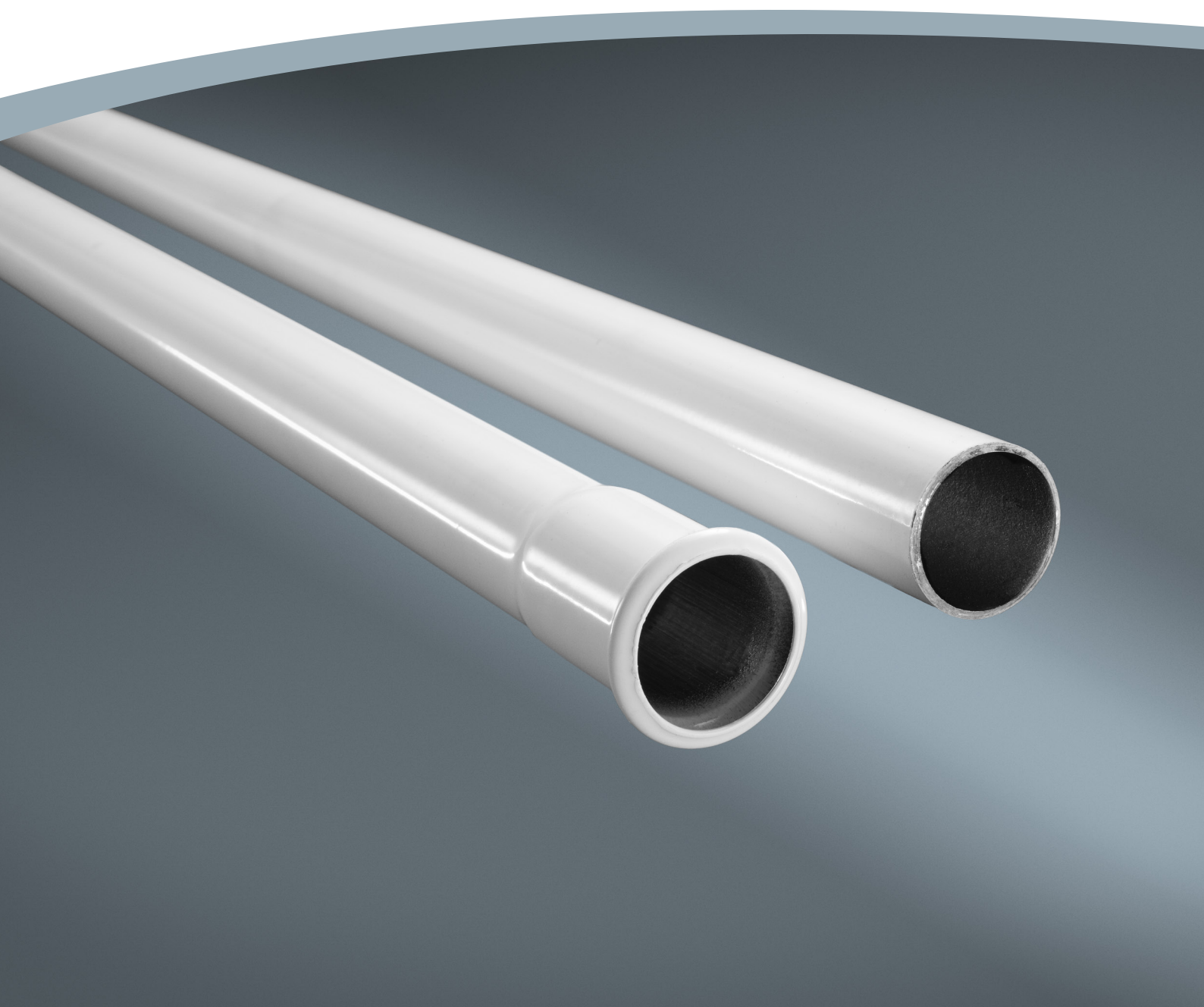


TATA STEEL



Forcas®

The crop heating pipe solution



Contents

- 03 Introduction
- 04 Benefits
- 05 Applications
- 06 Technical specifications





Forcas®

Forcas® is our range of special galvanised and coated precision steel tubes manufactured to EN 10305-3. Developed specifically for greenhouse heating systems, **Forcas®** combines maximum light reflection, outstanding corrosion protection, and fast, trouble-free installation. Its proven performance, low-maintenance design and durability have made it a trusted choice for horticulture worldwide.

Tata Steel Nederland Tubes

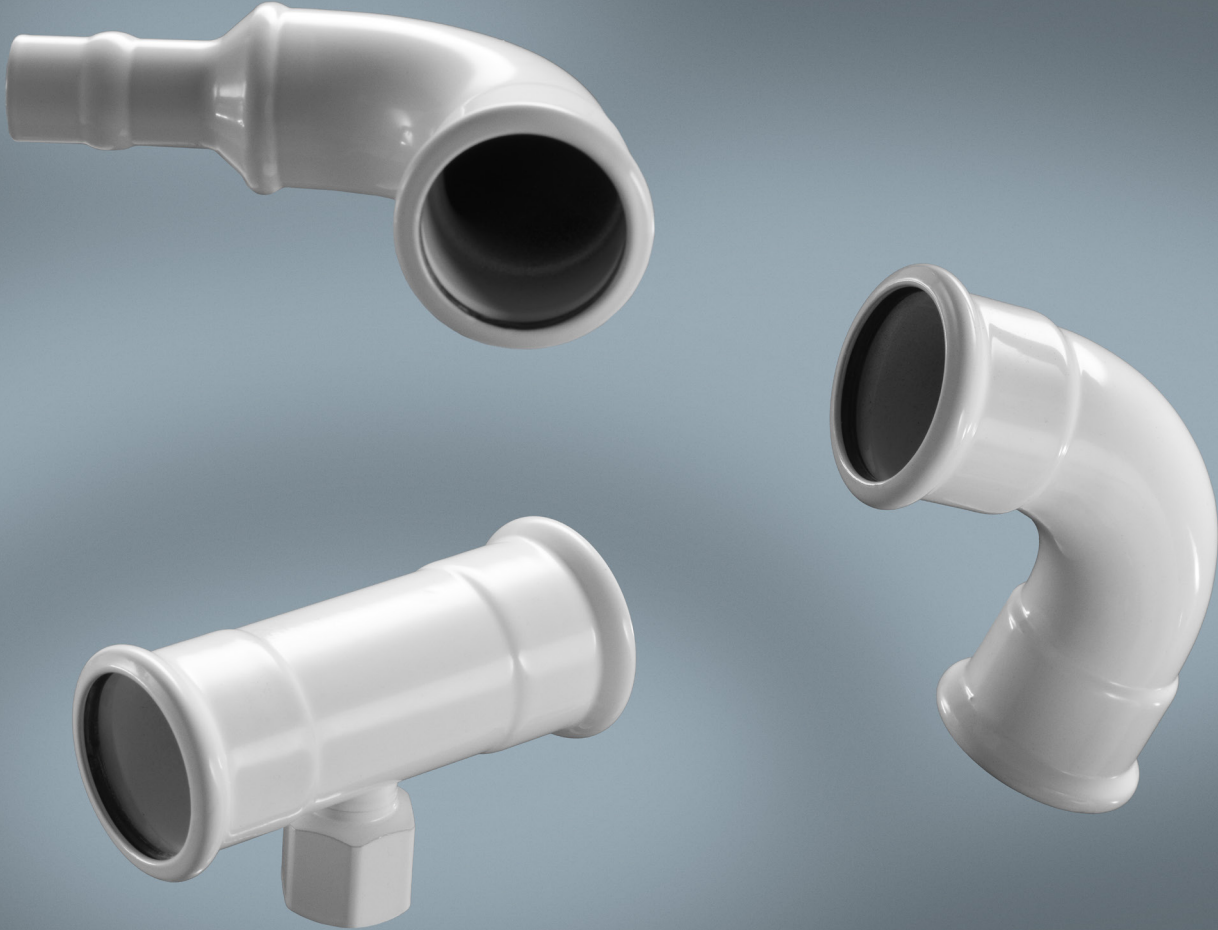
With over 100 years of experience in steel tube production in the Netherlands, we are dedicated to finding solutions that support our customers. At three manufacturing sites we produce a wide range of welded steel tubes. The special galvanised and coated precision tubes **Forcas®** are produced at our site in Oosterhout in the Netherlands. Our own integrated steel plant in the Netherlands allows full control over the quality of raw materials, ensuring consistent and high-quality steel for every tube produced.

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. Tata Steel Nederland Tubes BV stands out for its excellent aftersales service, offering guidance, support, and prompt responses to any queries or issues.

Why choose Forcas® ?

Forcas® is a special galvanised and coated thin-walled steel precision tube ideally suited for greenhouse heating systems. Combining maximum light reflection, outstanding corrosion protection and precise heat control, it creates the perfect growing climate. Its lightweight, easy-to-maintain design ensures quick installation and cleaning and guarantees long-lasting performance, boosting crop quality, increasing yields and reducing operating costs.



BENEFITS

Long-lasting corrosion protection

Externally thermally galvanised and finished with a white elastic powder coating for exceptional durability in demanding greenhouse conditions.

Maximum light reflection

The bright white powder-coated surface enhances light distribution throughout the greenhouse, improving crop growth and uniformity.

Quick and easy to install

Lightweight construction, integrated connectors, a wide range of accessories and the connection with an electrical pressing unit make installation faster, simpler and more cost-effective – with no welding or painting required.

Low-maintenance and hygienic

Double protection and a smooth, hygienic surface reduce cleaning time and upkeep, ensuring optimal light and a clean growing environment season after season.

Optimised for plant growth

Adjustable tube height positions heat close to crop tips, lowering humidity, reducing disease risk and enabling the heating system to 'grow' with the plants.

Energy-efficient heat control

Small-diameter tubes operate with minimal water volume for precise heat regulation, saving energy and reducing heating costs.

APPLICATIONS

Forcas® – The versatile heating solution for modern greenhouse cultivation

It's no surprise that **Forcas®** is becoming a fixture in virtually every area of greenhouse cultivation. The best known is the hoisting heating system. With this height-adjustable system, tubes are positioned near the growing tips of plants such as tomatoes and paprikas. This effectively lowers humidity and reduces the risk of diseases. The heating system is able to 'grow' with the plants, ensuring optimal conditions throughout the season. This not only improves crop quality, but also increases yield per square metre while reducing 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® can be installed as a main heating fixed system at the top of the greenhouse or under the growing tables. This system is increasingly being used in garden centres.

In addition, **Forcas®** excels in combination with modern 'gutter' cultivation systems for crops such as strawberries, tomatoes, and gerberas. Its benefits in these setups - consistent temperature control, improved plant health and energy saving - are immediately apparent.

From hoisting heating systems to fixed installations, whether installed as an overhead system, integrated under growing tables or combined with gutter systems, **Forcas®** is an innovative, proven solution for a wide range of greenhouse applications, maintaining ideal conditions from seeding to harvest.



TECHNICAL SPECIFICATIONS

- Forcas® is an externally special 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 EN 10305-3.
- Steel qualities in accordance with EN 10130.
- Outside diameters 28mm, 35mm with wall thickness 1.2mm and 42mm with wall thickness 1.5mm.
- Standard length 7 metres.
- Packaging: each bundle is film-wrapped in plastic polyethylene.

Main specifications

	Unit	Forcas® 28	Forcas® 35	Forcas® 42
Diameter	mm	28	35	42
Wall thickness	mm	1.2	1.2	1.5
Weight - without water	kg/m	0.80	1.01	1.51
Weight - with water	kg/m	1.31	1.84	2.69
Water content	litre/m	0.51	0.83	1.18
Surface	m ² /m	0.088	0.110	0.132

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.

The deflection is calculated for the worst case scenario using a single-span beam with hinged support. In practice, continuous tube multi-span beams with intermediate support points are usually used. Therefore, the maximum sag shown below will not be achieved in reality.

Maximum sag

Support interval in metres	Unit	Forcas® 28	Forcas® 35	Forcas® 42
3.00	mm	7.35	5.13	3.49
3.50	mm	13.62	9.50	6.47
4.00	mm	23.24	16.21	11.04
4.25	mm	29.62	20.66	14.06
4.50	mm	37.23	25.97	17.68

Heat emission

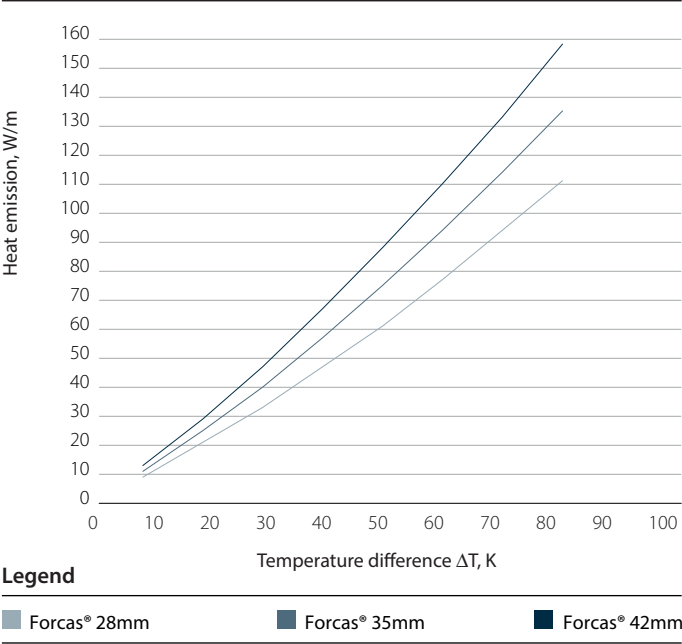
The heat emission of the tubes, expressed in Watts per metre, determines the amount of energy that can be transmitted to the surroundings (graph 1). The heat emission is dependent on the following factors:

- 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. **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).

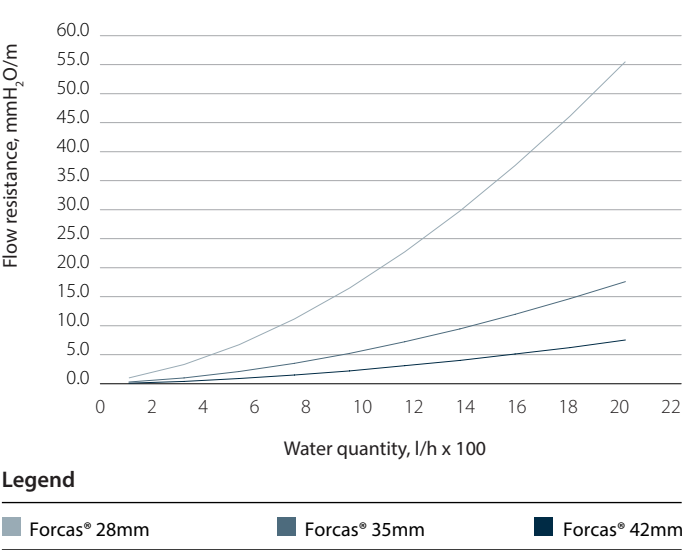
Flow resistance

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



Graph 2 Flow resistance



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