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SOLUTIONS FOR THE GLASS INDUSTRY

FURNACE CONTROL BOARD





GENERAL DESCRIPTION

The new generation of control boards manufactured by **Glass Service** can solve all of the problems of furnace parameter management.

The control boards are divided in 4 basic model with different electronic architecture but all based on the best modern control technology.

The reliability of the control boards is assured, based upon many years of experience, using only first class materials.

The versions are described below using only Honeywell, Allen Bradley/Siemens and other first class component suppliers.



LAN
ethernet

All the models of **Glass Service** control board use the "Open System Information" technology. (O.S.I.)

This technology allows, the use of the information not only in the furnace control room but also in the local LAN using a Ethernet link.

The information available on the LAN are reported in the single model description.

The control board CF2 are able to send the information stored in memory to a Ethernet link, the information can be send from recorder Sx series and also from the HC 900.

The main feature of this technology are:

- **Web Server** - With the recorder connected to a LAN, all process variables, alarm and message can be viewed from an internet browser with automatic refresh.
- **Remote Viewer** - Extends the user interface of the recorder onto the desktop PC. Providing full remote control of the unit launched from a web browser. Compatible with Microsoft™ Internet explorer 6 and higher.
- **TrendServer Pro** - TrendServer Pro is a fully network aware software package for real-time viewing and archiving of data with communications to the recorder. It supports all the capabilities of Trend Manager Pro plus real-time data acquisition and web browser access.

TrendServer Pro provides secure multi-level, multi-user access to the recorder data by various departments with security.

- **Standard features** of TrendServer Pro include data archive tools, graphing, print import and export data facilities.
- **TrendServer Pro with OPC Server** - Provides the same functions as the TrendServer Pro but includes the added function of an integrated OPC Server to allow easy interfacing to third party HMI software packages that support an OPC Client. This provides a real-time interface between servers and clients.
- **E-mail server** - Some events (alarms, totalizer, etc.) can be send by email to specific address from the recorder and also from the HC900.
- **HC900 remote control** - All the variable in the DCS HC900 memory can be send by LAN to 3rd party device (PC or other) using Ethernet MODBUS standard or OPC standard. Also by a specific program "Hybrid controller" all the system status (LOOPS, Variable, alarms, etc.) can be read and check by LAN.



THE GLASS SERVICE ADVANTAGE

REDUNDANCY

All Glass Service control boards are based on a redundant architecture where all or the most important control features are redounded. The redundancy are better reported in the single model description.

MODEL COMPARISON TABLE

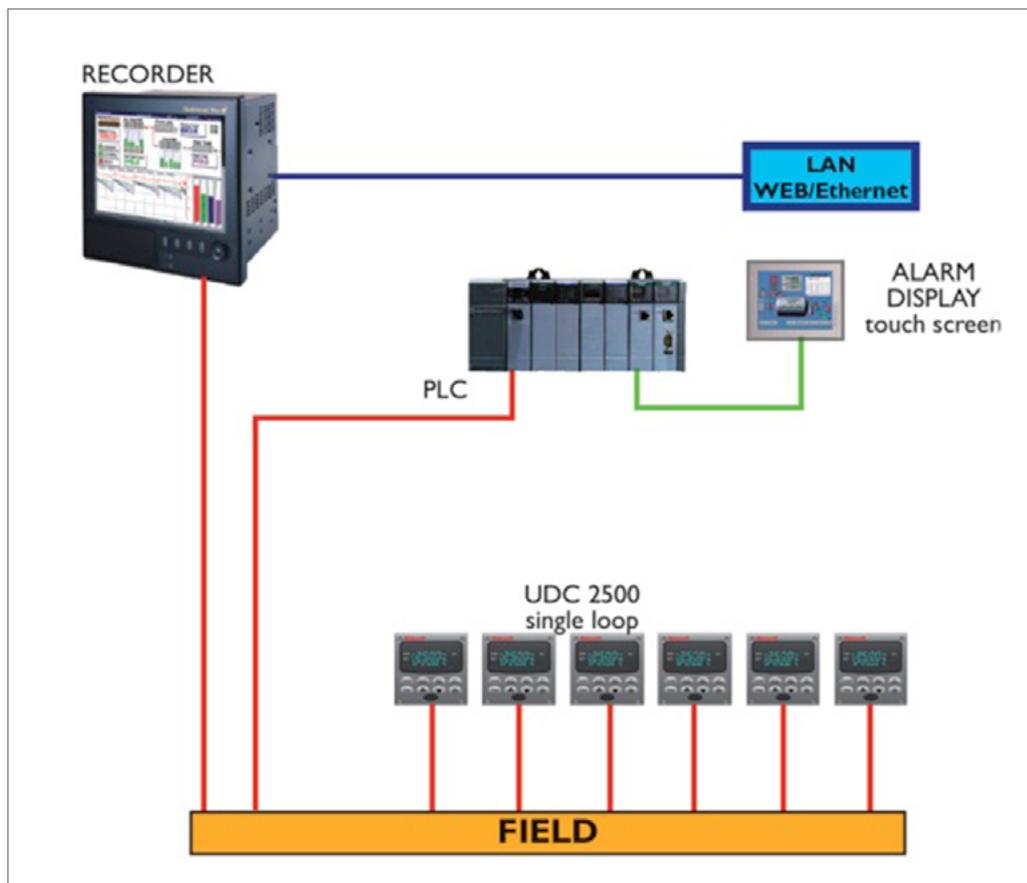
The table below gives a brief comparison of the models

Model	FC1	FC2	FC2 SCADA	FC2 - RD SCADA
Control loops management	Single loop UDC2500 Honeywell	DCS HC900 CPU50 Honeywell	HC900 CPU50 Honeywell	HC900 CPU70 redundancy CPU
Logic management	PLC Siemens	DCS HC900 CPU50 Honeywell	HC900 CPU50 Honeywell	HC900 CPU70 redundancy CPU
Loops redundancy	Not installed	DC1030 Honeywell		1- HC900 CPU70 redundancy CPU 2 - stations AUTO/MAN
Logic redundancy	electromechanically			1- HC900 CPU70 redundancy CPU 2 electromechanically
Trend management	Recorder multitrend SX series Honeywell	Recorder multitrend SX series Honeywell	1- Recorder multi- trend SX series Honeywell 2 - PC SCADA CITEC	1- Recorder multitrend SX series Honeywell 2 - redundancy PC SCADA CITEC
Alarm interface	Display touch screen Hitachi 10,5"	Honeywell touch screen operator interface	PC SCADA CITEC	1- Recorder multitrend SX series Honeywell
Plant scada supervisor	Not installed			



MODEL FC1

The model FC1 technology is reported in the following schematic diagram:



The technology is based on the Honeywell UDC 2500 single loop controller and the PLC model Siemens S7/300 the main features of the board are reported in the following table

MODEL	FC1
Control loop management	Single loop UDC2500 Honeywell
Logic management	PLC Siemens
Logic redundancy	Electromechanically
Trend management	On touch screen Recorder multitrend SX series Honeywell
Trend recording	On touch screen Recorder multitrend SX series Honeywell internal memory, exportable by flash card or USB memory key
Alarm interface	Display touch screen Hitachi 10,5"
WEB link	By Recorder multitrend SX series Honeywell
Email server	By Recorder multitrend SX series Honeywell
WEB server	By Recorder multitrend SX series Honeywell
Remote viewer	By Recorder multitrend SX series Honeywell
Thermocouple health monitor	By UDC 2500 Honeywell
Totalize	By Recorder multitrend SX series Honeywell
Alarm monitor	On touch screen Hitachi display
Alarm history	On touch screen Hitachi display

LOOPS

The loops controlled by the board are:

- Temperature (input from thermocouple or pyrometer)
- Gas/air ratio
- Oil/air ratio
- Furnace pressure
- Combustion air temperature
- The loop installed and the single loop UDC2500 instruments installed depends on the specific application

ALARMS

The alarms are displayed on the touch screen and recorded in the memory, the main allarm groups are:

- High/low temperature
- Device fault (fans - motor)
- Incorrect ratio Gas/air or oil/air
- Water cooling fault (es. For the batch charger)

TRENDS

The trends are reported on the Honeywell recorder SX series. Based on a 12.1" touch screen display. The trends are recorded in internal memory of 500 Mbyte and can be exported using a flash card or a USB memory key.



TECHNOLOGY AVAILABLE

The recorder SX series recorder is able open the information stored in memory to a Ethernet link. The main feature of this technology are:

- E-mail server - Some events (alarms, totalizer, etc.) can be send by email to specific address
- Web Server
- Remote Viewer
- TrendServer Pro
- TrendServer Pro (More detail on page 1)

LOGIC

The control board FC1 is able to manage the following in safety condition

- Start/stop of the combustion fans
- Start/stop of the furnace cooling fan
- Gas valve management
- In case of oil firing, manage the oil heating and pumping unit
- Glass level and batch charger

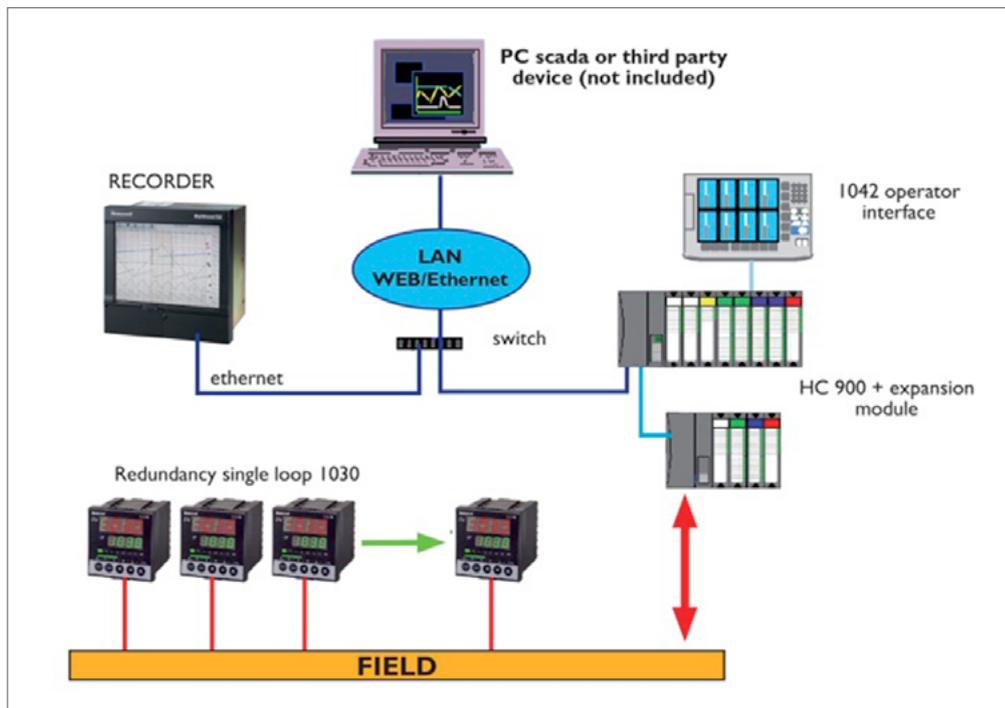
REDUNDANCY

In case of PLC fault the control board FC1 can be switched to emergency condition, all the main fe-
ature for the furnace heating are guarantee by an electromechanical emergency circuit.



MODEL FC2

The model FC2 technology is reported in the following schematic diagram:



The technology is based on the Honeywell DCS model HC900 controller single loop controller, the main features of the board are reported in the following table

MODEL	FC2
Control loops management	DCS HC 900 CPU50 Honeywell
Control loops redundancy	DC 1030 Honeywell single loop instruments
Control loops operator interface	Honeywell touch screen operator interface
Logic management	DCS HC 900 CPU50 Honeywell
Logic redundancy	Electromechanically
Trend management	On touch screen Recorder multitrend SX series Honeywell
Trend recording	On touch screen Recorder multitrend SX series Honeywell internal memory, exportable by flash card or USB memory key
Alarm interface	Honeywell touch screen operator interface
WEB link	1 - Recorder multitrend SX series Honeywell 2 - DCS HC 900 CPU50 Honeywell
Email server	1 - Recorder multitrend SX series Honeywell 2 - DCS HC 900 CPU50 Honeywell
WEB server	By Recorder multitrend SX series Honeywell
Remote viewer	1 - Recorder multitrend SX series Honeywell 2 - DCS HC 900 CPU50 Honeywell
Thermocouple health monitor	DCS HC 900 CPU50 Honeywell
Totalize	1 - Recorder multitrend SX series Honeywell 2 - DCS HC 900 CPU50 Honeywell
Alarm monitor	Honeywell touch screen operator interface
Alarm history	Honeywell touch screen operator interface

LOOPS

The loops controlled by the board are:

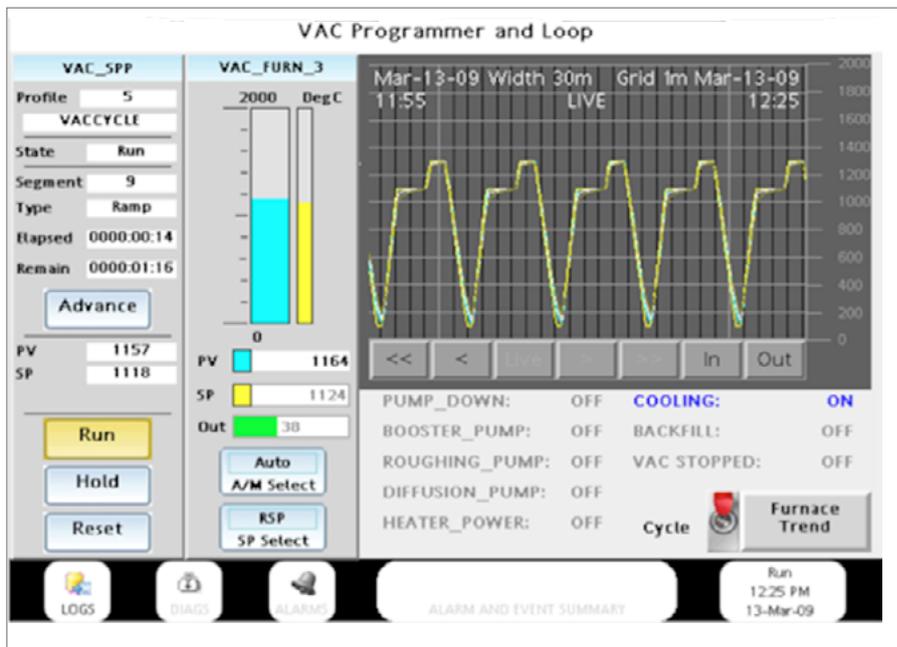
- Temperature (input from thermocouple or pyrometer)
- Gas/air ratio
- Oil/air ratio
- Furnace pressure
- Combustion air temperature

The loops installed and the redundancy single loops UD1030 instruments installed depends on the specific application.



Touch screen control station

OPERATOR INTERFACE SERIES CONTROL STATION LOOP SAMPLE



LOGIC

The control board by the DCS Honeywell HC900 is able to manage the furnace in safety condition as required by European standards

- Start/stop of the combustion air fans
- Start/stop of the furnace cooling air fans
- Gas valve management according to the safety specification
- In case of oil firing, manage the oil heating and pumping unit
- Glass level and batch charger
- Energy consumption logging / totalising

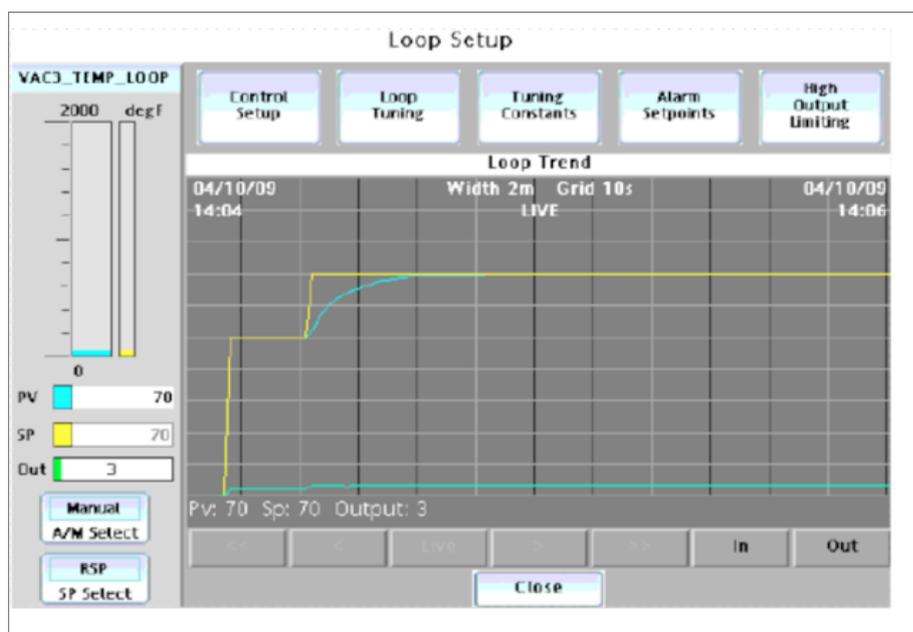
All the logic parameter and variable are available on the LAN in several format (Ethernet modbus, OPC, etc) and can be send to several device (PC scada or 3rd party device).

ALARMS

The alarms reported are displayed on the series control station and recorded in HC 900 memory for history, the mainly alarm groups are:

- High/low temperature
- Device fault (fans - motors)
- Incorrect ratio Gas/air or oil/air
- Communication LAN fault
- Thermocouple critical status (thermocouple health function)
- Furnace logic fault
- Glass level fault
- Water cooling fault (es. For the batch charger)

OPERATOR INTERFACE CONTROL STATION ALARM PAGE SAMPLE



REDUNDANCY

In case of HC900 fault the control board FC2 can be shift in emergency condition, all the main feature for the furnace heating are guarantee by:

- Electromechanically emergency circuit for the furnace logic
- By the DC1030 single loop instruments for the loops.

TRENDS

The trends reported on the Honeywell recorder SX series. Based on a 12.1" touch screen display. The trend are recorded in internal memory of 500 Mbyte and can be exported using a flash card or a USB memory key.



TECHNOLOGY AVAILABLE

The control board CF2 are able to send the information stored in memory to a Ethernet link, the information can be send from the SX series recorder and also from the HC900. The main feature of this technology are:

- Web Server
- Remote Viewer
- TrendServer Pro
- E-mail server

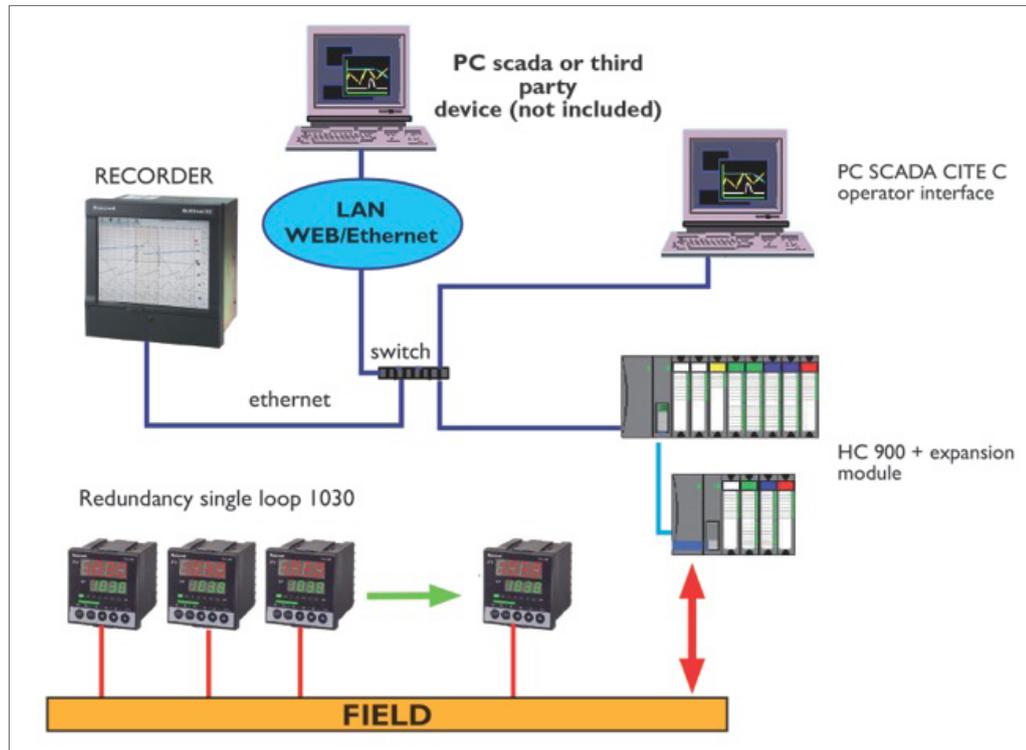
A NEW FEATURES

- HC900 remote control - All the variable in the DCS HC900 memory can be send by LAN to 3rd party device (PC or other) using Ethernet.
MODBUS stand ard or OPC standard. Also by a specific program "Hybrid controller" all the system status (LOOPS, Variable, alarms, etc.) can be read and check by LAN.
More detail on page 1.



Model FC2 SCADA

A typical schematic of the FC2 technology is shown below:

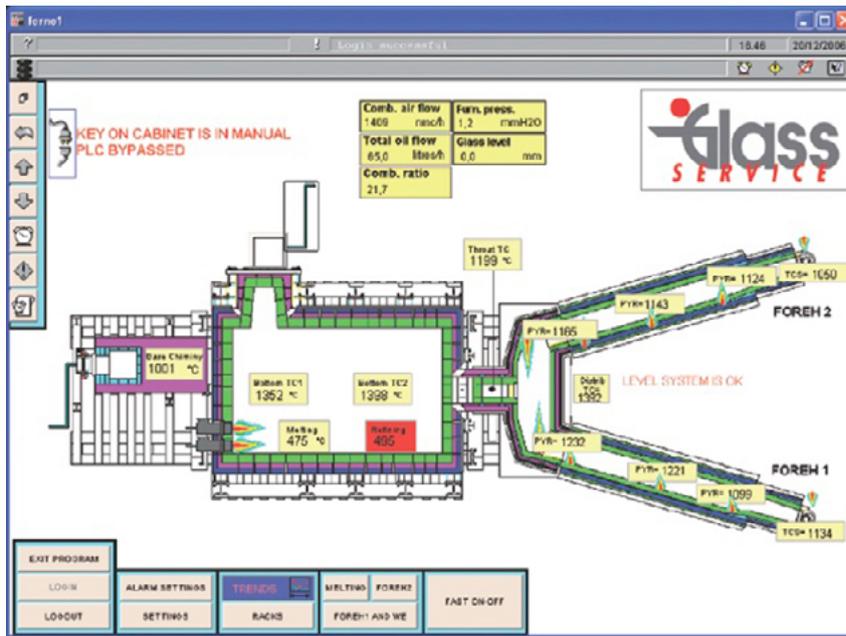


The technology is based on the Honeywell DCS model HC900 controller single loop controller, the main features of the board are reported in the following table

MODEL	FC2 – SCADA
Control loops management	DCS HC 900 CPU50 Honeywell
Control loops redundancy	DC 1030 Honeywell single loop instruments
Control loops operator interface	PC + SCADA CITEC software
Logic management	DCS HC 900 CPU50 Honeywell
Logic redundancy	Electromechanically
Trend management	1 - On touch screen Recorder multitrend SX series Honeywell 2 - PC + SCADA CITEC software
Trend recording	1 - On touch screen Recorder multitrend SX series Honeywell internal memory, exportable by flash card or USB memory key 2 - PC + SCADA CITEC software
Alarm interface	PC + SCADA CITEC software
WEB link	1 - Recorder multitrend SX series Honeywell 2 - DCS HC 900 CPU50 Honeywell
Email server	1 - Recorder multitrend SX series Honeywell 2 - DCS HC 900 CPU50 Honeywell
WEB server	By Recorder multitrend SX series Honeywell
Remote viewer	1 - Recorder multitrend SX series Honeywell 2 - DCS HC 900 CPU50 Honeywell
Thermocouple health monitor	DCS HC 900 CPU50 Honeywell
Totalize	1 - Recorder multitrend SX series Honeywell 2 - DCS HC 900 CPU50 Honeywell
Alarm monitor	PC + SCADA CITEC software
Alarm history	PC + SCADA CITEC software

The operator interface based on SCADA CITEC program is very user friendly. Based on active object software all the furnace functions are displayed as icons on push buttons on the screen. The furnace, distributor and forehearth zones are displayed in graphic display. Some examples of the screen as reported in the following description.

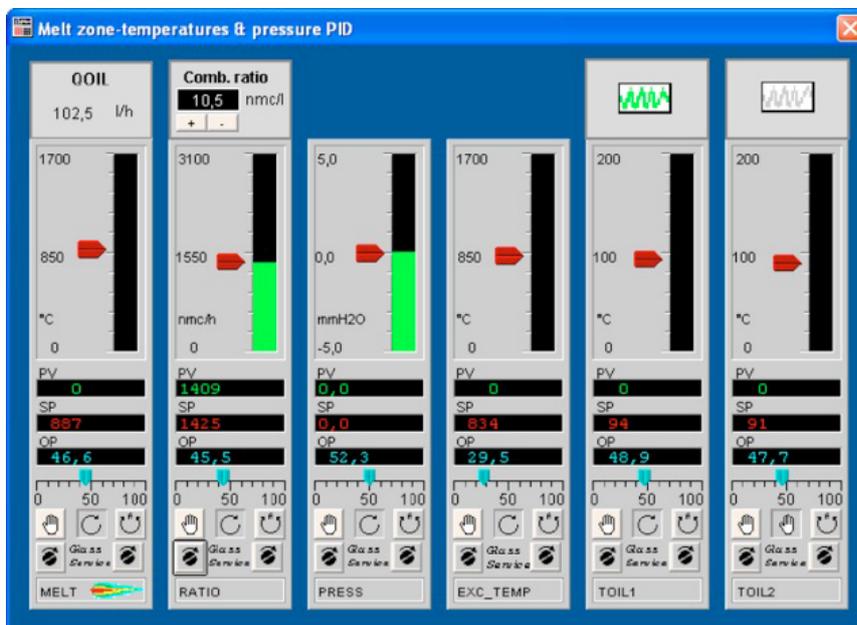
MAIN SCREEN SAMPLE



LOOPS

The same features as the model FC2, but the operator interface used is PC + SCADA CITEC technology.

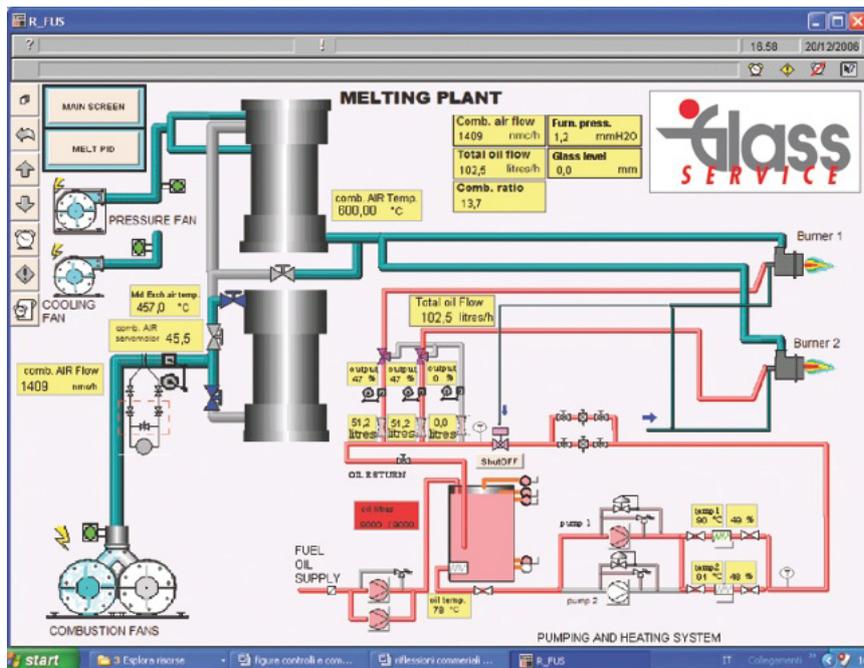
OIL MELTING AREA LOOP PAGE SAMPLE



LOGIC

The same features the model FC2, but the operator interface are used is PC + SCADA CITEC technology.

OIL PLANT LOGIC DISPLAY SAMPLE



ALARMS

The alarms reported are displayed on PC-SCADA CITEC operator interface and recorded in HC 900 memory for history, the main alarm groups are the same than model FC2.

ALARM PAGE HISTORY SAMPLE

Alarm ID	Description	Timestamp	Status
2	No compress air for oil	0	OFF
2	FLC BYPASS	20/12/2006	19:40:37 OFF
2	Oil tank level is too high	10/10/2006	10:50:13 ON
2	FLC BYPASS	20/12/2006	19:40:37 OFF
2	FLC BYPASS	20/12/2006	19:40:37 OFF
2	FLC BYPASS	20/12/2006	19:40:37 OFF
2	FLC BYPASS	20/12/2006	19:40:37 OFF
1	Refining temperature	10/10/2006	10:50:13 LOW LOW
2	No cooling H2O for batch charger	0	OFF
1	Melting temperature	0	OFF
2	No compress air for oil	0	OFF
2	No cooling H2O for batch charger	0	OFF
2	FLC BYPASS	20/12/2006	19:40:37 OFF
2	Composition level is low	0	OFF
2	FLC BYPASS	20/12/2006	19:40:37 OFF
2	Composition level is high	0	OFF
2	Composition level is low	0	OFF
3	H2000 combustion ratio high	0	OFF
3	H2000 combustion ratio high	0	OFF
3	H2000 combustion ratio high	0	OFF
3	H2000 combustion ratio high	0	OFF
3	H2000 combustion ratio high	0	OFF
2	Cooling Fan thermal switch	0	OFF
2	Cooling Fan thermal switch	0	OFF

REDUNDANCY

In case of a fault with the HC900, the control board FC2 can switch to emergency mode which allows manual control of all of the main features for the furnace operation by:

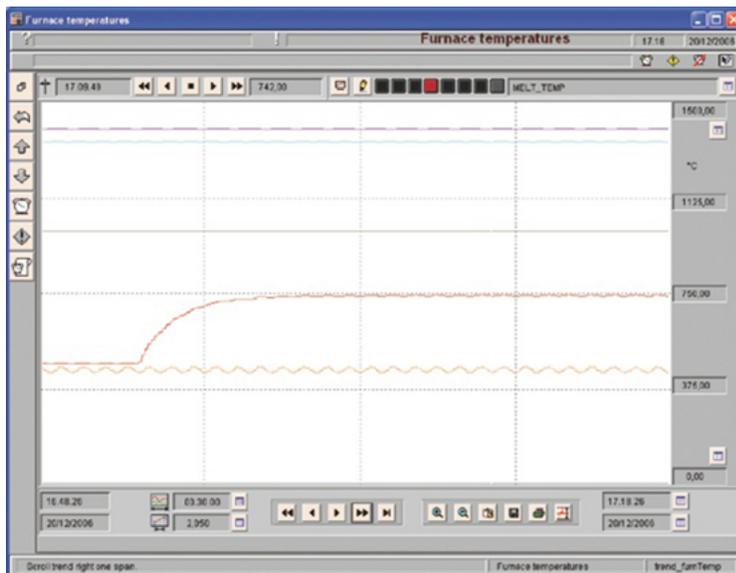
- Electromechanical emergency circuit for the furnace logic
- By the DC1030 single loop instrument for the loops

TRENDS

The trends reported on the Honeywell SX series recorder are shown on a 12.1" touch screen display. The trends are recorded in the internal memory of 500 Mbyte and can be exported using a flash card or a USB memory key.

The trends are also reported in the SCADA software, a sample is shown below.

TRENDS SAMPLE



The control board FC2 Scada are able to send the information stored in memory to a Ethernet link, the information can be send from recorder SX series and also from the HC900. The main feature of this technology are:

- Web Server
- Remote Viewer
- TrendServer Pro
- E-mail server
- HC900 remote control - all the variables in the DCS HC900 memory can be send by LAN to 3rd party device (PC or other) using Ethernet MODBUS standard or OPC standard.

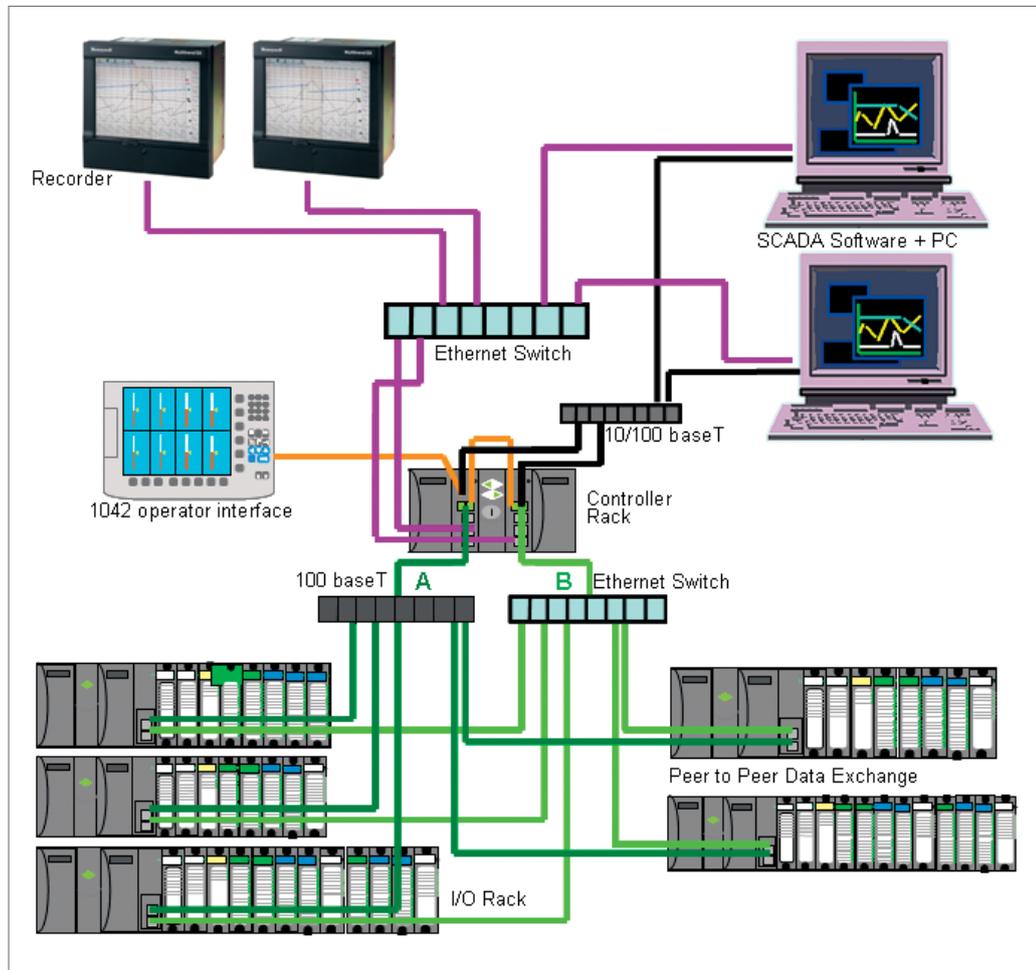
Also by a specific program "Hybrid controller" all of the system status (LOOPS, Variable, alarms, etc.) can be read and checked by LAN. (More detail on page 1).



Model FC2-RD-SCADA

The model FC2 - RD - SCADA technology is similar to the model FC2 - SCADA, but in this solution a very important difference is in the system redundancy. This model is suitable for continuous processes that cannot accept any production stoppages, such as the glass industry.

A typical schematic of the FC2 - SCADA technology is shown below:

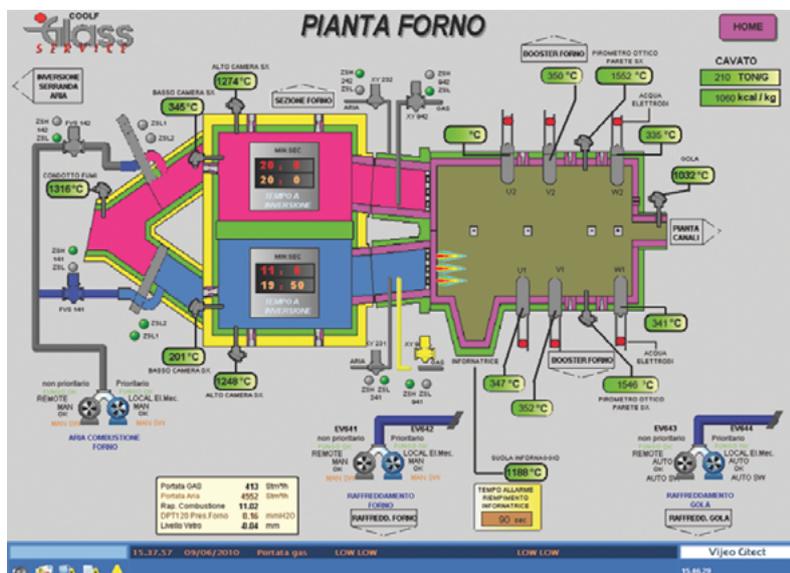


The technology is based on the redundancy Honeywell DCS model HC900 CPU70 controller the main features of the board are reported in the following table

MODEL	FC2 - RD SCADA
Control loops management	Redundancy DCS HC 900 CPU70 Honeywell
Control loops redundancy	Redundancy DCS HC 900 CPU70 Honeywell
Control loops operator interface	Redundancy PC + SCADA CITEC software
Logic management	Redundancy DCS HC 900 CPU70 Honeywell
Logic redundancy	1 - Redundancy DCS HC 900 CPU70 Honeywell 2 - Electromechanically
Trend management	1 - On touch screen Recorder multitrend SX series Honeywell 2 - redundancy PC + SCADA CITEC software
Trend recording	1 - On touch screen Recorder multitrend SX series Honeywell internal memory, exportable by flash card or USB memory key 2 - redundancy PC + SCADA CITEC software
Alarm interface	Redundancy PC + SCADA CITEC software
WEB link	1 - Recorder multitrend SX series Honeywell 2 - redundancy DCS HC 900 CPU70 Honeywell
Email server	1 - Recorder multitrend SX series Honeywell 2 - redundancy DCS HC 900 CPU70 Honeywell
WEB server	By Recorder multitrend SX series Honeywell
Remote viewer	1 - Recorder multitrend SX series Honeywell 2 - redundancy DCS HC 900 CPU70 Honeywell
Thermocouple health monitor	Redundancy DCS HC 900 CPU70 Honeywell
Totalize	1 - Recorder multitrend SX series Honeywell 2 - redundancy DCS HC 900 CPU70 Honeywell
Alarm monitor	Redundancy PC + SCADA CITEC software
Alarm history	Redundancy PC + SCADA CITEC software

The operator interface based on SCADA CITEC program is very user friendly, based on active object software with all of the furnace function displayed as icons on push button on the screen. The furnace ,distributor and foreheaths are displayed on a graphic display. Some typical samples of the screen are shown in the following description. The PC SCADA CITEC in redundancy version is a full redundant program, all the information is mirrored on the N.2 PC server and can be switched automatically in the case of any failure of the other PC.

MAIN SCREEN SAMPLE



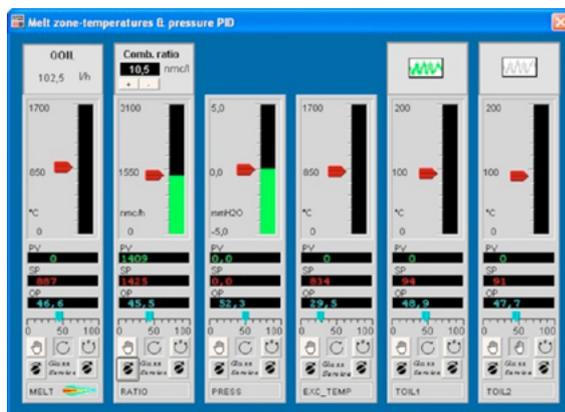
LOOPS

The loops controlled by the board are:

- Temperature (input from thermocouple or pyrometer)
- Gas/air ratio
- Oil/air ratio
- Furnace pressure
- Combustion air temperature.

The loops installed depends on the specific application. A typical graphic display is shown below.

OIL MELTING AREA LOOP PAGE SAMPLE



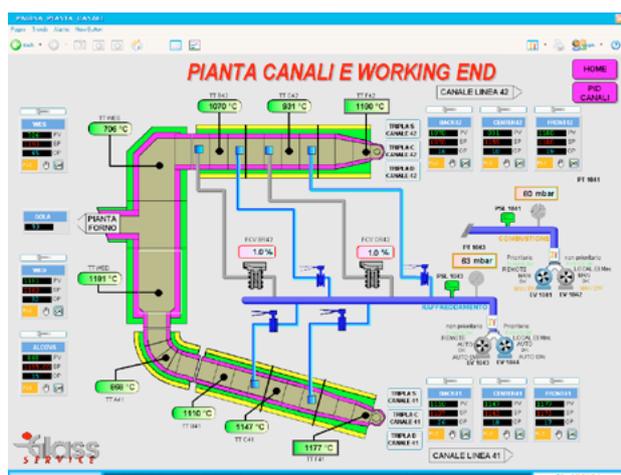
LOGIC

The control board by the DCS Honeywell HC900 is able to manage the furnace in safety condition as required from the European standards:

- Start/stop of the combustion fans
- Start/stop of the furnace cooling fan
- Gas valve management according to the safety specification
- In case of oil firing, manage the oil heating and pumping unit
- Glass level and batch charger
- Energy consumption logging / totalising

All the logic parameter and variable are available on the LAN in several format (Ethernet modbus, OPC, etc) and can be send to several device (PC scada or 3rd party device).

OIL PLANT LOGIC DISPLAY SAMPLE



ALARMS

The alarms reported are displayed on a double PC+SCADA CITEC operator interface and recorded in HC 900 memory, the mainl alarm groups are:

- High/low temperature
- Device fault (fans - motor)
- Incorrect ratio gas/air or oil/air
- Communication LAN fault
- Thermocouple critical status (thermocouple health function)
- Furnace logic fault
- Glass level fault
- Water cooling fault (es. for the Batch Charger)

ALARM PAGE HISTORY SAMPLE

Date	O/A	O/E	O/A	O/E	Name	Description	State
08/10/08	08/10/07	08/08/01			Atmosfera acqua calda		
08/10/08	08/10/07	08/08/01			Atmosfera acqua calda		
08/10/08	08/10/07	08/08/01			Atmosfera acqua calda		
08/10/08	08/10/07	08/08/01			Atmosfera acqua calda		
08/10/08	08/10/07	08/08/01			Atmosfera acqua calda		
08/10/08	08/10/07	08/08/01			Atmosfera acqua calda		
21/05/2010	09/16/08	09/16/07	ESL1841		Livello Bassotti, vasca elettrodi	ESL1841 Livello Bassotti, vasca elettrodi	CRS
21/05/2010	09/16/08	09/16/07	PCL1842		Pressostato H2O elettrodi	PCL1842 Pressostato H2O elettrodi	CRS
21/05/2010	09/16/08	09/16/07	PCL1841		Pressostato H2O elettrodi	PCL1841 Pressostato H2O elettrodi	CRS
21/05/2010	08/47/52	08/48/05			Pressione forno	Pressione forno	LOW LOW

REDUNDANCY

In case of N.1 CPU fault as N.1 power supply fault the CPU N.2 or power supply N.2 will take over the process control automatically without any change to the process conditions in the field.

The redundancy device of the CF2 - RD - SCADA are:

- HC900 CPU70
- HC900 CPU70 power supply
- HC900 I/O power supply
- Ethernet link to the operator interface PC SCADA
- Ethernet link to the remote I/O racks

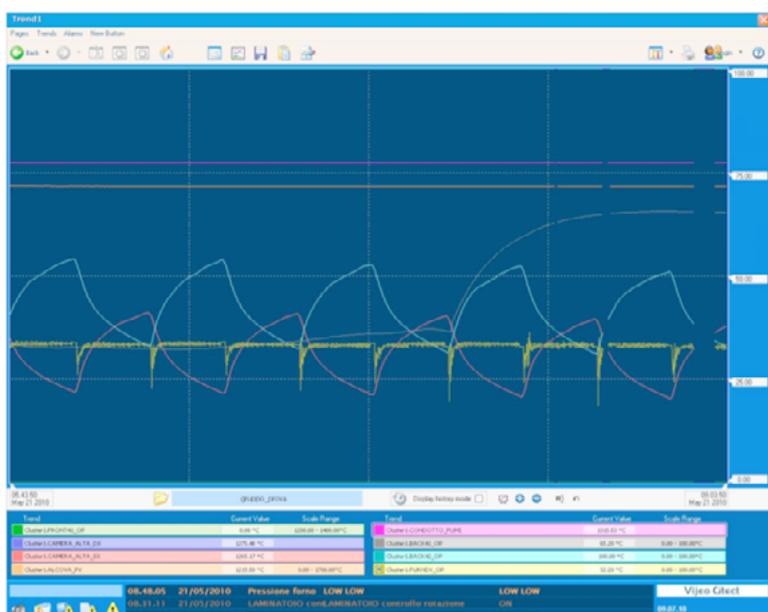
In case of a fault with the HC900, the control board FC2 - RD - SCADA can switch to emergency mode which allows manual control of all of the main features for the furnace operation by:

- Electromechanically emergency circuit for the furnace logic
- By the auto/man station for the actuator's loops

TRENDS

The trends reported on the Honeywell SX series recorder are shown on a 12.1" touch screen display. The trend are recorded in internal memory of 500 Mbyte and can be exported using a flash card or a USB memory key. The trends are also reported in the redundant SCADA software. The information is recorded and mirrored in both PCs and in case of a fault with one PC the second will continue recording. In the event that N.1 PC is off line intermittantly, at the first link access all of the logging information lost will be send from the active PC automatically. Using this technology both PCs are recording the logging data without any time hole. A display sample is shown below.

TRENDS SAMPLE



The control board FC2 Scada are able to send the information stored in memory to an Ethernet link, the information can be send from SX series recorder and also from the HC900. The main feature of this technology are the same the FC1 model:

- **Web Server**
- **Remote Viewer**
- **TrendServer Pro**
- **HC900 remote control** - All the variable in the DCS HC900 memory can be send by LAN to 3rd party device (PC or other) using Ethernet MODBUS standard or OPC standard. Also by a specific program "Hybrid controller" all the system status (LOOPS, Variable, alarms, etc.) can be read and check by LAN. More detail on page 1.



CUSTOMERS WORLD WIDE

FCB-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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