



OXY COMP-D[®]

The Superfast Oxygen Computer



- ◆ **Microprocessor Based**
- ◆ **Highly Versatile**
- ◆ **Instant Computation**
- ◆ **User Friendly**
- ◆ **Multiple Output**
- ◆ **Built-in Alloying Elements Correction**

DESCRIPTION :

FYKAYS' OXYCOMP - D[®] is a versatile microprocessor based, extremely fast instrument for rapid determination of active oxygen in molten steels and alloy steels as well as copper alloys.

The instrument derives its twin signals of oxygen cell voltage and bath temperature from two-in-one probe - THERMOXYTIP[®], INSTANTLY calculates and presents a DIRECT Digital display. By virtue of fast sampling techniques (less than 200 mS), unique Plateau detection method, latching and storing of data, the OXYCOMP - D[®] retains the transient output signals from the expendable probe (Max 10-15 secs) and calculates the oxygen content in the molten metal.

PRINCIPLE :

The OXYCOMP - D[®] uses the well known and established NERNST - EINSTEIN equation:

$$E = - \frac{\Delta G}{nF} - \frac{9.15 T}{nF} \log \% O$$

Where E = the probe voltage in volts

ΔG = Reaction free energy

n = Ionic Transference number for $2 O =$

F = Faraday equivalent

T = Temperature in degrees Kelvin
(degrees C + 273)

This equation is applicable for the reference mixture of Mo/MoO₂. Other mixtures (reference oxides) like Cr/Cr₂O₃, Fe/FeO, Ni/NiO, Co/CoO or even air (20.9%O₂) are used. The most common are Mo/MoO₂ and Cr/Cr₂O₃. Due to the phenomenon of polarisation, Mo/MoO₂ is generally used for low medium O₂PPM levels and Cr/Cr₂O₃ for medium-high O₂PPM levels.

The above expression is normally applicable to plain carbon steels. Presence of certain elements like Cb, Co, Cr, Cu, Mn, Ni and W increase or decrease the probe voltage depending upon the element concentration and the bath temperature. Suitable corrections have to be applied.

This is due to the fact that each of the above referred alloying elements has different effects on the solubility of oxygen in iron as well as upon the partial pressure of oxygen dissolved in the iron. The effect of alloying

elements is best represented by the equation:

$$E - E^{\circ} = - \frac{4.575 T}{nF} e_O^x (\%x), \text{ where}$$

E[°] = the probe voltage in the presence of the alloying element x

T = Temperature in Degrees Kelvin (°C + 273)

n = The ionic transference number for the alloy

F = Faraday Constant = 23066 calories per degree, volt.

e_O^x = Inter-action coefficient of element x with oxygen

These constants are given in the table below:

Elements	e _O ^x	n
Chromium	- 0.041	6
Cobalt	0.007	2
Columbium	- 0.066	4
Copper	- 0.013	2
Manganese	0	2
Molybdenum	0.007	4
Nickel	0.006	2
Tungsten	0.011	4

In alloy steels the cumulative effect of various alloying elements present is to be considered. The user has only to key in the percentages of alloying elements. The OXYCOMP - D[®] calculates the cumulative shift, applies correction to the measured voltage, calculates the O PPM and displays the value - all in seconds.

In addition to this EXTREMELY RAPID method of oxygen measurement, the OXYCOMP - D[®] along with THERMOXYTIP[®] has multipurpose applications such as:

(a) **Rapid Carbon determination** by use of carbon and oxygen equilibrium equation:

$$m = (\%C) (\%O) = 0.0022$$

(b) **Rapid Silicon determination** by use of Silicon equilibrium equation:

$$\log \% Si = \frac{20166 E}{T} - \frac{12530}{T} + 2.78$$

where E = Probe voltage in volts

T = Temperature in degrees Kelvin

(c) **Rapid determination of residual Aluminium in LCAK steels** by use of Aluminium equilibrium equation:

$$\log \% Al = \frac{15117E}{T} - \frac{11427}{T} + 2.09$$

DESIGN ARCHITECTURE :

The OXYCOMP – D® performing based on state-of-the-art software and retaining all equations and commands in ROM's and keyed-in and measured values in RAM's, enables the user to obtain all the above mentioned results in a maximum of 10-15 secs.

The instrument is totally operator independent and instantly calculates and displays the bath temperature and Oxygen values and optionally the % Carbon, % Silicon and % Aluminium too. All that the operator has to do is ensure that the THERMOXYTIP® is fitted properly on to the immersion lance, dip the probe into the melt and hold it steady well below the slag line for the duration of immersion.

OPERATION :

EXTREMELY EASY WAY TO your operational success:

PLUG



IMMERSE



READ



TECHNICAL FEATURES :

The instrument architecture is built around the versatile 8085 A microprocessor. Dual 4^{1/2} digit A/D converters convert the thermocouple and oxy cell mV signals in less than 200 mS. The detection of the steady values is achieved by unique "plateau detection" method. The RAM stored values are fed on to the CPU which calculates and displays the results on bright, 25mm, seven segment LED's. The various equations are stored in battery backed ROM's. In order to facilitate proper operation, the system has built-in audio visual signalling system which generates functional signals such as

READY
MEASUREMENT IN PROGRESS
OVER
ERROR

The signalling system consists of signal lamps and piezo electric hooter on the instrument panel with auxiliary relays to trigger field mounted lamps and hooter.

SPECIFICATIONS :

- (a) 8 bit microcomputer
- (b) 8 digit floating point computation
- (c) Triple display – 25mm high, 7 segment for Real Time – Hrs, Mins, Secs
Temperature – 3^{1/2} digits
Oxygen – 4 digits with floating decimal

The Temperature and Oxygen displays sequentially flash the values of Oxy mV, Carbon, Silicon and Aluminium.

- (d) Cold junction compensation is provided for type R, S or B type thermocouples with better than 0.1°C/ 1°C accuracy.
- (e) Least count 1°C, 1 PPM, 0.1 mV; 0.01% for Carbon, Silicon and Aluminium.
- (f) Input Impedance:-
10 K ohms for thermocouple
50 K ohms for Oxy cell
- (g) Data entry is easily achieved by a heavy duty user-friendly keypad.
- (h) Dynamic locking by means of electronic code is provided to prevent accidental erasure or tampering of stored values.

- (i) **Safety backup:** The duration of immersion can be varied by means of thumbwheel settings.
- (ii) Self diagnosis is built into the instrument by which the unit can be made to go through a total self test cycle, testing all boards, relays, signals, etc. Also built into the system are internal calibration points – 2 for each channel of temperature and cell mV.

PHYSICAL DATA :

L X W X H –Approx. 400 x 380 x 160mm. Weight less than 4.0 Kgs.

NOTE: The data given above is indicative and we reserve the right to alter the same without notice because of design improvements.

For further details contact our agent in your area:

STANDARD ACCESSORIES :

- Floor/Wall mounting cubicle of sturdy, vermin and dust-proof construction fully wired up.
- Field mounting signalling panel
- INSTAMETER – rapid calibrator
- Immersion lances
- Receptacles and Housings
- Special 4 core compensating cables
- Continuous supply of THERMOXYTIPS

OPTIONAL ACCESSORIES :

- Large Field Display of Values
- 4-20 mA output
- BCD/RS232C output
- Printer
- and many more

FYKAYS' PRODUCTS :

THERMOTIP ● MINITIP ● ANSPLATIP ● FONDITIP ● DIGITAL PYROMETERS ● CARBOTIP FOR STEELS AND IRONS ● THERMOXYTIP ● OXY-COMP G ● OXYCOMP AUTOMATIC O₂ ANALYSER IN STEELS ● IN-SITU OXY PROBES FOR COMBUSTION CONTROL AND HEAT TREATMENT FURNACES REGULATION ● OXYMONITORS FOR COMBUSTION & ATMOSPHERE CONTROL ● METALLIPOPS: SAMPLERS FOR METAL BATH, STREAMS, INGOTS, 2-IN-1, ETC ● VARIOUS TYPES OF THERMOCOUPLES ● VARIOUS TYPES OF PANEL INSTRUMENTS ● TEMPERATURE CONTROLLERS AND INDICATORS ● MICOUPLE AND MICAB ● INSTAMETER INSTANT CALIBRATOR ● AND MANY MORE



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