DIESEL VEHICLE METHANE SHUTDOWN SYSTEM

The Methane Monitor Shutdown System consists of the following components being fitted to a Diesel machine: -

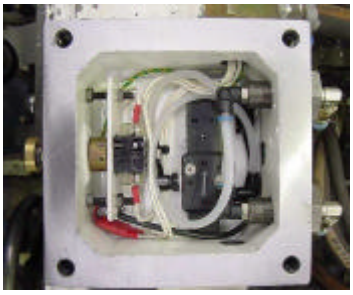
- Main Methane Monitor Flameproof Enclosure
- Shutdown Solenoid Flameproof Enclosure.
- Air Circuit Bug Eye Indicators

MAIN METHANE MONITOR FLAMEPROOF ENCLOSURE

Manufacturer :- Nautitech Mining Services
Dimensions :- 350 (L) x 200 (H) x 155 (D)
Weight :- 37kg
Houses :-

- Two batteries, regulated power supply and battery charger, microprocessor control unit with the methane sensors fitted to the side of the enclosure via an approved flameproof gland entry.
- On board batteries allow for fail safe shutdown system starting.
- (2) separate batteries for redundancy and longer life.
- Batteries are Exia when engine is off and Enclosure Isolator is Locked Off.
- Microprocessor controlled methane monitor.
- Approved Ex.s sintered methane sensing head.
- Regulated power supply and battery charger supplied from the alternator.
- Calibration of the sensors is made easy via magnetic hall effect sensor switches which are operated through the display window using a magnetic pen.
- Display unit is visible through a viewing window on front of the enclosure.
- LED's on the display unit provides indication for :-
    - Power On – Ready to Start
    - Methane Warning Level
    - Methane Shutdown
- LCD readout on the display unit provides :-
    - % Methane Reading
    - Main Menu Screen (Password Protected)
    - System Settings
    - Calibration Mode
    - Access to these functions are via the magnetic hall effect sensor switches

SHUTDOWN SOLENOID FLAMEPROOF ENCLOSURE



Manufacturer :- ATF Mining Electrics
Dimensions :- 180 (L) x 120 (H) x 180 (D)
Weight :- 10kg
Houses :-

- Shutdown solenoid fitted inside.
- Air lines fitted to this enclosure via approved flametraps and air fittings.
- Methane Monitor Power Up push button is located on the front of this enclosure. When pushed, the batteries are woken to power up system and energise shutdown solenoid.

AIR CIRCUIT BUG EYE INDICATORS

- Bug eye indicators on the air lines to either side of the Methane Shutdown Solenoid will indicate the state of the shutdown solenoid.
- These are located on the dashboard in the driver cabin.

BASIC OPERATIONAL GUIDE

1. STARTING

Due to the shutdown system being fail safe, the methane monitor is powered via the batteries. To start the system, the Methane Monitor Power Up push button in the drivers cabin is pressed to wake up the batteries and energise the system.

A self-test cycle of around 15 seconds takes place where the methane sensor is checked. During this period, the Red LED's on the display will indicate that the self- test is occurring and a Kangaroo will appear across the display screen. At this stage the engine OFF – RUN Valve can be switched to the RUN position, providing air to the shutdown solenoid. The INLET AIR SUPPLY bug eye indicator should be indicating GREEN

Once the 15 second period has elapsed, the Green LED's will indicate that the methane system is okay and the shutdown solenoid is energised allowing the engine to be started. This can be confirmed with the SOLENOID ENERGISED bug eye indicator turning to the healthy GREEN status.

This will now allow the engine to be started by pressing the START VALVE, as per normal diesel machines.

The Methane Shutdown Solenoid is in the air circuit of the engine shutdown system in series with the door interlock valve.

2. BATTERIES

There are two sets of Ni-Cad Batteries fitted to the system. This is for a couple of reasons, firstly to provide redundancy and also to increase battery and system life.

The basic operation of the two batteries is that only one battery is being used at any one time. So when the system energises, the microprocessor monitors both batteries and selects which of the two is the highest charged. It will leave this one on to run the system and switch the lowest charged off and places it on charge once the alternator is running.

The lowest charged battery will remain on charge until it reaches a set level above the other battery, which is in use. Once it reaches that level, it will be removed from the charger and the other battery will be placed on charge. This sequence will continue to keep the batteries alternating and both at reasonable charge levels.

Each set of batteries is encapsulated in their own case and each battery has a fuse on the charging input and battery output. Should a battery blow a fuse or fail in service, the system can continue to operate from just the one battery.

3. DISPLAY

The display panel is located on the front of the Main Methane Flameproof Enclosure and has the following features :-

- GREEN LED Cluster for Methane System “HEALTHY” Status
- AMBER LED Cluster for “1% METHANE WARNING” Status
- RED LED Cluster for “METHANE SHUTDOWN LEVEL” Status.
- LCD Display for “% METHANE DISPLAY” and Status of various System Settings and Calibration Modes
- (4) Hall Effect Magnetic Sensor Switches for System Settings and Calibration Modes.

4. CALIBRATION

This is accessible by a password-protected mode on the display screen. It is activated via the hall effect magnetic switches and there is pre-programmed steps which make this easy to be followed.

Once this function is entered into, it requires the unit to be set to zero gas. This can be achieved by applying a 0% of gas or can be done when the % Methane displayed is 0%. This level is accepted by the ENTER magnetic switch.

Then the Span Gas Level is required to be setup. This is achieved by setting the test gas level, then applying the test gas to the sensor. Once this is confirmed, it is entered and calibration is complete.

5. BYPASSING SYSTEM

In the event that the Methane System fails or gas is detected, the mine site is required to have a standard procedure for taking action as per Clause 250 of the Coal Mining Safety and Health Regulation 2001.

There is no allowance for an electrical bypass for the system to be overridden. This is due to the fact that the shutdown solenoid is fail safe, and it requires to be energised via the battery prior to the engine starting. It is not practical to do this electrically because it is not always guaranteed that there will be a supply available to energise the solenoid.

Therefore, it can be considered if the mine site requires a bypass, that this can be achieved by placing some type of lockable valve in the air circuit across the shutdown solenoid. It would then require the mine site to document procedures for this to be operated.