

**Wireless Receiver/Repeater  version for use  
with a STAPS Steam Trap Monitoring System**Installation and Maintenance Instructions

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1. Safety information
2. General product information
3. Installation of receiver/repeater
4. Electrical installation
5. Spare parts
6. Certification and approvals
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# 1. Safety information

Safe operation of this unit can only be guaranteed if it is properly installed, commissioned and maintained by a qualified person (see Section 1.7) in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

**Manufacturer:**  
Spirax-Sarco Limited  
Charlton House  
Charlton Kings  
Cheltenham  
Glos  
GL53 8ER

The product is designed and constructed to withstand the forces encountered during normal use. Use of the product for any other purpose, or failure to install the product in accordance with these Installation and Maintenance Instructions, could cause damage to the product, will invalidate the CE marking, and may cause injury or fatality to personnel.

## EMC directive

The product complies with the Electromagnetic Compatibility Directive 2004 / 108 / EC. A technical file with a reference title of 'UK Supply STAPS Wireless Steam Trap Monitoring System' supports the Spirax Sarco claim that the product complies with the requirements of the Directive and the product can be used in Class A (heavy industrial) and Class B (domestic / commercial areas).

The following conditions should be avoided as they may create interference above the heavy industrial limits if:

- The product or its wiring is located near a radio transmitter.
- Cellular telephones and mobile radios may cause interference if used within approximately 1 metre (39") of the product or its wiring. The actual separation distance necessary will vary according to the surroundings of the installation and the power of the transmitter.

If this product is not used in the manner specified by this IMI, then the protection provided may be impaired.

## 1.1 Intended use

Referring to the Installation and Maintenance Instructions, name-plate and Technical Information Sheet, check that the product is suitable for the intended use/application.

Spirax Sarco products are not intended to withstand external stresses that may be induced by any system to which they are fitted. It is the responsibility of the installer to consider these stresses and take adequate precautions to minimise them.

## 1.2 Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

### **1.3 Lighting**

Ensure adequate lighting, particularly where detailed or intricate work is required.

### **1.4 Hazardous environment around the product**

Consider: explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard, excessive noise, moving machinery.

### **1.5 Tools and consumables**

Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine Spirax Sarco replacement parts.

### **1.6 Protective clothing**

Consider whether you and/or others in the vicinity require any protective clothing to protect against the hazards of, for example, chemicals, high / low temperature, radiation, noise, falling objects, and dangers to eyes and face.

### **1.7 Permits to work**

All work must be carried out or be supervised by a suitably competent person. Installation and operating personnel should be trained in the correct use of the product according to the Installation and Maintenance Instructions.

Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety.

Post 'warning notices' if necessary.

### **1.8 Handling**

Manual handling of large and/or heavy products may present a risk of injury. Lifting, pushing, pulling, carrying or supporting a load by bodily force can cause injury particularly to the back. You are advised to assess the risks taking into account the task, the individual, the load and the working environment and use the appropriate handling method depending on the circumstances of the work being done.

### **1.9 Freezing**

This product does not contain fluid that will freeze, however lower temperatures will affect the product performance. Do not subject the product to temperatures below the stated minimum.

### **1.10 Disposal**

Unless otherwise stated in the Installation and Maintenance Instructions, this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken. The product should be recycled in line with local legislation.

## **1.11 Returning products**

Customers and stockists are reminded that under EC Health, Safety and Environment Law, when returning products to Spirax Sarco they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk. This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

## **1.12 Use of non genuine components or spare parts.**

This product is certified by a number of health and safety regulatory bodies for health and safety and environmental purposes. To maintain the approvals only genuine components and spare parts must be used.

## **1.13 Use within explosive atmospheres**

The STAPS receiver/repeater is certified for use within area where there is a potential for explosive atmosphere. The product certification information is shown in Section 6 of this document. Ensure that the product fully meets with the application requirements before installation.

# 2. General product information

## 2.1 General description

The STAPS wireless receiver/repeater  version is specifically designed for use with the STAPS wireless steam trap monitoring system, within hazardous areas.

In conjunction with the STAPS head units and PC software, the STAPS receiver/repeater, monitors steam trap operation to help ensure optimum plant performance.

**Please note:** To ensure that the unit is installed correctly and for optimum performance, please read these instructions in conjunction with the STAPS software and head installation and maintenance instructions.

### How does it work?

The STAPS wireless receiver/repeater  version takes the wireless signal from the STAPS head unit (see separate IMI) and passes the data onto the PC software (again, see separate IMI) via a LAN connection or network switch. In areas with considerable RF obstructions it can act as a repeater, relaying the data onto another receiver using the same 2.4 GHz wireless network.

The receiver is the link for the STAPS wireless system to the LAN network if powered and its RJ-45 socket is connected to a network point/PC. If the receiver is powered, but does not have a RJ-45 socket connected it will act as a repeater. As a repeater it will only relay signals from other head units to another receiver.



Fig. 1

## 2.3 System equipment and network overview

### Network

The STAPs steam trap monitoring system is based on a wireless network. Each steam trap is monitored by an individual STAPs sensor head, that communicates directly to a receiver or repeater, using wireless 2.4 GHz protocol.

The repeater/receiver needs to be sited within 20 - 30 m of the heads to ensure good communication. Obstructions such as walls, pipework and other industrial furniture may reduce the distance that a head can communicate.

A receiver/repeater can accommodate up to 200 heads.

Ideally the receiver should be fitted in the geographical centre of the heads that it is going to receive signals from.

The PC or PC and network switch are normally sited within a control room or a separate area outside of the hazardous area (ATEX zone).

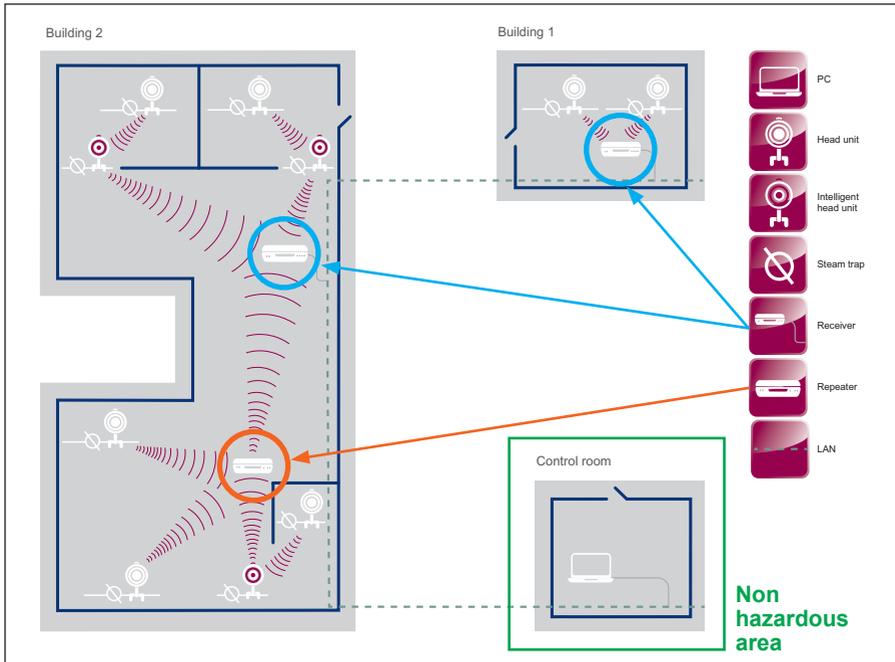


Fig. 2 Wireless architecture with access to customer LAN network

The receiver draws its power from a local mains supply. A suitably sized circuit breaker is to be fitted.

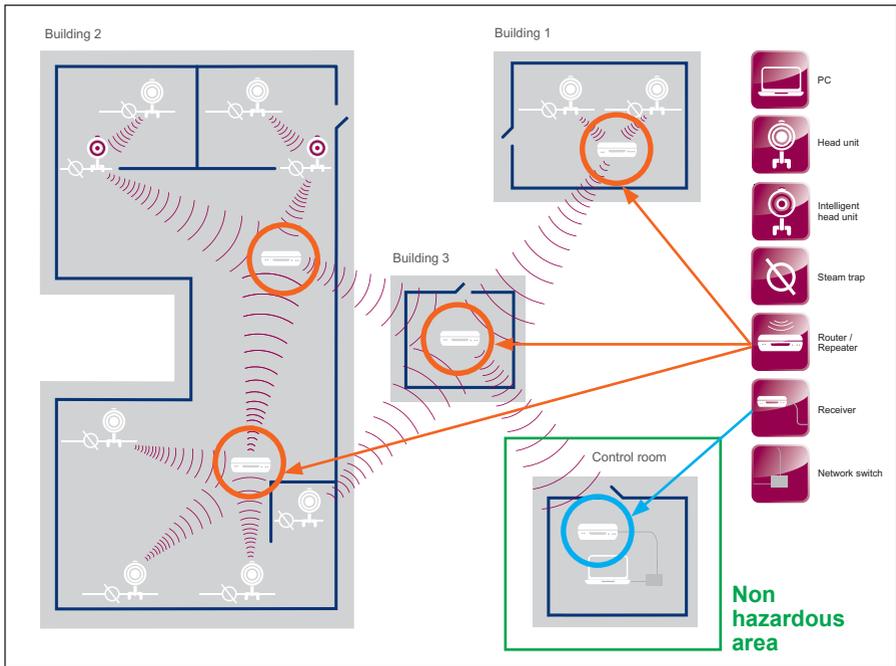


Fig. 3 Wireless architecture without access to LAN network

## 2.4 Preliminary site survey

Before any installation is started a preliminary survey of the plant by trained personnel must be conducted to establish what network access points are available adjacent to the steam traps that are to be monitored. Consideration should be made to obstructions that may interrupt the wireless signal. For the best results a direct line of sight between the head and the receiver/repeater should be maintained.

### 2.4.1 System environment

#### STAPS RF communication

Like all RF Communication devices, the STAPS Wireless Steam Trap Monitoring System has a transmitting and a receiving device. The STAPS head unit contains an inbuilt antenna that transmits the encoded data obtained from the sensor attached to the pipeline, via a wireless radio connection (2.4 GHz). The STAPS receiver decodes the data received through its own inbuilt antenna and communicates it through the LAN to the PC based software.

#### System environment

The space between the STAPS head unit and receiver (or repeater) is known as the system environment. Any physical obstructions or electrical devices within the system environment can reduce the communication range of the devices. The physical obstructions maybe static items such as walls, pipework, tanks and machinery or mobile items like vehicles or pedestrians, if the system is communicating across a road or path. Noise interference may be caused by other devices using the same communication frequency or machinery that is transmitting RF/electrical noise from items such as motors for instance.

For the best communication a line of sight (LOS) must be maintained between the STAPS head and the receiver within the system environment.

#### Visual and RF LOS

There are two types of LOS that must be maintained to achieve clear communications. Firstly, visual LOS, which is purely a direct clear linear path (sight) between the STAPS head and the receiver.

Secondly RF LOS must also be maintained, which is a concentric ellipsoid (rugby ball shaped) tunnel that provides a path for the RF signals to pass through between the transmitter (STAPS head) and receiver. This is known as the Fresnel Zone.

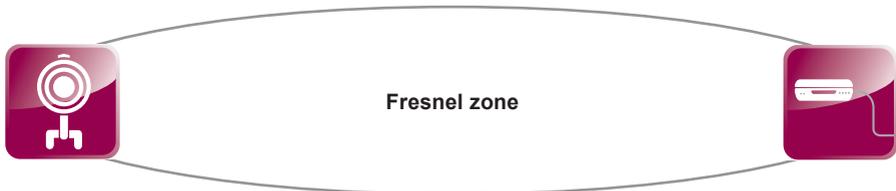
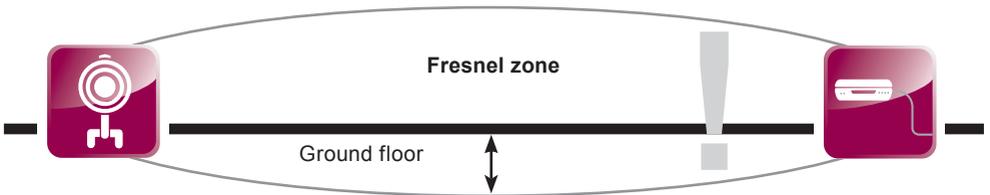


Fig. 4 Clear Fresnel zone – Good





**Fig. 5 Fresnel zone with blockage (obstacle) - Bad**



**Fig. 6 Fresnel zone with floor obstruction - Bad**

Any obstacles within the Fresnel Zone will reduce the quality and distance that the RF signals are transmitted.

The area of the Fresnel zone below the floor will be obstructed. For this reason it is suggested that the STAPS heads and receivers are fitted at a minimum of 1.5 m above the ground/floor.

Typically a blockage affecting 20% of the Fresnel zone will introduce little signal loss. However beyond 40% blockage the signal loss becomes rapidly significant.

## 2.5 Contacting site network administrator

In most cases, the STAPS system will be run through the sites internal computer network. Before any installation, preferably at the site survey stage, it is strongly recommended that the local network administrator is informed. The administrator will need to confirm that a suitable PC is available that supports Microsoft Windows and they are able to offer suitable TCP/IP addresses for the equipment.

# 3. Installation of receiver/repeater

**Note:** Before actioning any installation, observe the 'Safety information' in Section 1.

## 3.1 The STAPS receiver includes the following parts:

- 1 off Receiver with mounting lugs.

## 3.2 Consider where the receiver is to be fitted:

- The weather - Is the monitor suitable for the worst case weather conditions? The receiver is IP66 rated.
- Wireless signal obstructions - Will adjacent buildings, pipework or other objects obstruct the wireless signal?
- Interference - Is there any electrical or RF interference that may affect the performance?
- Access - Is there sufficient access for maintenance?
- Power supply - Access to a suitable power supply and Ethernet connection where applicable.

## 3.3 Mounting the receiver/repeater

The receiver/repeater should be mounted to a wall/surface using suitable fixing screws. Refer to the site  standards for guidelines.

An earth bonding connection is also provided.

**Note:** For optimum RF performance ensure that the above siting guidelines are considered.

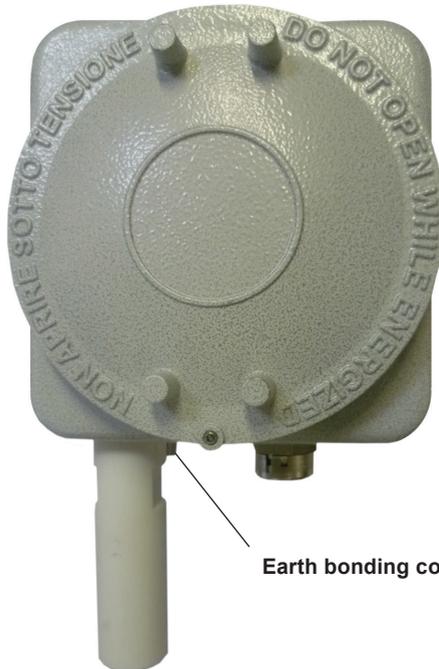


Fig. 7

Earth bonding connection

### 3.4 Wiring the receiver / repeater

This receiver/repeater can be used as either a receiver to convert the Wireless signal received from heads and connect to the LAN to communicate with the PC software, or as a repeater to relay the signal to another receiver using the Wireless signal.

To act as a receiver the Ethernet cable must be connected to the receiver via the RJ-45 socket.

In addition a receiver can be set up as a wireless repeater, if the power is applied without an RJ-45 valid Ethernet connection. This receiver/repeater is able to process signals from up to 200 individual trap heads. The repeater will then repeat these signals to a receiver.

**Important note: If the receiver/repeater is required to act as a receiver, the Ethernet cable must be connected between the receiver and the LAN before the mains power supply is connected.** If the power supply is connected first, the receiver will automatically set itself up as a repeater and will not communicate to the LAN, even if a network cable is then connected. **Ensure network cable is fully engaged.**

If the STAPS system is being set up with a stand alone network, using a network switch (Figure 8), the power to the switch must be switched on before power to the receiver.

If the receiver/repeater is set up as a repeater in error, turn off the power, unplug and start again.



Fig. 8

The receiver is now ready to receive signals from heads that are within range.

# 4. Electrical installation

**Note:** Before installing read the 'Safety Information' in Section 1.



## **Warning:**

Isolate the mains supply before touching any of the wiring terminals as these may be wired to hazardous voltages.

Use only the connectors supplied with the product, or spares obtained from Spirax-Sarco Limited. Use of different connectors may compromise product safety and approvals. Ensure there is no condensation within the unit before installing and connecting the power.

Connecting the mains supply incorrectly can cause damage and may compromise safety.

## 4.1 General wiring notes

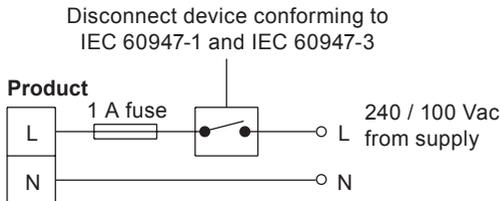
Every effort has been made during the design of the product to ensure the safety of the user but the following precautions must be observed:

1. Maintenance personnel must be suitably qualified to work with equipment having hazardous live voltages.
2. Ensure correct installation. Safety may be compromised if the installation of the product is not carried out as specified in this IMI.
3. The design of the product relies on the building/site installation for overcurrent protection and primary isolation.
4. Overcurrent protection devices rated at 1 amps must be included in all phase conductors of the installation wiring. If overcurrent protection is included in both supply wires then the operation of one must also cause the operation of the other. Refer to IEC 60364 (Electrical Installations of Buildings) or National or Local standards for full details of requirements for overcurrent protection.
5. A 1 A slow-blow overcurrent protection device must be fitted to the relay circuit(s).
6. Relay contacts must be supplied on the same phase as the mains supply.
7. The product is designed as an installation category II product.
8. Install wiring in accordance with:
  - IEC 60364 - Low-voltage electrical installations.
  - BS 6739 - Instrumentation in Process Control Systems: Installation design and practice or local equivalent.
9. All external circuits must meet and maintain the requirements of double/reinforced installation as stated in IEC 60364 or equivalent.
10. Additional protection must be provided to prevent accessible parts (e.g. signal circuits) from becoming Hazardous Live if a wire or screw is accidentally loosened or freed. Ensure all wires are secured to at least one other wire from the same circuit. The attachment must be as close to the terminal block as possible but must not apply undue stress on the connection. Example: Use a cable tie to secure the live and neutral wire together. If one wire becomes loose the other wire will prevent it from touching accessible parts.

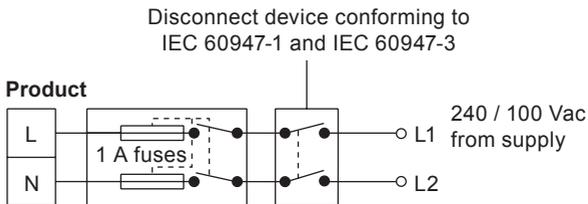
11. A disconnecting device (switch or circuit breaker) must be included in the building/site installation. It must:
  - Have a rating with sufficient breaking capacity.
  - Be in close proximity to the equipment, but not fitted in a position that makes it difficult to operate.
  - Disconnect all phase conductors.
  - Be marked as the disconnecting device for the product.
  - Not interrupt a protective earth conductor.
  - Not be incorporated into a mains supply cord.
  - Comply with the requirements for a disconnecting device specified in IEC 60947-1 (Specification for low-voltage switchgear and control gear – General rules) and IEC 60947-3 (Switches, disconnectors, switch-disconnectors and fuse-combination units).
12. See Section 7 - 'Technical information' for terminal and cable specification.

## 4.2 Mains wiring notes:

1. Read Section 4.1 - 'General wiring notes', before attempting to wire the supply to the product.
2. The wiring connections are identified on the terminal plugs.
3. Fuses must be fitted in all live conductors.



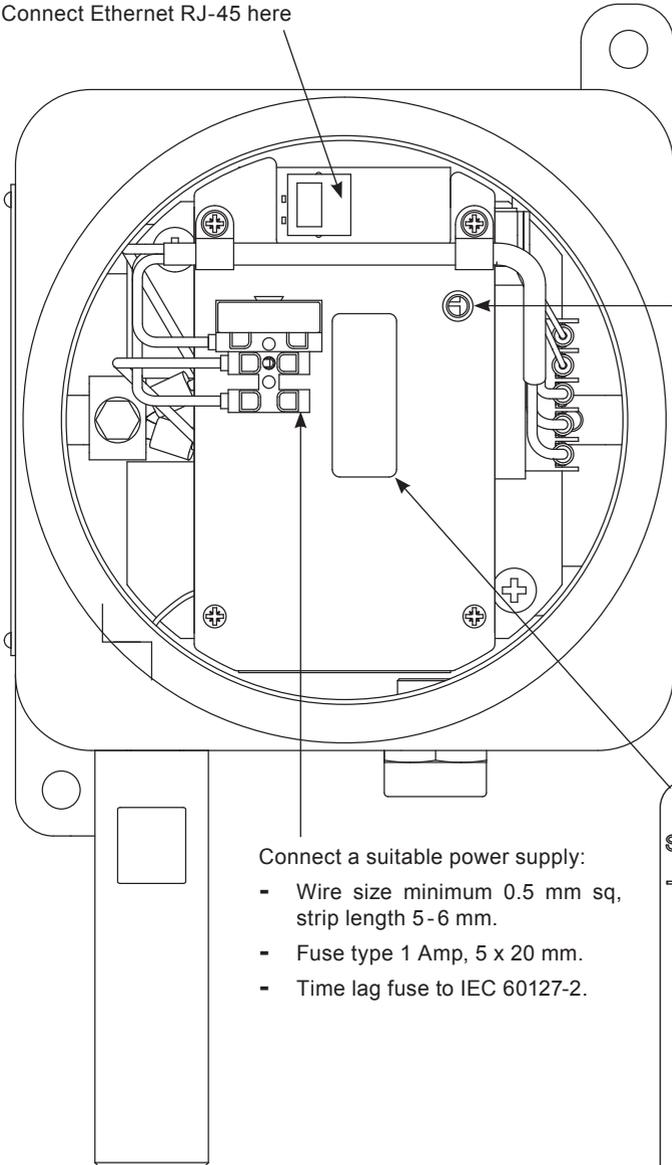
**Fig. 9**



**Fig. 10**

4. Double or reinforced insulation must be maintained between:
  - Hazardous live conductors (mains and relay circuits) and
  - Safety extra low voltages (All other components / connectors / conductors).
5. The wiring diagrams show relays and switches in the **Power off** position.

Connect Ethernet RJ-45 here



Use a suitable 'P' clip to support the mains cable.  
Thread M5x0.8 mm

Connect a suitable power supply:

- Wire size minimum 0.5 mm sq, strip length 5-6 mm.
- Fuse type 1 Amp, 5 x 20 mm.
- Time lag fuse to IEC 60127-2.

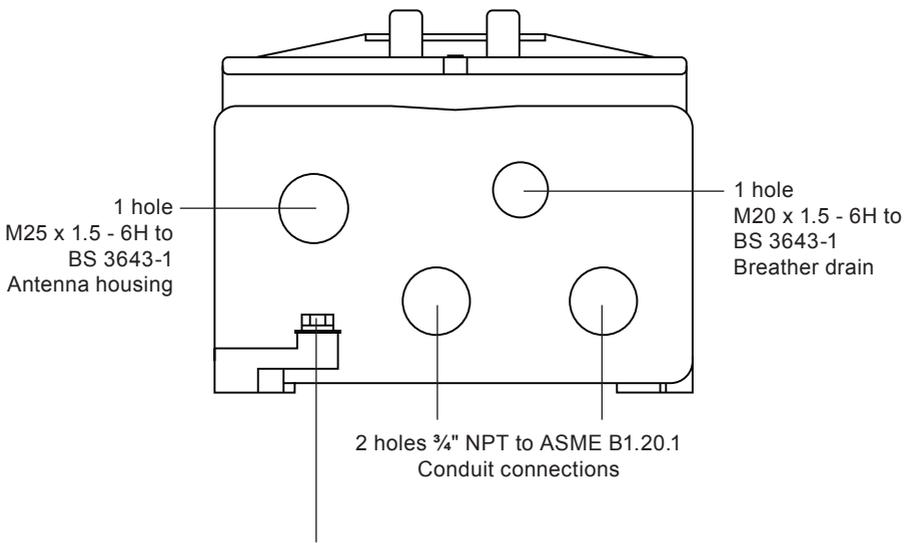
1A  
SLOW BLOW



N

CONDUCTOR SIZE  
2.5 mm<sup>2</sup> MAX

Fig. 11



**Fig. 12** Protective earth must be connected.  
Earth bonding connection M6.

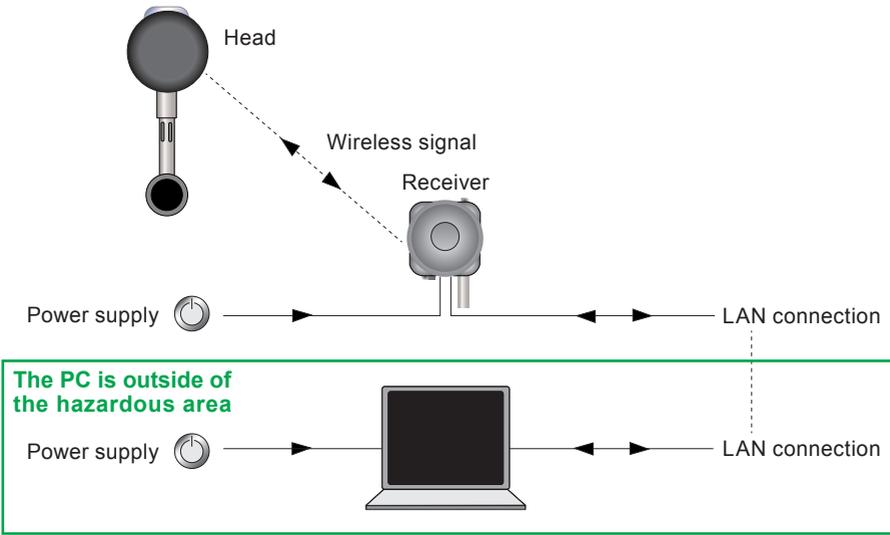


Fig. 13 System using building LAN (network)

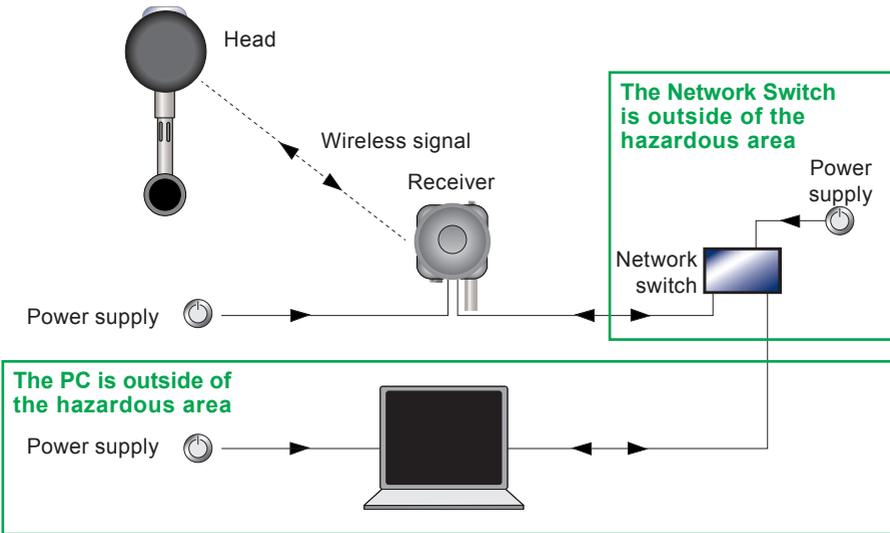


Fig. 14 System using network switch

# 5. Spare parts

Only the parts listed below are available for the STAPS system. No other parts are supplied as spares.

## Available spares

Enclosure 'O' ring	1
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## How to order spares

Always order spare parts by using the description given in the column headed 'Available spares' and state the size and unit nomenclature that they are intended for.

## Example:

1 off Enclosure 'O' ring for a STAPS wireless receiver/repeater Ex version.

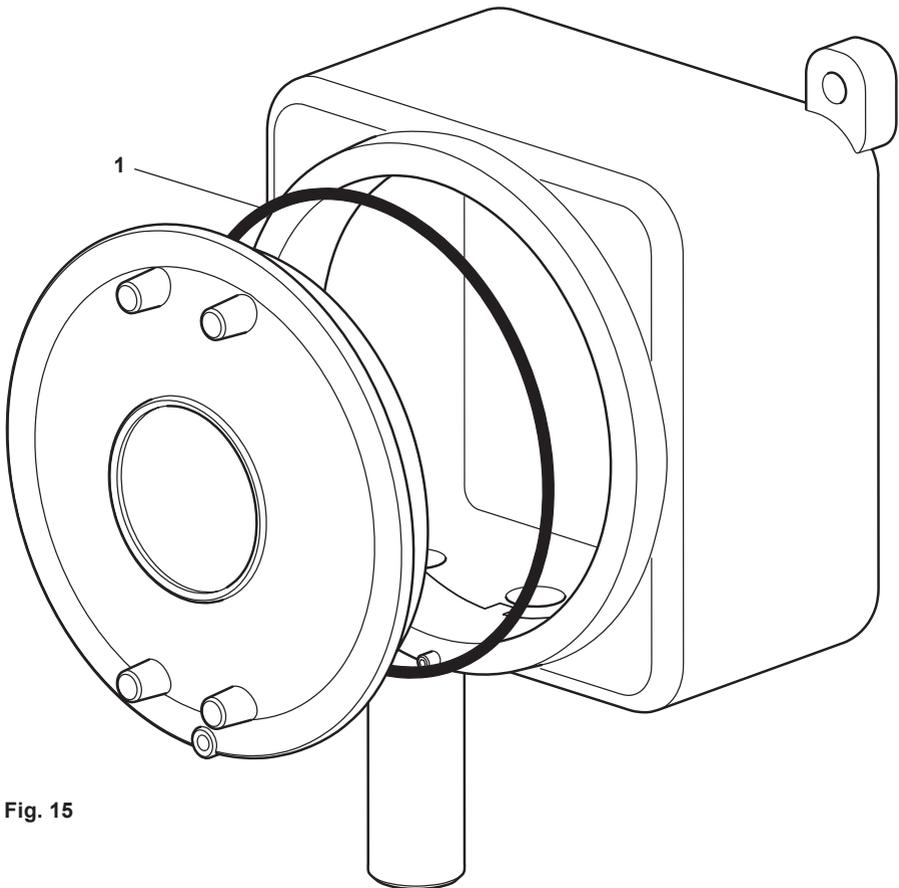


Fig. 15

# 6. Certification and approvals

## Certification

<b>IECEX certification</b>	Equipment protection level	
	Gas	Ex d IIC T4 Gb
	Dust	Ex tb IIIC T135oC Db
	Tamb	-20 to +70 °C
	Standards used	IEC 60079-0, IEC 60079-1 and IEC 60079-31

<b>European certification</b>	ATEX flame proof  II 2 GD	
	Gas	Ex d IIC T4 Gb
	Dust	Ex tb IIIC T135 °C Db
	Tamb	-20 °C to +70 °C
	Standards used are flame proof to	EN 60079-0, EN 60079-1 and EN 60079-31

## Warning:



1. The equipment must be inspected and cleaned regularly to prevent the build-up of dust on the product.
2. Electrostatic Hazard – Wipe only with a damp cloth.
3. Do not open when an explosive atmosphere is present.

## Note:

The above certification and approvals are only valid if the product is installed using the genuine supplied component parts and accessories.



**MADE IN UNITED KINGDOM**

See  
Figure  
17

See  
Figure  
18

UL 61010-1  
CSA-G22.2 No. 61010-1



See  
Figure 19

**WARNING – DO NOT OPEN WHEN AN  
EXPLOSIVE ATMOSPHERE IS PRESENT**

**AVERTISSEMENT – NE PAS OUVRIR LORSQU'UNE  
ATMOSPHÈRE EXPLOSIVE EST PRÉSENTE**

**INPUT 100–240 VAC 50/60 Hz 0.7A**

**SEE INSTALLATION INSTRUCTION DOCUMENT**

**THIS DEVICE CONTAINS APPROVED RADIO MODULES**

TYPE : XB24CZ7UR6-004      CONTAINS FCC APPROVED

MFD : XXXXXXXX XXXX      MODULE FCC ID : M00-XB24C

S/N : XXXXXXXX      P/N : 0140500

MAC ID : XX XX XX XX XX XX XX XX (WIRELESS)

MAC ID : XX XX XX XX XX XX XX XX (ETHERNET)

**SPRAX SARCO LTD – RUNNINGS ROAD – CHELTENHAM**

**UNITED KINGDOM GL51 9NQ**

Fig. 16 Product label



Fig. 17

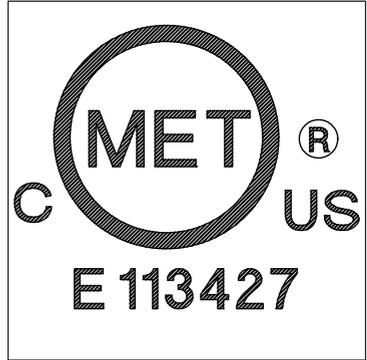


Fig. 18

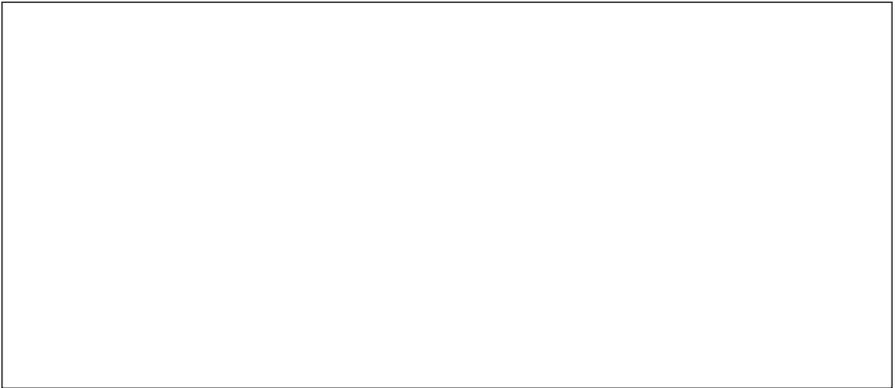


Fig. 19

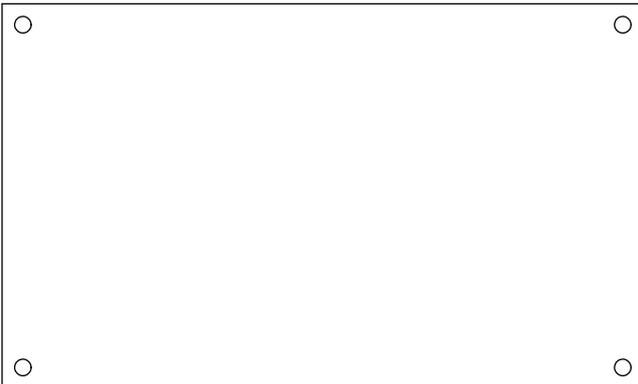


Fig. 20

# 7. Technical information

## Software statement

Certain computer programs contained in this product [or device] were developed by Spirax-Sarco Limited ('the Work(s)').

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## All Rights Reserved

Spirax-Sarco Limited grants the legal user of this product (or device) the right to use the Work(s) solely within the scope of the legitimate operation of the product (or device). No other right is granted under this licence. In particular and without prejudice to the generality of the foregoing, the Work(s) may not be used, sold, licensed, transferred, copied or reproduced in whole or in part or in any manner or form other than as expressly granted here without the prior written consent of Spirax-Sarco Limited.

### 7.1 For technical assistance

Contact your local Spirax Sarco representative. Details can be found on accompanying order/delivery documentation or on our web site: [www.spiraxsarco.com](http://www.spiraxsarco.com)

### 7.2 Returning faulty equipment

Please return all items to your local Spirax Sarco representative. Please ensure all items are suitably packed for transit (preferably in the original cartons).

#### Please provide the following information with any equipment being returned:

1. Your name, company name, address and telephone number, order number and invoice and return delivery address.
2. Description and serial number of equipment being returned.
3. Full description of the fault or repair required.
4. If the equipment is being returned under warranty, please indicate:
  - Date of purchase.
  - Original order number.

### 7.3 Power supply

Mains voltage range	100 V to 240 V at 50/60 Hz
Power consumption	0.7 A maximum

## 7.4 Environmental

General		Outdoor / Indoor use
Maximum altitude		2 000 m (6 562 ft) above sea level
Ambient temperature limits		-20 °C to +70 °C (4 °F to 158 °F)
Maximum relative humidity		95%
Overvoltage category		II
Enclosure rating		IP66
LVD (safety)	Electrical safety	EN 61010-1
		UL 61010-1
		CAN / CSA C22.2 No. 61010-1
EMC	Immunity to Class A	Heavy industrial
	Emissions to Class B	Commercial
Material	Enclosure	Aluminium
	Front panel seal	Silicone rubber, 60 shore.

## 7.5 Cable/wire and connector data

### Mains and signal connector

Termination	Rising clamp plug-interterminal blocks with screwed connectors
Cable size	0.5 mm <sup>2</sup> to 2.5 mm <sup>2</sup>
Stripping length	5 - 6 mm

## 7.6 STAPS RF security

The RF side of the network implements 128-bit advanced encryption standard (AES) cipher using a randomly generated key transmitted to the joining node by the network coordinator device when the node requests to join the network. All subsequent exchanges are encrypted using the key. The network header, APS header (this is the part of the frame that supports routing, acknowledgement, binding and address maps) and application data are all authenticated with 128-bit AES. Additionally a checksum is performed on these fields and is appended as a 4-byte message integrity code (MIC) to the end of the packet. The MIC allows receiving devices to ensure the message has not been changed. If a device receives a packet and the MIC does not match the device's own checksum of the data, the packet is dropped. The network header of the encrypted packets also includes a 32-bit frame counter; each device on the network maintains a 32-bit frame counter that is incremented for each transmission. Devices track the last known 32-bit counter for each of its neighbours. If a device receives a packet from a neighbour with a smaller frame counter than it has previously seen the packet is discarded thereby protecting against 'replay' attacks.





