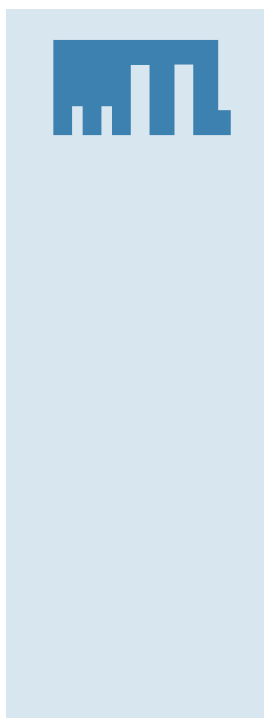


Intrinsically safe emergency shutdown ('ESD') link for gas tanker cargo transfer

MTL901 SYSTEM

ship-to-shore ESD link



- ◆ **Intrinsically safe link for shore and ship ESD systems used for gas tanker or other potentially hazardous liquid transfer**
- ◆ **Comprehensive electrical isolation between shore and ship**
- ◆ **Alternative pendant operation**
- ◆ **Indication of ESD source**
- ◆ **Built-in test facilities**
- ◆ **Internationally accepted: complies with SIGTTO* guidelines**
- ◆ **Suitable for Ex ia IIB T4 hazardous areas**

The MTL901 intrinsically safe link is used for interconnecting ship and shore ESD systems during the transfer of liquefied gas or other hazardous liquids. The link safely transfers the status of the shore ESD system to the ship and vice versa in accordance with SIGTTO* guidelines which ensure that the shutting-down of pumps and valves follows the safest possible sequence in the event of an emergency.

The system design overcomes the particular hazards presented by the transfer of liquid gas. First, the intrinsic safety feature makes sure that the electrical energy levels present are too low to cause gas ignition. Second, three stages of isolation between ship and shore ESD systems make it virtually impossible for the accidental bridging of isolating points to cause surges due to potential differences between ship and shore. Third, the physical link between ship and shore, the most vulnerable part, is made as short as possible.

The ship- and shore-based sections of the system are self-contained and include facilities to allow them to be used independently in circumstances where only one section is available.

The shore section consists of terminal assembly SIG01, jetty assembly SIG02, pendant unit SIG03, terminal assembly-to-jetty assembly linking cable SIG04 and ship-to-shore interlinking cable SIG04A.

The shore-based terminal assembly must be located in a safe area (eg, the main plant control room) and provides the interface with the shore-based ESD system. On this unit, a green cluster LED confirms the system is operational and two red cluster LEDs indicate the source of a shutdown, ie whether initiated from the ship or shore. The unit is linked by a user-specified length of cable SIG04 to the hazardous-area jetty assembly SIG02. The latter should be located as close to the edge of the jetty as is practicable (ideally in the jetty control room) to lessen the possibility of faults on the jetty affecting the cable between the jetty and the ship. A further user-specified length of cable is provided to link up with the ship section. Pendant unit SIG03, connected to a socket on the jetty assembly, is taken onto the ship and used in place of the ship section when this is not fitted. An emergency stop button on the pendant is provided for the operator to shut down the shore ESD system if necessary. System operation is confirmed by a green cluster LED while visual and audible proof of shutdown is provided by a red cluster LED and a buzzer.

The ship section includes ship assembly SIG06, pendant assembly SIG08, interlinking cable SIG09, and two junction boxes SIG10 and SIG11.

The ship assembly which provides the interface with the ship-based ESD system is generally similar to the terminal assembly and should be located in a safe area, ideally the main control room of the ship. LEDs indicate the status of the link, a green LED being on when the link is opera-

tional and a red LED being on when a shutdown occurs. The assembly is linked by a user-defined length of cable SIG09 to junction box SIG10 mounted near the loading/discharge section of the ship. This box provides socket connections for the cable from the shore section SIG04A or for the ship section pendant SIG08 if no shore-based system is fitted. A second optional junction box (SIG11) can also be included so that both port and starboard junction boxes, with identical socket connections, are provided. A user-defined length of cable SIG09 links the two junction boxes. The pendant unit, when needed, is placed on the jetty and operated similarly to the shore-based pendant (with which it is identical) in the reverse circumstances.

References:-

Guidelines for the alleviation of excessive surge pressures on ESD, SIGTTO

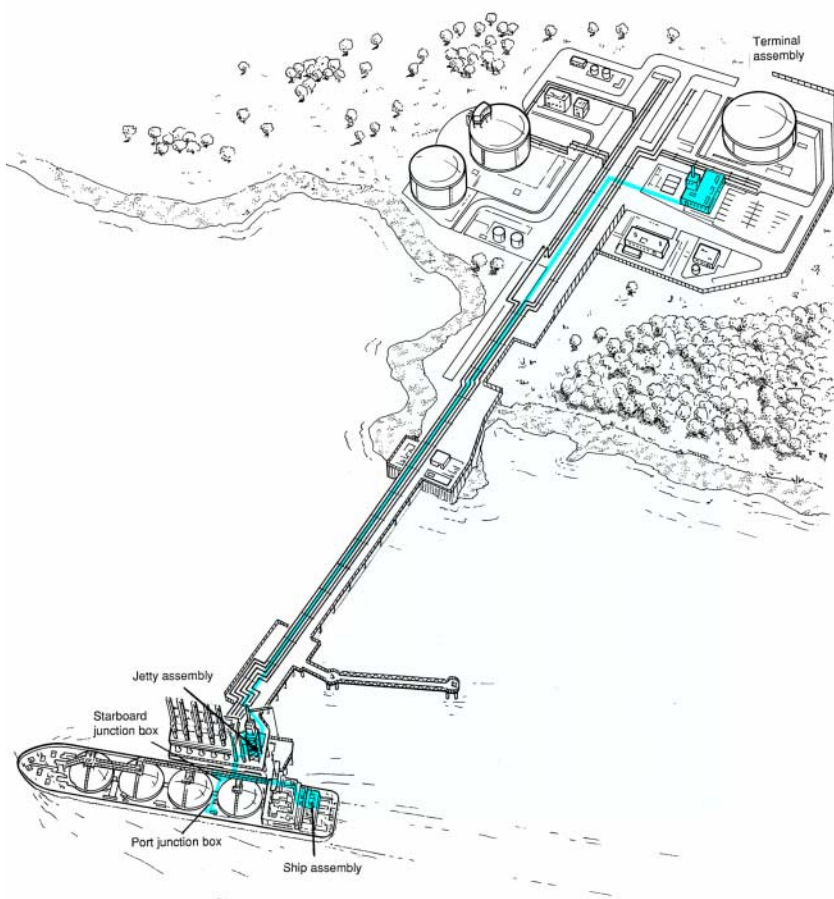
Recommendations and Guidelines for Linked Ship/Shore Emergency Shut-down of Liquefied Gas Cargo Transfer, SIGTTO, July 1987

A user's guide to the MTL901 ship-to-shore ESD link for liquefied gas cargo transfer (AN9012, available from Measurement Technology Ltd)

* Society of International Gas Tanker and Terminal Operators Ltd

SYSTEM ASSEMBLIES

Figure 1 Physical location of assemblies



Basic system diagram

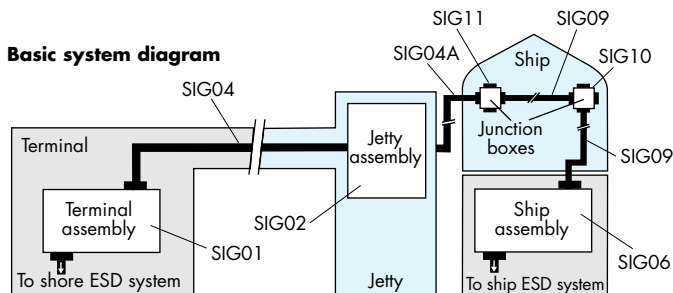


Figure 2

System diagram with pendant replacing ship system

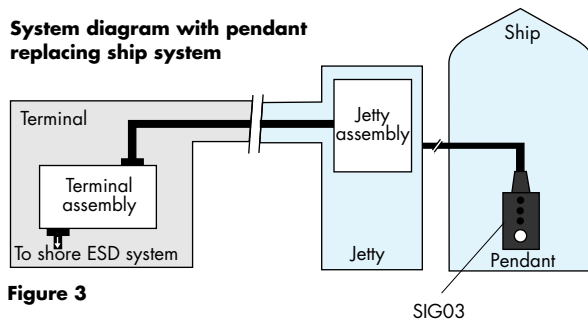


Figure 3

System diagram with pendant replacing shore system

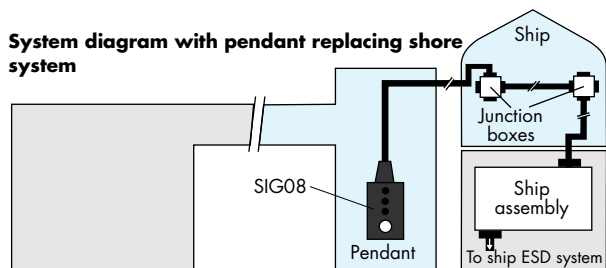
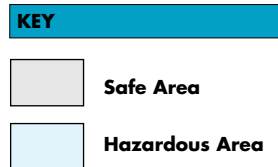


Figure 4



BASIC SYSTEM

Typical physical locations of the main assemblies forming a complete MTL901 link are shown in figure 1 and the basic system details in figure 2. The assemblies are isolated from each other by three isolating barriers located in the terminal, jetty and ship assemblies. The critical section, monitored by regular system checks, is between jetty and ship assemblies, the section of cable most susceptible to damage being the portion suspended between the loading arm and the ship.

Figure 3 illustrates the use of the pendant unit with a shore-based system when there is no ship-based system. Figure 4 illustrates the reverse situation.

The ESD systems are connected to the link system by single changeover contacts, the link output being a normally-closed, open-on-alarm volt-free contact.

SYSTEM OPERATION AND TESTING

Link system operation is carried out via a keyswitch on the jetty assembly. The system is 'armed' for ship-to-shore or shore-to-ship cargo transfer with the keyswitch set to 'RUN', the only position in which the key can be removed to 'lock' the system. When this is done, an ESD signal initiated from the ship will be transferred to the shore or vice versa.

The keyswitch is also used for comprehensive checking of the link system before operation. First, the terminal and jetty assemblies are tested before the ship-to-shore link cable is connected. This is done by using test buttons on the jetty assembly while the keyswitch is set to the 'test without ship' position. Second, once the link is connected, the keyswitch is set to 'test with ship' and a similar routine used to check the operation of the whole system. During both these procedures, the shore ESD system is inhibited, while for the overall check the ship ESD system is also inhibited by a second keyswitch on the ship assembly. Indication that shore and ship ESD systems are inhibited is given by yellow cluster LEDs on the terminal and ship assemblies. When both sets of test routines are completed, the keyswitches are returned to 'RUN', which resets the link and reactivates the ESD systems. More comprehensive checks are made with the pendant unit.

SPECIFICATIONS SHORE SYSTEM

SIG01 Terminal assembly

Power supply

240V ac nominal, 200 to 255V, 48 to 65Hz, or
120V ac nominal, 100 to 130V, 48 to 65Hz

Mounting

Wall or surface by 4 integral mounting holes

Location

Safe area

Ambient temperature limits

-20 to +50°C

Humidity

5 to 95% RH

Casing

GFR polyester, protected to IP55

Glands

Brass, industrial, shrouded,
(accept cable sizes 11.5 to 14mm O/D)

SIG02 Jetty assembly

Power supply

From SIG01

Mounting

As SIG01

Location

Zone 1 and 2 hazardous areas

Ambient temperature limits

-25 to +60°C

Humidity

5 to 95% RH

Casing

GFR polyester, protected to IP55

Glands

See SIG01

Sockets

NATO standard

SIG03 Shore emergency stop pendant

Power supply

From SIG01

Mounting

Hand held

Location

Zone 1 and 2 hazardous areas

Ambient temperature limits

-25 to +50°C

Humidity

5 to 95% RH

Casing

Double-insulated polypropylene, protected to IP65

Cable length

Specified by user

Plug

NATO standard

SIG04 Cable

Flexible cord

300 to 500V

Five-core

1.5mm² (16 x 0.25 copper wire)

Core insulation

EP rubber

Sheath insulation

CSP (*HOFR) black

Cable reference

3185TQ, 5-core

British Standard

BS 6500: 1984: Table 9

Length

Specified by user

SIG04A Ship-to-shore cable

Flexible cord

300 to 500V

Five-core

1.5mm² (16 x 0.25 copper wire)

Core insulation

EP rubber

Sheath insulation

CSP (*HOFR) black

Cable reference

3185TQ, 5-core

British Standard

BS 6500: 1984: Table 9

Length

Specified by user

Plugs

NATO standard

* (Heat, oil, fire resistant)

SHIP SYSTEM

SIG06 Ship assembly

As for SIG01 Shore terminal assembly

SIG08 Ship emergency stop pendant

As for SIG03 Shore emergency stop pendant

SIG09 Ship cable

As for SIG04 Shore cable

SIG10 Junction box

Power supply

From SIG06

Mounting

Bulkhead or surface by 4 integral mounting holes

Location

Zone 1 and 2 hazardous areas

Ambient temperature limits

-30 to +60°C

Humidity

5 to 95% RH

Casing

GFR polyester, protected to IP67

Sockets

NATO standard

Glands

See SIG01

SIG11 Additional junction box

As for SIG10 junction box

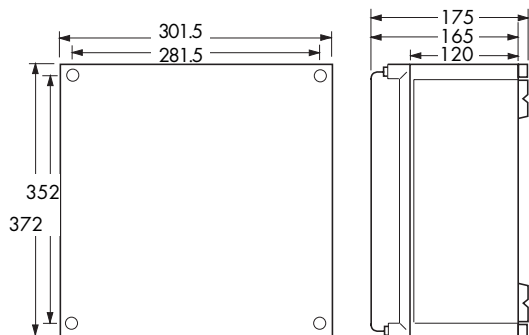


GENERAL SPECIFICATION

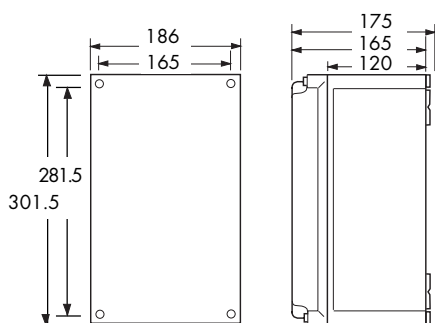
Plugs and sockets

All plugs and sockets provided with the equipment conform to NATO standards (with corresponding NATO stock numbers) and are designed to be submersible to a depth of 100m

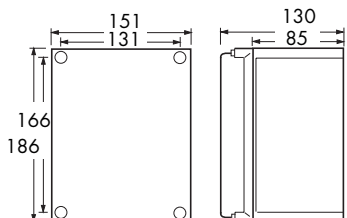
DIMENSIONS



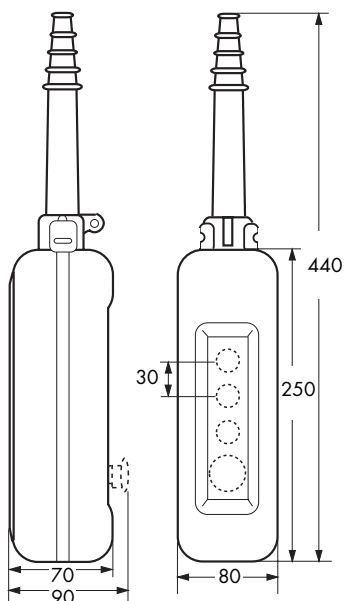
SIG01 & SIG06 Terminal and Ship assemblies



SIG02 Jetty assembly



SIG10 & SIG11 Junction boxes



SIG03 & SIG08 Pendant units

TO ORDER, specify:-

Shore system

- SIG01: Terminal assembly
- SIG02: Jetty assembly
- SIG03: Emergency stop pendant
(specify cable length required)
- SIG04: Terminal assembly to jetty assembly cable
(specify length)
- SIG04A: Ship-to-shore cable, including plugs
(specify length)

Ship system

- SIG06: Ship assembly
 - SIG08: Emergency stop pendant
(specify cable length required)
 - SIG09: i) Ship assembly to junction box cable
(specify length)
ii) Junction box (SIG10) to junction box (SIG11) cable
(specify length)
 - SIG10: Junction box
 - SIG 11: Additional junction box
- Note: Please specify the cable length required when ordering the following items:*

- SIG03
 - SIG04
 - SIG04A
 - SIG08
 - SIG09
- eg. '1 off SIG04A +30m'

Literature

- INM901: MTL901 Intrinsically safe ship-to-shore ESD link instruction manual
- AN9012: A user's guide to the MTL901 ship-to-shore ESD link