and CT less than 100 A

RATED MOTOR CURRENT [A]	CURRENT TRANSFORMER TYPE and NUMBER OF WINDINGS			
	CTM 010	CTM 025	CTM 050	CTM 100
0.4 – 1.0	10			
1.01 – 2.0	5			
2.01 – 3.0	3			
3.1 – 5.0	2			
5.1 – 10.0	1			
10.1 – 12.5		2		
12.6 – 25.0		1		
26.0 – 50.0			1	
51.0 – 100.0				1

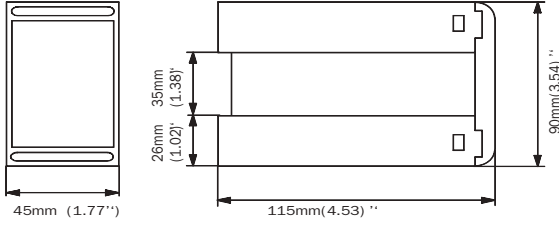
In order to ensure an accurate calibration of the M20, it is essential that you use the correct CTM and apply the exact number of windings in accordance with the tables.

Table 2 CT greater than 100A

RATED MOTOR CURRENT [A]	CURRENT TRANSFORMER TYPE and NUMBER OF PRIMARY WINDINGS			
101 – 150	150:5 1	+ +	CTM 010 2	
151 – 250	250:5 1	+ +	CTM 010 2	
251 – 500	500:5 1	+ +	CTM 010 2	
501 – 999	1000:5 1	+ +	CTM 010 2	

**NOTE:** The current transformer (CTMxxx) must be placed in the same phase that is connected to terminal 9, phase L1, see Fig. 2.

## Technical Data

Dimensions (WxHxD)	45x90x115 mm (1.77" x 3.54" x 4.53") 
Mounting	35 mm DIN rail 46277
Weight	0.30 kg (10.5 oz)
Supply voltage ( $\pm 10\%$ )	1x100-240 VAC, 3x100-240 VAC, 3x380-500 VAC 3x525-690 VAC
Frequency	50 or 60 Hz
Current input	Current transformer; CTM 010, 025, 050 and 100. Input 0-55 mA. (>100 A extra transformer needed)
Power consumption	Max. 6 VA
Start-up delay	1-999 s
Hysteresis	0-50% of rated motor power
Response delay max	0.1-500 s
Response delay min	0.1-500 s
Relay output	5 A/240 VAC Resistive, 1.5 A/240 VAC Pilot duty/AC12
Analogue output	Max. load 500 ohm
Digital input	Max. 240 VAC or 48 VDC. High: $\geq 24$ VAC/DC, Low: <1 VAC/DC. Reset >50 ms
Fuse	Max. 10 A
Terminal wire size	Use 75 °C copper (CU) wire only. 0.2-4.0 mm <sup>2</sup> single core (AWG12). 0.2-2.5 mm <sup>2</sup> flexible core (AWG14), stripped length 8 mm (0.32")
Terminal tightening torque	0.56-0.79 Nm (5-7 lb-in)
Accuracy	$\pm 2\%$ , $\pm 1$ unit $\cos \phi > 0.5$ ; excl. current transformer; +20 °C (+68 °F)
Repeatability	$\pm 1$ unit 24h; +20 °C (+68 °F)
Temperature tolerance	Max. 0.1%/°C
Operating temperature	-20 to +50 °C (-4 °F to +122 °F)
Storage temperature	-30 to +80 °C (-22 °F to +176 °F)
Protection class	IP20
RoHS directive	2002/95/EC
Approved to	CE (up to 690VAC), UL and cUL (up to 600 VAC)

## Article numbers

Article number	Designation
01-2520-20	Emotron M20 1x100-240/3x100-240 VAC
01-2520-40	Emotron M20 3x380-500 VAC
01-2520-50	Emotron M20 3x525-690 VAC

## Technical Data for Current Transformer (CT)

Type	Dimension (WxQ)	Weight*	Mounting
CTM 010	27 (35) x Ø48mm	0.20 kg	35mm DIN rail 46277
CTM 025	27 (35) x Ø48mm	0.20 kg	35mm DIN rail 46277
CTM 050	27 (35) x Ø48mm	0.20 kg	35mm DIN rail 46277
CTM 100	45 (58) x Ø78mm	0.50 kg	35mm DIN rail 46277

\*)Weight including 1m (39 inch) cable. Please note that max. length of the CTM cable is 1 m and this cable cannot be extended.

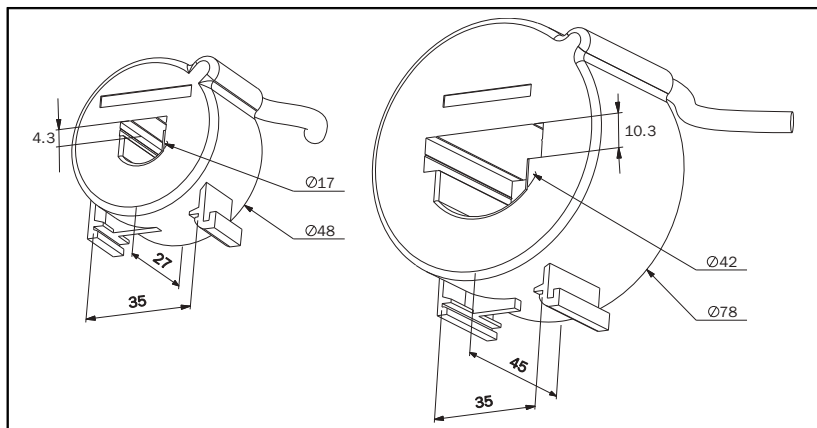


Fig. 3 Current transformer, CTM xxx.

## Accessories and documentation


Article number	Designation
01-2471-10	Current Transformer (CT) CTM010, max. 10 A
01-2471-20	Current Transformer (CT) CTM025, max. 25 A
01-2471-30	Current Transformer (CT) CTM050, max. 50 A
01-2471-40	Current Transformer (CT) CTM100, max. 100 A
01-2368-00	Front Panel Kit 1 (2xterminal covers included)
01-4136-01	2xTerminal covers
01-5958-00	Instruction manual (Swedish)
01-5958-01	Instruction manual (English)
01-5958-02	Instruction manual (German)
01-5958-03	Instruction manual (Dutch)
01-5958-04	Instruction manual (Spanish)
01-5958-08	Instruction manual (French)
01-5958-09	Instruction manual (Russian)

## EU (European Union) specifications

EMC	EN 50081-1, EN 50081-2, EN 50082-1, EN 61000-6-2	Pollution degree 2
Electrical safety	IEC 947-5-1	Terminals 3, 4, 5, 6, 7 and 8 are basic insulated from the line.
Rated insulated voltage	690 V	Terminals 3 and 4 are basic insulated from terminals 5, 6, 7 and 8.
Rated impulse withstand voltage	4000 V	



## Parameter List

Window	Function	Range	Default	Custom	Symbol
00	Alarm indication				
01	Measured shaft power in % of rated power	0-125			%
	Measured shaft power in kW	0-745			kW
	Measured shaft power in % of rated power	0-125			%
	Measured shaft power in HP	0-999			
02	Measured line voltage	90-760 V			V
03	Measured current	0.00-999 A			A
04	Parameter lock	0-999			
05	Monitor function	OVER- and UNDERLOAD, OVERLOAD, UNDERLOAD	OVERLOAD and UNDERLOAD		
11	MAX Main Alarm (relay R1)	0-125	100		%
		0-745	2.2		kW
		0-125	100		%
		0-999	3		
12	MAX Pre-Alarm (relay R2)	0-125	100		%
		0-745	2.2		kW
		0-125	100		%
		0-999	3		
13	MIN Pre-Alarm (relay R2)	0-125	0		%
		0-745	0		kW
		0-125	0		%
		0-999	0		
14	MIN Main Alarm (relay R1)	0-125	0		%
		0-745	0		kW
		0-125	0		%
		0-999	0		
21	MAX Main Alarm margin	0-100	16		%
22	MAX Pre-Alarm margin	0-100	8		%
23	MIN Pre-Alarm margin	0-100	8		%
24	MIN Main Alarm margin	0-100	16		%
31	Start delay	1-999	2		s
32	Response delay, overload	0.1-500 s	0.5		s
33	Hysteresis	0-50	0		%
34	Response delay, underload	0.1-500s	0.5		s
35*	Pause/Reverse time	3-90	5		s
36*	Autoreset (start attempts)	0-5	0		
41	Rated motor power	0.10-745	2.2		kW
		0.13-999	3		
42	Rated current	0.01-999	5.6		A
43	Number of phases	1PH/3PH	3PH		
61	Main alarm latch	on/OFF	OFF		
62	Alarm at no motor current	on/OFF	OFF		

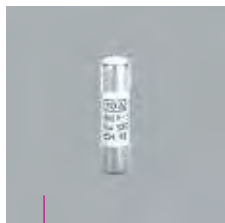
Window	Function	Range	Default	Custom	Symbol
63	Main Alarm relay R1	nc/no	nc		
64	Pre-Alarm relay R2	nc/no	no		
65*	Relay function	0 = M20 1 = DLM 2 = Reverse	0		
81	Digital input	rES/AU/bLo	rES		
82	Block timer	0.0-90	0.0		s
91	Analogue output	0.20/4.20/20.0/20.4	0.20		
92**	Analogue Out low value	0-100			
93**	Analogue Out high value	0-125			
99	Factory defaults	dEF/USr	dEF		

\* See Special functions in chapter 9, Emotron M20 Instruction manual.

\*\* See Setting analogue output range in chapter 9, Emotron M20 Instruction manual.

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CG Drives & Automation, 01-5959-01r0 2012-04-02



31 185

## gG cylindrical fuses

### gG (gL) fuses complies with IEC 60269-2

Size	Rated current	Rated voltage	Rated short circuit breaking capacity	Power output	Pack size	Weight kg/100 units		Part no.	
10 x 38 (gG)	1A	500V AC	120kA	0.5W	10	0.6		31 008	17
	2A	500V AC	120kA	0.6W	10	0.6		31 182	17
	4A	500V AC	120kA	0.7W	10	0.6		31 183	17
	6A	500V AC	120kA	0.8W	10	0.6		31 184	17
	8A	500V AC	120kA	0.9W	10	0.6		31 009	17
	10A	500V AC	120kA	1.0W	10	0.6		31 185	17
	12A	500V AC	120kA	1.3W	10	0.6		31 010	17
	16A	500V AC	120kA	1.6W	10	0.6		31 186	17
	20A	500V AC	120kA	2.0W	10	0.6		31 187	17
	25A	500V AC	120kA	2.6W	10	0.6		31 188	17
	32A	400V AC	120kA	2.9W	10	0.6		31 189	17
14 x 51 (gG)	2A	690V AC	80kA	0.8W	10	1.9		31 011	17
	6A	690V AC	80kA	1.0W	10	1.9		31 017	17
	10A	690V AC	80kA	1.3W	10	1.9		31 190	17
	16A	690V AC	80kA	2.0W	10	1.9		31 191	17
	20A	690V AC	80kA	2.5W	10	1.9		31 192	17
	25A	690V AC	80kA	3.3W	10	1.9		31 193	17
	32A	500V AC	80kA	3.5W	10	1.9		31 194	17
	40A	500V AC	120kA	4.8W	10	1.9		31 195	17
	50A	400V AC	120kA	4.9W	10	1.9		31 196	17
22 x 58 (gG)	32A	690V AC	80kA	3.7W	10	5.0		31 198	17
	40A	690V AC	80kA	4.5W	10	5.0		31 199	17
	50A	690V AC	80kA	5.2W	10	5.0		31 200	17
	63A	500V AC	80kA	6.9W	10	5.0		31 201	17
	80A	500V AC	120kA	7.8W	10	5.0		31 202	17
	100A	500V AC	120kA	8.6W	10	5.0		31 203	17
	125A	400V AC	120kA	11.4W	10	5.0		31 204	17

## 2.5 GPO & LIGHTS

- Clipsal – **4PSO10** – 1P 10A GPO
- NHP – **KL2494** – Fault Audible Alarm
- NHP – **KL3061A** – Fault Beacon

# POWER to PERFORM



Available in single or double

Clipsal's new range of DIN Rail Mounted Switched Sockets provide a fast, convenient source of power, letting you get on with the job.

**EXTRA STRONG**



Mounting Brackets



[clipsal.com](http://clipsal.com)



### 4SS025 Twin Outlet Model

A stand-out product in the 4SSO series, is the twin outlet model (4SS025). Unique to Clipsal, the flexible twin outlet model is available in switched 10A and 15A, double or single pole options. The double pole model meets the strict safety regulations required for building sites, caravan and mobile home applications.



### 4SSO Series DIN Rail Mounted Switched Sockets

Clipsal are pleased to announce we have now expanded our range of the popular DIN rail mounted outlets. The 4SSO series sockets are particularly useful when used in power supply applications such as temporary power on building sites, additional outlets in switchboards or meter enclosures. This innovative new range is available in both four and eight module wide units and features easy access to terminals for quick fit off.



### Extra Strong Mounting Brackets

The new 4SSO series also features extra strong mounting brackets for extra strength in aggressive temporary power supply applications. This coupled with the use of the reliable Clipsal 15 Series Mechanism in the new range, means that you can expect years of dependable service from these sockets.

Catalogue Number	NEW Switched Socket Outlets	
<b>4SSO15</b>	250V 10A 3 Pin socket outlet 4 modules wide	
<b>4SSO15D</b>	250V 10A 3 Pin socket outlet double pole 4 modules wide	
<b>4SSO15/15</b>	250V 15A 3 Pin socket outlet 4 modules wide	
<b>4SSO15D15</b>	250V 15A 3 Pin socket outlet double pole 4 modules wide	
<b>4SSO25</b>	250V 10A 3 Pin Twin socket outlet 8 modules wide	
<b>4SSO25D</b>	250V 10A 3 Pin Twin socket outlet double pole 8 modules wide	
<b>4SSO25/15</b>	250V 15A 3 Pin Twin socket outlet 8 modules wide	
<b>4SSO25D15</b>	250V 15A 3 Pin Twin socket outlet double pole 8 modules wide	

Catalogue Number	EXISTING Socket Outlets and Enclosures	
<b>4PSO10</b>	250V 10A 3 Pin socket outlet 2.5 modules wide	
<b>4PSO10D</b>	250V 10A 3 Pin socket outlet double pole 2.5 modules wide	
<b>4PSO10DL</b>	250V 10A 3 Pin socket outlet double pole with round earth socket 2.5 modules wide	
<b>4PSO15D</b>	250V 15A 3 Pin socket outlet double pole 2.5 modules wide	
<b>4PSO20D</b>	250V 20A 3 Pin socket outlet double pole 2.5 modules wide	
<b>4PS31</b>	Enclosure only accepts any 30 series switch mechanisms 2.5 modules wide	



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# SIGHT AND SOUND

For process, mining and industrial audible and visual signalling applications

## SIGNALLING DEVICES



**klaxon**

**MOFLASH**   
SIGNALLING





## NHP ELECTRICAL ENGINEERING PRODUCTS PTY LTD

NHP Electrical Engineering Products Pty Ltd specialises in industrial switchgear and automation, bringing together leading products, systems and solutions from key application categories - motor control, power distribution, hazardous location, sensing and detection, safety and protection, monitoring and display, enclosures and termination, control and switching and power quality.

NHP are also specialists in the Automation and Communication area and are now authorised distributors for Rockwell Automation and their Allen-Bradley® products in our designated areas of Australia and all of New Zealand. This means NHP is now partnered with the leading global provider of industrial automation solutions and switchgear components.

An Australian owned company, NHP is committed to serving the Australasian industry with quality products and customer support. This is achieved through a 820+ strong team which is distributed across 23 branches and 28 regional locations throughout Australia and New Zealand.

NHP is far more than a component supplier, offering systems and solutions, which 'Value Add' to products in a way which makes them 'Fit for Purpose'. NHP incorporates the world's best and most extensive range of low voltage products, into customer focused application solutions.

At NHP we have a strong customer focus and we look to provide the right product and product solutions for our customers' requirements and applications, all at a competitive price. We value and care for our customers and support them by offering personalised service and assistance to meet their every need and demand. Our customers can have 100 % confidence in our ability to support them when and where it is needed.

Put simply, NHP is 'easy to do business with'.



Klaxon Signals, located in the United Kingdom, have manufactured Sound Signalling and Air Movement equipment for over 80 years. What was once a number of small traditional businesses is now part of a fast-growing multi-national group, selling to an established market both in the UK and worldwide.

Working to ISO 9001, Klaxon's manufacturing team has the latest production, testing and demonstration facilities, to ensure the highest possible standards of manufacture and product quality. Their continued product development programme gives customers the most up to date products available.



Moflash Signalling Ltd. was formed in 1958 as part of the Silvaflame group. In the early years, the company was predominantly involved in the manufacture of Traffic Safety Beacons, however, they soon expanded their product range to include industrial beacons and led the way by becoming the first UK company to produce an AC Rotating Beacon. Moflash was purchased by the Kentermark Group in October 1997 and moved to

Birmingham. It now boasts one of the largest Visual Signalling ranges available in the marketplace, offering Xenon, Rotating, Flashing Filament, Static Filament, LED and EXD Beacons. It continues to develop new products to meet the demands of a constantly evolving safety market.

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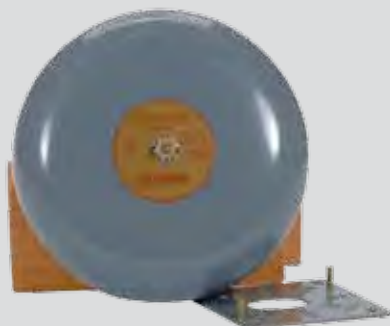




Evacuation Sirens



Electronic Sounders



Bells

The groups of products selected in this catalogue have been available in the market for over 20 years. With many years experience in the area of sounder selection your local NHP representative is always available to offer advice in helping to choose the correct product. When selecting a sound device a careful study of your requirements should be made.

The following points should be considered:

**1. The nature of the proposed signals,** including sequences, duration of blasts, intervals and length of signal. Each type of hazard should be given its own code to ensure the correct response. On-site signals must not be confused with off-site warnings.

**2. The nature of other signals in the locality.** Hazard signals must not conflict with emergency services or civil defence signals.

**3. Area and range of audibility to be covered by the system.** The signal must be clearly audible to all persons, inside and outside the plant likely to be affected

**4. Test facilities.** Siren motors, shutter and signal sequences should be regularly tested to ensure that they are still functioning properly. It should be possible to carry out testing without actually sounding the sirens..

**5. The nature of the terrain** and construction and heights of the buildings on the site. Undulating ground and enclosed or noisy areas must be taken into account.

**6. Availability of adequate power supply.**

**7. The type of system to be installed.**

Plants with high levels of machine noise - or covering large sites - may be better covered by a series of smaller sirens than by one large one.

**8. Local meteorological conditions.** For example, valley sites are likely to be affected by fog, mist and wind currents.

**9. The positioning of sirens.** The ideal height above ground level for a siren depends on the individual type and power of the instrument. Sirens should not be mounted too high above ground level: 4.5 m to 6 m is usually recommended. Putting sirens on top of high buildings often has the effect of deflecting the sound waves upwards because of negative temperature gradients. Sirens should not be located close to tall buildings. Ideally there should be at least a clear 50 m radius around each instrument.



International  
Protection Code



Sound (duration)  
rating  
C= continuous



Robust construction  
for industrial use



Units with more  
than one note  
selectable on same  
unit



Ambient noise  
level guide  
\*(see this page for  
details)







Dome material  
stabilised for ultra  
violet radiation

## SOUND SELECTION GUIDE

Distances quoted are approximate based on still air conditions. Current consumptions quoted are running currents. The momentary starting current is 2 - 3 times the running current.

When there is any doubt, please specify: application (giving operating conditions), distance over which sound must be heard, and electrical supply available.

### \*Ambient (background) noise level guide

Symbol	Description	Ambient dB/range
	Low Noise Close-up use only Quiet background	up to 65 dB
	Medium Commercial premises, hotels, factories	65 - 100 dB
	High Noisy factories, general outdoor use, marine	105 - 115 dB
	Very High Very noisy factories, outdoor use - marine	115 - 135 dB

### WHAT HAPPENS TO SOUND OVER DISTANCE

In selecting a sounder for a particular application, the table below can be used as a guide as to the sound level expected at a certain distance away. Local conditions such as wind speed and direction or objects masking the sound path will change the end result. In difficult conditions, the distances a sound can be heard may be significantly less.

m	Decibel level (dB)																											
1	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140		
2	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134		
3	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130		
5	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126		
10	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114	116	118	120		
20	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110	112	114		
30	50	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110		
50	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100	102	104	106		
100	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	96	98	100		
200	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94		
400	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90		
500	=	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86		
1000		=	=	=	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80		
2000					=	=	=	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74		
3000								=	=	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70		
5000										=	=	38	40	42	44	46	48	50	52	54	56	58	60	62	64	68		





Sounders or sirens for alert and alarm purposes are too often chosen from the wide range of models available on the market without sufficient attention being given to the particular application for which they will be used.

#### Factors determining choice

The selection of the sounder for a particular application is usually determined by several factors.

These are:-

- Ambient noise in the environment
- The quality and type of sound in the environment
- The duration of signal required
- The noise level required
- The type of electricity supply available
- Is visual indication also required?

#### Environmental factors

The type and intensity of sounder chosen for any application will be determined by the environment in which they are used. Thus, sounders for certain applications in hotels might be unsuitable for similar applications in a factory; a sounder for use in a dockyard may be quite inappropriate for use in a school.

#### There are four broadly different types of environments.

These can be categorised as follows:-

- **Industrial, manufacturing.** This category includes not only factory premises but also equipment and facilities used in factories, such as cranes, mechanical handling vehicles, diesel generating sets and control panels. This category also includes industrial hazardous locations such as coal mines and the petro-chemical industry (including the North Sea oil industry).
- **Buildings; commercial and public.** Schools, hospitals, residential homes, office complexes, airports and military sites are covered. Building sites, too.
- **Priority and public service vehicles.** This category includes ambulances, fire and police authority vehicles.
- **Maritime.** Ships and dock installations. Hazardous sites such as oil terminals are included.

**Frequency: Pitch of note.** The frequency is the identification of a note and is usually defined by the number of vibrations per second. Frequency can be measured by a frequency meter, which in its simplest form is the tuning fork. It is not expected that the electrical contractor will have such a meter amongst his equipment, but it is usually sufficient for the frequency of noise in an environment for our purposes to be identified generally. For instance, the noise in a machine shop in which a grinder is installed would be of a high frequency, while that in a forge with a drop hammer in operation would be low frequency.

**Time rating.** Account must be taken of the time cycle over which the alarm is required to operate and a signal has to be selected which has an adequate time rate. It should be noted that sounders used as fire alarms are required to be continuously rated. Hooters are available on the market which have time rating of either one minute or two minutes. Such hooters will not be accepted by the Fire Authorities. When modifying or inspecting existing installations, contractors should bear this in mind as many existing fire alarm installations have hooters with non-acceptable time ratings.

**Noise level required.** Having established the ambient or background noise and frequency level, the signal strength required is the sound which can be heard at the point of listening. Tests show that the ear can distinguish a warning signal which is ten decibels below that of the existing noise level, provided there is adequate frequency differential.

**Noise attenuation.** In selecting the signal strength required to cover an application, it is necessary to appreciate that as a "rule of thumb" sound is absorbed or reduces at the rate of six decibels as the distance from the signal is double. This factor is known as attenuation. Where the operating conditions are difficult, for instance where there is a likelihood of high winds, or where there are solid objects in the noise path, attenuation of eight or ten decibels should be allowed to avoid "blind spots" or inadequate coverage.

Before finally choosing the signal to be used, ensure that the same or similar sound is not used in an adjacent system for other applications. If the sounder is outdoors then a weatherproof version must be selected. It should be remembered that there are also indoor situations that require waterproof enclosures too. Explosion protected or flameproof signal devices are essential if the sounder is required to be sited in a location where there are explosive or fire hazard conditions.

## SIRENS

Sirens are high frequency devices usually continuously rated and are electric motor driven. Air is pulled in through a multi-bladed impeller and pushed out through radial vents. The combination of motor speed and the number of impeller blades and the number and spacing of the radial outlets, determines the frequency.

The siren is used extensively for disaster warnings but has many other applications. These include fire alarms, anti-theft/security alarms, process control, time signalling, fault indicating, machinery start-stop alarms. Most individual requirements are covered by sirens rated from 15 W to 746 W (1hp), which have sound outputs from 95 dB to 125 dB at 2 m distance, giving an audible signal over a range of 100 to 1000 m.

## BUZZERS AND HOOTERS

Buzzers are electro-mechanical devices where the diaphragm is deflected by a moving magnet, which is triggered by a make and break contactor. In general, buzzers are low cost and robust. Their applications include fire and security alarms in industrial and marine situations, industrial truck horns, process control, time signalling, telephone signalling, boat horns and as public vehicle attack alarms. Buzzers can be made available with projectors to give more directional sound.

The Hooter is an electric motor driven device, based on the principle of driving a notched disc against a stud which in turn operates a diaphragm. Hooters are low frequency devices and are available as either motor driven or hand operated. Because of the amount of heat generated by the method of operation, in general terms, the motor driven hooter is short time rated. Hand operated devices do not, of course, have a rating problem.

Hooters are used as general industrial alarms, crane warning alarms, industrial truck hooters and boat horns.

## ELECTRONIC SOUNDERS

The electronic sounder is by far the most versatile device available and has many distinct advantages as far as the contractor is concerned. Not least of these is the low current consumption and relatively high output, which makes the electronic sounder ideal for use in conjunction with battery powered systems. Consequently, this type of sounder is used extensively for fire and intruder alarm systems.

A particular feature of solid state sounders is that it is possible to vary the type of sound emitted. Fast and slow warble, fast and slow pip, and continuous note are available.

Of particular interest to the contractor is that models have been designed to make installation very easy. Fixing holes match the electrical accessory box and the in-coming supply cable is connected to a terminal block in the base of the unit.

## BELLS

The bells contained in this catalogue deliver a clear loud ring free from mechanical clatter. Available in either 4", 6" or 8" diameter there is a bell to suit every application.

Standard units are powder coated Grey (Red also available) and all have facility of fitting optional back box to ensure IP 65 rating. NHP bells are ideal for school class and process control alarms.



**Sirens**



**Buzzers**



**Electronic sounders**



**Bells**



		Light street noise												
		Average office noise												
		Stockroom noise												
		Light assembly room noise												
		Shipping room noise												
		Heavy street noise												
		Heavy assembly room noise												
		Light machine shop noise												
		Punch press room noise												
Whisper at 1m								Boiler factory noise						
		Casual conversation at 1m						Heavy machine room noise						
								Hammering on steel		Threshold of pain				

10      40      50      60      70      80      90      100      110      120      130      140 dB(A)

0 - 500 Hz - 0 dB(A)  
500 - 1000 Hz - 3 dB(A)  
1000 - 2000 Hz - 5 dB(A)  
2000 - 4000 Hz - 9 dB(A)

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## SELECTION & APPLICATION

The environment in which the beacon is to be installed will determine the product type and light intensity. Thus a beacon designed for industrial use incorporating a very high light output would not be suitable for local signalling at a control panel. Alternatively a low light output beacon would be ineffective for large factory equipment.

Generally Moflash can supply beacons for all types of applications. Listed below are some of the main market areas.

### Automotive

Warning beacons for use on automobiles (commercial and private), agriculture/off road vehicles and forklift trucks.

### Industrial

Warning beacons for heavy duty, high light output applications such as foundries, factory shopfloors, large warehouses.

### Commercial

Warning beacons for light duty, low to medium light output to give local indication such as offices, hospitals and schools. Also suitable for fire and security applications.

### Explosion protected

Warning beacons for use in potentially explosive environments such as oil rigs, refineries and mines.

### Environmental factors determining selection

- Safe atmosphere or potentially explosive atmosphere
- The ambient level of existing light
- The light output required from the beacon
- The duration the beacon has to operate
- The IP rating of the beacon
- The electrical supply available

### Types of visual warning beacons available

Moflash manufactures five different types of visual warning beacons.

#### Rotating beacons

A parabolic reflector, driven by an electric motor, revolves around a continuously illuminated lamp on the vertical axis of the beacon creating a powerful beam of light travelling through 360 degrees. These units are available with either a filament or a tungsten halogen lamp.

In general this type of beacon has a greater degree of light output than other models but this is reduced as the parabolic reflector only illuminates one given point at a time.

#### Flashing filament beacons

Operating through an internal circuit, which simply cycles the lamp on, and off. These types of beacons generally give a much lower light output as it takes longer for the lamp to fully illuminate itself. These units are available with either a filament or tungsten halogen lamp. The light output can be improved by the use of a Dioptric (Fresnal) lens which is placed over the lamp capturing the light emitted, magnifying and directing it to increase the brightness of the visual signal. In terms of light coverage this type of beacon is more efficient as it illuminates the whole surface of the beacon constantly through 360 degrees.

#### Static filament (Continuous) beacons

These units are identical to flashing filament beacons with the exception that they do not operate through an on, and off cycle. When the unit is energised the light source stays permanently 'on', until turned off. The main advantage of this type of beacon is that the light can be controlled by a separate source i.e. a control panel, giving the unit more flexibility. These units are available with either a filament or tungsten halogen lamp.

#### Xenon (Strobe) beacons

A discharge capacitor operating through a converter circuit ignites xenon gas inside a tube creating a brilliant flash of light. Xenon gas ignites virtually instantaneously so maximum brightness is obtained immediately. In some Moflash models a 'Double Flash' option is also available which extends the signal duration making it more noticeable to the human eye.

Xenons have the added advantage of low current consumption combined with long life. The tube life of a xenon beacon is approximately 5 million flashes. These units are the most efficient available, incorporating a 360 degree light output with the brightest and most effective visual gear.

#### LED beacons

LED 'light emitting diode' beacons are ideally suited for long life applications typically achieving 100,000 hours of service. The 125 series LED beacon incorporates 48 LEDs in one enclosure and has two modes of operation, static and flashing (switch selectable on the pcb). The 201/200 and 401/400 series LED beacons incorporate 144 LEDs in one enclosure and has three modes of operation, static, flashing and rotating (switch selectable on the pcb).







### Visual warning beacons communicate their message through two (sometimes three) variables:

- Level of brightness
- The colour of the beacon dome
- Audibility if fitted with the audible signal

#### Level of brightness

Brightness depends on the type of beacon chosen and the rated output of the unit i.e. Watts and Joules, the distance that the signal is observed from and the dome colour of the beacon used. In general, if the viewing distance is doubled the light intensity observed is reduced to a quarter and if the distance is quadrupled, the light intensity is reduced to a sixteenth.

#### Beacon dome colours

The intensity of the light can be greatly reduced as it passes through the dome of the beacon. The extent of this reduction is dependant upon:

- The type of light source used i.e. conventional filament (incandescent) lamp, tungsten halogen lamp or a xenon tube
- The colour of the beacon dome that is used

The table below gives an indication of the percentage of light that will pass through the beacon dome for different light sources and dome colours.

Colour	Filament	Halogen	Xenon
Clear	100 %	100 %	100 %
Amber	70 %	70 %	70 %
Red	30 %	27 %	23 %
Green	12 %	15 %	25 %
Blue	8 %	10 %	13 %

Different dome colours are used to convey different messages to the observer.

- RED = Serious danger act now
- AMBER = Warning proceed with care
- GREEN = OK, proceed as normal
- BLUE = Specific process notice/warning

Generally, Green colour beacons are used by Doctors and Veterinarians and Blue beacons for the Police and Fire departments.

#### Audibility

Simply producing an audible sound when the beacon is illuminated. This is of particular use in low level noisy environments if the warning light is obstructed from direct viewing, or as a back up warning should the lamp fail.

#### Siting and maintenance of visual warning beacons

- The siting and maintenance of visual warning beacons is as important as their selection and application. When installing a light, care should be taken to position it in the most effective place, if possible, to allow for all round light dispersion.
- Always ensure that there is air movement around the beacon enclosures as in normal operation, this will warm up due to heat emitted from the light source. High power models can be quite hot over an extended period of time, therefore, avoid sitting the light under gantries, overhangs or in tight enclosed spaces with restricted air movement.
- Regularly clean the dome of the beacon, as this will maintain optimum light output and reduce heat build up. All domes produced by Moflash are manufactured from 'UV' stable polycarbonate plastic. Therefore do not clean with petroleum based cleaners.
- Areas of vibration should be avoided. If this is not possible then our anti-vibration mount 50080 should be used.
- In general it is not recommended that beacons be mounted directly onto conduit tubing without the use of a conduit junction box or bracket.
- To maintain the IP rating of the units the beacon must be mounted with the dome upwards and fully locked onto the base assembly. The beacon should also be suitably sealed at the point of connection using the correct cable glands.
- Xenon tube failures, unlike filament lamps, which fail immediately, deteriorate very slowly. Irregular or erratic flashing will indicate the pending failure of the tube. Once this is recognised the tube should be replaced as soon as possible. Failure to do so will result in electronic damage to the printed circuit board.

# Electronic Sounders

## SONOS

The SONOS is a general purpose electronic sounder for fire, security and industrial applications. Twist and click operation of the dome allows easy access to base for cable entry.



### TECHNICAL SPECIFICATION

<b>SUPPLY VOLTAGE:</b>	9-60 V DC and 110/240 V AC
<b>PEAK SOUND LEVEL:</b>	93-106 dB @ 1 metre (tone dependant)
<b>IP RATING:</b>	IP 65
<b>NUMBER OF TONES:</b>	32
<b>FREQUENCY RANGE:</b>	400-2580 Hz
<b>OPERATING TEMPERATURE:</b>	-25 °C to + 70 °C (DC) -25 °C to + 55 °C (AC)
<b>CURRENT</b>	(AC) refer to tones table on page 53 (DC) refer to tones table on page 54
<b>RATING:</b>	Continuous
<b>CASING:</b>	Hi Impact Polycarbonate
<b>CABLE ENTRIES:</b>	2 x M20
<b>WEIGHT:</b>	250 grams

### VOLTAGE

9-60 V DC	<b>KL2494</b>
110/240 V AC	<b>KL2492</b>

### ORDER CODES

### NOTES:

dB range can vary between 94 - 106 depending on tone and voltage selected.

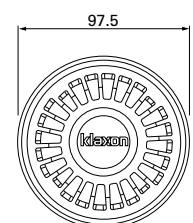
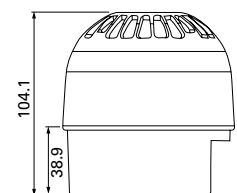
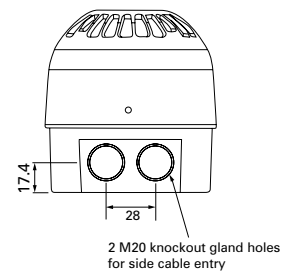
KL2494 has a two (2) stage alarm function. To activate the 2<sup>nd</sup> tone connect the positive supply to terminal 3 (in +) and the negative supply to terminal (-) and terminal (\*). Install switch between terminal 1 + 2, note NPN switching only for PLC control.



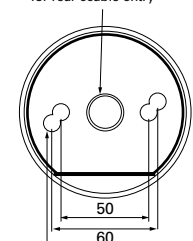
Overall height 100 mm

Base height 40 mm

Base diameter Ø 90 mm



M20 Knockout gland hole for rear cable entry



4 Ø 4.2 Fixing holes

Deep Base

## Xenon Strobes

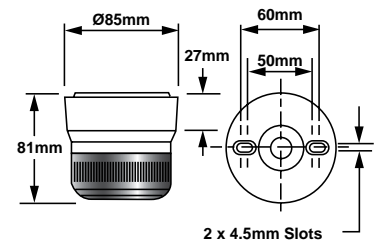
### FLASHGUARD

This ultra modern, sleek Xenon strobe light, is lightweight and easy to install. Sitting only 81 mm high and made from high quality polycarbonate. Incorporates a vandal-resistant locking mechanism on an 85 mm diameter base.



#### TECHNICAL SPECIFICATION

<b>SUPPLY VOLTAGE:</b>	12/24 V DC, 110 V AC or 240 V AC
<b>IP RATING:</b>	IP 65
<b>FLASH RATE:</b>	60 flashes per minute
<b>OPERATING TEMPERATURE:</b>	-20 °C to + 70 °C
<b>CASING:</b>	Polycarbonate lens / ABS body
<b>WEIGHT:</b>	138 grams



VOLTAGE	LENS COLOUR	CURRENT	ORDER CODES
12/24 V DC <sup>1)</sup>	Amber	(12 V DC ) 140 mA (24 V DC) 85 mA	<b>KL3061A</b>
12/24 V DC <sup>1)</sup>	Blue	(12 V DC ) 140 mA (24 V DC) 85 mA	<b>KL3061B</b>
12/24 V DC <sup>1)</sup>	Green	(12 V DC ) 140 m (24 V DC) 85 mA	<b>KL3061G</b>
12/24 V DC <sup>1)</sup>	Red	(12 V DC ) 140 mA (24 V DC) 85 mA	<b>KL3061R</b>
12/24 V DC <sup>1)</sup>	Clear	(12 V DC ) 140 mA (24 V DC) 85 mA	<b>KL3061C</b>
110 V AC	Amber	24 mA	<b>KL3063A</b>
110 V AC	Red	24 mA	<b>KL3063R</b>
110 V AC	Green	24 mA	<b>KL3063G</b>
240 V AC	Amber	15 mA	<b>KL3066A</b>
240 V AC	Red	15 mA	<b>KL3066R</b>
240 V AC	Blue	15 mA	<b>KL3066B</b>
240 V AC	Green	15 mA	<b>KL3066G</b>

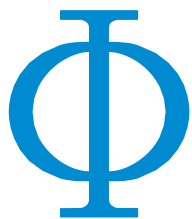
#### NOTES:

<sup>1)</sup> user configurable.



## 2.6 SWITCHES, PUSHBUTTONS & INDICATORS

- Kraus & Naimer – **CA10-A750-FT2**  
– 3Position Switch ‘Eng Rem Auto, Local Auto, Local Man’
- Sprecher & Schuh – **D7P-F3-PX10** – Flush Push Button
- Sprecher & Schuh – **D7P-F4-PX01** – Flush Push Button
- Sprecher & Schuh – **D7P-F6-PX10** – Flush Push Button
- Sprecher & Schuh – **D7P-LF3-PN3G-X10 c/w D7P-X10** – Illuminated Push Button
- Sprecher & Schuh – **D7P-MT44-PX01** – Emergency Stop Push Button
- Sprecher & Schuh – **D7P-P0-PN3A** – Bridge Fault Indication



**KRAUS & NAIMER**  
**BLUE LINE SWITCHGEAR**

[www.krausnaimer.com](http://www.krausnaimer.com)

SINCE 1907

## Catalog 100

**CL Switches 10 A-20 A**

**C, CA, CAD Switches 10 A-315 A**

**L Switches 350 A-2400 A**



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# KRAUS & NAIMER

*The development of the Blue Line rotary switch, contactor and motor starter product ranges is based on more than seventy-five years experience by Kraus & Naimer in the design and manufacture of electrical switchgear. Kraus & Naimer pioneered the introduction of the cam operated rotary switch and continues to be recognized as the world leader in that product field.*

## BLUE LINE

*Blue Line products are protected by numerous patents throughout the industrial world. They are built to national and international standards and designed to withstand adverse temperatures and climates.*

*Blue Line products are accepted and universally recognized for their quality and workmanship. They are supported by a worldwide sales and service organization.*

*The Kraus & Naimer Registered Trademark*



WORLDWIDE SYMBOL  
FOR QUALITY SWITCHGEAR

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## Construction Data

The load switches of the C, CA, CAD and CL-series offer a solution for most cam switch applications. Different contact designs, contact materials and terminals allow for their use as control switches, instrumentation switches and motor control switches, as well as in electronic circuitry and in aggressive environments according to IEC 60947-3 and VDE 0660 part 107.

The stage is the basis for all switches and can be supplied with a maximum of 2 contacts. The terminals are accessible from the side. CA and CAD switches are supplied with open terminals to facilitate wiring and are protected against accidental finger contact according to EN 50274, VDE 0660 part 514 and BGV A3. Captive plus-minus terminal screws and integrated screwdriver guides also reduce wiring.

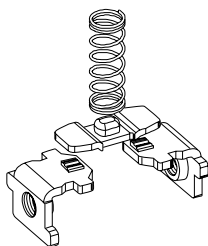
The switches of the new CL-series are supplied with rust-free and acid-resisting IDC terminals (Insulation Displacement Connection) instead of screw type terminals. The stripping or preparation of the insulation is no longer required. Eliminate errors due to i.e., stripped end of the conductor too long or too short, incorrect sleeves used, sleeves crimped incorrectly or wrong crimping tool is used, terminal screws not tightened properly etc. The CL switches reduce installation time by 60 %-70 % compared to the screw type terminals. This translates to significant cost savings. For connecting 2 conductors to a terminal an additional screw terminal with plus-minus screw is available.

If a positive manual operation or a higher DC rating is required, many of these switches can be fitted with a snap action latching mechanism - suffix „S“ - to the switch type.

The cam-operated switches L350-L2000 are continuous current rated for off-load switching. They may be used to switch resistive or low inductive loads.

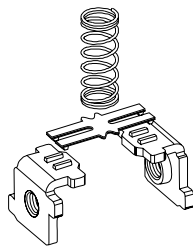
### Special Contact Systems

#### CA4/CA4-1



High contact reliability by multiple cross-point contacts, electronic compatible, CA4 with 1  $\mu$  and CA4-1 with 35  $\mu$  gold plating.

#### CAD11/CAD12



H-bridge with „cross-wire“ contact system, high contact reliability also at lower voltages. CAD11 with gold-plated contacts, CAD12 with silver contact.

Type	Size	Possible Switching Angles	Max. No. of Stages
CA4, CA4-1	S00	30°, 45°, 60°, 90°	9
CL4	S00	30°, 45°, 60°, 90°	8
CA10-CA25	S0	30°, 45°, 60°, 90°	12
CA10S-CA25S	S0	60°	on request
CAD11, CAD12	S0	30°, 45°, 60°, 90°	12
CL10	S0	30°, 45°, 60°, 90°	10
CA10B-CA25B	S1	30°, 45°, 60°, 90°	12
C26, C32, C42	S1	20°, 30°, 45°, 60°, 90°	12
C26S, C32S, C42S	S1	60°	on request
C43, C80, C125	S2	20°, 30°, 45°, 60°, 90°	12
C315	S3	20°, 30°, 45°, 60°, 90°	12
L350/51, L630/31, L1000/01, L1250/51	S2	30°, 45°, 60°, 90°	12
L400, L600, L800, L1200, L1600, L2000	S3	30°, 45°, 60°, 90°	12

### CL Switches



### CA and CAD Switches



### C Switches



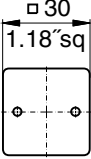
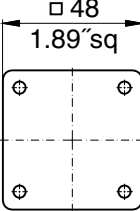
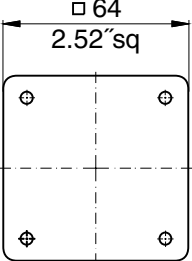
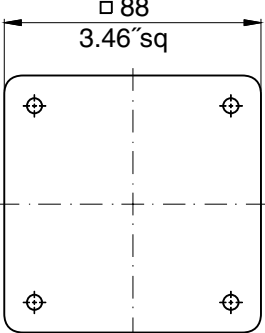
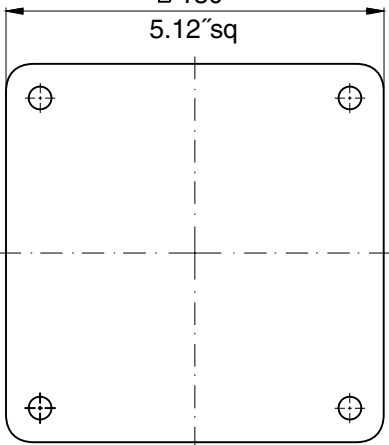
### L Switches



Above illustrates the standard terminal positions.



## Nominal Ratings

Switch Size	Type	According to IEC 60947-3/VDE 0660 part 107			
		Insulation Voltage <sup>1</sup> $U_i$ V	Thermal Current $I_u/I_{th}$ A	Motor Rating 3 x 380 V-440 V AC-23      AC-3 kW      kW	
<b>S00</b>  	<b>CA4</b>	440	10	3	2,2
	<b>CA4-1</b>	440	10	3	2,2
	<b>CL4</b>	440	10	3	2,2
<b>S0</b>  	<b>CA10</b>	690	20	7,5	5,5
	<b>CA11</b>	690	20	7,5	5,5
	<b>CA20</b>	690	25	11	7,5
	<b>CA25</b>	690	32	15	11
	<b>CAD11</b>	600	6	-	-
	<b>CAD12</b>	600	6	-	-
	<b>CL10</b>	690	20	7,5	5,5
<b>S1</b>  	<b>CA10B</b>	690	20	7,5	5,5
	<b>CA11B</b>	690	20	7,5	5,5
	<b>CA20B</b>	690	25	11	7,5
	<b>CA25B</b>	690	32	15	11
	<b>C26</b>	690	32	15	11
	<b>C32</b>	690	50	22	15
	<b>C42</b>	690	63	30	18,5
<b>S2</b>  	<b>C43</b>	690	63	30	18,5
	<b>C80</b>	690	115	45	30
	<b>C125</b>	690	150	75	37
	<b>L350</b>	690	350	90	37
	<b>L351</b>	690	350	90	37
	<b>L630</b>	690	630 <sup>2</sup>	90	37
	<b>L631</b>	690	630 <sup>2</sup>	90	37
	<b>L1000</b>	690	1000 <sup>2</sup>	90	37
	<b>L1001</b>	690	1000 <sup>2</sup>	90	37
	<b>L1250</b>	690	1250 <sup>2</sup>	90	37
	<b>L1251</b>	690	1250 <sup>2</sup>	90	37
<b>S3</b>  	<b>C315</b>	690	315	132	55
	<b>C316<sup>3</sup></b>	1000	315	132	55
	<b>L400</b>	690	500	132	55
	<b>L600</b>	690	800 <sup>2</sup>	132	55
	<b>L800</b>	690	1100 <sup>2</sup>	132	55
	<b>L1200</b>	690	1450 <sup>2</sup>	132	55
	<b>L1600</b>	690	1900 <sup>2</sup>	132	55
	<b>L2000</b>	690	2400 <sup>2</sup>	132	55
	For further technical details, refer to pages 40-43. To furnish with gold contacts and quick connects see page 4.				

<sup>1</sup>Valid for lines with grounded common neutral termination, overvoltage category III, pollution degree 3. Values for other supply systems on request. <sup>2</sup>Ambient temperature 35 °C max. <sup>3</sup>Additional switch functions on request.



## How to order

Disconnectors and Main Switches according to IEC 60947-3 see Catalog 500

Three types of data (shown below) are required for ordering Blue Line cam-operated switches. Code numbers for ordering are shown in this catalog.

### 1. Type of Switch

The type of switch required may be easily selected by referring to the table on page 3 which shows the thermal current, power rating and dimensions of each switch. For further technical details, refer to pages 40-43. Variations of contacts and terminals are shown below.

### 2. Switch Function

The code numbers for standard switches shown on pages 6-28 indicate the switch function, escutcheon plate, handle and any optional extras.

Additional coding to modify type and color of handle and escutcheon plate is explained below.

### 3. Type of Mounting

Types of mounting are shown on pages 29-35. Catalog **101** describes enclosures and optional extras.

Specify the mounting code to indicate required mounting.

**CA10**

**A202-600**

**VE**

## Type of Switch

Extending the switch type coding the following combinations will define:

Amendment	Definition	For switch types
-1	with gold contacts <sup>1</sup>	CA10, CA11, CA10B, CA11B
-4	with quick connects	CA4
B	S0 switches with latching mechanism size S1	CA10, CA11, CA20, CA25, CAD12
C	S1 switches with latching mechanism size S2	C26, C32
L	with lockout-relay w/o manual release for std. sw.	CA10, C26, C32, C42
M	with lockout-relay with manual release for std. sw.	CA10, C26, C32, C42
X	with power failure release	CA10, CA11, CA20, CA25, CAD12, C26, C32, C42
Y	with power failure release and trip-free release	CA10, CA11, CA20
S	with snap action	CA10, CA11, CA20, CA25, C26, C32, C42 with 60° switching
R	with spring return latching mechanism	CA10

**Example:** Coding for switch type **CA10** with gold contacts is **CA10-1**.

## Modification of Switches

The part number for switch function and options may be modified in cases where items are required other than standard. The modification may involve the escutcheon plate inscription, color combination of escutcheon plate and handle, type of escutcheon plate and handle or the optional extra.

Switch Size	Escutcheon Plate Frame	Handle	Escutcheon Plate Backing	Escutcheon Plate Lettering	Dash Number
S0, S1, S2, S3	electro-gray	electro-gray	brushed alu	black	-100
S0, S1, S2, S3	electro-gray	electro-gray	black	mat silver	-500
S00, S0, S1, S2, S3	black	black	brushed alu	black	-600
S00, S0, S1, S2, S3	black	black	black	mat silver	-700

<sup>1</sup>Technical data on request.

## How to order

### Modification of Switches

#### Color combinations of escutcheon plate and handle

The standard switch consists of a transparent escutcheon plate with brushed aluminum backing and black inscription. The escutcheon plate frame is black as well as the handle. Page 4 shows further color combinations of escutcheon plate and handle which are available. The appropriate dash number must be substituted in the switch function coding to specify other color combinations as required.

**Example:** The complete coding for switch type CA10 with a 3 pole ON/OFF switch function, electro-gray handle and electro-gray escutcheon plate frame with brushed aluminum backing and black inscription which reads 0-1 is as follows: **CA10 A202-100 E**.

The following is a list of special programs for escutcheon plate and handle combinations. They may be obtained by specifying any one of the following two (2) digit dash numbers as a part of the overall dash number. It is still necessary to prefix these two digit numbers with the first digit which represents the color combination desired.

#### Special programs for escutcheon plate and handle combinations

- **000** = without escutcheon plate, without handle
- **.01** = without escutcheon plate
- **.02** = without handle
- **.03** = with square escutcheon plate without lettering
- **.04** = with rectangular escutcheon plate without lettering
- **.05** = with square escutcheon plate without lettering and without handle
- **.06** = with rectangular escutcheon plate without lettering and without handle
- **.07** = standard escutcheon plate, without lettering on rectangular section
- **.08** = with F-handle
- **.09** = with P-handle
- **.10** = escutcheon plate with frame and fixation ring only (if using switches with single hole mounting: - **.16**)
- **.11** = without escutcheon plate, but with handle bearing plate
- **.12** = with yellow escutcheon plate backing and red handle
- **.14** = with B-handle
- **.16** = escutcheon plate with frame and fixation ring only, if using switches with single hole mounting
- **.17** = standard escutcheon plate and rectangular add-on escutcheon plate, if using switches with single hole mounting FT2

**Example:** The complete coding for switch type CA10 with a 3 pole ON/OFF switch function with electro-gray escutcheon plate frame, square escutcheon plate without lettering, brushed aluminum plate backing and electro-gray handle reads as follows: **CA10 A202-103 E**.

### Handles, Escutcheon Plates and Optional Extras

The handles for standard switches shown on pages 6-28 are suitable for mounting units with four hole mounting. Alternative types of handles available are illustrated on pages 29-35.

When a handle, escutcheon plate or optional extra is required but not covered by the dash number, the code number for the selected component should be entered separately. A comprehensive range of available standard escutcheon plates is illustrated on pages 36 and 37. Non-standard or special escutcheon plate engravings are available at extra cost.

The large number of optional extras and enclosures is covered in Catalog 101.

### Switch Size

Blue Line switches are available in sizes S00, S0, S1, S2 and S3. These size codes indicate the dimensions of the mounting, the escutcheon plate and the handle, as well as the size of optional devices and enclosures.

Page 3 lists these sizes and the various switch types they include.

### Ordering of Special Switches and Escutcheon Plates

When ordering special switches and escutcheon plates it is advisable to use our order form, as illustrated. The customer's requirements are shown in blue as an example.

For technical reasons, it may not be possible to follow the sequence of contacts requested by the customer. The final contact development which is sent with every switch will show the customer's original terminal markings.

ESCUTCHEON PLATE		MOTOR 1		POSITIONS		O		H		A		DATE		SIGNED	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112
113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176
177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192
193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208
209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224
225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256
257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272
273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288
289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304
305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336
337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352
353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368
369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384
385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400
401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416
417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432
433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448
449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464
465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496
497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512
513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528
529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544
545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560
561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576
577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592
593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608
609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624
625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640
641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656
657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672
673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688
689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704
705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720
721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736
737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752
753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768
769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784
785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800
801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816
817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832
833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848
849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864
865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880
881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896
897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912
913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928
929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944
945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960
961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976
977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992
993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008
1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	1020	1021	1022	1023	1024
1025	1026	1027	1028	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040
1041	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054	1055	1056
1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067	1068	1069	1070	1071	1072
1073	1074	1075	1076	1077	1078	1079	1080	1081	1082	1083	1084	1085	1086	1087	1088
1089	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104
1105	1106	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119	1120
1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132	1133	1134	1135	1136
1137	1138	1139	1140	1141	1142	1143	1144	1145	1146	1147	1148	1149	1150	1151	1152
1153	1154	1155	1156	1157	1158	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168
1169	1170	1171	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184
1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197	1198	1199	1200
1201	1202	1203	1204	1205	1206	1207	1208	1209	1210	1211	1212	1213	1214	1215	1216
1217	1218	1219	1220</												

## Switch Function and Configuration

## C, CA, CAD, CL Switches

Function	Escutch. Plate	Type/Handle	Code	Stages	Connection Diagram
		CA4 CA4-1 CL4	CAD.. CA10- CA10B- CA25 CL10		
			C80- C315		

## Multi-step Switches without „OFF“ with electrically isolated contacts

1 pole 3 Step						A730-600	2	<p>1 pole</p>
2 pole						A750-600	3	<p>2 pole</p>
1 pole 4 Step						A731-600	2	<p>1 pole</p>
2 pole						A751-600	4	<p>2 pole</p>

## Multi-step Switches with „OFF“


















1 pole 2 pole 3 pole 4 pole 5 pole 6 pole						A240-600 A260-600 A280-600 A480-600 A486-600 A491-600	1 2 3 4 5 6		1-6 pole
1 pole 2 pole 3 pole 4 pole 5 pole 6 pole						A240-620 A260-620 A280-620 A480-620 A486-620 A491-620	1 2 3 4 5 6		1-6 pole
1 pole 2 pole 3 pole 4 pole 5 pole						A241-600 A261-600 A281-600 A481-600 A487-600	2 3 5 6 8		1 and 2 pole
1 pole 2 pole 3 pole 4 pole 5 pole						A241-620 A261-620 A281-620 A481-620 A487-620	2 3 5 6 8		3 pole
1 pole 2 pole						A241-621 A261-621	2 3		4 pole
									5 pole

## Mounting

## C, CA, CAD, CL Switches

Single Hole Mounting		Terminals rotated 90°	Code	CA4 CA4-1 CL4	CAD.. CA10- CA25 CL10
      	With locking nut and shaft seal, protection IP 66	●	FS1 FS1-V	mm 16/22 16/22	mm
	Without escutcheon plate		FT1 FT1-V FT3 FT3-V	22 22 22/30 22/30	
	With square escutcheon plate		FS2 FS2-V	16/22 16/22	
			FT2 FT2-V FT4 FT4-V	22 22 22/30 22/30	
	With rectangular escutcheon plate		FS4 FS4-V	16/22 16/22	
	With size S1 escutcheon plate and heavy duty latching		FH3 FH3-V	22 22	
	Mounting key for locking nut		S00 T170 09		

## International Standards and Approvals

Country	Authority	Mark or Standard	CL4 CL10	CAD11/12 CA4 CA4-1	CA10 CA11 CA20	CA10B CA11B CA20B	CA25 CA25B	C26 C32 C42	C43 C80 C125	L350/1 L630/1 L1000/1	L1250/1 C315 C316	L400 L600 L800	L1200 L1600 L2000
USA	Underwriters Laboratories Inc.									●	●	●	●
			●	●	●	●	●	●	●			●	
			●	●	●	●	●	●	●				
Canada	UL investigated acc. to CSA			+	●	●	●	●	●	●	●	●	●
										●	●	●	●
			●	●	●	●	●	●	●			●	
Switzerland	Schweizerischer Elektrotechnischer Verein		+	+	+	+	+	+	+	+	+	+	+
Denmark	Danmarks Elektriske Materielkontrol		+	+	+	+	+	+	+	+	+	+	+
Norway	Norges Elektriske Materielkontrol		+	+	+	+	+	+	+	+	+	+	+
Sweden	Svenska Elektriska Materielkontrollanstalten		+	+	+	+	+	+	+	+	+	+	+
Finland	Sähkötar-kastuskeskus		+	+	+	+	+	+	+	+	+	+	+
Austria	Österreichischer Verband für Elektrotechnik		+	+	+	+	+	+	+	+	+	+	+
Federal Republic of Germany	Verband Deutscher Elektrotechniker	VDE 0660 <sup>4</sup>	+	+	+	+	+	+	+	+	+	+	+
Great Britain	British Standards Institution	BS EN 60947 <sup>4</sup>	+	+	+	+	+	+	+	+	+	+	+
International Electrical Commission (IEC) Recommendation		IEC 60947 <sup>5</sup>	+	+	+	+	+	+	+	+	+	+	+
China	China Quality Certification Centre			●	●	●							
Russian Federation	GOST			●	●	●	●	●	●	+	+	+	+
Russian Federation	Russian Maritime Register of Shipping			●	●	●	●						
Germanischer Lloyd				+	+	+		+	+	+	+	+	+
Lloyds Register of Shipping				+	+	+	+	+	+	+	+	+	+
● Switch approved      + Switch conforms to requirements      + No approval required													
<sup>1</sup> Approved under the "Component Program" (UL-Recognized Industrial Component). File No. E35541, Category Control No. NLRV2 (U.S.) resp. NLRV8 (Canada).													
<sup>2</sup> Approved under the "Listing Program". File No. E35541, Category Control No. NLRV (U.S.) resp. NLRV7 (Canada).													
<sup>3</sup> Switch types CAD11/CAD12 approved under the "Listing Program". File No. E60262, Category Control No. NRNT (U.S.) resp. NRNT7 (Canada).													
<sup>4</sup> It is not required for Industrial Switchgear to bear a symbol but must conform to requirements. By stating the specific standard no. on the product the manufacturer declares that all requirements of the product standard are met.													
<sup>5</sup> IEC does not operate an approval scheme.													
<sup>6</sup> File No. 13002, Class No. 3211-05 resp. 4652-04.													
<sup>7</sup> If this approval is required, please request when ordering.													

## Technical Data

## C, CA, CL Switches

## Selection Data

CA4 CA10 CA11 CA20 CA25 C42  
CA4-1 CL4 CA10B CL10 CA11B CA20B CA25B C26 C32 C43 C80 C125 C315/C316

<b>Rated Insulation Voltage U<sub>i</sub></b>			IEC 60947-3, EN 60947-3 <sup>1</sup> VDE 0660 part 107 <sup>1</sup> SEV <sup>4</sup> UL/Canada CEE/NEMKO min. voltage	V V V V V	440 380 300 400/380	440 380 300 —	690 660 300 380	690 690 600 —	690 660 600 400	690 690 300 —	690 660 600 400	690 660 600 400	690 660 600 400	690 660 600 —	690/1000 660 600 —		
<b>Rated Impulse Withstand Voltage U<sub>imp</sub></b>				kV	4	4	6	6	6	6	6	6	6	6	6/8		
<b>Rated Thermal Current I<sub>u</sub>/I<sub>th</sub></b>			IEC 60947-3, EN 60947-3 VDE 0660 part 107  SEV <sup>4</sup> 380 V 660 V UL/Canada	A A A A	10 10 — 10	10 10 — 10	20 16 12 20	20 16 12 20	25 25 25 30	32 32 32 30	32 32 32 40	50 40 40 50	63 63 63 65	115 100 — 100	150 160 — 150	315 315 315 240	
<b>Rated Operational Current I<sub>e</sub></b>																	
AC-21A	Switching of resistive loads, including moderate overloads	IEC 60947-3, EN 60947-3 VDE 0660 part 107	A	10	10	20	20	20	25	32	32	40	63	100	150	315	
AC-1	Resistive or low inductive loads	SEV <sup>4</sup> 380 V 660 V	A A	10 —	10 —	16 12	16 12	16 12	25 20	32 32	32 32	40 40	63 63	100 —	160 —	315 315	
AC-22A	Switching of combined resistive or low inductive loads including moderate overloads	IEC 60947-3, EN 60947-3 VDE 0660 220 V-500 V part 107 660 V-690 V	A A	10 —	10 —	20 20	20 20	20 20	25 25	32 32	32 32	40 40	63 63	100 100	150 125	315 125	
AC-15	Switching of control devices, contactors, valves etc.	IEC 60947-3, EN 60947-3 VDE 0660 220 V-240 V part 107 380 V-440 V	A A	2,5 1,5	2,5 1,5	5 4	5 4	5 4	8 5	12 6	14 6	16 7	— —	— —	— —	— —	
Pilot Duty		UL/Canada <sup>4</sup> Heavy		A300	C300	A300	A600	A600	A600	A300	A600	A600	A600	—	—	A600	
Ampere Rating Resistive or low inductive loads		UL/Canada <sup>4</sup>	A	10	10	20	20	20	30	30	40	50	65	100	150	240	
Resistive load/motor load		CEE NEMKO	A A	4/2 6/4 <sup>2</sup>	— —	10/6 10/6	— —	10/6 —	16/10 20/10	— —	25/10 —	32/10 —	40/10 —	63/10 —	— —	— —	
<b>Breaking capacity</b>			220 V-240 V 380 V-440 V 660 V-690 V	A A A	50 50 —	50 50 —	150 150 80	150 150 80	200 200 125	280 250 150	280 250 150	380 360 270	550 550 365	860 860 400	1100 1100 490	2000 2000 340	
Power loss per contact at I <sub>u</sub> Resistance to vibration Resistance to shock				W	0,4/0,9 0,4 min. 4 g, 2-100 Hz, 1,6 mm min. 6 g, 6 ms	0,9 0,9 0,9	1 0,9 0,9	0,9 0,9 0,9	0,7 0,7 0,7	1,3 1,3 1,3	1,3 1,3 1,3	1,7 1,7 1,7	5,8 5,8 5,8	3,8 3,8 3,8	17 17 17		
<b>Short Circuit Protection</b> Max. fuse size (gL-characteristic) Rated short-time withstand current (1s-current)				A A	10 60	10 90	25 140	25 140	25 140	35 280	35 480	50 350	63 800	80 1000	125 1300	200 2000	315 4200
<b>DC Switching Capacity<sup>6</sup></b>					<b>Rated Operational Current I<sub>e</sub></b>												
No. of series contacts		1 2 3 4 5 6 8		CA4	CA10	CA11	CA20	CA25								C315 <sup>3</sup>	
Voltage V				CA4-1	CL4	CA10B	CL10	CA11B	CA20B	CA25B	C26S	C32S	C42S	C80	C125	C316 <sup>3</sup>	
Resistive loads T ≤ 1 ms	24 48 70 95 120 145 190 48 95 140 190 240 290 350 60 120 180 240 300 360 450 110 220 330 440 550 660 — 220 440 660 — — — — 440 660 — — — — —	A	10 10 20 20 20 25 32 6 6 12 12 12 20 25 2,5 2,5 4,5 4,5 4,5 7,5 10 0,7 0,7 1 1 1 1,5 2 0,3 0,3 0,4 0,4 0,4 0,5 0,6 0,2 0,2 0,27 0,27 0,27 0,3 0,3	— 50 — 115 — 315 32 40 63 100 150 250 23 27 30 — — — 6,5 — — — — — 1,2 — — — — — 0,4 — — — — —													
Inductive loads T = 50 ms	24 48 70 95 120 145 190 30 60 90 120 150 180 240 48 95 140 190 240 290 350 60 120 180 240 300 360 450 110 220 330 440 550 660 —	A	6 6 12 12 12 20 25 3 3 5 5 5 9 12 1 1 2 2 2 3 3 0,7 0,7 1 1 1 1,5 1,5 0,3 0,3 0,4 0,4 0,4 0,5 0,5	32 40 63 100 150 250 25 30 55 33 50 70 16 20 — — — — 11 15 — — — — 3,2 3,5 — — — —													
<b>Ambient Temperature of Stages<sup>5,7</sup></b>				open at 100 % I <sub>u</sub> /I <sub>th</sub> enclosed at 100 % I <sub>the</sub>	55 °C during 24 hours with peaks up to 60 °C 35 °C during 24 hours with peaks up to 40 °C												

## Technical Data

## C, CA, CL Switches

Selection Data				CA4 CA4-1 CL4 CA10 CA10B CL10 CA11 CA11B CA20 CA20B CA25 CA25B C26 C32 C42 C43 C80 C125 C315 C316												

<sup>1</sup> Cable lug must accept M12 screw. <sup>2</sup> The insulation material of the conductor has to be PVC (typical wire codes are H05V-K0,5 ... H07V-K1,5 or H05V-U0,5 ... H07V-U1,5 etc.). Other materials on request. Connected conductors, which have to be disconnected and re-connected again must be cut in order to ensure a proper electrical connection and to prevent a complete cut-off of the wire insulation. The permissible ambient temperature range when connecting the wires is 5-40 °C.







# The Range of “Blue Line” Switchgear

Technical literature covering the following products is available on request.

	Catalog Number
<b>Main Switches and Main Switches with Emergency Function 16 A-315 A</b> <b>Maintenance Switches 20 A-315 A</b> <b>Switch Disconnectors 20 A-315 A</b> According to IEC 60947-3, EN 60947-3, VDE 0660 part 107, IEC 60204, EN 60204 and VDE 0113	<b>500</b>
<b>CL Switches 10 A-20 A</b> <b>C, CA and CAD Switches 10 A-315 A and L Switches 350 A-2400 A</b> C, CA and CAD switches are designed for universal application. They are recommended for instrument, isolator, double-throw and motor control. L switches are designed for load and off-load applications. They are used to switch resistive or low inductive loads.	<b>100</b>
<b>Optional Extras and Enclosures</b> The complete product line, a large number of optional extras is available, including door interlocks, push-pull devices, cylinder and padlock attachments, control and indicator devices, AC motor drives, as well as enclosures, both insulated and metal.	<b>101</b>
<b>A and AD Switches 6 A-25 A</b> A and AD switches have 4 contacts in each switching stage. These switches provide an extensive range of switch functions and require a minimum mounting depth. Up to 36 switching positions are possible, with availability of 48 contacts per 12 stage switch column.	<b>110</b>
<b>CG, CH and CHR Switches 10 A-25 A</b> Ultra compact CG, CH and CHR switches are ideally suited for control and instrumentation applications. Switch terminals are “finger-proof” and conveniently accessible for wiring and are delivered open. All CG4 switches offer specially designed gold plated contacts or H-bridges with “cross-wire” contact systems, which facilitates their use in electronic circuitry and chemically aggressive environments.	<b>120</b>
<b>DH, DHR, DK and DKR Switches 6 A-16 A</b> DH, DHR, DK and DKR switches incorporate unique corrosion resistant contacts that permit operation on system voltage as low as 1 V. They have fully enclosed and protected contacts which can be operated either by rotary and/or lateral handle movement. D switches are used in calibration and semiconductor circuits. They are also used for relay and contactor control.	<b>130</b>
<b>X Switches 80 A-630 A</b> X switches can be applied for load, tap and gang switching duties. They incorporate 6 contacts in each switching stage. Their compact design provides a minimum length dimension for mounting purposes.	<b>140</b>
<b>KG Switches 20 A-315 A and KH and KHR Switches 16 A-80 A</b> KG, KH and KHR switches are excellent circuit interruptors. They have high through fault and fault making capacities and are especially designed for use as isolators and safety switches for machine tools, distribution panels and switchboards. KG ON/OFF switches offer unusually high dimensioned air and creepage distances between terminals which are designed for time saving “straight-line” wiring. ON/OFF switches are available with up to 8 poles and double-throw switches are available with up to 4 poles.	<b>150</b>
<b>Contactors 16 A-115 A and Motor Starters 1,1 kW-55 kW</b> These include control relays, motor contactors, two and four pole output contactors, heating contactors, thermal overload relays.	<b>200</b>
<b>Push Buttons and Pilot Lights, 22,5 mm Ø</b> A complete range of state-of-the-art push buttons and pilot lights represent an ideal combination of functional security and economical efficiency in a modular design.	<b>302</b>

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42 Miramar Avenue, P. O. Box 15-009  
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Tel: +64 4 380-9888, Fax: 9877  
e-mail: sales@nzsol.co.nz

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N-0508 OSLO  
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e-mail: nos@norsksol.no

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e-mail: info@astat.com.pl

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Apartado 1083  
P-2671-852 SANTO ANTÓNIO DOS CAVALEIROS  
Tel: +351 21 989-8939, Fax: 988-6464

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# 03-17/23  
SINGAPORE 149 596  
Tel: +65 6473-8166, Fax: 8643  
e-mail: krausnaimer@singsol.com.sg

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Glavni trg 47  
SI-2380 SLOVENJ GRADEC  
Tel: +386 2 88 392 00, Fax: 434 71  
e-mail: schrack.sg@schrack-energietechnik.si

**Republic of South Africa*****south african solenoid Φ co.pty. ltd.***

7 Village Crescent, Linbro Village  
Linbro Business Park, SANDTON 2065  
P. O. Box 511, KELVIN 2054  
Tel: +27 11 608-6060, Fax: 608-2874  
e-mail: sales@sasolenoid.co.za

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e-mail: heshaze@catworld.net

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Box 42097, S-126 14 STOCKHOLM  
Tel: +46 8 97 00 80, Fax: 97 87 33  
e-mail: order@skansol.se

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e-mail: info@awag.ch

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TAIPEI 115, Taiwan, R. o. C.  
Tel: +886 2 265-13279, Fax: 13264  
e-mail: nathan.nuwtec@msa.hinet.net

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ÜNAL KARDEŞ ELEKTRİK GEREÇLERİ A. Ş.  
Beşyol, Eski Londra Asfaltı-6  
TR-34630 SEFAKÖY-İstanbul  
Tel: +90 212 624-9204, Fax: 592-4810  
e-mail: info@unal kardes.com.tr

**USA*****american solenoid Φ co. inc.***

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Tel: +1 732 560-1240, Fax: 8823  
e-mail: amsol@krausnaimer-us.com



[CATALOGUE D7-CAT]

# D7 Pushbuttons



INDUSTRIAL SWITCHGEAR & AUTOMATION SPECIALISTS



**PUT YOUR CONTROL AND SWITCHING  
SOLUTIONS IN OUR HANDS**

## New D7... Experience a Touch of Quality



Introducing the all new D7 range from Sprecher + Schuh. The D7 range is the latest in a long line of quality 22.5 mm control and signalling equipment from a company with a long built reputation for combining high quality manufacturing skills and attention to detail to produce only the finest quality products.

Available in both thermoplastic and metal variations, the D7 range incorporates all the features that you have come to expect from Sprecher + Schuh and raises the bar one step further with a functional low profile design and all new stylish appearance.

Once you get past the new appearance you will find the D7 range has some unique features incorporated, such as improved operational feel on the pushbuttons for a positive “tactile” response and a new positive detent on selector switches. In addition optional time saving cage style termination on contact blocks, improved LED illumination on pilot lights and hard wearing laser engraving have also been included.

Utilising state of the art modelling technologies and finite element analysis, you can be sure every component used in the D7 range has been optimised for durability and reliability with the aim of providing the ultimate in control and indication.

Designed and manufactured to meet the most exacting performance, the new D7 range is **the** pushbutton to use in today’s demanding environments.





## D7 at a glance...

### "Auto Break" Safety contacts

Separation of the contact block assembly from the front operator or mounting latch can prevent an Emergency Stop from shutting down the controlled process in an emergency. Correct contact block installation is critical to ensure that the normally closed contacts will open when the emergency stop operator is active. The exclusive Sprecher + Schuh "Auto Break" contact block monitors itself to ensure it is always correctly installed.

A normally open "Auto Break" contact is physically moulded and wired in series with a standard set of normally closed contacts. When correctly installed the operator creates a maintained pressure on the normally open "Auto Break" contact and automatically closes the contact. In this state the normally closed contact operates as normal.

If the contact block assembly should separate from the front operator, the pressure releases and the "Auto Break" contact will automatically open. Because the "Auto Break" contact is wired in series with the normally closed, the opening of either set of contacts will open the circuit controlled by the emergency stop operator.



### Coupling plates and contact blocks

Choice of metal or plastic coupling plates

Rotating collar with "snap secure" system ensures fast one-hand removal

Contact blocks snap-fit and are hinged at one end for easy installation

Colour coded contact block plungers for easy identification

H-bridge contact design and the option of gold contacts provides cleaner current flow for maximum reliability at lower voltages

Bifurcated contacts provide excellent wiping and optimal switching reliability

Option of Cage style wire termination or Screw clamp

Live components are shrouded and touch safe to IP 20



### Inscription caps and diffusers

Durable abrasion-proof press plates

6 colour choices

Ergonomically contoured design

Diffusers constructed in two colour moulded assembly

Durable wear resistant laser printing available



### Enclosures



Metal and plastic enclosures

In choices to accommodate up to 6 x 22.5 mm operators

Yellow thermoplastic pendant style enclosure available for up to 2 operators

20 mm metric cable entry

Suitable for base or panel mount contact blocks

Accepts two piece snap-in legend

### Illumination



Modern and compact integrated LED lamp modules

Superior illumination qualities

5 colour choices

11 year lamp life (100,000 hrs)

Maintenance free

Vibration and shock resistant

24 V AC/DC, 110 V AC and

240 V AC

Contents	Page No.
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### Design

Functional low profile appearance  
Ergonomic easy to operate handles  
Reduced depth contact blocks  
Improved positive "tactile" operation on pushbuttons  
Improved "positive detent" on rotary selector switches  
Durable two colour plastic caps and laser engraving

### Improved safety

Unique "Auto break" self-monitoring emergency contact system  
IP 20 touch protection  
Tamperproof rear fixing nut

### Time saving

New design snap-lock, twist-to-reset rotating collar on coupling plates for easier mounting and assembly  
Snap-on components  
Redesigned anti-rotation tab

### Flexibility

Thermoplastic or metal operators  
Latching or impulse operators  
Five different colour choices  
Maximum of six contact blocks  
Full voltage and transformer lamp blocks

### Improved reliability

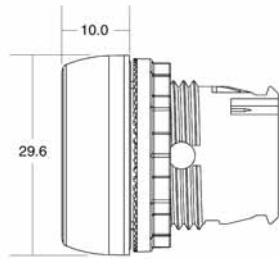
IP 65/66 sealing across the range for reliability in dusty and wet conditions  
Improved vibration resistance  
Continuous wiping contact for improved reliability  
Tested to IEC 947  
Positive detent on rotary switches which ensures operation will not "hang up" between positions

### Contact blocks

Improved mounting from "Snapsecure" snap fit mounting system  
Colour coded plungers for easy identification  
Optional Quadfurcated Gold contacts for improved low voltage switching  
Optional spring clamp termination on contact blocks for reduced wiring time



### Non-Illuminated Momentary Pushbuttons



Dimensions in (mm)



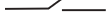
Metal or plastic options  
Improved momentary action for fast response  
Low mounting depth from panel

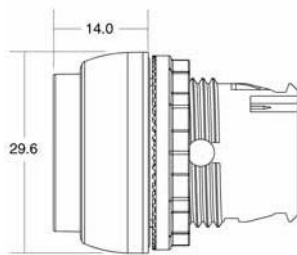


D7P-F3-PX10



D7M-F4-MX01

Description	Contact	Plastic Body Cat. No.	Metal Body Cat. No.
<b>Flush Pushbutton</b> with Green insert		D7P-F3-PX10 <sup>1)</sup>	D7M-F3-MX10 <sup>1)</sup>
with Red insert		D7P-F4-PX01 <sup>1)</sup>	D7M-F4-MX01 <sup>1)</sup>
with Blue insert		D7P-F6-PX10 <sup>1)</sup>	D7M-F6-MX10 <sup>1)</sup>



Dimensions in (mm)



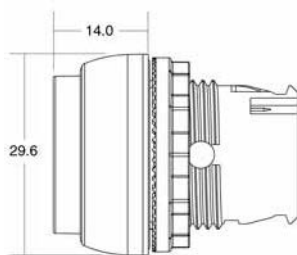
D7P-E4-PX01



D7M-E4-MX01

Description	Contact	Plastic Body Cat. No.	Metal Body Cat. No.
<b>Extended Pushbutton</b> with Red insert		D7P-E4-PX01 <sup>1)</sup>	D7M-E4-MX01 <sup>1)</sup>

### Non-Illuminated Momentary Pushbuttons with labelled Press Plates



Dimensions in (mm)



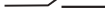

Laser etched markings  
for improved abrasion  
resistance



D7P-E402-PX01



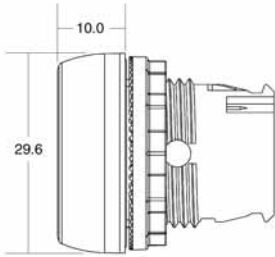
D7M-F301-MX10

Description	Contact	Plastic Body Cat. No.	Metal Body Cat. No.
<b>Flush Pushbutton</b> with Green insert labelled "Start"		D7P-F301-PX10 <sup>1)</sup>	D7M-F301-MX10 <sup>1)</sup>
with Red insert labelled "Stop"		D7P-F402-PX01 <sup>1)</sup>	D7M-F402-MX01 <sup>1)</sup>
with Blue insert labelled "Reset"		D7P-F607-PX10 <sup>1)</sup>	D7M-F607-MX10 <sup>1)</sup>
with extended Red press plate labelled "Stop"		D7P-E402-PX01 <sup>1)</sup>	D7M-E402-MX01 <sup>1)</sup>

**Note:** <sup>1)</sup> Add suffix "bx" for special box/hang-sell packaging eg: D7P-F3-PX10bx.



### Illuminated Momentary Flush Pushbuttons with integrated LED Lamp Block



Dimensions in (mm)

Long life integrated LED illumination

24 V and 240 V versions

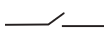

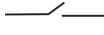
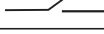
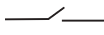

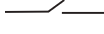
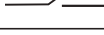
Supplied complete with contact blocks



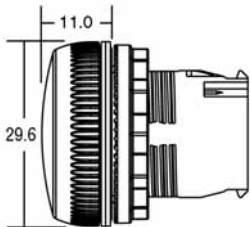
D7P-LF5-PN3Y-X10



D7M-LF6-MN3B-X10

Description	Contact	Plastic Body Cat. No.	Metal Body Cat. No.
<b>24 V AC/DC</b>			
Green pushbutton with Green LED		D7P-LF3-PN3G-X10 <sup>1)</sup>	D7M-LF3-MN3G-X10 <sup>1)</sup>
Red pushbutton with Red LED		D7P-LF4-PN3R-X01 <sup>1)</sup>	D7M-LF4-MN3R-X01 <sup>1)</sup>
Blue pushbutton with Blue LED		D7P-LF6-PN3B-X10 <sup>1)</sup>	D7M-LF6-MN3B-X10 <sup>1)</sup>
Yellow pushbutton with Yellow LED		D7P-LF5-PN3Y-X10 <sup>1)</sup>	D7M-LF5-MN3Y-X10 <sup>1)</sup>
<b>240 V AC</b>			
Green pushbutton with Green LED		D7P-LF3-PN7G-X10 <sup>1)</sup>	D7M-LF3-MN7G-X10 <sup>1)</sup>
Red pushbutton with Red LED		D7P-LF4-PN7R-X01 <sup>1)</sup>	D7M-LF4-MN7R-X01 <sup>1)</sup>
Blue pushbutton with Blue LED		D7P-LF6-PN7B-X10 <sup>1)</sup>	D7M-LF6-MN7B-X10 <sup>1)</sup>
Yellow pushbutton with Yellow LED		D7P-LF5-PN7Y-X10 <sup>1)</sup>	D7M-LF5-MN7Y-X10 <sup>1)</sup>

### Pilot Light with integrated LED Lamp Block



Dimensions in (mm)

Superior LED illumination qualities

Scratch resistant lenses











Modern low profile bodies



D7P-P5-PN3Y

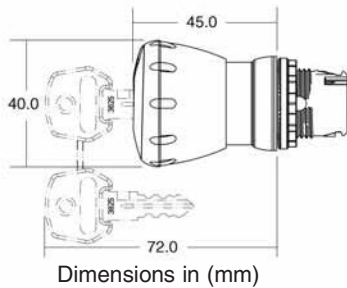


D7M-P3-MN3G

Description	Contact	Plastic Body Cat. No.	Metal Body Cat. No.
<b>24 V AC/DC</b>			
Green pilot light with Green LED		D7P-P3-PN3G <sup>1)</sup>	D7M-P3-MN3G <sup>1)</sup>
Red pilot light with Red LED		D7P-P4-PN3R <sup>1)</sup>	D7M-P4-MN3R <sup>1)</sup>
Blue pilot light with Blue LED		D7P-P6-PN3B <sup>1)</sup>	D7M-P6-MN3B <sup>1)</sup>
Yellow pilot light with Yellow LED		D7P-P5-PN3Y <sup>1)</sup>	D7M-P5-MN3Y <sup>1)</sup>
Translucent pilot light with White LED		D7P-P7-PN3W <sup>1)</sup>	D7M-P7-MN3W <sup>1)</sup>
<b>240 V AC</b>			
Green pilot light with Green LED		D7P-P3-PN7G <sup>1)</sup>	D7M-P3-MN7G <sup>1)</sup>
Red pilot light with Red LED		D7P-P4-PN7R <sup>1)</sup>	D7M-P4-MN7R <sup>1)</sup>
Blue pilot light with Blue LED		D7P-P6-PN7B <sup>1)</sup>	D7M-P6-MN7B <sup>1)</sup>
Yellow pilot light with Yellow LED		D7P-P5-PN7Y <sup>1)</sup>	D7M-P5-MN7Y <sup>1)</sup>
Translucent pilot light with White LED		D7P-P7-PN7W <sup>1)</sup>	D7M-P7-MN7W <sup>1)</sup>

**Note:** <sup>1)</sup> Add suffix "bx" for special box/hang-sell packaging eg: D7P-LF3-PN3GX10bx.

### Emergency Stop Operators



Choice of “Auto Break”  
or Standard normally  
closed contacts

30, 40 or 60 mm  
Mushroom head









Extra security key  
release



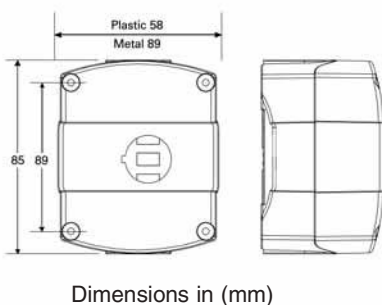
D7P-MT64-PX01S



D7M-MK44-MX01S

Description	Contact	Plastic Body Cat. No.	Metal Body Cat. No.
<b>Twist To Reset with Standard Contact Blocks</b>			
30 mm Operator		D7P-MT34-PX01 <sup>1)</sup>	D7M-MT34-MX01 <sup>1)</sup>
40 mm Operator		D7P-MT44-PX01 <sup>1)</sup>	D7M-MT44-MX01 <sup>1)</sup>
60 mm Operator		D7P-MT64-PX01 <sup>1)</sup>	D7M-MT64-MX01 <sup>1)</sup>
<b>Key To Reset with Standard Contact Blocks</b>			
40 mm Operator		D7P-MK44-PX01 <sup>1)</sup>	D7M-MK44-MX01 <sup>1)</sup>
<b>Twist To Reset with “Auto Break” Safety Contact Blocks</b>			
30 mm Operator		D7P-MT34-PX01S <sup>1)</sup>	D7M-MT34-MX01S <sup>1)</sup>
40 mm Operator		D7P-MT44-PX01S <sup>1)</sup>	D7M-MT44-MX01S <sup>1)</sup>
60 mm Operator		D7P-MT64-PX01S <sup>1)</sup>	D7M-MT64-MX01S <sup>1)</sup>
<b>Key To Reset with “Auto Break” Safety Contact Blocks</b>			
40 mm Operator		D7P-MK44-PX01S <sup>1)</sup>	D7M-MK44-MX01S <sup>1)</sup>

### Enclosed Emergency Stop Operators



Modern low profile  
enclosures

Supplied complete

20 mm metric cable entry





Plastic or Metal enclosures



D71YM1



D71MM1

Description	Contact	Cat. No.
<b>Plastic Enclosures with Emergency Stop “Twist To Reset” Operator</b>		
Yellow enclosure 40 mm plastic operator		D71YM1
<b>Plastic Enclosures with Emergency Stop “Twist Key To Reset” Operator</b>		
Yellow enclosure 40 mm plastic operator		D71Y4
<b>Metal Enclosures with Emergency Stop “Twist To Reset” Operator</b>		
Grey enclosure 40 mm metal operator		D71MM1
<b>Metal Enclosures with Emergency Stop “Twist Key To Reset” Operator</b>		
Grey enclosure 40 mm metal operator		D71MM4

**Note:** <sup>1)</sup> Add suffix “bx” for special box/hang-sell packaging eg: D7P-MT34-PX01bx.

## D7 22.5 mm CONTROL &amp; SIGNALLING PRODUCTS



Back of panel components for  
base or panel mounting  
Each component supplied  
separately

**D7-ALP / D7-ALM**

Contact block coupling plates

Time saving snap-on twist to release operation

Suitable for 3 contacts in one level

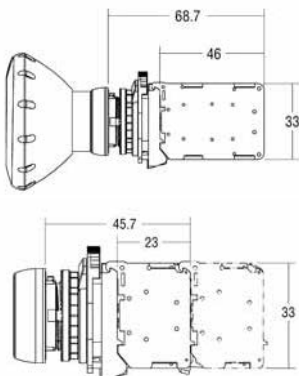
Available in metal or plastic

**Description****Cat. No.**

Plastic coupling plate

**D7-ALP**

Metal coupling plate

**D7-ALM**

Dimensions in (mm)

**D7-X / D7-Q  
D7-BX / D7-BQ**

Panel mount contact blocks

Base mount contact blocks

Option of screw or spring clamp termination

Self-cleaning operation for long life

Colour coded operators for easy identification

Small dimensions

Panel mount can be mounted to metal or plastic coupling plate



D7-X01S



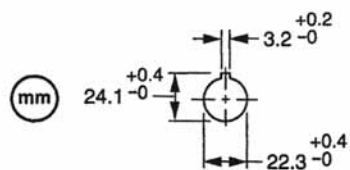
D7-X10V















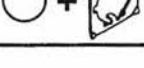

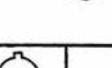
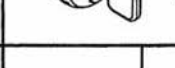

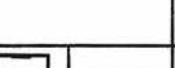






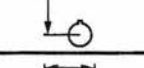
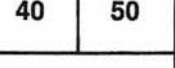
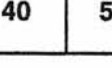
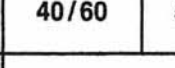
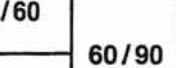
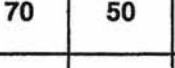
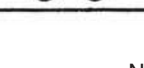
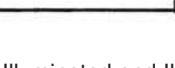
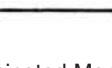
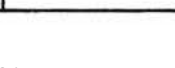
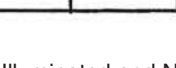
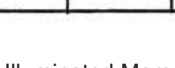
D7-BX01V

Description	Operator Colour	Panel Mount Cat. No.	Base Mount Cat. No.
Normally open contact block	Green	D7-X10	D7-B10
Normally closed contact block	Red	D7-X01	D7-B01
Normally open contact block with spring clamp terminals	Green	D7-Q10	D7-BQ10
Normally closed contact block with spring clamp terminals	Red	D7-Q01	D7-BQ01
Normally open early make	Green	D7-X10E	D7-BX10E
Normally closed late brake	Red	D7-X01L	D7-BX01L
Normally open low voltage (Quadfurcated gold contacts)	Blue	D7-X10V	D7-BX10V
Normally closed low voltage (Quadfurcated gold contacts)	Blue	D7-X01V	D7-BX01V
Dual circuit 2 normally open	Green	D7-X20D	N/A
Dual circuit 2 normally closed	Red	D7-X02D	N/A
Autobreak safety contact block for emergency stop operators	Yellow	D7-X01S	N/A

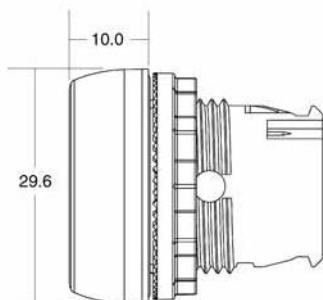
## Dimensions (mm) and panel hole spacing



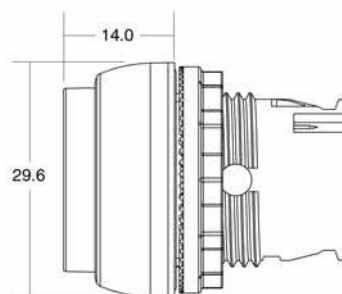
### Panel Hole Spacing

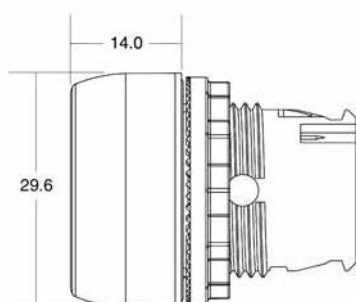
Non-Illuminated and Illuminated Momentary  
Flush pushbutton Operators



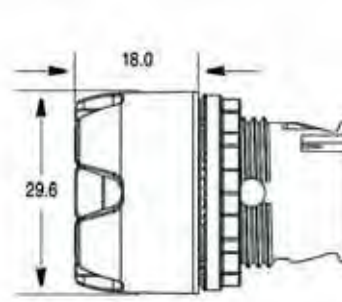
Illuminated and Non-Illuminated Momentary  
Extended pushbutton Operators



Non-Illuminated Guarded, Illuminated  
and Non-Illuminated Alternate Action  
pushbutton Operators

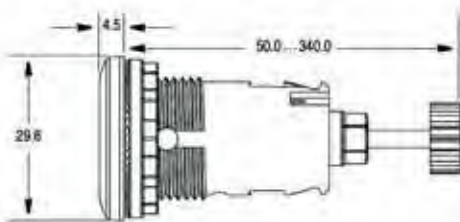


Illuminated Momentary Guarded  
pushbutton Operators

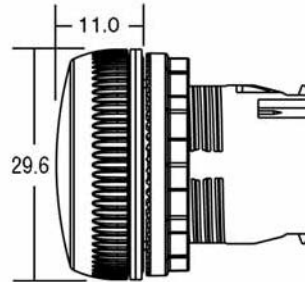
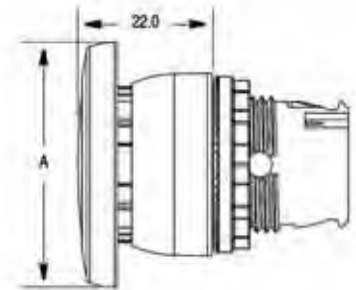
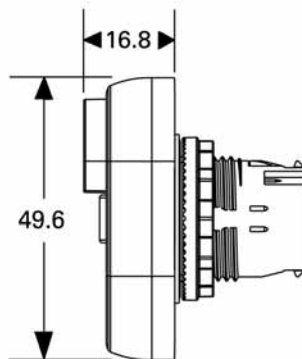
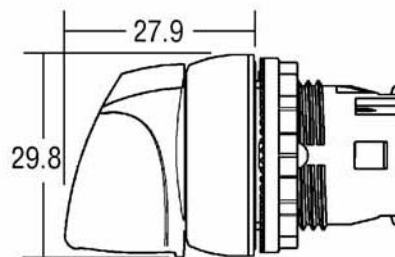
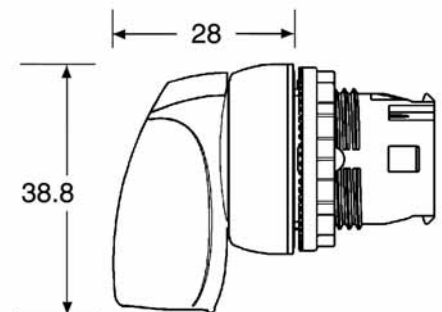
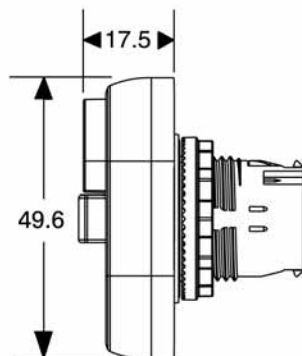
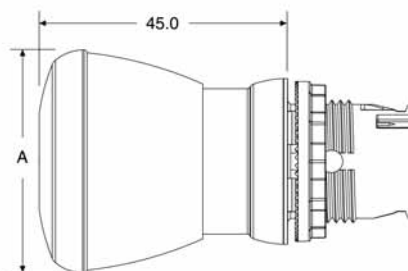
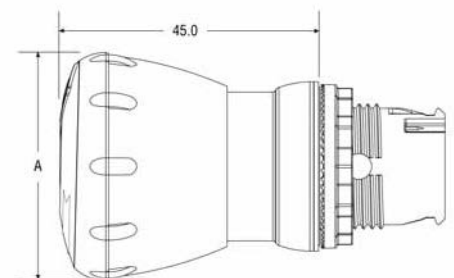


## Dimensions (mm)

Reset Operators with Reset Rod



Pilot Light Operators

Illuminated and Non-Illuminated  
Momentary Mushroom Operators  
40 mm and 60 mmIlluminated and Non-Illuminated  
2-Position Multi-Function OperatorsIlluminated and Non-Illuminated  
Knob Selector Switch and  
Potentiometer OperatorsNon-Illuminated Knob Lever  
Selector Switch OperatorsNon-Illuminated  
3-Position Multi-Function OperatorsIlluminated and Non-Illuminated  
Push-Pull Mushroom Operators  
30 mm, 40 mm and 60 mmIlluminated and Non-Illuminated  
Twist-to-Release Operators  
30 mm, 40 mm and 60 mm

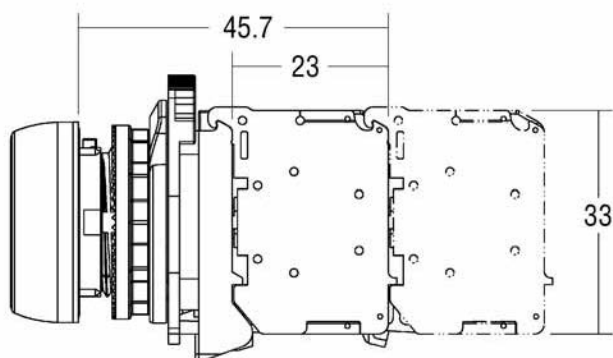
Operator	A
30 mm	30.0
40 mm	40.0
60 mm	60.0

Operator	A
30 mm	30.0
40 mm	40.0
60 mm	60.0

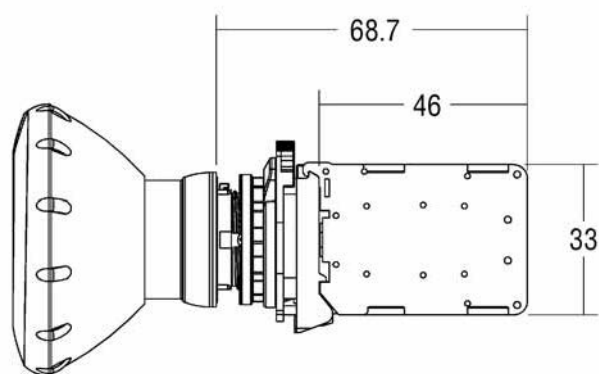


## Dimensions (mm)

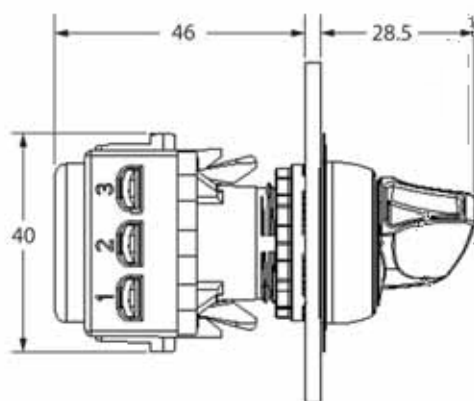
Back-of-Panel Components -  
Contact Cartridges with coupling plate



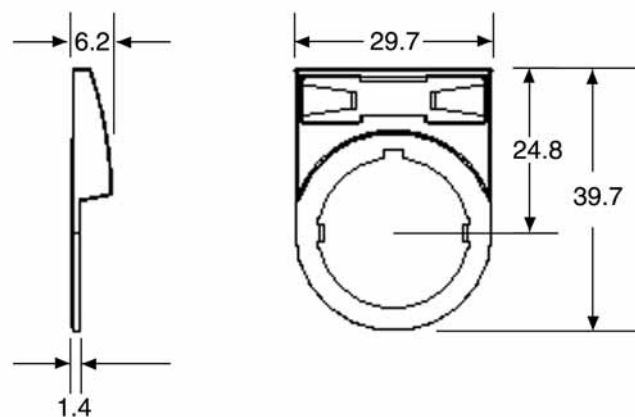
Back-of-Panel Components -  
Dual Circuit Contact Block or SMBC Contact Block  
(Max. of 1 Deep)



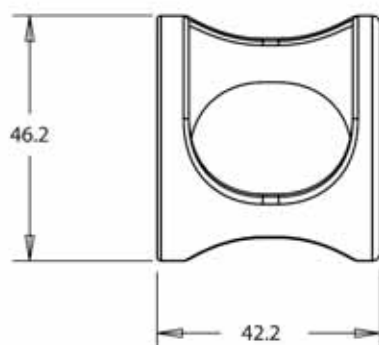
Potentiometer with Resistive Element



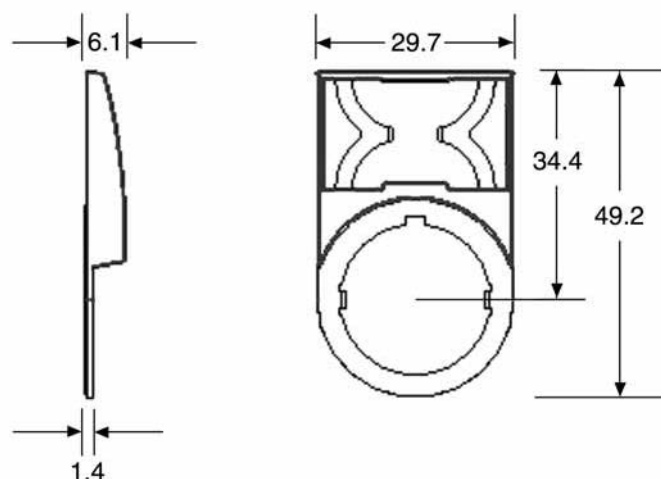
30 x 40 mm Snap-In Legend Plate



Protective Ring



30 x 50 mm Snap-In Legend Plate



## Product selection made easy

Until now, NHP has been easily recognisable by its logo **NHP**. However, we realise that, as a customer you need to locate the products and information most relevant to you quickly and easily. That's why we're phasing in our new product icons, to help you differentiate the product information you need amongst the clutter that is business today.

You may have already come across these icons, prominent on the front of our literature as new catalogues and flyers become available. These brightly coloured icons in an obvious location mean no longer will you have to worry about searching for product information amongst the mounds of promotional literature. No more flicking through pages of catalogues, wondering where the things you need might be. We've done the searching for you. Just look for the icon that suits your product needs.....your guide to save yourself time.....so that you can get back to your business.



When it comes to motor control, our product package is by far the most technically advanced and comprehensive. This includes the leading Sprecher+Schuh motor starting and protection products, well known for their reliability in service.



NHP offers an extensive range of power quality products to maintain and protect your power distribution network. All our products, from Terasaki circuit protection devices through to our load-break and switch-fuses, offer high levels of security and reliability.



Automation and communication systems are central to your productivity and efficiency. Our range consists of the world's best and proven products, from Hitachi drives to the technically advanced Adroit SCADA system.



Our control and switching range keeps the risk of human error to a minimum with pushbuttons, cam switches, pendant controllers, foot switches, relays and timers.



We are specialists in safety products and our vast range reflects that. From Schmersal safety switches through to Sunx light curtains, our safety and protection products enable you to provide and maintain 'Safety in the Workplace'. Our range also includes sirens, sounders and bells.



Our power quality range helps you to condition your power supply through power factor correction, surge protection and filtering, reducing your power consumption costs and saving you money while also protecting valuable equipment.



The NHP Ex Hazardous area equipment range helps you protect people and property in areas such as petro-chemical and grain handling. Products include Exde control equipment and Ex Lighting products.



If it's there, our sensing and detection products will see it, touch it, or find it. From beam sensors and magnetic reed switches to limit switches, we offer numerous variations of each sensor type.



When you need to know how high or low a level is, how much you have used or how long there is to go, NHP offers a vast series of measuring and display instruments, for panel, base or DIN rail mounting.

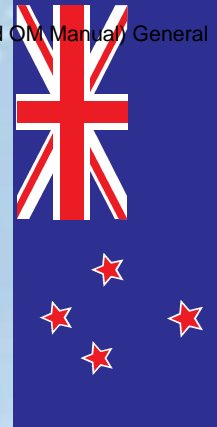
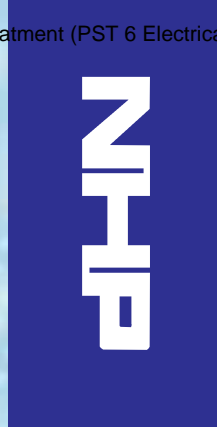
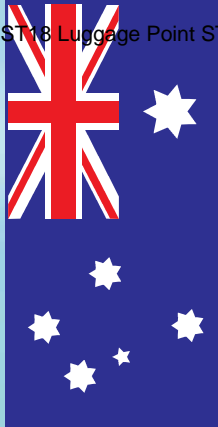


Our enclosures and termination products answer all your housing and cabling needs. The range includes insulated, weatherproof and stainless steel enclosures, slotted and solid cable duct and DIN rail mounting terminals.



These products are sold exclusively through electrical wholesaling outlets, and include such items as the BelMate conduit bell tool and the TestPro range of voltage and continuity testers.





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## 2.7 LINKS & TERMINALS

- Clipsal – L7– 7 Hole Link
- Clipsal – L16– 16 Hole Link
- Dore Electrics – 90E12 c/w E/N FEET– 12 Hole Bar
- Phoenix Contact – **(0712217) TCP2 + (3118203) UK6-FSI/C**  
– 2A Miniature Circuit Breaker + Terminal Base
- Phoenix Contact – **(0800307) UBE/D** – Terminal Group Marker
- Phoenix Contact – **(3030226 ) FBS-20-5** – Plug in Bridge
- Phoenix Contact – **(3030417) D-ST2,5** – Terminal End Plate
- Phoenix Contact – **(3036819) P-FU 5 x20 LED24** – Fuse Connector
- Phoenix Contact – **(3209510) PIT2,5** – Through Terminals
- Phoenix Contact – **(3210156) PIT2,5-MT** – Disconnect Terminal
- Phoenix Contact – **(3210198) PIT2,5 TWIN-TG**  
– Disconnect Terminal/Fuse Holder
- Phoenix Contact – **(3211003) D-PIT2,5-MT** – Terminal End Plate
- **5x20mm GLASS 500mA Fuses** – 500mA Fuses

## CLIPSAL NEUTRAL / ACTIVE / METER LINKS

Clipsal Links are produced from Impact Resistant materials to prevent cracking in transit or during installation.

The transparent covers enable you to check wiring and locate the sealing screw at a glance. The sealing screw (nylon with brass insert) resists stripping. Voltage and amperage ratings are clearly marked on both the cover and brass bar.

All links are available with black or red covers and bases for neutral, active or meter applications as required by local authorities.

### T-Type - 500 Volt 140 Ampere

#### L4T35

500V 140A 4 Hole Neutral Link with two screws per tunnel. Black base and cover.

#### L4T35R

500V 140A 4 Hole Active Link. Red base and cover.

Dimensions: 65 x 46 x 43mm.

Mounting centres: 28mm. 1 tunnel 8.7mm diameter accommodate 1 x 25mm<sup>2</sup> cable.

3 tunnels 7.7mm diameter accommodate 1 x 25mm<sup>2</sup> cable.

Certificate of Suitability No. CS2252N.



L4T35R

### Mini Links with Cover

#### 500V 100A

2 screws per tunnel.

#### L5

500V 100A 5 Hole Neutral Link with two screws per tunnel. Black base and cover.

#### L5R

500V 100A 5 Hole Active Link. Red base and cover.

Dimensions: 65 x 46 x 43mm.

Mounting centres: 46mm.

3 tunnels, 6.3mm diameter accommodate 1 x 16mm<sup>2</sup>.

2 tunnels, 5.8mm diameter accommodate 1 x 16mm<sup>2</sup>.

#### L5BW

500V 110A 5 Hole Back Wiring Neutral Link with two screws per tunnel. Black base and cover.

#### L5BWR

500V 110A 5 Hole Back Wiring Active Link. Red base and cover.

Dimensions: 65 x 46 x 43mm.

Mounting centres: 46mm.

5 tunnels, 7mm diameter accommodate 1 x 25mm<sup>2</sup>.

Transparent black cover, with cut outs.

#### L6

500V 100A 6 Hole Neutral Link with two screws per tunnel. Black base and cover.

#### L6R

500V 100A 6 Hole Active Link. Red base and cover.

Dimensions: 65 x 46 x 43mm.

Mounting centres: 46mm.

3 tunnels, 6.3mm diameter accommodate 1 x 16mm<sup>2</sup> cable.

3 tunnels, 5.8mm diameter accommodate 1 x 16mm<sup>2</sup> cable.

#### L6/25

500V 110A 6 Hole Neutral Link with 2 screws per tunnel. Black base and cover.

#### L6/25R

500V 110A 6 Hole Active Link. Red base and cover.

Dimensions: 65 x 46 x 43mm.

Mounting centres: 46mm.

2 tunnels, 7.5mm diameter accommodate 2 x 25mm<sup>2</sup> cable.

1 tunnel, 5.5mm diameter accommodates 1 x 16mm<sup>2</sup> cable.

3 tunnels, 4.7mm diameter accommodate 3 x 10mm<sup>2</sup> cable.

Transparent black cover with cut-outs.

#### L7

500V 100A 7 Hole Neutral Link with two screws per tunnel. Black base and cover.



L7

**L7R**

500V 100A 7 Hole Active Link.  
Red base and cover.

Dimensions: 65 x 46 x 43mm.  
Mounting centres: 46mm.  
3 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
4 tunnels, 5.8mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.

**L7BW**

500V 100A 7 Hole Back Wiring  
Neutral Link with two screws per  
tunnel. Black base and cover.

**L7BWR**

500V 100A 7 Hole Active Link.  
Red base and cover.

Dimensions: 65 x 46 x 43mm.  
Mounting centres: 46mm.  
2 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cables.  
5 tunnels, 5.8mm diameter  
accommodate 1 x 16mm<sup>2</sup> cables.  
Transparent black cover, with cut-outs.

**L8**

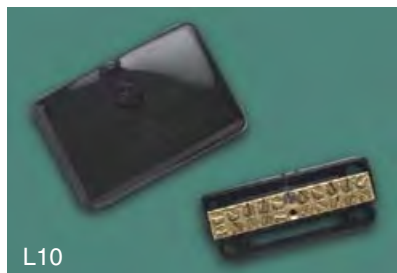
500V 100A 8 Hole Neutral Link with  
two screws per tunnel.  
Black base and cover.

Dimensions: 86 x 57 x 40mm.  
Mounting centres: 59 x 67mm.  
3 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
5 tunnels, 5.8mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
Transparent black cover with cut-outs.

**L10**

500V 100A 10 Hole Neutral Link with  
two screws per tunnel.

3 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
7 tunnels, 5.8mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
Dimensions: 86 x 57 x 40mm.



L10

**L10BW**

500V 100A 10 Hole Back Wiring  
Neutral Link with two screws per  
tunnel.

Dimensions: 86 x 57 x 40mm.

**L12**

500V 100A 12 Hole Neutral Link with  
two screws per tunnel.

2 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
4 tunnels, 5.5mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
6 tunnels, 4.5mm diameter  
accommodate 1 x 10mm<sup>2</sup> cable.  
Dimensions: 86 x 57 x 40mm.

**L14**

500V 100A 14 Hole Neutral Link  
with two screws in 8 tunnels and one  
screw in 6 tunnels.

2 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
6 tunnels, 5.5mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
6 tunnels, 4.5mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
Dimensions: 86 x 57 x 40mm.

**L16**

500V 100A 16 Hole Neutral Link  
with two screws in 6 tunnels and one  
screw in 10 tunnels.

2 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
4 tunnels, 5.5mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
10 tunnels, 4.5mm diameter  
accommodate 1 x 10mm<sup>2</sup> cable.  
Dimensions: 86 x 57 x 40mm.

**L18**

500V 100A 18 Hole Neutral Link  
with two screws in 6 tunnels and one  
screw in 12 tunnels.

2 tunnels, 6.3mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
4 tunnels, 5.5mm diameter  
accommodate 1 x 16mm<sup>2</sup> cable.  
12 tunnels, 4.5mm diameter  
accommodate 1 x 10mm<sup>2</sup> cable.  
Dimensions: 86 x 57 x 40mm.

**Tunnel Diameters**

Catalogue Number	4.7mm for 10mm <sup>2</sup> cable	6.3mm for 16mm <sup>2</sup> cable	5.7mm for 16mm <sup>2</sup> cable	7mm for 25mm <sup>2</sup> cable
L5	-	3	2	-
L5BW	-	-	-	5
L6	-	3	3	-
L6/25	3	-	1	2
L7	-	3	4	-
L7BW	-	2	5	-

**Tunnel Diameters**

Catalogue Number	6.3mm for 16mm <sup>2</sup> cable	5.5mm for 16mm <sup>2</sup> cable	4.5mm for 10mm <sup>2</sup> cable
L8	3	5	-
L10	3	7	-
L10BW	2	8	-
L12	2	4	6
L14	2	6	6
L16	2	4	10
L18	2	4	12

**TRADE PRICE LIST 2009 – 2010****Buzzers - IP44**

Part No.	Type	Dia.	dB	Price
BZ22R12AC/DC	Flashing-Red	22mm	80	\$26.62
BZ22R24AC/DC	Flashing-Red	22mm	80	\$26.62
BZ22R240	Flashing-Red	22mm	80	\$26.62
BZ30DC24	Flush	30mm	75	\$53.24
BZ30AC24	Flush	30mm	75	\$53.24
BZ30AC110	Flush	30mm	75	\$53.24
BZ30AC240	Flush	30mm	75	\$53.24
BZ80DC24	Flush	80mm	85	\$53.24
BZ80AC24	Flush	80mm	85	\$53.24
BZ80AC240	Flush	80mm	85	\$53.24
BZ82AC12	Surface	82mm	85	\$53.24
BZ82DC12	Surface	82mm	85	\$53.24
BZ82DC24	Surface	82mm	85	\$53.24
BZ82AC24	Surface	82mm	85	\$53.24
BZ82AC240	Surface	82mm	85	\$53.24

## SCHEDULE 1



BZ22



BZ30



BZ80



BZ82

**Sirens & Hooters - IP44**

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

## SCHEDULE 1

Siren



Hooter

**Earth & Neutral Bars – 165 Amp & 250 Amp**

## SCHEDULE 1

- Earth Links = 2 Main Screws for – 2 Screws per Tunnel for 16mm Cable.

**165 Amp Bars**

No. of Holes	Part No.	Price
6	165E6	\$8.53
12	165E12	\$10.45
18	165E18	\$13.43
24	165E24	\$18.76
30	165E30	\$23.69
36	165E36	\$28.88
42	165E42	\$30.94
48	165E48	\$33.00
54	165E54	\$42.49
60	165E60	\$45.38
72	165E72	\$50.88
80	165E80	\$54.18
84	165E84	\$54.18
96	165E96	\$75.35
108	165E108	\$96.25

**250 Amp Bars**

Part No.	Price
250E24	\$23.10
250E36	\$34.65
250E48	\$39.60
250E60	\$54.45
250E72	\$61.05
250E84	\$65.01
250E96	\$90.42



165E24



250E24

**Mounting Feet**

E/NFEET	Price Each
E/NFEET	\$1.42

**TRADE PRICE LIST 2009 – 2010**

## SCHEDULE 1

**Earth Links 90/140 Amp**

No. of Holes	Part No.	Price
6	90E6	\$7.70
12	90E12	\$13.65
18	90E18	\$19.36
24	90E24	\$23.23
36	90E36	\$30.49

**T Active/Neutral Enclosed Bars 135A**

	Part No.	Price
Black	135A4TB	\$14.63
Red	135A4TR	\$14.63



Enclosed "T" Bar

**Enclosed Active & Neutral Bars 100 Amp**

## • Clear Cover

Holes	Part Number	Price	Terminals	
5	100A5C	\$13.31	2 x 16mm	3 x 10mm
7	100A7C	\$14.64	3 x 16mm	4 x 10mm
9	100A9C	\$20.10	3 x 16mm	6 x 10mm
12	100A12C	\$22.99	2 x 25mm	10 x 10mm
13	100A13C	\$23.69	2 x 25mm	11 x 10mm

## SCHEDULE 1

**Enclosed Active & Neutral Heavy Duty Bars**

## SCHEDULE 1

**165Amp**

Red Active			Black Neutral		Terminals			
Holes	Part No.	Price	Part No.	Price				
7	165R7	\$41.62	165B7	\$41.62	2 x 50mm	1 x 35mm	2 x 25mm	2 x 16mm
13	165R13	\$54.64	165B13	\$54.64	2 x 50mm	9 x 25mm	2 x 16mm	

**350Amp**

Red Active			Black Neutral		Terminals			
Holes	Part No.	Price	Part No.	Price				
7	350R7	\$49.70	350B7	\$49.70	2 x 120mm	2 x 50mm	2 x 35mm	1 x 16mm
13	350R13	\$62.00	350B13	\$62.00	2 x 120mm	1 x 35mm	8 x 16mm	2 x 10mm

**Active, Earth & Neutral Links – 200, 400, 600 & 800Amps**

## SCHEDULE 1

- Main Stud for Incoming
- Main Stud for Bridging
- Two Holes for Direct or Bus Bar Mounting
- Multiple Size Outgoing Studs Numbered

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				

**Mounting Feet** - Fits all sizes up to 165 Amp

(For Active and Neutral Supports, use Stand off Insulators BBLV and NBB Series)

Part No.	Price Each
E/NFEET	\$1.42



## Thermal device circuit breaker - TCP 2A - 0712217

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Thermal miniature circuit breaker, pluggable in screw-type fuse terminal block UK 6-FSI/C and spring-cage fuse terminal block ST 4-FSI/C

### Product description

Thermal miniature circuit breaker, pluggable in screw-type fuse terminal block UK 6-FSI/C and spring-cage fuse terminal block ST 4-FSI/C

### Why buy this product

- ✓ A version with screw or spring-cage connection is used as a basic terminal block
- ✓ The redosable thermal circuit breaker is available in nine nominal current levels ranging from 0.25 to 10 A
- ✓ The integrated switching function enables immediate reclosure and therefore ensures the availability of the system
- ✓ Compact design



### Key commercial data

Packing unit	1
Minimum order quantity	20
Catalog page	Page 197 (TT-2011)
GTIN	 4 017918 848361
Weight per piece (including packing)	0.0 GRM
Weight per Piece (excluding packing)	11.62 GRM
Country of origin	INDONESIA

### Technical data

#### General

Note	When mounted in rows, the nominal device current can be limited to just 80% or must be oversized accordingly.
Color	black
Insulating material	PA
Inflammability class according to UL 94	V0

#### Dimensions

Width	8.2 mm
Length	24.5 mm

# Thermal device circuit breaker - TCP 2A - 0712217

## Technical data

### Dimensions

Height NS 35/7.5	55 mm
------------------	-------

### Technical data

Fuse	Slow-blow
Fuse type	Automatic device
Pollution degree	2
Nominal current IN	2 A
Nominal voltage UN	250 V AC
Nominal voltage UN	65 V DC
Switching capacity ICN	(6x IN for nominal currents 0.25 A to 4 A)
Switching capacity ICN	(8x IN for nominal currents 6 A to 10 A)
Ambient temperature (operation)	-20 °C ... 60 °C

## Classifications

### eClass

eClass 4.0	27141116
eClass 4.1	27141116
eClass 5.0	27141116
eClass 5.1	27141116
eClass 6.0	27141116

### etim

ETIM 2.0	EC000899
ETIM 3.0	EC000899
ETIM 4.0	EC000899

### unspsc

UNSPSC 6.01	30211812
UNSPSC 7.0901	39121411
UNSPSC 11	39121411
UNSPSC 12.01	39121411
UNSPSC 13.2	39121411

## Approvals

### Certificates

#### Certification

CSA / UL Recognized / VDE approval of drawings / cUL Recognized / GOST / cULus Recognized

#### Certification EX



# Thermal device circuit breaker - TCP 2A - 0712217

## Approvals

Certification submitted

### Approval details

CSA	
Nominal current IN	2 A
Nominal voltage UN	250 V

UL Recognized

VDE approval of drawings

cUL Recognized

GOST

cULus Recognized

## Accessories

Accessories

Marking

Flat zack marker sheet - ZBFM 5/WH:UNBEDRUCKT - 0803595

Flat zack marker sheet, Sheet, white, Unlabeled, Can be labeled with: Plotter, Mounting type: Snap into flat marker groove, P



Flat zack marker sheet - ZBFM 5/OG:UNBEDRUCKT - 0807180

Flat zack marker sheet, Sheet, orange, Unlabeled, Can be labeled with: Plotter, Mounting type: Snap into flat marker groove, P



## Thermal device circuit breaker - TCP 2A - 0712217

### Accessories

Flat zack marker sheet - ZBFM 5:SO/CMS - 0803647

Flat zack marker sheet, white, For terminal block width: 5.2 mm




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### Additional products

Fuse modular terminal block - UK 6-FSI/C - 3118203



Flat-t

I block, cross section: 0.2 - 6 mm<sup>2</sup>, AWG: 26 - 8, width: 8.2 mm, color: black

Fuse modular terminal block - ST 4-FSI/C - 3036372



Fuse terminal block for mounting on NS 35, for miniature circuit breakers, terminal width: 8,2 mm, color: Black

Fuse modular terminal block - ST 4-FSI/C-LED 24 - 3036505



Fuse terminal block with LED for mounting on NS 35, for miniature circuit breakers, terminal width: 8.2 mm, color: Black

Fuse modular terminal block - UK 6-FSI/C - 3118203



Flat-t fuse terminal block, cross section: 0.2 - 6 mm<sup>2</sup>, AWG: 26 - 8, width: 8.2 mm, color: black

## Thermal device circuit breaker - TCP 2A - 0712217

### Accessories

Fuse modular terminal block - UK 6-FSI/C-LED12 - 3001925



Flat-t fuse terminal block, cross section: 0.2 - 6 mm<sup>2</sup>, AWG: 26 - 8, width: 8.2 mm, color: black, with light indicator, voltage

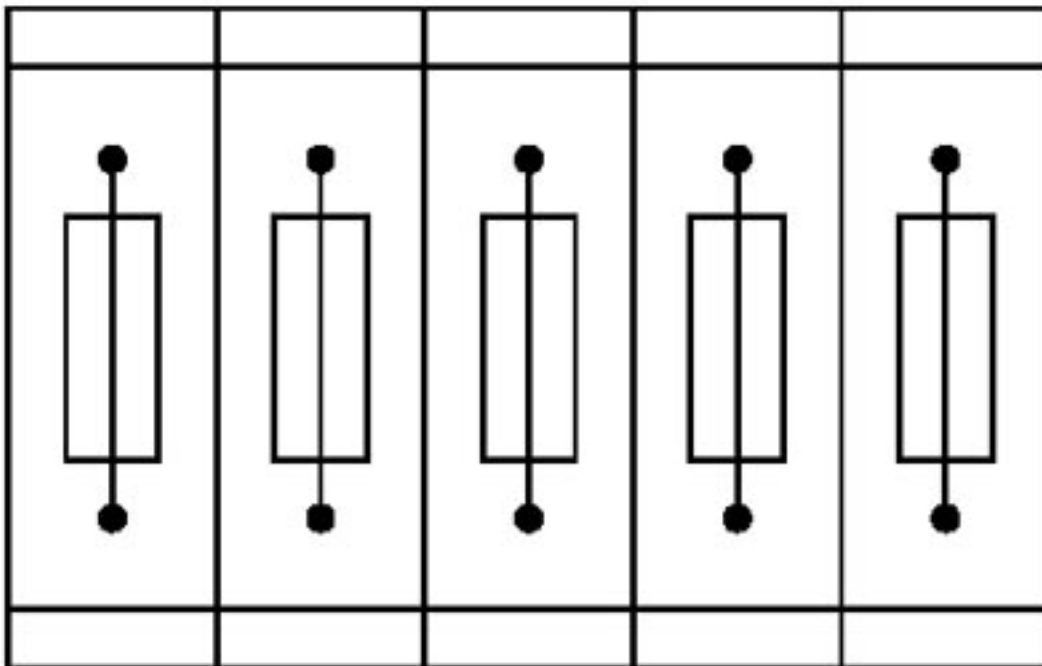
Fuse modular terminal block - UK 6-FSI/C-LED24 - 3001938



Flat-type fuse terminal block, cross section: 0.2 - 6 mm<sup>2</sup>, AWG: 26 - 8, width: 8.2 mm, color: black, with light indicator, voltage

### Drawings

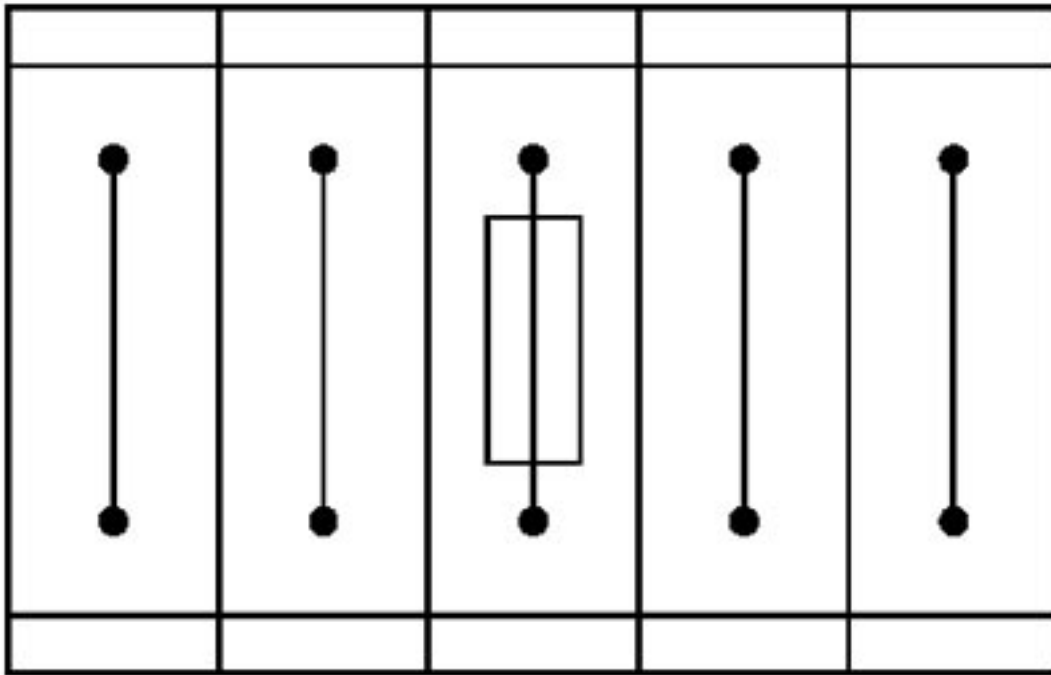
Application drawing



Fuse terminal blocks in interconnected arrangement,  
block consisting of 5 fuse terminal blocks

## Thermal device circuit breaker - TCP 2A - 0712217

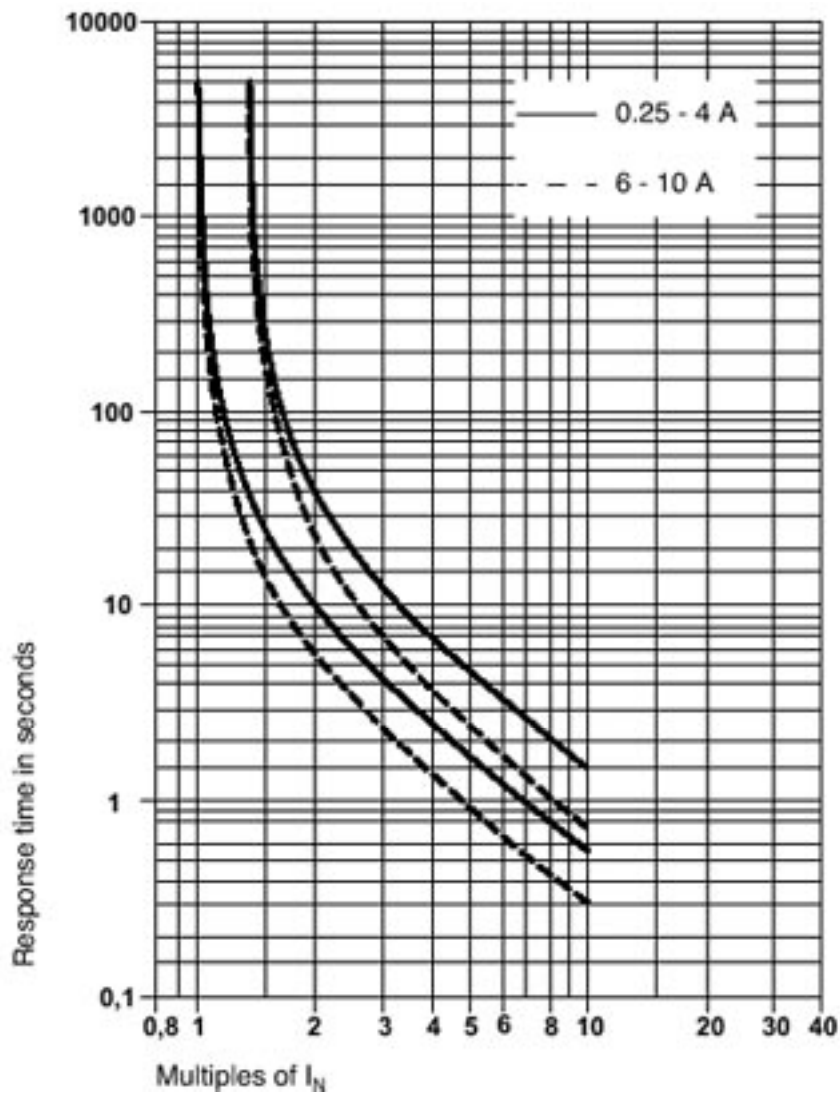
Application drawing



Fuse terminal block in single arrangement,  
block consisting of one fuse terminal block and 4 feed-through terminal  
blocks

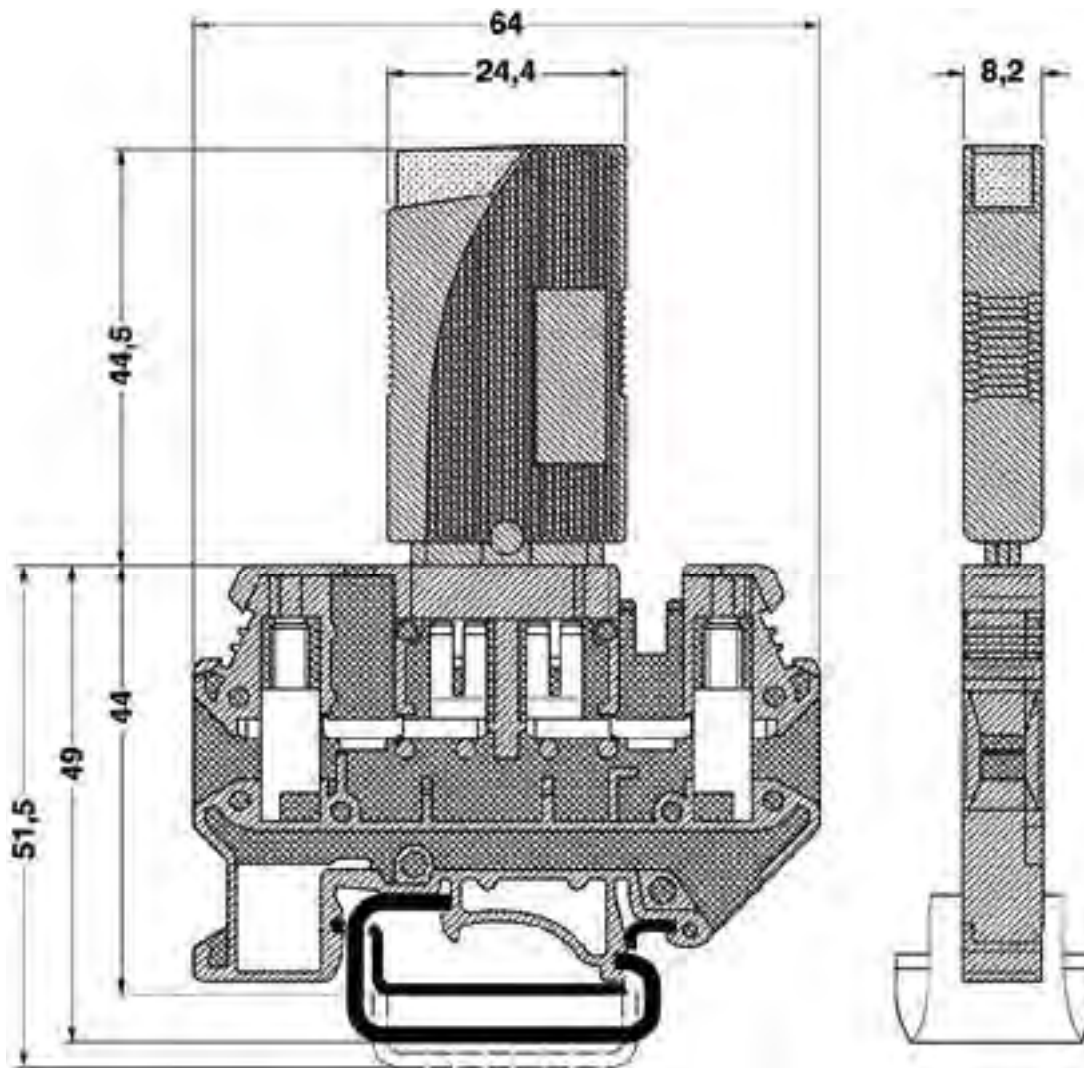
## Thermal device circuit breaker - TCP 2A - 0712217

Diagram



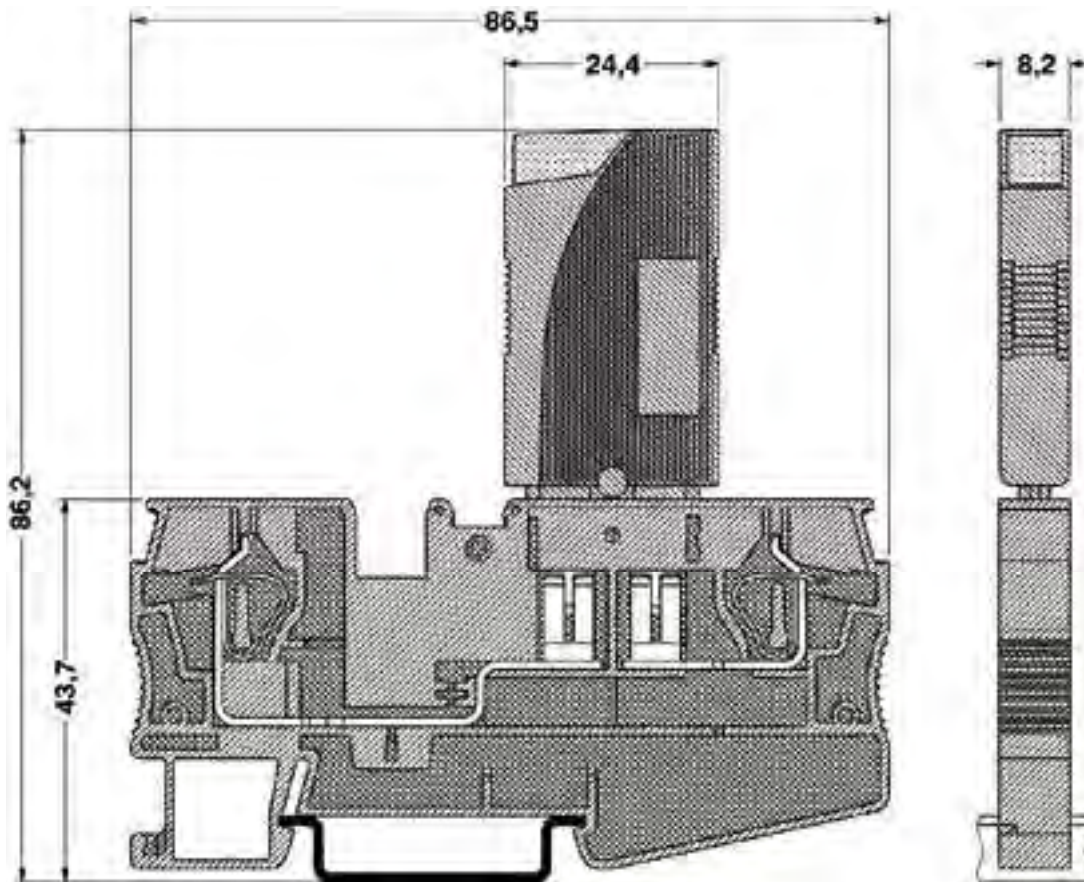
## Thermal device circuit breaker - TCP 2A - 0712217

Dimensioned drawing



## Thermal device circuit breaker - TCP 2A - 0712217

Dimensioned drawing



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## ► General data



Flat-type fuse terminal block, cross section: 0.2 - 6 mm,  
AWG: 26 - 8, width: 8.2 mm, color: black

Order number	3118203
Type	UK 6-FSI/C

Barcode number	4017918100605
Unit pack	50 Piece
Customs tariff	8536901000

## ► Technical data

### General

Number of levels	1
Number of connections	2
Color	black
Insulating material	PA
Inflammability class acc. to UL 94	V0

### Dimensions

Width	8.2 mm
Length	64 mm
Height NS 35:7,5	52 mm
Height NS 35:15	59.5 mm
Height NS 32	57 mm



**Technical data**

Fuse	C
Rated surge voltage	4 kV
Contamination class	3
Surge voltage category	III
Insulating material group	I
Connection in acc. with standard	IEC/ DIN VDE
Nominal voltage $U_N$	250 V
Maximum current with single arrangement	30 A (Special arrangements on request)

**Connection data**

Min. conductor cross section, rigid	0.2 mm <sup>2</sup>
Conductor cross section, rigid max.	10 mm <sup>2</sup>
Conductor cross section flexible min.	0.2 mm <sup>2</sup>
Max. conductor cross section, flexible	6 mm <sup>2</sup>
Min. conductor cross section AWG/kcmil	24
Conductor cross section AWG/kcmil max	8
Min. conductor cross section, flexible, with ferrule with plastic sleeve	0.25 mm <sup>2</sup>
Conductor cross section flexible, with ferrule without plastic sleeve max.	6 mm <sup>2</sup>
Conductor cross section flexible, with ferrule with plastic sleeve min.	0.25 mm <sup>2</sup>
Max. conductor cross section, flexible, with ferrule with plastic sleeve	4 mm <sup>2</sup>
2 conductors with same cross section, solid min.	0.2 mm <sup>2</sup>
2 conductors with same cross section, solid max.	2.5 mm <sup>2</sup>
2 conductors of the same cross section, flexible, min.	0.2 mm <sup>2</sup>
2 conductors with same cross section, flexible max.	2.5 mm <sup>2</sup>
2 conductors of the same cross section, flexible, with AEH without plastic sleeve, min.	0.25 mm <sup>2</sup>
2 conductors with identical cross section, flexible with AEH with plastic sleeve max.	2.5 mm <sup>2</sup>
2 conductors of the same cross section, flexible, with TWIN-AEH with plastic sleeve, min.	0.5 mm <sup>2</sup>
2 conductors with identical cross section, flexible with TWIN-AEH with plastic sleeve max.	4 mm <sup>2</sup>
Type of connection	Screw connection
Stripping length	10 mm
Screw thread	M 4
Tightening torque	1.5 Nm

## ► Certificates

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### CSA

Nominal voltage $U_N$	32 V
Nominal current $I_N$	30 A
AWG/kcmil	26- 8

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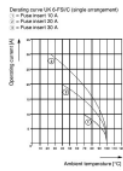
### UL

Nominal voltage $U_N$	300 V
Nominal current $I_N$	30 A
AWG/kcmil	26- 8

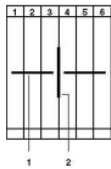
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## ► Drawings

### Diagram



### Circuit diagram



### Approval logo





## ► Accessories

Item	Designation	Description
<b>Assembly</b>		
3022218	CLIPFIX 35	Snap-on end bracket, for 35 mm NS 35/7.5 or NS 35/15 mounting rail, can be fitted with Zack strip ZB 8 and ZB 8/27, terminal strip marker KLM 2 and KLM, width: 9.5 mm, color: gray
1201442	E/UK	End clamp, for supporting the electronic base, if mounted vertically, 2 end clamps are required in each case
1201002	NS 32 GELOCHT METER	G-profile DIN rail, material: Steel, perforated, height 15 mm, width 32 mm, length 2 m
1201015	NS 32 UNGELOCHT METER	G-profile DIN rail, material: Steel, unperforated, height 15 mm, width 32 mm, length 2 m
1201028	NS 32-AL UNGELOCHT METER	G rail 32 mm (NS 32)
1201358	NS 32-CU/ 35 QMM UNGEL. METER	G-profile DIN rail, material: Copper, unperforated, height 15 mm, width 32 mm, length 2 m
1201280	NS 32-CU/120 QMM UNGEL. METER	G-profile DIN rail, deep-drawn, material: Copper, unperforated, height 15 mm, width 32 mm, length 2 m
0801733	NS 35/ 7,5 GELOCHT METER	DIN rail, material: Steel, perforated, height 7.5 mm, width 35 mm, length: 2 m
0801681	NS 35/ 7,5 UNGELOCHT METER	DIN rail, material: Steel, unperforated, height 7.5 mm, width 35 mm, length: 2 m
0801762	NS 35/ 7,5-CU UNGELOCHT METER	DIN rail, material: Copper, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1201730	NS 35/15 GELOCHT METER	DIN rail, material: Steel, perforated, height 15 mm, width 35 mm, length: 2 m
1201714	NS 35/15 UNGELOCHT METER	DIN rail, material: Steel, unperforated, height 15 mm, width 35 mm, length: 2 m
1201798	NS 35/15-2,3 UNGELOCHT METER	DIN rail, material: Steel, unperforated, 2.3 mm thick, height 15 mm, width 35 mm, length: 2 m
1201756	NS 35/15-AL UNGELOCHT METER	DIN rail, deep-drawn, high profile, unperforated, 1.5 mm thick, material: Aluminum, height 15 mm, width 35 mm, length 2 m
1201895	NS 35/15-CU UNGELOCHT METER	DIN rail, material: Copper, unperforated, 1.5 mm thick, height 15 mm, width 35 mm, length: 2 m
2770215	TS-KK 3	Separating plate, color: gray
<b>Bridges</b>		
0200020	FBI 2- 8	Fixed bridge, 2-pos.
0200059	FBI 3- 8	Fixed bridge, for cross connections, with screws, screw heads without insulation, 3-pos.
0200046	FBI 4- 8	Fixed bridge, for cross connections, with screws, screw heads without insulation, 4-pos.
0203263	FBI 10- 8	Fixed bridge, 10-pos., screw heads with insulating collar, divisible, with screws
<b>Marking</b>		
1007235	SBS 8:UNBEDRUCKT	Marker cards for modular terminal blocks, color: white
1050512	ZB 8:SO/CMS	Zack strip, 10-section, divisible, special printing, marking according to customer requirements

## Marker carriers - UBE/D - 0800307

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Terminal strip marker carriers for marking terminal group, f  
NS 35/7.5, lettering field size: 40 x 17 mm

ting on the terminal strip NS 32 or

### Key commercial data

Packing unit	1
Minimum order quantity	10
Catalog page	Page 347 (CL2-2011)
GTIN	 4 017918 005900
Custom tariff number	39269097
Country of origin	GERMANY

### Technical data

#### General

Length (b)	42.5 mm
Height	51.5 mm
Width (a)	20 mm
Color	gray
Inflammability class according to UL 94	V2
Ambient temperature (operation)	-40 °C ... 100 °C
Components	free from silicone and halogen
Material	PA

### Classifications

#### eclass

eCl@ss 4.0	24190208
eCl@ss 4.1	24190208
eCl@ss 5.0	27149103
eCl@ss 5.1	27149103
eCl@ss 6.0	27141137
eCl@ss 7.0	27141137

## Marker carriers - UBE/D - 0800307

### Classifications

etim

ETIM 2.0	EC000761
ETIM 3.0	EC000761
ETIM 4.0	EC000761

unspsc

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121410
UNSPSC 11	39121410
UNSPSC 12.01	39121410
UNSPSC 13.2	39121410

### Accessories

Accessories

Marking

Insert strip - ESL 40X17 - 0808095



Insert strip, Sheet, white, Unlabeled, Can be labeled with: Office-Drucksysteme, Plotter, Perforated,  
Mounting type: Insert, Lettering field: 40 x 17 mm



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## FBS 20-5

Order No.: 3030226



<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3030226>

Cross connector/bridge, Number of positions: 20, Color: red

### Commercial data

EAN	4017918188559
Pack	10 pcs.
Customs tariff	85389099
Weight/Piece	0.01779 KG
Catalog page information	Page 330 (CL-2009)

### Product notes

WEEE/RoHS-compliant since:  
01/01/2003



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## D-ST 2,5

Order No.: 3030417



<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3030417>

End cover, Length: 48.5 mm, Width: 2.2 mm, Height: 36.5 mm,  
Color: gray

### Commercial data

EAN	4017918188047
Pack	50 pcs.
Customs tariff	85389099
Weight/Piece	0.001986 KG
Catalog page information	Page 74 (CL-2007)

### Product notes

WEEE/RoHS-compliant since:  
01/01/2003



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## Fuse plug - P-FU 5X20 LED 24 - 3036819

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Fuse plug with LED for 12 - 30 V DC, 0.31 - 0.95 mA, width 6.2 mm, color black

The illustration shows the version without light indicator

### Why buy this product

- ☒ Large-surface labeling option
- ☒ Test contacts on both sides of the fuse
- ☒ Versions with bipolar defect indicator
- ☒ Can be used for overload/short-circuit protection



### Key commercial data

Packing unit	1
Minimum order quantity	10
Catalog page	Page 399 (CL1-2011)
GTIN	 4 017918 943905
Custom tariff number	85366990
Country of origin	POLAND

### Technical data

Product type	Fuse
Approval	CSA
Nominal current I <sub>N</sub>	0.00095 A

### Classifications

#### eclass

eCl@ss 4.0	27141199
eCl@ss 4.1	27141199
eCl@ss 5.0	27141145
eCl@ss 5.1	27141145

# Fuse plug - P-FU 5X20 LED 24 - 3036819

## Classifications

### eclass

eCl@ss 6.0	27141120
eCl@ss 7.0	27141120

### etim

ETIM 2.0	EC000897
ETIM 3.0	EC000897
ETIM 4.0	EC000899

### unspsc

UNSPSC 6.01	30211811
UNSPSC 7.0901	39121409
UNSPSC 11	39121409
UNSPSC 12.01	39121409
UNSPSC 13.2	39121409

## Approvals

### Approvals


Approvals

CSA

Ex Approvals

Approvals submitted

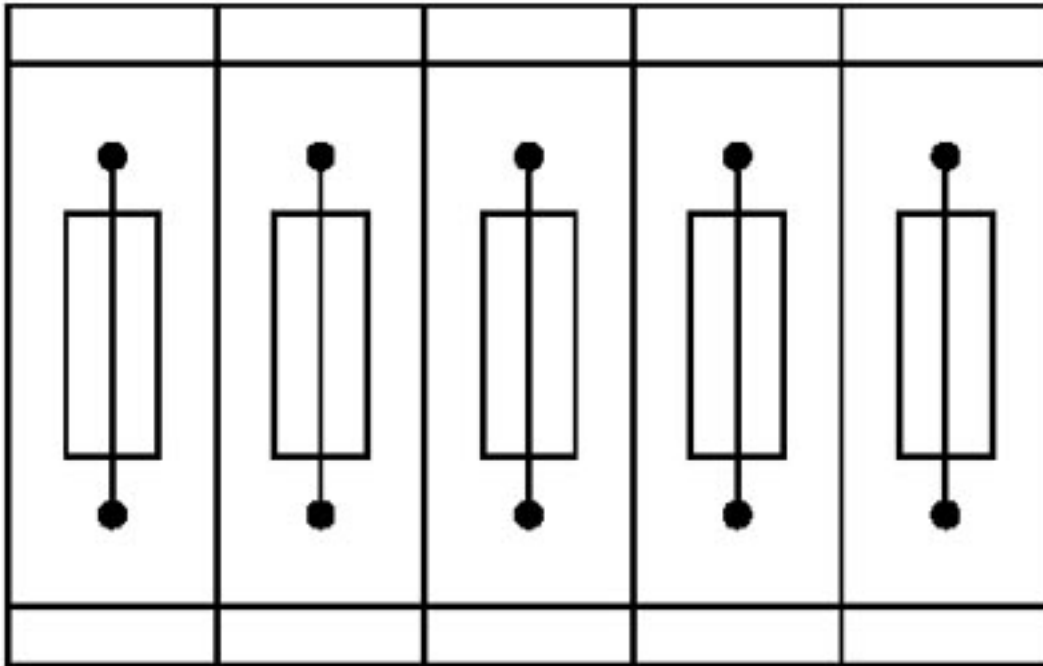
### Approval details

	
Nominal current I <sub>N</sub>	10 A
Nominal voltage U <sub>N</sub>	24 V

## Drawings

## Fuse plug - P-FU 5X20 LED 24 - 3036819

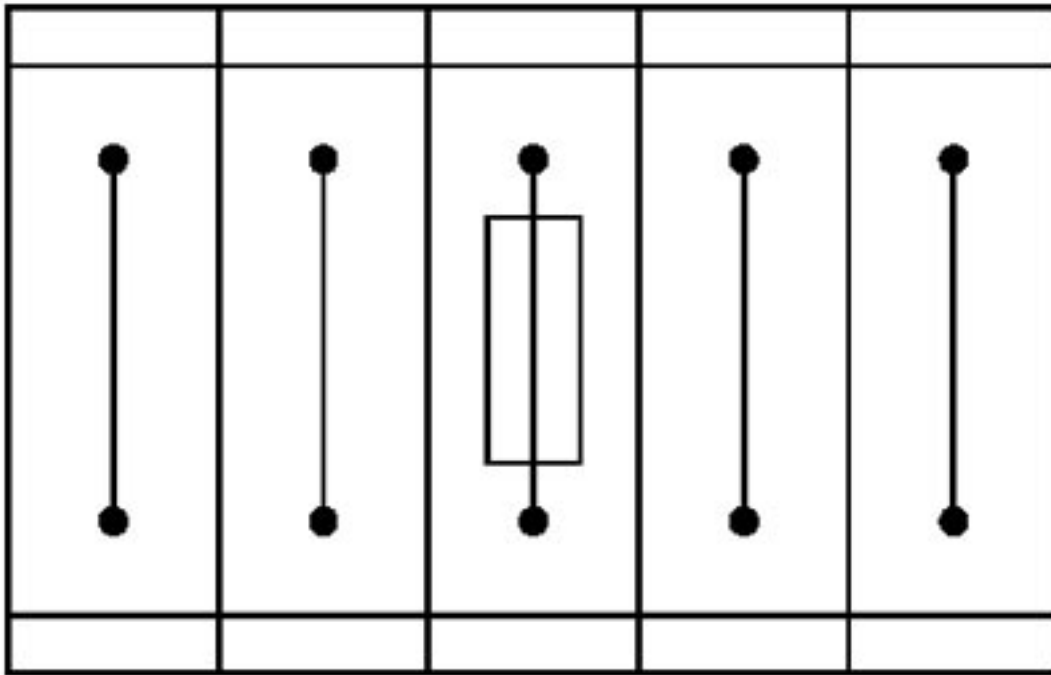
Application drawing



Fuse terminal blocks in interconnected arrangement,  
block consisting of 5 fuse terminal blocks

## Fuse plug - P-FU 5X20 LED 24 - 3036819

Application drawing



Fuse terminal block in single arrangement,  
block consisting of one fuse terminal block and 4 feed-through terminal  
blocks

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## PIT 2,5

Order No.: 3209510



<http://eshop.phoenixcontact.no/phoenix/treeViewClick.do?UID=3209510>

Feed-through modular terminal block, Type of connection: Leg spring connection, Leg spring connection, Cross section: 0.14 mm<sup>2</sup> - 4 mm<sup>2</sup>, A - 12, Width: 5.2 mm, Color: gray, Mounting type: NS 35/7,5, NS 35/15

### Commercial data

EAN	4046356329781
Electrical Number	1264906
Pack	50
Customs tariff	85369010
country of origin	DE
Catalog page information	Page 180 (CL-2009)

### Product notes

WEEE/RoHS-compliant since:  
06.04.2009



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### Technical data

#### General

Number of levels	1
Number of connections	2
Color	gray

**PIT 2,5** Order No.: 3209510
<http://eshop.phoenixcontact.no/phoenix/treeViewClick.do?UID=3209510>

Insulating material	PA
Inflammability class acc. to UL 94	V0

**Dimensions**

Width	5.2 mm
Length	48.5 mm
Height NS 35/7,5	36.5 mm
Height NS 35/15	44 mm

**Technical data**

Rated surge voltage	8 kV
Surge voltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-1
Nominal current $I_N$	24 A (For 2.5 mm <sup>2</sup> )
Nominal voltage $U_N$	800 V
Open side panel	ja

**Connection data**

Conductor cross section solid min.	0.14 mm <sup>2</sup>
Conductor cross section solid max.	4 mm <sup>2</sup>
Conductor cross section stranded min.	0.14 mm <sup>2</sup>
Conductor cross section stranded max.	2.5 mm <sup>2</sup>
Conductor cross section AWG/kcmil min.	26
Conductor cross section AWG/kcmil max	12
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.14 mm <sup>2</sup>
Conductor cross section stranded, with ferrule without plastic sleeve max.	2.5 mm <sup>2</sup>
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.14 mm <sup>2</sup>
Conductor cross section stranded, with ferrule with plastic sleeve max.	2.5 mm <sup>2</sup>
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	0.5 mm <sup>2</sup>
Type of connection	Leg spring connection
Stripping length	10 mm
Internal cylindrical gage	A3

PIT 2,5 Order No.: 3209510

<http://eshop.phoenixcontact.no/phoenix/treeViewClick.do?UID=3209510>**Certificates / Approvals**

Certification

CUL, UL

**CSA**

Nominal voltage $U_N$	600 V
Nominal current $I_N$	20 A
AWG/kcmil	24-12

**CUL**

Nominal voltage $U_N$	600 V
Nominal current $I_N$	20 A
AWG/kcmil	24-12

**UL**

Nominal voltage $U_N$	600 V
Nominal current $I_N$	20 A
AWG/kcmil	24-12

**Accessories**

Item	Designation	Description
<b>Assembly</b>		
3030721	ATP-ST 4	Partition plate, Length: 61 mm, Width: 2 mm, Height: 42 mm, Color: gray
3022276	CLIPFIX 35-5	Snap-on end bracket, for NS 35/7.5 or NS 35/15 DIN rail, can be fitted with Zack strip ZB 5 and ZBF 5, terminal strip marker KLM 2 and KLM, parking facility for FBS...5, FBS...6, KSS 5, KSS 6, width: 5,15 mm, color: gray
3036725	DP PS-5	Spacer plate, Color: red
3030417	D-ST 2,5	End cover, Length: 48.5 mm, Width: 2.2 mm, Height: 36.5 mm, Color: gray
0801704	NS 35/ 7,5 AL UTEN HULL 2M	DIN rail, material: Aluminum, unperforated, height 7.5 mm, width 35 mm, length: 2 m
0801762	NS 35/ 7,5 CU UTEN HULL 2M	DIN rail, material: Copper, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1208131	NS 35/ 7,5 HULLET/...	DIN rail, Color: silver

**PIT 2,5** Order No.: 3209510
<http://eshop.phoenixcontact.no/phoenix/treeViewClick.do?UID=3209510>

1207640	NS 35/ 7,5 HULLET 755MM	NS 35 DIN rail, height 7.5 mm, length 755 mm
1207666	NS 35/ 7,5 HULLET 1155MM	NS 35 DIN rail, height 7.5 mm, length 1155 mm
0801733	NS 35/ 7,5 HULLET 2M	DIN rail, material: Steel, galvanized and passivated with a thick layer, perforated, height 7.5 mm, width 35 mm, length: 2 m
1207653	NS 35/ 7,5 HULLET 955MM	NS35 DIN rail, height 7.5 mm, length 955 mm
1208115	NS 35/ 7,5 UTEN HULL/...	DIN rail, Color: silver
0801681	NS 35/ 7,5 UTEN HULL 2M	DIN rail, material: Steel, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1208128	NS 35/ 7,5 UTEN HULL/SO/...	DIN rail, Color: silver
0801377	NS 35/ 7,5 V2A UTEN HULL 2M	DIN rail, Width: 35 mm, Height: 7.5 mm, Length: 2000 mm, Color: silver
1206421	NS 35/ 7,5 ZN HULLET 2M	DIN rail, material: Galvanized, perforated, height 7.5 mm, width 35 mm, length: 2 m
1206434	NS 35/ 7,5 ZN UTEN HULL 2M	DIN rail, material: Galvanized, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1201895	NS 35/15 CU UTEN HULL 2M	DIN rail, material: Copper, unperforated, 1.5 mm thick, height 15 mm, width 35 mm, length: 2 m
1201730	NS 35/15 HULLET 2M	DIN rail, material: Steel, perforated, height 15 mm, width 35 mm, length: 2 m
1208144	NS 35/15 UTEN HULL/...	DIN rail, Color: silver
1201714	NS 35/15 UTEN HULL 2M	DIN rail, material: Steel, unperforated, height 15 mm, width 35 mm, length: 2 m
1208157	NS 35/15 UTEN HULL/SO/...	DIN rail, Color: silver
1206586	NS 35/15 ZN UTEN HULL 2M	DIN rail, material: Galvanized, unperforated, height 15 mm, width 35 mm, length: 2 m
3038943	RB ST (2,5/4)-1,5	Reducing bridge, Number of positions: 2, Color: red

**Bridges**

3030161	FBS 2-5	Plug-in bridge, Number of positions: 2, Color: red
3030174	FBS 3-5	Plug-in bridge, Number of positions: 3, Color: red
3030187	FBS 4-5	Plug-in bridge, Number of positions: 4, Color: red
3030190	FBS 5-5	Plug-in bridge, Number of positions: 5, Color: red
3030213	FBS 10-5	Plug-in bridge, Number of positions: 10, Color: red
3030226	FBS 20-5	Plug-in bridge, Number of positions: 20, Color: red
3038930	FBS 50-5	Plug-in bridge, Number of positions: 50, Color: red

**General**

0810588	GBS 5-25X12	Group marker label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with a 25 x 12 mm label or manually with the B-STIFT, in the foot part with ZB 5
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PIT 2,5 Order No.: 3209510

<http://eshop.phoenixcontact.no/phoenix/treeViewClick.do?UID=3209510>

0809298	GBS-ZB/26X6	Group marking label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with ESL 26x6 mm or EST 25x6 mm, in the foot part with Zack marker strip, length: 29 mm
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**Marking**

0818108	UC-TM 5	UniCard sheets, for labeling terminal blocks using Zack marker strip groove, 96-section, labeling with BLUEMARK X1 and CMS-P1-PLOTTER, color: White
0824581	UC-TM 5 CUS	UniCard sheets, for labeling terminal blocks with a zack marker strip groove, can be printed as per customer requirements
0819796	UC-TMF 5L	UniCard sheets, for labeling terminal blocks using a flat Zack marker strip groove, 192-section, can be labeled with CMS-P1-PLOTTER, color: White

**Plug/Adapter**

3002843	ISH 2,5/0,2	Insulation stop sleeve, Color: white
3002856	ISH 2,5/0,5	Insulation stop sleeve, Color: gray
3002869	ISH 2,5/1,0	Insulation stop sleeve, Color: black
0201731	MPS-IH BK	Insulating sleeve, Color: black
0201689	MPS-IH BU	Insulating sleeve, Color: blue
0201702	MPS-IH GN	Insulating sleeve, Color: green
0201728	MPS-IH GY	Insulating sleeve, Color: gray
0201676	MPS-IH RD	Insulating sleeve, Color: red
0201715	MPS-IH VT	Insulating sleeve, Color: violet
0201663	MPS-IH WH	Insulating sleeve, Color: white
0201692	MPS-IH YE	Insulating sleeve, Color: yellow
0201744	MPS-MT	Metal part
3030925	PAI-4	Test adapter, Color: gray
3030983	PS-5	Test adapter, Color: red

**Tools**

1204517	SZF 1-0,6X3,5	Screwdriver, blade: 0.6 x 3.5 x 100 mm, length 180 mm
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**Diagrams/Drawings**

Circuit diagram

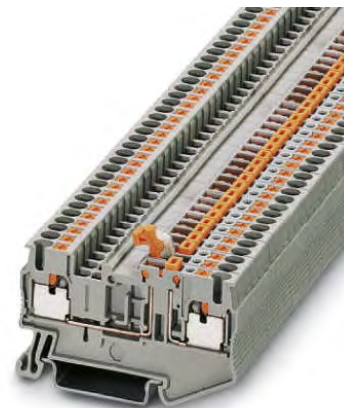




Extract from the online  
catalog

## PIT 2,5-MT

Order No.: 3210156



<http://eshop.phoenixcontact.no/phoenix/treeViewClick.do?UID=3210156>

Disconnect and test disconnect terminal block, Connection type: Leg spring connection, Cross section: 0.14 mm<sup>2</sup> - 4 mm<sup>2</sup>, AWG: 26 - 12, Nominal current: 20 A, Nominal voltage: 400 V, Length: 62 mm, Width: 5.2 mm, Color: gray, Assembly: NS 35/7,5, NS 35/15

### Commercial data

EAN	4046356333597
Electrical Number	1264914
Pack	50
Customs tariff	85369010
countr	PL
Catalog page information	Page 192 (CL-2009)

### Product notes

WEEE/RoHS-compliant since:  
27.04.2009



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### Technical data

#### General

Number of levels	1
Number of connections	2
Color	gray

**PIT 2,5-MT** Order No.: 3210156
<http://eshop.phoenixcontact.no/phoenix/treeViewClick.do?UID=3210156>

Insulating material	PA
Inflammability class acc. to UL 94	V0

**Dimensions**

Width	5.2 mm
Length	62 mm
Height NS 35/7,5	36.5 mm
Height NS 35/15	44 mm

**Technical data**

Rated surge voltage	6 kV
Pollution degree	3
Surge voltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-1
Nominal current $I_N$	20 A (the maximum load current must not be exceeded by the total current of all connected conductors)
Nominal voltage $U_N$	400 V
Open side panel	ja

**Connection data**

Conductor cross section solid min.	0.14 mm <sup>2</sup>
Conductor cross section solid max.	4 mm <sup>2</sup>
Conductor cross section stranded min.	0.14 mm <sup>2</sup>
Conductor cross section stranded max.	2.5 mm <sup>2</sup>
Conductor cross section AWG/kcmil min.	26
Conductor cross section AWG/kcmil max	12
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.14 mm <sup>2</sup>
Conductor cross section stranded, with ferrule without plastic sleeve max.	2.5 mm <sup>2</sup>
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.14 mm <sup>2</sup>
Conductor cross section stranded, with ferrule with plastic sleeve max.	2.5 mm <sup>2</sup>
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	0.5 mm <sup>2</sup>
Type of connection	Leg spring connection
Stripping length	10 mm

PIT 2,5-MT Order No.: 3210156

<http://eshop.phoenixcontact.no/phoenix/treeViewClick.do?UID=3210156>

Internal cylindrical gage	A3
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**Certificates / Approvals**

Certification GL

**CUL**

Nominal voltage $U_N$	300 V
Nominal current $I_N$	20 A
AWG/kcmil	24-12

**UL**

Nominal voltage $U_N$	300 V
Nominal current $I_N$	20 A
AWG/kcmil	24-12

**Accessories**

Item	Designation	Description
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**Assembly**

3030789	A -ST-TWIN	Partition plate, Length: 76.6 mm, Width: 2 mm, Height: 45 mm, Color: gray
3022276	CLIPFIX 35-5	Snap-on end bracket, for NS 35/7.5 or NS 35/15 DIN rail, can be fitted with Zack strip ZB 5 and ZBF 5, terminal strip marker KLM 2 and KLM, parking facility for FBS...5, FBS...6, KSS 5, KSS 6, width: 5,15 mm, color: gray
3036725	DP PS-5	Spacer plate, Color: red
3036602	DS-ST 2,5	Cover segment, Length: 72 mm, Height: 36.5 mm, Color: gray
0801704	NS 35/ 7,5 AL UTEN HULL 2M	DIN rail, material: Aluminum, unperforated, height 7.5 mm, width 35 mm, length: 2 m
0801762	NS 35/ 7,5 CU UTEN HULL 2M	DIN rail, material: Copper, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1208131	NS 35/ 7,5 HULLET/...	DIN rail, Color: silver
1207640	NS 35/ 7,5 HULLET 755MM	NS 35 DIN rail, height 7.5 mm, length 755 mm
1207666	NS 35/ 7,5 HULLET 1155MM	NS 35 DIN rail, height 7.5 mm, length 1155 mm
0801733	NS 35/ 7,5 HULLET 2M	DIN rail, material: Steel, galvanized and passivated with a thick layer, perforated, height 7.5 mm, width 35 mm, length: 2 m

**PIT 2,5-MT** Order No.: 3210156
<http://eshop.phoenixcontact.no/phoenix/treeViewClick.do?UID=3210156>

1207653	NS 35/ 7,5 HULLET 955MM	NS35 DIN rail, height 7.5 mm, length 955 mm
1208115	NS 35/ 7,5 UTEN HULL/...	DIN rail, Color: silver
0801681	NS 35/ 7,5 UTEN HULL 2M	DIN rail, material: Steel, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1208128	NS 35/ 7,5 UTEN HULL/SO/...	DIN rail, Color: silver
0801377	NS 35/ 7,5 V2A UTEN HULL 2M	DIN rail, Width: 35 mm, Height: 7.5 mm, Length: 2000 mm, Color: silver
1206421	NS 35/ 7,5 ZN HULLET 2M	DIN rail, material: Galvanized, perforated, height 7.5 mm, width 35 mm, length: 2 m
1206434	NS 35/ 7,5 ZN UTEN HULL 2M	DIN rail, material: Galvanized, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1201895	NS 35/15 CU UTEN HULL 2M	DIN rail, material: Copper, unperforated, 1.5 mm thick, height 15 mm, width 35 mm, length: 2 m
1201730	NS 35/15 HULLET 2M	DIN rail, material: Steel, perforated, height 15 mm, width 35 mm, length: 2 m
1208144	NS 35/15 UTEN HULL/...	DIN rail, Color: silver
1201714	NS 35/15 UTEN HULL 2M	DIN rail, material: Steel, unperforated, height 15 mm, width 35 mm, length: 2 m
1208157	NS 35/15 UTEN HULL/SO/...	DIN rail, Color: silver
1206586	NS 35/15 ZN UTEN HULL 2M	DIN rail, material: Galvanized, unperforated, height 15 mm, width 35 mm, length: 2 m
3038943	RB ST (2,5/4)-1,5	Reducing bridge, Number of positions: 2, Color: red

**Bridges**

3030161	FBS 2-5	Plug-in bridge, Number of positions: 2, Color: red
3030174	FBS 3-5	Plug-in bridge, Number of positions: 3, Color: red
3030187	FBS 4-5	Plug-in bridge, Number of positions: 4, Color: red
3030190	FBS 5-5	Plug-in bridge, Number of positions: 5, Color: red
3030213	FBS 10-5	Plug-in bridge, Number of positions: 10, Color: red
3030226	FBS 20-5	Plug-in bridge, Number of positions: 20, Color: red
3038930	FBS 50-5	Plug-in bridge, Number of positions: 50, Color: red

**General**

3211003	D-PIT 2,5-MT	Cover, Length: 62 mm, Width: 2.2 mm, Color: gray
0810588	GBS 5-25X12	Group marker label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with a 25 x 12 mm label or manually with the B-STIFT, in the foot part with ZB 5
0809298	GBS-ZB/26X6	Group marking label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with ESL 26x6 mm or EST 25x6 mm, in the foot part with Zack marker strip, length: 29 mm

PIT 2,5-MT Order No.: 3210156

<http://eshop.phoenixcontact.no/phoenix/treeViewClick.do?UID=3210156>**Marking**

3037643	STP 5-2-ZB	Double marker carrier, snaps onto the spring-cage terminal blocks ST 2.5..., labeled with ZB 5 or ZBF 5
0818108	UC-TM 5	UniCard sheets, for labeling terminal blocks using Zack marker strip groove, 96-section, labeling with BLUEMARK X1 and CMS-P1-PLOTTER, color: White
0824581	UC-TM 5 CUS	UniCard sheets, for labeling terminal blocks with a zack marker strip groove, can be printed as per customer requirements
0819796	UC-TMF 5L	UniCard sheets, for labeling terminal blocks using a flat Zack marker strip groove, 192-section, can be labeled with CMS-P1-PLOTTER, color: White

**Plug/Adapter**

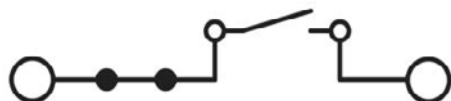
3002843	ISH 2,5/0,2	Insulation stop sleeve, Color: white
3002856	ISH 2,5/0,5	Insulation stop sleeve, Color: gray
3002869	ISH 2,5/1,0	Insulation stop sleeve, Color: black
0201731	MPS-IH BK	Insulating sleeve, Color: black
0201689	MPS-IH BU	Insulating sleeve, Color: blue
0201702	MPS-IH GN	Insulating sleeve, Color: green
0201728	MPS-IH GY	Insulating sleeve, Color: gray
0201676	MPS-IH RD	Insulating sleeve, Color: red
0201715	MPS-IH VT	Insulating sleeve, Color: violet
0201663	MPS-IH WH	Insulating sleeve, Color: white
0201692	MPS-IH YE	Insulating sleeve, Color: yellow
0201744	MPS-MT	Metal part
3030925	PAI-4	Test adapter, Color: gray
3030983	PS-5	Test adapter, Color: red

**Tools**

1204517	SZF 1-0,6X3,5	Screwdriver, blade: 0.6 x 3.5 x 100 mm, length 180 mm
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**Diagrams/Drawings**

Circuit diagram

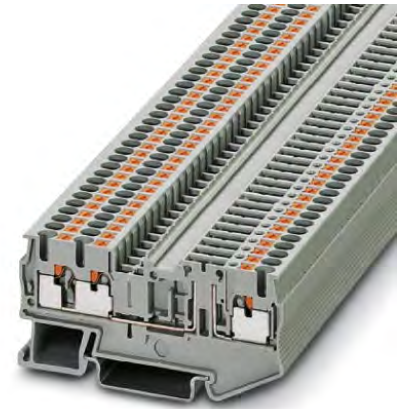




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## PIT 2,5-TWIN-TG

Order No.: 3210198



<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3210198>

Feed-through modular terminal block, Connection type: Leg spring connection, Cross section: 0.14 mm<sup>2</sup> - 4 mm<sup>2</sup>, AWG: 26 - 12, Nominal current: 20 A, Nominal voltage: 400 V, Length: 74 mm, Width: 5.2 mm, Color: gray, Assembly: NS 35/7,5, NS 35/15

### Commercial data

EAN	4046356333573
Pack	50 pcs.
Customs tariff	85369010
Weight/Piece	0.010452 KG
Catalog page information	Page 195 (CL-2009)

### Product notes

WEEE/RoHS-compliant since:  
08/07/2009



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### Technical data

#### General

Number of levels	1
Number of connections	3
Color	gray

PIT 2,5-TWIN-TG Order No.: 3210198

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3210198>

Insulating material	PA
Inflammability class acc. to UL 94	V0

**Dimensions**

Width	5.2 mm
Length	74 mm
Height NS 35/7,5	36.5 mm
Height NS 35/15	44 mm

**Technical data**

Rated surge voltage	6 kV
Pollution degree	3
Surge voltage category	III
Insulating material group	I
Connection in acc. with standard	IEC 60947-7-1
Nominal current $I_N$	20 A (the maximum load current must not be exceeded by the total current of all connected conductors)
Nominal voltage $U_N$	400 V
Open side panel	ja
Number of positions	1

**Connection data**

Conductor cross section solid min.	0.14 mm <sup>2</sup>
Conductor cross section solid max.	4 mm <sup>2</sup>
Conductor cross section stranded min.	0.14 mm <sup>2</sup>
Conductor cross section stranded max.	2.5 mm <sup>2</sup>
Conductor cross section AWG/kcmil min.	26
Conductor cross section AWG/kcmil max	12
Conductor cross section stranded, with ferrule without plastic sleeve min.	0.14 mm <sup>2</sup>
Conductor cross section stranded, with ferrule without plastic sleeve max.	2.5 mm <sup>2</sup>
Conductor cross section stranded, with ferrule with plastic sleeve min.	0.14 mm <sup>2</sup>
Conductor cross section stranded, with ferrule with plastic sleeve max.	2.5 mm <sup>2</sup>
2 conductors with same cross section, stranded, TWIN ferrules with plastic sleeve, max.	0.5 mm <sup>2</sup>
Type of connection	Leg spring connection



PIT 2,5-TWIN-TG Order No.: 3210198

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3210198>

Stripping length	10 mm
Internal cylindrical gage	A3

**Accessories**

Item	Designation	Description
<b>Assembly</b>		
3030815	ATP-ST QUATTRO	Partition plate, Length: 90.9 mm, Width: 2 mm, Height: 45 mm, Color: gray
3022276	CLIPFIX 35-5	Snap-on end bracket, for NS 35/7.5 or NS 35/15 DIN rail, can be fitted with Zack strip ZB 5 and ZBF 5, terminal strip marker KLM 2 and KLM, parking facility for FBS...5, FBS...6, KSS 5, KSS 6, width: 5,15 mm, color: gray
3036725	DP PS-5	Spacer plate, Color: red
0801704	NS 35/ 7,5 AL UNPERF 2000MM	DIN rail, material: Aluminum, unperforated, height 7.5 mm, width 35 mm, length: 2 m
0801762	NS 35/ 7,5 CU UNPERF 2000MM	DIN rail, material: Copper, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1207640	NS 35/ 7,5 PERF 755MM	NS 35 DIN rail, height 7.5 mm, length 755 mm
1207653	NS 35/ 7,5 PERF 955MM	NS35 DIN rail, height 7.5 mm, length 955 mm
1207666	NS 35/ 7,5 PERF 1155MM	NS 35 DIN rail, height 7.5 mm, length 1155 mm
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: 2 m
1208131	NS 35/ 7,5 PERF/...	DIN rail, Color: silver
0801681	NS 35/ 7,5 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 7.5 mm, width 35 mm, length: 2 m
1208115	NS 35/ 7,5 UNPERF/...	DIN rail, Color: silver
1208128	NS 35/ 7,5 UNPERF/SO/...	DIN rail, Color: silver
0801377	NS 35/ 7,5 V2A UNPERF 2000MM	DIN rail, Width: 35 mm, Height: 7.5 mm, Length: 2000 mm, Color: silver
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
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, perforated, height 15 mm, width 35 mm, length: 2 m
1201714	NS 35/15 UNPERF 2000MM	DIN rail, material: Steel, unperforated, height 15 mm, width 35 mm, length: 2 m
1208144	NS 35/15 UNPERF/...	DIN rail, Color: silver

PIT 2,5-TWIN-TG Order No.: 3210198

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3210198>

1208157	NS 35/15 UNPERF/SO/...	DIN rail, Color: silver
1206586	NS 35/15 ZN UNPERF 2000MM	DIN rail, material: Galvanized, unperforated, height 15 mm, width 35 mm, length: 2 m
3038943	RB ST (2,5/4)-1,5	Cross connector/jumper for modular terminal block, Number of positions: 2, Color: red

**Bridges**

3030161	FBS 2-5	Cross connector/jumper for modular terminal block, Number of positions: 2, Color: red
3030174	FBS 3-5	Cross connector/jumper for modular terminal block, Number of positions: 3, Color: red
3030187	FBS 4-5	Cross connector/jumper for modular terminal block, Number of positions: 4, Color: red
3030190	FBS 5-5	Cross connector/jumper for modular terminal block, Number of positions: 5, Color: red
3030213	FBS 10-5	Cross connector/jumper for modular terminal block, Number of positions: 10, Color: red
3030226	FBS 20-5	Cross connector/jumper for modular terminal block, Number of positions: 20, Color: red
3038930	FBS 50-5	Cross connector/jumper for modular terminal block, Number of positions: 50, Color: red

**General**

3211317	D-PIT 2,5-TWIN-MT	Cover
0810588	GBS 5-25X12	Group marker label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with a 25 x 12 mm label or manually with the B-STIFT, in the foot part with ZB 5
0809298	GBS-ZB/26X6	Group marking label, snaps onto terminal center for screw, spring-cage and quick connection terminal blocks, labeled with ESL 26x6 mm or EST 25x6 mm, in the foot part with Zack marker strip, length: 29 mm

**Marking**

3037643	STP 5-2-ZB	Double marker carrier, snaps onto the spring-cage terminal blocks ST 2.5..., labeled with ZB 5 or ZBF 5
0818108	UC-TM 5	UniCard sheets, for labeling terminal blocks using Zack marker strip groove, 96-section, labeling with BLUEMARK X1 and CMS-P1-PLOTTER, color: White
0824581	UC-TM 5 CUS	UniCard sheets, for labeling terminal blocks with a zack marker strip groove, can be printed as per customer requirements
0824588	UC-TM 5L CUS	UniCard sheets, for labeling terminal blocks with a zack marker strip groove, can be printed as per customer requirements
0819796	UC-TMF 5L	UniCard sheets, for labeling terminal blocks using a flat Zack marker strip groove, 192-section, can be labeled with CMS-P1-PLOTTER, color: White

PIT 2,5-TWIN-TG Order No.: 3210198

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3210198>

1050004	ZB 5 :UNBEDRUCKT	Zack strip, unprinted, 10-section, for individual labeling with M-PEN, ZB-T or CMS system, pack is sufficient for 100 terminal blocks, for a terminal width of 5.2 mm, color: White
1050295	ZB 5:SO/CMS	Zack strip, 10-section, divisible, special printing, marking according to customer requirements

**Plug/Adapter**

3002843	ISH 2,5/0,2	Insulation stop sleeve, Color: white
3002856	ISH 2,5/0,5	Insulation stop sleeve, Color: gray
3002869	ISH 2,5/1,0	Insulation stop sleeve, Color: black
0201731	MPS-IH BK	Insulating sleeve, for MPS metal part, Color: black
0201689	MPS-IH BU	Insulating sleeve, for MPS metal part, Color: blue
0201702	MPS-IH GN	Insulating sleeve, for MPS metal part, Color: green
0201728	MPS-IH GY	Insulating sleeve, for MPS metal part, Color: gray
0201676	MPS-IH RD	Insulating sleeve, for MPS metal part, Color: red
0201715	MPS-IH VT	Insulating sleeve, for MPS metal part, Color: violet
0201663	MPS-IH WH	Insulating sleeve, for MPS metal part, Color: white
0201692	MPS-IH YE	Insulating sleeve, for MPS metal part, Color: yellow
0201744	MPS-MT	Metal part for test connector
3030925	PAI-4	Test adapter, Color: gray
3030983	PS-5	Test adapter, Color: red

**Tools**

1204517	SZF 1-0,6X3,5	Screwdriver, blade: 0.6 x 3.5 x 100 mm, length 180 mm
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**Additional products**

Item	Designation	Description
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**Assembly**

3036796	P-CO	Component plug, Nominal current: 6 A, Length: 24 mm, Width: 5.2 mm, Height: 22 mm, Color: gray
---------	------	--

**Plug/Adapter**

3032460	P-CO 1N4007/L-R	
3032457	P-CO 1N4007/R-L	
3036783	P-DI	Isolating connectors, Length: 10.5 mm, Width: 3.5 mm, Height: 23.1 mm, Color: orange
3038956	P-FIX	Insulated through connector, Length: 10.5 mm, Width: 4 mm, Color: gray

PIT 2,5-TWIN-TG Order No.: 3210198

<http://eshop.phoenixcontact.de/phoenix/treeViewClick.do?UID=3210198>

3036806	P-FU 5X20	Fuse COMBI plug, Nominal current: 6.3 A, Length: 28 mm, Width: 6.2 mm, Height: 25 mm, Color: black
3036835	P-FU 5X20 LA 250	Fuse COMBI plug, Nominal current: 6.3 A, Length: 28 mm, Width: 6.2 mm, Height: 25 mm, Color: black
3036819	P-FU 5X20 LED 24	Fuse COMBI plug, Nominal current: 6.3 A, Length: 28 mm, Width: 6.2 mm, Height: 25 mm, Color: black
3036822	P-FU 5X20 LED 60	Fuse COMBI plug, Nominal current: 6.3 A, Length: 28 mm, Width: 6.2 mm, Height: 25 mm, Color: black

## Drawings

Circuit diagram





Extract from the online  
catalog


## D-PT 2,5-MT

Order No.: 3211003



Cover, Length: 62 mm, Width: 2.2 mm, Color: gray

### Commercial data

EAN	 4 046356 412735
Pack	50
Customs tariff	85472000
Country of Origin	PL
Catalog page information	Page 110 (CL1-2011)

### Product notes

WEEE/RoHS-compliant since:  
20/05/2008



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 at <http://www.download.phoenixcontact.com>. The General Terms and Conditions of Use apply to Internet downloads.

### Certificates



Certification

GOST

## 2.8 CONDUCTIX WAMPFLER

# Installation Instructions

## MOTOR DRIVEN CABLE REEL WITH MAGNETIC COUPLER

Type BNA11.1W0.M614 / 17TC080

Cable reel Nr 1206164/01 TO 02

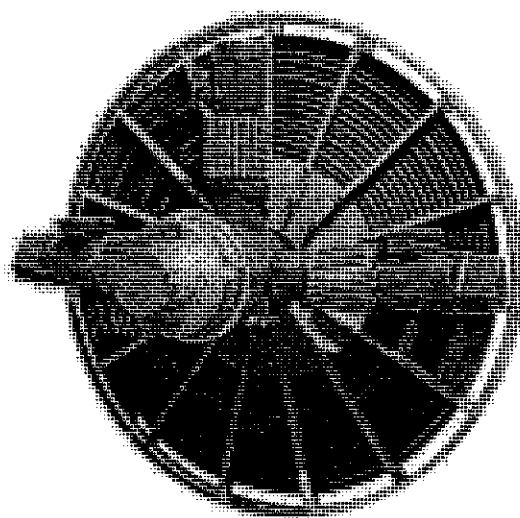
INSTALLATION

START-UP

MAINTENANCE

SPARE PARTS

ELECTRICAL DIAGRAM



### CONDUCTIX - WAMPFLER

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Internet: [www.conductix.com](http://www.conductix.com)



# INSTALLATION INSTRUCTIONS MOTOR DRIVEN CABLE REEL WITH MAGNETIC COUPLER

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- A.3. Security
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- C.5. Troubles shooting list

### D - MAINTENANCE

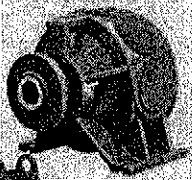
11-12



# INSTALLATION INSTRUCTIONS

## MOTOR DRIVEN CABLE REEL WITH MAGNETIC COUPLER

### MAIN GEARBOXES



- ▶ BNA0
- ▶ BNA1
- ▶ BNA2
- ▶ BNA3
- ▶ BNA4
- ▶ BNA5
- ▶ BNA7

### MAGNETIC COUPLERS

- ▶ Coupler V
- ▶ Coupler W
- ▶ Coupler CN
- ▶ Coupler D



### ADDITIONAL GEARBOXES

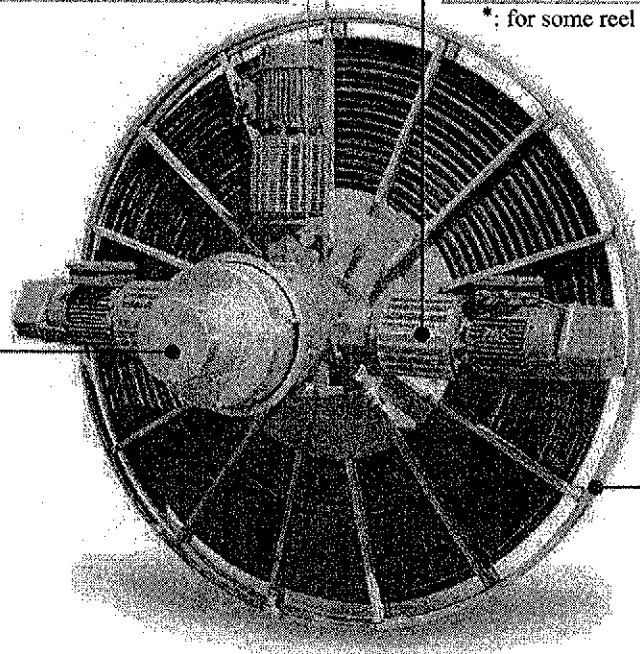


### SECONDARY GEARBOXES \*

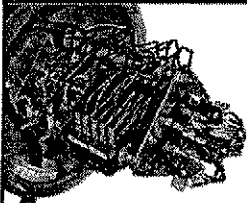
- ▶ BNA1x
- ▶ BNA2x
- ▶ BNA36 - 47 - 59 only
- ▶ BNA38
- ▶ BNA710



\*: for some reel configurations only



### LOW VOLTAGE SLIP RING



- ▶ C080 - C120 - C180
- ▶ P050
- ▶ P080 - P120 - P180
- ▶ P270

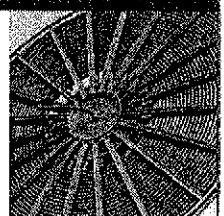
### HIGH VOLTAGE SLIP RING



- ▶ H7, H12, H24

### SPOOLS

- ▶ Monospiral spools
- ▶ XM spools (multi-monospirals)
- ▶ Trispiral spools
- ▶ Semi-wide spools
- ▶ One-layer spools



## INSTALLATION INSTRUCTIONS

### MOTOR DRIVEN CABLE REEL WITH MAGNETIC COUPLER

## A - GENERAL INFORMATION

### A.1. Responsibilities

The user is responsible for the installation and use of the equipment supplied according to the regulations described hereafter.

CONDUCTIX-WAMPFLER will not be able to guarantee the equipment if these regulations are not adhered to, except in the case of prior agreement.

All operation of the equipment must be carried out by qualified personnel, in accordance with current norms and regulations.

### A.3. Data and modifications

This document provides the information required for the start up, use and maintenance of the reel.

CONDUCTIX-WAMPFLER reserves the right to modify the characteristics of its products at any time in order to include the most recent technological developments. The information contained in this document may, therefore, be modified at any moment without prior notice.

### A.3. Safety

#### A.3.1. General information

During all maintenance and adjustment work and whenever the equipment is being operated with the protective covers open basic safety rules must be respected.

During normal working all the covers must be in place and the safety systems must be operational.

It is equally important to pay attention to parts which may move, for example the cable and the reel.

#### A.3.2. Slipping

The protective cover must never be opened unless power is off.

### A.4. Restrictions of use

#### A.4.1. Wind

- If the wind speed is  $\leq 20$  m/s : normal working
- If the wind speed is  $> 20$  m/s and  $\leq 28$  m/s : half speed working.
- If the wind speed is  $> 28$  m/s and  $\leq 35$  m/s : stop working. The machine must be stopped with empty spool.
- If the wind speed is  $> 35$  m/s and  $\leq 70$  m/s : stop working. Lash down the reel and spool. The machine must be stopped with empty spool.
- If the wind speed is  $> 70$  m/s: risk of damage to complete reel installation.



**NEVER REMOVE SLIPPING COVER WHEN POWER IS ON**  
**DANGER OF DEATH.**

## INSTALLATION INSTRUCTIONS

### MOTOR DRIVEN CABLE REEL WITH MAGNETIC COUPLER

## B - INSTALLATION

### B.1. Shipment

CONDUCTIX-WAMPFLER cable reels are shipped on a transport frame for easy handling by fork lift truck.  
All accessories and spools delivered in kit form are shipped on a wooden pallet  
Spools assembled in two parts are delivered in open-sided crates.

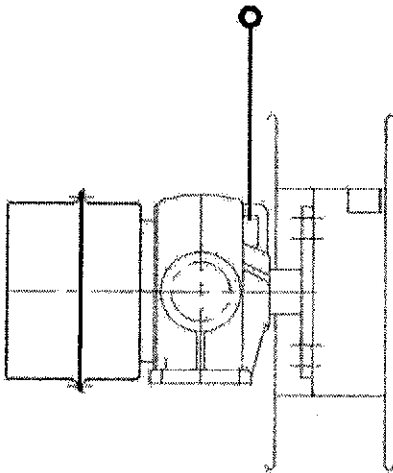
### B.2. Erection of the cable reel

#### B.2.1. Handling

The main gear-box has a special opening to pass a lifting sling through.

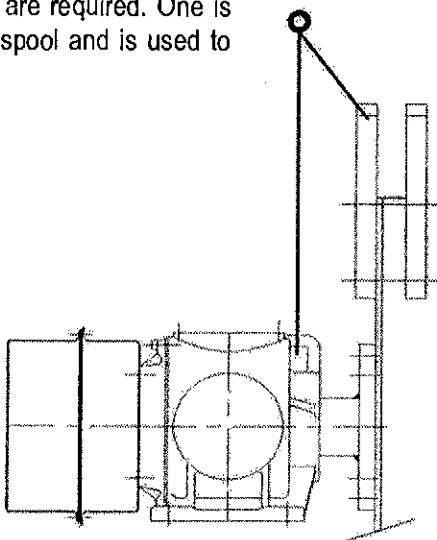
##### B.2.1.1 - Small cable reel with semi-wide spool :

A single lifting sling is sufficient.

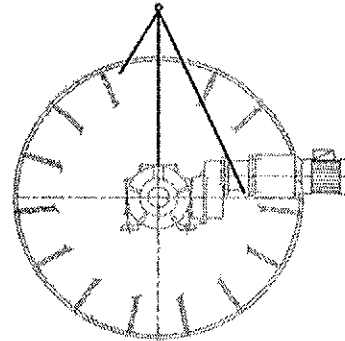


##### B.2.1.2 - Larger cable reel with monospiral spool :

Two lifting slings are required. One is hooked onto the spool and is used to balance the load.

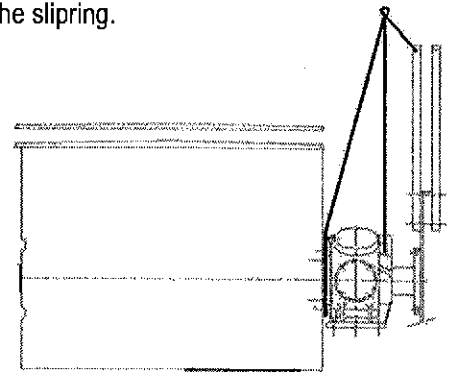


If the cable reel is equipped with only one drive, use an extra sling to counteract the lateral weight, according to the further diagram.



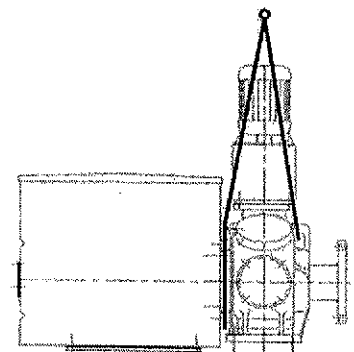
##### B.2.1.3 - Reel with large slipping.

Balance the load with a sling hooked between the gear box and the slipping.

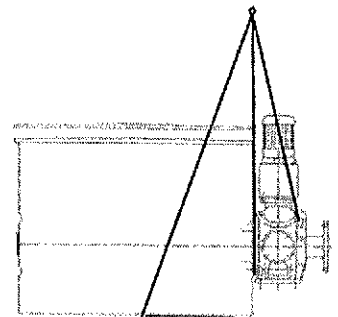


##### B.2.1.4 - Reel delivered without spool

Two lifting slings are required.  
One is hooked between the gear box and the slipping.  
Do not hook the lifting sling on the motors .



If the reel is equipped with a large slipping, use a third sling to balance the load.



**Do not use metallic slings or chains which may damage the cable reel point.**



## INSTALLATION INSTRUCTIONS

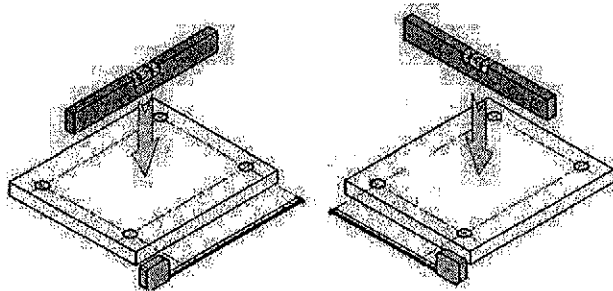
### MOTOR DRIVEN CABLE REEL WITH MAGNETIC COUPLER

#### B.2.2. Installation of the reel

##### B.2.2.1. Checking of the support

Before installing the reel, check:

- the base is flat,
- the base is level in all directions,
- the center distance and the diameter of all fixing holes.



The base must have dimensions which permit it to :

- support the weight of the reel and cable,
- Support the working stresses (speed of movement, vibrations...),
- Support the environmental stresses (wind pressure on fully wound on spool).

##### B.2.2.2. Installation of the reel

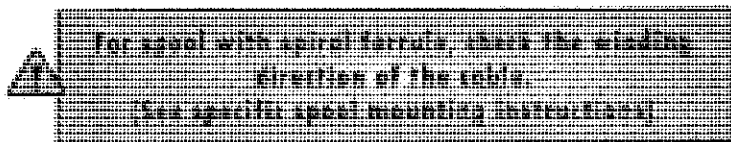
- Use fasteners of at least class 8.8, according to the diameter of the holes in the gear box.

#### B.2.3. Spools not mounted on the gear box

##### B.2.3.1. Preparation

See specific instructions :

- Monospiral spool delivered in 2 or 4 parts
- Monospiral spool delivered in kit form
  - with tubular arm
  - with profiled arm
- Monospiral spool delivered in 2 parts with connection box on the gear box.
- ...



##### B.2.3.2. Fitting of the spool onto the reel

It is **ESSENTIAL** to use the **bolts** provided on the hub with **safety nuts**.

Follow precisely the instructions concerning the position and tightening torque as indicated on tick-on label.

- nut on gear box side
- tightening torque for M18 = 23 mdaN
- tightening torque for M20 = 33 mdaN

Tighten crosswise with :

- initial tightening at half the maximum torque
- final tightening at maximum torque.

##### B.2.3.3. Checks

If no value is specified on the spool assembly instructions manual :

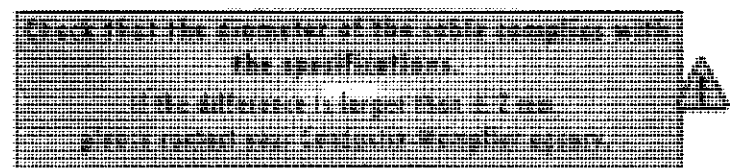
- Maximum out of round on the outside flange =  $\pm 5$  mm
- Maximum out of flatness of the outside flange =  $\pm 5$  mm
- Distance between 2 flanges = Test spacer +0 to -2 mm

#### B.3 - Fitting of accessories (Guiding device, Anchoring device, Entry device, Diverting device, Connection box)



#### B.4. Installation of the cable on the spool

##### B.4.1. Preparation



##### B.4.2. Installing the cable on the spool

It is essential to comply with the following:

- 1- **Winding direction:** It is the direction of the spool when motor(s) turned in the direction indicated by the arrow fixed on the motor(s)
- 2 - Positioning of the cable drum as per sketch

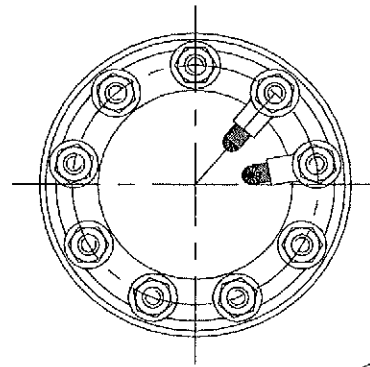
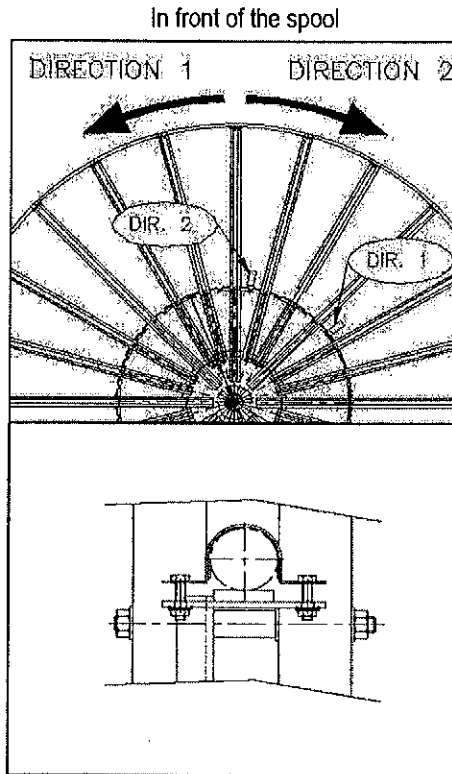


## INSTALLATION INSTRUCTIONS

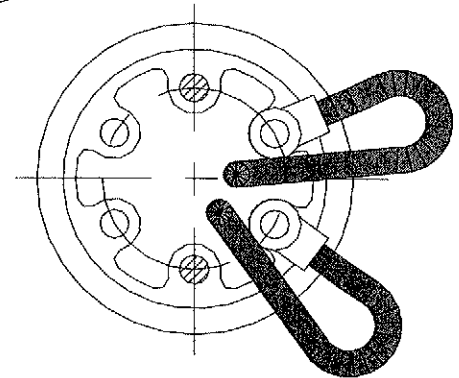
### MOTOR DRIVEN CABLE REEL WITH MAGNETIC COUPLER

#### B.4.3. Fixation of the cable to the moving part

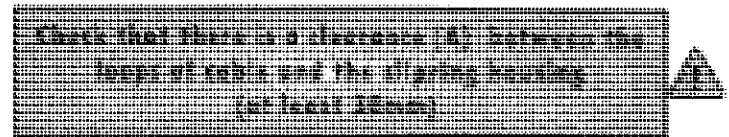
**P080 / P120 / P180**



**P050**



- Bring the end of the cable on the spool **according to the winding direction**.
- Let a sufficient length for the connection to the sliping (See § Connection onto the rings).
- Fix the collar and the cable reel.
- Engage the cable in the cable gland on the moving part.



**Type P**

**Type C**

#### B.4.4. Winding on of the cable

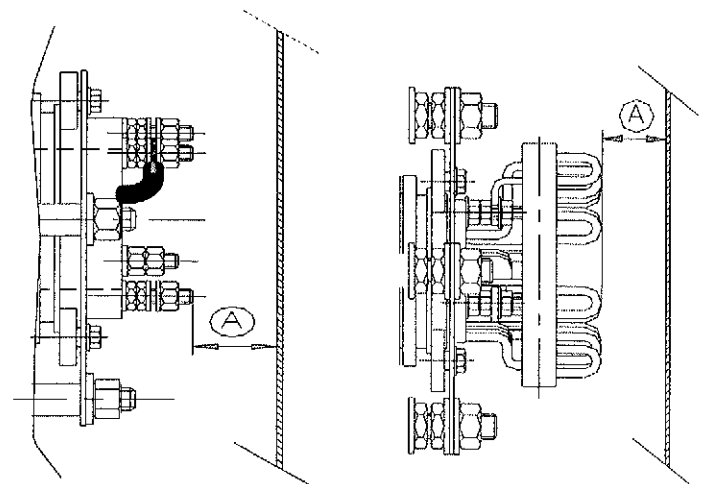
- Connect the drive motor(s) to wind the reel onto the spool.
- The cable drum must be **unwound manually to avoid any damage on the cable (caused by excessive load or twisting)**.

#### B.5. Connection of the cable to the motor reel

##### B.5.1. Low Voltage Slipings

*B.5.1.1. On the rings (Moving part - The cable is coming from the spool)*

- Push cable through the shaft of the reeling drum.
- Allow a sufficient length of cable coming out of the sliping ( $\cong 300\text{mm}$ ).
- Tighten the cable gland and the tie wrap on the spool.
- Strip the cable back and prepare the ends according to the table « Connections ».
- Connections by \* Core lead terminals on C type Slipings;  
\* Stud fixings on P type Slipings.
- Position the terminals according to the below sketches.
- Secure the terminals with nut and washer.

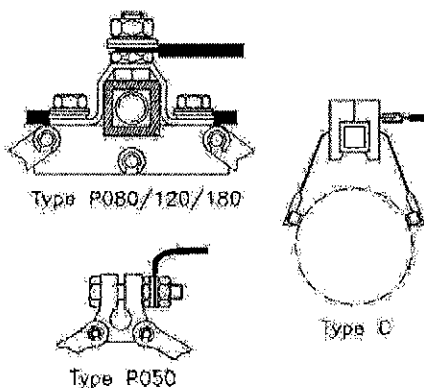
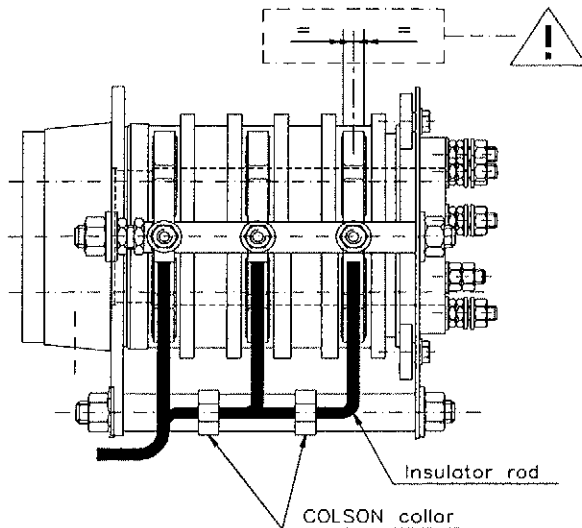


## INSTALLATION INSTRUCTIONS

### MOTOR DRIVEN CABLE REEL WITH MAGNETIC COUPLER

#### B.5.1.2. Onto the brushes (Fixed part - Cable supplied by the customer)

- The slipring housing is fitted with a removable plate for cable glands.
- Push the cable through the cable gland of the slipring housing.
- Let a sufficient cable length for the connections onto the brushes (see attached 'sliprings' technical leaflet).
- Strip back the cable up to the cable gland.
- Attach the cable with a COLSON collar on the insulator rod as per sketch to well organize the cores on the brush holders.



#### • Connection :

- with female Faston Terminal 6,6 for C type sliprings.
- with lug for P type sliprings:

- ⚠ - Place the terminal as indicated on the sketch.
- ⚠ - Tighten while holding the brushes parallel to the isolators.

- Make sure that each brush is in line with its corresponding ring **without any pressure on the isolators**.
- Tighten the cable gland.

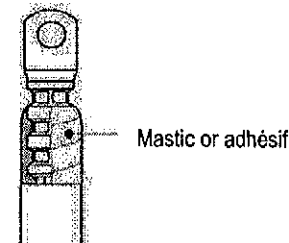
#### B.5.2. High Voltage Sliprings

##### • Preparation of cable ends:

**FOR HIGH VOLTAGE, THE CHOICE OF COMPONENTS AND THE JOB MUST BE ACHIEVED BY CERTIFIED SPECIALISTS.**

**THESE COMPONENTS MUST BE DESIGNED FOR A HUMID OUTSIDE USE.**

The extremity of the cable end, terminal side, must be made watertight with mastic or appropriate adhesif.



The conductors connected to the brushes (fixed part) must be attached lateral on the housing in order that the insulation distances are respected.

The conductors connected to the rings (moving part) and the cable ends must not touch the rings, on which they are not connected.

##### • Connection to the rings / brush holders :

- See attached technical leaflet (connections table).
- The High Voltage Housings are fitted with a REMOVABLE PLATE for the cable glands.

#### B.5.3. Option / TFO (Fibre Optic Transmitter)

- Inlet and Outlet optical connections **type ST** (Other type on request).
- A removable plate, fitted on the housing, is designed to accommodate the cable gland. Connection with optical connectors.

**It is absolutely essential to read the instructions before attempting the electrical and mechanical connections.**

## INSTALLATION INSTRUCTIONS

### MOTOR DRIVEN CABLE REEL WITH MAGNETIC COUPLER

#### B.6. Connection of the cable at the feed point

- Avoid using any device which pinches the cable
- For vertical application use an **anchoring device with shock absorber and cable sleeve** for the fixation of the cable to the mobile equipment.

#### B.7. Electrical connection of the motor(s)

- Connect the motor(s) in accordance with the motors manufacturer's wiring diagram, especially for terminal box.

During winding and unwinding, the drive motor turns always in the same direction (winding direction of the cable).

#### B.8. Electrical connection of the accessories

Depending on the chosen options:

- \* Space heater in the slipping.
- \* End limit switch : contact on the end limit switch .
- \* Over pull, under pull : switches on the cable guide.
- \* Temperature sensor and motor heating : in motor connection box.
- \* Brake motor: inside terminal box.

## C - COMMISSIONING

This equipment is not designed to be used in Explosive Atmospheres (ATEX) (in accordance with the definition in directive 92/92/CEE dated 14<sup>th</sup> December 1992).

This equipment is designed for an industrial use. Ensure that the operators are trained in the use of this material.

#### C.1. Energizing the drive motor(s)

Before the drive motor(s) is energized, make sure that:

- there is no slack cable
- the cable is in the correct position on the spool and guiding device.

When drive motor(s) is energized, make sure that the motor is rotating in the correct direction (winding direction).

#### C.2. Limit switch adjustment (option)

- Position the machine at the required point.
- Adjust the cam to the tripping position : See attached 'End limit switch' technical leaflet.
- Check that the adjustment is correct (travel through the end limit point several times).

**Note:** When using an under pull switch, the neutralising contact must be adjusted as close as possible to the middle point.

AT THE END OF PAYOUT, WHEN THE SPOOL IS EMPTY, ONE DEAD TURN OF CABLE MUST ALWAYS REMAIN.

#### C.3. Over Pull adjustment onto guiding device (Option)

- See attached technical leaflet.

#### C.4. Various adjustments

##### C.4.1. Change of the cable winding direction

- Reverse the direction of the cable on the drum:
  - \* Reverse the cable entry (depending on spool type)
  - \* Reverse the spiral ferrule (if fitted)
  - \* Reverse the cable clamp.
  - \* Reverse the free wheels (see data sheet for motor-couplers)
  - \* Reverse the rotation direction of the drive motors.
  - \* For TFO option: see specific instructions.

##### C.4.2. Cable of different diameter

- Width of monospiral and trispiral spools assembled using nuts and bolts are **adjustable**.

##### C.4.3. Adjustment of W - CN - D couplers

- See attached technical leaflet.

#### C.5. Troubles shooting list

- See list hereafter.



**INSTALLATION INSTRUCTIONS****MOTOR DRIVEN CABLE REEL WITH MAGNETIC COUPLER**

PROBLEM	POSSIBLE SOURCE	CORRECTIVE ACTIONS
Cable spool's off (unwinds) although cable reel main power is OFF	Free-wheel failure or break down	Replace free wheel by new.
	Brake failure on brake motor	Clean brake and replace if necessary.
	Motor coupling failure	Replace coupling by new.
	Magnetic coupler failure	Replace magnetic coupler.
	Broken or worn gear in additional gear box	Replace entry gear-set on coupler side if worn or broken. Replace complete additional gearbox if problem occurs inside of it.
	Broken or worn gear in secondary gearbox	Replace secondary gearbox if problem occurs inside of it.
	Broken or worn gear in main gearbox	Replace worn gear only.
	Torque transmission failure between conical gear and spool's shaft (key or thrust collar)	Replace the shaft with the conical gear and the thrust collar/key.
Cable reel does not wind cable fast enough or cable is not wound in the right manner while reel motors are powered ON	Motor(s) spinning direction has not been setup correctly.	Change motor power wiring to the right setting (in order that motor(s) revolve in the right direction according to cable reel setup).
	Motor failure/breakdown	Replace Motor with one that has the exact same characteristics.
	Free wheel has not been setup correctly	Change the free wheel spinning direction according to coupler documentation/manual delivered with cable reel.
	Brake failure on brake motor	Clean brake and replace if necessary.
Cable does not wind up the spool in the right manner	Spool's axle/shaft is not perfectly horizontal or perpendicular to cable lifting path. (spool is not well aligned with cable path/way)	Install / adjust the cable reel on its support in order that the spool is aligned in both directions.
	Friction on cable is excessive	Check and make sure that accessories (guiding device, roller boxes, anchoring...) are setup correctly and aligned with the spool. Check rollers on accessories and replace those that do not revolve freely. Check the gap/distance between the 2 flanges of the spool is setup correctly. Adjust it if possible. If the spool cannot be adjusted please contact your Conductix-Wampfler Agency.
	Setup parameters are different from the one used to determine the cable reel (speed, acceleration, height)	Check and adjust parameters. If necessary please contact your Conductix-Wampfler Agency.
	Cable submitted to torsion stresses	Unwind the cable and disconnect it. Remove strains.
	Coupler failure	Replace coupler by new.
	Secondary gearbox failure	Replace secondary gearbox by new.
	Additional gearbox failure	Replace additional gearbox by new.
	Main gearbox failure	Check gears and ball bearings are not worn. Replace those if necessary.
	The main gear box is defective.	Check the good state of the pinions and rollers. Change them if necessary.



**INSTALLATION INSTRUCTIONS****MOTOR DRIVEN CABLE REEL WITH MAGNETIC COUPLER**

PROBLEM	POSSIBLE SOURCE	CORRECTIVE ACTIONS
Guiding device returns wrong information (over pull, under pull, position)	Proximity switch failure or proximity switch wrongly adjusted.	Adjust the switch or replace it if necessary.
Faulty electrical continuity through cable reel system	Cable failure	Check cable integrity and replace it if necessary.
	Connections are not properly tightened	Check and tighten loose connections on slip-ring, connecting box, and control box.
	Slip-ring brushes are worn	Replace with new brushes.
	Rings inside the slip-ring are dirty	Remove dirt by gently polishing the rings with emery cloth.
	Humidity inside the slip-ring housing	Check and make sure the screws of the slip-ring cover are correctly tightened.. Check the gasket between slip ring and cover is not damaged nor worn (replace it if necessary). Check the respirators are not damaged nor worn and replace those if necessary.
	Condensation appears in the slip ring housing	Check heating resistance is correctly powered and working. Replace it if necessary. Install heating resistance inside the slip ring housing if not originally provided.
	Rings and brushes are not aligned	Align brushes with rings.
	Slip-ring guiding roller breakdown	Change worn or broken roller(s).
Faulty optical continuity through cable reel system	Cable failure	Check cable integrity and replace it if necessary.
	Optical Fiber transmitter failure	Replace Optical Fiber transmitter.
	Connection problem	Clean connectors and replace those if necessary.
Faulty equipotential protection continuity through cable reel system	Earth washers are missing on the bolts that tighten the spool onto the shaft flange	Place Earth washers.
	Shunt failure between slip ring housing and earth ring	Replace shunt.
	Loosening of the slip ring hub	Tighten the slip ring hub on the gear box shaft.

## INSTALLATION INSTRUCTIONS

### MOTOR DRIVEN CABLE REEL WITH MAGNETIC COUPLER

## D - MAINTENANCE

Frequency	
1	Every 2 000 working hours / 6 months
2	Every 2 000 working hours / 1 year
3	Every 8 000 working hours / 2 years
4	Every 10 000 working hours / 3 years
5	Every 15 000 working hours / 5 years

All new cable has some twisting stresses due to the manufacturing process.

After 200 working hours, these stresses must be eliminated in proceeding as follows:

- Place the reel approximately 10 m from the cable anchoring position.
- Switch off power to the reel.
- Disconnect and free the cable from its anchoring position.
- If stresses exist, the cable will eliminate them by turning on itself. If necessary, help the cable to do this.
- Re-assemble and reconnect following the steps in reverse order.

PART	Step	OPERATIONS	Fre- quency	Done	Comments
SPOOL	A	Spool centre bolts.	1		
	B	Rim gap at several points (every 3 arms).	2		Values =
	C	Geometry and visual aspect.	2		
	D	Rim connector bolts.	2		
	E	Cable entry : clamp and cable protection.	2		

**Firmly attach the spool to the crane to avoid cable pay-out.**

**Ensure POWER IS OFF !!!**

BRAKE AND MOTOR	A	Open and clean up.	1		
	B	Electrical test.	1		
	C	Evacuate moisture by bleed nipple opening.	1		

MAGNETIC COUPLER	A	Visual aspect.	1		
	B	Free wheel - Anti run back bearing working and visual aspect.	3		
	C	Coupling ring aspect.	1		
	D	Bolts tightening check.	2		

ADDITIONNAL GEAR BOX and SECONDARY GEAR BOX	A	Visual aspect of pinions (teeth).	2		
	B	Pinions play.	2		
	C	Grease leakage and aspect.	2		
	D	Lubricant replacement.	5		

# **INSTALLATION INSTRUCTIONS** **MOTOR DRIVEN CABLE REEL WITH MAGNETIC COUPLER**

Frequency	
1	Every 2 000 working hours / 6 months
2	Every 2 000 working hours / 1 year
3	Every 8 000 working hours / 2 years
4	Every 10 000 working hours / 3 years
5	Every 15 000 working hours / 5 years

PART	Step	OPERATIONS	Fre- quency	Done	Comments
MAIN GEAR BOX	A	Gearbox fixings.	2		
	B	Visual aspect (paint).	2		
	C	Sealing and oil leakage.	2		
	D	Grease level and use.	2		
	E	Bearing lubrication (old BNA).	1		
	F	Bearing use (noise ?).	2		
	G	Grease replacement.	5		
	H	Play between conical gears (0,3mm at contact point).	2		
	I	Visual aspect of gears.	2		
	J	Small conical gear bolt (if existing).	2		
SLIPRING	A	Heating resistance.	2		
	B	Alignment of the brush holders. Wear of the brushes.	1		X = mm
	C	Aspect and wear of the rollers.	1		
	D	Tightening of the hubs and screws.	2		
	E	Cleaning of the rings.	1		
	F	Tightening of the connections.	2		
	G	Cleaning of the enclosure.	2		
GUIDING DEVICE	A	Visual aspect (géométry, position, corrosion).	2		
	B	Rotation of the guide rollers.	2		
	C	Wear of the rollers.	2		
	D	Position switch.	2		
OPTIC FIBER TRANSMITTER	A	Visual aspect and connections.	2		
	B	Heating resistance.	2		

## **NOTES**

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## **INSTRUCTIONS FOR LONG TIME STORAGE (more than 9 months)**

The equipment should be stored in accordance with its working position.

The equipment should be stored:

- away from humidity (less than 80%),
- in an enclosed building, protect from the rain and water sprays (temperature from -15°C to +45°C),
- away from frequent significant variations in temperature, to avoid the risk of condensation.
- away from vibrations.
- away from aggressive vapours or fumes.

### **Before storage:**

- Using the grease supplied in the inside of the gear boxes, lubricate the pinions, the shafts and the inside of the housings.
- Apply grease on the outer joints.
- Every 6 months, open the bleed nipples of the motor to evacuate moisture. Put them back in place.

### **During storage:**

- Check regularly the condition of the paint. If necessary, make paint retouching.
- Every 6 months, using the grease supplied in the inside of the gear boxes, lubricate the pinions, the shafts and the inside of the housings.
- As far as possible, turn the spool axis from 4 to 5 turns, to modify the position of the bearings parts.

### **During the commissioning:**

- Bearings:
  - \* Sealed bearings: Replace them if the storage period is more than 3 years.
  - \* Bearings, which can be regreased:

Storage period	Operations
Less than 1 year	No operation on the bearings.
From 1 year to 2 years	Regrease the bearing.
From 2 years to 5 years	Dismantle the bearing, clean it and regrease it.
More than 5 years	Change the bearing. Regrease it.

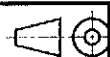
- \* Regrease the bearings, which are equipped with lubricators.
- Grease: Change the grease if the storage period is more than 3 years.
- Check the good conditions of the joints of mechanical and electric parts. Change them if necessary.
- Open the bleed nipples of the motor to evacuate moisture. Put them back in place.

**NOTICE D'INFORMATION TECHNIQUE**

**TECHNICAL INFORMATION LEAFLET**



**LONG TIME STORAGE (more than 9 months)**



**4 40N181**

Folio 1/1

**07/10**










## SLIPRINGS AND TERMINALS MARKING

### ALL OUR SLIPRINGS AND TERMINALS ARE MARKED.

The same stamping appears :

- on the brush holder,
- on the connection of the corresponding ring,
- on the terminal.

#### STAMPING USED

➤ Low Voltage Type P .....	P1 - P2 - P3... 
➤ Low Voltage Type C.....	1 - 2 - 3 - 4 - 5 - 6 - 7 - 8... 
➤ Low Voltage Type C + Silver plated Rings.....	1A - 2A - .A - .....10 - 11..... 
➤ Low Voltage Type C + Paladium Rings .....	1ML - 2ML - .ML - .....10 - 11..... 
➤ Low Voltage Type C + Gold plated Rings .....	1D - 2D - .D - .....10 - 11..... 
➤ High Voltage Type H.....	L1 - L2 - L3... 
➤ C Transmitter .....	C1 - C2 - C3 - C4... 
➤ M Transmitter.....	M1 - M2 - M3 - M4... 
➤ Explosion proof .....	1 - 2 - 3 - 4 - 5...  <u>Insulated Earth</u>
➤ Optic Transmitters (TFO) .....	F1 - F2 - F3 - F4 - F5 - F6

## CABLE MARKING

Except otherwise stipulated :

All the CABLES connected to

- the rings,
- the brush-holders,
- the terminals

are marked at the cable ends

either by

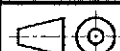
- \* a number stamped on the outer sheath,
- \* a mark attached to the cables.

NOTICE D'INFORMATION TECHNIQUE

TECHNICAL INFORMATION LEAFLET



SLIPRINGS AND TERMINALS MARKING



4 10N107

Folio 1/1

06/09

Slipring Type C  
Low Voltage

		C8 / C080 / C120 / C180
RINGS	Type connection	Terminal with Screws (Weidmüller) + End for 2,5 <sup>2</sup>
	Maximum cable size	2,5 <sup>2</sup> Option 6 <sup>2</sup> with 6 <sup>2</sup> special end (This option is restricted to 5 rings (4TC8) for C8 sliprings)
BRUSH HOLDER	Type connection	FASTON Type 6,35 (not insulated)
	Maximum cable size	2,5 <sup>2</sup> Option 6 <sup>2</sup> with FASTON Type 6,35 spécial 6 <sup>2</sup>

Slipring Type P  
Low Voltage

		P050	P080	P120	P180
RINGS	Type connection	Ring terminal insulated* Ø M5	Ring terminal insulated* Ø M6	Ring terminal insulated* Ø M8	Ring terminal insulated* Ø M10
	Maximum cable size	10 <sup>2</sup>	25 <sup>2</sup>	50 <sup>2</sup>	95 <sup>2</sup>
BRUSH HOLDER	Type connection	Ring terminal Ø M4	Ring terminal Ø M8	Ring terminal Ø M8	Ring terminal Ø M12
	Maximum cable size	10 <sup>2</sup>	25 <sup>2</sup>	50 <sup>2</sup>	95 <sup>2</sup>

\* Rings terminal should be protected by using heat-shrink sleeving or insulated terminal.

Slipring Type P  
Low Voltage

		P270/1 - /2 - /4	P400/1 - /2 - /4
RINGS	Type connection	Ring Terminal Ø M12 P270/1 & /2 ⇒ 2 screws P270/4 ⇒ 4 screws	Ring Terminal Ø M12 P400/1 & /2 ⇒ 2 screws P400/4 ⇒ 4 screws
	Maximum cable size	300 <sup>2</sup>	300 <sup>2</sup>
BRUSH HOLDER	Type connection	Ring terminal Ø M12 P270/1 ⇒ 1 screw P270/2 ⇒ 2 screws P270/4 ⇒ 4 screws	Ring terminal Ø M12 P400/1 ⇒ 1 screw P400/2 ⇒ 2 screws P400/4 ⇒ 4 screws
	Maximum cable size	300 <sup>2</sup>	300 <sup>2</sup>

Slipring Type H  
High Voltage

		H7	H12	H24
RINGS	Type connection	Ring terminal Ø M12	Ring terminal Ø M12	Ring terminal Ø M12
	Maximum cable size	120 <sup>2</sup>	240 <sup>2</sup>	240 <sup>2</sup>
BRUSH HOLDER	Type connection	Ring terminal Ø M12	Ring terminal Ø M12	Ring terminal Ø M12
	Maximum cable size	120 <sup>2</sup>	240 <sup>2</sup>	240 <sup>2</sup>

Fiber Optic  
Transmitter (TFO)

Standard : Connector : ST  
On request : FC

## NOTICE D'INFORMATION TECHNIQUE

## TECHNICAL INFORMATION LEAFLET



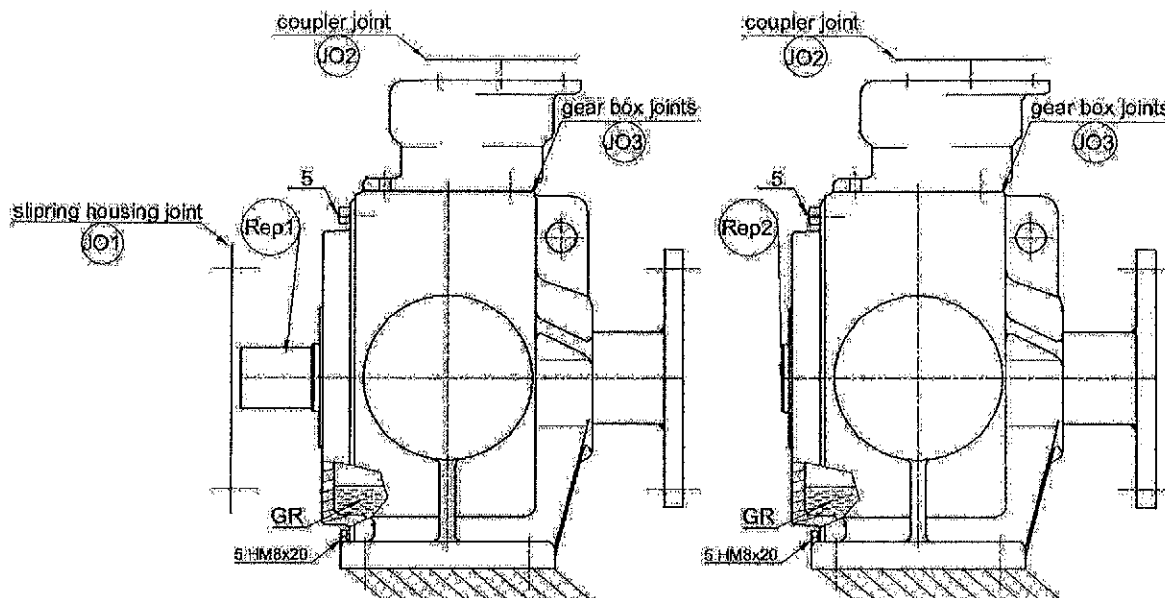
## CONNECTIONS TABLE



4 10N108

Folio 1/1

03/10



NUTS and BOLTS are assembled using LOCTITE thread-locking product 243

### MAINTENANCE

- **Original equipment is supplied greased for 15 000 operating hours or 5 years.**
- **Every 2 000 hours or every year, check the state of the gears.**

### MAIN GEAR BOX :

#### LUBRICATION

With grease.

Be sure that the respiration screw item 5 is on the upper part of the gear box.

#### CHANGE OF GREASE

- Free one aperture, by removing the drive unit and the secondary gear box.
- Remove the grease using a syringe or a rag.
- Replace the joint JO3.

**NOTE :** In case of damage on : - the toothed wheel,  
- the bearings,  
complete assembly (main gear box + secondary gear box) must be changed.

### SECONDARY GEAR BOX :

LUBRICATION + CHANGE OF GREASE: See technical leaflet 410N023.

### SPARE PARTS (Other parts on request) (*Please indicate the cable reel number*)

Rep2	450N032/2 (hose reel)	Replacement kit (grease, joints, screws and bolts, gear box, technical leaflet)
Rep1	450N032/1 (cable reel)	Replacement kit (grease, joints, screws and bolts, gear box, technical leaflet)
JO3	4J10018	Gear box joint
JO2	4J10021	Coupler joint
JO1	4J10038	Slipping cover joint
GR	According to 410N026	Grease-Qty : 1,2 kg
Item	Reference	Description

### NOTICE D'INFORMATION TECHNIQUE

### TECHNICAL INFORMATION LEAFLET



Main gear box type BNA10 + Secondary gear box



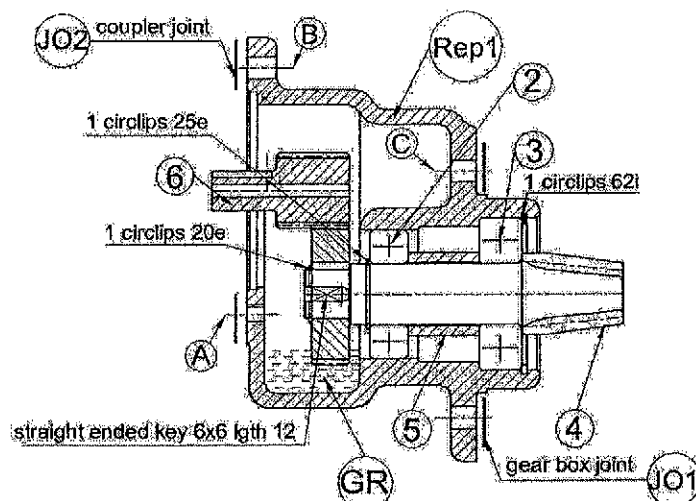
410N148

Folio 1/1

07/09

42R0029





NUTS and BOLTS are assembled using LOCTITE thread-locking product 243

#### MAINTENANCE

**ORIGINAL EQUIPMENT IS SUPPLIED GREASED FOR 15 000 OPERATING HOURS OR 5 YEARS**

#### LUBRICATION

- \* With grease.

#### SECONDARY GEAR BOX ACCESS

- \* Remove the motor-coupler unit fixed by 4 bolts CHC M8 x 25
  - 2 bolts are external (item B)
  - 2 bolts are on the motor coupler side (item A)

#### CHANGE OF GREASE (Replacement kit with grease, joints, screws and bolts must be at your disposal).

- \* When the secondary gearbox is open, remove the old grease
- \* Clean the inside with a brush and grease solvent
- \* Apply new grease on the inside of the housing
- \* Re-assemble the motor-coupler unit using a new joint between the two flanges

#### REPLACING THE SET OF GEAR WHEEL ITEM 6 AND SHAFT PINION ITEM 4

(Replacement kit with grease, joints, screws and bolts must be at your disposal)

- \* Access to interior of secondary gearbox as described above
- \* Remove the secondary gearbox and its flange fixed by 4 bolts CHC M8 x 25 which 1 internal bolt item C
- \* Remove the snap rings 62l and 20 E.
- \* Push the pinion shaft item 4 (from left to right of the drawing) to extract wheel item 6 and replace it. Pinion item 6 is fixed onto coupler by a bolt HM 5 x 70 ; if necessary, change the shaft pinion item 4
- \* Carry out the operation in reverse order for re-assembly
- \* Replace the joints.

#### SPARE PARTS (Please indicate the cable reel reference number when ordering spare parts)

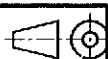
Rep1	450N012	Replacement kit (grease, joints, screws and bolts, gear box, technical leaflet)
JO2	4J10018	Coupler joint
JO1	4J10018	Gear box joint
GR	According to 410N026	Grease - Quantity: 100g
6	4P28024	Input gear set for secondary gear box type 5
6	4P28023	Input gear set for secondary gear box type 4
6	4P28022	Input gear set for secondary gear box type 3
6	4P28021	Input gear set for secondary gear box type 2
6	4P28020	Input gear set for secondary gear box type 1
4	4P28026	Shaft pinion
Item	Reference	Description

#### NOTICE D'INFORMATION TECHNIQUE

#### TECHNICAL INFORMATION LEAFLET



#### SECONDARY GEAR BOX R1-R2-R3-R4-R5

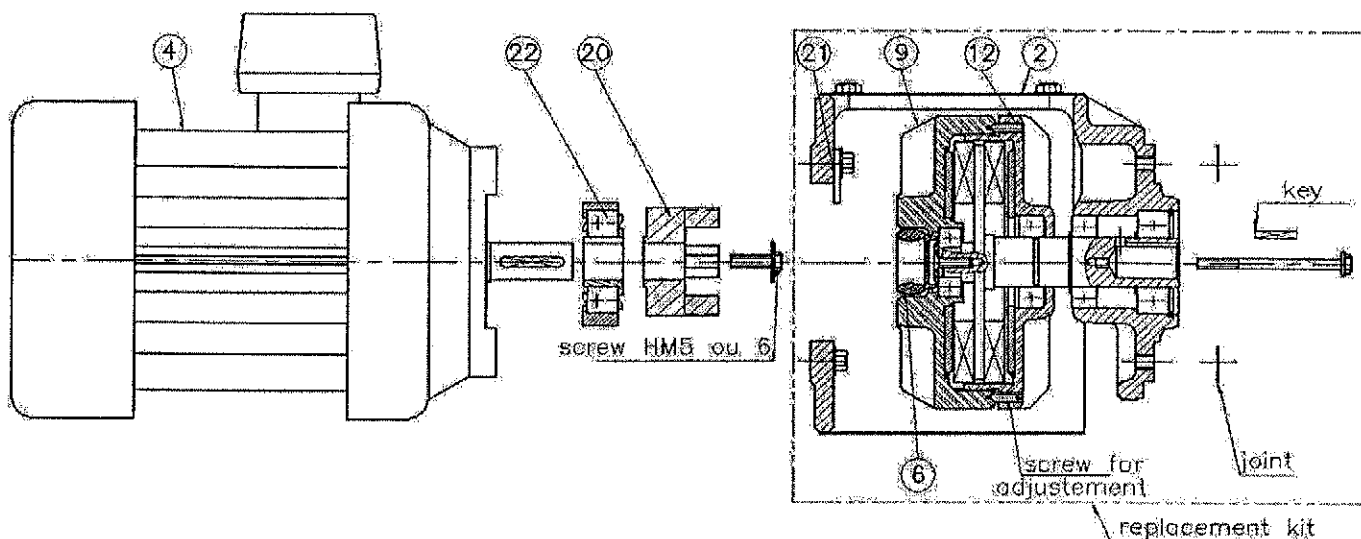


4 10N023

Folio 1/1

02/10





NUTS and BOLTS are assembled using LOCTITE thread-locking product 243

### MAINTENANCE (According to MAINTENANCE PROGRAMM)

- (E) - Check the good condition of the **anti run back bearing**, item 22 :
    - Remove the motor to have access to the anti run back bearing
    - The anti run back bearing is free to rotate in one direction and blocked on the other direction.
- If any problem, change the anti run back bearing.

### SPARE PARTS (Please indicate the cable reel reference number when ordering spare parts)

47C0005/3	W motorcoupling with motor without brake - without free wheel
47C0005/2	W motorcoupling with brake motor
47C0005/1	W motorcoupling with motor without brake - with free wheel
<b>Reference</b>	<b>Description</b>

### SOUS-ENSEMBLES

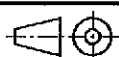
	450N014	Replacement kit for coupler W (joints, screws and bolts, key without motor - without free wheel)
<b>22</b>	41A0486	Free wheel adaptation
<b>20</b>	4A10035	Coupling hub
<b>1</b>		Motor with brake 0,75 KW
<b>1</b>		Motor without brake 0,75 KW
<b>Item</b>	<b>Reference</b>	<b>Description</b>

### NOTICE D'INFORMATION TECHNIQUE

### TECHNICAL INFORMATION LEAFLET

**DELACHAUX**  
**CONDUCTIX**

« W » MOTORCOUPLING



**440N059**

Folio 1/2

**07/06**

**REVERSING THE FREE WHEEL**

- \* Remove the perforated plate item 2 fixed by 2 screws HM6x10
- \* Remove the motor item 4 fixed by 2 screws HM6x20 + 2 screws HM6x25 with the antirotation plate of the free wheel item 21.
- \* At the end of the motor shaft, extract the coupling hub item 20 locked by 1 screw H M6 or M5.
- \* When the free wheel item 22 is freed, slide it along the motor shaft, turn it around and replace it on the shaft.
- \* Carry out the operations in reverse order for re-assembly.

**SETTING THE TORQUE (+ To be carried out away from dust and water)**

- \* Remove the perforated plate item 2 fixed by 2 screws HM6x10.
- \* Withdraw the 2 stop screws item 11.
- \* Hold the front flange item 9 stationary by hand and rotate the rear flange item 12. Clockwise flange item 12 will increase the torque.(1/4 of turn = + 0.02 mdaN).
- \* Locate the 2 screws in front of a mark and tighten it with Loctite 243 distributing the tight pull.

**MAXIMUM ADJUSTMENT**

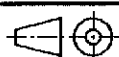
- \* Turn clockwise the rear flange item 12 TO THE MAXIMUM. Turn BACK of 1/8 of round minimum up to the mark (3/8 of round maximum).
- \* Lock the position by 2 screws. Check in turning the coupler by hand that there is no FRICTION NOISE.

**MINIMUM ADJUSTMENT**

Start from **MAXIMUM** position, turn the rear flange, item 12, counter-clockwise 2.5 complete turns up to the mark.

**NOTICE D'INFORMATION TECHNIQUE****TECHNICAL INFORMATION LEAFLET**


« W » MOTORCOUPLING

**440N059**

Folio 2/2

**07/06**

## LUBRIFICATION DES ENGRENAGES SOUS CARTER ETANCHE A LA GRAISSE PAR BARBOTAGE

D'origine, le matériel est lubrifié avec de la graisse "...." (Référence suivant repère).

➤ Rep. 1 : CONDAT 31028 Redugraisse suivant fiche technique 4 4 20F311

Matériels concernés : - P1 - BNA0 - BNA1 - BNA2 - BNA3 - BNA4 - BNA5 - BNA7-A3X - NCR - XO73 - XO74 - XO75 - XO77  
 - Réducteurs additionnels R1-R2-R3-R4-R5-R6-R7-R8-R9-R10  
 - Cellules additionnelles 11-22-33-44-55-66-77-88-99

➤ Rep. 2 : CONDAT type REDUSYNTH suivant fiche technique 4 4 20F322

Matériels concernés : - **Tous réducteurs et cellules en option basse et haute température**

Nota : Ne pas mélanger les graisses.



Utiliser impérativement une graisse de même nature que celle d'origine.



## LUBRIFICATION OF GEARBOXES IN SEALED HOUSING BY GREASE SOAKING

Original equipment is supplied greased with "...." (reference according to Item)

➤ Item 1 : CONDAT 31028 Redugraisse according to technical leaflet 4 4 20F311

Concerned materials : - P1 - BNA0 - BNA1 - BNA2 - BNA3 - BNA4 - BNA5 - BNA7-A3X - NCR - XO73 - XO74 - XO75 - XO77  
 - Secondary gear box R1-R2-R3-R4-R5-R6-R7-R8-R9-R10  
 - Additionnal gear box 11-22-33-44-55-66-77-88-99

➤ Item 2 : CONDAT type REDUSYNTH according to technical leaflet 4 4 20F322

Concerned materials : - **All gear box with option low or high temperature**

Note : Do not mix greases



The sort of grease used must be identical to the original grease.

NOTICE TECHNIQUE

TECHNICAL LEAFLET



GEAR BOX LUBRICATION  
 LUBRIFICATION DU REDUCTEUR



410N026

Folio 1/1

10/09

Lubrification des engrenages sous carter étanche par barbotage  
*Lubrification of gear boxes in sealed housing by grease soaking*

Température d'utilisation :  $-15^{\circ}\text{C}$   $+60^{\circ}\text{C}$

*Working temperature :  $-15^{\circ}\text{C}$   $+60^{\circ}\text{C}$*

\* Fournisseur : CONDAT

Graisse 31028 REDUGRAISSE ( $-25^{\circ}\text{C}$   $+150^{\circ}\text{C}$ )

- couleur : noire
- base : huile minérale
- épaississant : lithium
- viscosité de base à  $40^{\circ}\text{C}$  :  $330 \text{ mm}^2/\text{s}$
- pénétration travaillée 60 coups (ISO 2137) : 385–400 (0.1mm)

\* *Supplier* : CONDAT

*grease* 31028 REDUGRAISSE ( $-25^{\circ}\text{C}$   $+150^{\circ}\text{C}$ )

- *color* : *black*
- *base* : *semi fluide mineral*
- *thickener* : *lithium*
- *viscosity of the base oil at  $40^{\circ}\text{C}$*  :  $330 \text{ mm}^2/\text{s}$
- *Worked penetrability 60 strokes* : 385–400 (0.1mm)

B	7/03/2009	Température d'utilisation ==> $+60^{\circ}\text{C}$	L. Brunet
A	15/04/08	Emission N°1 – Issue N°1	Ivy Teissier
Rev	Date	Modifications – Revisions	Nom – Name
Validé à l'indice <B> le 17/03/2009 par Fonteneau et Chauland			<b>Format A4v</b>



Q-Pulse Id: TMS304

DESIGNATION GREASE

GRAISSE

FICHE TECHNIQUE

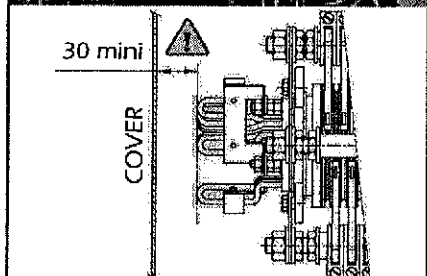
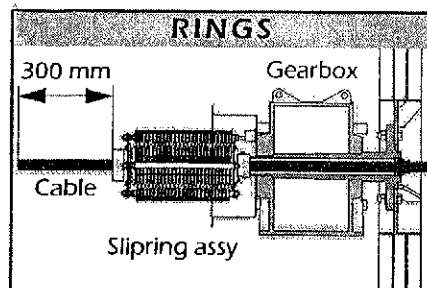
Active: 27/11/2015

Folio

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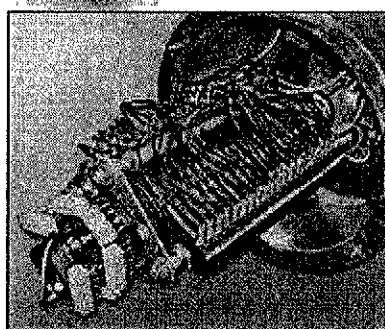
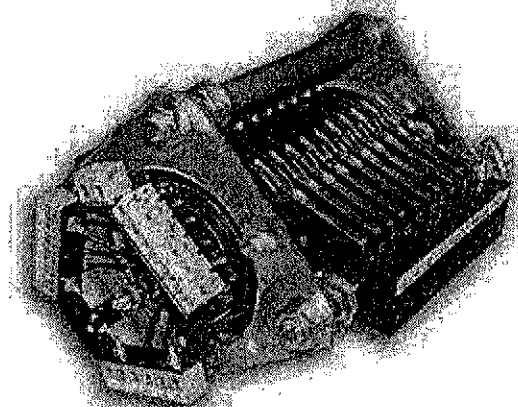
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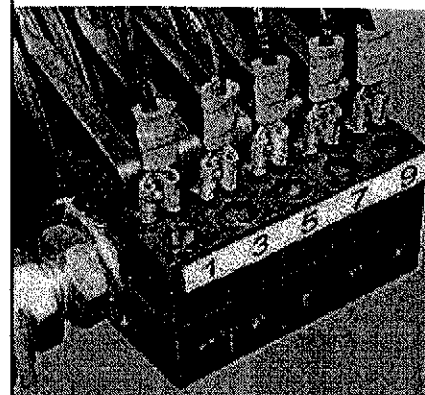
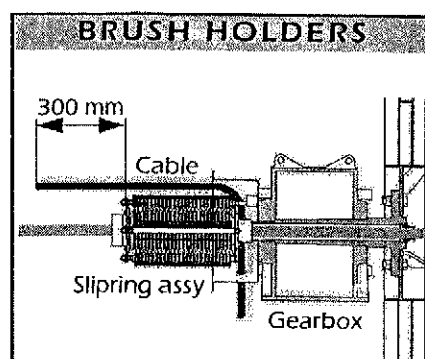


Core	2.5 mm <sup>2</sup> maxi
Connection	Terminal block WEIDMULLER + cap 2.5 mm <sup>2</sup>
Option	6 mm <sup>2</sup> with special cap 6 mm <sup>2</sup>

## CONNECTIONS



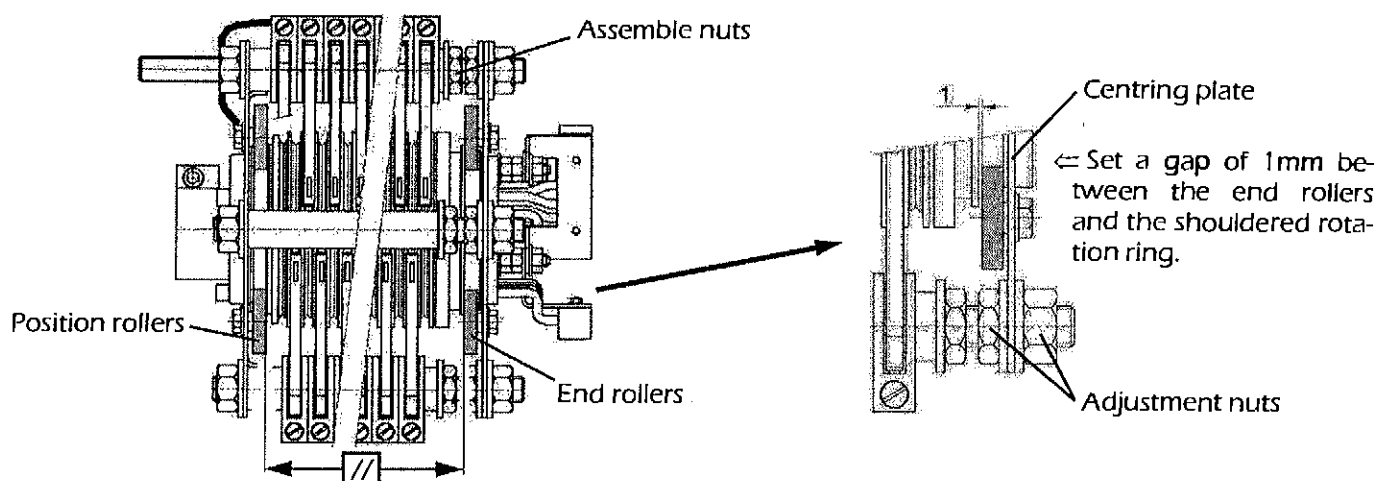
RING TYPE	MARKING
Standard	1 - 2 - 3 - 4 - 5 - 6 - ... - ⊕
Silvered	1A - 2A - 3A - 4A - ... - ⊕
ML	1ML - 2ML - 3ML - ... - ⊕
Gold	1D - 2D - 3D - 4D - ... - ⊕



Core	2.5 mm <sup>2</sup> maxi
Connection	FASTON terminal type 6.35 not insulated
Option	FASTON type 6.35 6 mm <sup>2</sup> special

## CHECK & ADJUSTMENT OF ROLLERS

- Rollers are located either in a groove or against a shouldered ring.
- Rollers must not be pressed against the rolling track. Ensure that each roller can be easily turned with fingers.
- Parallelism between the position rollers and end rollers should be observed without connection with the plate position.



## REPLACEMENT OF ROLLERS

- Loosen the centring plate to fit one or more rollers.

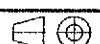
NOTICE D'INFORMATION TECHNIQUE

TECHNICAL INFORMATION LEAFLET

**CONDUCTIX**  
wampfler

© DELACHAUX GROUP

COLLECTEUR C(R)080 / C(R)120 / C(R)180  
SLIP RING ASSEMBLY C(R)080 / C(R)120 / C(R)180



4 40N004

1/2

12/09

232C005



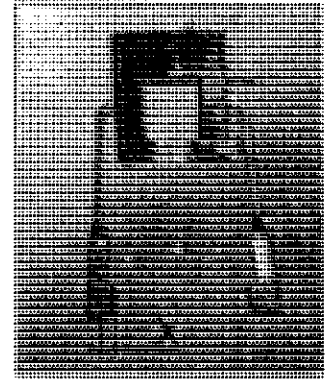
**BEFORE REMOVING THE SLIP RING COVER,  
ENSURE THAT POWER IS SWITCHED OFF.**

### BRUSH HOLDER ADJUSTMENT

- Position exactly the first brush holder of each row.
- Align each brush holder in accordance with the pitch between rings.

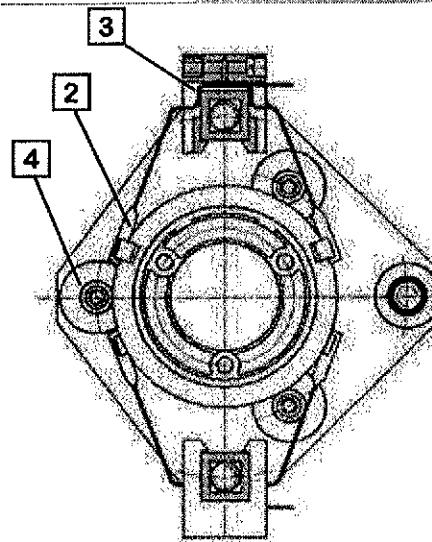
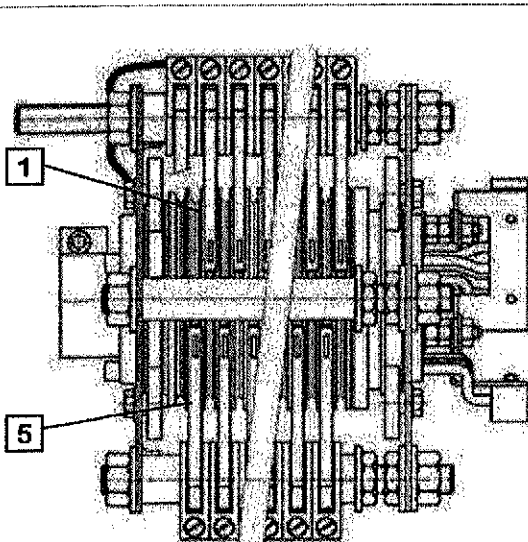
### MAINTENANCE

- Remove the slip ring housing (round housing) or its lateral or top cover (square housing).
- Check the connections.
- Check that the screws and threaded rods of the slipring are well tightened.
- Check that the hub slipring is well tightened on the driving shaft.
- Clean up the insulator rings.
- Remove the dust from the assembly.
- Check:
  - => Wear of each brush holder (replacement if  $X = 2,5 \text{ mm}$ ),
  - => Alignment of the brush holders with their corresponding ring,
  - => Contact pressure of the brush holders onto the rings.
- Install the cover with its seal.
- Change the joint if it is showing signs of wear.



### RECOMMENDED SPARE PARTS - Specify serial number of the cable reel.

DESCRIPTION	C(R)080	C(R)120	C(R)180
Standard ring replacement kit (Please indicate the slipring type)	210N013	210N014	210N015
Silvered ring replacement kit (Please indicate the slipring type)	210N016	210N017	210N018
ML ring replacement kit (Please indicate the slipring type)	210N019	210N020	210N021
Roller replacement kit (Please indicate the slipring type)	250N003	250N003 (C120) 250N004 (CR120)	250N004
Slip ring assembly w/o hub (Specify number of rings for each type and the slipring type (C or CR))	222C004	232C005	242C006
Housing / Main gear box contacts Joint (Only for square housing)	BNA40-50 : 4J10039		
Housing / Main gear box joint	P1 : 4J10049 BNA0 : 4J10050 BNA10-20 : 4J10038 BNA30 : 4J10037 BNA40-50 : 4J10038 A3X : 4J10037 - 4J10048		
Cable gland plate joint	Indicate the cable reel number		
Housing joint or housing cover joint	Indicate the cable reel number		



Each replacement kit includes:

- 3 Phase rings as per **1**
- 3 Sub/assembly including :
  - brush holders **2**
  - clamps + screws **3**
- 3 insulator rings as per **5**

Roller replacement kit **4** includes :  
 Number of rollers according to the  
 type of slip ring assembly + screws  
 + technical leaflet 440N004.

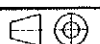
NOTICE D'INFORMATION TECHNIQUE

TECHNICAL INFORMATION LEAFLET

**CONDUCTIX**  
wampfler

© DELACHAUX GROUP

COLLECTEUR C(R)080 / C(R)120 / C(R)180  
 SLIP RING ASSEMBLY C(R)080 / C(R)120 / C(R)180



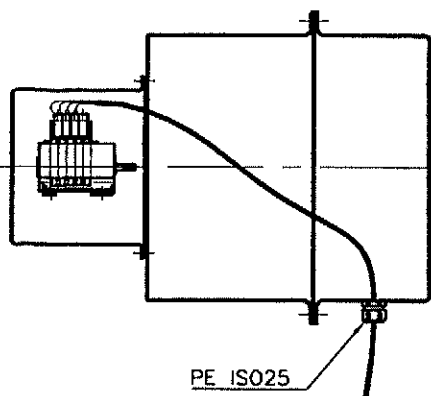
4 40N004

2/2

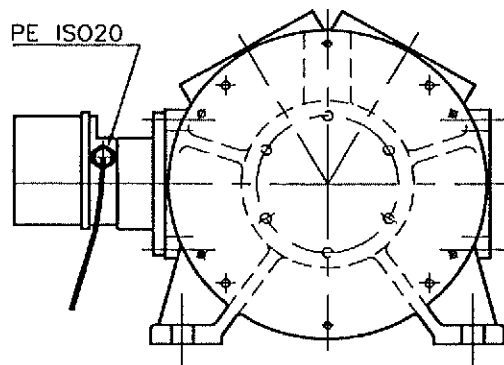
12/09

232C005

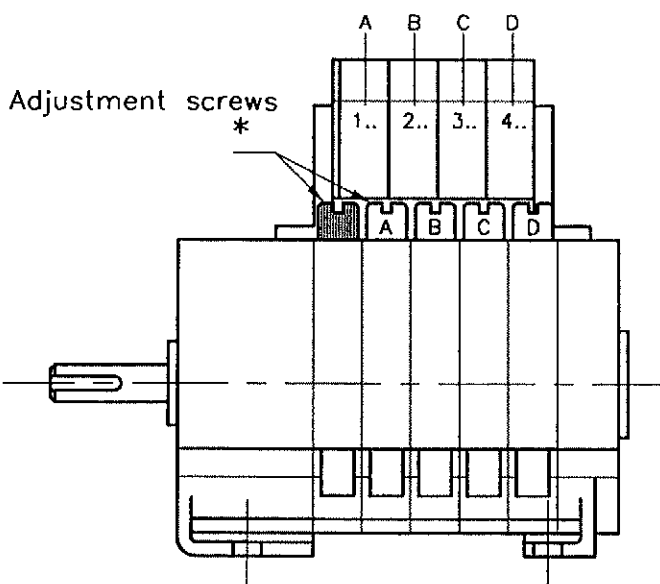
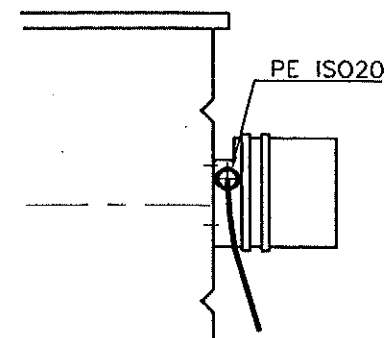
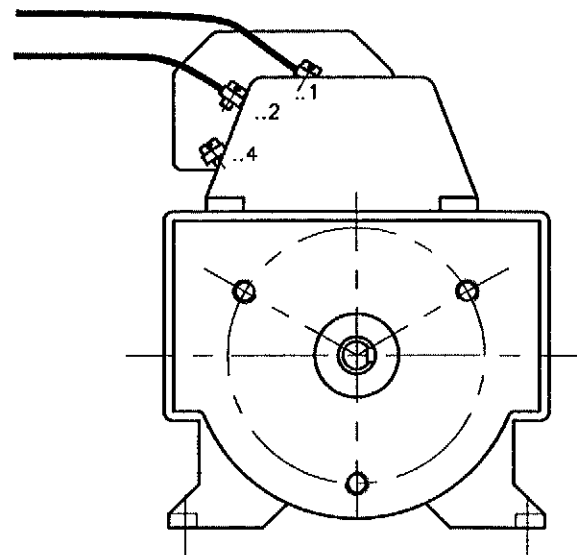
Standard / LV Slip ring assembly



Standard / Gearbox input



Standard / HV Slip ring assembly


 $0,75 < s < 1,5 \text{ mm}^2$ 


\*



Adjustment screw for all the cams



Adjustment screw for each cam →

contact A: 11–12

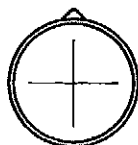
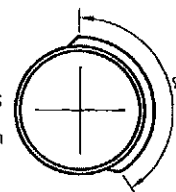
contact B: 21–22

contact C: 31–32

.....

.....

(12,22,...)

Cam: Standard $\alpha = 15^\circ$ Option  
various cam angles $\alpha = \text{according to the application}$ Snap action contact: 250V–6A /AC 80V–2A /DCNo maintenanceSpare parts: (according to the cable reel serial number)

1 complete end limit switch

NOTICE TECHNIQUE

TECHNICAL LEAFLET

**DELACHAUX**  
DIVISION CONDUCTIQUE



END LIMIT SWITCH "STROMAG"

4 4 10N100

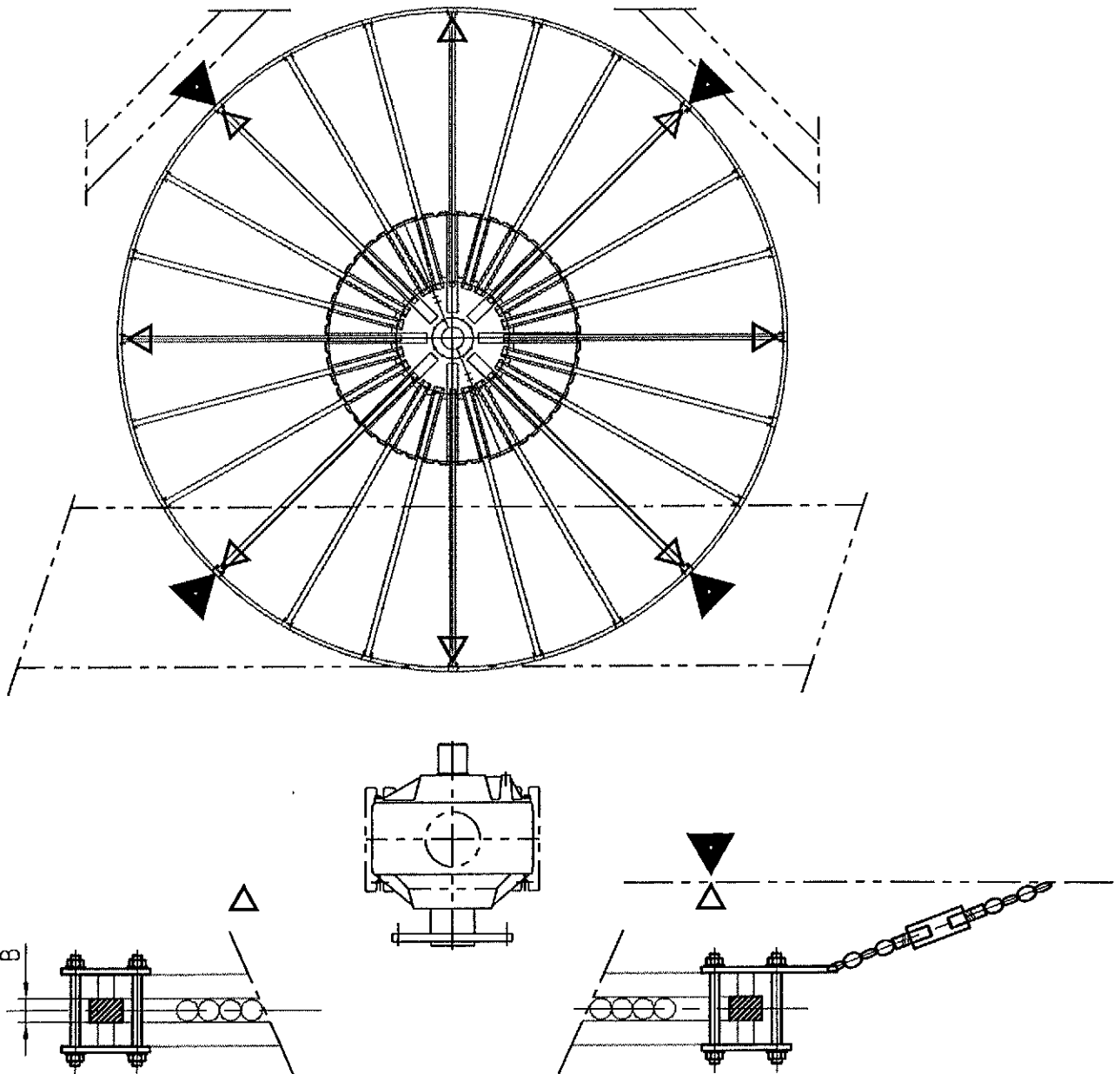
10/07

**Recommandations particulières:**

- pour transport en mer
- pour mise en sécurité (protection contre ouragan...)

*Special instructions:*

- for sea freight
- for safety measures (protection against hurricane)



- △ - relier les 2 viroles extérieures de la bobine avec cale (ép.=B) tout les 3 bras  
 - Fasten the 2 spoolerules with spacer (=B) every 3 arms
- ▼ - ancrer la bobine à la grue en 4 points équidistants.  
 - Fasten the spool to the crane in 4 equidistant points

NOTICE D'INFORMATION TECHNIQUE

TECHNICAL INFORMATION LEAFLET



© DELACHAUX GROUP

Q-Pulse Id: TMS304

Cable reel spool fastening to crane

Amarrage bobine enrouleur sur grue



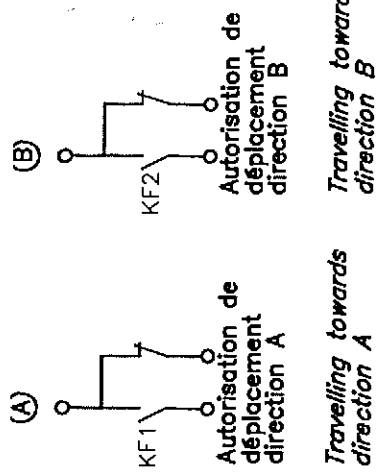
410N141

Folio 1/1 06/09

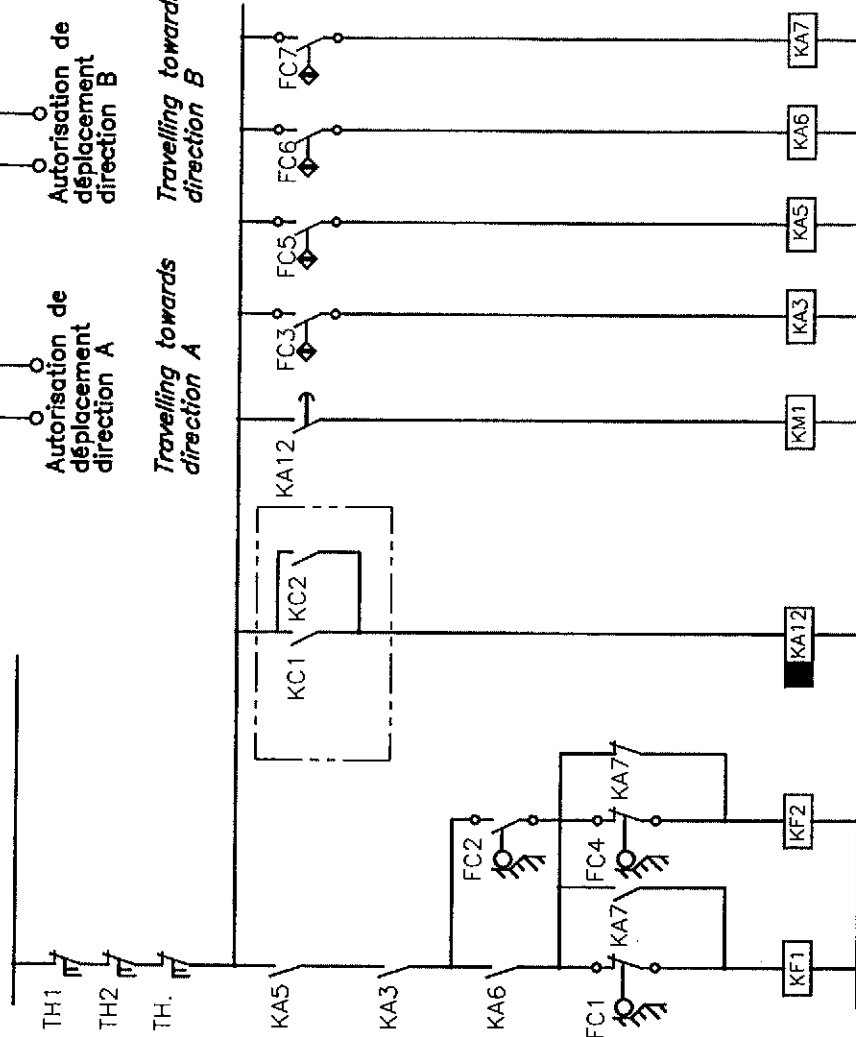
Active: 27/11/2015

Page 292 of 319





Schema de principe pour asservissement de l'enrouleur  
Cable reel principle control diagram  
Enrouleur.../ Cable reel ...



FC3-5-6 Contacts ouverts en cas de défaut  
Contacts open in case of fault

- KC1 Contact de déplacement machine direction A  
Contact travelling of the machine towards A
- KC2 Contact de déplacement machine direction B  
Contact travelling of the machine towards B

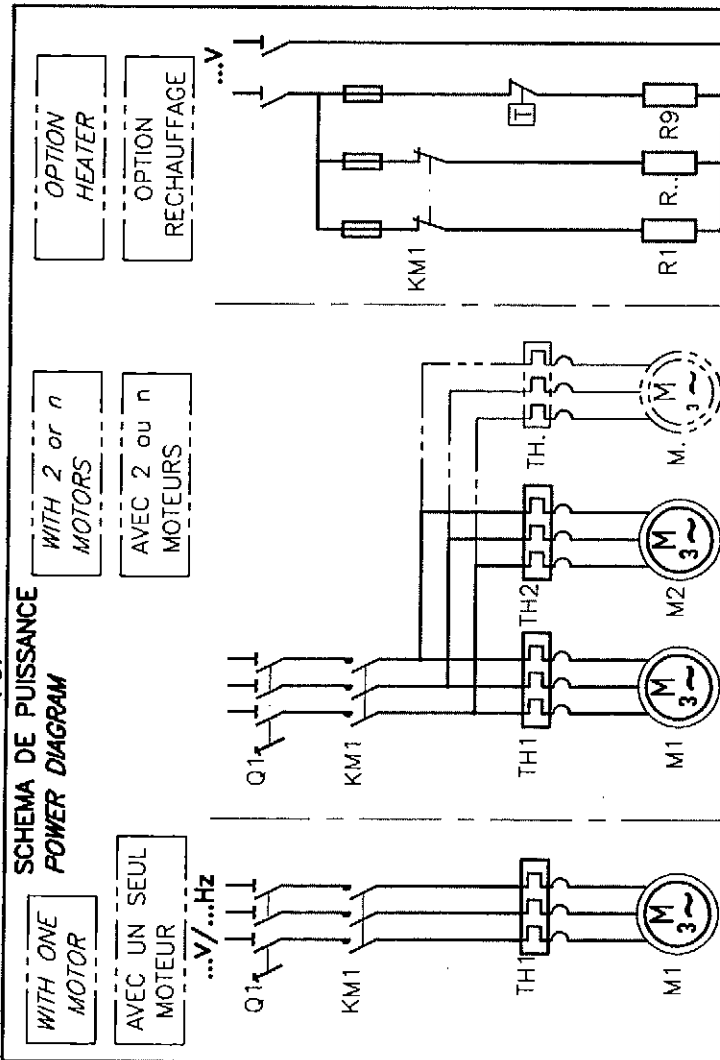
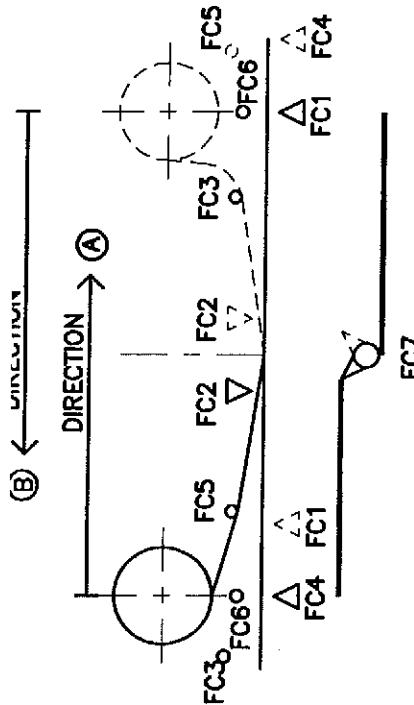
SCHEMA ELECTRIQUE | FOLIO 1/1 | ELECTRICAL DIAGRAM

**DELACHAUX**  
DIVISION CONDUCTEUR

RETRIEVE WITH CENTER FEED AND ALL OPTIONS  
RAMASSE CABLE POINT MILIEU TOUTES OPTIONS

34100007/01

06/02



Fourniture Delachaux/Delachaux scope of supply

- M1, M... Moteurs enrouleur / Cable reel motors ...kW-.....tr/mn
- FC1, FC4 Contacts de fin de course/ End limit switch contact
- FC7 Contact de position/Position contact
- FC3, FC5 Contact de sur traction/ Over pull contact
- FC2 Contact de neutralisation/ By pass of slack contact over the middle point
- FC6 Contact de sous traction/ Under pull contact
- R1, R... Résistance réchauffage moteur/ Motor heater
- R9 Résistance de réchauffage collecteur/ Slipping space heater



## DECLARATION OF INCORPORATION

The undersigned manufacturer :

**CONDUCTIX WAMPFLER**  
**DELACHAUX S.A.**  
**30, Avenue Brillat Savarin**  
**01300 BELLEY - France**

declares that the equipment described below:

Description: **MOTOR DRIVEN CABLE REEL**

Reference or Type: **BNA11.1W0.M614 / 17TC080**

Identification: **1206164/01 TO 02**

designed in accordance with :

- \* Machinery Directive 2006/42/CE of 17th May 2006,
- \* Low Voltage Directive 2006/95/CE of 12<sup>th</sup> December 2006,
- \* EMC Directive 2004/108/CE of 15<sup>th</sup> December 2004,

is a machine part and **cannot function independently.**

Moreover, **it is forbidden to put it into service,**

as long as the machine in which it is destined to be incorporated or,

as long as the whole of the interdependent machines to which it must be fitted,

**has not been declared conform to the measures of Machinery Directive 2006/42/CE,**

or to the national measures of transposition of this directive in the country where it is being used.

If the equipment is delivered incomplete further to the specific request of the customer, the latter is responsible for any adaptations he might make on this non-standard material. The responsibility of the manufacturer is restricted to the supplied parts.

The technical file of this equipment, which is established according to annexe VII, Part B of the Machinery Directive 2006/42/CE, is available in our premises and could be supplied on justified request of the National Authorities.

Belley, on 17 October 2012

Name and position: **B. FONTENEAU**

Product industrialization and design manager

### **3 TEST RESULTS**

#### **3.1 WORKS TEST RESULTS**

#### **3.2 SITE TEST RESULTS**

### **3.1 WORKS TEST RESULTS**



TASK	PRODUCT DETAIL	INSPECTED BY	DATE	PASS / FAIL	CORRECTIVE ACTION REQUEST OR COMMENTS
Design	Documents	Jaw	23/11/12	P	
Drafting	Documents	Jaw	23/11/12	P	
Sheetmetal (Refer F1018 for details)	Switchboard				
	Doors				
	Cell/Panels				
Painting  Process Min DFT (40 STD) Cure Test Colour Exterior Colour Internal Colour Panels					
	Powder / Wet				
Cubicle Erection					
Electrical Fitout (In accordance with drawings)		Jaw	2-9-13	✓	
Inspection & Test (Refer to F1019)		EEensor	1/2/13	Pass	
		J. T. George	1/2/13	Pass	
Packing					

NEIL + MITCH

504  
1/2/13

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

114 Campbell Avenue, WACOL QLD 4076

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

E-mail: jpr@jpr.com.au

**SWITCHBOARD / SHEETMETAL  
INSPECTION CHECKLIST**

CLIENT: <b>QUU</b>			JOB NO: <b>C/H/S 61300</b>		
PRODUCT DESCRIPTION: <b>LUGGAGE POINT PST N°6</b>			DRAWING & SCHEDULE NUMBERS <b>486/5/5 - 0163-010/19</b>		
CONSTRUCTION	QUALITY		COMPLIANCE WITH DRAWINGS		REMARKS OR ACTION
	GOOD	POOR	YES	NO	
1. Folds	✓		✓		
2. Welds	✓		✓		
3. Edges / File			✓		
4. Gauge			✓		
5. Material			✓		
6. Ventilation Openings / Filter Bracket			✓		
7. Water Ingress Test			✓		
8. Equipment Mounting Arrangement			✓		
9. Doors Stiffened			✓		
10. Escutcheons and Lexan Covers			✓		
11. Cable Saddles			✓		
12. Grinding			✓		
13. Door Stays Fitted			✓		
14. Earth Studs			✓		
15. Rubber Retainer			✓		
16. Drawing Holder			✓		
17. Hat Sections					
18. Locking Bars Fitted			✓		
19. External Crevice Welded and Ground			✓		
20. Legend Cards			✓		
21. General Conditions Satisfactory			✓		
22. Cabinet Clean			✓		
23. Job Name and Number Marked on Board and Panels			✓		
24. Lap Top Tray			✓		
25. Gland Plates Fitted			✓		
26. Sunshields Fitted			✓		



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**SWITCHBOARD / SHEETMETAL**  
**INSPECTION CHECKLIST**

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

AFFIX STATUS HERE

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



## J. &amp; P. RICHARDSON INDUSTRIES PTY LTD

114 Campbell Avenue, WACOL QLD 4076

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

E-mail: jpr@jpr.com.au

## SWITCHBOARD ELECTRICAL INSPECTION &amp; TEST REPORT

Customer Name: <u>QUU</u>							
Project: <u>Luggage Point Wastewater Treatment Plant</u>							
JPR Job No: <u>M 61300</u>				Item: <u>PST No 6</u>			
Constructed by: <u>M Zeidler</u>				Tested by: <u>E Ensor</u>		Date: <u>31/1/13</u>	
<b>Item check list</b>							
<i>To comply with Drawings, Documents &amp; Specification</i>							
Main Functional Unit/s	Qty		Size		Settings		
Fuse Fittings	Qty		Size		Fuse Size		
Circuit Breakers	Qty		Size		Settings		
Motor Protection C.B.	Rating		Setting		Function		
Neutral	Reqd		Size		ID		
Equipment Earthing	Checked		Size				
C.T.s	Qty		Rating		Pri Inject.		
Meters	Qty		Rating		Function		
Contactors	Qty		Rating		Voltage		
Overloads	Qty		Rating		Function		
Relays	Qty		Rating		Voltage		
Timers	Qty		Rating		Voltage		
Control Switches	Qty		Rating		Function		
Push Buttons	Qty		Rating		Function		
Pilot Lights	Qty		Rating		Voltage		
Transformers	Qty		Rating		Voltage		
ATT/VFD/Soft Starter	Qty		Rating		Function		
DC Supply	Qty		Rating		Voltage		
Terminals	Qty		Size		ID		
Engraving	Qty		Size		ID		
Cabling	Type		Size		ID		
Busbars	Type		Size		ID		
Escutcheons / Shrouds	Type		Label		IP rating		
S.A. Metering CTs	Qty		Rating				
S.A. Metering Links	Type						
S.A. Meters	Type		Size				
JPR Label	Fitted		Stamped		Safety Stkr		
Legend Card	Qty		Correct				
PLC/Telemetry	Qty		Size				
Power Monitor Relay	Qty		Rating		Function		
<b>General Check List</b>							
IP Sealing	Rating						
Door Latches/Hinges	Qty		Type		Operation		
Ventilation	Required		Type		Operation		
Circuit Schedule	Markup		Checked		Supplied		
Terminal Tightness	Power		Control		Result		
Busbar System	Clearances		Joints		ID		
Earth Continuity	Body to E		Doors to E		Panels to E		
Cubicle Cleaned							
Paint Finish Intact							
Polarity Check	R - R		W - W		B - B		
Function	Power		Control		PLC/Telem		
Continuity Check	R - R		W - W		B - B		N - N
Insulation Test	R to E	W to E	B to E	R to W	R to B	W to B	N to E
1000v Test (MΩ)	500	500	500	500	500	500	
<b>Earth Leakage</b>							
Earth Leakage Test		Rated Current		Trip Current		Trip Time	
<u>Q 4</u>		30 mA		25 mA		2.85 ms	
<u>Q 5</u>		30 mA		25 mA		30 x 2 ms	
<b>Comments:</b>							

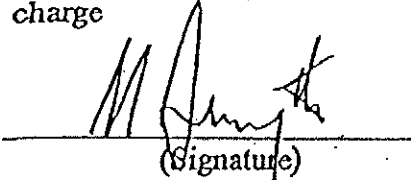
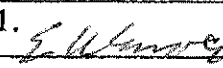


JOB SAFETY ANALYSISLIVE LOW VOLTAGE WORKTESTING SWITCHBOARDS AND CONTROL PANELS WITHIN OUR MANUFACTURING PREMISES

APPROVED BY: Eric McCulloch (WHSO)

LOCATION: WACOL WORKSHOP

DATE: 3.1.1.1.13

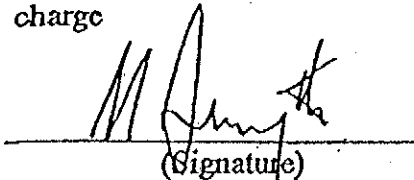

AUTHORISATIONS		PERSONAL PROTECTIVE EQUIPMENT			
<ul style="list-style-type: none"> <li>• Authorisation from person in charge</li> </ul>  (Signature)	<input checked="" type="checkbox"/> YES	<ul style="list-style-type: none"> <li>• Long cotton clothing</li> <li>• Insulating work gloves in test</li> <li>• Insulating mats / covers in test</li> <li>• Switchboard rescue kit in test</li> </ul>	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES		
<b>TASK</b>  <b>LIVE LOW VOLTAGE WORK</b>  <b>TESTING SWITCHBOARDS AND CONTROL PANELS WITHIN OUR MANUFACTURING PREMISES</b>	<ul style="list-style-type: none"> <li>• Isolation points identified and accessible</li> <li>• Work area clear of obstructions</li> <li>• Unauthorised access prevented to work area</li> <li>• P.P.E. is fit for purpose</li> <li>• Test equipment is fit for purpose</li> <li>• Written authority to proceed has been obtained from a person in charge</li> <li>• JPR authorisation to conduct live work is current</li> <li>• Approved dedicated power supply only used for testing.</li> <li>• Approved dedicated power supply in current test</li> </ul>	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input type="checkbox"/> YES <input type="checkbox"/> YES	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input type="checkbox"/> YES <input type="checkbox"/> YES		
<b>OPTION (A)</b> RCD protected outputs used at power supply	<ul style="list-style-type: none"> <li>&gt; RCD protection checked daily prior to use</li> <li>&gt; Safety Observer <del>is</del> is not required</li> </ul>	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES		
<b>OPTION (B)</b> Non RCD protected outputs used at power supply	<ul style="list-style-type: none"> <li>&gt; Supervisor consulted prior to use</li> <li>&gt; Safety Observer is in attendance</li> </ul>	<input type="checkbox"/> YES <input type="checkbox"/> YES	<input type="checkbox"/> YES <input type="checkbox"/> YES		
I understand and am fully aware of the requirements of this job safety analysis.					
Signatures:	1. 	2.	3.	4.	5.

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

APPROVED BY: Eric McCulloch (WHSO)

LOCATION: WACOL WORKSHOP

DATE: 1.1.2.1.1.3

AUTHORISATIONS		PERSONAL PROTECTIVE EQUIPMENT			
<ul style="list-style-type: none"> <li>• Authorisation from person in charge</li> </ul>  (Signature)	<input checked="" type="checkbox"/> YES	<ul style="list-style-type: none"> <li>• Long cotton clothing</li> <li>• Insulating work gloves in test</li> <li>• Insulating mats / covers in test</li> <li>• Switchboard rescue kit in test</li> </ul>	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES		
<b>TASK</b>  <b>LIVE LOW VOLTAGE WORK</b>  <b>TESTING SWITCHBOARDS AND CONTROL PANELS WITHIN OUR MANUFACTURING PREMISES</b>	<ul style="list-style-type: none"> <li>• Isolation points identified and accessible</li> <li>• Work area clear of obstructions</li> <li>• Unauthorised access prevented to work area</li> <li>• P.P.E. is fit for purpose</li> <li>• Test equipment is fit for purpose</li> <li>• Written authority to proceed has been obtained from a person in charge</li> <li>• JPR authorisation to conduct live work is current</li> <li>• Approved dedicated power supply only used for testing.</li> </ul>	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input type="checkbox"/> YES	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES <input type="checkbox"/> YES		
<b>OPTION (A)</b> RCD protected outputs used at power supply	<ul style="list-style-type: none"> <li>&gt; RCD protection checked daily prior to use</li> <li>&gt; Safety Observer is / is not required</li> </ul>	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES	<input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> YES		
<b>OPTION (B)</b> Non RCD protected outputs used at power supply	<ul style="list-style-type: none"> <li>&gt; Supervisor consulted prior to use</li> <li>&gt; Safety Observer is in attendance</li> </ul>	<input type="checkbox"/> YES <input type="checkbox"/> YES <input checked="" type="checkbox"/> YES	<input type="checkbox"/> YES <input type="checkbox"/> YES <input checked="" type="checkbox"/> YES		
I understand and am fully aware of the requirements of this job safety analysis.					
Signatures:	1. 	2.	3.	4.	5.

**FOR**  
**LIVE LOW VOLTAGE WORK**

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

APPROVED BY: Eric McCulloch (WHSO)

LOCATION: WACOL WORKSHOP

DATE: 25/02/13

AUTHORISATIONS	MINIMUM PERSONAL PROTECTIVE EQUIPMENT
<ul style="list-style-type: none"> <li>JPR induction completed <input checked="" type="checkbox"/> YES</li> <li>Authorisation from JPR person in control to perform live work <input checked="" type="checkbox"/> YES</li> <li>Independent body employee Qualifications in accordance with requirements of Electrical Safety Act. <input checked="" type="checkbox"/> YES</li> </ul> <p style="text-align: center;"><i>E. McCulloch</i> (Signature) JPR Person in Control</p>	<ul style="list-style-type: none"> <li>Long cotton clothing <input checked="" type="checkbox"/> YES</li> <li>Insulating work gloves in test <input type="checkbox"/> YES</li> <li>Insulating mats / covers in test <input type="checkbox"/> YES</li> <li>Switchboard rescue kit in test <input checked="" type="checkbox"/> YES</li> </ul> <p>Note:- Items 2,3,4 are to be supplied by the independent body and submitted to JPR for inspection prior to initial use</p>

HAZARDS	CONTROL MEASURES
<ul style="list-style-type: none"> <li>CONTACT WITH LIVE LOW VOLTAGE</li> <li>ELECTRIC SHOCK</li> <li>BURNS</li> </ul>	<ul style="list-style-type: none"> <li>Isolation points identified and accessible <input checked="" type="checkbox"/> YES</li> <li>Work area clear of obstructions <input checked="" type="checkbox"/> YES</li> <li>Unauthorised access prevented to work area Barriers and signage provided by independent body <input checked="" type="checkbox"/> YES</li> <li>P.P.E. is fit for purpose and in test <input checked="" type="checkbox"/> YES</li> <li>Test equipment is fit for purpose and in test <input checked="" type="checkbox"/> YES</li> <li>Authority to proceed has been obtained from JPR person in control <input checked="" type="checkbox"/> YES</li> <li>Independent body authorisation to conduct live work is current (documentation required to support evidence) <input checked="" type="checkbox"/> YES</li> <li>Approved dedicated power supply only used for testing. (JPR supplied) <input checked="" type="checkbox"/> YES</li> <li>Approved dedicated power supply in current test <input checked="" type="checkbox"/> YES</li> </ul> <p><b>OPTION</b> (A) RCD protected outputs used at power supply <input checked="" type="checkbox"/> YES</p> <p>&gt; RCD protection checked daily prior to use <input checked="" type="checkbox"/> YES</p> <p>&gt; Safety Observer is / is not required (Competent safety observer supplied by independent body for duration of live work, documentation required to support evidence) <input checked="" type="checkbox"/> YES</p> <p><b>OPTION</b> (B) Non RCD protected outputs used at power supply <input type="checkbox"/> YES</p> <p>&gt; JPR person in control prior to use <input type="checkbox"/> YES</p> <p>&gt; Safety Observer is in attendance (Competent safety observer supplied by independent body for duration of live work, documentation required to support evidence) <input type="checkbox"/> YES</p>

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

**ALL INDEPENDENT BODY EMPLOYEES ON SITE PERFORMING LIVE WORK TO SIGN**

Signatures:	<i>J. Clapp</i>				
Name Printed:	Joh. Clapp				
Date:	25/02/13				

## **3.2 SITE TEST RESULTS**



114 Campbell Avenue, WACOL QLD 4076  
Ph: (07) 3271 2911 - Fax: (07) 3271 3623  
E-mail: [jpr@jpr.com.au](mailto:jpr@jpr.com.au) ABN: 23 001 952 325

CUSTOMER: QUU.

JOB NO: C61300 DESCRIPTION: PT6 SCRAP

MCC / DISTRIBUTION BOARD NO: STAGE 2 Primary SLD SWITCHBOARD

Tested By: <i>G. Boxsell</i>	Date: <i>3/5/13</i>	Certificate No: <i>C5033</i>
------------------------------	---------------------	------------------------------

[illegible]

LOCATION: LJ66.462 PT STP DRAWING No:

FIELD INSPECTION BY:

CUSTOMER: QL  
G Boxs LLC

DATE: 8/5/13

**SUPERVISOR:**

DRAWING No:

PAGE 2 OF 2

Page 306 of 319



**J. & P. RICHARDSON INDUSTRIES PTY LTD**  
**SITE INSPECTION REPORT ELECTRICAL INSTALLATION (MAJOR)**

JOB No: U61300 CUSTOMER: Quu.LOCATION: PST6 Luggage Pt STP DRAWING No:

Form F1015/6

FIELD INSPECTION BY: GLANN BAXSELL DATE: 3/5/13SUPERVISOR: TONY KING

PAGE 1 OF 2

REMARKS			REMARKS		
CABLE LADDER	BRACKETS DE-BURRED	OK	TERMINATION	CABLE NUMBERING	OK
	ADEQUATE SUPPORTS	OK		CONNECTIONS	OK
	EARTH BONDING	N/A		TENSION ON TERMINALS	
	SPRING WASHER & FULL NUT THREAD	OK			
	PAINTING	NA	EARTHING	RESISTANCE OF EARTH GRID / STAKE	N/A
	WELDING STANDARD	OK		BONDING FENCES, EQUIPMENT, GRID AND GATES	N/A
				CABLE SUPPORTS, WATER, PIPES, ETC,	N/A
MOUNTING OF FIELD EQUIPMENT	WELDING STANDARD	OK		MEN CONNECTIONS	N/A
	BRACKETS DE-BURRED	OK		SIZE	N/A
	ADEQUATE STRENGTH	OK	MAINS	SIZE	6mm 4C+E
	SPRING WASHER & FULL NUT THREAD	OK		VOLTAGE DROP	
	MOUNTING POSITION APPROVED	OK		ELECTRICAL PROTECTION	OK
				SUPPLY AUTHORITY METERING APPROVED	N/A
RUNNING OF CABLES	GROUPING FOR DE-RATING	OK		POLARITY / VOLTAGE	OK
	CLEARANCE FROM INSTRUMENTATION	OK			
	DEPTH UNDERGROUND	N/A			
	ADEQUATE SUPPORT	OK			
	PROTECTION	OK			
	GLANDING	OK			
	LABELLING	OK			
	POINT TO POINT CHECKS	OK			

## **4 “AS INSTALLED” DRAWINGS**



DRAWING No.	Rev	DRAWING TITLE	CAD FILE No.	Remarks
486/5/5-0163-010	C	PRIMARY SEDIMENTATION TANK No6 DRAWING INDEX	55-0163-010C	AS INSTALLED
486/5/5-0163-011	C	PRIMARY SEDIMENTATION TANK No6 POWER DISTRIBUTION SCHEMATIC	55-0163-011C	AS INSTALLED
486/5/5-0163-012	C	PRIMARY SEDIMENTATION TANK No6 24VDC MISC INTERPOSING RELAYS	55-0163-012C	AS INSTALLED
486/5/5-0163-013	C	PRIMARY SEDIMENTATION TANK No6 24VDC MISC INTERPOSING RELAYS	55-0163-013C	AS INSTALLED
486/5/5-0163-014	C	PRIMARY SEDIMENTATION TANK No6 BRIDGE DRIVE SCHEMATIC AND CONNECTION DIAGRAM	55-0163-014C	AS INSTALLED
486/5/5-0163-015	C	PRIMATY SEDIMENTATION TANK No6 SCRAPER BLADES SCHEMATIC AND CONNECTION DIAGRAM	55-0163-015C	AS INSTALLED
486/5/5-0163-016	C	PRIMARY SEDIMENTATION TANK No6 CABLE REELER SCHEMATIC AND CONNECTION DIAGRAM	55-0163-016C	AS INSTALLED
486/5/5-0163-017	C	PRIMARY SEDIMENTATION TANK No6 MISC DIGITAL INPUTS / OUTPUTS	55-0163-017C	AS INSTALLED
486/5/5-0163-018	C	PRIMARY SEDIMENTATION TANK No6 EQUIPMENT LISTING & CONSTRUCTION NOTES	55-0163-018C	AS INSTALLED
486/5/5-0163-019	C	PRIMARY SEDIMENTATION TANK No6 GENERAL ARRANGEMENT	55-0163-019C	AS INSTALLED

## AS CONSTRUCTED DETAILS

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

SIGNED: *[Signature]* DATE: 4/7/13  
 NAME of SIGNATORY: G. Boxsell  
 RPEQ No. or LICENCE: 15033  
 COMPANY NAME: J. & P. RICHARDSON  
 START DATE: FINISH DATE:

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

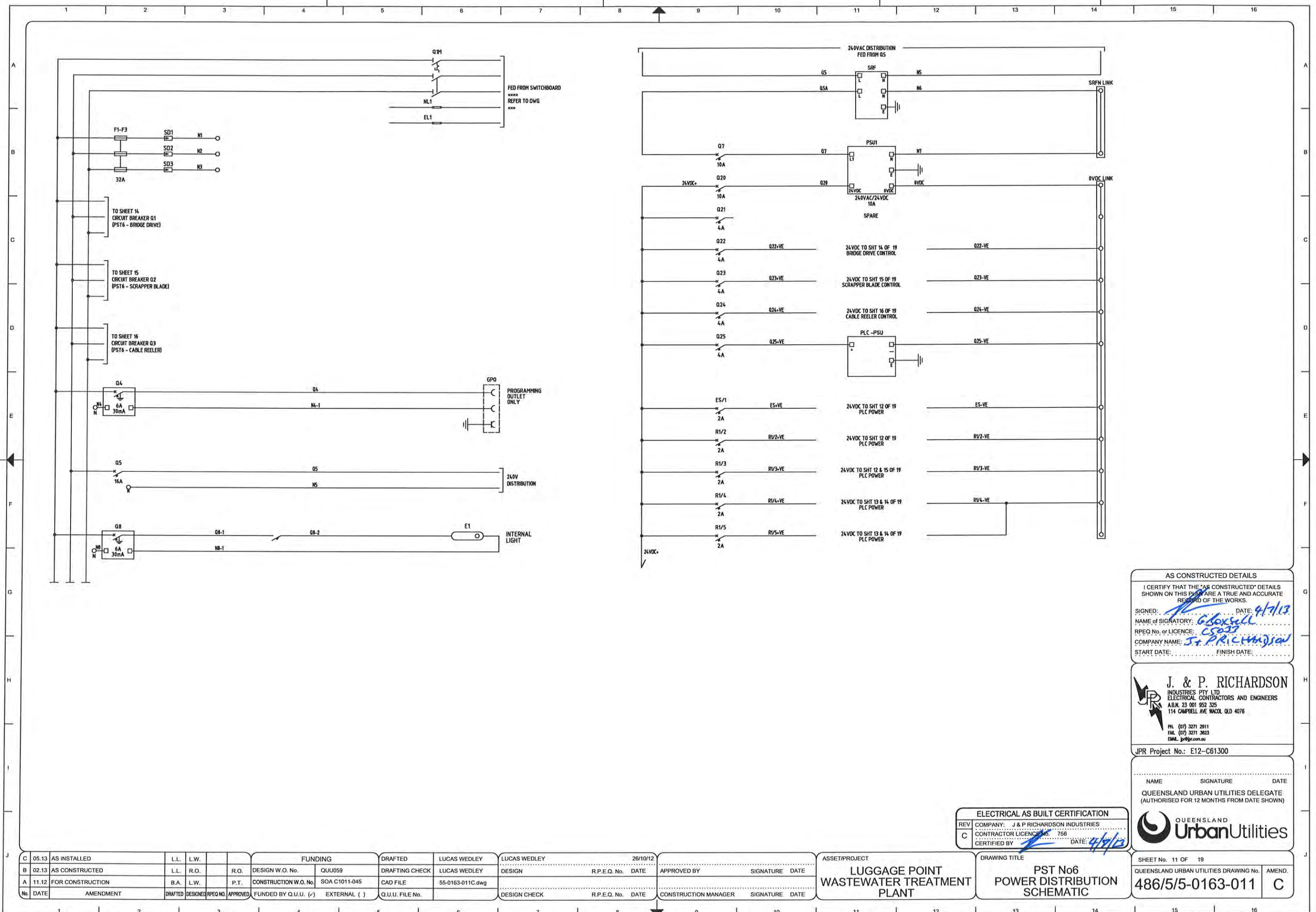
JPR Project No.: E12-C61300

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

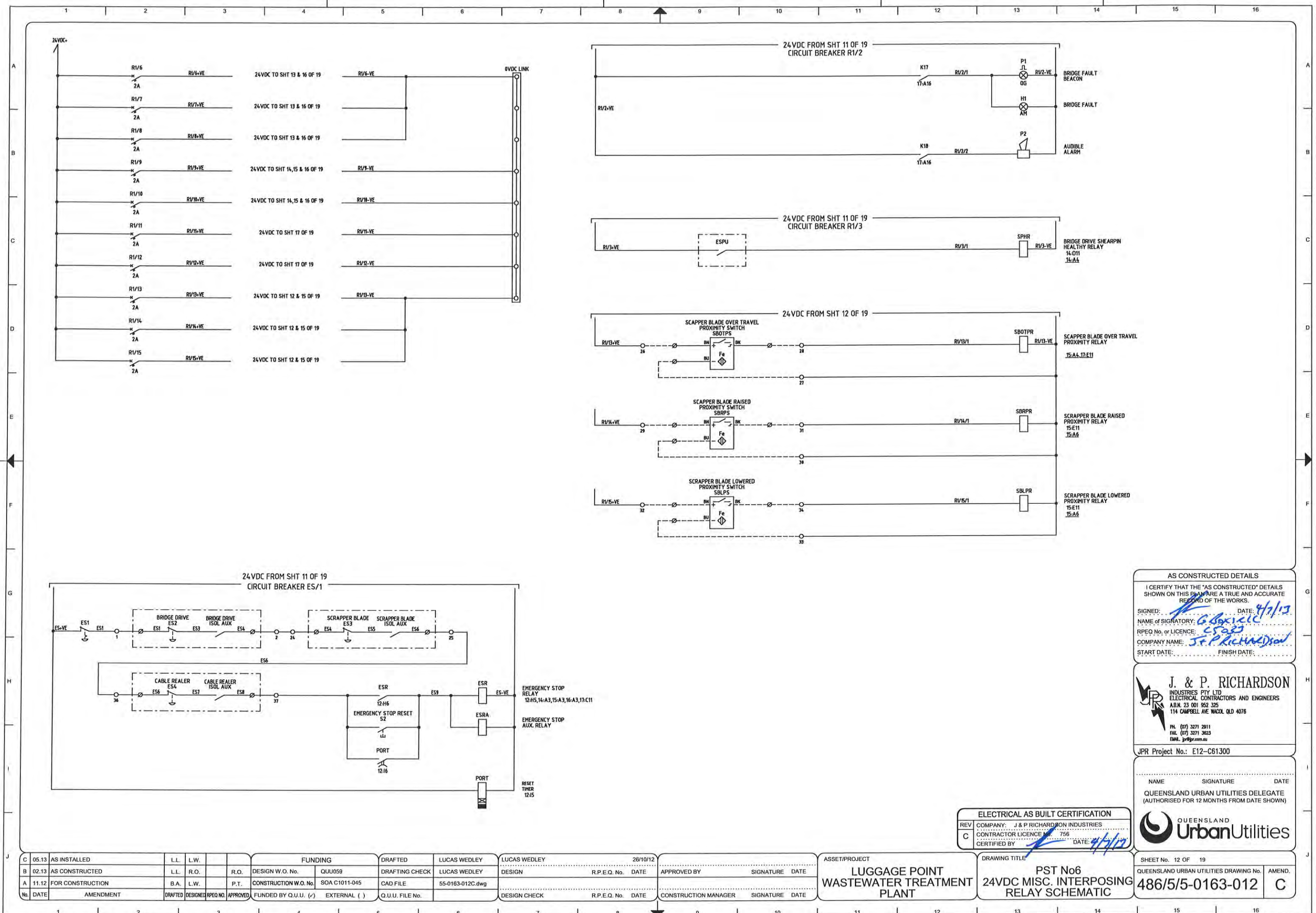


**ELECTRICAL AS BUILT CERTIFICATION**  
 REV COMPANY: J & P RICHARDSON INDUSTRIES  
 C CONTRACTOR LICENCE No. 756  
 CERTIFIED BY: *[Signature]* DATE: 4/7/13

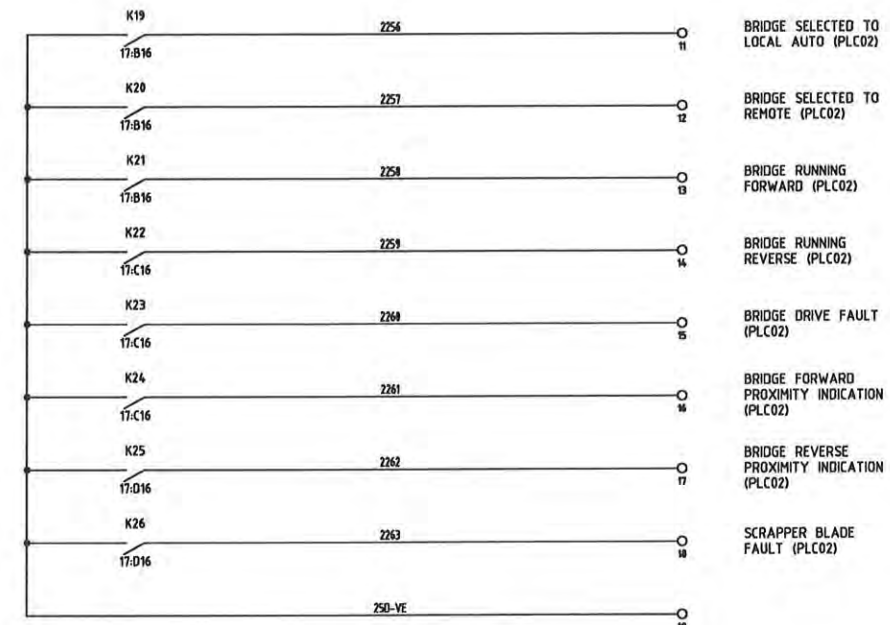
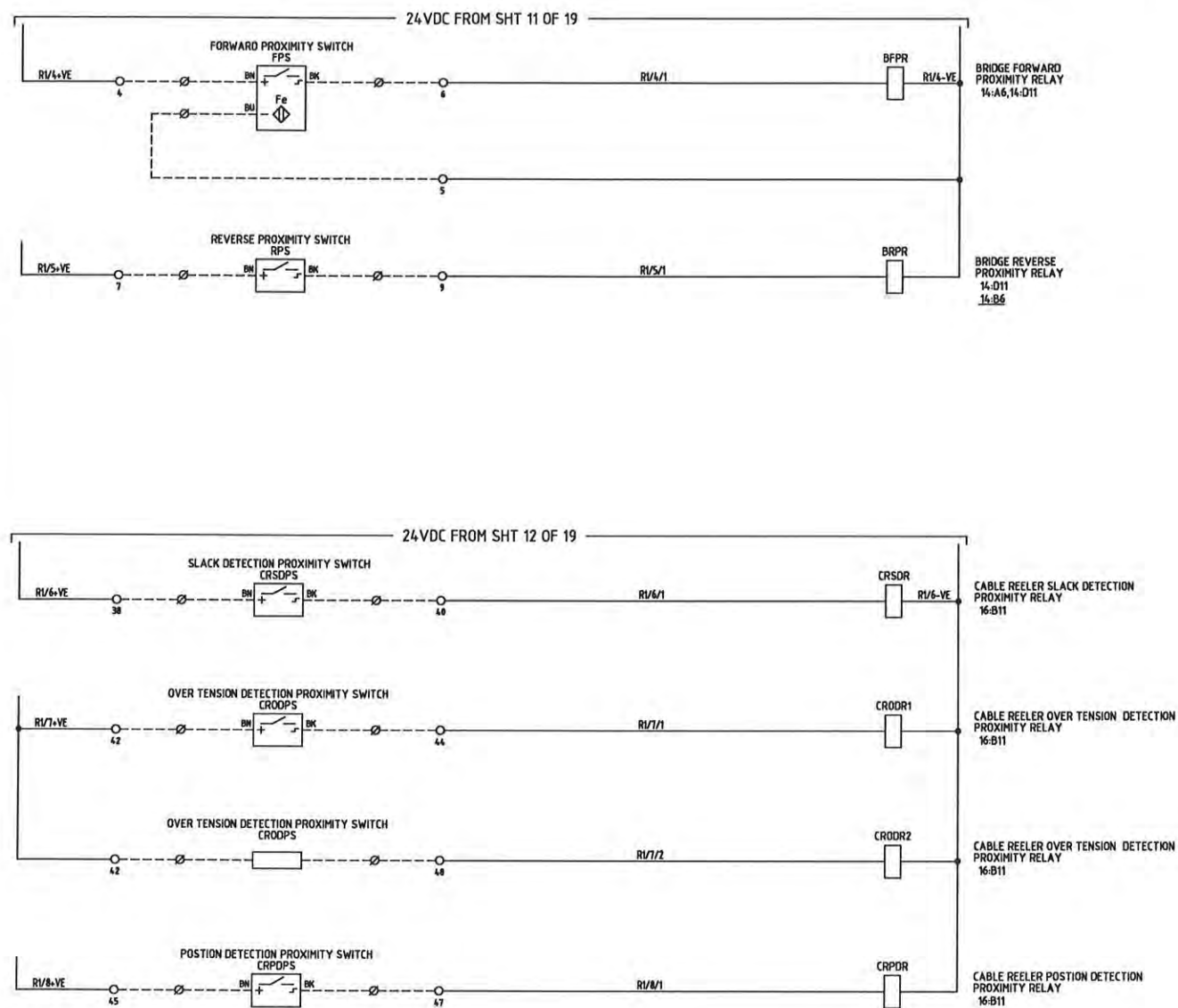
C	05.13	AS INSTALLED	L.L.	L.W.			FUNDING	DRAFTED	LUCAS WEDLEY	LUCAS WEDLEY	26/10/12	ASSET/PROJECT	LUGGAGE POINT WASTEWATER TREATMENT PLANT	DRAWING TITLE	PST No6 DRAWING INDEX	SHEET No. 10 OF 19	QUEENSLAND URBAN UTILITIES DRAWING No. 486/5/5-0163-010	AMEND. C
B	02.13	AS CONSTRUCTED	L.L.	R.O.		R.O.	DESIGN W.O. No. QUU059	DRAFTING CHECK	LUCAS WEDLEY	DESIGN	R.P.E.Q. No. DATE	APPROVED BY	SIGNATURE DATE					
A	11.12	FOR CONSTRUCTION	B.A.	L.W.		P.T.	CONSTRUCTION W.O. No. SOA C1011-045	CAD FILE	55-0163-010C.dwg	DESIGN CHECK	R.P.E.Q. No. DATE	CONSTRUCTION MANAGER	SIGNATURE DATE					
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ No.	APPROVED	FUNDED BY Q.U.U. (✓) EXTERNAL ( )	Q.U.U. FILE No.										





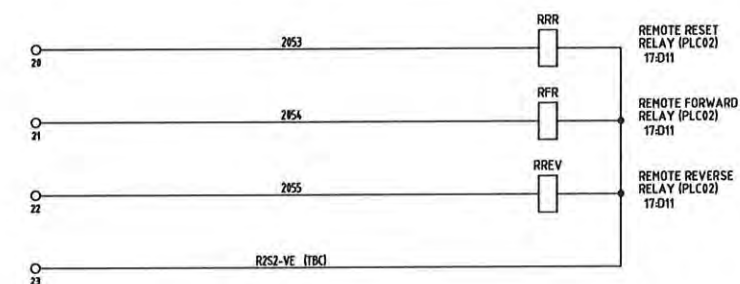






REFER TO DRAWING PLC02  
486/7/5-UT2L274

REFER TO DRAWING  
486/7/5-UT2ULXXX



#### AS CONSTRUCTED DETAILS

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

SIGNED: *[Signature]* DATE: 4/7/13  
NAME OF SIGNATORY: *[Signature]*  
RPEQ No. or LICENCE: *[Signature]*  
COMPANY NAME: *[Signature]*  
START DATE: ..... FINISH DATE: .....

**J. & P. RICHARDSON**  
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EMAIL. jpr@jpr.com.au

JPR Project No.: E12-C61300

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

**UrbanUtilities**

#### ELECTRICAL AS BUILT CERTIFICATION

REV COMPANY: J & P RICHARDSON INDUSTRIES  
C CONTRACTOR LICENCE No. 756  
CERTIFIED BY *[Signature]* DATE: 4/7/13

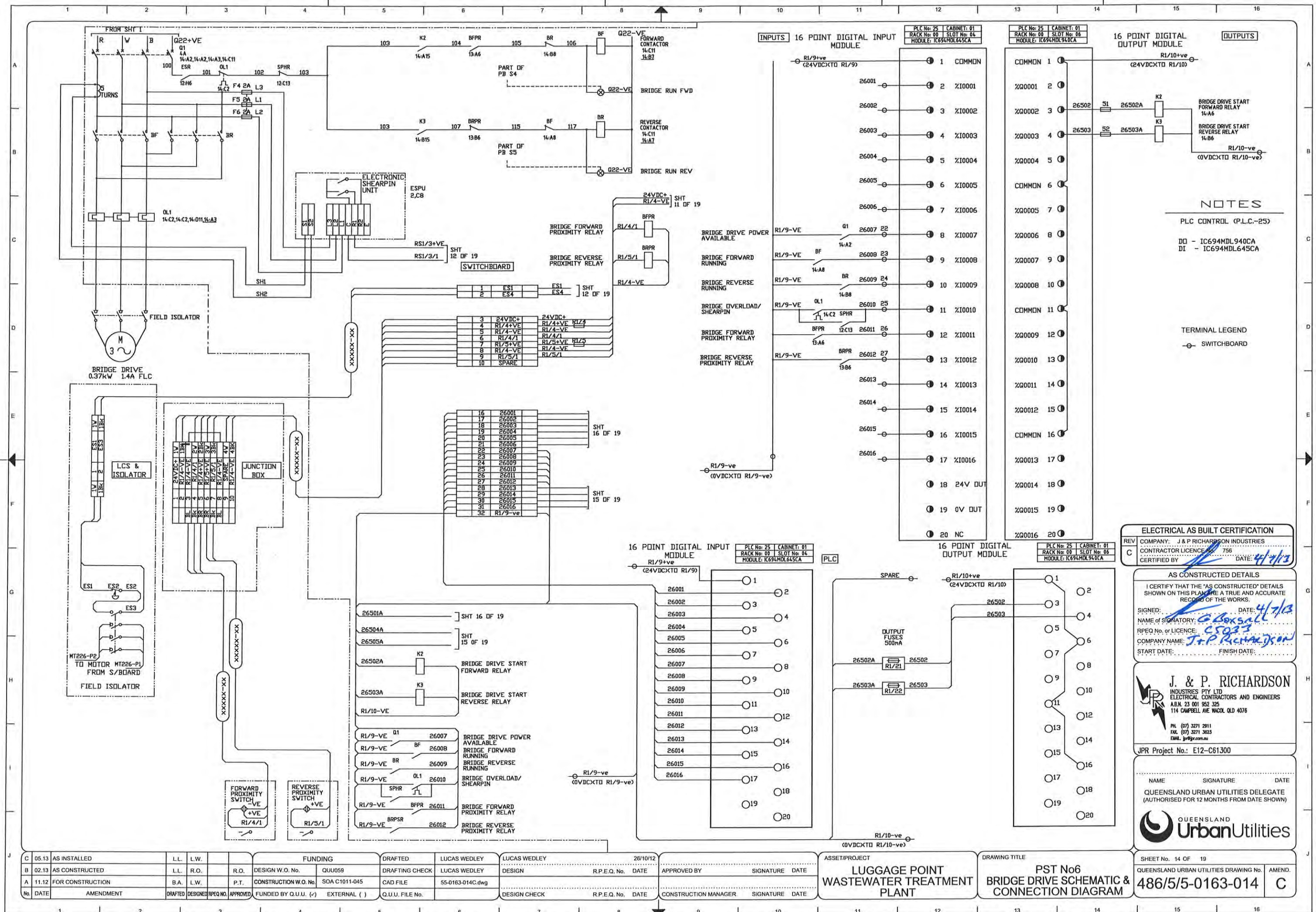
ASSET/PROJECT  
**LUGGAGE POINT  
WASTEWATER TREATMENT  
PLANT**

DRAWING TITLE  
**PST No6  
24VDC MISC. INTERPOSING  
RELAY SCHEMATIC**

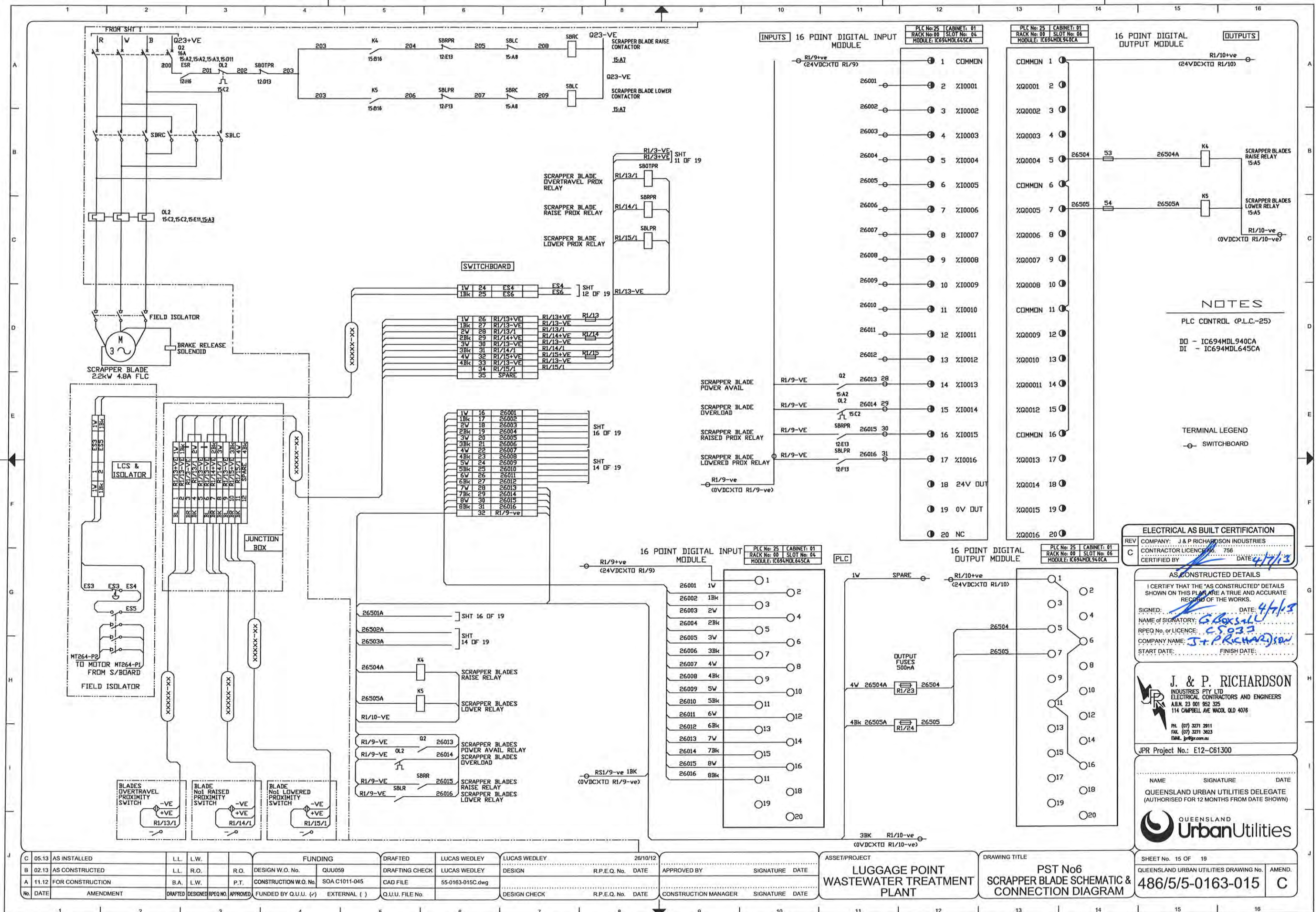
SHEET No. 13 OF 19  
QUEENSLAND URBAN UTILITIES DRAWING No. 486/5/5-0163-013  
AMEND. **C**

No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ No.	APPROVED	FUNDING	DESIGN W.O. No.	QUU059	SOA C1011-045	CAD FILE	55-0163-013C.dwg	Q.U.U. FILE No.	DESIGN CHECK	R.P.E.Q. No.	DATE	APPROVED BY	SIGNATURE	DATE	CONSTRUCTION MANAGER	SIGNATURE	DATE
C	05.13	AS INSTALLED	L.L.	L.W.																		
B	02.13	AS CONSTRUCTED	L.L.	R.O.																		
A	11.12	FOR CONSTRUCTION	B.A.	L.W.																		

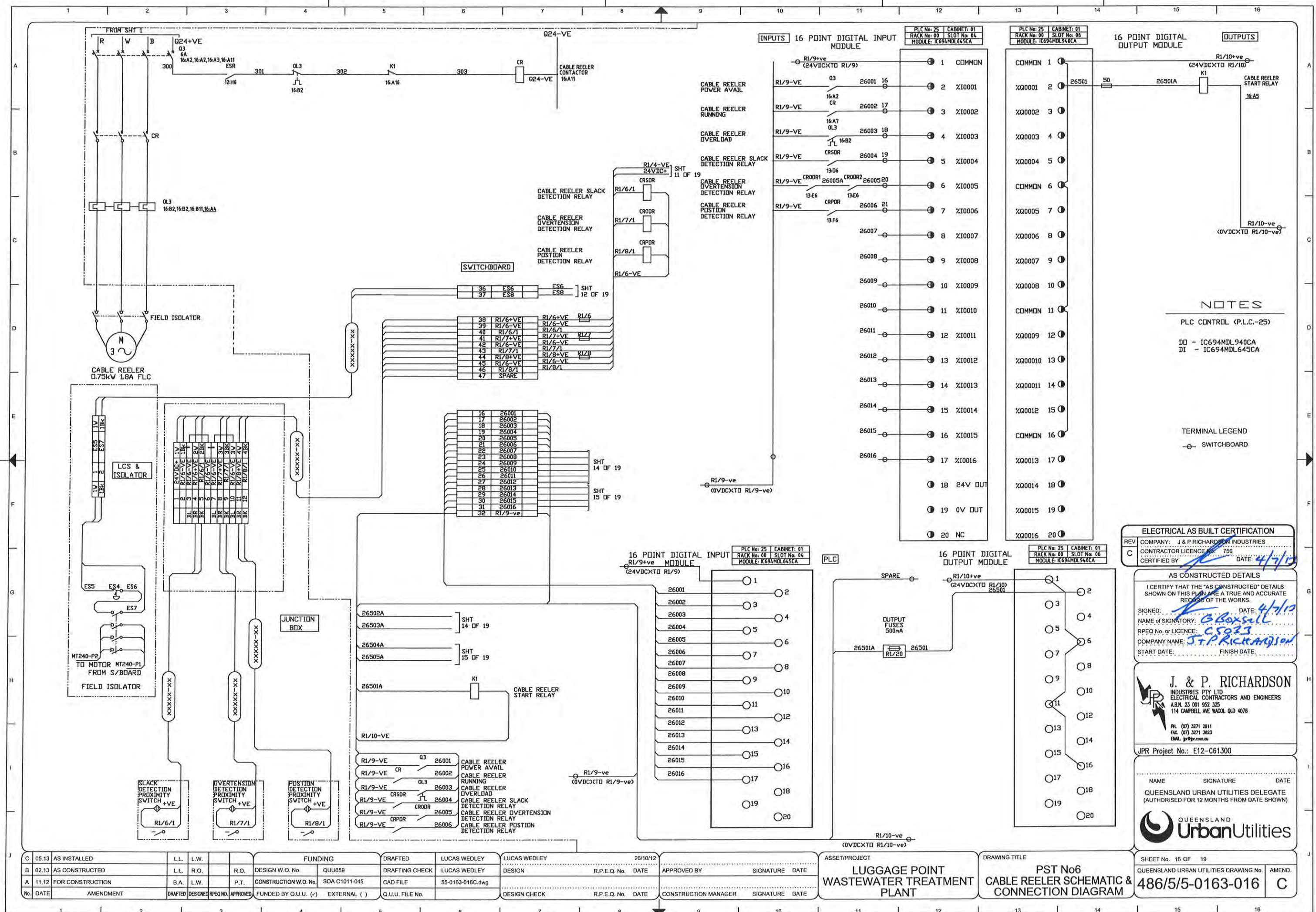




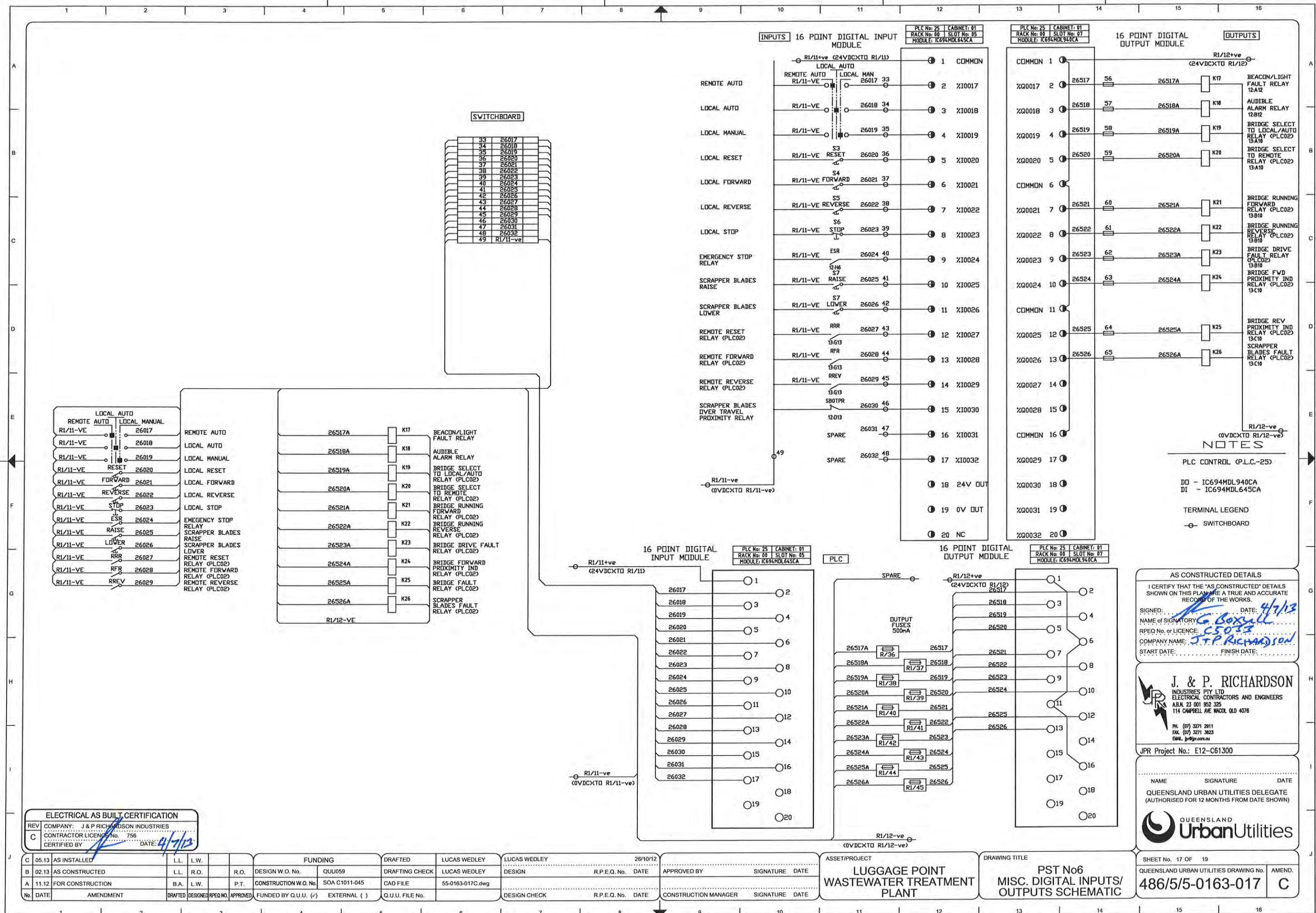














<b>PROJECT:</b>	<b>Client Details</b>
<b>JOB NO:</b>	<b>C61300</b>
<b>ITEM:</b>	<b>MCC / DB / Construction Notes</b>
<b>DOCUMENT NO:</b>	<b>Drawing No. 486/5-0163-018</b>
<b>DESIGN DETAILS: -</b>	
Place of installation	Outdoor
Type of installation	Stationary
S.C.A. Design	Custom
S.C.A. Detail	Front Access, Front Connect, Bottom Entry / Exit
Current Rating	40A
Frequency	50 Hz
Rated Voltage (operational)	415 VAC 3 Phase and Neutral
Control Voltage	240VAC / 24VDC
Insulation Rating	0.6 / 1 kV
Short Circuit withstand Current	10 kA for 1 second
Type Tested in accordance with	AS/NZS 3439.1:2002 / Not Specified
Arc Fault Containment	Limited
Segregation Classification	Form 1 to AS/NZS 3439.1:2002
Degree of Protection	Weather Resistant
Internal Degree of Protection	IP20B / IP10A to AS/NZS 3000:2007 Appendix G (See equipment shrouding measures below)
Design Ambient Temperature	40°C
Design Busbar Temperature Rise	50°C above Ambient
Earthing System	MEN
MEN Link	Not Required
Future Spare Space	10%
Future Extension	Refer drawing for detail
<b>CONSTRUCTION DETAILS: -</b>	
Cubicle Material	2mm thick 316 Grade Stainless Steel
Equipment Panels	3mm Marine Grade Aluminium
Fixings	All Fixings shall be 316 Grade Stainless Steel
Welding	Fully Welded on Facia
Sealing Against Sewer Gas	Switchboard to be Sealed to Limit Ingress of Sewer Well Gases
Stiffening	To prevent warping and form a rigid enclosure
Gland Plates	3mm Stainless Steel fitted with Gasket and fixed with M6 Hex Head Bolts, Earthed as necessary Gland Plate opening to be reinforced with 25mm x 6mm flat strip welded to cubicle body, drilled and tapped with M6 holes and sealed with 25mm x 6mm Adhesive backed Neoprene Rubber
Sun Shield	Required
Door Sealing	Adhesive backed Neoprene Rubber Dore Electrics ES60-051
Hinges Doors / Hinged Panels	Chrome Plated Lift Off Type
Door Locks	Chrome Plated Lockable keyed 92268 Vandal Proof Swing Handle
Escutcheon Locks	3 off 1/4 turn with Slotted Coin Locks
Three Point Locking	Required
Door Earthing	Fit Earthing Stud to all Doors / Hinged Panels fitted with Electrical Equipment, Earth Doors with 6 mm <sup>2</sup> Tinned Copper Braid
Door Opening	90 ° min
Door Stays	Drop Stay
Drawing Holder	Fit to Rear of Door
Laptop Tray	Fit Sliding Fold Down Tray to Rear of Door. (400mm x 400mm)
Legend Card Holder	Fit to Rear of Door
Ventilation	Louvers with Stainless Steel Mesh Gauze and Removable Filter Material, Refer drawing for detail
Cowls	Cowl Louvers with Stainless Steel Mesh Gauze and Removable Filter Material, Refer drawing for detail
Lifting	Via Gussets in Frame
Plinth	Frame Aluminium
Door Switch Brackets	Fit Door Switch Brackets to Cubicle Body, Refer drawing for detail
<b>EQUIPMENT SHROUDING: -</b>	
IP20B (finger)	Line Side of Main Switch, Line Side of Compartment Isolators and Protective Devices Compartments where access is NOT restricted by the use of door interlocks e.g. Isolator or Protective Device
IP10A (back of hand)	Compartments where access is restricted by the use of door interlocks e.g. Isolator or Protective Device
Main Neutral	Dore Electrics 12 hole link c/w ENFeet
Main Earth	Dore Electrics 12 hole link
<b>CABLE DETAILS: -</b>	
Power	V90 0.6 / 1 kV Multi-Stranded, Min. Size 2.5mm <sup>2</sup> (7/0.67)
Control	V90 0.6 / 1 kV Tinned Flexible, Min. Size 1.5mm <sup>2</sup> (30/0.25)
Protection / Metering	V90 0.6 / 1 kV Tinned Flexible, Min. Size 2.5mm <sup>2</sup> (50/0.25)
Module to Marshalling & PLC	V90 0.6 / 1 kV Tinned Flexible, 0.50mm <sup>2</sup> (16/0.25)
<b>Colours:</b>	
Power Wiring to 16mm	Red, White, Blue
Power Wiring above 16mm	Red with Phase Identification at Cable Ends
Phase Neutral	Black
Earth	Green Yellow
Control Active 240VAC	Red
Control Neutral 240VAC	Black
Control Positive ELV	Orange
Control Negative ELV	Violet
General ELV Wiring	Grey
Rtu & Plc Wiring	Grey
<b>Terminations:</b>	
Control Cable Identification	Brady Marking System (Clear Plastic Sleeves with Insertable Tabs)
Cable Ends	Metal Femules / Crimp Lugs as Necessary
Mains Incoming	Direct onto Equipment / Copper Tags / Terminals
Outgoing	Direct onto Equipment / Terminals
Control	Terminals
<b>LABELS: -</b>	
Material	ABS Plastic
Fixings External	316 Grade Stainless Steel Metal Threads and Adhesive
Fixings Internal	316 Grade Stainless Steel Metal Threads and Adhesive
Mounting	Labels to be secured to Equipment Panels
General Labels	WB / 4mm Letters
Warning Labels	WR / 7mm & 5mm Letters
Danger Labels	RW / 7mm Letters
Drive Labels	WB / 6mm Letters
Main Switch Labels	RW / 10mm Letters
S.C.A. Main Label	Fit label with the following wording in a prominent position on the front of the cabinet PST No6 WB / 20mm Letters

C	05.13	AS INSTALLED	L.L.	L.W.		
B	02.13	AS CONSTRUCTED	L.L.	R.O.		R.O.
A	11.12	FOR CONSTRUCTION	B.A.	L.W.		P.T.
No.	DATE	AMENDMENT	DRAFTED	DESIGNED	RPEQ NO.	APPROVED

LUCAS WEDLEY		26/10/12
DESIGN	R.P.E.Q. No.	DATE
DESIGN CHECK	R.P.E.Q. No.	DATE

ASSET/PROJECT  
LUGGAGE POINT  
WASTEWATER TREATMENT  
PLANT

DRAWING TITLE

PST No6  
EQUIPMENT LIST &  
CONSTRUCTION NOTES

 **J. & P. RICHARDSON**  
INDUSTRIES PTY LTD  
ELECTRICAL CONTRACTORS AND ENGINEERS  
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PH. (07) 3271 2911  
FAX. (07) 3271 3623  
EMAIL: [jpr@jpr.com.au](mailto:jpr@jpr.com.au)

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



SHEET No. 18 OF 19	
QUEENSLAND URBAN UTILITIES DRAWING No. 486/5/5-0163-018	AMEND. C





## 5 SERVICE AND MAINTENANCE

This product is designed to operate under specific environmental, supply and load conditions. Should these conditions change, consult a licenced electrician or electrical engineer before operating this product.

***These procedures are to be performed only by a licenced electrician as they may expose live equipment.***

The Switchgear and Controlgear Assembly is essentially maintenance free, however the following safety measures and routine maintenance is recommended.

- Where fitted, ensure cabinet vents and filters are clear and clean.
- During operation, ensure all doors and covers are secure and closed.
- All faults are to be investigated and repaired by an appropriately licenced electrician.
- All components to be operated in accordance with manufacturers data.
- The protective devices within switchboards are designed to operate in the event of a short circuit or overload condition. In the event of these devices operating under such conditions the device or devices must be inspected and tested by a suitably trained person to ascertain its condition prior to reconnecting the protective device to the supply.

### Periodic checks should ensure

- The switchboard is clean and free of any contaminants, which could reduce the insulation properties of the switchboard.
- All entries are sealed to ensure no vermin can enter.
- There is no evidence of overheating, arcing or moisture.
- The earthing system is maintained and is adequate to allow correct operation of protective devices.
- Insulation resistance is maintained to appropriate levels.
- Check terminations for correct tension.
- Test operation of protective devices.
- Re-calibrate instrument loops as required.

Refer to AS-INSTALLED electrical drawings for details of protection equipment settings.

No special tools or equipment are required to perform routine maintenance.