

Technical News Bulletin

Steinhausen, November 2020



Temperature Control System – TCS

- Automatic temperature measurement reduces work load to control process
- Multiple measurement points per section reduce downtime
- Automatic re-measuring when measurement is out of range

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 mold, 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 mold and plunger temperatures. The collected data is plotted on various graphs and a warning is activated if any of the temperatures fall outside of the pre-set limits.

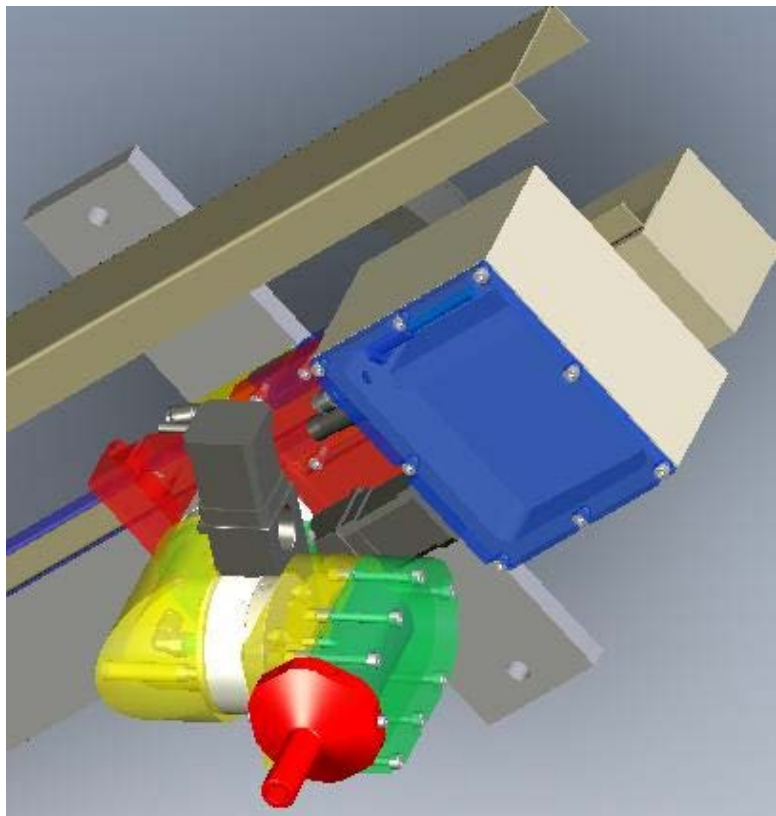
The system includes:

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 covers 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 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 to cool 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

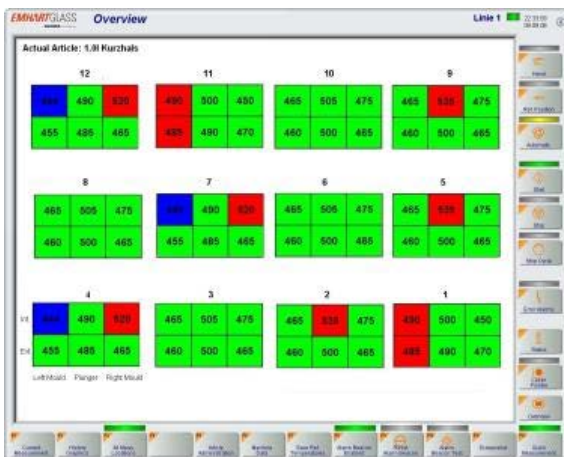
The operator, standing in front of the machine, uses the hand-held unit to move the three axes to position the pyrometer to a given measurement location and to save its coordinates. A laser pointer, which is internally fitted to the pyrometer, is used to verify the viewing location of the pyrometer and 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.



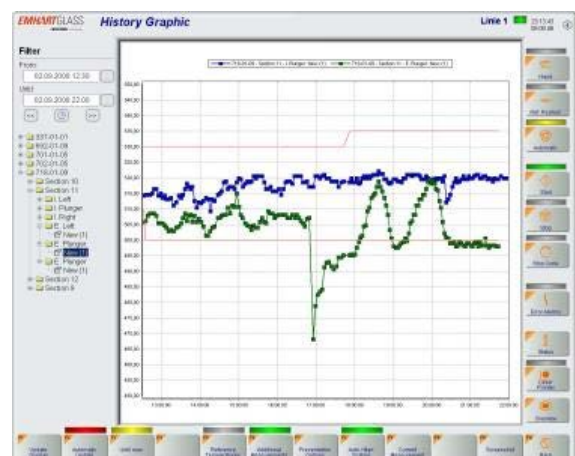
e) User interface

The user interface provides the operator with a variety of software features that automatically analyze and present the temperatures acquired on different screens in an easy to understand way.



The “Overview” display provides the temperatures of the various cavities for all the sections 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	

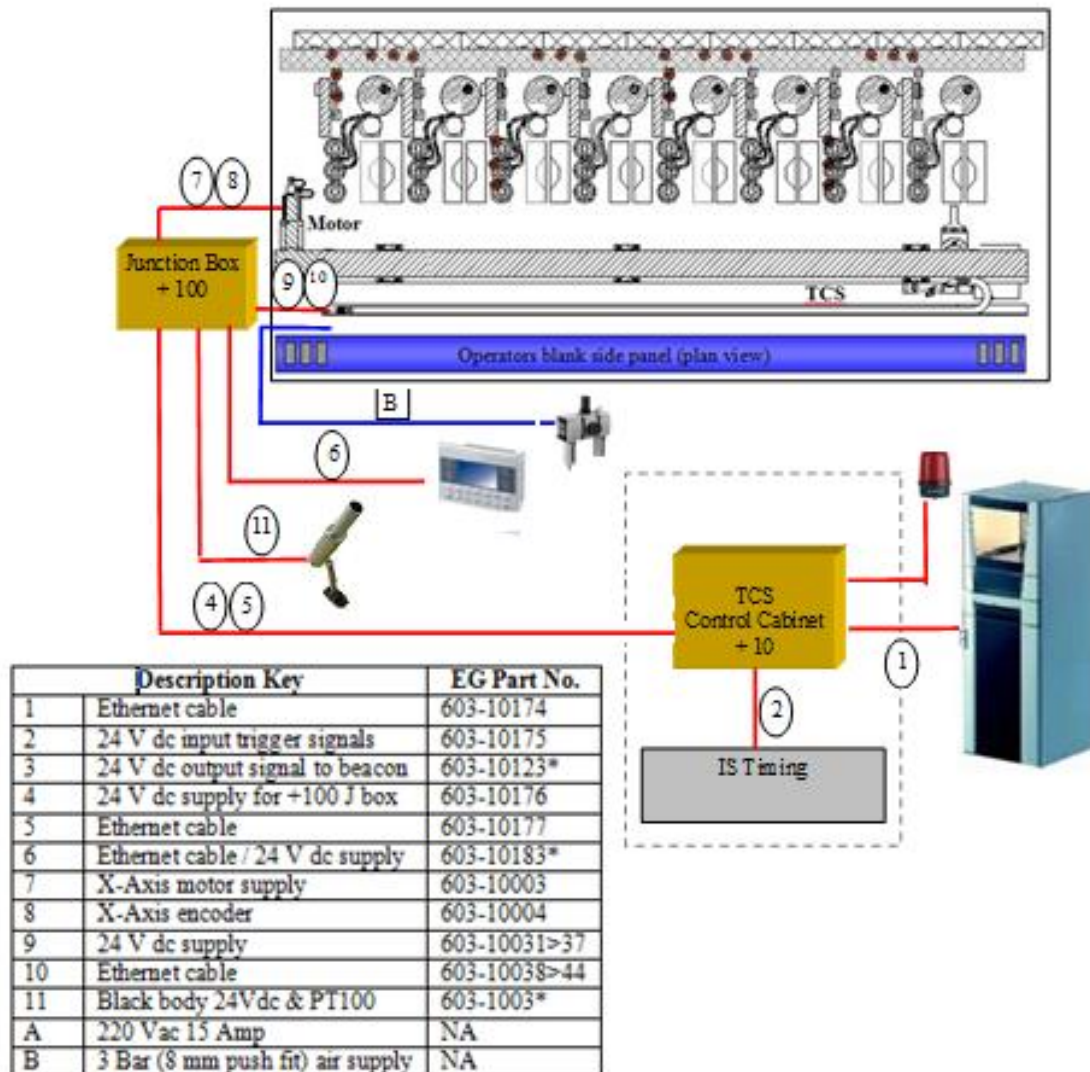
Hand Held Terminal

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/s² or 1,5mm amplitude,

Diskless design, but limitation
by TFT display &

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



Linear Module

Temperature: max. 60 °C
 Humidity: relative 20 – 95 % non-condensing (<70g/m³)
 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 VORTEX Cooler KIT 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)

Availability / Application

The TCS is available for the AIS/NIS machine types from 8 to 12 sections. For IS (Arcuate) machines availability is confirmed only after technical study and application restrictions investigated. Not all cavities will have the same measurement capabilities due to the design of the hinged mold holder.

The drawing 603-1-00 TCS Master Assembly shows the list of the components needed to install TCS. The drawing 603-2-00 contains the mounting parts for each blankside panel, spare part references and electrical schematics.

Layout and dimensions can be found on:

200-1973-00	AIS installation
400-5377-00	NIS installation

For installation on machines with legacy blank panels see layouts on 603-2-00.

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, the position of the TCS and blankside panel is considered, indicated in the above installation drawing.

Features / Benefits

Features	Benefits
Automatic temperature measurement	Reduces work load to control the process
Multiple measurement points per section	Reduces downtime
Warnings and alarms for violation of set temperature range	Valuable Information to maintain constant mold equipment temperatures
Automatic re-measuring when measurement is out of range	Device for the FlexIS close loop temperature control
Save reference temperatures as comparison	
Real-time point measurement	
Individual temperature limits	