GLASS CONDITIONING SYSTEMS

HORN
GLASS INDUSTRIES

innovation
ENGINEERED IN GERMANY

DISTRIBUTORS & FOREHEARTHS

Distributors and forehearths are glass conditioning systems, which are vital components of a glass melting plant. They are cooling, homogenising and forwarding the molten glass to the production machines. The HORN® glass conditioning systems allow specific conditioning of the molten glass for each particular forming process while ensuring the highest possible temperature homogeneity (K-factor) of the gob. Glass conditioning always and without exception starts in the distributor and is continued and completed in the forehearth. Therefore the HORN® distributors and forehearths are interconnected systems and are engineered as single units for the conditioning process.

DISTRIBUTOR GCS® SERIES 100

GLASS CONDITIONING SYSTEM

DESIGN:

- Higher superstructure at the entrance zone – crown execution
- Flat cover blocks at downstream zones
- Optimally calculated distances from the furnace centreline to each forehearth to minimise the risk of glass flow short-circuiting and to optimise the forehearth entrance temperature
- Differentiated control sections for accurate temperature adjustment

DIMENSIONS:

- Width individually customised depending on total pull, required temperatures and residence time
- Length individually customised to available space, number and arrangement of forehearths
- Depth individually customised depending on total pull, required temperatures, residence time and glass colour

COOLING SYSTEMS:

Several natural or forced cooling systems are available which are adapted to the design of each distributor:

- Radiation openings
- Direct cooling system (individually adjustable)

FEATURES

- **"Blind" connection possible for the subsequent installation of an additional forehearth**
- **Opening for the glass level measuring device**
- **Tailor-made for optimised pre-conditioning of the glass**
- **Different cooling systems are available and adapted to the specific requirements**

FOREHEARTH GCS® SERIES 200

GLASS CONDITIONING SYSTEM

DESIGN:

- The superstructure is designed for optimal combustion system performance
- Modular construction system to achieve optimal thermal homogeneity combined with minimum energy output
- Used for up to 50 t/d

DIMENSIONS:

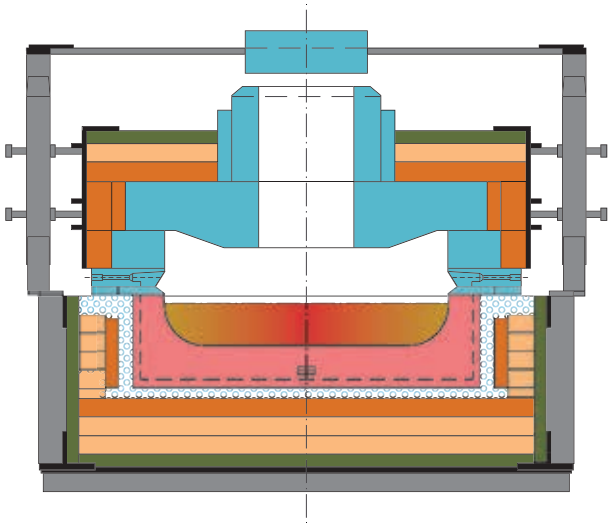
- Typical length starts at 10 ft
- Standard width from 16" to 26"
- Standard glass depth of 4" to 6"
- T-type, F-type or Y-type for tandem production available, depending on machinery layout

FEATURES

- **Fast and effective cooling with radiation openings**
- **Refractory can be designed for additional stirrers, VARI-DRAIN® or forehearth boosting**

RADIATION OPENINGS:

- Radiation openings are provided in the forehearth superstructure at each cooling zone
- Openings are sized according to the required cooling and are located at the beginning of each zone
- The heat radiation through the opening can be varied by adjusting the damper



Cross section of forehearth GCS® 200

FOREHEARTH GCS® SERIES 301-ADVANCED

GLASS CONDITIONING SYSTEM

DESIGN:

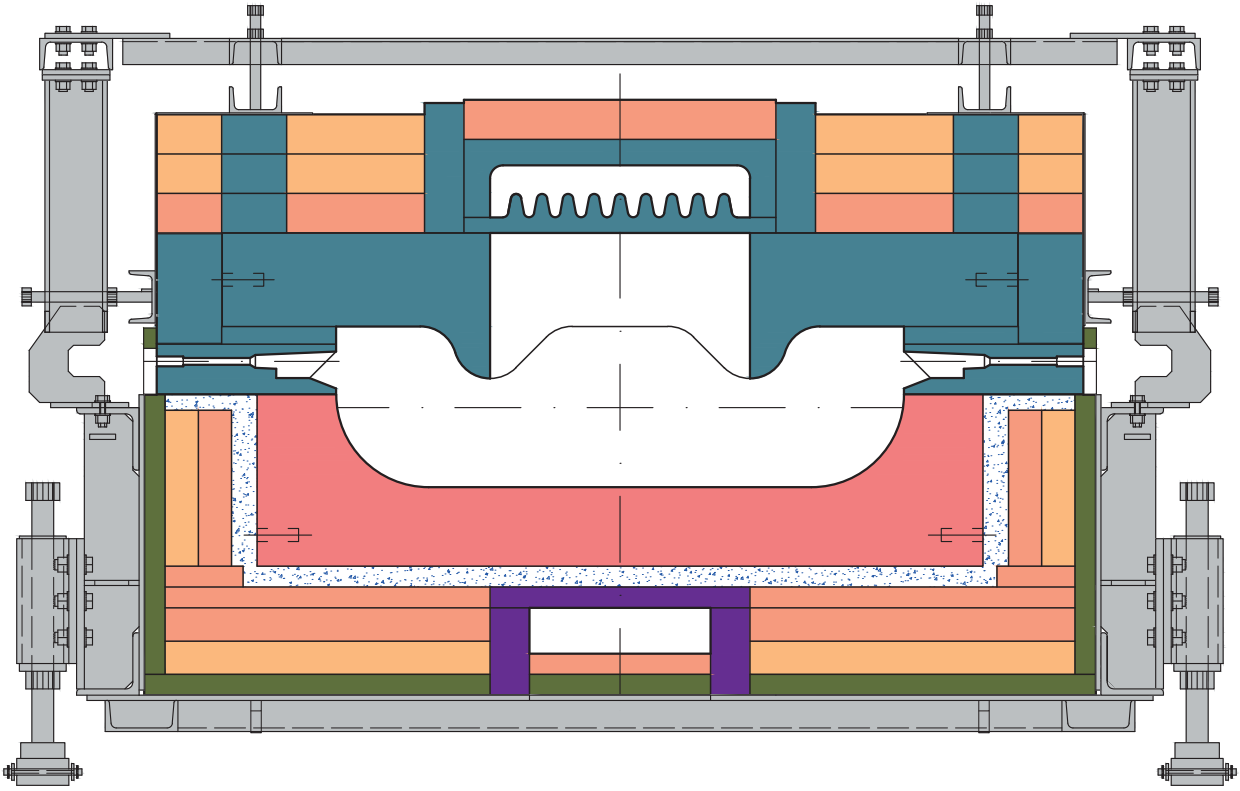
- The GCS® Series 301-advanced design allows a wide range of gob temperatures required to produce different sized articles
- Special roof cover block for area separation along the control zones:
  - > Separated boundary areas to heat the glass particularly at the side of the forehearth
  - > Separated central section to guide direct cooling air
- Improved thermal homogeneity through optimised transition between equalising zone and spout
- Roof design with indirect centreline cooling
- Use of high-performance insulating refractories
- High-end glass conditioning

DIMENSIONS:

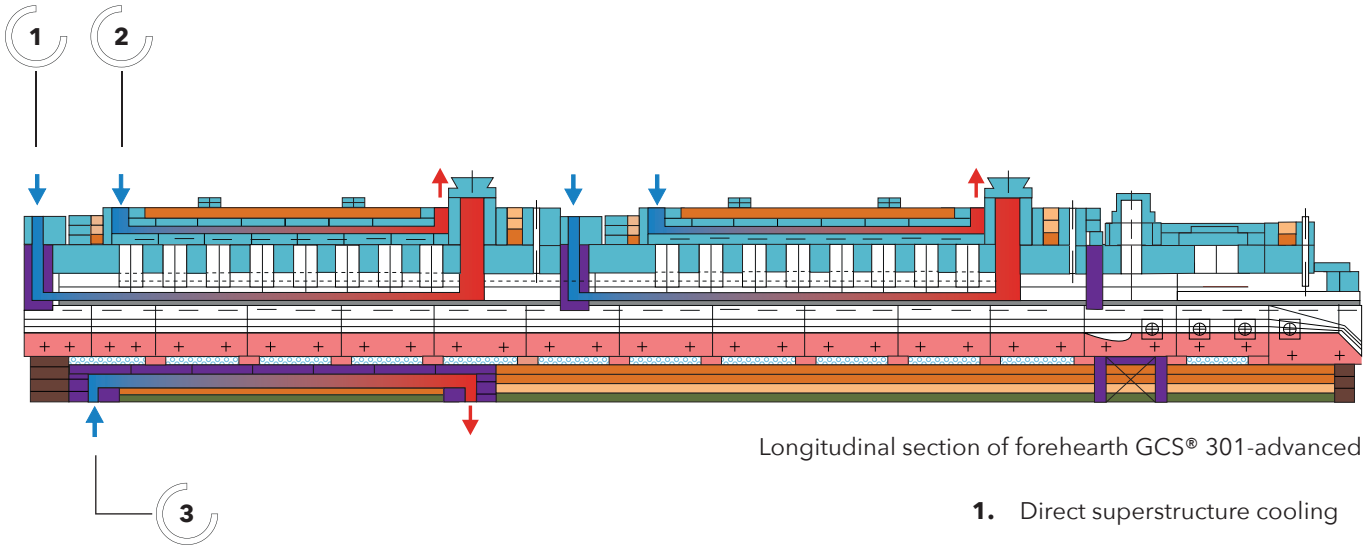
- Typical length starts at 16 ft
- Standard width from 36" to 54"
- T-type, F-type or Y-type for tandem production available, depending on machinery layout

AVAILABLE COOLING SYSTEMS:

- Direct superstructure air cooling
- Indirect superstructure air cooling
- Indirect bottom cooling

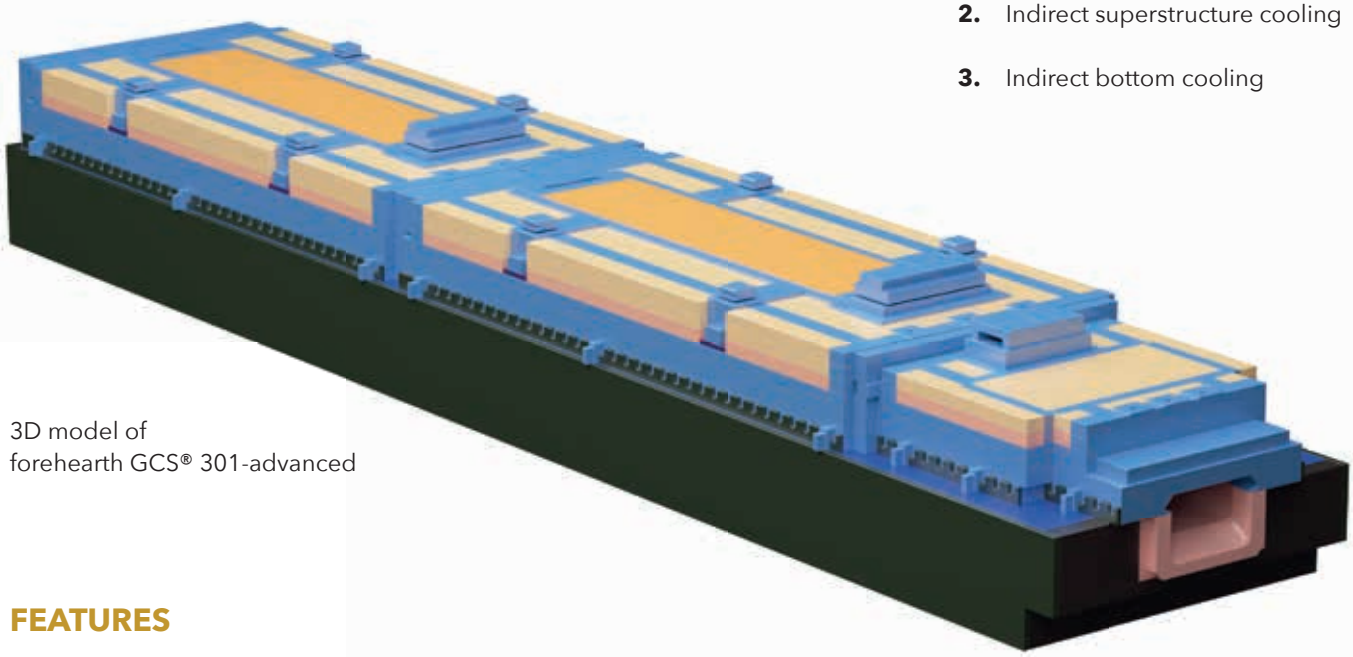


Cross section of forehearth GCS® 301-advanced



Longitudinal section of forehearth GCS® 301-advanced

1. Direct superstructure cooling
2. Indirect superstructure cooling
3. Indirect bottom cooling



3D model of
forehearth GCS® 301-advanced

FEATURES

- **High thermal homogeneity (THI) for flint glass and coloured glass (incl. HORN® forehearth boosting)**
- **Refractory can be designed for additional HORN® stirrers, VARI-DRAIN® or HORN® forehearth boosting**
- **High flexibility**
- **Wide range of production processes**
- **Superior glass conditioning**

OPTIONS

STEEL WORK

- Assembly of the forehearths follows conventional design
- Substructure refractories are enclosed in steel casings
- Braced frames support the superstructure

REFRACTORIES

- Designed to meet modern technical requirements to achieve optimal thermal homogeneity combined with minimum energy requirement
- Channel blocks of zircon mullite, fused cast AZS or alumina material
- Forehearth superstructure in sillimanite material and premium insulating refractory materials

CORA® MIXTURE HEATING SYSTEM

- **Co**nstant air/gas **Ra**tio
- Safety switch-off system (in accordance with DIN EN 746-2)
- Automatic lambda control (optional)
- Preassembled skids for easy installation including pipework
- Used at distributors and forehearths (GCS® Series 200 and 301-advanced)

COOLING EQUIPMENT FOR DISTRIBUTORS AND FOREHEARTHS

- Customised cooling fan layout
- Alternatively two central cooling air fans for all air cooling systems, one in operation and one as stand-by
- Radiation and/or flue gas openings can be operated manually or automatically

MEASUREMENT AND CONTROL SYSTEM

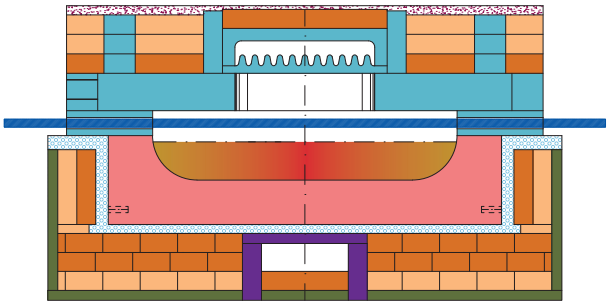
- Fully automatic temperature control loops in each zone
- Spout heating can be controlled manually or automatically
- Different types of temperature measurements (thermocouples or pyrometers) are available for each zone
- Grid-measurement in equalising zone with K-factor calculation, according to Emhart 9 point formula
- All measuring and control instrumentation housed in a completely assembled and wired control panel

OPTIONAL EQUIPMENT FOR FOREHEARTHS GCS® 200 & 301-ADVANCED

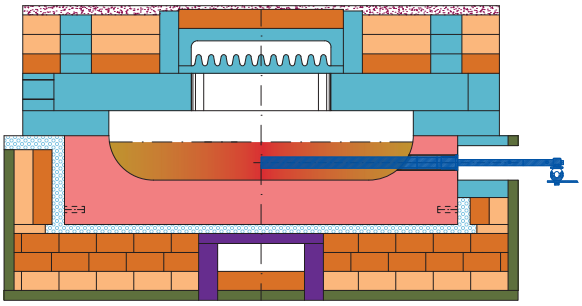
- HORN® drainage system VARI-DRAIN®
- Stirrer system in equalising zone
- Forehearth boosting in equalising zone

	GCS® 100	GCS® 200	GCS® 301-ADVANCED	GCS® ALL ELECTRICAL
CORA® heating system	O	X	X	–
Indirect electrical heating system	O	–	–	X
Direct electrical heating system	O	–	–	X
Radiation openings	O	O	O	–
Waste gas openings	O	X	X	–
Indirect air cooling	–	O	O	O
Direct air cooling	O	–	O	–
Indirect bottom air cooling	–	–	O	O
Stirrer unit	–	O	O	O
Equalising - Boosting	–	O	O	O

Key: X : included O : available – : not available

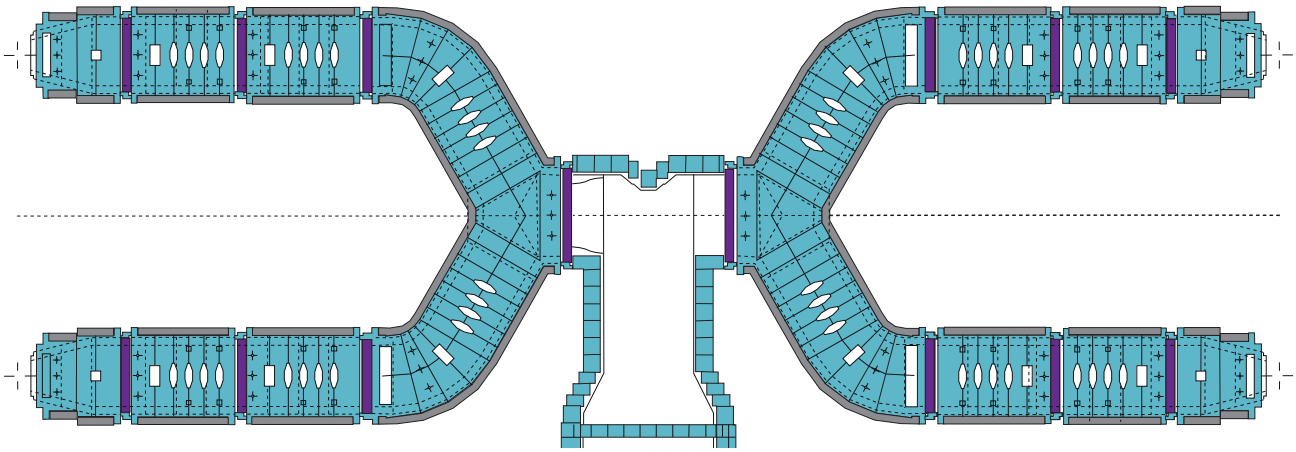


HORN® all electric forehearth with indirect SiC heating elements (cross section)

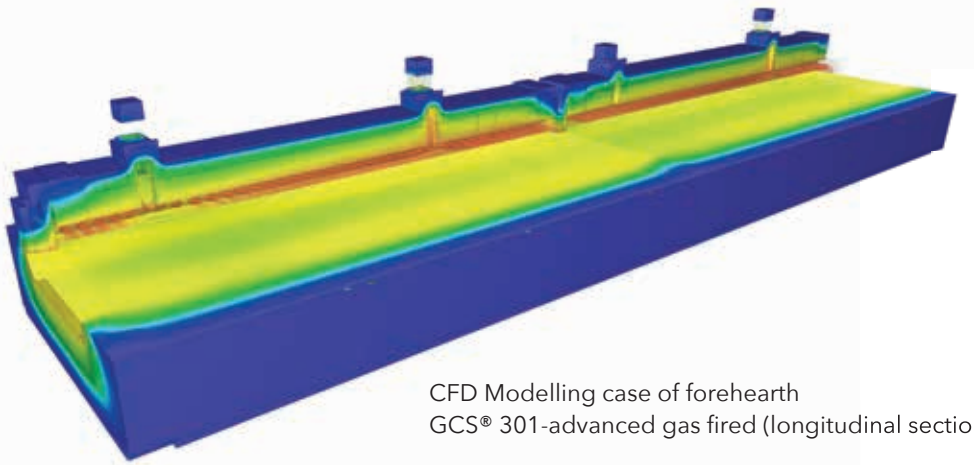


HORN® all electric forehearth with direct molybdenum electrodes (cross section)

Different arrangements of state-of-the-art HORN® glass conditioning systems



A sophisticated arrangement for two tandem machines based on HORN® conditioning systems (top view)



CFD Modelling case of forehearth
GCS® 301-advanced gas fired (longitudinal section)

LET'S GO FULL CIRCLE. WWW.HORNGLASS.COM

The key to HORN®'s extensive expertise in all fields of glass melting technology is the profound understanding of each detail within the entire process, making HORN® the specialist for technological progress and innovation for each aspect of a glass plant. In addition to its knowhow about individual elements such as furnaces, HORN® has expanded its services to become a one-stop supplier for turn-key plants. From initial planning to full operation – HORN® stands by you all the way.

PLANNING + ENGINEERING

MANUFACTURING

SERVICE / INSTALLATION + SUPPORT

LET'S GO FULL CIRCLE.

HORN
GLASS INDUSTRIES

HORN® GLASS INDUSTRIES AG
BERGSTRASSE 2
D-95703 PLÖSSBERG/GERMANY

TEL.: +49 9636 / 9204-0
FAX: +49 9636 / 9204-10

WWW.HORNGLASS.COM

04/2020