

Oppdatert usikkerhetshåndbok for fiskale gassmålestasjoner

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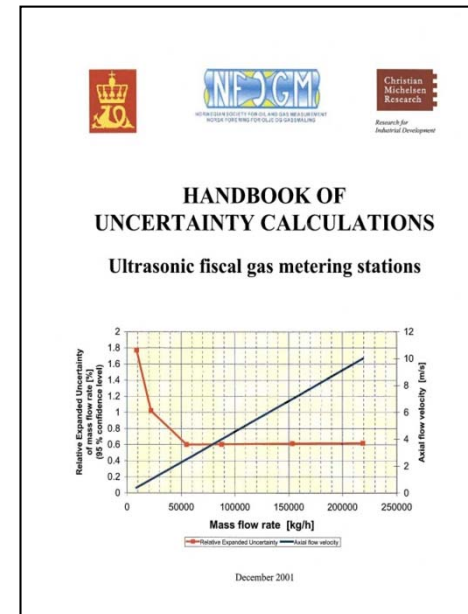
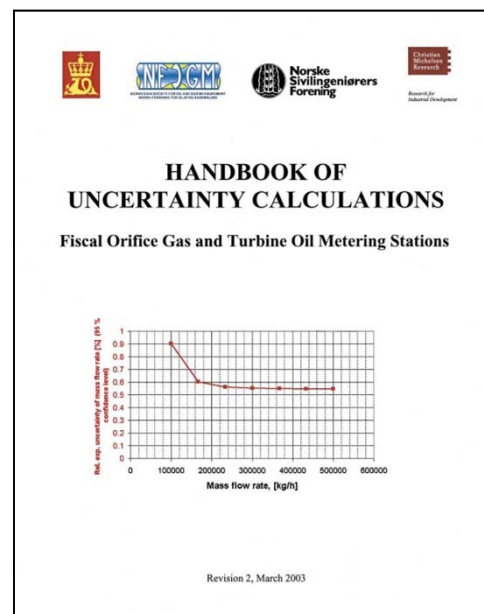
Innhold

- Innledning
- Tidligere håndbøker innen gassmåling
- Identifiserte behov for oppgradering
- Nytt prosjekt
 - Programfilosofi og –plattform
 - Nye funksjonaliteter
 - Demonstrasjon av nytt verktøy

Handbooks

Uncertainty evaluation of fiscal oil and gas metering stations:

- Orifice gas metering stations (1999 & 2003)
- Turbine oil metering stations (1999 & 2003)
- Ultrasonic gas metering stations (2001)



Behov for mer fleksibilitet

- Online gasskromatograf?
- Gasskomposisjon fra prøvetaking (sporadisk eller periodisk)?
- Målestasjon med parallelle løp?
- Andre måleteknologier, Coriolis?

- Klimakvote-rapportering

- Andre store og små behov

NFOGM initierer oppdateringsprosjekt

Initieringsgruppe møttes 25. august 2010:

- Dag Flølo, Statoil
- Kjell Arne Ulvund, Statoil
- Svein Neumann, ConocoPhillips
- Sidsel Corneliussen, BP
- Pål Jaghø, Talisman
- Leif Einar Falnes, Shell
- Anfinn Paulsen, Gassco
- Steinar Vervik, Oljedirektoratet
- Rune Andersen, Klif
- Reidar Sakariassen, Metropartner
- Kjell-Eivind Frøysa, CMR

NFOGM initierer oppdateringsprosjekt

Detaljert liste (19 punkter) med ønske for oppgraderinger av usikkerhetsverktøyene. Ekstrakt (1):

- Felles verktøy for flere måleteknologier, både eksportstasjoner og klimakvoter
- Håndtere gasskomposisjon fra GC eller sampling, usikkerhet i GCV, densitet, standard densitet, CO2-utslippsfaktor
- Tetthet fra komposisjon inn i strømningsmålingene (tetthet) som alternativ til tetthetsmåler
- Flere målere i parallell eller serie

NFOGM initierer oppdateringsprosjekt

Detaljert liste (19 punkter) med ønske for oppgraderinger av usikkerhetsverktøyene. Ekstrakt (2):

- Implementere Coriolis-målere på overordnet nivå
- Usikkerhet i standard volum, masse og energi
- Forenkle input, hjelpe brukeren (eks: standardverdier fra OD-måleforskrift, markering av verdier med liten signifikans)
- Usikkerhet for valgt periode, f.eks. år.
- Vurdere ny software-plattform

■ Microsoft Silverlight 5 Plattform:

- Web-basert
 - Selvstendig applikasjon. Kan enkelt installeres lokalt på datamaskinen og kan da benyttes uten nettforbindelse.
 - Støttes av Windows og Mac OS X
-
- Gasshåndbok-applikasjonen vil garantert være kompatibelt med fremtidig versjoner av Windows og Mac OS X, iallfall frem til oktober 2021.
 - I denne perioden skal nettleserne IE7, IE8, IE9 og nyere, samt Windows-versjonene av Firefox 3.6 og nyere, og Chrome 12 og nyere, støttes. Firefox 3.6 og nyere vil også støttes på Mac, sammen med Safari 4 og nyere.
-
- Mye benyttet i bedriftsmarkedet til såkalte «LOB» (Line-Of-Business) applikasjoner

Program - filosofi (forenklet)

- Velg målestasjon (Orifice, USM, Coriolis)
- Velg densitometer, GC eller sampling
- Velg trykk/temperaturmåling

- Oppgi trykk
- Oppgi temperatur
- Oppgi typisk gasskomposisjon

- Programmet beregner tetthet, lydshastighet, utslippsfaktor, brennverdi etc vha AGA8 / AGA10 / ISO 6976

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←→

http://gasmetering.cloudapp.net/#MeteringStation

MeteringStation

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metering station

Metering Station Specification

<Enter Name>

16.03.2012

15

<Enter Description>

Flow Metering

☐ Single Meter

☐ Dual in Series

☒ Dual in Parallel

Orifice

Line Conditions

Temperature

Single

Pressure

Single

Gas Analysis

Densitometer

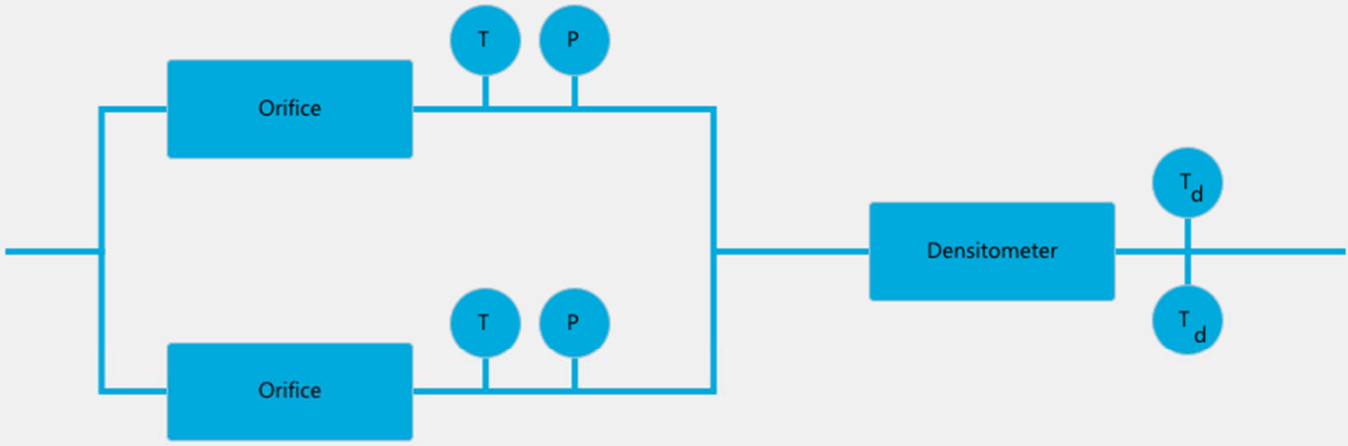
Densitometer Conditions

Temperature

Average

Pressure

None



Accept and Continue

Open From File..

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Process Conditions

Input tables for specifying process conditions that will be used in the uncertainty calculations. Values in blue color can be edited, and the most significant values are in bold.

LINE
CONDITIONS

GAS
COMPOSITION

Flow Rate: ☒ Sm³/h ☐ kg/h ☐ GJ/h

Meter Line Operating Conditions				
Line pressure	P	100	bara	
Line temperature	T	50	°C	
Ambient (air) temperature	Tair	0	°C	☒ Use default (0)

Densitometer Line Operating Conditions				
Pressure at densitometer	Pd	100	bara	☒ Use default (Line pressure, P)
Temperature at densitometer	Td	50	°C	☒ Use default (Line temperature, T)

Additional Operating Conditions				
Viscosity	μ	1.05E-05	Ns/m ²	☒ Use default (1.05E-5)

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Process Conditions

Input tables for specifying process conditions that will be used in the uncertainty calculations. Values in blue color can be edited, and the most significant values are in bold.

LINE CONDITIONS GAS COMPOSITION

Gas Components		$\Sigma = 100.00$	$\Sigma = 100$	
Methane	C1	86.29	86.29	mole %
Ethane	C2	5	5	mole %
Propane	C3	3	3	mole %
iso-Butane	iC4	1.1	1.1	mole %
n-Butane	nC4	0.9	0.9	mole %
iso-Pentane	iC5	0.35	0.35	mole %
n-Pentane	nC5	0.25	0.25	mole %
Hexane	C6	0.2	0.2	mole %
Heptane	C7	0.1	0.1	mole %
Octane	C8	0.05	0.05	mole %
Nonane	C9	0.02	0.02	mole %
Decane	C10	0.01	0.01	mole %
Nitrogen	N2	2	2	mole %
Carbon Dioxide	CO2	0.5	0.5	mole %
Water	H2O	0.01	0.01	mole %
Hydrogen Sulphide	H2S	0.1	0.1	mole %
Hydrogen	H	0.01	0.01	mole %
Carbon Monoxide	CO	0.01	0.01	mole %
Oxygen	O2	0.02	0.02	mole %
Helium	He	0.04	0.04	mole %
Argon	Ar	0.04	0.04	mole %

Computed Gas Properties (AGA8, AGA10, ISO6976)		
Compressibility at line conditions	Z	0.83776
Compressibility at std. ref. conditions	Z ₀	0.99703
Gas Density at line conditions	ρ	86.53311 kg/m ³
Gas Density at std. ref. conditions	ρ_0	0.82622 kg/m ³
Molar mass	m	19.47801 g/mol
Isentropic exponent	κ	1.41097
Velocity of sound	c	403.80138 m/s
Gross calorific value, 25°C Exhaust	H _s	51.86931 MJ/kg
Gross calorific value, 25°C Exhaust	H _s	42.85561 MJ/Sm ³
CO ₂ Emission Factor		2.69736 kg/kg
CO ₂ Emission Factor		2.22862 kg/Sm ³

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Gasskomposisjon

- **Må alltid ha denne**
 - Målt ved hjelp av online gasskromatograf
 - Målt ved hjelp av regulær prøvetaking
 - Fast komposisjon basert på sporadiske prøver eller simuleringer
- **Denne komposisjon benyttes til å beregne molar masse, tetthet, Z-faktor og brennverdi**
- **Metodikk for å beregne usikkerhet i gasskomponentene...?**

Gasskromatografi

-usikkerhet i gasskomponenter

■ Overall level

- ASTM 1945
- NORSOK I104
- Brukerdefinert

■ Detailed level

- Kalibreringsgass
- Repeterbarhet
- Linearitet

Gasskromatografi

-usikkerhet i gasskomponenter

■ Overall level

- ASTM 1945
- NORSOK I104
- Brukerdefinert

■ Detailed level

- Kalibreringsgass
 - NORSOK I104
 - 1 % i alle komponenter
 - 2 % i alle komponenter
 - Brukerdefinert
- Repeterbarhet
 - NORSOK I104
 - Brukerdefinert
- Linearitet
 - Brukerdefinert

Gass-sampling

-usikkerhet i gasskomponenter

- **Som for gasskromatograf**
- **Tillegg pga et endelig antall samples pr år, Student T**
 - Leser inn alle målte gasskomposisjoner fra analysene

Fast komposisjon

-usikkerhet i gasskomponenter

- **Må legge inn usikkerheter manuelt**

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Gas Analysis Properties and Uncertainty Specification

Input forms for specifying properties and uncertainties of the gas analysis equipment in the metering station. Values in blue color can be edited. Data for common equipment can be stored in template files and later be recalled.

GC ANALYSIS GAS PROPERTIES

Overall Input Level ▾

Select standard for overall uncertainty: NORSOK I104

Component		Concentration mol%		Relative Unc. %
Methane	C1	86.29	0.7285	0.84
Ethane	C2	5	0.0972	1.94
Propane	C3	3	0.0663	2.21
iso-Butane	iC4	1.1	0.0503	4.57
n-Butane	nC4	0.9	0.0503	5.59
iso-Pentane	iC5	0.35	0.0405	11.57
n-Pentane	nC5	0.25	0.0405	16.2
Hexane	C6	0.2	0.0339	16.95
Heptane	C7	0.1	0.0292	29.16
Octane	C8	0.05	0	0
Nonane	C9	0.02	0	0
Decane	C10	0.01	0	0

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Gas Analysis Properties and Uncertainty Specification

Input forms for specifying properties and uncertainties of the gas analysis equipment in the metering station. Values in blue color can be edited. Data for common equipment can be stored in template files and later be recalled.

GC ANALYSIS
GAS PROPERTIES

Overall Input Level ☐

Select standards for calibration and repeatability:

NORSOK I104
NORSOK I104

Component		Concentration mol%	NORSOK I104 1% Uncertainty 2% Uncertainty User Defined	Repeatability mol%, 95% Conf.	Linearity mol%, 95% Conf.	Total Unc. mol%, 95% Conf.	Relative Unc. %
Methane	C1	86.29		0.1	0	0.1995	0.23
Ethane	C2	5	0.025	0.04	0	0.0472	0.94
Propane	C3	3	0.015	0.04	0	0.0427	1.42
iso-Butane	iC4	1.1	0.0055	0.04	0	0.0404	3.67
n-Butane	nC4	0.9	0.009	0.04	0	0.041	4.56
iso-Pentane	iC5	0.35	0.0035	0.04	0	0.0402	11.47
n-Pentane	nC5	0.25	0.0125	0.04	0	0.0419	16.76
Hexane	C6	0.2	0.01	0.04	0	0.0412	20.62
Heptane	C7	0.1	0.005	0.04	0	0.0403	40.31
Octane	C8	0.05	0.0025	0.04	0	0.0401	80.16
Nonane	C9	0.02	0.001	0.04	0	0.04	200.06
Decane	C10	0.01	0.0005	0.04	0	0.04	400.03

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GC ANALYSIS
GAS PROPERTIES

Uncertainty in gas properties dependent on compressibility: first select Z_0 and Z specification

Z_0 Specification: ☒ ISO 6976 ☐ AGA8 ☐ User Def. [%, 95% conf.] 0.0522
 Z Specification: ☒ AGA8 ☐ User Def. [%, 95% conf.] 0.1

Uncertainty in CO2 Emission Factors

CO2 Emission Factor in kg/kg	0.185	%	95 % Confidence
CO2 Emission Factor in kg/Sm ³	0.375	%	95 % Confidence

Standard Volume Flow Model: uncertainty in $Z_0/\sqrt{mZ}$ factor due to model, line conditions and gas composition uncertainties

Input Variable	Uncertainty	Unit	Confidence	Std. Uncert. u_i	Sens. Coeff. s_i	Variance $(s_i \cdot u_i)^2$
$Z_{0,mod}$	0.0522	%	95% (norm)	0,0261 %	1,000 e+0	6,812 e-4 (%) ²
Z_{mod}	0.1	%	95% (norm)	0,05 %	5,000 e-1	6,250 e-4 (%) ²
$Z_0/\sqrt{mZ}_{ana}$	0.0544	%	95% (norm)	0,0272 %	1,000 e+0	7,395 e-4 (%) ²

Sum of variances, $\Sigma (s_i \cdot u_i)^2$ 0,002 (%)²

Relative Combined Standard Uncertainty 0,045 %

Relative Expanded Uncertainty (95% Confidence level, $k=2$) 0,09 %

Mass Flow Model: uncertainty in m/Z factor due to model, line conditions and gas composition uncertainties

Input Variable	Uncertainty	Unit	Confidence	Std. Uncert. u_i	Sens. Coeff. s_i	Variance $(s_i \cdot u_i)^2$
Z_{mod}	0.1	%	95% (norm)	0,05 %	1,000 e+0	2,500 e-3 (%) ²

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Flow Measurement Properties and Uncertainty Specification

Input forms for specifying properties and uncertainties of the flow meter equipment in the metering station. Values in blue color can be edited. Data for common equipment can be stored in template files and later be recalled.

ORIFICE METER
PIPE DIAMETER
ORIFICE METER
ORIFICE DIAMETER
ORIFICE METER
DISCHARGE COEFF.
ORIFICE METER
DIFF. PRESSURE
LINE CONDITIONS
TEMPERATURE
LINE CONDITIONS
PRESSURE

ISO 5167 Specification ▾

Properties and Constants						
Pipe Diameter	444.55	mm				

Input Variable	Uncertainty	Unit	Confidence	Std. Uncert. u_i	Sens. Coeff. s_i	Variance $(s_i \cdot u_i)^2$
Accuracy	0.4	%	95% (norm) ▾	0,8891 mm	1,000 e+0	7,905 e-1 (mm) ²

Combined Standard Uncertainty, U_c

0,889 mm

Expanded Uncertainty (95% Confidence level, $k=2$), $k \cdot U_c$

1,778 mm

Value

444,55 mm

Relative Expanded Uncertainty (95% Confidence level, $k=2$)

0,4 %

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http://gasmetering.cloudapp.net/#FlowMeter

FlowMeter Page

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Flow Measurement Properties and Uncertainty Specification

Input forms for specifying properties and uncertainties of the flow meter equipment in the metering station. Values in blue color can be edited. Data for common equipment can be stored in template files and later be recalled.

ORIFICE METER PIPE DIAMETER ORIFICE METER ORIFICE DIAMETER ORIFICE METER DISCHARGE COEFF. ORIFICE METER DIFF. PRESSURE LINE CONDITIONS TEMPERATURE LINE CONDITIONS PRESSURE

☒ Flange Tappings ☐ Corner Tappings ☐ D and D/2 Tappings

Computed Values	
Discharge Coefficient, C	0.6027
Reynolds Number, Re	22508357
L1	0.0571
L2	0.0571

Input Variable	Uncertainty	Unit	Confidence	Std. Uncert. u_i	Sens. Coeff. s_i	Variance $(s_i \cdot u_i)^2$
Discharge Coefficient, C	0.5	%	95% (norm)	0,0015	1,000 e+0	2,270 e-6
Misc.	0	%	95% (norm)	0	1,000 e+0	0,000 e+0

Sum of variances, $Uc^2 = \sum (s_i \cdot u_i)^2$ 2,270 e-6

Combined Standard Uncertainty, Uc 0,002

Expanded Uncertainty (95% Confidence level, $k=2$), $k \cdot Uc$ 0,003

Value 0,603

Relative Expanded Uncertainty (95% Confidence level, $k=2$) 0,5 %

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Flow Measurement Properties and Uncertainty Specification

Input forms for specifying properties and uncertainties of the flow meter equipment in the metering station. Values in blue color can be edited. Data for common equipment can be stored in template files and later be recalled.

ORIFICE METER
PIPE DIAMETER
ORIFICE METER
ORIFICE DIAMETER
ORIFICE METER
DISCHARGE COEFF.
ORIFICE METER
DIFF. PRESSURE
LINE CONDITIONS
TEMPERATURE
LINE CONDITIONS
PRESSURE

Overall Input Level ▼
Load ..
Save ..

Input Variable	Uncertainty	Unit	Confidence	Std. Uncert. u_i	Sens. Coeff. s_i	Variance $(s_i \cdot u_i)^2$
Uncertainty	0.3	mbar	95% (norm) ▼	0,15 mbar	1,000 e+0	2,250 e-2 (mbar) ²

Combined Standard Uncertainty, U_c
0,15 mbar
Expanded Uncertainty (95% Confidence level, $k=2$), $k \cdot U_c$
0,3 mbar
Value
305,201 mbar
Relative Expanded Uncertainty (95% Confidence level, $k=2$)
0,098 %

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Flow Measurement Properties and Uncertainty Specification

Input forms for specifying properties and uncertainties of the flow meter equipment in the metering station. Values in blue color can be edited. Data for common equipment can be stored in template files and later be recalled.

ORIFICE METER
PIPE DIAMETER
ORIFICE METER
ORIFICE DIAMETER
ORIFICE METER
DISCHARGE COEFF.
**ORIFICE METER
DIFF. PRESSURE**
LINE CONDITIONS
TEMPERATURE
LINE CONDITIONS
PRESSURE

Overall Input Level ☐
Load ..
Save ..

Properties and Constants

Span (calibrated)	550	mbar
Upper Range Limit	622	mbar
Time Between Calibrations	6	Months
Ambient Temp At Calibration	20	°C

Input Variable	Uncertainty	Unit	Confidence	Std. Uncert. u_i	Sens. Coeff. s_i	Variance $(s_i \cdot u_i)^2$
Transmitter	0.05	%Span	99% (norm)	0,0917 mbar	1,000 e+0	8,403 e-3 (mbar) ²
Stability	0.1	%URL/yr	95% (norm)	0,1555 mbar	1,000 e+0	2,418 e-2 (mbar) ²
RFI Effects	0.1	%Span	99% (norm)	0,1833 mbar	1,000 e+0	3,361 e-2 (mbar) ²
Ambient temp. effect	0.03	%Span	99% (norm)	0,002 mbar	1,000 e+0	4,000 e-6 (mbar) ²
Misc.	0	mbar	95% (norm)	0 mbar	1,000 e+0	0,000 e+0 (mbar) ²

Sum of variances, $U_c^2 = \sum (s_i \cdot u_i)^2$
6,620 e-2 (mbar)²

Combined Standard Uncertainty, U_c
0,257 mbar

Expanded Uncertainty (95% Confidence level, $k=2$), $k \cdot U_c$
0,515 mbar

Value
305,201 mbar

Relative Expanded Uncertainty (95% Confidence level, $k=2$)
0,169 %

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Uncertainty Calculation Results

Tables documenting the uncertainty calculations for the primary measurands. Values can not be edited in this view.

☒ Orifice Meter, Standard Volume Flow

Functional Relationship

$$q_{v0} = \frac{Z_0 T_0}{P_0} \frac{C}{\sqrt{1 - (\frac{d}{D})^4}} \varepsilon \frac{\pi d^2}{4} \sqrt{\frac{2 P_1 R \Delta P}{Z_1 m T_1}}$$

Computed Values

Expansibility Factor, ϵ	0.9991
Differential Pressure, ΔP	306.1353 mbar

Input Variable	Uncertainty	Unit	Confidence	Std. Uncert. u_i	Sens. Coeff. s_i	Variance $(s_i \cdot u_i)^2$
Discharge Coeff., C	0.5	%	95% (norm)	0,25 %	1,000 e+0	6,250 e-2 (%) ²
Expansibility Factor, ϵ	0.0076	%	95% (norm)	0,0038 %	1,000 e+0	1,451 e-5 (%) ²
Pipe Diameter, D	0.4	%	95% (norm)	0,2 %	2,950 e-1	3,481 e-3 (%) ²
Orifice Diameter, d	0.07	%	95% (norm)	0,035 %	2,295 e+0	6,452 e-3 (%) ²
Diff. Pressure, ΔP	0.1681	%	95% (norm)	0,084 %	5,000 e-1	1,766 e-3 (%) ²
Pressure, P	0.3	%	95% (norm)	0,15 %	5,000 e-1	5,625 e-3 (%) ²
Z0/√mZ factor	0.0905	%	95% (norm)	0,0452 %	1,000 e+0	2,046 e-3 (%) ²
Temperature, T	0.0928	%	95% (norm)	0,0464 %	5,000 e-1	5,387 e-4 (%) ²

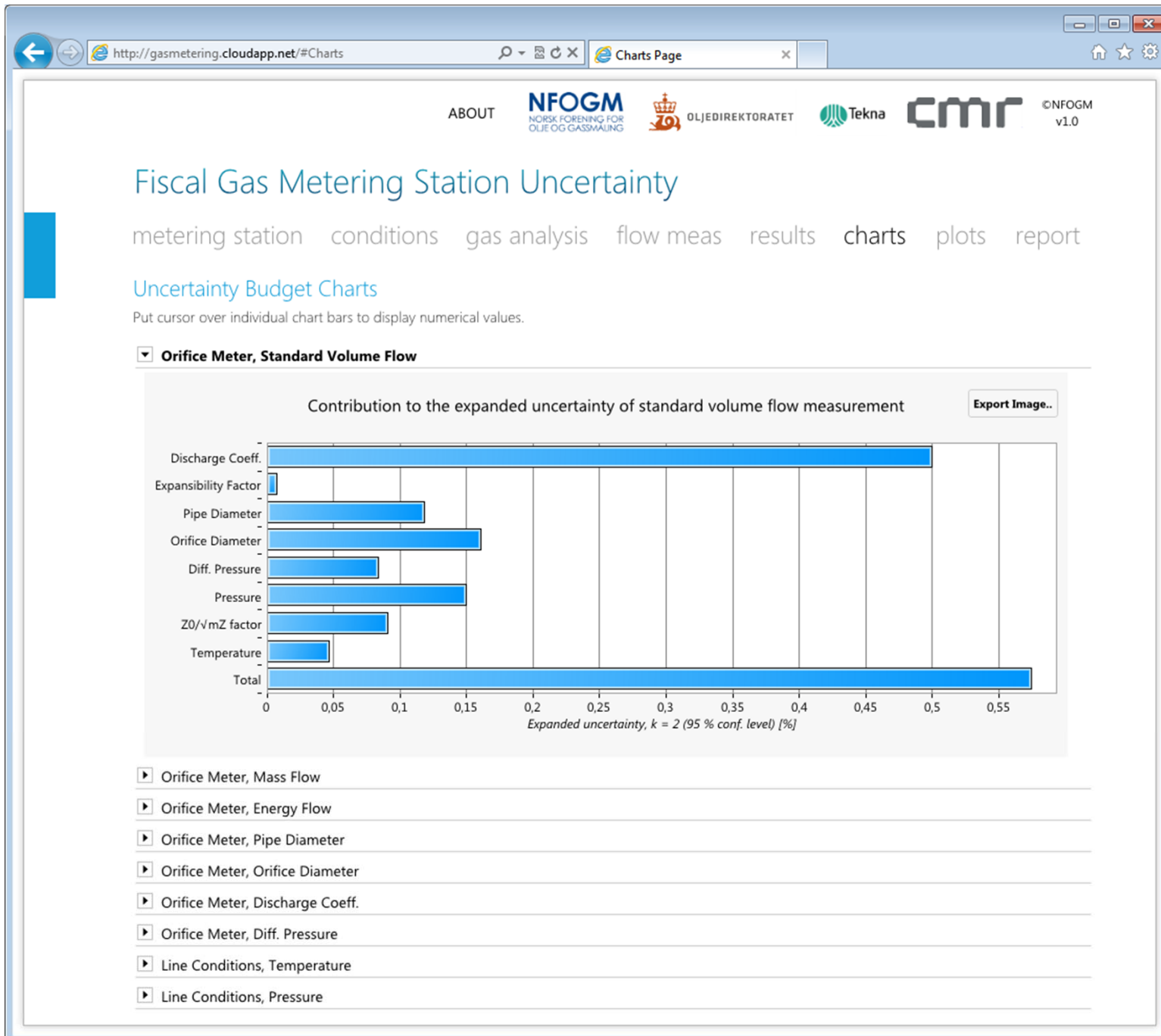
Sum of variances, $\Sigma (s_i \cdot u_i)^2$ 0,0824 (%)²

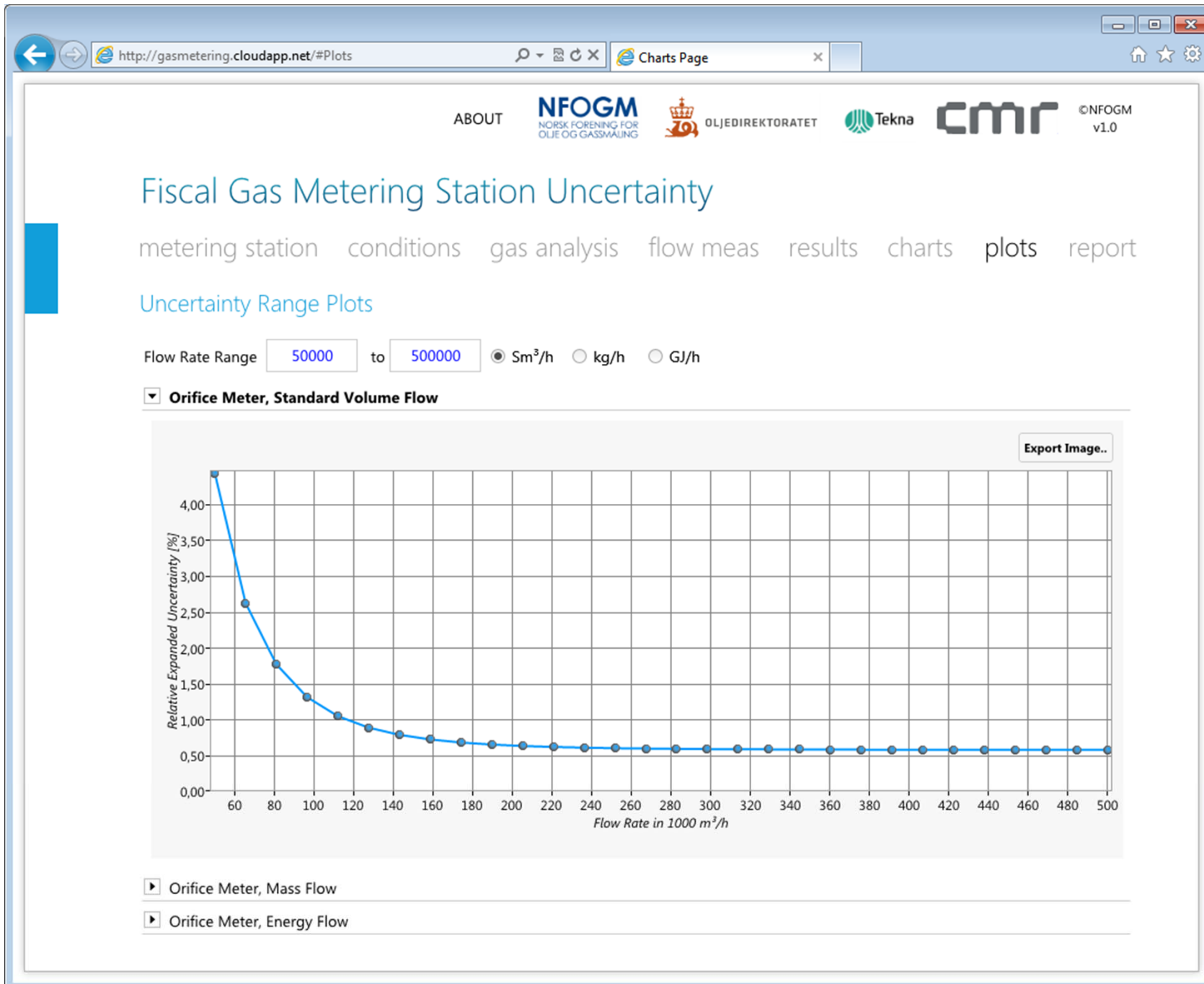
Relative Combined Standard Uncertainty 0,287 %

Relative Expanded Uncertainty (95% Confidence level, k=2) 0,574 %

☐ Orifice Meter, Mass Flow

☐ Orifice Meter, Energy Flow





http://gasmetering.cloudapp.net/#SaveResult Save Result Page

ABOUT NFOGM NORSK FORENING FOR OLJE OG GASSMÅLING OLJEDIREKTORATET Tekna cmr ©NFOGM v1.0

Fiscal Gas Metering Station Uncertainty

metering station conditions gas analysis flow meas results charts plots report

Uncertainty Report

Calculation result can be saved to file and opened for viewing and editing later.

Save uncertainty analysis.. Print report.. Note: preliminary file format that can change before final release

Gas metering station uncertainty report for: <Enter Name> 3/16/2012

<Enter Description>



Meter Line Operating Conditions			
Line pressure	P	100	bara
Line temperature	T	50	°C
Ambient (air) temperature	Tair	0	°C

Computed Gas Properties (AGA8, AGA10, ISO6976)			
Compressibility at line conditions	Z	0.83776	
Compressibility at std. ref. conditions	Z ₀	0.99703	
Gas Density at line conditions	ρ	86.53311	kg/m ³
Gas Density at std. ref. conditions	ρ ₀	0.82622	kg/m ³

Usikkerhetsmodell - ultralydmålere

■ Strømningskalibrering

- Avvikskurve
- Lab-referanse
- Repeterbarhet

■ Avvik fra kalibrering til feltinstallasjon

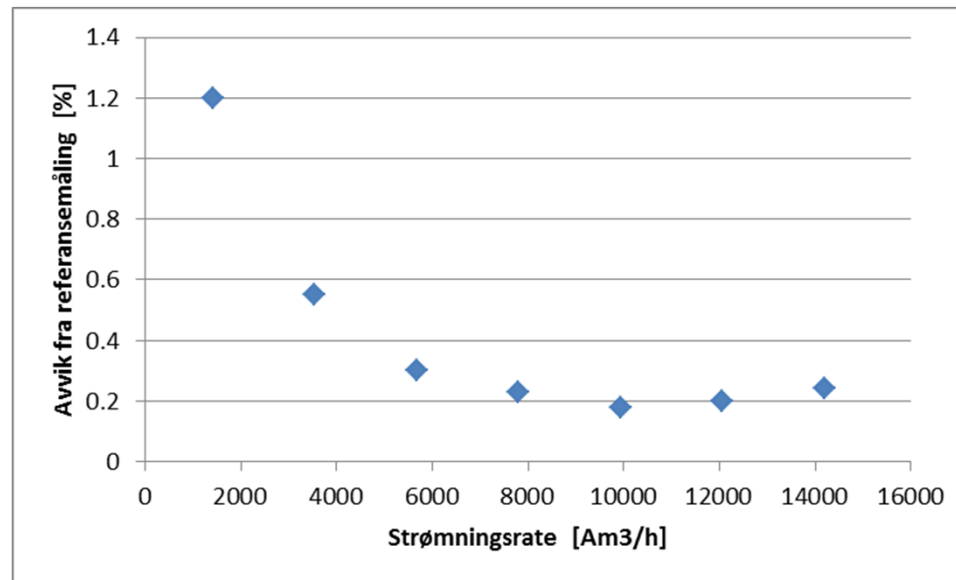
- Repeterbarhet
- Trykk og temperaturkorreksjoner på geometriske størrelser
- Gangtider
- Integrasjon/strømningsprofil
- Annet

■ Trykk, temperatur, tetthet etc.

Kalibreringsusikkerhet

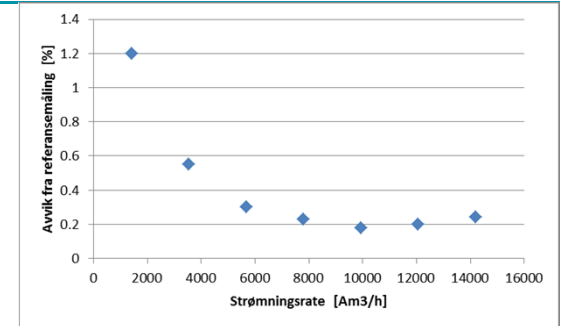
Eksempel:

Strømningstesten gir følgende resultat:



Hva blir usikkerhetsbidraget for dette avviket?

Kalibreringsusikkerhet

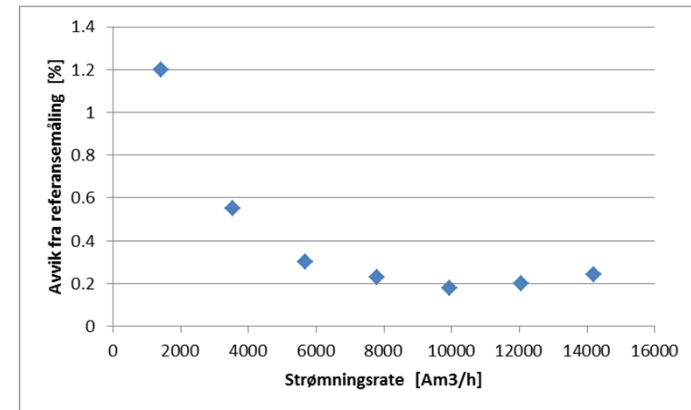


Kommer an på hvordan dette resultatet blir implementert i måleren!!!

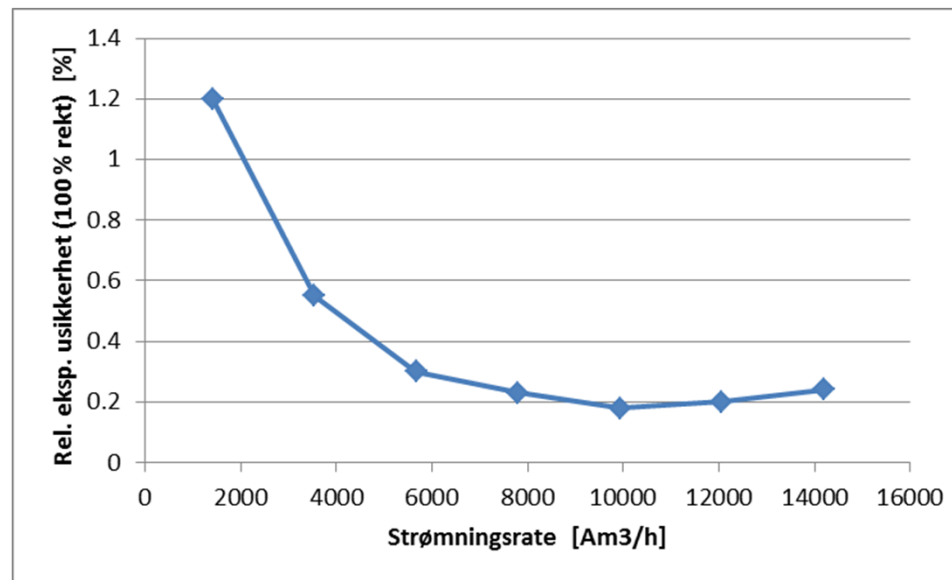
- Ingen korreksjon
- Strømningsuavhengig
- Lineær interpolasjon

Kalibreringsusikkerhet

- → Ingen korreksjon
- Strømningsuavhengig
- Lineær interpolasjon

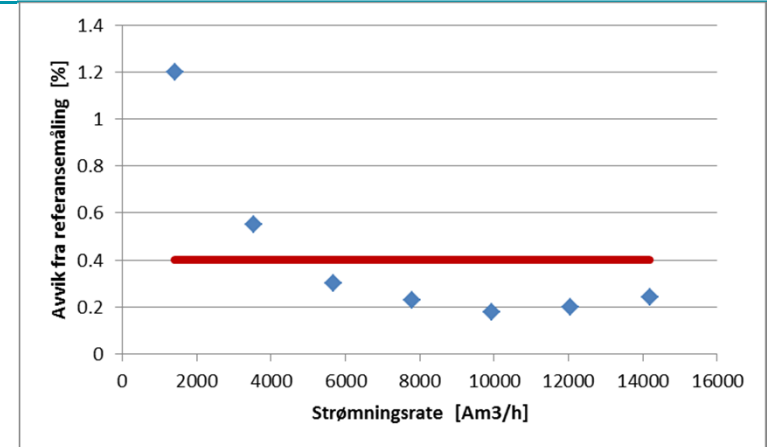


Relativ ekspandert usikkerhet (100 %, rektangulært)

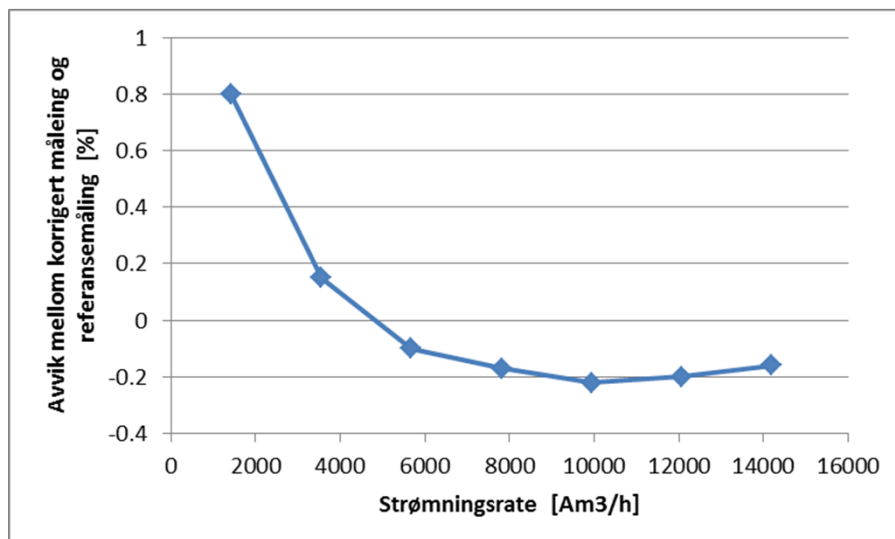


Kalibreringsusikkerhet

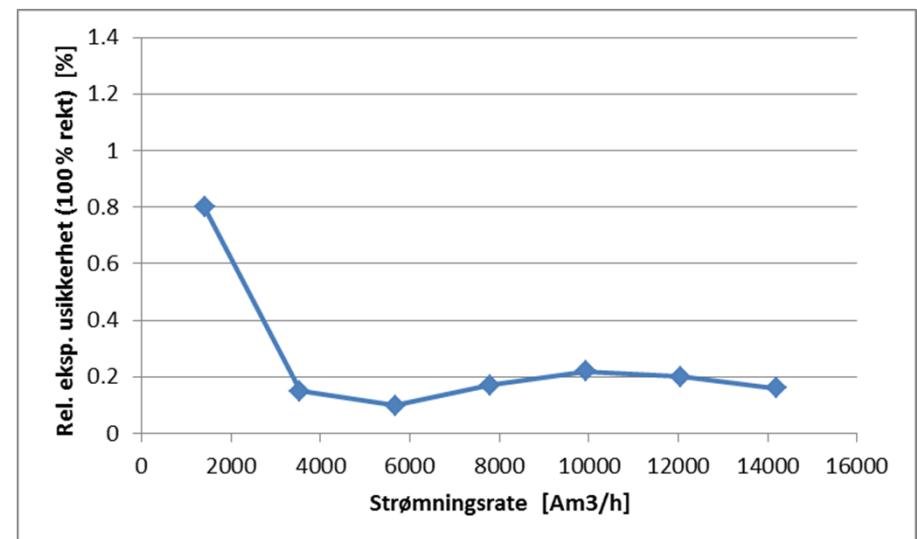
- Ingen korreksjon
- → **Strømningsuavhengig**
- Lineær interpolasjon



Avvikskurve etter korreksjon

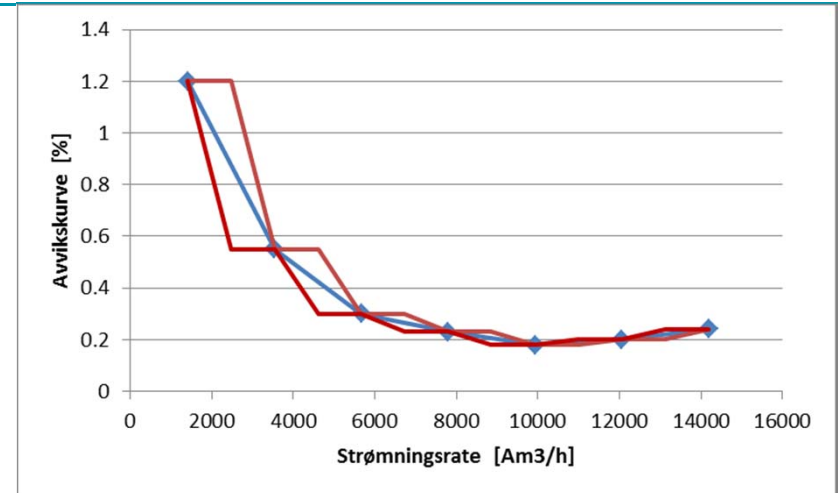


Relativ ekspandert usikkerhet (100 %, rektangulært)

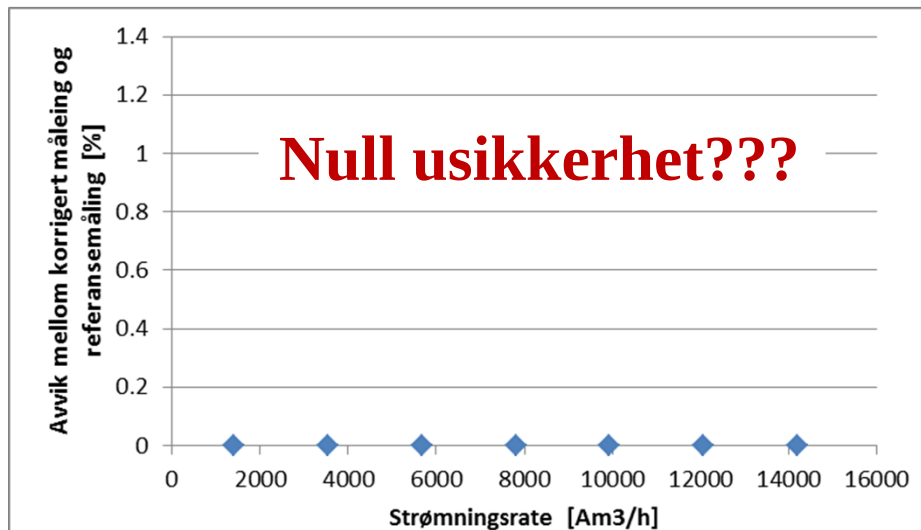


Kalibreringsusikkerhet

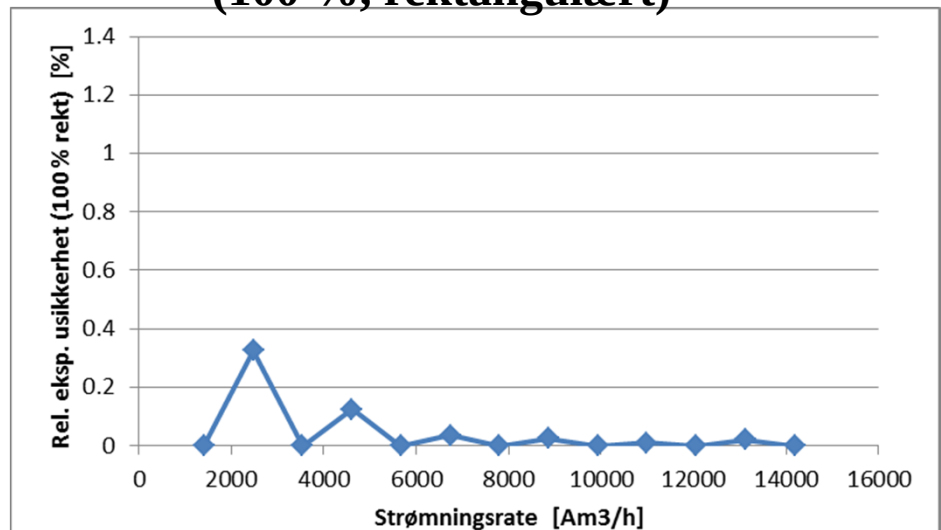
- Ingen korreksjon
- Strømningsuavhengig
- → Lineær interpolasjon



Avvikskurve etter korreksjon



Relativ ekspandert usikkerhet (100 %, rektangulært)



Ny håndbok - struktur

- *PART A - COMMON*
- *PART B – ORIFICE FISCAL METERING STATION*
- *PART C – USM FISCAL METERING STATION*
- *PART D – CORIOLIS FISCAL METERING STATION*
- *APPENDICES*

Ny håndbok - struktur

PART A - COMMON

- *Gas measurement uncertainties*
 - *Temperature measurement*
 - *Pressure measurement*
 - *Differential pressure measurement*
 - *Densitometer measurement*
 - *Gas composition measurement*
 - *Gas chromatography measurements*
 - *Flow proportional sampling and laboratory analysis*
 - *Spot sampling and laboratory analysis*
 - *Standard density*
 - *Calorific value*
 - *CO₂ emission factor*

Ny håndbok - struktur

PART B – ORIFICE FISCAL METERING STATION

PART C – USM FISCAL METERING STATION

PART D – CORIOLIS FISCAL METERING STATION

- *Description of metering station*
- *Functional relationship*
- *Uncertainty model*
- *Uncertainty evaluation example*
- *Activity data*
- *Two flow meters in series or parallel*

Ny håndbok - struktur

APPENDICES

- *Definitions and abbreviation*
- *Fundamentals of uncertainty evaluation*
- *Selected regulations for fiscal gas metering stations*
- *Pressure and temperature correction of the USM meter body*
- *Theoretical basis of USM uncertainty model*
- ...

Plan for ferdigstilling...

- Alle medlemmer av NFOGM får mail om mulighet til å se / teste ut dette verktøyet om få dager.
- Referansegruppemøte i april / mai.
- Publisering av håndbok/program ca juni 2012.