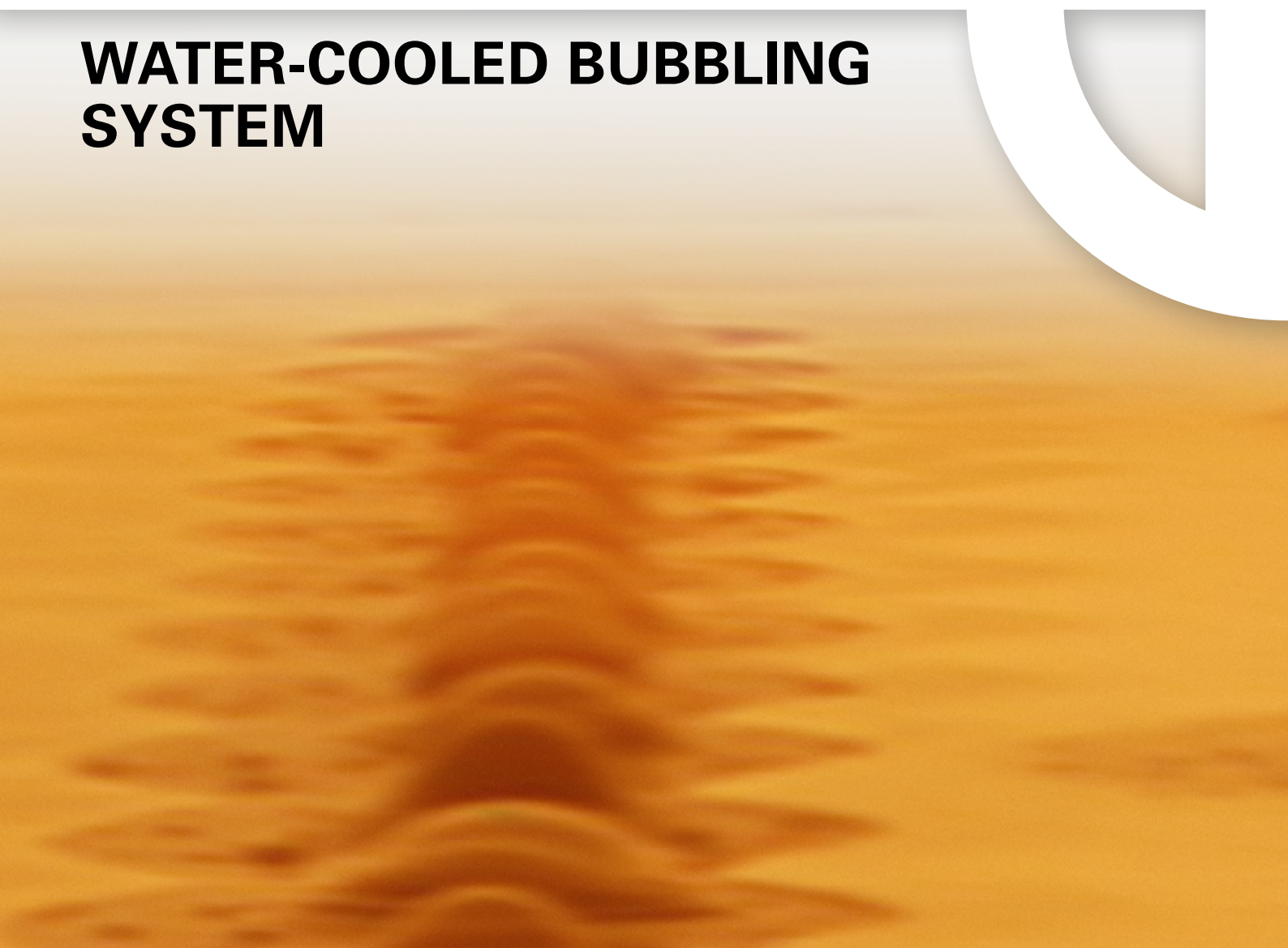




SOLUTIONS FOR THE GLASS INDUSTRY

# WATER-COOLED BUBBLING SYSTEM





Bubbler systems are installed for a number of reasons:

- Improved glass homogeneity
- Improved temperature homogeneity
- To fix the hot spot
- To control batch cover

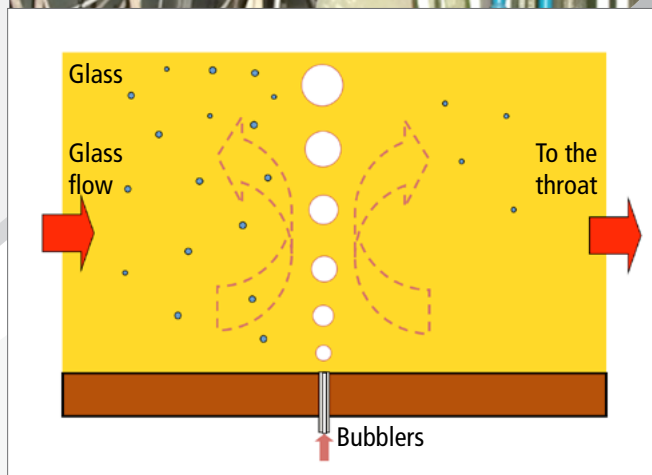
The main benefit of a bubbler system is to improve homogeneity by reinforcing the natural upward currents at the hot spot which is particularly beneficial when melting coloured glasses.

A single or double row of bubblers installed across the furnace at the hot spot reinforces the vertical currents, and leads to a notable improvement in temperature homogeneity.

The number of bubbler tubes installed and the diameter of the nozzle diameter will be decided according to the furnace design, the glass to be melted and the anti-

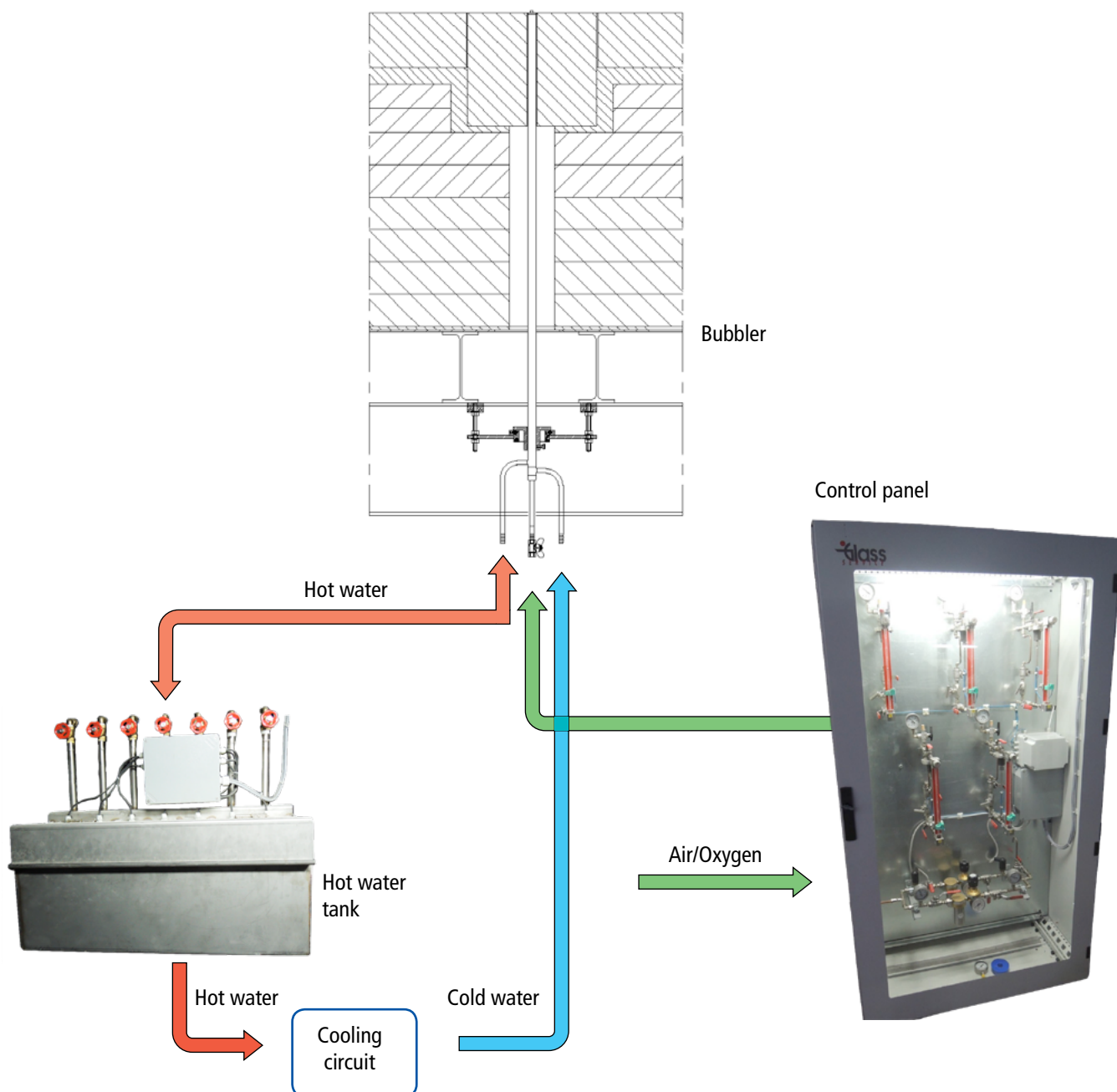
pated bottom temperature.

The air pressure and flow is used to regulate the frequency and size of the bubbles, it should be noted that a reduction of molten glass viscosity (equal to a temperature increase) reduces the size of the bubbles generated and also increases their frequency.





# WATER-COOLED BUBBLING SYSTEM



The working pressure range is from 0.5 to 2 bar and the amount of air flowing through each bubbler is between 80 and 200 Nliters per hour. When using compressed air from the factory network, suitable filters should be installed to completely remove any oil from the air in order to avoid clogging of the nozzles.

Upon installation the air is normally applied at a pressure of nominally 0,5 bar (to prevent the ingress of glass particles, etc.), after heat-up the

pressure is increased to the correct level by observing the size and frequency of the bubbles at the glass surface.

For some special glasses oxygen can be use in the bubbling system due to the easier chemical dissolution of oxygen into the molten glass.





# NEW WATER COOLED BUBBLER INJECTOR

This new technology provides the following features:

- Reduced bottom wear, due to the cooling effect in the area of the nozzles
- Bubblers can be replaced hot when required while the furnace is operating
- Bubblers can be unblocked using compressed air or with the aid of special tools
- Either oxygen or compressed air can be used

These bubblers are characterized by:

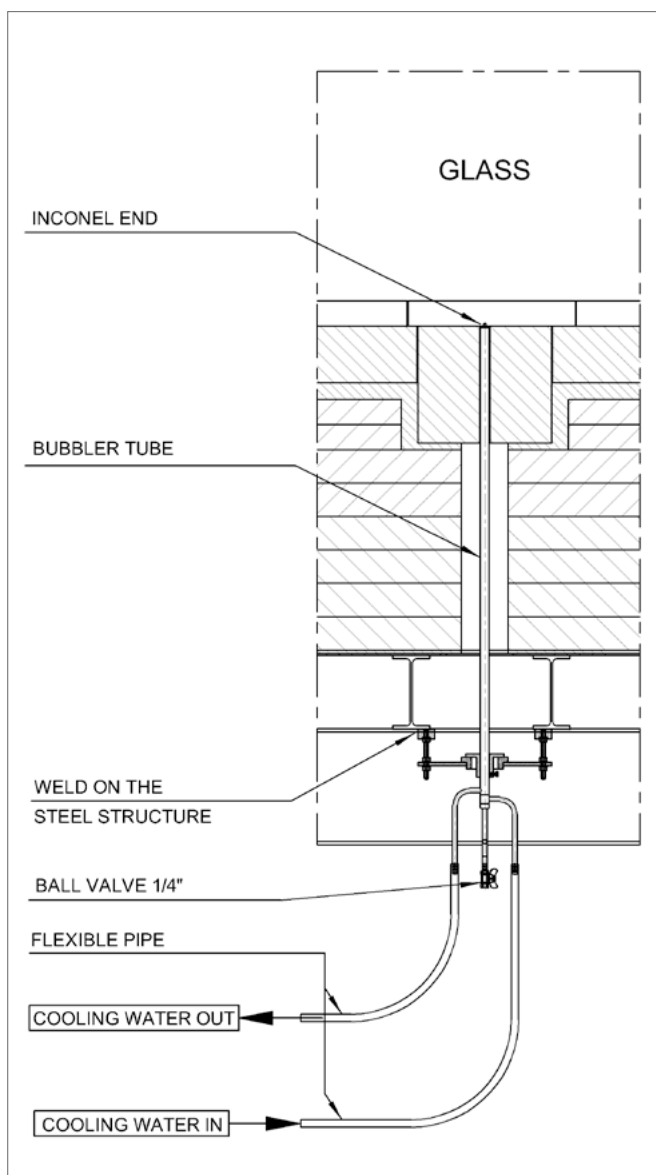
- Special stainless steel and Inconel nozzle
- Cooling with water jacket
- Proven long life
- Capable of being switched OFF and ON again

The system is completed with a control skid complete with filters, pressure regulators and a back-up tank to provide 30 minutes cover (in case of temporary lack of compressed air).

The **water-jacket-cooled injectors** assembly comprises:

- Support bracket
- Insulated support
- Insulating shield
- Straight connecting nipple for air and water input
- Bubbler tube

## INSTALLATION SCHEME AND PICTURE

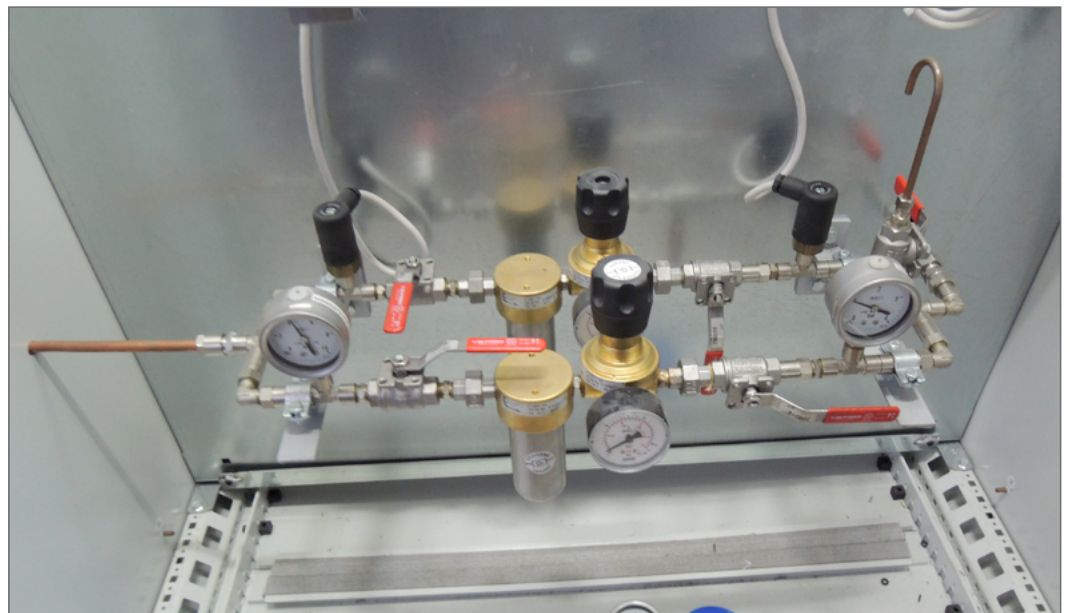
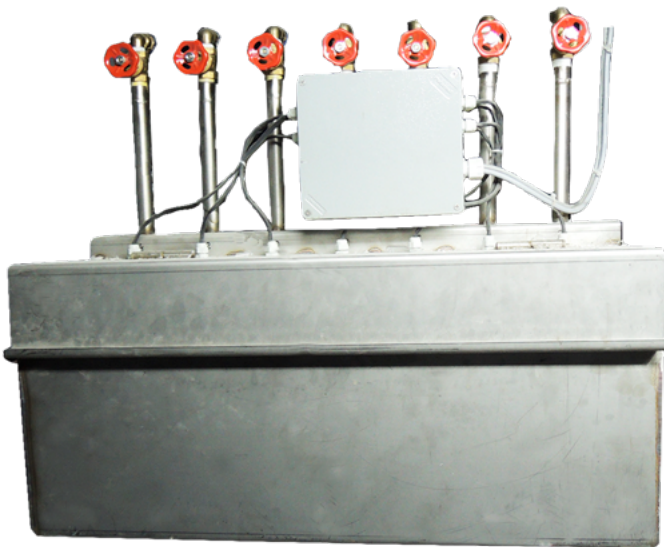


**Bubbling control panel**, the panel is supplied fully wired and tested, and contains all of the necessary instruments and controls to operate the system:

- A fully redundant reducing and filtering section for bubbling gas
- A flow regulating valve, pressure gauge and flow meter set for each injector
- Main control instrumentation positioned on front panel
- High pressure bypass for nozzle unclogging

A set of suitable mechanic tools for unclogging is provided with the system.

**Cooling water return** is achieved through a stainless steel water manifold with one flow detector for each bubbler.



## TECHNICAL FEATURES

Model		BUB H 1 AA
Max temperature cooling water Input	°C	20 to 35
Max temperature cooling water Output		45
Max Water calcium content	ppm	40
Water cooling inlet pressure range	bar	2 to 4
Air / oxygen input pressure range		4 to 8
Air / oxygen pressure reduced after skid		0.5 to 2
Air / oxygen flow range	Nliters/hour	60 to 360
Bubbling gas		Air / Oxygen

The **Glass Service** bubbler skid is designed and built according the latest European standards



- EN 15001
- ATEX zone II if required



**PED**  
97/23/EC

Or GOST standard for Russian market



The equipment design and the material use in construction are according the EU standards and best practice.

- Certified valves
- Certified welding and X-ray welding control for high pressure pipework
- Powder painting of pipework
- Certified sealing
- Certified leakage testing





# CUSTOMERS WORLD WIDE

BUB-17-01-E



**turn key project**

**batch plants**

**furnaces:**

recuperative

regenerative

gas fired

oil fired

oxy-fuel fired

mixed fuel

electric

**forehearth:**

colouring forehearth

combustion systems

**day tanks**

**mini melters**

**boosters**

**bubblers**

**metallic recuperators**

**batch chargers**

**stirring machines**

**glass level controls**

**frit dosing and transport**

**control cabinets**

**SCADA and DCS**

**cooling systems**

**robotics**

gathering - 4 or 5 axis

**services:**

installation and supervision

commissioning

training

preheating

technology transfer

assistance

laboratory and analysis

refractory consulting

**project financing**



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