

Data Sheet

flowIQ® 2100 & 3101 Encoded Output

- AWWA C715-18 compliant
- Ultrasonic measurement
- Pinpoint accuracy
- 20 year longevity
- Dual temperature measurement
- IP68 vacuum sealed construction
- Lead free and certified to NSF/ANSI 61



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Electronic ultrasonic cold water meter for measurement of cold water consumption in households, multi-unit buildings and industry.

Pinpoint accuracy

Ultrasonic flow measurement guarantees pinpoint accuracy and longevity. Ultrasonic flow measurement is based on the transit time method, and all measurements, references, readings, calculations and data communication are controlled by an advanced, specially designed electronic circuit. Thus, the meter includes no moving parts, which makes the meter less subject to wear and tear and impurities in the water.

Construction

The meter is hermetically closed and vacuum-sealed to prevent humidity from reaching the electronics and avoid condensation between the glass and display. The meter is IP68 (submersible) type tested and suitable for installation in meter pits.

Installation

In addition to water usage, the meter measures water and ambient temperatures and monitors and records numerous alarm conditions, including leak detection with a configurable sensitivity as low as 1/40th of GPM.

Kamstrup meters can be configured to transmit alarm flags and raw ambient temperature over Encoded Output. Several third party AMI radio endpoints support Kamstrup Extended Alarms via Encoded Output.

Using a magnet, a 4 step menu can easily provide WYSIWYG visualization of Encoded Output Configuration, real-time Rate of Flow and LCD Segment test using the 9-digit LCD.

Specific features

flowIQ® 2100/3101 measures the water and environment temperatures and it includes leak detection, securing that water loss is discovered quickly.

The unique combination of all the flowIQ® 2100/3101 features reduces current operating costs to measure water usage and minimizes unexpected expenses in connection with possible leakage.

Environmentally friendly

The meter has been approved according to Drinking Water Standards in multiple countries, and it is certified to NSF/ANSI 61. The meter housing and measuring part are made of the synthetic material polyphenylene sulfide (PPS), which is free from lead and other heavy metals. The environmental report, Carbon Footprint, documents the meter's high reusability and low environmental impact, including recycling of materials.

Hygiene

To protect the health of the consumers Kamstrup has a hygienic manufacturing process of the water meters. Kamstrup has a highly automated manufacturing process, and only uses materials which are approved for drinking water. Furthermore the products gets disinfected before dispatch. The hygiene is being controlled by external accredited laboratories and by frequent audits.

General description

The meter is a hermetically closed static water meter, intended for the measurement of cold water consumption. The water meter uses the ultrasonic principle and has been designed and constructed on the basis of Kamstrup's experience in the development and production of static ultrasonic meters, since 1991.

The meter has been subjected to a comprehensive set of tests to ensure a long-term, accurate and reliable meter. This technology has many advantages, including no moving parts so the meter is less sensitive to particles in the water which also ensures a high and stable accuracy throughout its lifetime. Furthermore, the meter has a start flow of only 0.015 GPM, which provides accurate measurement at low water flows.

The meter housing is constructed as a vacuum chamber of molded composite material. Thus, the electronics are fully protected against penetration of water, making the meter suitable for mounting in meter pits or other environments subject to frequent flooding.

The volume is measured using bidirectional ultrasonic technique based on the transit time method, proven as a long-term and accurate measuring principle. Two ultrasonic transducers send sound signals against and with the flow. The ultrasonic signal traveling with the flow reaches the opposite transducer first. The time difference between the two signals can be converted into flow velocity and thereby the volumetric flow rate can be calculated.

The accumulated water consumption is displayed in gallons or cubic feet with nine digits and up to three decimals, to clearly display usage data.

In addition to volume reading, a number of information codes are displayed.

The meter also measures both water and ambient temperature continuously, storing minimum, mean and maximum temperatures daily.

All registers are saved daily in the meter memory for 460 days. Monthly data for the latest 36 months are also saved.

The meter is fitted with an optical eye, which makes it possible to read consumption data and information codes, stored in the meter's data logger. Using a USB or Bluetooth connection, the optical eye gives access to configure the meter.

The water meter is powered by an internal lithium battery.

The meter can and must only be opened by one of Kamstrup's authorized service centers by means of special tools. If the meter has been opened and the seals have thus been broken, the meter is no longer valid for billing purposes. Furthermore, the factory guarantee no longer applies.

Technical data

Electrical data

Battery 3.65 VDC, 1 C cell lithium

Mechanical data

Mechanical environment Class M1 (Measuring Instruments Directive classification)

Ambient temperature 35 °F...130 °F ¹⁾

Protection class IP68-rated (waterproof/submersible)

Water temp.:

- flowIQ® 2100 33 °F...140 °F

- flowIQ® 3101 33 °F...140 °F

Storage temp. empty meter -10 °F...140 °F ¹⁾

Maximum operating pressure:

- flowIQ® 2100 250 PSI

- flowIQ® 3101 300 PSI

¹⁾Note: Battery life is assured by limiting maximum temperature to 95 °F

Accuracy

MPE (maximum permissible error) according to AWWA C715-18

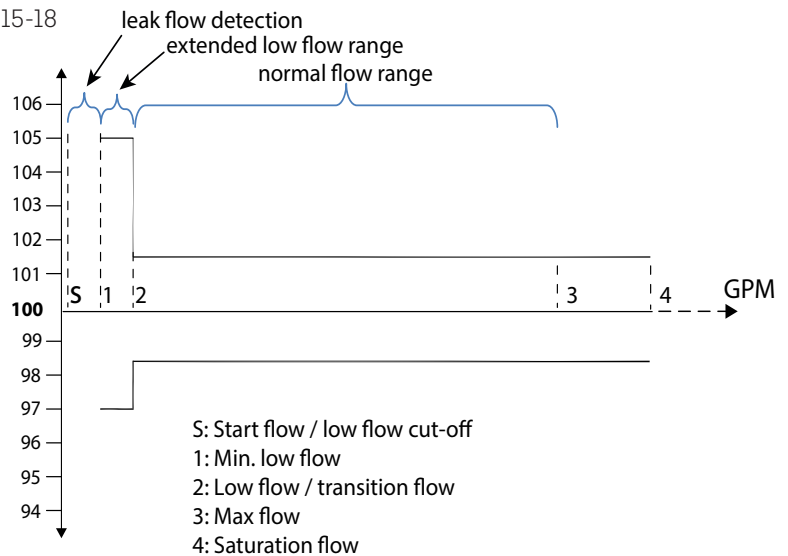
Meter approved for 33 °F...95 °F:

± 5 % in extended low flow range

± 1.5 % in 'normal flow' range

Approvals

Certified to NSF/ANSI 61



Material

Wetted parts

Meter housing Polyphenylene sulfide (PPS) with fiberglass reinforcement

Flow part:

- flowIQ® 2100 Polyphenylene sulfide (PPS) with fiberglass reinforcement

- flowIQ® 3101 Stainless steel, 316

Reflectors Stainless steel, 304L

Strainer Polyarylethersulfone

AWWA C715-18 Compliance

flowIQ® 2100 & 3101 Encoded output meters are fully compliant with the AWWA C715-18 guideline.

The meters fulfill all the requirements regarding:

- Test points (minimum, intermediate, maximum), according to AWWA Manual M6, November 2018
For more information see the table under “Meter sizes” below
- Pressure loss
For more information see the pressure loss graph under “Pressure loss” on page 14
- Low battery and flow indication in display
For more information see “Flow, low battery and indicator test.” on page 8

Meter sizes

flowIQ® 2100 is available in the following sizes:

Type number (composite)	Meter size	Max. flow for continuous operation GPM (3)	Start flow GPM (S)	Saturation flow rate GPM	Min. flow GPM (1)	Transition flow GPM (2)	Pressure loss at SMOC PSI	Connection on meter NPSM thread	Lay Length Inches
02U-23-C01-8EX	½" x ½"	25	0.015	37	0.10	0.15	4.1	¾" thread	7½"
02U-23-C03-8EX	½" x ¾"	25	0.015	37	0.10	0.15	4.1	1" thread	7½"
02U-23-C07-8EX	¾" x ¾"	25	0.015	37	0.10	0.15	4.1	1" thread	5.1"
02U-23-C08-8EX	¾"	32	0.02	42	0.10	0.15	3.0	1" thread	7½" or 9"

* Note: meter version C08 includes an 1½" extension (installed by the customer) to fit 7½" or 9" lay lengths.

flowIQ® 3101 is available in the following sizes:

Type number (stainless steel)	Meter size	Max. flow for continuous operation GPM (3)	Start flow GPM (S)	Saturation flow rate GPM	Min. flow GPM (1)	Transition flow GPM (2)	Pressure loss at SMOC PSI	Connection on meter NPSM thread/ flange	Lay length Inches
03U-23-C0R-8EX	¾"	35	0.025	50	0.10	0.15	5.3	1" thread	7½"
03U-23-C0U-8EX	¾"	35	0.015	50	0.10	0.15	5.3	1" thread	9"
03U-23-C0S-8EX	1"	55	0.04	100	0.25	0.4	4.0	1¼" thread	10¾"
03U-23-C0J-8EX	1½"	120	0.06	200	0.4	1.2	8.0	1½" flange	13"
03U-23-C0K-8EX	2"	160	0.11	330	0.5	1.5	2.0	2" flange	17"
03U-23-C0L-8EX	2"	160	0.13	330	0.5	1.5	2.0	2" flange	15¼"
03U-23-C0M-8EX	3"	350	0.23	500	2.5	7.5	3.5	3" flange	12"
03U-23-C0N-8EX	4"	700	0.35	1000	3.5	5	3.6	4" flange	14"

Meter face details

Meter information in permanent laser engraved text.



Measurement of temperatures

Temperature monitoring

All meters measure ambient temperature and meters rated 32 GPM or below measure water temperature. The measurements can be used to monitor the installation and to give an indication of the temperature of the water when the water reaches the end user. Both temperatures are logged in the daily and monthly records.

Minimum, mean and maximum values are logged daily. The register contains the last 460 days.

On the first day of each month the minimum, maximum and average temperatures, recorded in the past month, are stored in the register. The register stores values from the last 36 months.

Temperature values are referred to in °F and can be read via the optical eye. Extended Alarms can be configured to send "triggers", based on ascending or descending daily temperatures, or to send the raw ambient temperature over Encoded Output.

Ambient temperatures

Monitoring the ambient temperature of the installation can be used as a warning of freezing temperatures or unintended high temperatures. The measurement in the meter housing corresponds to the ambient temperature where the meter is installed. The temperature is measured every minute. The maximum and minimum values are calculated based on a 2 minute average value. The average temperature is a time-weighted mean value.

Water temperatures

Water temperature measurements are made as an indirect measurement of the water using the ultrasound signal. The water temperature is measured every 32 seconds.

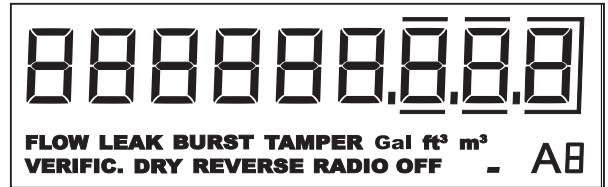
The maximum and minimum values are calculated every 2 minutes and is based on an average since the last calculation. Measurement of water temperature requires that the meter is filled with water. If there is no water within the meter a code will be saved, indicating DRY.

Display and information codes

Display

The meter can be read from the large, easily readable, specially designed display. Nine large figures indicate number of gallons or cubic feet. The last three figures may indicate decimals.

The information codes in the display have the following meaning and function:



Info codes

Info code flashes in the display	Meaning
FLOW	The FLOW info code is the digital equivalent of a spinning proving wheel featured on many mechanical meters. Indicates water flow through the meter. If there is no flow, the text will be off. This text does not blink.
LEAK	The water has not been stagnant in the meter during the last few days. This can be a sign of a leaky tap or toilet.
BURST	The water flow has exceeded a preprogrammed limit for a minimum of 30 minutes which is a sign of a burst pipe.
TAMPER	Attempt of fraud. The meter is no longer valid for billing.
Gal / ft ³ / m ³	Consumption is indicated in gallons, cubic feet or cubic meters
VERIFIC	Will always be off when the meter is in operation - text will be on during factory control and verification of the meter.
DRY	The meter is not water-filled. In this case nothing will be measured.
REVERSE	The water flows through the meter in the wrong direction.
Squared 'dot'	One small square flashing indicates that the meter is active.
'A' followed by a number Change log	Indicates the number of metrologic changes the meter has gone through after factory verification. If no adjustments have been made both the A symbol and the digit are inactive.

Information codes 'LEAK', 'BURST', 'DRY' and 'REVERSE' switch off automatically, when the conditions that activated them no longer exist. In other words, 'LEAK' disappears when the water is stagnant; 'BURST' disappears when the consumption falls to normal level; 'REVERSE' disappears when the water no longer flows in the wrong direction; and 'DRY' disappears when the meter again is filled with water.

Active alarm flags can persist for 2 to 6 minutes after the active alarm condition has cleared.

Display and information codes

Flow, low battery and indicator test.

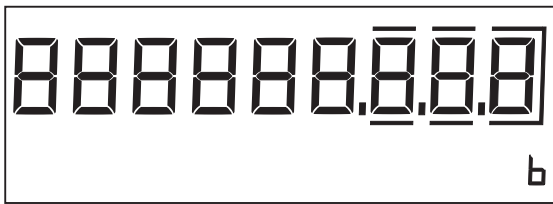
According to AWWA C715-18 it is required that the meter can display flow, low battery and test all the segments in the display.

Low battery

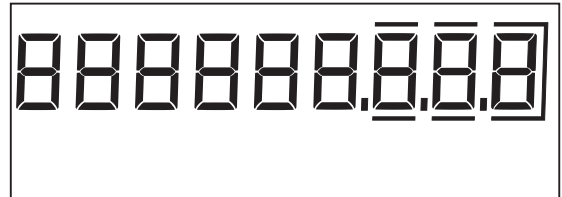
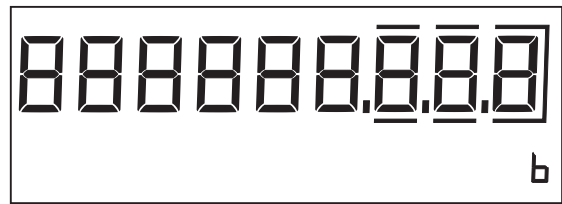
When the meter detects low battery it will automatically alternate between the adjustment mark (e.g. A1 or blank) and "b" for low battery. See illustration below.

The accumulated volume shown in the display will not be affected in any way.

Meter adjusted once






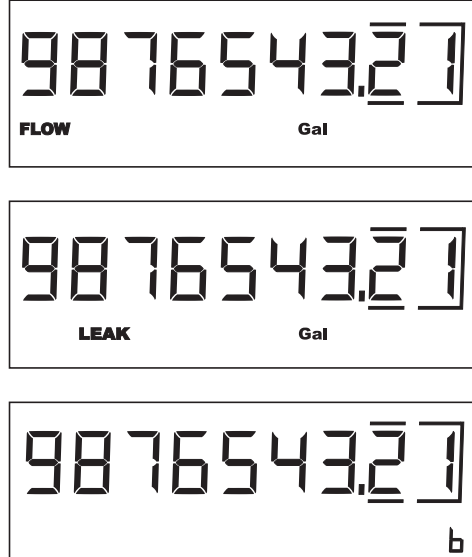
Meter not adjusted



Display and information codes

Flow and segment test

Apply a magnet (Optical reader head) to the optical eye on the meter to toggle between the menus shown in the list below. Once the magnet has been applied it will switch to the next page within 4 sec. Remove the magnet for 1 sec. and apply again for 1 sec. to toggle between the menus.

Menu number	Display example
<p>1 Normal display</p>	
<p>2 Encoded Output – visualization For more information see section Encoded Output - visualization</p>	
<p>3 Installation mode Flow in US gallon per minute [GPM] always shown with 2 fixed decimals. This is not configurable. To avoid any confusion all volumetric indicators such as “gal” are turned off. Adjustment mark shows “F” for flow When this menu is selected the meter switches back and forth every 4 seconds between menu 1 and 3. Installation mode runs for about 2 minutes.</p>	
<p>4 Display indicator test. Continually displaying the following info every second separately – regardless of the meter operation.</p> <ul style="list-style-type: none"> • All LCD Segments simultaneously illuminated, then current volume and unit is shown continuously again. • Flow • Leak • Burst • Tamper • Verification mode • Dry • Reverse • [A] – metrologic change • [b] – low battery • [E] – Encoded Output visualization • [F] – rate of flow [GPM] 	

Data registers

The meter has an integrated data logger, in which the values of various data logs are saved.

The meter includes the following registers:

Data logging interval	Data log records	Logged value
Monthly logger	36 months	See table below
Daily logger	460 days	See table below
Info logger	50 events	Info code, meter reading and date

Therefore, it is always possible to read target volume and information codes for each of the latest 36 months as well as corresponding meter reading and possible information codes for each of the latest 460 days. The data logs can only be read via the meter's optical eye.

The monthly log is written on the first day of the subsequent month; the daily logger is written at midnight.

The following registers are logged:

Register type	Description	Monthly logger, 36 months	Daily logger, 460 days
Date (YY.MM.DD)	Logging time, year, month and day	•	•
Volume	Current meter reading (legal)	•	•
Operating hour counter	Accumulated number of operating hours	•	•
Info	Information code	•	•
Vol Reverse	Volume during reverse flow	•	–
Date of max. flow	Date stamp of max. flow during period	•	–
Max. flow, V1	Value of max. flow during period	•	•
Date of min. flow, V1	Date stamp of min. flow during period	•	–
Min. flow V1	Value of min. flow during period	•	•
Min. temp. water ¹⁾	Water temperature – minimum	•	•
Max. temp. water ¹⁾	Water temperature – maximum	•	•
Avg. temp. water ¹⁾	Volume weighted mean water temp.	•	•
Min. temp.	Meter temperature – minimum	•	•
Max. temp.	Meter temperature – maximum	•	•
Avg. temp.	Meter temp. – time weighted average	•	•

¹⁾ Water temperature can only be measured for meters rated 35GPM or below.

Every time the information code changes, date and information codes are logged. Thus, it is possible to read the latest 50 changes of the information code as well as the date the change was made. Reading is only possible via the optical eye.

Encoded Output version

General description

Encoded Output is compatible with a number of RF network systems. In addition to Type Number and Configuration Code, three additional items are required to specify Encoded Output version meters:

EO Order Code: Letters A through Z, which specifies Data Packet and EO Digits
 Alarms included: Default = Off, optional Extended Alarm V1, Extended Alarm V2 (includes low battery and raw temperature)*

Connector/Cable Type:

Itron or Nicor – 5’ or 25’ AWG 22
 Open end, stranded – 5’ or 25’ AWG 22
 TRPL – 5’ or 25’ AWG 22

All must be ordered separately as accessories.

Encoded Output packages

18 Encoded Output options are available, which transmit from 4 to 9 digits, via the following three protocols:

Sensus UI-1203 4 to 9 digits, with or without extended alarms, 16 total EO options
 Neptune E-Coder 8 digits, with Neptune alarms, 1 EO option

*) Note. Kamstrup Alarm Protocol [KAP] is available and included by default with all Sensus data protocols.

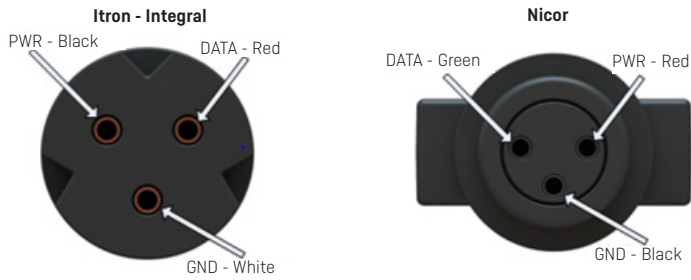
Encoded Output - ordering details

Encoded Output ordering details - total of 18 ordering options

Encoded Output Description	EO Digits Visualization	Order Code
Sensus 9-digit	[987654321]	Z
Sensus 8-digit	[98765432*]	A
Sensus 7-digit	[9876543**]	B
Sensus 7-digit [-1]	[*8765432*]	C
Sensus 6-digit	[987654***]	D
Sensus 6-digit [-1]	[*876543**]	E
Sensus 6-digit [-2]	[**765432*]	F
Sensus 5-digit	[98765****]	G
Sensus 5-digit [-1]	[*87654***]	H
Sensus 5-digit [-2]	[**76543**]	J
Sensus 5-digit [-3]	[***65432*]	K
Sensus 4-digit	[9876*****]	L
Sensus 4-digit [-1]	[*8765****]	M
Sensus 4-digit [-2]	[**7654***]	N
Sensus 4-digit [-3]	[***6543**]	P
Sensus 4-digit [-4]	[****5432*]	Q
Neptune 8-digit [E-Coder]	[98765432*]	X
Neptune 6-digit [ProRead]	[987654***]	Y

Encoded Output - wiring and pinouts

Connector pinouts



Wiring cross reference

Function	Kamstrup	Sensus	Neptune	Itron Integral	Itron Remote
DATA	Green	Green	Red	Red	Brown
PWR/Clock	Red	Red	Black	Black	Yellow
GND	Black	Black	Green	White	Grey

Encoded Output - visualization

Visualization of Encoded Output configuration

Under normal operation, the 9-digit LCD will show the contents of the Volume V1 data register. Using a magnet, the Encoded Output Configuration can be briefly visualized, after which the LCD automatically reverts to display V1 Volume. The figures to the right show normal display mode (visualization not activated).

To indicate that additional alarms are included, the small "dot" is enabled.

Sample Register for ½" meter used in examples, typical configuration for residential meters. The figures to the right show the Encoded Output Configuration (visualization activated).

Example 1 - Option D, Sensus 6-digit, Extended Alarms: OFF

E0 Resolution. Meters configured in:

USG - 6 most significant digits; 10s of US Gallons

CuFt - 6 most significant digits; whole Cubic Feet

Order Option D, Sensus 6-digit, without Extended Alarms, factory E0 configuration

Example 2 - Option Z, Sensus 9-digit; Extended Alarms: ON

E0 Resolution. Meters configured in:

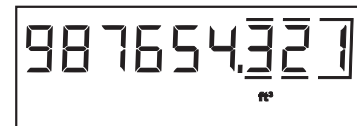
USG - 7 most significant integer digits + tenths and hundredths of US Gallons

CuFt - 6 most significant integer digits + tenths and hundredths and thousandths of Cubic Feet

Gallons



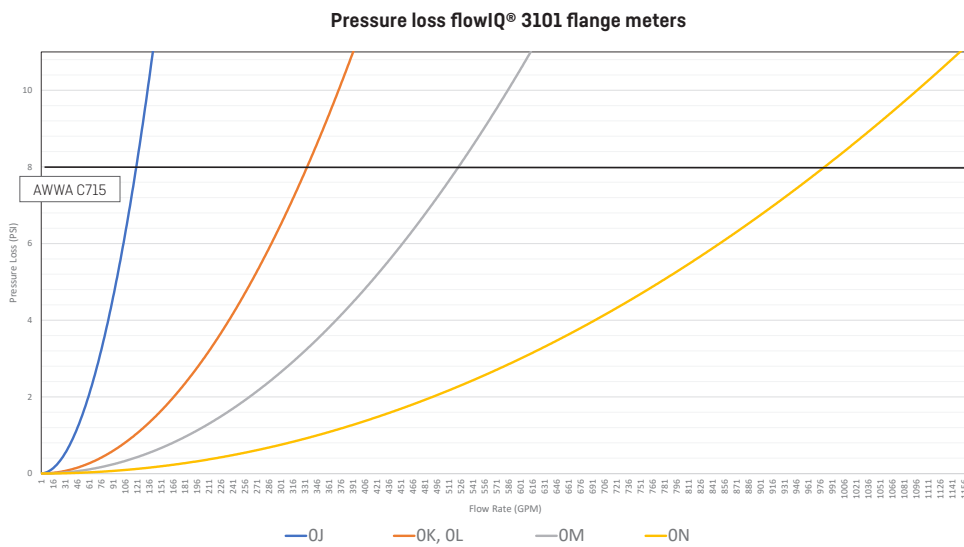
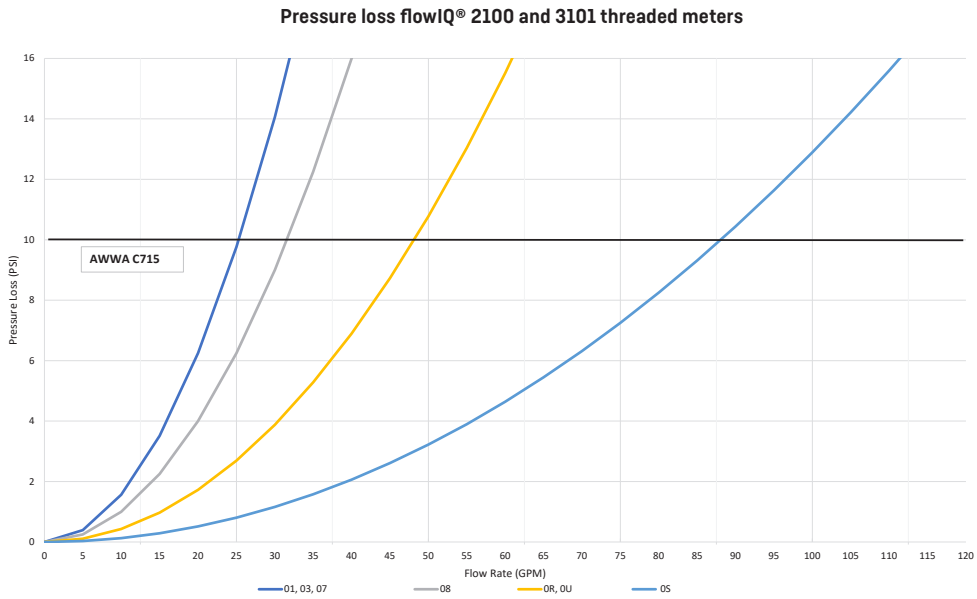
Cubic feet



Pressure loss

According to AWWA C715 standards the maximum pressure loss must not exceed 10 PSI for ½” to 2” meters and must not exceed 8 PSI for 3” to 4” meters at SMOC.

The following graphs show pressure loss with respect to flow rate:



Ordering details

Start your order by stating the type number of the selected model of flowIQ® 2100 or flowIQ® 3101. The type number includes information on meter type - Encoded Output, size, lay length, service connection and time zone.

The features included in the Type Number cannot be changed once the meter has been produced.

Subsequently the meter configuration, which determines customer-specific requirements such as number of digits in display etc., is selected. The configuration is completed during programming of the final meter.

Refer to Encoded Output Specification for further ordering details, for the Encoded Output version meter.

Kamstrup recommends 3 mm EDPM rubber gaskets, or fiber gaskets, which are sold separately.

Accessories are enclosed separately to be mounted by the installer.

Type number

flowIQ® 2100

Type 02U

C

8

Communication

Encoded/TRPL output

23

Battery

C

Meter size

GPM	Connection	Length [inches]	
25	5/8" x 1/2" (DN15) meter - 3/4" thread	7 1/2"	01
25	5/8" x 3/4" (DN20) meter - 1" thread	7 1/2"	03
25	5/8" x 3/4" (DN20) meter - 1" thread	5.12"	07
32	3/4" (DN20) meter - 1" thread	7 1/2" or 9"; includes 1 1/2" extension	08

Cold water meter

8

Meter type

Encoded output

E

Time zone

Eastern

E

Central

C

Mountain

M

Pacific

P

Ordering details

flowIQ® 3101			Type 03U	<input type="checkbox"/>	<input type="checkbox"/>	C	<input type="checkbox"/>	<input type="checkbox"/>	8	<input type="checkbox"/>	<input type="checkbox"/>
Communication											
Encoded/TRPL output						23					
Battery											
C											
Meter size											
GPM	Connection	Length [inches]									
35	¾" / 1" thread	7½"		OR							
35	¾" / 1" thread	9"		OU							
55	1" / 1¼ thread	10¾"		OS							
120	1½" flange	13"		OJ							
160	2" flange	17"		OK							
160	2" flange	15¾"		OL							
350	3" flange	12"		OM							
700	4" flange	14"		ON							
Cold water meter										8	
Meter type											
Encoded output										E	
Time zone											
Eastern										E	
Central										C	
Mountain										M	
Pacific										P	

Configuration

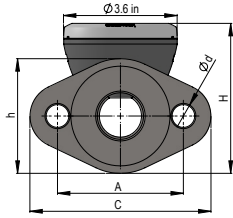
	KK	LLL	MMM	N	P	R	S	T
Target date (not applicable for E0)								
1 st of the month	01							
Average time of max. values - 2 minutes		002						
Customer label code			001					
Leakage message limit								
OFF				0				
Flow continuously > 0.5 % of max. flow				1				
Flow continuously > 1.0 % of max. flow				2				
Flow continuously > 2.0 % of max. flow				3				
Flow continuously > 0.25 % of max. flow				4				
Flow continuously > 0.1 % of max. flow				5				
Pipe burst limit								
OFF					0			
Flow > 5 % of max. flow for 30 minutes					1			
Flow > 10 % of max. flow for 30 minutes					2			
Flow > 20 % of max. flow for 30 minutes					3			
Wired M-Bus						0		
Display resolution								
000000.001 m ³							0	
000000001 Gal							1	
00000000.1 Gal							2	
0000000.01 Gal							3	
000000.001 Gal							4	
000000001 ft ³							5	
00000000.1 ft ³							6	
0000000.01 ft ³							7	
000000.001 ft ³							8	
Encryption level								
Encryption with separately forwarded key								3

Unless otherwise stated in the order, Kamstrup supplies the following:

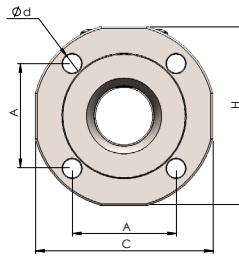
01	002	001	2	0	5	2	3
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Dimensional sketches

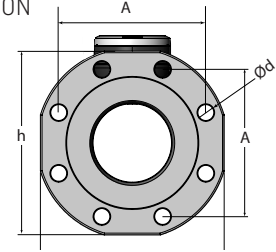
Meter types: C0J, C0K and C0L



Type: C0M



Type: C0N



flowIQ® 2100

Mechanical design	Meter type	Meter size	GPM	NPSM thread	L	H	[inch]				Weight approx. [Lbs.]
							h	A	C	Ød	
Composite	C01	5/8" x 1/2"	25	3/4" thread	7 1/2"	2.7"	N/A	N/A	N/A	N/A	1.1
Composite	C03	5/8" x 3/4"	25	1" thread	7 1/2"	2.6"	N/A	N/A	N/A	N/A	1.0
Composite	C07	5/8" x 3/4"	25	1" thread	5.1"	2.6"	N/A	N/A	N/A	N/A	0.9
Composite	C08	3/4"	32	1" thread	7 1/2"/9"	2.6"	N/A	N/A	N/A	N/A	1.0

flowIQ® 3101

Stainless steel	C0R	3/4"	35	1" thread	7 1/2"	3.5"	N/A	N/A	N/A	N/A	2.2
Stainless steel	C0U	3/4"	35	1" thread	9"	3.3"	N/A	N/A	N/A	N/A	2.5
Stainless steel	C0S	1"	55	1 1/4" thread	10 3/4"	3.7"	N/A	N/A	N/A	N/A	4.1
Stainless steel	C0J	1 1/2"	120	1 1/2" flange	13"	4.8"	3.6"	4.0"	5.7"	0.79"	13
Stainless steel	C0K	2"	160	2" flange	17"	5.43"	4.13"	4.49"	6.54"	0.79"	19
Stainless steel	C0L	2"	160	2" flange	15 1/4"	5.43"	4.13"	4.49"	6.54"	0.79"	17
Stainless steel	C0M	3"	350	3" flange	12"	7.5"	7.24"	4.24"	7.24"	0.75"	31
Stainless steel	C0N	4"	700	4" flange	14"	11.5"	8.66"	6.93"	8.66"	0.75"	43

Accessories

See Accessories for Water Meters: FILE100000644_US.

For information about our Hygiene concept go to: Kamstrup.com.

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