

## Technical News Bulletin

Cham, September 2012

### Temperature Control System - TCS



#### Introduction

The Temperature Control System (TCS) uses a high speed pyrometer mounted on an automatic positioning system on the blank side. It measures blank mold, plunger and neck ring temperature. The different temperature readings are displayed and recorded. These temperature readings give the process the transparency needed to reduce blank mould, plunger and neck ring temperature variations and lead to improved process stability.

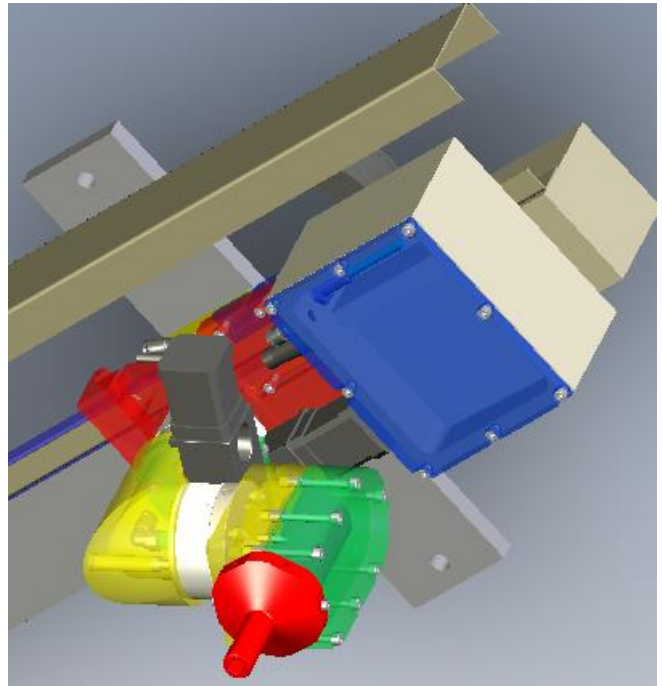
## System description

By means of three axes, the pyrometer is accurately positioned to measure all blank mould and plunger temperatures. The collected data are plotted on various graphs and a warning is activated if any of the temperatures fall outside of the pre-set limits.

The system includes:

a) A three axis positioning system

The first “X” axis, is composed of a linear rail, a stepper motor which drives a tooth belt and, in turn, moves a carriage along the linear rail that cover the full span of the IS machine. An encoder is employed to monitor the exact position of the carriage. The second and third “Horizontal” and “Vertical” axes include of two precision stepper motors with integrated gearing. The two motors are mounted together onto the X axis carriage. This particular arrangement provides a pan and tilt movement



b) High speed infrared pyrometer

The high speed pyrometer measures temperature using an infrared wave length of 1.45  $\mu\text{m}$ , in a range of 350°C to 1800°C. The pyrometer is housed in a small enclosure which has purge air continuously running through it to clean the lens and cooling the pyrometer.

c) Ethernet Bus and PLC interface

The Ethernet Bus system controls the horizontal and vertical motors and transfers the pyrometer signals to the PLC (programmable logic controller) interface. The PLC commands the positioning of all axes, handles the temperature signal in real time, activates the TCS alarm, processes the cycle trigger signal received from FlexIS for each independent section.

d) Hand-Held unit

The operator, standing in front of the machine, uses the hand-held to move the three axes to position the pyrometer to a given measurement locations and to save its coordinates. A laser pointer, which is internally fitted to the pyrometer, is used to verify the viewing location of the pyrometer and to set up the measurement locations. From the hand-held terminal the user can switch on/off the laser pointer and display the temperature received by the pyrometer.



e) User interface

The user interface provides the operator with a variety of software features that automatically analyze and present the temperatures acquired on different screens easy to understand. The “Overview” display provides for all the sections the temperatures of the various cavities



and a warning/alarm is activated if any of the temperatures fall outside of the predetermined set limits.

The “History” is a graphical display of the collected data over time. Additionally, the minimum and maximum alarm limits are shown using two horizontal red lines.

**Components Specification – TCS System Requirements 603-10015.**

User Console

Temperature:

without air conditioner 0-40°C

with air conditioner 0-55°C

Humidity:

without air conditioner 10-80% non condensing

with air conditioner 10-100%

Power consumption/supply

110 - 240V AC single phase, 1kVA; 48-62Hz

Line voltage tolerance -10%/+15%

Protection grade:

IP65

Control Cabinet

Temperature:

max. 60 °C housing cover surface

max. 55 °C inside cabinet

Humidity:

relative 20 – 95 % non condensing

Power consumption/supply:

110 - 240V AC single phase, 0.5 kW, 50 Hz

Protection grade

IP 66

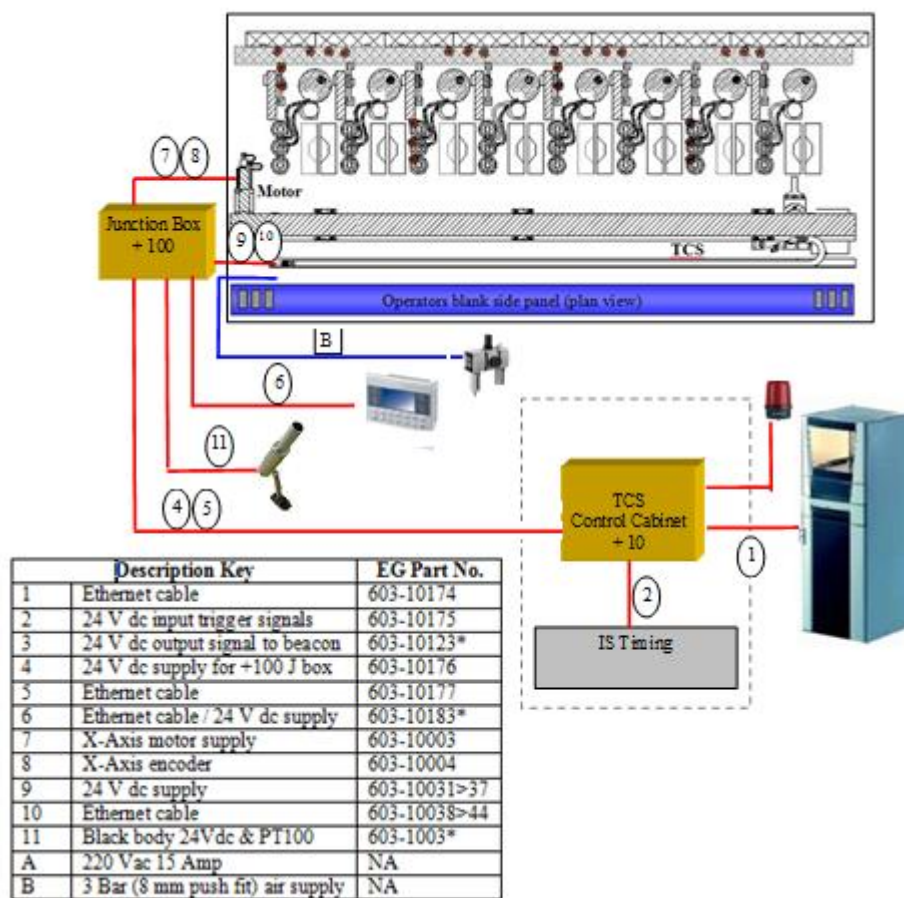
Hand Held Terminal

Temperature: max. 60 °C housing cover surface  
 Humidity: relative 20 – 95 % non condensing  
 Power consumption/supply: 24 V DC supplied through Control Cabinet

Vibration and mechanical shock: 5-100Hz 19,6m/s<sup>2</sup> or 1,5mm amplitude,

Diskless design, but limitation  
 by TFT display &

internal ventilation: 10-55Hz 539m/s<sup>2</sup> 11ms (whatever applies first)  
 Protection grade IP 66



Linear Module

Temperature: max. 60 °C  
 Humidity: relative 20 – 95 % non condensing (<70g/m<sup>3</sup>)  
 Power consumption/supply: 24 V DC supplied through Control Cabinet  
 Protection grade: IP65 (all connectors/covers properly attached)

**Measuring Head, including Pyrometer and Terminal Box**

Temperature:	max. 60 °C cable track chain
Humidity:	relative 20 – 95 % non-condensing
Power consumption/supply:	24 V DC supplied through Control Cabinet
Protection grade:	IP65 (all connectors/covers properly attached)
Pneumatic supply pressure/consumption	3.2 bar 280 NI/min
Air requirement	ISO Class 4 (ISO-8573-1) Air temperature max 40°C
	<b>VORTEX Cooler KIT</b> is required if the Air temperature at the TCS head is >50°C
Temp. Measurement range:	350 to 1800 deg. Celsius

**Control Interface**

**Input Per Section**

Timing signal (trigger)	24V DC (>10ms)
Delivery depending signal	24V DC (>10ms)
Swab depending signal	24V DC (>10ms)

**Output**

Cooling Fan control	4-20mA
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**Availability / Application**

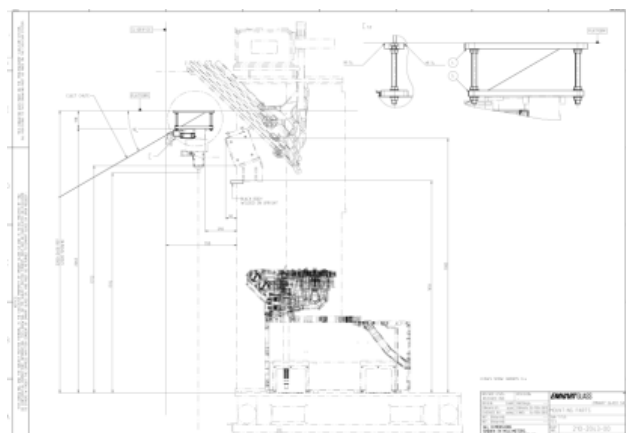
The TCS is available for all the machine type from 6 to 12 sections, for IS machine 6 and 8 sections, need to verify the layout.

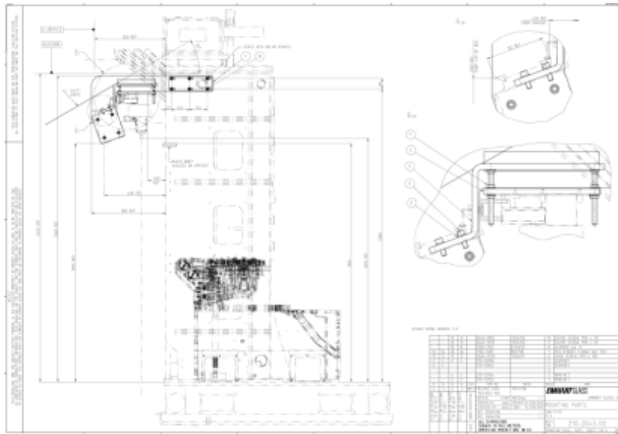
The drawing 603-1-00 TCS Master Assembly shows the list of the components needed to install TCS, for each group, under the voice "TCS Mounting parts", is indicated the TCS installation drawing for that specific machine:

200-2114-00	IS installation
210-2043-00	AIS installation
400-5329-00	NIS installation
401-1109-00	BIS installation

The above NIS and AIS drawings give also all the reference to position TCS under the existing gob distributor platform on existing machines if the required space is not available for the extended brackets.

All the TCS ordered with new machines will be assembled in the Emhart workshops according to the corresponding layout.





During the preparation of the machine installation layout, to design the gob distributor platform and the cullet chute, need to consider the position of the TCS and BK panel, indicated in the above installation drawing,.

The master assembly 603-1-00 shows also: spare parts list 603-10172 ,603-10173 and electrical schematics 603-10000

## Features / Benefits

Features	Benefits
<ul style="list-style-type: none"> <li>• Automatic temperature measurement</li> </ul>	<ul style="list-style-type: none"> <li>• Reduces worker load to control process</li> </ul>
<ul style="list-style-type: none"> <li>• Multiple measurement points per section</li> </ul>	<ul style="list-style-type: none"> <li>• Should reduces downtime</li> </ul>
<ul style="list-style-type: none"> <li>• Warnings and alarms for violation of set temperature range</li> </ul>	<ul style="list-style-type: none"> <li>• Valuable Information to maintain constant mold equipment temperatures</li> </ul>
<ul style="list-style-type: none"> <li>• Automatic re-measuring when measurement is out of range</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Device for the FlexIS close loop temperature control</b></li> </ul>
<ul style="list-style-type: none"> <li>• Save reference temperatures as comparison</li> </ul>	
<ul style="list-style-type: none"> <li>• Real-time point measurement</li> </ul>	
<ul style="list-style-type: none"> <li>• Individual temperature limits</li> </ul>	