

## RTK 9000TS system

### MTL sequence of events recorder

- **Modular, rack mounting design expandable to over 1900 inputs**
- **1ms time stamping of events irrespective of system size**
- **Up to 15,000 events stored per rack in distributed non-volatile memory**
- **Flexible auto-shelving facility to avoid nuisance alarms**
- **Fully programmable via a port on the interface card using configuration software under Microsoft Windows™**
- **Fully integrated alarm annunciator functionality**
- **Wide range of optional displays**
- **IRIG-B + time synchronisation protocols**
- **Comprehensive mapping features**
- **Master-slave**
- **Dual redundant communications**
- **Two part terminations**



#### 1ms event recorder and combined annunciator.

The RTK system 9000TS sequence of events recorder leads the way in the latest technically advanced event and alarm management systems.

Built on a rugged hardware platform, suitable for the most severe of industrial environments, this unit will provide true time-stamping of event occurrence to a resolution of 1ms irrespective of the system size.

Through the use of internal IRIG-B or external GPS synchronisation, events can also be related to real time.

By using the optional integrated alarm annunciator features it is possible to build a system that will capture, record, print and display events and alarms both for immediate action on the plant and for later analysis to find the prime cause of the failure.

Additional features of input-to-output mapping and many optional communications protocols mean the 9000TS forms the basis of an alarm and event capture device that is easily integrated into an alarm management system.

## FEATURES & BENEFITS

With personnel safety, increased regulation and the high cost of plant shutdowns the need to continuously monitor, record and analyse system performance has become more important than ever before.

The traditional back-lit annunciator will provide the clearest method of alerting the operator this can now be combined with accurate time tagging of the events. In the automated control and protection used in today's modern plant a typical failure can result in alarm bursts of over 100 alarms within the first few seconds. The key issue in these situations is not only to identify the alarms and inform the operator but also to identify the primary cause of failure within the process.

The system 9000TS has been developed with this in mind and will capture a change in state on digital events across the entire network to within a 1ms resolution.

- Provides independent annunciation and time stamping of critical plant alarms whilst communicating back to the host DCS, PLC, ESD, SCADA or computer system.
- Fully programmable, for all system features which can be stored and downloaded as required via the integral interface card.
- Suitable for systems from a sixteen-input package to a plant-wide alarm /recording system.
- Total flexibility in choice of system size, display style, operation and options.
- Field proven technology, with hundreds of thousands of alarm points already in operation worldwide.



Interface card

### Total configurability

All the facilities are field programmable using our windows-based setup software provided with the equipment.

All features are configurable for each individual input and output channel and can easily be set-up in minutes without the need to learn a special programming language.

All the alarm sequences specified in the ISA publication "annunciator sequences and specifications" are available in addition to a wide range of additional features.

### Total flexibility

The modular construction and the advanced programming facilities mean that the system 9000TS combined SER and alarm system can be supplied to match any process alarm application. Standard 19" racks provide almost unlimited system expansion and the user can configure each channel from a range of pre-defined features and embedded sequences as required. Configuration changes can easily be generated off-line and downloaded.

### High density packaging

Standard 3U 19" Euroracks with two part rear access terminals are used on the system 9000TS. As standard, the first rack houses the interface card and up to twelve 16-channel input/output cards. dual redundant first rack includes two interface cards and up to seven 16-channel input/output cards.

Extension racks for both variants are suitable for fourteen 16-channel input/output cards.

Multiple racks are interconnected using factory supplied ribbon cables/connectors to form large systems up to 1900 channels.

### Interfacing

The system 9000TS is ideally suited to interface to third party plant equipment. Systems are always supplied with a modbus RS485 serial interface. Other serial and ethernet protocols are available.

Eight system relays are provided as standard for use as watchdog, system faults, horn and group relays. Individual repeat relays for each channel can be provided as an option.

Using the powerful communications features it is possible to interface to existing PLCs, SCADA systems, emergency shutdown systems and plant-wide distributed control systems. The annunciator can monitor and

display critical alarms and communicate the results into the normal monitoring systems, giving another level of safety and independence from the general monitoring or control system.

### Event storage

The system has a unique distributed method of storing events so that, even following a cascade of alarms or a power failure, up to 15,000 1ms time-stamped events per rack are stored within the solid-state, non-volatile memory.

### Expandability

Each 19" rack is supplied fully equipped allowing simple expansion with the addition of input, output or relay cards. If a larger system is required additional racks can be interconnected to the existing unit using factory supplied ribbon cables and connectors to link system features.

### Interface card

Each system is supplied with an interface card. Customer connections for remote printing and programming are provided on the front of this card.

Configurable system relay outputs, RS485 serial and IRIG-B with sync are available on the rear of the associated chassis. Once configured, settings are stored on EEPROM, on the individual cards and the interface card.

In addition, the interface card filters and protects the incoming 24VDC supply and provides real time synchronisation to the system.

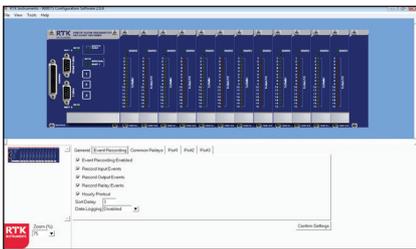
### Nuisance alarms

Each alarm can be set to automatically inhibit (shelve) if the alarm frequency exceeds configured parameters and are therefore considered invalid. Alarms are automatically re-instated once they return to normal patterns.



## SOFTWARE AND PRINTING FACILITIES

The majority of the features listed are supplied as standard as part of the normal software. This allows the system to be configured to match individual applications, Eaton also offer full software integration enabling us to provide complete systems, undertake programming and commissioning. Please consult our sales office for further information on alarm management software solutions.



### Event storage

The 9000TS uses an advanced, powerful inbuilt processor system complete with non-volatile memory to store both system settings and event and alarm data. The data storage system is designed without using any components with moving parts such as hard disk drives to provide the greatest system reliability possible. The software is programmed for all the system settings via the front mounted programming port using a standard RS232 output from a standard PC.

### System setup

The supplied configuration software allows the user to enable/disable features and assign alarm text ie.

- 60 character of text for alarm messages
- Event prefix for both alarm and return to normal states
- Normally open or closed inputs
- Input time delays
- Alarm priorities
- Printer setting
- Auto-shelve parameters
- Assigning group and common relays
- Mapping
- Comms protocols

### IRIG-B Time synchronisation

Available IRIG formats include IRIG-B 122, IRIG-B 123, IRIG-A 132 and NASA36.

### Mapping

Mapping of up to 496 mapping points allows users to group and or replicate Input wiring changes via software as opposed to the use of patch panels. Mapping I/O includes:-

- Port 1 Coil to input channel
- Port 2 Coil to input channel
- Port 3 Coil to input channel
- Input Card to Output Card

### Dual redundant communications

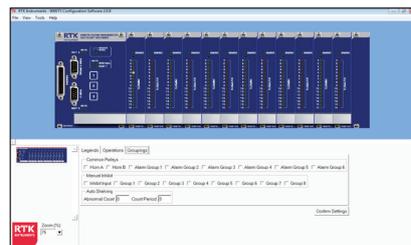
A dual redundant system has two interface cards. The system is intended to provide a secondary interface card in the event of a failure associated with the primary interface card. When no fault exists the customer ports 1, 2, and 3 on both cards provide the same contact and alarm data. Internal events data may be different since this is card specific.

### Printers

All systems can be supplied with a local printer to provide an immediate record of alarm and return-to-normal states. Configuration settings, summary and status reports can be printed on demand.

### Software Options

With its advanced communications facility the system 9000TS is an ideal front-end to a screen based alarm management /recording system. Eaton can provide Indicum, an alarm management software package, and complete systems using industrialised computers and screens. These are developed in conjunction with the users to provide the clearest possible means of showing alarms, the priority of these alarms, and exactly what to do in each alarm situation. These systems can also provide a means of displaying/storing all alarm and event history for analysis at a later date.



### Timers

Delay timers can be incorporated into the system 9000TS on both the inputs and the outputs. This facility can avoid the possibility of nuisance alarms by setting an input time delay from 1ms to 65,000ms. Using this setting the alarm contact must be in alarm for a predetermined minimum time before triggering the input circuitry whilst still maintaining an exact record of the time of the original event. For example, if an alarm occurs but it is dealt with and accepted, the remote telemetry system will not need to be notified.

### Complete systems

Eaton can provide the system 9000TS mounted in a wall mounted or floor standing cabinet and provide all the necessary wiring to the displays, PSU's and terminals ready for final installation on site. These panels are quoted against each specific customer requirement; please contact the sales office for further details.

### The best of both worlds

Ideally, critical plant alarms should be hard wired to a dedicated alarm and event recording system like the system 9000TS and data passed onto the DCS as a secondary function. This offers the best of both worlds in that the system 9000TS, which has been specially developed to offer high speed event capture and true first out discrimination, also provides the clearest possible indication of critical plant conditions.

The system 9000TS provides an independent, highly reliable, modular alarm system employing multiple redundant design features which should be used to complement centralised DCS platforms that have been primarily developed for control and monitoring.

**DISPLAYS**

To complement the system RTK 9000TS MTL alarm annunciator, Eaton offers a wide range of displays from simple lamp arrays to full mosaic mimic diagrams. Most of the displays are modular in design to enable us to match your exact needs, rather than compromising on the nearest available shape and size. The main display types are illustrated and described here; for more detailed information, refer to the separate display datasheet.



**RTK P725LO lamp-only modules**

This display has been designed to match the RTK 725 alarm annunciator range – it will look identical when viewed from the front. It is available in exactly the same format as the annunciator with three window sizes, six colours and a choice of lamp or LED illumination. This display is the best choice when LED illumination is required, offering the most competitive ultra-bright illumination. It is fitted with a 'lamp test' facility as standard



**RTK DF30 display facia**

The RTK DF30 display facia provides a flexible display panel for both LED or incandescent lamps. This display facia is totally modular allowing systems of almost any shape and size to be constructed. The basic lamp module is 30 x 30mm but these can be configured to give a range of window shapes and sizes by interconnecting multiple windows. This display can also have integral pushbuttons, keyswitches and audible devices. There is no limit to the number or position of these devices. All connections are by rear mounted screw terminals.



**RTK hazardous area displays**

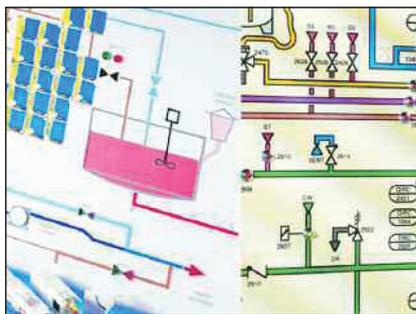
When supplied through suitable certified interface devices, the system 9000TS can be used to drive a display facia in the hazardous area. The DF30IS is a backlit display certified as Ex II 1G, EEx ia IIC T4. The display gives a bright LED illuminated backlit display that matches the safe area versions.

The L20 intrinsically safe multiplexer can also be used to drive a hazardous area display using only two cables into the hazardous area.



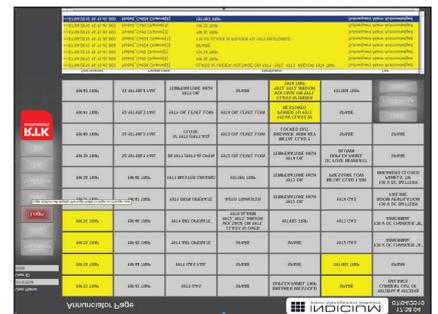
**RTK IP65 displays**

Where protection from the environment is essential a range of displays sealed to IP65 can be provided. These custom-built units have bright LED display modules wired to rear mounted terminals. The completed assembly is mounted with a gasket to the panel door to maintain the sealing.



**RTK mimic displays**

Mosaic tiled mimic systems can be driven by the system 9000TS to provide a flexible and informative overview display. The standard mosaic mimic uses a 24 or 25mm tile mounted on a strong aluminium honeycomb grid. Tiles are the moulded type for process mimics or alternatively screen-printed or engraved to form the required display drawing. A wide range of suitable lamps, switches, pushbuttons and displays can also be integrated into the finished mimic. On smaller projects and simpler display requirements a hard wearing, single piece mimic can also be provided.



**RTK alarm management software**

With its multi-redundant architecture and communications facility the system 9000TS is an ideal front-end to a screen based alarm management system. These can be set up in thousands of different ways to suit each individual alarm handling situation. Different display screens have already been developed and these building blocks would be used to provide a custom solution for each client. These systems could also incorporate touch screen displays, dual redundant servers and a range of industrial computers.



## ADVANCED ANNUNCIATOR FEATURES

When combined with the output cards the 9000TS becomes a powerful alarm annunciator system, some of the commonly used alarm functions available are shown below.

### Repeat relays

Each alarm way can have an individual repeat relay output in addition to any group relays configured. The relays can be set to be energised or de-energised and as N/O or N/C contact. The relay functions are also user configurable to follow the alarm logic or follow the input.

### Output relay reflash

Each of the group relays can have a reflash facility enabled. This is where the group relay will change state for 500ms when another alarm within the group occurs. This allows a control room annunciator or monitoring system to indicate each occurrence of a new alarm.

### Multiplexer

To cut down on the costs of installing vast numbers of cables across large sites, the System 9000TS can be used as an economical multiplexer system, where all the input contacts are gathered by a single system 9000TS-TX module and transmitted serially on 4 wires up to 1.2wkm away to the receiving module, the system 9000TS-RX module. The alarms can then be displayed on a display facia or within alarm management software packages.

### Sleep mode

Useful in unmanned/not normally manned situations. Any input can be configured as a "sleep" input. When this input is switched on the drive outputs to the lamps and audibles are disabled. The annunciator will work exactly the same in all other respects; all alarms are

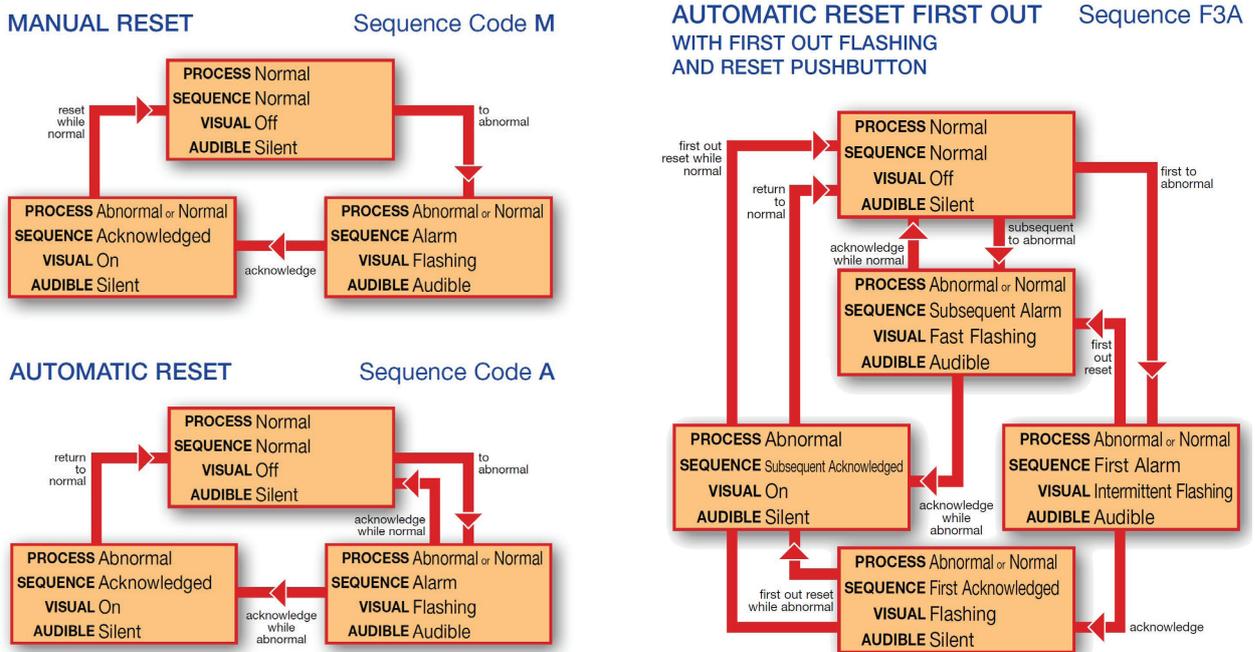
monitored as standard and all repeat relays and communications function as normal. As soon as the system is switched out of the "sleep" mode, the display fascias will display all alarm information, complete with all first-up details.

### First up

In alarm annunciation applications, it is often essential to know which alarm occurred first. For this reason, the system 9000TS can be supplied with a flexible high resolution first-up facility as standard. Four different first-up sequences are provided to match the ISA standard S18-1 1979 (R 1984). Up to four separate first-up groups can be defined within the one system; each alarm way can be configured as being in one of these four groups.

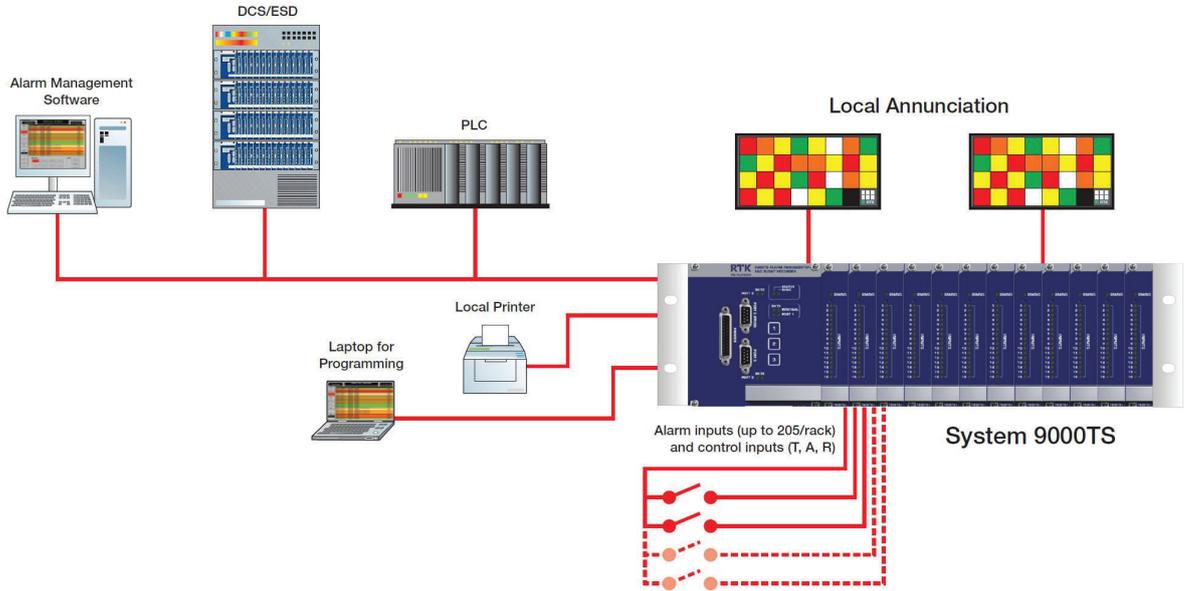
## SEQUENCE TABLES

Each alarm channel can be configured to suit the operating sequence required as listed in the ISA publication annunciator sequences and specifications S18.1 1979 (R1985). Systems can be configured with different features on different alarm ways and there is no need to switch the power off. The diagram below shows the most commonly used sequences.

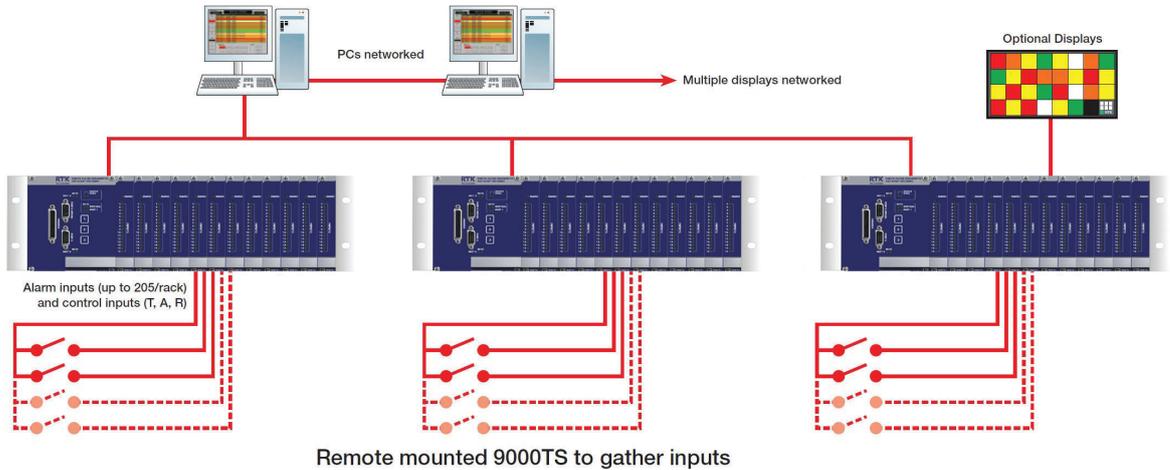


## INSTALLATION AND MECHANICAL DETAILS

### Standard system



### Networked system



The system 9000TS is based on the standard eurorack, manufactured to IEC 297-3 (DIN 1494 Pt.5). The standard subrack size is 3U high and 84E wide (19in). This module will fit the interface card and up to 13 input cards. Larger systems can be supplied by interconnecting multiple racks. All signals are fully buffered between racks, so no signal deterioration will occur even on extremely large systems.



**TECHNICAL SPECIFICATION**

**INPUTS**

**Alarm contacts**

All inputs are opto-isolated (isolation voltage 2.5kV). By using different wiring configurations, the same system can be used for both:

- Volt-free contacts which can have the operating mode configured using the setup card, to operate to alarm for contact open or to alarm for contact close.
- Voltage input from 24, 48, or 110VDC.

**Alarm contact and cable resistance**

N/C contact- series resistance of contact cables 20kΩ maximum.

N/O contact- parallel resistance of contact cables 200kΩ minimum.

**Field contact voltage and current**

The voltage for volt-free alarm contacts is fed from the unit at 24VDC at approximately 2mA.

To maintain complete isolation it is possible to use a separate PSU to feed all the alarm contacts.

**Overall system resolution**

1ms

**First-up discrimination**

1ms

**Alarm clearance discrimination**

1ms

**Control inputs**

Any input can be configured to one of the following control inputs:

- Lamp test
- Acknowledge
- Reset
- System test
- Silence
- First-up reset
- Sleep
- Horn inhibit

**OUTPUTS**

**Lamp drive (when Output Cards fitted)**

Each output can drive up to 160mA at 24VDC, making it suitable for multi-bulb displays or multiple repeat displays.

**Standard relays**

Eight standard relays fitted on the interface card, which are configurable as system alarms such as watchdog, printer fault, etc. or group alarms.

Contact rating 125VDC @ 0.5A, 24VDC @ 2A, resistive. Selection of N/O or N/C contact by jumper link.

**Repeat and group relays**

Group relay card and individual repeat relays for each alarm way. Contact rating 125VDC @ 0.5A, 24VDC @ 2A, resistive.

**Synchronisation**

By pulse, internal IRIG-B or external GPS signal.

**Printer port**

Standard parallel port.

**Serial data**

Event/alarm data can be transmitted using 9000TS ports 1,2 & 3 to transmit data to other System 9000TS units, DCS systems, PLCs or computers.

Transmission- RS485C

Baud Rate- 9600 to 38400

Protocol- MODBUS and RTU

**GENERAL**

**Supply voltage**

24VDC nominal (19–36VDC) Standard

A range of power supplies is available to convert from other AC or DC voltages.

**Supply current @24V**

Interface Card	1A
Input Card	100mA
Output Card	100mA
Relay current/per relay	250mA

Add the current for the lamp drive to the totals of the above cards.

**EMC compliance**

Immunity to EN61000-6-2:2005  
Emissions to EN61000-6-4:2007

**LVD compliance**

EN61010-1:2010 & IEC610101-2-201

**Environment**

Operating temperature –20°C to +60°C  
Storage temperature –20°C to +80°C  
Humidity 0–95% RH, non-condensing

**Mechanical details**

19in Rack Standard 3U by 19in Eurorack to IEC 297-3 (DIN 1494 Pt.5).

Larger systems can be provided using multiple racks and interconnecting cable.

**Mounting**

Industry standard 19" racks with rear terminal access.

**Assembly**

All cards plug into a standard pre-tested motherboard using DIN41612 connectors simplifying later system expansion.

**Connections (see image below)**

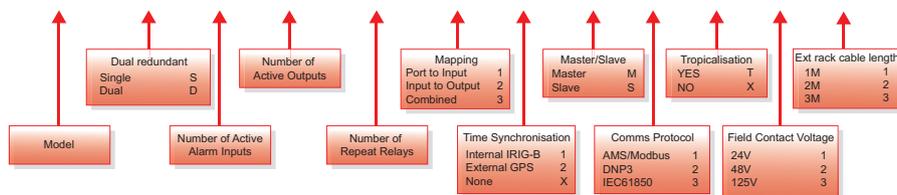
Quick disconnect, plug and socket connectors (with securing screws) and rising cage-clamp screw terminals.

Maximum cable size: 2.5mm<sup>2</sup>.

Other connector options are available by request.

**ORDERING INFORMATION**

P925TS - D - A96 - D96 - R96 - 2 - X - S - 3 - T - 2 - 2



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