

TATA STEEL



Forcas®
Crop heating system



Contents

- 03 Introduction
- 04 Improved performance
- 05 Applications
- 06 Technical specifications



FORCAS®

Precision steel tube ideally suited for greenhouse heating systems

We are Tata Steel

Tata Steel is one of Europe's leading steel producers, with steelmaking in the UK and in the Netherlands, and manufacturing plants across Europe. The company supplies high-quality strip steel products to demanding markets such as construction, automotive, packaging and engineering. We produce a wide range of welded steel tubes, including coated precision products. These tubes are produced at our dedicated site in Oosterhout in the Netherlands.

Working in partnership

We regard our customers as partners and we work closely with them to provide the best advice on the use of our precision tubes. Our technical experts are available to assist in the development of existing or new products to meet customer and market demands.

Forcas® galvanised precision tubes

Forcas® is a thin-walled steel precision tube ideally suited for greenhouse heating systems that increase crop yield. Forcas is available in two size ranges – 28mm and 35mm outside diameter. The smaller diameters enables more controlled heat emissions. Forcas offers a number of other benefits:

- Corrosion protection – provided by externally thermally galvanising.
- Maximum light reflection – resulting from a white elastic powder coating.
- Easy installation – as a wide range of fittings are available.
- Maintenance-friendly for cost and time savings.
- Adjustable height control of working system in greenhouses.

Specifications

- Forcas is externally thermally galvanised precision tube that is coated continuously on our lines for precise coating control and then given an additional white flexible powder coating.
- Forcas is available with an integrated connector for quick fixing.
- Forcas® tubes are manufactured in accordance with the EN 10305-3 (DIN 2394) international standard.
- Steel qualities in accordance with EN 10130-98.
- Outside diameters 28mm and 35mm, wall thickness 1.2mm, standard length 7 metres.
- Packaging: each bundle is film-wrapped in plastic polyethylene.
- These specifications are subject to alteration.



PRECISE HEAT CONTROL TO MAXIMISE ENERGY EFFICIENCY

The small tube diameter enables the heating system to be run on a minimum volume of water, this allows heat emission to be controlled very precisely to save costs and energy.

Forcas® is a thin-walled (1.2mm) crop-heating tube available in two diameters, 28mm and 35mm. The outside of the tube is thermally galvanised, in-line, as part of our manufacturing process, and then given an additional white flexible powder coating. This double protection makes Forcas® maintenance-friendly and ensures optimal light in the greenhouse.

The high quality Forcas® system is quicker, easier and more cost-effective to install than other systems on the market due to its light-weight design and integrated connector as standard.

Forcas® has a wide range of accessories available making it easy to expand the system. Tubes and accessories can be connected to each other quickly and easily using electrical pressing unit. With Forcas, no welding or painting is needed, so the system can be installed at any time with no adverse effects on the crop or the greenhouse.

The sustainable benefits of our Forcas tube range from manufacture to in-use. Our UK and Dutch construction products are certified as responsibly sourced to BES 6001 and during production we recycle

any powder coating. As the tube is pre-coated, during installation, solvents are not required and no unused paint is wasted. In-use the small tube diameter allows precise control of the heat emissions, saving energy usage.

APPLICATIONS

It's hardly surprising that Forcas® is finding its way into virtually every aspect of greenhouse cultivation.

With this height-adjustable system, tubes are positioned near the growing tips of plants such as tomatoes and paprikas. In this way, Forcas® lowers humidity, which reduces the likelihood of diseases developing. The heating system is able to 'grow' with the plants. This increases product quality, produces a higher return per square metre and saves on heating costs.

The versatile Forcas® system is also used in combination with tables on which various types of pot plants are grown. Here the system can be used in two ways: as a fixed or as a height-adjustable heating system.

Forcas® 35mm has now been developed for use in main heating systems. Forcas® is then installed as a fixed system at the top of the greenhouse or under the growing tables. This system is increasingly being used in garden centres.

But Forcas® can do much more. In recent years, for example, we have seen the Forcas® system used very successfully with 'gutter' cultivation systems, because its advantages when used with these systems are so obvious. Gutters are used to grow crops such as strawberries, tomatoes and gerberas.

Forcas® is an innovative greenhouse heating system with a wide range of applications. The best known is the hoisting heating system.



TECHNICAL SPECIFICATIONS

Heat emission

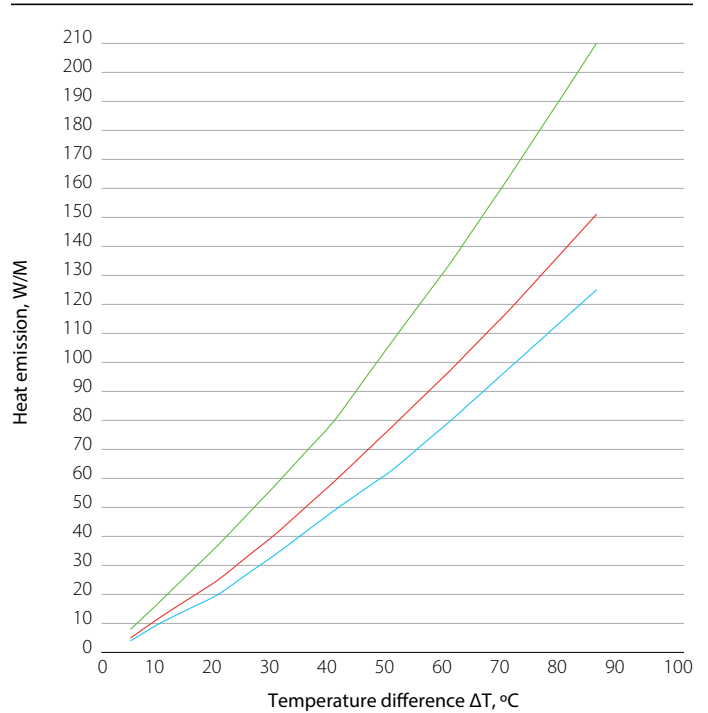
The heat emission of the tubes, expressed in Watts per metre, determines the amount of energy that can be transmitted to the surroundings (graph 1). The heat emission is dependent on the following factors:

1. Location of the tubes - The location of the tubes in relation to the crop affects the air circulation around the tube. If the tube is contained within a more or less closed crop, up to 15 % less heat will be emitted than if the tube is fully exposed. The location of the tubes does not affect the portion of heat emission transmitted by means of radiation.
2. The temperature difference - This is the temperature difference between the greenhouse air and the average tube temperature (i.e. the average of supply and return temperature per heating spiral).

Flow resistance

The flow resistance of heating tubes (expressed in water column millimetres per metre), which determines the head of the pump to be installed, depends for the internal tube diameter in question primarily on the volume of water flowing through the tube (expressed in litres per hour). Graph 2 shows the flow resistance according to the volume of water flowing through the tube. Different values apply for bends, valves, etc.

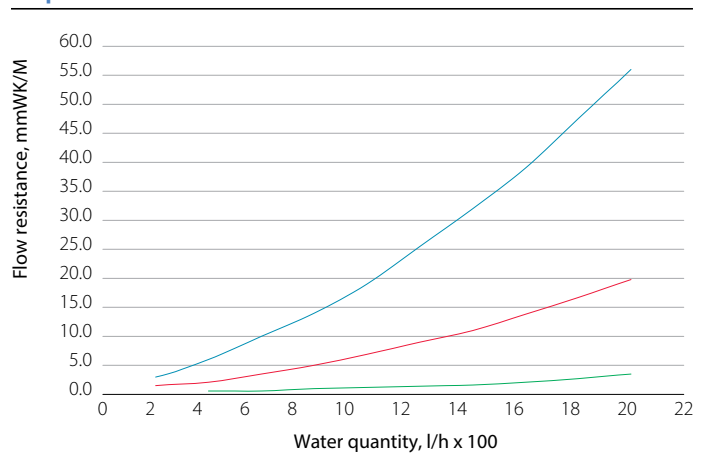
Graph 1 Heat emission



Legend



Graph 2 Flow resistance



Legend



Technical Specifications

The main specifications for various tube sizes are shown in the summary table below.

Main specifications

	Unit	Forcas® 28	Forcas® 35	3/4"	ø51
Diameter	mm	28	35	26.6	51
Wall thickness	mm	1.2	1.2	2.35	2.25
Weight - without water	kg/m	0.8	1	1.4	2.7
Weight - with water	kg/m	1.3	1.85	1.8	4.4
Water content	litre/m	0.5	0.85	0.4	1.7
Surface	m ² /m	0.088	0.11	0.084	0.16

Note: 3/4" and ø51 are competitor tubes

Support

The table below shows the theoretical maximum sag in the middle of a tube filled with water. The sag is shown for varying support intervals as a result of the tube's own weight.

Since lengthy spirals are used in practice, there will be upward pressures at the extremity of the tube. Therefore, the maximum sag shown below will not be achieved in reality.

Maximum sag

Support interval in metres	Unit	Forcas® 28	Forcas® 35	3/4"	ø51
3	mm	7.1	5.5	6.6	2.1
3.5	mm	13.1	10.4	12.2	3.3
4	mm	22.4	17.5	20.9	6.7
4.25	mm	28.6	22.3	26.6	8.5
4.5	mm	35.9	28.1	33.5	10.7

Note: 3/4" and ø51 are competitor tubes

www.tatasteeleurope.com

Forcas is a registered trademark of Tata Steel.

While care has been taken to ensure that the information contained in this publication is accurate, neither Tata Steel, nor its subsidiaries, accept responsibility or liability for errors or for information which is found to be misleading.

Before using products or services supplied or manufactured by Tata Steel and its subsidiaries, customers should satisfy themselves as to their suitability.

Copyright 2018
Tata Steel Europe Limited

Tata Steel

Souvereinstraat 35
4903RH, Oosterhout
The Netherlands
T: +31 (0) 162 482 000
F: +31 (0) 162 435 393
www.tatasteeleurope.com

Tata Steel Europe Limited is registered in England under number 05957565 with registered office at 30 Millbank, London, SW1P 4WY.

English Language 1018