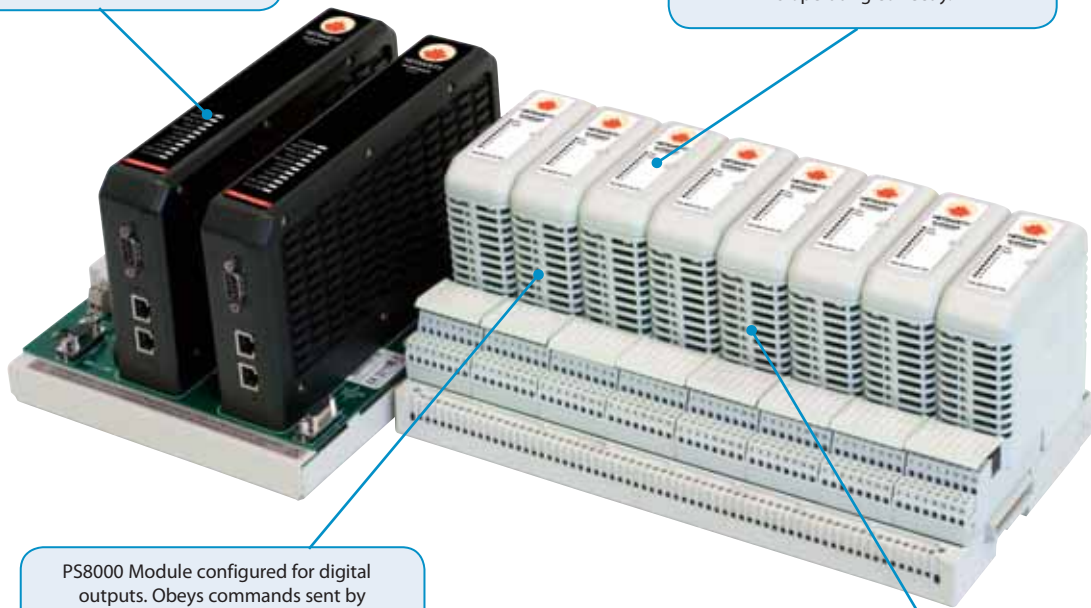


PlantSafe8000 (PS8000) System – Overview

PS8000 Controller - Runs the safety application program and carries out diagnostic checks to ensure it is operating correctly. If a fault is detected, it will shut itself down.

PS8000 Module configured for digital inputs. Monitors the inputs and also checks for line faults. Internal diagnostics check that the module is operating correctly.



PS8000 Module configured for digital outputs. Obeys commands sent by the Controller to set outputs. Internal diagnostics check that the module is working correctly. If a fault is detected, the Module will set outputs to their safe state of de-energised.

PS8000 Analog Input Module monitors the inputs and carries out internal diagnostics to check that the module is operating correctly.

Harsh and hazardous environments

The PS8000 System is as rugged as MOST Process Control Components: -40°C to +70°C operating ambient temperature; Zone 2 or Class 1 Division 2 hazardous area mounting; G3 corrosion resistance; and enhanced shock and vibration capability. The system will operate in the most extreme environments found in process industries, allowing remote mounting and a truly distributed architecture in even the most demanding situations.

Event Logging and Sequence of Events Recording

The PS8000 System has the same Event Logging and Sequence of Events (SOE) recording capability as the MOST Process Control System. Data received from PS8000 Modules is time-stamped by the Controller with a resolution of better than 200ms (this is dependent on the execution cycle - small nodes will deliver better resolution). Data from dedicated (non-SIL) SOE modules is time-stamped with a resolution of less than 0.25ms between different channels of the same SOE module and less than 1ms between channels from different SOE modules. The Controller can record up to 8000 events before its event data buffer begins to be overwritten by new data.

Reduced cabling and termination costs

In common with the MOST Process Control Components, the System offers users the opportunity to significantly reduce their spending on wiring and termination costs. Moving control and safety hardware out of the control room and on to the plant gives significant savings. The Field Terminal design allows users to avoid unnecessary spend on marshalling cabinets, cross wiring and marshalling terminals. Integral tagging and fusing further simplifies cabinet design and installation.

System - Overview

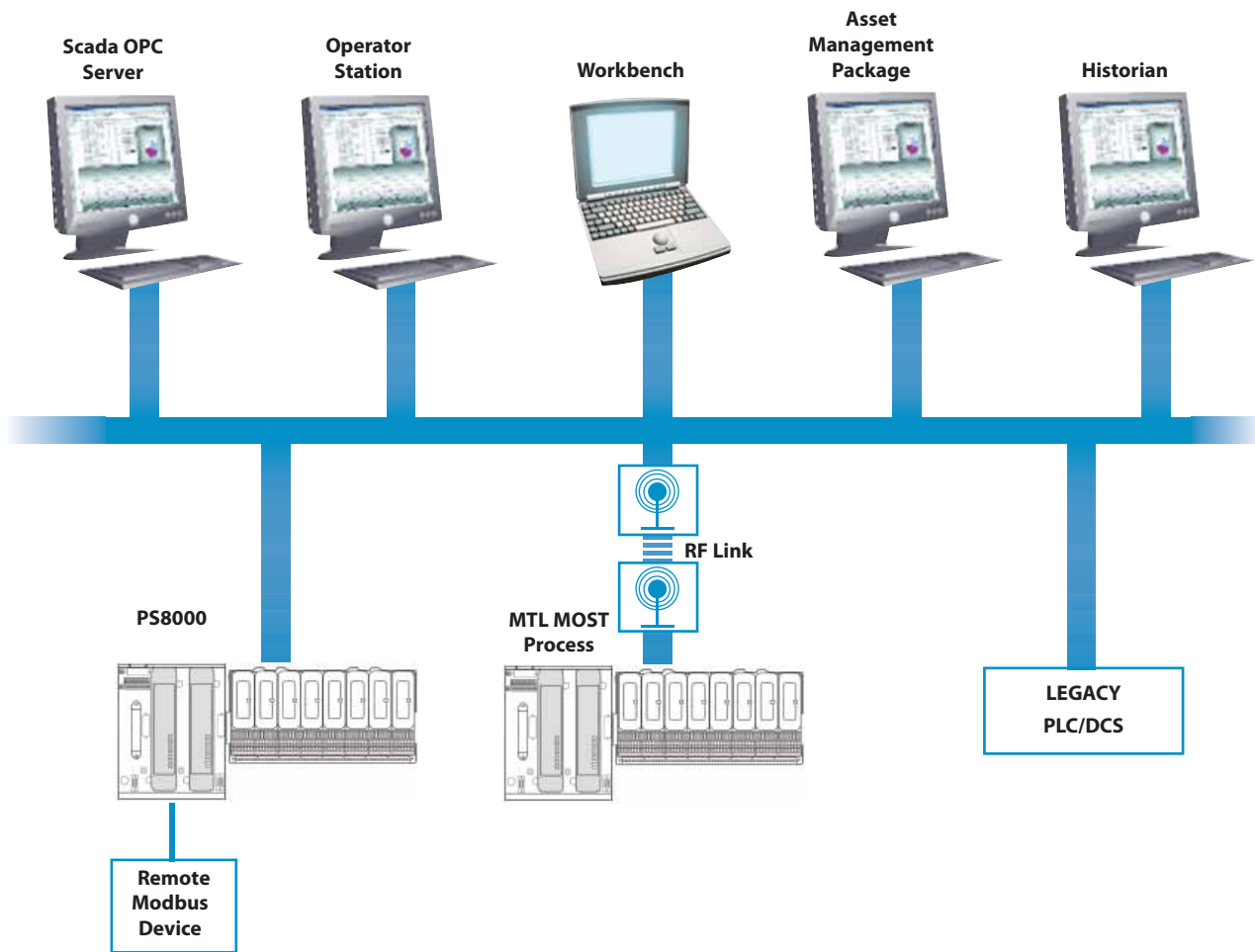


Figure 1 - Typical MOST System layout

PS8000 on your plant

Figure 1 shows a typical layout of a PS8000 System, together with a MOST Process Control System, an OPC Server, an HMI and asset management and historian packages all connected together via an Ethernet LAN. Also shown is the Workbench - the dedicated tool for programming and configuring PS8000 Systems.

PS8000 node layout and powering

Figure 2 shows a typical layout of a PS8000 node, with Controllers, IO Modules, Field Terminals, and Carriers. The power connections that need to be made are also shown.

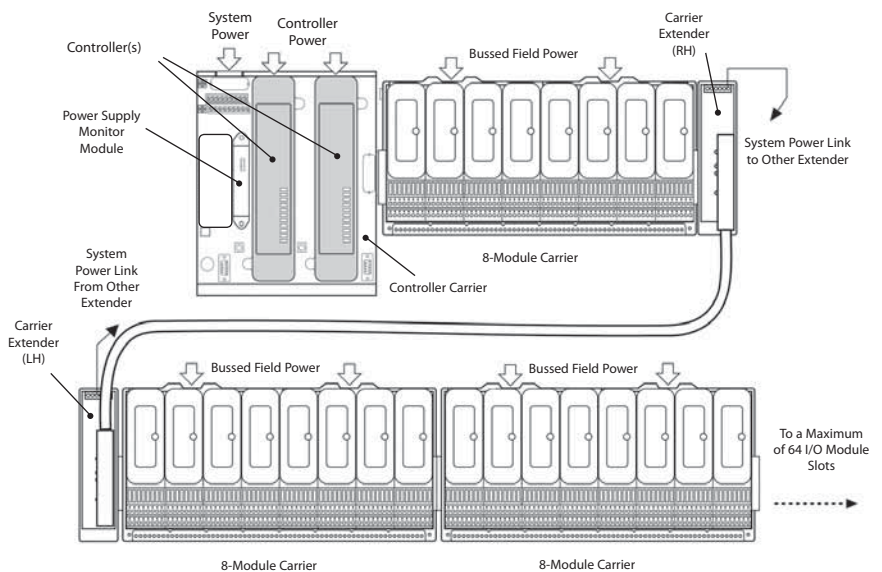


Figure 2 - Typical Node layout

PS8000 Controller - Overview



General

The PS-8851-LC-MT Controller stores and runs the application program which is downloaded from the Workbench.

It manages a number of communication paths: with the IO Modules mounted on the local node via the internal Railbus; with other entities on the Ethernet LAN (other MTL MOST nodes, PCs running the Workbench programming tools, HMI, historian packages and asset management tools) and with remote mounted serial devices.

The Controller also manages the implementation of the redundancy strategy either as master or standby.

Certification

The Controller is certified for use in safety-related applications up to and including SIL 2. The Controller achieves this Safety Integrity Level with a 1oo1D architecture (i.e. it operates in "simplex" mode, with correct operation ensured by comprehensive internal diagnostics). In such applications the Controller is used in conjunction with the PS-8811-IO-DC Digital Input/Output Module and the PS-8810-HI-TX Analog Input Module with HART*. The Controller is mounted on its dedicated Carrier PS-8751-CA-NS.

*First release of PS8000 will not have full HART capability.

Safe by design

The Controller has been designed specifically for safety-related applications and is certified on the basis of the excellence of its design. It does not depend for its certification on "proven in use" data.

Diagnostics

If the Controller's internal diagnostics detect a fault that would prevent the System from carrying out its safety function, then it will initiate a controlled shutdown. A controlled shutdown has two objectives - firstly, to ensure that the System enters its failsafe mode; and secondly, to record sufficient data to allow the reason for the shutdown to be determined.

If a Controller enters a controlled shutdown, then all communication with IO Modules is stopped and - when the programmed time delay for each IO module has elapsed - they will enter their safe states.

System size

The Controller can interface with up to 64 locally mounted, 8-channel IO Modules - giving a total capacity of over 500 channels per node. The Ethernet LAN is capable of supporting over 200 nodes, giving a maximum theoretical capacity of over 100 000 channels!

HART pass-through

Controllers can be configured to allow transparent access to the process variables and status information provided by HART field instruments. HART data cannot be used within the application (as - for example - it does not employ sufficiently rigorous data error detection algorithms), but communication with such devices can be achieved by using a "pass-through" command which does not involve, nor interfere with, the safety application.

Live maintenance

Once the Ethernet LANs are isolated, Controllers can be removed and replaced - with the local power supplies still connected - even in Division 1, Class 2 or Zone 2 hazardous areas.

Redundant Controllers

Controllers can be used in a master - standby redundant configuration to improve the availability of the safety function, but this is not required for safety. Redundancy is implemented by simply inserting the new Controller in to the free slot on the Controller Carrier.

The system will automatically upload the required application to the new Controller and initiate the redundancy algorithms. Switching between redundant Controllers on detection of a fault is automatic and bumpless.

The standby Controller continually performs the same processing, on the same data and at the same time as the Master and the results are routinely cross-checked. This ensures that the Standby is always ready to take over control from the Master. The redundancy strategy employed is known as "rendezvous redundancy".

The "Change State" button on the Controller Carrier is used to switch a master to being the standby in a redundant pair, to switch a standby offline and to instruct an offline standby Controller to synchronise itself with the Controller and to enter standby.

If a Controller has entered the "Failsafe" state, it can be brought out of this state by use of the "Change State" button.

Serial communications

Each Controller provides two serial ports - one of which is physically connected via the Controller Carrier, the other directly on the Controller itself. The two ports can be configured to be entirely independent, or can be made to work redundantly, either as redundant connections to the same serial link or as redundant connections to redundant links.

When redundant ports of a single Controller are configured as Modbus masters, redundancy issues are handled automatically by the Controller (deciding when to switch to the standby port, alarming failures in the standby).

When redundant ports of a single Controller are configured as Modbus slaves and multi-dropped on a single serial link, the Controller will again manage the redundancy (deciding which port respond to the Modbus master and alarming a fault in the standby port).

When redundant Controllers are used, this adds additional availability to the arrangements above. It is not possible to use the ports on the standby Controller as additional serial connections.

PS8000 Controller

PlantSafe 8000 Controller

PS-8851-LC-MT

- ◆ Certified for use in SIL 2 safety applications, according to IEC 61508
- ◆ Comprehensive internal diagnostics provide basis for safety architecture 1oo1D
- ◆ Optional redundancy with bumpless transfer for increased availability
- ◆ Dual redundant high speed fault tolerant Ethernet LAN
- ◆ Two connections to serial devices
- ◆ On-line configuration and re-configuration
- ◆ Communicates with up to 64 I/O modules
- ◆ Communicates on peer-to-peer basis with other MTL and standard Controllers
- ◆ Can write to standard output modules without compromising safety function
- ◆ Live maintainable and hot-swappable - even in Class 1, Div 2 or Zone 2 hazardous areas
- ◆ HART pass-through of process and status variables
- ◆ Event logging up to 8000 events
- ◆ 12V dc Controller power required from PS-8913-PS-AC



CONTROLLER SPECIFICATION

See also *System Specification*

LAN INTERFACE

Transmission medium 100BaseTX or 10BaseT Ethernet
Transmission protocol P2P*
Transmission rates 10 - 100 Mbits/s
LAN connector type (x2) RJ 45 (8-pin)
LAN isolation (dielectric withstand) 1500 V
Action on software malfunction Halt CPU / Reset CPU

* P2P is a modified form of Modbus™ certified as suitable for use in SIL 2 safety related applications that require peer-to-peer communication.

SERIAL INTERFACES (COM 1 & COM 2)

Transmission rates 1.2 – 115.2 kbits/s (async.)
Transmission standard RS485 half-duplex
COM 1 connector (on carrier) 9-pin D-type connector (F)
COM 2 connector (on controller) 9-pin D-type connector (M)

HAZARDOUS AREA SPECIFICATION

Protection Technique EEx nL IIC T4
Location (FM and CSA) Class 1, Div.2, Grps A,B,C,D T4

POWER SUPPLIES

Controller Power Voltage 12V dc (from PS-8913-PS-AC)
Controller Power Supply 0.4A (typical), 0.5A (max.)
System Power Supply 15mA (max.)

MECHANICAL

Module dimensions 69 (w) x 232 (l) x 138 (h) mm
Weight (approx.) 1.35kg

Note: PS-8851-LC-MT Controller is the same as MTL MOST 8851-LC-MT Controller. TÜV certificates are available under MTL part numbers.

Modbus™ is a trademark of Schneider Automation Inc
HART® is a registered trademark of the HART Communication Foundation

PS8000 Controller - Specification

SIL 2 Certified Controller

PS-8851- LC-MT

LED's

The PS8000 Controller has a number of LED's that indicate the status and mode of operation of the Controller. The table below explains what they refer to and describes their operation:

Note: the information here given here is simplified. Additional combinations of LED states are used to provide further indication of the status of the Controllers.

LED name	Colour	On	Off	Flashing
Power	Green	12V power supply to the Controller is ON.	12V power supply to the Controller is OFF.	-
Master	Yellow	The Controller is the Master in a redundant pair or is in simplex mode	The Controller is the Standby in a redundant pair.	-
Healthy	Yellow	(Master) Running the application program. (Standby) Capable of running the application program.	IO data is not current - cannot take control.	The Controller is running the application program.
Fault	Red	(Master) Running the application program. (Standby) Capable of running the application program.	For all other Controller states.	The Controller is running the application program.
Failsafe	Red	If HEALTH LED is also ON - is in Failsafe. If HEALTH LED is OFF - is offline.	The Controller is running the application program.	No IO Module scanning is taking place and the application program is not running.
LAN A	Yellow	LED is ON when a packet of data is being transmitted.		
LAN B	Yellow	LED is ON when a packet of data is being transmitted.		
COM 1	Yellow	LED is latched ON for 2 seconds after a valid packet of data is received.		
COM 2	Yellow	LED is latched ON for 2 seconds after a valid packet of data is received.		
Safe Mode	Yellow	In SAFE mode.	In CONFIGURATION mode	
I/O COM	Yellow	The internal communication link (Railbus) between Controller and IO Modules is working correctly.	The internal communication link (Railbus) between Controller and IO Modules is not in use.	The internal communication link (Railbus) between Controller and IO Modules is in fault.

Workbench for PS8000 – Overview

Workbench

The Workbench is the engineering and documentation tool for the PlantSafe 8000 Systems.

The Workbench is used to perform the following tasks:

- ◆ Configure IO Channel and Module parameters
- ◆ Configure Controller and network parameters
- ◆ Input and manage the IO tag database
- ◆ Engineer and document the control or safety application
- ◆ Generate wizards to simplify HMI design
- ◆ Simulate and test control and safety applications
- ◆ Generate reports to assist in Factory and Site Acceptance Testing

PS8000 Workbench

The Workbench (PS-8841-LC-MT) has all the features of the standard Workbench, but additionally includes the special tools required for safety applications.

Safety programming languages

The Workbench provides three IEC61131 programming languages that can be used to write safety-related application programs:

- ◆ Ladder logic (LD)
- ◆ Function Block Diagram (FBD)
- ◆ Structured Text (ST)

Configuration Mode and Safety Responsibility

Changes to safety-related parameters are carried out with the Controller in "Configuration Mode". Access to this mode is restricted to personnel with "Safety Responsibility" and its use is constrained by a number of further layers of protection for downloading parameters to Controllers. The system defines 6 password protected levels of access authority – with only the 3 highest levels being granted "Safety Responsibility".

Trusted Hosts

To prevent access to Controllers by non-approved instances of the Workbench, remote Modbus devices, asset management packages and HMI, only those that the Controller identifies as "Trusted Hosts" can download new parameters.

Each Trusted Host is recognised by its IP and MAC addresses (remote Modbus devices are recognised by the serial port to which they are connected). For each Trusted Host a number of other restrictions can be defined:

- ◆ Modbus write not allowed
- ◆ Workbench write not allowed
- ◆ HART pass-through not allowed

Key Switch Protection

When a Controller is added to the Workbench the user is given the option of selecting a tag to act as a "Key Switch". This can be used by an Operator to lock the System so that Configuration Mode cannot be entered without their awareness or permission.

The Key Switch can be a physical switch, driven from an HMI screen or it can be an output from the application.

Controller Passwords

When a Controller is added to the Workbench the user is given the option to use a Controller Password. If this option is selected, it is subsequently impossible to enter Configuration Mode without the Controller Password.

On-line download

Users with safety responsibility can download new parameters to a Controller, from a Trusted Host, to a Controller whose Key Switch is set to permit new downloads and where the particular Controller's Password is known.

New parameter download is carried out as a background task over a number of cycles to ensure that the fault reaction and response times are not compromised. Once download is complete and the new parameters have passed the checking and security tests, the new parameters will be automatically adopted. Where redundant Controllers are used, the stand-by Controller will also be automatically updated.

Note: on-line download should only be used where there are adequate procedures for approving the changes that have been made and testing them prior to download.

Static Analysis Tool

Any safety-related application program must be developed by suitably qualified personnel and must be subject to careful scrutiny to ensure safety, but the Workbench provides an additional safety test. The Static Analysis Tool checks for illegal constructs within the safety program prior to download.

Differences Utility

Once a new application is successfully compiled, it can be downloaded to a Controller. On download, two text reports are generated: a Download Report and a Master Tag Xref. These can be used for comparison with other downloads using the Differences Utility.

Download backup

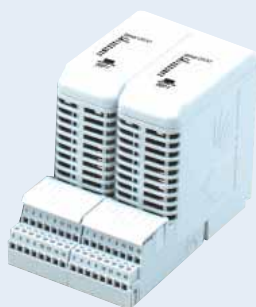
A time stamped backup of each safety application is automatically created following a successful download. Changes between versions can be viewed and backups can be used either as a start point for developing new safety applications or to restore an earlier version.

Change Control Log

The Workbench maintains a Change Control Log that records - for example - when:

- ◆ IO Modules are added, deleted or moved
- ◆ Tags are added to, removed from, or moved within an IO Module
- ◆ IO Configuration parameters are saved
- ◆ Controller IP addresses or node numbers are entered or modified
- ◆ External node numbers are entered or modified
- ◆ Serial communications parameters are entered or modified
- ◆ A successful download is made
- ◆ A Strategy is removed
- ◆ The Controller password is changed

IO Modules – Overview



General

IO Modules interface to safety system field wiring via Field Terminals. The IO Modules and the Field Terminals mount on Carriers that provide mechanical support, but also connect the internal communication bus and power supply connections to the Modules.

The IO Modules are certified as suitable for use in SIL 2 safety-related applications.

Certification

The IO Modules are certified for use in safety-related applications up to and including SIL 2. The System achieves this certification with a 1oo1D architecture.

The IO Modules have been designed specifically for safety-related applications and are certified on the basis of the excellence of their design. The certification does not depend on “proven in use” data.

Diagnostics

The IO Modules perform comprehensive internal diagnostic tests as an essential part of ensuring that the IO can carry out the required safety function.

If the IO Module’s internal diagnostics detect a fault that would prevent the System from carrying out its safety function, then it will initiate a controlled shutdown. A controlled shutdown has two objectives – firstly, to ensure that the IO Module enters its failsafe mode; and secondly, to record sufficient data to allow the reason for the shutdown to be determined.

If a Module enters a controlled shutdown, then all IO channels are de-activated: input channels are not scanned; and output channels are de-energised.

Bussed Field Power

The Bussed Field Power (BFP) connectors on the rear of IO Module Carriers provide the power connections for field instruments wired to the IO Modules.

For the System, BFP must be 24V dc and supplied by MTL’s PS-8914-PS-AC units. These power supplies may be used in redundant pairs, if required.

Live maintenance

IO Modules can be removed and replaced in a Class 1, Division 2 or Zone 2 hazardous area - once the relevant Bussed Field Power (BFP) connection has been isolated using an appropriate hazardous area switch (such as the MTL951). Removing and replacing the Modules does not interrupt the operation of the other parts of the node.

If a Module is replaced by another Module of identically the same type, then no intervention is required for the System to begin operating normally once the Bussed Field Power is restored.

Line fault monitoring

In addition to the comprehensive internal

diagnostics the IO Modules can monitor field wiring for line faults.

Event logging

Data from IO Modules can be time stamped and stored by the Controller before being downloaded to the MOST SOE Data Retrieval Client or a 3rd party historian package. IO Module data is time stamped with a resolution of better than 200ms.

Failsafe Mode

IO Modules will enter Failsafe Mode from the Running State either due to loss of communications with the Controller or because the module has received an instruction from the Controller to enter the Failsafe State. In this state:

- ◆ The Red Fault LED is lit
- ◆ The IO Module is flagged as unhealthy to the Controller
- ◆ All Railbus Write requests are rejected, except instructions to Reset or to exit the Failsafe State
- ◆ Inputs and HART data are read
- ◆ Outputs are de-energised
- ◆ Background diagnostics continue and if a failure is detected, the module will enter Controlled Shutdown

Controlled Shutdown

A Controlled Shutdown is carried out if a fault is detected in the Module. In this state it can communicate the reason for shutdown.

LED’s

A number of LED’s are provided on each IO Module to provide visual indication of the status of the Module, its channels and its power supply.

Module ‘Fault’ LED (red)

On - Failsafe

Off - Normal operation

Flashing (equal:mark space ratio) - Cold start in process, will flash until communication is established with Controller.

Blinking (On for a short period, then On for a longer period – morse code ‘a’) - Fault state after controlled shutdown

Module ‘Power’ LED (green)

On - Power OK

Off - BFP or Railbus Power Failure

Module ‘Channel’ LED’s (yellow)

See Individual Module Specifications.

Analog IO Module – Overview



General

The Analog Input Module with HART provides the interface to 8 channels of 4-20 mA input signals.

The Analogue Input Module is certified for use in safety-related applications up to SIL 2. In such applications the module is used with the PS-8851-LC-MT Controller and PS-8811-IO-DC Discrete Input/Output Module.

Note: PS-8810-HI-TX Analogue input Module is the same as MTL MOST 8810-HI-TX Module

Diagnostics

The Analogue Input Module carries out a number of diagnostic checks to confirm the accuracy of the measurement reported and the correct operation of the module.

In addition to the primary measurement, a second diagnostic measurement is made using different internal circuitry. The two values are then compared. The primary measurement is reported as faulty if it differs from the diagnostic measurement value by more than 2%.

Further tests are carried out on internal supply and reference voltages.

If a particular channel fails a test, then that channel is made inactive. If the failed test indicates that the Module is not working correctly, it will enter Controlled Shutdown.

Live maintenance

The field wiring connections to the Analogue Input Module are classified as non-incendive and can therefore be live worked in a Class 1, Division 2 or Zone 2 hazardous area.

(Note the Bussed Field Power connection must be isolated before the module is removed or replaced).

Input sampling and filtering

Each input channel is sampled once every 25ms and is filtered by 1st order hardware and software filters. The software filter can be disabled or set to a number of different values according to the filtering requirements of each channel.

HART capability

The HART capabilities of the Analogue Input Module allow acquisition of secondary variables – which can be used by a standard (but not PS8000) application program. The Module also allows Emerson’s AMS package to communicate with any HART field device transparently, using HART pass-through. (The first release of PS8000 will not have full HART capability, contact Net Safety for further information).

LED’s

For the operation of the Power and Fault LED’s see IO Module Overview.

Module ‘Channel’ LED’s (yellow)

On – Channel in range (4-20mA)

Off – Channel inactive

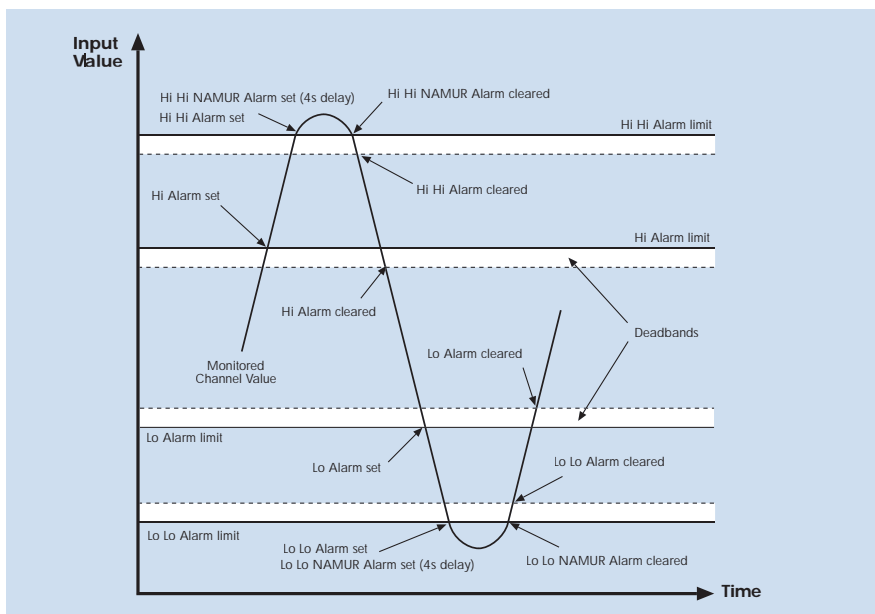
Flashing (equal:mark space ratio) – Any of the following, with an active channel: line fault (indicated by the input measurement being outside the 4-20mA range), loss of HART signal, Hi-Hi or Lo-Lo alarm.

Alarms, Deadband, Dead Zone

The Analogue Input Module has a number of configurable parameters for managing setting and clearing alarms and triggering the reporting of a new input value.

Hi, Hi-Hi, Lo and Lo-Lo alarms can be configured – together with a Deadband through which the input must move before the alarm is cleared. The relationship between these parameters is shown in the diagram below.

A Dead Zone can also be configured, which is the value by which an input measurement must change before it is reported as a new value.



Analogue Input Module

4-20 mA with HART

PS-8810-HI-TX

- ◆ 8 single ended 4-20mA input channels
- ◆ Certified for use in SIL 2 safety applications
- ◆ Non-incendive field circuits
- ◆ 2-, 3- or 4-wire transmitters
- ◆ HART pass-through, acquisition and status reporting*
- ◆ 24V dc Bussed Field Power required from PS-8914-PS-AC

MODULE SPECIFICATION

See also System Specification

INPUTS

Number of channels	8, single-ended
Nominal signal range (span)	4 to 20mA
Full signal range	0.25 to 24mA
Line fault detection	
Short circuit current	> 23.5mA
Open circuit current	< 0.5mA
Output voltage (@ 20mA)	10.2V (min.)
Output current	28mA (max.)
Accuracy (at 25°C)	± 0.1% of span
Temperature coefficient	38 ppm/C
Resolution	16 bits
Repeatability	0.05% of span
Data format	16-bit unsigned (0-25mA = 0-65,535)
HART data format	IEEE754 floating point
Isolation	
(any channel to Railbus)	250V ac RMS
(between channels)	none

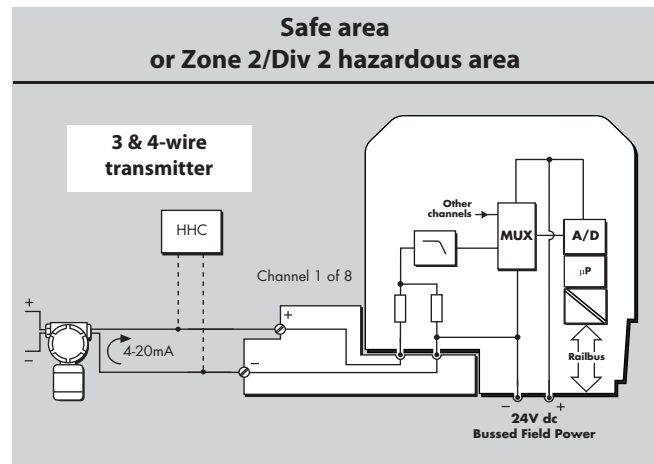
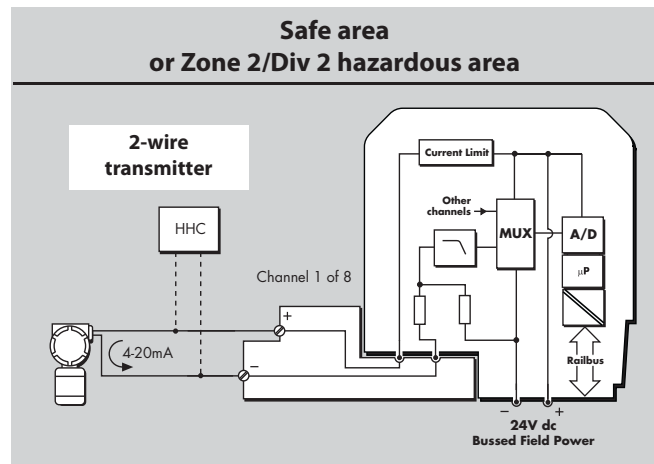
CONFIGURABLE PARAMETERS

Alarms	high, high-high, low and low-low
Alarm deadband (hysteresis)	user defined value
Input filter time constant	user defined value
Input dead zone	user defined value
Drive on fault state	disabled /upscale /downscale
HART variable and status reporting	enable /disable

RESPONSE TIME

Signal change to availability on Railbus	
4- 20 mA mode	25ms (max.)
HART mode	0.75s per channel

* The first release of PS8000 will not have full HART capability, contact Net Safety for further information.



HAZARDOUS AREA SPECIFICATION

Protection Technique

Location (FM and CSA)

(CSA with non-incendive field terminal, subject to conditions in CSA certificate.)

FM non-incendive field wiring parameters (each channel)

..... Voc = 28.7V; Isc = 33mA

Gas groups A, B

Gas group C

Gas group D

POWER SUPPLIES

System Power Supply

Bussed Field Power Supply

MECHANICAL

Module Key Code

MODULE WIDTH

WEIGHT

For recommended and compatible Field Terminals, see Field Terminal - Specification and Selection Guide.

Discrete Input/Output Module

8-channel combination

PS-8811-IO-DC



General

The Discrete Input/Output Module provides the interface to 8 channels that may be configured in any combination of discrete inputs and outputs.

The Discrete Input/Output Module is certified for use in safety-related applications up to SIL 2. In such applications the module is used with the PS-8851-LC-MT Controller and PS-8810-HI-TX Analogue Input Module with HART.

Note: PS-8811-10-DC Discrete Input/Output Module is the same as MTL MOST 8811-10-DC Module.

Combined inputs and outputs

Each of the 8 channels of the Discrete Input/Output Module may be configured, on a channel-by-channel basis, as either an input or an output.

When configured as an input, the channel is suitable for use with dry contacts – with power supplied from the Module.

When configured as an output, the channel is capable of switching up to 2.0A (maximum of 6.0A continuous per module). Output channels are used with solenoids, valves and alarms

Diagnostics

Comprehensive diagnostic tests are performed on the module and each of its channels, including tests for stuck ON and stuck OFF output switches.

Live maintenance

The field wiring connections to the Discrete I/O Module are classified as non-sparking and can only be worked on in a Class 1, Division 2 or Zone 2 hazardous area once the Bussed Field Power connection has been isolated.

Note: the Bussed Field Power connection must also be isolated before removing or replacing the module.

Input configuration

Input channels are used to interface to volt free contacts. Line fault detection can be turned OFF or can detect open circuits or both open and short.

Input filtering

A change in the input state is recorded only if the states observed at the start and end of the filter time interval are the same. If they are different the previous state is maintained. (This reduces the chance of noise being incorrectly interpreted as a change of input value).

The filter time interval can be configured between 0 and 8s, in 1ms intervals.

Input transition counting

A counter can record the number of filtered transitions of a particular type. Depending on the polarity setting, the counter will either count transitions from 0 to 1, or from 1 to 0. The counter “wraps around” from 65 535 to zero without indication.

Transitions are counted even if the channel is configured to “latching”.

Earth leakage detection

Where earth leakage fault detection is required, a single channel of an PS-8811-IO-DC module must be configured to monitor earth leakage and wired to the appropriate terminals of an PS-8751-CA-NS Controller Carrier.

Input latching

Inputs can be configured to “latch” a particular (filtered) input transition and maintain the output in the latched state until the latch is cleared. “Normal Polarity” will latch a transition from 0 to 1 as 1, “Inverse Polarity” will latch a transition 1 to 0 as 0. The operation is described in **Figure 1**.

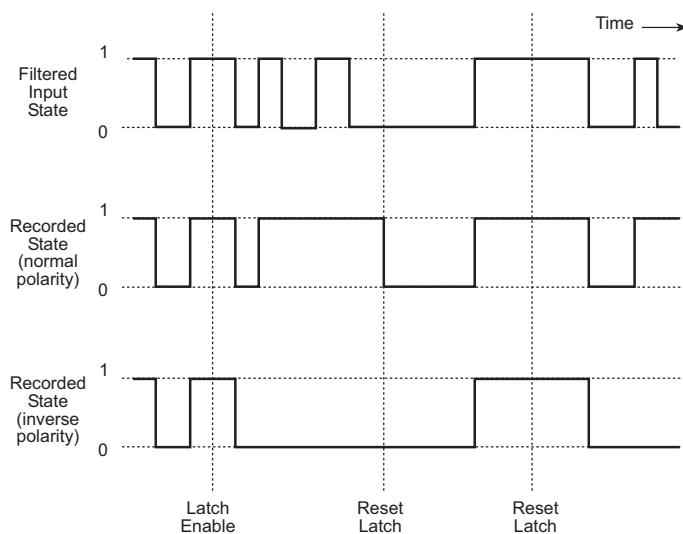


Figure 1 - recording of input states

Discrete Input/Output Module

PS-8811-IO-DC

Normally energised and normally de-energised outputs

Individual output channels can be either normally energised or de-energised.

Each output channel comprises 2 switches that operate in series with the load – one on the supply line, the other on the return

For normally energised outputs, if a single switch fails short circuit, the other switch can still de-energise the load. If either fails open circuit, the load will be immediately de-energised by the fault.

For normally de-energised outputs, if a single switch fails short circuit, the other switch can energise the load. If either fails open circuit, the load cannot be energised.

Switches are tested by pulsing them ON or OFF for a maximum of 5 ms – the load must not respond to this length of pulse. This test can be disabled if required.

Short circuit protection

Channels that are configured as outputs and which are short-circuited are protected by over-temperature thermal detection. If an output channel is short-circuited it will briefly conduct an over specification current, but this will be identified by the thermal detection and the relevant channel made inactive.

Pulsed output

Output channels can be configured to give a

pulsed output – of either single static, single dynamic, continuous or continuous dynamic form.

The single static pulse is ON for a pre-determined time. It then remains OFF until a new pulse instruction is received.

The single dynamic pulse is ON for a period that may be changed by the application, then remains OFF until a new instruction to write is received.

In continuous pulse mode a series of pulses of defined ON period are sent, with a defined OFF period between.

Continuous dynamic pulse mode allows the application to continually vary the ON and OFF times of the pulse train.

For all types of Pulsed Output, the ON time of the pulse may be between 0 and 60s in 1ms intervals.

For the continuous pulse mode, the OFF period can be set between 0 and 60s, in 1ms intervals.

Pre-configured output patterns

A number of different, pre-defined output patterns are available, which can be used to indicate the occurrence of different events, using the same alarm hardware. The patterns comply with the requirements of NFPA 72 and are shown in **Figure 2**.

Input channel line fault detection

Line fault detection (LFD) for open and short circuit line faults will normally be enabled for

safety related input channels. Series resistors are required for short circuit detection and end of line resistors for open circuit detection, as shown in **Figure 3**.

The nominal resistance thresholds employed are shown in the table below.

Output channel line fault detection

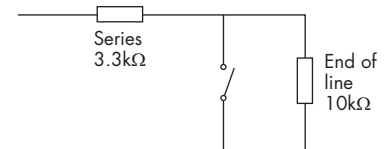


Figure 3 - LFD resistor values

Line fault detection (LFD) for open and/or short circuit line faults can optionally be enabled for normally de-energised outputs. (Normally energised loads would be de-energised by

Resistance	Value
Open circuit	>30kΩ
Open contact	>6.5kΩ
Closed contact	<6.5kΩ
Short circuit	<1.95kΩ

either open or short circuit line faults, of these only short circuit faults will be detected and reported by the IO Module).

An open circuit fault will be reported for line resistances above 30kΩ.

Short circuit line fault detection can be enabled with forward or reverse biased test currents. With forward biased test currents, the threshold at which a short circuit fault is reported is configurable up to 1kΩ. With reverse biased test currents, the threshold is fixed at 1.95kΩ.

LED's

For the operation of the Power and Fault LED's see IO Module Overview.

Module 'Channel' LED's (yellow)

On – Input or output ON

Off – Input or output OFF

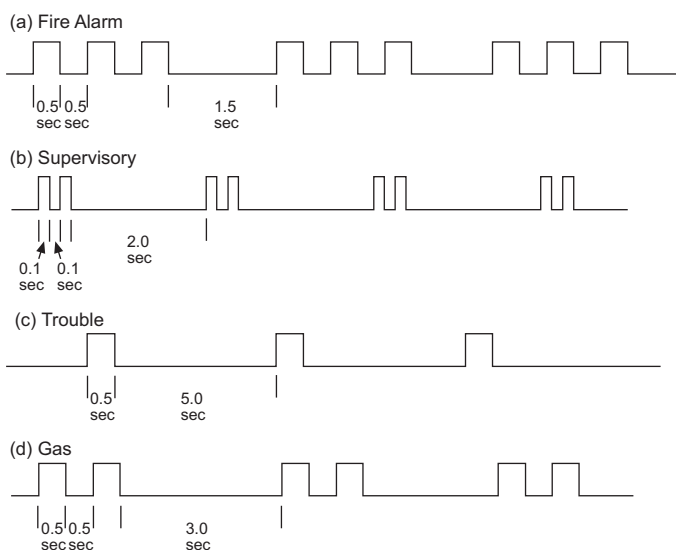


Figure 2 - pre-configured output patterns

Discrete Input/Output Module

24Vdc, non-isolated, module powered inputs and outputs

PS-8811-IO-DC

- ◆ 8 inputs - any combination of inputs and outputs
- ◆ Certified for use in SIL 2 safety applications
- ◆ Non-arcing inputs and outputs
- ◆ Output channels rated up to 2A continuous
- ◆ Inputs for dry contact switches
- ◆ 24V dc Bussed Field Power required from PS-8914-PS-AC

MODULE SPECIFICATION

See also System Specification

Number of channels 8
(independently configured as inputs or outputs)

INPUTS

ON/OFF threshold current 0.9mA (typ.)
O/C Voltage 24V dc (typ.) - depends on BFP Supply
Wetting current 1.2mA (typ.)
Minimum pulse width detected 5ms
Max input frequency in pulse counting mode (no debounce) 30Hz
Isolation (any channel to Railbus) 250V ac

OUTPUTS

Maximum Output Current per Channel 2A
Maximum Output Current per Module
 Continuous 6A
 Non-continuous (<10 seconds) 8A

INPUT CONFIGURABLE PARAMETERS

Filter time interval 0 to 8s (in 1ms steps)
Earth Leakage Detection Channel ON/OFF
Latch inputs enable /disable
Latch polarity latch on high/latch on low
Pulse counting up transition/down transition/disable
Line fault detection none/open circuit/open & short circuit

OUTPUT CONFIGURABLE PARAMETERS

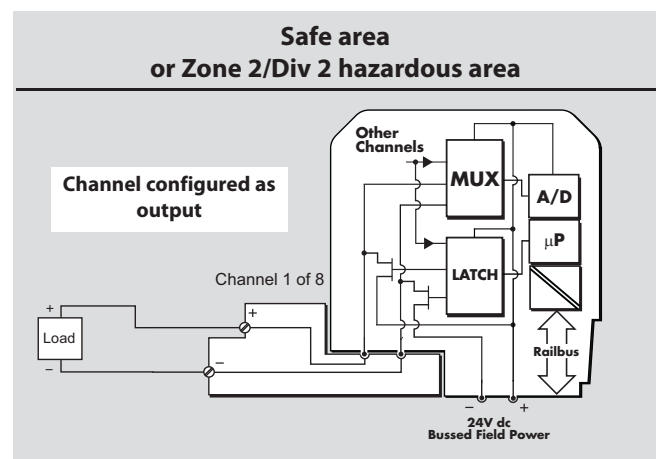
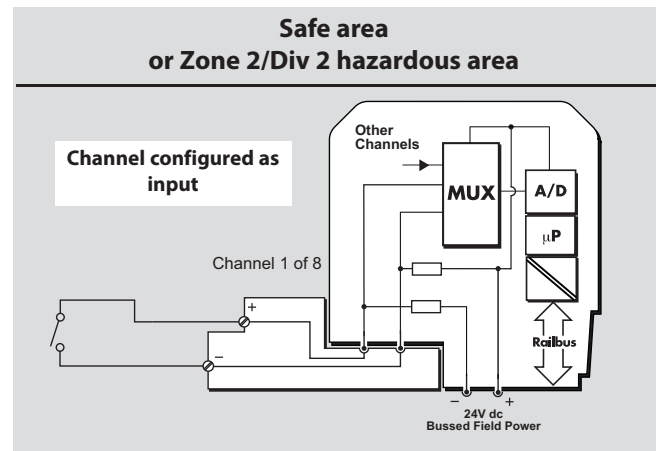
Output type pulse/discrete/pattern
Pulse width 1ms to 60s
Line fault detection* open line & short circuit detect /disable
 * Normally de-energised channels only

RESISTANCE MEASUREMENT ACCURACY

For normally de-energised output open and short-circuit detection.
With forward biased test current
 $\pm(3.4\%+5.3\Omega)$ for line resistance 220Ω
 greater of: $\pm 7\%$ or $\pm(3.1\%+27\Omega)$ for line resistance $>220\Omega$, $<1k\Omega$
With reverse biased test current
 greater of: $\pm 7\%$ or $\pm(3.1\%+430\Omega)$

RESPONSE TIME

Input Signal change to availability on Railbus 5ms (max.)
Railbus command to output change 1ms (max.)



HAZARDOUS AREA SPECIFICATION

Protection Technique EEx nA nL IIC T4
Location (FM and CSA) Class 1, Div.2, Grps A,B,C,D T4

POWER SUPPLIES

System Power Supply 50mA (typ.), 70mA (max.)

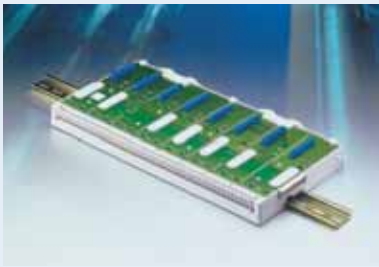
Bussed Field Power Supply

All channels configured as inputs 50mA (max)
 Any channels configured as output 50mA + output load currents

MECHANICAL

Module key code B6
Module width 42mm
Weight 210g

Carriers - overview



General

Carriers are the backplanes on to which the PlantSafe 8000 Systems are mounted. A Controller Carrier is required for each node, then IO Module Carriers, Carrier Extenders and Cables can be added as required – depending on the number of IO Modules needed and their physical distribution within the cabinet or junction box.

Note: All PlantSafe Carriers are the same as MTL MOST SafetyNet Carriers

Power and communication

Carriers distribute “system” power to IO Modules and provide the communications route between Controllers and IO Modules. (Controller power is supplied by direct connections to the Controllers themselves).

IO Module Carriers provide connectors through which field power can be supplied (see “Bussed Field Power”).

Multi-pin connectors at the end of each carrier allow further Carriers to be added – and the “system” power supply and “Railbus” connections to be made.

Earthing screens and shields

All I/O Module Carriers have their own independent earthing/grounding strip to terminate the screens/shields of field wiring cables.

Controller Carrier

The Controller Carrier (PS-8751-CA-NS) is the dedicated Carrier for the System. It can support simplex or redundant Controllers and the Power Supply Monitor (PS-8410-NS-PS).

Serial communications

Two D-type connectors are provided on the Controller Carrier for connecting to serial devices. These link to Serial Port “1” of Controller A and Controller B.

A second pair of D-type connectors is found on the Controllers themselves, to provide connections to Serial Port “2” where redundant serial communication is required.

Further details of the serial port connections are given in the data sheet for the Controllers and Carriers.

Controller Carriers

Two Controller Carriers are available - the standard Controller Carrier and the ELFD Controller Carrier.

To comply with the earth leakage fault detection (ELFD) requirements of Fire & Gas application standards, the ELFD Controller Carrier (PS-8751-CA-NS) can be used. A single channel of an PS-8811-IO-DC module must be allocated to earth leakage detection to implement this function.

Applications that do not require ELFD can use the standard Controller Carrier (PS-8750-CA-NS).

Change State buttons

Two change state buttons are mounted on the Controller Carrier – one for each Controller. The button is used to switch a master to being the standby in a redundant pair, to switch a standby offline and to instruct an offline standby Controller to synchronise itself with the Controller and to enter standby.

Terminations for power fail inputs

The PS-8913-PS-AC and PS-8914-PS-AC power supplies each have an output that indicates the health of the supply. These outputs can be connected to the termination block on the Controller Carrier and are used by the Power Supply Monitor Module to detect failures in any of up to 7 of these external power supplies.

Module Carrier

PS8000 Systems use the 8-module Carrier with 64-slot addressing (PS-8709-CA-08).

Up to 8 of these may be used together to provide slots for up to 64 IO Modules.

Carrier Extenders and Cables

To allow for flexibility in cabinet layout, Carrier Extenders are provided which – together with the Extender Cables – are used to connect Carriers mounted on different sections of the cabinet backplane or DIN rail. Carrier Extenders are used in left- and right-hand pairs.

Controller Carrier

ELFD Controller Carrier

PS-8751-CA-NS

- ◆ terminals for earth leakage fault detection
- ◆ accommodates two Controllers
- ◆ accommodates Power Supply Monitor module
- ◆ two serial port connections
- ◆ manual "change state" buttons

The ELFD Controller Carrier provides a mounting platform for up to two Controllers (PS-8851-LC-MT). It can also accommodate a Power Supply Monitor module (PS-8410-NS-PS) which can monitor the health of up to two PS-8913-PS-AC, four PS-8914-PS-AC power supplies and the 12V supply to Intrinsically Safe Modules (when these are used). For each Controller there is a serial port connector and a manually operated "Change State" button. The Carrier also provides terminals that are used when earth leakage fault detection is required.

CARRIER SPECIFICATION

See also *System Specification*

CARRIER MOUNTING MODULES

Controller (x2) PS-8851-LC-MT
 Power Supply Monitor Module PS-8410-NS-PS

ELECTRICAL CONNECTIONS

Railbus connector male out
 Serial port connectors 9-pin, D-type (female) (x2)
 Power Fail connections screw terminals (x7 pairs)
 Ground connection M4 screw terminal (x1)
 BFPOV connection M4 screw terminal (x1)
 Earth leakage fault detection connections screw terminals (1 pair)
 System Power connections 6-Pin (male)
 (Note: this does not provide power to the Controllers)

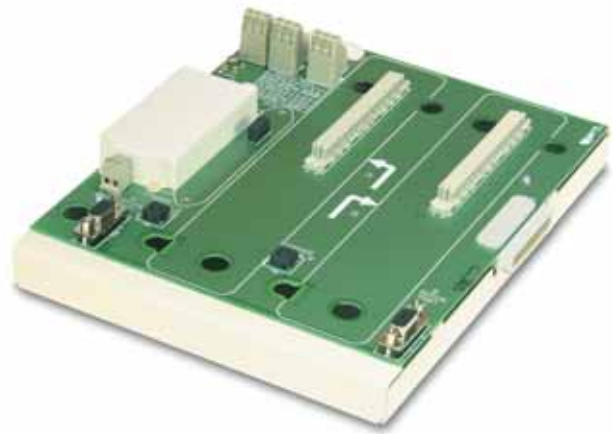
MECHANICAL

Dimensions 200 (w) x 253 (d) mm (footprint)
 Height 28 mm (top of circuit board)
 55 mm (overall)
 Weight 1.43 kg (approx.)
 Mounting methods flat panel (4 fixings)

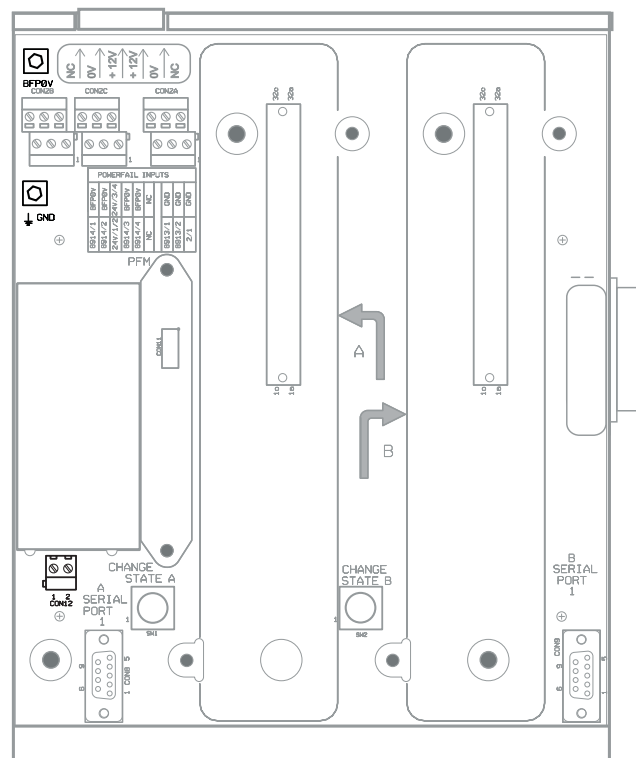
USER CONTROLS

Two "change state" buttons, one for each Controller, are provided on the carrier. The state change depends upon the controller state before the button is pressed. See table below for effects.

State	Effect
Master	Change to standby if current standby is healthy
Standby	Change to offline state
Backup	Re-synchronise and return to standby



CONTROLLER CARRIER LAYOUT

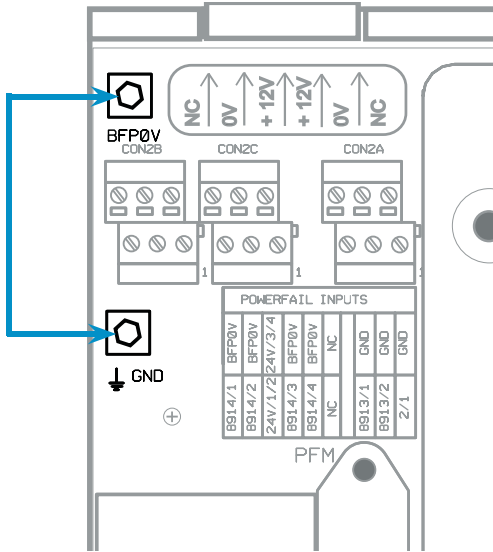


Controller Carrier

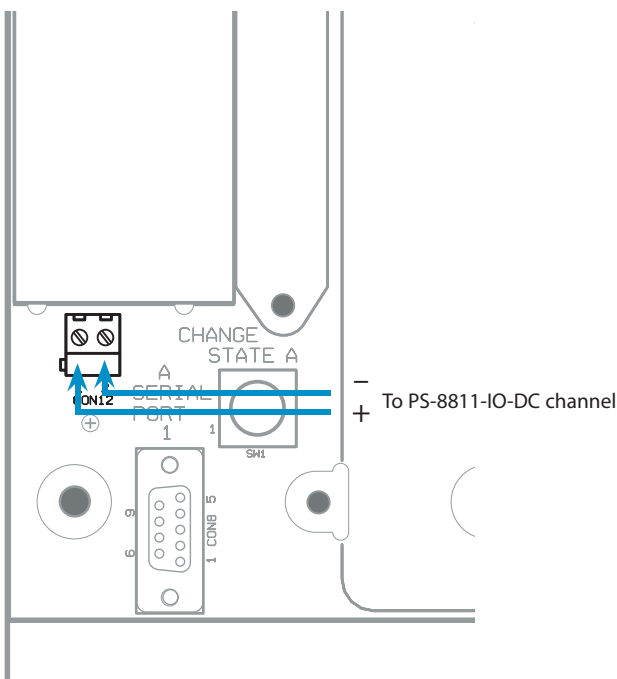
PS-8751-CA-NS
(continued)

EARTH LEAKAGE FAULT DETECTION

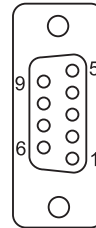
When earth leakage fault detection is NOT required, a link should be made - as shown below - between the BFP0V and GND connection studs. Note: the BFP0V connection stud must still be connected to Bussed Field Power 0V, marked "-" on the PS-8914-PS-AC power supply, and the GND connection must still be connected to ground.



When earth leakage fault detection IS required, then the terminals of connector CON12 must be wired to a channel of an PS-8810-IO-DC module - as shown below - that has been configured for earth leakage. Note: earth leakage fault detection can only operate when BFP0V and all field wiring and field instruments are isolated from ground (GND).

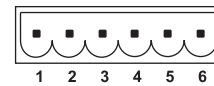


SERIAL PORT CONNECTORS (X2)



Pin #	Function
1	0V
2	NC
3	Tx/Rx (+)
4	Tx/Rx (+)
5	Tx/Rx (-)
6	Tx/Rx (-)
7	NC
8	NC
9	0V

SYSTEM POWER SUPPLY CONNECTIONS



Terminal	External Power
1	No connection
2	0V
3	+12V
4	+12V
5	0V
6	No connection

Two pairs of System Power supply connections (terminals 2/3 and terminals 4/5) are provided for wiring a redundant pair of PS-8913-PS-AC power supplies.

Note: The Controllers do not draw their power from these connections, they are supplied with Controller Power via connections on the Controllers themselves.

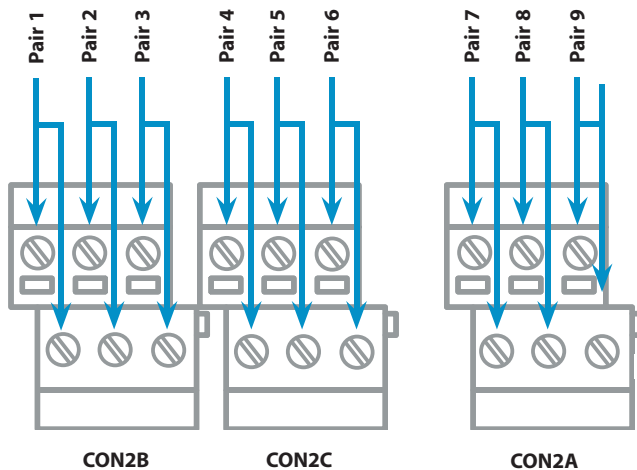
GND AND BFP0V CONNECTIONS

The GND terminal must always be connected to the main instrument earth or the 'star-point' bus-bar. (Note: the 0V of the PS-8913-PS-AC power supplies is GND).

The BFP0V terminal must always be connected to 0V of the PS-8914-PS-AC power supplies.

PSU POWER FAIL CONNECTIONS

An PS-8410-NS-PS Node Services Power Supply Monitor Module must be installed on the Controller Carrier to make use of this capability. If an PS-8410-NS-PS is not being used, then it is not necessary to make any connections to the PSU Power Fail terminals.



Terminal pairs 1, 2, 4 and 5

These terminal pairs are used to monitor the AUX (or power fail) output from up to four PS-8914-PS-AC power supplies.

The upper terminal of each pair is connected directly to the AUX terminal of the PS-8914-PS-AC that is to be monitored. It is not necessary to connect the lower terminal - as this is internally connected to the BFP0V terminal on the Carrier.

If any of the PS-8914-PS-AC supplies are acting as redundant pairs, then these should be connected to terminal pairs 1 and 2 and/ or terminal pairs 4 and 5.

If a pair is unused, a shorting link must be placed between the upper and lower terminals, otherwise the Power Supply Monitor Module will continuously report a fault.

Terminal pair 3

The upper terminal of this pair should be connected to the 24V dc supply of the PS-8914-PS-AC supply monitored by terminal pairs 1 and 2. The lower should be connected to the 24Vdc supply of the PS-8914-PS-AC monitored by terminal pairs 4 and 5.

If a single pair of PS-8914-PS-AC power supplies is being monitored, then it is only necessary to make single connection to appropriate terminal of pair 3.

Terminal pair 6

This terminal pair is unconnected and should not be used.

Terminal pairs 7 and 8

These terminal pairs are used to monitor the AUX (or power fail) output from up to two PS-8913-PS-AC power supplies.

The upper terminal of each pair is connected directly to the AUX terminal of the PS-8913-PS-AC that is to be monitored. It is not necessary to connect the lower terminal - as this is internally connected to the GND terminal on the Carrier.

If a pair is unused, a shorting link must be placed between the upper and lower terminals, otherwise the Power Supply Monitor Module will continuously report a fault.

Terminal pair 9

If a Railbus Isolator (8922-RB-IS) is not used in the node, this terminal pair must be fitted with a shorting link to prevent an alarm condition being signalled to the Controller.

If a Railbus Isolator is used, internal connections are made to monitor the failure of any power supplies used to provide power for the Intrinsically Safe IO Modules.

Module Carrier

8-module Carrier - extended addressing

PS-8709-CA-08

- ◆ 64-slot address bus
- ◆ accepts up to eight I/O modules
- ◆ DIN rail or panel mounting
- ◆ carries control signals and data on Railbus
- ◆ distributes System Power to modules
- ◆ distributes Bussed Field Power to modules
- ◆ isolated earthing bar for cable screens/shields

CARRIER SPECIFICATION

See also *System Specification*



ELECTRICAL CONNECTIONS

Railbus connectors..... female in, male out

Cable screens/shield connectionsM4 screw terminals (x34)

Bussed field power supply connectors.....8-pin male (x2)

The two 8-pin connectors provided at the top rear of the carrier connect power supplies for 'field power'. These supplies are routed through I/O modules that require power for their field circuits.

MECHANICAL

Dimensions342 (w) x 170 (d) x 22 (h)mm

Weight.....680g

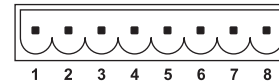
Mounting methods.....Flat panel or DIN rail

DIN-rail types

.....'Top hat' 35 x 7.5mm rail or 35 x 15mm rail to EN 50022

.....G-section rail to EN 50035

BUSSED FIELD POWER CONNECTOR



Terminal	Function
1	I/O modules 1 & 2 -ve (or Neutral)
2	
3	I/O modules 1 & 2 +ve (or Live)
4	
5	I/O modules 3 & 4 +ve (or Live)
6	
7	I/O modules 3 & 4 -ve (or Neutral)
8	

The table above gives the connection details for modules 1 to 4. The second connector provides identical connections for modules 5 to 8.

Carrier Extender

Left-hand/right-hand

PS-802x-CE-xH

- ◆ ensures Railbus and power supply continuity
- ◆ pairs (left & right hand) link separate carrier runs
- ◆ sub-D connectors linked via multi-way cable
- ◆ multi-pin connector to carrier
- ◆ maximum of 3 extender pairs per node
- ◆ 32- and 64-slot address capable

CARRIER SPECIFICATION

See also System Specification

ELECTRICAL CONNECTIONS

Railbus carrier connector

PS-8020-CE-RH female in
PS-8021-CE-LH male out

Extender cable connector Sub-D, 37-pin female

System Power cable connections* screw terminal (x6)

System Power cable conductor size 2.5mm² (max.)

* The six terminals for the System Power connections must be made in addition to connecting the Extender cable. The Terminals on the left- and right- hand extenders indicate which connections need to be made for System Power (HVCC + and HVCC -) and an internal ground connection (SGND).

MECHANICAL

Dimensions (overall) 42 (w) x 168 (d) x 37 (h)mm

Weight 135g

Mounting method integral DIN-rail fixings

DIN rail types

..... 'Top hat', 35 x 7.5mm or 35 x 15mm to EN 50022

..... G-section, to EN 50035

PART NUMBERS

Carrier Extender, Right-hand	PS-8020-CE-RH
Carrier Extender, Left-hand	PS-8021-CE-LH



Carrier Extender Cable

0.35m, 0.85m 1.2m

PS-800x-CC-xx

- ◆ Railbus data extender cables
- ◆ three lengths - 0.35, 0.85 and 1.2 m
- ◆ Sub-D cable connectors

SPECIFICATION

See also System Specification

ELECTRICAL CONNECTIONS

Extender cable connectorsSub-D, 37-pin male (X2)

Carrier Extension Cable, 0.35m	PS-8001-CC-35
Carrier Extension Cable, 0.85m	PS-8002-CC-85
Carrier Extension Cable, 1.2m	PS-8003-CC-12



Field Terminals - overview



General

Field terminals are removable units for terminating wiring from field instruments.

Each IO Module combines with a Field Terminal to which the wiring from field instrumentation is connected.

Recommended and compatible Field Terminal types are given in the Field Terminal Specification and Selection Guide. They can be selected to optionally include loop disconnection and fusing – eliminating the need for additional terminals and wiring between the Field Terminal and the instrumentation.

By wiring directly to the Field Terminal, there is no need for additional terminals or wiring.

Note: The PlantSafe field terminals are the same as MTL MOST SafetyNet field terminals.

8-channel Field Terminals

IO Modules use standard MTL MOST 8-channel Field Terminals. Depending on the application, the Field Terminals may be for general purpose, non-arcing or non-incendive field wiring, may incorporate fused disconnects and may be for 2-, 3- or 4-wire transmitters.

Fused disconnect

The fused disconnect Field Terminals incorporate a 2A fuse that can be partially withdrawn from the Field Terminal to act as a loop disconnect.

Tag strip

Each Field Terminal is supplied with an integral tag strip, which is hinged to provide access to the wiring terminals and the fuse disconnects.

Field Terminal clicks on to Carrier

The Field Terminal is easily removed from the Carrier – it is held in place by a sprung latch that can be released without the need for tools. This simplifies connection of the field wiring. The Field Terminal is secured in place by the insertion of the IO Module.

Wiring to Field Terminals

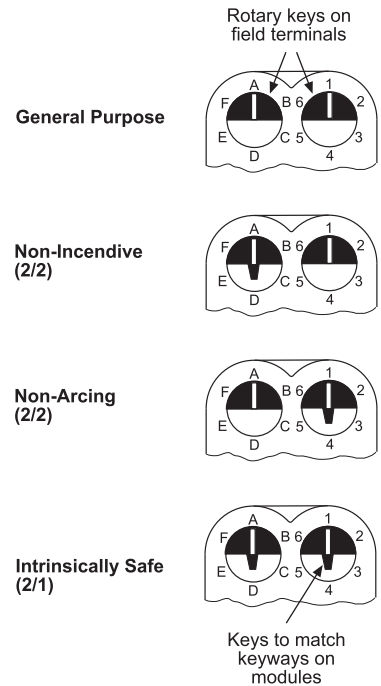
IO Modules all use 8-channel Field Terminals, to which wiring with a cross section of up to 2.5mm² can be connected. Each termination point is clearly numbered to simplify recognition of each terminal. The two rows of terminals are offset to allow access to the lower row when wiring is in place.

Keying

Rotary keys in the Field Terminal are adjustable

to allow insertion of certain modules. Modules that would cause field wiring to be unsafe (in respect of hazardous areas) cannot be inserted.

The four types of Field Terminal can be identified from the diagram below:



Field Terminal - Specification and Selection Guide

Field Terminals

PS-86xx-FT-xx

- ◆ a range of Field Terminals
- ◆ standard, fused and loop-disconnect
- ◆ tag strip fitted to all Field Terminals

FIELD TERMINAL SPECIFICATION

See also System Specification

ELECTRICAL

Rated voltage..... 250V ac
 Maximum current per I/O channel..... 3A
 Fuse rating (where fitted)..... 2A
 Conductor size 0.14–2.5mm²

MECHANICAL

Dimensions - approx (including tagging strip)
 42 (w) x 88 (d) x 39.5 (h)mm
 Weights (typical - including tagging strip)
 Unfused type..... 78g
 Fused type..... 86g

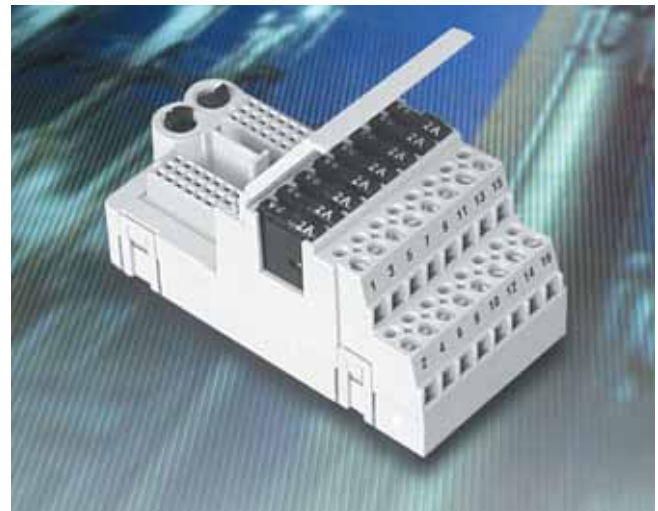
PART NUMBERS

GENERAL PURPOSE FIELD WIRING

Field terminal description	Part number
Standard	PS-8602-FT-ST
4-wire transmitter	PS-8615-FT-4W

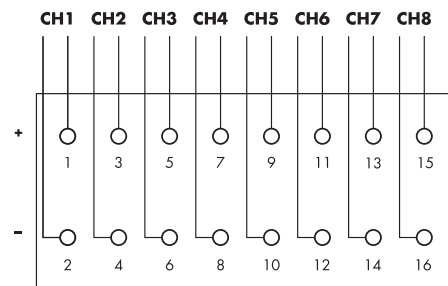
ADDITIONAL COMPONENTS

Description	No. in Pack	Part Number
2A Fuse pack	10	PS-8401-FU-2A
Loop-disconnect links pack	10	PS-8405-LK-ZE



CONNECTION DIAGRAM

The connection diagram below applies to all Field Terminals used with IO Modules.



FIELD TERMINAL SELECTION

Field terminal	PS-8810-HI-TX	PS-8811-IO-DC
8601-FT-NI	R (2-wire TX)	
8602-FT-ST	C	
8603-FT-FU	C	
8604-FT-FU	C	C
8610-FT-NA		R
8611-FT-FU		C
8615-FT-4W	R (3 & 4-wire TX)	

R = Recommended, C = Compatible

Power Supplies - overview



General

In order to meet the relevant safety requirements, the power supplies specifically designed for use with the PlantSafe 8000 products must be used to power the Controller and IO Modules.

The PS-8913-PS-AC power supply must be used to supply the 12V dc for the Controller and System Power, and the PS-8914-PS-AC power supply must be used for the 24V dc Bussed Field Power supply to the IO Modules.

Note: All PlantSafe power supplies and accessories are the same as MTL MOST SafetyNet power supplies and accessories.

Redundancy

Redundancy is implemented by “pairing” each power supply with a second power supply. If the optional Nodes Services Power Supply Monitor (PS-8410-NS-PS) is used, then this can detect if there has been a failure in any one of up to six PS-8913-PS-AC/ PS-8914-PS-AC power supplies and the 2/1 power supplies for nodes including Intrinsically Safe IO – and will then report that such a failure has occurred.

Wide range of input voltages

The PS-8913-PS-AC and PS-8914-PS-AC power supplies accept AC input voltages in the range 85 - 264V ac.

Hazardous area mounting

Each power supply can be mounted in Class 1, Division 2 or Zone 2 hazardous areas.

Operating ambient temperature

When mounted with the optimum orientation for cooling, the power supplies will provide their full rated output in operating ambient temperatures of +70°C (provided the input range is in excess of 125V ac).

Power Supply

System Power

- ◆ 12V dc @ 5A System and Controller power
- ◆ 24V dc @ 5A for powering local instrumentation
- ◆ 85 – 264V ac input voltage
- ◆ Zone 2/Div 2 hazardous area mounting
- ◆ 12V output supports load sharing for redundancy†

POWER SUPPLY SPECIFICATION

See also System Specification

ELECTRICAL CONNECTIONS

AC Input connections.....screw terminals (x3)
 DC Output connectionsscrew terminals (x8)
 Power fail signal connectionscrew terminal (x1)

INPUT SPECIFICATION

Input voltage85–264V ac
 Input frequency47–65Hz
 Power efficiencyUp to 87 %
 Input protectioninternal (6.3A) slow-blow fuse and VDR*

OUTPUT SPECIFICATION

DC24V output voltage.....24.7V dc ± 10%
 DC12V output voltage.....11.95V dc ± 5%
 DC24V output current.....5A (nominal - see Figure1)
 DC12V output current.....5A (nominal - see Figure 1)
 Input-output isolation.....2800V dc
 Hold-up time (at full rated load)15ms (typ.)
 Thermal protection.....reduced output power
 Supply health indicator.....LED

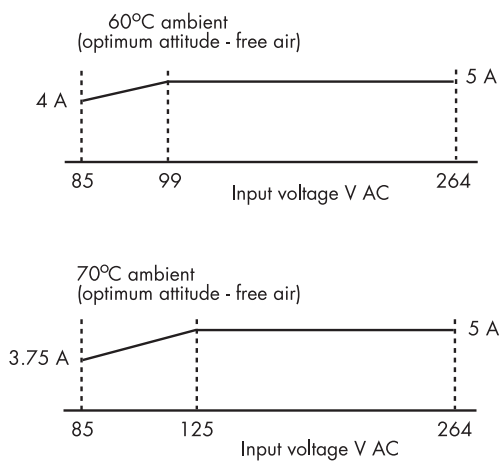


Figure 1 - DC24V and DC12V output current de-rating

† The 24Vdc output does not support load sharing and should only be used for supplying local 24Vdc instrumentation. It should not be used to supply 24Vdc Bussed Field Power.

* voltage dependent resistor

PS-8913-PS-AC



POWER-FAIL SIGNALLING - DC12V output only

Threshold to trigger "power-fail" signal11.33V (max.)
10.30V (min.)

Power-fail signal output (open collector)

Power supply "OK"Low impedance to -ve of DC12V output
 Power supply "failure"High impedance to -ve of DC12V output

HAZARDOUS AREA SPECIFICATION

Protection Technique.....EEx nA II T4
 Location (FM)Class 1, Div.2, Grps A,B,C,D T4
 Location (CSA).....Class 1, Div.2, Grps A,B,C,D T3C

MECHANICAL

Dimensions103 (w) x 138 (h) x 113.6 (d)mm (see Figure 4)
 Mounting methods35 mm x 7.5 mm T-section DIN rail (see also Accessories overleaf)
 Weight.....750g

APPROVALS

- EN 61204: 1995 Low-voltage power supply devices, d.c. output - Performance characteristics and safety requirements
- EN 60950-1: 2002 Safety of information technology equipment
- EN 61326: 1997 + A1: 1998 + A2: 2001 Electrical equipment for measurement, control and laboratory use - EMC requirements (Class A equipment)
- EN50021: 1999 Electrical apparatus for potentially explosive atmospheres - Type of protection "n"

Power Supply

System Power

PS-8913-PS-AC continued

TERMINAL ASSIGNMENTS

Input connector screw terminals

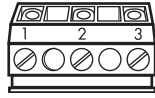


Figure 2 - AC input connector

Terminal	Des.	Description
1		Protective earth
2	N	Input neutral
3	L	Input live

Output connector screw terminals

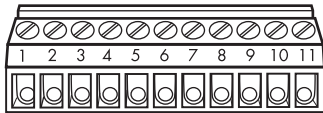


Figure 3 - DC output connector

Terminal	Des.	Description
1		Not connected
2	+	Output 1 + ve
3	+	Output 1 + ve
4	-	Output 1 - ve
5	-	Output 1 - ve
6	+	Output 2 + ve
7	+	Output 2 + ve
8	-	Output 2 - ve
9	-	Output 2 - ve
10	Aux.	Power fail signal
11		Not connected

ACCESSORIES

Heavy duty DIN rail mounting kit*8413-FK-DN

Surface panel mounting kit.....8414-FK-SU

* For high vibration environments

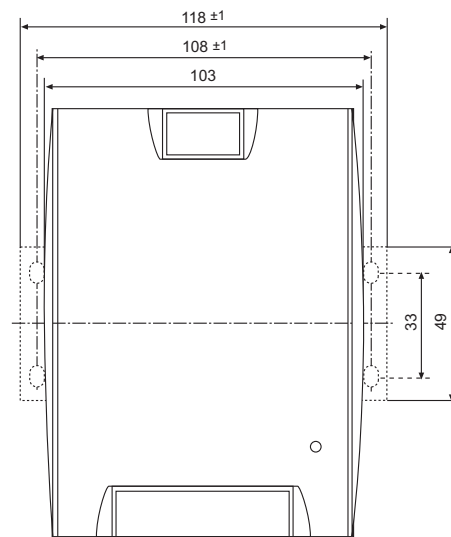
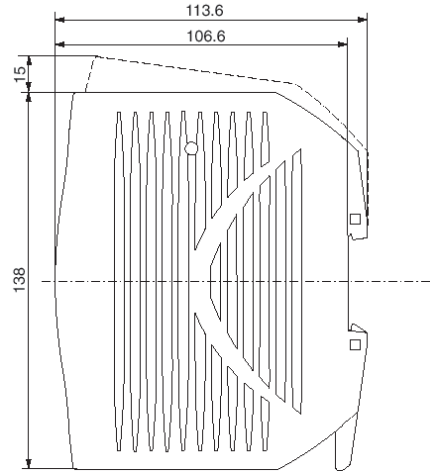


Figure 4 - outline and fixing dimensions

Power Supply

Bussed Field Power

PS-8914-PS-AC

- ◆ 24V dc @ 10A for Bussed Field Power
- ◆ 85 – 264V ac input voltage
- ◆ Zone 2/Div 2 mounting
- ◆ supports load sharing for redundancy

POWER SUPPLY SPECIFICATION

See also System Specification

ELECTRICAL CONNECTIONS

AC Input connections.....screw terminals (x3)
DC Output connectionsscrew terminals (x8)
Power fail signal connectionscrew terminal (x1)

INPUT SPECIFICATIONS

Input voltage85–264V ac
Input frequency 47–65Hz
Power efficiency up to 87 %
Input protection internal (6.3A) slow-blow fuse and VDR*

OUTPUT SPECIFICATIONS

Output 24V dc \pm 10%
Output current10A (nominal - see Figure 1)
Input-output isolation.....2800V DC
Hold-up time (at full rated load)15ms (typ.)
Thermal protection reduced output power
Supply health indicator LED



POWER-FAIL SIGNALING

Threshold to trigger "power-fail" signal 23.3V (max.)
 22.0V (min.)
Power-fail signal output (open collector)
Power supply "OK"low impedance to ground
Power supply "failure"high impedance to ground

HAZARDOUS AREA SPECIFICATION

Protection Technique..... EEx nA II T4
Location (FM) Class 1, Div.2, Grps A,B,C,D T4
Location (CSA)Class 1, Div.2, Grps A,B,C,D T3C

MECHANICAL

Dimensions 103 (w) x 138 (h) x 113.6 (d)mm (see Figure 4)
Mounting methods35 mm x 7.5 mm T-section DIN rail
 (see also Accessories overleaf)
Weight750g

APPROVALS

- EN 61204: 1995 Low-voltage power supply devices, d.c. output - Performance characteristics and safety requirements
- EN 60950-1: 2002 Safety of information technology equipment
- EN 61326: 1997 + A1: 1998 + A2: 2001 Electrical equipment for measurement, control and laboratory use - EMC requirements (Class A equipment)
- EN50021: 1999 Electrical apparatus for potentially explosive atmospheres - Type of protection "n"

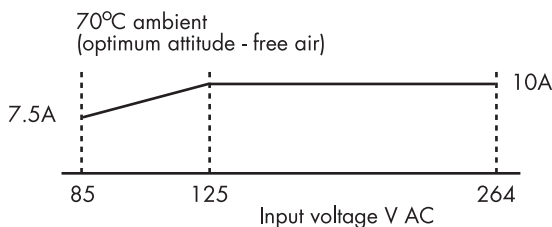
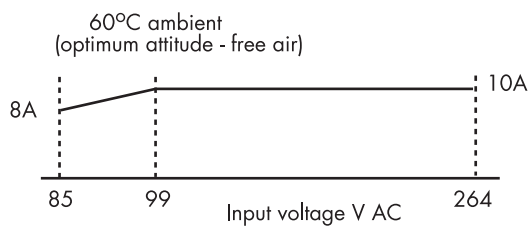


Figure 1 - output current de-rating

* voltage dependent resistor

Power Supply

Field Power

PS-8914-PS-AC
continued

TERMINAL ASSIGNMENTS

Input connector screw terminals

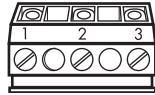


Figure 2 - AC input connector

Terminal	Des.	Description
1		Protective earth
2	N	Input neutral
3	L	Input live

Output connector screw terminals

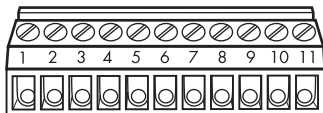


Figure 3 - DC output connector

Terminal	Des.	Description
1		Not connected
2	+	Output + ve
3	+	Output + ve
4	-	Output - ve
5	-	Output - ve
6	+	Output + ve
7	+	Output + ve
8	-	Output - ve
9	-	Output - ve
10	Aux.	Power fail signal
11		Not connected

ACCESSORIES

Heavy duty DIN rail mounting kit*8413-FK-DN

Surface panel mounting kit.....8414-FK-SU

* For high vibration environments

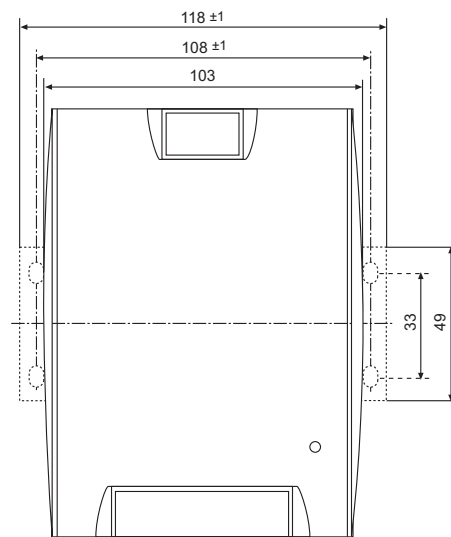
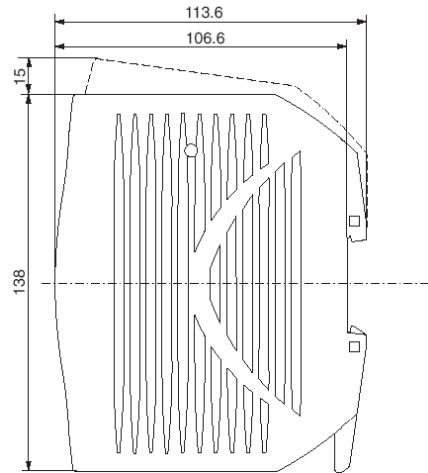


Figure 4 - outline and fixing dimensions

Node Services Power Supply Monitor

PS-8410-NS-PS

- ◆ power supply status monitoring for PS-8913-PS-AC and PS-8914-PS-AC power supplies
- ◆ indicates supply failures to Controller
- ◆ monitors up to two PS-8913-PS-AC, four PS-8914-PS-AC power supplies and the 2/1 supply for nodes including IS IO modules
- ◆ Zone 2/Div 2 hazardous area mounting
- ◆ mounts on PS-8571-CA-NS Carrier

The Power Supply Monitor can monitor the health of supplies powering a PS8000 node and signal the Controller in the event of any one of them failing. The module can receive power supply status signals from up to two PS-8913-PS-AC and four PS-8914-PS-AC power supplies. It can also monitor the status of PS-8920-PS-DC supplies powering intrinsically safe I/O modules. Where power supply redundancy is employed, the module enables failed power supplies to be identified and replaced without interference to the process. The module itself may be removed and replaced in a Zone 2/ Div 2 hazardous area without gas clearance.



MODULE SPECIFICATION

See also *System Specification*

LED INDICATOR

PWR (i.e. System power supply present)

HAZARDOUS AREA SPECIFICATION

Protection Technique EEx nL IIC T4

Location (FM and CSA) Class 1, Div.2, Grps A,B,C,D T4

POWER SUPPLIES

System Power Supply 5mA (typ.), 10mA (max.)

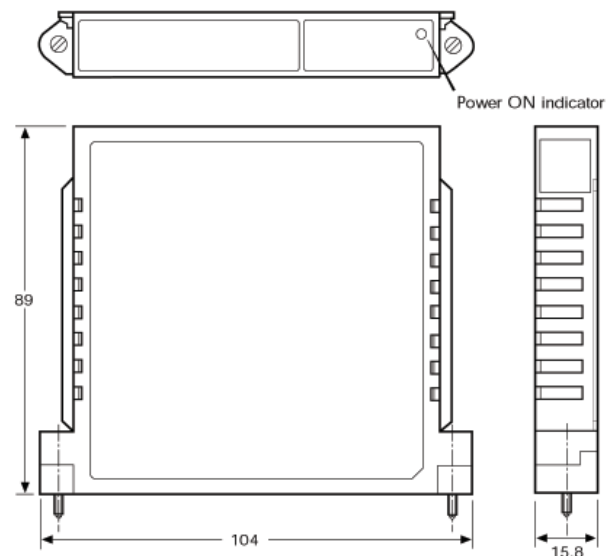
MECHANICAL

Mounting method (captive x2) screw fixing

Weight (approx.) 75g

DIMENSIONS

Dimensions in mm



System Specification

System Specification

ENVIRONMENTAL

Operating Ambient Temperature

Optimum orientation*-40°C to +70°C

Non-optimum orientation-40°C to +50°C

Storage-40°C to +85°C

Relative Humidity 5 to 95% (non-condensing)

Ingress protection IP20 to BS EN60529: 1992

Corrosion resistance..... Designed to meet ten year service in Class G3 corrosive environment, as per ISA S-71.04: 1985 "Environmental Conditions for Process Measurement and Control Systems: Airborne Contaminants".

* With field terminals vertically above or below the IO Modules.

Operating vibration resistance

DIN rail mounted*.....

..... 1g (sinusoidal vibration 10 – 500Hz to EN 60068-2-6)

..... 1g (random vibration 20 – 500Hz to BS2011: Part 2.1)

Surface mounted.....

..... 5g (sinusoidal vibration 10 – 500Hz to EN 60068-2-6)

..... 5g (random vibration 20 – 500Hz to BS2011: Part 2.1)

* The ELFD Controller Carrier PS-8751-CA-NS can only be surface mounted.

Operating, Storage and Transportation vibration resistance

.....30g peak acceleration, with 11ms pulse width (EN 60068-2-27)

Storage and Transportation shock resistance

.....1m drop onto flat concrete (EN 60068-2-32)

MECHANICAL

DIN-rail types

.....'Top hat', 35 x 7.5mm to EN 50022

.....'Top hat', 35 x 15 mm to EN 50022

.....G-section, to EN 50035

ISOLATION

Between PS8000 channelsnone

Channel (any) to railbus250V ac rms

NODE SIZE LIMITATIONS

Maximum physical length of railbus* 6.8m

Maximum number of extender cables.....3

Maximum number of IO Modules..... 64

Maximum number of PS8000 nodes.....249

* overall including backplanes and extender cables

HAZARDOUS AREA APPROVAL

Node location

.....Safe area or

.....Zone 2, IIC, T4 hazardous area

..... Class 1, Div 2, Groups A-D T4* hazardous location

* PS-8913-PS-AC and PS-8914-PS-AC power supplies T3C

Field equipment and wiring location

.....Safe area or

..... Zone 2, IIC hazardous area

..... Class 1, Div 2, Groups A-D hazardous location

(Temperature classification will be determined by the field apparatus)

Applicable hazardous area standards:

◆ Factory Mutual Research Co., 3611: 2004. "Non-incendive Electrical Equipment for use in Class I and II, Division 2, and Class III Divisions 1 and 2, Hazardous (Classified) Locations".

◆ CSA C22.2 No 213-M1987, Reaffirmed 2004. "Non-incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations".

◆ EN 60079-0:2004 "Electrical apparatus for explosive gas atmospheres. Part 0: General Requirements".

◆ EN 60079-15: 2005 "Electrical apparatus for explosive gas atmospheres. Part 15: Construction, test and marking of type of protection 'n' electrical apparatus".

ELECTRICAL STANDARDS AND APPROVALS

Applicable EMC standards

◆ EN 61326-1: 2005. "Electrical equipment for measurement, control and laboratory use – EMC requirements. Part 1: General requirements".

Applicable Electrical Safety standards

◆ IEC 61131-2: 2003. "Programmable controllers - Part 2: Equipment requirements and tests".

SAFETY APPROVALS

Applicable Functional safety standards

◆ IEC 61508:2000. "Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems"

◆ IEC 61511:2004. "Functional Safety - Safety Instrumented Systems for the Process Sector".

CABLE PARAMETERS FOR NON-INCENDIVE FIELD WIRING

Module (each channel)	FM		
	Gas Group	Ca (µF)	La (mH)
PS-8811-HI-TX	A + B	0.17	11
	C	0.51	33
	D	1.36	88