# Spiratec
# Steam trap monitoring


spirax sarco

# Why monitor steam traps?

Spirax Sarco continues to advise on the efficient use of steam and its associated plant to many organisations in Industry and Commerce. This service provides the proper association needed between products and systems so that energy is used as effectively and efficiently as possible around the plant.

One such product is the steam trap - an essential part of any steam system, releasing hot condensate from the process for recovery and use elsewhere on the plant.

Today's steam trap is the product of over 100 years of development and is more reliable now than ever before. But failures will inevitably occur, and when they do, you will probably want to know - **fast**.

Why? Because a failed steam trap is a potential for saving money!

A steam trap can block or leak. Blockages can increase production times and reduce performance, steam leaks will lose energy and jeopardise safety.

**Fast and correct identification of trap failure is the key to:**

- Saving process energy.
- Optimising process performance.
- Optimising safety levels.

**Thereby reducing:**

- Productivity costs and times.
- Steam raising cost.
- Emission loss from boiler plant.
- Environmental impact.
- Maintenance costs.
- Repair costs.

The need to save money is real and obvious. The need to save energy now is no less important than ever before. Some reasons for doing so remain the same. Some, such as environmental legislation, require us to adopt new ideals about the way we use energy. Whatever drives you to meet these objectives, Spirax Sarco can help!

Any steam management system should include steam trap monitoring as a basic tool to reduce waste, costs, and environmental liability. Whether this is conducted manually or automatically will depend on the size of the site, the number of traps, the number of personnel, and the urgency of repair.

## The cost of ignoring leaking steam traps?

Steam leaks are costly in both a financial and environmental sense and therefore need prompt attention to ensure your steam system is working at its optimum efficiency with a minimum impact on the environment. For example, for each litre of heavy fuel oil burned unnecessarily to compensate for a steam leak, approximately 3 kg of $CO_2$ are emitted to the atmosphere.

Steam traps can have different sized orifices to suit different conditions. If a trap leaks steam, the amount wasted will depend on the size of the trap and the steam pressure. The cost of waste will also depend on the number of traps and the operating time. A simple example is given below.

**Table 1 Typical steam wastage and annual costs due to leaking steam traps**

| Trap size | Average orifice size in steam traps (mm) | Steam loss (kg/h) | | | Typical annual cost £000s | | |
|---|---|---|---|---|---|---|---|
| | | 6 bar g | 14 bar g | 32 bar g | 6 bar g | 14 bar g | 32 bar g |
| **DN15** | 3.0 | 8 | 19 | 43 | 13 | 32 | 72 |
| **DN20** | 5.0 | 24 | 53 | 119 | 40 | 89 | 200 |
| **DN25** | 7.5 | 55 | 121 | 270 | 92 | 203 | 453 |
| **DN40** | 10.0 | 98 | 214 | 478 | 164 | 359 | 802 |
| **DN50** | 12.5 | 152 | 335 | 747 | 255 | 562 | 1 254 |

**Example:**
A process plant has 200 steam traps of which 10% fail annually. The average trap size is DN20 and the steam pressure is 14 bar g.

The plant runs 24 hours a day, 7 days a week for 50 weeks a year = 8 400 hours a year
Average number of traps failing over a year (10% of 200) = 20 traps
From the chart, the steam loss per trap = 53 kg/h
Steam loss per year for the total plant = 20 x 53 x 8 400 tonnes per annum
**Steam wasted each year = 8 900 tonnes.**

**The cost of overlooking leaks:** If the overall cost of steam for this plant were £10 per tonne, the direct cost of ignoring these leaking steam traps would be £89 000 each year, equivalent to well over a million litres of fuel oil!

**The cost to the environment** is that over 3 000 tonnes of $CO_2$ would be dumped into the atmosphere. The 'global 'Kyoto' Agreement is designed to curb environmental waste, and National agreements are designed to incur energy taxes on inefficient plant.

**Note:** Leaking steam also has to be replaced with chemically treated water. **A costly operation.**

## The cost of ignoring blocked steam traps?

Water will not be removed from the process, with the result that both safety and performance are compromised. In the case of the latter, the cost will depend on the process. In the case of the former the cost can prove incalculable.

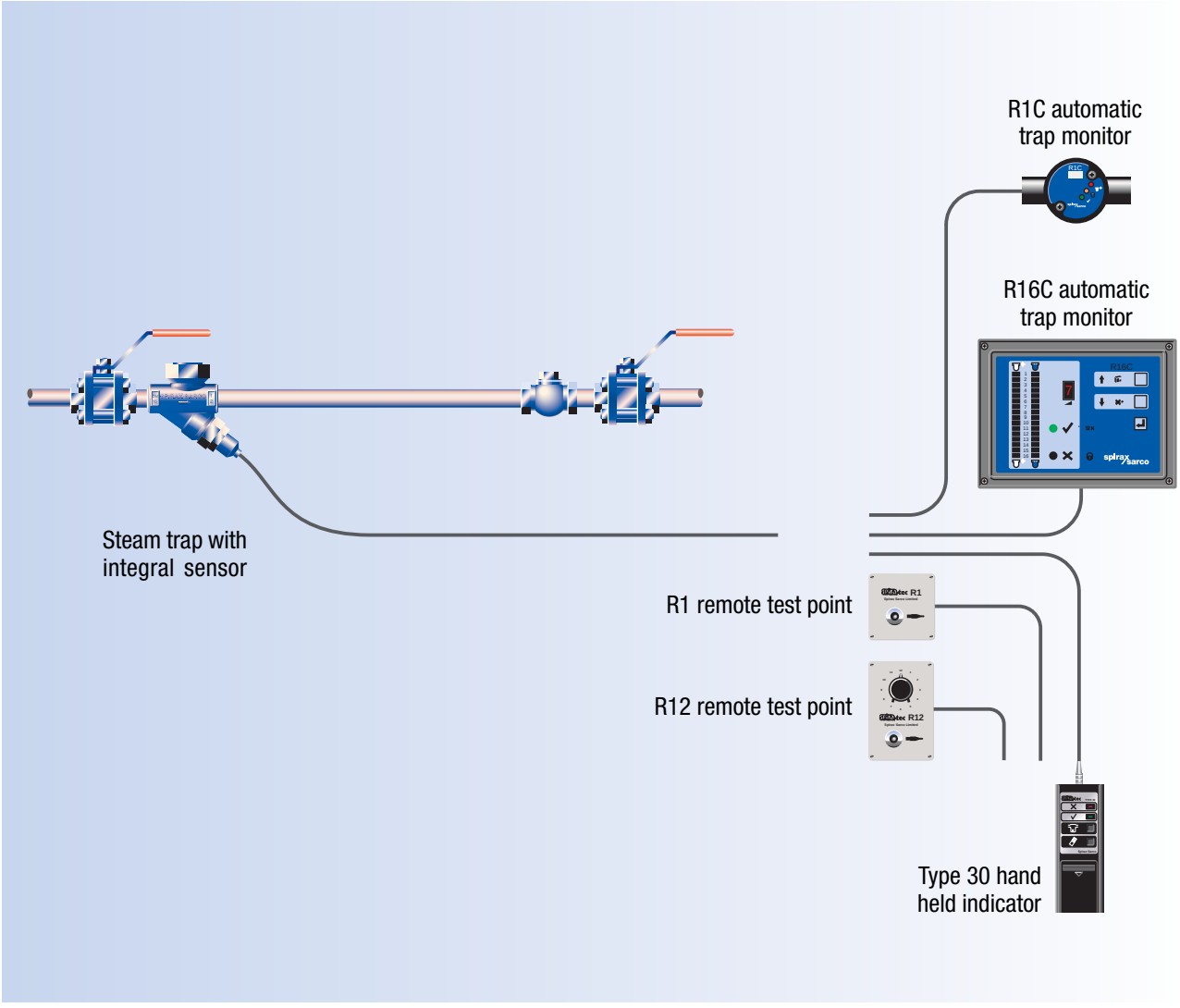
# The answer is an effective monitoring procedure

In order to reduce fuel costs, emission surcharges, and maximise process efficiency, it is important that four simple measures are taken:

- Steam trap failures are identified soon after they occur.
- Steam trap failures are identified correctly - without proper means, it is easier to wrongly identify a working trap than correctly identify a faulty one.
- Steam trap failures are corrected as soon as they are identified.
- The monitoring system can meet the above three criteria, accurately, repeatedly, and continuously.

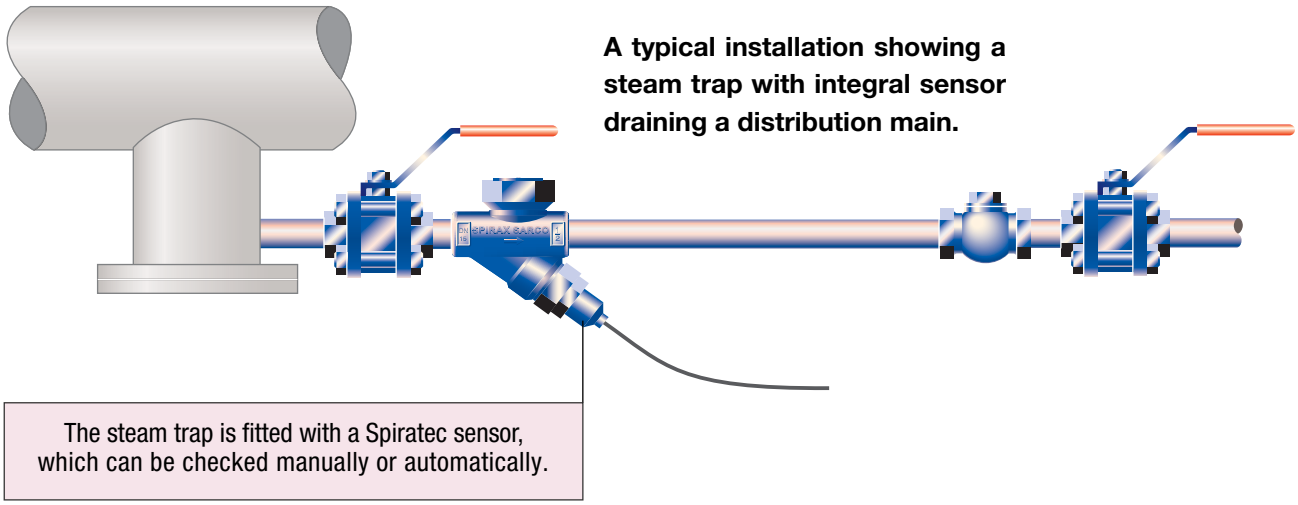
**There are many types of steam trap monitoring devices on offer. Only one satisfies all four of the above considerations. It is permanently fitted, constantly guarding against leaks and waterlogging and giving an immediate and correct response to fault conditions.**

# The answer is Spiratec



# The Spiratec system

## Where does the Spiratec system fit?



**A typical installation showing a steam trap with integral sensor draining a distribution main.**

The steam trap is fitted with a Spiratec sensor, which can be checked manually or automatically.

## How does the Spiratec system work?

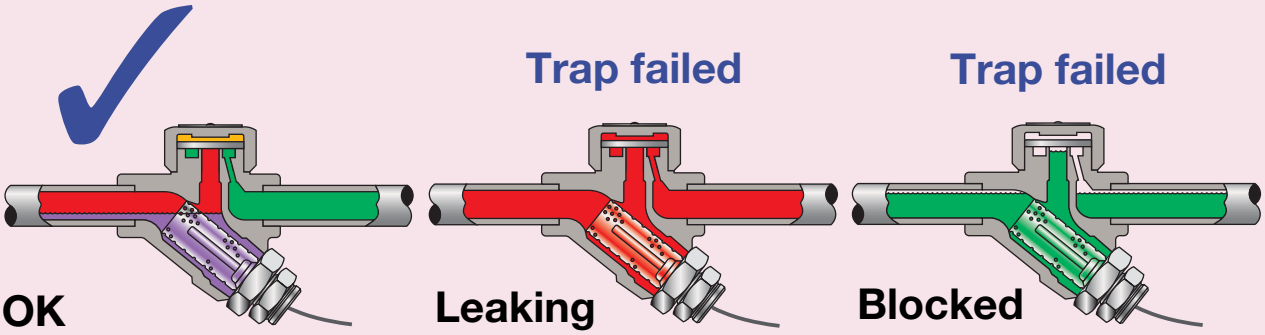
The hub of the Spiratec system is a sensor capable of distinguishing between steam and condensate. It can be part of a trap or a separate chamber.

If the steam trap is operating correctly, the sensor will be immersed in hot condensate. If the steam trap is leaking, it will be immersed in steam. If the steam trap is blocked, it will be immersed in cool condensate.

As the sensor is permanently fitted in the heart of the trap, it is continually alert to any trap malfunction.

Faults can be identified manually or automatically, and locally or remotely.

**Whatever method suits your system, nothing could be simpler, more foolproof or cost effective.**




## User benefits

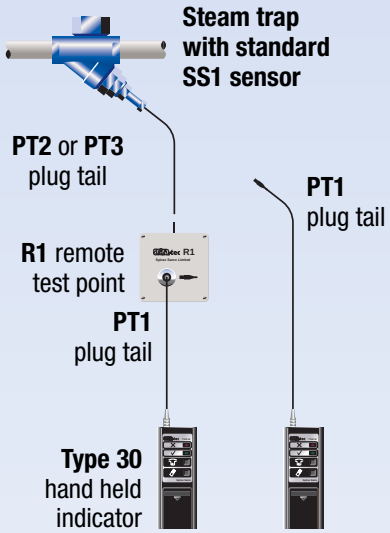
- Immediate indication of 'correct operation', 'trap waterlogged' or trap 'leaking steam'.
- Trap status indicated by coloured lights - no skilled labour needed.
- Separate chambers or integral sensor options to suit all steam trap system applications.
- Compatible with BEMS / EMS/SCADA system for efficient system monitoring.
- Reduced energy losses and improved system efficiency leading to increased profits.
- Remote test points allow inaccessible traps to be monitored during trap surveys.

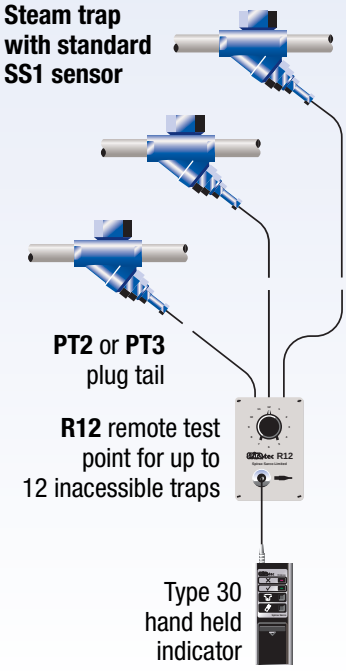
# Selecting a Spiratec system

## Manual
**hand held monitoring**
**steam leak detection**

**Advantages:**

- Cheap to install.
- You choose when to monitor.
- Faults positively identified.
- Local or remote diagnosis.

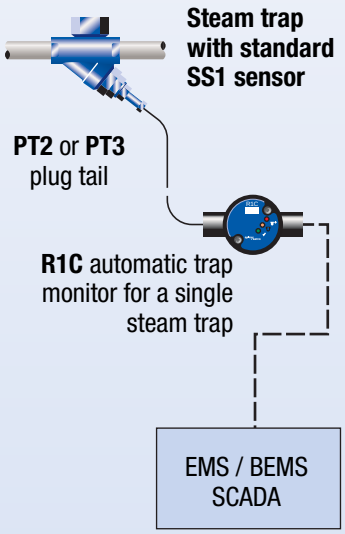


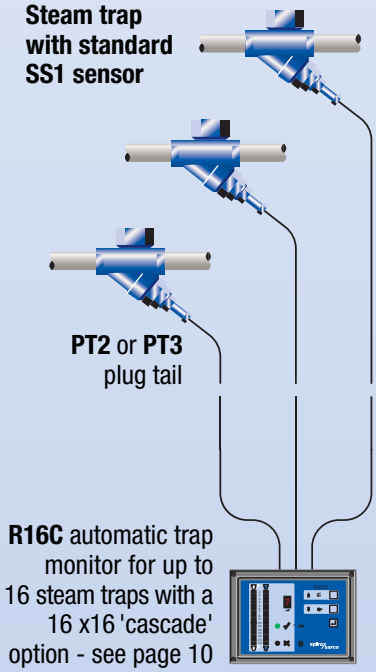




## Automatic
**continuous monitoring**
**steam leak detection**

**Advantages:**

- Local or remote diagnosis.
- Fully automatic diagnosis.
- Continuous assessment.
- Faults positively identified.

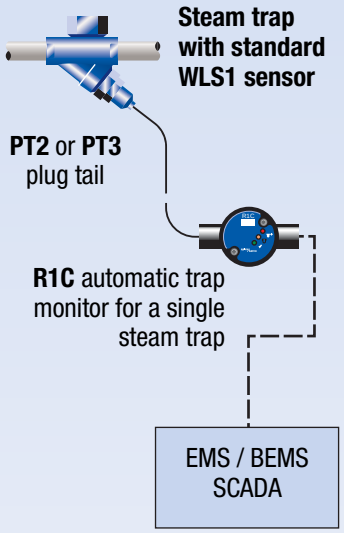


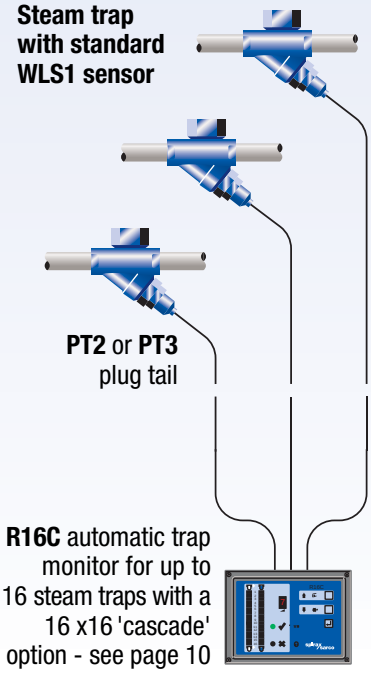




## Automatic
**continuous monitoring**
**steam leak and waterlogging detection**

**Advantages:**

- Local or remote diagnosis.
- Fully automatic diagnosis.
- Continuous assessment.
- Faults positively identified.
- Leaks and blockages diagnosed.



# Steam monitoring equipment

## Traps

**Balanced pressure and Bimetallic steam traps**

**Quick fit steam traps**

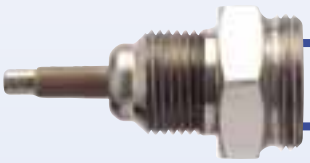
**Thermodynamic steam traps**

**Float/ thermostatic steam traps**

## Sensors

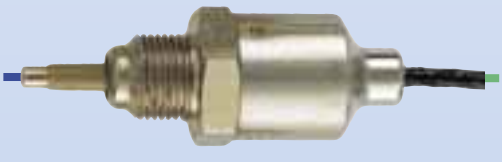
**PT1**

**PT2**



**SS1**
Sensor used for steam leak monitoring

**PT3**



**WLS1**
Sensor used for both
steam leak and waterlogging monitoring

## Plug tails and remote test points

## Monitors

**R1**

**PT1**

**R1 and R12**
For manual testing
of inaccessible traps

**R12**

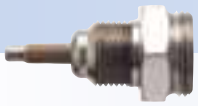
**PT1**

**Type 30**
Hand held monitor
with indicator cable.

**R1C**
Automatic monitor of
leak sensors and waterlog sensors.
Provides local/remote visual status
plus repeater signal to EMS/SCADA system.


**R16C**
Monitor of leak sensors and leak/waterlog sensors.
Provides remote visual status plus
repeater signal to EMS/SCADA system.

# Application Selection of steam traps and

| Application | | Steam trap | Recommended sensor | | Sensors required |
|---|---|---|---|---|---|
| | | | WLS1 | SS1 | |
| Canteen equipment | Boiling pans - fixed | BP or IFT | | SS1 | Leak only SS1  |
| | Boiling pans - tilting | IBP | | SS1 | |
| | Boiling pans - pedestal | IBP or IFT | | SS1 | |
| | Steaming ovens | IBP | | SS1 | |
| | Hot plates | IBP or IFT | | SS1 | |
| Oil transfer / storage | Bulk oil storage tanks | IFT | WLS1 | | |
| | Line heaters | IFT | WLS1 | | |
| | Outflow heaters | IFT | WLS1 | | |
| | Tracer lines | IBP or ITD | | SS1 | |
| | Jacketed pipes | IBP or ITD | | SS1 | |
| Hospitals | Autoclaves and sterilisers | IBP or IFT | WLS1 | | |
| Industrial dryers | Drying coils (continuous) | IFT, ITD or IBP | WLS1 | | |
| | Drying coils (grid) | IBP or ITD | WLS1 | | |
| | Drying cylinders | IFT | WLS1 | | |
| | Multi-bank pipe dryers | IFT, IBP or ITD | WLS1 | | |
| | Multi-cylinder sizing machines | IFT | WLS1 | | |
| Laundry equipment | Garment presses | ITD or IFT | | SS1 | |
| | Ironers and calenders | IFT, IBP or ITD | WLS1 | | |
| | Dry cleaning machines | IFT or ITD | | SS1 | |
| | Tumble dryers | IFT | WLS1 | | |
| Presses | Multi-platen presses (parallel connections) | ITD or IFT | WLS1 | | |
| | Multi-platen presses (series connections) | ITD | WLS1 | | |
| | Tyre presses | IBP, ITD or IFT | WLS1 | | |
| Process equipment | Boiling pans - fixed | IFT, ITD or IBP | WLS1 | | |
| | Boiling pans - tilting | IFT | WLS1 | | |
| | Brewing coppers | IFT | WLS1 | | |
| | Digesters | IFT or ITD | WLS1 | | |
| | Evaporators | IFT | WLS1 | | |
| | Hot tables | IBP, ITD or IFT | | SS1 | |
| | Retorts | IFT | WLS1 | | |
| | Bulk storage tanks | IFT | WLS1 | | |
| | Vulcanisers | IFT or ITD | WLS1 | | |
| Space heating | Calorifiers | IFT | WLS1 | | Leak and waterlogging WLS1  |
| | Heater batteries | IFT | WLS1 | | |
| | Radiant panels and strips | IFT or ITD | WLS1 | | |
| | Radiators and convection cabinets | IBP or IFT | | SS1 | |
| | Overhead pipe coils | IBP or IFT | | SS1 | |
| Steam mains | Horizontal runs | IFT or ITD | WLS1 | | |
| | Separators | IFT or ITD | WLS1 | | |
| | Terminal ends | IFT or ITD | WLS1 | | |
| | Header drainage | IFT or ITD | WLS1 | | |
| Tanks and vats | Process vats (rising discharge pipe) | IBP, IFT or ITD | WLS1 | | |
| | Process vats (discharge pipe at base) | IBP, IFT or ITD | WLS1 | | |
| | Small coil heated tanks (quick boiling) | IBP or IFT | | SS1 | |
| | Small coil heated tanks (fast boiling) | IBP | | SS1 | |

# monitoring equipment

| Manual or Automatic | Plug tails from trap to test point | Remote test point | Plug tails from trap or test point to monitor | Monitor | EMS / to SCADA |
|---|---|---|---|---|---|
| Manual — Traps accessible | – | – |  PT1 |  Type 30 Hand held unit | **No** |
| Manual — Traps non-accessible |  PT2 or PT3 | Single R1  or Multi R12  |  PT1 |  Type 30 Hand held unit | **No** |
| Automatic | – | – |  PT2 or PT3 |  Single R1C | **Yes** |
| Automatic | – | – |  PT2 or PT3 |  Multi R16C | **Yes** |
| Automatic | – | – | The plug tail is an integral part of the WLS1 sensor |  Single R1C | **Yes** |
| Automatic | – | – | The plug tail is an integral part of the WLS1 sensor | Multi R16C  Diode pack required | **Yes** |

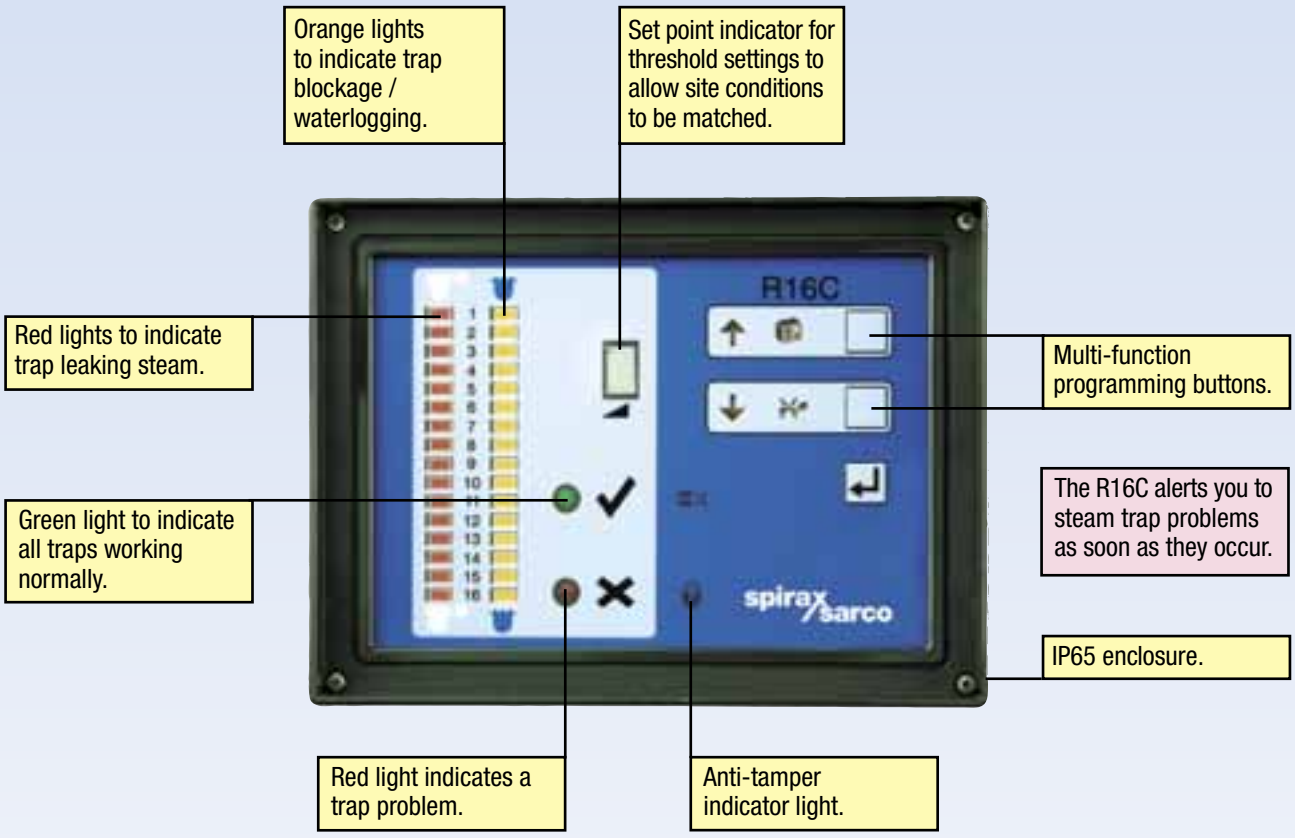
## R16C automatic trap monitor

The R16C automatic trap monitor enables up to 16 steam traps to be continuously monitored. If they are all working correctly a single green light is illuminated. If one or more of the steam traps is passing steam, then the corresponding red 'fail' light is illuminated and the green light is extinguished. If one or more of the steam traps is blocked with dirt or has failed closed then the corresponding orange 'waterlogging' light is illuminated and the green light is extinguished. The waterlogging option can be disabled for any of the traps if desired.

Both the waterlogging temperature and the steam/condensate conductivity threshold levels can be easily altered to suit specific installation requirements.

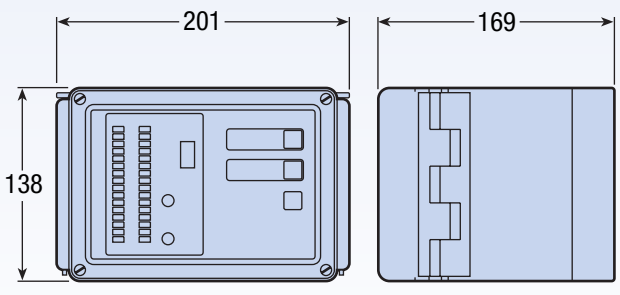
The R16C can easily be incorporated into most computerised management systems. It can also be made tamper-proof. It can be sited considerable distances away from the sensor chambers.

The unit can be installed on a cascade basis. One 'master' box will monitor up to 16 x R16C 'local' boxes. A red light on the 'master' box will indicate which 'local' box is registering a faulty trap. Inspection of that 'local' box will then identify the specific trap.



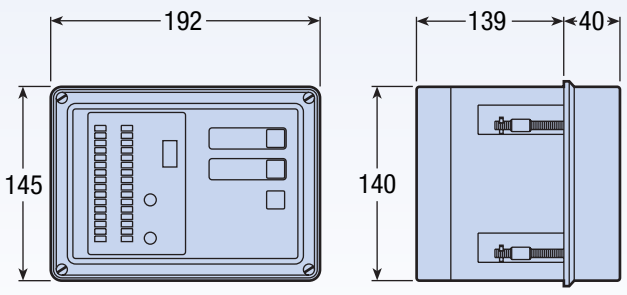

The R16C steam trap monitor is available for 90 - 240 Vac or 24 Vac supplies and for either wall mounting or panel mounting. The box is ABS plastic and has an IP65 enclosure rating, when fitted with suitable cable glands.

**Wall mounting**




**Weight** 1.88 kg

**Panel mounting**




**Dimensions** (approximate) in mm

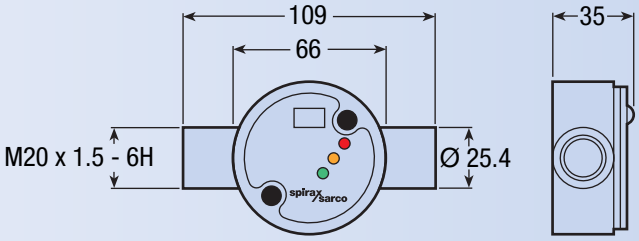
**Weight** 1.66 kg

## R1C automatic trap monitor

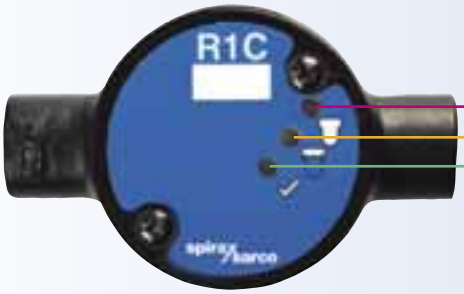
The R1C will monitor the performance of a single steam trap. It will indicate whether the trap is operating correctly, passing live steam or has failed closed. It does this by means of coloured status lights on the unit.

Analogue and digital outputs allow it to be connected directly to BEMS / EMS or SCADA systems to indicate steam trap status remotely.

The R1C requires a 24 Vdc supply and is available with either npn or pnp output. The enclosure is cast malleable iron and has an IP65 enclosure rating when fitted with suitable cable glands.




**Dimensions** (approximate) in mm




Red light indicates trap leaking steam.
Orange light indicates trap blockage / waterlogging.
Green light indicates trap working correctly.

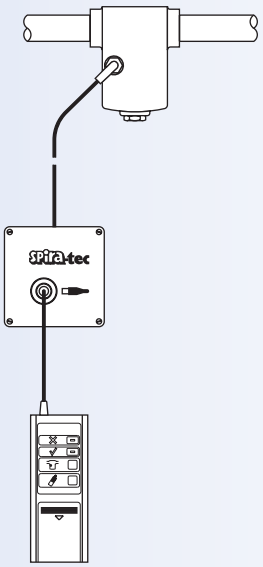
## Type 30 indicator and remote test points

The Type 30 indicator is simply plugged in and removed as each trap is tested, making it ideal for steam trap surveys. It will immediately indicate which traps are leaking steam. It is convenient to use when traps are within easy reach. In roof trusses, floor ducts and other awkward places, remote test points are the solution.

Where remote test points are used a heat resistant plug tail is permanently connected to the sensor in the sensor chamber or the steam trap and then wired to a test point (single or 12-way) sited at any convenient position. Trap checking is carried out by plugging the Type 30 indicator into the test point instead of the sensor.

The Type 30 indicator is a hand held, portable, battery operated instrument with an enclosure rating to IP20. It is supplied complete with 1.25 m cable.


**R1** remote test point
for a single inaccessible trap.



**Type 30**
indicator


**R12** remote test point
for up to 12 inaccessible traps.

**Dimensions / weights** (approximate) in mm and g

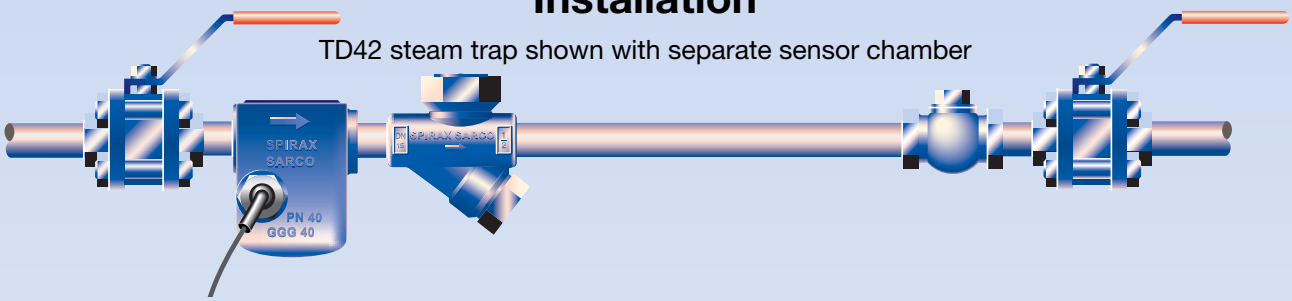
| | Height | Width | Depth | Weight |
|---|---|---|---|---|
| **Type 30** | 157 | 62 | 25 | 130 |
| **R12** | 120 | 80 | 55 | 300 |
| **R1** | 80 | 82 | 55 | 200 |

# Sensors in chambers

For steam traps outside the scope of the intrap range, separate sensors can be fitted in the pipeline. The same benefits apply as for the inline traps.

## Installation

TD42 steam trap shown with separate sensor chamber

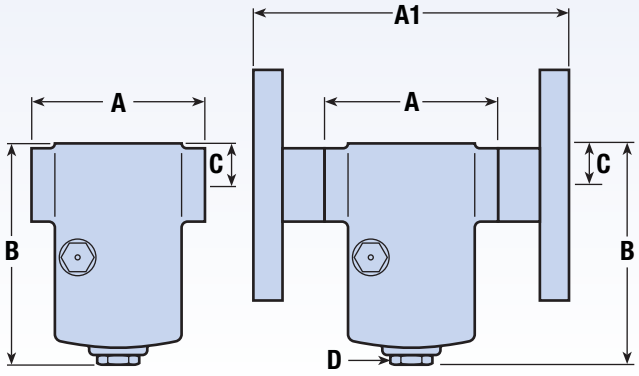



## Range and options

| ST14 Steel | ST16 Stainless steel | ST17 SG iron |
|---|---|---|
| Screwed BSP or NPT, socket weld<br>Flanged BS 4504 PN40,<br>ANSI 150 and 300, BS 10 tables H and J | Screwed BSP or NPT, socket weld<br>Flanged BS 4504 PN40,<br>ANSI 150 and 300, BS 10 tables H and J | Screwed BSP or NPT |
|  |  |  |

## Dimensions / weights (approximate) in mm and kg

| Size | | ½" DN15 | ¾" DN20 | 1" DN25 | 1½" DN40 | 2" DN50 | ½" DN15 | ¾" DN20 | 1" DN25 | ½" - | ¾" - | 1" - |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | | 75 | 75 | 120 | 252 | 252 | 75 | 75 | 120 | 72 | 72 | 120 |
| A1 | | 130 | 150 | 185 | 393 | 393 | 130 | 150 | 185 | - | - | - |
| B | | 101 | 101 | 120 | 215 | 215 | 101 | 101 | 120 | 89 | 89 | 120 |
| C | | 23 | 23 | 28 | 45 | 45 | 23 | 23 | 28 | 23 | 23 | 28 |
| D | | ½" | ½" | ¾" | 1" | 1" | ½" | ½" | ¾" | - | - | ¾" |
| Weight | Scr | 0.82 | 0.82 | 2.20 | 22.0 | 22.0 | 0.82 | 0.82 | 2.20 | 1.2 | 1.2 | 2.2 |
| | Flg | 2.30 | 2.80 | 4.60 | 27.5 | 29.0 | 2.30 | 2.80 | 4.60 | - | - | - |




Some of the products may not be available in certain markets.

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