



Software Applications

Uncertainty Calculation Module Details

Abstract

This document lists the uncertainty calculation modules available for use in KELTON™
UNCERTAINTYPLUS™ and UNCERTAINTYLIVE™

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1.0 Revision Control

Rev	Issue date	Description	Prep.	App.
1	27/01/17	Format Document	MH	JON
1.1	27/07/17	Revised Module List	JS	MH
1.2	28/11/17	Reformatted	KW	JON
1.3	22/12/17	Revised Module List	JS	JON
1.4	10/09/18	Updated in accordance with Brand Guidelines	KW	JON

2.0 Coriolis Meter Modules

Module no.	Title	Module Description
UN-101	Gas Coriolis (Calc Dens, Calc Std Dens, Calc CV)	Calculates the uncertainty in mass, standard volume and energy flowrates for a gas flow through a Coriolis meter. Standard density, CV and their respective uncertainties are calculated from the gas composition. Coriolis meter flowrate uncertainty is determined using the technical specification for the Coriolis meter selected from the integrated meter selection tool.
UN-102	Gas Coriolis (basic)	Calculates the uncertainty in mass flowrate for a gas flow through a Coriolis meter. Coriolis meter flowrate uncertainty is determined using the technical specification for the Coriolis meter selected from the integrated meter selection tool.
UN-110	Liquid Coriolis (basic)	Calculates the uncertainty in mass and standard volume flowrates for a liquid flow through a Coriolis meter. Standard density and its uncertainty are manual inputs. Coriolis meter flowrate uncertainty is determined using the technical specification for the Coriolis meter selected from the integrated meter selection tool.
UN-112	Liquid Coriolis (Density based water cut meter, no prover)	Coriolis meter flowrate uncertainty is determined using the technical specification for the Coriolis meter selected from the integrated meter selection tool. Water cut is determined from known standard densities of water and oil in addition to line density of the oil-water mixture. Pressure, temperature and measured density uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool. The module replicates the “Net Oil” calculations to determine the “Net Oil” and “Water” mass flowrates and determines the associated uncertainties in these outputs. The “Net Oil” calculation require standard density inputs for both the oil and water phases, and uses the relevant standards for Ctl and Cpl to convert these densities to line conditions.
UN-113	Liquid Coriolis (Water cut meter, prover)	Calculates the uncertainty in mass and standard volume flowrate for a liquid flow through a Coriolis meter with an online prover and/or master meter. Meter observed volume flowrate uncertainties are determined from proving statistics as per API MPMS 4.2. Pressure, temperature and measured density uncertainties are determined using the technical

Module no.	Title	Module Description
		specification for the transmitters selected from the integrated transmitter selection tool.
UN-114	Liquid Coriolis (Water cut meter, no prover)	As per module UN-113, without prover/master meter configuration and is designed for stand-alone Coriolis meters. Coriolis meter flowrate uncertainty is determined using the technical specification for the Coriolis meter selected from the integrated meter selection tool. Pressure, temperature and measured density uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.

3.0 Ultrasonic Meter Modules

Module no.	Title	Module Description
UN-201	Gas USM (Calculated density, VCF and ECF)	Calculates the uncertainty in observed volume, mass, standard volume and energy flowrate for a gas USM. USM flowrate uncertainties are determined from an assessment of the meter calibration performance, installation and on-going performance/usage parameters. Density, standard density and CV calculations and their uncertainties are performed using user-selectable calculations. Pressure and temperature uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.
UN-202	Gas USM (Measured density)	Calculates the uncertainty in observed volume, mass, standard volume and energy flowrate for a gas USM. USM flowrate uncertainties are determined from an assessment of the meter calibration performance, installation and on-going performance/usage parameters. Density is determined from measurement and its uncertainty determined from the technical specifications of the densitometer used. Standard density and CV calculations and their uncertainties are performed using user-selectable calculations and the gas composition data. Pressure and temperature uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.
UN-204	Flare Gas USM (Calculated density from MW)	Calculates the uncertainty in observed volume, mass and standard volume flowrates for a USM used for flaring. USM flowrate uncertainties are determined from an assessment of the meter calibration performance, installation and on-going performance/usage parameters. Density is derived from molecular weight and its uncertainty gained from this relationship. Pressure and temperature uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.

Module no.	Title	Module Description
UN-414	Liquid USM (Water cut meter, no prover)	Calculates the uncertainty in observed volume, mass and standard volume flowrate for a liquid flow through a USM. USM flowrate uncertainties are determined from an assessment of the meter calibration performance, installation and on-going performance/usage parameters. Line and standard densities and their uncertainties are performed by user-selected density referral calculations. Pressure, temperature, measured density and water cut uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.
UN-416	Liquid USM (Sample based water cut, no prover)	Calculates the uncertainty in observed volume, mass and standard volume flowrate for a liquid flow through an USM. USM flowrate uncertainties are determined from an assessment of the meter calibration performance, installation and on-going performance/usage parameters. Line and standard densities and their uncertainties are performed by user-selected density referral calculations. Water cut is determined by sample and analysis. Pressure, temperature and measured density uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.

4.0 Turbine Meter Modules

Module no.	Title	Module Description
UN-211	Gas Turbine	Calculates the uncertainty in observed volume, mass, standard volume and energy flowrate for a gas turbine meter. Meter flowrate uncertainties are determined from an assessment of the meter calibration performance, installation and on-going performance/usage parameters. Density, standard density and CV calculations and their uncertainties are performed using user-selectable calculations. Pressure and temperature uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.
UN-212	Gas Turbine (AGA7 PTZ)	Calculates the uncertainty in observed volume and standard volume flowrate for a gas turbine meter. Observed volume flowrate uncertainty are determined from an assessment of the meter calibration performance, installation and on-going performance/usage parameters. VCF is calculated as per AGA Report No. 7 and its uncertainty is used to determine the uncertainty in standard volume flowrate. Pressure and temperature uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool. Uncertainty in line and standard density can be entered by the user.

Module no.	Title	Module Description
UN-213	Gas Turbine (Basic)	Calculates the uncertainty in observed volume, standard volume and mass flowrate for a gas turbine meter. Meter flowrate uncertainties are determined from an assessment of the meter calibration performance, installation and on-going performance/usage parameters. Pressure and temperature uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.
UN-401	Liquid Turbine (Density based water cut, prover)	Calculates the uncertainty in observed volume, mass and standard volume flowrate for a liquid flow through a turbine with an online prover and/or master meter. Meter observed volume flowrate uncertainties are determined from proving statistics as per API MPMS 4.2. Line and standard densities and their uncertainties are performed by user-selected density referral calculations. Pressure, temperature and measured density uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool. The module replicates the “Net Oil” calculations to determine the “Net Oil” and “Water” mass flowrates and determines the associated uncertainties in these outputs. The “Net Oil” calculation require standard density inputs for both the oil and water phases, and uses the relevant standards for Ctl and Cpl to convert these densities to line conditions.
UN-403	Liquid Turbine (Water cut meter, prover)	Calculates the uncertainty in observed volume, mass and standard volume flowrate for a liquid flow through a turbine meter with an online prover and/or master meter. Meter observed volume flowrate uncertainties are determined from proving statistics as per API MPMS 4.2. Line and standard densities and their uncertainties are performed by user-selected density referral calculations. Pressure, temperature, measured density and water cut uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.
UN-404	Liquid Turbine (Water cut meter, no prover)	As per module UN-403, without prover/master meter configuration.
UN-405	Liquid Turbine (Sample based water cut, prover)	Calculates the uncertainty in observed volume, mass and standard volume flowrate for a liquid flow through a turbine meter with an online prover and/or master meter. Meter observed volume flowrate uncertainties are determined from proving statistics as per API MPMS 4.2. Line and standard densities and their uncertainties are performed by user-selected density referral calculations. Water cut is determined by sample and analysis. Pressure, temperature and measured density uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.

Module no.	Title	Module Description
UN-406	Liquid Turbine (Sample based water cut, no prover)	As per module UN-405, without prover/master meter configuration.

5.0 Vortex Meter Modules

Module no.	Title	Module Description
UN-221	Gas Vortex (Calculated density, VCF and ECF)	Calculates the uncertainty in observed volume, mass, standard volume and energy flowrate for a gas vortex meter. Meter flowrate uncertainties are determined from an assessment of the meter calibration performance, installation and on-going performance/usage parameters. Density, standard density and CV calculations and their uncertainties are performed using user-selectable calculations. Pressure and temperature uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.
UN-423	Liquid Vortex (Water cut meter)	Calculates the uncertainty in observed volume, mass and standard volume flowrate for a liquid flow through a vortex meter. Line and standard densities and their uncertainties are performed by user-selected density referral calculations. Pressure, temperature, measured density and water cut uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.

6.0 Orifice Plate Meters

Module no.	Title	Module Description
UN-301	Gas Orifice (Calc Dens, Calc Std Dens, Calc CV)	Calculates the uncertainty in mass, standard volume and energy flowrate for a gas orifice meter run. Mass flowrate, density, standard density and CV calculations and their uncertainties are performed using user-selectable calculations. Pressure, temperature and differential pressure uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.
UN-302	Gas Orifice (NX-19 density)	As per module UN-301, except this module has been modified to use NX-19 as opposed to a full compositional analysis.
UN-303	Liquid Orifice	Calculates the uncertainty in mass and standard volume flowrate for a liquid orifice meter run. Mass flowrate, density and standard density calculations and their uncertainties are performed using user-selectable calculations based on the density measured using a densitometer. Pressure, temperature, differential pressure and density uncertainties

Module no.	Title	Module Description
		are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.
UN-304	Liquid Orifice (Water cut meter)	As per module UN-303 with the addition of the calculation of 'wet' and 'dry' flowrate uncertainty where the water content is user entered or measured using a water cut meter.
UN-305	Wet Gas Orifice (Calc Dens, Calc Std Dens, Calc CV)	Calculates the uncertainty in the corrected gas mass flowrate from an orifice plate encountering a wet gas flow using the wet gas correction described in ISO TR 12748. Mass uncertainty is based on "dry gas" uncertainty (as per Module 301) in addition to wet gas parameters and their uncertainties. Standard density and energy flowrate uncertainties are also estimated from this corrected gas mass flowrate. Pressure, temperature and differential pressure uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.
UN-306	Gas Orifice (Measured density)	Calculates the uncertainty in mass, standard volume and energy flowrate for a gas orifice meter run. Mass flowrate, standard density and CV calculations and their uncertainties are performed using user-selectable calculations. Pressure, temperature, differential pressure and density uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.
UN-307	Gas Orifice (User entered density)	Calculates the uncertainty in mass and standard volume flowrate for a gas orifice meter run. Mass flowrate and its uncertainty are performed using user-selectable calculations. Pressure, temperature and differential pressure uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool. Uncertainty in line and standard density can be entered by the user.
UN-308	Liquid Orifice (User entered density)	Calculates the uncertainty in mass and standard volume flowrate for a liquid orifice meter run. Mass flowrate and its uncertainty are performed using user-selectable calculations. Pressure, temperature and differential pressure uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool. Uncertainty in line and standard density can be entered by the user.

7.0 Cone Meter Modules

Modules under development.

8.0 Venturi Meter Modules

Module no.	Title	Module Description
UN-321	Gas Venturi (Calc Dens, Calc Std Dens, Calc CV)	Calculates the uncertainty in mass, standard volume and energy flowrate for a gas Venturi meter run. Mass flowrate, density, standard density and CV calculations and their uncertainties are performed using user-selectable calculations. Pressure, temperature and differential pressure uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.
UN-322	Wet Gas Venturi (Calc Dens, Calc Std Dens, Calc CV)	Calculates the uncertainty in the corrected gas mass flowrate from a Venturi encountering a wet gas flow, using a “Chisholm De Leeuw” based wet gas correction. Mass uncertainty is based on “dry gas” uncertainty (as per Module 321) in addition to wet gas parameters and their uncertainty. Standard density and energy flowrate uncertainties are also estimated from this corrected gas mass flowrate. Pressure, temperature and differential pressure uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.
UN-324	Gas Venturi (Measured density)	Calculates the uncertainty in mass, standard volume and energy flowrate for a gas Venturi meter run. Mass flowrate, standard density and CV calculations and their uncertainties are performed using user-selectable calculations. Pressure, temperature, differential pressure and density uncertainties are determined using the technical specification for the transmitters selected from the integrated transmitter selection tool.

9.0 Electromagnetic Flow Meter Modules

Module no.	Title	Module Description
UN-501	Water Electromagnetic Flow Meter	Calculates the uncertainty in volume flowrate for an electromagnetic flow meter measuring water. Water density and its uncertainty are entered by the user to also obtain mass flow uncertainty.