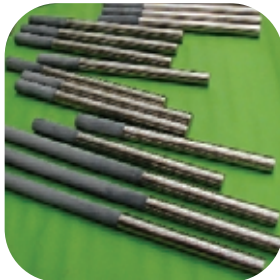


# KTG ENGINEERING

Part of the TECO Group



Glass Plant Equipment Manufacturers

## Products

KTG Engineering is part of the TECO group, one of the worlds leading companies in glass furnace design and melting technology.

KTG Engineering are specialist manufacturers, providing a wide range of ancillary items for glass furnaces.

- Electrode Holders
- On site engineering and furnace drilling services
- Furnace, Throat and Forehearth Boost Systems
- Bubbler Systems
- Controllable Drain Systems
- Spy Hole Covers
- Screw Batch Chargers
- Glass Level Control Systems
- Forehearth Stirrers
- Tin Oxide Electrodes and Connectors
- Molybdenum Electrodes

Standard items, or custom made products to suit your individual requirements.

## Molybdenum Electrode Holders

### SX Electrode Holders

KTG Engineering has supplied thousands of this type of holder to many customers throughout the world, over the course of many years.

- Nose manufactured from solid high temperature resistant alloy
- No welds at the front of the holder
- Cooling close to glass ensuring a good seal
- Horizontal or vertical installation
- Electrodes can be advanced as often as required
- K type thermocouple drilled into nose
- Excellent service record in all types of glass



### Scroll Electrode Holders

A more traditional design which provides an economical solution for all general applications. The nose has a scroll groove machined in it; a tube is then fitted over the scroll section and welded at each end, forming a continuous water passage.

### Services

Both types of KTG Engineering electrode holders can be factory fitted with gas purging facilities, which provide a sealed inert gas shield to give the electrode added protection against oxidation.

KTG Engineering also offers a range of support installation kits tailored to suit individual applications, as well as an installation and advancing service if required.

As well as the products listed above, KTG Engineering also manufacture electrode holders and related products to individual customer designs and specifications, including 'splash cooled' holders.

## Technical Services

KTG Engineering offers a comprehensive range of technical services to the glass industry - worldwide.

Our experienced team of engineers are able to undertake -

- Drilling of bottom or sidewall blocks and fitting electrode holders.
- Drilling of bottom blocks and fitting drains.
- Drilling of bottom or sidewall blocks and fitting tin oxide electrodes.
- Drilling of forehearths and fitting air cooled molybdenum electrodes.
- Installation of equipment including electrode holders, thermocouples and bubbler systems.
- Maintenance of equipment including electrode advancement.
- Replacing water cooled electrode holders, air cooled forehearth electrodes and tin oxide electrodes.
- Commissioning electric, mixed melt and fossil fuel fired furnaces.
- Furnace surveys for new installations and replacement of existing equipment.
- Emergency call-out and repairs.



## Boost Systems

The demand from glass manufacturers for better glass quality and increased rates of pull is resulting in the greater use of boost systems in melters, throats and forehearth.

KTG Engineering offers a range of electrical boosting systems to suit particular furnace needs. We offer traditional single phase and 3 phase systems, Scott – T connected defined thermal barriers and a range of other methods. We offer either SCR (thyristor) or regulated transformer control, and phase balancing if necessary.



We can supply complete boost packages that include:

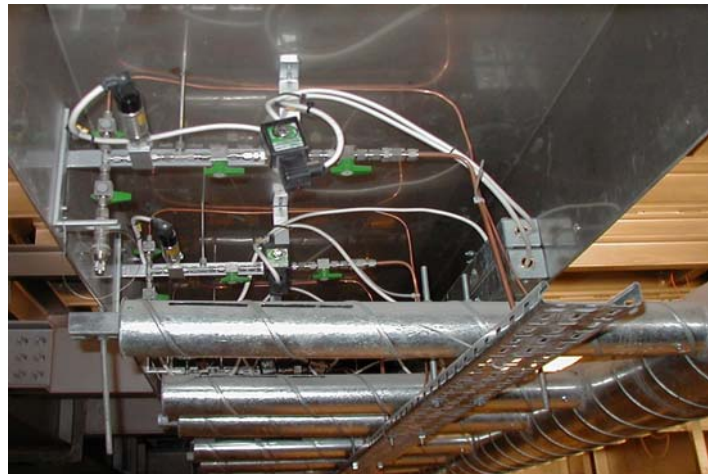
- Electrode holders and electrodes.
- Open or closed loop water pumping systems, including cooling modules.
- Flow and return water manifolds, including flow/temperature switches etc.
- Boost transformer.
- Electrical control, alarm and monitoring panels for the entire system.
- All the necessary electrode and holder support brackets and cable clamps.
- Electrode installation, pushing, sealing and commissioning.
- After sales support and maintenance.

## Bubbler Systems

KTG Engineering offers a number of bubbling solutions tailored to meet your individual needs.

### Pulse Bubbling System

KTG Engineering provides an effective multi-point bubbler system adapted for use with a range of gases and glasses. The system provides fully automatic or fully manual operation with independent control to each bubbler point. In addition, there are a number of pre-defined recipes that allow the user to determine the optimum bubbling pattern quickly.



### Manual Bubbler System

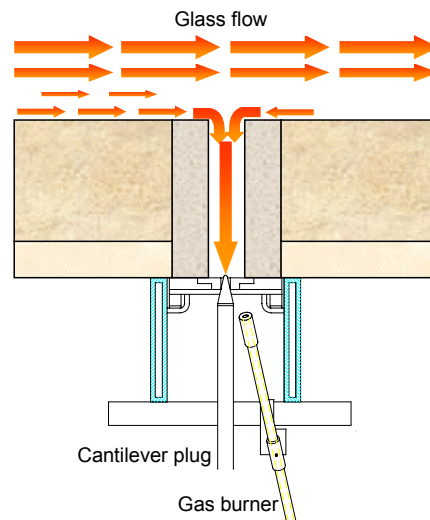
We have supplied many of these systems to customers around the world. The principle of the system has been long established and has proven to be very successful. This incorporates individual flow control to each bubbler, manually adjusted using panel mounted flow meters. There is a separate variable holding pressure facility, which is used to reduce the risk of glass ingress in the bubbler tubes.

### Bubbler Tubes

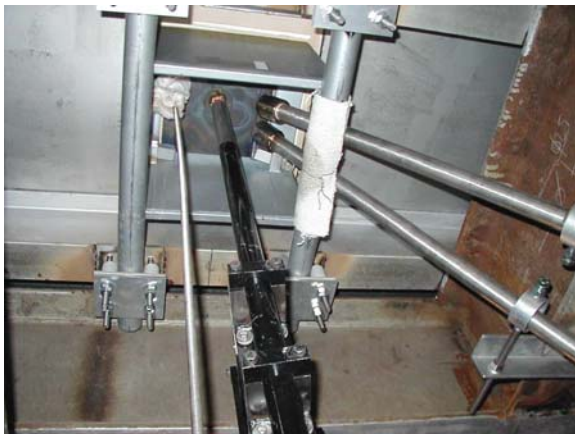
We supply a number of designs of tubes, from standard alloy/alumina tubes to platinum tubes manufactured to existing customer designs.

## Intermittent Controllable Drain System

Simple, effective and economical, this is a proven system with a number of installations on a variety of glass types worldwide - including borosilicates. This unique system allows periodic drains to be performed in order to remove glass and contaminants from the furnace bottom.



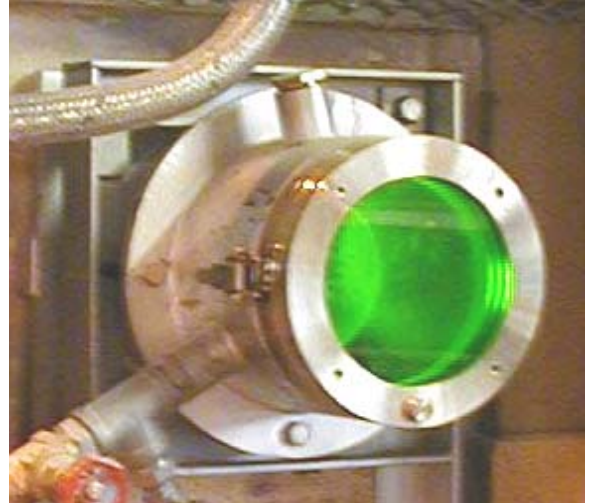
Typical pull rates are between 20 and 200 Kg per hour – controlling flow in both increasing and decreasing flow conditions. Once a small flow is achieved, this can be controlled and only glass and contaminants local to the drain are removed from the furnace bottom rather than a hot stream of glass direct from the main body of the glass melt.



The drain unit is usually positioned at the entrance to the throat, and involves a current being passed between the drain orifice plate and a local 'partner' electrode. The 'partner' electrode can either be an existing boost electrode or one installed specifically for the drain system. Scope of supply usually includes drain unit, burner system, drain cables, SCR controlled transformer and automatic control panel.

## Sealed Spy Hole Covers

- Uses fan air usually available from existing sources such as flux line or skewback cooling. Can use oxygen as a cooling medium if required.
- Typical air cooling supply is 25m<sup>3</sup>/hr @ 8 mbar, depending on furnace conditions.
- Lens assemblies can be easily removed for cleaning etc.
- Used on all types of glass furnace, including gas fired, oil fired and oxy-fuel.
- Used on container, tubing, TV, fibre glass furnaces amongst others.
- Can be installed on new or existing 'hot' furnaces and flues.



- Support brackets can be designed by our engineers to suit local furnace steelwork.
- Options of clear or green tinted lenses, standard window size is  $\varnothing 160\text{mm}$  other sizes available upon request.
- Reduced health & safety risks for operators.
- Better operator viewing comfort by removing 'sting out'.
- Reduction in flue gas emissions due to sealed spy holes preventing egress of external air.

## Screw Batch Chargers

A range of high quality water-cooled screw chargers are supplied for feed rates of up to 90 tonnes of batch per day. They can be used on conventionally fired or mixed melt furnaces.

- Water-cooled nose is manufactured from a high temperature resistant stainless steel, and is electrically isolated from the rest of the charger to prevent earth leakage faults on electric or boosted furnaces.
- Screw flight assembly consists of a stainless steel shaft with replaceable intermediate flights sections made from a wear resistant manganese steel, and an end flight to from a heat resistant alloy designed to withstand extreme temperatures.
- Speed variation is by means of a constant torque drive unit which provides variable control of screw speed. This enables high torque's to be maintained and minimal speeds without the motor stalling.
- All batch chargers conform to the latest European standards and directives, with all moving parts are fully guarded.



## Glass Level System

The Glass Level Sensor provides highly accurate glass level measurements from reliable, design-simplified and cost-effective equipment. Accessible components and basic design simplicity result in easy operation; self-lubricating fittings and durable, high temperature construction reduce maintenance downtime.

### Probe:

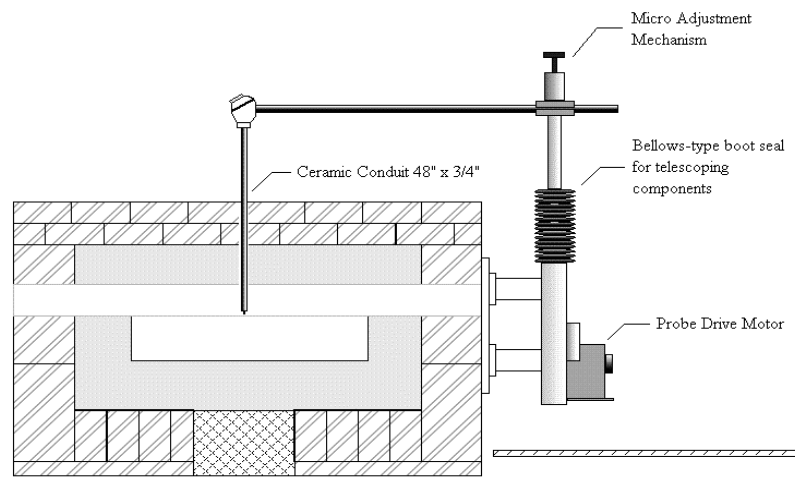
Platinum probe tip.  
Ceramic protection tube.

### Probe Mechanism:

Micro adjustment mechanism enables adjustment to 0.25mm during operation.

### Resolution:

Resolution specifications based on 12-bit A/D conversion. Usable resolution depends on choice of position feedback device (solid-state 4-20 milliamp sensor or wire-wound slidewire), stability of mounting, and length of probe mounting arm.



### Typical Control Range: +/-25 mm

Control depends on furnace type, location of glass level sensor, stability of furnace pressure, and accuracy of level control tuning +/-0.25mm observed.

### Output Signal:

Linear with position based on 0~5 Volt supply (0 ~ 1000Ω slidewire).

### Ambient Temperature:

50° C Normal, 70° C Peak

### Dimensional Information:

Height - 1.73 meters. Shipping Weight - 180 kg. Power Requirements - 120 Volts 50/60 Hz (220 Volts available)

## Forehearth Stirrers

Forehearth stirrer assemblies are used to homogenise the glass in a forehearth or gathering bay by mechanically stirring the glass and breaking up any cord present in the system. They are used very effectively in lead crystal glass with up to 30% lead, particularly in reducing the effect of Zirconia cord. Stirrers are essential in a colour forehearth to mix the frit with the base glass to ensure an even distribution of the colouring materials.

KTG Engineering manufacture a range of stirrer assemblies, standard units are shown below, these can be modified to suit individual customer requirements.

- **Four vertical paddle assembly**

This type is used either alone or in a refractory cell in a KU forehearth and consists of two pairs of vertically mounted AZS type refractory paddles. This type of assembly is mainly used in high quality, lead crystal glass.

- **Two vertical paddle assembly**

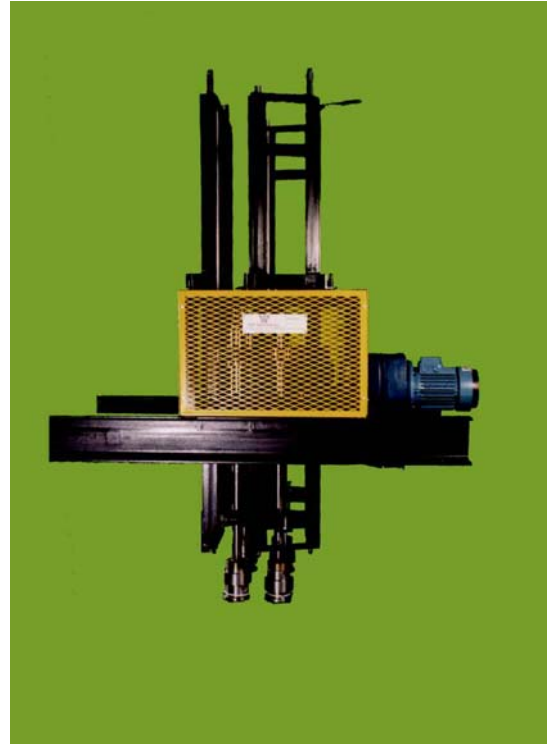
For use in a KU forehearth or in a spout bowl, this consists of a pair of vertically mounted AZS type refractory paddles. This type of assembly is mainly used in high quality, lead crystal glass where there is insufficient space for the four-paddle unit.

- **Two inclined paddle assembly**

Used in either a KU (16") or a KW (26") forehearth, and consists of two Zircon-Mullite refractory paddles inclined at an angle of 11 or 13 degrees to the vertical to suit either a standard or a deep forehearth. This type of assembly is mainly used in soda lime glass. A group of them are used for mixing in a colour forehearth.

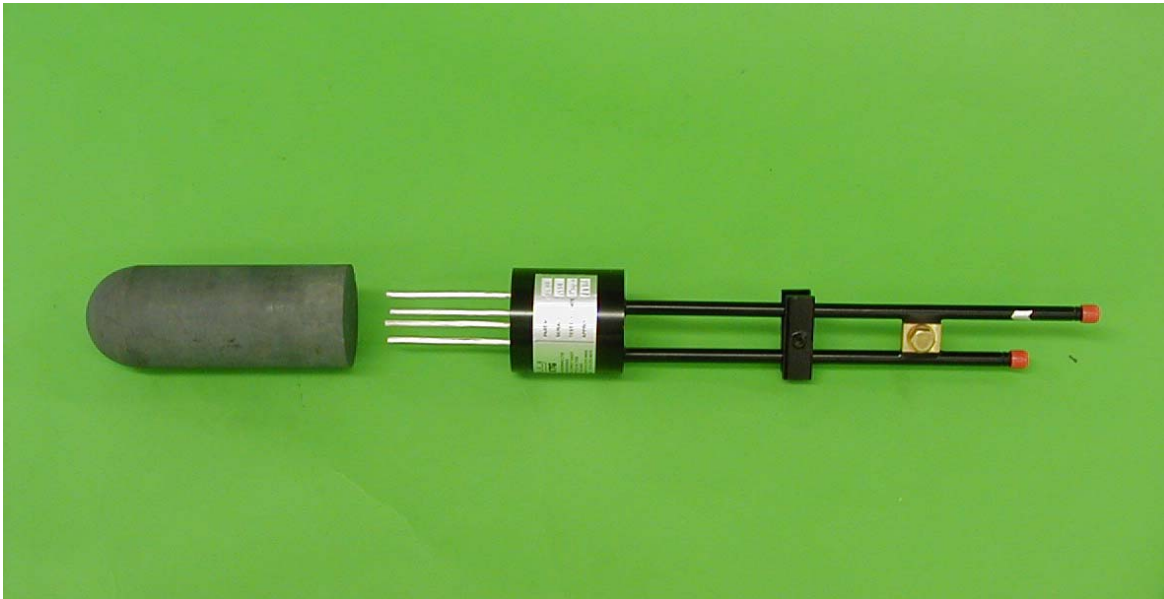
- **Single vertical gathering bay assembly**

A Zircon-Mullite refractory paddle is screwed to a water-cooled shaft and mounted vertically through the crown of a gathering bay. This type of assembly is used mainly in lead crystal glass but is suitable for use in soda lime glass.



## Tin Oxide Electrodes

Tin oxide electrodes have been used for many years for the electric melting of glass. The main use is in heavily oxidised glasses, which would erode molybdenum electrodes, resulting in excessive molybdenum consumption and contamination of the product. On lead glasses tin oxide electrodes are usually used in the furnace, forehearth and gathering bay systems. For high quality soda lime glass tin oxide electrodes can be used in the forehearth and gathering bay systems.



KTG Engineering's tin oxide rod electrodes have a number of long internal, blind holes, drilled through the base. These fit over pure silver rods, mounted on the water-cooled pot connector, which is retained by an insulated support assembly. The power cable is connected to a brass terminal fitted between the water cooling tubes of the pot connector. Due to the heat of the furnace the ends of the silver rods melt and make a very efficient molten silver contact with the tin oxide electrode, while at the same time the water cooling on the pot connector prevents leakage of glass past the electrode.

Standard sizes available are 64, 88, 100, 150, 160mm diameter.

Advancing mechanisms are available for sizes of 88mm and above.

## Dry Molybdenum Electrodes

Dry molybdenum electrodes provide a cost-effective solution to applying direct electrical heating to glass. It is non-advancing and therefore should only be used in areas of low wear and modest temperatures, such as a forehearth. As the electrode is 'dry' there is no heat loss due to water-cooling.

The electrodes can be supplied coated to prevent oxidation during heat-up, and may be installed horizontal or vertical.

Special water boxes to provide added security against glass leaks can be provided if required.

KTG Engineering also manufactures molybdenum/alloy bi-metallic electrodes.



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