

SVM F2

TECHNICAL DESCRIPTION



SVM F2

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1 Installation

1.1 At delivery

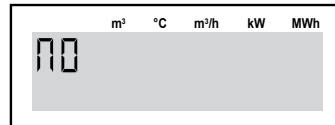


Fig. 1.1 – Transport mode



Fig. 1.2 – F2 display button

F2 is delivered in transport mode. This means that only the real time clock is active. No measurements take place in this mode. The transport mode is indicated with “no” on the LCD in the upper left corner. Before installation commences the meter must be set in operation mode. This is done by pressing and holding the push button for approximately five seconds, and thus entering one of the following two modes:

1. Service mode: Normally the calculator is set to enter the service mode. Here it is possible to alter certain parameters in the calculator. See also 4 Service on page 11. To indicate that the meter has left transport mode, “no” on the display extinguishes and is replaced by “00” - service mode.
2. Operation mode: If so ordered, the F2 calculator is set to enter the operation mode directly. To indicate that the meter has left transport mode, “no” on the display extinguishes and is replaced by “10” - operation mode. To enter the service mode from operation mode, please cf. 4 Service on page 11.

Note: In order to complete the installation the integrator must be set to *operation mode*.

YES

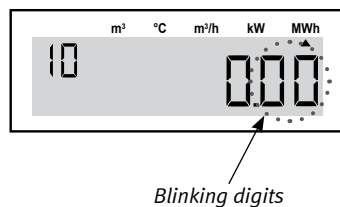


Fig. 1.3 – Operation (normal) mode. The calculator must be set into this mode in order to measure

NO

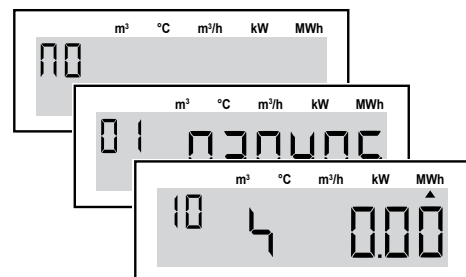


Fig. 1.4 – NOT operation mode
Upper display Transport mode
Middle display Service mode
Lower display Test mode

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1.2 Connections

The screw terminal blocks are situated under the cover on the rear side of the calculator.

Note: One of the screws holding the cover, is protected by a labelled sticker seal. If the calculator is mains supplied, it is provided with a fixed connection cable.

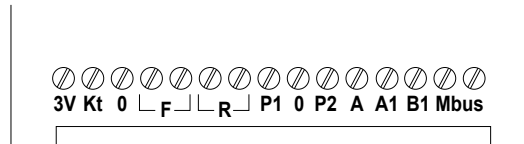


Fig. 1.5 – F2 terminal blocks

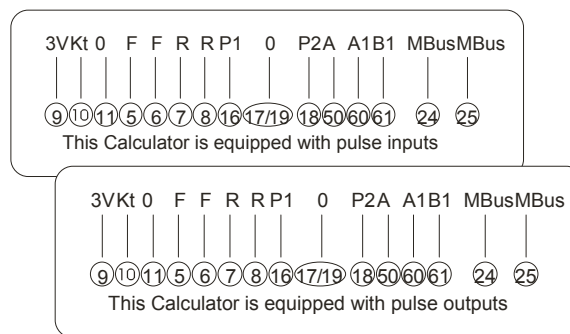


Fig. 1.6 – A label on the inside of the rear cover indicates whether the F2 is equipped with pulse inputs OR pulse outputs.

Numbering according to EN1434	Marking on terminals	Description
9	3V	Flow sensor power supply (+)
10	Kt	Flow sensor, signal input (+)
11	0	Flow sensor, reference input (-)
5	F	High temperature sensor (H)
6	F	High temperature sensor (H)
7	R	Low temperature sensor (L)
8	R	Low temperature sensor (L)
16	P1	Pulse input/output 1 (+)
17/19	0	Pulse input/output 1 and 2 (-)
18	P2	Pulse input/output 2 (+)
50	A	Alarm output (optional)
60	A1	Siox input (optional)
61	B1	Siox input (optional)
24	MBUS	M-Bus
25	MBUS	M-Bus

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2 Mounting

F2 can be mounted either on the flow sensor or wall mounted. When the calculator is mounted on the flow sensor, the adapter provided for this purpose has to be used.

2.1 Mounting on ULTRAFLOW® 54

With a special adapter it is possible to mount the F2 directly onto an ULTRAFLOW® 54 flow sensor, cf- Fig. 2.1.

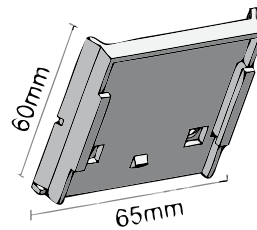


Fig. 2.1 –

2.2 Cable glands

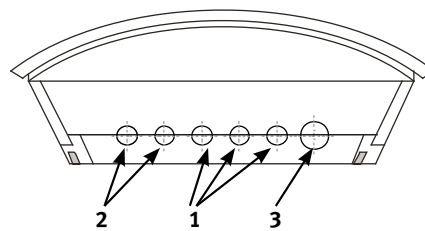


Fig. 2.2 – Cable glands

F2 has six cable glands for connection cables. To obtain protection class IP54, it is important to use cables of the following diameters:

1. Flow sensor cables and temperature sensor cables, $\varnothing 4,3 \pm 0.2$ mm.
2. Communication, eg. M-Bus, $\varnothing 4,3 \pm 0.2$ mm.
3. Mains supply, 230 VAC, $\varnothing 6.4 +0, -0.2$ mm.

2.3 Dimensions

All dimensions are in [mm].

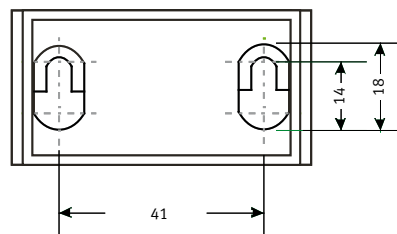


Fig. 2.3 – Dimensions wall adapter

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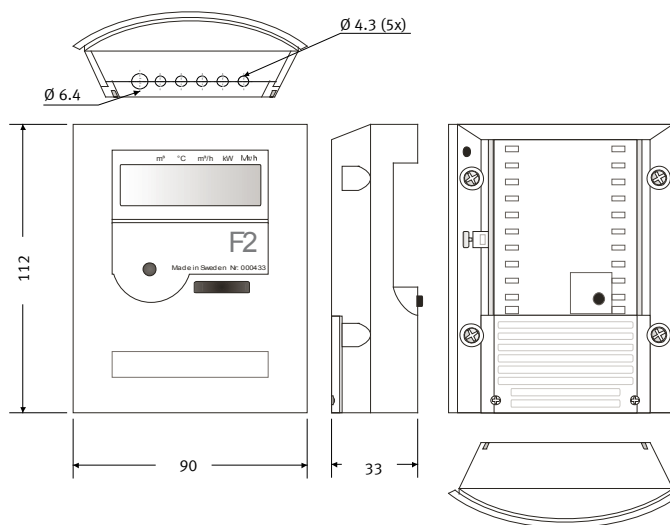


Fig. 2.4 – F2 dimensions [mm]

2.4 Installation test

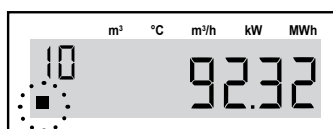


Fig. 2.5 – Flow pulse indicator

When the installation is complete, a simple test to verify that the calculator is working properly should be conducted.

1. Wait for the flow sensor to emit a volume pulse. This is shown on the F2 LCD where the pulse symbol, a square in the lower left corner, flashes once. This test is done in sequence 10.
2. Check the error code in sequence 15. If everything is OK, sequence 15 displays all zeros.
3. Check high, low and differential temperatures in sequences 22, 23 and 24 to see if the values are reasonable.
4. Check the pulse value setting in sequence 63. It must match that of the flow sensor.
5. Check the flow sensor placing in sequence 64. “L” indicates that the flow sensor should be installed in the low temperature line, and “H” indicates that the flow sensor should be installed in the high temperature line.

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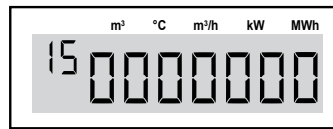


Fig. 2.6 – Display sequence "15" error codes

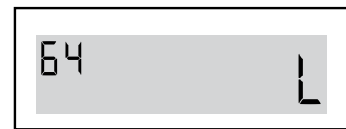
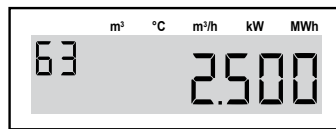


Fig. 2.7 – Display sequence "63" pulse value flow sensor "64" flow sensor placing

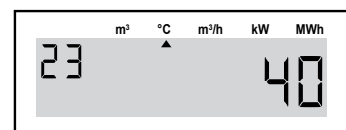
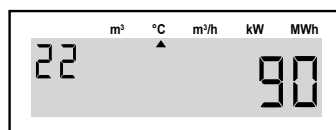


Fig. 2.8 – Display sequence temperature sensors, "22" high (H) and "23" low (L)

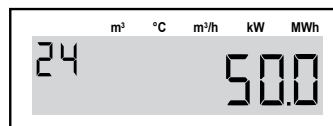


Fig. 2.9 – Display sequence "24", temperature difference

2.5 Momentary values

Momentary power, display sequence "20", and momentary flow, display sequence "21", are calculated as follows: As long as the time between the flow sensor pulses is longer than four seconds, flow and power are calculated for each flow sensor pulse. When the time is less than four seconds, the pulses are summated for approximately four seconds, where after calculation takes place.

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3 Handling

3.1 Display

The F2 has an LCD (Liquid Crystal Display), see Fig. 3.1.

The values are displayed in sequences. The left-hand sequence digit shows the relevant sequence.

The right-hand sequence digit shows which value in the sequence is being displayed. When the button is pressed and released the display steps to the next value in the current sequence.

When the button is pressed and held for four seconds, the display steps to the next sequence, e.g. from sequence 10 to 20. If the button is held further the sequence digit continues to increment to 30, 40 and so on, until the button is released.

If the button is inactive for 60 seconds, the display reverts to sequence 10, accumulated energy.

The display is configured as below:

1. Sequence digits
2. Flow sensor pulse indicator
3. Relevant value shown here, maximum 7 digits
4. Arrow that indicates unit for displayed value

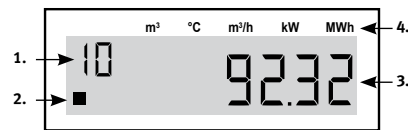


Fig. 3.1 –

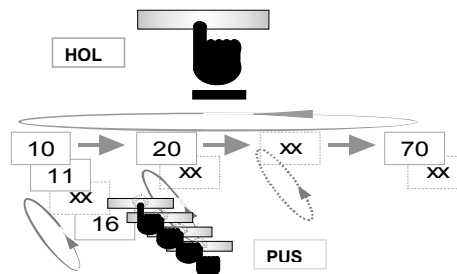
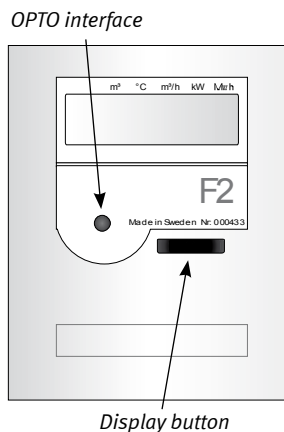


Fig. 3.2 – Push to toggle to next value. Hold to enter next sequence.



3.2 Display sequence table

	Description
10	Accumulated energy (Default position)
11	Accumulated volume according to flow sensor ¹
12	Display test
13	Accumulated volume for pulse input 1 (Only when F2 fitted with pulse inputs)
14	Accumulated volume for pulse input 2 (Only when F2 fitted with pulse inputs)
15	Error code, see Error code
16	Error time, [Minutes]
20	Momentary power
21	Momentary flow
22	High temperature, 0 decimals
23	Low temperature, 0 decimals
24	Temperature difference, 1 decimal
30	Account days ² , when values are stored, [YMMDD]
31	Account days ² , Accumulated energy
32	Account days ² , Accumulated volume according to flow sensor
33	Account days ² , Accumulated volume according to energy calculation
34	Account days ² , Accumulated volume pulse input 1, [m ³]
35	Account days ² , Accumulated volume pulse input 2, [m ³]
36	Possible error code, at time of storage of account days
37	Possible accumulated error time, at the time of storage account days, [Minutes]
3x	Following account days registers (loop back)
40	Monthly registers ³ , date when values are stored, [YMMDD]
41	Monthly registers ³ , Accumulated energy
42	Monthly registers ³ , Accumulated volume according to flow sensor
43	Monthly registers ³ , Accumulated volume according to energy calculation
44	Monthly registers ³ , Accumulated volume pulse input 1, [m ³]
45	Monthly registers ³ , Accumulated volume pulse input 2, [m ³]
46	Possible error code, at time of storage of monthly register
47	Possible accumulated error time, at the time of storage, [Minutes]
4x	Following monthly registers (loop back)
50	Operating time, [Hours]
51	Relevant date, [YMMDD]
52	Relevant time, [HH.MM]
53	Recommended date for battery replacement, [YMMDD]
60	Communication address, Primary address
A0	Communication address, Secondary address (normally same as meter S/N)
bx	Calculator serial number (S/N)
63	Pulse value [l/p]
64	Placing of flow sensor, [H/L], H/L = High/Low temperature line
70	Accumulated volume corresponding to accumulated energy
73	Last remote read accumulated energy
74	Time since latest remote read accumulated energy, [Hours]
75	Accumulated total error time, [Minutes]

1. The calculator has two registers for accumulated volume. Value 11, is incremented at the rate of arrived flow pulses. The other register, value 70 is incremented in conjunction with energy calculation.
2. In order to change to the next account day, keep pushing the button until the date starts to increment, then release the button. After the display 37, see table above, the next account day will display. Note: If the "Push button" is held again, the display reverts to default position (seq. 10).
3. To change to another month, keep pushing the button until the date starts to increment. Release at the requisite month. After display 47, see above, the next stored date will be displayed. Note: If the "Display button" is held again, the display reverts to default position (seq. 10).

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3.3 Error codes

Error codes are shown in display sequence "15".

Code	Description
0001	Break in low temperature sensor (L)
0002	Short circuit in low temperature sensor (L)
0004	Break in high temperature sensor (H)
0008	Short circuit in high temperature sensor (H)
0005	Error code combination 0001 + 0004
000A	Error code combination 0002 + 0008
0040	Low flow
0080	Mains power failure
0100	Battery replacement recommended

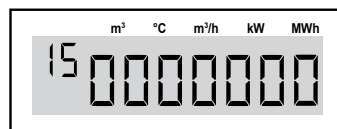


Fig. 3.3 – Display sequence "15" error codes

4 Service

Certain parameters in F2 can be altered using the display button when F2 is set in the service mode. Procedure to enter the service sequence:

1. Hold the service button on the rear side of the calculator pressed by using a small screwdriver. A seal protects the service button.
2. Then press and release the display button.
3. Release the service button.

The calculator will be set to service sequence and the display will show "00" as confirmation.

To leave the service mode, use the same procedure as entering the service mode.

Note The altered values are not stored until the next sequence is displayed. Example, changing the real time clock it's necessary to proceed to date before leaving the service mode.

Manoeuvre in service sequence, and changing values

By pushing the display button the value for the blinking digit can be altered. To change next digit "HOLD" the display button pressed until next digit starts to blink. To change service sequence "HOLD" the display button pressed until next service sequence is reached.

00: Time

"00" is the real time clock is the format HHMM.

01: Date

"01" the relevant date in the format "YYMMDD".

02, 03: Pulse value

"02" and "03" pulse value for flow sensor. "02" pulse value and "03" decimals for pulse value.

Example 1 The pulse value shall be 2.5 [l/p]. "02" shall be 2500, and "03" shall be 3.
E.g. 2500 with 3 decimals = 2.5 [l/p].

Example 2 The pulse value shall be 10 [l/p]. "02" = 1000, "03" = 2. E.g. 10 [l/p].

04, 05: Account days

"04" and "05" are account days with the format MMDD. F2 can store two. To deactivate the account days set, MMDD to "0000".

06: Communication address

"06" set communication address. The address is set with four digits.

Example: Address 5 is set as "0005".

07: Reset the accumulated error time

"07" the error time can be reset. Format "0" or "1".

0 = Reset error time

1 = Do not reset error time

08: Flow sensor placing

"08" set flow sensor placing, format "0" or "1".

0 = Flow sensor installed in low

1 = Flow sensor installed in high

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09: Recommended date for battery replacement

"09" sets the battery replacement date, format YYMMDD.

0A: Exit service mode

In sequence "0A" it is possible to leave the service mode without using the service button:

0 = Return to service sequence "00"

1 = Leave service mode and go to sequence "10"

4.1 Service sequence table

Service sequence	Description
00	Time [hhmm]
01	Date [YYMMDD]
02	Pulse value for flow sensor, Without decimal placing, 4 digits
03	Pulse value decimal placing, 0-4
04	Account days 1, MMDD
05	Account days 2, MMDD
06	Primary communication address, set 4 digits), e.g. "5" is set "0005".
07	Reset stored error time 0 = Reset stored error time (default) 1 = Do not reset error time
08	Flow sensor placing, 0 = Installed at low end (L) 1 = Installed at high end (H)
09	Recommended battery replacement date [YYMMDD]. Do not change without consulting Kamstrup SVM.
0A	Exit service sequence, 0 = return to service sequence "00" 1 = leave service mode

Table 4.1 – Service sequence, hh – hour, mm –minute, YY – Year, MM – month, DD – Day

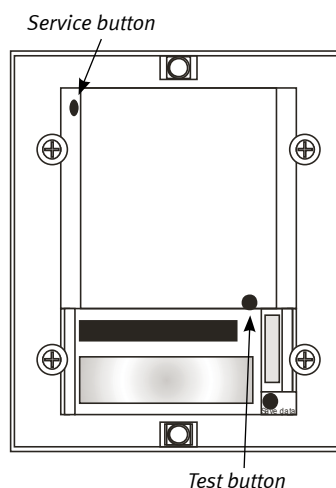


Fig. 4.1 – Service and test buttons



Fig. 4.2 – Test key

Note The display sequence in the "Service mode" may vary depending on calculator configuration.

5 Verifying the calculator

Verification of the calculator's measurement accuracy is undertaken in the test mode, where the energy value/flow sensor pulse is issued via the HF-output at the service adapter. For each flow sensor pulse, measurement takes place on the temperature sensors and a pulse burst corresponding to the measured energy of the meter is issued.

To test (verify) the measurement accuracy of the calculator by means of HF-pulses proceed as follows:

1. While short circuiting the test button with a "Test key", see Fig. 4.1 and Fig. 1.2, press and release the "Push button" and the display mode changes.
2. The calculator now enters test mode. This is indicated by a flash symbol being displayed.
3. Connect fixed resistance for simulation of Pt100 or Pt500 via terminal block units Nos. 5-6 (high) and 7-8 (low).
4. Connect a pulse generator via terminal block unit Nos. 10-11 (connection 11 is ground) in order to simulate flow sensor pulses. Note: Voltage level is max. 3V.
5. Connect an OPTO-head to the HF-pulse interface at the front of the meter.
6. Simulate a flow sensor pulse after which the meter issues an (approximately) 20 kHz pulse burst corresponding to $100 \cdot k \cdot dt$ pulses via the HF-output. "k" is the energy factor (kWh/°C/m³) and dt is the difference between simulated flow and return temperatures.

Example: $R_f=138.50\Omega$ (100.00°C), $R_r=127.07\Omega$ (70.00°C) $\Rightarrow dt=30.00^\circ\text{C}$, $k=1.141$ gives
 $100 \cdot 1.141 \cdot 30 = 3423$ pulses

7. The next flow sensor pulse can be sent immediately after the HF-pulse burst from the meter has been dispatched.

To leave test mode proceed as follows:

1. While short circuiting the test button, press and release the "Push Button", see Fig. 1.2 on page 3.
2. The calculator now enters operation mode.

To verify (test) the measurement accuracy of the meter with help of the display, first set up connections in accordance with points 3 and 4 above for testing by means of HF-pulses. Testing is undertaken in the meter's operation mode. Proceed as follows:

1. Supply flow sensor pulses until the energy display is incremented one step.
2. Supply flow sensor pulses with a maximum frequency of 12 Hz until the display has been stepped appropriate numbers of steps.
3. Errors in testing decrease with the number of steps made during the test. If the meter is programmed for 1.0 litre/pulse and resolution for display of energy is 0.001MWh, this means that 10 steps on the display correspond to 288.85 pulses from the flow sensor with selected temperatures in accordance with the above. The testing error is maximum + - 1 pulse, which, in the example, corresponds to 0.35%.

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6 Seals

1. Service seal
2. Test seal
3. Factory/warranty seal
4. Installation seals

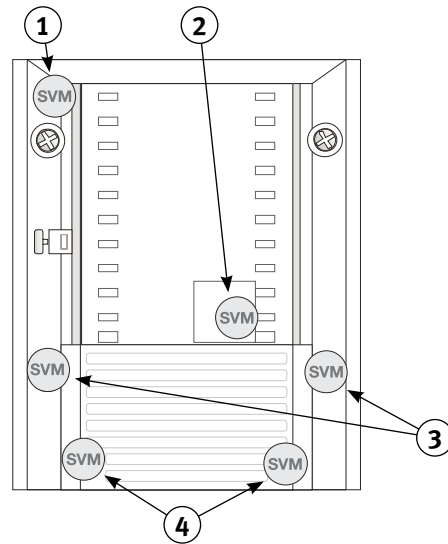


Fig. 6.1 – Sticker seals

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7 Technical data

7.1 Power supply

Battery	3 V - 2.2 Ah, or 3.6 V - 3.6 Ah (F25) Operation time max 10 years
Mains	230 V±10%, 45-65 Hz
M-Bus supply	2 bus loads

Table 7.1 – Power supply

7.2 Temperature sensors

Approved and matched pairs of temperature sensors of the type Pt 100 or Pt 500 are to be used. Maximum sensor current (RMS) 4 µA for Pt100.

Cable cross section [mm ²]	Maximum cable length for Pt100 sensors [m]
0.22	2.5
0.50	5.0
0.75	7.5
1.50	15.0

Table 7.2 – Cable lengths for Pt100. 5 times the above lengths for Pt500

7.3 Flow sensors

Flow sensor with pulse output.

Max. frequency	[Hz]	12
Pulse value range	[l/p]	0.0001-9999
Min. pulse length	[ms]	40
Max. voltage	[V]	3
Max. cable length	[m]	15

Table 7.3 – Technical specifications

7.4 Temperature range

Temperature range	0 - 190°C
Temperature difference	2 – 120K

Table 7.4 – Temperature range

7.5 Ambient temperature & environmental class

F2 complies with the prerequisites for Environmental Class C according to EN1434.

Ambient temperature storage/transport	-20°C to +70°C
Ambient temperature operation	+5°C to +55°C

Table 7.5 – Ambient temperature ranges

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7.6 Flow sensor placing

F2 can be configured for flow sensor placement in the high or low temperature lines (supply or return pipes). This is indicated by "H" = high temperature, or "L" = low temperature in display sequence "64".

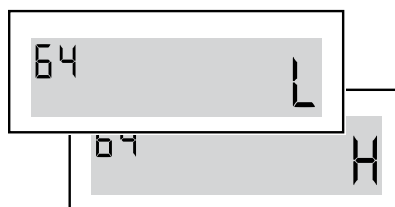


Fig. 7.1 – Flow sensor placing

7.7 Maximum values for power

The values below are valid for energy unit [MWh] and standard decimal setting.

Pulse value [l/p]	Maximum power [MW]
1.0	3.3
10.0	33.0
100.0	330.0
2.5	3.3
25.0	33.0
250.0	330.0

Table 7.6 – maximum power at pulse values

7.8 Dynamic behaviour

Measurements are undertaken for each flow sensor pulse, provided the time between the pulses is five (5) seconds or longer. If the time between pulses is less than five seconds, measurement takes place each five seconds. When the period between the flow sensor pulses exceeds 60 seconds, a measurement takes place every 60 seconds, where only the temperatures are updated.

7.9 Data output interface

M-Bus acc. to EN1434-3	Via OPTO-interface (EN60870-5) or bus connection (terminals)
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Table 7.7 – data output interfaces

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7.10 Pulse outputs (either pulse outputs or pulse inputs on F2)

F2 can be equipped with two pulse outputs as standard of the type “Open collector” for energy (pulse output 1) and volume (pulse output 2).

The last digit and the energy unit will reveal the pulse value of the pulses. Example: sequence “10” (energy) on display is shown “1001.01” MWh \Rightarrow pulse value = 0.01 MWh/pulse.

Pulse output 1

Energy; one (1) pulse for each update of the last digit in the energy register (seq. “10”).

Pulse output 2

Volume, one (1) pulse for each update of the last digit in the volume register (seq. “11”).

Pulse width	[ms]	125
Voltage	[V]	3 – 30
Maximum current	[μ A]	20

Table 7.8 – Pulse output data

7.11 Pulse inputs (either pulse outputs or pulse inputs on F2)

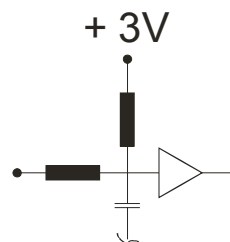


Fig. 7.2 – Pulse output

F2 is equipped with two pulse inputs as an option. The pulse inputs can be used for collecting pulses from other devices, such as domestic water meters, gas meters, electricity meters and other meters with a pulse output. The pulse inputs are normally set as volume registers with cubic meters [m³] as nominal unit. They may also be used as pulse counters with the pulse value set to 1000 (1[m³] per pulse).

Frequency, max	[Hz]	12
Min. pulse duration	[ms]	40
Max. Voltage	[V]	3

Table 7.9 – Pulse inputs

7.12 Alarm output

The F2 is equipped with an alarm output of the type “Open collector”. The alarm output sends a pulse every hour as long as an error code exists. The pulse duration 125 [ms] for pulse and alarm output can be altered using the “Service program” version 2 or higher in 125 [ms] steps.

Alarm frequency when an error exists	Once every hour
Pulse width	[ms] 125

Table 7.10 – Alarm output

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8 Appendix

8.1 Decimal placing F2

Pulse value [l/p]	MWh	GJ	m ³	KWh	MBTU	kW	m ³ /h
1.0	0.001	0.001	0.01	0.1	0.001	0.01	0.001
10	0.01	0.01	0.1	1	0.01	0.1	0.01
100	0.1	0.1	1	-	0.1	1	0.1
1000	1	1	1	-	1	1	1
2.5	0.001	0.01	0.01	0.1	0.01	0.01	0.001
25	0.01	0.1	0.1	1	0.1	0.1	0.01
250	0.1	1	1	-	1	1	0.1
2500	1	1	1	-	1	1	1

Table 8.1 – Options marked ”-” should not be used

SVM F2

TECHNICAL DESCRIPTION

8.2 Article number F2

F2 ABCDEFGHIJ KLM

Pos	Choice	Code	Description
A	Sensor type	1	Pt100 2-wired. Flow meter in low temperature.
A	Sensor type	2	Pt100 2-wired. Flow meter in high temperature
A	Sensor type	5	Pt500 2-wired. Flow meter in low temperature.
A	Sensor type	6	Pt500 2-wired. Flow meter in high temperature
B	Power supply	0	None
B	Power supply	1	Battery std.
B	Power supply	2	M-Bus powered (2 Bus loads)
B	Power supply	3	Mains 230 VAC (w. backup batt.)
B	Power supply	4	Mains 230 VAC for flow meter supply (w. Supercap)
B	Power supply	U	Battery for flow meter supply
C	Pulse value Kt	1	2.5 l/p
C	Pulse value Kt	2	25 l/p
C	Pulse value Kt	3	250 l/p
C	Pulse value Kt	4	2500 l/p
C	Pulse value Kt	5	1 l/p
C	Pulse value Kt	6	10 l/p
C	Pulse value Kt	7	100 l/p
C	Pulse value Kt	8	1000 l/p
D	Energy type	0	KWh
D	Energy type	1	MWh
D	Energy type	2	GJ
D	Energy type	3	MBTU
D	Energy type	4	MBTU (kUSG kW USG/m)
D	Energy type	5	KWh (kUSG °F USG/m kW KWh)
E	Configuration	-	Standard
E	Configuration	E	Customer number - See separate specification!
E	Configuration	S	Special - See separate specification in text!
E	Configuration	A	Extra option board and extra information in order text!
F	Pulse in/outlets	1	Pulse inlets: 2.5 l/p.
F	Pulse in/outlets	2	Pulse inlets: 25 l/p.
F	Pulse in/outlets	3	Pulse inlets: 250 l/p.
F	Pulse in/outlets	5	Pulse inlets: 1 l/p.
F	Pulse in/outlets	6	Pulse inlets: 10 l/p.
F	Pulse in/outlets	7	Pulse inlets: 100 l/p.
F	Pulse in/outlets	8	Pulse inlets: 1000 l/p.
F	Pulse in/outlets	9	Pulse outlets
G	Display	0	Backlight with Opto and M-Bus
G	Display	1	No backlight. With Opto and M-Bus
H	Montage	0	For wall mounting. Walladapter is included. Packaging: 1 pc.
H	Montage	2	Compact adapter is included. Packaging: 1 pc.
I	Connections	-	Standard connector
J	Communication	1	M-Bus 300 Baud.
J	Communication	2	M-Bus 2400 Baud.
KLM	Country code	300	English standard

Table 8.2 – Article numbers for F2 calculator. All combinations are not available

SVM F2

TECHNICAL DESCRIPTION

8.3 Data output table

The following data is accessible via the data output:

Data	EN 60870-5	Manufacturers specific	SIOX (option)
Flow sensor placing	X		X
Program version	X		X ⁴
Manufacturer	X		
Communication address	X		X
Meter number	X		
Error code (limited)	X		X
Accumulated energy	X		X
Accumulated, volume 1 ¹	X		X
Accumulated, volume 2 ²	X		
Flow temperature (high)	X		X
Return temperature (low)	X		X
Temperature difference	X		X
“Operation time” (operation time, error time)	X		
Momentary flow	X		X
Momentary power	X		X
Time and date	X		
Pulse register for pulse input 1	X		
Pulse register for pulse input 2	X		
Monthly values ³ data storage			
Monthly values ³ accumulated energy	X		
Monthly values ³ accumulated volume 1 ¹	X		
Monthly values ³ accumulated volume 2 ²	X		
Account days, same as monthly values, see above	X		
High resolution energy		X	X
High resolution volume 1 ¹		X	X
High resolution volume 2 ²		X	X
Relevant error code		X	X
Accumulated time for relevant error		X	
Previous error code		X	
Previous accumulated time for relevant error		X	X ⁵
Manufacturing number		X	
Pulse value		X	
Latest read energy via communication		X	
Time [h] since latest reading		X	
Recommended date for battery replacement		X	
Error codes and accumulated error times during storage (see monthly registers and account days above)		X	
Flow sensor placing		X	
Program version		X	

Table 8.3 – Data output

1. As per flow sensor
2. Corresponding to energy registers
3. 37 registers
4. To be compatible with existing system, the version number is fictitiously set to 4
5. Total error time