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Manufacturers of Switchboard, Motor Control Centres and Modular Control Systems

Winch Signaling System

Product Description

At a Glance:
The Winch Signaling System is a plug and play safety management system to assist the winch driver in his duties of moving material safely through the gulley. It also assists the winch driver to safely manage and assist people using the gulley as a walkway. This is achieved by means of the existing mechanical winch system in conjunction with a Winch Signaling System

The Winch Signaling System consists of the following components:

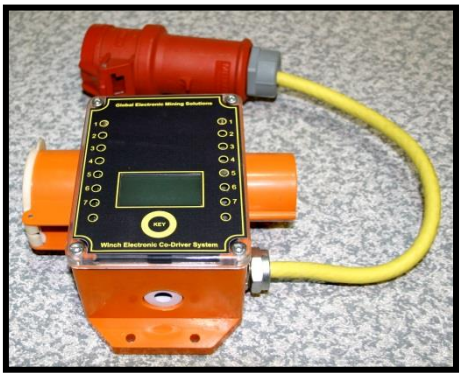
1. Winch starter
2. Winch Controller and mounting bracket
3. Winch signaling device
4. Cabling 42m or 21m and 5m.
5. Magnetic key
6. Plastic cable holder

Winch Starter

Starter with a Winch Controller

Winch Starter Box:
The existing winch starter-box will still be used without any wiring changes. Only the existing *controller and splitter module* will be removed and replaced with a *bridge piece module in each 11 pin base*.

Winch Controller:



This winch controller is retro-fitted on top of the existing winch starter-box with a ready-made bracket.
No drilling, welding or additional cables are required.
This controller provides a LED as well as a LCD display indication to the winch operator.
The LED indication is used by the driver as a quick viewing reference option to observe the status of the signaling devices in the gulley.
The LED indication does not provide diagnostic or fault finding conditions, but the LCD display is utilized to gain detailed information when any faulty or unresolved conditions appear.
It also has a non-volatile data logger as standard.
The Winch Controller interfaces with the starter box and supplies independent power to the left and right installed devices.

Winch Controller mounting bracket:

This bracket is used made of mild steel and power coated for durability, the Winch Controller in fitted to the winch Controller mounting bracket and fitted to the mounting holes of the Winch Starter box.

Signaling Device:

The signaling devices are installed along the full gulley length, approximately 40m apart.
The device illuminates red or green to indicate safe or unsafe conditions and a buzzer will sound as an audible indication.
These devices have a **dual** signaling capability. It can be signaled by means of a pull cable or cap-lamp.
Cap-lamp signaling can be generally enabled or disabled.
The Sentry device inside the signaling device will detect cap-lamp light movement of up to a distance of 16 meter as opposed to 5 meters at best in the past. Three LEDs are used for additional indication and fault analysis, for power and communication indicators.

42m or 21m Cable:

This is a 42m or 21m cable made from the standard yellow armored, ***four-core***, and pull wire cable. The signaling devices are linked with this armored pull-wire cable, which serves as a power and signaling cable. This cable is supplied as a standard 40m or 21m length fitted with a 16A male plug and female socket on each end. 5 Plastic cable holders are placed in the center of the reel and can be removed by pulling out the two nails on the outer of the reel. These different lengths of cable are used to link the Winch Controller with the first signaling units installed inside the gulley.

5m Cable:

The 5 meter cable is made from the standard yellow armored, ***four-core***, pull wire cable.
This cable link the Winch Controller with the winch starter box and if close enough the first signaling device.

Magnetic Key:

This magnetic key serves three functions. The winch driver uses this key to initiate a prestart siren startup cycle, stop the winch motor and to reset the signaling device from a lockout condition.

Plastic Cable Holder:

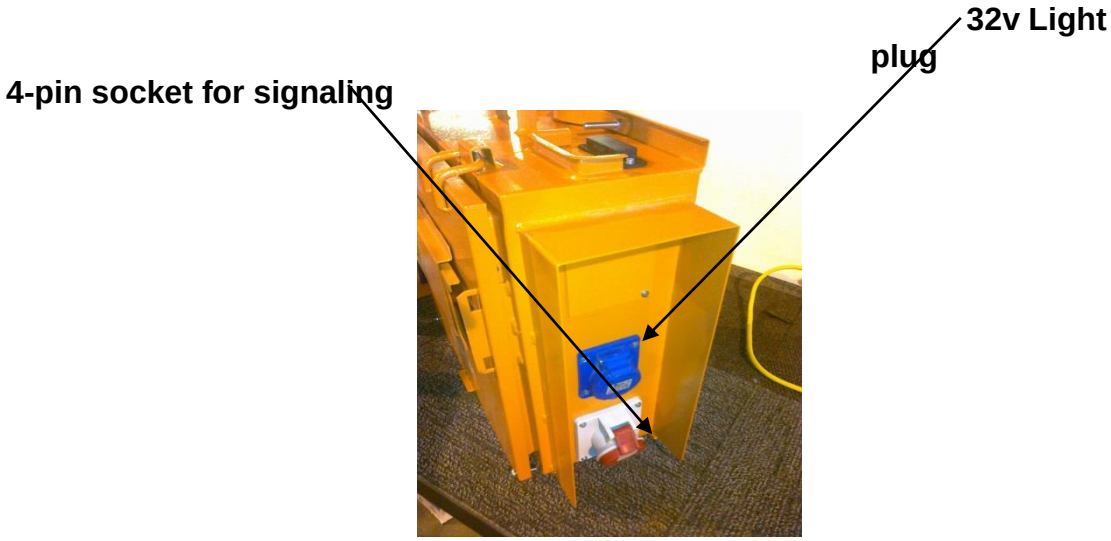
These devices are used to support the 42m Cable along the gulley sidewalls.
The ABS cable holder as apposed to the original metal pigtail is much less abrasive to the cables.
The pull-wire is routinely installed on eye level. The ABS cable holder do not stand proud from the side-wall as was the case with the metal pegs and therefore prevents possible injury to personnel.
Cable replacement is now much easier and faster.

Installation and Operating Procedure

INSTALLATION PROCEDURE:

1. After the winch has been installed to standard, the electrician must install the Winch Starter Box and winch controller. The winch starter box must be installed that it is within arm's length from the winch driver, the starters box cover (door) must face the operator to enable him to access the emergency stop button, the magnetic key reader and the circuit breaker on the winch starter box without leaving his normal driving position. Plug the blue 3-pin male light plug into the blue 3-pin female plug of the starter box.

2. Mount the light as high as possible on the mechanical prop to shine on the winch and tip area without shining into the operators eyes. Tie the light and the cable neatly against the prop to secure it firmly in position.



3. Plug the 5m extension cable plug in the RED 4-pin socket on the starter box and into the left hand side plug on the Winch Controller situated on top of the Winch Starter (Orange unit).
4. Nail 4x100mm mild steel nails through the 4 holes provided in the base of the signaling device to the wooden packs/ poles next to the gulley at the required distances and height as per Mine installation procedure.
5. Use the 21 m or 42 m to connect the signaling devices to each other for proper communication and correct functioning.
6. In order to prevent damage to the yellow cable that will be used as a pull wire the plastic cable holders inside the cable reel can be removed and used to support and cable along its route.
7. The winch signaling system can be installed on one side of the gulley or on both sides – depending on the application required.

8. The Winch signaling system is installed and need to be tested for correct functioning

Functions of the Winch Signaling system

1. Pre startup warning alarm
2. Indication
    a. Safe to enter the gulley
    b. Unsafe to entre gulley
3. Signaling – Communicating with the winch driver
4. Trip out the electrical supply to the winch motor
5. Auto reset system within 60 seconds if trip is not activated again.
6. Lock out system if trip is activated again and winch driver is required to manually reset at signaling device
7. Cap lamp used to lock out signaling device if bell pull is not within reach during auto reset time

Start-up and Operating procedure

1. Start-up Cycle:

    Open the slide for Emergency Stop Push button. If the slide is not open the starter unit cannot function.

    Slide for emergency pushbutton
    The pre-start cycle can be initiated only by means of a magnetic key, held by the driver.
    The winch driver need to hold the magnetic key on the demarcated area on the winch controller unit and the pre start up alarms will sound at each controller and signaling device connected to the system for 15 seconds. The LED's on the signaling devices will change color from green to red

    During a '**Safe to enter the gulley'** condition the winch starter is locked out until an uninterrupted 15 second pre-start audible and visual cycle is completed.
    The pre-start cycle can be terminated by any of the above signaling methods.
    The winch driver can only restart the winch after a 15 second pre-start cycle during which no signals were received from anybody, anywhere in the gulley.

2. The main breaker can be switch to the “ON” position in order for the winch to be used.
3. Signaling during winch operation:
   Signals can be achieved in three different ways from anywhere across the gulley:
   a. Signaling by means of pulling the pull-wire.
   b. Cap-lamp signaling when this option is enabled. Cap-lamp signaling will be possible up to 16m from a signaling device (guard (sentry) device). This method was redesigned and is much more reliable and accurate
   c. Driver acknowledgement of signal received – driver swipe magnetic key over key area indicated on the controller.

4. **Safe to enter the Gulley' condition:**
   When the winch is locked out and it is safe to travel across the gulley, all installed signaling devices illuminate **Green** and the buzzer is off.

5. **Unsafe to enter the Gulley' condition:**
   When the winch is unlocked after a successful uninterrupted pre-start cycle and it is unsafe to travel across the gulley, all installed guard devices illuminate red and the buzzer is off.

6. **Signaling device Tripping the Winch:**
   When the system is in an '**Unsafe to enter the Gulley condition',** the winch can be stopped by signaling for longer than 3 seconds with the pull wire.
   The system then changes into a '**Safe to enter the Gulley condition'** and the main breaker is tripped**.**

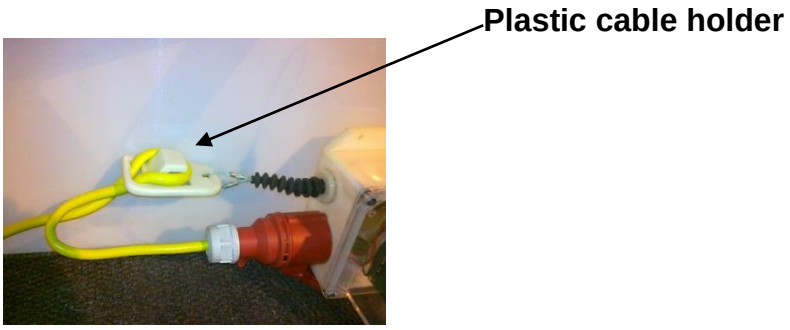
   The 60 second auto reset period will start and if a trip signal was not received during this period the winch driver can initiate the startup sequence again at time out with his magnetic key on the controller .
   If any trip signal was received from a signaling device that unit will initiated a lock out command and the winch driver need to physically re-set that unit with his magnetic key by swiping it on the face / front of the unit before the startup sequence can be initiated, the unit that tripped the system will flash red and green in order to indicate it has tripped and need to be manually reset.

7. **Stop / Start of the winch:**
   The winch driver can only start the winch motor after a pre-start cycle. The pre-start cycle is initiated by means of a magnetic key held by the driver
   The winch can also be stopped by any of the following methods:
   1. Emergency button
   2. Magnetic key
   3. Over-load condition
   4. Switching the breaker to the OFF position

EXTENDING the SIGNALING SYSTEM:

Take note of the following requirements before installing or extending the signaling system:

1. The signaling cable and signaling devices must be easy to reach by pulling the cable or pull wire to the signaling device from any point along the scraper path.
2. Always place the signaling components such that it will not foul with the scraper or mono winch systems or system's attachments.
3. To extend the signaling system, install the first 42m extension cable and secure it with plastic cable holders maximum 6m apart on the side of the centre gully being mined.
4. Bend the cable on both sides and hook the bended side through the cable holder on the signaling device unit, pull the cable tight and hook the other side on the next signaling unit. Connect the 4-pin red plug side to the Signaling device unit and the 4-pin red female plug of the next signaling unit.



OPERATING PROCEDURES:

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3.4 Place magnetic key onto magnetic key reader.

3.5 The signaling units will sound for 15 seconds, during the 15 seconds the winch driver cannot start the winch. All lights are red to indicate to people that the winch is going to start.

3.6 After the 15 seconds the winch operator can switch on the main circuit breaker and the winch will be active.

3.7 In the event of an emergency the winch operator must activate the **EMERGENCY STOP PUSH BUTTON.** This will deactivate the starter and the winch. (Signaling color will change from red to green)

3.8 The signaling system allows us to send signals and to trip the circuit breaker in the winch starter if the operator doesn't respond to any signal. (Signaling is either by pulling the signaling cable or by flashing the cap lamp on the signaling unit.)

3.9 In the event of any of the signaling units tripping, the driver has to take the magnetic key and swipe it for 2 seconds on the specific unit which was tripped.

a. This unit forces the driver to go and reset the specific unit that has tripped. On resetting it, the unit is now in the failsafe mode and at this point the winch will not start, the driver has to go back to the winch and swipe the magnetic key on the magnetic key reader, and startup procedure will commence.
b. If the driver responds promptly to signals received, it will not be necessary to trip the winch and cause the driver to go and reset the system at the point tripped.
c. In an emergency the winch must be stopped or tripped immediately by giving one long signal either by pulling the signal cable or by shining a light continuously on the nearest signal unit from a direction facing the signaling unit and within 5m from the unit.
d. The winch operator can also sent a return signal to indicate that he has received a signal and acknowledge it by scanning his magnetic key once on the magnetic key reader.

4.0 DISTINGUISHING FEATURES OF THIS SIGNALING SYSTEM COMPARATIVE TO OTHER SYSTEMS ON THE MARKET:

a.1 The starter box is simplified with no other device equipment, such as the trip-box / master controller previously installed or mounted on the starter box, therefore:

a. All auxiliary equipment to the starter box interfaces via a four pin panel socket.
b. The winch starter box now operates without any interference from any third party equipment.
c. Electricians are not required to have any specialized knowledge of third party equipment during the installation or maintenance on a starter box.

4.2 Combination signaling device and trip-box / master controller.

a. The first signaling device installed at the winch starter box also becomes the trip box.
b. This eliminates the need for a separate trip-box installed with the starter box.
c. A minimum functional system can be achieved by using one 5m cable and the combination device.
d. There is a significant installation and cost saving.
e. A minimum functional system can be set up in less than five minutes.
f. This unit eliminates the need of a CT module or auxiliary contact on the breaker; however the device will still determine the status of the winch motor, emergency button, overload and breaker.

4.3 SIGNALING DEVICE:

a. The 4 pin male and female connectors are molded into the device. This eliminates fly leads to the device which also improves durability.
b. All cable connectors inside the device are of a latched type.

c. The enclosure is IP65 rated.
d. An optional “cross gulley signaling” add-on device can be mounted on the device to signal from both sides of the gully. This feature eliminates the need to have a system and bell wire installed on both sides of the gulley. Cap lamp signaling is no longer required. This is another significant cost saving.
e. The new improved pull-wire connection to the signaling device eliminates the use of D-shackles and Crosby clamps, which used to damage the cable and was also prone to theft.

4.4 <u>TRIP OR FAILURE INDICATION FEATURE</u>:

This new upgraded system indicates a trip or failure condition by means of flashing red lights on the particular device responsible for the condition. We re-designed to indicate a failure / trip on the signaling device only, for the following reasons.
In older, previous systems it was required to number or address each device by either a DIP switch or electronic sequential numbering to have fault indication on the master / trip box which required more complex electronics and communication protocols.

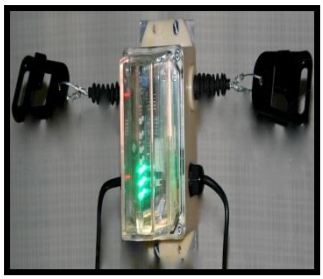
The <u>disadvantages</u> of the older previous systems are:

a. The DIP switch method required the switches to be set during installation. The device enclosure had to be opened during the installation and improper closure of the device could lead to water and dust contamination.
b. The complex communications necessitated advanced electronics and would increase cost and be prone to electronic failure.
c. The communication also required the four core wire to be increased to a six or seven core wire. This in turn caused the plugs and socket pins to be increased and ultimately increase cost, wire connections and possible loose wire connections.
d. All the above used to lead to more nuisances tripping, increased maintenance and production losses.
e. It can adversely affect the use of splitter cables.

The advantage of the redesigned indication mechanism is, splitter cables can be used anywhere in the installation.

4.5 As an optional extra a temporary handheld RF remote signaling device is available during development stages prior to permanent signaling device installation.

Old signaling device starter



New signaling device starter