

# SVM F4

## TECHNICAL DESCRIPTION

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# SVM F4

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### 1 General

#### 1.1 Installation

The calculator is delivered in “Transport mode”, but depending on delivery options the calculator can be delivered in other “display modes”, cf. paragraph 3.3 Display modes on page 11 for more information. The following paragraphs of the User manual may be helpful when installing the F4 calculator:

1. Change calculator settings, cf. paragraph 3.3.3 Service Mode.
2. Install option boards, cf. paragraph 5.5.1 Option board installation procedure. Also read the specific instructions in the option board documentation.
3. Mounting of the calculator, cf. paragraph 5.7 Mounting.
4. Connecting signal leads to the calculator, cf. paragraph 5.2 Connection terminals.
5. Factory seals and user seals, cf. paragraph 4 Seals, calculator protection.
6. Put the calculator into “Operation mode”, cf. paragraph 3.3 Display modes.
7. Perform a simple function test after installation, cf. paragraph 7.3 Installation test.

#### 1.2 Principle of energy measurement

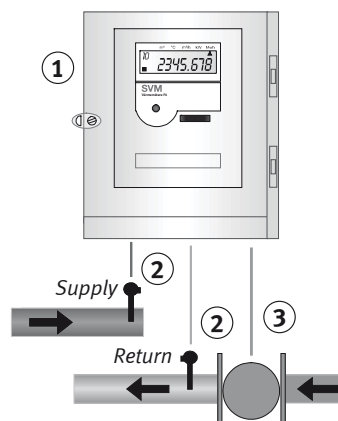


Fig. 1.1 – Principle of energy measurement

**A thermal energy meter** consists of:

1. Calculator
2. Temperature sensor pair, resistance thermometers Pt100 or Pt500
3. Flow sensor with a pulse output.

For each volume pulse from the flow meter the F4 measures the flow and return line temperatures, and uses the volume flow and the temperature difference to calculate the energy. If the flow rate is high and the volume pulses are received more often than every 5 seconds, the volume will accumulate and an energy calculation will be done every five seconds.

Energy data is stored in the calculator EE-prom memory and can be read on the display or through an external communication. M-Bus is the standard communication protocol. Other communication protocols are available by means of an option board.

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### 1.2.1 Alternative naming

The nomenclature for the energy industries are not unified, different words are used to explain the same things.

**Calculator**, also known as heat meter, BTU meter or meter.

**Flow sensor**, also known as flow meter.

**Supply line**, also known as forward line, and in heating applications also high temperature or hot line.

**Return line**, also known in heating applications as low temperature or cold line.

### 1.2.2 Heat carrying medium

The F4 calculator is only approved for applications where water is used as the heat carrying medium.

When glycol or other mixed fluids are used, the special version MF4 should be used in order to maintain the highest possible accuracy in the energy measurement.

### 1.2.3 Operating conditions

The use of a calculator is different in each application. In order for the battery life expectancy to be valid, the following definition of normal operating conditions must be considered:

#### 1.2.3.1 Normal operating conditions for battery supplied calculators

The use of a calculator is different in each application. In order for the battery life expectancy to be valid, the following definition of normal operating conditions must be considered:

**M-Bus telegram reading** (all protocols) maximum once per day. High frequency usage of M-Bus reading reduces battery life.

**Only one option board** can be installed in the calculator. When more boards are required and installed the battery life expectancy will be reduced. E.g. one option board 10 years, two option boards 6 years. Note: Not every option board can be used in a battery supplied calculator, cf. the specific documentation for each option board for more detailed information.

**Flow sensor pulses emitted** at the average rate of maximum 1.5 p/min and with the maximum temperature difference at 50 degrees K. The average shall be based on the whole lifetime of the battery. The calculator shall also have standard decimal setting, see paragraph 9.1 Decimal settings.

**Configuration** by improper use of the "FlexServ program" may reduce the battery life significantly. Use factory settings when possible.

The calculator must be set in "**Operation mode**" (sequence 10) when used as a regular heat meter. "Service, Init and Test mode" reduces the battery life if the calculator is left in any of these modes for extensive periods of time.

#### 1.2.3.2 Limitations for mains supplied calculators

The M-Bus reading frequency must not exceed once every 20 min. If more frequent M-Bus readings are required, the F4 calculator must be equipped with an M-Bus isolation board, FCR2.

### 1.3 Calculator specifics

The calculator also stores additional data, besides recorded and calculated values. The calculator specifics are explained below.

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### 1.3.1 Monthly values

SVM F4 stores up to 37 monthly registers. The monthly values are stored as a snap shot of the registers at the end of each month. The stored values are:

- Date of storage
- Energy
- Total volume, according to flow sensor
- Volume, according to energy calculation
- Pulse register 1
- Pulse register 2
- Error code at the time of storage
- Accumulated error time (minutes)

When the maximum number of monthly values is reached, the calculator replaces the “oldest” value with a new.

The monthly values can be read on the display (sequence 40) and via M-Bus communication. The order of presentation is the “newest” value first and then the previously stored value will be presented and so on.

The number of monthly registers that are stored can be set by using the FlexServ software.

See also paragraph 3.3.5.1 Display sequence normal mode, for more information on display sequence 40.

### 1.3.2 Account days

Some utility companies prefer to read all their meters at the same time twice a year, at two preset dates, also called account days.

The F4 has the possibility to store two account days. The user can specify these dates using service mode or the “FlexServ program”. The registers stored are the same as for Monthly values, but the date of storage may be different. The default setting for the Account days are:

Account day 1: 1 January (0101)

Account day 2: 1 July (0701)

The values for the account day will be stored at midnight on the preset date, e.g. the values are stored at 00:00 on January 1st and July 1st each year.

The “newest” value will be presented first and then the previously stored value and so on. The “old” account day values will be replaced when “new ones” are to be stored. See also paragraph 3.3.5.1 Display sequence normal mode, for more information on display sequence 30.

The dates for the Account days can be set by using the FlexServ software.

### 1.3.3 Pulse counter register 1 and 2

The calculator has two (2) pulse inputs that acts as volume accumulators in [m<sup>3</sup>]. To set the volume accumulators to pulse counters the pulse weight in calculator must be set to:

**1000 [l/p], 0 decimals**

**Example:** 1000 [l/p], 0 decimals - 1 m<sup>3</sup> per pulse (one increment per pulse). See also paragraph 3.3.5.1 Display sequence normal mode for more information on sequence 13 and 14.

### 1.3.4 Placing of flow sensor

The calculator uses different algorithms to calculate the energy depending on which pipe (hot or cold) the flow sensor is placed. Always set the flow sensor placing correctly in the calculator.

It is **recommended** to put the flow sensor in the return line. In heating applications the temperature is lower and thus also the temperature wear. In cooling applications the temperature is higher, and the risk for condensation is reduced.

The flow sensor placing can be set in "Service mode", see paragraph 7.4.7 Flow sensor placing, or in the "FlexServ software".

See also paragraph 3.3.5.1 Display sequence normal mode, for more information on display sequence 64.

### 1.3.5 M-Bus

The F4 calculator is equipped with M-Bus communication, according to EN1434-3 (terminals) and EN60870-5 (opto) and to the M-Bus user group.

**Battery powered** calculators are sensitive and may not be connected into loops with more than 250 M-Bus nodes with maximum one M-Bus reading a day, otherwise the battery life expectancy in the calculator will be affected.

**Extreme M-Bus communication**, when the calculator is flooded by the M-Bus, the calculator will prioritize the M-Bus over the display. This flooding will result in strange calculator display behaviour.

Flooding of the M-Bus communication will not affect the calculator readings.

### 1.3.6 Communication address

The calculator has two (2) communication addresses in M-Bus.

**Primary address**, this is a value from 1-250. The primary address can be changed in the "service mode", see paragraph 7.4 Service, or by using the "FlexServ" software.

When two or more meters within an M-Bus loop use the same primary address a communication collision will occur. The primary address must be unique for each meter or node in the M-Bus loop.

**Secondary address** is normally set as the serial number, but can also be customized.

Calculators using the serial number as its secondary address will always have a unique address. Secondary addressing is recommended in order to avoid communication collisions.

In most M-Bus reading programs the user can choose to address the calculator by the primary or secondary address. The transfer and communication speed for the calculator will not be affected by choosing the primary or the secondary addressing in M-Bus.

### 1.3.7 Power cut

#### Mains powered

When the mains power is cut the calculator will run the following sequence:

1. Automatically switch over to the backup battery.
2. Store calculator data to the EEPROM.
3. Generate an error code "0000080" on display sequence 15.

When mains supplied, the SVM F4 is equipped with a back-up battery. This battery will supply the calculator for at least 10 years under "normal" operating conditions, with maximum one M-Bus reading each day and normal flow and temperature readings.

The F4 always stores the energy data to the EEPROM at dayshift. When power fails, both mains and battery/back-up battery, all data in the temporary memory is lost. When the power is cut deliberately it is possible to force the F4 to store the data to the EEPROM by short circuiting the "save data" button, see paragraph 2.4 Save data button.

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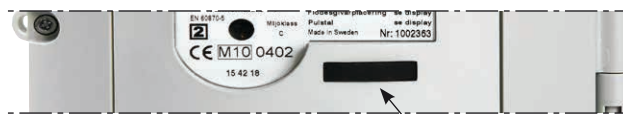
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## 2 Buttons and jumpers

### 2.1 Push button

SVM F4 is equipped with a “Push button”. With the “Push button” the user can toggle between different values and display sequences. There are two ways to use the “Push button”

1. Press and release the push button to toggle between different values in the display sequence.
2. Press and hold the push button for a few seconds and the display sequence is changed from 10 to 20 and so on. Also see paragraph 3 Display, for further information.



Push button

Fig. 2.1 – Push button

### 2.2 Service button

The service button is used in combination with holding the “Push button” to enter service mode, see also paragraph 3.3.3 Service Mode.

**Tool:** Screwdriver or any other suitable dull object.

To enter (or exit) service mode, hold the service button (carefully) pressed using a small screwdriver and then also press and hold the push button for a few seconds (5s), then release the push button and then release the service button. The display sequence changes to “00” (or back to “10”).



Fig. 2.2 – Location of service and test buttons

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### 2.3 Test button

This button is used in combination with holding the “Push button” to set calculator into test mode.

**Tool:** Test key  
(Rubber key with a leading top).

Enter test mode: press and hold the test button by using the Test key, and then press and hold the Push button for approximately five (5) seconds then release the Push button and then release the test button. A flash symbol will appear on the display to indicate the test mode.

Exit test mode, by using the same procedure as entering the “test mode”, see above, the flash will disappear after exiting the test mode.

**Note:** only to be used by authorized personnel



Fig. 2.3 – Test key

### 2.4 Save data button

The save data button is used when saving data is necessary, when changing batteries or when installing option boards.

When the “Save data button” is short circuited, the calculator makes readings and saves all data from temporary memory to the calculator EEPROM.

**Note:** Data from option boards will not be saved.

**Tool:** Test key

To save, use the “Test key” and short circuit the “Save data button” the calculator will store all temporary data to the EEPROM.

Check “save data” procedure:

The calculator will briefly display an error code when data is properly saved. Prior to “save” change the display sequence to number 15. Then short circuit the “Save data button” using a “Test key”, the code “0000080” will be displayed briefly to confirm data storage, see also 3.4 Error codes.

Save data button

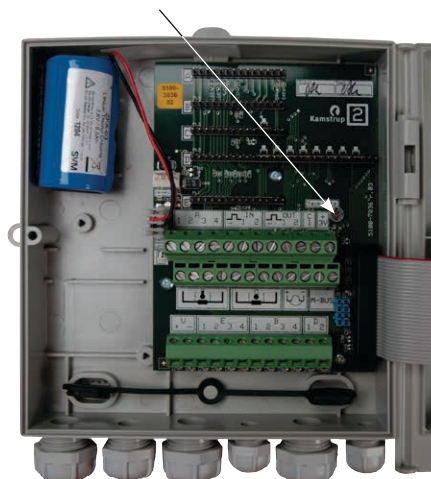


Fig. 2.4 – Save data button



Fig. 2.5 – Error code displayed when data is saved.

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### 2.5 Jumpers 2/4-Wire method for temperature sensors

The F4 is by default configured for 2-wire measuring method connection for temperature sensors. The calculator allows 4-wire measuring method, by removal of jumpers, see Fig. 2.6.

**4-wire connection**, remove jumpers J1, J2, J3 and J4.

**2-wire connection**, place jumpers J1, J2, J3 and J4.

**Note:** Wrongly placed jumpers can damage the calculator.

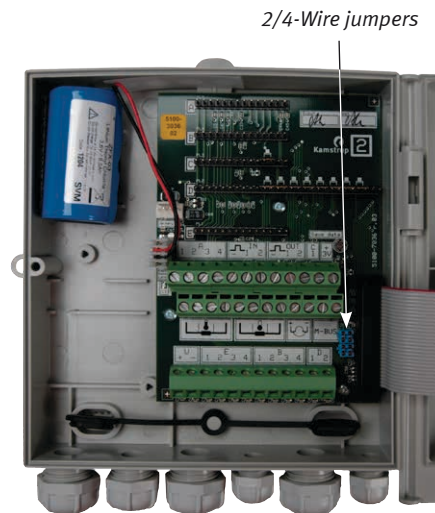


Fig. 2.6 – 2/4-Wire jumpers

### 2.6 Slot jumpers Signal/Power redirecting

On the option board slots "C" and "D" there are jumpers for redirecting power and bus signals. When these are removed without placing an option board in to the slot, the signals from the calculator can be disturbed and the calculator's pulse output and alarm output can be disabled depending on which jumpers are removed. Only remove the jumpers when an option board is being installed in slot "C" or "D". If the option board is removed again later, the jumpers must be replaced.

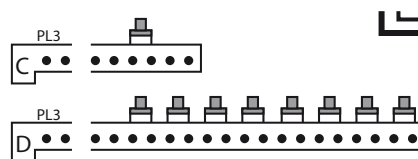


Fig. 2.7 – Slot jumpers on slot C and slot D

### 2.7 Power ON/OFF

For power off cut the power to the calculator by removing the 4-pole connector "K2" and then "K3". Recommended procedure:

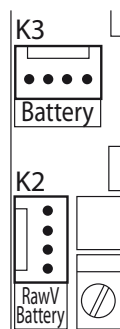


Fig. 2.8 – Power off

#### Power OFF:

1. Save data by short circuiting the "save data button"
2. Remove connector K2 (RawV)
3. Remove connector K3 (Battery).

#### Power ON:

1. Reconnect K3 (Battery)
2. Reconnect K2 (RawV).

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### 3 Display

SVM F4 is equipped with an LCD (Liquid crystal display). The display units and the decimal placing is depending on the calculator configuration.

1. Display sequence 10, showing the accumulated energy, is the default position. The calculator always returns to sequence 10 if the push button is left inactive for 60 seconds.
2. Flow pulse indicator and error indicator. This indicator appears briefly every time a flow pulse is received from the flow sensor. If an error code is active, the symbol is lit steadily, and disappears briefly for each volume pulse received. When the flow pulse frequency is 2Hz or more, the symbol will appear steadily, and disappear on error.
3. Value on current reading, maximum 7 digits.
4. Unit indicator. An arrow symbol points at the relevant unit.
5. Display frame with different units printed.
6. Decimal point. In accordance with EN1434 the decimals must be clearly marked, and are thus blinking.

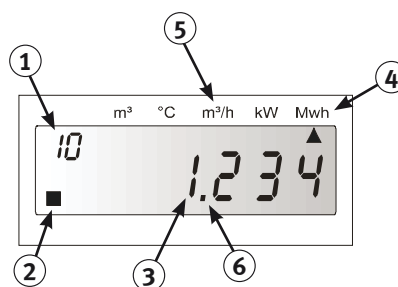


Fig. 3.1 – Display

#### 3.1 Back-light

The calculator display can be equipped with a “back-light” function. The “back-light” will light up the display each time the “Push button” is pressed, and will be turned off one minute after “Push button” inactivity.

In the display modes Service/INIT/Test mode the back-light is lit steadily. Avoid setting a calculator equipped with “back-light” in these modes for longer periods (10 min.), otherwise the backup battery life span will be reduced.

During transport and storage of the calculator the “Transport mode” mode is to prefer, where the “back-light” is off.

**Note:** The back-light function should only be used in mains supplied calculators, since it reduces the battery life.

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### 3.2 Display test

In accordance with EN1434 all calculators must have display test. For SVM F4 the display test is found in sequence 12.

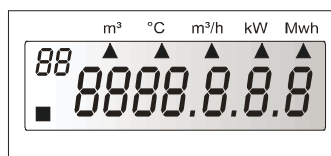


Fig. 3.2 – Display test

### 3.3 Display modes

The calculator can be set in different display modes depending on what data that shall be accessed in the calculator. To enter the different modes the seals must be broken and a recommended tool should be used, see paragraph 2.2 Service button, and 2.3 Test button. The calculator is normally delivered in “Transport mode”. Depending on configuration, the calculator can be delivered in other display modes as well.

The sequences in the different display modes can vary depending on different customizations of the calculator. The display modes are:

1. Transport mode
2. Initial mode (INIT-mode)
3. Service mode
4. Test mode (programming mode)
5. Operation mode (normal mode)

**Note:** Avoid setting the calculator into service mode/INIT-mode or test mode for longer time periods (1 hour), or the battery life expectancy may be affected.

#### 3.3.1 Transport mode

Calculator F4 is delivered in transport mode. Only the RTC is active in transport mode, and no measurements take place. All other functions, including any installed option boards, are idle. Transport mode is indicated on the LCD with the word “no” displayed in the upper left corner.

**To exit Transport mode,** press and hold the push button for 5 seconds, and enter INIT mode.

**Note!** Meters delivered with a customized setting can go directly from transport mode to operation mode (sequence 10).

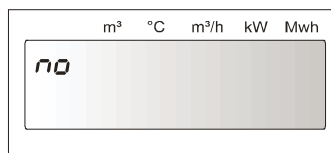


Fig. 3.3 – Transport mode

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### 3.3.2 Initial mode (INIT mode)

Press and hold the push button for 5 seconds in order to exit the transport mode, and enter INIT mode. INIT mode is really the same thing as service mode, but some sequences are left out in INIT mode. When entering INIT mode the LCD changes and "00" is displayed in the upper left corner, cf. Fig. 3.4.

In paragraph 3.3.3.1 Service/INIT mode sequence, all parameters that can be set in Service and INIT mode are listed..

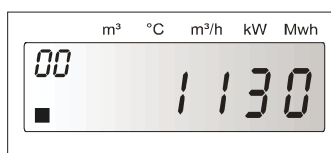


Fig. 3.4 – Service or INIT mode

### 3.3.3 Service Mode

In Service mode it is possible to set the parameters listed in paragraph 3.3.3.1 Service/INIT mode sequence, by using the push button. When entering Service mode the LCD changes and "00" is displayed in the upper left corner, cf. Fig. 3.4.

**To enter Service mode**, press and hold the service button with e.g. a screwdriver and press and release the push button, then release the service button. The LCD change to Service mode and sequence "00" is displayed. See also paragraph 2.2 Service button, for further information.

**To exit Service mode**, repeat the same procedure as when entering Service mode. The LCD will change to Operation mode and sequence "10" is displayed.

**To change a parameter**, use the push button to change the meter settings in accordance with paragraph 3.3.3.1 Service/INIT mode sequence.

**Use the push button, as in the example below to change the date:**

1. Sequence "00" is displayed when the meter is set into Service or INIT mode. Keep the button depressed until sequence "01" is displayed.
2. Sequence "01" is displayed with YMMDD = 110520. The first digit flashes. The date shall be set to 110525.
3. Press and hold the push button until the next digit starts flashing, and keep the button depressed until the last digit, the one to be changed, starts flashing.
4. Press and release the button five times until the last digit is set to 5.
5. Press and hold the push button again until sequence "02" is displayed.
6. When all desired changes are made, press and hold the push button until sequence "0A" is displayed.
7. Press and release the push button to change the digit in sequence "0A" from 0 to 1.
8. Press and hold the push button once again until sequence "10" (Operation mode) is displayed.

**Note!** Meters delivered with a customized setting can go directly from Transport mode to Operation mode (sequence 10).  
After leaving Service/INIT mode it is only possible to return to Service mode by pressing the sealed service button, cf. paragraph 2.2 Service button.

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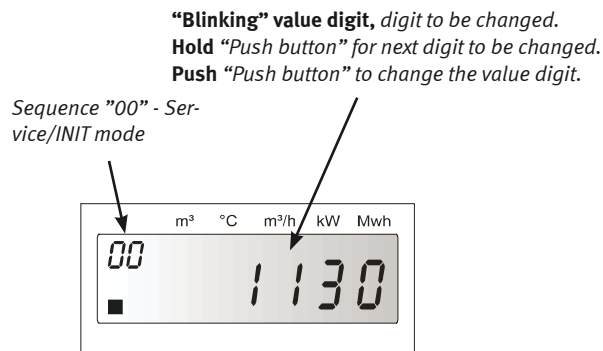


Fig. 3.5 – Handling in service or INIT mode

### 3.3.3.1 Service/INIT mode sequence

Se-quence	Description, format
00	Real time clock [HHMM]
01	Date [YMMDD]
02	Pulse value, without decimals [0000-9999]
03	Pulse value, no. of decimals [0-4]
04	Account day 1 [YMM] (n.a. in INIT mode)
05	Account day 2 [YMM] (n.a. in INIT mode)
06	Primary communication address [0000-0255]
07	Reset error time [0=reset, 1=save] (n.a. in INIT mode)
08	Flow sensor placing [0=low temperature line, 1=high temperature line] (n.a. in INIT mode)
09	Recommended battery replacement date [YMMDD] (n.a. in INIT mode)
0A	Exit Service/INIT mode [0=return to “00”, 1=go to Operation mode “10”]

Table 3.1 – Service/INIT mode display sequence

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### 3.3.4 Test mode (programming mode)

In Test mode it is possible to conduct verification tests of the SVM F4, see paragraph 7.5 Verifying the calculator, for further information. It is also possible to configure all parameters in Test mode by using the service program "FlexServ".

The optical interface is activated in Test mode and emits high frequent pulses corresponding to the energy increment. The M-Bus communication and the display response can be slow and in some cases interrupted when the calculator is in Test mode.

**Put the calculator in Test mode:** See paragraph 2.3 Test button.

**Energy consumption** is higher in Test mode compared to Operation mode. Avoid putting the calculator in Test mode for longer periods of time (+1h) or the battery life may be affected.

Flash symbol

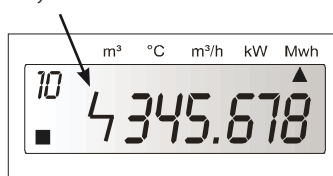


Fig. 3.6 – A flash symbol in the LCD indicates Test mode

**Configure the calculator with FlexServ**, should only be done by authorized personnel. All parameters can be configured, the meter type can be changed and the calculator mode can be changed.

**Note 1:** Changing the meter type will erase all meter registers.

**Note 2:** Avoid to put the calculator in Service/INIT or Test mode for long periods of time (+1h) or the battery life will be affected.

**Note 3:** Only use FlexServ v.2 or later.

**Note 4:** Calculators with energy unit "BTU" and flow unit "USG/min" have a fixed decimal setting.

# SVM F4

## TECHNICAL DESCRIPTION

### 3.3.5 Operation mode (Normal mode)

In Operation mode the calculator measures flow rate and flow and return temperatures and accumulates energy. It is also possible to read all registers on the display or via M-Bus or another communication protocol if applicable.

#### Display sequences

The default sequence in Operation mode is sequence 10, accumulated energy. The display always reverts to sequence 10 after 60 seconds of push button inactivity.

The first sequence digit is the sequence number, indicating the displayed sequence from 1 to F. Sequence 0, service/INIT, is only available after exiting Transport mode or activating the service button.

The second sequence digit is the value number, indicating which value is displayed in the specific sequence. The value number loops within each sequence. See also paragraph 3.3.5.1 Display sequence normal mode and 3.3.5.2 Display sequence normal mode (summary), for further information.

Go to the next value: Press and release the push button and the next value is displayed, e.g. from "10" to "11". After the last value the sequence is looped back again to the first value, e.g. from "16" to "10".

Enter next sequence: Press and hold the push button for a few seconds to enter another sequence. Release the push button when the desired sequence is displayed. After the last sequence, "F0" the display returns to "10" again.

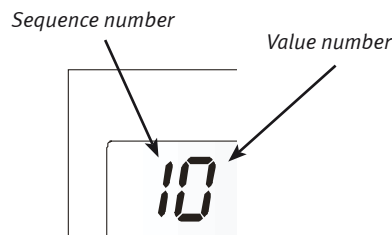


Fig. 3.7 – Sequence number and value number together form the display sequence.

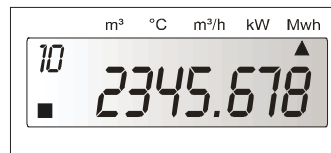


Fig. 3.8 – Display sequence "10" is the default sequence in Operation mode

#### Default position

In Operation mode the display will revert to the default sequence "10" after 60 seconds of push button inactivity.

#### Blinking digits

In accordance with EN1434 the digits after the decimal point is blinking.

#### Unit arrow

An arrow indicates the unit of the displayed value. The display label varies depending on the calculator type and configuration. Labels are available with different energy units (MWh, kWh, GJ and BTU), different temperature units (°C and °F) and different volume and flow units (m<sup>3</sup> and USG).

### 3.3.5.1 Display sequence normal mode

Seq	Description
10	Accumulated energy (Default position)
11	Accumulated volume according to flow sensor <sup>1</sup>
12	Display test, see Fig. 3.3
13	Accumulated volume for pulse input 1, [m <sup>3</sup> ]
14	Accumulated volume for pulse input 2, [m <sup>3</sup> ]
15	Error code, see Tabel 3.4
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 <sup>2</sup> , date of storage, [YYMMDD]
31	Account days <sup>2</sup> , Accumulated energy
32	Account days <sup>2</sup> , Accumulated volume according to flow sensor.
33	Account days <sup>2</sup> , Accumulated volume according to energy calculation
34	Account days <sup>2</sup> , Accumulated volume pulse input 1, [m <sup>3</sup> ]
35	Account days <sup>2</sup> , Accumulated volume pulse input 2, [m <sup>3</sup> ]
36	Account days <sup>2</sup> , Error code
37	Account days <sup>2</sup> , Error time, [Minutes]
3x	Following account days registers (loop back)
40	Monthly registers <sup>3</sup> , date of storage, [YYMMDD]
41	Monthly registers <sup>3</sup> , Accumulated energy
42	Monthly registers <sup>3</sup> , Accumulated volume according to flow sensor
43	Monthly registers <sup>3</sup> , Accumulated volume according to energy calculation
44	Monthly registers <sup>3</sup> , Accumulated volume pulse input 1, [m <sup>3</sup> ]
45	Monthly registers <sup>3</sup> , Accumulated volume pulse input 2, [m <sup>3</sup> ]
46	Monthly registers <sup>3</sup> , Error code
47	Monthly registers <sup>3</sup> , Error time, [Minutes]

Seq	Description
4x	Following monthly registers (loop back)
50	Operating time, [Hours]
51	Date, [YYMMDD]
52	Time, [HH.MM]
53	Recommended date for battery replacement, [YYMMDD]
60	Communication address, Primary address
A0	Communication address, Secondary address (normally same as meter S/N)
b0	Meter 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 <sup>1</sup>
71	Last remote read accumulated energy
72	Time since latest remote read accumulated energy, [Hours]
73	Accumulated error time, [Minutes]
74	Previous error code
75	Time for previous error code, [Minutes]
90	ID option board A
91	Status option board A
92	ID option board B
93	Status option board B
94	ID option board C
95	Status option board C
96	ID option board D
97	Status option board D
98	ID option board E
99	Status option board E
9A	ID option board F
9b	Status option board F
A0	Data for option board A (loop)
b0	Data for option board B (loop)
C0	Data for option board C (loop)
d0	Data for option board D (loop)
E0	Data for option board E (loop)
F0	Data for option board F (loop)

Table 3.2 – Display sequence

# SVM F4

## TECHNICAL DESCRIPTION

1. SVM F4 has two registers for accumulated volume. The volume in sequence 11, is incremented at the rate of arrived flow pulses. The volume in sequence 70 is only incremented in conjunction with energy calculation. Any volume pulse received when e.g. the temperature difference is 0, is added to the volume in sequence 11, but not added to the volume in sequence 70.
2. To change to the next account day (while sequence 30 is displayed) press and hold the push button until the date changes, and then release the button. After sequence 37 the display is looped back to sequence 30 and the next account day.
3. To change to a previous monthly register (while sequence 40 is displayed) press and hold the push button until the date changes, and then release the button when the desired date is displayed. After sequence 47 the display is looped back to sequence 30 and the previous monthly register.

### 3.3.5.2 Display sequence normal mode (summary)

10	-	Readout values 1 (Power, flow)
20	-	Readout values 2 (Temperature, momentary values)
30	-	Account days values
40	-	Monthly registers
50	-	Date registers
60	-	Communication, settings
70	-	Volume check, error listings
90	-	Option board status
A0	- F0	Option board sequences

### 3.3.5.3 Display sequence normal mode schematics

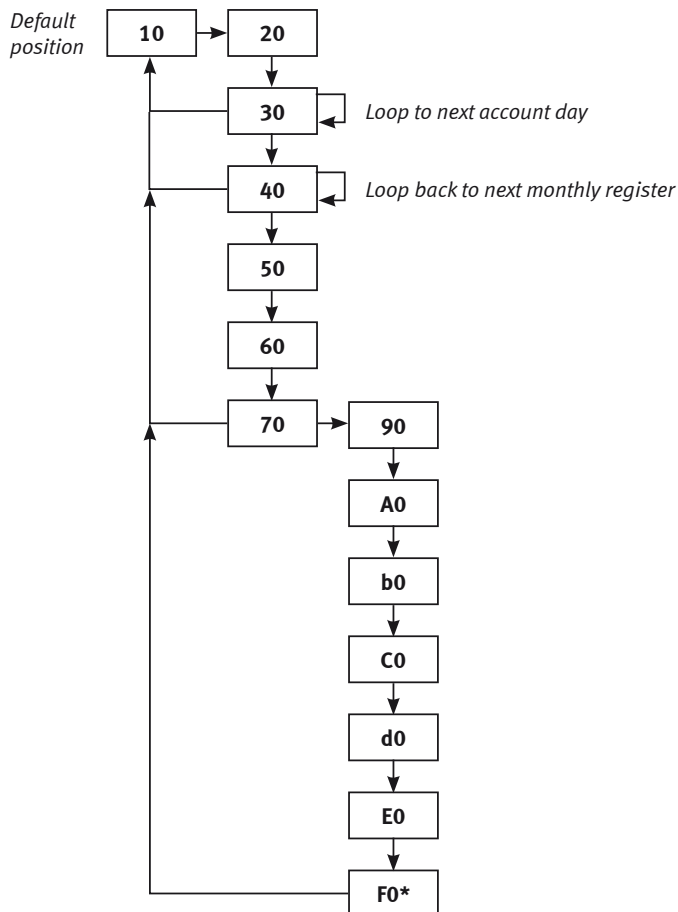


Fig. 3.9 – Display schematics for “normal mode”.

**To change sequence**, press and hold the push button, and release the button when the desired sequence is displayed.

**To change values** within a specific sequence, press and release the push button.

# SVM F4

## TECHNICAL DESCRIPTION

### 3.4 Error codes

If an error or malfunction occurs the error indicator described in paragraph 3 Display, appears on the LCD, and an error code is triggered.

The error code can be read on the display or over the M-Bus communication and is also stored in the monthly registers and the account days. Error codes are found in the following display sequences:

15	Current error code
36	Account day; error code at date of storage
46	Monthly register; error code at date of storage
74	Previous error code

The error code consists of three hexadecimal digits, cf. Table 3.3, and is read from the right to the left. Each digit can have up to 4 different errors in combination.

Display digit 1 (first from right)	1	Low temp. sensor disconnected
	2	Low temp. sensor short circuit
	4	High temp. sensor disconnected
	8	High temp. sensor short circuit
Display digit 2 (second from right)	1	Internal bus collision has occurred within 24 hours.
	2	I <sup>2</sup> C error (internal bus error)
	4	Low flow
	8	Alarm input, low voltage*
Display digit 3 (third from right)	1	Battery expire
	2	Oscillator error
	4	Pulse input too long
	8	Not in use

Table 3.3 – Error code numbers

**Example:** 0000045

First digit 5 from right = Error code 4 + Error code 1 = Temperature sensors (low+high) disconnected

Second digit 4 from right = Error code 4 = Low Flow

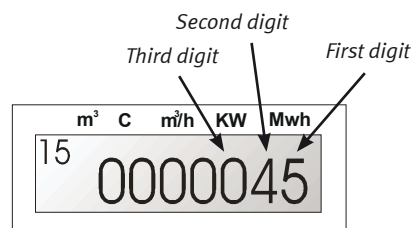


Fig. 3.10 – Error at display sequence “15”  
first digit “5”, second digit “4”

# SVM F4

## TECHNICAL DESCRIPTION

Hex.	No.		Error number(s)
	Hex.	Dec.	
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	1 + 2
4	4	4	4
5	5	5	4 + 1
6	6	6	4 + 2
7	7	7	4 + 2 + 1
8	8	8	8
9	9	9	8 + 1
A	10	10	8 + 2
B	11	11	8 + 2 + 1
C	12	12	8 + 4
D	13	13	8 + 4 + 1
E	14	14	8 + 4 + 2
F	15	15	8 + 4 + 2 + 1

Table 3.4 – Hexadecimal error codes

\* The error code "0000080" can have different meanings depending on the calculator settings.

1. Low voltage is the default meaning and appears when mains is disconnected.
2. External alarm, if an external device is connected.
3. Error code "0000080" appears briefly when the Save data button is shorted, see paragraph 2.4 Save data button.

# SVM F4

## TECHNICAL DESCRIPTION

### 4 Seals, calculator protection

SVM F4 is protected against tampering with a number of seals. Sticker seals protect the service button and the test button. The interior of the meter including the PCB is protected with factory sticker seals. If the factory seal is broken, the warranty and the verification are void. The calculator lid can also be sealed by the user with a wire seal.

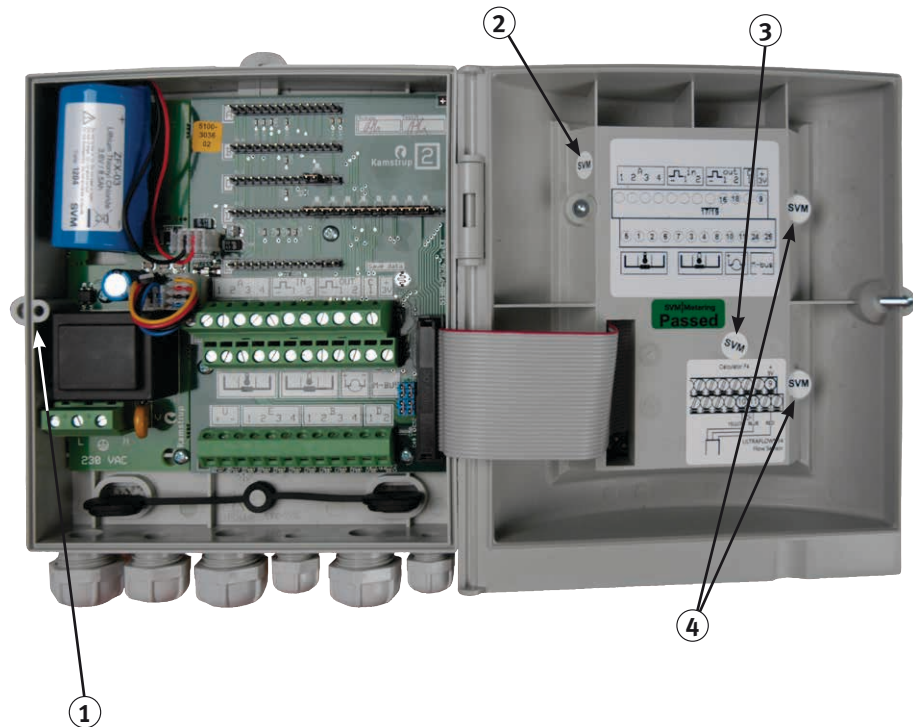


Fig. 4.1 – SVM F4 seals

#### Seals

1. User seal, installation and tampering protection
2. Service seal, protects the service button/service mode
3. Test seal, protects the test button/test mode
4. Factory seal, protects the warranty and verification of the meter.

# SVM F4

## TECHNICAL DESCRIPTION

### 4.1 Neutral seals

A set of neutral seals are included with each SVM F4 calculator. These neutral seals can be used to re-seal e.g. the service button after installation or configuration.

### 4.2 Volume check

SVM F4 has two separate volume registers that after comparison can be used to detect mal-function or fraud.

The two volume registers operate in different ways:

- Total volume, accumulates for each flow sensor pulse (display sequence 11)
- Volume accumulated only in conjunction with energy calculation (display sequence 70)

If the calculator works properly, these two registers should be a close match. However there could be a small difference of a few percent, where the volume in sequence 70 is slightly smaller. A significant difference in these two registers indicate that the meter is not working properly.

### 4.3 Error log

If an error code occurs in SVM F4 it is stored and can be traced in several ways, both on the LCD and over the M-Bus communication:

- An error indicator is triggered on the LCD, see paragraph 3 Display.
- The current error code is shown in display sequence 15.
- The previous error code is shown in display sequence 74.
- The error code and error time is stored in the account day registers in display sequence 36-37.
- The error code and error time is stored in the monthly registers in display sequence 46-47.
- The accumulated error time is shown in display sequence 16.

# SVM F4

## TECHNICAL DESCRIPTION

### 5 Connecting the calculator / handling

Fig. 5.1 below shows the main connection board of SVM F4.

**Note:** Only option boards marked with “2” may be installed in SVM F4.

#### 5.1 SVM F4 connection board

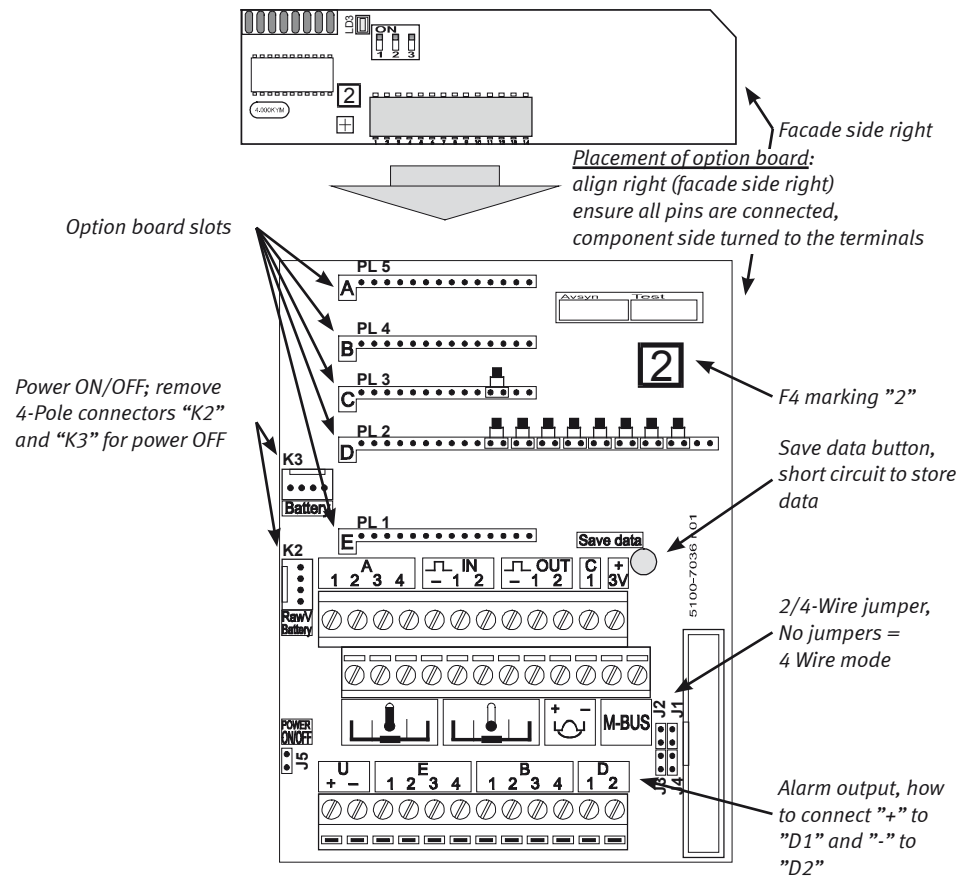


Fig. 5.1 – SVM F4 connection board

# SVM F4

## TECHNICAL DESCRIPTION

### 5.2 Connection terminals

#### 5.2.1 Sensors and M-Bus connection

The connections of temperature sensors are shown in Fig. 5.2 and Table 5.1, numbering in accordance to EN1434.

**Warning;** Make sure that the M-Bus is connected to the proper terminals. Incorrect connection may damage the meter.

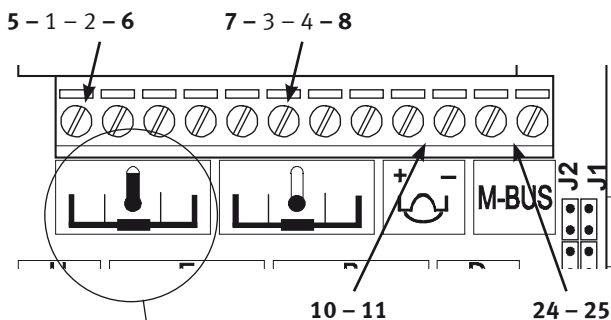


Fig. 5.2 – Terminal numbering according to EN1434.

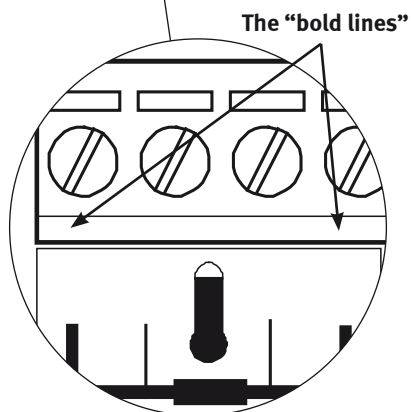


Fig. 5.3 – When using the 2-wire method, the wires are to be connected to terminals marked with the "bold lines".

# SVM F4

## TECHNICAL DESCRIPTION

### 5.2.1.1 EN1434 terminal table

Terminal no.	Signal description
1	High temp. sensor*
2	High temp. sensor*
3	Low temp. sensor*
4	Low temp. sensor*
5	High temp. sensor
6	High temp. sensor
7	Low temp. sensor
8	Low temp. sensor
10	Flow sensor signal input (+)
11	Flow sensor signal input (-)
16	Pulse 1 output (+)
17	Pulse 1 output (-)
18	Pulse 2 output (+)
19	Pulse 2 output (-)
24	M-Bus interface**
25	M-Bus interface**
26	Earth symbol
27	N (neutral)
28	L (line)

Table 5.1 – Terminal connection according to EN1434

\* Used for 4-wire connection only.

\*\* Polarity insignificant

For 2-wire connection of the temperature sensors, use terminals 5, 6, 7 and 8.

# SVM F4

## TECHNICAL DESCRIPTION

### 5.2.2 Pulse input connection

The calculator can accumulate pulses from other meters, such as electricity meters, cold and warm water meters and gas meters. The pulse input shall be connected to the terminals marked "IN" and the output from the external device shall be of the type "Open collector". The input is of the type "TDL" and can supply a pulse output with 3 V – max. 20 mA.

**Pulse input 1**, connect  
"+" to "IN 1",  
"-“ to "IN -“



Fig. 5.4 – Pulse input

**Pulse input 2**, connect  
"+" to "IN 2",  
"-“ to "IN -“

#### Specification pulse input:

Min. pulse duration 40 ms, Voltage: 3 V. The pulse registers accumulates the pulses, see also paragraph 1.3.3 Pulse counter register 1 and 2.

**Note:** The jumpers on slot C and D must be correctly set according to the marking on the connection board, otherwise the pulse inputs will not work.

### 5.2.3 Pulse output connection

Pulse outputs for energy and volume are generated from the terminals marked "OUT". The pulse outputs are of the type "Open collector".

The pulse factor follows the display settings, where energy and volume units can be found together with the decimal setting. For each increment of the least significant digit on the display, a pulse is emitted.

**Example:** Energy in MWh with 3 decimals (e.g. 1.234 MWh). An energy pulse is emitted for every 0.001 MWh = 1 imp/kWh.

Volume in m<sup>3</sup> with 2 decimals (e.g. 5.67 m<sup>3</sup>). A volume pulse is emitted for every 0.01 m<sup>3</sup> = 1 imp/10 litres.

**Pulse output 1**, connect  
"+" to "OUT 1" and  
"-“ to "OUT -“

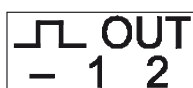


Fig. 5.5 – Pulse output

**Pulse output 2**, connect  
"+" to "OUT 2" and  
"-“ to "OUT -“

**Specification** of the pulse outputs max. 30 V, max. 20 mA and pulse duration 125 ms.

**Note:** The jumpers on slot D must be correctly set according to the marking on the connection board, otherwise the pulse outputs will not work.

# SVM F4

## TECHNICAL DESCRIPTION

### 5.2.4 Connection 3V/12V

The calculator can supply an external device with 3 V/12 V, with 20 mA in total, see Fig. 5.6. The 12 V connection exists only in mains powered calculators.

**3 V**, connect “+” to “+3 V” and “-“ to “IN -”

**12 V**, connect “+” to “U +” and “-“ to “IN -“

**Note:** The calculator can supply max. 20 mA to other devices.

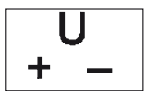


Fig. 5.6 – Terminals for 3 V/12 V

### 5.2.5 Save data

By short short-circuiting the “Save data” button using the plastic “Test key” the calculator will store the measured values to the built-in EEPROM. This is necessary when installing option boards to avoid losing calculator data. See also paragraph 2.4 Save data button, for further information.

### 5.2.6 Alarm output connection

SVM F4 is equipped with an alarm output. The alarm emits one pulse every hour as long as an alarm exists in the calculator. The alarm output can be configured in the Service Program “FlexServ” and may also be disabled.

The alarm output shall be connected to the terminals marked D. The alarm output is of the type “Open collector”.

**Alarm,** connect  
“+” to “D1” and  
“GND” to “D2”

**Specification:** max 30 V, max 20 mA,  
Pulse duration 125 ms.

**Note:** The jumpers on slot D must be correctly set according to the marking on the connection board, otherwise the alarm output will not work.

# SVM F4

## TECHNICAL DESCRIPTION

### 5.2.7 Option board connection

The terminals marked A, B, C, D and E are used when option boards are installed in the corresponding card slots. For connection, cf. the specific documentation for each option board. The following option boards can be installed into SVM F4:

Option board	Description	Type
FCUN	Un-install	Function board
FCLG	Data logger	Function board
FCMX	Peak values	Function board
FCTF	Tariff	Function board
<i>FC2M</i>	<i>RS232-M-Bus, terminated</i>	<i>Communication board</i>
FC2N	RS232-M-Bus	Communication board
FCMB	M-Bus	Communication board
FC10	LON FTT10	Communication board
FC2S	RS232-SIOX	Communication board
FCSX	SIOX	Communication board
FCAU	Analogue output	Analogue board
FCII	Analogue input, 0/4-20mA	Analogue board
FCIU	Analogue input, 0/2-10V	Analogue board
FCIP	Analogue input, Pt100	Analogue board
<i>FCRA</i>	<i>Alarm, terminated</i>	<i>Relay board</i>
FCRC	Relay, isolation	Relay board
FCR2	M-Bus isolation	Relay board
<i>FCU2</i>	<i>Pulse adaptation U2500, terminated</i>	<i>Relay board</i>

Table 5.2 – Option boards for SVM F4.

# SVM F4

## TECHNICAL DESCRIPTION

### 5.3 Battery and mains connection

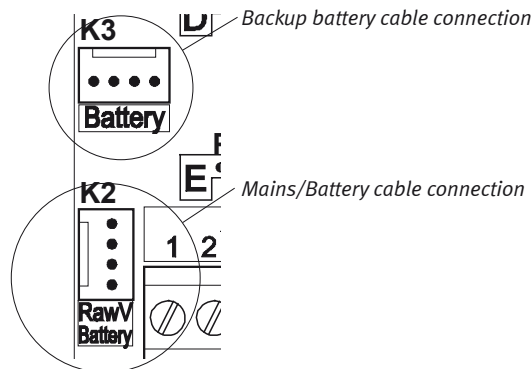


Fig. 5.7 – Battery/Mains power supply and backup battery connection

**Battery supply:** When battery supply is selected, SVM F4 is delivered with a C-cell or with a D-cell. The battery is connected to the connector marked “K2”. With a D-cell the F4 can also supply an ULTRAFLOW® 54 flow sensor. Old versions of SVM F4 can also be equipped with 2 AA-cells where one is connected to the connector marked “K2” and the other to “K3”.

**Mains supply:** When mains supply is selected, SVM F4 is delivered with a mains module including a C-cell for back-up. Old versions of the mains module for SVM F4 are equipped with an AA-cell as back-up. In both cases, the cable from the mains transformer is connected to the connector marked “K2” and the back-up battery is connected to “K3”.

Connect the mains cable to the terminals marked “L”, “N” and earth symbol, see also Fig. 5.9.

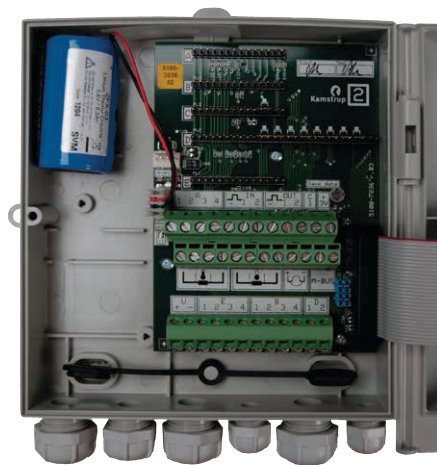


Fig. 5.8 – SVM F4 with battery supply (C-cell).

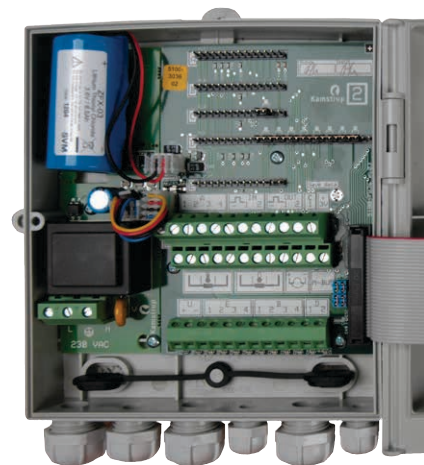


Fig. 5.9 – SVM F4 with mains supply.



# SVM F4

## TECHNICAL DESCRIPTION

### 5.5.1 Option board installation procedure

Some option boards are equipped with a processor and must be installed into the EEPROM memory of the calculator. These option boards are the function boards, communication boards and analogue boards. The following installation procedure is a general description of how to install an option board in SVM F4. Each option board has its own specific documentation where the installation procedure is described in detail.

1. Short circuit the “save data” button.
2. Disconnect the flow sensor.
3. Turn power off by removing the 4-pole connectors “K2” and “K3”.
4. Check that the dip switches are correctly set for the selected card slot, see Table 5.3.
5. Install the option board into the selected card slot. The component side shall be turned towards the terminals, and align the chambered end of the board with the right side of the calculator box. Ensure that all pins are connected.
6. Turn power back on by reconnecting the 4-pole connectors “K3” and “K2”. If the installation is successful, the LED “LD3” blinks a few seconds and is then turned off.
7. If additional boards shall be installed, repeat the steps 3-6 above.
8. Reconnect the flow sensor.

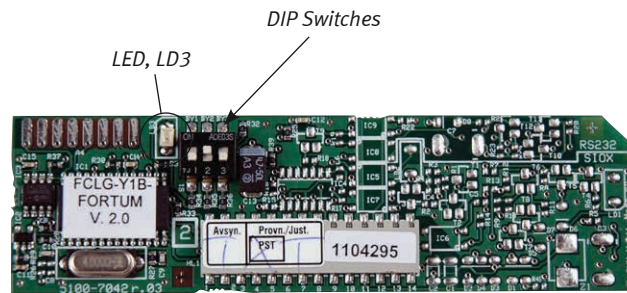


Fig. 5.11 – Option board, Component side

### 5.5.2 DIP-Switch setting of option board

Slot	BY 1	BY 2	BY 3
A	On		
B		On	
C	On	On	
D			On
E	On		On
F			
Service	(On)	On	On

Table 5.3 – DIP-Switch setting of option board for card slots, On – “ON”, “ ” – “OFF”, (On) – insignificant

Not all option boards can be combined and most of the option boards must be installed in certain slots. For further information see the specific documentation for each option board.

### 5.5.3 Configure the option board

The option boards can be configured with the F4 adapter kit (FT-4-adapt-kk) and the Plug & Play service utility. Before configuring an option board, also read the data sheet for the specific option board.

### 5.5.4 Reconfigure option boards

When an option board shall be re-configured it must be removed from the F4 calculator and uninstalled from the E<sup>2</sup>PROM memory. The un-installation procedure is described in paragraph 5.5.5 below. All stored option board data will be lost after re-configuring.

### 5.5.5 Removal, uninstillation and re-configuration of option boards

To remove an option board completely from SVM F4 it must also be uninstalled from the calculator E<sup>2</sup>PROM memory. The uninstillation procedure is described in steps 1-7 below. When the option board is re-configured, this procedure is described in steps 8-14 below.

1. Short circuit the “save data” button.
2. Disconnect the flow sensor.
3. Turn power off by removing the 4-pole connectors “K2” and “K3”.
4. Remove all option boards from the calculator.
5. Install the uninstillation option board into card slot A. The component side shall be turned towards the terminals, and align the chambered end of the board with the right side of the calculator box. Ensure that all pins are connected.
6. Turn power back on by reconnecting the 4-pole connectors “K3” and “K2”. If the uninstillation is successful, the LED “LD3” blinks a few seconds and is then lit steadily.
7. Turn power off by removing the 4-pole connectors “K2” and “K3”.
8. Remove the uninstillation option board. If new and/or reconfigured option boards shall be installed, follow steps 9-13. If no option boards shall be installed, turn power back on by reconnecting the 4-pole connectors “K3” and “K2”, and go directly to step 14.
9. When required, reconfigure the option board by using the Plug & Play Service utility.
10. Check that the dip switches are correctly set for the selected card slot, see Table 5.3.
11. Install the option board into the selected card slot. The component side shall be turned towards the terminals, and align the chambered end of the board with the right side of the calculator box. Ensure that all pins are connected.
12. Turn power back on by reconnecting the 4-pole connectors “K3” and “K2”. If the installation is successful, the LED “LD3” blinks a few seconds and is then turned off.
13. If additional boards shall be installed, turn power off by removing the 4-pole connectors “K2” and “K3”, and then repeat the steps 10-12.
14. Reconnect the flow sensor.

# SVM F4

## TECHNICAL DESCRIPTION

### 5.6 Cable glands

SVM F4 is equipped with 6 PG cable glands for signal leads, cf. Fig. 5.12 below. The protection class for the electronic casing comply with IP54.

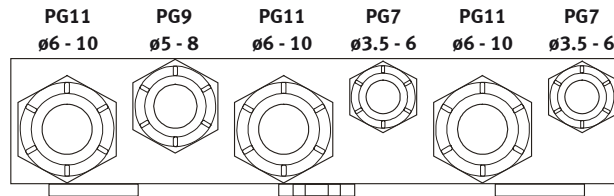


Fig. 5.12 – Cable glands SVM F4

### 5.7 Mounting

SVM F4 is designed for wall mounting, cf. Fig. 5.13 and Fig. 5.14. After installation the holes should be sealed with the enclosed rubber plugs.

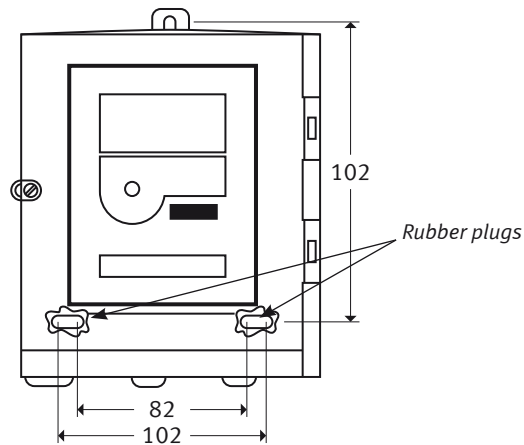


Fig. 5.13 – F4 front view (dimensions)

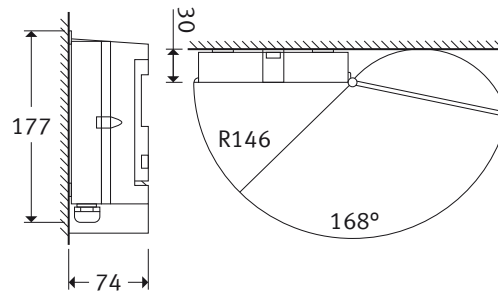


Fig. 5.14 – F4 wall mounted (dimensions)

# SVM F4

## TECHNICAL DESCRIPTION

### 5.8 Zero sequence current

When SVM F4 is connected to different inputs and outputs there is a possibility that sub sequence currents may occur. These currents can cause problems in the meter with disturbed signals or lost communication, and it is therefore recommended to galvanically isolate the calculator in order to avoid these problems. SVM F4 can be equipped with option boards for galvanic isolation of the pulse inputs, pulse outputs, alarm output and the M-Bus:

FCRC option board: Galvanic isolation of pulse inputs, pulse outputs and alarm output.

FCR2 option board: Galvanic isolation of the M-Bus loop.

FCMB option board: An additional M-Bus output with galvanic isolation.

#### 5.8.1 Description of zero sequence current

The phenomena are common in electrical circuits that are not isolated from each other and where two or more devices are connected to ground. A current will appear if there is a difference in potential between two ground levels. This current uses the non isolated I/O and the signal leads to travel through the calculator and may cause problems. The difference in potential and thus the zero sequence current in district heating or cooling systems can be considerable.

The problem with zero sequence current is illustrated in Fig. 5.15 and Fig. 5.16.

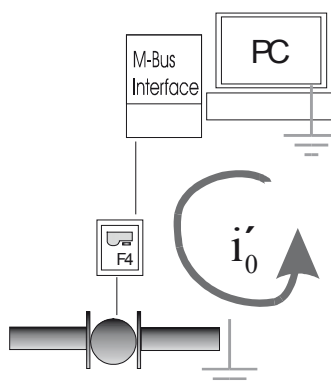


Fig. 5.15 – Zero sequence current between the M-Bus system PC and heat meter flow sensor. The current runs through the calculator causing disturbance.

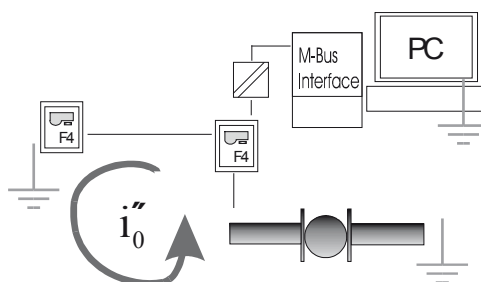


Fig. 5.16 – The M-Bus interface provides galvanic isolation between the PC and the M-Bus loop. A zero sequence current appear on the M-Bus loop between heat meters on different ground levels. The current runs through the calculators causing disturbance.

## 6 Calculation

SVM F4 is approved according to the measuring instruments directive 2004/22/EC (MID) and fulfils EN1434:2006 part 1 and 2.

SVM F4 also fulfils the requirements for environmental class C, in accordance with EN1434:2006 part 4.

### 6.1 Energy measurement

SVM F4 measures the temperature difference between the hot and cold lines with a sampling time in the range 5-60 seconds\*. The sampling time depend on the pulse frequency in the following way:

Time between pulses	Measurement
<5 sec.	Every 5 seconds, the sum of all received pulses is used for energy calculation
>5 sec.	Energy measurement takes place after each volume pulse received.
>60 sec.	Temperatures updated every 60 seconds even if no pulse is received.

The minimum time between two measurements is 5 seconds, and the maximum time is 60 seconds. If the pulse frequency is high, the sum of all pulses received during 5 seconds is used in the energy calculation. If the pulse frequency is moderate with less than 1 pulse every 5 seconds, energy calculation takes place after each volume pulse received. If the pulse frequency is low and if no pulses are received in 60 seconds, the temperatures are measured and updated anyway, but no energy calculation takes place. The recorded temperature difference and the pulse value are necessary parameters for the energy calculation.

\* *Default values for the sampling time. Other values can be set by using the FlexServ software.*

### 6.2 Power and flow

Power and flow (momentary values) are calculated at the end of an averaging period of 4 seconds\*.

The calculation of the flow is based on the number of volume pulses received during an averaging period. There are two different cases with the following simplified formulas applicable:

1. Normal condition  $F=k*(N/t)$

2. Shut off  $F=k*(N0/t+t0)$

where

F Flow

k Constant, depending on pulse factor, decimal setting and energy unit

N Number of pulses received during an averaging period

t Averaging time

t<sub>0</sub> Time since the last pulse was received

Flow and power are updated simultaneously, and power is based on the flow calculation and the temperature measurement.

\* *Default value for the averaging time. Other values can be set by using the FlexServ software.*

### 6.3 Storing values

SVM F4 automatically stores the measured values at each dayshift (at 00:00 each day) or when the “save data button” is shorted, see also paragraph 2.4 Save data button.

If power fails or if the 4-pole connectors “K2” and “K3” are disconnected without first shorting the save data button, the measured values in the temporary memory of the calculator will be lost. When power is restored, the meter will recall the last readings from the E<sup>2</sup>PROM memory stored at the last dayshift, and reset the internal clock to “00:00”.

## 7 Testing, programming & service

### 7.1 Programming the calculator

The calculator settings in SVM F4 can be configured by putting the calculator in Service mode or INIT mode, see also paragraphs 3.3.2 and 3.3.3.

SVM F4 can also be put in Test mode where it is possible to conduct verification tests, cf. paragraph 7.5.

Test mode is also called Programming mode, where all parameters can be configured and the calculator can be completely re-programmed. To put SVM F4 in programming mode it is necessary to break the seal protecting the Test button, cf. paragraph 2.3. Use the service program "FlexServ" v.2.0 or higher to reprogram SVM F4.

**Note:** When the calculator is reprogrammed all stored data, including option board data is lost.

**Note:** All option boards must be removed prior to reprogramming the calculator, and then re-installed. Depending on the new calculator settings, it may be necessary to reconfigure the option boards as well before they can be re-installed.

### 7.2 Display test

A display test is available in display sequence 12, cf. Fig. 7.1.

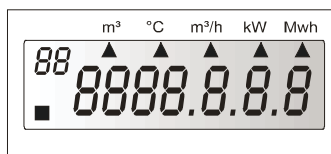


Fig. 7.1 – Display test

### 7.3 Installation test

After installation, it is recommended to perform a simple test, to ensure that the calculator has been properly installed. Always check the following before the meter installation is considered finalized:

1. If there currently is a flow through flow sensor, check that the flow indicator (a square symbol) in the lower left corner is flashing. Also check that the momentary flow rate in display sequence 21 is reasonable.
2. Check the error code in display sequence 15. If everything is OK the LCD will display "000000". If error code 40 appears, this means "low flow". Wait until the flow sensor emits a pulse and check the error code again.
3. To ensure that the temperature sensors have been installed correctly, check the forward temperature, return temperature and the temperature difference in display sequences 22, 23 and 24.
4. Ensure that the pulse value in display sequence 63 corresponds to the pulse value on the flow sensor label.
5. Check the date, real time clock and the communication address.

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### 7.4 Service

When SVM F4 is in for service or re-verification it may be necessary to change the calculator settings by using the service menu. In the following paragraphs the service procedure and service menu is described in detail.

Recommended procedure for Service mode:

1. Break the service seal, push and hold the service button, push and release the push button, release the service button. SVM F4 is now in service mode with sequence "00" on the LCD.
2. Go through the service sequence and make necessary changes. See also paragraphs 7.4.1 to 7.4.9.
3. Exit service mode from sequence "0A" or push and hold the service button, push and release the push button, release the service button. SVM F4 is now in normal mode with sequence "10" on the LCD.
4. Replace the broken seal.

The push button has a dual function. When the button is pressed and held the meter toggles through the service sequence without any values being changed. When the button is pressed and released again, the value of the current flashing digit is changed one step (+1).

**Use the push button, as in the example below to change the date:**

1. Sequence "00" is displayed when the meter is set into Service mode. Keep the button depressed until sequence "01" is displayed.
2. Sequence "01" is displayed with YYYYMMDD = 110520. The first digit flashes. The date shall be set to 110525.
3. Press and hold the push button until the next digit starts flashing, and keep the button depressed until the last digit, the one to be changed, starts flashing, then release the button.
4. Press and release the button five times until the last digit is set to 5.
5. Press and hold the push button again until sequence "02" is displayed. Continuing to the next sequence "02" stores the changed settings in the previous sequence "01".
6. When all desired changes are made, press and hold the push button until sequence "0A" is displayed.
7. Press and release the push button to change the digit in sequence "0A" from 0 to 1.
8. Press and hold the push button once again until sequence "10" (operation mode) is displayed.

#### 7.4.1 Time (RTC)

The real time clock (RTC) is set in sequence "00" with the format "HHMM".

#### 7.4.2 Date

The date is set in sequence "01" with the format "YYYYMMDD".

#### 7.4.3 Pulse value

The pulse value or pulse factor is set in two steps in sequences "02" and "03":

"02", pulse value with four digits, and

"03", no. of decimals for the pulse value.

**Example:** Pulse value 2.5 l/p.  
"02" is set to 2500, and "03" is set to 3.

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## TECHNICAL DESCRIPTION

### 7.4.4 Account days

The account days are two extra monthly registers with a programmable date of storage. The dates are set in sequences "04" and "05":

"04", Account day 1 with the format "MMDD".

"05", Account day 2 with the format "MMDD".

The default setting is "0101" for account day 1, and "0701" for account day 2.

### 7.4.5 Communication address (primary address)

The primary communication is set in sequence "06". The communication address is displayed with four digits, but uses only three in the range 0-250.

**Example,** The primary address 58 is selected and set as "0058".

### 7.4.6 Resetting stored error time

The accumulated error time can be reset in sequence "07". Set the value to "0" and continue to sequence "08" by pressing and holding the push button. To keep the accumulated error time, set the value to "1" and then continue to sequence "08".

### 7.4.7 Flow sensor placing

The flow sensor placing, in the high or low temperature line, is set in sequence "08" in the format "0" or "1":

0 = Flow sensor installed in low temperature (cold) pipe.

1 = Flow sensor installed in high temperature (hot) pipe.

### 7.4.8 Recommended date for battery replacement

The recommended date for battery replacement is set in sequence "09" in the format "YYMMDD".

**Note:** If the date expires an alarm is triggered that can only be reset by using the service program "Flex-Serv".

### 7.4.9 Return to Operation mode/Normal mode

In sequence "0A" it is possible to either start all over again with the service sequence and go to "00", or to return to Operation mode/Normal mode:

"1" = Exit Service mode, and return to sequence "10", Operation mode.

"0" = Start over in Service mode and go back to sequence "00".

### 7.4.10 Clarifications on format

YY	=	Years with two digits
MM	=	Months with two digits
DD	=	Days with two digits
HH	=	Hours with two digits
MM	=	Minutes with two digits

**Example:** Account days, format "MMDD", Display shows, "1201".  
December (12) the first (01).

### 7.5 Verifying the calculator

Verification of the calculator's measurement accuracy is undertaken in Test mode, where energy and volume pulses are issued via the optical HF-output at the service adapter. A pulse burst is emitted from the calculator for each conducted energy calculation, that is usually done after each volume pulse received from the flow sensor.

To test or verify the measurement accuracy of SVM F4 by means of the HF-pulses, proceed as follows:

1. Short circuit the test button with a test key, push and release the push button and then release the test button to put the SVM F4 in Test mode. Test mode is indicated with a flash symbol on the LCD. Also cf. paragraph 3.3.4 for further information.
2. Connect fixed resistances for simulation of Pt100 or Pt500 temperature sensors to terminals 5-6 (high temperature) and to 7-8 (low temperature). Terminals 1-4 are only used for 4-wire connection of the temperature sensors.
3. Connect a pulse generator to terminals 10-11 (terminal 11 is ground) in order to simulate flow sensor pulses.

**Note:** Max voltage is 3V.

4. Connect an OPTO-head/interface to the optical HF adapter at the front of the calculator.
5. Simulate a flow sensor pulse and the calculator will issue a 20kHz (approx.) pulse burst corresponding to  $100 \cdot k \cdot dt$  pulses via the HF-output. "k" is the energy factor (kWh/°C/m<sup>3</sup>) and dt is the temperature difference between the simulated flow and return temperatures.

**Example:**  $R_f=138.50\Omega(100.00^\circ\text{C})$ ,  $R_r=127.07\Omega(70.00^\circ\text{C}) \rightarrow$

$dt=30.00\text{K}$ ,  $k=1.141 \rightarrow$

$100 \cdot 1.141 \cdot 30=3423$  HF-pulses

6. The next flow sensor pulse can be simulated immediately after the HF pulse burst from the calculator has been issued.

To leave Test mode, short circuit the test button with a test key, push and release the push button and then release the test button. The calculator returns to Operation mode.

To test or verify the measurement accuracy of the meter with the help of the display, first set up connections in accordance with points 2 and 3 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 liter/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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### 8 Technical data

#### 8.1 Power supply

Battery	3.6 V – 8.5 Ah C-cell, or 3.6 V – 19 Ah D-cell Operation time max. 10 years
Mains	230 V±10%, 45-65 Hz, back-up batter 3.6 V, 8.5 Ah C-cell

Table 8.1 – Power supply

#### 8.2 Temperature sensors

Approved and matched pairs, Pt100 or Pt500 may be used.

**Note:** SVM F4 is configured for Pt100 or Pt500 upon ordering the calculator, and this configuration can not be changed. The calculator label indicates if the F4 is configured for Pt100 or Pt500.

Maximum sensor current (RMS): Pt100 – 4 µA; Pt500 – <1 µA

Cross section [mm <sup>2</sup> ]	Maximum cable length in [m] for	
	Pt100	Pt500
2-wire, 0.22	2.5	7.5
2-wire, 0.50	5	25
2-wire, 0.75	7.5	37.5
2-wire, 1.50	15	75
4-wire, min. 0.5	100	100

Table 8.2 – Cross section vs. cable length

#### 8.3 Flow sensors

Flow sensors with pulse output.

Frequency Max.	[Hz]	12 Hz
Pulse Value	[l/p]	0.0001-9999
Pulse Length Min.	[ms]	40
Voltage Max.	[V]	30
Cable length Max.	[m]	15

Table 8.3 – Flow sensor specifics

#### 8.4 Temperature ranges

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

Table 8.4 – Temperature ranges

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## TECHNICAL DESCRIPTION

### 8.5 Ambient temperature & Temperature class

SVM F4 comply with the prerequisites for Environmental Class C according to EN1434.

Ambient temperature Storage/Transport	-20...+70°C
Ambient temperature Operation	+5...+55°C

Table 8.5 – Ambient temperature ranges

### 8.6 Flow sensor placing

SVM F4 can be configured for flow sensor placed in hot or cold pipe. This is marked H = hot or L = Low in the display.

### 8.7 Maximum values for power

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

Pulse values [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 8.6 – Max. power pulse values

### 8.8 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 every five seconds. When the period between the flow sensor pulses exceeds 60 seconds, a measurement takes place every 60th second. For this measurement only the temperature is updated.

### 8.9 Data output interfaces

M-Bus acc. to EN1434-3	OPTO-interface (EN60870-5) and bus connection (terminal)
SIOX	Option Board, bus connection (terminal)
LonWorks	Option board, bus connection (terminals)

Table 8.7 – Data output interfaces

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## TECHNICAL DESCRIPTION

### 8.9.1 Data output table

Data	M-Bus		SIOX	
	acc. EN 60870-5	Manufactures Specific	SVM820	Ext-ended
Flow sensor placing	X		X	X
Program version	X		X <sup>4</sup>	X
Manufacturer	X			
Communication address	X		X	X
Meter number	X			X
Error code (limited)	X		X	X
Accumulated energy	X		X	X
Accumulated, volume 1 <sup>1</sup>	X		X	X
Accumulated, volume 2 <sup>2</sup>	X			X
Flow temperature (high)	X		X	X
Return temperature (low)	X		X	X
Temperature difference	X		X	X
“Operation time” (operation time, error time)	X			X
Momentary flow	X		X	X
Momentary power	X		X	X
Time and date	X			X
Pulse register for pulse input 1	X			X <sup>6</sup>
Pulse register for pulse input 2	X			X <sup>6</sup>
Monthly values <sup>3</sup> data storage	X			X
Monthly values <sup>3</sup> accumulated energy	X			X
Monthly values <sup>3</sup> accumulated volume 1 <sup>1</sup>	X			X
Monthly values <sup>3</sup> accumulated volume 2 <sup>2</sup>	X			X
Account days, same as monthly values, see above	X			X
High resolution energy		X	X	X
High resolution volume 1 <sup>1</sup>		X	X	X
High resolution volume 2 <sup>2</sup>		X		X
Relevant error code		X		X
Accumulated time for relevant error (minutes)		X		X
Previous error code		X	X <sup>5</sup>	X <sup>5</sup>
Previous accumulated time for relevant error		X		
Manufacturing number		X		
Pulse value		X		
Latest read energy via communication		X		
Time [h] since latest reading		X		
Recommended date for battery replacement		X		X
Error codes and accumulated error times during storage (see monthly registers and account days above)		X		X

Table 8.8 – Data output

- 1) Total volume according to the flow sensor
- 2) Total volume according to energy calculation
- 3) 37 registers
- 4) To be compatible with existing systems, the version no. is fictitiously set to 4
- 5) Total error time
- 6) The option board can be configured to display pulse register units.

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## TECHNICAL DESCRIPTION

### 9 Appendix

#### 9.1 Decimal settings

Pulse value [l/p]	MWh	GJ	m <sup>3</sup>	KWh	MBTU	kW	m <sup>3</sup> /h
1.0	0.001	0.001	0.001	0.1	0.001	0.01	0.001
10	0.01	0.01	0.01	1	0.01	0.1	0.01
100	0.1	0.1	0.1	-	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 9.1 – Decimal settings. The options marked "-" should be avoided

#### 9.2 Decimal settings for pulse inputs

Pulse value [l/p]	m <sup>3</sup>
1.0	0.001
10	0.01
100	0.1
1000	1
2.5	0.01
25	0.1
250	1
2500	1

Table 9.2 – Decimal settings for pulse inputs