

General Description

Grabwire switches are the equipment of choice to provide safety protection over long distances. Prior to the development of Grabwire switches, machinery such as conveyors had to be fitted with a number of separate Emergency Stops.

Positioning the 'Stops' such that at least one could be reached from any point, was often difficult to fulfil.




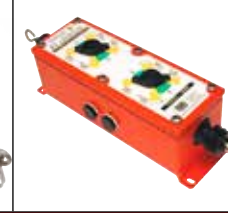
A Grabwire switch assembly gives a continuous and uninterrupted safety provision over long distances. With our Live-Wire system, this can stretch to 2km.

Conveyors are the obvious application for such devices, but with the ability to take the protection wire around bends, and provide safety cover over both horizontal and vertical runs, the system lends itself to many different applications.

Craig & Derricott offer two different systems:-

- The 'GW' range, is a tensioned wire system which is designed to cover small to medium sized runs. (Up to 100m max. between pairs)
- The 'LW' range, specially developed for long installations (Up to 2km).

GW Range - Tensioned Wire System

Reference standards:- BS EN ISO 12100-1:2003 Pts. 1 & 2 BS EN 418 BS EN 60947-5-1 BS EN 60529 BS EN 60947-5-5 BS EN 60204-1 PD 5304				
Catalogue Ref.	GWN1	GWN2	GWN2/SS	GWDE
Description	Universal single ended	Universal single ended	Universal single ended	Universal double ended
Max. span between pairs (L) *	50m	100m	100m	2 x 100m
Enclosure material	Die-cast Aluminium (LM24)	Die-cast Aluminium (LM24)	Stainless Steel 1.6 mm Grade 316	Sheet Steel 1.6 mm
Finish	Textured Powder Coat RAL 3020	Textured Powder Coat RAL 3020	Polished	Textured Powder Coat RAL 3020
Ingress Protection	IP65	IP65	IP65	IP65
Rope Tensioner	Included	Included	Included	Included
Earthing	M4 Internal & External	M5 Internal & External	M5 Internal & External	M5 Internal & External
Electrical Contacts	2 N/C (Safety) + 1 N/O	2 N/C(Safety) + 2 N/O	2 N/C (Safety) + 2 N/O	2 x {2 N/C (Safety) + 2 N/O}
Electrical Rating:- Ith / Ui	10A/415V	10A/415V	16A/600V	16A/600V
AC21/22/23A to BS EN 60947-3	-	-	16A at 415V	16A at 415V
AC15 to BS EN 60947-5-1	5A at 415V	5A at 415V	5A at 415V	5A at 415V
Optional Indicator Lamp	✓	✓	-	-
Setting-up indicator	✓	✓	✓	✓
Hand reset knob	✓	✓	✓	✓
Universal (LH or RH) mounting	✓	✓	✓	✓

* Or between switch & anchor box

Ordering Requirements



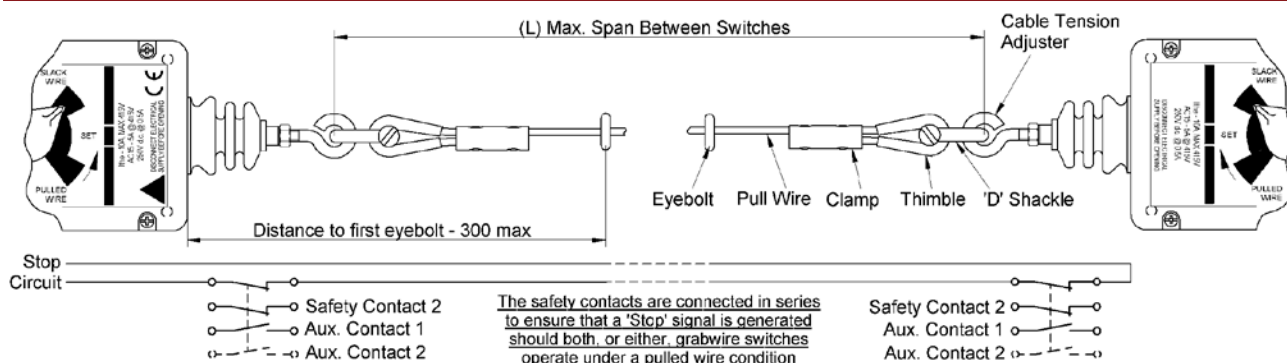
Connection Kits

Apart from the Grabwire switch, the only other item required in a simple set-up, is the connection kit. In the kit you will find all the parts necessary to install the system. Each kit includes:-

- Multi strand steel catenary cable with red PVC covering *
- Stainless steel eyebolt supports. Sufficient to support the cable at 2M intervals. Supplied complete with two fixing nuts.*
- 2 x Stainless steel thimbles.
- 2 x Stainless steel 'D' shackles.
- 2 x Stainless steel clamps.

Description	Catalogue Ref.
Basic connection kit *Catenary wire and eyebolts not included	GK00
5m Connection kit All items for installations up to 5m	GK5
10m Connection kit All items for installations up to 10m	GK10
20m Connection kit All items for installations up to 20m	GK20
50m Connection kit All items for installations up to 50m	GK50
75m Connection kit All items for installations up to 75m	GK75
100m Connection kit All items for installations up to 100m	GK100

Installation Data



It is necessary to place the first eyebolt close to the switching body to ensure that if the wire is pulled at a very oblique angle, then the pull on the switch remains linear.

Recommendations for installation

When planning a grabwire installation, it is vital that the operators safety is always the primary objective.

- Plan the route of the 'pull wire' carefully to ensure maximum accessibility by the possible users. Ensure that supports can be placed at a maximum of 2m spacing.
- The placement of the grabwire switches need to be in reachable positions for setting-up, monitoring and resetting after an incident.
- Although corners/bends can be incorporated in the run, try to avoid too many. It may be necessary to install additional systems to ensure an effective installation.
- The ultimate objective must be to provide a free running 'pull wire' with the minimum of resistance to movement.
- Measure each run and select a Grabwire switch whose max. span (L) is greater than the measured distance.
- If the total length is over 100m, then multiple installations will be necessary. If the length is excessive, then consider using the 'LW' system.
- Choose the Stainless Steel grabwire switch option if the working environment will be continuously wet or subject to systematic cleansing routines.

Anchor boxes

Without doubt the most effective installation involves the fitting of Grabwire switches at both ends of the 'pull wire'. However, this does involve electrical cabling up to, and between, the switching units. The use of a non electrical 'Anchor Box' at one end removes the need to cable between the end assemblies.

The 'Anchor Box' effectively houses a long spring, which is compressed when the 'pull wire' is activated. At a fixed point during the compression, a latch is operated which locks the spring in the compressed or shortened state. When the 'pull wire' is released, it will be in a 'slack' condition, and the switching unit at the other end of the 'pull wire' senses the 'slack' condition and activates the 'Stop' signal. Although the 'Anchor Box' contains no electrical contacts, the latch needs manual resetting to restore the system.



Description	Catalogue Ref.
Non Switching Anchor Box with manual reset	GW/AB



Minimum Installation Requirements

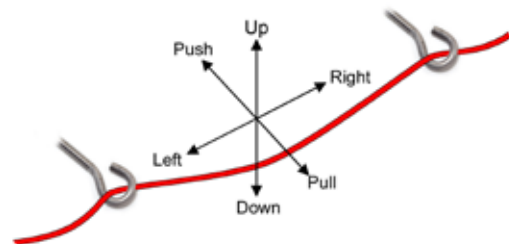
The operator must be able to reach and move the 'pull wire' in any direction. When someone gets into trouble they may only be able to move the 'pull wire' in one direction.

Taking the simple conveyor as an example, the top surface may run left to right, but the underside will be running right to left. Depending upon how and where someone gets caught, they may well be pulled in either direction and only have a hand free to pull the 'grab wire' in one direction only.

Having this requirement means that the use of one grabwire switch and the 'pull wire' terminated at the other end to a fixed point is almost always dangerous.







If an operator gets trapped in the equipment, and the only direction they can pull the 'grab wire' is against the fixed end, nothing will happen.

The minimum requirements in this situation would be a Grabwire Switch at one end and an Anchor Box at the other.



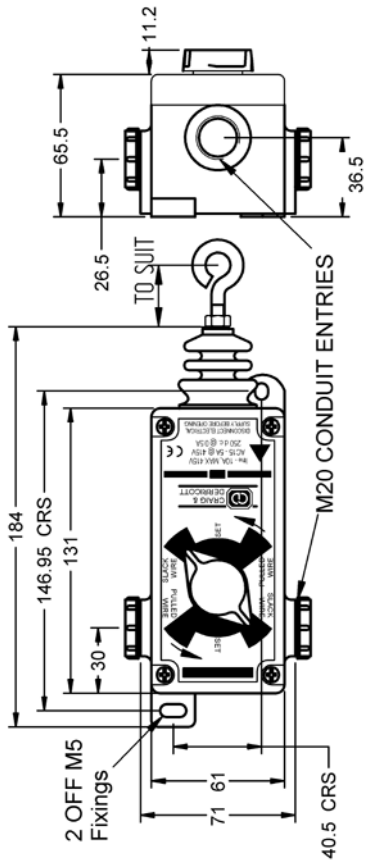
Accessories

To assist with the possible variations necessary when designing an installation, the following accessories are available.

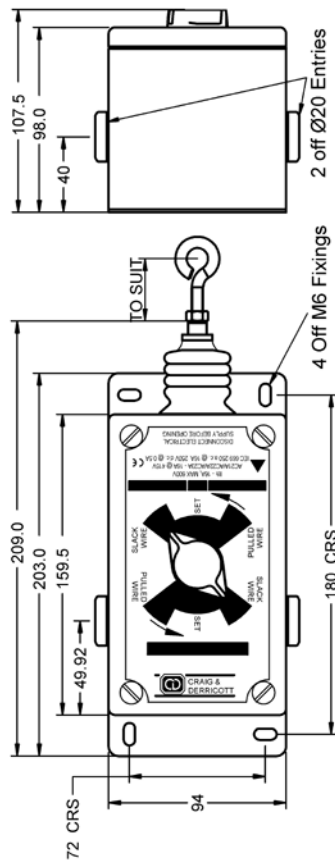
Image/Diagram	Description	Catalogue Ref.
	Indicator lamp, which when powered through one of the spare N/O contacts, will indicate which grabwire switch has been actuated. (Indicates on 'Pulled' or 'Slack Wire' conditions) Supplied complete with bulb. Other colours and supply voltages available to order. 24V (Amber) Annunicator Lamp 110V (Amber) Annunicator Lamp	GW024A GW110A
-	Stranded steel 'pull wire' with red PVC covering. (Ø5 approx O/D) Sold per Metre. Pull Wire (As supplied in the connecting kits)	MR 0221
	Standard length 'eyebolt' for 'pull wire' support. Supplied complete with 2 x locking nuts. Material - Stainless steel Size - M6 Overall length - 80 Thread length - 58 Standard M6 Eyebolt (As supplied in the connection kits)	GWA 0070
	Extended length 'eyebolt' for 'pull wire' support. Supplied complete with 2 x locking nuts. Material - Stainless steel Size - M6 Overall length - 230 Thread length - 200 Extended M6 Eyebolt	GWC 0270
	Wrap around 'thimble' to terminate the 'pull wire'. Material - Stainless steel Termination 'thimble' (As supplied in the connection kits)	GWC 0163
	'D Shackle' to connect the 'pull wire' to the grabwire switches. Material - Stainless steel Connection 'D Shackle' (As supplied in the connection kits)	GWC 0166
	Cable clamp for securing the 'pull wire' back upon itself once passed around the 'thimble'. Tightening via 2 x Allen screws. Material - Stainless steel Cable clamp (As supplied in the connection kits)	GWC 0167
-	Allen key for tightening 'Cable Clamp' above Size - 2.5 A/F Allen Key (As supplied in the connection kits)	GWC 0189



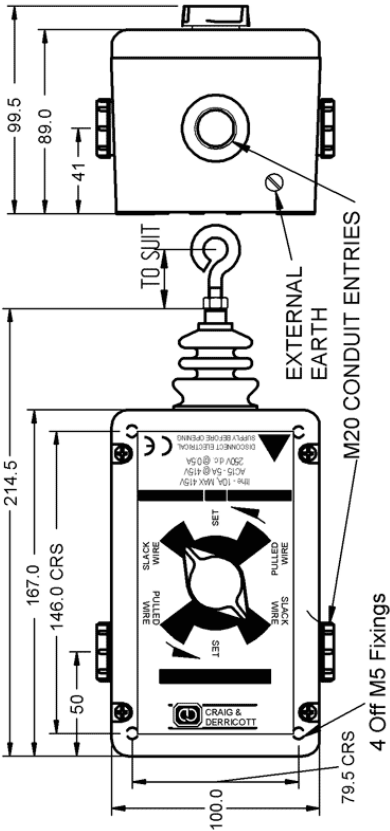
GWN1 Grabwire Switch



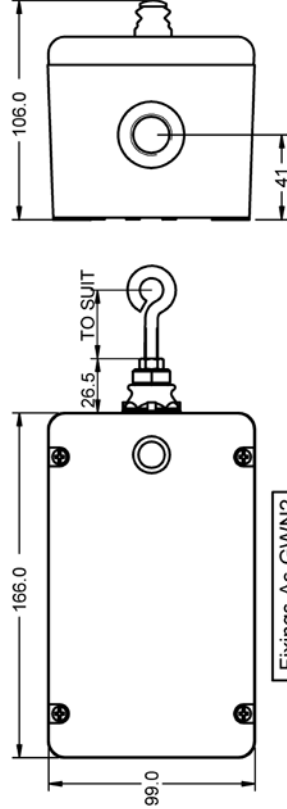
GWN2/SS Grabwire Switch



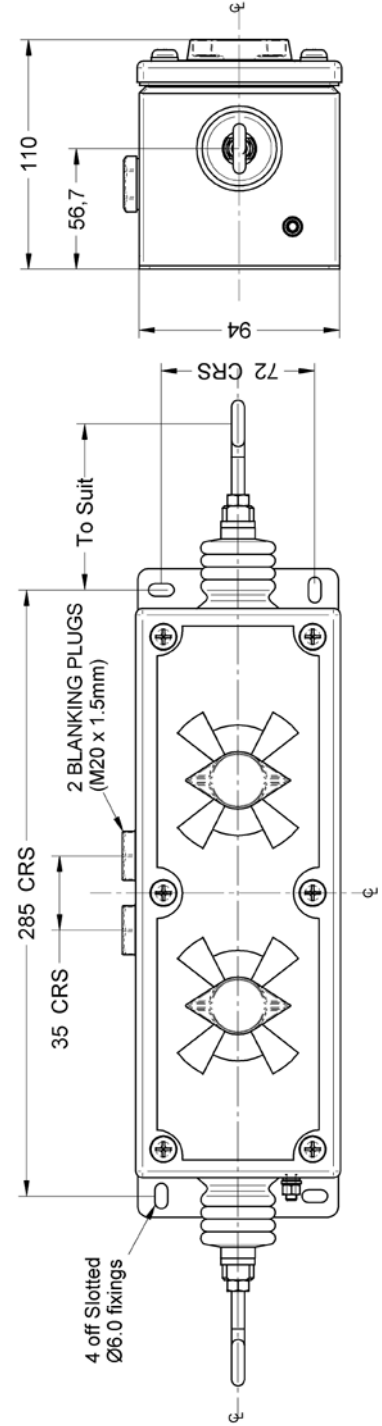
GWN2 Grabwire Switch



GW/AB Anchor Box



GWDE Double Ended Grabwire Switch



Live Wire Grabwire System

Designed specifically for long distance protection, where a tensioned wire installation (GW series) becomes expensive or impractical.

The Live Wire system incorporates the following safety features:-

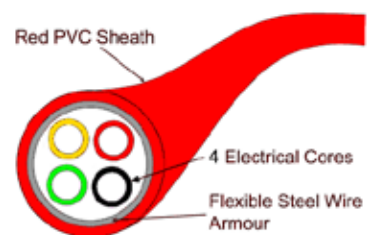
- The trip switch interior to each grabwire assembly contains positive push-off contacts
- The system will trip in the event of -
 - (a) a Grab-Line being pulled in any direction.
 - (b) a Grab-Line being broken or the Grab-Line circuit interrupted.
 - (c) a short circuit condition occurring in the Grab-Line circuit.
 - (d) a loss of power to the Control Station.
- Once tripped, the system requires manual resetting.
- Only a safe low voltage is applied to the Grab-Line circuit and Grab-Line switch assemblies.

The system is ideal for heavy duty and exposed situations. The Control Station and Grab-Line switch assemblies are housed in substantial enclosures which are sealed to IP65. Stainless steel components are used where necessary to ensure reliability is maintained.

Principle of the Design

The design of the overall system has been kept as flexible as possible to allow for additional features that may be required to fulfil specific applications. However, the basic operating system will be at the heart of every system and can be described simply as follows:-

A single Control Station is required for each installation, and from there a low voltage rectified output is fed to the Grab-Line circuit. Unlike the tensioned wire systems (GW), which use a form of catenary wire with a stranded steel core, the Grab-Line used here is very different. The cable is constructed with a flexible steel armour, however down the centre of the Grab-Line run four electrical cores.



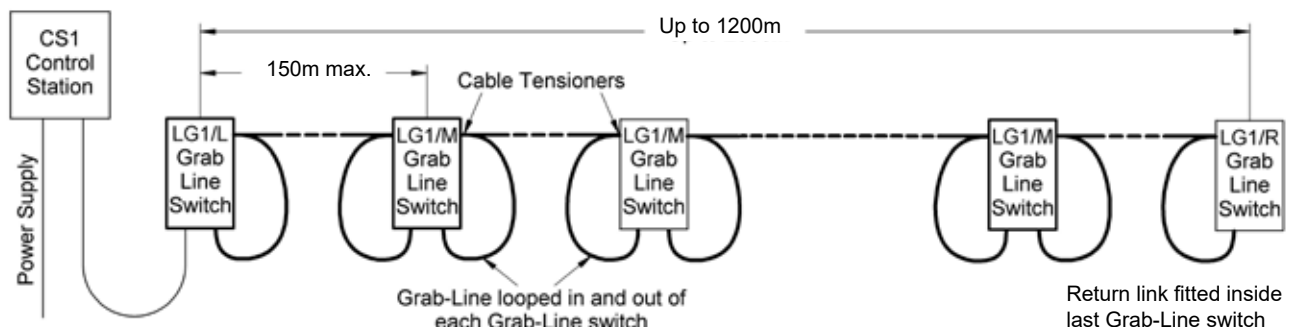
The low voltage supply is taken from the control station to the first Grab-Line switch in normal cable. The safety circuit is then fed through the rotary switch within the Grab-Line switch and leaves using the special Grab-Line cable. This is fed through the cable tensioner and on to the next Grab-Line switch. This continues along the protection run until at the last Grab-Line switch, where a wire link completes the return path of the safety circuit.

When the system is setup, and the control station is indicating 'Set To Run', a relay in the control station is held energised. For any of the fault conditions as listed above, the relay de-energises. The correct connection of the relay contacts ensures a 'Fail Safe' condition.

The relay has 3 sets of contacts:-

- The protected machinery Start/Stop control circuit. (Safety circuit - N/C)
- An alarm or indication circuit. (N/O)
- An interlock whereby the emergency stopping of a single conveyor, in a multi-conveyor installation, will also stop 'upstream' conveyors as required. (N/C)
- and many other possibilities

Two of the three inner cores of the Grab-Line cable comprise the 'go & return' safety circuit, the third core is used for signalling. With very long conveyors, typically found in quarries or gravel pits, the protection may go 'out of sight' of the control centre. Here, someone might be despatched to rectify a fault which could be up to 1.2km from the source. After correcting the fault he can then signal to the control by pressing the 'Signal to Reset' pushbutton which is fitted on every Grab-Line switch. The 'Reset System' indicator will illuminate on the CS1 control station, and the conveyor 'Start-Up' sequence can begin.



Installation Components

- CS1 - Control Station Assembly (1 required for each safety circuit run)
- LG1/L - Grab-Line switch - Left Hand (1 required for each safety circuit run)
- LG1/R - Grab-Line switch - Right Hand (1 required for each safety circuit run)
- LG1/M - Grab-Line switch - Mid Unit (1 required every 150m along the safety circuit run)



Installation Parameters

The installed system must fall within the following parameters:-

- The total length of Grab-Line safety circuit will consist of
 - The feed from the CS1 Control Station to the first Grab-Line switch
 - The Grab-Line run
 - If connected, the two wire connection for conveyor interlock control

The total of the above must not exceed 1.2km.

The distance between Grab-Line switches must not exceed 150m.

- The interconnections between Grab-Line switches is by the Grab-Line cable which must be secured to each of the Grab-Line switches by the attachments provided.
- The Grab-Line should be supported at 2m intervals, and 'pigtailed' are available for this purpose. The first support should be as close to the Grab-Line switches as practical. This ensures that the pull on the switches is always linear.
- The CS1 Control Station must be fed by either a 110V or 240V clean a.c. supply.
- A minimum of 0.75 sq mm cable must be used for the following connections.
 - The 3 wire connection between the CS1 Control Station and the first GrabLine switch
 - The loop 'return' connection in the most distant Grab-Line switch
 - If required, the 2 wire connection to a 'down stream' control station.



CS1 Control Station



CS1 Control Station Interior

Components

CS1 Control Station

Required for each installation, the sheet steel housed control station contains the following equipment:-

Internal

- Half wave rectified low voltage source from either a 110V or 240V a.c. supply.
- Control circuit relay
- Fuse protection
- Terminal blocks for external connections

Lid Mounted

- On/Off switch
- 'Supply On' Indicator Lamp (Blue)
- 'Reset' Pushbutton
- 'Reset System' Indicator Lamp (White)
- 'System Tripped' indicator Lamp (Red)

LG1 Grab-Line Switches

Supplied in three versions **LH**, **RH** & **Mid**, the assemblies are housed in heavy duty die-cast aluminium enclosures and contain the following components:-

Internal

- Chassis plate mounted safety rotary switch
- Terminal blocks for external connections
- A diode (LH & RH units only) which is only connected into the safety circuit if the Grab-Line switch is at the end of the run
- Bellows protected stainless steel 'pull shafts' to which the Grab line is attached
- M20 glands to terminate the Grab-Line cable
- Thimbles, shackles & clamps are supplied loose. Required to attach the Grab-Line to each switch assembly.

Lid Mounted

- Manual 'Reset/Condition Indicator' knob
- 'Signal to Reset' pushbutton



LG1/M Grab-Line switch



LG1/M Grab-Line switch
with cover removed

Grab-Line Cable

Specialist cable with the following characteristics:-

Internal

- Supplied in four different cut lengths. (75m, 100m, 125m & 150m). A 2m allowance for 'making off' the cable is added to the nominal lengths.
- Thick outer sheath of red PVC
- Flexible steel wire armour
- Four 0.75 sq mm flexible cores with Red, Yellow, Green & Black sheaths
- Approx. Ø10 O/D



Technical Specification

Input Voltage	110V (15W max.), 240V (15W max)	
System Voltage	24V a.c. - 1/2 wave rectified	
Control Circuit Relay	Contact Operation	Positively operated
	Rated Load	3A at 240V a.c. 3A (Resistive) at 24V d.c.
	Max. Switching Current	6A
	Max. Switching Voltage	250V a.c. & 24V d.c
	Minimum Permissible Load	5V d.c. - 10mA
	Mechanical / Electrical Life	10 x 10 ⁶ /10 x 10 ³
Contact Resistance	100 mΩ	
Power Protection Fuse	2A	
Safety Circuit Fuse	200mA	
Max. Grab-Line Circuit Resistance	50 Ohms	
Pull Force To Operate	Approx 5kg.	

Full documentation and installation instructions are supplied with each control station

Ordering Codes

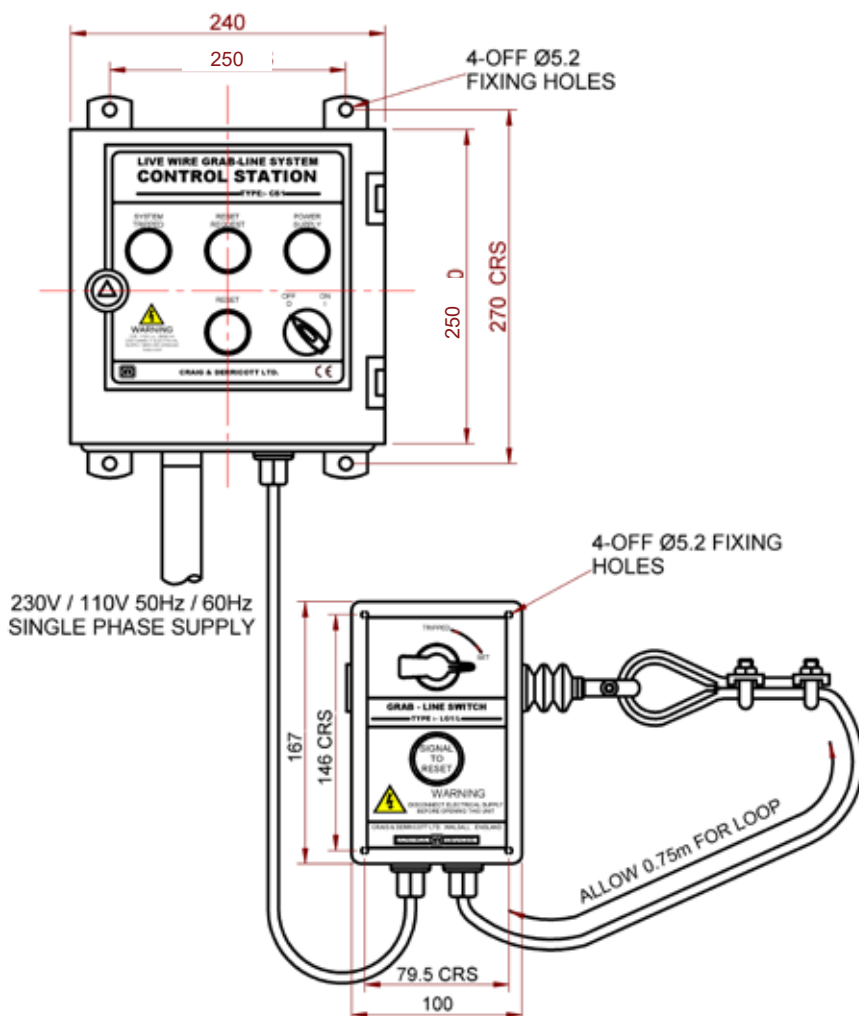
Control Station Assembly	CS1
LH Grab-Line switch	LG1/L
RH Grab-Line switch	LG1/R
Mid Grab-Line switch	LG1/M
Grab-Line cable (75M)	GWC 0038A
Grab-Line cable (100M)	GWC 0038B
Grab-Line cable (125M)	GWC 0038C
Grab-Line cable (150M)	GWC 0038D
St St Eyebolt with fixing nuts	GWA 0070

Accessories

Grab-Line Thimble	GWC 0031A
Grab-Line Clamp	GWC 0032A
Grab-Line 'D' shackle	GWC 0033A
Cable gland	GWC 0039

"The Live-Wire system is designed to be as flexible as possible, so if you have an unusual or complicated application, then please phone our technical sales team who will be at hand to give advice"

Dims



Application in Rolling Stock Repair pits