

**COMMONWEALTH OF KENTUCKY**  
**BEFORE THE PUBLIC SERVICE COMMISSION**

**In the Matter of:**

<b>ELECTRONIC APPLICATION OF</b>	)	
<b>MCCREARY COUNTY WATER DISTRICT</b>	)	
<b>FOR AUTHORIZATION TO EXECUTE</b>	)	<b>CASE NO. 2018-00038</b>
<b>LEASE-PURCHASE AGREEMENT AND</b>	)	
<b>RELATED RELIEF</b>	)	

**APPLICATION**

Pursuant to KRS 278.020(1), KRS 278.300, and 807 KAR 5:001, McCreary County Water District (“McCreary District”) applies to the Public Service Commission for an Order authorizing McCreary District to execute a lease-purchase agreement to finance the purchase of \$781,144 of water metering equipment and declaring that a certificate of public convenience and necessity is not required for the purchase and installation of such equipment, or in the alternative, issuing a certificate of public convenience for such purchase and installation.

In support of its Application,<sup>1</sup> McCreary District provides the following:

**A. General Information**

1. The full name and post office address of McCreary District is: McCreary County Water District, Post Office Box 488, Whitley City, Kentucky 42653. Its e-mail address is mcwd@highland.net.

2. Copies of all orders, pleadings and other communications related to this proceeding should be directed to:

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<sup>1</sup> To facilitate the Public Service Commission’s initial review of this Application, McCreary District has attached to this Application a “Filings Requirements List” that consists of five pages, lists each statutory and regulatory requirement for an application for a declaratory order, a certificate of public convenience and necessity and authorization to issue evidence of indebtedness, and identifies the exhibit or paragraph that satisfies the requirement.

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3. McCreary District not a corporation, limited liability company or limited partnership. It has no articles of incorporation or partnership agreements.

4. McCreary District is a water district created under the provisions of KRS Chapter 74.

5. McCreary County Court created McCreary District pursuant to an order entered November 16, 1962. A copy of this Order and a subsequent Order modifying McCreary District's territory is attached at **Tab 1** of this Application.

6. As of December 31, 2016, McCreary District provides retail water service to approximately 6,149 customers in McCreary County, Kentucky and wholesale water service to Whitley County Water District.<sup>3</sup>

7. A copy of the resolution of McCreary District's Board of Commissioners authorizing the filing of this application is attached at **Tab 2** of this Application.

8. The testimony of Stephen Whitaker, Superintendent, McCreary County Water District supports this Application. In his testimony, Mr. Whitaker describes the proposed

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<sup>2</sup> On January 26, 2018 pursuant to 807 KAR 5:001, Section 8, McCreary District notified the Public Service Commission of its election of the use of electronic filing procedures for this proceeding.

<sup>3</sup> Annual Report of McCreary County Water District to the Public Service Commission of the Commonwealth of Kentucky for the Calendar Year Ended December 31, 2016 ("2016 Annual Report") at Ref Page 27.

purchase of metering equipment and the method to finance the proposed purchase. A copy of this testimony is attached at **Tab 3** of this Application.

**B. Proposed Purchase of AMR Water Metering Equipment**

9. McCreary District proposes to purchase a total of 5,696 Kamstrup Water Meters and replaced accessories to replace most of its existing water meters. Table 1 reflects the number of meters based upon meter size to be purchased.

<b>TABLE 1</b>	
<b>Size</b>	<b>Number</b>
5/8-inch x 3/4-inch	5,600
1-inch	24
1 1/2-inch	16
2-inch	48
3-inch magnetic flow meter	5
4-inch magnetic flow meter	3

10. A detailed description of the meters as provided by the meter manufacturer is set forth at **Tab 4 and Tab 5** of this Application. The proposed water meters have the following characteristics:

A. The meters are static ultrasound meters. They use transmit time methodology and ultrasonic sound to measure the flow of the water. Two ultrasonic transducers, which function as both transmitters and receivers, send sound signals against and with the flow of water. The ultrasonic signal traveling with the flow will reach the opposite transducer first. The time difference between the two signals is converted into a flow and the flow sensor sends out pulses corresponding to the amount of the flow. In contrast to mechanical meters that use rotating turbines, ultrasound meters have no moving parts and are thus unaffected by wear and tear. They can measure flow even with low pressure, which is difficult for mechanical flow sensors.

B. The meters have a low start flow down to 0.15 gallons per minute which ensures the measurement of water at relatively low flows and allows for greater measurement accuracy. The meters are also capable of detecting signs of water leaks and pipe bursts.

C. The meter housing and measurement part are made of the synthetic material polyphenylene sulfide, which is free from lead and other heavy metals. The meters are fully compliant with NSF/ANSI 61, which establishes the minimum requirements for the control of potential adverse human health effects from products that contact drinking water.

D. The meter measures water and ambient temperatures and thus will enable McCreary District to monitor the temperature of the water reaching the end user and warn of freezing temperatures that may damage meter equipment and piping.

E. Each meter is equipped with a wireless radio transmitter and high power antenna that can transmit a data package every 16 seconds. This data package includes target meter readings, daily maximum flow, monthly maximum flow, and water and ambient temperature. The meter can collect and store up to 460 days of information. All transmitted information is encrypted.

F. Each meter is warranted for a period of twenty years. Each is equipped with a lithium battery that is also warranted for twenty years. A copy of the manufacturer's warranty is found at **Tab 6**.

11. Computer software that will enable McCreary District to remotely read the meters is included in the purchase price of the proposed meters. With this software, a smartphone or tablet may be used as a meter reading device. The software uses Google Maps to indicate meter locations. As the McCreary District meter reader drives along a street or road, his smartphone will automatically display nearby meters, receive and store the data transmitted from those

meters, and indicate which meters are being read and which remain to be read. The meter reader can then send these readings to McCreary District's office while remaining in the field. A description of the remote reading system is found in the manufacturer's literature set forth at **Tab 7** of this Application.<sup>4</sup>

12. McCreary District will use its own personnel to remove the existing meters and replace them with the newly purchased meters. The replacement is expected to be completed within 90 days after the purchase and receipt of the metering equipment.

13. The proposed purchase will achieve several operational efficiencies as well as provide additional benefits to McCreary District.

A. Currently McCreary District employs three employees to manually read its meters. Each employee is assigned a vehicle and spends 40 hours per week to perform this task. After the installation of the proposed metering equipment, only one McCreary District employee will perform meter reading duties. He will read all meters within a four day period. McCreary District estimates that the deployment of the proposed metering equipment will produce an annual savings in labor expense for meter reading of approximately \$105,406.

B. McCreary District will assign other duties to two of the employees currently performing meter reading duties. One will be assigned to McCreary District's water treatment plant as an additional water treatment plant operator. The other employee will be assigned to perform system maintenance and other duties, including locating leaks and other sources of water loss. McCreary District has long intended to create these positions to meet the additional workload. The reduction in the number of meter readers, however, will eliminate the need to hire additional employees.

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<sup>4</sup> For a video describing the Kamstrup READy software and its use for meter data collection, see [https://www.youtube.com/watch?v=6cZqX\\_oeUsQ](https://www.youtube.com/watch?v=6cZqX_oeUsQ) (last visited Apr. 4, 2018).

C. With the installation of the proposed metering equipment, fewer motor vehicles will be needed. McCreary District, therefore, will also be able to reduce the size of its vehicle fleet and the fleet's operation and maintenance costs.

D. The installation of the proposed metering equipment will create a safer work environment by eliminating meter reading visits to areas with fenced yards or fields, encounters with dogs or other animals, and hazardous landscaping. It also eliminates the risks associated with constant travel on rural roads and the frequent need to park on the shoulder of narrow county roads and exit and re-enter their vehicles in the face of traffic to obtain meter readings.

E. The installation of the proposed metering equipment will reduce the need to issue estimated bills. Currently, if a meter cannot be timely read due to inclement weather, such as snow, ice, or freezing rain, or the inaccessibility of the meter, McCreary District will issue an estimated monthly bill. Once installed, the proposed metering equipment will enable McCreary District to read meters that previously could not be accessed under many conditions.

F. The installation of the proposed metering equipment will eliminate human errors associated with manual meter reading.

G. The installation of the proposed metering equipment will reduce non-revenue water by enabling McCreary District to quickly identify water leaks, meter tampering, and theft of service.

H. The installation of the new meters enhanced customer service by alerting the utility if a customer exceeds a threshold water usage set by the utility and allowing McCreary District to respond to customer issues more quickly and with more accurate water usage

information. It will provide a significant amount of customer usage data on the hour, day, and week, which will be useful to customers and the utility.

14. In accordance with KRS 424.260, McCreary District published notice soliciting bids for the furnishing of AMR Water Metering Equipment. It received, opened and reviewed bids on January 19, 2018. The bid of Kamstrup Water Metering, LLC, of Darien, Illinois, which was \$781,144, was the only submitted bid. A copy of the certified bid tabulations and the Project Engineer's recommendation is found at **Tab 8** and **Tab 9** of this Application respectively.

15. On January 30, 2018, McCreary District's Board of Commissioners adopted a resolution awarding a contract for the proposed meter purchase contingent upon the Public Service Commission authorizing McCreary District to issue a promissory note in the amount of \$781,144 to purchase the metering equipment and either declaring that the proposed purchase and installation of the metering equipment did not require a certificate of public convenience and necessity or issuing a certificate of public convenience and necessity for such purchase and installation.. This resolution is found at **Tab 10** of this Application.

### **C. No Certificate of Public Convenience and Necessity is Required**

16. The proposed purchase of the AMR water metering equipment and related accessories meets the definition of an extension in the ordinary course of business as set forth in 807 KAR 5:001, Section 15(3). It will not result in the wasteful duplication of utility plant, will not compete with the facilities of existing public utilities, and does not involve a sufficient capital outlay to materially affect McCreary District's existing financial condition or to require an increase in McCreary District's rates.

17. The legal standard for determining whether a proposed facility is “an ordinary extension in the usual course of business” is set forth in KRS 278.020(1) and 807 KAR 5:001, Section 15(3).<sup>5</sup> KRS 278.020(1) states:

No person, partnership, public or private corporation, or combination thereof shall commence providing utility service to or for the public or begin the construction of any plant, equipment, property, or facility for furnishing to the public any of the services enumerated in KRS 278.010, **except** retail electric suppliers for service connections to electric-consuming facilities located within its certified territory and **ordinary extensions of existing systems in the usual course of business**, until that person has obtained from the Public Service Commission a certificate that public convenience and necessity require the service or construction. [emphasis added].

807 KAR 5:001, Section 15(3), which provides:

Extensions in the ordinary course of business. No certificate of public convenience and necessity will be required for extensions that do not create wasteful duplication of plant, equipment, property or facilities, or conflict with the existing certificates or service of other utilities operating in the same area and under the jurisdiction of the commission that are in the general area in which the utility renders service or contiguous thereto, and that do not involve sufficient capital outlay to materially affect the existing financial condition of the utility involved, or will not result in increased charges to its customers.

Distilling the requirements of this statute and this regulation to their essentials, the Public Service Commission has declared that a Certificate is not necessary “for facilities that do not result in the wasteful duplication of utility plant, do not compete with the facilities of existing

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<sup>5</sup> *The Application of Northern Kentucky Water District (A) For Authority to Issue Parity Revenue Bonds in the Approximate Amount of \$16,545,000; and (B) A Certificate of Convenience and Necessity for the Construction of Water Main Facilities*, Case No. 2000-481 (Ky. PSC Aug. 30, 2001) at 4 (“When viewed together, KRS 278.020(1) and Administrative Regulation 807 KAR 5:001, Section 9(3) clearly identify those facilities for which a Certificate of Public Convenience and Necessity is not required.”) (referring to §15(3) prior to revisions in 807 KAR 5:001 that resulted in renumbering).



public utilities, and do not involve a sufficient capital outlay to materially affect the existing financial condition of the utility involved or to require an increase in utility rates.”<sup>6</sup>

18. “Wasteful duplication” is defined as an “excess of capacity over need” and “an excessive investment in relation to productivity or efficiency.”<sup>7</sup> A proposed facility does not constitute wasteful duplication unless an “existing facility is reasonably available for the present and future needs of those who will be served by it.”<sup>8</sup>

19. To determine if a proposed facility’s construction material affects a utility’s financial condition, the Public Service Commission has historically compared the cost of the proposed facility to the present value of the utility’s existing facilities. The Public Service Commission recently declared:

In assessing whether a proposed project is a system extension in the ordinary course of business, Kentucky courts have traditionally looked to the size and scope of a project in the context of the monetary cost involved. The Commission has similarly adopted this method and likewise looks to the scale of a proposed project in relation to the relative size of the utility and its present facilities.<sup>9</sup>

20. The Public Service Commission has previously found that that the construction of a proposed facility whose cost represents three percent or less of the utility’s net utility plant is in the ordinary course of business and does not require a Certificate.<sup>10</sup>

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<sup>6</sup> *Id.*

<sup>7</sup> *Kentucky Utilities Co. v. Pub. Serv. Comm’n*, 252 S.W.2d. 885, 890 (Ky. 1952).

<sup>8</sup> *Covington v. Board of Commissioners*, 371 S.W.2d 20, 23 (Ky. 1963)

<sup>9</sup> *Application of Northern Kentucky Water District for Approval of Dixie Highway Water Main Improvements, Issuance of a Certificate of Convenience and Necessity and Approval of Financing*, Case No. 2014-00171 (Ky. PSC Aug. 6, 2014) at 4.

<sup>10</sup> *See, e.g., The Application of the Southern Madison Water District to Issue Securities In the Approximate Principal Amount of Eight Hundred Sixty Thousand Dollars (\$860,000) For the Purpose of Refunding Certain Outstanding Revenue Bonds of the District and To Provide Funds Pursuant To the Provisions of KRS 278.300 and 807 KAR 5:001*, Case No. 99-310 (Ky. PSC Sept. 1, 1999); *Application of Madison County Utility District For An Order Issuing A Certificate of Public Convenience and Necessity and for Authority to Borrow Funds and to Refinance Certain Indebtedness of the District*, Case No. 2007-00424 (Ky. PSC Mar. 20, 2008).

21. As of December 31, 2016, McCreary District had net utility plant totaling \$27,287,860.<sup>11</sup> The purchase price of the proposed AMR water metering equipment is \$781,144. The cost of the proposed equipment represents approximately 2.86 percent of McCreary District's net utility plant.

#### **D. Certificate for Public Convenience and Necessity**

22. McCreary District restates and incorporates the information contained in paragraphs 9 through 15 of this Application.

23. The proposed AMR water metering equipment will be located throughout McCreary District's service territory, which consists of all of McCreary County, Kentucky. A map depicting McCreary District's territory is found at **Tab 11** of this Application.

24. The proposed AMR water metering equipment will not complete with those of another public utility. Its purchase and installation will not result in the wasteful duplication of utility facilities or inefficient investment.

25. A detailed description and the specifications for the AMR water metering equipment are attached to this Application at **Tabs 4 and 5** and **Tab 12**.

26. McCreary District is not aware of any franchises, permits, or regulatory approvals required for the proposed purchase and installation of the AMR Water Metering Equipment.

27. The proposed purchase and installation of the AMR Water Metering Equipment does not require the approval of the Kentucky Division of Water.

28. The proposed purchase and installation of the AMR Water Metering Equipment does not require the acquisition of any parcels of land or easements.

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<sup>11</sup> 2016 Annual Report at Ref Page 7.

29. The total estimated cost of purchasing and installing the proposed water meter is \$781,144. McCreary District proposes to enter a lease-purchase agreement with Government Capital Corporation of Southlake, Texas (“Government Capital”) to finance this cost.

30. There is no annual cost for the operation of the proposed AMR Water Metering Equipment. McCreary District expects a decrease in annual costs of approximately \$111,406 and additional decreases in fuel and vehicle maintenance expense once the metering equipment is installed. A statement of annual cost of the proposed equipment is set forth at **Tab 13** of the Application

31. The Proposed Facilities will not compete with the facilities of any other public utility.

#### **E. Authorization to Execute Lease-Purchase Agreement**

32. To finance the cost of proposed purchase of the meter equipment, McCreary District proposes to execute a lease purchase agreement with Government Capital. Under the terms of the Lease-Purchase Agreement, Government Capital will acquire ownership of the metering equipment and will lease that equipment to McCreary District for a period of ten years. Beginning one year after the execution of the lease-purchase agreement, McCreary District will make annual lease payments of \$96,987.62 to Government Capital. At the end of the lease period, McCreary District will acquire legal title to the metering equipment. This arrangement is the equivalent of a note in the amount of \$781,144 payable over a term of 10 years at an interest rate of 3.744 percent per annum. Government Capital retains a security interest in the metering equipment and may take possession of the equipment in the event McCreary District defaults on its obligations under the agreement. The proposed terms of the lease-purchase Agreement and a sample of the agreement are found at **Tab 14**.

33. A description of McCreary District's water system and its property, stated at original cost by accounts, is contained in Annual Report of McCreary County Water District to the Public Service Commission for the Year Ending December 31, 2016 ("2016 Annual Report"), a copy of which McCreary District has previously been filed with the Public Service Commission and which is incorporated by reference into this Application.

34. McCreary District does not propose to issue any stock or bonds.

35. No proceeds from the proposed lease-purchase agreement will be used to refund outstanding obligations.

36. A copy of McCreary District's written notification to the State Local Debt Officer is attached as **Tab 15**.

37. Pursuant to 807 KAR 5:001, Section 18(2)(a), the following information is provided:

a. For the 12-month period ending December 31, 2016, McCreary District had less than \$5,000,000 in gross annual revenues.

b. McCreary District's 2016 Annual Report is incorporated by reference into this Application. McCreary District also incorporates into this Application its audited financial statements for the years ending December 31, 2016 and December 31, 2015, which have previously been filed with the Commission.

c. No material changes have occurred in McCreary District's financial condition since December 31, 2016.

38. There are no trust deeds or mortgages applicable.

39. A map of the area in which the new meters will be deployed is found at **Tab 11** of this Application.

40. A detailed estimate of the acquired property, arranged according to the Uniform System of Accounts for Class A/B Water Districts and Associations, is attached to this Application as **Tab 16** of this Application.

41. Execution of the proposed lease-purchase agreement will not require McCreary District to seek an immediate adjustment of its rates for service.

42. McCreary District's execution of the proposed lease-purchase agreement with Government Capital to acquire \$781,144 of metering equipment is for a lawful objective within McCreary District's corporate purposes, is necessary, appropriate for and consistent with McCreary District's proper performance of its service to the public and will not impair Ohio District's ability to perform that service, and is reasonably necessary and appropriate for such purpose.

#### **F. Requested Relief**

**WHEREFORE**, McCreary County Water District requests that the Commission:

1. Place this Application at the head of the Public Service Commission's docket as KRS 278.300(2) requires;

2. Enter an Order

A. Authorizing McCreary District to enter and execute a lease-purchase agreement with Government Capital Corporation to acquire \$781,144 of AMR Water Metering Equipment;

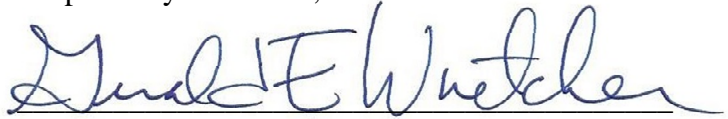
B. Declaring no Certificate of Public Convenience and Necessity is required for the proposed purchase and installation of AMR Water Metering Equipment, or in the alternative, granting a Certificate of Public Convenience and Necessity to McCreary District to purchase and install the AMR Water Metering Equipment;

3. Enter an Order granting the requested relief without holding an evidentiary hearing in this matter and no later **than April 30, 2018**; and,

4. Grant any and all such other relief to which McCreary District may be entitled.

Dated: April 11, 2018

Respectfully submitted,

A handwritten signature in blue ink that reads "Gerald E. Wuetcher". The signature is written in a cursive style and is positioned above a horizontal line.

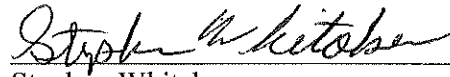
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*Counsel for McCreary County Water District*

COMMONWEALTH OF KENTUCKY )  
 ) SS  
COUNTY OF MCCREARY )

The undersigned, Stephen Whitaker, being duly sworn, deposes and states that he is the Superintendent of McCreary County Water District, the Applicant in the above proceedings; that he has read this Application and has noted its contents; that the same is true of his own knowledge, except as to matters which are therein stated on information or belief, and as to those matters, he believes same to be true.

IN TESTIMONY WHEREOF, witness the signature of the undersigned on this April 10, 2018.

  
\_\_\_\_\_  
Stephen Whitaker  
Superintendent  
McCreary County Water District

Subscribed and sworn to before me by Stephen Whitaker, Superintendent, McCreary County Water District, on this April 10, 2018.

  
\_\_\_\_\_  
Notary Public

Notary ID: 514600

My Commission Expires: 7/13/18

CERTIFICATE OF SERVICE

In accordance with 807 KAR 5:001, Section 8, I certify that McCreary County Water District's April 11, 2018 electronic filing of this Application is a true and accurate copy of the same document being filed in paper medium; that the electronic filing was transmitted to the Public Service Commission on April 11, 2018; that there are currently no parties that the Commission has excused from participation by electronic means in this proceeding; and that an original paper medium of the Application will be delivered to the Public Service Commission on or before April 13, 2016.

A handwritten signature in blue ink, reading "Gerald E. Wuetcher". The signature is written in a cursive style with a horizontal line underneath the name.

Gerald E. Wuetcher



## FILING REQUIREMENTS

### FILING REQUIREMENTS FOR AN APPLICATION FOR A DECLARATORY ORDER

Source Authority	Requirement	Location
807 KAR 5:001, § 14(1)	Applicant's name, mailing address and e-mail address	Page 1, Para 1
807 KAR 5:001, § 14(1)	Statutory Reference – 807 KAR 5:001	Page 1
807 KAR 5:001, § 4(3)	Signature of Applicant's Attorney	Page 14
807 KAR 5:001, § 4(3)	Name, Address, Telephone Number, Fax Number, and e-mail address of Applicant's Attorney	Page 14
807 KAR 5:001, § 14(2)	If Applicant is corporation: State and date of incorporation, attestation of good standing in state of incorporation, statement regarding authorization to transact business in Kentucky	Page 2, Para 3 <b>Not Applicable</b>
807 KAR 5:001, § 14(3)	If Applicant is a limited liability company: State and date of organization, attestation of good standing in state of incorporation, statement regarding authorization to transact business in Kentucky	Page 2, Para 3 <b>Not Applicable</b>
807 KAR 5:001, § 14(4)	If the Applicant is a limited partnership: a certified copy of limited partnership agreement and all amendments or statement identifying prior Commission proceedings in which limited partnership agreement and all amendments filed	Page 2, Para 3 <b>Not Applicable</b>
807 KAR 5:001, § 19(2)(a)	An Application for declaratory order shall be in writing	Written Document Submitted
807 KAR 5:001, § 19(2)(b)	Contain a complete, accurate, and concise statement of the facts upon which the application is based	Pages 3-10, Para 7-21
807 KAR 5:001, § 19(2)(c)	Fully disclose the Applicant's interest	Pages 3-10, Para 7-21
807 KAR 5:001, § 19(2)(d)	Identify all statutes, administrative regulations, and orders to which the Applicant relates	Pages 7-10, Paras 16-21
807 KAR 5:001, § 19(2)(e)	States the Applicant's proposed resolution or conclusion	Page 13

## FILING REQUIREMENTS

### FILING REQUIREMENTS FOR AN APPLICATION FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY

Source Authority	Requirement	Location
807 KAR 5:001, § 14(1)	Applicant's name, mailing address and e-mail address	Page 1, Para 1
807 KAR 5:001, § 14(1)	Statutory Reference – KRS 278.020	Page 1
807 KAR 5:001, § 4(3)	Signature of Applicant's Attorney	Page 14
807 KAR 5:001, § 4(3)	Name, Address, Telephone Number, Fax Number, and e-mail address of Applicant's Attorney	Page 14
807 KAR 5:001, § 14(2)	If Applicant is corporation: State and date of incorporation, attestation of good standing in state of incorporation, statement regarding authorization to transact business in Kentucky	Page 2, Para 3 <b>Not Applicable</b>
807 KAR 5:001, § 14(3)	If Applicant is a limited liability company: State and date of organization, attestation of good standing in state of incorporation, statement regarding authorization to transact business in Kentucky	Page 2, Para 3 <b>Not Applicable</b>
807 KAR 5:001, § 14(4)	If the Applicant is a limited partnership: a certified copy of limited partnership agreement and all amendments or statement identifying prior Commission proceedings in which limited partnership agreement and all amendments filed	Page 2, Para 3 <b>Not Applicable</b>
807 KAR 5:001, § 15(2)(a)	The facts relied upon to show that the public convenience and necessity requires the proposed construction	Pages 10-11, Paras 22-31 Exhibit 3
807 KAR 5:001, § 15(2)(b)	Copies of franchises or permits for the proposed construction or extension	Page 10, Paras 26-28 Exhibit 3 <b>Not Applicable</b>
807 KAR 5:001, § 15(2)(c)	A full description of the proposed location, route, or routes of the proposed construction or extension, including a description of the manner in which same will be constructed, and the names of all public utilities, corporations, or persons with whom the proposed construction or extension is likely to compete	Page 10, Para 23 Exhibit 11

<b>Source Authority</b>	<b>Requirement</b>	<b>Location</b>
807 KAR 5:001, § 15(2)(d)1	Maps to suitable scale showing the location or route of the proposed construction or extension, as well as the location to scale of like facilities owned by others located anywhere within the map area with adequate identification as to the ownership of the other facilities (Only one copy submitted pursuant to 807 KAR 5:001, Section 8)	Page 10, Para 23 Exhibit 11
807 KAR 5:001, § 15(2)(d)2	Plans and specifications and drawings of the proposed plant, equipment, and facilities	Page 10, Para 25 Exhibits 4-5 and 12
807 KAR 5:001, § 15(2)(e)	The manner in detail in which the Applicant proposes to finance the proposed construction or extension.	Page 11, Paras 29 & 32
807 KAR 5:001, § 15(2)(f)	An estimated annual cost of operation after the proposed facilities are placed into service	Page 11, Para 30 Exhibit 13
807 KAR 5:001, § 4(13)	Engineering plans, specifications, drawings, plats and reports for the proposed construction or extension prepared by a registered engineer, must be signed, sealed, and dated by an engineer registered in Kentucky	Exhibits 8, 9 & 12

**FILING REQUIREMENTS FOR AN APPLICATION FOR A  
AUTHORITY TO ISSUE EVIDENCES OF INDEBTEDNESS**

<b>Source Authority</b>	<b>Requirement</b>	<b>Location</b>
807 KAR 5:001, § 14(1)	Applicant's name, mailing address and e-mail address	Page 1, Para 1
807 KAR 5:001, § 14(1)	Statutory Reference – KRS 278.300	Page 1
807 KAR 5:001, § 4(3)	Signature of Applicant's Attorney	Page 14
807 KAR 5:001, § 4(3)	Name, Address, Telephone Number, Fax Number, and e-mail address of Applicant's Attorney	Page 4
807 KAR 5:001, § 14(2)	If Applicant is corporation: State and date of incorporation, attestation of good standing in state of incorporation, statement regarding authorization to transact business in Kentucky	Page 2, Para 3 <b>Not Applicable</b>
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807 KAR 5:001, § 14(4)	If the Applicant is a limited partnership: a certified copy of limited partnership agreement and all amendments or statement identifying prior Commission proceedings in which limited partnership agreement and all amendments filed	Page 2, Para 3 <b>Not Applicable</b>
KRS 278.300(2)	Application is made under oath and signed on utility's behalf by its president, or by a vice president, auditor, comptroller or other executive officer having knowledge of the matters set forth and duly designated by the utility	Page 15
807 KAR 5:001, § 18(1)(a)	Information required by 807 KAR 5:001, § 14	See Above
807 KAR 5:001, § 18(1)(b)	Description of Applicant's property and the field of its operation	Page 12, Para 33
807 KAR 5:001, § 18(1)(c)	Description of amount and kinds of stock to be issued	Page 12, Para 34 <b>Not Applicable</b>
807 KAR 5:001, § 18(1)(c)	Description of amount, terms and interest rate of bond or note	Page 11, Para 32
807 KAR 5:001, § 18(1)(c)	Description of how bond or note will be secured	Page 11, Para 32
807 KAR 5:001, § 18(1)(d)	Statement of how proceeds are to be used	Page 11, Paras 29 & 32
807 KAR 5:001, § 18(1)(e)	If proceeds will be used to acquire, construct, improve, or extend property: a detailed description of property and all contracts	Pages 3-7, Paras 9-13
807 KAR 5:001, § 18(1)(f)	Requirements if proceeds are to refund outstanding obligations	Page 12, Para 35 <b>Not Applicable</b>
807 KAR 5:001, § 18(1)(g)	Applicant's written notification to state local debt officer regarding proposed issuance	Page 12, Para 36 Exhibit 15

<b>Source Authority</b>	<b>Requirement</b>	<b>Location</b>
807 KAR 5:001, § 18(2)(a) 807 KAR 5:001, § 12(1)(b)	Financial Exhibit	Page 12, Para 37
807 KAR 5:001, § 18(2)(b)	Copies of trust deeds or mortgages	Page 12, Para 38
807 KAR 5:001, § 12(2)(c)	If property acquired: maps and plans of property	Page 3, Para 10 Page 10, Para 23 Page 12, Para 39 Exhibits 4, 5 & 11
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# **EXHIBITS**

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# **EXHIBIT 1**



MCCREARY COUNTY WATER DISTRICT by Eldred E. Musgrove, Chairman of Its Board of Commissioner, and R. H. Anderson and O. O. Duncan, Members of the Board.

PETITIONERS

VS.

JUDGMENT

ENLARGING THE TERRITORIAL LIMITS OF THE MCCREARY COUNTY WATER DISTRICT BY ANNEXATION.

This cause came on for a hearing on the 11th day of July, 1969, in the McCreary County Court Room at the Court House, Whitley City, Kentucky, at the hour of 10:00 A. M., with the Hon. A. W. Holmes, Judge of the McCreary County Court, presiding.

It appearing to the Court that the petition of the McCreary County Water District by Eldred E. Musgrove, Chairman of its Board of Commissioners, and R. H. Anderson and O. O. Duncan, Members of the Board, to enlarge the territorial limits of the McCreary County Water District by annexation contained a description of the territory to be annexed, set-out the reasons for said annexation and otherwise met and complied with the law setout in KRS 74.110; and it further appearing that notice of the filing of the petition, containing a description of the proposed annexation, together with a notification to the public that they had 30 days in which to file objections and exceptions to the petition, and including a notice that a hearing on the petition and upon the objections would be held at the time and place setout in the first paragraph hereof was placed in the McCreary County Record, a newspaper of general circulation in McCreary County, Kentucky, in its june 19, 17 and 24; 1969, publications, pursuant to KRS. 424.130-150 on legal notices; and it further appearing that the McCreary County Water District is located in McCreary County, Kentucky, and the territory to be annexed adjoins and encompasses said district and is located exclusively in said county and state; that no defense, objection or remonstrance has been made to the petition by anyone; and that the Court has heard the testimony of the petitioners in support of their petition for annexation that the annexation was reasonably necessard for the public health, convenience, fire protection and comfort of the residents thereof and would materially enhance the economic development of the district as a whole and would benefit and profit the owners of property and the inhabitants of the area, IT IS, THEREFORE, ORDERED AND ADJUDGED THAT:

1. The proposed annexation be, and it is hereby ,created, established and annexed; that the territorial limits of said annexation, which is inclusive of and contains within its perimeter the original McCreary County Water District, is described as follows:

Situate, lying and being in McCreary County, Kentucky, and more particularly described as follows:

The geographical area and political entity of McCreary County, Kentucky, and all the lands contained within its territorial boundaries.

The entire County of McCreary of the Commonwealth of Kentucky be, and is hereby, denominated as and known by its official, corporate and business name of McCreary County Water District.

Given under my hand as Judge of the McCreary County Court, this 11th y of July, 1969.

/S/ A. W. Holmes

McCreary County Court  
Whitley City, Kentucky.

STATE OF KENTUCKY

COUNTY OF MCCREARY

I, Carl Barnett, Clerk of the Court, and State aforesaid, certify that the foregoing Judgment is a true and correct copy as appears of record here in my office in

*witnessed*

*21<sup>st</sup> day of August, 1973*

ORDERS

McCreary

COURT

Special Term, November Day, 5 Day of November 1962

McCreary County Court
Special Term
November 5, 1962

The said Will of John Brooks, having lain over for a period of thirty days for exceptions, none being filed same was this day approved by the Court, and same was ordered to record.

Whereupon the said Will was duly recorded on the 5 day of November 1962.

/s/ Prince L. Stephens, Judge

McCreary County Court
Special October Term
October , 1962

IN RE: MATTER OF THE ESTATE OF M. NEAL, DECEASED

ORDER APPOINTING ADMINISTRATRIX

On the application filed by Sallie Neal on the 29th day of October 1962, for the appointment as administratrix as required by law, administration of the estate of M. Neal, late of this county, is granted Sallie Neal, whereupon the said Sallie Neal took the necessary fiduciary's oath and qualified as required by law and filed herein the executed bond in the sum of \$1540.00, the amount fixed by the Court with Arnold Davenport as surety, all of which is approved by the Court and said administratrix shall hereafter assume the administration of the estate of M. Neal.

This 29th day of October 1962.

/s/ Prince L. Stephens, Judge

McCreary County Court

Special November Term

November 16, 1962

In Re: Order Establishing and Creating the McCreary County Water District:

In accordance with Chapter #74 of the Kentucky Revised Statutes, Section #74.010 thereof, a petition was filed with this Court on October 5, 1962, containing more than seventy-five (75) names of resident freeholders of the hereinafter described water district in McCreary County, Kentucky, and in said petition said free holders have prayed for the creation and establishment of the hereinafter water district in McCreary County, Kentucky,

The Court finds and determines that said petition has been filed in this Court more than thirty days, that a notice to the public has been given by publication in the McCreary County Record, a news paper published in McCreary County, Kentucky and in three issues of said paper, that no objections have been made to this Court against the creation and establishing of said water district and the time of more than thirty days having expired for objections, the Court finds and adjudges as follows:

- 1. The Court hereby sustains the allegations of the petition filed herein and by authority of the Sections of Chapter #74 of the Kentucky Revised Statutes hereby establishes a water district in McCreary County, Kentucky to be known and designated as "McCreary County Water District" and described as follows, to-wit:

## ORDERS

McCreary

COURT

Special Term, November Day, 16 Day of November 19 62

Form O-7T

Beginning at a point in McCreary County, Kentucky in the center of old Highway #27, one-half mile north of Sand Hill Road and said old U. S. Highway #27 intersection and extending directly eastward for a distance of three miles; thence following a line southward and parallel to the meanders of old U. S. Highway #27 to a point two miles south of the intersection of Highway #92, east of Pine Knot, Kentucky, thence westward directly to and crossing U. S. Highway (old) #27 for a distance of three miles west of Highway #27; thence northward following a line parallel with the meanders of old U. S. Highway #27 to a point three miles directly west of the beginning point; thence turning eastward, a straight line to the beginning point, thus including an area designated as the McCreary County Water District.

In so far as this Court has authority to act, all former established water districts of McCreary County, Kentucky are hereby superseded and included in the area hereby established in the description set out herein and agreements and obligations heretofore made or entered into by reason of former water districts should be legally honored by the Commissioners hereinafter named.

The Court hereby appoints the following named as members of the McCreary County Water District, Dr. M. A. Winchester, appointed for a term of 4 years; for a term of three years, A. W. Holmes; and Eldred Musgrove for a term of 2 years who have taken oath to faithfully perform the duties of his position and executed a Bond for the faithful performance of their duties which bond is approved by the Court.

Given under my hand as Judge of McCreary County, Kentucky, this November 16, 1962.

/s/ Prince L. Stephens, Judge  
McCreary County, Kentucky

McCREARY COUNTY COURT

RE: ESTATE OF JOHN JOSEPH RILEY, DECEASED

TO: ORDER APPOINTING LORA WOOD ADMINISTRATRIX

This day came Lora Wood, in open Court, and offered to file and, was by the Court, permitted to file her petition for letters of administration and for appointment as Administratrix of the Estate of John Joseph Riley and, it being shown that Evadene Wood Riley, the surviving widow of decedent, has heretofore been declared incompetent and has never been restored, and that said surviving widow is the sole surviving heir of John Joseph Riley, deceased, it is now ordered by the Court that Lora Wood be, and she is hereby appointed Administratrix of the estate of John Joseph Riley, deceased. The said applicant, Lora Wood, being in open Court accepted said trust, executed bond in the penal sum of none required at present, with Dewey Spradlin as her surety, and took the oath of office and otherwise qualified as Administratrix of said estate, as required by law, and the bond offered by the said Lora Wood, with Dewey Spradlin as surety, is now and hereby approved by the Court, and Lora Wood having fully qualified, she is now and hereby appointed Administratrix of the estate of John Joseph Riley, deceased.

Witness my hand this 28 day of November 1962.

/s/ Prince L. Stephens, Judge  
McCreary County Court

# **EXHIBIT 2**

RESOLUTION NO. \_\_\_\_\_

**A RESOLUTION OF THE BOARD OF COMMISSIONERS OF  
MCCREARY COUNTY WATER DISTRICT AUTHORIZING AN  
APPLICATION TO THE KENTUCKY PUBLIC SERVICE  
COMMISSION FOR AUTHORIZATION TO ISSUE AN EVIDENCE  
OF INDEBTEDNESS AND OTHER RELIEF AS NECESSARY**

**WHEREAS**, McCreary County Water District owns and operates a water distribution system that provides water service to the residents of McCreary County, Kentucky;

**WHEREAS**, McCreary County Water District's water distribution operations are subject to the jurisdiction and regulation of the Kentucky Public Service Commission;

**WHEREAS**, McCreary County Water District proposes to purchase approximately 5,600 water meters to replace its existing water meters at an approximate cost of \$781,144;

**WHEREAS**, McCreary County Water District proposes to finance the purchase of these meters through the issuance of a promissory note to Government Capital Corporation in the amount of \$781,144 and payable over a 10-year period;

**WHEREAS**, the proposed promissory note to Government Capital Corporation constitutes an evidence of indebtedness;

**WHEREAS**, KRS 278.300 prohibits a utility from issuing an evidence of indebtedness until it has been authorized to do so by an order of the Kentucky Public Service Commission;

**WHEREAS**, the Kentucky Public Service Commission has determined that KRS 278.020(1) requires a water utility in some instances to obtain a certificate of public convenience and necessity prior to commencing the replacement of all meters in its distribution system; and

**WHEREAS**, the circumstances of McCreary County Water District's proposed meter replacement do not clearly indicate whether KRS 278.020(1) requires McCreary County Water District to obtain a certificate of public convenience and necessity to perform the proposed meter replacement;

**NOW, THEREFORE, IT IS HEREBY RESOLVED BY THE BOARD OF COMMISSIONERS OF MCCREARY COUNTY WATER DISTRICT AS FOLLOWS:**


**Section 1.** The facts, recitals, and statements contained in the foregoing preamble of this Resolution are true and correct and are hereby affirmed and incorporated as a part of this Resolution.

**Section 2.** The General Manager, all appropriate Staff, and McCreary County Water District's attorney are hereby further authorized and directed to take any and all actions to apply to the Kentucky Public Service Commission for authorization for McCreary County Water District to issue a promissory note in the amount of \$781,144 and payable over a 10-year period


to Government Capital Corporation and to apply for such other relief as appropriate and necessary to ensure that McCreary County Water District's proposed replacement of its water meters is consistent with the requirements of KRS 278.020.

**Section 3.** This Resolution shall take effect upon its adoption.

**ADOPTED BY THE BOARD OF COMMISSIONERS OF MCCREARY COUNTY WATER DISTRICT** at a meeting held on January 30, 2018 signed by the Chairman, and attested by the Secretary.

  
\_\_\_\_\_  
Chairman

**ATTEST:**

  
\_\_\_\_\_  
Secretary

# **EXHIBIT 3**

**COMMONWEALTH OF KENTUCKY**  
**BEFORE THE PUBLIC SERVICE COMMISSION**

**In the Matter of:**

<b>ELECTRONIC APPLICATION OF</b>	)	
<b>MCCREARY COUNTY WATER DISTRICT</b>	)	
<b>FOR AUTHORIZATION TO ISSUE A</b>	)	<b>CASE NO. 2018-00038</b>
<b>PROMISSORY NOTE IN THE AMOUNT OF</b>	)	
<b>\$781,144 AND RELATED RELIEF</b>	)	

**DIRECT TESTIMONY OF**  
**STEPHEN WHITAKER**  
**SUPERINTENDENT, MCCREARY COUNTY WATER DISTRICT**

**Filed: April 11, 2018**



1 **Q. Please state your name, position, and business address.**

2 A. My name is Stephen Whitaker. I am Superintendent of McCreary County Water  
3 District (“McCreary District”). My business address is 19 Crit King Road, Post  
4 Office Box 488, Whitley City, Kentucky 42653.

5 **Q. How long have you been employed by McCreary District?**

6 A. Twenty-one years.

7 **Q. In what positions McCreary District have you served?**

8 A. From 2002 until 2006, I was employed as supervisor of McCreary District’s water  
9 treatment plant. I was promoted to Assistant Superintendent in 2006. I have served  
10 as Superintendent since September 1, 2017.

11 **Q. What are your duties as Superintendent?**

12 A. I am McCreary District’s chief executive officer. I am responsible for McCreary  
13 District’s day-to-day operations and manage McCreary District’s operational and  
14 financial functions. I oversee the implementation of the policy decisions of  
15 McCreary District’s Board of Commissioners.

16 **Q. Briefly describe your educational background.**

17 A. I have a Bachelor of Arts in Criminal Justice from Eastern Kentucky University.

18 **Q. Describe your professional certifications.**

19 A. I am currently certified by the Certification and Licensing Branch of the Kentucky  
20 Division of Compliance Assistance as a Class IV Water Treatment Plant Operator,  
21 Class IV Water Distribution System Operator, a Class III Wastewater Treatment Plant  
22 Operator, and a Class II Wastewater Collection Operator, and a Landfarming  
23 Operator.

1 **Q. Have you previously testified before the Kentucky Public Service Commission?**

2 A. No.

3 **Q. What is the purpose of your testimony?**

4 A. The purpose of my testimony is to describe the AMR Water Metering Equipment that  
5 McCreary District intends to purchase, discuss why the purchase and installation of  
6 this equipment is necessary and how it will benefit McCreary District and its  
7 ratepayers, and explain how the purchase will be financed.

8 **Q. Briefly describe McCreary District.**

9 A. McCreary District is a water district organized under KRS Chapter 74. It was created  
10 by Order of McCreary County Court on November 16, 1962. It provides water  
11 service to approximately 6,149 retail customers in McCreary County, Kentucky,  
12 including the U.S. Penitentiary McCreary at Pine Knot, Kentucky. It also provides  
13 water for resale to Whitley County Water District. McCreary District currently  
14 serves over 95 percent of McCreary County. It has over 350 miles of water mains  
15 which range up to 18 inches. It also operates 13 water storage tanks throughout  
16 McCreary County and possesses a total system storage capacity of 2.75 million  
17 gallons. McCreary District operates two water treatment facilities. As of  
18 December 31, 2016, its water operations employed 19 full-time employees and two  
19 part-time employees.

20 McCreary District also provides sewer service to approximately 1,139  
21 customers, including the United States Penitentiary McCreary. McCreary District  
22 currently operates a sewage treatment facility that has a total daily treatment capacity

1 of 900,000 gallons. As of December 31, 2016, its sewer operations employed four  
2 full-time employees.

3 **Q. Describe the AMR Water Metering Equipment that McCreary District proposes**  
4 **to purchase.**

5 A. McCreary District proposes to purchase a total of 5,696 Kamstrup water meters and  
6 replaced accessories to replace most of its existing water meters. The table below  
7 reflects the number of meters to be purchased based upon meter size.<sup>1</sup>

<b>Size/Type</b>	<b>Number</b>
5/8-inch x 3/4-inch (Kamstrup Flow IQ 2100)	5,600
1-inch (Kamstrup Flow IQ 3101)	24
1 1/2-inch (Kamstrup Flow IQ 3101)	16
2-inch (Kamstrup Flow IQ 3101)	48
3-inch magnetic flow meter (MAG 8000)	5
4-inch magnetic flow meter (MAG 8000)	3

8 These meters are static ultrasound meters. They use transmit time  
9 methodology and ultrasonic sound to measure the flow of the water. Two ultrasonic  
10 transducers, which function as both transmitters and receivers, send sound signals  
11 against and with the flow of water. The ultrasonic signal traveling with the flow will  
12 reach the opposite transducer first. The time difference between the two signals is  
13 converted into a flow and the flow sensor sends out pulses corresponding to the  
14 amount of the flow.

15 In contrast to mechanical meters that use rotating turbines, ultrasound meters  
16 have no moving parts and are thus unaffected by wear and tear. Unlike mechanical  
17 meters, they have a low start flow down to 0.15 gallons per minute which ensures the

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<sup>1</sup> McCreary District also proposes to purchase ten external antenna and two READY converters. The external antenna will be placed upon meters that are located in areas that are distant from a local road or streets and whose internal transmitter cannot produce a signal sufficient to reach a vehicle traveling along that road or street. The converters will translate the meter signals into data that can be viewed on mobile devices.

1 measurement of water at relatively low flows and allows for greater measurement  
2 accuracy. The meters are also capable of detecting signs of water leaks and pipe  
3 bursts.

4 The meters' measurement part and housing are made of the synthetic material  
5 polyphenylene sulfide, which is free from lead and other heavy metals. They are  
6 fully compliant with NSF/ANSI 61, which establishes the minimum requirements for  
7 the control of potential adverse human health effects from products that contact  
8 drinking water.

9 The meters measure water and ambient temperatures. This feature permits  
10 McCreary District to monitor the temperature of the water as it reaches the end user  
11 and to warn of freezing temperatures that may damage the metering equipment and  
12 piping.

13 Each meter is equipped with a wireless radio transmitter and high power  
14 antenna that can transmit every 16 seconds a data package that contains the following  
15 information: target meter readings, daily maximum flow, monthly maximum flow,  
16 and water and ambient temperature. It can collect and store this information for up to  
17 460 days. All transmitted information is encrypted.

18 **Q. What is the expected useful life of the proposed metering equipment?**

19 A. Twenty years.

20 **Q. What is the warranty period for the metering equipment?**

21 A. The manufacturer will warrant the accuracy and performance of the 5/8-inch x 3/4-  
22 inch, one-inch, one and one-half inch, and two-inch meters for twenty years. Each of

1 these meters is equipped with a lithium battery, which is also warranted for twenty  
2 years. A copy of the manufacturer's warranty is found at Tab 6 of the Application.

3 **Q. Has McCreary District provided a technical description of the proposed**  
4 **metering equipment in its Application?**

5 A. Yes. A detailed technical description for the 5/8-inch x 3/4-inch, one-inch, one and  
6 one-half inch and two-inch meters can be found at Tab 4 of the Application.  
7 Technical data on the larger sized meters can be found at Tab 5 of the Application.

8 **Q. Why is McCreary District proposing to purchase this metering equipment?**

9 A. McCreary District believes significant savings can be achieved in terms of labor costs  
10 and reduce unaccounted-for water with the replacement of its existing mechanical  
11 meters with ultrasonic metering devices that are capable of being remotely read.

12 **Q. Please describe the meters that McCreary District proposes to replace.**

13 A. They are mechanical displacement meters. The 5/8-inch x 3/4-inch, one-inch, one  
14 and one-half inch, and two-inch meters range in age from seven to ten years. The  
15 manufacturers of these meters are: Badger Meter; Hersey Meters Division of Mueller  
16 Co.; and Neptune Technology Group. The larger meters are slightly older with some  
17 meters having been in service for up to 20 years.<sup>2</sup>

18 **Q. How does McCreary District presently read its meters?**

19 A. Three McCreary District employees are presently assigned to read meters. Meter  
20 reading is their sole work responsibility. Each employee has an assigned vehicle for  
21 this purpose. Each also has a handheld device used to enter the meter readings. Prior  
22 to beginning his daily meter route, the handheld device is program for the day's route.

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<sup>2</sup> McCreary District currently owns 591 Kamstrup meters, which it purchased within the last two years. Most of the purchased meters were the flowIQ2100 meters, but some flowIQ3101 meters were also purchased. These meters are not among the meters that McCreary District proposes to replace.

1 The employee visits each metering point along the prescribed route and reads the face  
2 of the meter. He then enters the reading into a handheld device. Upon completing his  
3 run, the meter reader returns to McCreary District's office where he uploads the  
4 information from the handheld device into a desktop computer.

5 **Q. How will McCreary District read its meters if the proposed metering equipment**  
6 **is purchased and installed?**

7 A. Computer software that will enable McCreary District to remotely read the meters is  
8 included in the proposed metering equipment's purchase price. With this software, a  
9 smartphone or tablet may be used as a meter reading device. The software uses  
10 Google Maps to indicate meter locations. As the McCreary District meter reader  
11 drives along a street or road, his smartphone will automatically display nearby meters,  
12 receive and store the data transmitted from those meters, and indicate which meters  
13 are being read and which remain to be read. The meter reader can then send these  
14 readings to McCreary District's office while remaining in the field. A more detailed  
15 description of this remote reading system can be found at Tab 7 of McCreary  
16 District's Application.<sup>3</sup>

17 While McCreary District plans to collection data from the metering equipment  
18 using a drive-by method, it can also construct a data collection network by erecting a  
19 number of wireless or wired collection units at strategic locations throughout its  
20 territory. Such a network would permit the continuous collection of information and  
21 monitoring of its distribution system's operation. At the present time, however,  
22 McCreary District has no plans to establish such network.

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<sup>3</sup> For a video describing the Kamstrup READY software and its use for meter data collection, see [https://www.youtube.com/watch?v=6cZqX\\_oeUsQ](https://www.youtube.com/watch?v=6cZqX_oeUsQ) (last visited Apr. 4, 2018).

1 **Q. How much savings in labor expense related to meter reading does McCreary**  
 2 **District estimate will be achieved annually with the purchase and installation of**  
 3 **the AMR Water Metering Equipment?**

4 A. McCreary District estimates that its annual savings in labor expense for meter reading  
 5 will be approximately \$105,406. The replacement of its existing meters will generate  
 6 sufficient savings in labor expense for meter reading in their first nine years of  
 7 operation to cover the cost of the metering equipment.

8 **Q. How did McCreary District arrive at this estimate?**

9 A. Currently McCreary District employs three employees to manually read its meters.  
 10 Each employee devotes his entire work week to meter reading. After the proposed  
 11 purchase and installation of the new meters, only one McCreary District employee  
 12 will read meters. This employee will read all of McCreary District's meters within a  
 13 four day period. Based upon the three employees' current wages and benefits,  
 14 McCreary District annually expends approximately \$112,798.40 for meter reading  
 15 services. After the installation of the proposed metering equipment, this amount will  
 16 be reduced to \$7,392.<sup>4</sup>

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<sup>4</sup> Currently three employees read meters. The table below provides a breakdown of their compensation. The wage and benefit components are stated as cost per hour.

	Wage	Life & Disability Insurance	Health Insurance	Uniform	KRS	Vac/Sick Leave	Total Hr	Weekly	Annual
Reader #1	12.05	0.04	3.82	0.03	2.31	1.00	19.25	770.00	40,040.00
Reader #2	11.00	0.00	0.00	0.03	2.10	0.49	13.62	544.80	28,329.60
Reader #3	11.00	0.21	7.50	0.06	2.10	0.49	21.36	854.40	44,428.80
<b>Total</b>							54.23	2,169.20	112,798.40

Upon the purchase and installation of the proposed metering equipment, Reader #1 will assume all meter duties. He will spend 32 hours each month performing meter reading duties. The portion of his annual compensation related to meter reading duties is: 32 hours x \$19.25 compensation per hour x 12 months, or \$7,392. If this amount is deducted from the present annual cost for meter reading, the savings from reduced labor compensation is \$105,406 (\$112,798 - \$7,392).

1 **Q. Will the deployment of the new metering equipment reduce McCreary District's**  
2 **total labor expenses?**

3 A. No. However, it will eliminate the need to hire additional employees to perform other  
4 duties and thus enable McCreary District to avoid expected increases in labor  
5 expenses.

6 McCreary District is assigning the two employees no longer needed to read  
7 meters to other duties. One will be assigned as a water treatment plant operator. The  
8 other will become a field crew member and perform system maintenance and other  
9 duties, including locating leaks and other sources of water loss. McCreary District  
10 had long planned to create and fill these two positions.

11 The remaining employee will have additional duties besides meter reading.  
12 He will effectively become responsible for all matters pertaining to McCreary  
13 District's meters. He will be responsible for testing meters, maintaining meter  
14 records, marking meters in the routes on the highways, dealing with damaged meter  
15 boxes, testing that have been pulled for service due to non-payment, removing and  
16 reinstalling meters, and conducting annual inspections of meters and meter settings.  
17 McCreary District field employees, not its meter readers, currently perform these  
18 duties. This reassignment of duties, therefore, will free up McCreary District field  
19 employees to devote more attention to distribution system matters.

20 **Q. What other benefits, if any, will result from the purchase and installation of the**  
21 **AMR Water Metering Equipment?**

22 A. First, with the installation of the proposed metering equipment, fewer motor vehicles  
23 will be needed. McCreary District can thus reduce its vehicle fleet and its vehicle



1 operation and maintenance costs. McCreary District estimates annual savings of at  
2 least \$6,000 due to the fleet reduction.<sup>5</sup>

3 Second, a safer work environment will result from the elimination of meter  
4 reader visits to areas with fenced yards or fields, encounters with dogs or other  
5 animals, and hazardous landscaping. The risks associated with constant travel on  
6 rural roads and the frequent need to park on the shoulder of narrow county roads and  
7 exit and re-enter their vehicles in the face of traffic to obtain meter readings will also  
8 be reduced.

9 Third, the number of estimated bills will be reduced. Currently, if a meter  
10 cannot be timely read due to inclement weather, such as snow, ice, or freezing rain, or  
11 the inaccessibility of the meter, McCreary District will issue an estimated monthly  
12 bill. Once installed, the remote meter reading system will enable McCreary District  
13 to read meters that previously could not be accessed under many conditions.

14 Fourth, human errors associated with manual meter reading will be eliminated  
15 or significantly reduced. McCreary District estimates that approximately two percent  
16 of all meter readings performed are misread.

17 Finally, customer service will be enhanced because the utility will be alerted if  
18 a customer exceeds a threshold water usage set by the utility and therefore will be  
19 able to respond to customer issues more quickly and with more accurate water usage  
20 information. The proposed metering equipment will provide a significant amount of

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<sup>5</sup> McCreary District assumes that the current cost of a vehicle used in meter reading is \$15,000 and that the vehicle has a useful life of five years. Annual depreciation expense for the vehicle is \$3,000. As the use of two vehicles devoted solely to meter reading will no longer be required, the annual savings from eliminating the need for these vehicles is approximately \$6,000. These savings do not include avoided costs for fuel and maintenance on the vehicles.

1 customer usage data on the hour, day, and week, which will be useful to customers  
2 and the utility.

3 **Q. What effect, if any, will the purchase and installation of the proposed metering  
4 equipment have on McCreary District's water loss?**

5 A. McCreary District expects a significant reduction in non-revenue water because the  
6 metering equipment will enable the quick identification of water leaks, meter  
7 tampering, and theft of service. A meter will report if the flow exceeds a given value  
8 for a continuous period of 30 minutes – a sign of a pipe burst requiring prompt action.  
9 It will also report if it has been exposed to unauthorized access or been removed and  
10 re-installed in the reverse direction. Furthermore, because the new meters are much  
11 more accurate measuring water use at low flows, water use that previously would  
12 have gone unmeasured is more likely to be recorded and billed.

13 **Q. What is McCreary District's current level of water loss?**

14 A. In its last annual financial and statistical report to the Public Service Commission,  
15 McCreary District reported a water loss percentage of 14.5616.

16 **Q. Describe the process used to select the metering equipment.**

17 A. In 2014 McCreary District Staff began reviewing various types of metering  
18 equipment as possible replacements for existing metering equipment. This review  
19 had the following goals: (1) the elimination of manual meter reading and the  
20 automation of the reading process to the greatest extent practical; (2) the reduction of  
21 non-revenue water and increased water revenues through improved meter accuracy;  
22 (3) more timely identification of water leaks and meter tampering; and (4) obtaining  
23 meters with a longer useful life, preferably as long as 20 years. After McCreary

1 District Staff's initial review, McCreary District's Board of Commissioners received  
2 presentations from representatives of several metering manufacturers whose metering  
3 equipment would meet these goals. These included Kamstrup, Mueller Company,  
4 Badger Metering, Sensus, and Neptune Technology. Eclipse Engineers, PLLC,  
5 which served as the Project Engineer, was heavily involved throughout the  
6 procurement process.

7 As part of the procurement process, McCreary District purchased small  
8 batches of meters from major meter manufacturers and placed them into service for  
9 testing purposes. In 2017 McCreary District purchased and installed approximately  
10 591 Kamstrup meters. Most were 5/8-inch x 3/4-inch flowIQ 2100 meters, but some  
11 one-inch and two-inch flowIQ 3101 meters were also purchased. McCreary District  
12 used Kamstrup's remote meter reading system to read these meters. The meters and  
13 the remote meter reading system performed very well.

14 Based upon a three-year review of various meters, McCreary District's Board  
15 of Commissioners, in consultation with its Staff and the Project Engineer, determined  
16 that the Kamstrup metering equipment best met McCreary District's needs.

17 **Q. Has McCreary District requested bids on the purchase of the proposed metering**  
18 **equipment?**

19 A. Yes. McCreary District has requested and received bids on the proposed purchase. A  
20 request for bids was published in the *McCreary County Voice* on January 11, 2019.  
21 McCreary District opened bids on January 19, 2018. The bid of Kamstrup Water  
22 Metering LLC, of Darien, Illinois, which was \$781,144, was the only submitted bid.  
23 A copy of the certified bid tabulations and the Project Engineer's recommendations is

1 found at Tabs 8 and 9 of McCreary District’s Application. A copy of the resolution  
2 of McCreary District’s Board of Commissioners authorizing the selection of  
3 Kamstrup Water Metering LLC can be found at Tab 10 of McCreary District’s  
4 Application.

5 **Q. Has McCreary District obtained all necessary permits, approvals and easements**  
6 **to purchase and install the proposed metering equipment?**

7 A. McCreary District is not aware of any franchises, permits, or regulatory approvals  
8 required for the proposed purchase and installation of the AMR Water Metering  
9 Equipment. The proposed purchase and installation of the AMR Water Metering  
10 Equipment will not require the acquisition of any parcel of land or easement.

11 Based upon advice of its legal counsel, McCreary District believes that the  
12 purchase and installation of the AMR Water Metering Equipment is an extension in  
13 the ordinary course of business and does not require a certificate of public  
14 convenience and necessity. It has applied to the Public Service Commission for a  
15 declaratory order to that effect. It has applied in the alternative for a certificate of  
16 public convenience and necessity authorizing the purchase and installation of the  
17 AMR Water Metering Equipment if the Public Service Commission determines that a  
18 certificate is required.

19 **Q. How much time is required for McCreary District to replace its existing meters**  
20 **with the proposed metering equipment?**

21 A. McCreary District estimates that the existing meters will be replaced within 90 days  
22 of the purchase and receipt of the proposed metering equipment.

23 **Q. How will the existing meters be replaced?**

1 A. McCreary District will use its own employees to remove the existing meters and  
2 install the new metering equipment.

3 **Q. How will McCreary District dispose of the replaced meters?**

4 A. McCreary District has not finalized its plans for meter disposal. A firm has offered to  
5 purchase the replaced meters for \$3.00 per meter. McCreary District has investigated  
6 selling the meters for scrap metal. The cost of breaking the meters down, however,  
7 appears to make this option financially unattractive.

8 **Q. Will the replaced meters be tested when removed from service?**

9 A. No. McCreary District has no plans to test the meters when they are removed from  
10 service. 807 KAR 5:066 does not require the testing of a removed meter unless it is  
11 returned to service. McCreary District does not intend to return any replaced meters  
12 to service. It is considering storing a replaced meter for a reasonable period of time  
13 and, if a customer experiences a significantly different water usage with the new  
14 meter, testing the replaced meter for compliance with Public Service Commission  
15 accuracy standards.

16 **Q. Once the proposed metering equipment is installed and remote metering begins,  
17 will McCreary District still annually inspect its meters and meter settings as 807  
18 KAR 5:006, Section 26 requires?**

19 A. Yes.

20 **Q. Did McCreary District prepare a detailed estimate of the property that it will  
21 acquire as a result of the proposed project?**

1 A. Yes. This estimate, arranged according to the Uniform System of Accounts for Class  
2 A/B Water Districts and Associations, is attached to McCreary District's Application  
3 at Tab 16.

4 **Q. What is the annual cost of operating the proposed metering equipment?**

5 A. There is no initial cost to install and operate the proposed metering equipment. As  
6 earlier noted, this equipment is expected to produce an annual savings of \$111,406.

7 **Q. Will the proposed metering equipment compete with the facilities of any other  
8 public utility?**

9 A. No.

10 **Q. How does McCreary District propose to finance the proposed purchase of the  
11 metering equipment?**

12 A. McCreary District proposes to execute a lease-purchase agreement with Government  
13 Capital Corporation of Southlake, Texas ("Government Capital"). Under the terms of  
14 the lease-purchase agreement, Government Capital will acquire ownership of the  
15 metering equipment and will lease that equipment to McCreary District for a period  
16 of ten years. Beginning one year after the execution of the lease-purchase agreement,  
17 McCreary District will make annual lease payments of \$96,987.62 to Government  
18 Capital. At the end of the lease period, McCreary District will acquire legal title to  
19 the metering equipment.

20 This arrangement is the equivalent of a note in the amount of \$781,144  
21 payable over a term of 10 years at an interest rate of 3.744 percent per annum.  
22 Government Capital retains a security interest in the metering equipment and may  
23 take possession of the equipment in the event McCreary District defaults on its

1 obligations under the agreement. The proposed terms of the lease-purchase  
2 Agreement and a sample of the agreement are found at Tab 14 of the Application.

3 **Q. Has McCreary District notified the State Local Debt Officer of its intent to**  
4 **execute the lease-purchase agreement?**

5 A. Yes. A completed Form SLDO-1, "Notification of Intent to Finance and Application  
6 for Debt Approval," was submitted to the State Local Debt Officer on or about  
7 April 11, 2016. A copy of this completed form is found at Tab 15 of McCreary  
8 District's Application.

9 **Q. What effect will the proposed purchase of the metering equipment have on**  
10 **McCreary District's rates?**

11 A. It will have no immediate effect on McCreary District's rates.

12 **Q. What is your recommendation concerning McCreary District's Application?**

13 A. The proposed purchase and installation of the metering equipment will provide  
14 significant financial and operational benefits to McCreary District and its customers.  
15 I recommend that the Public Service Commission authorize McCreary District to  
16 execute the proposed lease-purchase agreement with Government Capital. If the  
17 Public Service Commission determines that the proposed purchase and installation  
18 require a certificate of public convenience and necessity, then I recommend that the  
19 Public Service Commission grant McCreary District a certificate of public  
20 convenience and necessity for such purchase and installation.

21 **Q. Does this conclude your testimony?**

22 A. Yes.


VERIFICATION

COMMONWEALTH OF KENTUCKY )  
 ) SS:  
COUNTY OF MCCREARY )

The undersigned, **Stephen Whitaker**, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing testimony and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

  
\_\_\_\_\_  
STEPHEN WHITAKER

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 10 day of April, 2018.

  
\_\_\_\_\_  
Notary Public  
Notary ID: 514600  
My Commission Expires: 7/13/18



# **EXHIBIT 4**

Technical Description

flowIQ® 2100

flowIQ® 3101

Water Meters





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## 1 General description

flowIQ® 2100/3101 covers a series of integrated, hermetically sealed water meters, intended for measurement of cold water consumption in residential, multi-unit buildings and commercial applications. These meters employ the ultrasonic measurement principle, based on Kamstrup's experience since 1991 with the initial development and production of static ultrasonic meters.

The water meter has been subjected to a very comprehensive set of type tests (performed in accordance with the international OIML R49 recommendations), in order to ensure a long-term stable, accurate and reliable meter. One of the water meter's many advantages is the fact that it has no wearing parts, which entails longevity. The meter complies with all applicable AWWA standards.

Small meter sizes – in the flowIQ® 2100 series, are fully made in composite. For the large meter sizes – in the flowIQ® 3101 series – the composite housing is mounted on a stainless steel meter body. Thus, the electronics are fully protected against internal or external penetration of water.

flowIQ® 3101 is suitable for measurement in multi-unit apartments and light commercial premises. The meter is suitable for use in pump stations or wellheads as it will function in fully submerged conditions.

The water meter can and must only be opened by Kamstrup A/S. If the meter has been opened and the sealing has thus been broken, the meter is no longer valid for billing purposes and the warranty is void.

The water meter measures the water consumption electronically, as a volume, using a pair of ultrasonic signals. Through two ultrasonic transducers, an audio signal is sent with and against the flow direction. A transducer serves both as a 'speaker' when transmitting and as a 'microphone' when a signal is received. The ultrasonic signal traveling with the flow will be the first to reach the opposite transducer, while the signal running against the flow will be received a little later. The time difference, between the two signals, can be converted into flow velocity, and thereby also into a volume. The measuring principle is called '*bidirectional ultrasound technique based on the transit time method*', which is a proven, long-term stable and accurate measuring principle.

The accumulated The display has been specially designed to operate in a wide temperature range, with high contrast, regardless of lighting - and therefore easy to read - and still have long lifetime.

In addition to volume reading, an indication of current flow and a number of other information codes are displayed. All registers are saved daily in the meter data logger (EEPROM) and are kept for 460 days. Furthermore, monthly data for the latest 36 months and 50 infocode events are saved.

The water meter is powered by an internal lithium battery which can provide up to a 20 year lifetime.

The water meters are available with a choice of two integrated data communication options:

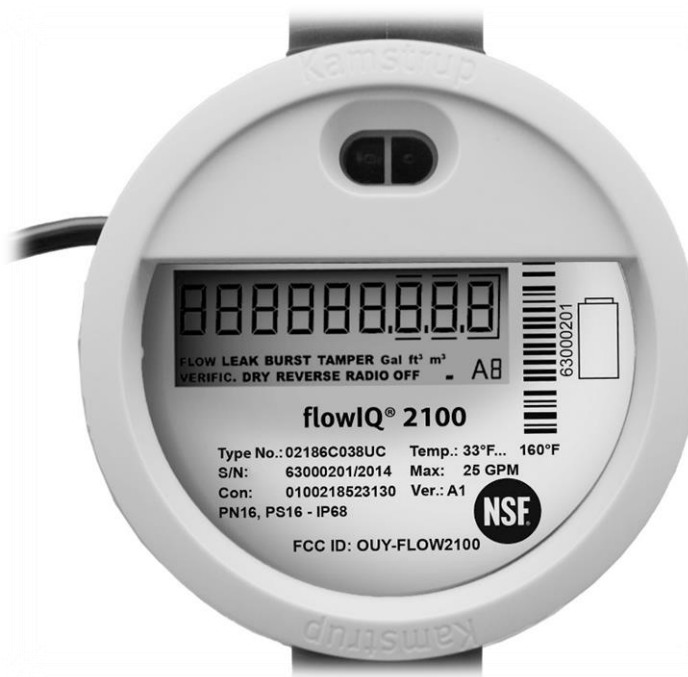
- 915 MHz – Wireless Radio version (RF) for Wireless M-Bus – US localization of European standard for remote reading of meters EN 13757-4
- Encoded Output (EO) – Following Rockwell/Sensus UI-1203/R20 3-wire protocol

The meter is fitted with an optical eye which makes it possible to read saved consumption data and info codes, stored in the meter's data logger. Using an optical reading head, with USB connection, the optical eye, in addition, allows the meter to be configured.

## 1.1 Front Plate

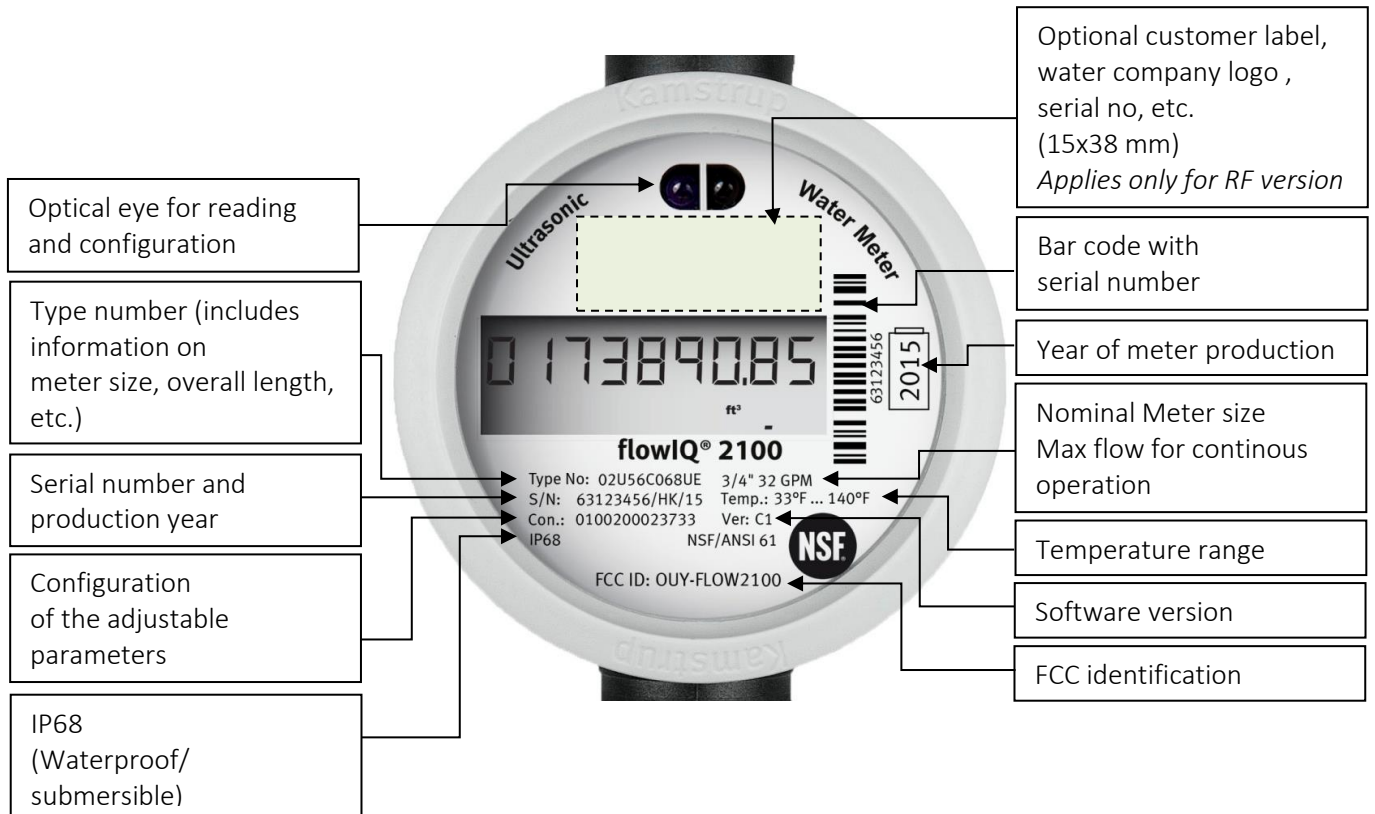
Meter face plate contains permanent laser engraved information about type number, serial number, software version, temperature range, production year, rated flow, software configuration, software version, IP rating and approvals.

### 1.1.1 Front Plate – Encoded Output version





1.1.2 Front Plate – RF version



### 1.2 Sealing

The flowIQ® 3101 is of two piece construction. Each stainless steel meter body is individually mated with the composite vacuum sealed measurement mechanism/register and therefore cannot be exchanged in the field. Therefore, in addition to the register ring seal (below), it is also mechanically sealed across two diagonally opposed meter body screws. All meter register rings also feature a hole to mechanically attach a wire seal when attaching a Pulse Adapter, described in Section 12.4 'Connection of Pulse Adapter', and the LCD display features visually evident electronic tamper seal, described in Section 9.7 'Display functions'



flowIQ® 2100



## 2 Technical data

### 2.1 Approved meter data

Certified to NSF/ANSI 61

Complies to part 15 of the FCC rules \*)

Approved according to AWWA and US Drinking Water Standards

\*) FCC Cautions

**Caution:** Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

#### RF Exposure compliance statement:

*This device may be used with no restrictions, since the source-based time-averaged output power is  $\leq 60/f(\text{GHz})$  mW.*

*This device complies with Part 15 of the FCC Rules.*

#### Operation is subject to the following two conditions:

1 This device may not cause harmful interference, and

2 This device must accept any interference received, including interference that may cause undesired operation

### 2.2 Electrical data

Battery	3.65 VDC, 1 C cell lithium
Battery lifetime	up to 20 years at $t_{\text{BAT}} < 40$ °F up to 16 years at $t_{\text{BAT}} < 55$ °F up to 8 years at $t_{\text{BAT}} < 130$ °F

### 2.3 Mechanical data

Protection class	IP68-rated (waterproof/submersible)
Weight	see tables in section 5.2 and 5.4

#### Maximum operating pressure

– flowIQ® 2100:	250 PSI
– flowIQ® 3101:	Thread mounted: 300 PSI Flange mounted: 300 PSI

#### Ambient temperature

– flowIQ® 2100:	35 °F...140 °F
– flowIQ® 3101:	35 °F...130 °F

#### Water temperature

– flowIQ® 2100:	33 °F...140 °F
– flowIQ® 3101:	33°F...120 °F

#### Storage temp. empty meter

flowIQ® 3101	-10 °F...140 °F
flowIQ® 2100*)	-10 °F...140 °F

\*) **Note!** A packaged water meter must not – due to packaging limitations – be stored at temperatures higher than 105 °F (40 °C) for periods exceeding 24 hours.

2.4 Meter data - overview

	Meter size	Start Flow (S)	Max. flow	Min. flow	Transition flow <sup>1)</sup>	Pressure loss <sup>2)</sup> at 15 GPM	Connection on meter	Lay length	Non-return valve	Strainer	Temp. measurement of water
Type number	[inches]	[GPM]	[GPM]	[GPM ]	[GPM ]	[PSI]	NPSM thread	[inches]			
<b>flowIQ® 2100</b>											
02U-YY-C02-8UX	5/8"	0.01 5	25	0.10	0.15	4.1	3/4" thread	7 1/2"	N/A	Yes	Yes
02U-YY-C02-8EX											
02U-YY-C04-8UX	5/8" x 3/4"	0.01 5	25	0.10	0.15	4.1	1" thread	7 1/2"	Yes	Yes	Yes
02U-YY-C04-8EX											
02U-YY-C06-8UX	3/4"	0.01 5	32	0.10	0.15	3.0	1" thread	7 1/2 or 9" <sup>2)</sup>	Yes	Yes	Yes
02U-YY-C06-8EX											
						Pressure loss <sup>2)</sup> max flow					
Type number						[PSI]					
<b>flowIQ® 3101</b>											
03U-YY-C02-8XX	1"	0.04	55	0.25	0.4	4.0	5/4" thread	10 3/4" /(273)	N/A	No	No
03U-YY-C02-8XX											
03U-YY-C04-8XX	1 1/2"	0.06	120	0.4	1.2	8.0	1 1/2" thread	12 5/8" /(321)	N/A	No	No
03U-YY-C04-8XX											
03U-YY-C06-8XX	1 1/2"	0.06	120	0.4	1.2	8.0	1 1/2" flange	13" /(330)	N/A	No	No
03U-YY-C06-8XX											
03U-YY-C07-8XX	2"	0.1	160	0.5	1.5	2.0	2" thread	15 1/4" /(387)	N/A	No	No
03U-YY-C07-8XX											
03U-YY-C08-8XX	2"	0.1	160	0.5	1.5	2.0	2" flange	17" /(432)	N/A	No	No
03U-YY-C08-8XX											

YY defines:

02U-57 = RF, 3 channel, narrow band

02U-21 = Encoded Output version, 4-, 5-, 6-, 7-, 8-, 9-digit; Extended Alarms available

**Note:** 02U-XX-C06-8XX includes a 1 1/2" extension and washer (installed by the customer) to fit 7 1/2" [190 mm] or 9" [228 mm] lay lengths.

<sup>1)</sup> At flows between 'Min. flow' and 'Transition flow' measurement occurs, but accuracy is not warranted.

<sup>2)</sup> According to AWWA standards the maximum pressure loss must not exceed 15 PSI at 20 GPM (5/8" to 1" meters). Refer to section 7 for details on Pressure Loss.

## 2.5 Material

### 2.5.1 flowIQ® 2100 materials

#### Wetted/external meter parts

Meter housing and flow parts	Polyphenylene sulfide (PPS) with fiberglass (40 %) reinforcement
Reflectors	Stainless steel

#### External meter parts

Top ring (sealing)	Polycarbonate (gray)
--------------------	----------------------

### 2.5.2 flowIQ® 3101 materials

#### Wetted parts

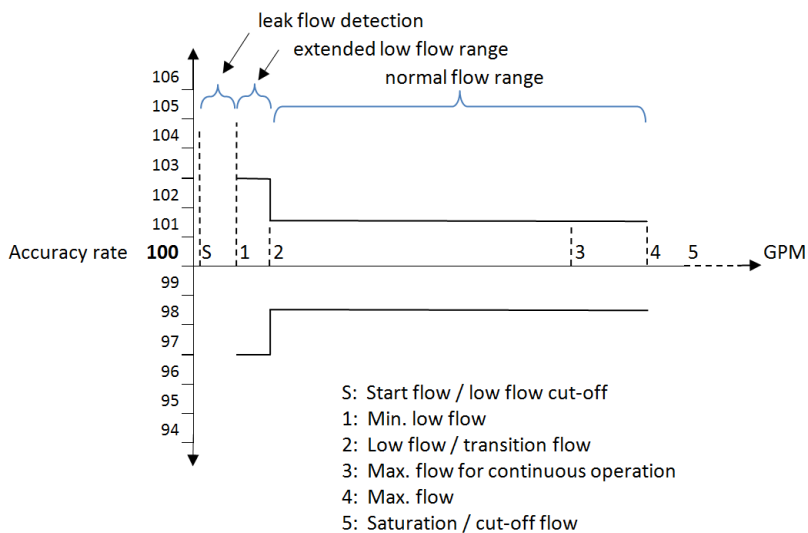
Flow part, threaded/flanged	Stainless Steel 316L
O-ring/gasket	EPDM
Measuring tube	PPS with fiberglass
Reflectors	Stainless steel

#### External meter parts

Meter housing	Polyphenylene sulfide (PPS) – 40 % fibreglass
Cover	Glass
Spring ring	Stainless steel
Top ring (sealing)	Polycarbonate (gray)

## 2.6 Accuracy

MPE (maximum permissible error)  
 According to AWWA C-708  
 ± 3 % in extended low flow range  
 ± 1.5 % in 'normal flow' range



Accuracy requirements to water meters

## 2.7 Temperature measurement

flowIQ® 2100 / 3101 measures meter/ambient temperature continuously, storing minimum, mean and maximum temperatures daily. flowIQ® 2100 measures both water and meter/ambient temperature.  
- see section 9.5 for details on Measuring Temperature.

The following accuracy limits apply, as a function of temperature:

\*<sup>1</sup>) Water temperature:            32 - 68 °F            ± 2 °F  
    68°F – 86 °F            ± 5 °F  
    > 86 °F – No valid measurement

Ambient/meter temperature: 23°F - 127°F            ±2 °F  
    (temperature within meter housing)

\*<sup>1</sup>) *Water (media) temperature applies only for flowIQ® 2100 meters*

### 3 Type overview

#### 3.1 Meter type - flowIQ® 2100

			Type	02U-	□□	C	□□	8	□	□
<b>Communication</b>										
RF, 3 channel, narrow band – 915 MHz US					57					
Encoded output 4- to 9-digit – Extended Alarms					21					
<b>Supply</b>										
Lithium battery one C-cell						C				
<b>Meter size</b>										
GPM	Connection	Length [inches/mm]								
25	5/8" (DN15) meter 3/4" thread	7½ / 190	02							
25	5/8" x 3/4" (DN20) meter 1" thread	7½ / 190	04							
25	5/8"x 3/4" (DN20) meter 1" thread	/ 130	05							
32	3/4" (DN20) meter 1" thread	7½ / 190	06							
"	"	9 / 228 + 1-1/2" extension	06 +							
<b>Meter type – cold water meter</b>									8	
Radio version (RF)										U
Encoded Output version (EO)										E
<b>Time zone</b>										
Eastern										E
Central										C
Mountain										M
Pacific										P

3 mm EDPM rubber gaskets are included with all flowIQ® 2100 meters.  
 The features included in the type number cannot be changed once the meter has been produced.

### 3.2 Meter type - flowIQ® 3101

			Type	03U-	□□	C	□□	8	□	□
<b>Communication</b>										
RF, 3 channel, narrow band – 915 MHz US					57					
Encoded output 4- to 9-digit – Extended Alarms					21					
<b>Supply</b>										
Lithium battery one C-cell						C				
<b>Meter size</b>										
GPM	Connection	Length [inches/mm]								
55	1" (DN32) meter 5/4" thread	10 ¾" / 273 mm						02		
120	1½" (DN40) meter 1½" thread	12 ⅝" / 321 mm						04		
120	1½" (DN40) meter 1½" flange	13" / 330 mm						06		
160	2" (DN50) meter 2" thread	15 ¼" / 387						07		
160	2" (DN50) flanged meter	17" / 432 mm						08		
<b>Meter type – cold water</b>								8		
Radio version (RF)									U	
Encoded Output version (EO)									E	
<b>Time zone</b>										
Eastern										E
Central										C
Mountain										M
Pacific										P

The features included in the type number cannot be changed once the meter has been produced. Fibre gaskets are supplied along with flowIQ® 3101.



### 3.3 Accessories

An overview of suitable accessories can be found in the document: '*Accessories List*' on [Kamstrup.com](http://Kamstrup.com).

- Extender
- Strainer
- Check valve
- Couplings
- Gaskets

Accessories are ordered separately in BOS (Kamstrup ordering system) and will be delivered as single parts in the packaging.

For information about our hygiene concept, please go to: [products.kamstrup.com](http://products.kamstrup.com).

## 4 Configuration – flowIQ® 2100 / 3101

Configuration	KK □□	LLL □□□	MMM □□□	N □	P □	R □	S □	T □
<b>Target date for RF package</b> <sup>(2)</sup>								
01 <sup>st</sup> of the month	<sup>(1)</sup> 01							
10 <sup>th</sup> of the month	10							
15 <sup>th</sup> of the month	15							
<b>Average time of max. values</b> - 2 minutes		002						
<b>Customer label code</b> (available for RF meters only)			MMM					
<b>Leakage message limit</b>	<b>1"</b>	<b>1½"</b>	<b>2"</b>					
OFF	--	--	--	0				
Flow continuously > 0.5 % of max. flow	17	36	48	1				
Flow continuously > 1.0 % of max. flow	33	72	96	2				
Flow continuously > 2.0 % of max. flow	66	144	192	3				
Flow continuously > 0.25 % of max. flow	8	18	24	4				
Flow continuously > 0.1 % of max. flow	3	7	10	5				
<b>Pipe burst limit</b>	<b>1"</b>	<b>1½"</b>	<b>2"</b>					
OFF	--	--	--	0				
Flow > 5 % of max. flow for 30 minutes	83	180	240	1				
Flow > 10 % of max. flow for 30 minutes	165	360	480	2				
Flow > 20 % of max. flow for 30 minutes	330	720	960	3				
<b>Optional data in RF package</b> <sup>(2)</sup>								
Monthly target volume							1	
Maximum flow (monthly)							2	
Monthly target volume/ Min.temp.water* – daily / Time weighted average temp. meter - daily							3	
Monthly target volume/ Min. water* temperature - monthly/Min. temp. meter - latest month							5	
Monthly target volume/Min.water* temperature - monthly / Max temp. meter - latest month							7	
Daily max flow / Min.temp.water* - daily / Time weighted average temp. meter - daily							9	
<i>* Only valid in flowIQ 2100 meters</i>								
<b>Display resolution</b>								
000000.001 m <sup>3</sup>								0
000000001 Gal								1
00000000.1 Gal								2
0000000.01 Gal [Default setting for US Gallon configured meters - 5/8" and 3/4"]								3
000000.001 Gal								4
000000001 ft <sup>3</sup>								5
00000000.1 ft <sup>3</sup>								6
0000000.01 ft <sup>3</sup>								7
000000.001 ft <sup>3</sup> [Default setting for cubic feet configured meters - 5/8" and 3/4"]								8
<b>Encryption level for RF package</b> <sup>(2)</sup>								
Encryption with separately forwarded key								3

Configuration	KK	LLL	MMM	N	P	R	S	T
	□□	□□□	□□□	□	□	□	□	□
Unless otherwise stated in the order, Kamstrup supplies the following:	01	002	000	2	3	5	3	3

Note:

- <sup>(1)</sup> Monthly target date KK is 01 by default, but can be configured for 10 and 15, which also affects the day of the month for monthly log calculations.
- <sup>(2)</sup> Configuration Codes KK, R and T affect only the RF version meter. Default values are used for EO meters, but serve no purpose.

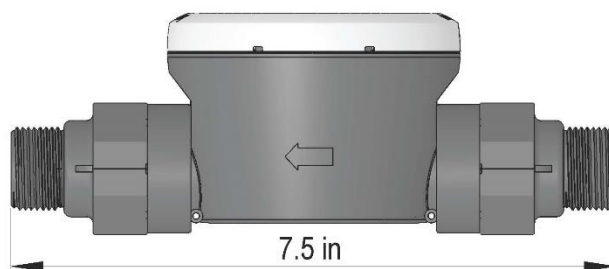
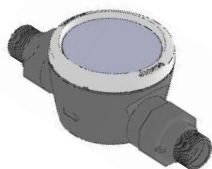
## 5 Dimensions

### 5.1 Dimensioned sketches – flowIQ® 2100

Type: **02** Size: GPM 25  $\frac{5}{8}$ " x  $\frac{1}{2}$ " x  $7\frac{1}{2}$ "

RF version: 02U-57-C02-8UX

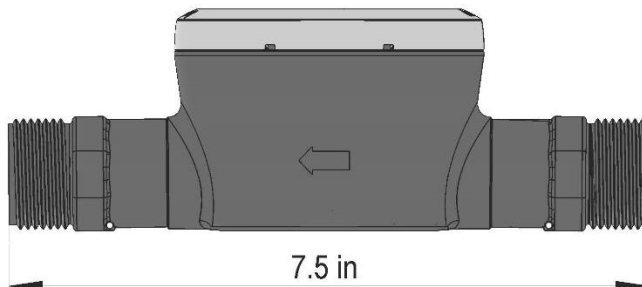
(Encoded version: 02U-21-C02-8EX – not shown )



Type: **04** Size: GPM 25  $\frac{5}{8}$ " x  $\frac{3}{4}$ " x  $7\frac{1}{2}$ "

RF version: 02U-57-C04-8UX

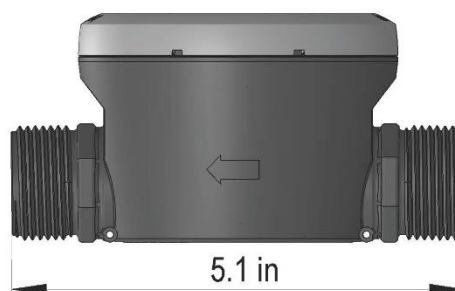
(Encoded version: 02U-21-C04-8EX – not shown )



Type: **05** Size: GPM 25  $\frac{5}{8}$ " x  $\frac{3}{4}$ " x 130mm

RF version: 02U-57-C05-8UX

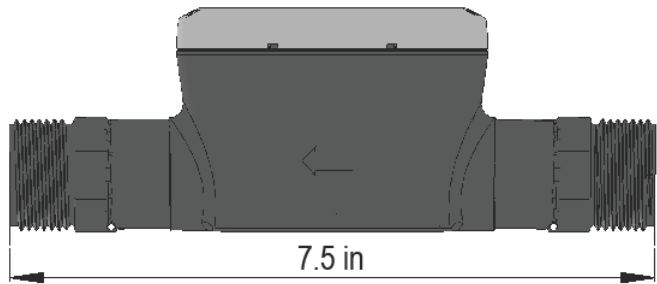
(Encoded version: 02U-21-C05-8EX – not shown )



Type: **06** Size: GPM 32  $\frac{3}{4}$ " x  $\frac{3}{4}$ " x 7½"

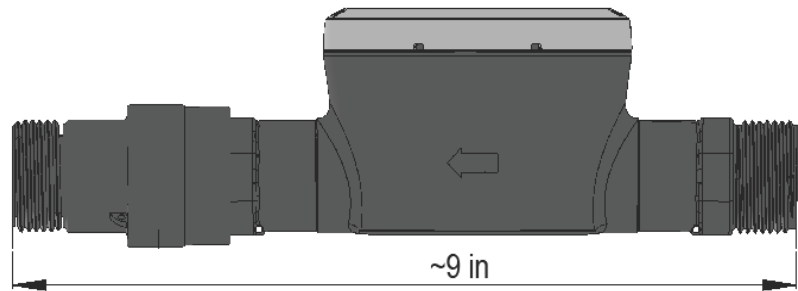
RF version: 02U-57-C06-8UX

(Encoded version: 02U-21-C06-8EX - not shown)



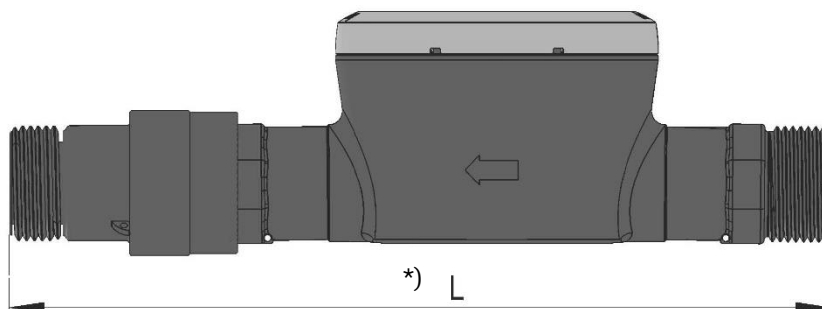
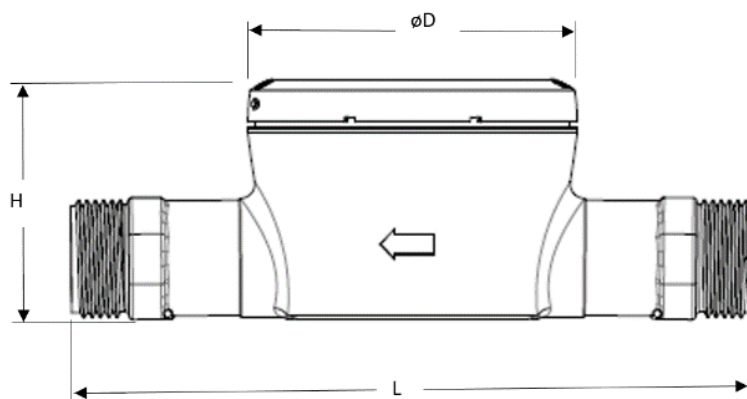
With extension

Type: **06 +** Size: GPM 32  $\frac{3}{4}$ " x  $\frac{3}{4}$ " x 9 inches (228mm)



5.2 Connection, weight and dimensions – flowIQ® 2100

GPM	Connection	L	H	øD	Weight approx. [Lbs / g]	Meter type
		[Inch/mm]				
25	5/8" x 1/2"	7 1/2" / 190	2.4" / 60	3.6" / 91.6	1.07 / 484 g	02
25	5/8" x 3/4"	7 1/2" / 190			1.02 / 462g	04
25	5/8" x 3/4"	5.12" / 130			0.91 / 412g	05
32	3/4"	7 1/2" / 190			1.02 / 463g	06
32	3/4"	*) 9" / 226			1.11 / 505g	06 +

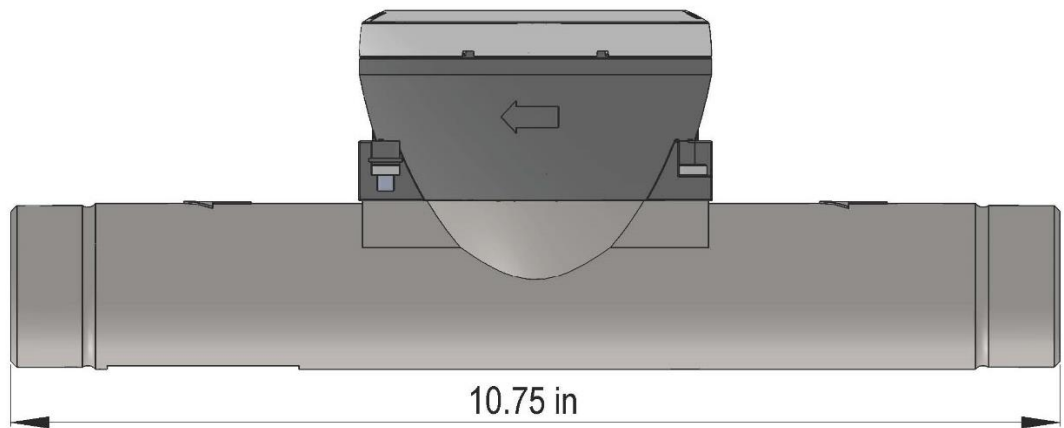
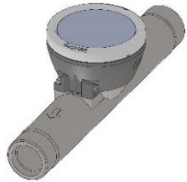


\*) for 3/4" type 06 meters, the total lay length, when using the included extension adapter, is 9" / 226 mm

5.3 Dimensioned sketches – flowIQ® 3101

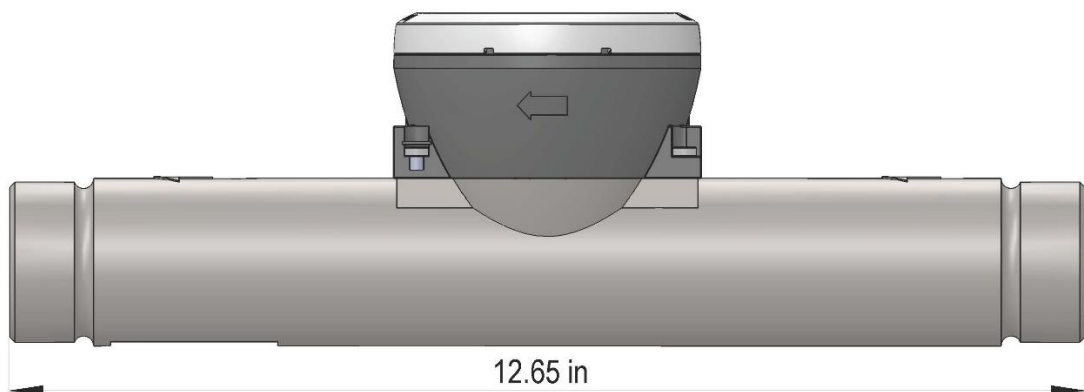
Type: **02**    Size: GPM 55    1" / 5/4" x 10 3/4" (273 mm)

RF version: 03U-57-C02-8UX                      (Encoded version: 03U-21-C02-8EX – not shown)



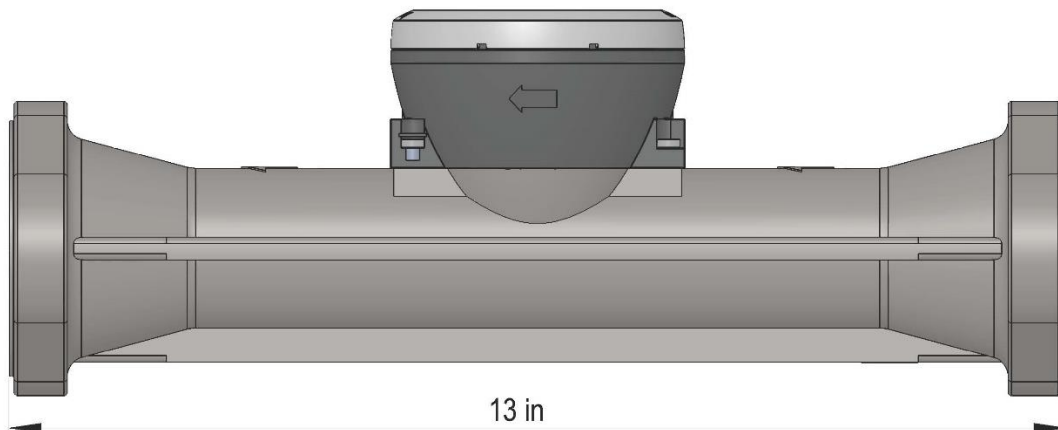
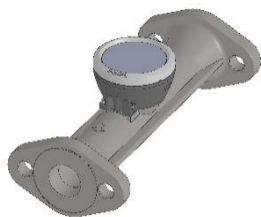
Type: **04**    Size: GPM 120    1 1/2" / 38 x 12 5/8" (321 mm)

RF version: 03U-57-C04-8UX                      (Encoded version: 03U-21-C04-8EX – not shown)



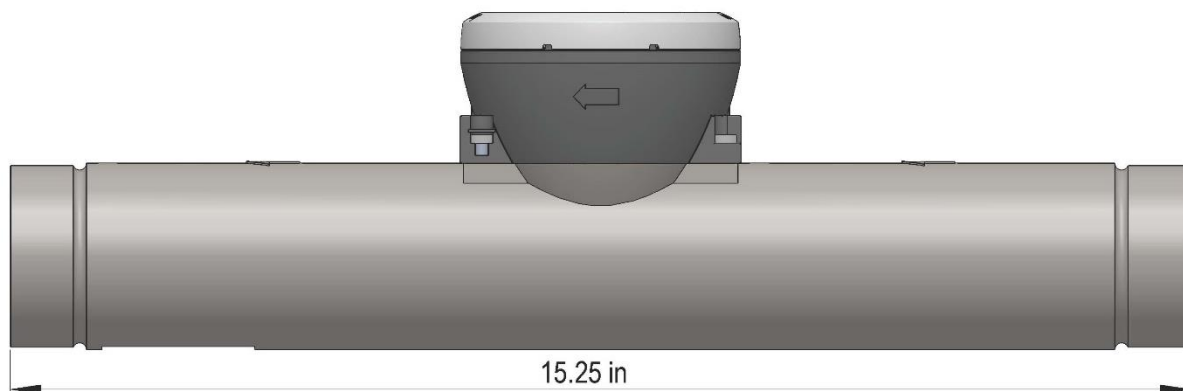
Type: **06**    Size: GPM 120    1½" / 1 ½" x 13" (330 mm)

RF version: 03U-57-C06-8UX                      (Encoded version: 03U-21-C06-8EX – not shown)



Type: **07**    Size: GPM 160    2" / 2" x 15 ¼" (387 mm)

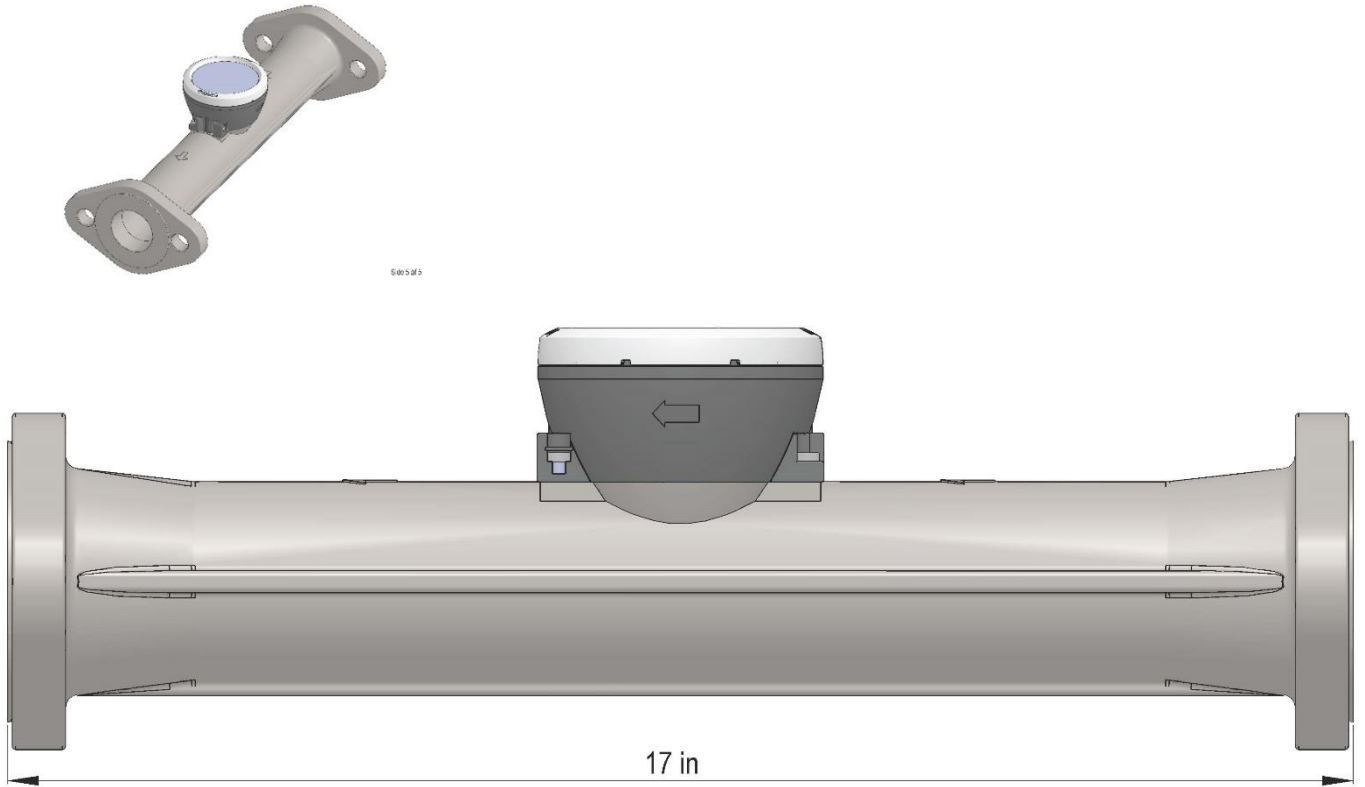
RF version: 03U-57-C07-8UX                      (Encoded version: 03U-21-C07-8EX – not shown)





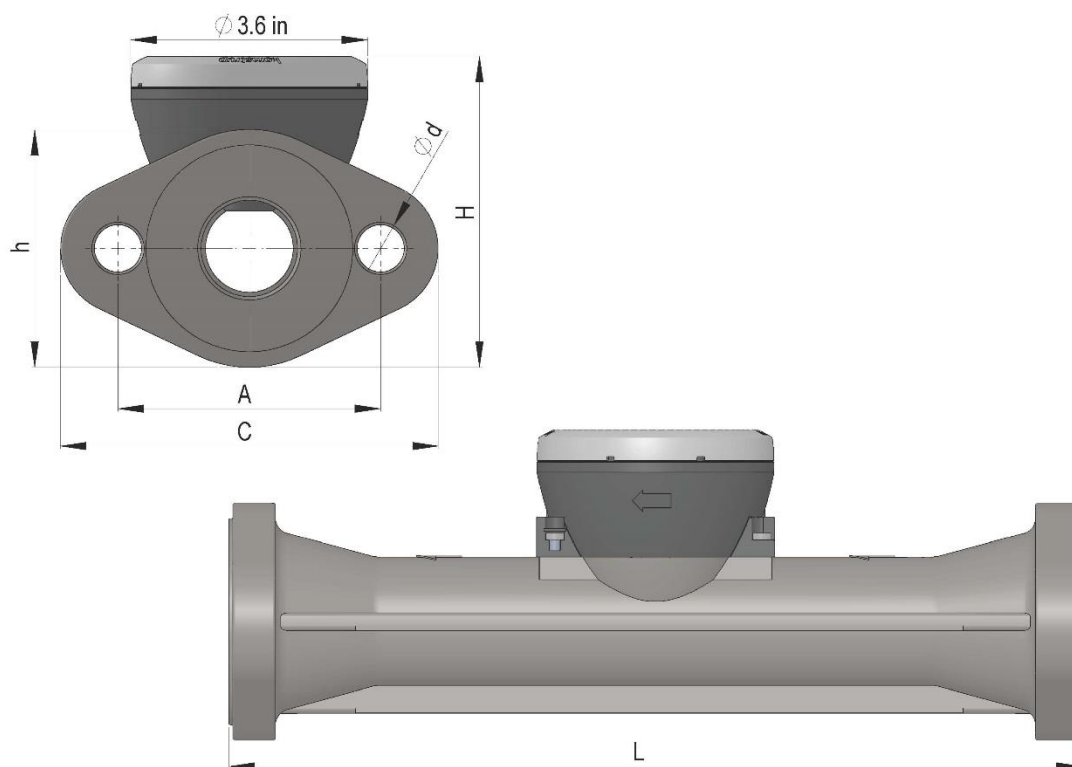
Type: **08**    Size: GPM 160    2" (F) x 17" (432 mm)

RF version: 03U-57-C08-8UX                      (Encoded version: 03U-21-C08-8EX – not shown)



5.4 Connection, weight and dimensions – flowIQ® 3101

GPM	Connection	L	H	h	A	C	d	Weight approx. [Lbs]	Meter type
		[Inch/mm]							
55	5/4" thread	10 3/4" / 273	3.7" / 95	--	--	--	--	4.1	02
120	1 1/2" thread	12 5/8" / 321	3.9" / 100	--	--	--	--	6.0	04
120	1 1/2" flange	13" / 330	4.8" / 122	3.6" / 92	4.0" / 102	5.7" / 146	0.79" / 20	13	06
160	2" thread	15 1/4" / 387	4.33" / 110	--	--	--	--	9.2	07
160	2" flange	17" / 432	5.43" / 138	4.13" / 105	4.49" / 114	6.54" / 166	0.79" / 20	19	08



Dimensions for meter type 06 and 08

## 6 Measuring principle

### 6.1 Ultrasound with piezo ceramics

Flow meter manufacturers have been working on alternative techniques to replace the mechanical principle. Research and development at Kamstrup has proven that ultrasonic measuring is the most viable solution. Based on microprocessor technology and piezo ceramics, ultrasonic measuring is not only accurate but also reliable.

### 6.2 Principles

The thickness of a piezo ceramic element changes when exposed to an electric field (voltage). When the element is mechanically influenced, a corresponding electric charge is generated. Therefore, the piezo ceramic element can function as both sender and receiver.

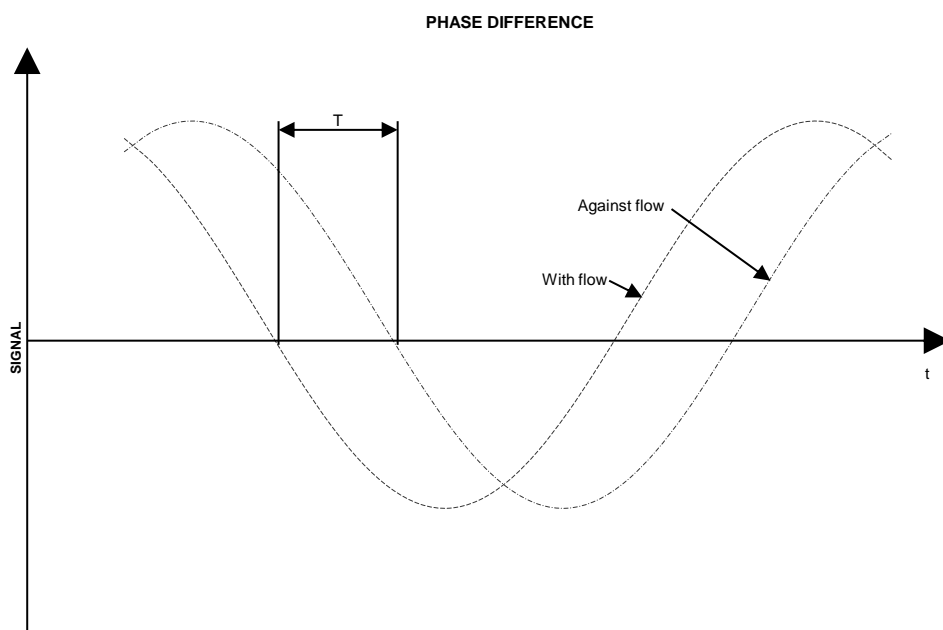
Within ultrasonic flow measuring there are two main principles: the transit time method and the Doppler method.

The Doppler method is based on the frequency change which occurs when sound is reflected by a moving particle. This is very similar to the effect you experience when a car drives by. The sound (the frequency) decreases when the car passes by.

### 6.3 Transit time method

The transit time method used in flowIQ® 2100/3101 utilizes the fact that it takes an ultrasonic signal sent in the opposite direction of the flow longer to travel from sender to receiver than a signal sent in the same direction as the flow.

The transit time difference in a flow meter is very small (nanoseconds). Therefore, the time difference is measured as a phase difference between the two 1 MHz sound signals in order to obtain the necessary accuracy.



In principle, flow is determined by measuring the flow velocity and multiplying it by the area of the measuring pipe:

$$Q = F \times A$$

where:

$Q$  is the flow

$F$  is the flow velocity

$A$  is the area of the measuring pipe

The area and the length which the signal travels in the sensor are well-known factors. The length which the signal travels can be expressed by  $L = T \times V$ , which can also be written as:

$$T = \frac{L}{V}$$

where:

$L$  is the measuring distance

$V$  is the sound propagation velocity

$T$  is the time

$$\Delta T = L \times \left( \frac{1}{V_1} - \frac{1}{V_2} \right)$$

In connection with ultrasonic flow sensors the velocities  $V_1$  and  $V_2$  can be stated as:

$V_1 = C - F$  and  $V_2 = C + F$  respectively

where:  $C$  is velocity of sound in water.

Using the above formula you get:

$$\Delta T = L \times \frac{1}{C - F} - \frac{1}{C + F}$$

which can also be written as:

$$\Delta T = L \times \frac{(C + F) - (C - F)}{(C - F) \times (C + F)}$$

⇓

$$\Delta T = L \times \frac{2F}{C^2 - F^2}$$

As  $C \gg F$ ,  $F^2$  can be omitted and the formula reduced as follows:

$$F = \frac{\Delta T \times C^2}{L \times 2}$$

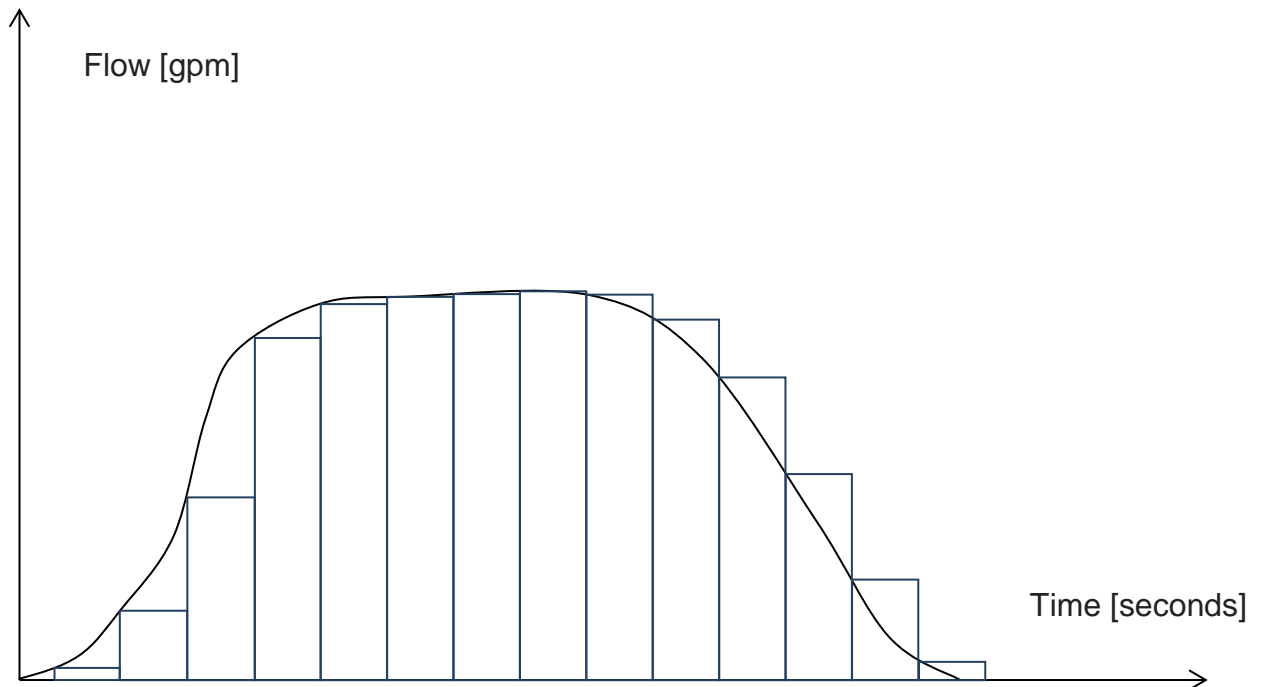
To minimize the influence from variations of the velocity of sound in water, the latter is measured via absolute time measurements between the two transducers. These measurements are subsequently in the built-in ASIC converted into the current velocity of sound, which is used in connection with flow calculations.

### 6.4 Calculation of flow volume

The measurement of the actual velocity of sound in water is also used to determine the temperature of the water, as there is a correlation between these two values, at temperatures below approx. 55 °F. The flow is calculated, as mentioned above, by multiplying the flow rate and the cross-sectional area:

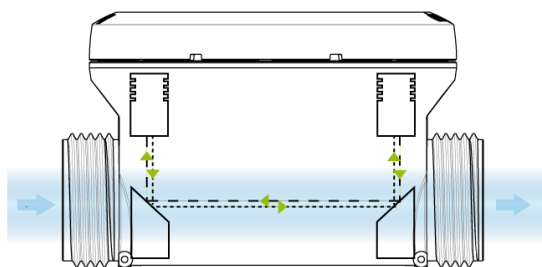
$$Q = F \times A$$

This measurement and calculation is performed every four seconds in the meter; the calculation itself only takes a few milliseconds. The measurement is therefore a 'snapshot' of the current flow. This will, like any type of digital sampling, integrate the measurements over time, leading to the calculation of the final volume.

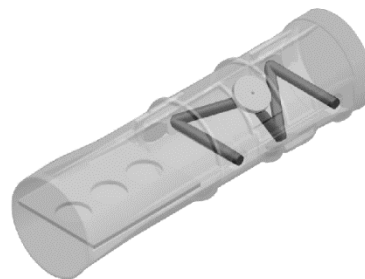


## 6.5 Signal paths

The ultrasonic signal path through the meter...



for flowIQ® 2100 and



for flowIQ® 3101

Max flow: 55...160 GPM

### Triangle

The sound path covers the measuring tube in a triangle. Ultrasound signals are sent from the transducers through the measuring tube via reflectors.

### 6.5.1 Measuring sequences

During flow measuring the meter passes through a number of sequences, which are repeated at fixed intervals. Deviations only occur when the meter is in test mode.

## 6.6 Flow limits

In the meter's working range from 'minimum cut-off' to saturation flow, the flow through the meter will be registered with an accuracy which reflects applicable AWWA standards as well as legal requirements. If the flow exceeds saturation flow ('max cut-off') see table in section 2.4 '*Meter data - overview*', the meter registers a constant flow at max cutoff. In practice, the highest possible water flow through the meter will be limited by the pressure in the installation, or by cavitation due to too low downstream pressure.

If the value of the flow is lower than 'min. cutoff', the meter does not register any flow.

In the meter's working range, from min. cut-off to max. cut-off, there is a linear connection between the quantity of water which has passed through the meter and the measured water flow.

According to metrological and technical requirements, the upper flow limit (max flow) is the highest flow, at which the flow meter may operate for short periods, without exceeding maximum permissible error. The water meter has no functional limitations during the period, when the meter operates this limit. Please note, however, that high flow velocities > max flow involve the risk of cavitation, especially at low static pressures – see section 8.4 '*Operating pressure*'

## 7 Pressure loss

According to AWWA standards the maximum pressure loss must not exceed 15 PSI at 20 GPM.

The pressure loss in a meter increases with the square of the flow and can be stated as:

$$Q = kv \times \sqrt{\Delta p}$$

where:

Q = volume flow rate GPM

k<sub>v</sub> = volume flow constant

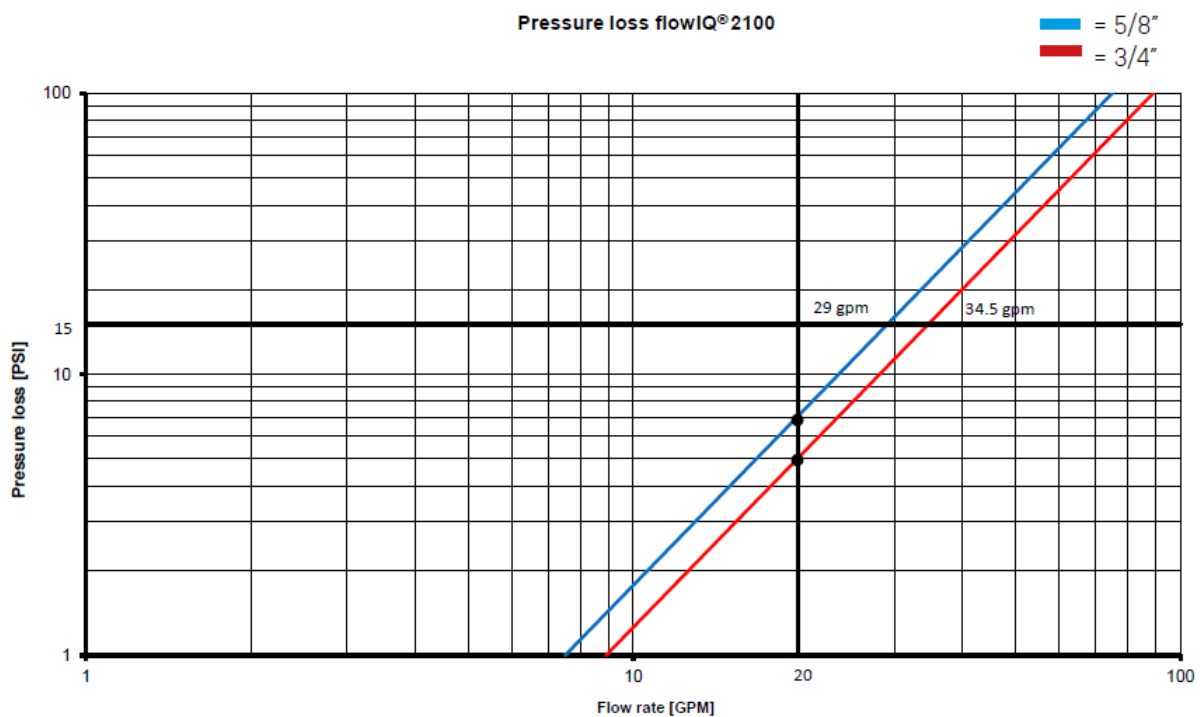
Δp = pressure loss PSI

The graphs below shows pressure loss with respect to flow rate.

### 7.1 Pressure loss - flowIQ® 2100

Pressure loss table - flowIQ® 2100

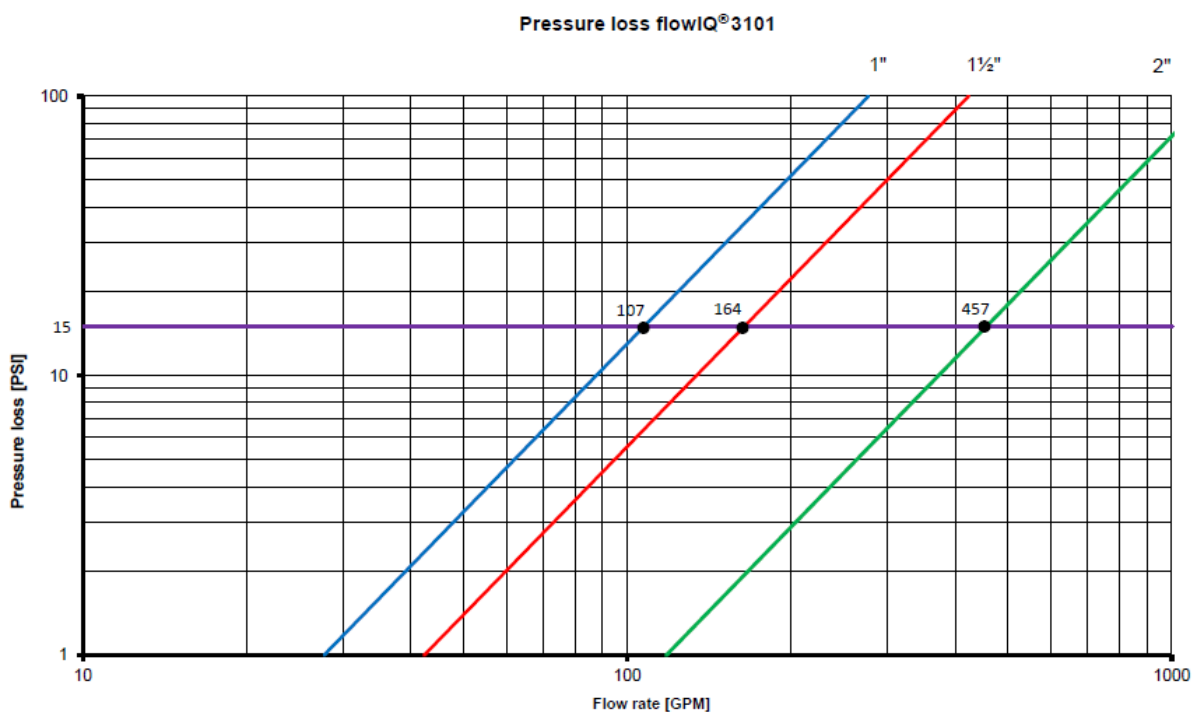
Graph	Max flow GPM	Meter size	k <sub>v</sub>	Flow rate at 15 PSI [GPM]
A	25	5/8" & 5/8" x 3/4"	7.5	29.0
B	32	3/4"	8.9	34.5



7.2 Pressure loss - flowIQ® 3101

Pressure loss table - flowIQ® 3101

Graph	GPM	Size	K <sub>v</sub>	Theoretical flow rate at 15 PSI GPM
A	55	1"	28	107
B	120	1 ½"	42	164
C	160	2"	117	457





## 8 Installation

### 8.1 Installation requirements

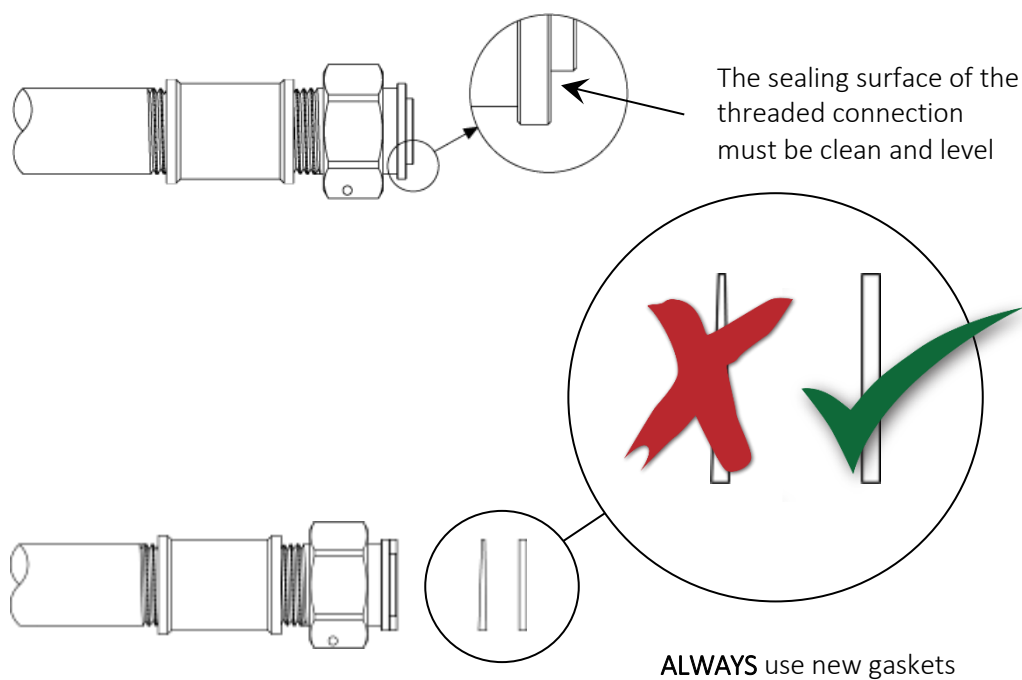
Prior to installation of the water meter the pipe should be flushed to clear any debris. Install the meter - it must be mounted with matching couplings and new gaskets in original quality.

The meter can be mounted at any angle, however, it must be installed in the correct flow direction, as indicated by an arrow on the side of the meter housing. Furthermore, the meter ought to be orientated so that the display is easy to read.

When mounting the water meter, you must ensure that the length of the meter thread will not prevent sufficient tightening of the sealing surface. Do not use multiple gaskets or use the meter threads to 'jack' (draw together) supply piping that is in excess of the meter lay length. Kamstrup includes NSF approved gaskets with all flowIQ® water meters.

#### 8.1.1 Installation conditions

As mentioned above the use of new gaskets in original quality is of crucial importance.



### 8.1.2 Permissible operating conditions

Ambient temperature:	35...130°F – indoors or outdoors. <b>Avoid installing meters in direct sunlight</b>
Humidity:	Up to 100%, and including fully submerged in water
Temperature of water:	
flowIQ® 2100:	up to 140 °F
flowIQ® 3101:	up to 120 °F
System pressure:	
flowIQ® 2100:	5 ...250 PSI (using comparable couplings/gaskets)
flowIQ® 3101 thread meters:	5 ...300 PSI (using comparable couplings/gaskets)
flowIQ® 3101 flanged meters:	5 ...300 PSI (using comparable opposing flanges/gaskets)

### 8.1.3 EMC conditions

flowIQ® meters do not emit significant levels of EMC for either RF or EO versions.

### 8.1.4 Service connection

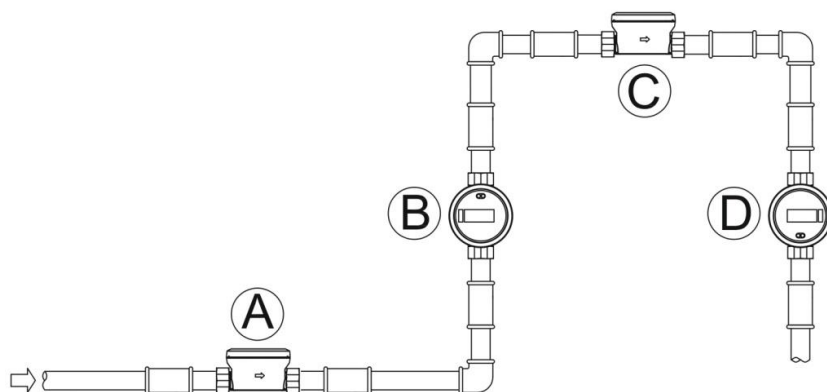
When the meter has been mounted in the system, neither welding nor freezing is allowed. Dismount the meter from the system before starting such work. Should the building electrical service be grounded via the plumbing, ensure that adequate electrical ground is maintained both during and after installation. In order to facilitate replacement of the meter, closing valves should be mounted on both sides of the meter. Under normal operating conditions, a strainer is not required in front of the meter

## 8.2 Installation angle

The meter can be mounted at all angles and in all positions. Thus, the meter can be mounted in a usual horizontal installation. It can be mounted vertically in an ascending pipe, it can be mounted at any angle and it can be mounted with its display pointing downwards, e.g. under a ceiling. Mounting the meter on a pipe with downward flow direction will result in the display being 'upside down'.

### 8.3 Straight inlet

The meter normally requires neither straight inlet nor straight outlet to achieve accurate measurement. In atypical installation environment (heavy flow disruptions), a several pipe diameters of straight pipe may be advisable on the inlet section.



- A** Recommended water meter position
- B** Recommended water meter position
- C** Recommended for well installation. Air build-up may occur
- D** The meter functions optimally, but the display is 'upside down'

### 8.4 Operating pressure

In order to avoid formation of air bubbles or vapor dents in the meter (cavitation) – and to ensure correct measurement under all circumstances – the operating pressure in the pipe installation should observe the test conditions of AWWA M6 manual. The static pressure, immediately after the meter (the downstream), must always be at minimum:

- 5 PSI (0.3 bar) for flowIQ® 2100 versions
- 20 PSI (1.4 bar) for flowIQ® 3101 versions

Cavitation will negatively affect measurement accuracy and can physically damage the meter.

## 9 Reading and data

### 9.1 Reading

flowIQ® 2100 and flowIQ® 3101 – **RF version** can be read in three different ways:

- Visual reading of the LCD display
- Receiving the Wireless M-bus signal, which is emitted at intervals of 16 or 96 seconds
- Reading via the optical eye, e.g. by means of a wired (USB) or wireless optical reading head.

flowIQ® 2100 and flowIQ® 3101 – **Encoded Output version** can be read in three different ways: \*)

- Visual reading of the LCD display
- Receiving the Encoded Output signal, which is transmitted upon interrogation by a radio endpoint
- Reading via the optical eye, e.g. by means of a wired (USB) optical reading head

\*) Note! **The radio in the EO meter is permanently disabled.**

### 9.2 Volume measurement

The meter calculates water flow currently according to a fixed measuring cycle. When the meter is in normal mode a measurement is carried out every four seconds, and after a total of 32 seconds the meter reading is updated in the display.

Every 24 hours the meter count is saved in the daily register. The register includes data for the latest 460 days. The daily register can be read via the optical eye.

The Wireless M-Bus signal always includes current meter count.

### 9.3 Data function: Target volume

The water meter saves the meter reading on the first day of the month in the target volume V1-Historic register. Configuration Code KK (default = 01) establishes which day of the month to use, with options of 01, 10 and 15. At the second after midnight on that day each month, historic data is stored in the monthly register of the data logger. The register includes data for the latest 36 months.

The Wireless M-Bus signal includes target volume of current month if selected during customer specific configuration. The customer can select whether the Wireless M-Bus signal is to include target volume of current month or max. flow of latest month, plus a number of combinations of water<sup>1)</sup> and ambient temperature. (see 9.6.2 and 9.6.3 '*Optional register*').

Reading the target volume is suitable for use by the waterworks settlement with the consumer.

The complete register of target volumes for the latest 36 months can be read by means of the optical eye.

<sup>1)</sup> *Measuring the water temperature is only valid for flowIQ® 2100 meters*

## 9.4 Data function: Maximum flow and minimum flow

flowIQ® 2100 and 3101 registers maximum and minimum flow on a daily as well as monthly basis. Maximum and minimum flow are calculated as the largest and the smallest value respectively of a number of current flow measurements. The average period used for all calculations can be selected in the interval 1...120 minutes in leaps of one minute. The choice must be made when submitting the order, but can also later be changed with METERTOOL.

**If no choice is made, the average period will by default be 2 minutes.**

The Wireless M-Bus signal includes max. flow of latest full month if selected during the customer specific configuration. (see paragraph 9.6 *'Radio packet options'*)

Values of maximum and minimum flow are saved in both daily and monthly registers. Daily registers of the latest 460 days and monthly registers of the latest 36 months are always readable via the optical eye.

The development of maximum flow can indicate an error in the water installation. If e.g., max flow falls over a longer period, this can be a sign of a blocking in the installation or a leakage in the supply pipe before the meter.

## 9.5 Data function: Measuring temperature

### 9.5.1 Temperature monitoring

The water meter measures water<sup>\*)</sup> and ambient/meter temperatures, respectively. The measurements can be used to monitor the installation and to give an indication of the quality of water. Both temperatures are stored in the meter's daily and monthly records<sup>\*)</sup>.

For each day, temperature values, minimum, maximum and average are stored in the 24 hours' register. The register contains the last 460 days.

On the Target Date, generally the first day of the month, temperature values, minimum, maximum and average, for the latest month, are stored in monthly register.

The register contains the last 36 months. Temperature values, are referred in °F and can be read using the optical eye. These are sent via the Wireless M-Bus radio signal. The temperature values can be combined, as described in 9.6.2 and 9.6.3 '*Optional register*'.

### 9.5.2 Ambient/meter temperature

Monitoring ambient/meter temperature in the installation can be used for warnings of freezing or unintended high temperatures. The measurements of the meter temperature are made inside the meter housing, which corresponds to the ambient temperature where the meter is installed. The temperature is measured every minute.

The maximum and minimum values are based on a two-minute averaging value. The average temperature is a time-weighted mean value.

### 9.5.3 Water temperature

Monitoring the water<sup>\*)</sup> temperature can help to indicate quality of the water when it reaches the consumer. Every 32 seconds an indirect measurement of water temperature is made, using the ultrasound signal. The maximum and minimum values are calculated every 2 minutes, based on a volume weighted mean value since the last minimum/maximum temperature calculation.

Measurement of water<sup>\*)</sup> temperature requires that the meter is filled with water. If there is no water in the meter a code will be saved, saying that the meter is not water filled.

During periods of very low water consumption, the water temperature approaches the ambient temperature. During periods without water flow the weighted average cannot be calculated and then a code 128 is stored, indicating that there is no consumption.

<sup>\*)</sup> *Measuring the water temperature is only valid for flowIQ 2100® meters*

## 9.6 Radio packet options

The meter communicates via an an integrated 915MHz band RF signal, which gives access to easy and fast wireless reading of the meter.

The integrated 915MHz band RF transmits a data package every 16 or 96 seconds. In order to obtain long battery lifetime, the data package has been compressed and includes only the most important meter readings. The radio is ready for multi-channel transmission to avoid interference with nearby transmitters. Besides readout of the current total registered water use, the meter saves a number of other consumption data. Following values can be send via the Wireless RF radio signal:

- Target Volume - e.g., meter read from the first day of the month
- Maximum flow - daily
- Maximum flow - monthly
- Selected values of water temperature and ambient temperature

### 9.6.1 Optional RF output

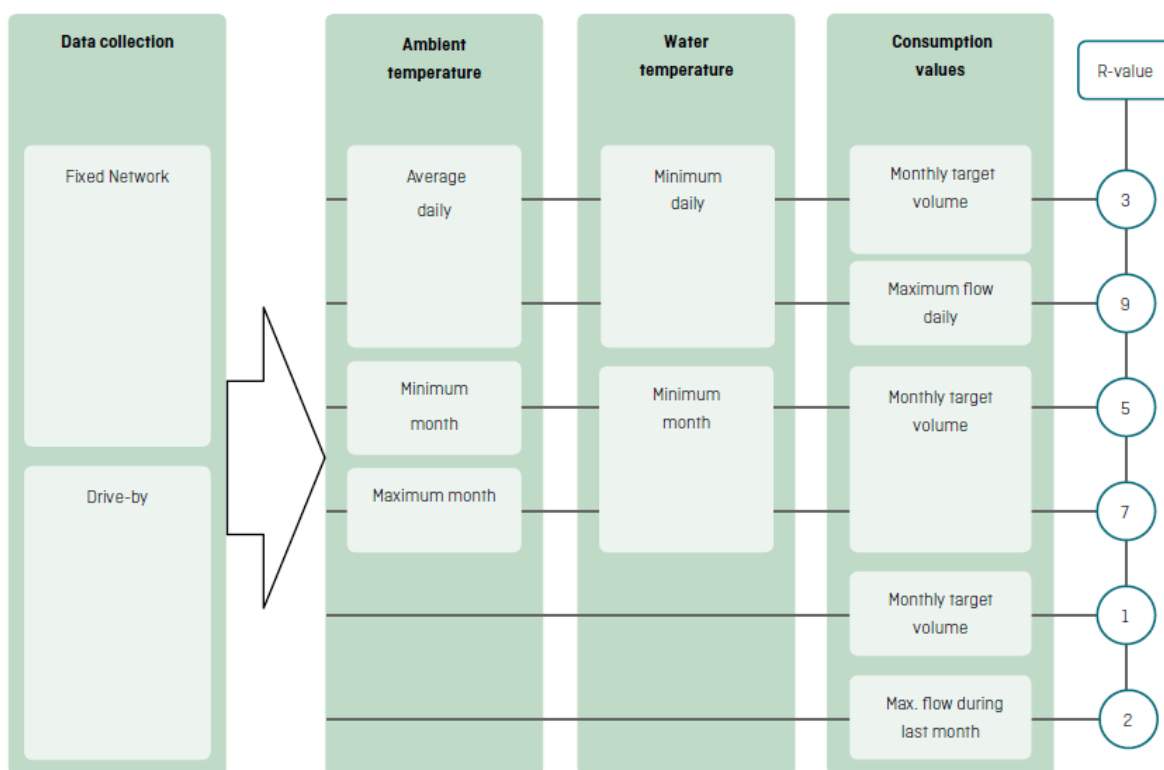
Some of the data sent via a high-power antenna and integrated 915MHz band RF is optional. It is possible to select one of the data packages with content illustrated in the figure below.

The choices are determined by means of the selected R-value when ordering a water meter – shown to the right in the figures.

Also see description of Wireless M-Bus signal in section 14 *'Data communication – Wireless'*. In addition the RF package will contain actions and historical events from the infologger from within the past 30 days.

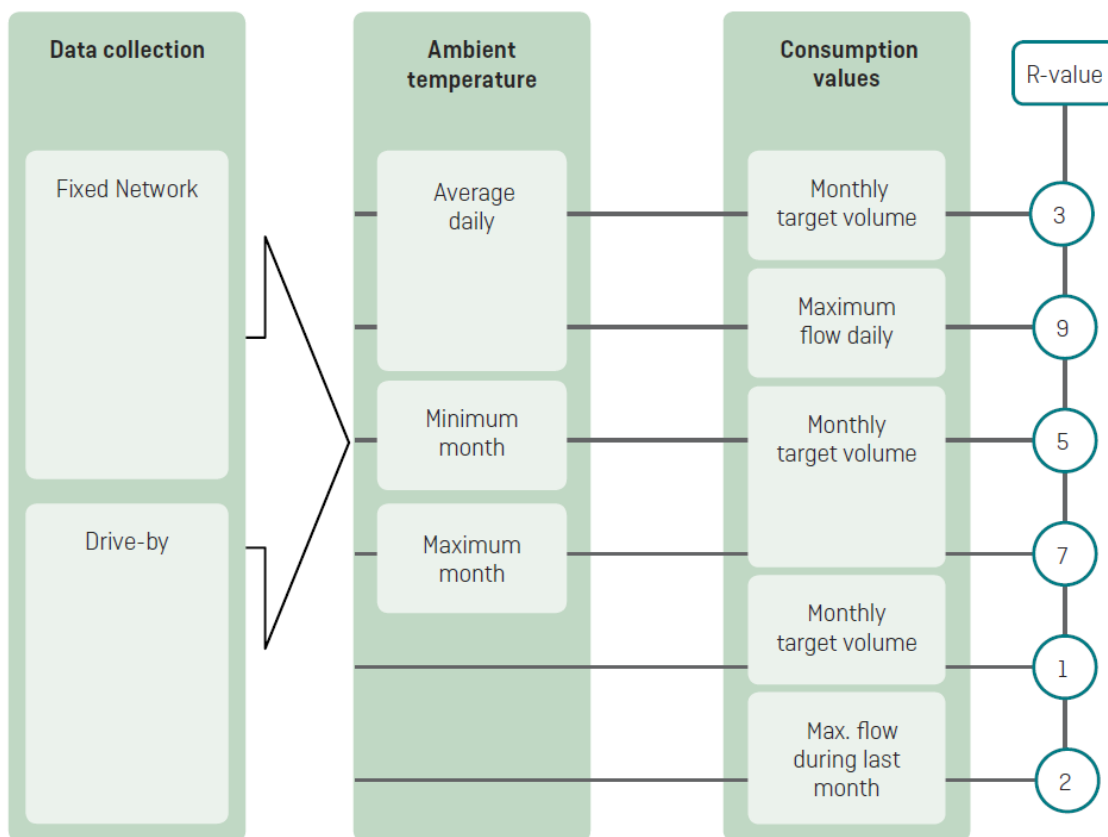
### 9.6.2 Optional register – flowIQ® 2100

'R- value' refers to the structure of the data in the optional register.



9.6.3 Optional register – flowIQ® 3101

'R- value' refers to the structure of the data in the optional register.





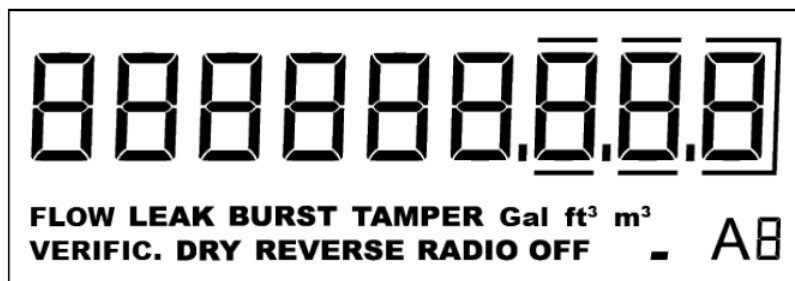
### 9.7 Display functions

The meter is fitted with an easily readable LCD-display including 9 digits, measuring units and information field with info codes.

The display layout is shown in the figure below.



#### 9.7.1 Volume



Volume can be displayed in three different units – Gal, ft<sup>3</sup> or m<sup>3</sup>.

Depending on 'mode' the legal volume is displayed in the unit [Gal ft<sup>3</sup> or m<sup>3</sup>] (normal mode) - or the part of the legal volume, which is below 100.000 units of the displayed value (verification mode). This setting is only used during verification.

The display resolution can be configured with either zero, one, two or three decimal points, depending on the desired resolution. This means that the value that can be shown in the display, and thereby the measured quantity, can be maximum 999,999,999. Should the meter reach this point, the display will roll over and the meter continues counting.

The table below shows an overview of modes and readings:

	Normal mode	Verification mode
Data register	V1	V1HighRes
Unit	Gal, ft <sup>3</sup> or m <sup>3</sup>	(Gal, ft <sup>3</sup> or m <sup>3</sup> ) x10 <sup>-3</sup>
Number of digits	9	6
Decimals after point	0-1-2 or 3 (by 6,7,8 or 9 digits)	3

**9.7.2 Resolution**

The resolution of the display (combined with the selected unit) can be varied by moving the decimal point. Bars over and under the digits indicate decimals after the point. This change has no influence on the measurement itself, and all 9 digits will remain on. The number of decimals after the point can be selected by the customer to be:

0, 1, 2 or 3 decimals when submitting the order or later by METERTOOL. If no selection is made, the default value will be Gallons with zero decimals.

**9.7.3 Dot (flashing square)**

The small square in the display indicates that the meter is active. It is alternately ON at a frequency determined by the meter's mode. In normal mode it flashes once a second. In verification mode it flashes twice a second.

**9.7.4 Info codes**



The info codes count 8 separate text signs (marked in the above sketch), which indicate a special condition in the meter. The signs flash when active, if not they are OFF.

The individual info codes are described below:

**Info code - FLOW**

This info code is turned on (not flashing) when the water is running. If the water is stagnant, the symbol will be off.

**Info code - LEAK**

This info code is activated if the water is never stagnant in the meter. Possible untight connections, running cisterns, untight safety valves in water tanks, or other untightnesses will result that the meter registers water flow 24 hours a day.

If the water meter has not registered minimum 1 continuous hour without water flow within the latest 24 hours, this is a sign of a leakage in the water installation. The alarm automatically disappears after an hour without flow in the meter.

The sensivity of the leak surveillance can be selected by the customer when submitting the order. The following options are available:

Leakage message limits		Continuous GPH for 24 hours meter size:				
		flowIQ® 2100		flowIQ® 3101		
		5/8"	¾"	1"	1½"	2"
<b>N =</b>	Constant minimum flow alarm is activated at:					
0	OFF	--	--	--	--	--
1	Flow continuously > 0.5 % of max flow	7.5	10	17	36	48
2	Flow continuously > 1.0 % of max flow	15	19	33	72	96
3	Flow continuously > 2.0 % of max flow	30	38	66	144	192
4	Flow continuously > 0.25 % of max flow	4	5	8	18	24
5	Flow continuously > 0.1 % of max flow	1.5	2	3	7	10

The utility must be aware that there can be water consumption all the 24 hours in households with many residents. This means that there will not be an hour without flow, and the water meter will set an alarm for this 24-hour period. Users and water utilities must, therefore, be critical of the leakage alarm.

The leakage alarm is saved with a date stamp in both daily register for 460 days and in monthly register for 36 months. Furthermore, it is saved in the info code register of the latest 50 info code events. Together with the info code event a time indicator with 7 time intervals, which indicates how long the info code has existed, is registered.

The Wireless M-Bus signal includes the LEAK code. If the LEAK code is active or has been active within the latest 30 days, a time indicator with 7 time intervals will indicate how long the info code has been active.

**Info code - BURST**

This info code is activated if the flow exceeds a given value for a continuous period of 30 minutes. This can be a sign of a burst in the pipe installation which requires prompt action.

The size of the 30-minute flow (which prompts the info code BURST) can be determined by the customer when submitting the order. The following options are available:

Pipe burst limits		Total gallons within 30 minutes for meter size:				
		flowIQ® 2100:		flowIQ® 3101:		
		5/8"	¾"	1"	1½"	2"
<b>P =</b>	Constantly high flow alarm is activated at:					
0	OFF	--	--	--	--	--
1	Flow > 5 % of max flow in 30 minutes	38	48	83	180	240
2	Flow > 10 % of max flow in 30 minutes	75	96	165	360	480
3	Flow > 20 % of max flow in 30 minutes	150	192	330	720	960

The info code BURST disappears when the flow falls below the above-mentioned limit. It can take up to 64 seconds after the flow has fallen below the above-mentioned limit until the info code disappears. Utilities must be aware that water consumption, which activates the pipe BURST alarm from the water meter, may occur in systems with many connected households. Users and water utilities must, therefore, be critical of the burst alarm.

BURST is saved with a date stamp in both the daily register for 460 days and the monthly register for 36 months. Furthermore, it is saved in the info code register of the latest 50 info code events. Together with the info code event a time indicator with 7 time intervals, which indicates how long the info code has been active, is registered. The Wireless M-Bus signal comprises the BURST code. If the BURST code is active, or has been active within the latest 30 days, a time indicator, with 7 time intervals, will indicate how long the info code has been active.

**Info code - TAMPER**

This info code becomes active if the water meter has been exposed to unauthorized access, i.e. an attempt to cheat. This means that the meter is no longer valid for billing purposes. The info code TAMPER cannot be removed.

If the info code TAMPER is active, no other info codes can be read. The tamper event is due to disassembly of the meter. In the event the meter were tampered with by removal and re-installation in the reverse direction, the TAMPER alarm would not display, but other alarms such as LEAK, DRY and REVERSE would provide a clear indication that such a tamper event had occurred.

**Info Code – DRY**

This info code indicates that there is air in the meter. The ultrasonic measuring principle implies that the meter must be water-filled. If there is air in the meter, nothing is measured.

The info code DRY is activated in the display when 8 successive measurements have shown that there is air in the meter, i.e. after minimum 32 seconds and maximum 64 seconds. The code disappears after one measurement without air, i.e. after 4 seconds.

If the info code DRY is active, it will immediately appear in the display, and from readings via the optical eye.

In order to avoid false alarms, due to short-term air build-up in the meter, the info code DRY is not added to the relevant registers until it has been continuously active for 30 minutes.

DRY is saved with a date stamp in both the daily register for 460 days and the monthly register for 36 months. Furthermore, it is saved in the info code register of the latest 50 info code events. Together with the info code event, a time indicator with 7 time intervals (which indicates how long the info code has been active) is registered.

Correspondingly the info code DRY is not added to the Wireless M-Bus signal until it has been continuously active for 30 minutes. Furthermore, if the info code DRY has been active within the latest 30 days, a time indicator with 7 time intervals indicates how long the info code has been active.

**Infokode – REVERSE**

This info code indicates that the water in the meter flows in the wrong direction.

Info code REVERSE is activated when the water runs backwards in the meter at a flow which numerically exceeds minimum low flow for 5 consecutive minutes.

The code disappears from the display when the water is stagnant, or again runs in the correct direction in the meter. It can take up to 64 seconds until the info code disappears.

The alarm REVERSE is saved with a date stamp in both the daily register for 460 days and in the monthly register for 36 months. Furthermore, it is saved in the info code register of the latest 50 info code events. Together with the info code event a time indicator with 7 time intervals, which indicates how long the info code has been active, is registered.

If the code REVERSE is active or has been active within the latest 30 days, a time indicator with 7 time intervals will indicate how long the info code has been active.

Reverse flow is counted and logged in a separate internal register in the meter and can only be read on a monthly basis. If a meter has been incorrectly installed (with reverse flow direction) for a longer period, the reverse volume could be read in the monthly logger. This log is, similar to the legal log, an absolute log – which means that the total reverse consumption for the past month are shown in the log at the end of the month. So even if the fault is corrected, the total reverse consumption can not be seen until the end of the month.

The total reverse volume is measured and recorded whether the info code is being activated or not.

The register can only be read via the optical eye with LogView.

The legal volume register, V1, and thus the meter reading is not affected by the reverse flow.

**Info code – RADIO OFF (transport mode) \*)**

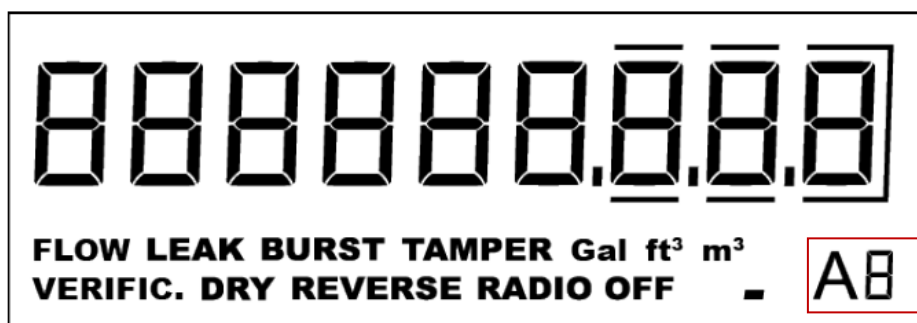
When the water meter leaves the Kamstrup factory, it is (as part of the production process) placed in ‘transport mode’ and therefore the RADIO OFF info code is active in the display . This is to conserve battery life and limit extraneous radio transmission indicates that the meter is still in ‘transport mode’ and that the built-in radio transmitter has not yet been activated.

In transport mode the meter displays info codes, if any, but they are not logged into the corresponding registers, and they are not added to the corresponding hour counters.  
 The radio transmitter is activated and turns on automatically (as part of the installation process) when water starts flowing and the first 1/4 gallon of water has run through the meter. The radio transmitter remains active.

The info code RADIO OFF is one info code signal, which either flashes, or is inactive. When RADIO OFF flashes in the display, the radio is off. When the RADIO OFF signal is inactive in the display, the radio transmitter is turned on.

*\*) As the radio has been permanently disabled, RADIO OFF will not display on Encoded Output meters.*

**9.7.5 Adjustment mark**



The symbol ‘A’ and the corresponding figure indicate the number of flow adjustments and legal changes after factory verification.

It is possible to reset the legal registers and change the factory programmed flow curve to a limited extent. The flow adjustment makes it possible to adjust the existing curve at three points. The total adjustment compared to the factory adjustment cannot exceed +/- 10 %.

As long as no adjustments have been made, both the ‘A’ and the digit are inactive, and Kamstrup A/S does not add further adjustment marking to the meter. After the first adjustment, the ‘A’ is activated and the digit shows the number of adjustments (1 to 9).

## 9.8 Radio Transmitter

### 9.8.1 Transmission

Data packages are sent at intervals of approx. 16 seconds via the built-in radio transmitter> Every eighth package is a 'full string', whereas the 7 intervening packages are 'compact strings'.

The first time new Kamstrup meters are read by RF, it is necessary to wait for the 'full string' package, for the first meter in a batch (line item on Kamstrup's Order Confirmation). This means it can take more than two minutes.

**Please note:** The contents of the data package is updated every time a package is sent.

A 'full string' includes extra information on how the meter data are to be interpreted. Once a single 'full string' has been received, the remaining meter population of identically configured meters can be read by a 'compact string'. (Depending on the meter reading sw).

When sending a data package each 16. second the data package is short and compressed to achieve a long battery life.

By 96 second intervals, a long and intelligent radio package with built-in 'repair coding' is sent. At the same time the power of the signal is higher and therefore optimized for use in fixed networks. With the increased interval between the transmissions, the same high battery life is guaranteed.

### 9.8.2 915MHz band RF – wireless radio communication

The water meter has a built-in radio transmitter 915MHz band RF for Wireless M-Bus.

Consequently it is one way transmission. The meter does not include a radio receiver and cannot be contacted via radio.

The table below summarizes and describes the data comprised by the data package:

Data	Explanation
Serial number	The meter's serial number. The serial number will never be encrypted.
Meter specific data	Identification as cold water meter Kamstrup's specific Wireless M-Bus producer-ID Information on length and format of data package Information on encryption of data package
Meter reading	The current meter reading from the meter's legal register
Target volume	Meter reading of the 1 <sup>st</sup> of the month.
Max flow	Maximum flow, which has been measured in the last completed month, respectively completed day.
<sup>*)</sup> Water temperature	Minimum or average water temperature for the last completed month or day depending on the choice of the 'R'
Meter temperature	Minimum, maximum or average ambient/meter temperature, latest month or completed day – depending on choice of 'R'- value
Info codes	Info codes which are active at present
Historical info codes	Info codes which have been active within the latest 30 days, including information on how long they have been active – on a scale of 1-7

<sup>1)</sup> For more information - See section 9.6 'Radio packet options'

The meter communicates via a **high-power antenna and integrated 915MHz band RF**, which gives access to easy and fast wireless reading of the meter.

The integrated 915MHz band RF transmits a data package every 16 seconds. In order to obtain long battery lifetime, the data package has been compressed and includes only the most important meter readings. The radio is ready for multi-channel transmission to avoid interference with nearby transmitters.

Besides readout of the current total registered water use, the meter saves a number of other consumption data. Following values can be send via the Wireless RF radio signal:

- Target Volume - e.g., meter read from the first day of the month
- Maximum flow - daily
- Maximum flow - monthly
- Selected values of water temperature and ambient temperature

Encryption is default when submitting the order, which means that all variable data will be encrypted with 128 bit AES counter mode encryption.

### 9.9 Optical eye

The meter is fitted with an optical eye that gives access to the meter's external interface, with which all the meter's data registers can be read. For instance data can be read using Kamstrup's optical reading head. The reading head includes a permanent magnet which switches on the optical eye. The interface communicates at 1200 baud.

In order to limit current consumption the default setting of the optical eye is OFF.

By means of a magnet sensor the optical eye will automatically switch ON, if an optical reading unit with magnet is placed on the meter. The start-up time of the optical eye (from the magnet is attached to the meter until the optical eye switches on) depends on the meter's mode as shown in the table below.

Normal mode	4 sec.
Verification mode	0.5 sec.

For Kamstrup's optical reading head a holder is available, which fits flowIQ® 2100/3101 and is clicked onto the meter. A holder for RF version as well as for the encoded versions are available.

Below is a picture of optical reading head and holder.





## 10 Encoded Output

### 10.1 General description

Encoded Output is compatible with a number of third party AMR and AMI network systems. These systems consist of a number of endpoints, each of these is electrically connected to a meter. Each radio endpoint sends an RF packet to a mobile receiver or fixed network collector. Encoded output is specified by the type numbers: 0XU-2X-COX-8EX, with 2 versions available. Multiple protocols are supported, and Version 2 meters are available with an option for the inclusion of Extended Alarm data within the data packet

Encoded Output is compatible with a number of RF network systems, not developed nor sold by Kamstrup. The systems consist of a number of endpoints, each of these is electrically connected to a meter. Each endpoint sends RF to a collector. Encoded output is specified by the type number: 02U-21-COX-8EX. Eight EO data packets are supported, with a total of 18 Encoded Output digit configurations.

### 10.2 Versions

There are two versions of Encoded Output. Version 1 (V1)<sup>1)</sup> is defined by Type Number: 0XU-20-COX-8EX (this version has been discontinued) and Version 2 (V2) is defined by Type Number: 0XU-21-COX-8EX.

<sup>1)</sup> V1 Encoded Output can support 6 or 9 digit Sensus protocols and 6 or 8 digit Neptune (ProRead or E-Coder) protocols. For meters configured for 6-digit or 9-digit Sensus protocols, the transmitted digits are dependent on the placement of the decimal point (radix symbol). The specified number of transmitted digits are then counted to the left, starting at the decimal point. This means that only the integer portion of the usage, as reflected on the LCD register are available for inclusion in the data packet, and decimal fraction digits (to the right of the decimal) are not available. It is also important to note that the specific digits (wheels) which will be transmitted will vary, based on the setting of Configuration Code S, which defines 1) unit of measure (Cu M, Gal and Cu Ft) and 2) decimal placement. A special case occurs for V1 Encoded Output meters when Sensus 9-digit is selected, and Configuration Code S does not equal 0, 4 or 8, meaning there will be one or more digits behind the decimal the number of available digits to transmit will be less than 9. In this case, the Encoded Output data packet will prepend corresponding number of zeros, followed by the remaining 6 to 8 available integer digits from the register.

V2 Encoded Output can support 4, 5, 6, 7, 8 or 9 digit Sensus protocols and 6 or 8 digit Neptune (ProRead or E-Coder) protocols. V2 Encoded Output meters are independent of the placement of the decimal (radix), as the transmitted digits are counted starting from the leftmost (most significant) digit (wheel), and counting to the right. Depending on the placement of the decimal, as defined by Configuration Code S, and the number of digits to be transmitted, it is possible for V2 Encoded Output meters to transmit one or more fractional digits via Encoded Output. Please note that neither the Neptune nor the Sensus protocol supports transmission of the actual decimal point. V2 Encoded Output also provides the option for transmission of Extended Alarm data via the wired connection. The Extended Alarm data resides to the right of the volume and serial number, which permits this data to be sent to legacy third party radios (e.g., radios which cannot interpret the Extended Alarms) without corruption of the serial number and volume data.

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
Connector/cable Type:	Itron or Nicor, with 5' cable length and open end solid strain cables of 3 lengths: 5', 15' and 25'.
Alarms included:	Default = ON, optional = OFF <sup>*)</sup>

<sup>\*)</sup> Note. Kamstrup Alarm Protocol [KAP] is available and included by default with all Sensus data protocols; Neptune E-Coder includes [Neptune] alarms; Neptune ProRead does not support alarms.

**Encoded Output packages**

18 Encoded Output options are available, which transmit from 4 to 9 digits, via the following 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
- Neptune ProRead                6 digits, no alarms, 1 EO option

The following table details eight EO data packet options, packet length, protocol and extended alarm availability:

Encoded Output description	Packet content, (optional extended content)	Std. packet length, (ext. packet length) * # bits	Extended alarm (default)	Protocol
Sensus 9-digit	Volume, Serial Number, (Alarms)	25 bytes (29 bytes) * 10 bits	Optional (ON) <sup>1</sup>	UI-1203/R20
Sensus 8-digit	Volume, Serial Number, (Alarms)	24 bytes (28 bytes) * 10 bits	Optional (ON) <sup>1</sup>	UI-1203/R20
Sensus 7-digit	Volume, Serial Number, (Alarms)	23 bytes (27 bytes) * 10 bits	Optional (ON) <sup>1</sup>	UI-1203/R20
Sensus 6-digit	Volume, Serial Number, (Alarms)	22 bytes (26 bytes) * 10 bits	Optional (ON) <sup>1</sup>	UI-1203/R20
Sensus 5-digit	Volume, Serial Number, (Alarms)	21 bytes (25 bytes) * 10 bits	Optional (ON) <sup>1</sup>	UI-1203/R20
Sensus 4-digit	Volume, Serial Number, (Alarms)	20 bytes (24 bytes) * 10 bits	Optional (ON) <sup>1</sup>	UI-1203/R20
Neptune 8-digit (E-Coder)	Vol Hi, Serial Number, Vol Lo, Alarms	34 bytes * 11 bits	Included <sup>1</sup>	Neptune E-Coder
Neptune 6-digit (ProRead)	Volume, Serial Number	34 bytes * 11 bits	N/A <sup>2</sup>	Neptune ProRead

<sup>1</sup> Kamstrup Alarm Protocol (KAP):

*LEAK, REVERSE, BURST, DRY PIPE, TAMPER, NO USAGE, MIN TEMP x 3, MAX TEMP x 3, EO CHANGE*

<sup>2</sup> *LEAK, REVERSE, NO FLOW, mapped to E-Coder Alarm Protocol*

Neptune ProRead Protocol does not support alarms

**10.3 Protocols**

Encoded output is available in three general protocols: Sensus UI-1203 (6 or 9 digit for V1, 4-9 digits for V2), Neptune ProRead (6 digits) and Neptune E-Coder (8 digits). Encoded Output emulating Sensus protocols conform to the UI-1203R20 release, while Neptune protocols have been derived from independent research.

### 10.4 Encoded Output - ordering details

Encoded Output ordering details - total of 18 ordering options

Encoded Output Description	EO Digits Visualization	Optional Extended Alarm Protocol	Order Code
Sensus 9-digit	[987654321]	Kamstrup Alarm Protocol (KAP)	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*]	Only available <b>with</b> Neptune Alarms	X
Neptune 6-digit (ProRead)	[987654***]	Only available <b>without</b> Neptune Alarms	Y

### 10.5 Data Packet Types and Contents

Sensus data packets are based on a 10 bit structure and vary in size, according to the number of transmitted digits, and the inclusion or absence of the optional 2 byte Extended Alarm data. Neptune data packets are based on an 11 bit structure and are fixed a length of 34 bytes. All data packets contain 1 start bit, 7 data bits 1 parity bit and 1 stop bit. Neptune data packets contain a 2<sup>nd</sup> stop bit. The following table describes the 8 data packet details for version 2 Encoded Output:

EO Description	Packet Content, (optional Extended Alarms)	Packet Length, (optional Extended Alarms Length) * # bits
Sensus 9-digit	Volume [9 digits], Serial Number [8 digits], (Alarms [2 bytes])	25 bytes (29 bytes) * 10 bits
Sensus 8-digit	Volume [8 digits], Serial Number [8 digits], (Alarms [2 bytes])	24 bytes, (28 bytes) * 10 bits
Sensus 7-digit	Volume [7 digits], Serial Number [8 digits], (Alarms [2 bytes])	23 bytes, (27 bytes) * 10 bits
Sensus 6-digit	Volume [6 digits], Serial Number [8 digits], (Alarms [2 bytes])	22 bytes, (26 bytes) * 10 bits
Sensus 5-digit	Volume [5 digits], Serial Number [8 digits], (Alarms [2 bytes])	21 bytes, (25 bytes) * 10 bits
Sensus 4-digit	Volume [4 digits], Serial Number [8 digits], (Alarms [2 bytes])	20 bytes, (24 bytes) * 10 bits
Neptune 8-digit (E-Coder)	Vol Hi [6 digits], Serial Number [10 digits], Vol Lo [2 digits], Alarms [2 bytes]	34 bytes * 11 bits
Neptune 6-digit (ProRead)	Volume [6 digits], Serial Number [10 digits]	34 bytes * 11 bits

Note: V1 Encoded Output does not support 4, 5, 7 or 8 digit Sensus data packets, or Extended Alarm data.

V2 Encoded Output

ID	Encoded Output Description	AMI Digits Visualization	Optional Extended Alarm Protocol	Order Code
50	Sensus 9-digit	[987654321]	Kamstrup Alarm Protocol (KAP)	Z
51	Sensus 8-digit	[98765432*]	Kamstrup Alarm Protocol (KAP)	A
52	Sensus 7-digit	[9876543**]	Kamstrup Alarm Protocol (KAP)	B
53	Sensus 7-digit (-1)	[*8765432*]	Kamstrup Alarm Protocol (KAP)	C
54	Sensus 6-digit	[987654***]	Kamstrup Alarm Protocol (KAP)	D
55	Sensus 6-digit (-1)	[*876543**]	Kamstrup Alarm Protocol (KAP)	E
56	Sensus 6-digit (-2)	[**765432*]	Kamstrup Alarm Protocol (KAP)	F
57	Sensus 5-digit	[98765****]	Kamstrup Alarm Protocol (KAP)	G
58	Sensus 5-digit (-1)	[*87654***]	Kamstrup Alarm Protocol (KAP)	H
59	Sensus 5-digit (-2)	[**76543**]	Kamstrup Alarm Protocol (KAP)	J
60	Sensus 5-digit (-3)	[***65432*]	Kamstrup Alarm Protocol (KAP)	K
61	Sensus 4-digit	[9876*****]	Kamstrup Alarm Protocol (KAP)	L
62	Sensus 4-digit (-1)	[*8765****]	Kamstrup Alarm Protocol (KAP)	M
63	Sensus 4-digit (-2)	[**7654***]	Kamstrup Alarm Protocol (KAP)	N
64	Sensus 4-digit (-3)	[***6543**]	Kamstrup Alarm Protocol (KAP)	P
65	Sensus 4-digit (-4)	[****5432*]	Kamstrup Alarm Protocol (KAP)	Q
66	Neptune 8-digit (E-Coder)	[98765432*]	only available with Neptune Alarms	X
67	Neptune 6-digit (ProRead)	[987654***]	only available without Neptune Alarms	Y

### 10.6 Extended alarms

There are two extended alarm protocols offered: Kamstrup Alarm Protocol (KAP) and Neptune E-Coder Alarm Protocol. KAP complies with Sensus UI-1203/R20 protocol, and can be used with Sensus 4 to 9 digit protocols (ON by default). Neptune Alarm Protocols are provided by default with the E-Coder setting. The Neptune ProRead protocol does not support extended alarms. Refer to the below table for details:

Kamstrup Alarm Protocol (KAP)		Neptune Alarm Protocol (E-Coder)	
Alarm Byte 1		Alarm Byte 1	
Bit # [ID]	Alarm condition	Bit # [ID]	Alarm condition
Bit 0 [RE1]	Reverse, active	Bit 0 [RF1]	Reverse, active
Bit 1 [RE2]	Reverse, historic [last 30 days]	Bit 1 [RF2]	Reverse, historic [last 30 days]
Bit 2 [DR1]	Dry Pipe, active	Bit 2 [NF1]	No usage [last 15 days]
Bit 3 [DR2]	Dry Pipe, historic [last 30 days]	Bit 3 [NF2]	No usage [last 25 days]
Bit 4 [BR1]	Burst, active	Bit 4 [NF1]	No usage [last 35 days]
Bit 5 [BR2]	Burst, historic [last 30 days]	Bit 5 [1]	- not used -
Bit 6 [EOC]	EO config change [from factory]	Bit 6 [1]	- not used -
Alarm Byte 2		Alarm Byte 2	
Bit # [ID]	Alarm condition	Bit # [ID]	Alarm condition
Bit 0 [LK1]	Leak, active	Bit 0 [0]	not used
Bit 1 [LK2]	Leak, historic [last 30 days]	Bit 1 [LK1]	Leak, active
Bit 2 [TF1]	Daily temp below 50 F, 42 F	Bit 2 [LK2]	- not used -
Bit 3 [TF2]	Daily temp below 41 F, 36 F	Bit 3 [LK3]	Leak, historic [last 30 days]
Bit 4 [TO1]	Daily temp above 95 F, 113 F	Bit 4 [0]	- not used -
Bit 5 [TO2]	Daily temp above 114 F, 125 F	Bit 5 [0]	- not used -
Bit 6 [NU]	No usage [last 35 days]	Bit 6 [1]	- not used -

### 10.7 Extended alarms

Extended Alarms are available to be included in the data packet as an option for Version 2 Encoded Output meters. The Alarm Fields are embedded within the Encoded Output message string, in compliance with UI-1204/R20 protocol, which designates an Alarm Field. The Alarm Field is transmitted at the end of the packet, after the Meter Reading, which follows the Meter Serial Number, as follows:

7-Bit Binary (Non-ASCII) Encoding – 2 Bytes

Example: **V;RBnnnnnnnnn;IBnnnnnnnnn;Ann<CR>**

...where the 2-Digit Alarm Code (nn) is Non-ASCII, 7-Bit Binary

Definition of the two Extended Alarm bytes:

Address	Description
0x3B, ';'	Start field
0x41, 'A'	Alarm field Type
0x30, '0'	Info-code Dry, Reverse. Burst, SetupChanged
0x30, '0'	Info-code Leak, Temperature triggers, NoUsage

The logic of '1' indicates that a specific condition is active. The logic of '0' indicates that the condition

#### Alarm Byte 1

Bit Position	Type	Description
00 (LSB)	RE1	Reverse – Active
01	RE2	Reverse – Historic (last 30 days)
02	DR1	Dry – Active
03	DR2	Dry – Historic (last 30 days)
04	BR1	Burst – Active
05	BR2	Burst – Historic (last 30 days)
06	EOC	Encoder Setup Changed One Or More Times Since Production
07 (MSB)	–	– Unused –

Alarm Byte 2

Bit Position	Type	Description
00 (LSB)	LK1	Leak – Active
01	LK2	Leak – Historic (last 30 days)
02	TF1	Triggers For The <u>Minimum</u> Detected Meter Temp Since Midnight: TF2/TF1: 0/0 – The temp has been >= 10C (50°F)
03	TF2	0/1 – The temp has been between 6-9C (42°-49°F) 1/0 – The temp has been between 3-5C (37°-41°F) 1/1 – The temp has been <= 2C (36°F)
04	TO1	Triggers for the <u>Maximum</u> Detected Meter Temp Since Midnight: TO2/TO1: 0/0 – The temp has been <= 35C (95°F)
05	TO2	0/1 – The temp has been between 36-45C (96°-113°F) 1/0 – The temp has been between 46-52C (114°-125°F) 1/1 – The temp has been >= 53C (126°F)
06	NU	No Usage Detected on V1 for Last 35 Days
07 (MSB)	–	– Unused –



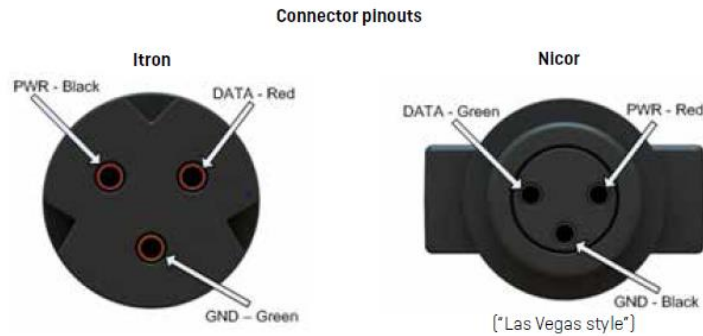
### 10.8 Encoded Output - compatibility chart

Compatibility Matrix

Order codes	Radio system	Status	Extended alarms
Z	Itron 100 W+	Certified by Itron (without alarms)	In testing by Itron
A-Q	Itron 100 W+	In testing by Itron, not certified	In testing by Itron
D	Itron 50, 60 100 W	Certified by Itron (without alarms)	In testing by Itron
Z, D	Aclara Series 3000	Certified by Aclara (without alarms)	Not tested
X, Y	Aclara Series 3000	Tested by Kamstrup, not certified	Tested, not certified (Note: Excludes Neptune proprietary Series 3000 MTU)
D	Mueller Hot Rod	Tested by Kamstrup, not certified	Not tested
D	KP Electronics	Tested by KP, not certified	Not tested
Z, D	Badger Orion	Tested by Kamstrup, not certified	Not tested
D	Sensus FlexNet 520M	Tested by Kamstrup, not certified	Not tested
Z, D	Tehama TW-140 B	Certified by Tehama	Not tested
A-Z	Ethermeter	Certified by Scadаметrics	Tested and certified by Scadаметrics. Specify Kamstrup ver. 1.2 firmware
X, Y	Neptune R900	Tested by Kamstrup, not certified	Tested by Kamstrup (X only), not certified
Z, D	Neptune R900	Tested by Kamstrup, not certified	Not tested

Remaining Order Codes, both with and without Extended Alarms are being testing by Kamstrup, but are not yet tested or certified by their respective manufacturers. AMR/AMI system manufacturers with interest in supporting Kamstrup’s UI-1203/R20 compliant alarm flags are encouraged to contact Kamstrup to obtain Encoded Output test kits.

### 10.9 Encoded Output – wiring and pinouts



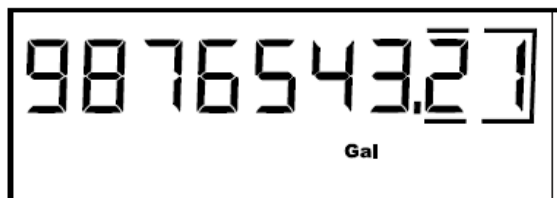
**Wiring cross reference**

Function	Kamstrup	Sensus	Neptune	Itron
DATA	Green	Green	Red	Red
PWR/Clock	Red	Red	Black	Black
GND	Black	Black	Green	White

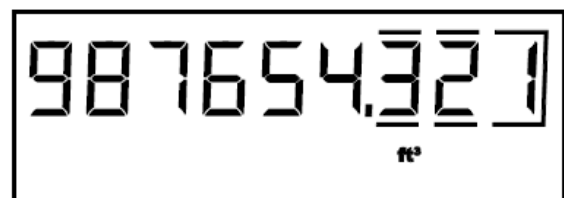
### 10.10 Encoded Output – visualization

Under normal operation, the 9-digit LCD will show the contents of the Volume V1 data register. The Encoded Output Configuration can be viewed and edited with Kamstrup’s METERTOOL utility. A second method, which does not require software can be used to view, but not edit this information. Using a magnet, the Encoded Output Configuration can be briefly visualized, after which the LCD automatically reverts to display V1 Volume. To toggle, place a magnet over the optical eye, which is located directly above the LCD. Within 8 seconds, LCD will toggle to visualize the Encoded Output Configuration for a duration of 5 seconds. To repeat the visualization of Encoded Output Configuration, the magnet must first be removed for 5 to 8 seconds. After replacing the magnet over the optical eye, within 8 seconds, the LCD will again toggle to visualize the Encoded Output Configuration, for a duration of 5 seconds.

**Gallons**



**Cubic feet**



Sample Register for 5/8” meter used in examples, typical configuration for residential meters. The figures above show the Encoded Output Configuration (visualization activated).

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



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



**Example 3** - Neptune 8-digit (E-Coder)  
 EO Resolution. Meters configured in:  
 USG - 7 most significant integer digits + tenths of US Gallons  
 CuFt - 6 most significant integer digits + tenths and hundredths  
 of Cubic Feet



*Note: Neptune 8-digit (E-Coder) data package can be distinguished by the display of LEAK and BURST alarms. Sensus 8-digit data package contains all or none of the Alarms (see example 2).*

**Example 4 - Option L, Sensus 4-digit, Extended Alarms: OFF**

EO Resolution. Meters configured in:

USG - 4 most significant digits; 1,000s of US Gallons

CuFt - 4 most significant digits; 100s of Cubic Feet



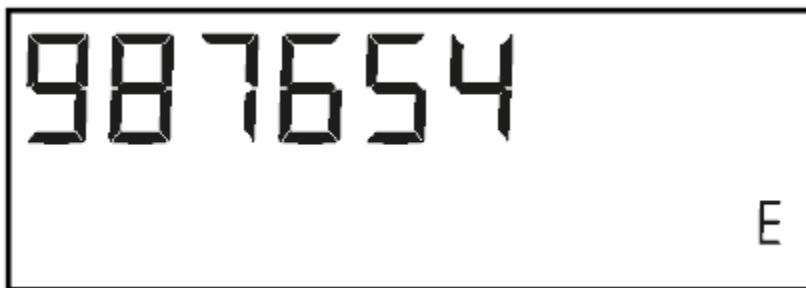
**Example 5 - Option D, Sensus 6-digit, Extended Alarms: OFF**

EO 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 EO configuration



**Example 6 - Option C, Sensus 7-digit [-1]; Extended Alarms: ON**

EO Resolution. Meters configured in:

USG - 2nd to 7th most significant integer digits + tenths of US Gallons

CuFt - 2nd to 6th most significant integer digits + tenths and hundredths of Cubic Feet  
 Note: this would provide 6 wheels + tenths of gallons; (-1) indicates first most significant digit is not transmitted

Note: Option C Data Package Description is appended by [-1]; this indicates the Encoded Output data stream will exclude the first most significant digit, otherwise displayed on V1 Volume register. Use EO Option Codes that exclude leading V1 digits with care.



**Example 7 - Neptune 8-digit (E-Coder); Extended Alarms: ON**

EO Resolution. Meters configured in:

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

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

Note: Neptune 8-digit (E-Coder) data package can be distinguished by the display of LEAK and BURST alarms. Sensus 8-digit data package contains all or none of the Alarms (see below).



**Example 8 - Option Z, Sensus 9-digit; Extended Alarms: ON**

EO 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.



## 11 Data loggers

### 11.1 Memory

flowIQ® 2100/3101 has a permanent memory (EEPROM), in which the values of various data loggers are saved. Loggers are read through the optical eye.

The meter includes the following registers:

Data logging interval	Data logging depth	Logged value
Monthly logger	36 months	Counter register
Daily logger	460 days	Counter register
Info logger	50 events	Info code, meter reading and date

The loggers are static ones. Thus, the register types cannot be changed. The same applies to the logging intervals. When the last record has been written into the EEPROM the oldest one will be overwritten.

### 11.2 Monthly and daily loggers

The table below shows which registers are logged on the first day of the month, and which are logged every day. The daily logger is an absolute log, i.e. current meter reading is logged every day at midnight.

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	Info code	•	•
Vol Reverse	Volume during reverse flow	•	-
Date of max flow	Date stamp of max. flow during period	•	-
Max flow V1	Value for max. flow during period	•	•
Date of min. flow V1	Date stamp of of min. flow during period	•	-
Min. flow V1	Value of min. flow during period	•	•
Min. temp. water *)	The lowest measured water temperature during period	•	•
Average temp. water *)	Volume weighted average water temperature during period	•	•
Max temp. water *)	The highest measured water temperature during period	•	•
Min. ambient temp.	The lowest measured meter/ambient temperature during period	•	•
Average ambient temp.	Time weighted average meter/ambient temperature during period	•	•
Max ambient temp.	The highest measured meter/ambient temperature during period	•	•

\*) Applies only for flowIQ® 2100

### 11.3 Hour counter

Each info code, DRY, REVERSE, LEAK and BURST, has a corresponding hour counter. The hour counters are incremented by one every hour, counted on the meter's clock, the corresponding info code is active.

Counting starts immediately the first time the info code is active within the hour in question. Even though the info code occurs more than once within an hour, the counter is only incremented once. If the info code remains active for several hours, the counter is incremented by one for each hour. The increment is independent of how small a part of the hour the info code is active.

Please note: The info code 'DRY' is set in two steps, the increment of the hour counter follows the second step. See paragraph 9.7.4 'Info codes'

The hour counters cannot be accessed directly but are represented in the info register in coarse resolution. See paragraph 11.4 'Info register'

No hours are counted as long as the meter is in transport mode.

### 11.4 Info register

Every time the information code changes, date and info code are logged. Thus, it is possible to data 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. The table below represents an overview of the register.

Register type	Description	50 shifts
Date (YY.MM.DD)	Logging time, year, month and day	•
Volume	Meter reading	–
Info	Information code on above date	•

The info codes and info code hour counters are brought together in one register for presentation in loggers, the Wireless M-Bus information package and read-outs via the optical eye. The information has been compacted in order to reduce the quantity of data in the Wireless M-Bus package and partly also in the loggers.

The register size is 2 bytes, apportioned with 4 bits for info codes and 12 bits for the info code hour counters. The distribution is shown below, the numbering shows the bit position.

MSB								LSB							
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Info code hour counters												Info codes			

The first 4 bits for info codes represent DRY, REVERSE, LEAK and BURST as shown below. The info code is active when the bit value is 1.

In the Wireless M-Bus package, in the info logger and in read-outs of the current info register via the optical eye, the current status of the info codes is shown (also see different update of DRY, in paragraph 9.7.4 'Info codes'. The daily and monthly loggers show all info codes which have been active since the latest logging.

3	2	1	0
BURST	LEAK	REVERSE	DRY

The hour counters of the four info codes are represented by the last 12 bits, apportioned with 3 bits each as shown below.

15	14	13	12	11	10	9	8	7	6	5	4
BURST			LEAK			REVERSE			DRY		

Every time an info code has been active it is logged together with an indication of how long the info code has been active.

The time indication informs with coarse resolution, how many hours the corresponding info code has been active within the latest 30 +1 days, i.e. the latest 30 days + current day.



Below, please find interval limits and corresponding intervals.

Interval	Hours
0	0 hours
1	1-8 hours
2	9-24 hours = 1 day and night
3	25-72 hours = 2-3 days and nights
4	73-168 hours = 4-7 days and nights
5	169-336 hours= 8-14 days and nights
6	337-504 hours = 15-21 days and nights
7	≥ 505 hours = 22-31 days and nights

**Example:** By means of LogView or by exporting a reading from Wireless M-Bus Meter Reader to Excel the decimal value 14396 has been read. The value is converted to binary digits, and leading zeroes are added to reach a total of 16 characters. This makes:

001 110 000 011 1100

Entering these digits into the above table makes:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
001			110			000			011			1	1	0	0

As mentioned above the first four fields with the figures 0-3 indicate whether the info codes are active, and it thus appears that LEAK and BURST are currently active.

The binary values of the remaining fields must now be converted into decimal values, which indicate how long the corresponding info code has been active within the latest 31 days according to the above table. It appears that BURST has been active for 1-8 hours and LEAK has been active for between 15 and 21 days. Furthermore, DRY has been active for 2-3 days within the latest 31 days.

### 11.5 Meter modes (settings)

The meter has 2 modes: Meter mode:	Normal	Verification
Measuring cycle (measurement/calculation)	4 s/32 s	0.5 s/4 s
Display value	[Gal, ft <sup>3</sup> m <sup>3</sup> ]	[Gal, ft <sup>3</sup> L] x 10 <sup>-3</sup>
Display dot, frequency	1 Hz	2 Hz
Mode, time out	No	Yes

Verification mode is only used by authorised laboratories during verification.

### 11.6 Normal mode

Normal mode is meant for normal operation.

In normal mode the symbol (volume unit) is displayed. Furthermore, the square 'dot' at the bottom right of the display flashes every second.

The flow is measured every four seconds and new values (flow, volume, etc.) are calculated every 32 seconds.

### 11.7 Verification mode

Verification mode is meant for verification of the meter.

In the display verification mode is indicated by the volume unit. In addition, the dot at the bottom right of the display flashes twice per second.

The flow is measured twice a second and new values (flow, volume, etc.) are calculated every four seconds.

When the meter switches to 'verification mode', the radio transmitter will be turned off. At the same time a time-out starts. When the time-out period has expired the meter switches back to normal mode. The time-out period is 9 hours.

### 11.8 Legal changes outside seal

This paragraph describes the legal changes, which can be carried out without disassembling the meter and thereby breaking the legal seal.

All legal changes are fully traceable in an adjust log, which cannot be deleted. The number of legal changes appears from the display. Maximum 9 changes are possible.

The adjust log can only be deleted if the meter is disassembled and the legal seal is broken.

It appears from the meter's software version whether a specific meter can be reset outside the legal seal. See support of legal changes below:

SW revision	Re-adjustment	Reset
A1		
B1 – F1	•	
G1 – ...	•	•

• = Supported

### 11.8.1 Flow adjustment

The meter is initially verified from the factory. A new factory adjustment requires disassembling of the meter and can only be carried out by Kamstrup. After the final steps in production it is only possible to make a percentage correction of the flow curve at three individual points. This is called readjustment.

### 11.8.2 Re-adjustment

A readjustment can be made without disassembling the meter and thereby breaking the legal seal. The following restrictions apply:

- Maximum 9 readjustments are possible.
- Maximum adjustment compared to the factory adjustment is +/-10%.
- Each readjustment is logged in the meter.

During a readjustment the flow curve is corrected at three fixed points and the curve will be readjusted to these new points.

**IMPORTANT:** The laboratory, which makes the readjustment, must attach an adjustment label with the valid adjustment number to the meter. Naturally, this number must be identical with the number (AX) in the meter's display.

### 11.8.3 Reset

The meter can be reset via the optical eye. This is used in connection with re-verification by authorized laboratories. All loggers and registers including the legal volume register are reset. Only the adjust log and the clock are not reset. At the same time the meter is set to transport mode and the radio is switched off. The following restrictions apply to reset:

- The meter can maximum be reset 9 times.
- Each reset is logged in the meter.

**IMPORTANT:** The laboratory, which resets the meter, must attach an adjustment label with the valid adjustment number to the meter. Naturally, this number must be identical with the number (AX) in the meter's display.

## 12 Pulse Adapter for flowIQ® 2100 / 3101

The Pulse Adapter is a stand-alone unit designed to be mounted on the flowIQ® 2100/3101 water meter. The unit must be mounted indoors in utility rooms or similar.

The Pulse Adapter receives optical pulses from the water meter and transmits these to external data acquisition or control systems through a wired pulse output.



*Pulse Adapter type 66-99-023*

*- here shown mounted on the meter*

### 12.1 Function

Pulse output:

- 'Open Collector' (2-wire connection)
- Pulse duration 100 ms

Resolution:

- US gallons - 2½ gal / pulse
- Cubic feet - ½ ft<sup>3</sup> / pulse
- Cubic meters - 10 Liter / pulse

Cable type:

- length approx. 50 ft. sleeves on cable ends

## 12.2 Application – environment

- Ambient temperature: 35°F - 130°F
- Storage temperature: -10°F - 140°F
- Protection class: IP65 (dust-tight and protected against water jets)

## 12.3 Lifetime

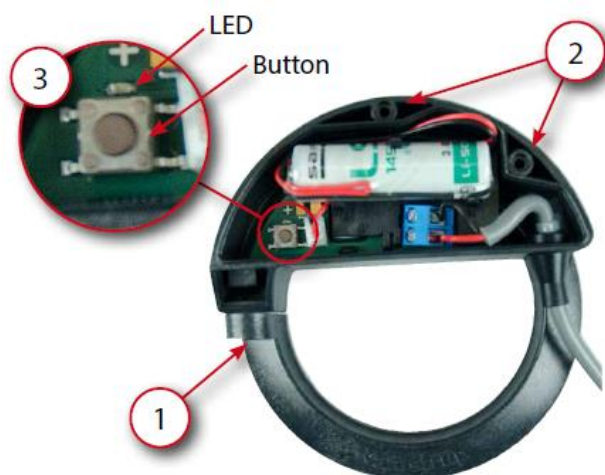
- 16 years, with a single AA battery
- Battery change is possible

## 12.4 Connection of Pulse Adapter

From the factory the meter is configured not to transmit optical pulses – otherwise, battery life will be shortened. Therefore, having mounted the Pulse Adapter, the installer must set up the meter to transmit optical pulses.

After cleaning the glass to remove dirt and dust - and enable reading via the optical eye, the procedure is as follows:

1. Unfasten the screw of the adapter ring to allow mounting of the unit on the meter
2. Dismount the two screws at the top and remove the cover
3. Push the button on the PCB, which is placed under the cover (see figure below)



As soon as the button is activated, serial optical communication between Pulse Adapter and meter starts.

If the set up is successful, 'PULSE ON' is displayed for five seconds (as shown below) and the LED on the unit remains ON for three seconds – shown in the figure below.

It takes only a very short time from setup is started until it is completed.

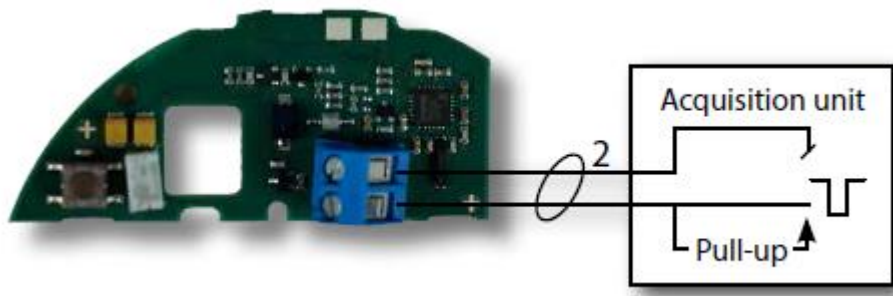
PULSE on

*Display, after set-up*

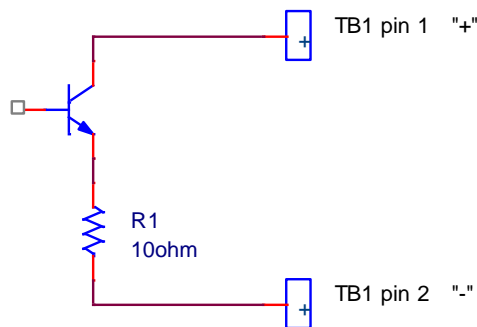
Having set up the meter, remount the cover on the Pulse Adapter and fasten the three screws.

### 12.5 Pull-up

The acquisition unit must have built-in 'pull-up' – shown in figure below – to ensure correct voltage level of the pulse. The pulse output is two-wired and must be connected as follows:



Sketch for connection of Pulse Adapter



Simplified diagram for Pulse Adapter output

#### 12.5.1 Description

Pulse output:	
Type	Open Drain
Maximum input voltage	30V
Maximum current sink	27mA
On voltage	Vout < 0.3V @ 0.1mA current Vout < 2V @ 27mA current
OFF condition	R > 6Mohm

The connection marked '-' must be connected to the receiver's GND level. The connection marked '+' should be connected to a pull-up resistor of an appropriate size, so that the maximum limits, shown in the table above, are met.

### 13 Pulse Interface for flowIQ® 2100 / 3101

Pulse Interface, type 66-99-143, is used during calibration and verification in test stands with pulse interface. The optical reading head is retained on flowIQ® 2100/3101 by means of a transparent plastic holder (Optical support, type 6561-331). Data from the meter is read by the optical reading head, and in the pulse interface unit converted into high-resolution volume pulses which can be registered by a pulse receiver. When the optical reading head is removed, it takes 9 hours, before the meter returns to normal mode.



*Pulse Interface, type 66-99-143, with Optical Support type 6561-331 on flowIQ® 2100 RF*

Supply: 3.5-30 VDC < 15 mA  
 Standby: < 0.2 mA  
 Pulse width: = 3.9ms  
 Frequency: Max frequency of 128 Hz

Meter size (Max flow gpm)	Volume 10 <sup>-3</sup> Gal/pulse	Volume 10 <sup>-3</sup> Ft <sup>3</sup> /pulse	Volume 10 <sup>-3</sup> L/pulse
5/8" (25 gpm)	10	2	40
3/4" (32 gpm)	20	4	80
1" (55 gpm)	20	4	80
1½" (120 gpm)	40	8	160
2" (160 gpm)	80	16	320

### 13.1 Connection Pulse Interface

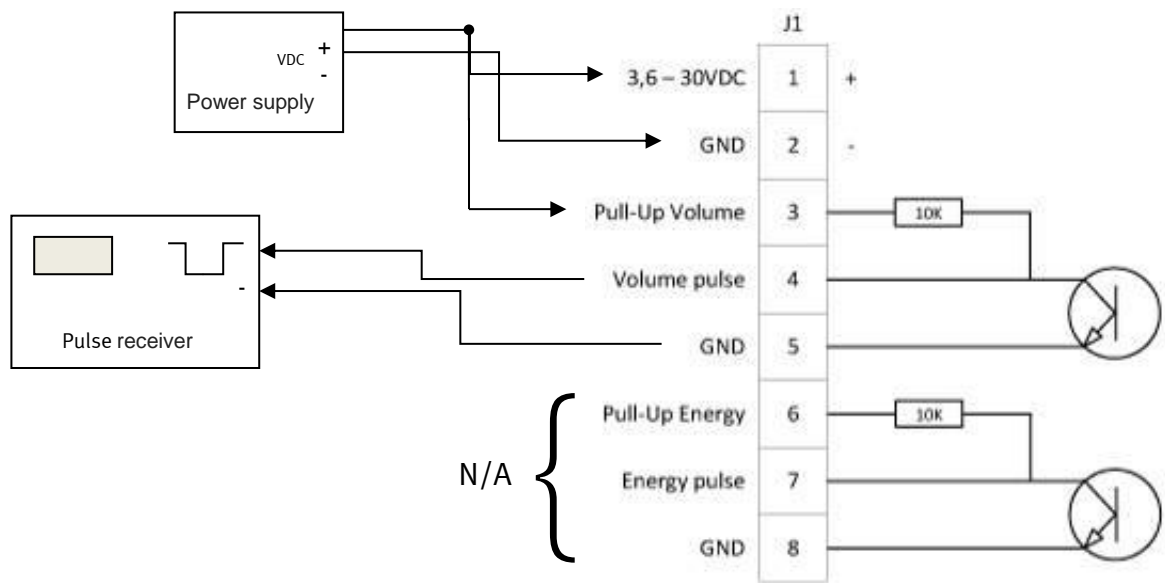
The pulse interface has two outputs - volume and Energy. flowIQ® 2100/3101 only uses the volume output.

Each pulse output consists of 3 terminals: GND, Volume Pulse and Pull-up Volume. When the pulse output is active, Pulse is drawn to GND, i.e. the output is 'active low'. A 10kΩ resistance is placed from Pull-Up to Pulse.

The supply for terminals 1 and 2 and the supply connected to the Pull-Up need not be the same or at the same level. The connection of the 8-pole plug J1 is indicated in figures below/next page

### 13.2 Connection with pulse receiver without supply

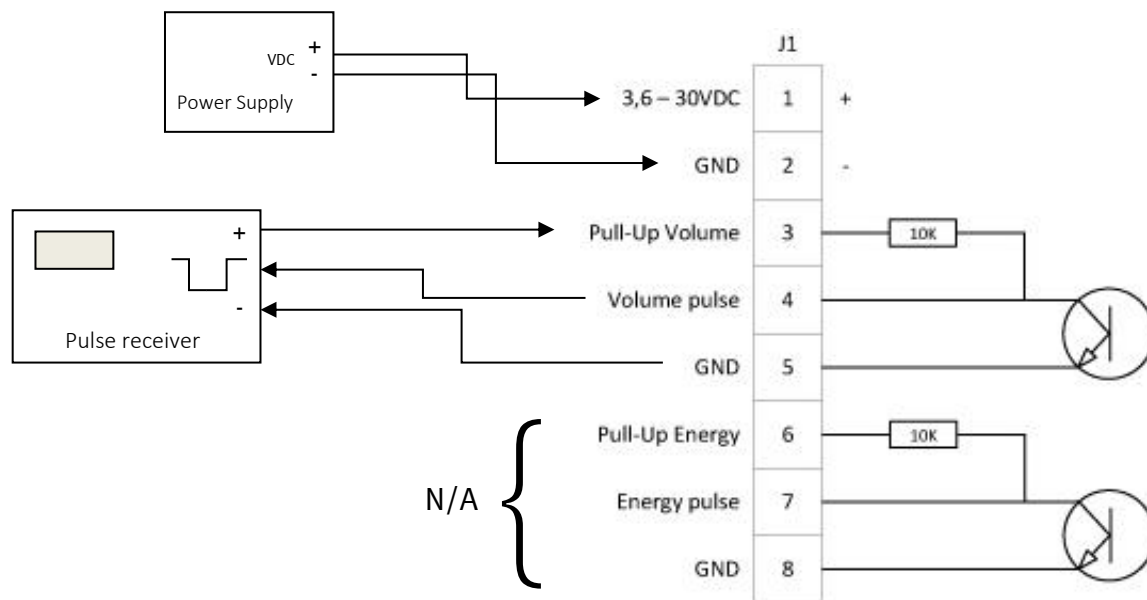
Here, external supply for Pull-up is required





### 13.3 Connection of pulse receiver with supply

Here, the supply from the receiver can be used.



## 14 Data communication – Wireless

The meter has built-in radio for Wireless RF radio (one-way data transmission from meter, no data receipt in meter).

### 14.1 Transmission

Data packages are sent at intervals of approx. 16 or 96 seconds. Every eighth package is a full data string, whereas the 7 intervening packages are compact data strings.

The contents of the data package is updated at every transmission.

### 14.2 RADIO OFF

Radio transmission has been interrupted if 'RADIO OFF' is displayed.

RADIO OFF is activated at the end of the production process at Kamstrup. The meter removes RADIO OFF automatically when the volume register has counted water consumption for approx. 5 seconds.

RADIO OFF is intended for situations where radio transmission is inappropriate – e.g. in laboratories, in warehouses and during air transport, where many meters will typically be concentrated in one place.

It is not possible to stop the radio transmission of a meter in normal operation permanently, but the meter can be turned OFF by means of the optical eye e.g. in advance of air transport. However, the radio will automatically turn ON again, as soon as a water flow is registered.

RADIO OFF secures that the meter does not send radio communication until the meter is put into operation for the first time.

### 14.3 Data content

The data content of the data transmission partly depends on the configuration.

See document 5512-1700 – Technical Description for Wireless M-Bus.

### 14.4 Encryption

flowIQ® 3101 can only be ordered with encryption of the data transmission. The data encryption consists of 128 bit AES counter mode encryption.

## 15 Communication (KMP)

The meter has an optical communication interface on the front. The interface communicates at 1200 baud and can be used if an optical reading head is connected to METERTOOL and LogView.

### 15.1 Optical eye activation

In order to limit current consumption the optical eye is usually switched off. The meter's optical communication is automatically switched on 4 sec. after having placed the magnetic optical reading head on the meter.

## 16 METERTOOL for Kamstrup Water Meters

METERTOOL is a PC program, giving access to change the customer selected parameters of a water meter configuration and read its data memory without dismounting the meter from the installation.

Get further information and technical details on METERTOOL/LogView in document:

5512-1653-GB – *Technical Description for METERTOOL & LogView*

## 17 Approvals

### 17.1 Type approvals

The meter has been MID approved on the basis of OIML R49

The flowIQ® 2100 meter series has furthermore been approved by the California Weight and measures.

Please contact Kamstrup LLC for further details on type approvals and verification.

## 18 Troubleshooting

The meter has been constructed with a view to quick and simple installation as well as long and reliable operation at the consumer.

The meter housing is hermetically closed and any repair requires that the sealing is broken. Therefore, repairs must be carried out by Kamstrup. However, the meter is designed for many years of maintenance free operation and will not require any service.

Should you, however, experience an operating problem with the meter, the table below can be used for troubleshooting.

Before sending us the meter to be repaired or checked, please use the error detection table below to help you clarify the possible cause of the problem.

Symptom	Possible reason	Proposal for correction
No display function (empty display)	Battery to be replaced	Send the meter to Kamstrup
Info code DRY flashes in the display	The meter is not water-filled	Air the installation. The info code disappears when the meter is water-filled
Info code RADIO OFF flashes in the display	The meter is still in transport mode with the built-in radio transmitter turned off	The radio switches on and the info code disappears when the first ½ liter of water has run through the meter
Info code REVERSE flashes in the display	The meter is mounted with water flow in the wrong direction	Mount the meter in accordance with the flow arrow on the side of the meter case

## 19 Disposal

Kamstrup holds an environmental certification according to ISO 14001, and as part of our environment policy we use materials which can be recovered environmentally correct to the greatest possible extent.

- **Disposal by Kamstrup**

Kamstrup accept worn-out meters for environmentally correct disposal according to previous agreement. The disposal is free of charge to the customer, except for the cost of transportation to Kamstrup.

- **The customer sends for disposal**

The meters must not be disassembled prior to dispatch. The complete meter is handed in for approved national/local disposal. Enclose a copy of this page in order to inform the recipient of the contents.

- **Disposal by the customer himself**

The meters should be disassembled as described below and the separate parts handed in for approved destruction. The batteries must not be exposed to mechanical impact and the lead-in wires must not be short-circuited during transport.

Also see table next page.

19.1 Instructions for disposal

Item	Material	Recommended disposal
<b>flowIQ® 2100 &amp; 3101</b>		
Lithium cells	Lithiumthionylchloride >UN 3090< C-cell: 2.0 g lithium	Approved deposit of lithium cells
Printed circuits (remove LCD-display)	Coppered epoxy laminate, components soldered on	PCB scrap for metal recovery
LCD-display	Glass and liquid crystals	Approved processing of LCD-displays
Sight glass	Soda lime glass	Glass recovery
Moisture-absorbent	98% Bentonite 2% Quarz	Ordinary disposal
Threaded measuring tube	DZR brass	Metal recovery
Measuring tube with flanges	Stainless steel 1.4408	Metal recovery
Measuring pipe	PPS Forton MT9141L4 40 % GF	Plastic recovery
Reflector plate, mirrors	Stainless steel AISI 316, 1.4306, 1.4401	Metal recovery
Top cover (type label)	ABS	Plastic recovery
Other plastic parts, casted	PC + 10% glass	Plastic recovery
<b>flowIQ® 2100</b>		
Meter housing, measuring tube, transducer holder	PPS – 40% fibreglass	Plastic recovery
Moisture-absorbent	98% Bentonite 2% Quarz	Ordinary disposal
Packing	APET - (Amorphous Polyethylene Terephthalate) – also used for storage of food	Plastic recycling 'Combustible'
<b>flowIQ® 3101</b>		
Packing	Environmental cardboard	Cardboard recycling
Packing (inside)	Polystyrene	EPS-recovery

Please send any questions you may have regarding environmental matters to:

**Kamstrup A/S**  
 Att.: Quality and environmental dept.  
 Fax: +45 89 93 10 01  
 info@kamstrup.com

## 20 Documents

Current documents related to flowIQ® 2100 & flowIQ® 3101

Document	flowIQ® 2100	flowIQ® 3101
Technical Description	5512-2015	
Data Sheet	5810-1227	5810-1228
Installation Guide	5512-1224	5512-1388
Accessories list	5810-1270	
Technical description Wireless M-Bus	5512-1700	
Technical Description for METERTOOL/LogView	5512-1653	

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# **EXHIBIT 5**



Data sheet

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## Siemens MAG 8000 with READY Gateway

- Wireless M-Bus
- Long range
- 'Drive-by' or network
- Great measuring accuracy



## Description

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### Built-in Wireless M-Bus

The meter is delivered with wireless radio communication – Wireless M-Bus – for data communication on 868 MHz which means that consumption data can be easily read remotely. In addition, the data can be read directly from the display or using an optical eye.

### Long range

The meter is equipped with a powerful long-range antenna which sends out a powerful radio signal with intelligent coding to the network. Furthermore, the meter can be read from a long distance via 'drive-by'. In addition, it is possible to mount an external pit antenna to optimise the range.

### 'Drive-by' or network

In the Kamstrup version, MAG 8000 is equipped with the newest radio technology which meets the increasing demands of the market for smart consumption measurement both in case of 'drive-by' and network installation.

### Great measuring accuracy

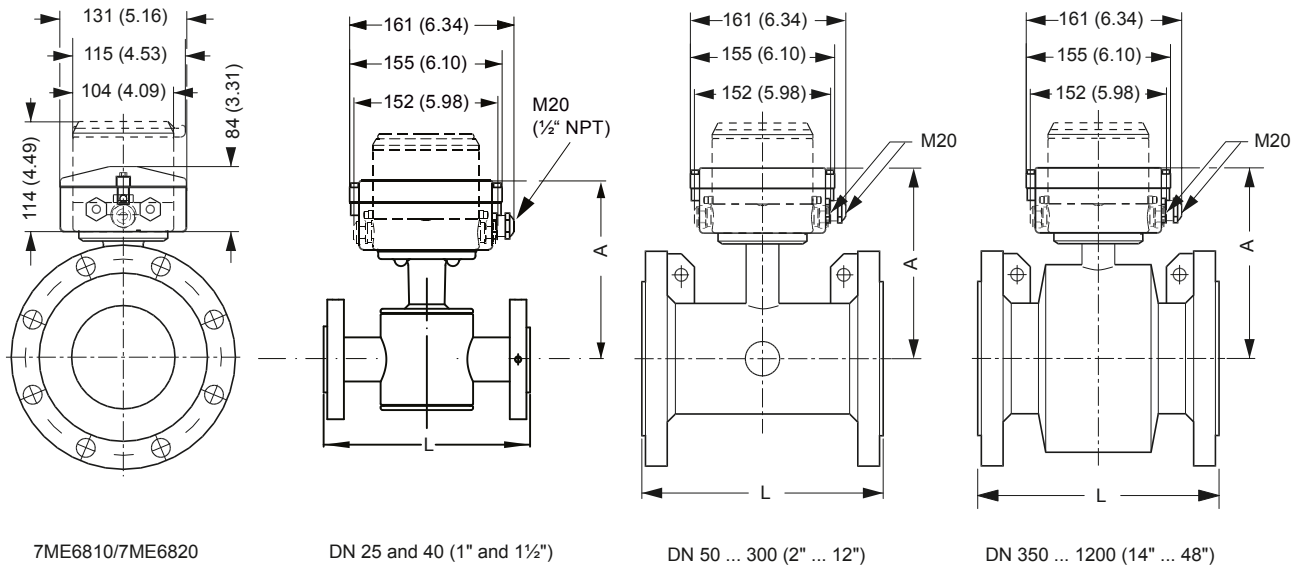
Magnetic inductive flow measurement guarantees high measuring accuracy. Thus, the meter includes no moving parts, which makes the meter resistant to wear and impurities in the water.

The meter is watertight, IP68 type tested and, therefore, also suitable for installation in meter pits. The meter has been MID approved and type tested according to OIML R49.



\*It is also possible to select a version with power supply for 115 - 230 VAC.

## Meter sizes



Nominal Size DN	A	L, lengths							D, diameter		Weight 1)	
		EN 1092-1			ANSI 16.5 Cl. 150	AS 4087 PN16	AWWA		DI	D	AS 4087 PN16	
		PN10	PN16	PN40			mm	inch			kg	lbs
50 [2]	195 [7.7]	-	200	-	7.9	200	N/A	N/A	42 [1.65]	2]	11	25
65 [2½]	201 [8]	-	200	-	7.9	200	N/A	N/A	55 [2.17]	2]	13	29
80 [3]	207 [8.2]	-	200	-	7.9	200	N/A	N/A	67 [2.64]	2]	15	34
100 [4]	214 [8.5]	-	250	-	9.8	250	N/A	N/A	81 [3.19]	2]	17	38
125 [5]	224 [8.9]	-	250	-	9.8	250	N/A	N/A	101 [3.98]	2]	22	50
150 [6]	239 [9.5]	-	300	-	11.8	300	N/A	N/A	131 [5.16]	2]	28	63
200 [8]	264 [10.5]	350	350	-	13.8	350	N/A	N/A	169 [6.65]	2]	50	113
250 [10]	291 [11.5]	450	450	-	17.7	450	N/A	N/A	212 [8.35]	2]	71	160
300 [12]	317 [12.6]	500	500	-	19.7	500	N/A	N/A	265 [10.43]	2]	88	198
350 [14]	369 [14.6]	550	550	-	21.7	550	N/A	N/A	350 [13.78]	2]	127	279
400 [16]	394 [15.6]	600	600	-	23.6	600	N/A	N/A	400 [15.75]	2]	145	318
450 [18]	425 [16.8]	600	600	-	23.6	600	N/A	N/A	450 [17.72]	2]	175	394
500 [20]	450 [17.8]	600	600	-	26.8	600	N/A	N/A	500 [19.68]	2]	225	494
600 [24]	501 [19.8]	600	600	-	32.3	600	N/A	N/A	600 [23.62]	2]	340	747
700 [28]	544 [21.4]	700	875	-	N/A	N/A	N/A	N/A	700 [27.55]	2]	316	694
750 [30]	571 [22.5]	N/A	N/A	-	N/A	N/A	N/A	N/A	750 [29.52]	2]	N/A	N/A
800 [32]	606 [23.9]	800	1000	-	N/A	N/A	N/A	N/A	800 [31.49]	2]	398	1045
900 [36]	653 [25.7]	900	1125	-	N/A	N/A	N/A	N/A	900 [35.42]	2]	476	1045
1000 [40]	704 [27.7]	1000	1250	-	N/A	N/A	N/A	N/A	1000 [39.36]	2]	602	1322
1050 [42]	704 [27.7]	N/A	N/A	-	N/A	N/A	N/A	N/A	1050 [41.33]	2]	N/A	N/A
1100 [44]	755 [29.7]	N/A	N/A	-	N/A	N/A	N/A	N/A	1100 [43.30]	2]	N/A	N/A
1200 [48]	810 [31.9]	1200	1500	-	N/A	N/A	N/A	N/A	1200 [47.23]	2]	887	1996

The meter is available in two versions: MAG 8000 or MAG 8000 CT. CT stands for "Custody Transfer" and refers to the fact that the meter has been approved according to OIML R49/MID.

## Functionality

	MAG 8000	MAG 8000 CT
Where is the meter used?	Pumping and district pit	Billing
Output	2 individual pulse outputs	
Communication	Wireless M-Bus, optical eye both on the meter and on READy Gateway	
Power supply	Meter: External battery package with 6 years' lifetime or 230 V Gateway: Internal battery package with 6 years' lifetime	
Meter flow in both directions	Yes	
Drinking water approval	ACS (France), WRc (UK), DVGW (Germany), NSF (USA) and Belgaqua (Belgium). The "Approved for use with drinking water" mark has been applied for.	

## Accuracy

Calibration type	Application	Accuracy	Water meter type
Standard	General water applications	0.4 %	MAG 8000
Extended	High performance applications	0.2 %	MAG 8000
Bulk water/revenue	Custody transfer applications (CT)	Class 1: 1 % at low flow 3 % Class 2: 2 % at low flow 5 %	MAG 8000 CT

## Data package

Volume	Current volume
Volume Month	Shows the volume of the latest month
Volume Reverse	Shows the amount running backwards in relation to the flow direction
Hour Counter	Hour counter
Info code Transmitter	Info code of the transmitter part
Info code Meter	Info code of the meter part
Serial Number	Shows the meter's serial number
Type (CT / ST)	Shows if the meter is a CT or ST meter. CT means that the meter has been approved according to OIML R49/MID

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# **EXHIBIT 6**

# General terms and conditions of sale and delivery

of Kamstrup Water Metering L.L.C.

- 1.0 Definitions.** As used herein: (a) **Seller.** Seller shall refer to Kamstrup Water Metering L.L.C. and shall include its agents, subsidiaries, parent company, and any affiliated entity of Seller. (b) **Buyer.** Buyer shall refer to the purchaser of goods sold by Seller as set forth in the particular Sales Order, and shall include all agents, subsidiaries, parent company, and any affiliated entity of Buyer. (c) **Sales Order.** Sales Order shall refer to the purchase order acceptance, order confirmation or invoice issued by Seller reflecting the sale of the Products to Buyer. (d) **Products.** Products shall refer to the products, and related services if any, sold by Seller to Buyer as identified in the Sales Order.
- 2.0 Application.** These terms and conditions shall apply to and shall govern all Sales Orders, agreements or other documents which memorialize an agreement to purchase Products from Seller, regardless of whether such Sales Order or other document references these terms and conditions. All shipments, services, sales and quotations between Seller and Buyer are subject to these terms and conditions.
- 3.0 Acceptance.** No order by Buyer shall be effective until confirmed by Seller. No effect shall be given to any terms proposed in Buyer's purchase order, proposal, sales note, acknowledgment or other document which add to, vary from, or conflict with the Sales Order or with these terms and conditions. Any such proposed terms shall be void. Except as set forth herein, the Sales Order and these terms and conditions constitute the entire agreement between Buyer and Seller with respect to the subject matter of a Sales Order. Buyer shall be deemed to have accepted and acknowledged the Sales Order and these terms and conditions unless Buyer notifies Seller in writing of its rejection of the Sales Order and/or these terms and conditions within three (3) working days of Buyer's receipt of the Sales Order.
- 4.0 Termination.** Seller may terminate any Sales Order or any part thereof without liability at any time by written notice. If Seller terminates any part of a Sales Order, then Buyer shall be relieved of any obligation with regard to the terminated portion of the Sales Order. Any sums paid by Buyer pursuant to a Sales Order or any portion of a Sales Order that has been terminated shall be refunded by Seller.
- 5.0 Price.** Unless another currency is specified on the Sales Order, all monetary amounts are deemed to be expressed in US\$. Unless otherwise specifically set forth in the Sales Order, the price specified in the Sales Order shall not include any packaging, shipping or transportation costs or charges for any international or domestic freight, import duties or storage. A handling fee in the amount of \$30.00 shall be added to all Sales Orders for less than \$150.00. Unless otherwise specified in the Sales Order, the price does not include any services related to the Products, including installation, travel, consultation, evaluation, or service. Buyer may return the packaging materials to Seller, at Buyer's own expense, and shall be credited the cost of the returned packaging if such materials are received by Seller in undamaged condition.
- 6.0 Payment.** Buyer shall pay for Products in accordance with the terms set forth in the Sales Order, or as otherwise set forth in a subsequent writing executed by both Buyer and Seller. If no such terms are set forth, Seller shall issue an invoice to Buyer via email or mail to the address of Buyer set forth in the Sales Order. All invoices are payable no later than thirty (30) days after receipt by Buyer. Payment shall not be contingent upon any payment to the Buyer from any third party. Seller may, in its discretion, require pre-payment from Buyer, or may require such credit terms as it deems appropriate. Seller may change any credit terms, at any time, in its discretion. If Buyer has a delinquent account with Seller, then any subsequent purchasing orders will not be processed until Buyer's account balance becomes current. Buyer may not set off any sums owed to Seller for any reason.
- 7.0 Taxes.** Buyer shall pay, in addition to any invoiced amounts, all taxes, if applicable, upon the production, sale, shipment, or use of the Products, including, without limitation, all federal, state, or local property, license, privilege, sales, use, excise or gross receipts taxes or other like taxes and tariffs. In the event that Seller is required to pay any such taxes, Buyer shall reimburse Seller on demand for such payments and any penalties or fees related thereto.
- 8.0 Product Descriptions, Modifications, Improvements.** All representations or references on Seller's website, in sales brochures, technical data sheets and offers as to size, weight, technical specifications, price and other details of the Products are approximate and shall not be binding on Seller unless expressly incorporated in a Sales Order. Such references are not to be deemed warranties. Seller reserves the right, at any time, to alter, change, or modify the Products without notification to Buyer, provided that the alteration, change, or modification does not adversely affect the price, quality or substantial function of the Products.

## General terms and conditions of sale and delivery

**9.0 Risk of Loss.** All risk of loss during shipment of the Products shall be in accordance with INCOTERMS (2010) as referenced in the Sales Order. If no such INCOTERM is referenced, all shipments shall be shipped ex works Seller's facility, Atlanta, Georgia. In such an event, Seller's responsibility with regard to the Products shall end when Seller makes the Products available for pickup at its facility as noted in the Sales Order or otherwise in writing. Buyer shall assume the sole responsibility for the transportation and importation of the Products.

### 10.0 Delivery

**10.1 Shipment; Installments.** All dates of delivery set forth in a Sales Order are approximate and nonbinding. Seller will use commercially reasonable efforts to ship the Products on or before the estimated supply date set forth in the Sales Order.

**10.2 Shipment; Delays.** Buyer acknowledges and agrees that lead time will vary according to availability of supply, transportation delays, manufacturing problems and other conditions, and that, consequently, all delivery dates communicated by Seller are estimates. Delay in delivery of any shipment of Products shall not relieve Buyer of its obligations to accept that shipment or any other shipment. Under no circumstances shall Seller, because of late delivery or non-delivery, be liable to Buyer, its agents or any other persons for any special or consequential damages, whether based upon lost goodwill, lost profits, work stoppage, impairment of or breach of contract, negligence or other alleged causes of losses to Buyer.

**10.3** Unless otherwise set forth in the Sales Order, delivery shall be deemed made when Seller makes the Products available for pickup at its facility as noted in the Sales Order or otherwise in writing.

**10.4** Seller reserves the right to deliver in installments. All such installments shall be separately invoiced and paid when due, without regard to subsequent deliveries. Delay in delivery of any installment shall not relieve Buyer of its obligation to accept remaining deliveries.

**10.5 Carrier and Routing.** Unless otherwise agreed to in a writing executed by Buyer and Seller, Buyer shall select the carrier(s) and routing of each shipment from Seller's facility to its destination. Seller shall assume no responsibility for selection of carriers or other entities involved in the transportation and delivery of the Products, even in the event that Seller is retained or otherwise assumes the responsibility for the transportation of the Products. Buyer assumes all responsibility for payment of freight charges to all carriers used to transport the Products and all other costs associated therewith, regardless of whether the freight charges and other costs are reflected in the Sales Order.

**11.0 Claims.** Buyer shall inspect the Products immediately upon receipt and shall, within three (3) business days from the date of delivery, give written notice of any claim that the Products do not conform to their description as set forth in the Sales Order covering the Products or that the Products are damaged. Notations regarding such a claim shall be made on the applicable bill of lading, air waybill or delivery receipt. If Buyer does not provide such notice within the three

(3) day period, the Products shall be deemed accepted by Buyer. Buyer expressly waives any rights it may have to reject or revoke acceptance of the Products after such three (3) day period. In no event, however, shall Seller be responsible for any damage or loss to Products resulting from the transportation, importation or storage of the Products.

### 12.0 Limited Warranty

**12.1 General.** Seller warrants that the Products shall be free from defects in Materials and Workmanship for a period of two (2) years from the date of delivery (the "Warranty Period").

**12.2 Special Limited Warranty Terms For flowIQ® 2100 Series, flowIQ® 2250 Series, flowIQ® 3101 Series Cold Water Meters and flowIQ® 3250 Series Cold Water Meters.** Notwithstanding Section 12.1, with regard to flowIQ® 2100 Series, flowIQ® 2250 Series, flowIQ® 3101 and flowIQ® 3250 Series Cold Water Meters and USB Meter Readers which are delivered to Buyer directly from Seller, the following warranty terms shall apply:

#### Accuracy

Seller warrants that the flowIQ® 2100 Water Meters, flowIQ® 2250 Water Meters, flowIQ® 3101 Water Meters and flowIQ® 3250 Water Meters will perform to the accuracy as defined in applicable AWWA standards for a period of twenty (20) years from date of delivery to Buyer. In the absence of published AWWA standards specific to cold water ultrasonic revenue meters the new meter accuracy refers to AWWA standard C708-11 [section 4.2.8] and to AWWA M6 manual (chapter 5, Testing new meters and table 5-3 defining test rates in accordance with AWWA C708).

Seller shall, at its sole discretion, repair or replace any defective meters at no cost for year one (1) through year ten (10) following the date of delivery or refund the purchase price for the defective meters. For year eleven (11) through year twenty (20) following the date of delivery, Seller shall, at its sole discretion, repair or replace any defective meters at a cost based on the prices set out in the price list valid at the time of return of the product and reduced by a percentage according to the following schedule:

Year	Replacement Price	Year	Replacement Price
1 - 10	no cost	16	50%
11	20%	17	60%
12	25%	18	70%
13	30%	19	80%
14	35%	20	90%
15	40%		

The limited warranty is conditional on the meters having been used only for clean drinking water as defined in the Safe Drinking Water Act (SDWA), United States Environmental Protection Agency (EPA) for normal meter operation and on the meters having been installed in accordance with the product documentation supplied with the product by Seller and provided on its website.

Any meter accuracy claims shall be subject to verification - initiated by Seller - through testing by a NIST Traceable laboratories or ISO 17025 accredited laboratories.

## General terms and conditions of sale and delivery

### Battery Life

Based on operation of the meters with either communication via the three wire encoded output OR with communication via the embedded radio, the warranty on the system battery in the flowIQ® Water Meters shall be for a period of twenty (20) years. Seller shall, at its sole discretion, (i) replace any defective batteries or any meters that contain defective batteries at no cost for year one (1) through year ten (10) following the date of delivery or (ii) refund the purchase price for the defective batteries or the meters that contain defective batteries. For year eleven (11) through year twenty (20) following the date of delivery, Seller shall, at its sole discretion, replace any defective batteries or any meters that contain defective batteries at a cost based on the prices set out in the price list valid at the time of return of the product and reduced by a percentage according to the following schedule:

Year	Replacement Price	Year	Replacement price
1 – 10	no cost	16	50%
11	20%	17	60%
12	25%	18	70%
13	30%	19	80%
14	35%	20	90%
15	40%		

The Special Limited Warranty Terms related to Battery Life for flowIQ® 2250 Series and flowIQ® 3250 Series Cold Water Meters is void if the flowIQ® 2250 Series and flowIQ® 3250 Series Cold Water Meters at any time has been configured into priority mode.

The limited warranty is conditional on the meters having been used only for clean drinking water as defined in the Safe Drinking Water Act (SDWA), United States Environmental Protection Agency (EPA) for normal meter operation and on the meters having been installed in accordance with the product documentation supplied with the product by Seller and provided on its website.

- 12.3. **Product Return.** IF, WITHIN THE APPLICABLE WARRANTY PERIOD, (i) BUYER DISCOVERS ANY DEFECTS IN MATERIALS OR WORKMANSHIP AND (ii) NOTIFIES SELLER IN WRITING OF SUCH DEFECTS, AND (iii) RETURNS THE DEFECTIVE PRODUCTS TO SELLER, SELLER SHALL, AT SELLER'S SOLE DISCRETION, REPAIR OR REPLACE THE DEFECTIVE PRODUCTS, OR REFUND THE PURCHASE PRICE FOR THE DEFECTIVE PRODUCTS. THIS WARRANTY SHALL NOT APPLY TO ANY OF THE FOLLOWING: (A) PRODUCTS THAT HAVE BEEN ALTERED; (B) PRODUCTS THAT HAVE BEEN DAMAGED BY NEGLIGENCE OR ACCIDENT OR BY OTHER CIRCUMSTANCES BEYOND THE REASONABLE CONTROL OF SELLER; OR (C) PRODUCTS THAT HAVE BEEN IMPROPERLY USED OR MAINTAINED BY BUYER, OR THAT HAVE BEEN SUBJECTED TO ABNORMAL CONDITIONS OF USE OR MAINTENANCE NOT IN CONFORMITY WITH ACCEPTED INDUSTRIAL PRACTICES OR ANY INSTRUCTIONS, MANUALS OR OTHER DOCUMENTATION PROVIDED BY SELLER. NO WARRANTY CLAIMS WILL BE PROCESSED IF RECEIVED AFTER THE WARRANTY PERIOD. REJECTED PRODUCTS MAY BE RETURNED ONLY

WITH SELLER'S PRIOR EXPRESS WRITTEN CONSENT AND AT BUYER'S COST AND RISK. IF PRODUCTS ARE RETURNED WITHOUT SELLER'S PRIOR CONSENT, SELLER MAY REFUSE TO ACCEPT THE RETURNED PRODUCTS AND MAY RETURN THEM TO SELLER AT BUYER'S COST AND EXPENSE.

- 12.4. **Set-Off.** IN NO CASE WHATSOEVER, INCLUDING JUSTIFIED WARRANTY CLAIMS, IS THE BUYER ENTITLED TO RETAIN ANY MONIES OWED TO SELLER, EXCEPT UPON THE WRITTEN CONSENT OF SELLER. FURTHER, THE WARRANTIES PROVIDED FOR HEREIN SHALL NOT APPLY IN THE EVENT BUYER HAS FAILED TO REMIT PAYMENT IN FULL FOR SUCH PRODUCTS.
- 12.5. **WARRANTY DISCLAIMER.** THE FOREGOING LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR NON-INFRINGEMENT, ALL OF WHICH ARE HEREBY EXPRESSLY DISCLAIMED.
- 12.6. **LIMITATION OF LIABILITY.** IN ALL EVENTS, THE LIABILITY OF SELLER, WHETHER BASED IN TORT, BREACH OF CONTRACT, BREACH OF WARRANTY, OR OTHERWISE, SHALL NOT EXCEED THE PRICE OF THE PRODUCTS IN QUESTION OR WITH RESPECT TO WHICH SUCH BREACH, DEFAULT, OR NEGLIGENCE IS CLAIMED. BUYER ACKNOWLEDGES THAT THE REMEDIES PROVIDED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER REMEDIES. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER OR ANY THIRD PARTY, IN CONTRACT, TORT OR OTHERWISE, FOR ANY LOSS OF PROFITS OR BUSINESS, OR FOR ANY SPECIAL, INCIDENTAL, INDIRECT, EXEMPLARY, PUNITIVE OR CONSEQUENTIAL DAMAGES RELATING TO THE PRODUCTS, EVEN IF SELLER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. NOTWITHSTANDING THE FOREGOING, IN THE EVENT THAT ANY CLAIM IS BROUGHT AGAINST SELLER FOR PRODUCT LIABILITY, SELLER'S LIABILITY SHALL BE LIMITED TO A MAXIMUM OF AVAILABLE INSURANCE COVERAGE AVAILABLE FOR SUCH DAMAGE, IF ANY. ANY AMOUNT IN EXCESS THEREOF SHALL BE BORNE BY THE BUYER. SELLER SHALL NOT BE LIABLE FOR ANY DEFECT THAT WAS CAUSED BY THE PRODUCTS HAVING BEEN INTEGRATED INTO PRODUCTS OF BUYER OR THOSE OF ITS CUSTOMERS. SELLER SHALL NOT BE LIABLE IN THE EVENT THE PRODUCTS SUPPLIED WERE IMPROPERLY USED, TREATED, HANDLED, STORED OR SUPPLIED BASED ON BUYER'S INSTRUCTIONS (INCLUDING, WITHOUT LIMITATION, DESIGN DETAILS, SPECIFICATIONS, PLANS, TEMPLATES OR STORAGE AND TRANSPORT RULES).
- 13.0 **DAMAGES DISCLAIMER AND LIMITATION**
- 13.1. BUYER HEREBY EXPRESSLY WAIVES ANY AND ALL CLAIMS FOR ANY AND ALL INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES, INCLUDING BUT NOT LIMITED TO ANY CLAIMS FOR DAMAGES FOR LOSS OF USE, LOSS OF TIME, LOSS OF PROFITS, OR LOSS OF INCOME RELATING TO THE PURCHASE OR USE OF THE PRODUCTS.
- 13.2. SELLER SHALL HAVE NO LIABILITY TO BUYER IF ANY PATENT INFRINGEMENT OR CLAIM THEREOF IS BASED UPON



## General terms and conditions of sale and delivery

THE USE OF THE PRODUCTS DELIVERED HEREUNDER IN CONNECTION WITH A PROCESS OR IN COMBINATION WITH EQUIPMENT, DEVICES, OR SOFTWARE NOT SUPPLIED OR APPROVED IN WRITING BY SELLER, OR USED IN A MANNER FOR WHICH THE PRODUCTS WERE NOT DESIGNED.

**14.0 Indemnity.** Buyer agrees to defend, indemnify and hold Seller, its officers, directors and employees, harmless from and against losses, damages, expenses, actions, attorney fees, liabilities, penalties, fines, duties as well as for any claims for injury, illness, or death of persons and damage to property arising out of, or in connection with: i) the Products after their delivery; ii) any action or inaction taken by Buyer, its employees, agents or independent contractors, with regard to the services provided with regard to the Products comprising the Sales Order; iii) arising out of or resulting from any violation by Buyer, its employees, agents, or independent contractors, of any applicable law, regulation or other mandate by a competent authority; or iv) the infringement or violation of any third party intellectual property rights which may be suffered by Seller due to the act or omission of Buyer, its employees, agents, or independent contractors.

### **15.0 Intellectual Property**

**15.1.** Buyer acknowledges Seller's exclusive right, title, and interest in trademarks, logos and other markings of Seller relating to the Products, as well as in any and all manuals or documents provided by Seller relating to the Products (collectively, "Seller's Marks"), and will not at any time do or cause to be done any act or thing contesting or in any way impairing or tending to impair this right, title, and interest.

**15.2.** Buyer acknowledges that Seller claims and reserves all rights and benefits afforded under federal and international intellectual property laws in all Intellectual Property relating to the Products. "Intellectual Property" means all intellectual property and/or proprietary rights, including without limitation all rights of inventorship and authorship, in inventions, patents, patent applications, and know how, for any Product, process, method, machine, manufacture, design, composition of matter, or any new or useful improvement thereof, as well as all copyrights, trademark, trade dress and service mark rights and all rights in trade secrets, computer software, data and databases, and mask works.

**15.3.** Buyer is not authorized to make any changes, additions, improvements, alterations, or modifications of any sort to the Products. Whether authorized or unauthorized, any changes, additions, improvements, alterations, or modifications of any sort to the Products made by Buyer shall inure to the benefit of Seller, and Seller shall have full right, title, and interest in them.

**15.4.** The rights and obligations set forth in this Section shall survive the termination of this agreement.

**16.0 Security Interest.** Buyer hereby grants a security interest in the Collateral to the Seller to secure the payment and performance of the Obligations listed below. The Collateral shall consist of all now owned and hereafter acquired and wher-

ever located Products, as defined in Article 9 of the Uniform Commercial Code as enacted in Georgia, which are Products acquired by the Buyer from Seller, and, all proceeds (cash and non-cash) and products of the foregoing. The Obligations shall consist of: (i) all of Buyer's present and future indebtedness and obligations to Seller; (ii) all amounts owed under any modifications, additional advances, renewals, extensions or substitutions of any of the foregoing obligations; (iii) all costs associated with Seller's exercise of its rights hereunder; and (iv) any of the foregoing that may arise after the filing of a petition by or against Buyer under the Bankruptcy Code, even if the obligations do not accrue because of the automatic stay under Bankruptcy Code § 362 or otherwise. Any capitalized term used in this Section 16, and not otherwise defined in these Terms, shall have the meaning given to it in Article 9 of the Georgia Uniform Commercial Code. Buyer agrees to execute and deliver to Seller any and all documents necessary to perfect Seller's security interest, including all financing statements.

**17.0 Cancellation for Default.** Seller reserves the right to cancel all or any part of any Sales Order, without liability to Seller, if Buyer fails to perform under any applicable provision of these terms and conditions or of any applicable Sales Order and the failure is not cured within ten (10) days after delivery of written notice to Buyer by Seller. In the event of cancellation, Seller may exercise all rights and remedies available to it hereunder and under law.

**18.0 Remedies.** Seller's remedies shall be cumulative and shall include any remedies allowed by law. Seller's waiver of any breach by Buyer shall not constitute a waiver of any other breach of the same or any other provision. Acceptance of any payments shall not waive any breach. In any dispute involving moneys owed to Seller, Seller shall be entitled to all costs of collection, including reasonable attorney's fees and interest at 15% per annum or the highest rate allowed by law, whichever is greater, unless Seller agrees to a lower amount. The confiscation or detention of a shipment by any governmental authority shall not affect or diminish the liability of the Buyer to the Seller to pay all charges or other money due promptly on demand.

**19.0 Insolvency.** Seller shall have the right to cancel any outstanding Sales Order or any part thereof, without any liability whatsoever in the event of (i) insolvency, or anticipated insolvency, of Buyer, (ii) commencement of any proceedings, voluntary or involuntary, in bankruptcy or insolvency by or against Buyer; or (iii) the appointment of an assignee for the benefit of creditors of Buyer or a receiver or trustee for Buyer.

**20.0 Arbitration.** In the event that the parties are unable to agree on any matter for which agreement is required under an accepted Sales Order, including these terms and conditions, or if a party commits a material default hereunder, the non-breaching party shall submit the matter to binding arbitration in accordance with the Expedited Procedures of the Commercial Arbitration Rules of the American Arbitration Association ("AAA"), then in effect. Each party shall pay one-half of the deposit required by AAA. If the matter in dispute

## General terms and conditions of sale and delivery

exceeds \$100,000, the matter shall be considered by a panel of three arbitrators. Each party shall appoint one arbitrator within fifteen (15) days of receipt of the notice of the party requesting arbitration and the arbitrators so selected shall, within fifteen days of their appointment, then select a third arbitrator. Upon failure of a party(ies) to appoint an arbitrator (or of the arbitrators selected to appoint a third arbitrator) as contemplated in the foregoing sentence, AAA shall appoint an arbitrator. If the matter in dispute is less than \$100,000, the matter shall be considered by a single arbitrator. The parties shall mutually agree to the single arbitrator, or if the parties are unable to so agree on an arbitrator within twenty (20) days following a request for arbitration by either party, the arbitrator shall be selected by AAA. The decision of the arbitrator(s) [by majority vote if there are three arbitrators] shall be binding upon all parties and non-appealable. If there are three arbitrators, each party shall bear the cost of its appointed arbitrator and cost of the third arbitrator shall be borne by the non-prevailing party. If there is a single arbitrator, the non-prevailing party shall bear the cost of the arbitrator. Each party shall bear all of its own witness fees and attorneys' fees. The arbitration proceeding shall occur in Atlanta, Georgia, unless another location is chosen by mutual agreement of the parties.

**21.0 Force Majeure.** Seller shall not be liable for any delay in performance of its obligations and responsibilities under a Sales Order due to causes beyond its control, and without its fault or negligence, such as but not limited to war, embargo, national emergency, insurrection or riot, acts of the public enemy, fire, flood or other natural disaster, provided that said party has taken reasonable measures to notify the other promptly in writing, of delay.

**22.0 Jurisdiction; Venue.** For purposes of injunctive relief or should arbitration not be available in any legal action relating to the sale and shipment of Products under these terms and conditions, each party irrevocably agrees and consents (i) to the exercise of jurisdiction over it by the state or federal courts located in Atlanta, Georgia and (ii) that the action shall be instituted in one of the courts specified in Subsection (i) above.

**23.0 Governing Law.** This agreement shall be construed in accordance with the laws governing contracts made and to be performed in the State of Georgia, U.S.A., exclusive of the U.N. Convention on the International Sale of Goods.

**24.0 Severability.** If any provision of a Sales Order, including these terms and conditions, shall be judged by a court of competent jurisdiction to be invalid, illegal or unenforceable in any respect, such adjudication shall not affect or modify any other provision of the Sales Order, or these terms and conditions and the effect thereof shall be confined to the provision as to which such adjudication is made.

**25.0 Notice.** Any notice or other communication required or permitted by these terms and conditions must be given in writing and must be delivered by personal delivery (including personal delivery by overnight courier such as Federal Express, DHL, or similar overnight courier), first class mail (registered or certified), telecopy or e-mail (with a copy sent by personal delivery or first class mail), in each case addressed as follows, or to such other address or addresses as may be hereafter furnished by one party to the other party in compliance with the terms hereof. Notice will be deemed given when received or delivered. Notice shall be given:

Attn.: \_\_\_\_\_ Telefax: \_\_\_\_\_  
\_\_\_\_\_ Email: \_\_\_\_\_  
\_\_\_\_\_

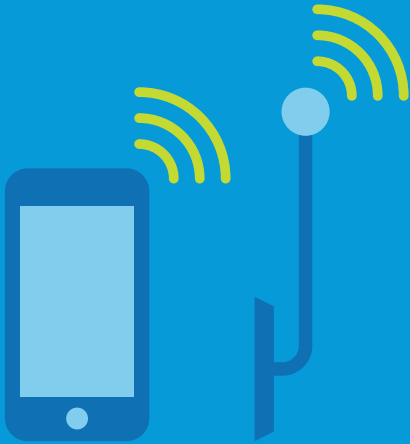
If to Buyer at such address, physical or electronic, as furnished in the Sales Order or such other address utilized or referenced by Buyer in its correspondence with Seller.

**26.0 Miscellaneous.** Seller reserves the right to change, modify, add, or delete portions of these terms and conditions from time to time without further notice. The headings contained in these terms and conditions are included for convenience and shall not affect the language included herein.

**27.0 Entire Agreement.** Except as provided for herein, these terms and conditions, together with the Sales Order contain all of the terms and conditions governing the sale of the Products and may not be modified or amended by Buyer except by written agreement duly executed by the parties. Aside from the terms of any Sales Order, all prior agreements, representations, statements, negotiations and undertakings, whether oral or written, are superseded by these terms and conditions.

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# **EXHIBIT 7**



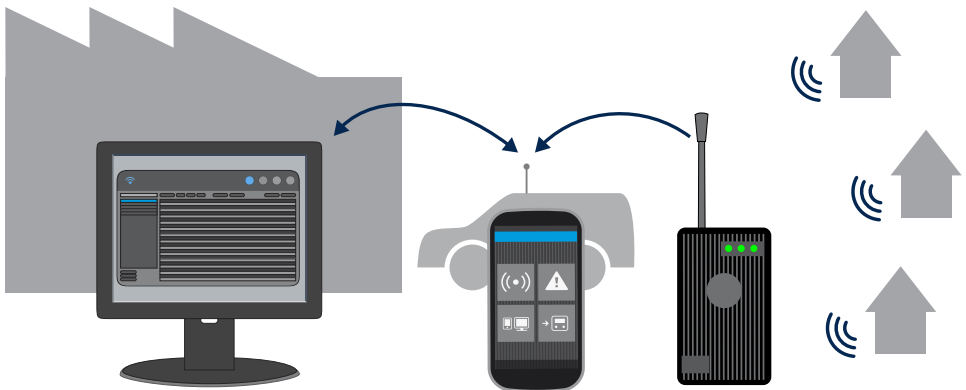
# 11 steps to getting started

## Quick Guide for REAdy Suite

**REAdy** is a simple solution that lets you read Kamstrup water meters on your smartphone or tablet. It consists of **REAdy Manager** software, **REAdy App** for Android phones or tablets and **REAdy Converter**.

### At the office

### On the road



#### **REAdy Manager**

helps you manage and export meter data.

#### **REAdy App**

enables you to read meters from your smartphone or tablet.

#### **REAdy Converter**

translates the meter signals.

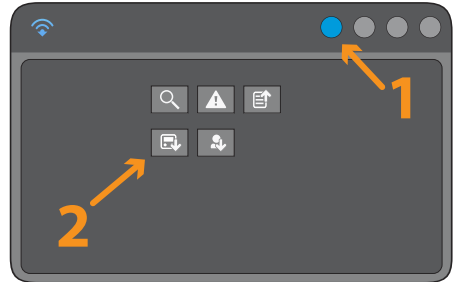
## A. Prepare PC

### 1. Install READY Manager



- Download and install READY Manager from your My Kamstrup account at <https://www.kamstrup.com/my-kamstrup-login>

### 2. Import meters




To be able to read meters, you need to import meter data into READY Manager.

- Click **Import meters**.
- Add the files/links you received from customer service when you bought the meters.

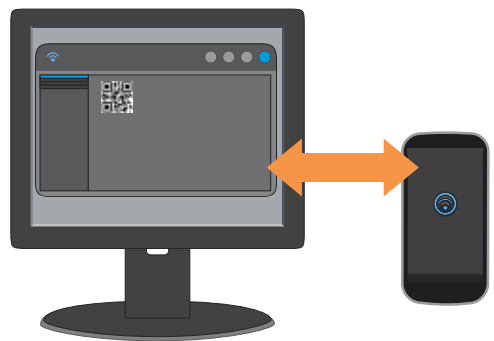
## B. Prepare mobile device

### 5. Install READY App




- Open **Google Play** on your mobile device.
- Enter **Kamstrup READY** in the search field, and install the app.
- Open **Apps** on your mobile and tap .

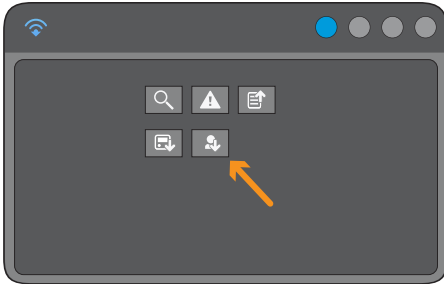
### 6. Pair with READY Manager



Make sure that PC and mobile device have access to the internet and follow the instructions on your mobile device.

Find the QR code on the PC: Click on  and **Pair with mobile**.

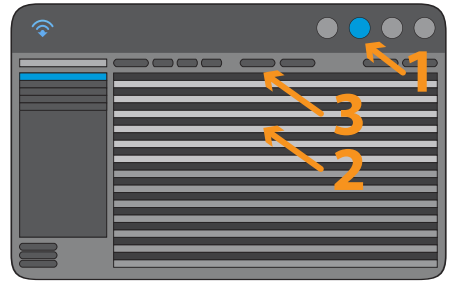
### 3. Add customer details




If you use a customer information system, you can add customer data automatically.

- Click **Import customers**.
- Add the file created by your customer information system.

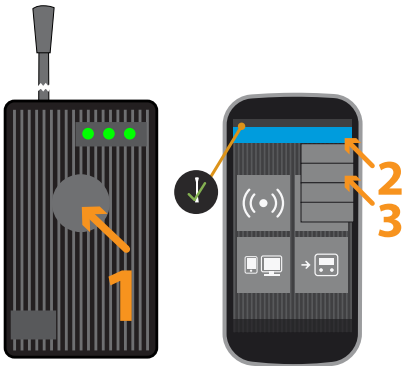
### 4. Organise in groups





You can organise your meters in groups that match the way you carry out readings.

- Click  in the top menu.
- Select meters in the list.
- Click **Add to group**.

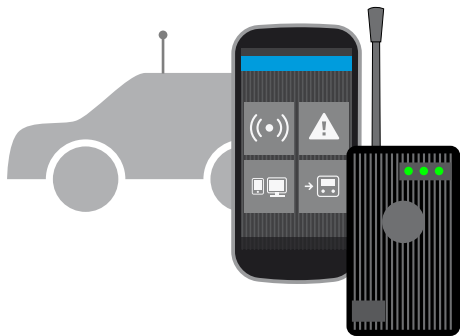
### 7. Pair with READY Converter



- Turn on READY Converter with a long press.
- On mobile: Tap  and **Pair with READY Converter**.
- Select the converter from the list.
- Tap  to return to the main menu.

## C. Read meters

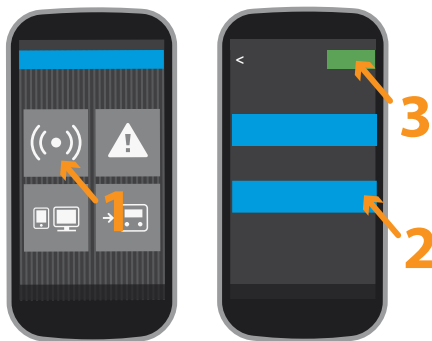
### 8. Set up equipment





Bring along your mobile device and converter to your car.


Improve the collection range by replacing the converter antenna with a roof antenna (the roof antenna is bought separately).

### 9. Read meters



- Tap **Read meters**.
- Select the group(s) you wish to read.
- Tap **Start**.

Tap  /  to switch between map and list view.

Tap  to pause or finish.

## D. After reading

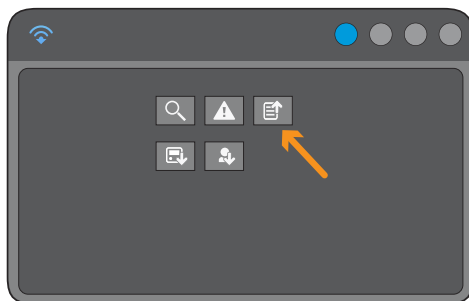
### 10. Transfer data




You can transfer data when you are on the road. Make sure READY Manager is turned on and that PC and mobile device have access to the internet.

- On mobile device: Tap **Send/Receive**.
- On PC: Click **Refresh**.

### 11. Export data



- Click  to export meter data from READY Manager. The exported file can be imported into your customer information system.

Need more help?

Go to [www.kamstrup.com/ready](http://www.kamstrup.com/ready)

or call the READY hotline +45 89 93 11 10.

For Kamstrup Authorized Distributors

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**READy Manager Setup Guide**



## Prerequisites

Before you start setting up READy Manager, there is a few things that need to be established:

- You need a superuser login for My Kamstrup.
- You need to have received a password and login for READy and an order confirmation with an activation key.
- The end user must have a My Kamstrup account.
- The billing information of the end user must have been sent to Kamstrup.

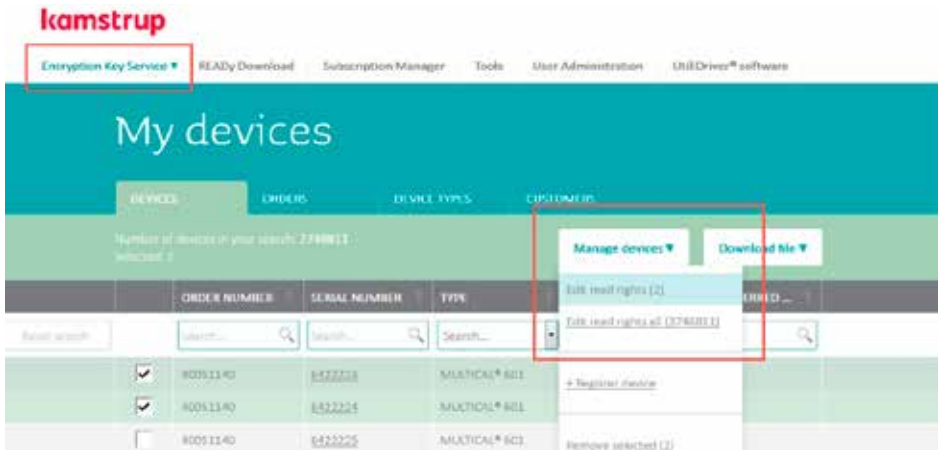
### Prerequisite: You need a superuser account for My Kamstrup

With a superuser account for My Kamstrup, you get the possibility of forwarding encryption keys from your account to the end user's account.

The encryption keys are required for the end user to read the meters.

You can check weather you have a superuser account by logging into My Kamstrup. Under "Encryption Key Service" and "Manage devices", you should have the option "Edit read rights".

If you do not yet have a superuser account, you can request one by sending an email to [mykamstrup@kamstrup.com](mailto:mykamstrup@kamstrup.com).



**Prerequisite: You need to have received a password and login for READY and an order confirmation with an activation key**

To set up the system, you need two things:

- 1 The login and passwords for READY Manager.
- 2 The activation key which you can find on the order confirmation.

The activation key ensures that the “clock” of the subscription does not tick until you activate it on the end users My Kamstrup account.

**Prerequisite: The end user must have a My Kamstrup account**

The My Kamstrup account is what ties together both the subscription and the encryption keys for the meters. Therefore, it is necessary that the end user has his own My Kamstrup account before READY Manager can be set up. It is not possible to use your own My Kamstrup account when setting up the end user’s version of READY.

The end user can create a My Kamstrup account on kamstrup.com.



**Prerequisite: Billing interface information sent to Kamstrup**

Kamstrup will help ensure that READY Manager can import the customer data from the end user’s existing billing system.

To get this process started as fast as possible, we need the following information:

- Details about the billing software provider
- Contact information of the billing software provider
- Contact information of the billing clerk at the end-user company
- Layout information, if applicable, route and upload file with sample data
- Spreadsheet dump of customer database
- My Kamstrup credentials of the end user
- READY Manager login credentials (these are available on the order confirmation)

The information must be sent to: READYUS@kamstrup.com.

## Commissioning

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You are now ready to set up the system at the customer's place. Follow the steps below to ensure success:

- 1 Activate REAdy Manager on the end-users My Kamstrup account.
- 2 Transfer keys from your My Kamstrup account to the end user's My Kamstrup account.
- 3 Connect REAdy Manager to the My Kamstrup account of the end user.
- 4 Activate "Address coordinates".
- 5 Import meters.
- 6 Send My Kamstrup credentials and REAdy login credentials to REAdyUS@kamstrup.com.
- 7 Test the billing software integration.
- 8 Install REAdy Manager Client on the end user's PC.
- 9 Download REAdy App to the end user's device.


### 1 Activate REAdy Manager on end user My Kamstrup account

---

First step is to activate the subscription.

Log in to My Kamstrup with the credentials of the end user. It is very important that it is the end user's My Kamstrup account that is used and not the distributor's My Kamstrup account.

Go to Subscription Manager in My Kamstrup and activate the subscription by entering the activation code from the order confirmation.



Activation code

Activate

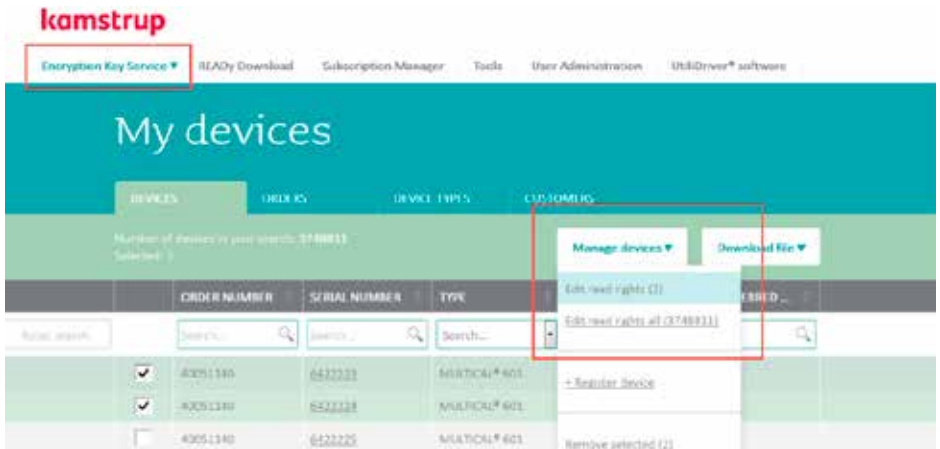
**Activation:** To use your Kamstrup software product, it needs to be activated. To activate a softw be found on the order confirmation or the invoice of your software product.

**Note:** When the subscription has been activated, the "clock" of the subscription starts ticking.

## 2 Transfer keys from your My Kamstrup account to end user's My Kamstrup account

Log in to **the distributor's** My Kamstrup account. Go to "Encryption Key Service", and select the encryption keys that you want to transfer to the end user.

Select "Manage devices" and "Edit read rights", and enter the email address used for the end user's My Kamstrup account. The keys of the selected meters will now be available in the end user's My Kamstrup account.



## 3 Log in to READY Manager

There are a few things that need to be set up in READY Manager. You can log into READY Manager from your own PC via a READY Manager hosted client. Use the login information which you received together with the order confirmation.

If you do not have a client, you can download it here: [us01.ready.kamstrup.com](https://us01.ready.kamstrup.com).

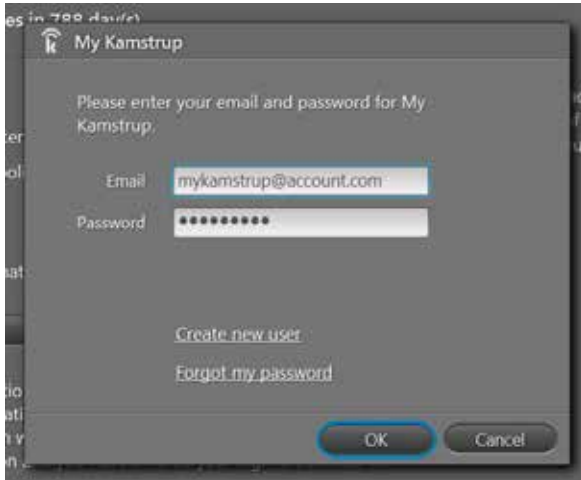
Normally, no setup changes to the PC are required. However, in some cases the local setup of the firewall on the PC can create problems when connecting to the server. If this problem occurs, you can check that the following ports are open in the firewall:

Protocol	Port	URL	IP address	Comment
TCP	808	<a href="http://tcp://us01.ready.kamstrup.com">tcp://us01.ready.kamstrup.com</a>	173.0.64.15	Required for hosted customers in the US region
TCP	443	<a href="https://us01.ready.kamstrup.com">https://us01.ready.kamstrup.com</a>	173.0.64.15	Required for hosted customers in the US region
TCP	443	<a href="https://us01.ready.kamstrup.com">https://us01.ready.kamstrup.com</a>	173.0.64.15	Required for hosted customers in the US region

## 4 Connect READy Manager to the My Kamstrup account of the end user

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To connect READy Manager to the subscription that you activated earlier, the My Kamstrup credentials of the end user must be entered.



## 5 Activate "Address coordinates"

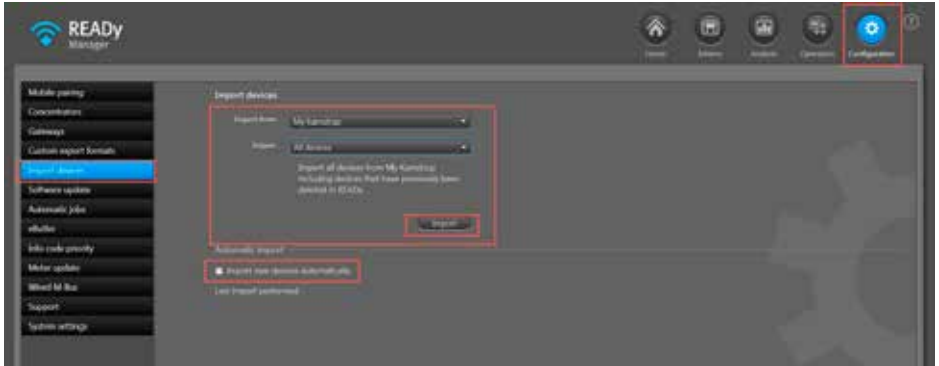
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To enable automatic lookup of GPS coordinates, you can activate this function for the customer.



## 6 Import end user's meters from My Kamstrup

READY Manager can automatically import the encryption keys of the meters. This is done by clicking "Import". You can also set up READY to automatically import new encryption keys if the end user buys more meters.



## 7 Test billing software integration

To ensure seamless integration between the billing software and READY Manager, Kamstrup will test the connection.

To start this process, please contact Kamstrup via email at [READYUS@kamstrup.com](mailto:READYUS@kamstrup.com) to request the billing interface integration and test.

Once the billing interface has been tested with the billing software provider, you will receive a confirmation by email.

Note: Kamstrup will not poste transactions without the review and approval of the billing software provider.

## 8 Download READy Manager to the end user's PC

You are now ready to start up the program on the end user's PC. Start by installing the READy Manager client on the end user's PC. This can be downloaded from [us01.ready.kamstrup.com](http://us01.ready.kamstrup.com).

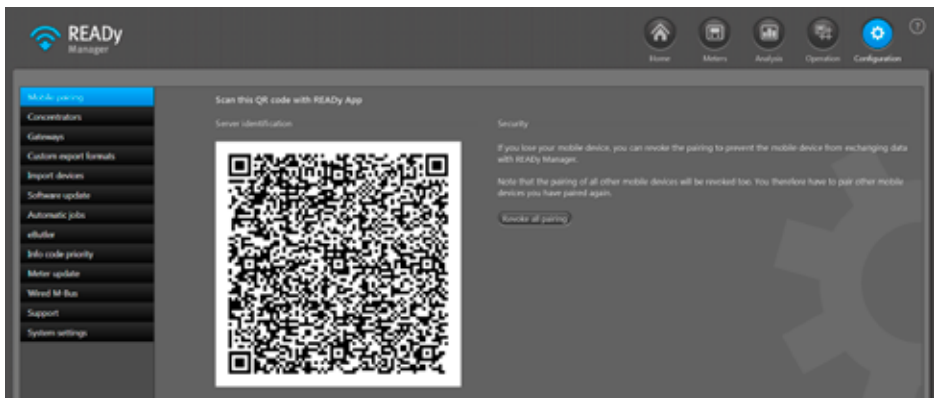
Normally, no additional settings to the PC are required. However, in some cases the local setup of the firewall on the end user's PC can create problems when connecting to the server. If this problem occurs, you can check that the following ports are open in the firewall:

Protocol	Port	URL	IP address	Comment
TCP	808	<a href="http://us01.ready.kamstrup.com">tcp://us01.ready.kamstrup.com</a>	173.0.64.15	Required for hosted customers in the US region
TCP	443	<a href="https://us01.ready.kamstrup.com">https://us01.ready.kamstrup.com</a>	173.0.64.15	Required for hosted customers in the US region
TCP	443	<a href="https://us01.ready.kamstrup.com">https://us01.ready.kamstrup.com</a>	173.0.64.15	Required for hosted customers in the US region

## 9 Download READy App to the end user's device

Go to Play Store on the end user's device and search for "Kamstrup READy".

Download the app and pair it with READy Manager.



Note: It is important that the app is always up to date. Therefore, check for app updates regularly.

Data sheet

## READY Manager and App

- Intuitive PC software and app for handling data from devices within heat, cooling and water
- Simple icon-based navigation
- Supports both mobile reading and direct reading
- App with built-in installation tool





## **READy Manager – easy to use and with a multitude of functionalities**

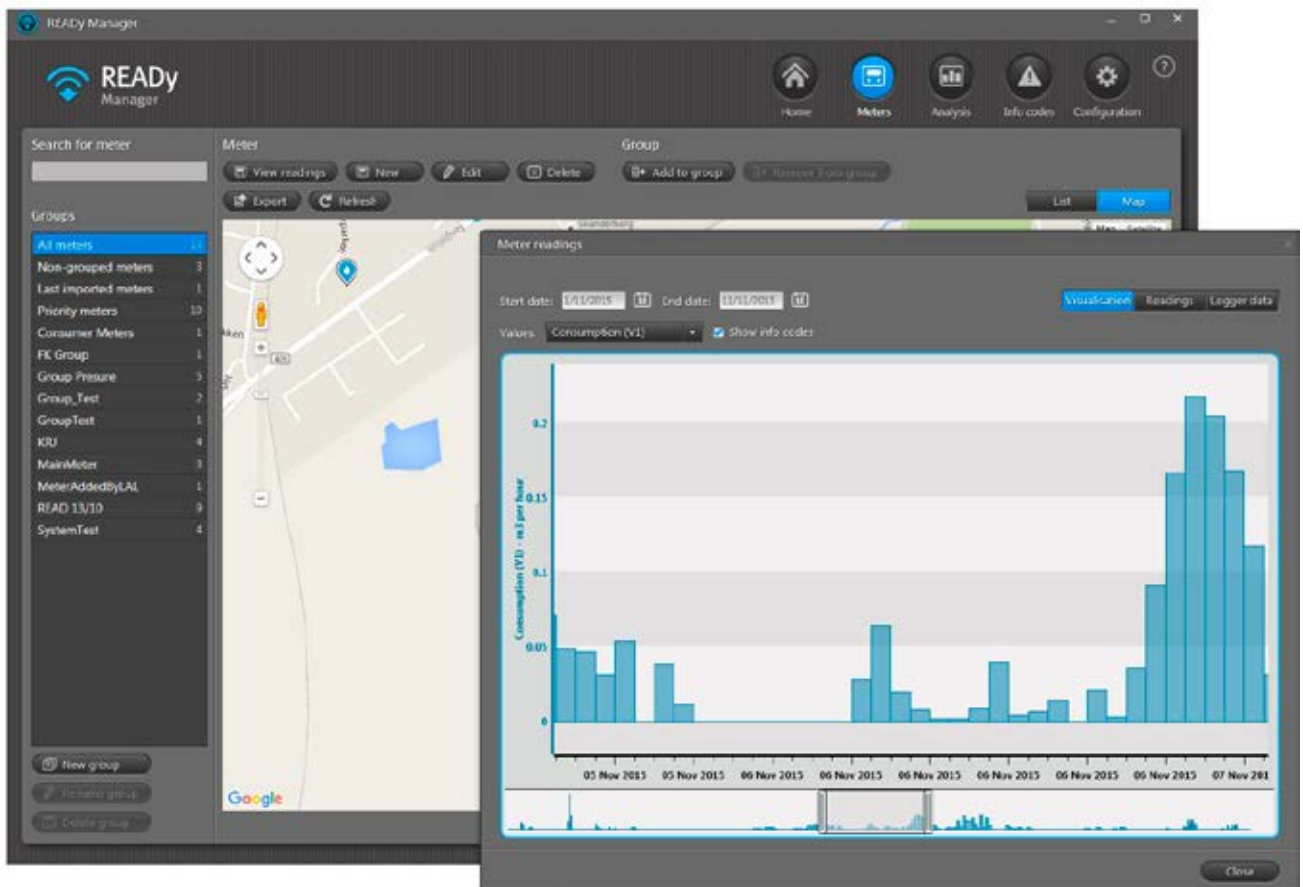
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READy Manager is the PC software for handling meters, sensors and read data. READy Manager has a simple and logical user interface with a start page as the starting point and icon-based navigation to further features, making the application very intuitive and easy to use. Information about the most basic features becomes available by clicking the help icon on the start page. READy Manager is primarily designed to be run as a hosted solution in which read data is saved on secured servers at Kamstrup. Alternately, it can be offered as a local installation as well, where data is stored locally on a customer computer.

The application offers a multitude of features which make data handling easy, for example:

- Mobile reading
- Direct reading on a daily basis via Fixed network (purchase)
- Direct reading on an hourly basis via Fixed network (purchase)
- Direct reading of selected meters in 5-minute intervals (purchase)  
The interval time depends on the network strength
- Generic import functionality for importing customer database
- Graphical visualisation of read data
- Display of meters on map
- Automatic GIS coordinates on the basis of addresses
- User-defined export formats for exporting to billing systems
- Automatic export functionality
- Possibility of receiving readings by email on an hourly, daily, weekly or monthly basis (hosted solutions only)
- Grouping of meters
- Management of mobile reading units
- Overview of info codes
- Display of logged data from heat, cooling and water meters.

## READY Manager – easy to use and with a multitude of functionalities



## READy Manager – hardware and software requirements

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The hardware requirements depend on if the application is run as a hosted solution or is installed locally.

### Hosted solution

PC with Microsoft Internet Explorer 9 or newer and Microsoft Windows 7, 64 bit or newer.

The PC must be fully updated via Windows Update.

Internet access and open outgoing TCP/443 and outgoing TCP/808.

### Locally installed solution

Processor	Intel Core I3 compatible processor 2.4 GHz or faster
RAM	8 GB RAM

### Hard disk (recommended)\*

Metering points	Mobile reading (based on one reading per month)	Fixed network Daily basis	Fixed network Hourly basis
0-15000	128 GB	128 GB	256 GB
15001-50000	128 GB	128 GB	500 GB
50001-100000	256 GB	500 GB	1000 GB

\* (included storage of hourly readings for 13 months, daily readings for 5 years and monthly readings for 10 years)

### Software (water)

Metering points	Mobile reading (based on one reading per month)	Fixed network Daily basis	Fixed network Hourly basis
0-1000	●	●	●
1001-25000	●	●	■
25001-50000	●	■	■
50001-100000	■	■	■

## READY Manager – hardware and software requirements

### Software (heat, cooling, water)

Metering points	Mobile reading (based on one reading per month)	Fixed network Daily basis	Fixed network Hourly basis
0-10000	●	●	●
10001-25000	●	■	■
25001-100000	■	■	■

● =

- Windows 7 Professional / Windows 10, 64 bit / Windows 10 Pro
- Windows Server 2012 Standard
- .Net Framework 4.5
- Microsoft SQL Server 2012 Express (LocalDB) [included in the price].

■ =

- Windows 7 Professional / Windows 10, 64 bit / Windows 10 Pro
- Windows Server 2012 Standard
- .Net Framework 4.5
- Microsoft SQL Server 2012 Standard [to be purchased separately].

The PC must be fully updated via Windows Update.

In addition, some features require internet connection and that the following ports are open:

- TCP/443 outgoing (synchronisation with mobile units and concentrators via web and with Encryption Key Service)
- TCP/20 and 21 outgoing (access to automatic updates)
- TCP/80 outgoing (automatic licence renewal)
- TCP/8703 incoming (direct synchronisation with concentrators and mobile units)
- TCP/8704 outgoing (used if server and client are not installed on the same unit)
- UDP/8705 local area network (READY App and READY Manager discovery)
- TCP/9443 outgoing (facilitated synchronization with concentrators)
- TCP/11443 outgoing (facilitated synchronization with concentrators).

## READY App – mobile reading and installation tool

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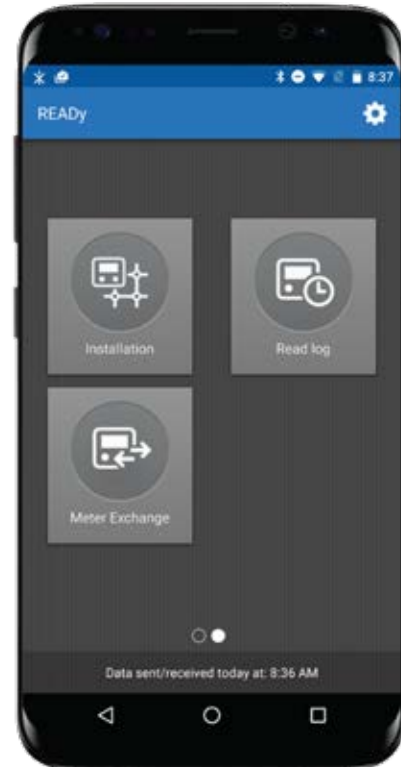
READY App is a mobile application which – together with a Bluetooth®-connected converter – changes your smartphone into an efficient reading tool. READY App is extremely intuitive and makes meter reading and data synchronisation with the central data management software easy.

By pressing a button in READY App, data is synchronised wirelessly with data in the central data management software by which the meters become available in the app. When READY App is in reading mode, an integrated Google Maps feature shows the geographical position of not yet read meters on a map, making meter reading with READY App very simple and efficient. As the meters are read, they light up and disappear from the map. In this way, the operator is provided with a clear picture of the positions of the remaining meters.

In addition to reading the wireless data communication from the meters, READY App can be used together with a Bluetooth®-connected optical eye. When the optical eye is placed on the infrared connection port of Kamstrup's heat, cooling and water meters, the data logger in the meter can be accessed from READY App.

READY App contains functionalities which make mobile reading and network setup simple and efficient, including:

- Handling of up to 15,000 metering points
- Map view and list view of meters
- Search function
- Graphical display of logged data from heat, cooling and water meters
- Display of info codes
- In-field synchronisation of data with READY Manager
- Verification of the signal strength from meters
- Configuration of network components.



## READY App – recommended hardware

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### Smart phones

- Samsung Galaxy S6/S7/S8
- Sony Xperia X
- HTC One M9/10
- Nexus 6/5X/6P

### Tablets

- Nexus 9
- Sony Xperia tablet Z4

Recommended Android version      Minimum 5.0

## READY App – hardware and software requirements

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### Hardware

Memory	Minimum 12 MB
Connection	Wi-Fi, Bluetooth 2.1
Display size and resolution	Minimum 4.3" and 1024 x 768

### Software

OS      Android, minimum version 4.1

IP access to PC software via Wi-Fi

Google Play access (Google account).

In addition, some features require the following:

- Mobile data access (SIM card) for using map view
- Integrated camera in smartphone (for easy pairing of PC software and smartphone app).

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**Kamstrup A/S**

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DK-8660 Skanderborg  
T: +45 89 93 10 00  
F: +45 89 93 10 01  
info@kamstrup.com  
kamstrup.com

# **EXHIBIT 8**



ECLIPSE ENGINEERS, PLLC  
 113 West Mt. Vernon Street  
 Somerset, Kentucky 42501  
 (606) 451-0959

**BASE BID TABULATIONS**  
**PROJECT: AMR Water Metering Equipment Purchase**  
**LOCATION: Whitley City, Kentucky**  
**BID DATE: 1/19/2018**  
**BID TIME: 2:00 P.M.**

Kamstrup Water Metering, LLC  
 819 High Ridge Court  
 Darien, IL 60561

ITEM NO.	ITEM DESCRIPTION	UNIT	QTY	UNIT COST	TOTAL
1	Kamstrup FlowIQ 2100 RF - 5/8 in x 3/4 in	EA	5,600	\$127.00	\$711,200.00
2	Kamstrup FlowIQ 3101 RF - 1 in	EA	24	\$273.00	\$6,552.00
3	FlowIQ 3101, Internal Kamstrup RF - 1 1/2 in	EA	16	\$467.00	\$7,472.00
4	FlowIQ 3101, Internal Kamstrup RF - 2 in x 17 in	EA	48	\$600.00	\$28,800.00
5	FlowIQ 3101, Internal Kamstrup RF 2 in x 15 1/4 in	EA	2	\$680.00	\$1,360.00
6	External Antenna, 5 ft cable length	EA	10	\$19.00	\$190.00
7	READy Converter, 3 Channel	EA	2	\$585.00	\$1,170.00
8	MAG8000 with converter - 3 in	EA	5	\$2,900.00	\$14,500.00
9	MAG8000 with converter - 4 in	EA	3	\$3,300.00	\$9,900.00
					<b>\$781,144.00</b>

I certify that these bid tabulations are a true and correct tabulation of the bids received by the McCreary Co. Water District on January 19, 2018 at 2:00 p.m.

BY: Alan R. Robinson  
 ALAN R. ROBINSON, P.E.  
 Eclipse Engineers, PLLC



# **EXHIBIT 9**

February 19, 2018

Mr. Stephen Whitaker  
Superintendent  
McCreary County Water District  
19 Crit King Road  
Whitley City, Kentucky 42653

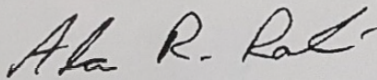
Re: Recommendation for Award  
Mobile Work Order System Purchase

Dear Mr. Whitaker:

I have compiled the bid tabulations as received by the McCreary County Water District for the project referenced above on February 16, 2018 and have attached the certified original. I have examined the bids and have checked references of the low bidder, Bennett & Williams Environmental Consultants, Inc. I recommend that the McCreary County Water District award the Contract to Bennett & Williams Environmental Consultants, Inc. for the amount of \$30,000.00.

Please do not hesitate to call if you have any questions.

Sincerely,  
**Eclipse Engineers, PLLC**



Alan R. Robinson, P.E.  
President



# **EXHIBIT 10**

RESOLUTION NO. \_\_\_\_\_

**A RESOLUTION OF THE BOARD OF COMMISSIONERS OF  
MCCREARY COUNTY WATER DISTRICT AUTHORIZING AN  
APPLICATION TO AWARD CONTRACT FOR AMR WATER  
METERING EQUIPMENT PURCHASE**

**WHEREAS**, McCreary County Water District caused to be published in the January 11, 2018 edition of *The McCreary County Voice* an advertisement for bids for “AMR Water Metering Equipment Purchase” (“Contract”) in accordance with the provisions of KRS Chapter 424;

**WHEREAS**, the Contract involves the purchase of 5,600 meters to replace all existing water meters in McCreary County Water District’s water distribution system;

**WHEREAS**, Kamstrup Water Metering, LLC, of Darien, Illinois was the only firm that submitted a bid on the Contract and its bid was in accordance with the terms of the advertisement;

**WHEREAS**, Kamstrup Water Metering, LLC submitted a bid of \$781,144;

**WHEREAS**, the Project Engineer has recommend that McCreary County Water District award the Contract to Kamstrup Water Metering, LLC;

**WHEREAS**, McCreary County Water District proposes to finance the purchase of these meters through the issuance of a promissory note to Government Capital Corporation in the amount of \$781,144 and payable over a 10-year period;

**WHEREAS**, McCreary County Water District must obtain authorization from the Kentucky Public Service Commission to issue the proposed promissory note;

**WHEREAS**, McCreary County Water District may be required to obtain a certificate of public convenience and necessity from the Kentucky Public Service Commission prior to commencing the replacement of all water meters in its distribution system; and

**WHEREAS**, McCreary County Water District intends to seek authorization from the Kentucky Public Service Commission to issue the proposed promissory note to Government Capital Corporation and also to obtain from the Kentucky Public Service Commission a certificate of public convenience and necessity for the replacement of its water meters or an order declaring that no such certificate is required;

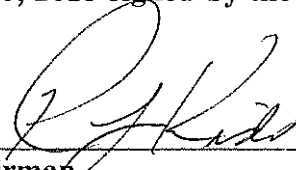
**NOW, THEREFORE, IT IS HEREBY RESOLVED BY THE BOARD OF COMMISSIONERS OF MCCREARY COUNTY WATER DISTRICT AS FOLLOWS:**

**Section 1.** The facts, recitals, and statements contained in the foregoing preamble of this Resolution are true and correct and are hereby affirmed and incorporated as a part of this Resolution.

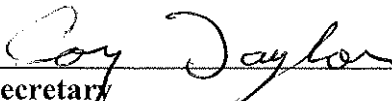
**Section 2.** Kamstrup Water Metering, LLC of Darius, Illinois, is awarded the Contract at the bid amount.

**Section 3.** The General Manager is authorized and directed to take any and all actions reasonably necessary to implement the award of the Contract to Kamstrup Water Metering, LLC, to include the execution of any and all documents for such purpose, upon receiving notice of the Kentucky Public Service Commission's entry of an Order authorizing McCreary County Water District to issue a promissory note to Government Capital Corporation in the amount of \$781,144 and payable over a 10-year period and either issuing a certificate of public convenience and necessity for the proposed water meter replacement or declaring that such certificate is not required.

**ADOPTED BY THE BOARD OF COMMISSIONERS OF MCCREARY COUNTY WATER DISTRICT at a meeting held on January 30, 2018 signed by the Chairman, and attested by the Secretary.**

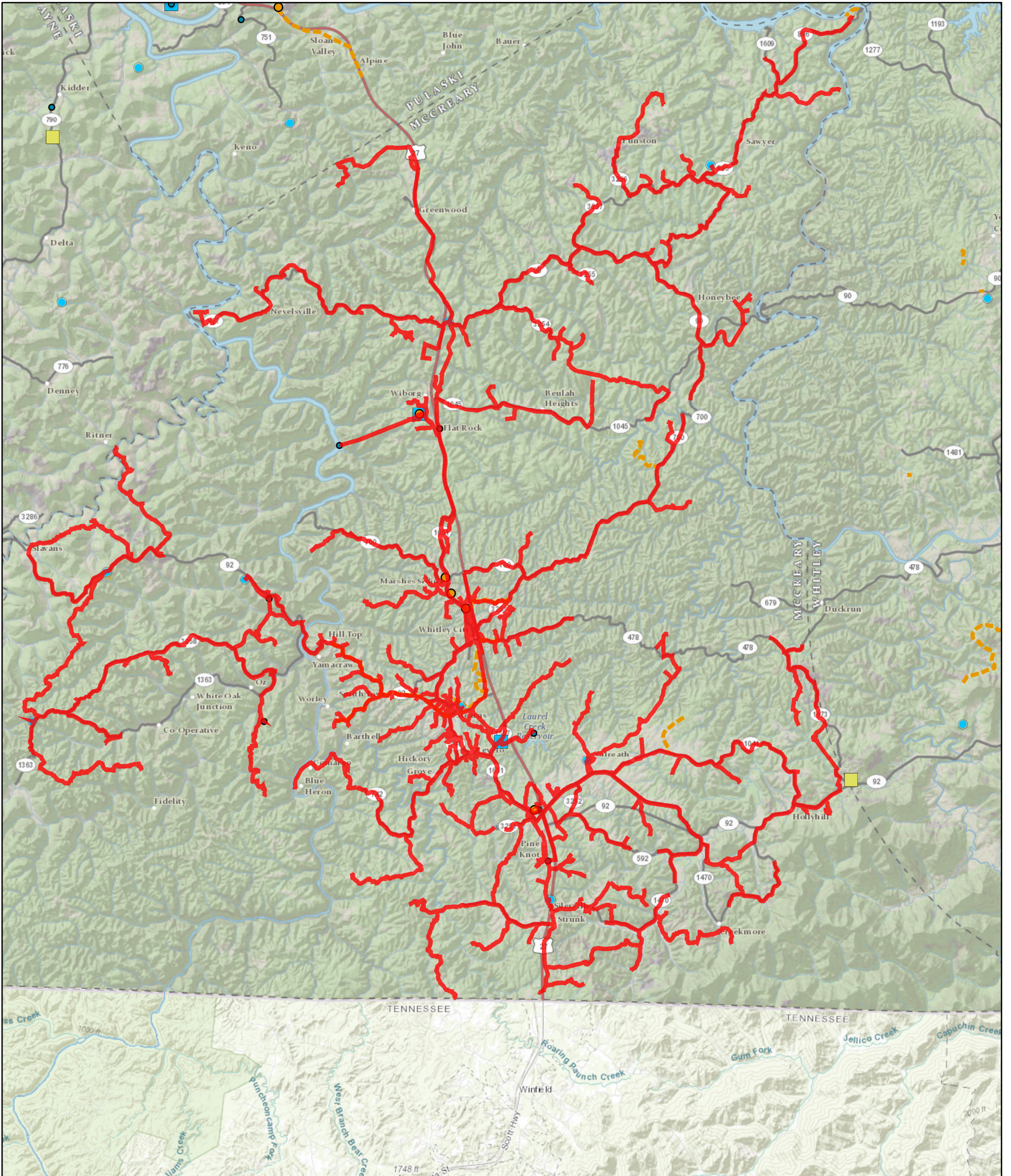
  
\_\_\_\_\_  
Chairman

**ATTEST:**

  
\_\_\_\_\_  
Secretary

# **EXHIBIT 11**

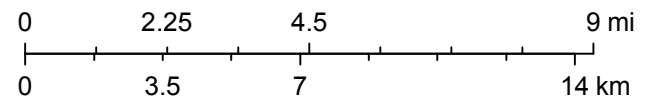
# McCreary County Water District Water System



April 4, 2018

- + Proposed Water Improvements
- Non-Community Points
- + Water Pumps
- Purchase Sources
- + Water Tanks
- Water Treatment Plants
- + Well Sources
- Proposed Water Extensions

1:192,597



Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community



# **EXHIBIT 12**

# Specifications

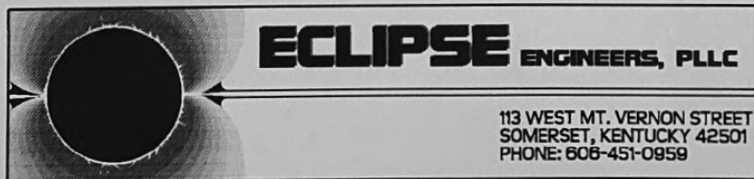
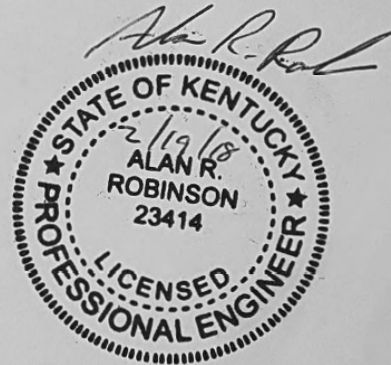
for:

## Mobile Work Order System Purchase

McCreary County Water District  
19 Crit King Road  
P.O. Box 488  
Whitley City, KY 42653

February 2018

Prepared by:



SECTION 00010 - ADVERTISEMENT FOR BIDS

Sealed Bids for **“AMR Water Metering Equipment Purchase”** for the McCreary County Water District, will be received by the McCreary County Water District, 19 Crit King Road, Whitley City, Kentucky 42653 until 2:00 p.m. (local time) on January 19, 2018, and then publicly opened and read aloud.

The scope of work involves the manufacturing and delivery various size AMR equipment equal to that currently installed in the water system. Installation of the units are not including in this BID.

The Bid Form and Specification may be examined at the following:

Eclipse Engineers, PLLC	McCreary Co. Water District
113 West Mt. Vernon Street	19 Crit King Road
Somerset, KY 42501	Whitley City, KY 42653
(606) 451-0959	(606) 376-2540

Copies of the BID Package may be obtained by contacting Eclipse Engineers listed above. Partial sets of documents will not be provided.

The OWNER reserves the right to waive any informality or to reject any or all bids.

No BIDDER may withdraw Bid within ninety (90) consecutive calendar days after the actual date of the opening thereof.

**“EQUAL EMPLOYMENT OPPORTUNITY”**

Stephen Whitaker, Superintendent  
McCreary County Water District

END OF SECTION 00010

SECTION 00300 - BID FORM

**BIDDER'S PROPOSAL**  
**AMR Water Metering Equipment Purchase**  
**McCreary County Water District**  
**Whitley City, Kentucky**

Proposal of KAMSTRUP WATER METERING, LLC (hereinafter called "BIDDER"), organized and existing under the laws of the state of GEORGIA, doing business as KAMSTRUP WATER METERING, LLC (a corporation, a partnership, or an individual), to the McCreary County Water District (hereinafter called "OWNER").

In compliance with the Advertisement for Bids, BIDDER hereby proposes to furnish all equipment, materials, and services for the work required for the "AMR Water Metering Equipment Purchase" in strict accordance with the Specification Section 11001, within the time set forth herein, and at the following price:

**BASE BID SCHEDULE**

Item	Description	Qty	Unit	Unit Cost	Total Amount
1.	Kamstrup FlowIQ 2100 RF - 5/8 in x 3/4 in	5,600	EA	\$127. <sup>00</sup>	\$711,200. <sup>00</sup>
2.	Kamstrup FlowIQ 3101 RF - 1 in	24	EA	\$273. <sup>00</sup>	\$6,552. <sup>00</sup>
3.	FlowIQ 3101, Internal Kamstrup RF - 1 1/2 in	16	EA	\$467. <sup>00</sup>	\$7,472. <sup>00</sup>
4.	FlowIQ 3101, Internal Kamstrup RF - 2 in x 17 in	48	EA	\$600. <sup>00</sup>	\$28,800. <sup>00</sup>
5.	FlowIQ 3101, Internal Kamstrup RF 2 in x 15 1/4 in	2	EA	\$680. <sup>00</sup>	\$1,360. <sup>00</sup>
6.	External Antenna, 5 ft cable length	10	EA	\$19. <sup>00</sup>	\$190. <sup>00</sup>
7.	READy Converter, 3 Channel	2	EA	\$585. <sup>00</sup>	\$1,170. <sup>00</sup>
TOTAL BASE BID (Items 1 through 7)				\$14,500. <sup>00</sup>	\$14,500. <sup>00</sup>

BID ADDENDUM  
 BID ADDENDUM

(8) MAG 8000 w/ converter 5 pcs \$2,900  
(9) 4" MAG 8000 w/ converter 3 pcs \$3,300  
**TOTAL BASE BID AMOUNT** expressed in words: TOTAL BID \$ 781,144.<sup>00</sup>  
SEVEN HUNDRED-EIGHTYONE THOUSAND - ONE HUNDRED AND FORTY-FOUR  
 Dollars and ZERO Cents.

The above sum contract prices shall include all manufacturing costs associated with the production of the equipment system and its appurtenances, all shipping costs to the McCreary County Water District, and all related start-up services. Installation will be by others.

By submission of this Bid, the BIDDER certifies, and in the case of a joint Bid, each party thereto certifies as to its own organization, communication or agreement as to any matter relating to this Bid, with any other bidder or with any competitor.

BIDDER hereby agrees to commence work under this Contract by entering into a formal Purchase Order agreement with the McCreary County Water District, upon the discretion of the McCreary County Water District and after the evaluation of all BIDS. BIDS will be evaluated

upon the UNIT PRICE SUM, life cycle costs as determined by the engineer, and the ability of the BIDDER to comply with the specifications in its entirety. Complete delivery of the equipment shall occur no later than sixteen (16) weeks from the date of a checked shop drawing.

BIDDER acknowledges receipt of the following Addenda:

- ① BID ADDENDA 3" MAG METER w/ MTA & GROUNDING RIM
- ② BID ADDENDA 4" MAG METER w/ MTA & GROUNDING RIM

BIDDER understands that the OWNER reserves the right to reject any or all Bids and to waive documented informalities in the Bidding. BIDDER agrees that this Bid shall be good and may not be withdrawn for a period of thirty (90) consecutive calendar days after the actual date of Bid opening.

Within ten (10) consecutive calendar days after receiving written Notice of Award of this Bid by the OWNER, the BIDDER will execute and deliver to the OWNER a Purchase Order Agreement and such other required Contract Documents.

BIDDER: KAMSTRUP WATER METERING, LLC

By: REGIONAL SALES MANAGER

Name: RICHARD GARDNER

(type or print)

Title: MIDWEST REGIONAL SALES MANAGER

Address: 819 HIGH RIDGE COURT, DARIEN, IL 60561

Date: JANUARY 18, 2018

END OF SECTION 00300

## SECTION 11001 – AMR WATER METERING EQUIPMENT

### PART 1 - GENERAL

#### 1.01 WATER METER BID SPECIFICATIONS

The McCreary County Water District (Utility) owns and reads all water meters wirelessly with Kamstrup READY meter reading system. Water meters requested to be bid are the FlowIQ 2100 and 3101 series water meter as manufactured by Kamstrup Water Metering.

All water meters are located in wet meter pits or vaults and are subject to harsh environmental issues such as corrosive soils, high pressures, elevation change, full submersion in water, inclimate temperature changes, and occasionally located in hazardous roadway and driveway meter pit settings.

### PART 2 - PRODUCTS

#### 2.01 TECHNICAL SPECS

1. All water meters shall be solid-state ultrasonic type water meters with no internal moving parts.
2. Water meters shall be of design for 20 years of service life and maintain meter accuracy over the full course of the meter life.
3. All meters shall be new and unused. Rebuilt meters are not acceptable.
4. All meters shall be manufactured and supplied by a company with greater than 20 years of ultrasonic experience of manufacturing residential size ultrasonic water meters.
5. All meters shall be tested by a certified and accredited testing facility. A certificate of each water meter's testing shall be delivered for file record at the Utility for each water meter delivered.
6. All water meters shall contain internal radio communication transceiver board that is sealed within the water meter and communicates directly with the Utility's Kamstrup READY meter reading system.
7. All meters shall have self-contained internal wireless transceiver communication boards which transmit meter reading data wirelessly to the Utility's READY reading system and, shall not require a remotely connected or mounted radio meter transmitter unit which may be subjected to damage, moisture infiltration, cable disconnection,

traffic load shock conditions, and severe temperature variances, harsh soil conditions and /or rodent and pest issues.

8. All water meter bodies shall be lead free and fully comply with NSF-61 lead free standard and shall have the NSF-61 compliance stamp located for inspection on the meter's register face for verification.
9. Meters shall have redundant Kamstrup reading output capabilities to communicate meter readings, meter tamper codes, notification alerts and logs. Minimally the meter's internal logs and alerts must contain 460 days of data storage capability.
10. FlowIQ meters shall be data logging and provide alarm notification for each of the following: Reverse flow, leak detection, burst pipe condition detection, air event monitoring, temperature monitoring and temperature alarm output for each of the above.
11. Each radio communication package radios shall be individually encrypted using AES 128 bit encryption.
12. Group/utility encryption shall not be allowed.
13. Meter RF transmitters shall be FCC compliant.
14. Meters shall be rated IP68 for submersion in water.
15. Meters shall be pressure rated for 250psi designed to withstand high and low pressures.
16. Meters shall have a 20-year battery life design and shall have full 10-year plus 10-year prorated warranty.
17. All meters shall maintain new meter accuracy per AWWA C700 standard for life of the meter and fine granular particulate matter and typical water processing fluids within the drinking water shall not affect the meter's accuracy.

All meters shall be as manufactured by Kamstrup Water Metering or pre-approved by the Utility and shall be manufactured in full compliance with specifications herein. The Utility reserves the right to reject all or any portion of the bid.

END OF SECTION 11001

# **EXHIBIT 13**



**STATEMENT OF ANNUAL COST OF OPERATION  
OF THE PROPOSED EQUIPMENT**

McCreary County Water District does not anticipate any costs associated with the operation of the AMR Water Metering Equipment.

# **EXHIBIT 14**



April 9, 2018

**McCreary County Water District**

19 Crit King Road  
Whitley City, KY 42653

RE: Water Meter Project

Thank you for the opportunity to present proposed financing. I am submitting for your review the following proposed structure:

ISSUER	McCreary County Water District
FINANCING STRUCTURE	Tax Exempt Financing
PROJECT	\$ 781,144.00
TERM	10 Annual
INTEREST RATE	3.744%
PAYMENT AMOUNT	\$ 96,987.62
PAYMENTS BEGINNING	One year from signing, annually thereafter

The above proposal is subject to audit analysis, assumes bank qualification and mutually acceptable documentation. The terms outlined herein are subject to change and rates are valid for **fourteen (14)** days from the date of this proposal. The above payment amount includes all applicable fees expressed as .02. These costs can include documentation fees, legal fees, issuance expenses, etc.

Our finance programs are flexible and my goal is customer delight. If you have any questions regarding other payment terms, frequencies or conditions, please do not hesitate to call.

With Best Regards,

*Tara Clawson*

Tara Clawson  
Vice President Public Finance  
817-722-0242  
817-988-9880  
[tara.clawson@govcap.com](mailto:tara.clawson@govcap.com)

# MUNICIPAL LEASE-PURCHASE AGREEMENT

THIS MUNICIPAL LEASE-PURCHASE AGREEMENT No. «Deal\_Number» (hereafter referred to as "Agreement") dated as of «AgreementContract\_Date», by and between «Lessor\_Name», a «Lessor\_State» corporation (herein referred to as "Lessor"), and «Lessee», a political subdivision or agency of the State of «Lessee\_State» (hereinafter referred to as "Lessee").

WITNESSETH: In consideration of the mutual covenants and conditions hereinafter set forth, the parties hereto agree as follows:

**1. Term and Payments.** Lessor hereby leases to Lessee and Lessee hereby leases from Lessor the property described in Exhibit A hereto (hereinafter, with all replacement parts, substitutions, proceeds, increases, additions, accessions, repairs and accessories incorporated therein or affixed thereto, referred to as the "Property") for the amounts to be paid in the sums (the "Lease Payments") and on the dates (the "Lease Payment Dates") set forth in Exhibit B hereto. Except as specifically provided in Section 2 hereof, the obligation of the Lessee to make the Lease Payments called for in Exhibit B hereto shall be absolute and unconditional in all events and shall not be subject to any set-off, defense, counterclaim or recoupment for any reason. The term of the lease hereunder shall commence upon the dated date of the lease and shall continue until the end of the Lessee's current fiscal period and thereafter for such additional fiscal periods as are necessary to complete the anticipated total lease term as set forth in Exhibit B, unless earlier terminated as provided herein.

**2. Renewal and Non-Appropriation.** Lessee agrees that it will take all necessary steps and make timely requests for the appropriation of funds to make all Lease Payments called for under Exhibit B, and use its best efforts and take all steps to cause such appropriations to be made. In the event that **(i)** funds for the succeeding fiscal period cannot be obtained, **(ii)** Lessee has exhausted all legally available means for making payment called for under this Agreement, **(iii)** Lessee has invoked and diligently pursued all legal procedures by which payment called for under this agreement may be made, **(iv)** such failure to obtain funds has not resulted from any act or failure to act of Lessee, **(v)** Lessee has not acquired, and has no intent to acquire during the subsequent fiscal period, items of property having functions similar to those of the Property or which provide similar benefits to Lessee, and **(vi)** no funds have been appropriated for the acquisition of such property, Lessee may terminate this Agreement at the end of any fiscal period during the payment schedule set forth in Exhibit B by giving notice to Lessor or its successors at least sixty (60) days prior to the first day of such fiscal period for which appropriations cannot be made. Such failure to obtain proper appropriation and approval of the full amount of funds necessary to make required payments hereunder during any fiscal period subsequent to the current fiscal period shall terminate all Lessee's right, title and interest in and obligations under this Agreement and to all the Property, effective on the last day of the last fiscal period for which appropriation or approval was properly obtained.

**3. Taxes.** In addition to the Lease Payments to be made pursuant to Section 1 hereof, Lessee agrees to indemnify and hold Lessor harmless from and against and to pay Lessor, as additional rent, on demand, an amount equal to all licenses, assessments, sales, use, real or personal property, gross receipts or other taxes, levies, imposts, duties or charges, if any, together with any penalties, fines, or interest thereon imposed against or on Lessor, Lessee or the Property by any governmental authority upon or with respect to the Property or the purchase, ownership, rental, possession, operation, return or sale of, or receipt of payments for, the Property, except any Federal or state income taxes, if any, payable by Lessor. Lessee may contest any such taxes prior to payment provided such contest does not involve any risk of sale, forfeiture or loss of the Property or any interest therein.

**4. Lessee's Covenants and Representations.** Lessee covenants and represents as follows:  
**(a)** Lessee represents, and will provide an opinion of its counsel to the effect that, it has full power and authority to enter into this Agreement which has been duly authorized, executed, and delivered by Lessee and is a valid and binding obligation of Lessee enforceable in accordance with its terms, and all requirements for execution, delivery and performance of this Agreement have been, or will be, complied with in a timely manner;

**(b)** All Payments hereunder have been, and will be, duly authorized and paid when due out of funds then on hand and legally available for such purposes; Lessee will, to the extent permitted by State law and other terms and conditions of this Agreement, include in its budget for each successive fiscal period during the term of this Agreement a sufficient amount to permit Lessee to discharge all of its obligations hereunder, and Lessee has budgeted and available for the current fiscal period sufficient funds to comply with its obligations hereunder;

**(c)** There are no pending or threatened lawsuits or administrative or other proceedings contesting the authority for, authorization of performance of, or expenditure of funds pursuant to, this Agreement;

**(d)** Information supplied and statements made by Lessee in any financial statement or current budget prior to or contemporaneously with the Agreement are true and correct;

**(e)** Lessee has an immediate need for, and expects to make immediate use of, substantially all the Property, which need is not temporary or expected to diminish in the foreseeable future; specifically Lessee will not give priority or parity in the appropriation of funds for the acquisition or use of any additional property for purposes or functions similar to those of the Property.

**(f)** There are no circumstances presently affecting the Lessee that could reasonably be expected to alter its foreseeable need for the Property or adversely affect its ability or willingness to budget funds for the payment of sums due hereunder; and

**(g)** Lessee's right to terminate this Agreement as specified in Section 2 hereof was not an independently bargained for consideration, but was included solely for the purpose of complying with the requirements of the laws of the State in which Lessee is located.



GOVERNMENT CAPITAL  
CORPORATION

(h) No lease, rental agreement, lease-purchase agreement, payment agreement or contract for purchase to which Lessee has been a party at any time during the past ten (10) years has been terminated by Lessee as a result of insufficient funds being appropriated in any Fiscal Year. No event has occurred which would constitute an event of default under any debt, revenue bond or obligation which Lessee has issued during the past ten (10) years.

(i) Lessee will pay the Lease Payment Due by check, wire transfer, or ACH only

**5. Use and Licenses.** Lessee shall pay and discharge all operating expenses and shall cause the Property to be operated by competent persons only. Lessee shall use the Property only for its proper purposes and will not install, use, operate or maintain the Property improperly, carelessly, or in violation of any applicable law, ordinance, rule or regulation of any governmental authority, or in a manner contrary to the nature of the Property or the use contemplated by its manufacturer. Lessee shall keep the property at the location stated on the Certificate of Acceptance executed by Lessee upon delivery of the Property until Lessor, in writing, permits its removal, and the Property shall be used solely in the conduct of the Lessee's operations. Lessee shall obtain, at its expense, all registrations, permits and licenses, if any, required by law for the installation and operation of the Property. Any license plates used on the Property shall be issued in the name of the Lessee. If a certificate of title is issuable with respect to the Property, it shall be delivered to the Lessor showing the interest of the Lessor.

**6. Maintenance.** Lessor shall not be obligated to make any repairs or replacements. At its own expense, Lessee shall service, repair and maintain the Property in as good condition, repair, appearance and working order as when delivered to Lessee hereunder, ordinary wear and tear from proper use alone excepted, and shall replace any and all parts thereof which may from time to time become worn out, lost, stolen, destroyed, or damaged beyond repair or rendered unfit for intended use, for any reason whatsoever, all of which replacements shall be free and clear of all liens, encumbrances and claims of others and shall become part of the Property and subject to this Agreement. Lessor may, at its option, discharge such costs, expenses and insurance premiums necessary for the repair, maintenance and preservation of the Property, and all sums so expended shall be due from Lessee in addition to rental payments hereunder.

**7. Alterations.**

(a) Lessee may, at its own expense, install or place in or on, or attach or affix to, the Property such equipment or accessories as may be necessary or convenient to use the Property for its intended purposes provided that such equipment or accessories do not impair the value or utility of the Property. All such equipment and accessories shall be removed by Lessee upon termination of this Agreement, provided that any resulting damage shall be repaired at Lessee's expense. Any such equipment or accessories not removed shall become the property of Lessor.

(b) Without the written consent of Lessor, Lessee shall not make any other alterations, modifications or improvements to the Property except as required or permitted hereunder. Any other alterations, modifications or improvements to the Property shall immediately become part of the Property, subject to the provisions hereof. Without the prior written consent of Lessor, Lessee shall not affix or attach any of the Property to any real property. The Property shall remain personal property regardless of whether it becomes affixed or attached to real property or permanently rests upon any real property or any improvement thereon.

**8. Liens.** Lessee shall not directly or indirectly create, incur, assume or suffer to exist any mortgage, security interest, pledge, lien, charge, encumbrance or claim on or with respect to the Property, title thereto or any interest therein, except the respective rights of Lessor and Lessee hereunder.

**9. Damage to or Destruction of Property.** Lessee shall bear the entire risk of loss, damage, theft or destruction of the Property from any and every cause whatsoever, and no loss, damage, destruction or other event shall release Lessee from the obligation to pay the full amount of the rental payments or from any other obligation under this Agreement. In the event of damage to any item of the Property, Lessee will immediately place the same in good repair, with the proceeds of any insurance recovery applied to the cost of such repair. If Lessor determines that any item of Property is lost, stolen, destroyed or damaged beyond repair, Lessee, at the option of Lessee, will either (a) replace the same with like property in good repair or (b) on the next Lease Payment Date, pay Lessor (i) all amounts then owed by Lessee to Lessor under this Agreement, including the Lease Payment due on such date, and (ii) an amount equal to the applicable Option to Purchase Value set forth in Exhibit B.

**10. Insurance.** Lessee shall either be self-insured with regard to the Property or shall purchase and maintain insurance with regard to the Property. Lessee shall indicate on each Certificate of Acceptance executed in relation to this Agreement its election to be self-insured or company insured with regard to the Property listed on that Certificate of Acceptance. Whether Lessee is self-insured or company insured, Lessee shall, for the term of this Agreement, at its own expense, provide comprehensive liability insurance with respect to the Property, insuring against such risks, and such amounts as are customary for lessees of property of a character similar to the Property. In addition, Lessee shall, for the term of this Agreement, at its own expense, provide casualty insurance with respect to the Property, insuring against customary risks, coverage at all times not less than the amount of the unpaid principal portion of the Lease Payments required to be made pursuant to Section 1 as of the last preceding Payment Date specified in Exhibit B on which a Lease Payment was made. If insurance policies are provided with respect to the Property, all insurance policies shall be with insurers authorized to do business in the State where the Property is located and shall name both Lessor and Lessee as insureds as their respective interest may appear. Insurance proceeds from casualty losses shall be payable solely to the Lessor, subject to the provisions of Section 9. Lessee shall, upon request, deliver to Lessor evidence of the required coverages together with premium receipts, and each insurer shall agree to give Lessor written notice of non-payment of any premium due and ten (10) days notice prior to cancellation or alteration of any such policy. Lessee shall also carry and require any other person or entity working on, in or about the Property to carry workmen's compensation insurance covering employees on, in or about the Property. In the event Lessee fails, for any reason, to comply with the requirements of this Section, Lessee shall indemnify, save harmless and, at Lessee's sole expense, defend Lessor and its agents, employees, officers and directors and the Property against all risk of loss not covered by insurance.

**11. Indemnification.** Lessee shall indemnify, to the extent permitted by law, and save harmless Lessor and its agents, employees, officers and directors from and, at Lessee's expense, defend Lessor and its agents, employees, officers and directors against all liability, obligations, losses, damages, penalties, claims, actions, costs and expenses (including but not limited to reasonable attorneys' fees) of whatsoever kind or nature which in any way relate to or arise out of this Agreement or the ownership, rental, possession, operation, condition, sale or return of the Property. All amounts which become due from Lessee under this Section 11 shall be credited with any amounts received by the Lessor from insurance provided by the Lessee and shall be payable by Lessee within thirty (30) days following demand therefor by Lessor and shall survive the termination or expiration of this Agreement.

**12. No Warranty.** EXCEPT FOR REPRESENTATIONS, WARRANTIES, AND SERVICE AGREEMENTS RELATING TO THE PROPERTY MADE OR ENTERED INTO BY THE MANUFACTURERS OR SUPPLIERS OF THE PROPERTY, ALL OF WHICH ARE HEREBY ASSIGNED TO LESSEE, LESSOR HAS MADE AND MAKES NO REPRESENTATION OR WARRANTY, EXPRESS OR IMPLIED, AND ASSUMES NO OBLIGATION WITH RESPECT TO THE TITLE, MERCHANTABILITY, CONDITION, QUALITY OR FITNESS OF THE PROPERTY DESCRIBED IN EXHIBIT A FOR ANY PARTICULAR PURPOSE OR THE CONFORMITY OF THE PROPERTY TO SPECIFICATION OR PURCHASE ORDER, ITS DESIGN, DELIVERY, INSTALLATION OR OPERATION. All such risks shall be borne by Lessee without in any way excusing Lessee from its obligations under this Agreement, and Lessor shall not be liable to Lessee for any damages on account of such risks. All claims or actions on any warranty so assigned shall be made or prosecuted by Lessee, at its sole expense, upon prior written notice to Lessor. Lessor may, but shall have no obligation whatsoever to, participate in such claim or action on such warranty, at Lessor's expense. Any recovery under such a warranty shall be made payable jointly to Lessee and Lessor.

**13. Option to Purchase.** Provided Lessee has complied with the terms and conditions of this Agreement, Lessee shall have the option to purchase not less than all of the Property which is then subject to this Agreement, "as is" at the payment date, for the Option to Purchase Values set forth in Exhibit B by giving written notice to Lessor not less than sixty (60) days prior to the date specified in Exhibit B for the exercise of such option; provided that upon Lessee's timely payment of all Lease Payments specified in Exhibit B, Lessee shall be deemed to have properly exercised its option to purchase the Property and shall be deemed to have acquired all of Lessor's right, title and interest in and to the Property, free of any lien, encumbrance or security interest except such liens, encumbrances or security interest as may be created, or permitted and not discharged, by Lessee but without other warranties. Payment of the applicable Option to Purchase Value shall occur on the applicable Lease Payment Date specified in Exhibit B hereto, at which time Lessor shall, unless not required hereunder, deliver to Lessee a quitclaim bill of sale transferring Lessor's interest in the Property to Lessee free from any lien, encumbrance or security interest except such as may be created, or permitted and not discharged, by Lessee but without other warranties. Upon Lessee's actual or constructive payment of the Option to Purchase Value and Lessor's actual or constructive delivery of a quitclaim bill of sale covering the Property, this Agreement shall terminate except as to obligations or liabilities accruing hereunder prior to such termination.

**14. Default and Lessor's Remedies.**

(a) The occurrence of one or more of the following events shall constitute an Event of Default, whether occurring voluntarily or involuntarily, by operation of law or pursuant to any order of any court or governmental agency:

(1) Lessee fails to make any payment hereunder when due or within ten (10) days thereafter;  
(2) Lessee fails to comply with any other covenant, condition or agreement of Lessee hereunder for a period of the ten (10) days after notice thereof;  
(3) Any representation or warranty made by Lessee hereunder shall be untrue in any material respect as of the date made;

(4) Lessee makes, permits or suffers any unauthorized assignment, transfer or other disposition of this Agreement or any interest herein, or any part of the Property or any interest therein; or

(5) Lessee becomes insolvent; or admits in writing its inability to pay its debts as they mature; or applies for, consents to or acquiesces in the appointment of a trustee, receiver or custodian for the Lessee or a substantial part of its property; or, in the absence of such application, consent or acquiescence, a trustee, receiver or custodian is appointed for Lessee or a substantial part of its property and is not discharged within sixty (60) days; or any bankruptcy, reorganization, debt arrangement, moratorium, or any proceeding under any bankruptcy or insolvency law, or any dissolution or liquidation proceeding is instituted by or against Lessee and, if instituted against Lessee, is consented to or acquiesced in by Lessee or is not dismissed within sixty (60) days.

(b) Upon the occurrence of any Event of Default specified herein, Lessor may, at its sole discretion, exercise any or all of the following remedies:

(1) Enforce this Agreement by appropriate action to collect amounts due or to become due hereunder, by acceleration of otherwise, or to cause Lessee to perform its other obligations hereunder in which event Lessee shall be liable for all costs and expenses incurred by Lessor;

(2) Take possession of the Property, without demand or notice and without court order or any process of law, and remove and relet the same for Lessee's account, in which event Lessee waives any and all damages resulting therefrom and shall be liable for all costs and expenses incurred by Lessor in connection therewith and the difference, if any, between the amounts to be paid pursuant to Section 1 hereof and the amounts received and to be received by Lessor in connection with any such reletting;

(3) Terminate this Agreement and repossess the Property, in which event Lessee shall be liable for any amounts payable hereunder through the date of such termination and all costs and expenses incurred by Lessor in connection therewith;

(4) Sell the Property or any portion thereof for Lessor's account at public or private sale, for cash or credit, without demand on notice to Lessee of Lessor's intention to do so, or relet the Property for a term and a rental which may be equal to, greater than or less than the rental and term provided herein. If the proceeds from any such sale or rental payments received under a new agreement made for the periods prior to the expiration of this Agreement are less than the sum of (i) the costs of such repossession, sale, relocation, storage, reconditioning, reletting and reinstallation (including but not limited to reasonable attorneys' fees), (ii) the unpaid principal balance derived from Exhibit B as of the last preceding Lease Payment Date specified in Exhibit B, and (iii) any past due amounts hereunder (plus interest on such unpaid principal balance at the rate specified in Section 19 hereof, prorated to the date of such sale), all of which shall be paid to Lessor, Lessor shall retain all such proceeds and Lessee shall remain liable for any deficiency; or

(5) Pursue and exercise any other remedy available at law or in equity, in which event Lessee shall be liable for any and all costs and expenses incurred by Lessor in connection therewith. "Costs and expenses," as that term is used in this Section 14, shall mean, to the extent allowed by law: (i) reasonable attorneys' fees if this Agreement is referred for collection to an attorney not a salaried employee of Lessor or the holder of this Agreement; (ii) court costs and disbursements including such costs in the event of any action necessary to secure possession of the Property; and (iii) actual and reasonable out-of-pocket expenses incurred in connection with any repossession or foreclosure, including costs of storing, reconditioning and reselling the Property, subject to the standards of good faith and commercial reasonableness set by the applicable Uniform Commercial Code. Lessee waives all rights under all exemption laws.

(6) Under no circumstances shall Lessee be liable under this subsection 14 (b) for any amount in excess of the sum appropriated pursuant to Section 1 hereof for the previous and current fiscal years, less all amounts previously due and paid during such previous and current fiscal years from amounts so appropriated.

**15. Termination.** Unless Lessee has properly exercised its option to purchase pursuant to Section 13 hereof, lessee shall, upon the expiration of the term of this Agreement or any earlier termination hereof pursuant to the terms of this Agreement, deliver the Property to Lessor unencumbered and in at least as good condition and repair as when delivered to Lessee, ordinary wear and tear resulting from proper use alone excepted, by loading the Property, at Lessee's sole expense, on such carrier, or delivering the Property to such location, as Lessor shall provide or designate at or within a reasonable distance from the general location of the Property. If Lessee fails to deliver the Property to Lessor, as provided in this Section 15, on or before the date of termination of this Agreement, Lessee shall pay to Lessor upon demand, for the hold-over period, a portion of the total payment for the applicable period as set forth in Exhibit B prorated from the date of termination of this Agreement to the date Lessee either redelivers the Property to Lessor or Lessor repossesses the Property. Lessee hereby waives any right which it now has or which might be acquired or conferred upon it by any law or order of any court or other governmental authority to terminate this Agreement or its obligations hereunder, except in accordance with the express provisions hereof.

**16. Assignment.** Without Lessor's prior written consent, Lessee will not either (i) assign, transfer, pledge, hypothecate, grant any security interest in or otherwise dispose of this Agreement or the Property or any interest in this Agreement or the Property; or (ii) sublet or lend the Property or permit it to be used by anyone other than Lessee or Lessee's employees. Lessor may assign its rights, title and interest in and to this Agreement, the Property and any other documents executed with respect to this Agreement and/or grant or assign a security interest in this Agreement and the Property, in whole or in part. Any such assignees shall have all of the rights of Lessor under this Agreement. Subject to the foregoing, this Agreement inures to the benefit of and is binding upon the heirs, executors, administrators, successors and assigns of the parties hereto. No assignment or reassignment of any of Lessor's rights, title or interest in this Agreement or the Property shall be effective with regard to Lessee unless and until Lessee shall have received a copy of the document by which the assignment or reassignment is made, disclosing the name and address of such assignee. No further action will be required by Lessor or by Lessee to evidence the assignment. During the term of this Agreement, Lessee shall keep a complete and accurate record of all such assignments in form necessary to comply with the United States Internal Revenue Code of 1986, Section 149 (a), and the regulations, proposed or existing, from time to time promulgated thereunder.

**17. Personal Property.** The Property is and shall at all times be and remain personal property.

**18. Title.** Upon acceptance of the Property by Lessee hereunder, Lessee shall have title to the Property during the term of this Agreement; however, in the event of (i) an Event of Default hereunder and for so long as such Event of Default is continuing, or (ii) termination of this Agreement pursuant to the provisions of Section 2 hereof, title shall be reverted immediately in and shall revert to Lessor free of any right, title or interest of Lessee unless Lessor elects otherwise.

**19. Lessor's Right to Perform for Lessee.** If Lessee fails to make any payment or perform or comply with any of its covenants or obligations hereunder, Lessor may, but shall not be required to, make such payment or perform or comply with such covenants and obligations on behalf of Lessee, and the amount of any such payment and the expenses (including but not limited to reasonable attorneys' fees) incurred by Lessor in performing or complying with such covenants and obligations, as the case may be, together with interest thereon at the highest lawful rate, shall be payable by Lessee upon demand.

**20. Interest on Default.** If Lessee fails to pay any Lease Payment specified in Section 1 hereof within ten (10) days after the due date thereof, Lessee shall pay to Lessor interest on such delinquent payment from the due date until paid at the highest lawful rate.

**21. Notices.** Any notices to be given or to be served upon any party hereto in connection with this Agreement must be in writing and may be given by certified or registered mail, and shall be deemed to have been given and received forty-eight (48) hours after a registered or certified letter containing such notice, postage prepaid, is deposited in the United States mail, and if given otherwise shall be deemed to have been given when delivered to and received by the party to whom it is addressed. Such notice shall be given to the parties at their respective addresses designated on the signature page of this Agreement or at such other address as either party may hereafter designate.

**22. Security Interest.** As security for Lessee's covenants and obligations hereunder, Lessee hereby grants to Lessor, and its successors, a security interest in the Property, all accessions thereto and proceeds therefrom, and, in addition to Lessor's rights hereunder, all of the rights and benefits of a secured party under the Uniform Commercial Code as in effect from time to time hereafter in the State in which the Property is located or any other State which may have jurisdiction over the Property. Lessee agrees to execute, acknowledge and deliver to Lessor in recordable form upon request financing statements or any other instruments with respect to the Property or this Agreement considered necessary or desirable by Lessor to perfect and continue the security interest granted herein in accordance with the laws of the applicable jurisdiction. Lessee hereby authorizes Lessor or its agent/assigns to sign and execute on its behalf, any and all necessary UCC-1 forms to perfect the Purchase Money Security interest herein granted to Lessor.

**23. Tax Exemption.** Lessee certifies that it does reasonably anticipate that not more than \$10,000,000 of "qualified tax-exempt obligations" as that term is defined in Section 265 (b) 3 (D) of the Internal Revenue Code of 1986 ("the Code"), will be issued by it and any subordinate entities during «Issue\_Year». Further, Lessee designates this issue as comprising a portion of the \$10 million in aggregate issues to be designated as "qualified tax exempt obligations" eligible for the exception contained in Section 265 (b) 3 (D) of the Code allowing for an exception to the general rule of the Code which provides for a total disallowance of a deduction for interest expense allocable to the carrying of tax exempt obligations.

**24. Continuing Disclosure.** Specifically and without limitation, Lessee agrees to provide audited financial statements, prepared by a certified public accountant not later than six (6) months after and as of the end of each fiscal year. Periodic financial statement shall include a combined balance sheet as of the end of each such period, and a combined statement of revenues, expenditures and changes in fund balances, from the beginning of the then fiscal year to the end of such period certified as correct by one of Lessee's authorized agents. If Lessee has subsidiaries, the financial statements required will be provided on a consolidated and consolidation basis.

**25. Miscellaneous.**

(a) Lessee shall, whenever requested, advise Lessor of the exact location and condition of the Property and shall give the Lessor immediate notice of any attachment or other judicial process affecting the Property, and indemnify and save Lessor harmless from any loss or damage caused thereby. Lessor may, for the purpose of inspection at all reasonable times enter upon any job, building or place where the Property and the books and records of the Lessee with respect thereto are located.

(b) Lessee agrees to equitably adjust the payments payable under this Agreement if there is a determination for any reason that the interest payable pursuant to this Agreement (as incorporated within the schedule of payments) is not excludable from income in accordance with the Internal Revenue Code of 1986, as amended, such as to make Lessor and its assigns whole.

(c) Time is of the essence. No covenant or obligations hereunder to be performed by Lessee may be waived except by the written consent of Lessor, and a waiver of any such covenant or obligation or a forbearance to invoke any remedy on any occasion shall not constitute or be treated as a waiver of such covenant or obligation as to any other occasion and shall not preclude Lessor from invoking such remedy at any later time prior to Lessee's cure of the condition giving rise to such remedy. Lessor's rights hereunder are cumulative and not alternative.

(d) This Agreement shall be construed in accordance with, and governed by, the laws of the State in which the Property is located.

(e) This Agreement constitutes the entire agreement between the parties and shall not be modified, waived, discharged, terminated, amended, altered or changed in any respect except by a written document signed by both Lessor and Lessee.

(f) Any term or provision of this Agreement found to be prohibited by law or unenforceable shall be ineffective to the extent of such prohibition or unenforceability without, to the extent reasonably possible, invalidating the remainder of this Agreement.

(g) The Lessor hereunder shall have the right at any time or times, by notice to Lessee, to designate or appoint any person or entity to act as agent or trustee for Lessor for any purposes hereunder.

(h) All transportation charges shall be borne by Lessee. Lessee will immediately notify Lessor of any change occurring in or to the Property, of a change in Lessee's address, or in any fact or circumstance warranted or represented by Lessee to Lessor, or if any Event of Default occurs.

(i) Use of the neuter gender herein is for purposes of convenience only and shall be deemed to mean and include the masculine or feminine gender whenever and wherever appropriate.

(j) The captions set forth herein are for convenience of reference only and shall not define or limit any of the terms or provisions hereof.

(k) Except as otherwise provided herein, this Agreement shall be binding upon and inure to the benefit of the Parties hereto and their respective heirs, executors, administrators, legal representatives, successors and assigns, where permitted by this Agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the \_\_\_\_ day of \_\_\_\_\_ in the year «Present\_Year».

**Lessor:** «Lessor\_Name»

\_\_\_\_\_  
Authorized Signature  
«Lessor\_Address»  
«Lessor\_City\_State\_Zip»

Witness Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Print Title: \_\_\_\_\_

**Lessee:** «Lessee»

\_\_\_\_\_  
«Lessee\_Authorized\_Signer»,  
«Lessee\_Authorized\_Signer\_Title»  
«Lessee\_Physical\_Address»  
«Lessee\_Physical\_City\_State\_Zip»

Witness Signature: \_\_\_\_\_

Print Name: \_\_\_\_\_

Print Title: \_\_\_\_\_



**EXHIBIT A**  
**DESCRIPTION OF PROPERTY**  
MUNICIPAL LEASE-PURCHASE AGREEMENT No. «Deal\_Number» (THE "AGREEMENT")  
BY AND BETWEEN  
**Lessor,** «Lessor\_Name» and **Lessee,** «Lessee»  
Dated as of «AgreementContract\_Date»

QTY	DESCRIPTION
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«Lessee\_Equipment»

SAMPLE

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PROPERTY LOCATION:  
«Equipment\_property\_location»  
«Equipment\_Property\_Location\_address»  
«Equipment\_Property\_Location\_City\_State\_Z»

**EXHIBIT B**

**>> SCHEDULE OF PAYMENTS & OPTION TO PURCHASE PRICE <<**  
MUNICIPAL LEASE-PURCHASE AGREEMENT No. «Deal\_Number» (THE "AGREEMENT")  
BY AND BETWEEN

**Lessor:** «Lessor\_Name» and **Lessee:** «Lessee»

Dated as of «AgreementContract\_Date»

PMT NO.	PMT DATE MO. DAY YR	TOTAL PAYMENT	INTEREST PAID	PRINCIPAL PAID	OPTION TO PURCHASE after pmt on this line
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SAMPLE

Accepted By Lessee: \_\_\_\_\_  
«Lessee\_Authorized\_Signer», «Lessee\_Authorized\_Signer\_Title»

**INCUMBENCY, INSURANCE, AND ESSENTIAL USE CERTIFICATES**  
MUNICIPAL LEASE-PURCHASE AGREEMENT No. «Deal\_Number» (THE "AGREEMENT")  
BY AND BETWEEN

**Lessor, «Lessor\_Name» and Lessee, «Lessee»**  
Dated as of «AgreementContract\_Date»

I, «Lessee\_Secretary», do hereby certify that I am the duly elected or appointed and acting «Lessee\_Secretary\_Title» (Keeper of the Records), of «Lessee», a political subdivision or agency duly organized and existing under the laws of the State of «Lessee\_State», that I have custody of the records of such entity, and that, as of the date hereof, the individual(s) named below are the duly elected or appointed officer(s) of such entity holding the office(s) set forth opposite their respective name(s). I further certify that (i) the signature(s) set opposite their respective name(s) and title(s) are their true and authentic signature(s), and (ii) such officers have the authority on behalf of such entity to enter into that certain Municipal Lease-Purchase Agreement dated as of «AgreementContract\_Date», between such entity and «Lessor\_Name».

<u>Name</u>	<u>Title</u>	<u>Signature</u>
«Lessee_Authorized_Signer»	«Lessee_Authorized_Signer_Title»	_____

IN WITNESS WHEREOF, I have duly executed this certificate hereto this \_\_\_\_\_ day of \_\_\_\_\_, «Present\_Year».

BY: \_\_\_\_\_  
«Lessee\_Secretary», «Lessee\_Secretary\_Title»

Lessee certifies that property and liability insurance, if applicable, have been secured in accordance with the Agreement and such coverage will be maintained in full force for the term of the Agreement. "Lessor or its Assigns" should be designated as loss payee until Lessee is notified, in writing, to substitute a new loss payee. **The following information is provided about insurance— (PLEASE FILL IN THE INFORMATION BELOW)**

INSURANCE COMPANY/AGENT'S NAME: \_\_\_\_\_

INSURANCE COMPANY ADDRESS: \_\_\_\_\_

PHONE NUMBER: \_\_\_\_\_

POLICY NUMBER: \_\_\_\_\_

I, «Lessee\_Authorized\_Signer», «Lessee\_Authorized\_Signer\_Title», of «Lessee» ("Lessee"), hereby certify that the Equipment to be leased to the undersigned under the certain Lease Agreement, dated as of «AgreementContract\_Date», between such entity and «Lessor\_Name» ("Lessor"), will be used by the undersigned Lessee for the following purpose: **(PLEASE FILL OUT PRIMARY USE BELOW)**

**PRIMARY USE:** \_\_\_\_\_

The undersigned hereby represents that the use of the Equipment is essential to its proper, efficient and economic operation.

IN WITNESS WHEREOF, I have set my hand this \_\_\_\_\_ day of \_\_\_\_\_, «Present\_Year».

By Lessee:

\_\_\_\_\_  
«Lessee\_Authorized\_Signer», «Lessee\_Authorized\_Signer\_Title»

For Lessee: «Lessee»

# CERTIFICATE OF ACCEPTANCE

MUNICIPAL LEASE-PURCHASE AGREEMENT No. «Deal\_Number» (THE "AGREEMENT")  
BY AND BETWEEN

Lessor, «Lessor\_Name» and Lessee, «Lessee»  
Dated as of «AgreementContract\_Date»

1. **ACCEPTANCE:** In accordance with the Agreement, Lessee hereby certifies that all of the Property described herein (i) has been received by Lessee, (ii) has been thoroughly examined and inspected to the complete satisfaction of Lessee, (iii) had been found by Lessee to be in good operating order, repair and condition, (iv) has been found to be of the size, design, quality, type and manufacture specified by Lessee, (v) has been found to be and is wholly suitable for Lessee's purposes, and (vi) is hereby unconditionally accepted by Lessee, in the condition received, for all purposes of this Agreement.

By Lessee:

\_\_\_\_\_ (\*)  
«Lessee\_Authorized\_Signer», «Lessee\_Authorized\_Signer\_Title»

For Lessee: «Lessee»

ACCEPTED on this the \_\_\_\_\_ day of \_\_\_\_\_, «Present\_Year».

(\*) ACCEPTANCE MUST BE SIGNED **ONLY IF NO** ESCROW AGREEMENT IS INCLUDED

## 2. PROPERTY:

«EQUIPMENT\_IN\_CAPS», see attached Exhibit A.

## 3. USE: The primary use of the Property is as follows (PLEASE FILL OUT PRIMARY USE BELOW)

**PRIMARY USE:** \_\_\_\_\_

## 4. PROPERTY LOCATION:

«Equipment\_property\_location»  
«Equipment\_Property\_Location\_address»  
«Equipment\_Property\_Location\_City\_State\_Z»

## 5. INVOICING: Invoices shall be sent to the following address, including to whose attention invoices should be directed:

«Lessee»  
«Send\_Invoices\_To»  
«Lessee\_Mailing\_Address»  
«Lessee\_Mailing\_City\_State\_Zip»

6. **INSURANCE:** Lessee certifies that property and liability insurance have been secured in accordance with the Agreement and such coverage will be maintained in force for the term of the Agreement. Lessor will be designated as loss payee until Lessee is notified, in writing, to substitute a new loss payee. **(PLEASE CONFIRM INSURANCE TYPE BELOW)**

\_\_\_\_\_ Company Insured      \_\_\_\_\_ Election to self-insure (in accordance with Section 10 of the Agreement).

7. **MAINTENANCE:** In accordance with Section 6 of the Agreement, Lessee agrees to, at its own expense, service, repair and maintain the Property for the term of the Agreement as follows: **(PLEASE CONFIRM MAINTENANCE TYPE BELOW)**

\_\_\_\_\_ Maintenance Contract      \_\_\_\_\_ Election to self-maintain

***[to be retyped on letterhead of lessee's counsel]***

«Lessor\_Name»  
Attention: Documentation Department  
«Lessor\_Address»  
«Lessor\_City\_State\_Zip»

RE: Municipal Lease-Purchase Agreement No.«Deal\_Number»

Dear Lessor,

I have acted as Counsel to «Lessee» with respect to that certain Municipal Lease-Purchase Agreement No.«Deal\_Number», by and between «Lessor\_Name» as Lessor and «Lessee» as Lessee. I have reviewed the Agreement and such other documents, records and certificates of Lessee and appropriate public officials as I have deemed relevant and am of the opinion that:

1. The Lessee is a political subdivision or agency of the State of «Lessee\_State» with the requisite power and authority to incur obligations, the interest on which is exempt from taxation by virtue of Section 103(a) of the Internal Revenue Code of 1986;
2. The execution, delivery and performance by the Lessee of the Agreement have been duly authorized by all necessary action on the part of the Lessee; and
3. The Agreement constitutes a legal, valid and binding obligation of the Lessee enforceable in accordance with its terms.
4. The above opinions may be relied upon by the Lessee, Lessor, or its Assigns.

Sincerely,

Attorney at Law

**RESOLUTION # \_\_\_\_\_**

A RESOLUTION REGARDING A LEASE PURCHASE AGREEMENT FOR THE PURPOSE OF FINANCING  
**"«EQUIPMENT\_IN\_CAPS»".**

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WHEREAS, «Lessee» desires to enter into that certain Lease-Purchase Agreement No.«Deal\_Number», by and between «Lessor\_Name» and «Lessee», for the purpose of financing "**«Lessee\_Equipment»**". The «Lessee\_City\_Town\_District\_VFD» desires to designate this Agreement as a "qualified tax exempt obligation" of the «Lessee\_City\_Town\_District\_VFD» for the purposes of Section 265 (b) (3) of the Internal Revenue Code of 1986, as amended. The «Lessee» desires to designate «Lessee\_Authorized\_Signer», «Lessee\_Authorized\_Signer\_Title», as an authorized signer of the Agreement.

NOW THEREFORE, BE IT RESOLVED BY THE BOARD OF THE «LESSEE\_CAPS»:

Section 1. That the «Lessee\_City\_Town\_District\_VFD» enters into a Lease Purchase Agreement with «Lessor\_Name» for the purpose of financing "**«Lessee\_Equipment»**".

Section 2. That the Lease Purchase Agreement No.«Deal\_Number», by and between the «Lessee\_City\_Town\_District\_VFD» and «Lessor\_Name» is designated by the «Lessee\_City\_Town\_District\_VFD» as a "qualified tax exempt obligation" for the purposes of Section 265 (b) (3) of the Internal Revenue Code of 1986, as amended.

Section 3. That the «Lessee» designates «Lessee\_Authorized\_Signer», «Lessee\_Authorized\_Signer\_Title», as an authorized signer of the Lease Purchase Agreement Number «Deal\_Number», by and between the «Lessee» and «Lessor\_Name».

PASSED AND APPROVED by the Board of the «Lessee» in a meeting held on the \_\_\_\_ day of \_\_\_\_\_, «Present\_Year».

Lessee: «Lessee»

Witness Signature

\_\_\_\_\_  
«Lessee\_Board\_President», «Lessee\_President\_Title»

\_\_\_\_\_  
«Lessee\_Secretary», «Lessee\_Secretary\_Title»

# ESCROW AGREEMENT

MUNICIPAL LEASE-PURCHASE AGREEMENT No. «Deal\_Number» (THE "AGREEMENT")

BY AND BETWEEN

Lessor, «Lessor\_Name» and Lessee, «Lessee»

TAX ID # «Federal\_TAX\_ID» Dated as of «AgreementContract\_Date»

THIS ESCROW AGREEMENT (the "Agreement") is made and entered into as of «AgreementContract\_Date» ("Agreement Date"), by and among «Lessor\_Name» ("Lessor"), «Lessee» ("Lessee") and \_\_\_\_\_ ("Agent").

## WITNESSETH:

WHEREAS, Lessor and Lessee have entered into a certain Municipal Lease-Purchase Agreement dated as of «AgreementContract\_Date» (the "Lease"), pursuant to which the property more particularly described therein (the "Equipment") will be leased to the Lessee under the terms stated in the Lease;

WHEREAS, Lessor and Lessee desire to make funding arrangements for the acquisition of the Equipment, and Agent agrees to serve as escrow agent for such funding and acquisition;

NOW THEREFORE, in consideration of the mutual agreements and covenant herein contained and for other valuable consideration, the parties hereby agree as follows:

1. Agent shall undertake the duties and obligations of escrow agent as set forth in this Agreement. Agent shall not be deemed to be a party to the Lease.
2. Lessor has delivered to Agent the sum of \$«Fund\_to\_Escrow» ("Escrow Amount") for deposit by Agent in the «Lessee» Escrow Account (the "Fund"). The Fund will be administered by Agent pursuant to the terms of this Agreement.
3. Deposits in the Fund shall be used to pay for the acquisition of the Equipment. The Equipment may be acquired as individual items or as groups of items. Agent shall make disbursements from the Fund in payment for the acquisition of each item or group of items of the Equipment promptly upon receipt of a properly executed Escrow Disbursement Request Form, in the form attached hereto as "Schedule 1", for that portion of the acquisition of the Equipment for which payment is requested. Upon full acquisition of an item or group of items of the Equipment, any remaining cost of such item or group of items shall be disbursed promptly by the Agent upon receipt of a properly executed Acceptance Certificate and a corresponding Escrow Disbursement Request Form in the form attached hereto as "Schedule 1", for that portion of the Equipment for which payment is requested. Payment by Agent shall be to the payee shown on the Escrow Disbursement Request Form.
4. Agent will invest the Fund, as specified by Lessor, in general obligations of the United States or in obligations fully insured by the United States or in certificates of deposit of a bank which is either fully insured by an agency of the federal government or fully collateralized by such federal or federally guaranteed obligations, or in no-load money market mutual funds registered with and regulated by the Securities and Exchange Commission that includes in their investment objectives the maintenance of a stable net asset value of \$1 for each share, or Money Market Mutual Funds registered under the Investment Act of 1940. Agent will retain in the Fund all earnings from investment of the Fund until termination of the Fund pursuant to Section 5 hereof.
5. Upon execution of one or more Acceptance Certificates by Lessee and payment of acquisition costs by Agent for all the Equipment, this Agreement and the Funds shall terminate, and Agent shall transfer to Lessor all remaining sums in the Fund. If not terminated earlier, this Agreement and the Fund shall terminate on «Escrow\_Termination\_Date» ("Termination Date"). In this latter event, interest accrued pursuant to investment of the Fund under the terms of Section 4 hereof and all remaining principal in the Fund shall be transferred by Agent to Lessor; Exhibit "A" attached to the Lease shall thereupon be revised to delete any non-acquired portions of the Equipment and to substitute an amended amortization payment schedule to reflect the reduced acquisition costs.
6. Lessor and Lessee may by written agreement between themselves remove the Agent, at any time and for any reason, and appoint a successor escrow agent. Such removal shall not be effective until thirty (30) days after written notice thereof if provided to Agent.
7. Agent may at any time and for any reason resign as escrow agent by giving written notice to Lessor and Lessee of its intention to resign and of the proposed date of resignation, which date shall be not less than thirty (30) days after giving Lessee and Lessor written notice of intent to resign, nor less than thirty (30) days after being appointed by Lessor and Lessee.
8. Agent shall have no obligation under the terms of this Agreement to make any disbursement except from the Fund. Agent makes no warranties or representations as to the Equipment or as to performance of the obligations of Lessor or Lessee under this Agreement or the Lease.
9. Agent shall be entitled to rely in good faith upon any documents signed by a party hereto and shall have no duty to investigate the veracity of such documents. Agent (i) may assume that any person giving notice pursuant to the terms hereof is authorized to do so and (ii) shall not be liable for good faith reliance thereon.
10. To the limited extent required to perfect the security interest granted by Lessee to Lessor in the cash and negotiable instrument from time to time comprising the Fund, Lessor hereby appoints the Agent as its security agent, and the Agent hereby accepts the appointment as security agent, and agrees to hold physical possession of such cash negotiable instruments on behalf of Lessor.
11. This Agreement may be amended by written agreement executed by all the parties.
12. This Agreement may be executed in several counterparts, each of which shall be an original.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date first written above.

LESSOR: «Lessor\_Name»

BY: \_\_\_\_\_  
Authorized Signer

LESSEE: «Lessee»

BY: \_\_\_\_\_  
«Lessee\_Authorized\_Signer», «Lessee\_Authorized\_Signer\_Title»

AGENT: \_\_\_\_\_

BY: \_\_\_\_\_  
Agent Rep, Agent Rep Title

**ESCROW AGREEMENT - SCHEDULE 1**  
MUNICIPAL LEASE-PURCHASE AGREEMENT No. «Deal\_Number» (THE "AGREEMENT")  
BY AND BETWEEN  
Lessor, «Lessor\_Name» and Lessee, «Lessee»  
Dated as of «AgreementContract\_Date»

**ESCROW DISBURSEMENT REQUEST FORM**

\_\_\_\_\_, acting as escrow agent (the "Agent") under the Escrow Agreement dated as of «AgreementContract\_Date» (Escrow Date), by and among the Agent, «Lessor\_Name» as Lessor and «Lessee» as Lessee, is hereby requested to pay to the person or corporation designated below as Payee the sum set forth below in payment of the acquisition and installation costs of the equipment described below. The amount shown below is due and payable under the invoice of Payee with respect to the described equipment and has not formed the basis any prior request for payment.

PAYEE: \_\_\_\_\_

AMOUNT: \_\_\_\_\_

DESCRIPTION OF EQUIPMENT: \_\_\_\_\_

INVOICE # \_\_\_\_\_ DATED: \_\_\_\_\_

Indicate Method for Payment Disbursement:

\_\_\_\_\_ Overnight Check \*\*\*      \_\_\_\_\_ Regular Mail Check      \_\_\_\_\_ Wire Funds

Mailing Address: \_\_\_\_\_ Wire Instructions: \_\_\_\_\_

(\*\*\*Please note that there might be a fee charged for overnight delivery. This fee will be deducted from the Escrow Balance before disbursement is made.)

Lessee: «Lessee»

By: \_\_\_\_\_  
«Lessee\_Authorized\_Signer», «Lessee\_Authorized\_Signer\_Title»

Lessor: «Lessor\_Name»

By: \_\_\_\_\_  
Authorized Signer

**ACCEPTANCE CERTIFICATE**

«Lessee» as Lessee under that certain Municipal Lease-Purchase Agreement dated as of «AgreementContract\_Date» ("Agreement Date") (the "Lease"), hereby acknowledges receipt in good condition of all the equipment described on the attached Vendor Invoice(s), hereby accepts such equipment, and hereby certifies that Lessor has fully and satisfactorily performed all covenants and conditions to be performed by it under the Lease with regard to such equipment, that such equipment is fully insured in accordance with Section 10 of the Lease and that such equipment constitutes all or a portion of the Equipment as that term as defined in the Lease.

Date: \_\_\_\_\_, «Present\_Year».

By Lessee:

\_\_\_\_\_  
«Lessee\_Authorized\_Signer», «Lessee\_Authorized\_Signer\_Title»

For Lessee: «Lessee»



# **EXHIBIT 15**

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## NOTIFICATION OF INTENT TO FINANCE AND APPLICATION FOR DEBT APPROVAL

Form # SLDO-1  
Revised 1/1/2011

For DLG staff use only:

File # \_\_\_\_\_  
Received \_\_\_\_\_

Completion and delivery of this form to the address below shall satisfy the requirements of KRS 65.117, which prohibits any city, county, urban-county, consolidated local government, charter county, special district, or taxing district from entering into any financing obligation of any nature, except leases under \$200,000, without first notifying the state local debt officer in writing. This form shall also serve as application for approval of debt issuance when applicable. An electronic version of the form is available at [www.dlg.ky.gov](http://www.dlg.ky.gov).

✓ **Type of debt to be issued (must check one):**                      **SLDO Approval Required**                      **Complete Sections**

<input type="checkbox"/> Short Term Borrowing - KRS 65.7701 et seq.	No	A, B, C
<input type="checkbox"/> Lease from \$200,000 - \$500,000 - KRS 65.940 et seq.	No	A, B, D
<input checked="" type="checkbox"/> Lease exceeding \$500,000 - KRS 65.940 et seq.	Yes (Counties only)	A, B, D
<input type="checkbox"/> General Obligation Bond - KRS Chapter 66	Yes (Counties only)	A, B, E
<input type="checkbox"/> Public Project Rev. Bond - KRS Chapter 58	No	A, B, E
<input type="checkbox"/> Public Project Rev. Bond w/Lease - KRS 66.310(2)	Yes (Counties only)	A, B, D, E
<input type="checkbox"/> Industrial Revenue Bond - KRS Chapter 103	Yes (All Borrowers)	A, B, F
<input type="checkbox"/> Other Bonds (True Revenue, Utility Assessment, TIF)	No	A, B, E

### Section A - Borrower Information

Agency Name	McCreary County Water District		
Governing Body	Board of Commissioners		
Street Address	19 Crit King Road		
P.O. Box #	488	City	Whitley City
County	McCreary	Zip	42653
Authorized Official	Stephen Whitaker, Superintendent		

### Section B - Terms of Financial Obligation

Please provide all relevant information. Fields in **bold** are mandatory.

<b>Principle Amount:</b>	781,144	<b>Date of Issue:</b>	04/30/2018
<b>Maturity Date(s):</b>	04/30/2028	<b>Payment Schedule:</b>	(must attach schedule)
<b>Term:</b>	10 years	<b>Number of Renewal Periods:</b>	
<b>Interest Rate(s):</b>	3.74	<b>Type of Interest (fixed or variable):</b>	Fixed
<b>Retirement Method:</b>	Annual Lease Payments from General Revenues		
Lender's Name:	Government Capital Corporation		
Lender's Address:	345 Miron Drive, Southlake, Texas 76092		
Right of Termination:	Terminates at end of lease period; payment of lease payments constitutes election of purchase option		
Termination Penalties:			
Prepayment Provisions:	Prepayment permitted; No prepayment penalties		
Trustee or Paying Agent:	None		
AOC Funded Percentage:	0.00		

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**NOTIFICATION OF INTENT TO FINANCE AND APPLICATION FOR DEBT APPROVAL**

Form # SLDO-1  
Revised 1/1/2011

**Section C - Note (Loan) Information/Documentation**

Purpose - Briefly explain the documented need that necessitates this note (loan) and the public purpose it is intended to address. (Attach additional information if necessary):

Pledge of Taxes/Description:

Pledge of Revenue/Description:

Pledge of Project Revenues (Attach documentation which substantiates the revenue projections):

Have bids been sought by the local governments to determine the financial and programmatic competitiveness of the note (loan) proposal?  Yes  No

If No, explain what steps were taken to ensure adequate competition.

**Required Attachments**

1. Certification from local government attesting to the ability to meet additional financial commitments necessitated by the note and statement as to taxes and revenues to be collected during the term of the note.

**Section D - Lease Information/Documentation**

Describe the real or personal property to be acquired or constructed:

McCreary County Water District is acquiring water metering equipment

Type of Lease :  General Obligation  Revenue

Is Lease Annually Renewable?  Yes  No

Does Agency seek approval without a hearing?  Yes  No Justification:  Revenue  Refunding

If yes, must attach certification from counsel regarding county obligation. Borrower is water district; SLDO hearing is not required

Does this lease refund a prior lease?  Yes  No

If yes, please state the name, date and principal amount of original issue(s) being refunded:

**Required Attachments (If lease requires SLDO approval)**

1. Minutes from the local public hearing
2. Affidavit of publication of SLDO hearing (if hearing is required) and newspaper advertisement tear sheet
3. Copy of lease
4. Executed copy of ordinance/resolution of fiscal court authorizing the lease
5. Certification from local government attesting to the ability to meet additional financial commitments necessitated by the lease and statement as to taxes and revenues to be collected during the term of the lease.

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**NOTIFICATION OF INTENT TO FINANCE AND APPLICATION FOR DEBT APPROVAL**

Form # SLDO-1  
Revised 1/1/2011

**Section E - Bond Information/Documentation**

Please provide all relevant information. Fields in bold are mandatory

**Describe the purpose of the bond:**

Bond Counsel:

Counsel Address:

Financial Advisor:

Advisor Address:

**Bond Series:**

**Call Date:**

Does this bond refund a prior bond?  Yes  No

If yes, please state the name, date and principal amount of original issue(s) being refunded:

**Required Attachments (If SLDO Approval is Required)**

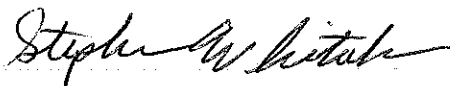
1. Minutes from the local public hearing
2. Affidavit of publication of SLDO hearing and newspaper advertisement tear sheet
3. Executed copy of ordinance/resolution of fiscal court authorizing financial plan for the issuance of the bonds
4. Proposed plan of financing
5. Preliminary official statement (if applicable)
6. Sources and uses table

**Additional Required Attachments for KRS Chapter 103 Bonds**

1. Documentation in an appropriate form substantiating the project's eligibility under KRS 103.2101(1)(a)-(e).
2. If the project requires approval of the reduction in property taxes, attach any documentation provided to agency responsible for approval.

\*\*\*\*\*

By signing below, the Authorized Official certifies that the foregoing is true and accurate to the best of his or her knowledge.

Name (please print) Stephen Whitaker	Date: 04/10/2018
Title: Superintendent	Signature: 

Mail to:  
Department for Local Government  
Attn: State Local Debt Officer  
1024 Capital Center Drive, Suite 340  
Frankfort, KY 40601

Fax to: 502-573-3712

# **EXHIBIT 16**

**Detailed Estimate of Acquired Property Classified According  
To The Uniform System of Accounts For  
Class A/B Water Districts and Associations**

<b>Account No.</b>	<b>Account Description</b>	<b>Estimate</b>
334	Meters and Meter Installations	\$779,974
340	Office Furniture and Equipment	1,170
	<b>TOTAL</b>	\$781,144