ROTARY PISTON GAS METER IRM - 3
INTRODUCTION

Instromet International is proud to introduce the latest member of the Instromet family of positive displacement rotary piston meters. As an alternative to the popular cartridge, Instromet engineers have developed a very compact design that minimises the leakage of gas through the measurement chamber and maximises the volume transferred by the rotors. The result is the IRM 3, a meter of remarkable performance.

The IRM 3’s body is exceptionally rigid and will not be deformed by misalignment in the installation that could, in conventional rotary meters, cause the rotors to block. Special consideration has also been given to the service maintainer of the IRM 3 with special features that assist his task.

The meter is robust, accurate and has a turn down ratio that can only be surpassed by an internal cartridge design. It is certified for custody transfer applications.

OUTSTANDING FEATURES

EXTRAORDINARY TURN DOWN RATIO

For all rotary meters, the performance at lower capacities is determined by the amount of gas leaking across the rotors. The turn down ratio that can be achieved by a meter is inversely proportional to this unregistered gas; the smaller the leakage, the greater the meter’s range. Instromet’s new radical design allows as little gas as possible to leak through the measurement chamber giving the best turn down ratio of all conventional meters. The IRM 3 has also a number of unprecedented features.

The most striking aspect of the IRM 3 is the “square shape” of the rotors where the length of each rotor is equal to its width. The rotors thus contain the largest possible volume of gas for the smallest outline profile and this reduces to a minimum the areas where unregistered gas can pass. The two lobes of the rotors being larger have wider tips that again reduces the leakage.

The rotors revolve at a slower speed for an equivalent flow rate thus increasing the life of the bearings and making the meter noticeably quieter.

The “square” profile of the IRM 3 rotor (L) compared to a conventional (R)
INSENSITIVE TO INSTALLATION STRESSES

Normally the most vulnerable feature of a conventional rotary meter is the body’s sensitivity to stresses caused by the installation. With all aluminium rotary meters (except for the cartridge design) even small misalignments in the installation can distort the body thereby altering the rotor clearances and in severe cases causing the rotors to block. To avoid this effect, special attention must be given to construction of the meter body as the material normally used (aluminium) tends to deform under stress. The IRM 3 has massive end plates giving the meter such a rigidity that the performance of the meter is not affected under conditions of bending, torsion or vibration.

The design of the body also deadens the sound caused by the internal moving parts and contributes to the meter’s quietness.

EXTREMELY ROBUST

Although a meter is a precision instrument it can be subjected under field conditions to rough handling and mistreatment such as overloading the meter, flow and pressure shocks, impurities in the gas etc. Under these circumstances the rotors or the rotor shafts will bend or twist resulting in their locking with subsequent serious damage. The short square construction is highly resistant to this kind of abuse.

In most rotary meter types the weakest part of the internal construction is usually the main shaft. These shafts on which the timing gears are fitted have a particular tendency to twist due to their narrow diameter. Since the main bearing is fitted on the shaft between the rotor and the timing gear, the diameter of the shaft and therefore its strength is limited to the internal dimensions of the bearing. Increasing the diameter of the shaft and thus its strength would require a larger bearing with consequential detriment to the turn down ratio.

The IRM 3 uses a radical different concept. In the IRM 3 the timing gear is fitted between the rotor and the main bearing, thereby removing any limit to the size of the shaft. The resultant resistance to twisting is at least 10 times higher than in other meters thus making the IRM 3 less sensitive to meter mistreatment.
EASE OF MAINTENANCE AND REPAIR
The modified position of the bearings gives the IRM 3 another unique advantage. By placing the timing gears between the rotor and the main bearing the meter can be disassembled and the bearings can be replaced without removing the timing gears from the shaft. During disassembling the timing is not disturbed, making bearing replacement a fast and easy job even for less experienced shops.

MINIMUM WEIGHT AND INSTALLATION DIMENSIONS
By using the Square Shaped Rotor design, the dimensions and weight of the meter is completely different to conventional designs. The flange to flange length of the meter is in accordance with recognised standards and therefore the IRM 3 is exchangeable with other positive displacement meters. But the biggest improvement is made regarding installation depth. Experience shows that the interchangeability between, for instance, turbine gas meters and positive displacement gas meters is not always possible since the installation depth of the turbine meter is smaller than an equivalently sized PD meter. Indoor installations where the adjacent piping is close to a wall give particular problems. Since the installation depth of the IRM 3 is scarcely larger than the adjacent flanges, its depth is comparable to other meter types such as turbine meters.

The length of the meter is about 40 % smaller than equally sized conventional types, and consequently the weight of the IRM 3 is significantly less. Even the largest in the series (G650 / 38 M) is a mere 62 kilos (137 lbs) and does not require to be floor mounted.

LOW PRESSURE DROP
The short square design enables the measurement chamber to fill rapidly during operation, lowering the pressure drop across the meter.

BREAKTHROUGH IN ROTARY METER LIMITS
A characteristic of rotary meters is that the alternate transfer of gas by the two rotors causes the meter to pulsate. The effect of the pulsations increases with pressure and quantity that in turn can produce destructive resonances in the installation. It is these pulsations that practically limit the upper measurement boundaries of the rotary meter.

Instromet in line with its tradition of extending the frontiers of accurate measurement has developed the patented Duo design that eliminates the major pulsations generated by ordinary rotary meters. By skilfully coupling two pairs of rotors in the same body in such a way that their pulsations oppose each other, a smooth movement of gas is obtained. This principle is the basis of the Instromet Rotary Piston Prover®, now in operation as reference standards by a number of leading international metrological authorities. This same concept is now applied to the 4” and 6” IRM 3 resulting in rotary meters of unparalleled quietness and smoothness (no noise).

The IRM 3 has been officially approved by the Dutch, German and European Union authorities.
The two sine curves represent the pulsations of the two sets of rotors. The rotors are synchronised so that the sine curves are in opposite phases.

The dual rotors are standard in the G 400 and G 650 (23 M and 38 M) and optional in the G 250 (16 M).

All aluminium surfaces are hard anodised for maximum protection against corrosion and wear.

**OTHER FEATURES**

Two Index options are presently available, the economical Compact Index and the novel Universal Index. An eight digit mechanical counter and low frequency pulse digit sensor are fitted as standard in both index models. The universal index has the added feature that the meter can read the gas flow from either direction without changes to the meter itself. Such a meter can therefore be installed for either left, right, top or bottom flow entry. This flexibility greatly reduces inventory requirements.

- Two thermal wells for temperature probes are standard.
- The meter is lubricated for up to ten years continuous service.

*IRM 3 with the Compact Index*
**PRINCIPAL OPERATING CHARACTERISTICS**

**Accuracy:**
less than 1.0% uncertainty

**Repeatability:**
better than 0.1%

**Rangeability:**
greater than 1:100

**Flange rating:**
PN 16 - ANSI 150

**Max. operating pressure:**
16 bar - 232 psi

**Gas Temperature Range:**
-30°C to +60°C / -22°F to 140°F
Other temperature ranges on request.

**Flow Range:**
G 25 to G 650 / 1.5 M - 38M
(0.6 m³/h - 1,000 m³/h) / (20 cfh - 38,000 cfh)
### DIN FLANGES

<table>
<thead>
<tr>
<th>Flow Range</th>
<th>LK</th>
<th>M</th>
<th>No.</th>
<th>H</th>
<th>BL</th>
<th>BT</th>
<th>C</th>
<th>E</th>
<th>WT (lbs)</th>
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<tbody>
<tr>
<td>G 25</td>
<td>1½” &amp; 2”</td>
<td>M16</td>
<td>4</td>
<td>202</td>
<td>171</td>
<td>228</td>
<td>137</td>
<td>91</td>
<td>11</td>
</tr>
<tr>
<td>G 40</td>
<td>1½” &amp; 2”</td>
<td>M16</td>
<td>4</td>
<td>202</td>
<td>171</td>
<td>228</td>
<td>137</td>
<td>91</td>
<td>11</td>
</tr>
<tr>
<td>G 65</td>
<td>2”</td>
<td>M16</td>
<td>4</td>
<td>202</td>
<td>171</td>
<td>228</td>
<td>137</td>
<td>91</td>
<td>11</td>
</tr>
<tr>
<td>G 100</td>
<td>3”</td>
<td>M16</td>
<td>8</td>
<td>308</td>
<td>241</td>
<td>305</td>
<td>175</td>
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<td>29</td>
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<td>G 160</td>
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<td>8</td>
<td>308</td>
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<td>149</td>
<td>32</td>
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<td>M16</td>
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<td>308</td>
<td>241</td>
<td>466</td>
<td>270</td>
<td>196</td>
<td>46</td>
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<td>G 400</td>
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<td>M16</td>
<td>8</td>
<td>308</td>
<td>241</td>
<td>466</td>
<td>270</td>
<td>196</td>
<td>50</td>
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<td>G 650</td>
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<td>M20</td>
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<td>598</td>
<td>336</td>
<td>262</td>
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All dimensions are in mm unless otherwise indicated. No. = Number of bolts.

### ANSI FLANGES

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<th>Flow Range</th>
<th>LK</th>
<th>M</th>
<th>No.</th>
<th>H</th>
<th>BL</th>
<th>BT</th>
<th>C</th>
<th>E</th>
<th>WT (lbs)</th>
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<tbody>
<tr>
<td>1.5 M</td>
<td>1½” &amp; 2”</td>
<td>3/4</td>
<td>4</td>
<td>8</td>
<td>6 1/4</td>
<td>9</td>
<td>5 1/3</td>
<td>3 1/2</td>
<td>23</td>
</tr>
<tr>
<td>2 M</td>
<td>1½” &amp; 2”</td>
<td>3/4</td>
<td>4</td>
<td>8</td>
<td>6 1/4</td>
<td>9</td>
<td>5 1/3</td>
<td>3 1/2</td>
<td>23</td>
</tr>
<tr>
<td>3 M</td>
<td>2”</td>
<td>4/4</td>
<td>4</td>
<td>8</td>
<td>6 1/4</td>
<td>9</td>
<td>5 1/3</td>
<td>3 1/2</td>
<td>23</td>
</tr>
<tr>
<td>5 M / 7 M</td>
<td>3”</td>
<td>6</td>
<td>4</td>
<td>8</td>
<td>6 1/4</td>
<td>11 3/8</td>
<td>6 1/8</td>
<td>4 3/4</td>
<td>26</td>
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<td>7 M / 11 M</td>
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<td>6</td>
<td>4</td>
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<td>12</td>
<td>6 1/4</td>
<td>5 1/4</td>
<td>63</td>
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<tr>
<td>16 M</td>
<td>4”</td>
<td>7 1/2</td>
<td>8</td>
<td>12 1/8</td>
<td>9 1/2</td>
<td>13 1/2</td>
<td>7 3/8</td>
<td>5 1/8</td>
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<td>9 1/2</td>
<td>18 3/8</td>
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<td>101</td>
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<tr>
<td>23 M</td>
<td>6”</td>
<td>9 1/2</td>
<td>8</td>
<td>12 1/8</td>
<td>10 1/4</td>
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<td>6”</td>
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<td>8</td>
<td>12 1/8</td>
<td>10 1/4</td>
<td>23 1/2</td>
<td>13 1/8</td>
<td>10 3/8</td>
<td>137</td>
</tr>
</tbody>
</table>

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