TM Tecnomatic has been a Leading Manufacturer of flow and temperature measurement devices since 1962.

TM Tecnomatic - offices and factory - is located in Cremona, the Ancient Italian City that has been producing violins since 16th Century, which is near Milano.

TM Tecnomatic Quality Standards are in compliance with the latest ISO:9001. TM Tecnomatic is also PED and ATEX Certified.

Besides, TM Tecnomatic cooperates with Important University Research Centers to continuously improve its products and develop innovative solutions. In particular, the Certified Flow Rate Calculation for Multistage Restriction Orifice shall be highlighted.

TM Tecnomatic is the 1st European Company for Flow Measurement Devices
Contents

01 INTRODUCTION

02 CONTENTS

04 WORLD-WIDE PRESENCE

07 FLOW MEASUREMENT DEVICES

- Venturi Tubes
- Venturi Cone Meters
- Pressure Reduction
- Mapflow
- Wedge Meters
- Flow Nozzles
- Flow Conditioners
- Orifice Plate Assembly

17 TEMPERATURE MEASUREMENT DEVICES

- Thermocouples
- Resistance Temperature Detector
- Thermowells
- Skin Thermocouples
- Multipoint Thermocouples Assemblies

23 PROFESSIONAL SERVICES

24 EXTRA PRODUCTS
World-Wide Presence

TM Tecnomatic is a Multinational Company with its presence in more than 30 Countries Worldwide.

United Kingdom, Spain, Libya, Egypt, Turkey, Iran, Kuwait, Qatar, Oman, UAE, India, Pakistan, Indonesia, China, South Korea, Japan, Canada, Venezuela, Russia, Syria, Greece, Brasil, Portugal, Germany, Turkmenistan, Malaysia, Algeria, USA, Kazakhstan, Vietnam, Mexico

and many more...
WORLD WIDE END USER CLIENTS

ADCO, ADGAS, ADMA, ADWEA, ARAMCO, BHARAT, ENI, ENOC, EXXONMOBIL, GAZPROM, KNPC, KOC, MOTOR OIL, ONGC, PARS OIL, PDO, PDVSA, PETROBRAS, PIDEC, QATAR PETROLEUM, SABIC, TAKREER, TOTAL and many more.

WORLD WIDE EPC’S CLIENTS

AMEC FOSTER WHEELER, BECHTEL, BONATTI, DAEILM, ENPPI, FLUOR, GE OIL & GAS NUOVO PIGNONE, HYUNDAI ENGINEERING, HYUNDAI HEAVY INDUSTRIES, HYUNDAY E&C WILSON CONSORTIUM, KBR, KT, L&T, MAIRE TECNIMONT, PETROFAC, SAIPEN, SAMSUNG, TECHNIP FMC, TECNICAS REUNIDAS, WORLEY PARSONS and many more.
Descrizione Sezione
Venturi Tubes

**DESCRIPTION**

The Venturi Tube is a differential pressure device suitable to measure flow rate in a closed conduit with the minimum permanent pressure loss.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Applications</th>
<th>Oil &amp; Gas / Petrochemical Industries / Power Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type and Construction</strong></td>
<td>Manufactured by bar stock / Manufactured by welded plate / For big size and very high wall thickness Venturi Meter can also be manufactured by forging / Conical divergent angle of 7° for low loss venturi / Conical divergent angle of 15° for Classical Venturi / All types can be supplied Truncated or not Truncated / Process connections: all types / Instrument connections: all types / Venturi tube for rectangular duct</td>
</tr>
<tr>
<td><strong>Material</strong></td>
<td>All material requested by the customer / Material Specifications: all / Main material Reference: ASTM-ASME Code</td>
</tr>
</tbody>
</table>

**STANDARD LIMITS AND APPLICATION FIELDS**

| Dimensions: | Venturi by bar stock: 2"-10" / Venturi by welded plate: up to 48" (and above, where acceptable by the Customer) / Venturi by forging: all dimensions |
| Beta Ratio: | Venturi by bar stock: 0.4+0.75 / Venturi by welded plate: 0.4+0.7 / Venturi By Forging: 0.3+0.75 |
| Reynolds Number Range: | Venturi by bar stock: 200000+1000000 / Venturi by welded plate: 200000+2000000 / Venturi by forging: 200000+2000000 |

**PERFORMANCES**

- Accuracy (referred to flow coefficient): as per ISO Code
- Rangeability: 1 ÷ 4.5
- Ripetibility: (+/- 0.1%)
- Max PPL (5-15)% of full scale differential pressure
- Straight Lengths Requirements: as Specified in ISO 5167 International Code

**CALIBRATION**

- Accuracy (referred to flow coefficient) after calibration in accredited lab: (+/- 0.25%)

**NOTE**

- Flow Meters can be manufactured according to all Customer Specifications
- Flow Meter can be supplied with all suitable accessories (valves / manifold / condensing pot / transmitter / fitting / tubing)
Venturi Cone Meters

DESCRIPTION

The Venturi Cone Meter is a differential pressure device to measure flow rate in a closed conduit with the minimum pipe straight length and with high rangeability.

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Applications</th>
<th>Oil &amp; Gas / Petrochemical Industries / Power Stations / Off Shore Platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element Type and Construction</td>
<td>Manufactured by bar stock</td>
</tr>
<tr>
<td></td>
<td>Manufactured by welded Plate</td>
</tr>
<tr>
<td>Material</td>
<td>As per Customer’s requirements</td>
</tr>
<tr>
<td></td>
<td>Main material Reference: ASTM-ASME Code</td>
</tr>
<tr>
<td>Flow Calculation</td>
<td>Main Reference code: ISO 5167 -5</td>
</tr>
</tbody>
</table>

STANDARD LIMITS AND APPLICATION FIELDS

| Dimensions:                  | Nominal Diameter of Pipeline: over 2"                                   |
| Beta V-Cone Ratio:           | 0.45 ÷ 0.85                                                              |
| Diameter Ratio:              | 0.893 ÷ 0.526                                                            |
| Reynolds Number Range:       | Over 200000                                                              |

PERFORMANCES

- Accuracy (referred to flow coefficient): as per ISO Code
- Rangeability: 1÷10
- Ripetibility: (+/- 0.1%) 
- Max PPL 20÷40% of full scale differential pressure
- Required straight length: 3 I.D. (upstream) ; 2 I.D. (downstream) in the worst conditions

CALIBRATION

- Accuracy (referred to the discharge coefficient) after calibration in accredited laboratory: +/- 0.25%

NOTE

- Flow Meters can be manufactured according to Customer specifications
- Flow Meter can be supplied complete with all relevant accessories (valves / manifold / condensing pot / transmitter / fitting /tubing)
Pressure Reduction
(Single and Multistage Restriction Orifice)

These devices are designed to reduce the fluid pressure. The table here below summarizes typical applications and calculation criteria.

<table>
<thead>
<tr>
<th>FLUID</th>
<th>GAS</th>
<th>LIQUID</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DP &gt; DP critical</td>
<td>CAVITATION NUMBER &lt;=2.5 (SEE MILLER ENG HANDBOOK)</td>
</tr>
<tr>
<td>PROCESS</td>
<td>BLOW DOWN</td>
<td>FLARE</td>
</tr>
<tr>
<td>CONTINUOUS SERVICE</td>
<td>INTERMITTENT SERVICE</td>
<td>BOTH SERVICE</td>
</tr>
<tr>
<td>SINGLE RESTRICTION</td>
<td>MULTISTAGE</td>
<td>MULTISTAGE OR SINGLE RESTRICTION</td>
</tr>
<tr>
<td>SINGLE HOLE (NOISE LEVEL &lt;= 85 Dba)</td>
<td>SINGLE HOLE (NOISE LEVEL &lt;= 85 Dba)</td>
<td>SINGLE HOLE (NOISE LEVEL &lt;= 85 Dba AND LOW FLOW RATE)</td>
</tr>
<tr>
<td>MULTIHOLE (SEE NOTE1 AND NOTE2)</td>
<td>MULTIHOLE (SEE NOTE1)</td>
<td>MULTIHOLE (SEE NOTE1)</td>
</tr>
</tbody>
</table>

NOTE 1: CRITICAL DP APPROXIMATELY A HALF OF UPSTREAM PRESSURE
NOTE 2: MULTIHOLE APPLICABLE TO REDUCE NOISE WHEN NOISE LEVEL BY SINGLE PLATE > 85 Dba
NOTE 3: MULTIHOLE ALSO APPLICABLE IN CASE OF CRITICAL RESTRICTION TO REDUCE TO REDUCE PLATE

TECHNICAL SPECIFICATIONS

Applications
Oil & Gas / Petrochemical Industries / Power Stations

Type Of Elements
Single Stage Restriction (refer to pipe taps configuration in~ISO 5167 and in Miller Engineering Handbook) Critical Restriction (typically sized according to Miller Engineering Handbook) Multistage Restriction (sized according to TM Tecnomatic certified calculation)

Material
All material requested by the customer / Material Specifications : all
Main Material Reference : ASTM~ASME Code

Type Of Multistage Construction
With body by bar stock
With body from pipe

Calculation
Accuracy (referred to the pressure drop): +/- 2% up to 1 1/2” ; +/- 1% for 2” and above
Gas Service: multistage calculation is performed to avoid to have sound velocity in the vena contracta section of each stage
Liquid Service: multistage calculation shall be carried out to avoid cavitation
Multiport Averaging Pitot Tube
(Mapflow)

DESCRIPTION

The Multiport Averaging Pitot Tube (Mapflow) is a differential pressure device suitable to measure the flow rate in a closed conduit for general applications (it is a general purpose and affordable device). Normally used in big pipes with low flow velocity.

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Applications</th>
<th>Oil &amp; Gas / Petrochemical Industries / Power Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type Of Elements</td>
<td>Standard Model ED-20/21: Diamond Shape—Manufactured by Square Bar 20x20 mm</td>
</tr>
<tr>
<td></td>
<td>Standard Model ED-45/46: Diamond Shape—Manufactured by Square Bar 45x45 mm</td>
</tr>
<tr>
<td></td>
<td>Special Device: Diamond Shape—Manufactured by Square Bar sized with Stress and Vibrations Analysis Results;</td>
</tr>
<tr>
<td>Material</td>
<td>As per Customer's requirements / Main material References: ASME/ASTM</td>
</tr>
<tr>
<td>Process Connections</td>
<td>Threaded Coupling / Flanged Nozzle</td>
</tr>
<tr>
<td>Flow Calculation</td>
<td>Main Reference code: TM TECNOMATIC STANDARDS</td>
</tr>
</tbody>
</table>

NOTE: All Type of Sensors can be supplied with End Support and Retractable System

STANDARD LIMITS AND APPLICATION FIELDS

<table>
<thead>
<tr>
<th>Dimensions:</th>
<th>Up to 100&quot; and over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reynolds Number Range:</td>
<td>Over 200000</td>
</tr>
</tbody>
</table>

PERFORMANCES

- Accuracy (referred to flow coefficient): 2+2.5% for Standard Device; to be evaluated case by case for Special Devices
- Repeatability: +/- 0.15%
- Max PPL 10+15% of full scale differential pressure

CALIBRATION

- Not Applicable

NOTE

- Flow Meters can be manufactured according to all Customer Specifications
- Flow Meter can be supplied complete with all relevant accessories (valves / manifold / condensing pot / transmitter /fitting /tubing)
Wedge Meters

DESCRIPTION

The Wedge Meter is a differential pressure device suitable to measure the flow rate of dirty liquids in a closed conduit (slurry applications).

TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Applications</th>
<th>Oil &amp; Gas / Petrochemical Industries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Element Type and Construction</td>
<td>Manufactured by bar stock</td>
</tr>
<tr>
<td></td>
<td>Manufactured by welded Plate</td>
</tr>
<tr>
<td>Material</td>
<td>As per Customer’s requirements</td>
</tr>
<tr>
<td></td>
<td>Main material Reference: ASTM-ASME Code</td>
</tr>
<tr>
<td>Flow Calculation</td>
<td>Miller Engineering Handbook</td>
</tr>
</tbody>
</table>

STANDARD LIMITS AND APPLICATION FIELDS

| Dimensions: | Nominal Diameter of Pipeline: over 2" |
| Wedge Equivalent Ratio: | 0.4÷0.7 |
| Reynolds Number Range: | Over 200000 |

PERFORMANCES

- Accuracy (referred to the discharge coefficient): 3÷3.5%
- Rangeability: 1÷4.5
- Repeatability: +/- 0.1%
- Max PPL: 20÷40% of full scale differential pressure
- Straight pipe requirements: 5 I.D. (upstream); 5 I.D. (downstream) in the worst conditions

CALIBRATION

- Accuracy (referred to the discharge coefficient) after calibration in accredited laboratory: +/- 0.25%

NOTE

- Flow Meters can be manufactured according to Customer specifications
- Flow Meter can be supplied complete with all relevant accessories (valves / manifold / condensing pot / transmitter / fitting / tubing)
Flow Nozzles

**DESCRIPTION**

Flow Nozzle is a differential pressure device to measure flow rate in a closed conduit for heavy applications and high flow rate.

**TECHNICAL SPECIFICATIONS**

- **Applications**: Oil & Gas / Petrochemical Industries / Power Stations
- **Type Of Elements**: ASME Long Radius / ASME Long Radius with diffuser / ASME Throat Taps; ASME Throat Taps with diffuser / Short Nozzle ISA 1932 / Venturi Nozzle with ISA Inlet
- **Material**: All material requested by the customer / Material Specifications : all Main Material Reference : ASTM–ASME Code
- **Type Of Construction**: Flanged / Welding in Pipe with pins / With complete spool pipe and Flow conditioner

**STANDARD LIMITS AND APPLICATION FIELDS**

- **Dimensions**: ISA 1932 Nozzle: 2”~20” / Long Radius Nozzle: 2"~24" / Venturi Nozzle: 2 1/2” – 20”
- **Beta Ratio**: ISA 1932 Nozzle: 0.3~0.8 / Long Radius Nozzle 0.2~0.8 / Venturi Nozzle: 0.316~0.775
- **Reynolds Number Range**: ISA 1932 Nozzle: 70000~10000000(For Low Beta ratio); 20000~10000000(For High Beta ratio) Long Radius Nozzle 10000~10000000 / Venturi Nozzle: 150000~2000000

**PERFORMANCES**

- Accuracy (referred to flow coefficient): as per ISO Code
- Rangeability : 1~4.5
- Ripetibility: (+/- 0.1%)
- Max PPL (50~70)% of full scale differential pressure
- Straigth Lengths Requirements: as Specified In ISO 5167 International Code

**CALIBRATION**

- Accuracy (referred to flow coefficient) after calibration in accredited lab: (+/- 0.25%)

**NOTE**

- Flow Meters can be manufactured according to all Customer Specifications.
- Flow Meter can be supplied with all suitable accessories (VALVES / MANIFOLD/CONDENSING POT /TRANSMITTER/FITTING/TUBING)
Flow Conditioners

DESCRIPTION

The Flow Conditioner is a device that improves the fluid velocity profile across the flow section. This device is typically applied when pipe straight length requirements cannot be satisfied. This often happens when, due to layout constraints, it is not possible to install a flow meter in a straight portion of pipe suitable to obtain acceptable metering conditions. With this device it is possible to have the best fluid velocity profile, even if the pipe straight length is less than the minimum prescribed by the code.

On the other hand, the introduction of a flow conditioners introduces additional permanent pressure losses that shall be verified against process constraints.

PERFORMANCES

- Flow conditioner can reduce upstream pipe straight length requirements to a half of what prescribed by ISO 5167-1

NOTE

Flow Conditioners can be supplied alone or included in meter run section as an accessory of flow meter device

TECHNICAL SPECIFICATIONS

Applications

Oil & Gas / Petrochemical Industries / Power Stations

Conditioner Type

The Tube Bundle flow Straightener / The Gallagher Flow Conditioner / Perforated Plate Flow Conditioner (K=Lab Nova / Spearman) / Sprenkle Flow Conditioner / Zanker Flow Conditioner

Material

As per Customer’s requirements / Main material Reference : ASTM-ASME Code

Permanent Pressure Loss introduced by Flow Conditioners

- Tube Bundle flow Straightener: k=0.75 / Gallagher Flow Conditioner: k=2 (approx.)

REFERENCE CODE: ISO 5167
# Orifice Plate Assembly

## DESCRIPTION

The Orifice Plate is a differential pressure device suitable to measure the flow rate in a closed conduit (it is an affordable device for general applications).

## TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Applications</th>
<th>Oil &amp; Gas / Petrochemical Industries / Power Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type Of Elements</td>
<td>Square Edge Orifice / Quadrant Orifice / Conical Entrance Orifice / Segmental orifice</td>
</tr>
<tr>
<td>Material</td>
<td>As per Customer’s requirements / Main material Reference: ASTM–ASME Code</td>
</tr>
<tr>
<td>Type of Pressure Taps and Relevant Calculation</td>
<td>Flange Taps</td>
</tr>
<tr>
<td></td>
<td>Corner Taps</td>
</tr>
<tr>
<td></td>
<td>Radius Taps</td>
</tr>
<tr>
<td></td>
<td>Pipe Taps</td>
</tr>
<tr>
<td>Type Of Construction</td>
<td>Flange Taps: with pressure taps on flanges or on carrier ring</td>
</tr>
<tr>
<td></td>
<td>Corner Taps: with pressure taps on flanges, or on annular chambers, or on a monolithic plate</td>
</tr>
<tr>
<td></td>
<td>Radius / Pipe Taps: pressure taps shall be welded on pipe (in this case the assembly shall be supplied complete with the relevant spool pipe)</td>
</tr>
<tr>
<td>Type of Plate Connections</td>
<td>All / Main Connections: RF–RJ</td>
</tr>
<tr>
<td>Type of Flanges</td>
<td>WN–SW–LJ–THD–SO according to International Standards (ANSI/ASME/UNI/DIN/API)</td>
</tr>
<tr>
<td>Other Options</td>
<td>Single Chamber Orifice Plate Assembly: is a special kind of construction with a system that allows an easy removal of the plate from the assembly</td>
</tr>
<tr>
<td></td>
<td>Dual Chamber Orifice Plate Assembly: is a special kind of construction with a system that allows an easy removal of the plate from the assembly under pressure (with the line still in operation)</td>
</tr>
</tbody>
</table>
# Flow Measurement Devices

- **Accuracy (referred to the discharge coefficient):** as per ISO Code
- **Rangeability:** 1÷4.5
- **Repeatability:** +/- 0.1%
- **Max PPL 50÷70% of full scale differential pressure**

**Straight Lengths Requirements:** as per ISO 5167

**Calibration Performances:**

- **Orifice Plate only**
- **Orifice Plate Assembly**
- **Meter Run Assembly (up to 2")**
- **Complete Upstream/Downstream Spool Orifice Assembly (with Flow Conditioner, if required) for 2" and above**

**Typical Supply Configurations:**

- **Accuracy (referred to the discharge coefficient) after calibration in an accredited laboratory:** +/- 0.25%

**Dimensions:**

- All taps configurations: 2”÷40”

**Beta Ratio:**

- All taps configurations: 0.1÷0.75
- For beta ratio up to 0.56: greater than 5000 (for lower Reynolds numbers, special orifice types are required)

**Reynolds Number Range:**

- All taps configurations: 0.1÷0.75

**Performances:**

- Accuracy (referred to the discharge coefficient): as per ISO Code
- Rangeability: 1÷4.5
- Repeatability: +/- 0.1%
- Max PPL 50÷70% of full scale differential pressure
- Straight Lengths Requirements: as per ISO 5167

**Note:**

- Flow Meters can be manufactured according to Customer specifications
- Flow Meter can be supplied complete with all relevant accessories (valves / manifold / condensing pot / transmitter / fitting / tubing)
**Thermocouples**

**DESCRIPTION**

Thermocouples are the temperature sensing elements most widely used throughout industry for temperature measurements. Their inherent simplicity and low cost together with good characteristics of accuracy and reproducibility, make them precious and handy tools to answer the many challenging probe, encountered in modern producing Processes.

TM Tecnomatic thermocouple assemblies are produced in a wide variety of design to fit practically all applications.

**TECHNICAL SPECIFICATIONS**

**Applications**

Oil & Gas / Petrochemical Industries / Power Stations

**Type of Elements**

Insert with accessories

Complete assemblies with / without Thermowell

**Material**

All material requested by the customer / Material Specifications : all

**Type of Construction**

Manufactured according to the Customer’s requirements (Type E, J, K, R,S,T, B,C,N );
TM Tecnomatic RTD are carefully selected to meet the basic resistance values and accuracies specified from IEC 60751 Nominal resistance value is 100ohm at 0°C. Standard bulbs have platinum or Nickel wound resistance elements, with hard glass or ceramic base. One, two or three windings are available on the same bulb. Resistance thermometer bulbs always take up the mean value of the temperature operating over the full winding length, therefore it is important that the full length of the element is exposed to the medium whose temperature is to be measured.

Trouble free working of resistance thermometer bulbs is dependent on proper care being taken in their installation and the selection of associated components used for this purpose. For this reason we recommend the use of TM resistance inserts.

TM Tecnomatic resistance thermometer inserts are built-up from nickel or st. tube. Standards inserts size are 4, 6 or 8mm O.D. Resistance thermometer bulbs conforming to most other known international standard are already available upon request.

### TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Applications</th>
<th>Oil &amp; Gas / Petrochemical Industries / Power Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Elements</td>
<td>Insert with accessories / Complete assemblies with / without Thermowell</td>
</tr>
<tr>
<td>Material</td>
<td>All material requested by the customer / Material Specifications : all</td>
</tr>
<tr>
<td>Type of Construction</td>
<td>Manufactured according to the Customer’s requirements</td>
</tr>
</tbody>
</table>

### PERFORMANCES

- Versatility
- Different Type of Connections
- Accurate detection

### CALIBRATION

- Calibration according to International Standards (IEC 60751, etc.)

### NOTE

- Our temperature elements are custom designed to fit all your specific process parameters
Thermowells

**DESCRIPTION**

Thermowells are precise components serving as protective devices for the primary or sensing temperature elements, as thermocouples, resistance thermometer bulbs, bimetallic thermometers, filled system, etc. of all types of temperature indicating, recording and controlling instruments. Particular care, together with long experience and special designed drilling machines, guarantee the choice of materials and construction of TM Tecnomatic thermowells.

**TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Applications</th>
<th>Oil &amp; Gas / Petrochemical Industries / Power Stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Elements</td>
<td>Bar Stock Thermowell / Pipe Thermowell</td>
</tr>
<tr>
<td>Material</td>
<td>All material requested by the customer / Material Specifications : all</td>
</tr>
<tr>
<td>Type of Construction</td>
<td>Manufactured according to the Customer’s requirements</td>
</tr>
</tbody>
</table>

**PERFORMANCES**

- Versatility: they are the most widely used throughout industry for temperature measurements
- Resistance: they are built to resist to pressure and temperature solicitations; Accurate temperature and steam velocities measurements

**STRESS CALCULATION**

- On request it is possible to verify thermowells according to ASME PTC 19.3 (Latest revision)

**NOTE**

- Our assemblies are custom designed to fit all your specific process parameters
Skin Thermocouples

DESCRIPTION

These thermocouples are built in such a way to guarantee the most intimate contact with the controlled surface together with better accuracy and high speed of response. Suitable for boilers, furnaces, super heaters process tubes, heater tubes and many other applications.

TECHNICAL SPECIFICATIONS

Applications Oil & Gas / Petrochemical Industries / Power Stations

Type of Elements Insert or complete assemblies with different accessories (union, nipples, pad, flanged or threaded process connection, etc.)

Material All material requested by the customer / Material Specifications : all

Type of Construction Manufactured according to the Customer’s requirements

PERFORMANCES

• Versatility: they are the most widely used throughout industry for temperature measurements
• Accuracy and Reproducibility: make their precious and handy tools to answer the many challenging problems encountered in modern producing processes
• Accurate detection

CALIBRATION

• Calibration according to International Standards (ANSI, IEC, etc.)

NOTE

• Our temperature elements are custom designed to fit all your specific process parameters
Multipoint Thermocouples Assemblies
(Radial with or without Thermowell)

DESCRIPTION

Multipoint thermocouple assemblies obtain fast temperature readings at different levels in deep or tall vessels reactors, catalyst beds, furnaces and other applications where individual thermocouple would be too difficult or costly to install. Because of the many different conditions peculiar to each application, Multi Point Thermocouples Radial or Thermowell Type generally are custom designed. They are built with the proper number of protecting tubes with thermocouples inside, protecting tubes diameter, thickness, lengths, materials, fittings, flange, extension wires, flexible conduits, supporting frame and junctions boxes to suit your individual installation.

TECHNICAL SPECIFICATIONS

Applications
Oil & Gas / Petrochemical Industries / Power Stations

Type of Elements
Radial / With Thermowell / Without Thermowell

Material
All material requested by the customer / Material Specifications : all

Type of Construction
 Manufactured according to the Customer’s requirements

PERFORMANCES
- Versatility
- Wide range of configurations
- Accurate reading

CALIBRATION
- Calibration according to International Standards (IEC 60751, etc.)

NOTE
- Our temperature elements are custom designed to fit all your specific process parameters

![Diagram]

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CABLE GLAND FOR ARMORED</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>GASKET</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>18 TERMINALS</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>FLEXIBLE EXTENSION WIRE</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>SINGLE T. TYPE “J”</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>SUPPORTING RING</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>TUBEubby 5MM</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>SUPPORTING PIPE</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>TIP FROM BAR STOCK</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>BOLT 12 X 1.75 X 6</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>FIXING SCREW</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>1/2” S. S. Nipple FOR THERMowell</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>1/2” NPT T/F UNION</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>METAL NIPPLE</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>NAMEPLATE</td>
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<tr>
<td>16</td>
<td>1 JUNCTION BOX</td>
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Professional Services

TRAINING

TM Tecnomatic offers specific Technical Training on the use and performance of its products on site or at its head office. Our Engineers can work closely with you to ensure your employees have the skills needed to ensure safety and efficiency during line operation and intervene immediately in case of possible displayed signals of errors.

SUPERVISION

Our highly qualified staff can assist and survey the maintenance, commissioning or start-up activities to facilitate quick assistance, minimize downtime and improve the various assembly phases of our instrumentation ensuring the correct placement and application of the items. In this way the performance is not compromised.

MAINTANCE

TM Tecnomatic can assist you when you do not have sufficient knowledge or the necessary resources to perform periodic maintenance on our instruments.

EXPERTISE

| Engineering Degree | Certified European Welding Engineer | Certified International Welding Engineer | BOSIET Qualification | Years of experience |
THE METERING SKID MAIN COMPONENTS ARE

- the structural frame and supports
- the pipework
- the process equipment
- the electrical power feed, including the MCC, the earthing system, all cabling and trays
- the instrumentation including control valves, actuators, instrument primary elements, transmitters
- the local control system including PLC, flow computer, personal computer & printer (for the local control, print report and the interface with the plant DCS)

Moreover TM Tecnomatic can provide supervision on site for pre-commissioning, commissioning, startup and training.
TM Tecnomatic, with a long experience in producing classical welded Multistage restriction Orifices characterised by having calibrated disks kept in position by welding, is now presenting an innovative configuration for this product. The new configuration is based on inserting disks into a dedicated pipe spool and keeping them in position by means of a central rod, connected to a plate installed between flanges. This revolutionary design increases safety, maximises operational flexibility, facilitates maintenance and reduces cost.

**THE MROD MAIN FEATURES**

**Strengths**
- Compact and simple design compared with a standard MRO
- Modular design (internals and pressure-retaining parts are independent from each other)
- Limited number of pressure-retaining welds
- It can be fabricated avoiding dissimilar welds
- The pressure-retaining parts can be subject to PWHT without damaging the internals
- Maintainability
- Easier to upgrade (just replace internals)
- Buying more than one set of internals, it is possible to accommodate temporary operational modes (e.g. startup conditions different than normal design conditions)
- Full RT inspectability without the need to introduce offset disk design
- Provided that TM Tecnomatic finds an effective solution to seal around disks in a commercial pipe, the MROD could be marketed without the pressure-retaining part, with further cost reduction.

**Opportunities**
- After the drop of oil price, the Oil and Gas industry is trying to reduce production costs (CAPEX and OPEX): in such an environment, more players might be keen to test a prototype that could increase safety, maintainability and reliability (i.e. reduce OPEX), and ideally at a lower price (i.e. reduce CAPEX). TM Tecnomatic should make direct contact with Oil Companies to promote the new design and possibly have it included in their Specifications.
- Main Contractors tend to purchase the cheapest solution that still complies with the Client specifications. In this respect, for all cases where the new design determines a lower price compared with the standard MRO (i.e. lower CAPEX), main Contractors may promote the application of our MROD and allow TM Tecnomatic to gain some experience and generate a log of positive applications.

**Since the MROD is an innovative product, it can be protected by an international patent in order to maintain a competitive advantage for TM Tecnomatic (process already ongoing).**
THE MROD MAIN FEATURES

**Improved safety**

The innovative MROD improves the plant safety by reducing the number of welds present in the line:
- Classical welded MRO typically have one weld for each stage. The MROD only requires two pressure-retaining welds for flange-to-pipe connections.
- The pressure-retaining welds are designed for 100% RT: this feature ensures full inspectability and increases safety.
- Even in case of different metallurgies between disks and pipe, the MROD will not require dissimilar welds. This minimises elements migration phenomena, corrosion phenomena and thermal fatigue in correspondence of the weld.

**Maximum Operational Flexibility**

The MROD uncouples the pressure-retaining part of the equipment (i.e. the pipe spool) from the orifice plates, with the following benefits and possibilities:
- The MROD can be opened for inspection and cleaning: this can make a difference during pre-commissioning and commissioning.
- The same MROD spool may be equipped with different sets of internals: this is especially advantageous for those situations where different operating regimes are foreseen, such as temporary operating conditions with fluids and/or flowrates different than design, debottlenecking, etc.
- The number of pressure steps and the length of the MROD are virtually independent: should the number of pressure steps vary due to process changes, the length of the equipment would be unchanged: this allows for new process conditions without modifying the existing pipework. No cuts and no welds means no hot works and time savings: replacing the internals of the MROD takes just a little longer than replacing a single restriction orifice, and does not involve handling of heavy loads on and off the plant.

**Easier to maintain**

The MROD can be opened for cleaning and inspection: this determines an unprecedented increase of maintainability if compared with a standard MRO.
- In a traditional MRO, the length of the equipment is influenced by the minimum distance to be kept between welds: the thicker the pipe, the longer the MRO. The MROD instead does not have this kind of limitation and the first restriction orifice is always installed between flanges: all this leads to a much shorter piece of equipment, easier to handle and to maintain.
- Purchasing just a new set of internals is much quicker and cost-effective than purchasing a classical MRO: shorter delivery time means time savings and shorter plant downtime.

**Better value for money**

The MROD is engineered to reduce cost, not quality:
- The purchase cost is comparable with the cheapest configurations of the classical MRO, but provides 100% RT inspectability, allows for cleaning and maintenance, and introduces an innovative modular design.
- Even if the specific application requires several pressure reduction steps (e.g. pressure reduction of liquids near to the cavitation), the MROD remains short and affordable.
- The maintenance cost of the MROD is lower than any classical MRO, which cannot be opened for cleaning and inspection.
- The cost of a new set of internals is just a small fraction of the replacement cost of a classical MRO.

DON’T COMPROMISE BETWEEN QUALITY AND COST!
If you are looking for an innovative solution that ticks all boxes and fits your budget, just contact us for a free quotation today!