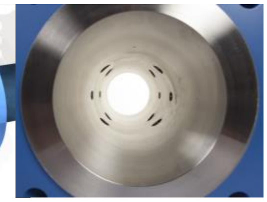
Honeywell

Product Information Note

Honeywell RMG USM GT400
Meeting OIML accuracy class 0.5



This document describes flow disturbance tests performed at the TCC (Trans Canada Calibration) natural gas flow facility in Canada with a Honeywell Ultrasonic Flowmeter RMG USM GT400 to prove OIML class 0.5 accuracy.

PTB PTB (Physical Technical Federal Institution) in Germany has analyzed the test results and provided the following compliancy statement:

"[…] Honeywell has presented test results which show that the stability of the ultrasonic gas meter USM GT400 in case of perturbation fulfills the requirements which are given in section 5.13.3 of OIML 137 1&2 for meters of the accuracy class 0.5 […]"

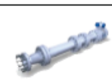
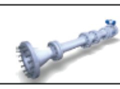
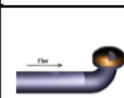
OIML R137 1&2:2012

OIML (International Organization of Legal Metrology) is a worldwide organization that publishes recommendations which establish metrological characteristics for certain measuring instruments and are the base for type test approvals. R137 states the requirements for gas flow meters of any measurement technology (incl. ultrasonic flow, coriolis and turbine meters).

OIML R137 Paragraph 12.6.8 (*Flow disturbance*) prescribes that gas meters are tested under flow disturbances caused by piping arrangements specified in Annex B of the document. The upstream piping used during the testing is defined by the manufacturer. During the flow tests the error compared to a baseline test under ideal conditions must not exceed 1/3 of the accuracy class of the meter (defined in paragraph 5.13.3).
MID calls for class 1.0 accuracy which means that the shift may not be more than 0.33%.
The error readings of meters with accuracy class 0.5 must not shift more than 0.17% compared to the baseline which is a big challenge considering the severe flow disturbances the meters are tested under (e.g. swirls, asymmetries, cross flows).

Test Matrix

Testing was performed at four (4) flow rates for each flow disturbance. The flow rates defined in R137 are 25%, 40% and 100% of Q_{max} of the meter. An additional test at 10% was conducted. In case of the GT400 this translates to flow velocities of 4, 10, 16, 40 m/s (13, 33, 52, 130 ft/s). Below the piping configurations for flow disturbances according to OIML R137 1&2:2012 annex B are presented:

Test		Test conditions	Remarks	Turbine	Ultrasonic
a		Reference conditions	approx. 80 D straight line		×
			approx. 10 D straight line (see Note)	×	
b		A single 90° bend	radius elbow: 1.5 D	×	×
c		Double out-of-plane bend	rotating right; radius elbows: 1.5 D	×	×
d		Double out-of-plane bend	rotating left; radius elbows:1.5 D	×	×
e		Expander	one step difference of the pipe diameter is applied angle of expansion/reduction part: ≤ 15°		×
f		Reducer			×
g		Diameter step on the upstream flange	approx. +3 % and −3 %	×	×
+		Half pipe area plate	image shows first bend in piping and mounting of half-moon plate.	×	×

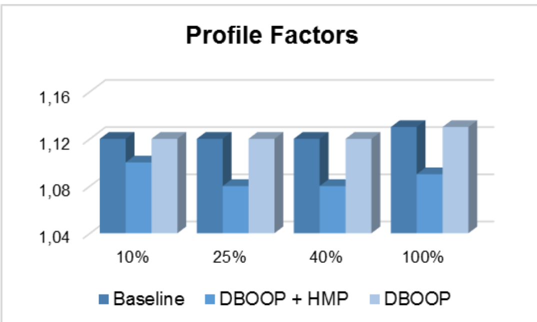
Piping configurations acc. OIML R137 Annex B (Table B.1)

Value of OIML class 0.5

During a high pressure calibration new generation ultrasonic flow meters like the USM GT400 typically have an accuracy of +/- 0.1% compared to the test stand. These calibrations are performed under almost ideal conditions in a known environment. But can this accuracy level be transferred to the field? A meter which fulfills AGA 9 or OIML class 1.0 have an overall maximum uncertainty of >0.3% if the installation effects are taken into account on top of the 0.1% uncertainty after calibration. A class 0.5 meter on the other hand only has a maximum uncertainty of 0.2%, which is an improvement by about **0.1%** or **30%**!
Considering an 8" meter with average load the decreased uncertainty translates to almost **$100,000** in measurement uncertainty.

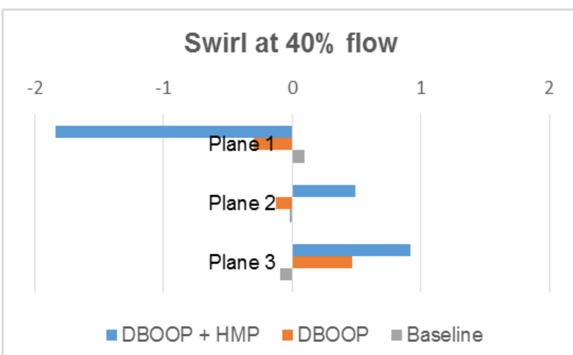
Observations during testing

The double bend out of plane incl. the half-moon plate (DBOOP + HMP) posed the biggest challenge within the test matrix. As one can see in the chart below the profile factors detected by the meter during less severe perturbations were close to those measured at reference conditions. The flow disturbance created by the half-moon plate on the other hand was so severe that the difference is clearly visible in the chart below.



Flow profile changes during testing

The half-moon plate also creates a lot of swirl which the meter must detect and measure. The detected swirl levels at different flowrates can be seen in the graphic below. The GT400 was not only able to detect these swirls but to accurately measure them and take this into account while calculating the bulk flowrate

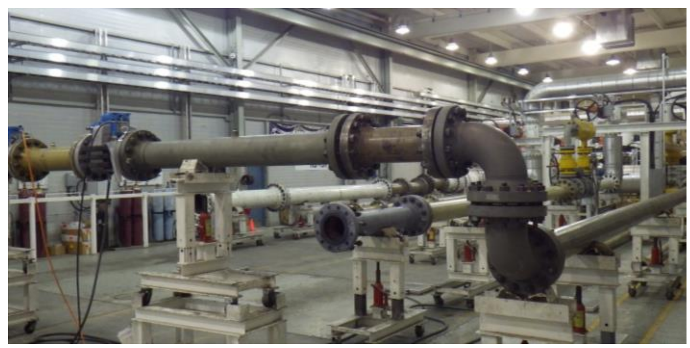


Swirl angle during severe flow disturbances and baseline

Results

The GT400 showed excellent measurement behavior during the complete testing with a signal detection rate of 100% throughout. The error compared to the reference conditions (baseline with 80D inlet) at different flow disturbances is presented in the chart below. All errors were within the accuracy limits of a class 0.5.

Shifts vs. reference conditions with class 0.5 accuracy limits



USM GT400 during testing in configuration DBOOP with HMP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RMG Gaszähler USM-GT-400 – Einhaltung der Genauigkeitsklasse 0,5
RMG gas meter USM-GT-400 – compliance with accuracy class 0.5


TransCanada Calibrations

CLAS

TransCanada Calibrations Ltd.

Certificate of Calibration

Customer: RMG by Honeywell

Manufacturer: RMG

Model: GT400

Calibration Date: March 19, 2015

Date of Issue: March 19, 2015

For More Information

Learn more about how Honeywell's RMG USM GT400 can reduce maintenance costs and improve bottom line results - visit our website www.honeywellprocess.com or contact your Honeywell account manager.

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