TMP

TMP is a complete modern supervisory system for checking mechanical dimensions of machines such as turbines, motors, generators, couplings, fans, pumps, Thanks to this integrated system it is possible to keep all the main mechanical status of machinery under control through the monitoring of:

- relative vibrations
- absolute vibrations
- relative and absolute expansion
- eccentricity

- speed
- acceleration
- valve positions
- temperature

API-VDI and ISO STANDARDS

The **TMP** instrumentation has been designed and built in accordance with API 870 and VDI 2059 standards for measuring the vibrations as well as with VDI 2056 and ISO 2372 standards for measuring the absolute vibrations of bearings.

SAFE AND RELIABLE OF OPERATION

The **TMP** system incorporates the very latest microprocessor digital technologies. Many protective devices of Hardware and Software type have been implemented in order to avoid untimely tripping of the alarm relays. This enables the following features to be obtained:

- high reliability during system operation
- high rejection of electromagnetic interference
- digital readout of the controlled condition
- provision for connection to external computer through serial line
- storage of all alarms with relative date and time
- memorization of calibration and preset data on non-volatile memory
- self-calibration without use of potentiometers

FLEXIBLE AND SIMPLE SETTINGS

The front panel of each measuring module gives all indications regarding one or two measuring channels, namely:
- reading of the dimension
- display of alarm (LED)
- correct performance of the measuring chain (LED)
- indication of alarm exclusion (LED)
- threshold multiplier (LED).

Push buttons are also provided for presetting all the accessory functions implemented in the processor module. This solution allows maximum flexibility in enabling and modifying the setting of the various operative parameters.

The serial output socket RS 232 allows the presetting of all the functions for the module through an external PC with an adequate program.

PROGRAMMABLE FUNCTIONS

Alarm threshold
It is possible to read on the display the value of the preset threshold and modify its value. Two different thresholds for each measuring channel are available for each monitor.

Alarm display logic
The indications can be activated according to a special sequence (ISA, stable, etc.).

Delays in actuating the alarm
These delays are directly programmable from the front panel; the relay for each threshold can be actived with various delays.

OK functions
Each module supplies an indication (green LED) which confirms the correct operation of the measuring channel. When any abnormal condition is detected (transducer, wiring, power supply, etc.), a function can be activated for disabling the monitor. This function, which interacts with the logic driving the alarm relays, minimizes untimely actuations of the alarms.

Alarm logic
It is possible to configure the alarm logic at the output of each monitor by energizing the relay according to an OR or AND logic of the two measuring channels.

Relays normally energized or normally deenergized
The 4 output relays of each module can be energized or deenergized under normal operating conditions of the system. The operator can program the operation directly from the front panel. Some relays can be set for summarizing alarms, abnormal condition alarms, by-pass alarms, etc.

By-pass
The by-pass allows excluding a measuring channel when it is required to avoid signalling of untimely alarms (e.g. during a check on the sensor or on the measuring chain). When the function is enabled, an led indication will appear on the panel and an output relay can be activated.

Threshold multiplier
The threshold multiplier allows varying the level of the alarm threshold by a factor programmable from 1 to 5. This function is especially useful for the vibration measuring channels during start-up or shut-down.

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MONITORING OF LARGE TURBOMACHINERY
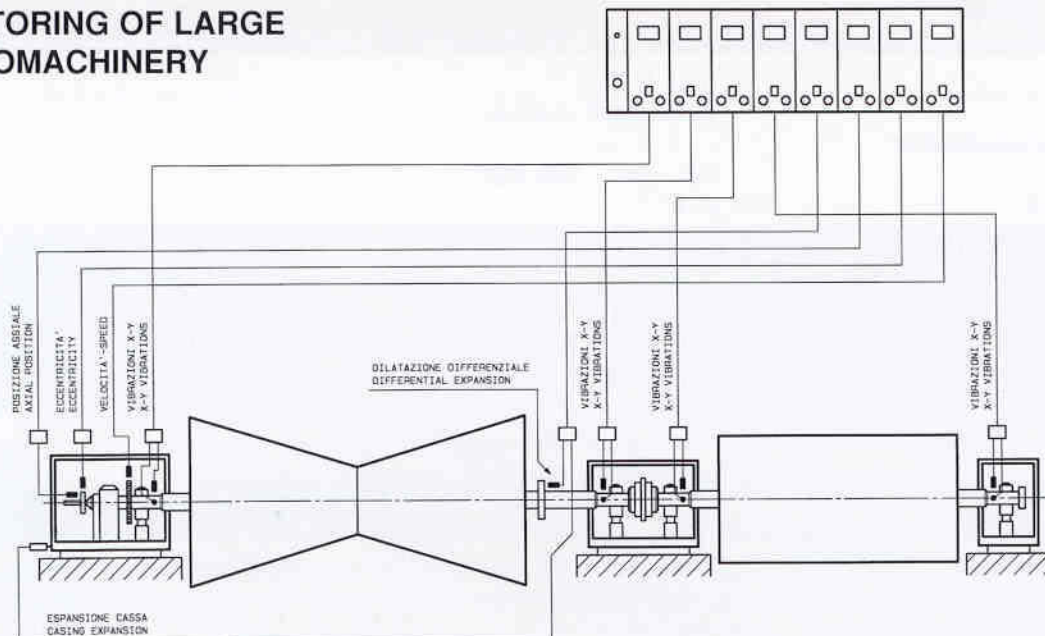
INTERNAL AND EXTERNAL CONNECTIONS TO THE SYSTEMS

The built-in microprocessor technology adopted allows the following connections through communication lines RS485 and RS232:

– Internal interconnection between the various modules making up the equipment (RS485). The first module is configured as "master" for display and indication of the various statuses regarding the entire system (first measurement in alarm, maximum level of the measured parameters, etc.). Each "master" module can be connected to 32 "slave" modules for a total of 64 measuring channels.

– Connection of Master module to an external computer (RS232) for memorizing trends, displaying the more significant data, exceeding of alarm and trip thresholds, etc.

– Connection of the "master" module with a 40-column printer (RS232) to obtain both the list of the presettings as well as date, time, level and identifier of the alarms occurring on all the channels connected to the "master".

– Connection via RS232 to each single module in order to make all the various presettings of the processor module through P.C.

MONITORING OF DIFFERENT MACHINES (PUMP, FANS, COMPRESSORS, etc.)
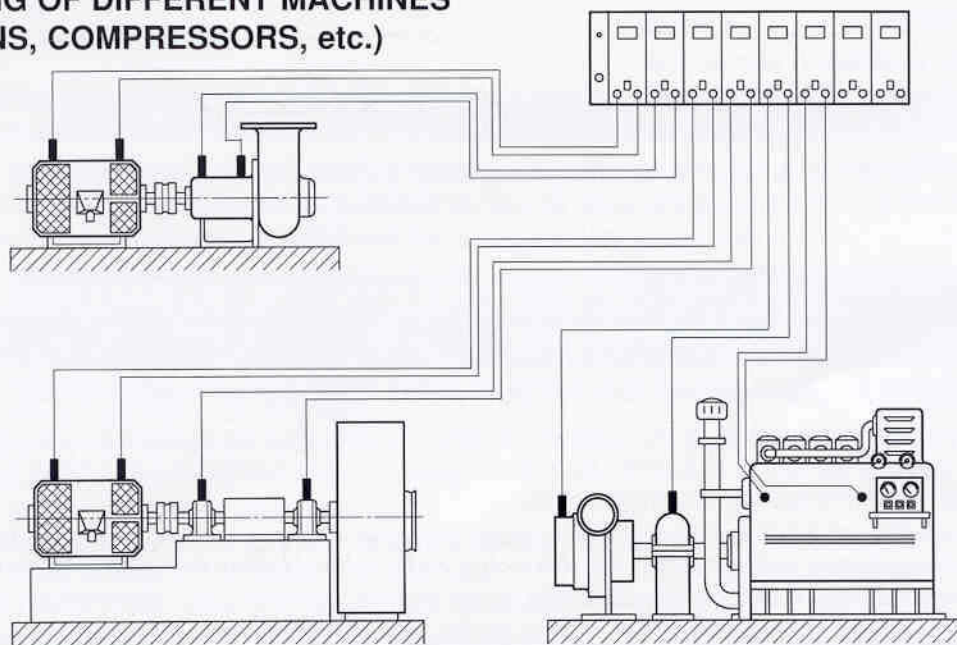
MAIN TECHNICAL SPECIFICATIONS

– Power supply	max 100 W
– Output relays	(4 for each module)
Relay characteristics:	
voltage	250 VAC - 220 VDC
max current	6 A
max load (resistive)	1500 VA
insulation between coil and contact	4 KV
insulation between contacts	1 KV
– Analog output (2 for each module)	4 - 20 mA, load 500 ohm
– Internal connection	RS485
– External connection	RS232
– A/D conversion	12 bit (resolution 1/4096)

FEATURES OF THE MEASURING MODULE

Each measuring module is dual-channel type and is able to process the signal generated by the transducers as well as to supply indication of the controlled parameter through the display on the frontal panel. The module consider of the following three complementary elements:

– **processing module** able to perform the general functions (control of relays, analog output signals, A/D conversion of the analog signals, etc.) for two measured channels.

– **analog module**, available in different versions depending on the measuring functions required:
  vibrations
  - according to API 670 - VDI 2059
  - RMS conversion - peak-to-peak - vectorial sum of the signals. Selection of the measurement can be programmed by the user by acting on the setting of the module
  - power supply of acceleration transducers ICP
  - high-pass and low-pass filters (optional)
  - possibility of integration of the signal

  static measurements suitable for measuring eccentricity, expansions, axial movements
  - able to process signals generated by proximity probes or LVDT transducers

  speed measurement
  - tachometer
  - zero speed
  - acceleration
  - reverse rotation

– **display module** available in two versions:
  numeric (TMP-N)   able to display the value of the controlled parameter in a definite measuring unit up to 3 digits (normally used for vibrations, differential expansions, axial positions, eccentricity)

  alphanumeric (TMP-AN) able to simultaneously on display graphic LCD the value of the parameter of the 2 measuring channels as well as showing the measuring unit selected (normally used for speed and acceleration or when two different magnitudes are detected in the same measuring module).

CONFIGURATION OF THE SYSTEM

The system consists of an equipment mounted in a standard 19" rack and normally comprises:

a) 1 power supply module able to supply the voltages required for operating the system, The power supply module is also able to process the signal of a probe for measuring an angular reference. One power supply is required for every 8 **TMP**'s (16 measuring channels).

b) up to 8 **TMP** measuring modules, each one able to process the signal of one or two measuring transducers. (Proximity probes, velocity transducers, acceleration transducers, etc.). Each module, configured as described above, detects and displays the 2 input signals; it also supplies 2 analog output signals (optional) plus 4 alarm relay contacts.

c) transducers installed on the machinery for measuring the various dimensions. The transducers are energized by the respective measuring modules when necessary.

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