DAVIS DERBY

# Product Catalogue


## Safety In Automation

Davis Derby Limited · Alfreton Road · Derby DE21 4BF
Tel: +44 (0)1332 227500 · Fax: +44 (0)1332 372190 · Email: info@davisderby.com



MINEWATCH

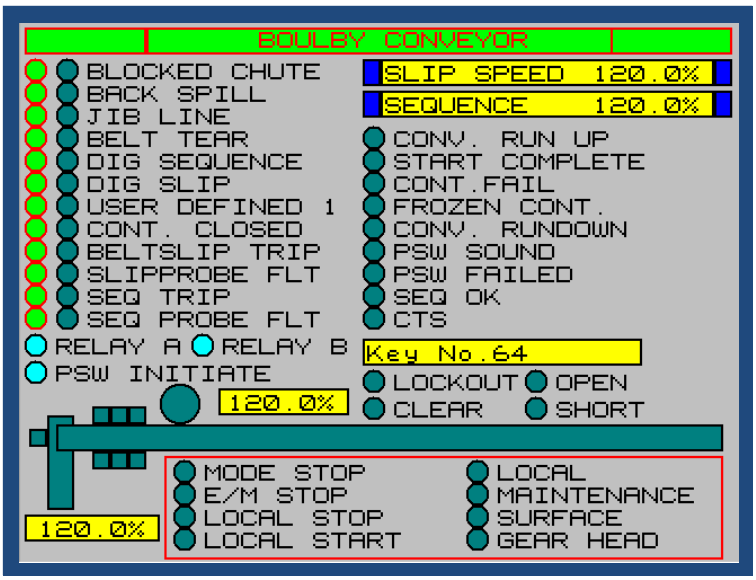
www.minewatch.co.uk

MINEWATCH

# Product Catalogue Contents

# PC21 Control and Monitoring Units

- ATEX M1 and IECEx Certified Intrinsically Safe
- Distributed intelligence for effective plant control and monitoring
- Cost effective solution minimises hardware and cable costs
- Units can be up to 5000 metres apart enabling remote operation
- Extremely flexible to allow a wide range of applications
- Expandable to suit future changes
- The PLC ladder logic software is user Programmable
- Modules can be reprogrammed on site
- Intrinsically safe Colour Diagnostics mimic with trend capabilities
- Configurable Set Point capabilities via 4x4 key pad



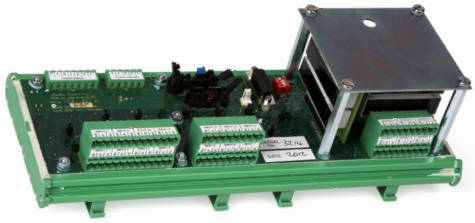

The Davis Derby MineWatch PC21 system is certified intrinsically safe to the ATEX directive M1 and IECEx Standards. The system is a remote control and monitoring system comprising of seven modules which can be used in combinations for a wide variety of applications such as conveyors, pumps, fans, compressors and environmental monitoring.

MINEWATCH

## MINEWATCH PC 21 Modules

There are seven MineWatch PC 21 modules :-

1. **PC 21-1 Control module (Input/Output)**
2. **PC 21-CD Colour Display module**
3. **PC 21-2T Telemetry module**
4. **PC21-FE/PC21-E Ethernet module**
5. **PC21-MC Modbus Controller (Fibre or RS 485)**
6. **PC21-MS Modbus Slave (Fibre or RS 485)**
7. **PC21-R Radio Frequency Identification Interface Unit**



PC21-1 Control module

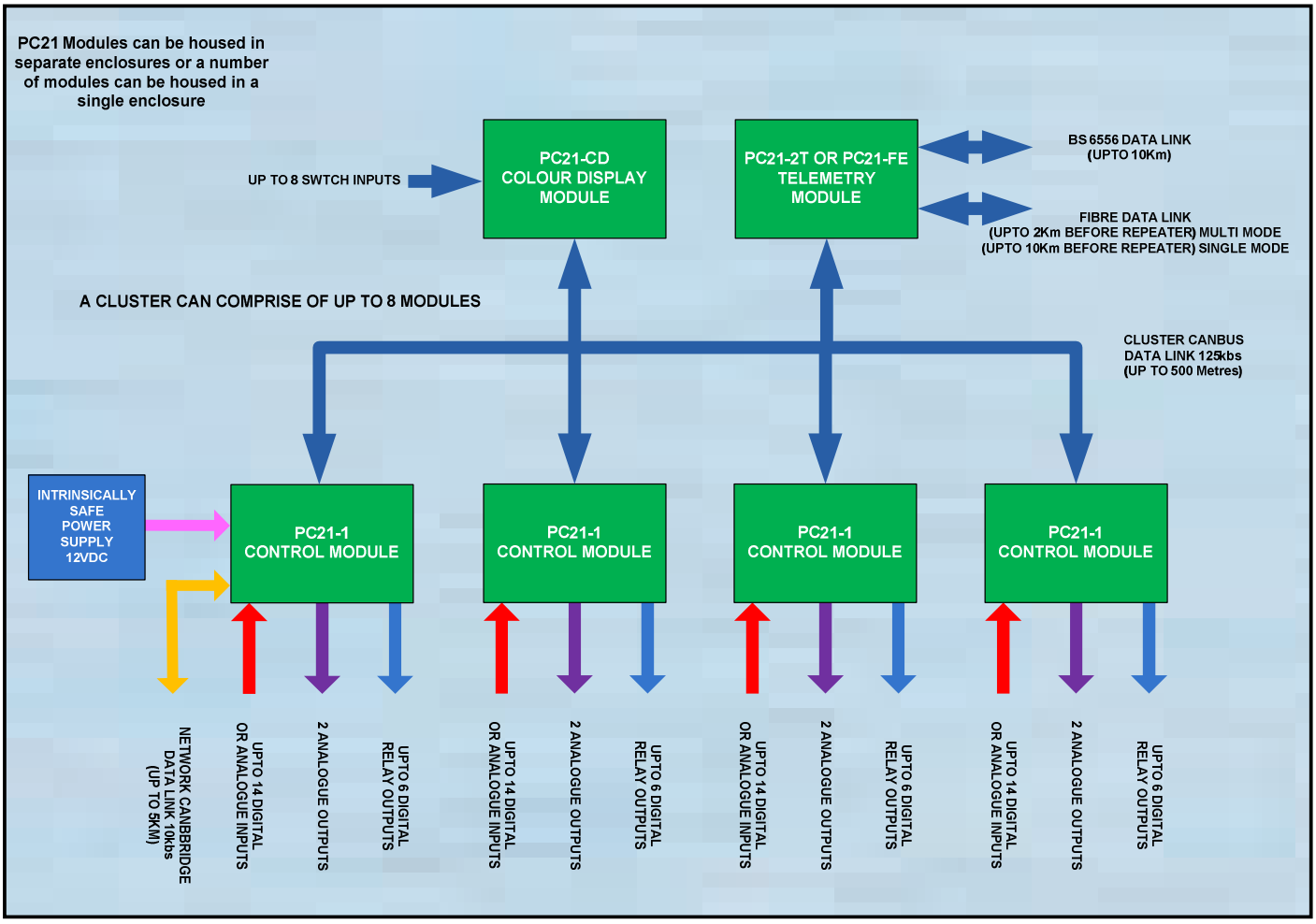
PC21-E Ethernet module

PC21-CD

PC21-FE Ethernet module

This brochure describes a range of dedicated control units based on the PC21 modules. They can be connected together to form a cluster as shown below.

## A Typical MineWatch PC21 Module Cluster.



MINEWATCH

## MINEWATCH PC21-3 Conveyor Control Unit

Davis Derby offers a dedicated conveyor control unit based on the MineWatch PC 21 modules, both single and dual pilot versions are available. The unit is equipped with one or two built in signalling systems to provide lock out facilities with key monitoring indicating the number (or position) of the signal key was used to stop the conveyor.
The unit is also fully compatible with the Davis Derby DIS 5 intrinsically safe communication system, thus providing fully monitored and interlocked pre-start warning for each of the controlled conveyors. The conveyor control unit may be used for coal face AFC and stage loader applications or for roadway conveyors.

The conveyor control unit can be supplied with a integral flameproof power supply unit providing an intrinsically safe 12 volt dc output to power the two signalling systems and the DIS 5 communications system. The unit is also equipped with relays to connect to the pilot circuit of the conveyors. The MineWatch PC 21 modules are powered from a separate power supply unit, which can provide the supply for several modules via the CAN bus.

The PC21-3's can contain several PC 21-1 control modules, such as a PC 21-CD display module, Modbus, RS 485, and fibre interfaces. They may also contain integrated Telemetry or Ethernet Units, as a method of delivering the data to a surface SCADA system. However these units are normally housed separately .

**PC21-3 Conveyor Controller (Standard version)**

**PC21-3 Conveyor Controller (Slim line version)**

**PC21-3 Conveyor Controller (No Power Supply Relay )**

**PC21-3 Conveyor Controller (With PC21-FE and Fibre Switch)**

MINEWATCH

## MINEWATCH General Purpose Control Unit

The MineWatch General Purpose Control unit is intended for various applications, including:-

- Environmental Monitoring
- Hydraulic pump control,
- Auto-loop control,
- Compressor control.
- Water pump control,
- Fan Control,
- Hydraulic coupling control
- And many more...

**MineWatch GPMC**

The basic unit contains a PC 21-1 control module and a PC 21-CD display module, although other combinations of module are possible.

The unit is powered from a separate 12 volt intrinsically safe source. A power supply unit with interposing relays can be bolted directly to the General Purpose unit if required. This power supply can be used to power several PC 21modules via the cluster CAN bus.

The Cluster CAN bus can be connected to other modules and units as required provided the maximum number of modules is limited to 8 in a single cluster and the maximum length is observed.

## MINEWATCH Input/output Unit

The MineWatch Input Output unit is available to expand the I/O (Input output) facilities of the other units described in this brochure. It connects to the Cluster CAN bus data link.

**MineWatch Input/output Unit**

The unit contains a MineWatch PC 21-1 Control module and can be supplied with a LCD display.

The unit can be powered from a separate 12 volt intrinsically safe power supply, alternatively, the unit can be powered from a common supply feeding several units, via the CAN bus. The Cluster CAN bus may be connected to other modules and units as required (*provided the maximum number of modules is limited to eight in a single cluster and the maximum length is observed).*

**MineWatch Telemetry Unit**

## MINEWATCH Telemetry/Ethernet Units

The MineWatch Telemetry unit contains the PC 21-2T module and the associated intrinsically safe barrier to interface with a SCADA system via BS 6556 FSK telemetry.

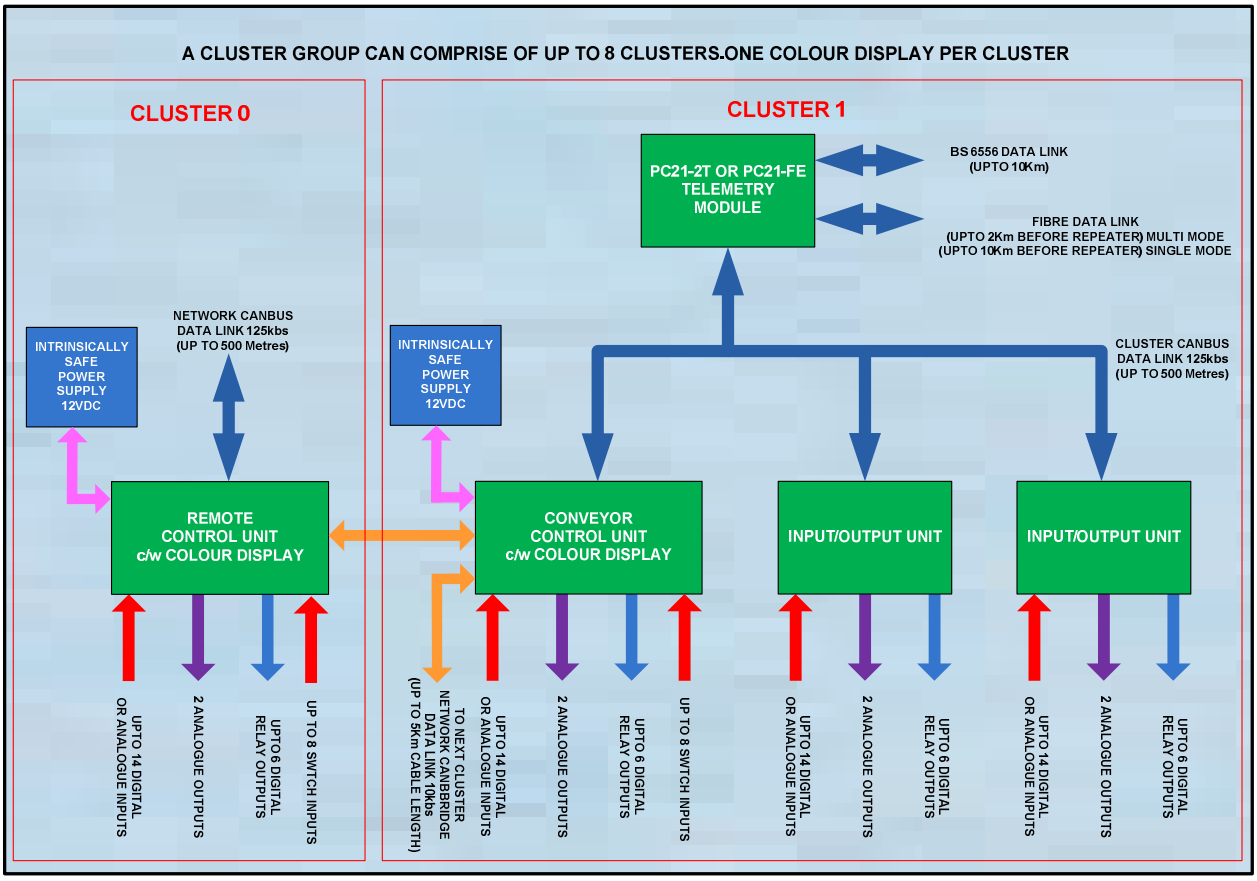
These units can be powered in the same manner as the MineWatch I/O units either from a separate 12 volt intrinsically safe power supply, or from a common supply feeding several MineWatch units, via the CAN bus.

PC21 Ethernet interface, comprises two separate modules. A PC21-FE (CAN bus to serial data converter) and a PC21-E (serial data to Ethernet I/P converter). These modules connect together to provide Ethernet I/P telemetry for PC21 systems connecting via standard copper Ethernet cable into underground switches or hubs, which form part of the fibre optic system.

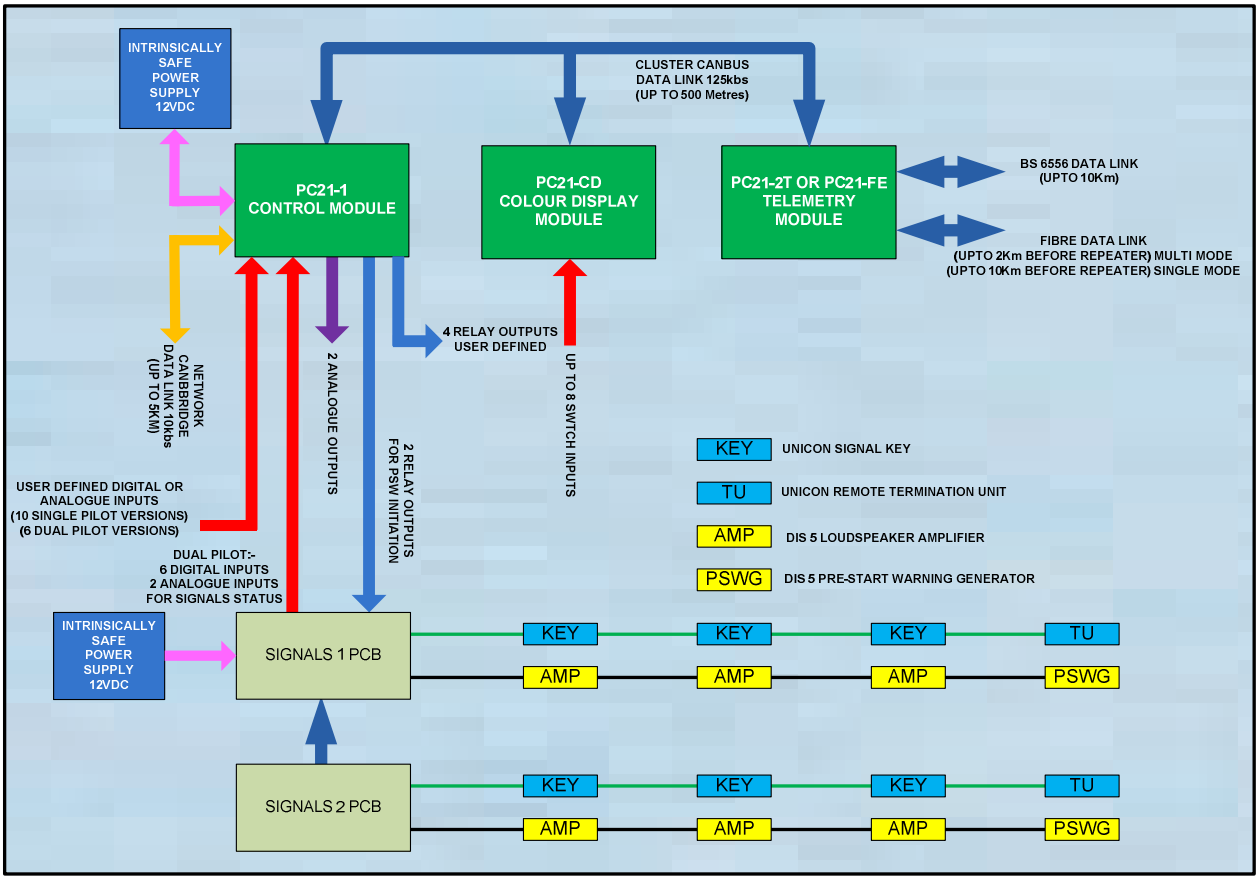
**MineWatch Ethernet Switch**

In conjunction with our Ethernet switch media convertors, in either Multi-mode or Single mode forms and along with the required single or multi mode fibre cables Davis Derby provides a robust fibre backbone.

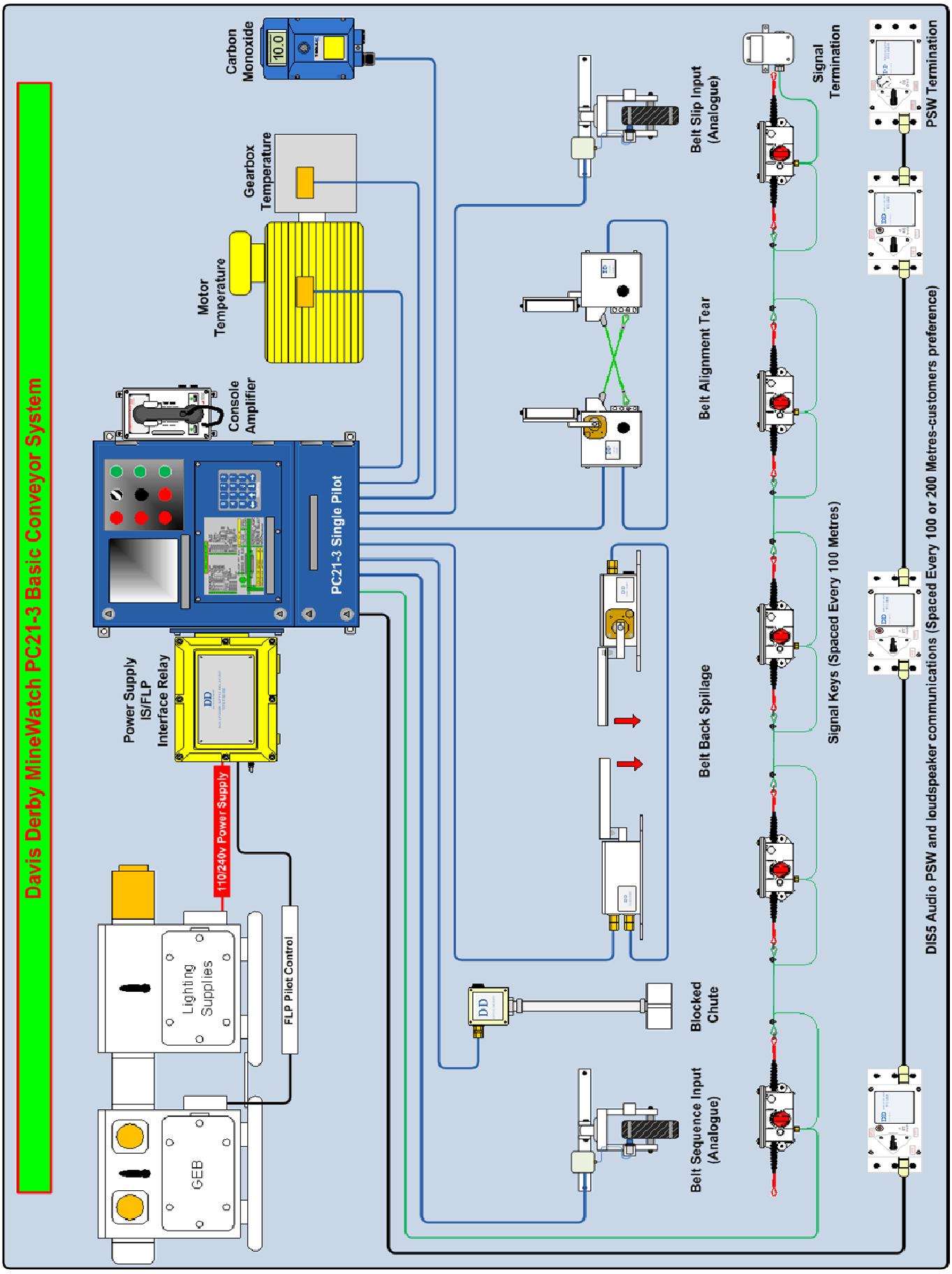
## TYPICAL MINEWATCH APPLICATION



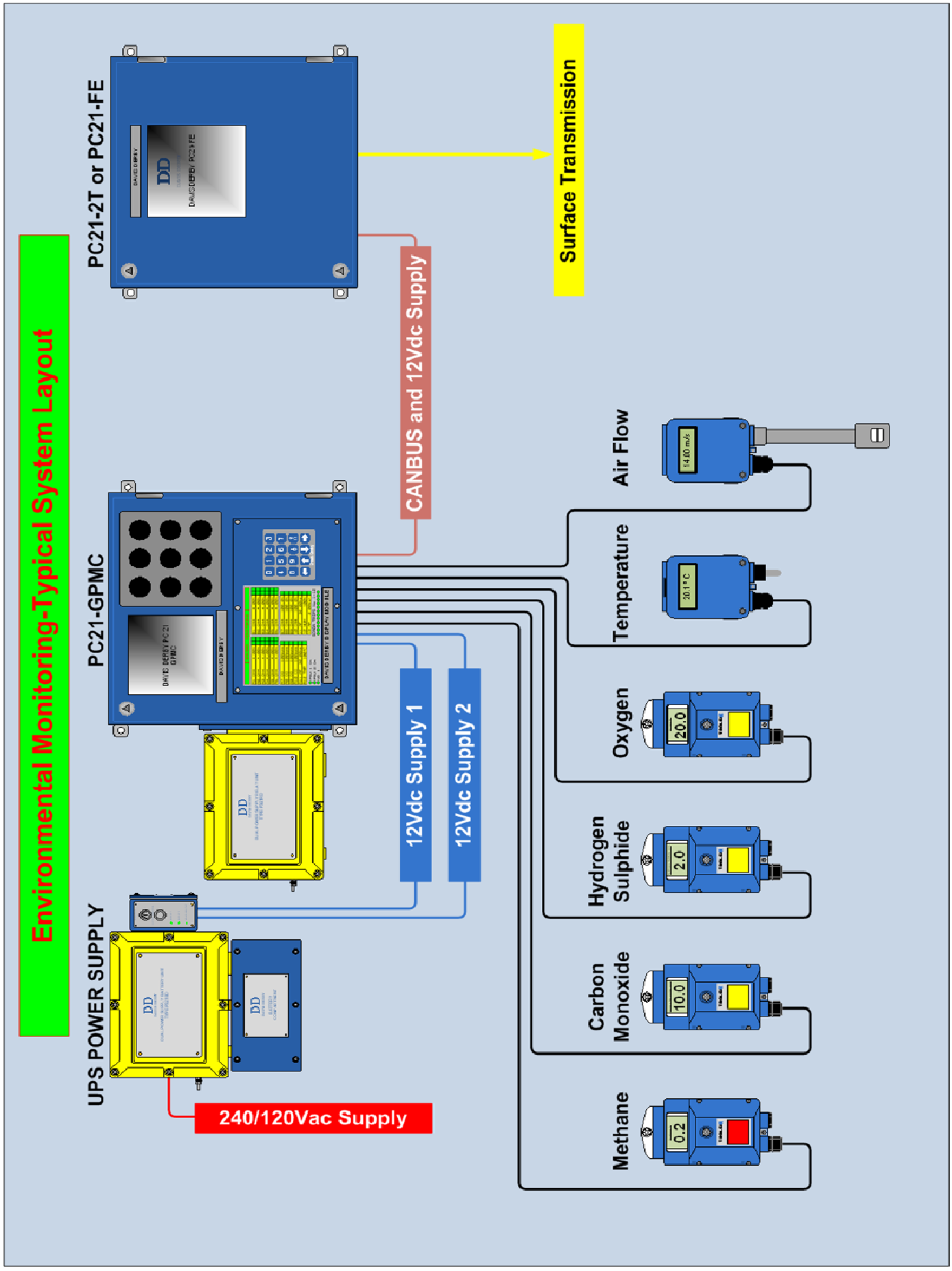

## TYPICAL MINEWATCH CONVEYOR CONTROL UNIT LAYOUT



# TYPICAL MINEWATCH CONVEYOR LAYOUT



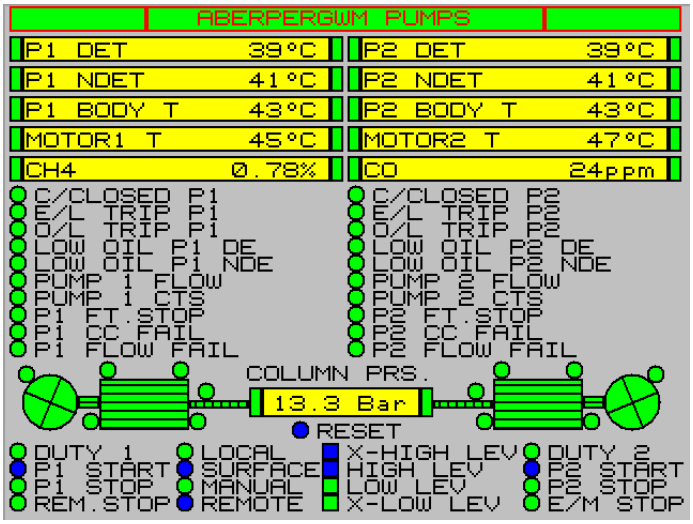
## MINEWATCH ENVIRONMENTAL LAYOUT



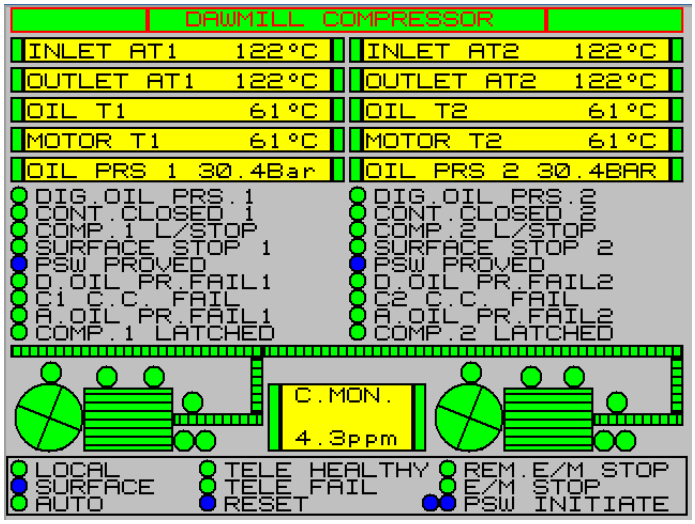
MINEWATCH

# EXAMPLES OF COLOUR DISPLAY MIMICS

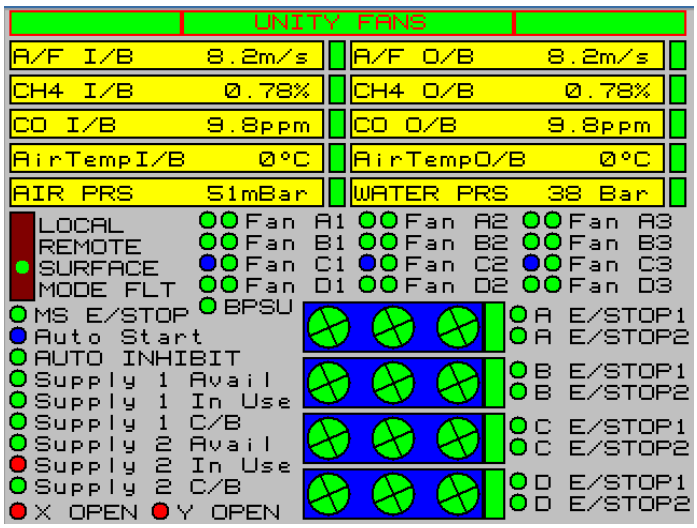
## WATER PUMP CONTROL



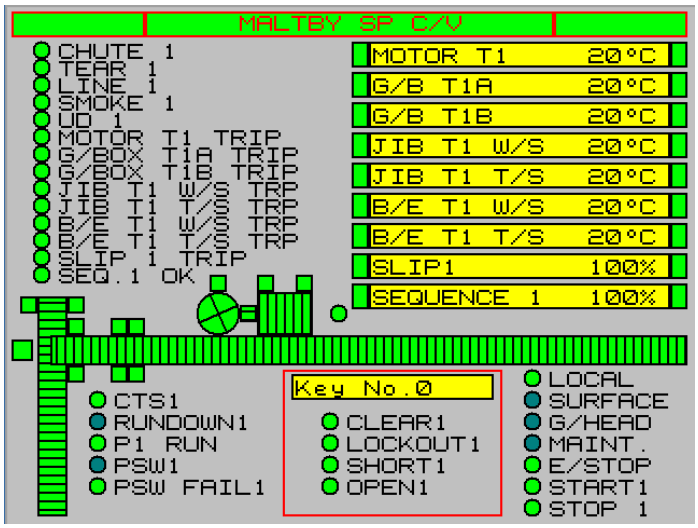

## COMPRESSOR CONTROL



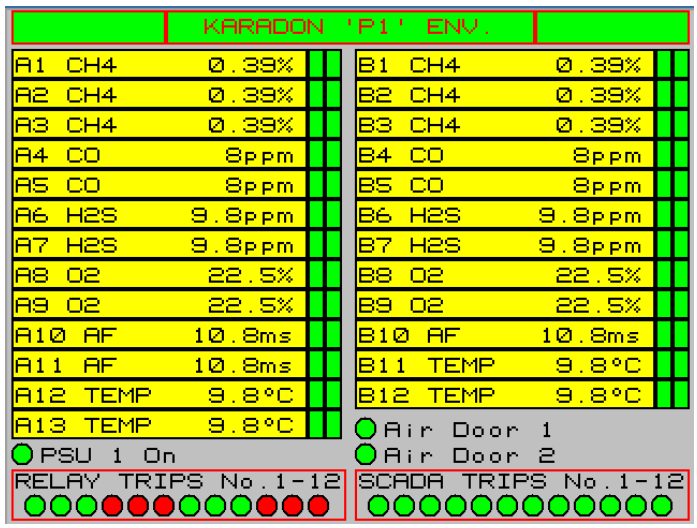

## FAN CONTROL



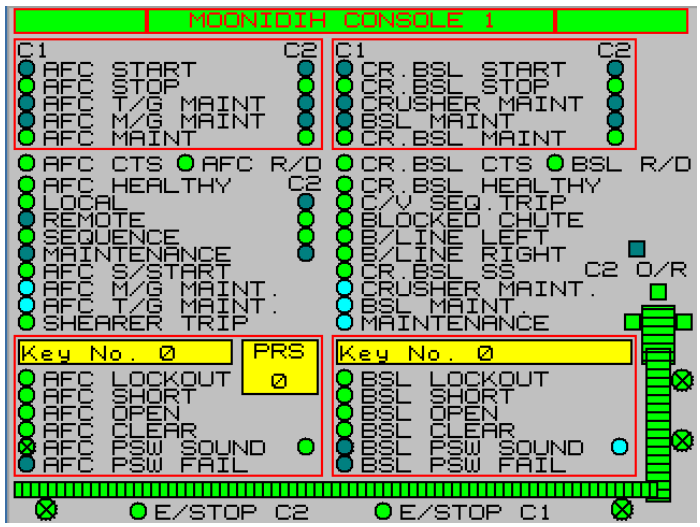

## CONVEYOR CONTROL




## ENVIRONMENTAL MONITORING




## COAL FACE CONTROL




**All mimics are bespoke and individually tailored to meet the customers requirements.**

# PS21 Range of Power Supply/Relay Units


*(PS21-BD Pictured)*

The Davis Derby MINEWATCH PS21 range high capacity Intrinsically Safe 12v dc Power Supplies and Relay Units provide simple robust solutions for the supply of Intrinsically Safe controllers and sensors.

The MINEWATCH PS21 Range of Power Supplies/Relays is available in 8 versions.

| | |
|---|---|
| **MINEWATCH PS21** | Flameproof/Intrinsically Safe (12Vdc @ 500Ma) Power Supply with 120/240Vac input (other input voltages available). |
| **MINEWATCH PS21-D** | Flameproof/ Dual Intrinsically Safe (2x12Vdc @ 500mA each) Power Supply with 120/240v ac input (other input voltages available). |
| **MINEWATCH PS21-R** | As per MINEWATCH PS21 but including 6 Intrinsically Safe to Flameproof Interposing Relays for the control of mining flameproof switchgear. |
| **MINEWATCH PS21-RD** | As per MINEWATCH PS21-D but including 6 Intrinsically Safe to Flameproof Interposing Relays for the control of mining flameproof switchgear. |
| **MINEWATCH PS21-B** | As per MINEWATCH PS21 but including an 8A/Hr battery packs to create an uninterruptible Power Supply Unit. |
| **MINEWATCH PS21-BD** | As per MineWatch PS21-D but including an 8A/Hr battery packs to create an uninterruptible Power Supply Unit. |
| **MINEWATCH PS21-BD/B** | As MINEWATCH PS21-D but including an 8A/Hr battery pack to create an Uninterruptible Power Supply Unit with the addition of analogue output monitoring capabilities of the battery unit. |
| **MINEWATCH PS21-Int/R** | This has the same Flameproof enclosure as the MINEWATCH PS21-RD but has no Power Supply chassis and contains 2, 4or 6 Intrinsically Safe to Flameproof Interface Relays. |

MINEWATCH

## Construction

The main transformer and relays (MineWatch PS21-R_ PS21-RD) are housed inside SG cast iron flame-proof enclosure with 6 FLP entries for supply and control cables. The MineWatch PS21-B; PS21-BD; PS21-BD/B also includes a sheet steel intrinsically safe battery enclosure. All variants have a sheet steel intrinsically safe terminal chamber for connecting the 12vdc to intrinsically safe controllers and/or sensors as a stand- alone unit; alternatively, the MineWatch PS21 can be directly mounted to a MineWatch PC21 intrinsically safe controller to provide a composite unit.

## Operating Principles

The PS21 and PS21-D have 12vdc outputs that are regulated to maintain the output voltage to a minimum of 11.5v up to the full load capacity of 500mA.
The MineWatch PS21-B; PS21-BD; PS21-BD/B will maintain this output at full load for an 8 hour period.
The MineWatch PS21-B and PS21-BD also contains an intrinsically safe opto- output to indicate to the intrinsically safe controller when the power supply has changed from mains to battery. The PS21-BD/B gives an Intrinsically Safe Analogue output proportional to the Battery voltage status to be used on an approved monitoring system.
In the case of the MineWatch PS21-R and PS21-RD, up to 6 FLP control relays can be operated by an approved intrinsically safe controller (such as a MineWatch PC21) and Interface to FLP control circuits.
The unit can also have up to two 12Vdc 500mA intrinsically safe outputs.

## Cable entries

The PS21 (D) and PS21-B (D) units have 2 x 25mm threaded FLP cable gland entries. The PS21-R (D) and PS21-Int/R units have 6 x 25mm threaded FLP cable gland entries.
MineWatch PS21 variants: when mounted directly to a MineWatch PC21 controller, a through adaptor plate is fitted instead of the intrinsically safe terminal chamber to accommodate the through connection of the 12vdc supply and control relays.

## Certification

The Davis Derby PS21 Range is certified Flameproof and Intrinsically Safe to the European ATEX standard for Group I atmosphere (methane in underground coalmines).

**Certificate Number: Baseefa 07ATEX0161**

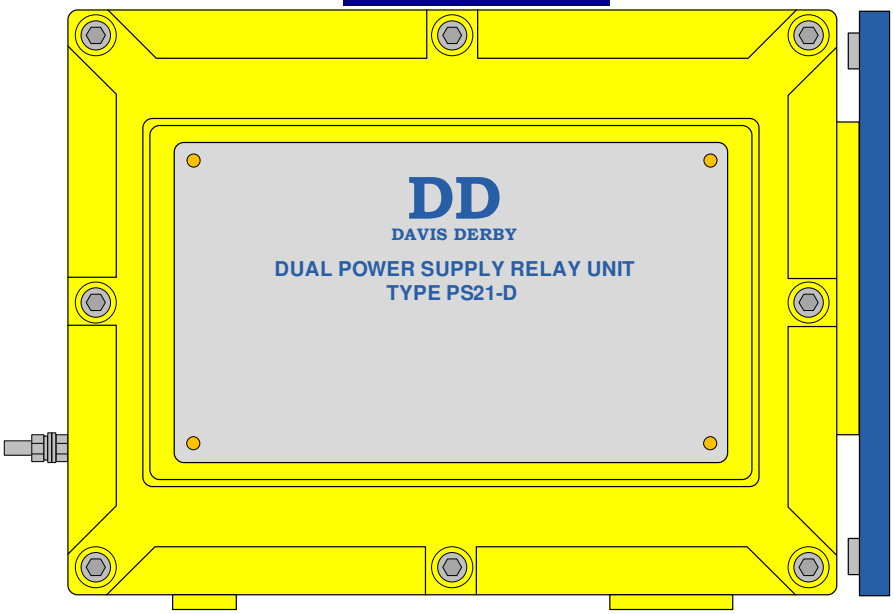
| | | |
|---|---|---|
| Ex | I M2 | Ex d [ia Ma] I Mb-PS21 Power Supply Relay Unit |
| Ex | I M2 (M1) | Ex d [ia Ma] I Mb-PS21 Power Supply fitted with Battery |

The Davis Derby PS21 Range is also certified Flameproof and Intrinsically Safe to the IEC standard for Group I atmosphere (methane in underground coalmines).

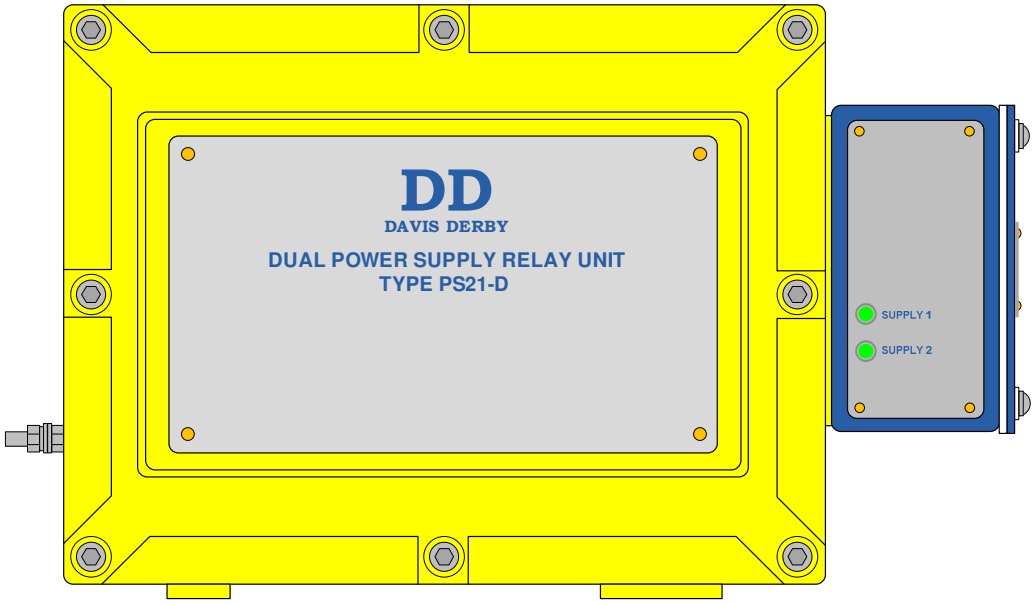
**Certificate Number: IECEx BAS 09.0051**

Ex d [ia Ma] I Mb

# PS21-(D)



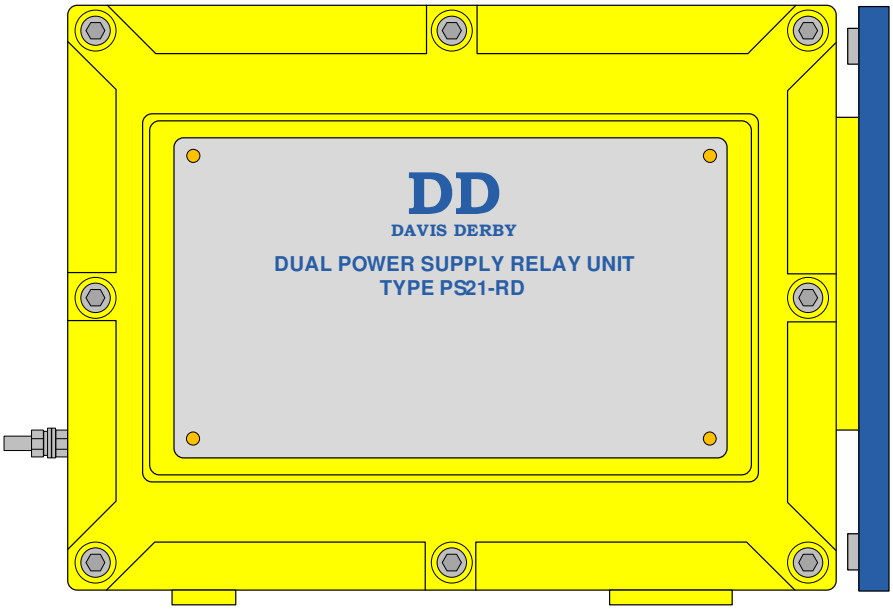

**(PS21-D Flange Mounted Version)**



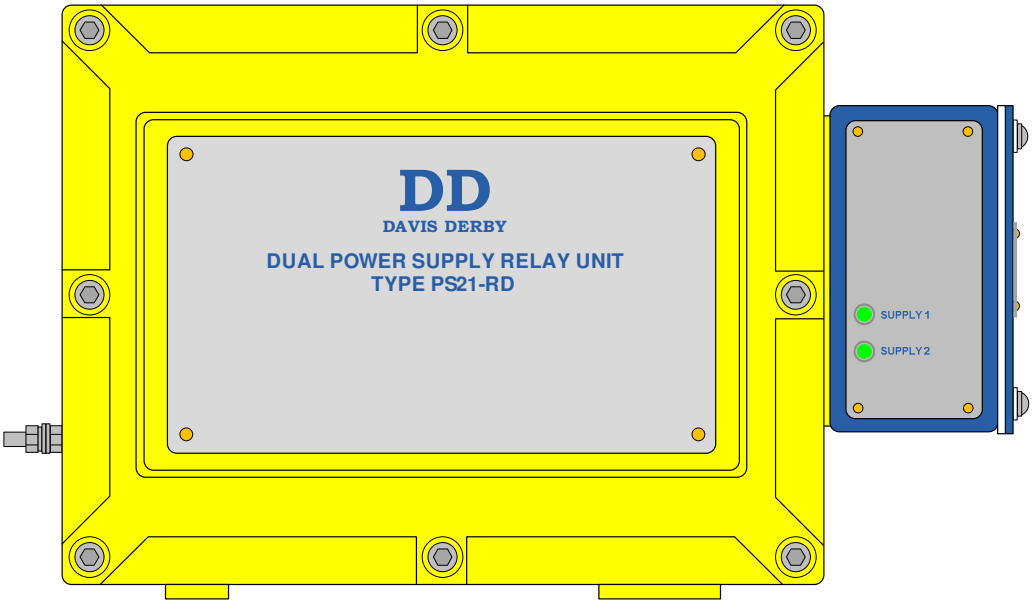

**(PS21-D Terminal Chamber Version)**

| Specification-PS21-(D) | |
|---|---|
| Mains input voltage | 120 Volts ac +10% -25% 50Hz or<br>240 Volts ac +10% -25% 50Hz |
| Intrinsically safe output voltages | 11.5 Volts dc (minimum) @ I out = 500mA,<br>= 2 x 500mA(D)<br>14.10 Volts dc (maximum) |
| Intrinsically safe output current (Mains Operation) | Up to 500mA dc, (normal operation)<br>3.52A dc (maximum under fault conditions)<br>2.42A dc (maximum under fault conditions [D]) |
| Dimensions | 400mm wide x 200mm deep x 240mm high<br>(neglecting gland cable projections) |
| Weight | 40kg |
| Operating Temperature Range | -20ºC To + 40ºC |

# PS21-R(D)



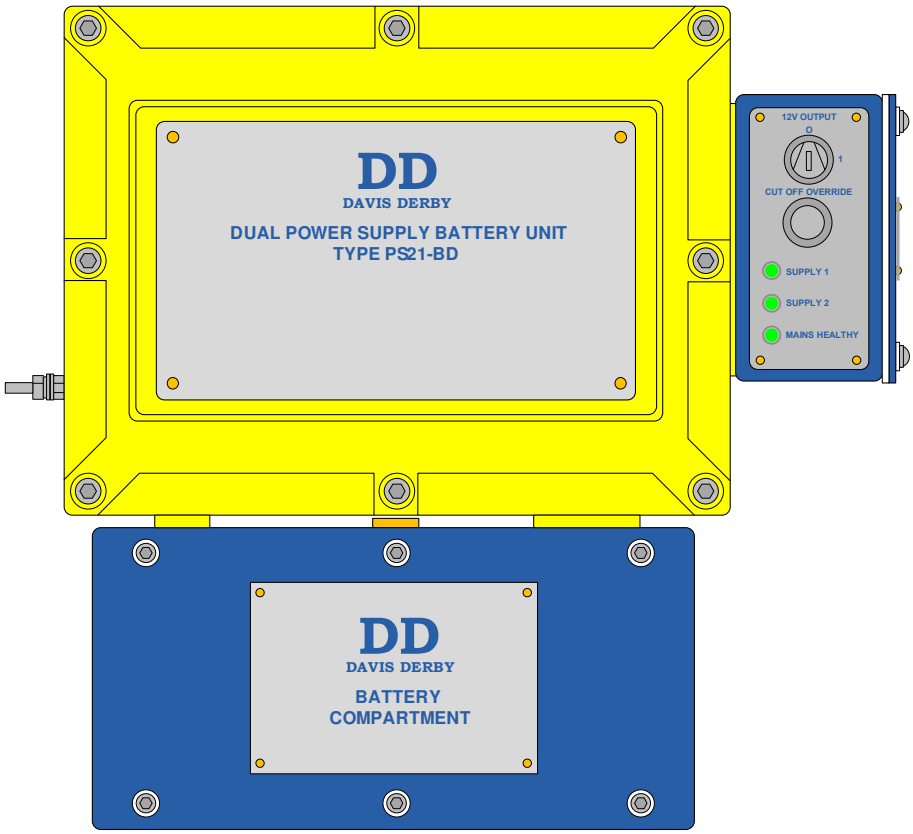

**(PS21-RD Flange Mounted Version)**




**(PS21-RD Terminal Chamber Version)**

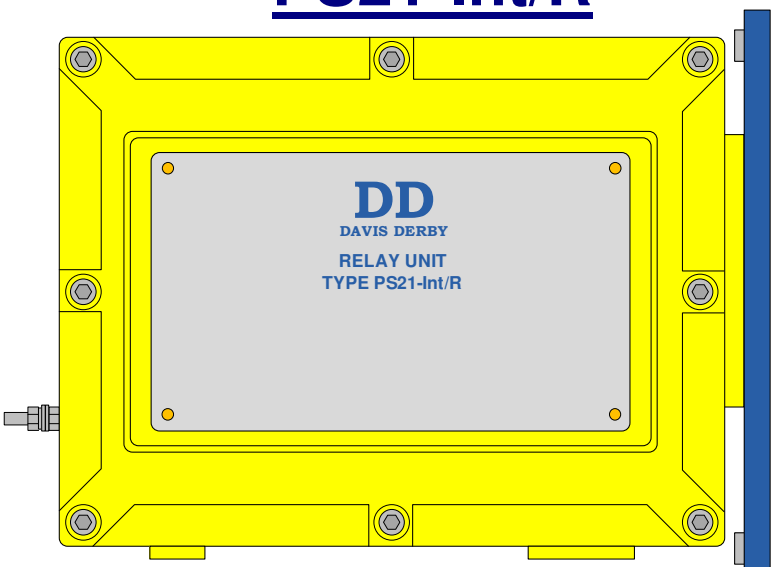
| Specification-PS21-R(D) | |
|---|---|
| Mains input voltage | 120 Volts ac +10% -25% 50Hz or<br>240 Volts ac +10% -25% 50Hz |
| Intrinsically safe output voltages | 11.5 Volts dc (minimum) @ I out = 500mA(R),<br>= 2 x 500mA(RD)<br>14.10 Volts dc (maximum) |
| Intrinsically safe output current (Mains Operation) | Up to 500mA dc, (normal operation)<br>3.52A dc (maximum under fault conditions)<br>2.42A dc (maximum under fault conditions [D]) |
| FLP/IS Relays | Six relays are provided with IS coils and FLP contacts which are link configurable |
| Dimensions | 400mm wide x 200mm deep x 240mm high (neglecting gland cable projections) |
| Weight | 40kg |
| Operating Temperature Range | -20ºC To + 40ºC |

# PS21-B(D)

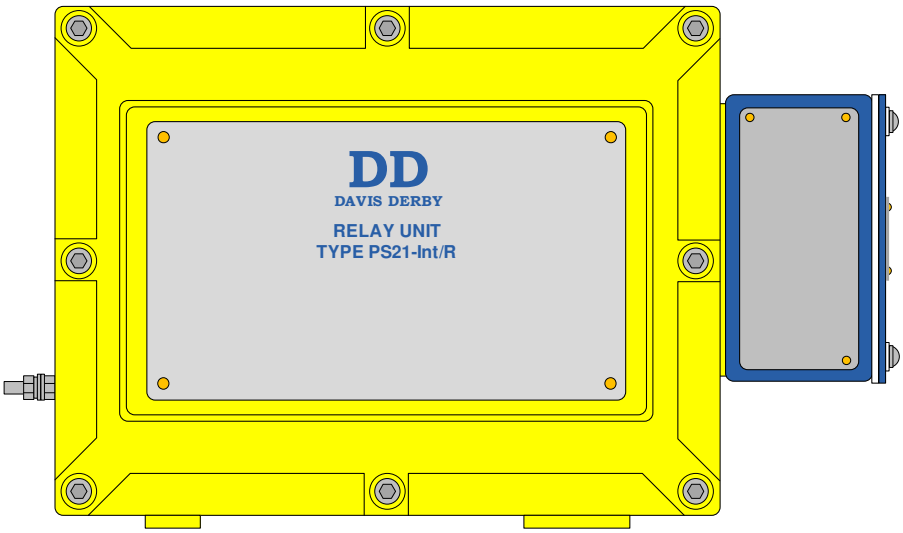



| Specification-PS21-B(D) | |
|---|---|
| Mains input voltage | 120 Volts ac +10% -25% 50Hz or<br>240 Volts ac +10% -25% 50Hz |
| Intrinsically safe output voltage (Mains Operation) | 11.5 Volts dc (minimum) @ I out = 500Ma(B),<br>= 2 x 500mA(BD)<br>14.10 Volts dc (maximum) |
| Intrinsically safe output voltage (Battery Operation) | 10.7 Volts dc (minimum) @ I out = 1A<br>14.10Volts dc (maximum) |
| Intrinsically safe output current (Mains Operation) | Up to 500mA dc (normal operation)<br>3.42A dc (maximum under fault conditions )<br>2.42A dc (maximum under fault conditions [D]) |
| Intrinsically safe output current (Battery Operation) | Up to 500mA dc (normal operation)<br>3.52A dc (maximum under fault conditions)<br>2.42A dc (maximum under fault conditions [BD]) |
| Battery capacity | 8 Ampere hour (Sealed Lead Acid batteries)<br>Typically 12 hours of operation@ I out=500mA of one or both outputs. |
| Battery Charging Current | Typically 100mA (This can vary from 400mA to 0mA depending on the battery state). |
| Battery Charging Time<br>Flat Batteries to Full Charge | Typically 50 hours |
| Dimensions | 400 mm wide x 210 mm deep x 385 mm high (neglecting gland cable projections) |
| Weight | 49kg |
| Operating Temperature Range | -20ºC To + 40ºC |

# PS21-Int/R



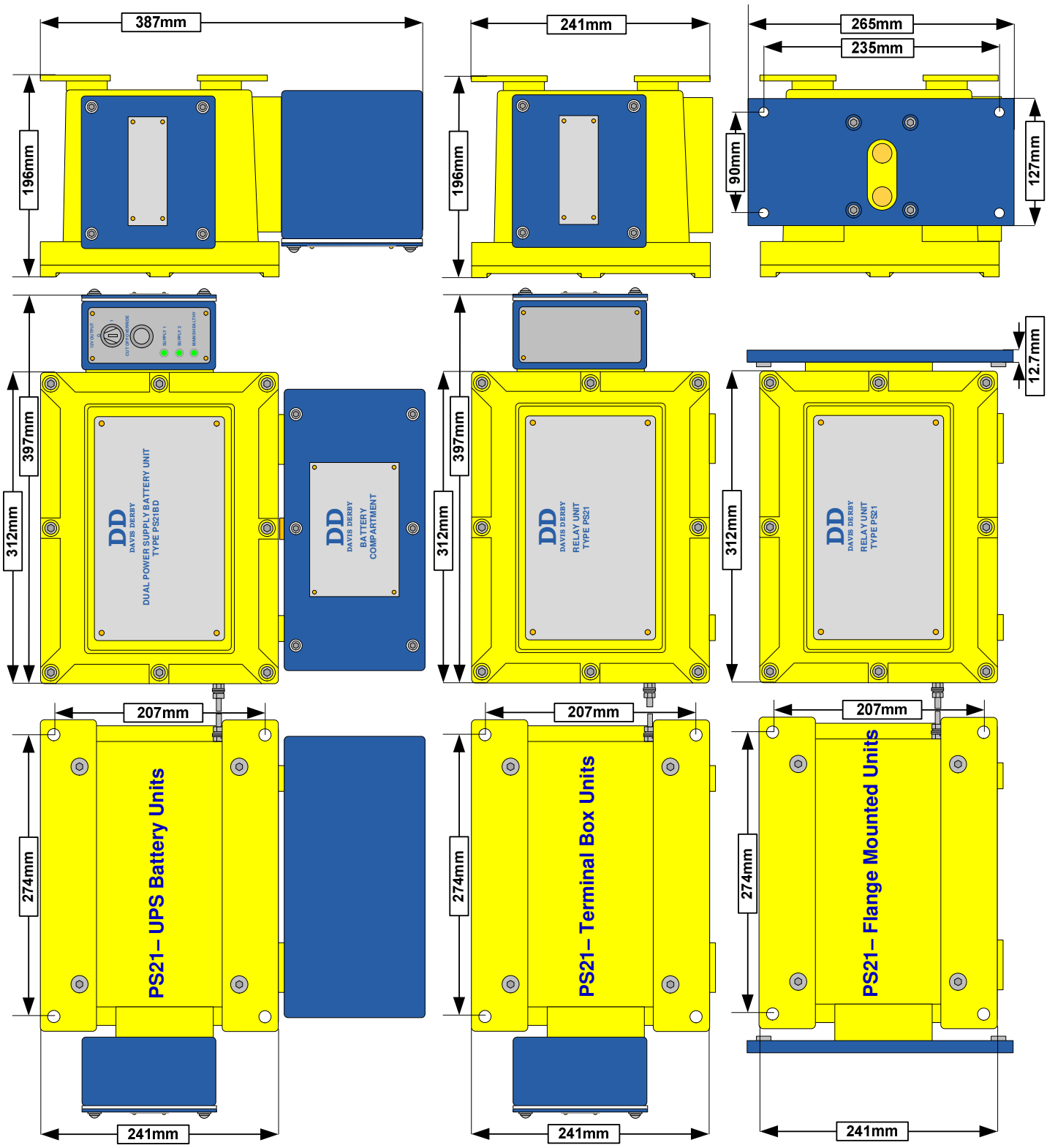

**(PS21-Int/R Flange Mounted Version)**




**(PS21-Int/R Terminal Chamber Version)**

| Specification-PS21-Int/R | |
|---|---|
| Mains Input Voltage | Not Applicable |
| Relay Coil Supply Input Voltage | Powered from an appropriately certified Intrinsically Safe 12 Volts dc Supply (15 Volts dc maximum). |
| Relay Coil Operation | The Relay coils are designed to be operated remotely from volt-free contacts within other Approved Intrinsically Safe Equipment. |
| Interface Relay Coils Available | 2 ; 4 or 6 Coil Versions |
| Contact Configuration | One set of Flameproof (Non-I.S.) change over contacts are available for each relay. |
| Relay Contacts Maximum Voltage/Current | 250 Volts r.m.s or 5 Amps r.m.s or 100VA |
| Dimensions<br>MineWatch PS21-Int/R | Approximately :400 mm wide x 210 mm deep x 240 mm high (neglecting gland cable projections) |
| Weight | 32kg |
| Operating Temperature Range | -20ºC To + 40ºC |

# PS21 Range of Power Supply/Relay Units (Dimensions)



# Unicon Signalling System

The signalling system is powered via a suitable Intrinsically safe nominal 12Vdc power supply. It consists of a Signals 1 PCB control board for one conveyance; a Signals 1 and a Signals 2 PCB for two conveyances (Integrated into a PLC), monitored pull keys, DIS 5 system communications and Pre-Start Warning (A description can be found in the DIS 5 Brochure).

**Roadway Signalling Key Type 26831**

**Signals 1 PCB**

**Face Signalling Key Type 26825**

**Signals Remote Termination Unit Type 26827**

**Signals 2 PCB**

**Face Signalling/Audio Key Type 26824**

The signalling system checks for four operational states:-Open circuit, Healthy, Lockout, and Short circuit conditions. Monitoring of two digital outputs from the signals board will determine the signals status to the respective PLC. The status of the signals 1 and signals 2 boards can also be deduced utilising the diagnostic LED indications on the Signals PCB's.

Key number monitoring is provided for both Open circuit and Lockout conditions providing an analogue value in steps of 25mVdc/key in the range 0.4125Vdc to 1.9875Vdc to the PLC for actual key number display.

The signalling system caters for up to 63 keys per signals board.

A single signalling system comprises of a PCB mounted in a Davis Derby PC21-3 unit (or a relevant Intrinsically safe ATEX Certified PLC controller), an encapsulated electronic module in each key unit and an encapsulated remote oscillator in the remote termination unit.

The operating principle of the signalling system is based on current monitoring with different DC currents for Open, Lockout and Short circuits, and an AC current for Healthy. Pulse currents are used for key monitoring in both Open and Lockout conditions added to the respective DC current.

An Healthy (or Clear) system is deduced by the detection of a 75Hz sinusoidal current which is generated by the remote oscillator. This sinusoidal current is checked for amplitude and frequency by two parallel circuits on the signals PCB, which must both prove a healthy condition to enable signals Healthy (clear) to be deduced and close the signals hardwire output relay.

Healthy is the only condition deduced from an oscillating current (generated by the remote oscillator fitted to the end of the system), all other conditions are deduced from different DC currents (generated by the encapsulated electronic module fitted to each key or from signal cable faults) which are monitored by the signals PCB.

Key monitoring is provided for both Open circuit and Lockout conditions. Once these conditions are detected by the signals PCB a 10ms duration pulse is generated from the signals PCB to the first key unit on the pulse line. When this pulse is received by the key unit it is delayed for 10ms and then an answer current pulse is returned to the signals PCB on the Lockout line and a Pulse is generated to the next key unit on the Pulse line. When an Open circuit or an operated device is encountered no Pulse will be returned to the signals PCB from this point to the end of the system.

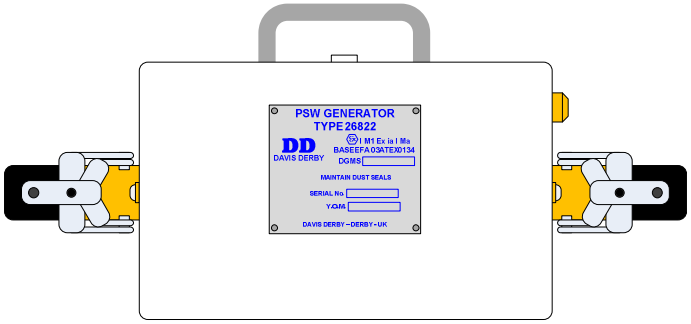
The Pulse line is therefore connected between keys and all other lines are continuous to the end of the system.

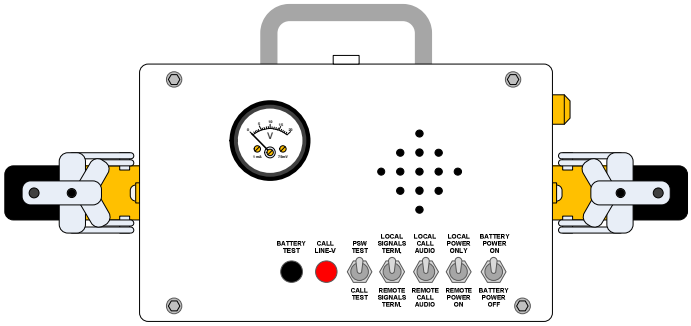
The signals PCB counts the returned current pulses on the Lockout line (Open circuit and Lockout conditions) and looks for a missing pulse. When the missing pulse is found the count of pulses is converted to an analogue signal for display by the processor, then the sequence is repeated after a delay by a new pulse sent from the signals PCB to the first key unit on the Pulse line.

This method of key monitoring will count to the first key which is Open circuit or Locked out. If another key unit closer to the signals PCB is operated its number will be counted and displayed on the next key monitoring cycle. If another key unit beyond the current unit is operated its number will be counted and displayed when the current unit is reset. Key monitoring therefore gives the number of the nearest key unit to the signals PCB for Open circuit or Lockout conditions.

**The Signal System is certified Intrinsically Safe to European ATEX M1 and IECEx Standards.**

# Unicon Test Box-Type: 26222/S




## General Description

The portable test box is designed to aid customers in fault diagnosis on Davis Derby Unicon Signals and Communications Systems. The unit is basically a portable Pre-Start Warning Generator complete with a 75Hz Signals Termination Unit but with extra test functionality. It can be used for testing and fault finding on any system utilising Unicon Signals and Communications including Roadway Conveyors, Face Conveyors, Haulage Systems etc. It can easily be plugged into any Davis Derby combined Signals and Communication 6 pin hose cable system or by utilising adaptor cables (separately supplied) into the 4 core connection for the Signals system only or 4 core connection to the Communications/Pre-Start Warning system only.

The internal battery can be charged from an approved Intrinsically Safe 12Vdc source. For charging from non-approved sources please refer to the Davis Derby DIS 5 operation manual.

The unit has the following test facilities:

1. Pre-Starting Warning Proving / Initiation.
2. Call Line Test.
3. Local 75 Hz Signals Termination Insertion.
4. Remote 75 Hz Signals Termination Insertion.
5. Call Line / Audio Line Local Termination.
6. Call Line / Audio Remote Termination.
7. 0V Line / -VS Line Local Termination.
8. 0V Line / -VS Line Remote Termination.
9. Call Line Voltage.
10. Battery Test Voltage.
11. System Supply Voltage.
12. Test Unit Battery Power On / Off.

**Unicon Test Box (Closed)**

**Unicon Test Box (Open)**

## Standard Supply for Hose Cable Systems:

Unicon Signals and Communications Test Box.
1 x Catch Restrained blank Connector .
1 x Catch Restrained Adaptor Cable for Battery Charging.

**Charging Cable/Blank**

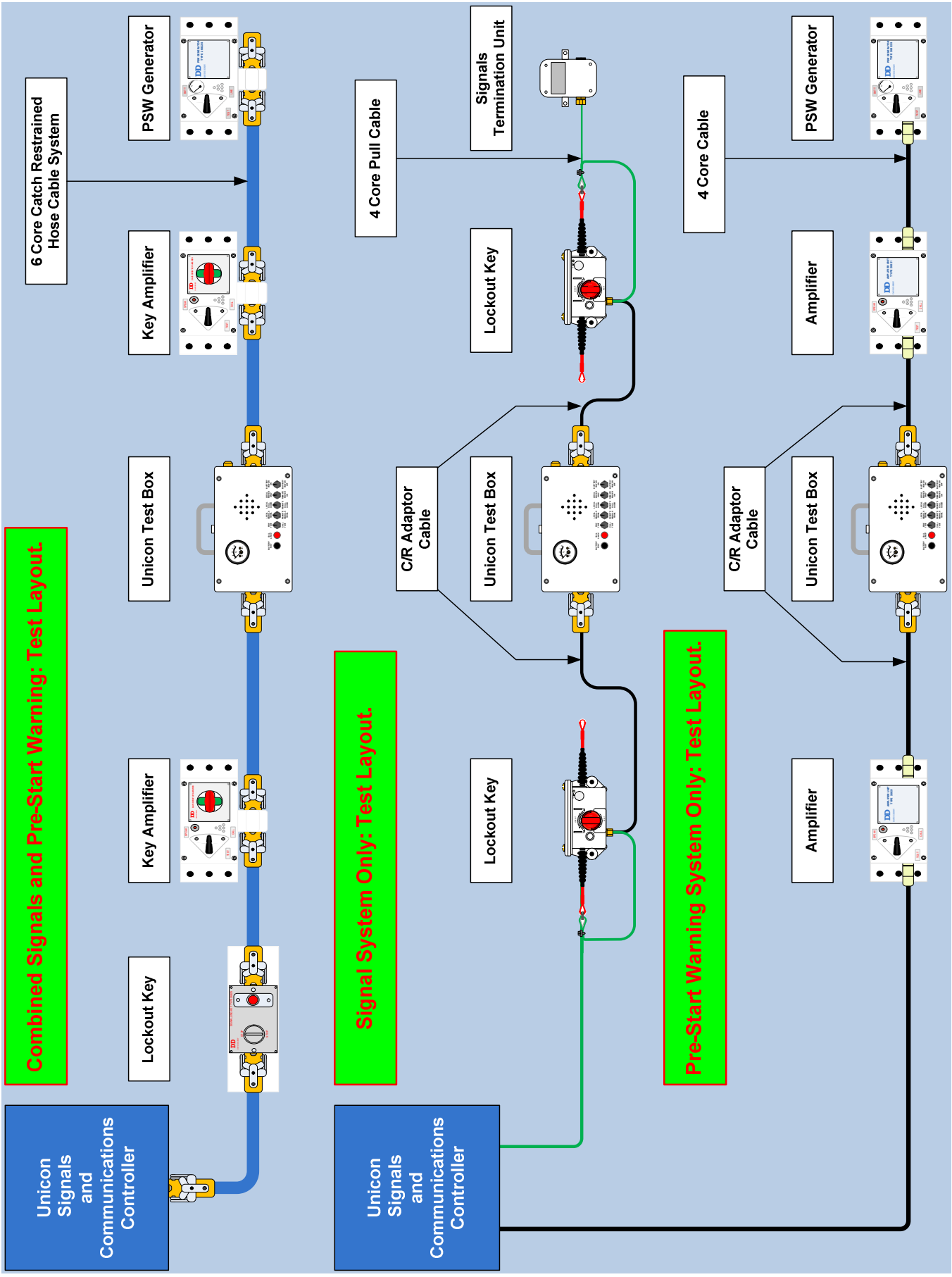
**Adaptor Cables**

## Additional Supply for Standard Cable Systems.

2 x Catch Restrained Adaptor Cables for none Hose Type Systems.

**Certification:** Ex I M1 Ex ia I Ma **BASEEFA 03ATEX0134**

# Unicon Test Box Connection Details




**Warning Note:**

**The Unit is not designed to be used in an operational system. It is for test and fault diagnostic purposes only.**

# DIS 5 Intrinsically Safe Communication System

- ATEX M1 certified
- Superb speech clarity
- High output >95db
- Amplifier enclosure acoustically designed to maximise output
- Battery backed in the event of power failure
- Plug-in trickle charged replaceable battery
- Battery state indicator
- Re-entrant horn Loudspeaker
- Vibration tested at 5g
- Optional integrated lockout facility for coal face applications
- Plug and Socket or cable gland arrangement available

The ATEX M1 Certified DIS 5 system provides speech communications and pre-start warning facilities over long distances via a 4 core cable allowing several amplifiers to be connected to a single 12vdc intrinsically safe power supply.
Each amplifier is equipped with a trickle charged NiMH (Nickel Metal Hydride) re-chargeable battery giving long standby operation in the event of loss of mains power. The system can also be used as part of an integrated control system.

## System Components

The DIS 5 communication system comprises of a console amplifier, several remote amplifiers, a pre-start warning generator, safety couplers and a 12 volt intrinsically safe power supply unit.
Versions of the console amplifier, remote amplifier and pre-start warning generator are available fitted with either plugs and sockets or cable glands for the incoming and outgoing cables.

MINEWATCH

## Console Amplifier Type 26823

The intrinsically safe console amplifier is housed in a rugged sheet metal enclosure. The unit comprises a plug in chassis, a durable telephone handset, a loudspeaker with a mylar cone and an audio safety coupling transformer which allows the system to be connected to other audio systems or the surface audio switchboard. The amplifier circuitry and the NiMH (Nickel metal hydride) re-chargeable battery are each separately encapsulated and are plug in for ease of maintenance. The trickle charged battery provides stand-by power in the event of a mains power failure.

The front panel of the amplifier unit is equipped with a light emitting diode to indicate the state of the internal battery and three push button switches as follows:

LOCAL Allowing communication to the remote amplifier units.

SURFACE Allowing private speech to the audio system connected to the audio coupling transformer, usually this is the surface control room audio switchboard.

CALL Allowing a 5kHz call tone to be generated to alert the operator in the surface control room, in addition to activating the internal battery test function.

**Certificate No. BASEEFA 03ATEX0135**

**Ex I M1 Ex ia I Ma**


**Console Amplifier Type 26823**


**Amplifier Type 26821**

## Amplifier Unit Type 26821

The amplifier unit comprises a die cast front panel housed in a rugged sheet metal enclosure designed to enhance the audio performance of the single or dual re-entrant horn loudspeakers. The amplifier unit has an output of 95db and has been vibration tested at 5g. The unit is also equipped with a microphone, a light emitting diode battery state indicator and a three position lever switch which allows speech or the call function to be selected.

**Certificate No. BASEEFA 03ATEX0132**

**Ex I M1 Ex ia I Ma**

## Pre-start Warning Generator Type 26822/S

The construction of the Pre-start Warning generator is similar to the remote amplifier unit type 26821. It uses the same encapsulated amplifier and battery used in the console amplifier and remote amplifier. In addition the unit has a tone generator to produce the pre-start warning tone and a three position test switch on the front panel.
The pre-start warning generator has two loudspeakers to broadcast the pre-start warning tone enabling the unit to be used as a stand alone pre-start warning unit for fixed items of plant, the loudspeakers do not broadcast speech.
**Certificate No. BASEEFA 03ATEX0134**
**Ⓔx I M1 Ex ia I Ma**


**Pre-Start Warning Generator Type 26822/S**

## Surface Barrier Assembly Type 25235

The surface barrier unit type 25235 is an encapsulated module equipped with a coupling transformer, and safety devices. It enables the extension audio connection from a DIS 5 console amplifier to be connected to un-certified apparatus on the surface of the mine.
The encapsulated barrier assembly can be housed on a chassis, a multiple barrier chassis or in a sheet metal enclosure.
The cable used to connect the extension audio connection to the control room should be two core twisted pair telephone cable.
**Certificate No. BASEEFA 03ATEX0136**
**Ⓔx I M1 Ex ia I Ma**

## Certification

The DIS 5 system and components are certified intrinsically safe to the European ATEX standard for Group 1 atmospheres (methane in coal mines).
The cable used to connect the DIS 5 system amplifiers should be a 4 core cable with a maximum L/R ratio of 44µH/Ω.

## Safety Coupler Unit Type 27020

The intrinsically safe coupler unit is designed for use on very long systems where a second DIS 5 system is to be connected with a separate power ,providing galvanic isolation of the two power supplies.
**Certificate No. BASEEFA 03ATEX0132**
**Ⓔx I M1 Ex ia I Ma**

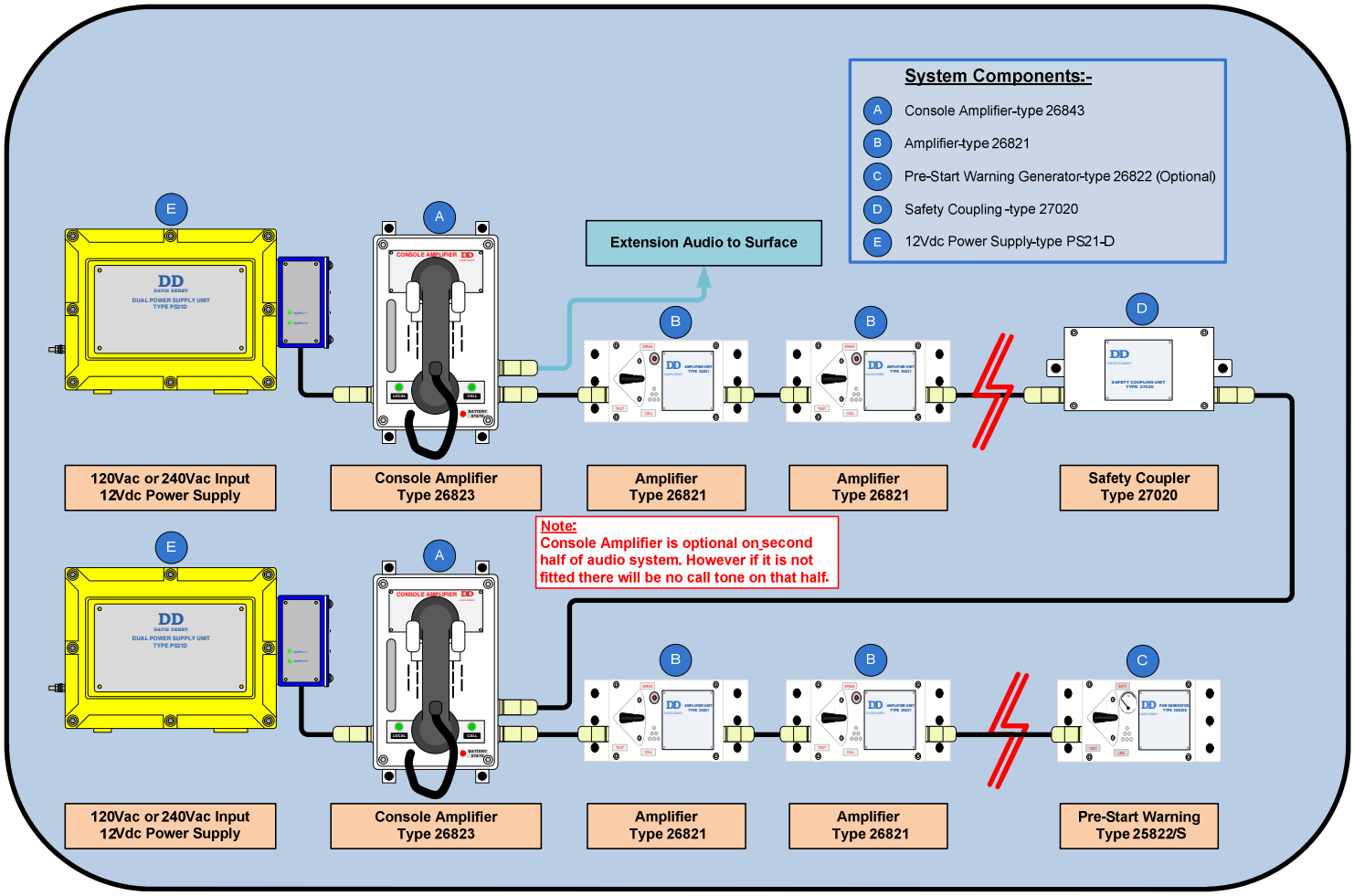
**Safety Coupler Type 27020**

## Control Systems

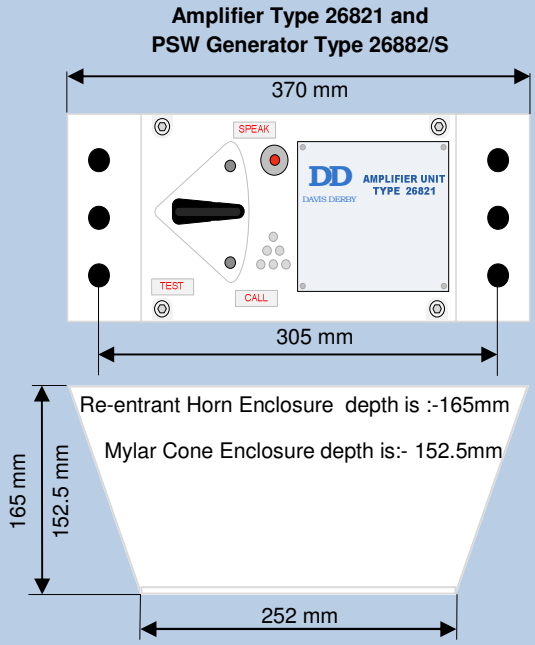
The DIS 5 system can be incorporated into composite control systems, with an option of a combined key amplifier unit for coal face applications. Quick release catch restrained plug and sockets can be fitted for rapid installation/ salvage (as seen below).
**Certificate No. BASEEFA 03ATEX0576**
**Ⓔx I M1 Ex ia I Ma**

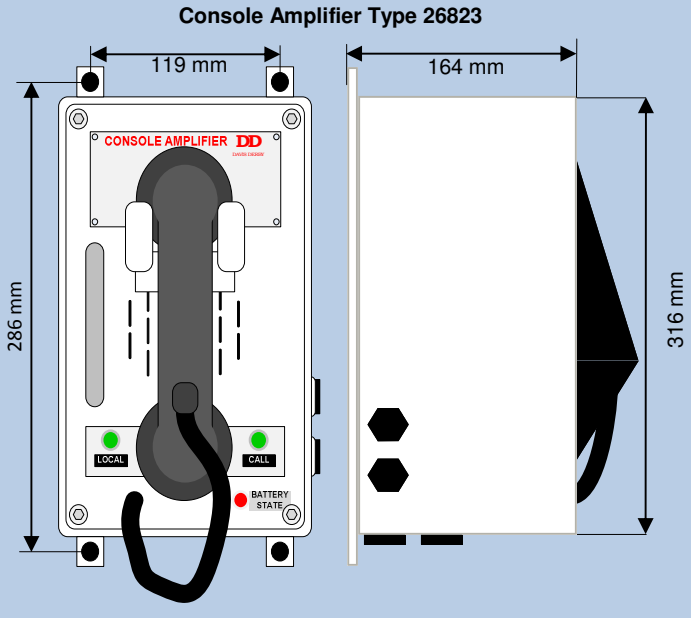

**Combined Key- Amplifier Type 26824**

# Typical Installation Diagram




# Dimensions




Note:-All fixing holes are 14 mm diameter.

DAVIS DERBY

# Catch Restrained Waterproof Plug and Socket Type: 24850.

Face Signalling/Audio Key Type 26824

Face Signalling Key Type 26825

**General Description-**The plug and socket is intended for use in transmission of Intrinsically Safe Signals and Communications along a coal face. Four way and six way version are available.

The bodies of the plug and socket are brass. The plug has a mounting flange with two 6 mm clearance holes to enable it to be secured to the relevant equipment. The socket is secured to flexible conduit by means of an annular cable clamp; for SWA cable, an adaptor and 20mm cable gland are employed.

## Assembly

No tools are required to fit the socket fully into the plug: a stainless steel hand operated lever assembly permanently mounted on the plug is used both to complete the engagement of the socket and to clamp it into position. The lever assembly has an over centre action to provide the latching effect. There is provision for the lever assembly to be locked in position by a 6mm screw.

The actions of fitting the socket to the plug are in sequence:

**Location-**insertion of the brass body of the socket into the brass body of the plug.

**Polarisation**-rotation of the socket until the correct angular relationship with the plug is achieved.

**Contact makes-**a progressive action with wiping of the contact areas.

**Clamping into position**-movement of the clamp assembly to carry out the final engagement and latching.

The design of the plug and socket ensures that all four operations are carried out rapidly and successfully.

## Sealing

The assembly of plug and socket is sealed (to a rating of IP67) against ingress of water: from the outside environment; from the flexible conduit or cable gland; and from the equipment on which the plug is mounted.

Sealing between the plug and socket is achieved via a nitrile rubber washer which has a special quadrilateral cross-section. This component also provides the resilience for the over centre clamp.

When flexible conduit is used, the cores pass through a truncated rubber cone which is located by a cable separator and seal (the seal prevents ingress of water from the outside environment). As the rear adaptor is tightened, the rubber cone is compressed axially and radially to grip the cores and clamp the cable. It also provides a seal against any water in the conduit.

With SWA cables, the cable gland provides the required seal.

Sealing between the plug and the equipment is achieved by passing the cable cores through the nitrile rubber diaphragm which has an integral ‘O’-ring

A polypropylene protective cap is available to blank the plug and socket when it is not in use/storage and transit.

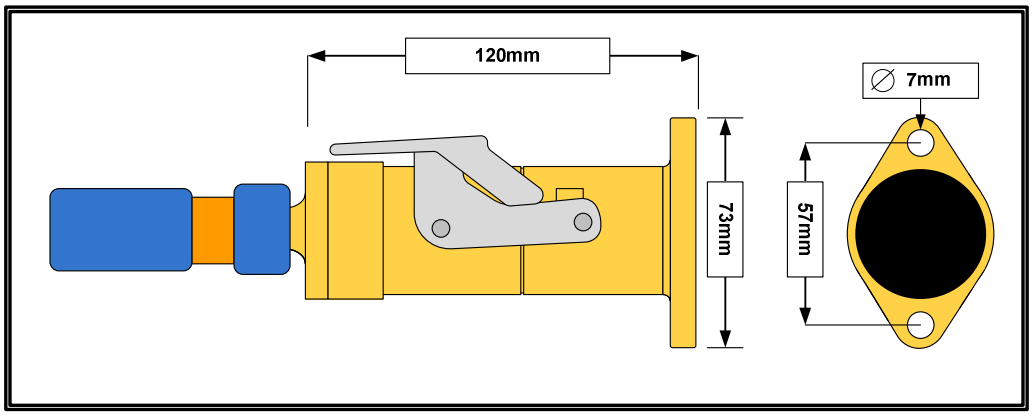
### Contacts

To ensure high reliability heavy duty silver plated brass contacts are employed. The design gives four points of high pressure contact per connection.

The contacts are hermaphroditic to allow identical components to be used in the plug and socket. The type chosen has a particularly effective wiping action during engagement. As the insertion of the socket proceeds, the wiping action cleans the contact areas.

When the clamp is moved beyond TDC position to the point at which it latches, the contacts separate slightly, thus moving back onto the areas previously wiped.


Key Amplifier Device fitted with Catch Restrained Connectors




| Ordering Details | Part No. |
|---|---|
| Plug, six way | 62 313 501 |
| Plug, four way | 62 313 503 |
| Socket, six way with flexible conduit adaptor | 62 323 501 |
| Socket, six way with 20mm flexible conduit adaptor | 62 323 502 |
| Socket, four way with flexible conduit adaptor | 62 323 503 |
| Socket ,four way with 20mm flexible conduit adaptor | 62 323 504 |

### Sealing

IP67- Outside Environment.

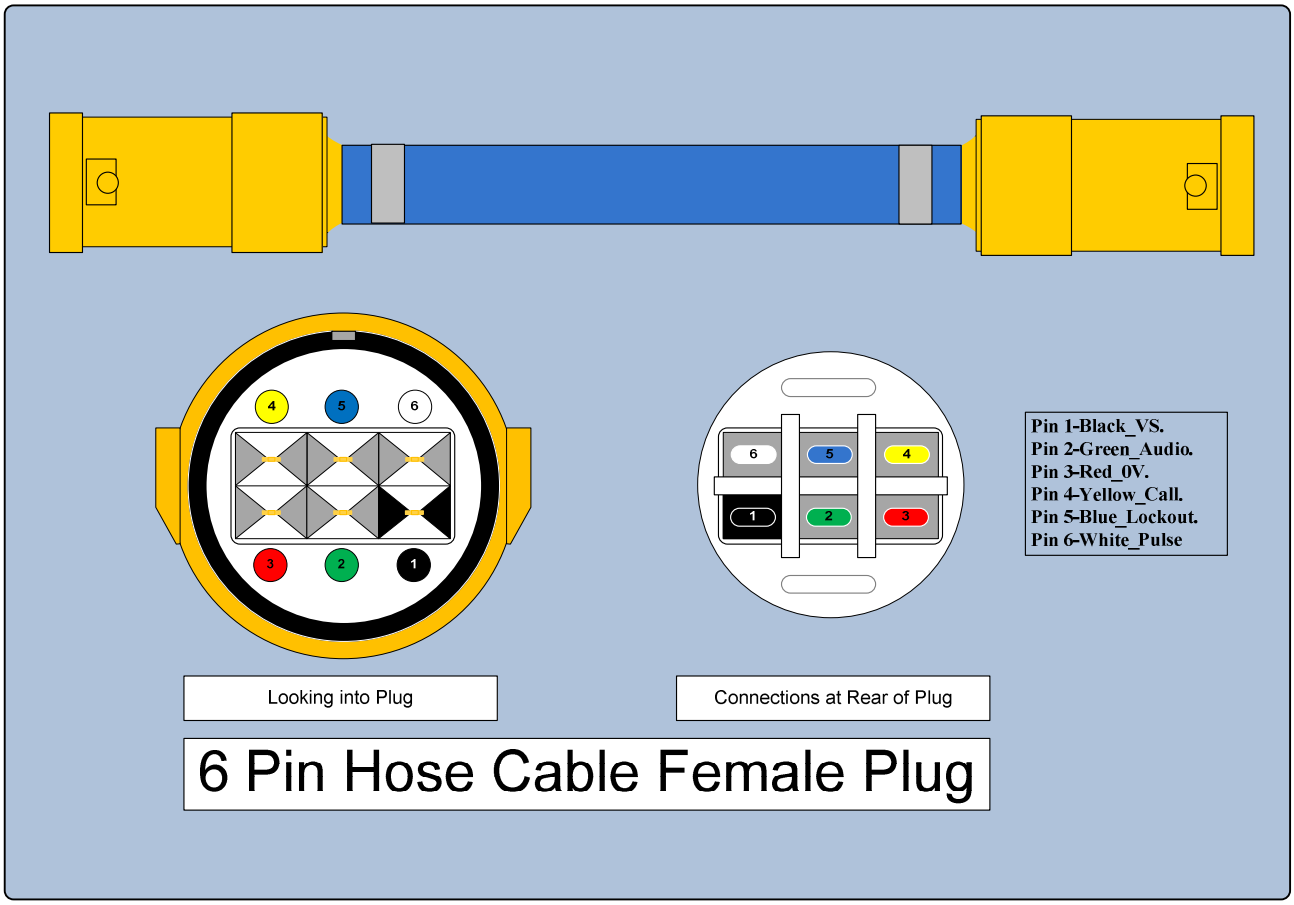
IP67- Flexible Conduit or Cable Gland.

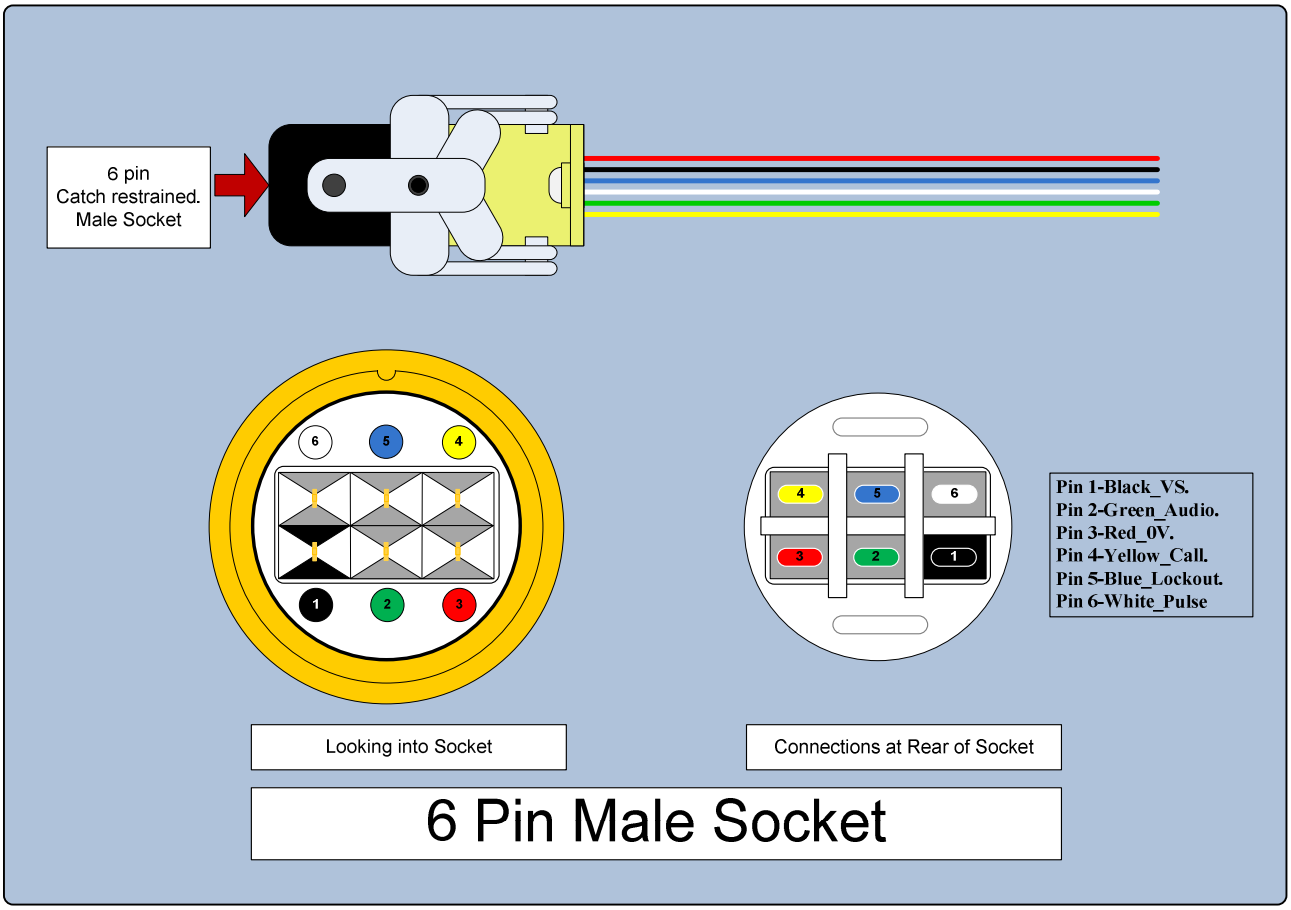
IP67- Equipment on which the Plug is mounted.

### Product Design

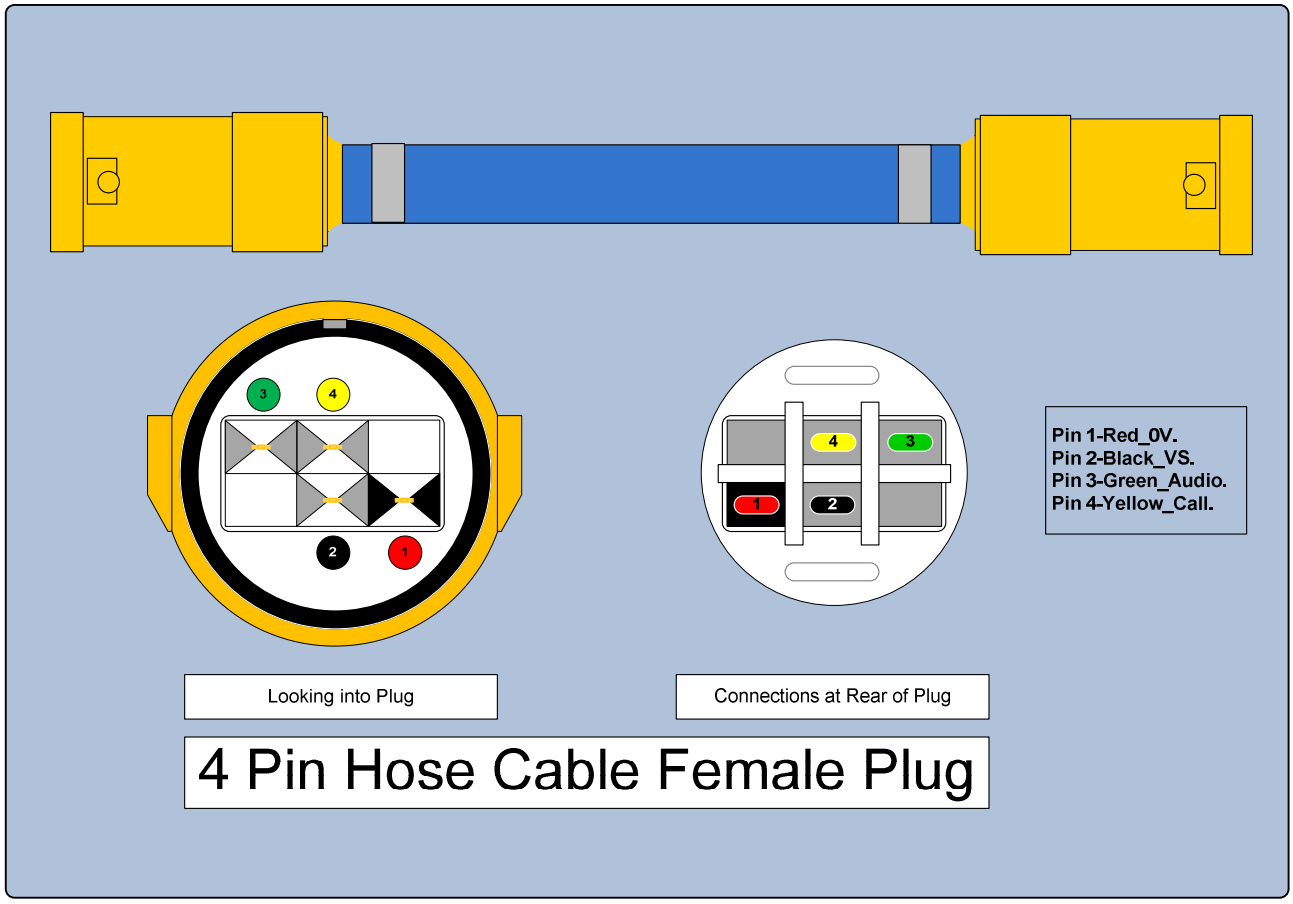
We strive continually to improve our range of products, we therefore reserve the right to alter without notification all design data in this leaflet.

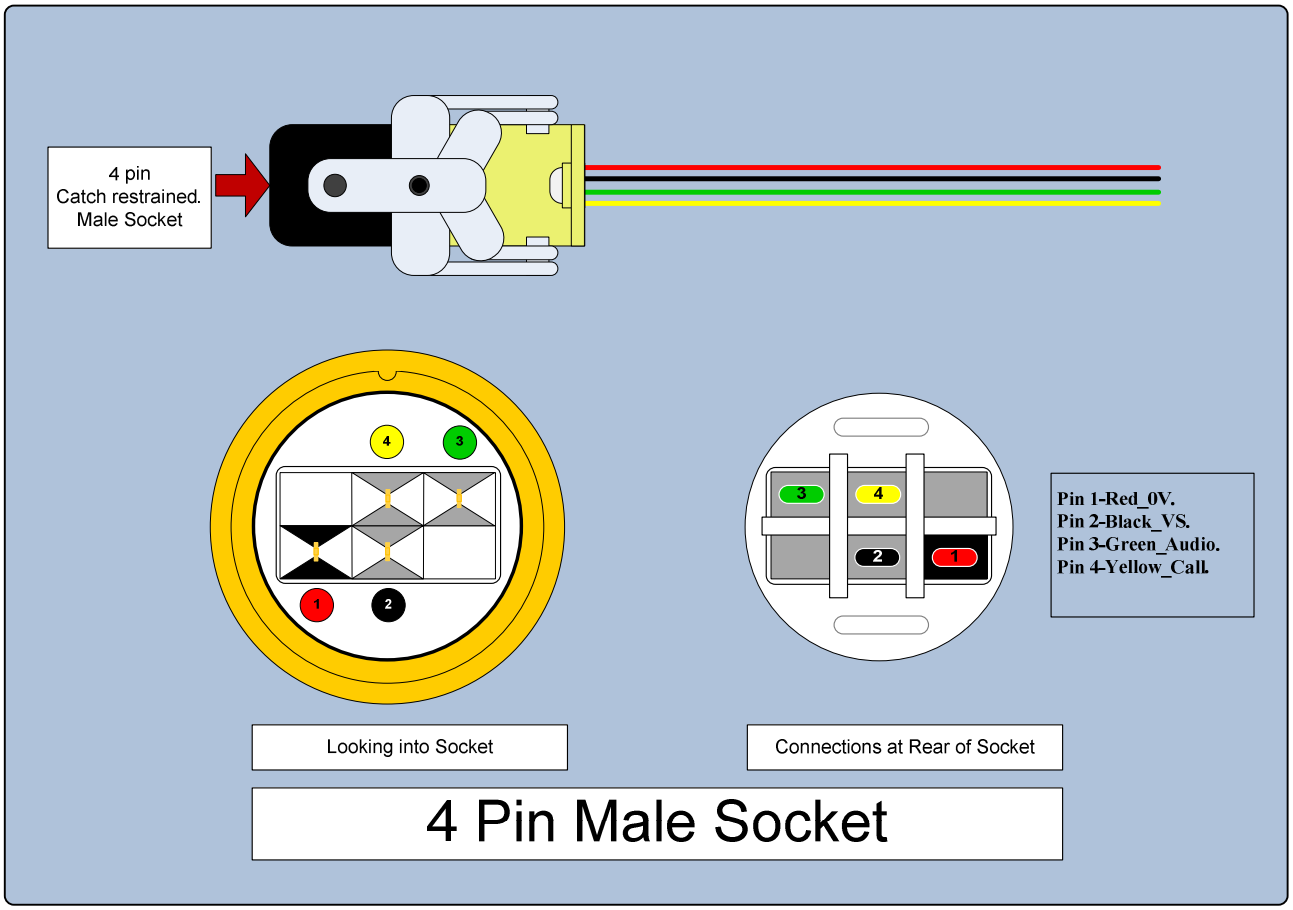
## Connection Drawings-6 Pin



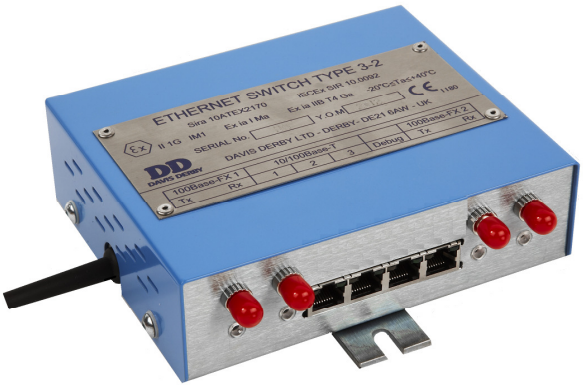
## Connection Drawings-4 Pin



DAVIS DERBY

# Intrinsically Safe Ethernet Switch & Media Convertor




**The MINEWATCH ES3-2S and MINEWATCH ES3-2M**

Three-port electrical, two-port optical 10/100M Ethernet switch, certified Intrinsically safe for Coal mining and group II environments. Capable of switching Ethernet Traffic to and from any of the Ethernet ports.

It allows easy connection of intrinsically safe certified, Ethernet compatible devices such as controller interfaces, Video cameras and underground terminals into the mines fibre, high speed data backbone.

## Specification

### Electrical Ports (x3)

- 10/100Base-T Full or Half Duplex
- Auto negotiation of line rate
- Automatic MDI/MDIX crossover
- RJ45 connection
- 100m reach
- Compliant with IEE802.3 (except where complying with Intrinsic safety makes this unfeasible**)**

### Fibre Optical Ports (x2)

- 100 Base-FX (Multi-Mode)
- 100 Base-LX10 (Single Mode)
- 1300nm wavelength
- ST connection
- Reach of up to 2km over multi mode fibre (no joints)
- Reach of up to 10km over single mode fibre (no joints)
- Compliant with IEEE802.3

### Indication

- Optical Link Activity
- Electrical Link Activity
- Data rate on electrical ports

### Certification

- **Sira 10ATEX2170**

**Ⓔx I M1; II 1G**
**Ex ia I Ma; Ex ia II T4 Ga;**

- **IECEx SIR 10.0092**

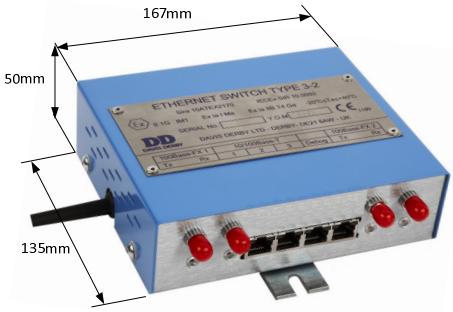
**Ex ia I Ma; Ex ia II T4 Ga;**

### Power Consumption

- 12Vdc IS supply(10.7V min)
- 312mA@12Vdc;
- 350mA@10.7Vdc

### Other

- Must be Housed in an >IP54 enclosure
- Layer 2 switching of all ports



# Intrinsically Safe RGB Programmable Display

The MINEWATCH PD series are certified intrinsically safe, RGB displays supplied in any of 3 configurations:-

- A single sided display with the capability of 2 lines of 8, 8x8, characters.
- A single sided display with the capability of 4 lines of 4, 8x8,characters.
- Double sided display of 2 lines of 4, 8x8, characters front and back capable of indicating different messages.

- Units offer full graphic displays with up to 7 colours.
- Various scrolling features and flash modes are available.
- Proportional text to increase screen capacity.

The MINEWATCH PD series provides intrinsically safe certified Ethernet and /or Canbus communications. Message selection may be made from:-

1. Volt-free contacts into the unit selecting pre-programmed messages.
2. A MINEWATCH PC21/RF21 system utilizing Canbus.
3. An Ethernet connection.

Options 2 and 3 allow variable messages as received over the data links to give dynamic displays or alternate signage in the event of an emergency.

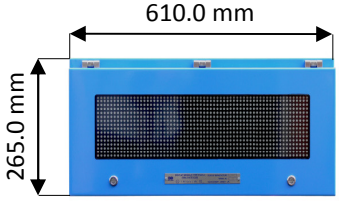
## Specification

### Ethernet Port

- 10/100 Base-T Full or Half Duplex
- Auto negotiation of line rate
- RJ45 connection
- Up to 100m reach
- Compliant with IEE802.3 (except where complying with intrinsic safety makes this unfeasible)
- Messages may be sent from central computer for display
- Can bus - MINEWATCH PC21/RF21 Protocol
- 120kbs CAN Cluster speed
- Reach of up to 500m
- Compatible with Davis Derby PC21/RF21 Systems
- Messages may be sent from PC21 cluster for display

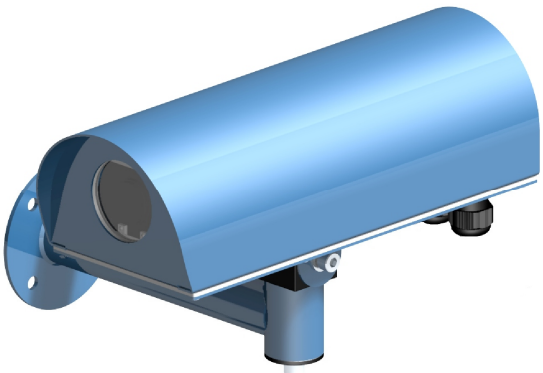
### Other

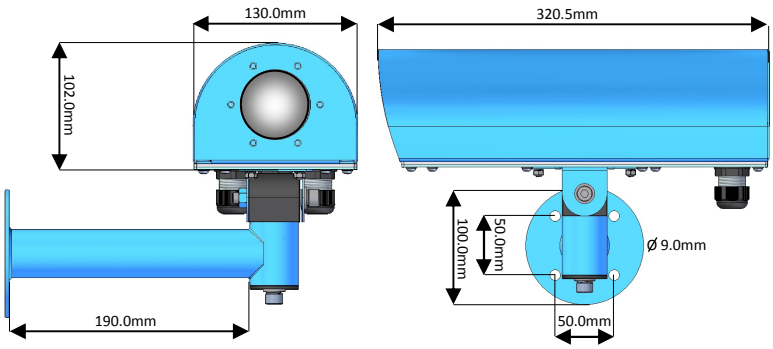
- RGB Multi pixel Display
- Programmable via PC21 memory module
- Certified to ATEX & IECEx; Group 1 and Group 2
- Multilingual
- Downloadable Fonts
- Up to 7 colours
- Fully aligned for display of simple graphics
- Powered by 12V IS supply <500mA (10.7v min)
- Housed in an IP65 enclosure



# NC5 Intrinsically Safe Network Camera

- The MINEWATCH NC-5 is an intrinsically safe, Internet protocol, network camera certified for Coal mining.
- The MINEWATCH NC-5 captures video for display and storage at different physical locations. The IP enabled network camera uses IP (using http or other protocols) to transmit compressed video for display.
- Its web based management console facilitates users for various settings and streaming of video.






## Specification

### Video

- 5M CMOS sensor
- NTSC/PAL composite output (optional)
- Highest Resolution 1280x720
- Auto white balance range 2500 to 7000K
- Min illumination 0.5 lux@F1.2
- 2D/3D noise filter

### Image

High speed shutter 1/1000

- Configuration of:
- Brightness
- Contrast
- AWB
- Sharpness
- Hue
- Saturation
- Gain
- Compression H264/MPEG4/MJPEG
- Resolution
- SXVGA
- VGA
- 720p
- CIF

### Network

- Ethernet 10/100 Base-T Full or Half duplex
- Throughput 2MB/sec

### Software

- Web Browser – Microsoft IE 6.0 or above
- Security – Multiple levels of user Storage
- Internal SD card for scheduled recordings.

Or

- Recording to server

### Resolution Options

Single Stream

- H.264 SXVGA 24fps
- MPEG4 SXVGA 30fps
- JPEG SXGA 30fps

Dual Streaming g.711

- H.264(720p, 30fps)/ H.264(CIF, 30fps)
- H.264(720p, 30fps)/ JPEG(VGA, 15fps)
- H.264(D1, 30fps) x2 dual streaming
- MPEG4(720p, 30fps)/ MPEG4(CIF, 30fps)
- MPEG4(720p, 30fps)/ JPEG(VGA, 30fps)

Triple Streaming g.711

- H.264(720p,30fps)/ JPEG(VGA, 5fps) /H.264(CIF, 30fps)
- MPEG4(720p, 30fps/ JPEG(VGA,15fps)/MPEG(CIF, 30fps)

### Other

- LED indication: Power / Network
- Powered by 12V IS supply 0.25A (10.7V min)
- IP65 enclosure
- See above Drawing

### Certification

- Sira 10ATEX2170
  Ex I M1 Ex ia I Ma
- IECEx SIR 10.0092
  Ex ia I Ma

DAVIS DERBY

# Thermistor Temperature Probes

## Introduction

There are three types of probes available from Davis Derby:-

**DYP Probe** For Insertion into bearing housings, oil crank cases and general purpose applications.

**GUM Probe** For applications were insertion is not possible, this type of probe is bonded to the surface to be monitored.

**BRAKE Probe** For monitoring the brake shoe path of a brake drum.

A range of end fittings are available for all probe types and various probe lengths and fixing fittings are available for the DYP type.

The DYP and GUM probes are also available with two dual thermistors for separate alarm and trip applications. The standard probe is designated as 'A' and the alarm and trip probes which contain two separate thermistors are designated 'B'. (see ordering details)

## Certification

The Thermistor Temperature probes are deemed intrinsically safe to the ATEX standard EN 60079-11:2012 Explosive Atmospheres-Part 11:Equipment protection by intrinsic safety "i" section 5.7 'Simple Apparatus'.

## Construction

The probes are ruggedly constructed for use in demanding environments. They take the form of high stability thermistors mounted in a suitable housing.

The DYP probe thermistor tube is 6mm diameter brass tube and is available in four different lengths up to 130 mm.

The GUM probe thermistor housing is a small brass machined block designed to be bonded to the surface of the machine being monitored.

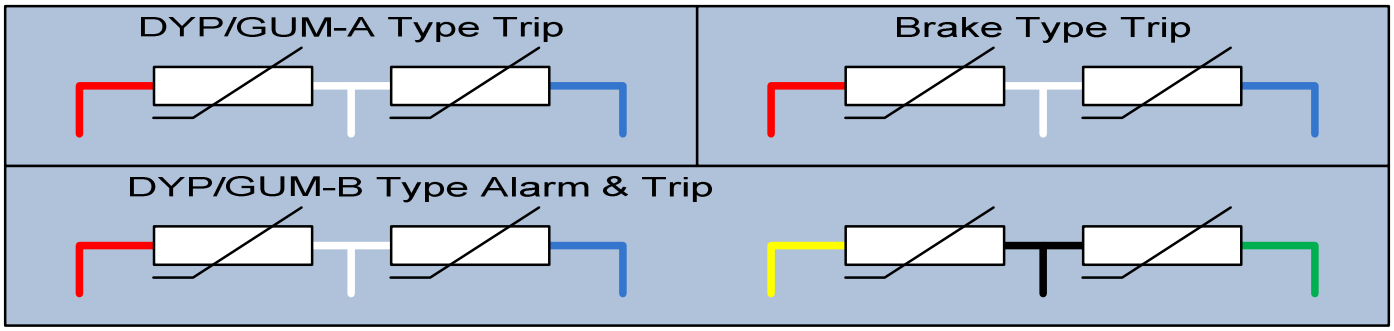
The BRAKE probe thermistor is mounted in a flexible brush which is housed in an enclosure designed to be mounted on a brake disc. The probes can be handed to a left or right orientation to suit the application.

The thermistors in all types of probes are connected using PTFE cable which is sheathed in hydraulic rubber hose in lengths of up to 25 metres to suit customer requirements. A threaded gland connector is provided to enable the probes to be terminated into a connection box or a suitable temperature monitoring unit. i.e. Davis Derby PC21

## Specification

| PROBE TYPE | Type Number | Thermistor Resistance at 25ºC | Normal Operating Range | Maximum ambient Temperature |
|---|---|---|---|---|
| DYP (Trip) | H273A | 5KΩ | 0-85ºC | 160ºC |
| DYP (Alarm & Trip) | H273B | 5KΩ | 0-85ºC | 160ºC |
| GUM (Trip) | HC27301A | 5KΩ | 0-85ºC | 160ºC |
| GUM (Alarm & Trip) | HC27301B | 5KΩ | 0-85ºC | 160ºC |
| BRAKE RIGHT HAND | HC35768 | 15KΩ | 0-150ºC | 160ºC |
| BRAKE LEFT HAND | HC35769 | 15KΩ | 0-150ºC | 160ºC |

## Connection Details



## Ordering Details

The ordering details are as follows:-

### 1.DYP type H273A and H273B

| Probe Type | Trip Function | | Probe Length | | Hose Length | | Gland Type | |
|---|---|---|---|---|---|---|---|---|
| DYP | Type | Suffix | Length | Suffix | Length | Suffix | Type | Suffix |
| H273 | Single Trip | A | 45mm | 045 | 1.5M | 1 | 1/8"BSP | 1 |
| | Alarm & Trip | B | 48mm | 048 | 3.0M | 2 | 1/4"BSP | 2 |
| | | | 55mm | 055 | 5.0M | 3 | 3/8"BSP | 3 |
| | | | 60mm | 060 | 10.0M | 4 | 1/2"BSP | 4 |
| | | | 65mm | 065 | 12.0M | 5 | | |
| | | | 75mm | 075 | 15.0M | 6 | | |
| | | | 85mm | 085 | 25.0M | 7 | | |
| | | | 90mm | 090 | 7.5M | 8 | | |
| | | | 95mm | 095 | | | | |
| | | | 100mm | 100 | | | | |
| | | | 110mm | 110 | | | | |
| | | | 130mm | 130 | | | | |
| | | | 135mm | 135 | | | | |
| | | | 140mm | 140 | | | | |
| | | | 150mm | 150 | | | | |
| | | | 160mm | 160 | | | | |
| | | | 180mm | 180 | | | | |
| | | | 200mm | 200 | | | | |
| | | | 220mm | 220 | | | | |
| | | | 240mm | 240 | | | | |
| | | | 275mm | 275 | | | | |
| | | | 290mm | 290 | | | | |
| | | | 300mm | 300 | | | | |
| | | | 330mm | 330 | | | | |
| | | | 360mm | 360 | | | | |
| | | | 460mm | 460 | | | | |

**Example how to order:-**

Probe Required:H273,Single Trip,75mm Probe length, 3.0m Hose Length,1/4"BSP Gland =

**Order Code:-H273 A 075 2 2**

| H273 | A | 075 | 2 | 2 |
|---|---|---|---|---|
| Probe Type | Trip Function | Probe Length | Hose Length | Gland Type |

### 2.GUM type HC27301

**Example how to order:-**

Probe Required:HC27301,Single Trip,3.0m Hose Length =

**Order Code:HC27301 A BH**

| HC27301 | A | BH |
|---|---|---|
| Probe Type | Trip Function | Hose Length |

| Probe Type | Trip Function | | Hose Length | |
|---|---|---|---|---|
| GUM | Type | Suffix | Length | Suffix |
| HC27301 | Single Trip | A | 1.5M | AH |
| | Alarm & Trip | B | 3.0M | BH |
| | | | 5.0M | CH |
| | | | 10.0M | DH |
| | | | 12.0M | EH |
| | | | 15.0M | FH |
| | | | 25.0M | GH |

Note:-This type of probe may be bonded to the surface with a suitable adhesive.

### 2.BRAKE type HC35768 & HC35769

**Example how to order:-**

Probe Required:HC35768,3.0m Hose Length =

**Order Code:HC35768 C**

| HC35768 | C |
|---|---|
| Probe Type | Hose Length |

| Probe Type | Cable Entry | Hose Length | |
|---|---|---|---|
| BRAKE | Type | Length | Suffix |
| HC35768 | Right Hand | 3.0M | C |
| HC35768 | Right Hand | 5.0M | D |
| HC35768 | Right Hand | 10.0M | E |
| HC35769 | Left Hand | 3.0M | C |
| HC35769 | Left Hand | 5.0M | D |
| HC35769 | Left Hand | 10.0M | E |

# Conveyor Stop/Emergency Stop Pull key Systems

- **ATEX-certified dustproof models available, Group II Category 1D**
- **IP65 enclosure & corrosive resistant components**
- **Double-ended**
- **Cats-eye indication (optional semaphore flag)**
- **Easy installation**
- **3 years UK warranty (1 year overseas, from date of supply)**

## Description

Davis Derby's comprehensive range of StedFAST® conveyor protection devices protect people and plant in quarries, mines, tunnels, processing plants, ports and railway depots worldwide.

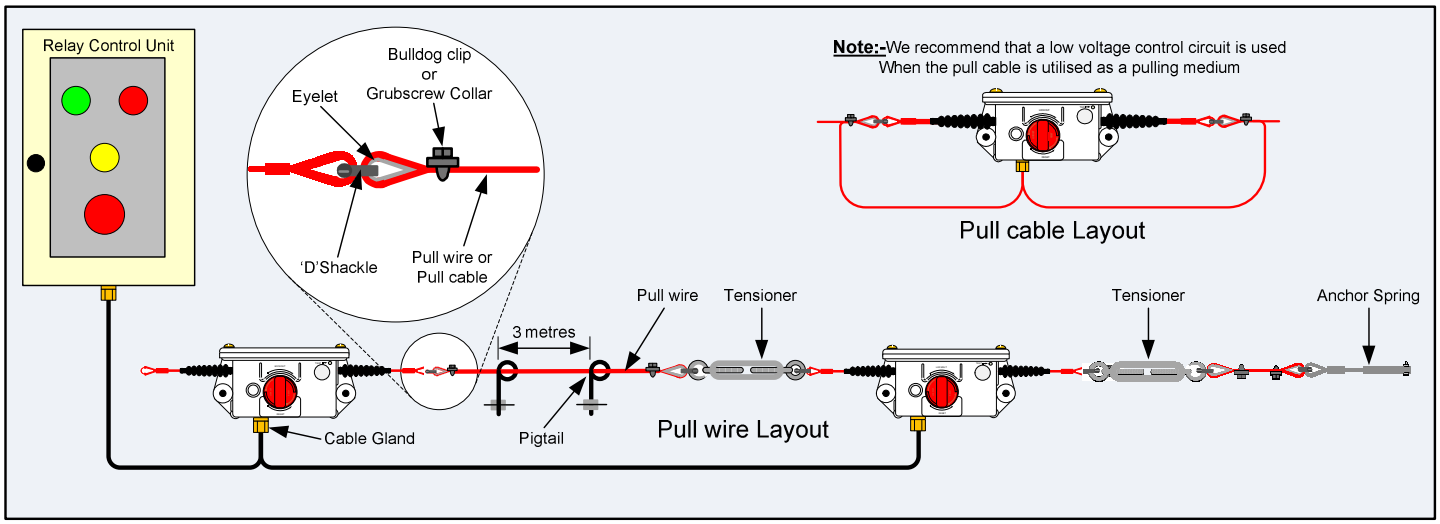
All Davis Derby devices are compatible and can be easily installed by qualified electrical engineers on new or retrofit schemes. The primary stopping device on any conveyor system is the pull cable/wire *operated* safety switch, now available in compliance to BS EN ISO 13849-I PLe Category 3 standards.

Davis Derby design and manufacture a double-ended stop device, which can be adopted as either a normal stop switch, or wired to function as an emergency stop switch, isolating conveyor movement in the event of incidents. When required to operate as a normal stop switch, the Pullkey device can be either, wired and fitted to some or all of the moving parts of conveyor machinery to render them safe.

Alternatively, when required to operate as an emergency stop switch, all the pulleys internal positive break micro-switches should be used and connected to any/all parts of conveyor machinery.

By connecting up all the micro switches to a certified safety relay, the Pullkey system will comply with the emergency stop standards of BS EN ISO 13849-I PLe (Category 3) . To enable a successful emergency stop control, all pulleys and safety relays must be connected to the machinery it is protecting and to all upstream and downstream equipment, where deemed necessary.

Dimensions:- 303mm L x 135mm D x 116mm H; Fixing Hole Centres:- 178mm, 10mm Diameter; Weight:- 2.2Kg.



## Types

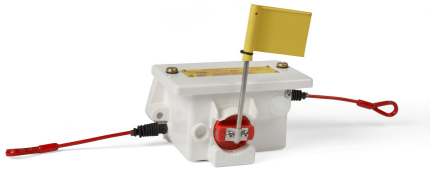
The Davis Derby's StedFAST® HT 800 Series Pullkey range is designed for use in safety critical systems for controlling conveyors. Each key can therefore be used as either a Stop Switch or as a Category 2 or Category 3 Emergency Stop Switch as defined in BS EN ISO 13849-I PLe.

All Pullkeys are moulded from high stability UV protected polycarbonate, which is tough and lightweight.

All Pullkeys can be used in conjunction with all StedFAST® relay control units, or on a control circuit up to 110 volts ac. For systems to comply with emergency stop safety regulations, safety relays* must be used.

| HT 800 Series Pullkey Type ORDER CODES | 32 kg Springs | 12 kg Springs | 6 kg Springs | Optional Semaphore Flag Indication |
|---|---|---|---|---|
| **HT832V3** (Standard) | ■ | | | |
| **HT832FV3** (Standard + Semaphore Flag) | ■ | | | ■ |
| **HT806V3** (Basic) | | | ■ | |
| **HT806FV3** (Standard + Semaphore Flag) | | | ■ | ■ |
| **HT812DP23** (Dustproof) | | ■ | | |
| **HT812FDP23** (Dustproof + Semaphore Flag) | | ■ | | ■ |
| **HT812CSA/DD** (Dustproof + Semaphore Flag) | | ■ | | ■ |

* Relays available to order:
ICR3 (2 relay output); 23418 (standard relay); and the SRP1 (Pilz Safety Relay).



## Installation

Incoming and outgoing cables are connected via 2 x 20mm threaded cable entries to the internal 12-way easy-access terminal block. The operating knob is sealed with an O-ring and the lid is fitted with a fully recoverable closed cell silicon gasket.
Each Pullkey comes boxed with wiring instructions, and several types can be supplied with the wiring and mechanism preconfigured to suit specific applications upon request, and manuals are available upon request.
The recommended spacing between StedFAST® pullkeys with 3m pigtail intervals is shown in the table below:

| 800 Series Pullkey Maximum Recommended Spacing | | |
|---|---|---|
| | Pullkey to Pullkey | Pullkey to Anchor Spring |
| **32Kg Rated Spring (Taut wire)** | **50 Metres** | **25 Metres** |
| **6Kg Rated Spring (Taut wire)** | **40 Metres** | **20 Metres** |
| **12Kg Rated Spring (Taut wire)** | **40 Metres** | **20 Metres** |
| **32Kg Rated Spring (Slack wire)** | **100 Metres** | **N/A** |

## Operating the Safety Switch

The StedFAST® Pullkey has a snap action mechanism to meet the requirements of :-

PD 5304:2005 and BS EN 620:2002.

| Stop/Trip system via Pull Switch | Stop/Trip system via Pull Cable/Wire |
|---|---|
| To stop, turn the red switch 90° to the right. To reset, turn 90° to left (to the normal operating position). | Pull cable or wire until the red switch turns to the right and clicks. To reset, turn 90° to left (to the normal operating position). |

## Accessories & Assistance

For all practical guidance on protecting conveying equipment and your specific application, and/or international pricelists, phone StedFAST® Customer Services on: +44 (0)1332 227 534 or +44 (0)7736 638 759
View our full range of StedFAST® conveyor protection products www.davisderby.com/stedfast

# Stedfast Relay Control Unit-SRP1

## Description

The Relay Control Unit is robust and versatile Pullkey state monitoring device self-contained in a IP 65 rated polycarbonate enclosure suitable for use in a variety of environments. These units are manufactured for use in industrial and arduous environments such as coal preparation plants, processing plants, power stations and quarries where safety and reliability are of paramount importance.

## Specifications

The Relay Control Unit has the following features: -

- Operation from a 120 or 240Vac 50 / 60Hz Supply.
- IP 65 rated Robust polycarbonate enclosure.
- 4 x 20mm Gland Entries.
- PILZ Safety Relay Monitoring Circuit.
- Incoming Connections Terminal Rail.
- Green 'Mains Power On' lamp.
- Red 'Tripped indication' lamp.
- Emergency Stop button twist to release.
- Reset Button.
- Auto Reset facility.
- Category 2 or Category 3 Compliant.


## Operation

### General Operation Description

The Relay Control Unit when powered and if the Pullkeys are set correctly along with the contactors in a healthy condition should display the Power On green lamp lit only.

### Green Power on Lamp

If the power to the Relay Control Unit is on then the green power on lamp should be lit

### Red Tripped Lamp

The tripped lamp should only be lit when a trip has occurred caused by the following: -

The knob on a Pullkey being turned to the lockout position

A slackwire condition (the pulling medium between Pullkeys going slack

Operation of the Emergency stop button, on the Relay Control Unit

It should be noted that if certain conditions occur the tripped lamp will light and stay lit even if you think the fault has been cleared these are as follows: -

The operation of only one lockout switch will cause a trip and the tripped lamp will light but both switches need to have been operated and reset before the tripped lamp goes off.
The operation of only one slackwire switch will cause a trip and the tripped lamp will light but both switches either left or right hand side need to have been operated and reset before the tripped lamp goes off.

### Reset Button

The Reset button is used to reset the Relay Control Unit once all faults have been cleared. If all faults are clear and the reset button is pressed the tripped lamp should go out, if the tripped lamp stays on this means a fault is still present.

### Emergency Stop Button

The Emergency Stop button can be pressed at any time and is intended for use in cases of emergency and will still stop the conveyor.

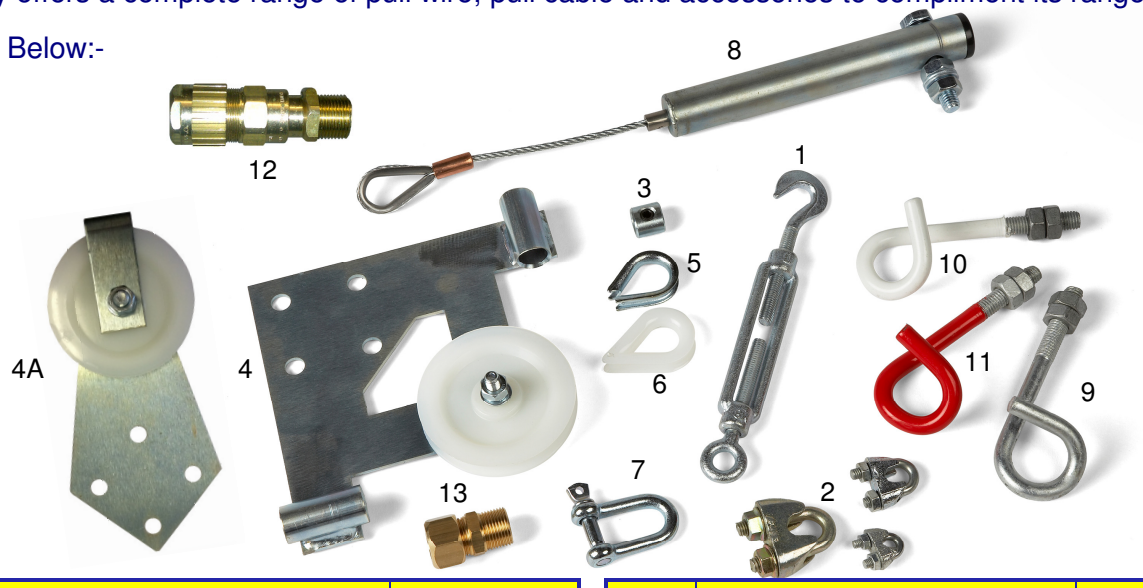
### Auto Reset

The Relay Control Unit has the facility for an auto reset (**customer's decision**) and this means that if used whenever a fault condition is cleared the conveyor has the potential to start up.

# Pull wire, Pull cable and Accessories

Davis Derby offers a complete range of pull wire, pull cable and accessories to compliment its range of Pullkeys.

See Details Below:-




| Item | Accessories | Code Number |
|---|---|---|
| 1 | Tensioner | A2198 |
| 2A | Bulldog grip 5mm for pull wire | 42 113 011 |
| 2B | Bulldog grip 8mm for 4 core pull cable | 42 113 012 |
| 2C | Bulldog grip 10mm for 6 core pull cable | 42 113 013 |
| 3 | Grub screw Collar for Pull wire | HS0105 |
| 3A | Grub screw Collar for Pull cable | HS0148 |
| 4 | Corner Pulley | X2 002 419 |
| 4A | Corner Pulley-NEW | 69 060 001 |
| 5 | Eyelet for Pull wire | HS0106 |
| 6 | Eyelet for Pull cable | 38 563 001 |
| 7 | D' Shackle | A1942 |
| 8A | 6kg Anchor Spring | 69 403 006 |

| Item | Accessories | Code Number |
|---|---|---|
| 8B | 12kg Anchor Spring | 69 403 012 |
| 8C | 32kg Anchor Spring | 69 403 032 |
| 9A | Galvanised Pigtail 89mm | A2227 |
| 9B | Galvanised Pigtail 125mm | A2227-5 |
| 10A | White PVC Coated Pigtail 89mm | 62 402 004 |
| 10B | White PVC Coated Pigtail 125mm | 62 402 001 |
| 11A | Red PVC Coated Pigtail 89mm | 62 402 005 |
| 11B | Red PVC Coated Pigtail 125mm | 62 402 003 |
| 12 | Cable Gland SWA | 62 173 005 |
| 13 | Cable Gland SWB | HS0116 |
| 14 | Remote Diode (Not Shown) | 62 011 007 |
| | | |

## Pull wire and Pull cable

The pull wire supplied is a flexible steel wire cord 3/16” outside diameter with green or red PVC covering.
The pull cable is a single wire braided armour cable all cores being unscreened, available as either 4 core or 6 core with green or red PVC covering. Each core being 24/0.2mm copper insulated with resistance of 54Ω/loop km.

| Pull Wire Order Details | | |
|---|---|---|
| 3/16" Green Pull wire | 5mm Outside diameter | Code No: 41 032 002 |
| 3/16" Red Pull wire | 5mm Outside diameter | Code No: 41 032 003 |
| **Pull Cable Order Details** | | |
| 4 Core Green PVC Covered | 9mm Outside diameter | Code No: 42 649 001 |
| 4 Core Red PVC Covered | 9mm Outside diameter | Code No: 42 649 012 |
| 6 Core Green PVC Covered | 10.6mm Outside diameter | Code No: 42 649 002 |
| 6 Core Red PVC Covered | 10.6mm Outside diameter | Code No: 42 649 009 |

# Pease Probe Sensing Device

## Description

The Pease Probe Sensing device comprises a compact weatherproof plastic moulded enclosure containing a micro-switch and associated terminals. The enclosure is also fitted with a flexible actuating probe which operates the micro-switch when it is deflected sideways. Thus the Pease Probe is suitable for many applications in mining and the minerals handling industry. Typical applications include the following:-

- Conveyor Blocked Chutes
- Broken Haulage Rope Strands
- Belt Misalignments
- Dead Mans Handles
- Torn Belts
- Vehicle Movement
- Liquid Levels
- Door Positions

## Versions

The Pease Probe can be supplied with probe lengths of 12", 18" or 24" and an option of a time delay on the switching function which is adjustable up to 15 seconds.

## Switch Rating

The Pease Probe is fitted with a single pole change-over micro-switch rated at 240volts ac, 10Amps.

## Cable entries

The unit is supplied with one CM 20 20mm cable gland and one 20mm tapped blanked off entry.

## Certification

The Pease Probe unit is deemed intrinsically safe to the ATEX standard EN 60079-11:2012 Explosive Atmospheres-Part 11:Equipment protection by intrinsic safety "i" section 5.7 'Simple Apparatus'. The switch contacts can be used to switch an intrinsically safe circuit with the following characteristics:

: Ui max = 50 volts; Ii max = 100ma.

## Ordering Details

Ordering details are as follows:-

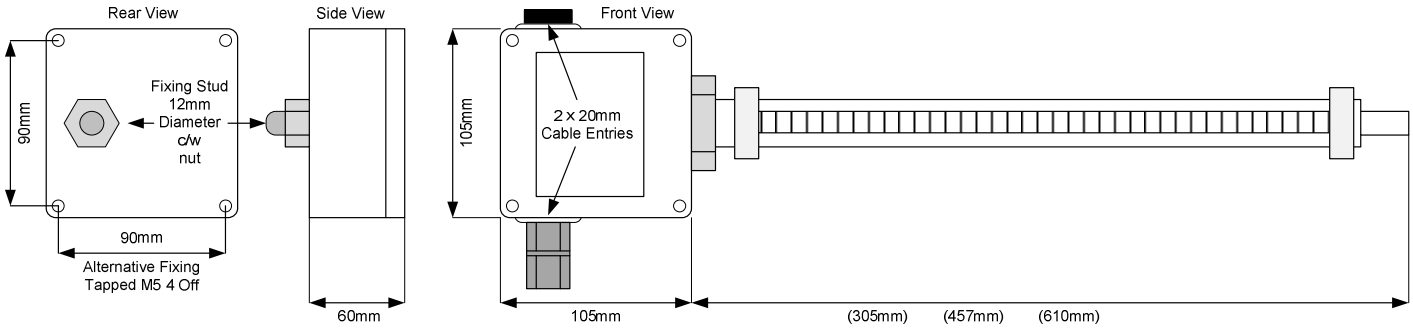
| Probe Length | Standard Version | Timed Version |
|---|---|---|
| 12" | HD20218 | HD20221 |
| 18" | HD20219 | HD20222 |
| 24" | HD20220 | HD20223 |

**Note:-** The above units can be supplied with a variety of different end fittings, when ordering these versions, the appropriate suffix should be added to the code number.

Gill end fitting – Suffix 'A', Roller Suffix 'B', Domed nut Suffix 'F'.

## Dimensions

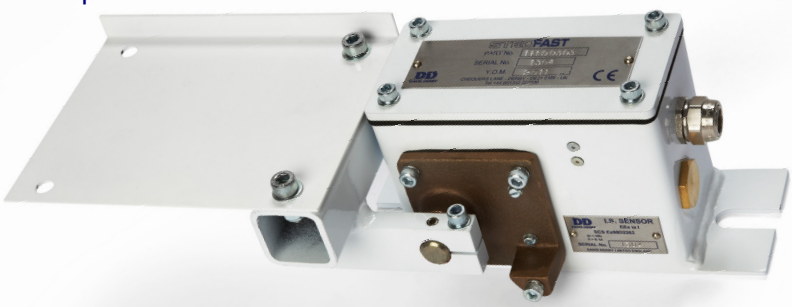
The dimensions of the Pease Probe are shown below:



# Back Spillage Device

## Description

The Heavy Duty Back Spillage Detector is designed to prevent spillage of conveyed mineral around transfer points and chutes. The complete transducer comprises of two similar units, one mounted on each side of the conveyor at a point where spillage is likely to occur. The unit is designed to be mounted such that the centre line of the paddle is in line with the edge of the conveyor belt. When the paddle is depressed due to spillage of material, a rotary switch operates within the unit.



## Versions

As an option a time delay function can be provided which prevents the conveyor from being tripped if the paddle is depressed momentarily by a lump of material dropping off the conveyor.

## Switch Rating

The Heavy Duty Spillage Detector is fitted with a rotary switch equipped with one normally open and one normally closed contact.
The contact ratings are as follows:-
16 Amps 250 volts ac 3 kw
1 Amp 125 volts dc

## Certification

The Heavy Duty Back Spillage unit is deemed intrinsically safe to the ATEX standard EN 60079-11:2012 Explosive Atmospheres-Part 11:Equipment protection by intrinsic safety "i" section 5.7 'Simple Apparatus'. The switch contacts can be used to switch an intrinsically safe circuit with the following characteristics:
Ui max = 50 volts; Ii max = 100ma.

## Ordering Details

Ordering details for the Heavy Duty Back Spillage unit are as follows:-

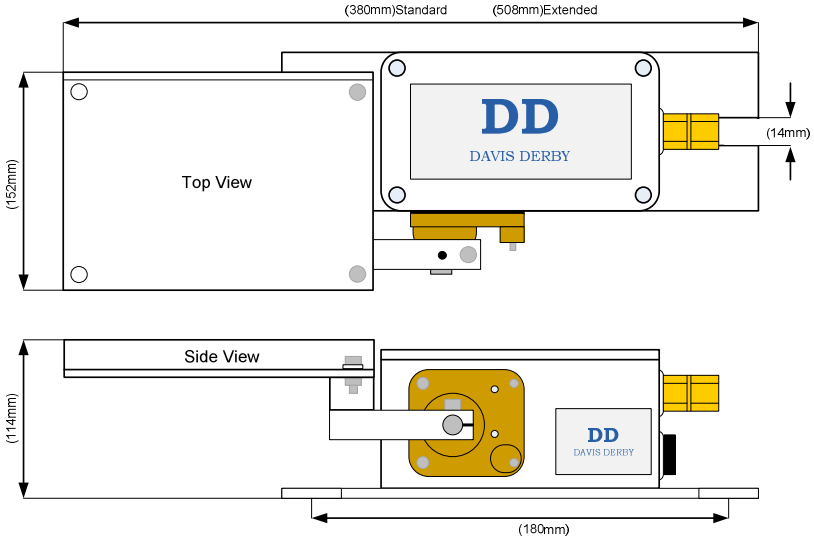
| Type | Code Number (per pair) | Dimensions (mm) | | | Weight (kg) |
|---|---|---|---|---|---|
| | | L | W | H | |
| Standard type | B11100303/FP | 380 | 152 | 114 | 9kg (per pair) |

## Cable entries

The unit is supplied with one CM 20 20mm cable gland and one 20mm tapped blanked off entry.

## Dimensions

The dimensions of the Heavy Duty Spillage Detector are as follows:-



# Belt Alignment Switch

## Description

This robust unit is designed to give consistent and reliable operation when used in the most demanding of environments such as the conditions encountered in mines and quarries. These units are used in pairs, one on each side of the conveyor to be protected at those points where a mis-alignment is likely to occur. The unit is equipped with a switch which is activated when a mis-alignment of the conveyor occurs and thus the conveyor can be stopped before the conveyor or the associated rollers are damaged.


## Construction

The switch and associated terminals are mounted in a weatherproof plastic moulded enclosure which is fitted with two CM20 20mm cable glands.

The plastic enclosure is mounted on a steel channel which carries the actuating arm. When the unit detects a mis-alignment, the actuating arm rotates 90° to a horizontal position allowing it to be seen from along the conveyor.

## Certification

The Belt Alignment and Tear unit is deemed intrinsically safe to the ATEX standard EN 60079-11:2012 Explosive Atmospheres-Part 11:Equipment protection by intrinsic safety ”i” section 5.7 ‘Simple Apparatus’. The switch contacts can be used to switch an intrinsically safe circuit with the following characteristics: Ui max = 50 volts; Ii max = 100ma.

## Switch Rating

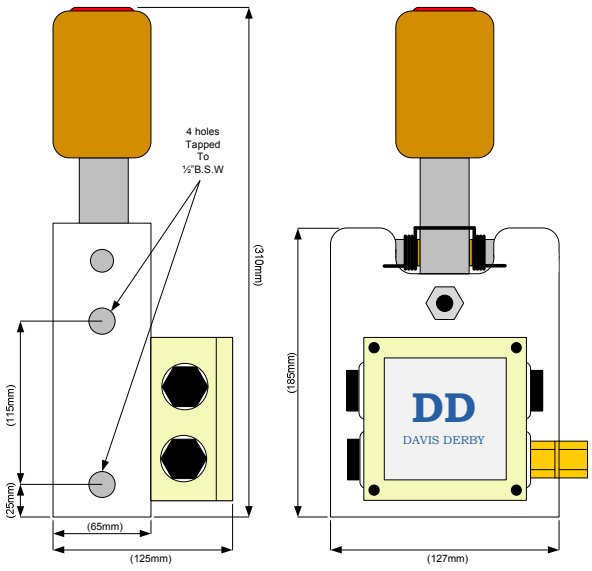
The unit is fitted with a single-pole changeover micro-switch rated at 250volts ac; 10amps.

## Ordering Details

When ordering, please specify code number HC35382 for a single unit, normally two units are required.

## Dimensions

The overall dimensions are shown :



# Belt Alignment and Tear Device

## Description

The complete transducer comprises of two identical units, one positioned each side of the conveyor to be protected. This device prevents belt misalignment or ‘wander’, which can cause a conveyor belt to turn over causing considerable damage and spillage of the conveyed material. Belt alignment protection is provided by a pair of vertically mounted nylon 66 or ceramic rollers. When belt mis-alignment occurs, one of the rollers is bought into contact with the edge of the belt which activates a rotary switch housed in the associated unit. The mechanism is arranged such that either latching or non-latching operation is possible. The belt tear protection facility is provided by dual plastic coated steel wires each set at an angle to suit the curvature of the conveyor belt.

## Advantages

The same units can be used on conveyors of different widths by simply changing the length of the two plastic coated steel wires.
Installation is greatly simplified since only the plastic coated steel wires are underneath the conveyor belt. The switch enclosures are mounted at the side of the conveyor eliminating the need to carry out work underneath the conveyor belt.

## Certification

The Belt Alignment and Tear unit is deemed intrinsically safe to the ATEX standard EN 60079-11:2012 Explosive Atmospheres-Part 11:Equipment protection by intrinsic safety ”i” section 5.7 ‘Simple Apparatus’. The switch contacts can be used to switch an intrinsically safe circuit with the following characteristics:
Ui max = 50 volts; Ii max = 100ma.

## Switch Rating

The Belt Alignment and Tear Unit is fitted with a rotary switch with one normally open and one normally closed contact.
The contact ratings are as follows:
16 Amps;250 volts ac;3 kw
1 Amp;125 volts dc.

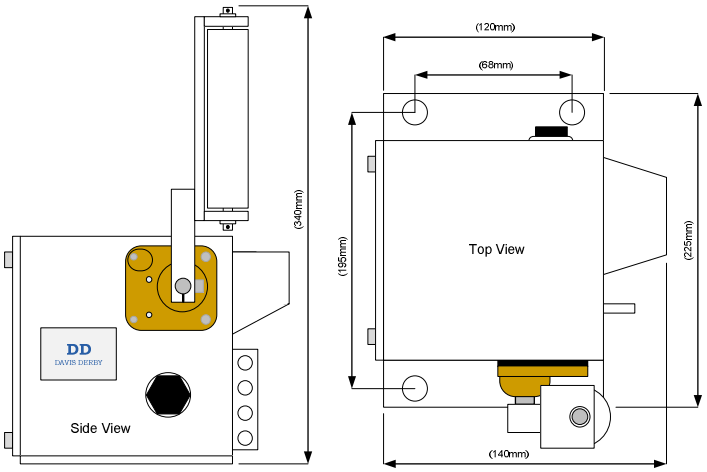
## Ordering Details

Ordering details are as follows:-

| Version | Description | Code Number |
|---|---|---|
| Standard | Nylon 66 Rollers | B11100201/FP |
| | Ceramic Rollers | B11100201/C/FP |
| Time Delay on Operate | Nylon Rollers | B11100208/N/FP |
| | Ceramic Rollers | B11100208/FP |

## Dimensions

The overall dimensions are shown below:-



# Digital Sequence and Slip Roller

## Description

Davis Derby manufactures two types of conveyor sequence and belt slip roller. They can be used to provide a simple means of conveyor sequence control and also for belt slip detection. One version is a cantilever type for mounting under the top belt or bottom belt. The other version is a bottom belt type only and is designed to fit on top of the bottom conveyor belt and is primarily an analogue type device using a NAMUR type sensor with an analogue interface PCB. This type of roller is shown on a separate data sheet :

'**Analogue Sequence and Slip Roller'.**

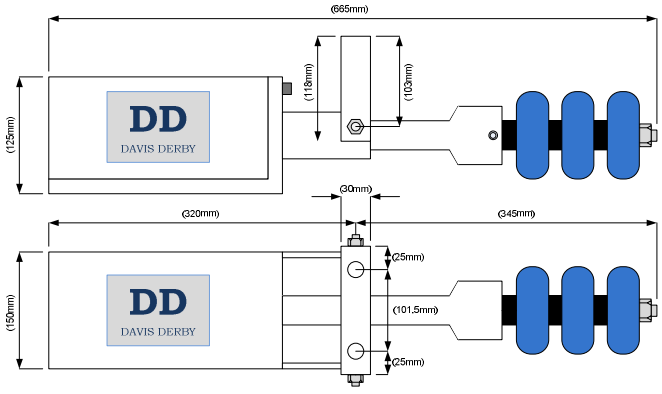
## Construction

The unit incorporates a magnetically coupled switch enclosed in a robust steel case with a removable cover. This provides ease of access for installation of the incoming cables and the speed adjustment setting which determines the speed at which the contacts operate. The cantilever type has a sealed self-aligning bearing at the drive end of the shaft.

## Operating Principles

When the conveyor is in motion, a magnetic induction linkage is operated to activate the internal switch via a coupling. There are two sets of switch contacts, one for each direction and at a pre-determined speed, set by the adjusters inside the unit, one of the sets of contacts operates depending on the direction of travel.

## Dimensions




## Certification

The Conveyor Sequence and Slip Roller unit is deemed intrinsically safe to the ATEX standard EN 60079-11:2012 Explosive Atmospheres-Part 11:Equipment protection by intrinsic safety "i" section 5.7 'Simple Apparatus'. The switch contacts can be used to switch an intrinsically safe circuit with the following characteristics:
Ui max = 50 volts; Ii max = 100ma.

## Cable entries

The unit is supplied with one CM 20 20mm cable gland and one 20mm tapped blanked off entry.

## Switch Contact Ratings

| Type | Code Number | Dimensions (mm) | | | Weight (kg) |
|---|---|---|---|---|---|
| | | Length | Width | Height | |
| Cantilever (Standard) | B11100109/FP | 560 | 145 | >120 | 15 |

## Ordering Details

| AC | | | | | | DC | |
|---|---|---|---|---|---|---|---|
| | Amps | | Continuous Carrying current | Volt Amperes | | | |
| Max ac Voltage | Make | Break | | Make | Break | Max voltage | Amps |
| 120 | 30 | 3.0 | 5.0 | 3600 | 360 | 115 - 125 | 0.12 |
| 240 | 15 | 1.5 | 5.0 | 360 | 360 | 230 - 250 | 0.08 |
| 480 | 7.5 | 0.75 | 5.0 | 3600 | 360 | | |
| 600 | 6.0 | 0.06 | 5.0 | 3600 | 360 | | |

**Note:** When ordering please state the normal speed of the conveyor and in the case of the bottom belt type only, the width of the conveyor and the height from the fulcrum.

# Analogue Sequence and Slip Roller

## Description

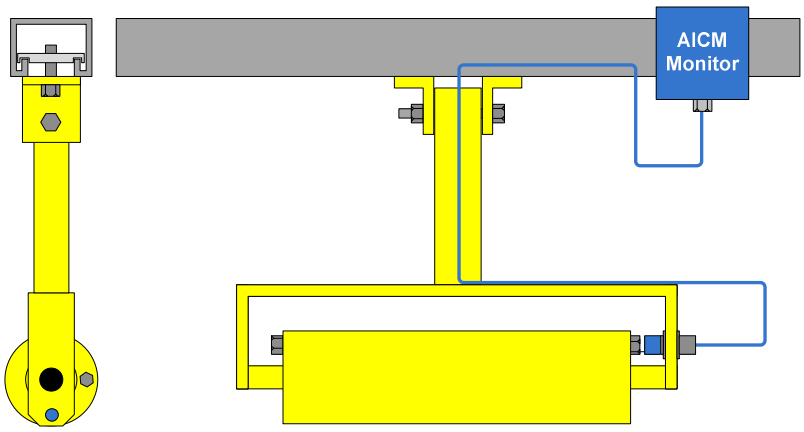
The Analogue Sequence Slip Roller is designed to fit on top of the bottom conveyor belt and is primarily an analogue type device using a NAMUR speed sensor. Two variations of the AICM housed in a IP rated enclosure can be purchased:

1.Analogue Output: 0.4-2.0Vdc, ATEX, IECEx certified .

2.Digital Output type: Non certified

## Operation

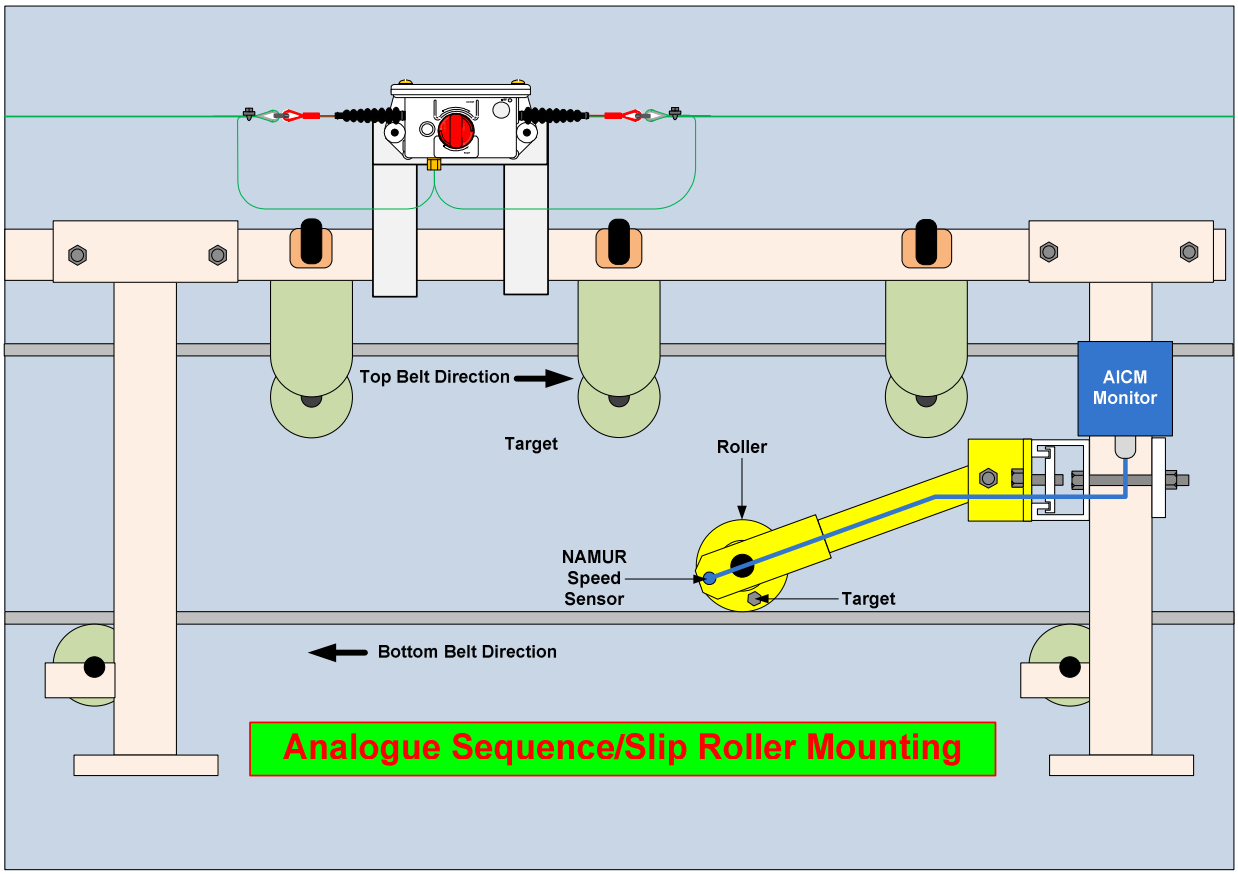
An analogue interface (AICM) PCB is utilised to convert the monitored pulses from the bottom belt roller target (monitored by the NAMUR speed sensor) to a 0.4 to 2vdc (0 – 120% speed) analogue signal or converted to a digital output signal.




## Certification

The Conveyor Sequence and Slip Roller AICM unit (analogue type only) is certified to European ATEX and IECEx Standards.

- **Baseefa 12ATEX 0009U**
  **Ⓔx I M1 Ex ia I Ma**
- **IECEx BAS 14.0019U**
  **Ex ia I Ma**



# MineSCADA

## Mine Supervisory Control and Data Acquisition

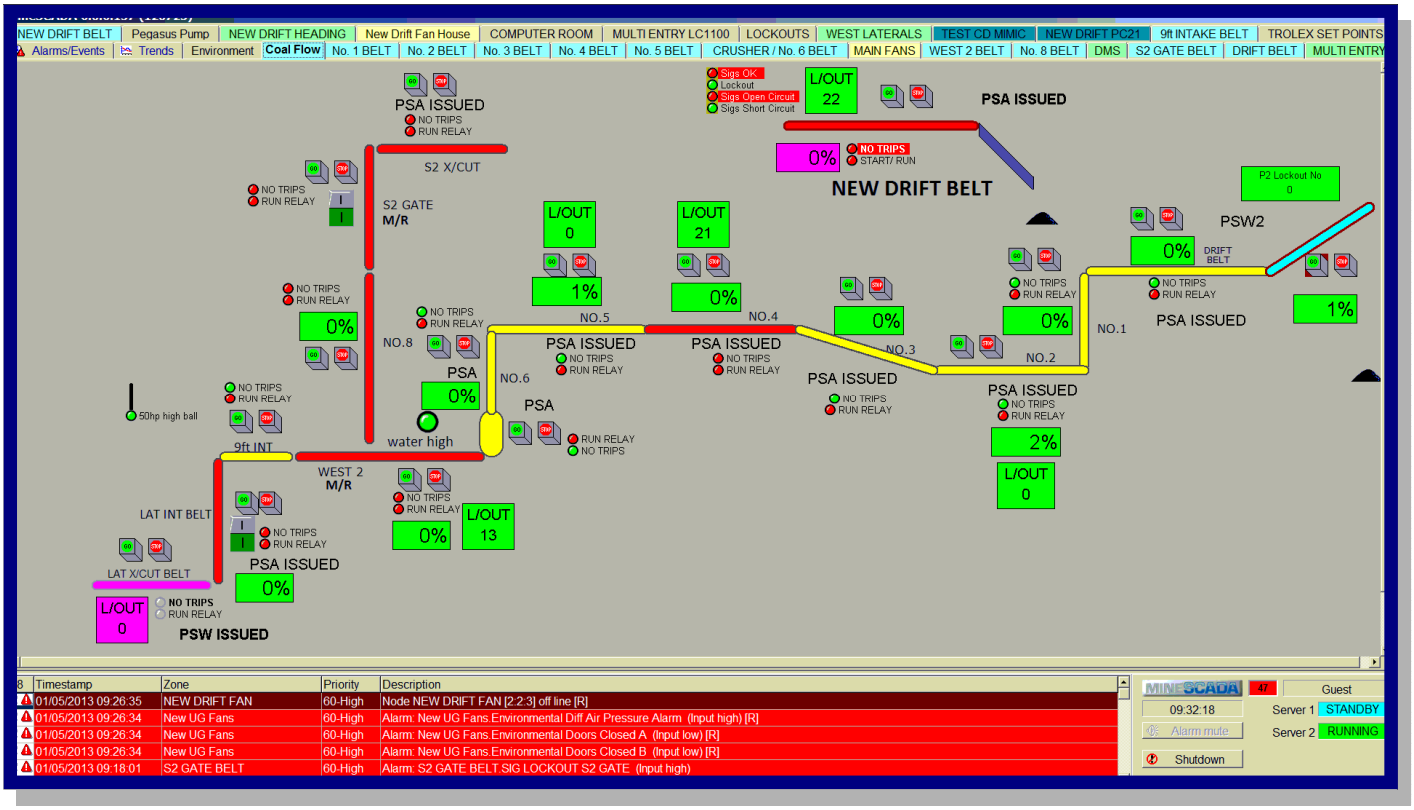
MineSCADA is Davis Derby's own SCADA system, optimised for mining applications. Mining is unusual from a SCADA point of view because the layout of the mine is constantly changing. MineSCADA accommodates this by making it easy to change the configuration on a live system. Changes take effect immediately without the need for separate 'configure' and 'run' modes. There is also no artificial limit on the number of tags in a MineSCADA system. Our standard system has redundancy built in with two hot-standby servers. In the event of hardware or software failure the servers will automatically change over. All critical components are powered by UPS for reliable data acquisition and control. The server applications run continuously, logging data and events. MineSCADA supports up to 50 client workstations over local and wide area networks. Each workstation supports up to 6 monitors.
The access level of each MineSCADA user can be configured to limit what they can see and do.
There is now an option available to send alarm messages by either email or text message. This can be very useful when there are high priority problems at the mine which need to be monitored constantly. These areas can be setup to send the messages to the management when ever there is a problem so they are constantly kept up to date with the situation.


The MineSCADA software application is based upon the accumulated experience of 30 years of software developed for the Mine Monitoring and Control system market both in the UK and around the world, and yet uses all the latest features of current PC software technology. Its advanced user interface conforms to Windows standards, and hence is very easy for operators and other users to understand and use.

MineSCADA has been developed to be fully compatible with open standards in the computing industry and to be compatible with most makes of PCs. It runs under any version of Windows from NT to Windows 8. This allows MineSCADA end users to benefit from the on-going market and technological advances within the PC and Windows environments, particularly the improvements in performance and software availability, and reduction in costs.

The MineSCADA system can be installed on a simple 'Stand Alone' computer network or it can be used with a larger and more complicated network. These typically include PC based server(s), workstation(s) and communications server(s) which can communicate with a large mixture of underground data transmission rings, PLC highways, plant wide busses and MIS links.

Standard or large systems can be grouped or networked together to provide manual or automatic change-over main/standby systems, or completely hierarchical networked systems. Additional computers can be added to these systems as management terminals or as separate management information systems.




When used in a dual hot standby server configuration, automatic system backup is provided should a server fail. Either server can be designated as being on-line or standby. Both servers are connected to a common set of data transmission circuits or buses. Any system can be extended by the end user, hence it is relatively easy to start with a small system and migrate to a standard or even a large system.

The MineSCADA system can be connected to existing control systems in the mine. It is compatible with various communication systems such as:-

1. BS6556 Part1 and 3 FSK SAP. (Underground Exi Data Transmission)
2. CAN bus.
3. Ethernet/IP. (Industrial Protocol)
4. OPC
5. Transmitton TM204.
6. Profibus DP.
7. Arcnet.

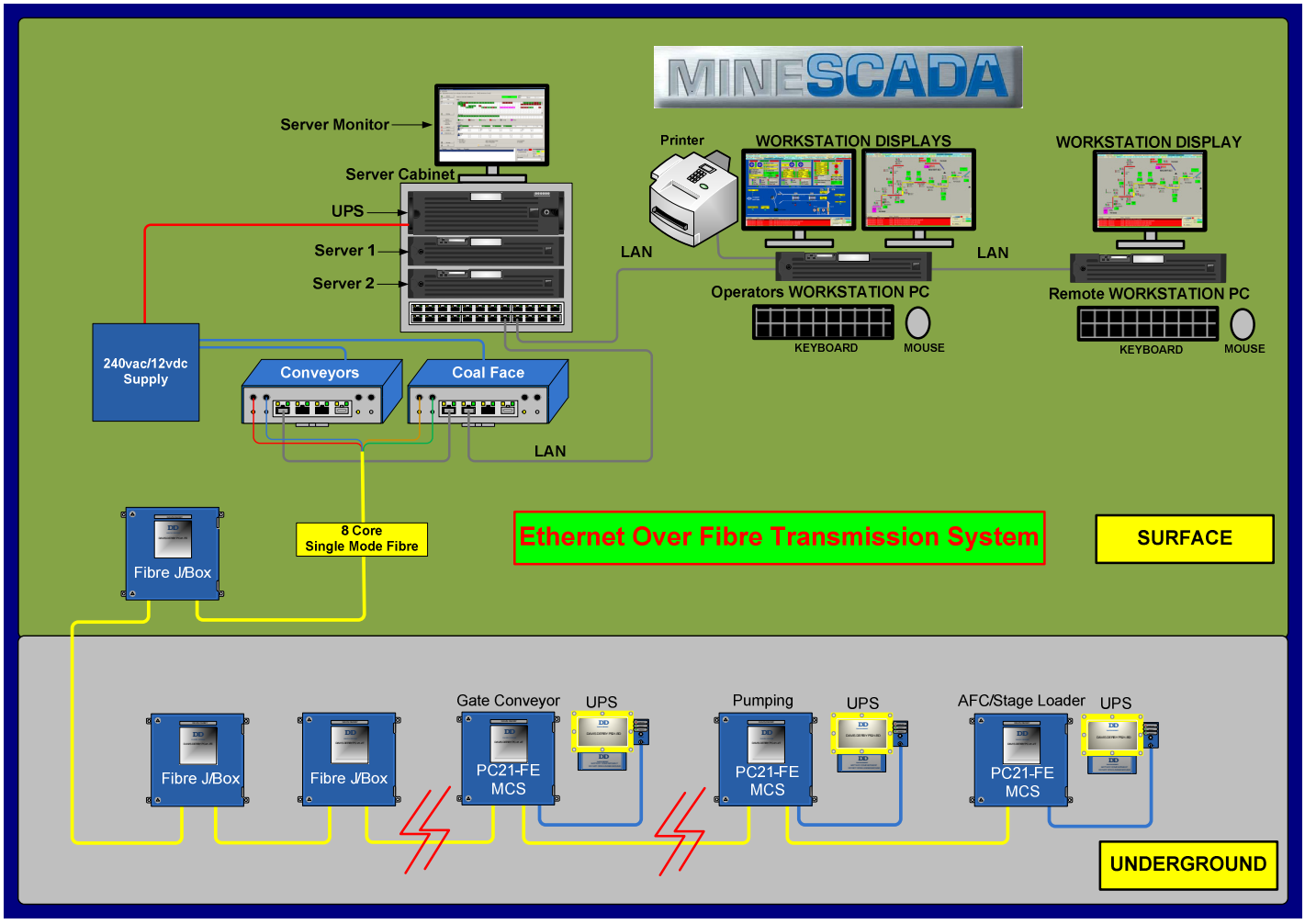
It can also be modified to communicate with other systems as well.

The MineSCADA software provides the following facilities:

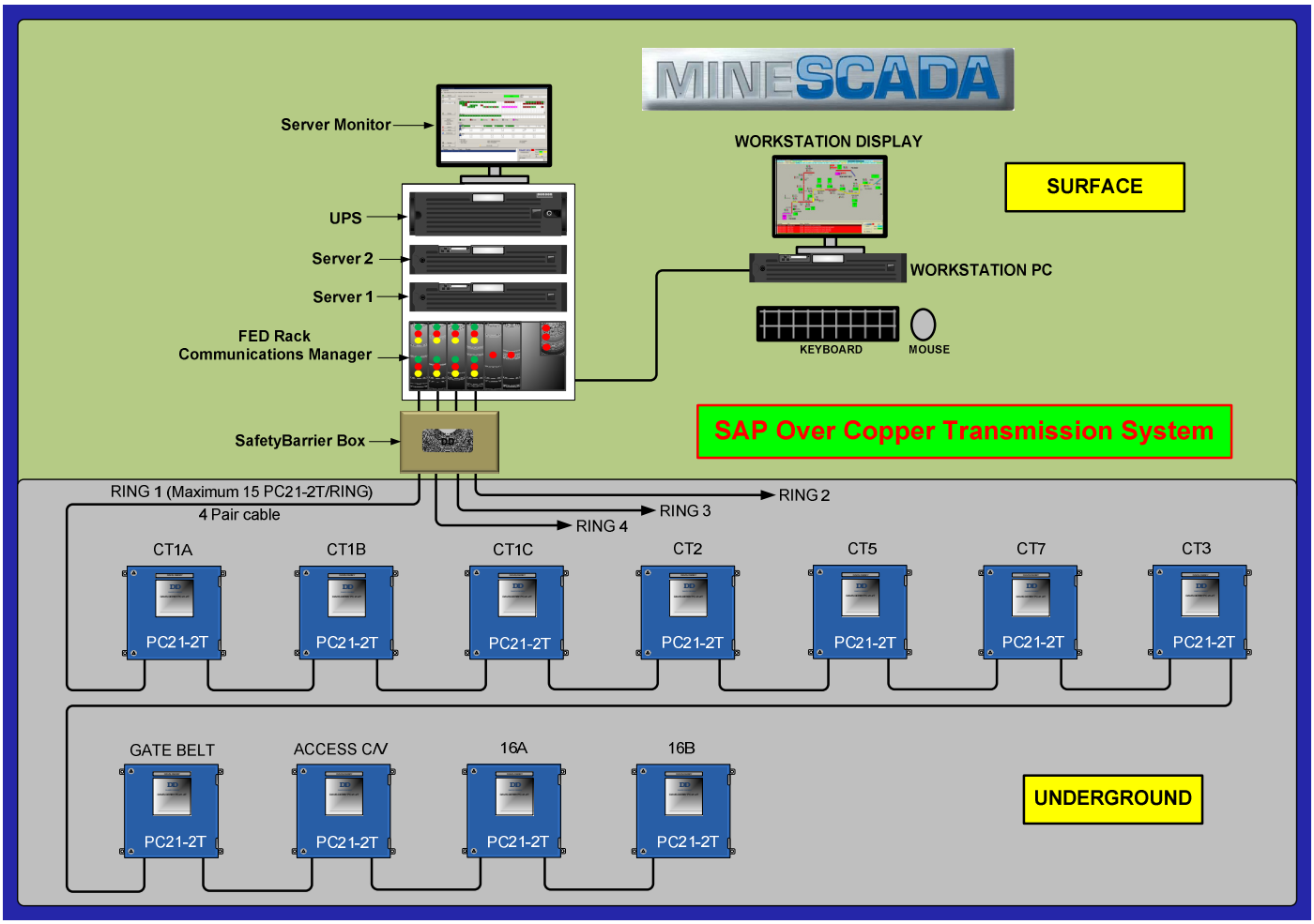
1. Monitoring and Control of Remote Plant and the Mine Environment.
2. Alarm Generation and Logging.
3. Mimic Displays.
4. Standard Status, Trend and System Diagnostic Displays.
5. Report Generation Facilities.
6. Text Message and e-mail Alarm Generation Capabilities.
7. Web Server for Remote Access from any Web Browser.

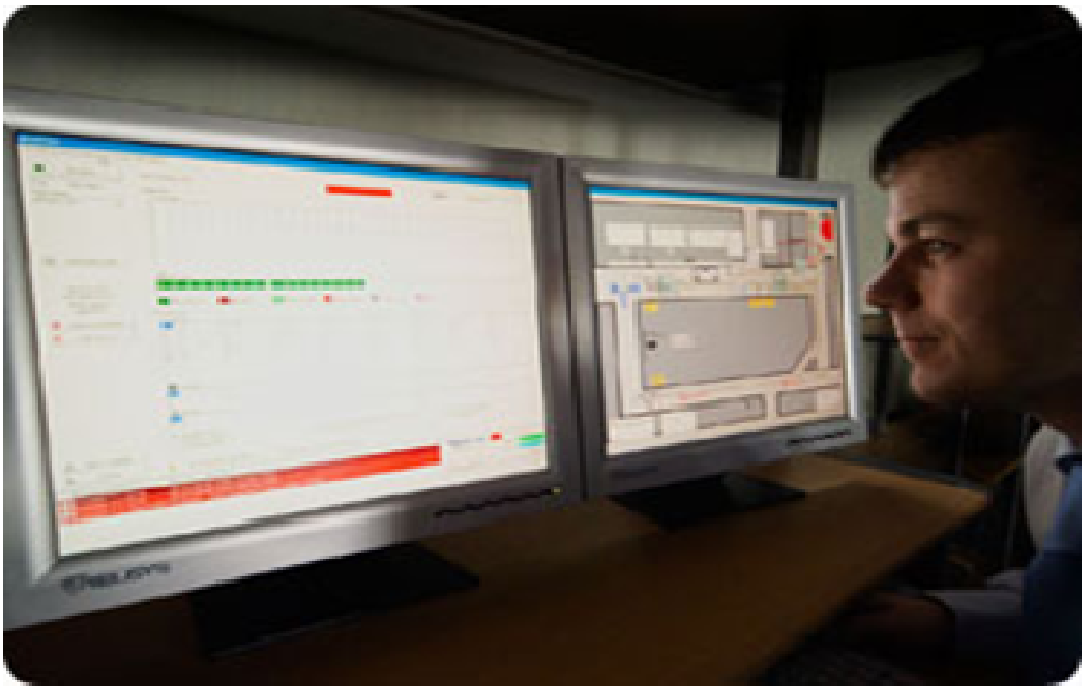
The MineSCADA mimics can be designed to show the mine as a whole and use links to go to other parts of the mine where the detailed systems are shown. There are lots of different images that can be used to show what is actually happening underground. The systems can be as simple or complicated as the administrator wants them to be. Trends can easily be configured to the user requirements to look at historic data from individual and multiple transducers.

Below shows a very basic layout for a MineSCADA system utilising Ethernet over Fibre Communication. These can be operated as a ring system or serial connection. Up to 253 individual outstations can be connected to one Ethernet line.



Davis Derby can supply SAP transmission system monitored and controlled by MineSCADA via a FED rack with 2 interfaces. Each interface is capable of having 60 transmission units connected underground. The MineSCADA system can handle 256 digital channels, 64 analogue channels, 16 digital outputs and 16 analogue outputs per outstation.



# MineWatch RF21 Access Control and Tracking System

- Personnel Tracking and Protection.
- Vehicle Tracking and Identification.
- ATEX certified M1 and Russian Mining approved.
- Multiple Transponders can be read.

## Introduction

The Davis Derby MineWatch RF21 radio frequency based access control and tracking system for hazardous atmospheres comprises of three basic components:

- Compact radio frequency Intrinsically Safe Transponders
- An Intrinsically Safe Electronic Reader Unit
- A range of Intrinsically Safe Antennas

## Applications

Applications include man-power tracking and deployment, personnel protection, vehicle tracking and fuel loading and discharging systems.

## System Components

### Intrinsically Safe Transponders

The miniature intrinsically safe personnel transponder is certified for Group I coal mines; it is an active device, containing a lithium battery to ensure maximum range can be achieved.

The battery has a life of 5 years based on being read for 10 minutes per day. The transponder sends a battery low warning when it is almost discharged.

The tag data is stored using a secure 32 bit code, which once programmed cannot be changed. The transponder measures 86mm x 56mm x 6.5mm thick.


RFID Tag

RFID Tag on Lamp

## Reader Unit

The 12vdc powered intrinsically safe reader unit is housed in a sheet steel outer enclosure which contains the main reader module and a separate printed circuit board (for the PC 21 CAN bus interface, intrinsically safe switch inputs, opto-coupled digital outputs) and connection terminals chamber and intrinsically compartment.

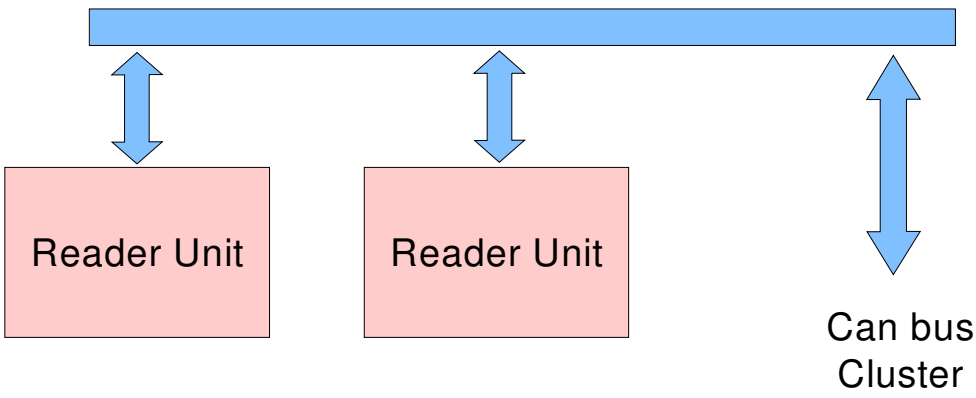
The reader can drive up to 4 Antennas which are sequentially scanned by the Antenna Multiplexer board. In its basic form the reader unit is fitted with only one Antenna, in which case the Multiplexer board is not fitted.

## Certification

The Davis Derby RF21 Reader Unit is certified Intrinsically Safe to the European ATEX Standard Group 1 atmosphere (methane in coal mines. **Sira 06 ATEX 2369; Ex I M1 Ex ia I Ma**

RFID Reader

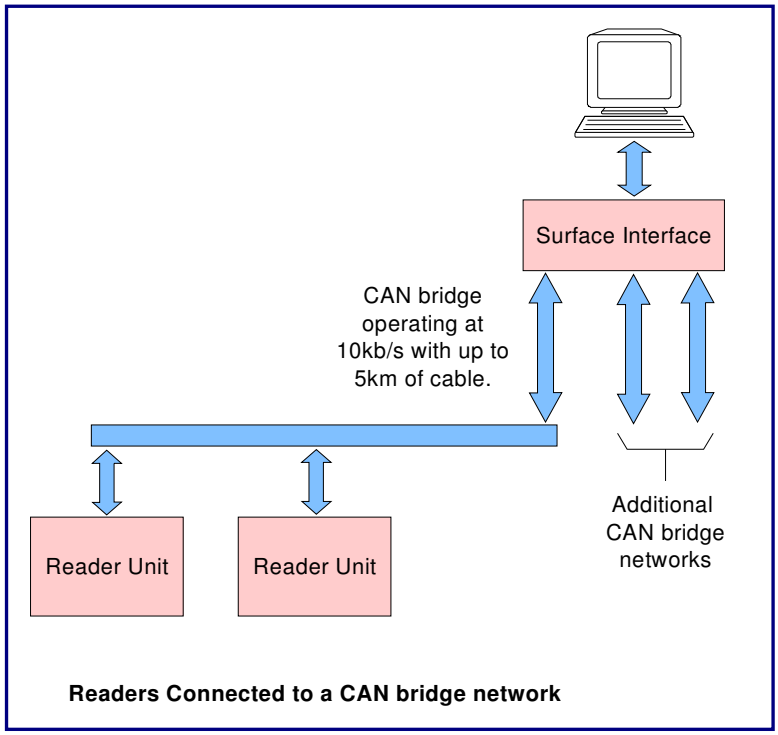
The reader is fitted with a CAN bus data link, this can be either a high speed link running at 125 kb/s at distances of 500 metres, which connects to a CAN bus cluster typically comprising of the Davis Derby Group I MineWatch PC 21 modules, there can be up a total of 8 modules connected to the CAN bus cluster. Alternatively it may be a CAN bus low speed data link operating at 10 kb/s at distances of up to 5 km. The slow speed option allows connection to a computer via a suitable Davis Derby interface unit.




**Readers Connected to a CAN bus network**

The reader unit has 4 intrinsically safe inputs derived from voltage free switch contacts. There are also 6 segregated opto-coupled outputs designed to interface with other intrinsically safe equipment.

The reader unit has an intrinsically safe compartment containing the PC 21–1R module and the associated terminals. The unit is equipped with diagnostic LED's which are visible through a window in the intrinsically safe compartment.



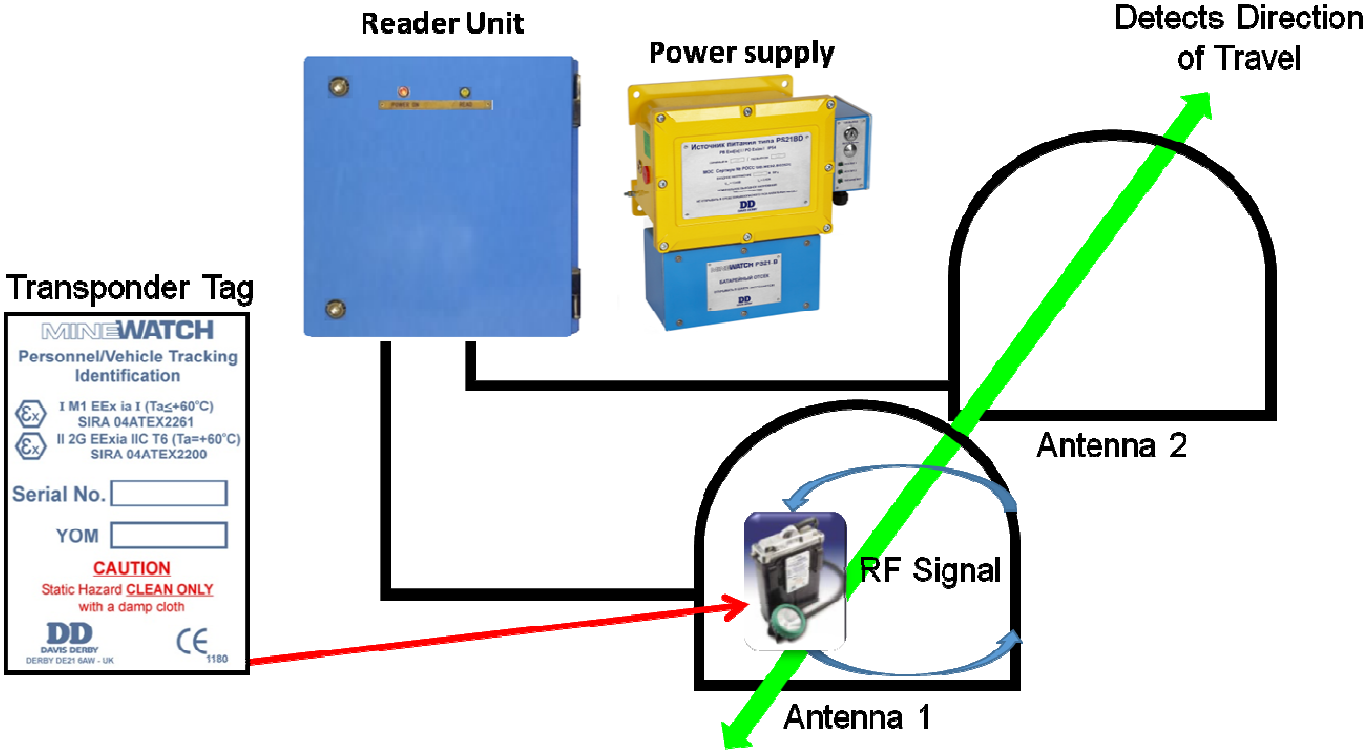

**Readers Connected to a CAN bridge network**

## Antennas

A range of Antennas for various applications are available, for man power tracking applications, these are normally hose sheathed wire loop antennas which form a portal within the roadway and so cover the entire cross section of the roadway. For man detection antennas on conveyor applications, similar hose type antennas are configured to form a loop underneath the top belt of the conveyor such that a person on the belt can be detected. These are certified as part of the intrinsically safe certification of the main reader unit.

RFID Antenna

# Basic Layout




## How Does It Work

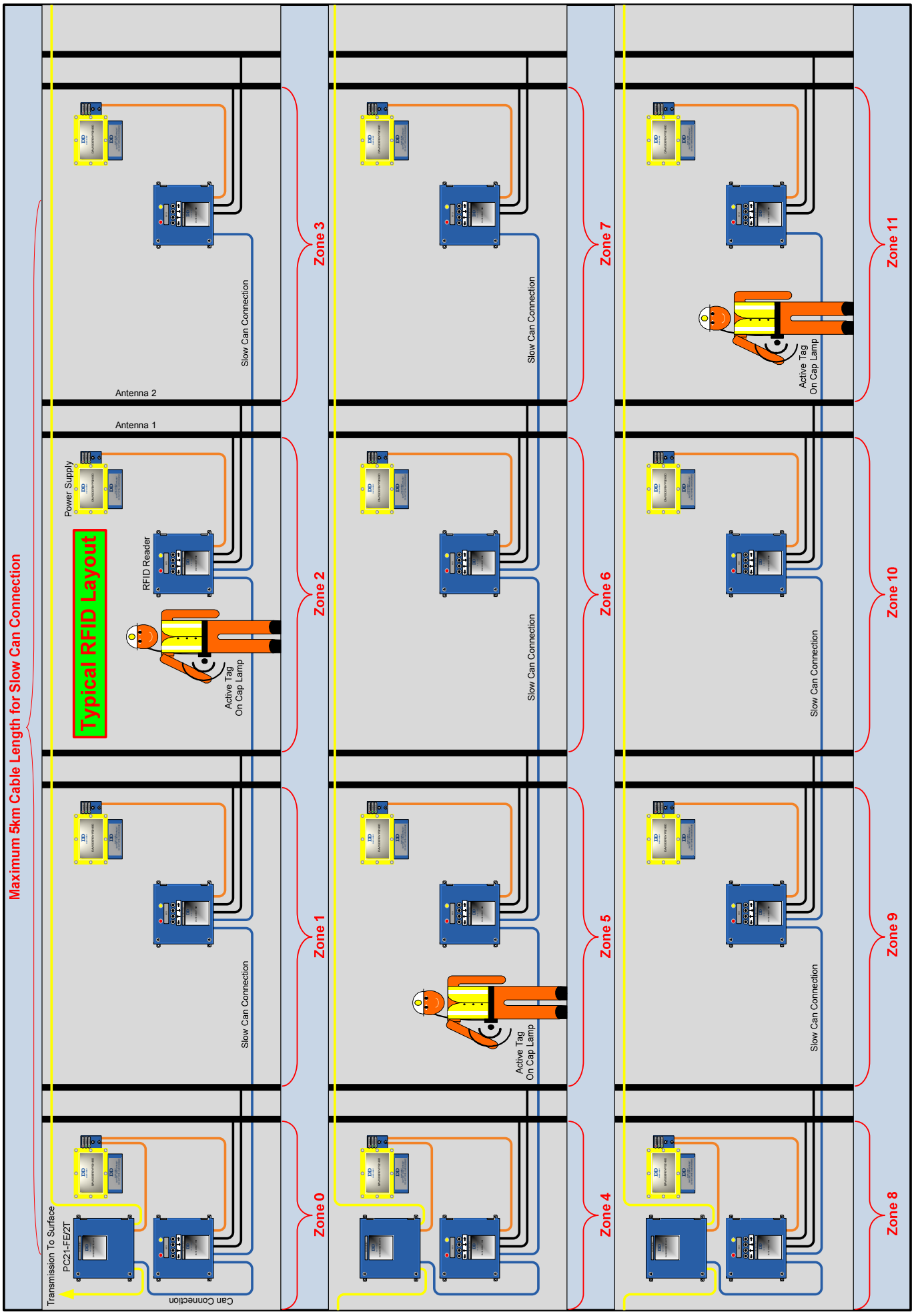
Each person entering the mine is equipped with a small credit card sized transponder (or Tag) configured with a unique number assigned to each subjects details in the Surface Control Room. These tags can be secured to a miners belt or Cap lamp battery cover to ensure all miners are locatable.

RFID readers and antennae are strategically installed throughout the mine to detect miners as they enter and exit specific zones. The information from each tag is then transferred to each reader as 2-4 antennae are passed. The reader then automatically identifies and counts any number of protected personnel and the direction of travel as they pass the antennae. When the reader has read the tag data, the information is then passed to the surface control room via a telemetry link and stored in the relevant data base. The readers 6 opto-isolated outputs allow it to feed local indicators (such as the Davis Derby programmable display) ,alarms and switchgear.

## Benefits

- Multi – Tag Identification with up to 50 tags in the Antenna field at any one time.
- Detects Direction of Travel.
- Up to four antennas per Reader Unit.
- Small easily carried credit card size Tags
- Multiple Reader configurations for multiple entry and exit applications.
- Easily integrated in to Environmental Monitoring and Control Systems.
- Easily integrated in to Conveyor Monitoring and Control Systems

# Basic Roadway Zonal Layout



# Davis Derby Wireless Personal Area Network

A hazardous group I and II certified technology that provides tracking and performance data on any asset monitored.

The System comprises of 3 basic components:

## Coordinator

The Coordinator node is a special Router device that forms the hub the other routers to join the WiPAN Router network.
In addition to operating as a Router in its own right, it is also responsible for receiving forwarded tag broadcasts from the other routers in the network. Data received by the Coordinator is output over the mine Ethernet network via UDP stream to the Surface Scada system.

## Router

These devices are responsible for receiving the Endpoint broadcasts and forwarding them to the Coordinator node. The Routers are permanently powered, so they are always ready to receive Endpoint broadcast messages. The Routers form a WiPAN network, allowing data to be transferred over the whole area covered by the network.

## End points

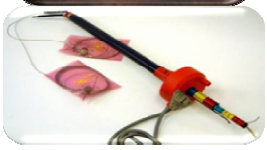
These are the devices that are tracked by the WiPAN system. Endpoint devices can be integrated into devices as such portable gas sensors, miners cap lamp batteries, remote transducers etc., and will transmit packets of data to any router in range. The Endpoints can be battery powered and spend most of their time in sleep mode to extend battery life. Endpoints can also be used in stationary application such as tell tails or fixed gas sensors monitoring.

# Applications

- Man tracking for escape and rescue with notification and acknowledgement functionality. Auto switching of signage to aid escape.
- Asset tracking and performance data on all monitored mobile plant .
- Performance data on other assets that are not presently monitored fixed or mobile.
- Wireless monitoring of transducer

People

Tell Tales



Carbon Monoxide (Smoke)

Back Spillage

Blocked Chute

Conveyors for Full Operational information

Conveyor Idler Roller Temperature and Vibration Monitoring

Belt Alignment and Tear

Belt slip

Signals

Locomotives

Gases

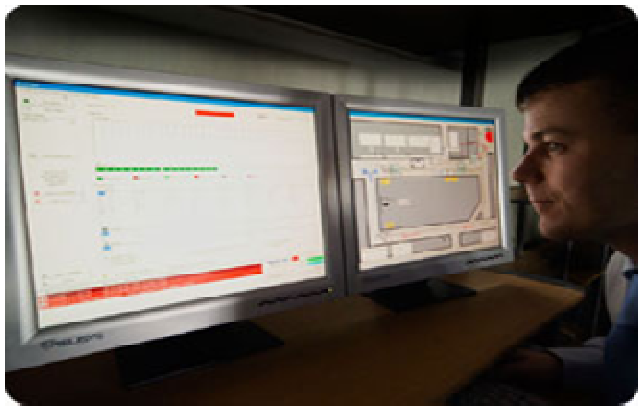
Vehicles, Authorised drivers And engine management

## Personnel Tracking

- Embedded in the miners cap lamp is a Davis Derby endpoint that sends messages to the WiPAN routers on the network showing the location of each miner.
- Within the WiPAN area the miner can be alerted to a situation by his cap lamp light being flashed on and off.
- Within the WiPAN area signage can be automatically switched.

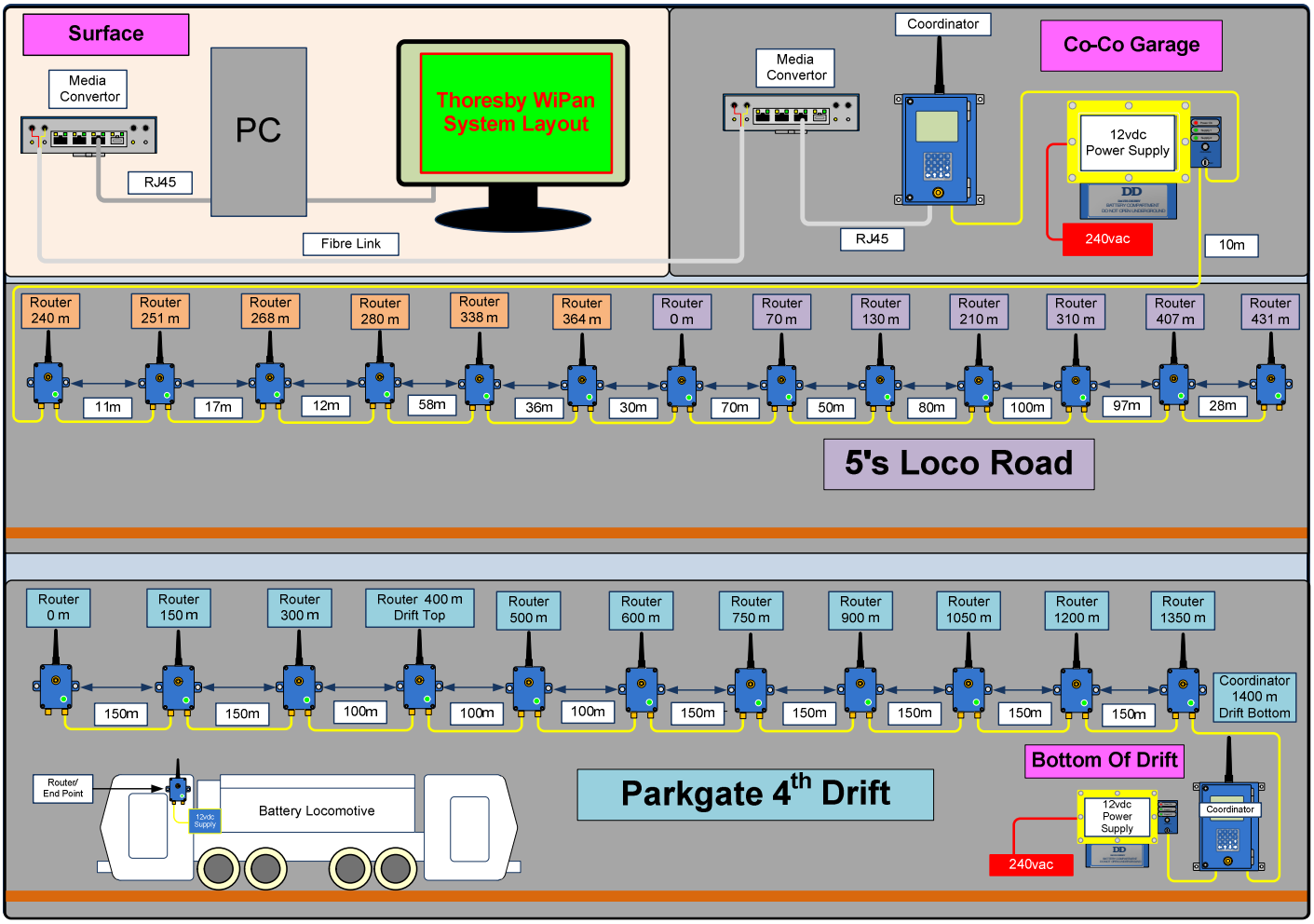
MINEWATCH

# Typical Applications Include:



- Personnel Location (within 10metres).
- Vehicle Tracking and Condition Monitoring.
- Pedestrian Safety.
- Portable Sensor Monitoring.
- Battery Powered Remote Sensors.
- Asset Tracking.
- Enhanced Diagnostics in Automation Applications.
- Emergency/Evacuation Systems.

# Typical WiPAN Layout



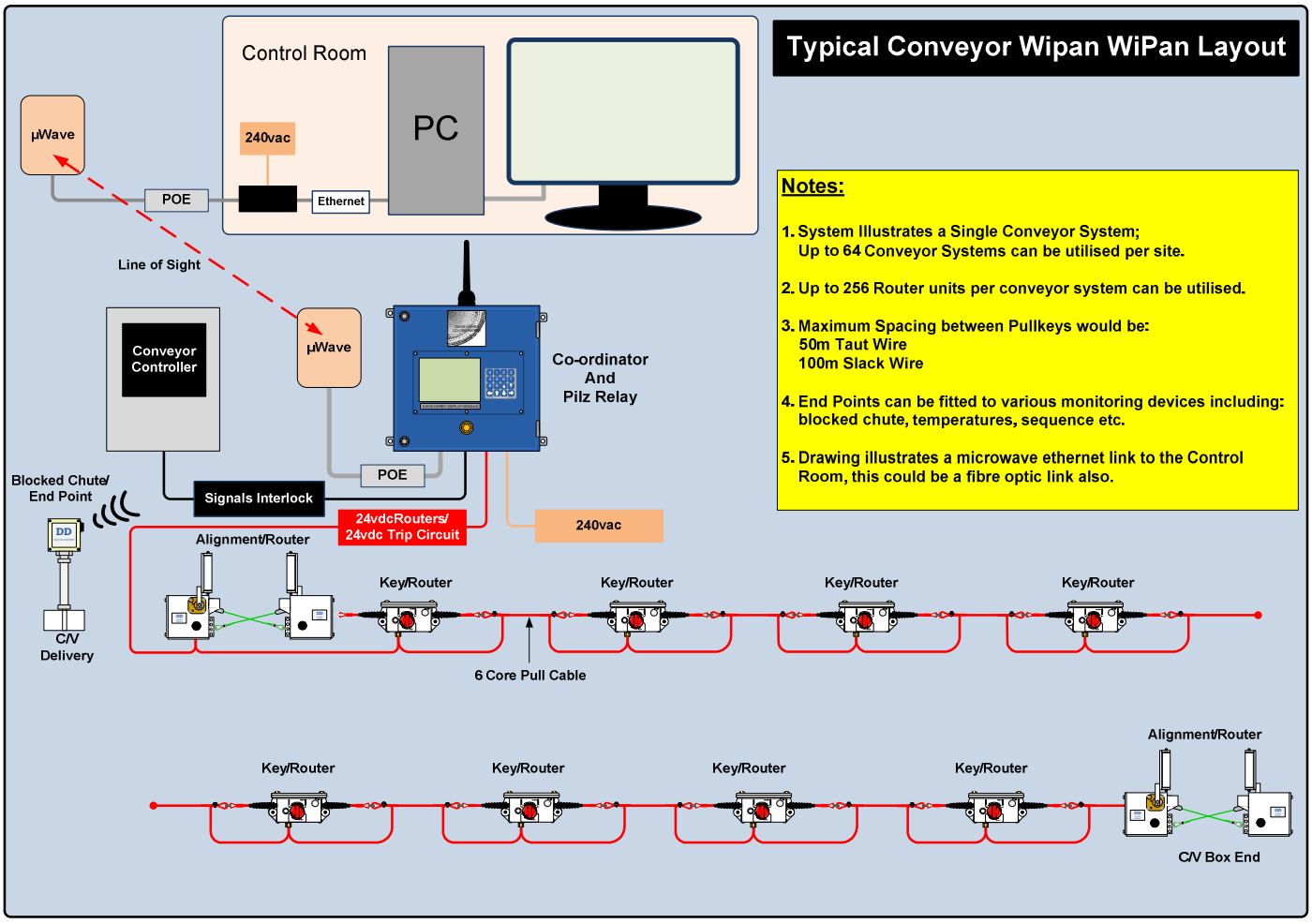

# 'So Why Join Our Network'?

By integrating our WiPAN endpoints into your portable devices, reliable, near real-time monitoring to the surface can become a reality for many safety monitoring applications.

# WiPAN Conveyor Systems

## Introduction

In today' s quarrying industry, trained engineering resources are costly and faults on conveyor pullkey systems can result in extended and unnecessary stand time. By integrating WiPAN technology into the Davis Derby pullkey and other monitoring devices, conditions of the emergency stop system and conveyor transducers can be displayed locally on the system Coordinator and can be transmitted wirelessly to the main control room and displayed on a suitable computer with KeySCADA software installed. The benefits of time saved in locating problems and increased productivity will ensure a speedy payback. The system can be easily retro fitted to existing Davis Derby taut wire pullkey installations. This is because the WiPAN PCB router is mounted on the pullkey lid which can be exchanged with existing lid and a simple wiring loom change is required on the pullkey terminal block.



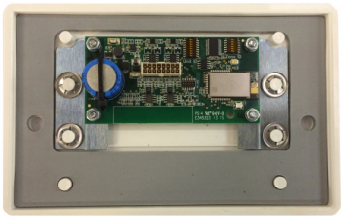

## System Components

The WiPAN conveyor system consists of three basic components:

1. WiPAN Coordinator with PILZ Safety Relay.
2. WiPAN Pullkey Router
3. WiPAN Endpoint
4. KeySCADA monitoring in Control Room via Ethernet Link from Coordinator. (Optional)

MINEWATCH

## Pullkey Specification



**WiPAN router Mounted on Pullkey Lid**

The WiPAN board in the pullkey can detect lockout, left-slack and right-slack conditions. In addition it can detect open circuit and short circuit in the safety circuit and can use a remote lockout feature to identify the location of the fault. It also monitors its own supply voltage (before and after regulation) and has backup power to give it time to notify the system of power loss.

Rather than just notifying the user of the first pullkey that has tripped or a fault condition the WiPAN system identifies multiple simultaneous faults allowing all faults to be corrected at the same time.

The new WiPAN pullkey has high intensity daylight-visible LED's fitted to help identify which pullkey or pullkeys have tripped. These LED's can also be retrofitted during standard pullkey conversion to WiPAN type units.

| Parameter | Minimum | Typical | Maximum | Units |
|---|---|---|---|---|
| Supply voltage | 4.5 | 12/24 | 36 | V |
| Power usage | 120 | 130 | 140 | mW |
| Wireless range | 100 | 200 | 400 | m |
| Pullkeys per conveyor (Unit ID) | 1 | | 256 | |
| Conveyors per site (Zone ID) | 1 | | 64 | |
| Pullkeys per site | 1 | | 16384 | |
| Fault tolerance | CAT II | | CAT III | |
| Digital inputs* | | | 4 | |
| Digital outputs* | | | 2 | |
| Analogue inputs* | | | 6 | |

*Number of available I/O depends on configuration

## Other Devices

In addition to the pullkey a number of other conveyor monitoring devices can be WiPAN enabled to identify the device that has caused a conveyor to trip. These include:

- Blocked chute probe
- Belt alignment
- Two-in-one (belt alignment and belt tear detection)
- Back-spill detection
- Temperature Monitoring

Other device types can also be WiPAN enabled, contact Davis Derby for details. Every device has its own Unit ID and Zone (Conveyor) ID to make it uniquely identifiable, both at the Coordinator and on the KeySCADA system (if used).

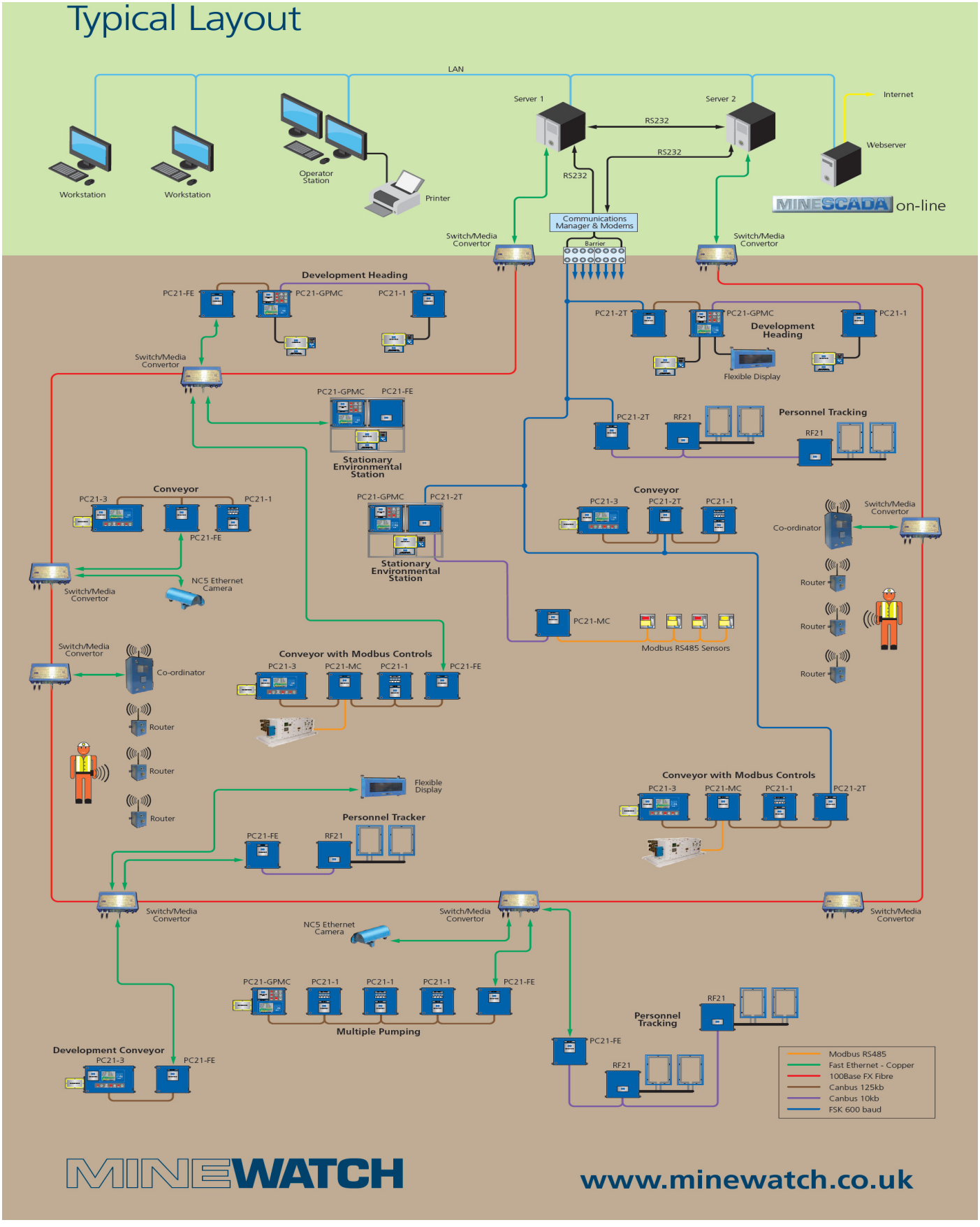
## KeySCADA Software

The KeySCADA software gives a visual presentation of each conveyor showing any trips and faults that are present. It also keeps a log of alarms and events and can display historical data on trend charts. KeySCADA provides the option of SMS and email alerts to one or more recipients to notify them of trips or fault conditions. There is an option to export information to other SCADA systems if required.

DAVIS DERBY

# Intrinsically Safe Data Transmission System

## Typical Layout




MINEWATCH

www.minewatch.co.uk

# DAVIS DERBY

## ‘Safety In Automation’

**Davis Derby is a world leader in the Design, Manufacturer and Installation of Control and Monitoring for the Mining and Extractive Industries.**

**Note:-**Prices can be supplied for any Davis Derby item featured in this brochure on request.

Davis Derby Limited · Alfreton Road · Derby · England · DE21 6BF
Tel: +44 (0)1332 227500 · Fax: +44 (0)1332 372190 · e-mail: **sales@davisderby.com**