TI-P401-25
EMM Issue 4

DH Type
Flash Condensing Deaerator Heads

A simple low cost solution for deaerating boiler feedwater at atmospheric pressure

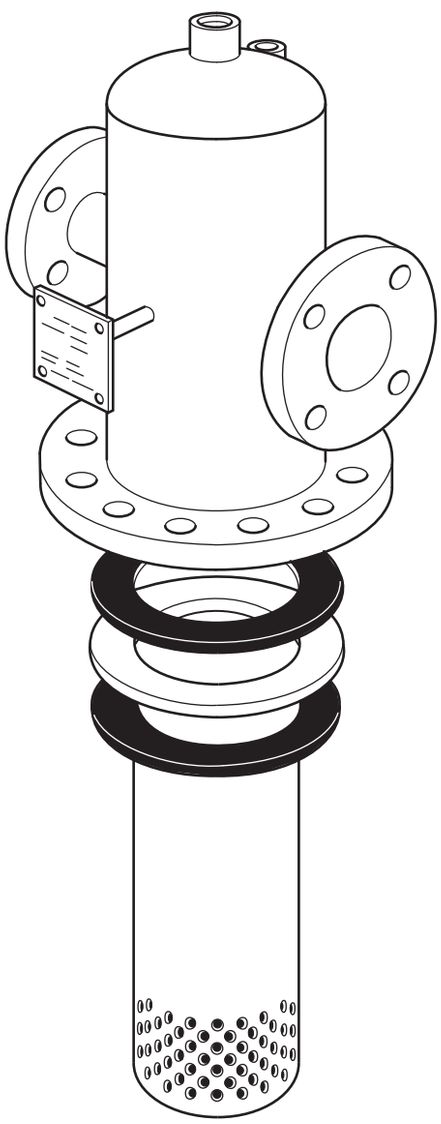
- Mixes hot and cold incoming flows
- Liberates oxygen and other gases
- Stainless steel for long maintenance free life
- Easy to install

Description

Spirax Sarco flash condensing deaerator head is designed to mix incoming flows of cold make-up, condensate return and flash steam to the boiler feedtank. This mixing action is achieved by directing the downward flow through a baffle arrangement within the unit. This liberates dissolved gases from the cold make-up, which are vented to atmosphere. The cold make-up inlet is fitted with a spray screen which diffuses the flow, increasing its surface area to promote thorough mixing with the condensate and flash steam.

A Spirax Sarco flash condensing deaerator head consists of three parts:

- A mixing unit, which is bolted to the top of the tank and is supplied with connections to customer specification for cold make-up, condensate return, flash steam from blowdown etc.
- An immersion tube, which distributes the mixed fluids into the tank and has an integral plate flange which is sandwiched between the tank and mixing unit flanges.
  Immersion tubes are fully described in separate literature.
- Gaskets. Two gaskets are required, one fitted each side on the immersion tube flange. They are ordered separately.



Available types

The mixing unit is available in five nominal diameters (DN150, DN200, DN250, DN300 and DN400) flanged to EN 1092 PN16 or BS 7076 Class 150.
Immersion tubes are available in diameters to suit the deaerator heads and lengths of 950, 1200, 1600 and 2100 mm to suit TM metric feedtanks. Since each deaerator head is built to suit specific plant requirements we recommend that your local Spirax Sarco Engineer is contacted for a connection layout sheet and to discuss your requirements.

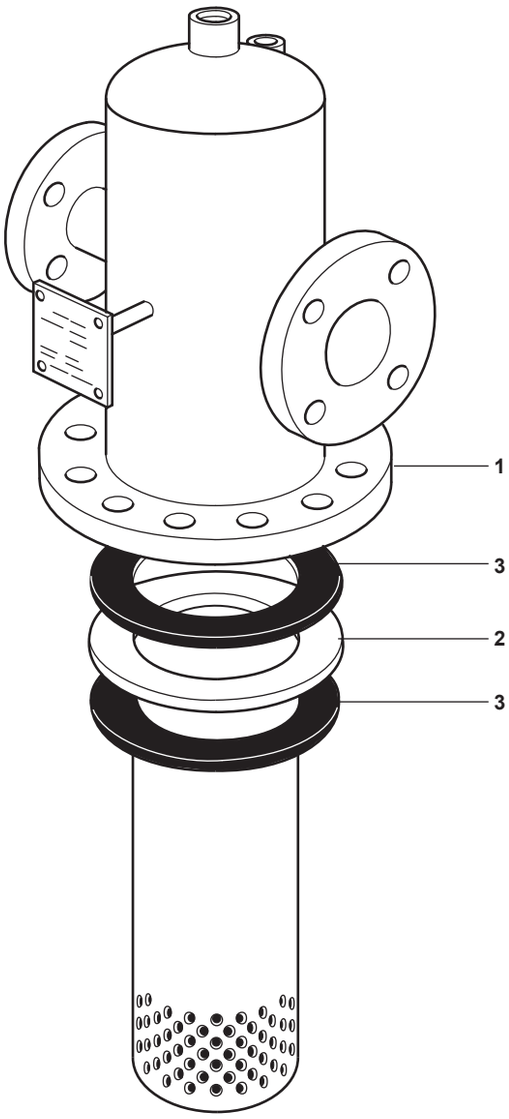
Polígono Industrial O Rebullón s/n. 36416 - Mos - España - rodavigo@rodavigo.com

2 Boiler house

Feedtank ancillaries

Head comprises

Item	Quantity	Description	Material
1	1	Mixing unit	Austenitic stainless steel
2	1	Immersion tube	Austenitic stainless steel
3	2	Gasket	Silicone rubber



Application

Spirax Sarco flash condensing deaerator heads are ideal for boiler feedtank applications. They are suitable for both new and retrofit applications. Each head is fitted with a connection for air vent and recirculating feedwater spray nozzle. The air vent is for the immediate venting of liberated gases (the connection should also include a vacuum breaker). For further details on the RFS recirculating feedwater spray systems see separate literature.

2.1

2

Limiting conditions

PN2.5 rating. Suitable for saturated steam 1 bar g, 120 °C.
The mixing unit only is hydraulically tested to 2 bar g.

Selection table

Total steam generation rate (kg/h)	Mixing unit	Tank depth			
		1250	1500	2000	2500
		Mixing unit/immersion tube selection			
5 000	DN150	MU150	MU150	MU150	MU150
		IT-950	IT-1200	IT-1600	IT-2100
10 000	DN200	MU200	MU200	MU200	MU200
		IT-950	IT-1200	IT-1600	IT-2100
20 000	DN250	MU250	MU250	MU250	MU250
		IT-950	IT-1200	IT-1600	IT-2100
30 000	DN300	MU300	MU300	MU300	MU300
		IT-950	IT-1200	IT-1600	IT-2100
50 000	DN400	MU400	MU400	MU400	MU400
		IT-950	IT-1200	IT-1600	IT-2100

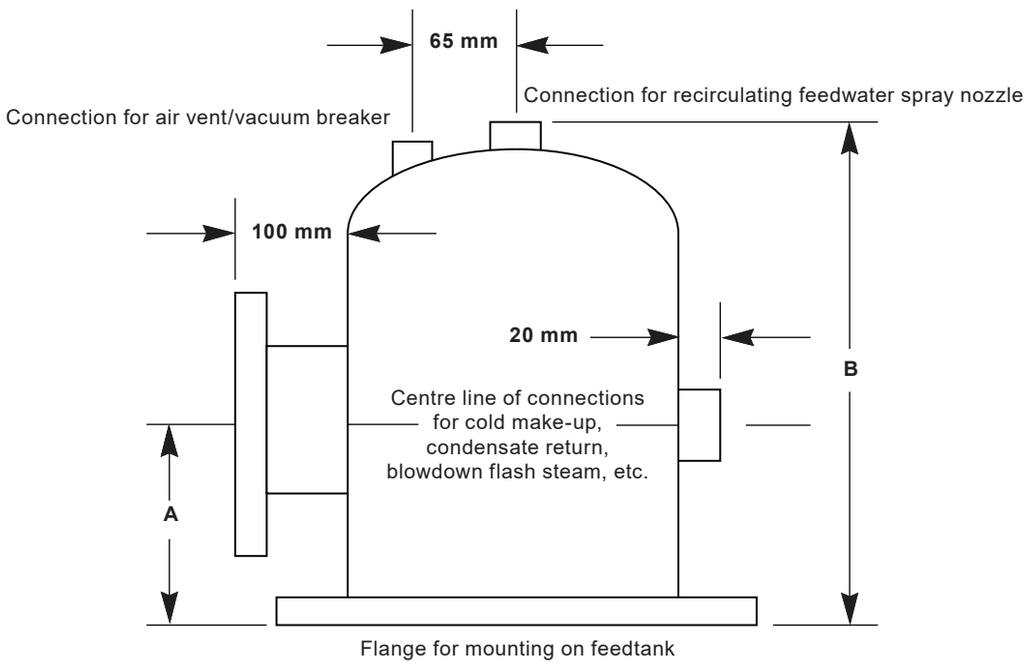
Polígono Industrial O Rebullón s/n. 36416 - Mos - España - rodavigo@rodavigo.com

Dimensions/weights (approximate) in mm and kg

Mixing unit

Type	A	B	Weight
MU150_	175	484	30
MU200_	200	522	50
MU250_	220	557	65
MU300_	250	617	90
MU400_	290	680	125

For details of immersion tube and gaskets see separate literature.



How to specify

Atmosperic deaerator head in austentic stainless steel consisting of mixing unit, immersion tube, and two gaskets. DN150, DN200, DN250, DN300 and DN400. Flanged EN1092-1 PN16/BS 7076 Class 300.

How to order

To specify a 150 mm flash condensing deaerator head flanged EN1092-1 PN16 (mixing unit plus immersion tube and gaskets to suit a 1250 mm deep feedtank):

- MU150 - PN16
- IT150 - 950 PN16
- 2 off gaskets to suit IT150 - 1200 PN16
- Connection details also need to be specified

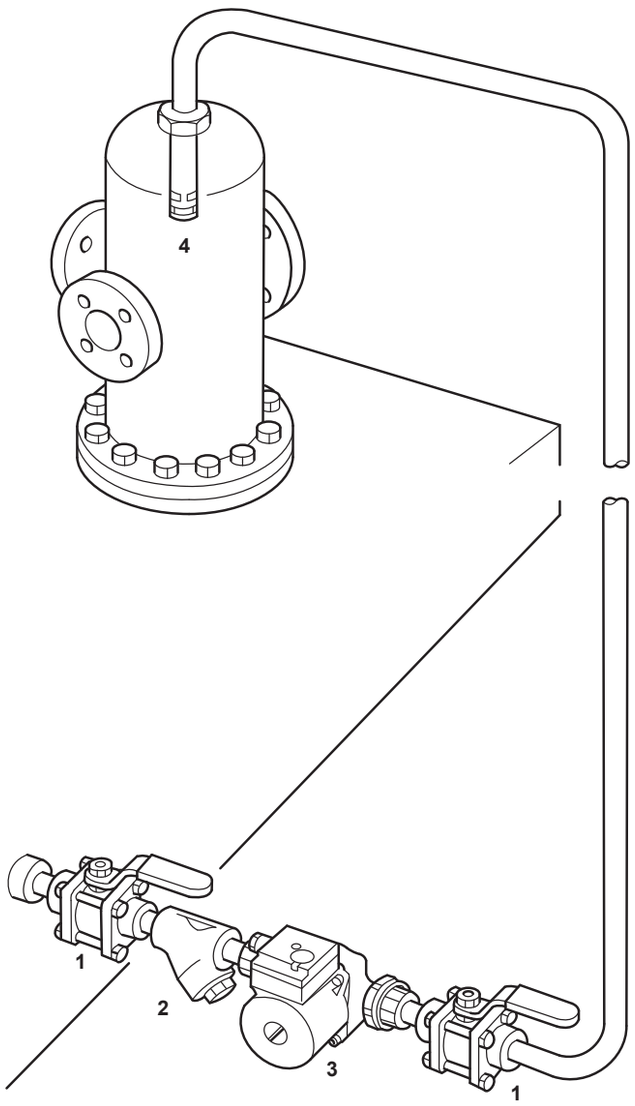
2 Boiler house
Feedtank ancillaries

2.1
4

TI-P401-08
EMM Issue 4

RFS1 and RFS2
Recirculating Feedwater Spray Systems

- Increases flash steam condensing capability
- Improves thermal efficiency of the feedtank
- Improves deaeration within the feedtank
- Energy saving three speed pump



Description

The Spirax Sarco RFS1 and RFS2 recirculating feedwater spray systems are designed to provide additional flash steam condensing capacity on boiler feedtank applications. When the condensate return flowrate is high and the cold make-up flowrate is intermittent it is likely that valuable flash steam will be lost through the vent. To ensure that this flash steam is condensed it is often worthwhile to take feedwater from a relatively cool part of the feedtank and pump it to a spray nozzle. Approximately 20% of the feedtank content can be circulated per hour to provide this additional flash condensing capacity. By using a low energy pump the thermal efficiency of the feedtank can be improved.

Application

The RFS1 and RFS2 systems are specifically designed for use with Spirax Sarco flash condensing deaerator heads. The mixing unit of each head is fitted with a connection for the spray nozzle.

System components

System type	Isolating valve	Y-Type strainer	Pump	Spray nozzle
RFS1	M10 1" BSP	Fig 12 1" BSP	RP1 1" BSP 240 V 50 Hz	1" BSP male taper
RFS2	M10 1¼" BSP	Fig 12 1¼" BSP	RP2 1¼" BSP 240 V	1" BSP male taper 50 Hz

Materials

No.	Part	Material
1	Isolating valve	Carbon steel with stainless steel internals
2	Y-type strainer	SG iron with stainless steel screen
3	Electric pump	Cast iron with stainless steel internals
4	Spray nozzle	Stainless steel

2 Boiler house
Feedtank ancillaries

Limiting conditions
The system is designed for pumping water up to 100 °C from an atmospherically vented tank. Maximum ambient temperature 80 °C.

Selection
A system is selected based on circulating approximately 20% of the feedtank contents.

Gross feedtank contents litre (kg)	Recirculating feedwater spray systems	
	Designation	Speed setting
£ 3 000	RFS1	1
3 000 to 6 000	RFS1	2
6 000 to 8 000	RFS1	3
8 000 to 10 000	RFS2	2
10 000 to 30 000	RFS2	3

2.1
6

How to order
Example: 1 off Spirax Sarco RFS1 recirculating feedwater spray system.

Dimensions/weights (approximate) in mm and kg

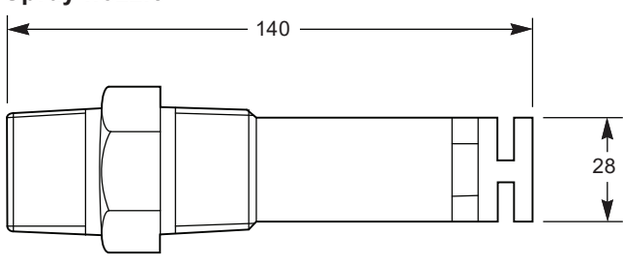
M10
For details of the M10 isolating valve refer to separate literature.

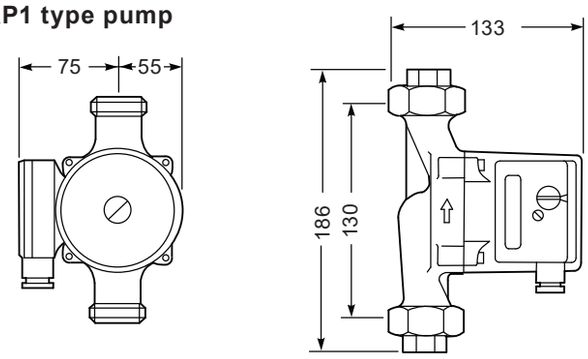
Fig 12
For details of Fig 12 Y-type strainer refer to separate literature.

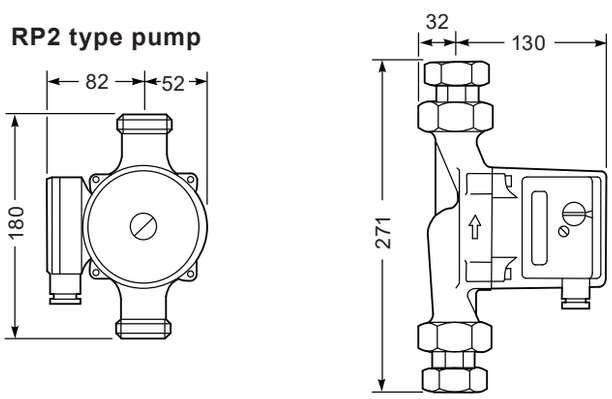
Spray nozzle
A specially designed stainless steel nozzle for distributing the recirculated feedwater within the flash condensing deaerator head. Screwed 1" BSP taper male. Kv = 6.65.

RP type pump
Three speed induction rotor.
BSP union suction and discharge connections.
Single phase 240 V, 50 Hz.

System pump type	Connection	Input power watts	Weight kg
RP1	1" BSP Union	40 to 100	2.5
RP2	1¼" BSP Union	85 to 100	2.5

Spray nozzle


RP1 type pump


RP2 type pump


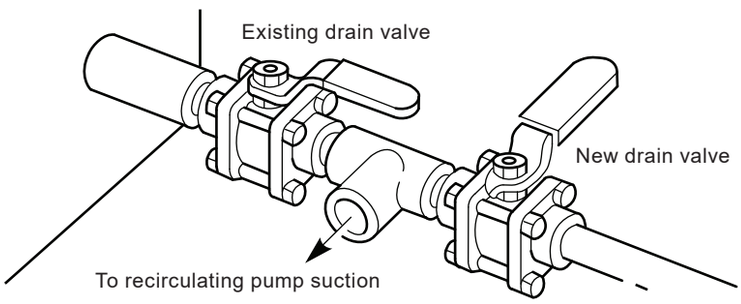
Installation

For new applications

For new applications a specific connection should be incorporated into the feedtank design. This connection should be the same nominal size as the pump and should be positioned as near as possible to the bottom of the tank. The suction side isolating valve, strainer and pump should be positioned as near to the tank as possible whilst allowing access for operating the ball valve and removing the strainer screen. The discharge side pipework should be as short in length as possible. On RFS2 systems the discharge pipework should be reduced to 1" at the spray nozzle.
The pump must be wired in accordance with The Electricity at Work Regulations, that is, using a direct on-line (DOL) starter fitted with a thermal overload plus local isolator.

For retrofit applications

Where no suitable spare connection is available it is recommended that the drain connection be utilised by fitting a 'T' piece as follows. It should be noted that the tank does not need to be drained to fit these pieces.



Caution

For all applications the pump shaft must be horizontal, or slightly higher at the vent plug end to prevent premature wearing of the top bearing and shaft.

Operation

The pump should run continuously when the boiler(s) is on load. Water should flow through the pump at all times while the pump is running.

Maintenance

At convenient regular intervals it is recommended that the strainer screen is inspected and any debris removed.

2 Boiler house
Feedtank ancillaries

2.1
8

TI-P401-07
EMM Issue 7

IT
Immersion Tubes

Description

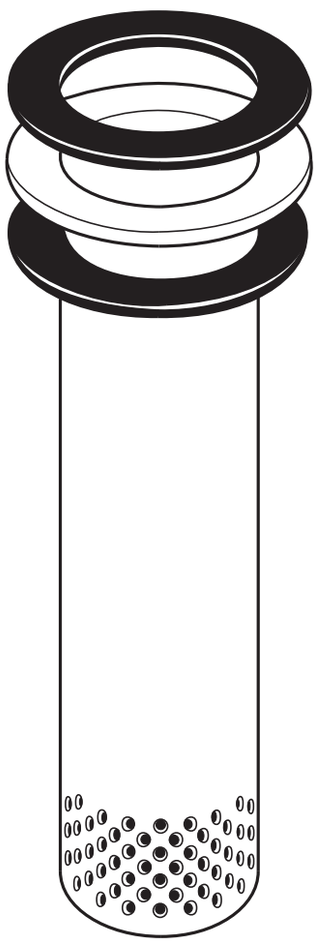
Spirax Sarco immersion tubes may be:

- Connected directly to the pipeline, to distribute condensate into feedtanks.
- Used with a mixing unit to form a flash condensing de-aerator head (not applicable to the IT100 unit).

Note: A flash condensing de-aerator head can be used to mix flash steam (from a TDS control system), cold make-up water, and condensate, and sparge it into a feedtank. It is described in separate literature.
Immersion tubes offer a much neater solution than traditional sparge pipes, and can reduce many of the problems associated with them, for example vibration, rusting, and waterhammer.
Immersion tubes are suitable for both new and retrofit applications where the feedtank is adequately constructed and braced.

Available types

Available as types IT100_, IT150_, IT200_, IT250_, IT300_, and IT400_ with an integral inside bolt circle sandwich flange to suit ANSI 150 or EN 1092 PN16. They are available in lengths to suit TM metric feedtanks. Other lengths can be made to special order.
Immersion tubes are designated by IT followed by DN followed by length of immersion tube in mm. e.g. IT250-1600 is DN250 and is 1 600 mm long from the underside of the flange. It is suitable for a 2 000 mm deep tank.



Capacity - when used without a Mixing Unit (MU)

		* Gravity condensate (with 5% Flash)	Pumped condensate
IT type	**DN**	**kg/h**	**kg/h**
IT100_	100	1 015	2 500
IT150_	150	2 285	5 000
IT200_	200	4 065	10 000
IT250_	250	6 350	20 000
IT300_	300	9 145	30 000
IT400_	400	16 255	50 000

* For other quantities of flash steam the capacity may be determined pro rata i.e. for 10% flash capacity is half that shown.

As a general rule the size of an immersion tube should be at least one DN larger than the condensate return main.

Important note:

The above table is only valid for condensate, where the flash steam content has to be considered. When sizing an immersion tube for use with a de-aerator head, use the guidelines in the flash condensing de-aerator head TI. The DH/IT has a higher overall capacity as it is able to condense the flash steam content of the fluid before it enters the tank. We do not make a mixing unit to suit the IT100.

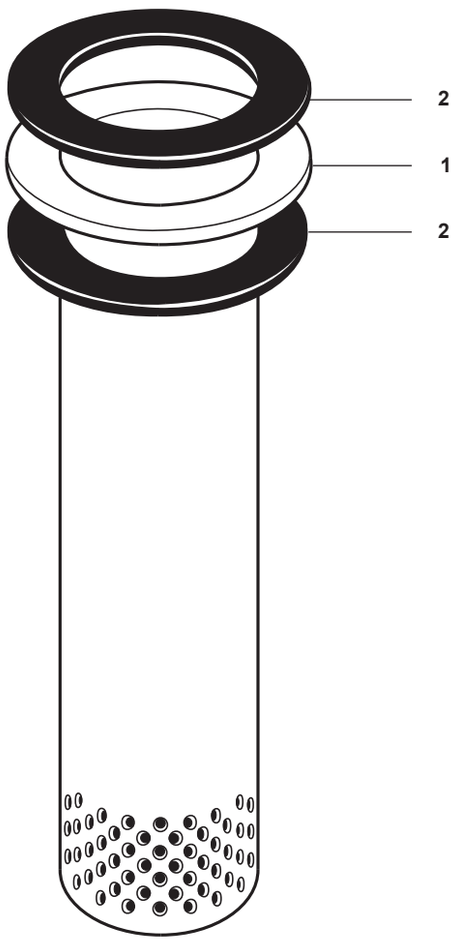
Limiting conditions

PN2.5 rating. Suitable for condensate at up to 1 bar g, 120 °C.

Polígono Industrial O Rebullón s/n. 36416 - Mos - España - rodavigo@rodavigo.com

Materials

No.	Part	Material
1	Immersion tube	Austenitic stainless steel
2	Gaskets	Silicone rubber (colour may vary)



Installation

We recommend the immersion tube is positioned in the middle of the top of the tank.
The immersion tube can be fitted to a boiler feedtank by the following methods:

1. Using an existing flange.

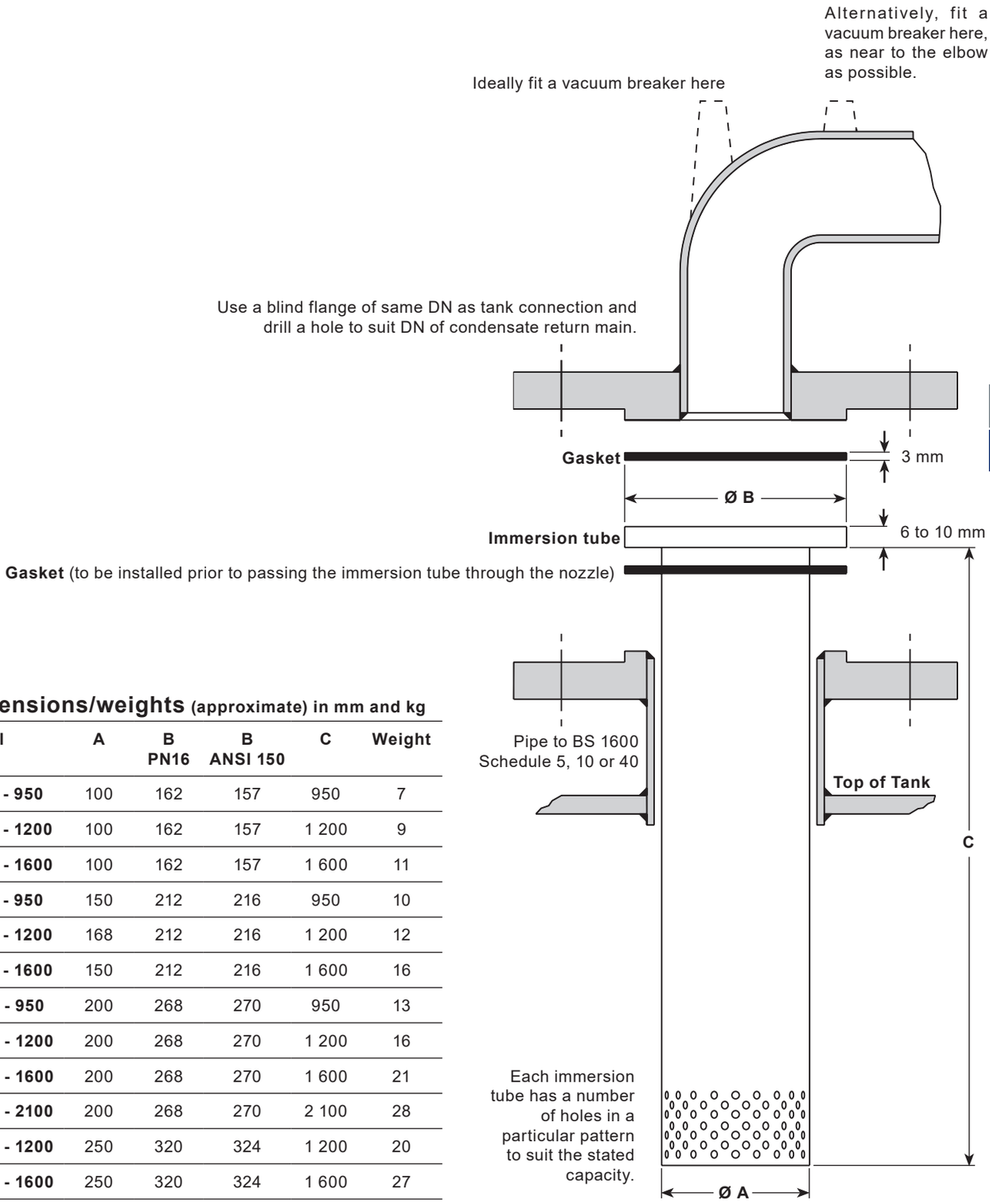
   The immersion tube is designed so that it can pass through an apperture with dimensions according to BS 1600 Schedule 40. The sandwich flange of the immersion tube is equal to the raised face diameter of the flange for which it is suitable. Gaskets are to be placed above and below the sandwich flange.

2. On new installations a specific connection should be incorporated, as described in separate literature.

   It is essential that a vacuum breaker is fitted to the condensate return main near to the immersion tube. Consider the use of a Spirax Sarco VB14 vacuum breaker.

How to order example:

1. Immersion tube IT150-950 in austentic stainless steel to suit DN150, PN16 flanges complete with:
2. Silicone rubber gaskets to suit DN150, PN16.



Dimensions/weights (approximate) in mm and kg

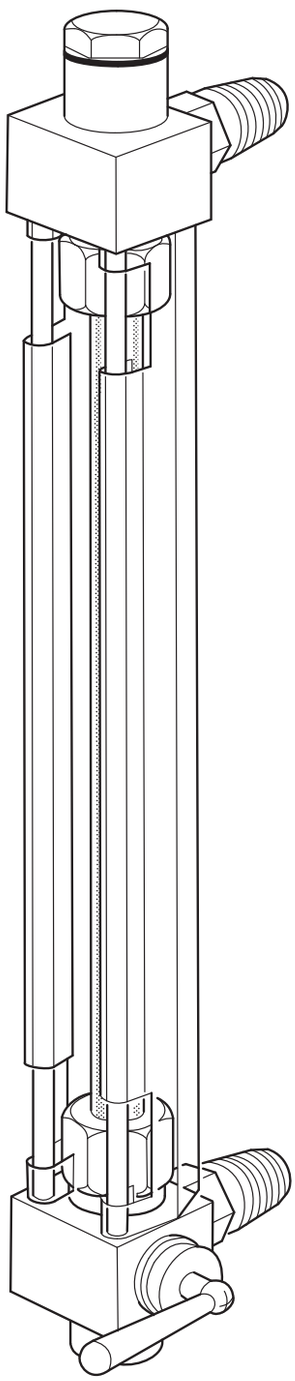
Model	A	B PN16	B ANSI 150	C	Weight
IT100 - 950	100	162	157	950	7
IT100 - 1200	100	162	157	1 200	9
IT100 - 1600	100	162	157	1 600	11
IT150 - 950	150	212	216	950	10
IT150 - 1200	168	212	216	1 200	12
IT150 - 1600	150	212	216	1 600	16
IT200 - 950	200	268	270	950	13
IT200 - 1200	200	268	270	1 200	16
IT200 - 1600	200	268	270	1 600	21
IT200 - 2100	200	268	270	2 100	28
IT250 - 1200	250	320	324	1 200	20
IT250 - 1600	250	320	324	1 600	27
IT250 - 2100	250	320	324	2 100	35
IT300 - 1200	300	378	381	1 200	24
IT300 - 1600	300	378	381	1 600	32
IT300 - 2100	300	378	381	2 100	42
IT400 - 1200	375	490	470	1 200	29
IT400 - 1600	375	490	470	1 600	39
IT400 - 2100	375	490	470	2 100	51

2 Boiler house
Feedtank ancillaries

TI-P409-04
EMM Issue 4

WG2
Water Level Gauge

- Simple gauge glass for low pressure duties
- Recommended for boiler feedtank applications
- Available in lengths up to 2 200 mm
- Supplied in modular form for maximum versatility



Description

The Spirax Sarco WG2 level gauge enables an instant visual check to be made of liquid level in tanks and process vessels.
It consists of a glass tube (plastic also available) mounted in top and bottom support arms, with packing seals and washers to prevent leakage and accommodate expansion. The bottom arm incorporates a three port plug cock to allow isolation and checking of gauge operation.
An intermediate arm provides additional support and sealing for gauges with centres longer than 1100 mm, and enables two unequal length tubes to be used together to give a wide choice of overall lengths.
Two protector rods mounted either side of the tube reduce the risk of accidental damage. For greater protection 'C' section protectors are also available (used with rods).

Limiting conditions

	Glass	Plastic tube
Maximum working pressure (Pmax)	6.9 bar g	2.0 bar g
Maximum working temperature (Tmax)	152 °C	134 °C
Maximum saturated steam conditions	4.1 bar g	2.0 bar g
Cold hydraulic test pressure	13.8 bar g	3.0 bar g

Polígono Industrial O Rebullón s/n. 36416 - Mos - España - rodavigo@rodavigo.com

2 Boiler house
Feedtank ancillaries

Available lengths (approximate) in millimetres

WG 2 level gauge glasses are designated WG2 followed by/(centres dimension). Protector rods (in sets of two) and 'C' section protectors are available in 700, 800, 1000 and 1100 mm lengths. Two sets are required for gauges with intermediate arms. The glasses themselves are available in four lengths which may be paired in the following combinations to give the gauge centre dimensions opposite.

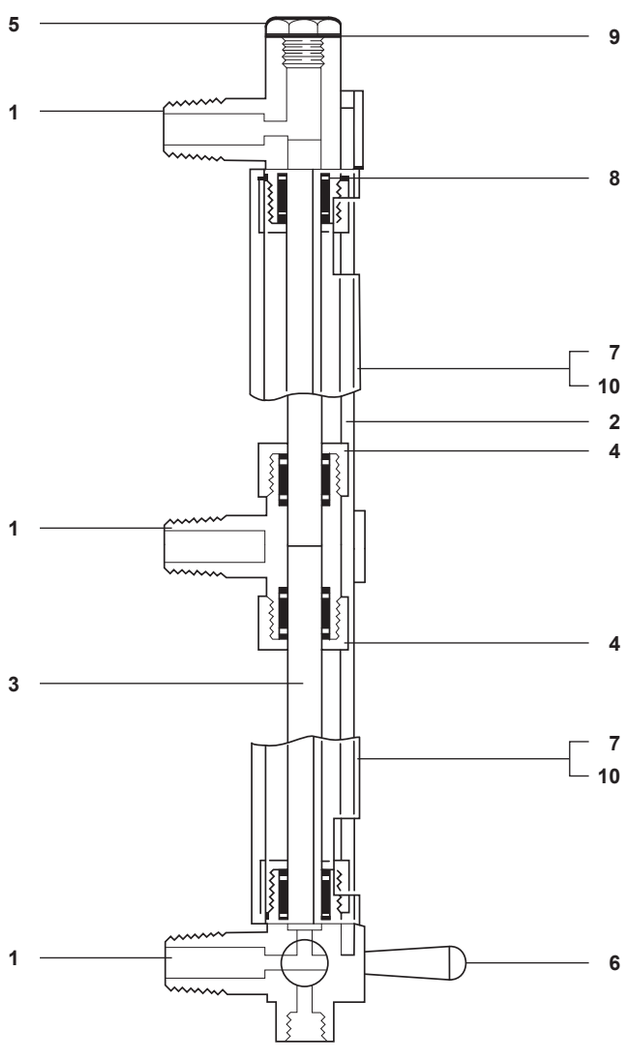
Plastic tubes (complete with 2 off tube supports) are supplied in 1100 mm nominal lengths which can be cut to length with a knife.

Glass 1 length	Glass 2 length	Intermediate arm	Gauge centres	Designation
686	-	No	700	**WG2/700**
786	-	No	800	**WG2/800**
986	-	No	1000	**WG2/1000**
1086	-	No	1100	**WG2/1100**
686	686	Yes	1400	**WG2/1400**
686	786	Yes	1500	**WG2/1500**
786	786	Yes	1600	**WG2/1600**
686	986	Yes	1700	**WG2/1700**
786	986	Yes	1800	**WG2/1800**
786	1086	Yes	1900	**WG2/1900**
986	986	Yes	2000	**WG2/2000**
986	1086	Yes	2100	**WG2/2100**
1086	1086	Yes	2200	**WG2/2200**

Materials

No.	Description	Material	
1	Arm body	Gunmetal	BS 1400 LG2
2	Protector rods	Brass	BS 2874 CZ121
3	Glass tube	Glass	Borosilicate
4	Gland nut	Brass	BS 2874 CZ121
5	Top plug	Brass	BS 2874 CZ121
6	Gauge cock	Gunmetal	BS 1400 LG 2
7	Packing sleeve	Rubber	Nitrile
8	Packing washer	Permanite	AF 2000
9	Top plug gasket	Red fibre	BS 216 Grade B
10	'C' section protector	Stainless steel	Type 304/304L
11	Plastic tube	FEP	
12	Tube supports (used with item 11)	Brass (Dezincification resistant)	BS 2874 CZ132

Note: 11 and 12 not illustrated for clarity



Polígono Industrial O Rebullón s/n. 36416 - Mos - España - rodavigo@rodavigo.com

Installation

WARNING

Your attention is drawn to Safety information leaflet IM-GCM-10. Tanks or vessels must be drained, vented to atmosphere, and inlets isolated before work is commenced.

In particular, make sure that any connections which could carry hot fluids, for example condensate return or flash steam from blowdown, are isolated.

Top, intermediate, and bottom arms have a ½" BSP taper male thread (R½) for connection to the tank.

- The tank should have ½"BSP Pl (Rp ½) screwed sockets to take the top and bottom arms, and intermediate arm if fitted. Notes:-For certain lengths, the intermediate arm is not equidistant between the top and bottoms arms. The socket for the intermediate arm does not need to pierce the tank.
- Fit arms to tank using PTFE tape or a suitable jointing compound.
- Align arms vertically.
- Slacken all gland nuts and remove the ⅜" BSP top arm plug and gasket.
- Trim plastic tube to the required length (686, 786, 986, or 1086 mm). Each end of the tube requires an internal brass support, (supplied with the tube).
- Sligthly flatten the ends of the tube with thumb and forefinger before fitting the supports, to stop them moving during positioning.
- Pass glass/plastic tube through ⅜" BSP thread in top arm and lower into position. When an intermediate arm is fitted, the ends of the two glasses/tubes should touch and the joint should sit between the intermediate arm glands.
- Gently tighten gland nuts and refit top arm plug and gasket.
- Fit the 'C' section protector (if used) to the front of the unit, then rotate it so that its hooked edges line up with the protection rod drillings.
- Fit the protector rod(s) through the drillings in the top and intermediate arms and locate in the blind drillings in the bottom arm.
- Use the cutouts in the side of the protector to ensure the rods are correctly positioned.
- The drain connection must not be plugged. It can either be left open to a tundish, or may be piped to drain.

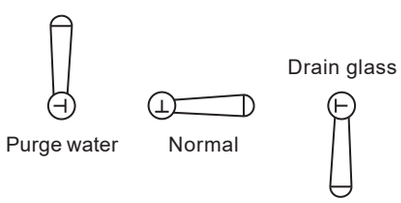
Operation

The plug cock has three positions:-

Up Purge water connection.

Horizontal Normal operation.

Down Drain glass. This position also isolates the water connection in case of a broken glass.



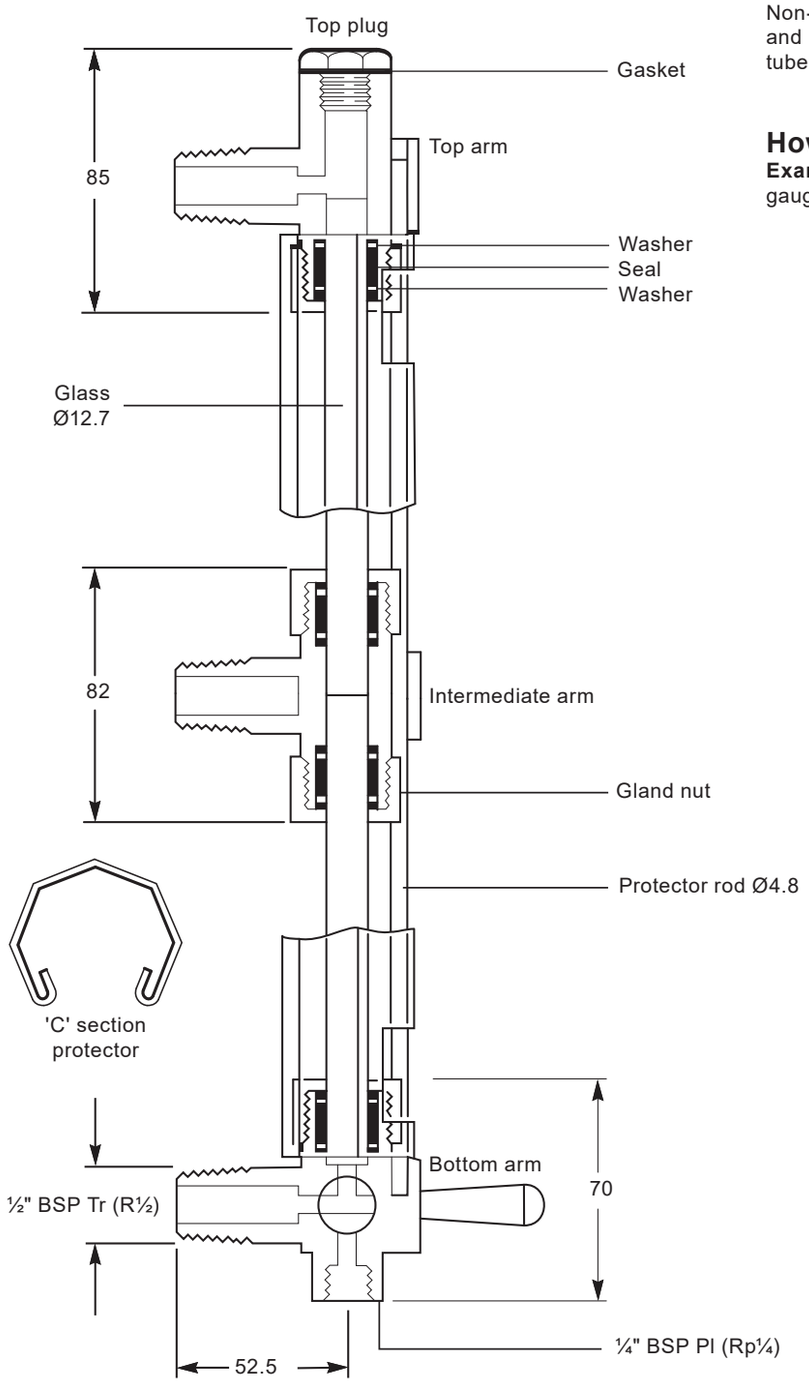
An indication of the plug position is marked on the lever. We recommend that the water connection is purged and the glass drained periodically. It is important to check that water flows to drain and that the level is rapidly re-established in the glass. A slowly rising level could indicate a partial blockage.

Maintenance

No specific maintenance is required. We recommend that the arms are checked for leakage periodically and the packing sleeves and washers renewed if necessary. Always fit new packing sleeves and washers if the tube has to be replaced.

Dimensions/weights (approximate) in mm and kg

		Weight
Top arm		0.65
Intermediate arm		0.62
Bottom arm		0.69
Glass	100 mm length	0.145
Protector rod	100 mm length	0.015
'C' section protector	100 mm length	0.12
Plastic tube (1100 mm)		0.4



Available spares

Glass 686 mm
Glass 786 mm
Glass 986 mm
Glass 1086 mm
Plastic tube (1100 mm) with 2 internal supports
Spare packing seal set consisting of:-
4 off Packing sleeves
8 off Washers (1 fitted each side of the sleeve)
2 off Top plug gaskets
The set is suitable for two re-packings of a gauge with no intermediate arm or one re-packing of a gauge with an intermediate arm.
Order:- 1 spares pack for Water Level Gauge WG 2.

How to specify

Non-ferrous water level gauge with 3 port plug cock and protector rods (and 'C' section protector), glass tubes/plastic tubes.

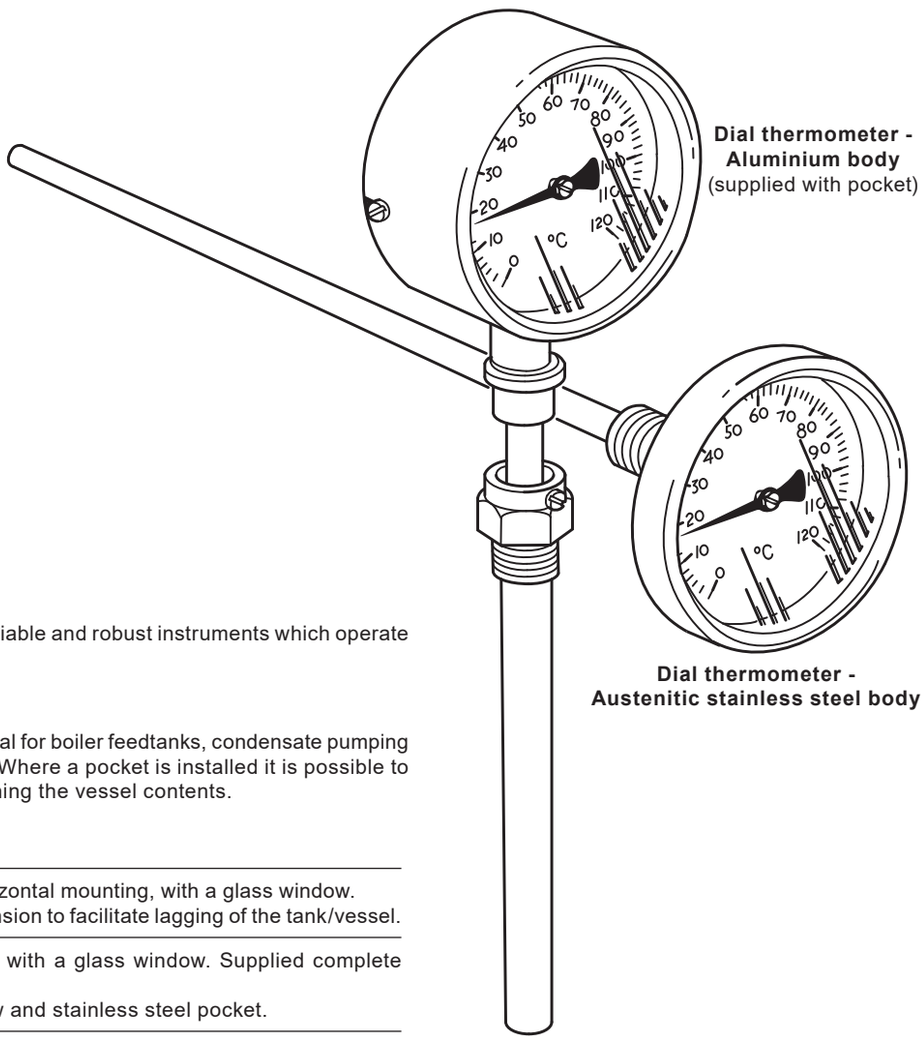
How to order

Example: 1 off Spirax Sarco WG 2/1000 water level gauge with 'C' section protector and rods.

4090050/4

TI-P409-03
EMM Issue 5

Dial Thermometers



Dial thermometer - Aluminium body (supplied with pocket)

Dial thermometer - Austenitic stainless steel body

Description

Spirax Sarco dial thermometers are reliable and robust instruments which operate on the bimetallic coil principle.

Applications

Spirax Sarco dial thermometers are ideal for boiler feedtanks, condensate pumping and many other industrial processes. Where a pocket is installed it is possible to remove the thermometer without draining the vessel contents.

Available types

Austenitic stainless steel body, horizontal mounting, with a glass window.
Optional pocket, with a 150 mm extension to facilitate lagging of the tank/vessel.

Aluminium body, vertical mounting, with a glass window. Supplied complete with brass slip-on pocket.
Optional version with acrylic window and stainless steel pocket.

Optional extra

Sanitary pocket	Surface finish		0.4 µm
	Process condition		1½" sanitary clamp
	Insertion length	Horizontal stainless steel temperature dial	274 mm
		Vertical aluminium temperature dial	174 mm

Note: Surface finish certification is available if stated at the time of order placement.

Polígono Industrial O Rebullón s/n. 36416 - Mos - España - rodavigo@rodavigo.com

2 Boiler house
Feedtank ancillaries

Limiting conditions

Stainless body protection rating IP54	With or without pocket	Pressure maximum	25 bar g
		Temperature maximum	120 °C
Aluminium body	Maximum pressure rating of pocket	Pressure maximum	6 bar g
		Temperature maximum	20/160 °C

Range

Stainless body	0-120 °C
Aluminium body	0-120 °C and 0-160 °C

Accuracy

2.1
18

Stainless body	Complies with DIN 16203 Class 1
Aluminium body	Complies with DIN 16203 Class 2 Zero adjustment at pointer.

Materials

Body	**Stainless steel**
Bezel	Stainless steel
Window	Glass
Stem	Stainless steel
Standard pocket	Stainless steel
Optional sanitary pocket	Stainless steel

Body	**Aluminium**
Bezel	Stainless steel
Window	Glass (acrylic optional)
Stem	Brass
Standard pocket	Brass (stainless optional)
Optional sanitary pocket	Stainless steel

Safety information, installation and maintenance

For full details see the Installation and Maintenance Instructions supplied with the product.

Installation note:

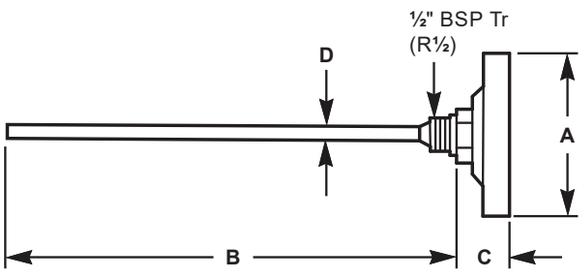
Screw the pocket into a ½" BSP connection on the vessel, using PTFE tape as a thread sealant. The austenitic stainless steel dial thermometer can be screwed directly into the vessel if required.
Position the thermometer so that it will measure a representative temperature in the vessel. Vertical mounting thermometers have a minimum insertion depth - see dimension '**H**'. Heat conducting paste is not normally necessary, but may be used if desired.

Dimensions/weight (approximate) in mm and kg

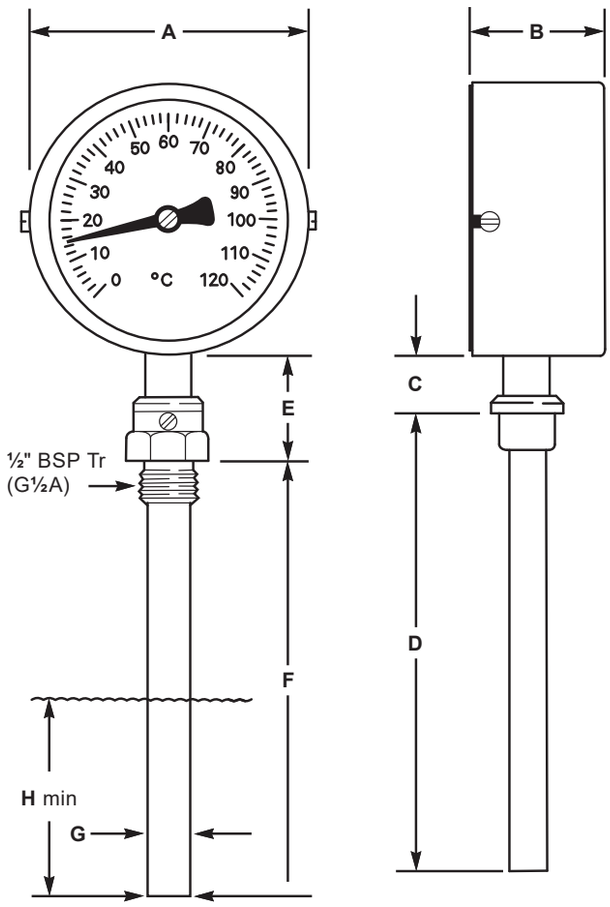
Austenitic stainless steel body	A	B	C	D	E	F	G	H	I	Weight	
										Thermometer	Pocket
	100	274	35	8	13	150	18	113	28	0.25	1.0

Aluminium body	A	B	C	D	E	F	G	H min	Weight including pocket
	100	48	16	174	35	160	13	65	0.4

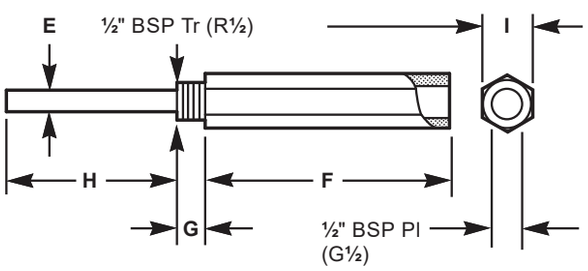
Thermometer (Austenitic stainless steel body)



Thermometer (Aluminium body) with pocket



Optional pocket (Stainless steel)



How to specify

1 - Horizontal mounting dial thermometer with stainless steel wetted/exposed parts, IP54 rating.

1 - Pocket with ½" BSPT thread (R½)

1 - Vertical mounting dial thermometer with slip-on pocket 0-120 °C range.

How to order example:

1 - Spirax Sarco dial thermometer, having an austenitic stainless steel body for horizontal mounting, 0-120 °C.

1 - Pocket with 150 mm extension for the above.

1 - Spirax Sarco dial thermometer having an aluminium body and c/w brass pocket. 0-120 °C range.

2 Boiler house
Feedtank ancillaries