

## TECHNICAL SPECIFICATIONS

|                       |                                                                                                       |
|-----------------------|-------------------------------------------------------------------------------------------------------|
| Measured magnitudes:  | Carbon monoxide<br>Oxygen<br>Temperature.                                                             |
| Measuring range:      | CO: 0 - 1000 or other to define<br>O2: 0 - 25% or 0 -10%<br>Temperature 0 - 500 °C or other to define |
| Precision:            | for every magnitudes: within 1% of F.S.                                                               |
| Repeatability:        | within 1% del F.S.                                                                                    |
| Response time:        | within 30" al 90% for step variation<br>within 15" for in situ oxygen: al 90%                         |
| Length sampling probe | 500 mm                                                                                                |
| Connection to process | male thread 1" NPT                                                                                    |
| Housing               | Water-proof IP 54 enclosure<br>Dimensions 800 X 1000 depth 250 mm                                     |

FER STRUMENTI srl  
Italia - 20038 SEREGNO (MI) - Via Ripamonti, 58  
tel. +39 0362 231203 - Fax +39 0362 330349  
e-mail:ferstrumenti@fer-strumenti.com

# FER

strumenti

**Modular analysis system of combustion emissions**  
**According to Italian law normative D.M. 05.02.98**



- oxygen measure directly in the emissions (extractive measure optional),
- extractive carbon monoxide measure
- temperature measure
- high-speed response of the system
- easy installation
- easy use
- maintenance and management low costs
- panel printer integrated in the system

The ministerial decree 05.02.1998 provides, in the plants with efficiency between 1 ... 3 MW that use virgin and treated wood as combustible, the emissions control (O<sub>2</sub>-CO-T°), the auto regulation of carburant air and that the measured values of the emissions respect the prescribed limits, as average of 30 minutes and as daily average.

For this purpose FER Strumenti Company has projected a modulated analysis system, which executes provided measures and uses the following modules:

- oxygen measure with zirconium oxide in situ analyser
- carbon monoxide extractive measure with double electrochemical cell analyser
- measure of emissions temperature
- acquisition system, elaboration and printing of measured values.

**About oxygen measure** it is provided a zirconium oxide analyser, directly installed in the smoke flow, assuring a fast response time necessary for the prescribed carburant air auto regulation. An optional regulator, with set point settable on the whole measuring range 0-25% oxygen in volume and relay output for the piloting of the modulator valve, manages the carburant air auto regulation. The oxygen can be measured in extractive way by one electrochemical cell placed in the enclosure, if carburant air auto regulation would not be necessary or if the process would not require a fast response time. This solution reduces instrumentation and installation costs more than in situ measure.

**About carbon monoxide measure**, CO, it is used a sample gas probe, placed in the smoke flow, with a head filter for particulate retention. Inside there is a thermocouple detecting the emissions temperature. The sample is transported to cooler for the condense drainage, to the filter, to the pump and to CO analyser. A peristaltic pump ejects the condense. For the measure it is used a double electrochemical cell analyser with alternated working, that assures a long life-time and high efficiency. Alternating the use of the cells, (one in measure and the second one in air for about 20 minutes and vice versa) the cell in air regenerates itself without the risk to be saturated; this could happen using continuously only one cell. The life-time of the cells is normally more than a year.

In alternative carbon monoxide measure can be effected using a NDIR analyser.

**About temperature measure** it is used the thermocouple type K placed inside the sample probe. This solution does not require a second hole and the relative stack connection. A converter with a settable measure range generates the analogical signal, that is visualized to panel by a display with alarms.

**Acquisition and processing data** is according to regulations: D.M. 05.02.1998

#### Hardware

Data acquisition PLC of analogical signals (4-20 mA) regarding oxygen, carbon monoxide, temperature and digitals concerning the working condition of the instrumentation. Inside the PLC there is the calendar clock with buffer battery and life-time of more than ten years.

24 columns panel alphanumeric printer on normal paper and paper collector..

#### Software

The acquisition happens by a Fer Strumenti register resident on PLC programmed at works. It contains CO emission limit to respect and oxygen value of reference. The communication between PLC and printer is in RS232.

#### Functionality

Average of 30 minutes: the program, that uses the PLC calendar clock, considers primary CO, oxygen and temperature values received during 30 minutes. It calculates the arithmetical average and at the end of 30 minutes it prints it with hour and date underlining if CO value is higher than one fixed by law or another one that the customer would include. At every switching on the system, it is printed a title indicating the plant where the emissions analysis system is placed. The values are valid, as laid down by law, if the PLC receives at least 70% of valid measures as to possible measures. If valid measures are less than 70% of the possible ones, it is printed the mean value of half an hour indicating that the measures are less than 70% of the possible ones, therefore these are no valid.

Daily average: everyday at midnight the program executes the arithmetical average of the averages of available semi-hours. It prints the value indicating the validity (>70% of possible measures).

#### **The analysis system is provided with**

- Flowmeters with niddle valve for the mixing of the sample gas to the cells about CO measure and if necessary extractive oxygen.
- Hard-lift suction pump with membrane and valves resistant to corrosive gas.
- Panel fine filter and presence of condense control, that in case of alarm stops the suction pump automatically, so in case of anomaly of the cooler, the system will not damage. Alarm warning light. Manual start.
- High temperature cooler or in situ oxygen analyser anomaly alarm warning light.
- Double electrochemical cell for CO measure, changing inox electrovalve, timer and pump to furnish ambient air to the no measure cell.
- In option, stopping system of the working of the pump, if the temperature at the probe is lower than dew point. During the starting of the plant the suction of the gas in presence of condense could cause a quick obstruction of the filter.
- Separated switch for every user.
- Accurate electrical and pneumatic wiring.
- Metallic enclosure with transparent door and inside revolving panel, cable entries and compression connections for pneumatic part.

