16 – CHANNEL SIGNAL MONITOR

MARK Monitor

USER'S MANUAL

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I. INTRODUCTION

The multichannel signal monitor **MARK Monitor** is a general purpose measuring device, suitable for use in industrial and laboratory conditions.

The signal monitor has 16 input channels, free programmable to perform the following measurements:

Thermocouples:

chrom-copel (temp. range -50 ÷ 800 °C) - grade XK,
chrom-alumel (temp. range -50 ÷ 1300 °C) - grade XA,
Pt10Rh-Pt (temp. range 0 ÷ 1600 °C) - grade PP1
copper-constantan (temp. range -270 ÷ 400 °C) - type T,
iron - constantan (temp. range -210 ÷ 1200 °C) - type J,
chrome - constantan (temp. range -270 ÷ 1000 °C) - type E,
Pt10Rh-Pt (temp. range -50 ÷ 1770 °C) - type S,
Pt13Rh-Pt (temp. range -50 ÷ 1770 °C) - type R,

RTD:

Pt 100 with coefficient 1.385 (temp. range -200 ÷ 850 °C) - IEC 751,
Pt 100 with coefficient 1.391 (temp. range -200 ÷ 650 °C) - grade 22,
Pt 46 (temp. range -200 ÷ 650 °C) - grade 21,
Cu 53 (temp. range -50 ÷ 180 °C) - grade 23,
Cu 100 (temp. range -50 ÷ 180 °C) - grade 24,
Ni 100 (temp. range -60 ÷ 250 °C) - DIN 43760,
Cu 50 (temp. range -50 ÷ 200 °C)
Pt 50 (temp. range -260 ÷ 750 °C)

Current measurement:

4÷20 mA, 0÷20mA or 0÷5mA.

- The maximum possible ranges for thermosensors are listed above. For each channel and sensor an input range can be selected (relatively arbitrary), within the specified limits - a measuring "**magnifier**" can be applied so to say, by setting a narrower input range and using the whole resolution of the device in this range.
- Temperature measurements are carried out by comparing measured voltages or resistances to standard graduation tables written in the ROM of the device. (see Appendix)*.
- Manual or automatic cold junction temperature compensation for thermocouple measurements.
- Manual line resistance trimming possibility (to an arbitrary value between 0Ω and 100Ω) for two wire RTD measurements. Extremely suitable for working with safety barriers.
- A three-wire circuit for RTD measurements with automatic transformation to two-wire measurement if the third wire brake down.
- Measured currents can be converted by use of different formulas and displayed in required units.
- Periodic and automatic device autocalibration.
- Accumulation is implemented over current measuring channels. Measured quantities like output, flow or similar can be integrated over time in order to register resultant consumption, drain etc.
- Real-time clock/calendar. [date.month]/[hour.minute].
- Technological violation alarm for every input channel with light and sound signalling. Optional modules are available with 16 relay outputs (one per channel) for every type of registered violation and a module with 7 relay outputs summing different type of violations over all 16 channels.
- Serial interface RS232 for connection to computer or network.
- Specialised serial printer interface for connection with printer ISOTTA SP80, with software control of printout speed and appearance.

II. TECHNICAL SPECIFICATIONS.

Number of analog inputs - 16 programmable setting.

Type of analog inputs - differential - relays.

Input channels (isolation) separation - by means of relays.

Inputs overload protection - 40 V.

Accuracy:

- current measurements: >0.5%
- measurements by use of thermosensors: >0.5% except for the cases of:*

Input scan time - 0.5 seconds per channel.

Optional relay outputs - 250V/1A

Power supply - 220V ±10% /50Hz /10VA.

Operating conditions:

- ambient temperature from 5 to 40єC;
- relative humidity up to 80 % at 30єC;
- atmospheric pressure from 61 to 107 kPa.

Dimensions [mm] - W 482.5, H 132.5, L 244 .

Opening required for mounting in a shield - 444/131 mm.

*measurements with RTD **Cu50, Cu53, Cu100;** measurements of temperatures below 200єC by means of thermocouples **PP1**, type **R** and type **S** when the accuracy is 1%.

III. DEVICE CONSTRUCTION

III.1 DEVICE APPEARANCE

The device is closed in a standard mounting box suitable for a command room panel. There is a display and a keyboard on the front panel of the device.

The display consists of:
- a row of 16 light emitting diodes (LED's), signalling different violations for each channel;
- CHANNEL field for the number of the channel;
- TIME/DATE field;
- MAIN DISPLAY field for the measured quantity and its dimension.

In set-up mode the display is used for communication with the operator.

The keyboard consists of 24 functional buttons, whose purpose will be described below. A buzzer for sound signalling is connected to the keyboard. It fixes the moments of separate key presses when they perform some action in the device and gives a sound signal at the occurrence of different type of violations;
- a power supply on/off switch.

On the rare panel of the device there is:
- a mains cable socket for 220V, 50Hz;
- power supply fuse holders,
- a lid with 16 pairs of terminals for 16 input channels connection and a pair of terminals for a Pt100 RTD connection (1.385) to be used for automatic cold end temperature compensation of thermocouples. There are also 16 single terminals for the RTD third end connection if a three wire circuit of measurement is used. There are two more optional rows of terminals for relay output signals,
- 9-pin serial printer connector,
- serial interface RS-232 9-pin connector.

III.2. HARDWARE AND SOFTWARE

The signal monitor is a two-processor microcomputer device with program controlled measuring and printing control part. It is a modular type device. A digital bus connects different modules. The measuring part control microcomputer has a built in double integration type analog to digital converter (ADC). Input signals are fed to a relay input analog multiplexer. It switches them one after the other to a measuring converter with programmable gain, programmable offset and switchable current source.

From this point the normalised signal goes to an analog to digital converter. The result thereafter is subjected to arithmetical processing, displayed and sent to the external printing device (if present) and serial interface RS-232.

Both the measuring and of the printing control part, operate under the control of a specialised firmware. The program operation is flexible and depends on some parameters - called device parameters. Changing values of these parameters a great number of different device configurations can be achieved, which makes the signal monitor a powerful measuring and signalling tool.

Connecting **Mark Monitor** to external printer converts it to convenient and flexible process recorder.

III.3. MEASURING PART PARAMETERS

All parameters are saved in battery back-up memory and retain their values in power supply drop out conditions.

III.4. PRINTING CONTROL PART PARAMETERS.

There are two types of printing control parameters. The first one is similar to the measuring part parameters and refers to each individual channel. The other type refers to the printing control part and these are device common rather than channel specific parameters. Parameter settings are saved in battery back up memory and do not lose their values in power supply drop out conditions.

IV. DEVICE SETUP

The device is mounted in a command room shield and fastened by screws. The input signals to be measured are connected to the device. The device is connected to the mains and earthen.

IV.1. SENSOR / SIGNAL CONNECTING

A sensor or a signal is connected to the device in order to be measured on given channel. The number of the terminal corresponds to the number of the channel. It is recommended that unused channels are deactivated, i.e. **SCAn = no** and **WrC = no** is set for each one of them.
Thermocouples are connected with the positive terminal to the “**+**” marked row of terminals and the negative to the “**-**” one.

Polarity is of no importance if thermistors measured in a two wire circuit are connected.

Thermistors measured in a three wire circuit are connected with one end to the "**+**" terminal and with common point ends to "**-**" and "**3 WIRE**" terminals.

Current signals are connected to given channel terminals by use of a external shunt resistor **100Ω 0.1%.** The "**+**" terminal is connected to the positive end and the "**-**" terminal to the negative end of the current signal. Pt100 RTD (1.385) used for thermocouple cold end temperature compensation is connected to terminals "**Temp. Comp**".

Connecting circuits for each type of input signals are shown on the rare panel of the device.

IV.2. CONNECTING TO THE MAINS

Turn off the power supply switch. Connect the device to **220V/50Hz** mains socket by use of a "shoko" type cable, that ships with the device. It is mandatory to earth the device either by means of the neutral wire of the cable or by the earthing screw, placed on the rare lid of the power supply module.

IV.3. PRINTER CONNECTING

Connect Mark monitor to 9-pin **PRN ISOTA** socket by use of interface cable that ships with the device. The second end plug in printer's interface socket.

V. DEVICE OPERATING.

VI. DEVICE SETUP

In set-up mode device continues to measure and to transmit data, but does not display. This mode is used by the operator to set device parameters, i.e. to specify the desired device configuration.

VI.3. TEMPERATURE COMPENSATION CHANNEL SETUP

VI.4. SETTING THE REAL-TIME CLOCK

VII. OPTIONAL DISCRETE OUTPUTS.

The device can be optionally equipped (on a special request) with up to two discrete output (relay) modules. There are five different types of discrete output modules:

- 16 outputs, activated on lower technological limit **LL1** violation;
- 16 outputs, activated on lower breakdown limit **LL2** violation;
- 16 outputs, activated on higher technological limit **HL1** violation;
- 16 outputs, activated on higher breakdown limit **HL2** violation;
- 7 outputs summing up different types of violations.

For 16 outputs modules, the activated output number corresponds to the number of the channel on which the respective violation is registered. For 7 outputs modules, the corresponding output is activated in the following conditions:

- output 1 - one or more violations of **LL1** are registered;
- output 2 - one or more violations of **HL1** are registered;
- output 3 - one or more violations of **LL2** are registered;
- output 4 - one or more violations of **HL2** are registered;
- output 5 - some type of violation is registered (no matter what);
- output 6 - one or more violations of **LFL** is registered;
- output 7 - one or more violations of **HFL** is registered;

All discrete outputs are of the “dry contact” type. They may switch alternating or direct voltages up to 250 Volts and currents up to 2 amperes. By use of jumpers (placed in the modules) each discrete output can be pre-set in “normal open” or “normal close” state.

There are free places for two discrete output modules in the device. An arbitrary modules combination can take these places or they can be left free.