RMG ONE STEP AHEAD

Worksheet A.80.2

Suitability and Compatibility for Hydrogenous Natural Gas

Ultrasonic Flowmeter

The USM GT-400 is generally applicable and designed for the use with hydrogenous natural gas up to 40 mole% hydrogen. For custody transfer measurements, the USM GT-400 is suitable and approved for the use with natural gas up to a maximum hydrogen content of 30 mole% in accordance with the German TR-G19.
For secondary metering, the ultrasonic meter USM GT-400 from nominal size DN 100 (4") can be used to measure natural gas up to a maximum hydrogen content of 40 mole%. Here, adapted measuring ranges as well as a deviating measuring uncertainty compared to the pure natural gas measurement have to be considered. The expected performance data can be calculated for the desired conditions of use.

Device type	Max. permissible H_2 concentration technically	Max. permissible H_2 concentration custody transfer	Manufacturer's declaration for H_2 operation available?	Remarks
USM GT400	30 % unrestricted	30 %	Yes	Clearance certificate from PTB according to TRG-19 for up to 30% H_2 is available
USM GT400 H_2	100 % unrestricted	In preparation	Yes	
USZ 08	30 % unrestricted	10 %	No	Es liegt keine Unbedenklichkeitsbescheinigung vor
RSM 200-VM, -VC, -VMF, -VCF	10 %	10 %	In process	Custody transfer H_2 content referring to RSM200 VMF & VCF version only
RMG LP 35 flow straightener	100 %	To be defined	No	Material design required is stainless steel 1.430

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Turbine Gas Meter

The TRZ03 (-K) is generally applicable and designed for the use with hydrogenous natural gas up to pure hydrogen. For custody transfer metering, the TRZ03 is suitable and approved for the use with natural gas up to a maximum hydrogen content of 30 mole% in accordance with the German TR-G19.

When using turbine meters of type TRZ03 and TRZ 03-K for secondary metering, adjusted measuring ranges as well as a deviating measurement uncertainty compared to pure natural gas measurement must be considered. The expected performance data can be calculated for the desired conditions of use. It may also be necessary to evaluate used add-on parts for hydrogen compatibility.

Device type	Max. permissible H_2 concentration technically	Max. permissible H_2 concentration custody transfer	Manufacturer's declaration for H_2 operation available?	Remarks
TRZ 03 from YOM 2008	100 %	30 %	Yes	A-clearance certificate from PTB according to TRG-19 for up to 30% H_2 is available
TRZ 03 from YOM 2008	30 %	10 %	Yes	Technical area of application limited due to Ex approval (only IIB), area of application for custody transfer is limited, as there is no clearance certificate from PTB.
TRZ 03 K from YOM 2008	100 %	n. a.	No	Not for custody transfer
TRZ 03 K until YOM 2008	30 %	n. a.	No	Technical area of application limited due to Ex approval (only IIB), not for custody transfer
TME 400-VM all YOM	100 %	n. a.	Yes	Not for custody transfer
TME 400-VC all YOM	10 %	n. a.	Yes	
TME 400-VMF all YOM	100 %	10 %	Yes	Area of application for custody transfer is limited, as there is (yet) no clearance certificate from PTB
TME 400-VCF all YOM	10 %	10 %	Yes	Technical area of application limited by the maximum permissible H_2 concentration of the pressure transducer

Process Gas Chromatograph and correlative measuring device

The PGCs of the 930X series and RGC 7 series are approved and designed for the custody transfer analysis of hydrogenous natural gas containing different portions of hydrogen.
The PGC 9304 and RGC 7 are approved for hydrogenous natural gas up to a hydrogen content of 20 mol-%. The PGC 9303 and PGC 9302 are each approved for natural gas or for biogas with up to 5 mol-% hydrogen. The PGC 9301 is not approved for the analysis of hydrogenous gases.
The correlative measuring devices RGQ 3 and RGQ 5 are designed for gas mixtures with a hydrogen content up to 30 mol-%. In the future the correlative devices will measure gas mixtures with a hydrogen content higher than 30 mol%.

Device type	H_2 compatibility	Remarks
PGC 9301	0 %	No approval for hydrogenous natural gas
PGC 9302	5 %	PGC 9302 is approved for biogas up to a hydrogen content of 5 mol-%
PGC 9303	5 %	PGC 9303 is approved for biogas up to a hydrogen content of 5 mol-%
PGC 9304	20 %	PGC 9304 is approved for biogas up to a hydrogen content of 20 mol-%
RGC 704	20 %	RGC 704 is approved for biogas up to a hydrogen content of 20 mol-%
RGQ 3/5	30 %	RGQ 3 and RGQ 5 are designed for gas mixtures with a hydrogen content up to 30 mol-%

Compact Corrector

Device type	Max. permissible H_2 concentration technically	Max. permissible H_2 concentration custody transfer	Remarks
Primus 400	20 %	10 %	With gas group IIA
EC 900	10 %	10 %	Is currently still being examined

Flow Computer

<table>
<tr><th>Device type</th><th>H_2 compatibility</th><th>Remarks</th></tr>
<tr><td>ERZ 2000-NG</td><td>100 %</td><td>100% possible with Beattie Bridgeman method - pure gases only. 98% to 100% with AGA8-92DC acc. DVGW G685-6 worksheet. Admixture of up to 10% with: AGA 8, GERG 88S</td></tr>
<tr><td>ERZ 2000-DI</td><td>100 %</td><td>GERG2004 or GERG2008 are compatible up to 100%; full analysis required. 98% to 100% with AGA8-92DC acc. DVGW G685-6 worksheet. Admixture of up to 10% with: AGA 8, GERG 88S</td></tr>
<tr><td>Pressure transmitter Rosemount</td><td>100 %</td><td>
<table>
<tr><th>Item</th><th>Process medium/ conditions</th><th>Stainless steel separating membrane</th><th>Gold coated stainless steel separating membrane</th><th>Transmitter/ diaphragm seal decision</th></tr>
<tr><td>1</td><td>Hydrogen gas (< 69 bar)</td><td>Yes</td><td>Yes</td><td>2088, 2051, 3051, 3051S, 1199</td></tr>
<tr><td>2</td><td>Hydrogen gas (> 69 bar)</td><td>Not recommended</td><td>Yes</td><td>3051C, 3051S_C, 1199</td></tr>
<tr><td>3</td><td>Hydrogen gas (< 176 °C)</td><td>Yes</td><td>Yes</td><td>2088, 2051, 3051, 3051S, 1199</td></tr>
<tr><td>4</td><td>Hydrogen gas (> 176 °C)</td><td>Not recommended</td><td>Yes</td><td>3051C, 3051S_C, 1199</td></tr>
<tr><td>5</td><td>Hydrogen gas with H_2S (NACE MR01-75)</td><td>Not recommended</td><td>Yes</td><td>3051C, 3051S_C, 1199</td></tr>
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</td></tr>
<tr><td>Pressure transmitter E+H</td><td>100 %</td><td>100% H2 up to 10 bar, 20% H2 up to 60 bar, 10% H2 without restriction</td></tr>
<tr><td>Thermowells for the T. transmitter</td><td>100 %</td><td>Thermowells are made of stainless steel, material: 1.4571 Material is mentioned in the final report DVGW_240714 on page 12</td></tr>
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