

Operating Instructions for Calorimetric Flow Meter, Monitor, Totalizer

Model: DVK



1. Contents

1. Contents.....	2
2. Note	3
3. Regulation Use	3
4. Operating Principle.....	4
5. Instrument Inspection.....	4
6. Mechanical Connection.....	5
6.1. Check Operating Conditions	5
6.2. Installation.....	5
7. Electrical Connection	6
7.1. General.....	6
7.2. Compact Version DVK-12.....	6
7.3. Separate Version DVK-22., DVK-42.....	7
8. Commissioning.....	7
8.1. General.....	7
8.2. Flow Rate Setting	8
8.3. Error Connection.....	12
9. Technical Information.....	12
10. Order Codes	14
11. Dimensions	15
12. EU Declaration of Conformance	18

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2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.

The instruction manuals on our website www.kobold.com are always for currently manufactured version of our products. Due to technical changes, the instruction manuals available online may not always correspond to the product version you have purchased. If you need an instruction manual that corresponds to the purchased product version, you can request it from us free of charge by email (info.de@kobold.com) in PDF format, specifying the relevant invoice number and serial number. If you wish, the operating instructions can also be sent to you by post in paper form against an applicable postage fee.

The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EC-machine guidelines.

as per PED 2014/68/EU

In acc. with Article 4 Paragraph (3), "Sound Engineering Practice", of the PED 2014/68/EU no CE mark.

Diagram 6, Pipe, Group 1 dangerous fluids

3. Regulation Use

Any use of the device, which exceeds the manufacturers specification may invalidate its warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage.

4. Operating Principle

The digital KOBOLD flow meter/monitor model DVK serves to measure and monitor small and average flows of air in piping and hoses.

The device is absolutely maintenance-free and uses the calorimetric method. When the operating voltage is applied, a thermistor integrated in the sensor is heated to a defined value above the medium temperature. When air (or gas) flows through the sensor, the heat generated in the sensor is absorbed by the medium. This means that the sensor is cooled down to the medium temperature. Depending on the velocity and rate of flow, the temperatures are equalized and the resistance of the sensor is reduced proportionally. The flow velocity can be determined by measuring the resistance. The medium temperature is measured by a second sensor.

The resistance values of both sensors are compared by the electronics over a Wheatstone bridge circuit and an output relay is actuated if the set switching values have been fallen short or exceeded. The switch state is signalled by two LED's (ON: LED on; OUT 1*: green, OUT 2*: red).

The digital KOBOLD flow meter type DVK works with practically no pressure loss. Typically, the device is available in two different versions (display and sensor as compact instrument, or display and sensor separated but connected with a cable) with the necessary screw connections.

* The two outputs OUT 1 and OUT 2 can only be activated by flow measurement per unit of time, and not by totalising.

5. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.

Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

Scope of delivery:

The standard delivery includes:

- Calorimetric Flow Meter, Monitor, Totalizer Model: DVK-...

6. Mechanical Connection

6.1. Check Operating Conditions

- flow rate
- max. operating pressure
- max. operating temperature
- medium

6.2. Installation

- flow in direction of arrow (position independent)
- avoid pressure and radial tension
- fasten the pipe at up stream and down stream at a distance of 50 mm from the connections
- check sealing of connections

7. Electrical Connection

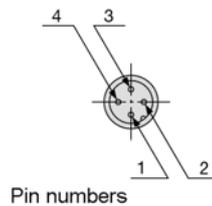
7.1. General



Attention! Make sure that the voltage values of your system correspond with the voltage values of the measuring unit.

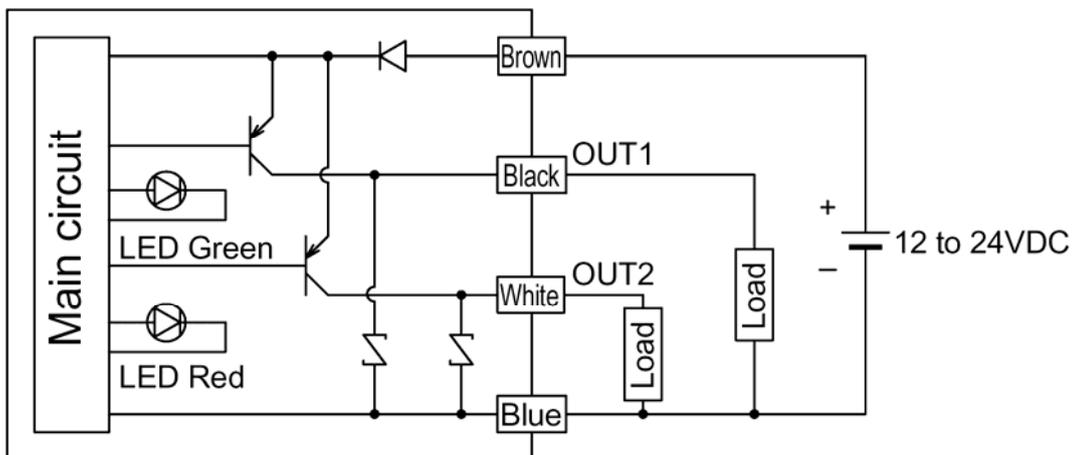
7.2. Compact Version DVK-12...

- Make sure that the lines are powerless.
- Connect the supply voltage and the output signal to the plug PIN's as below:



1	DC (+)
2	OUT 2
3	DC (-)
4	OUT 1

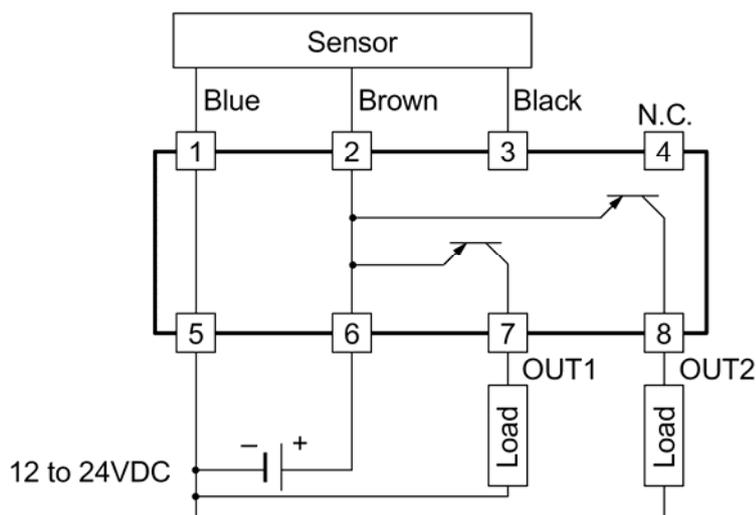
Connector thread M12



Attention! A wrong connection of plug connection can lead to damage of the unit's electronics.

7.3. Separate Version DVK-22..., DVK-42..

- Make sure that the supply wires are de-energized.
- Connect the supply voltage and the output signal to the plug PIN's as given below.



Attention! A wrong connection of plug connection can lead to damage of the unit's electronics.

8. Commissioning

8.1. General

RESET Buttons

Pressing the UP and DOWN buttons simultaneously activates the RESET function.

This clears the unit when an abnormality occurs and clears the accumulated flow display to "0".

Output (OUT1) Indicator/Green

Lights up when OUT1 is ON. It also blinks when an overcurrent error occurs on OUT1.

Output (OUT2) Indicator/Red

Lights up when OUT2 is ON. It also blinks when an overcurrent error occurs on OUT2.

LED Display

Displays the real-time flow rate, accumulated flow, and setting value. The  mark blinks when the accumulated flow is being measured.

UP Button (▲ Button)

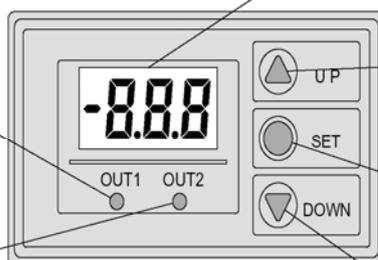
Use when increasing a setting value.

SET Button (● Button)

Use when changing a setting value or any of the modes.

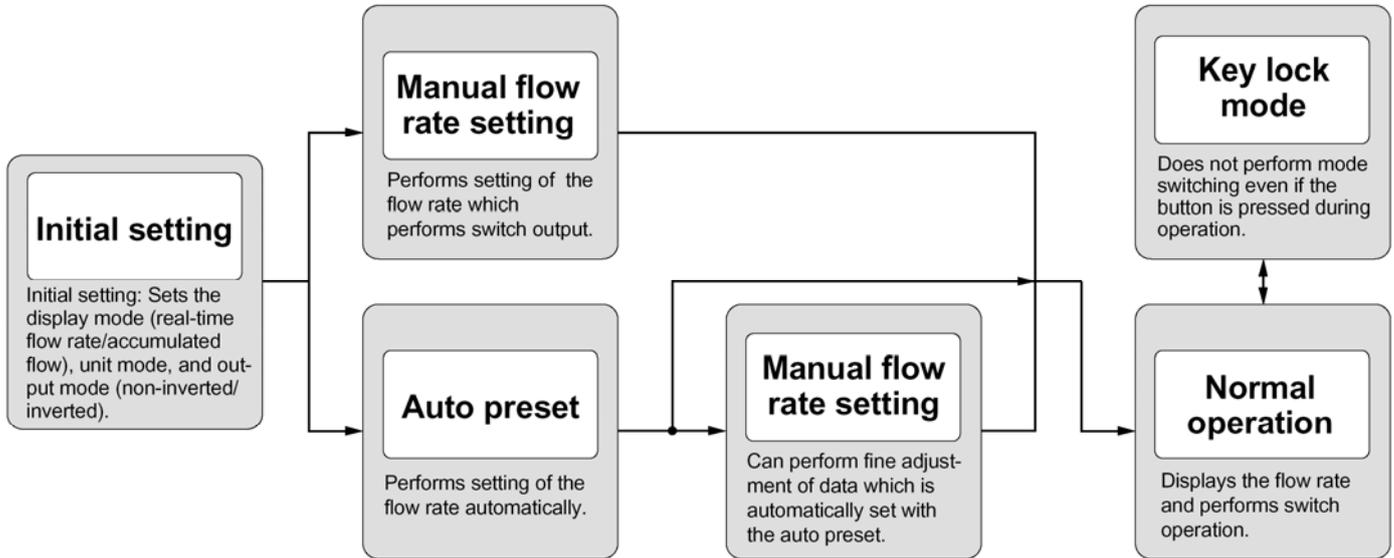
DOWN Button (▼ Button)

Use when decreasing a setting value.



8.2. Flow Rate Setting

8.2.1. Setting Procedure



8.2.2. Initial Setting

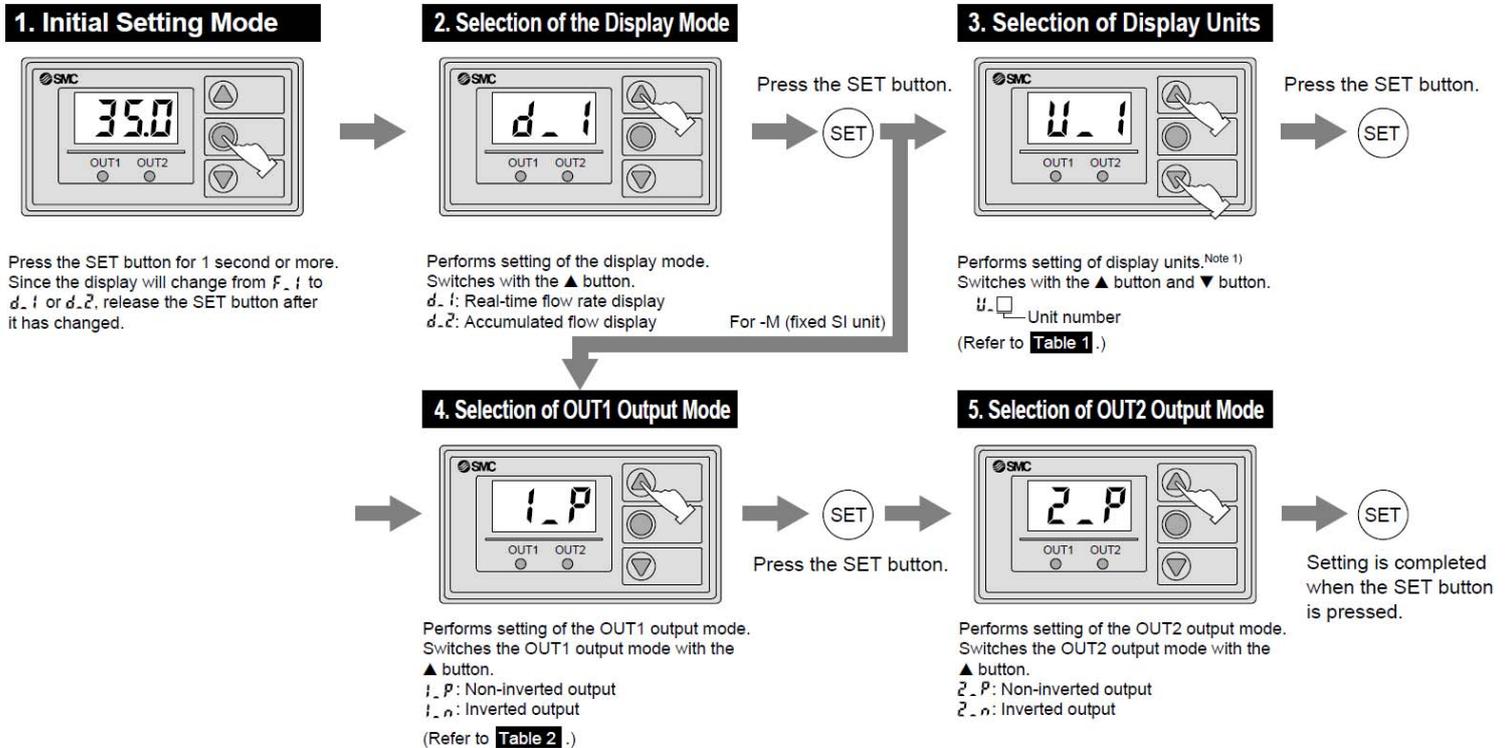


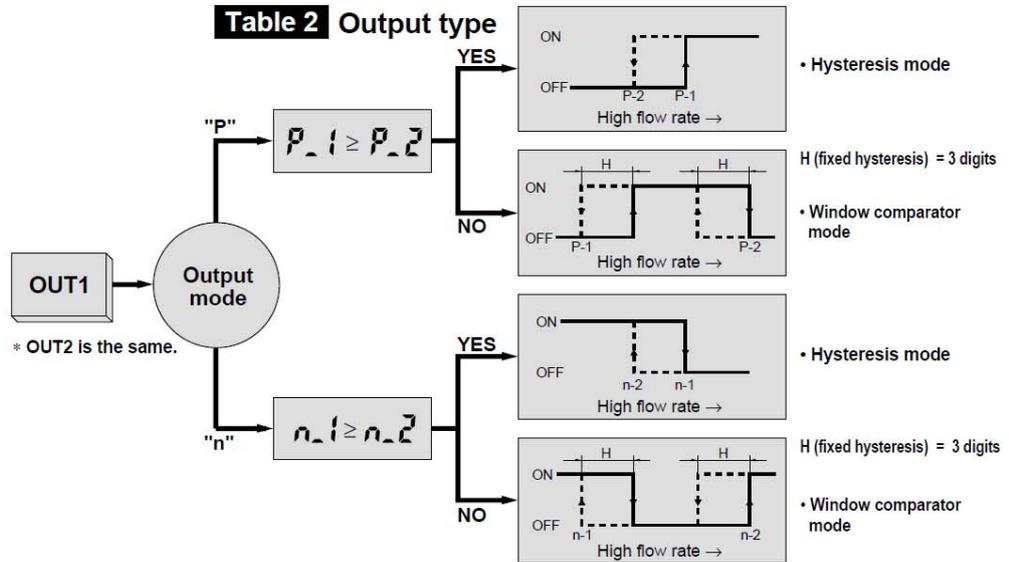
Table 1 (Note 1)

For air

Display	Real-time flow rate	Accumulated flow
\bar{u}_1	\bar{u}/min	\bar{u}
\bar{u}_2	$\text{CFM} \times 10^{-2}$	$\text{ft}^3 \times 10^{-1}$

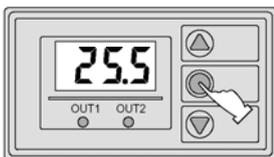
CFM = ft³/min

Table 2 Output type



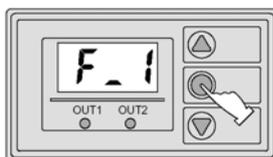
8.2.3. Flow Rate Setting Mode (manual)

1. Setting Value Input Mode (Manual)



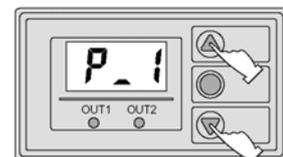
Press the SET button.
(Refer to **Table 2** for the relationship of each value to the switch output.)

2. Setting in the Manual Mode



The display shows $F_{.1}$.
Press the SET button.

3. OUT1 Setting Value (1) Input

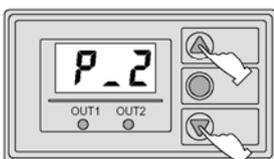


Display changes to input of OUT1 setting value (1).
The setting value and $P_{.1}$ (or $n_{.1}$) are displayed alternately.

▲ Button: Increases the setting value
▼ Button: Decreases the setting value

SET
Press the SET button.

4. OUT1 Setting Value (2) Input

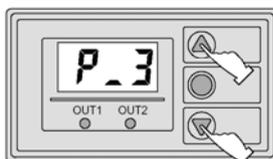


Display changes to input of OUT1 setting value (2).
The setting value and $P_{.2}$ (or $n_{.2}$) are displayed alternately.

▲ Button: Increases the setting value
▼ Button: Decreases the setting value

SET
Press the SET button.

5. OUT2 Setting Value (1) Input

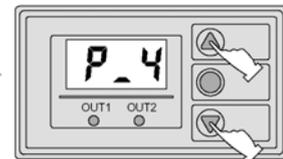


Display changes to input of OUT2 setting value (1).
The setting value and $P_{.3}$ (or $n_{.3}$) are displayed alternately.

▲ Button: Increases the setting value
▼ Button: Decreases the setting value

SET
Press the SET button.

6. OUT2 Setting Value (2) Input

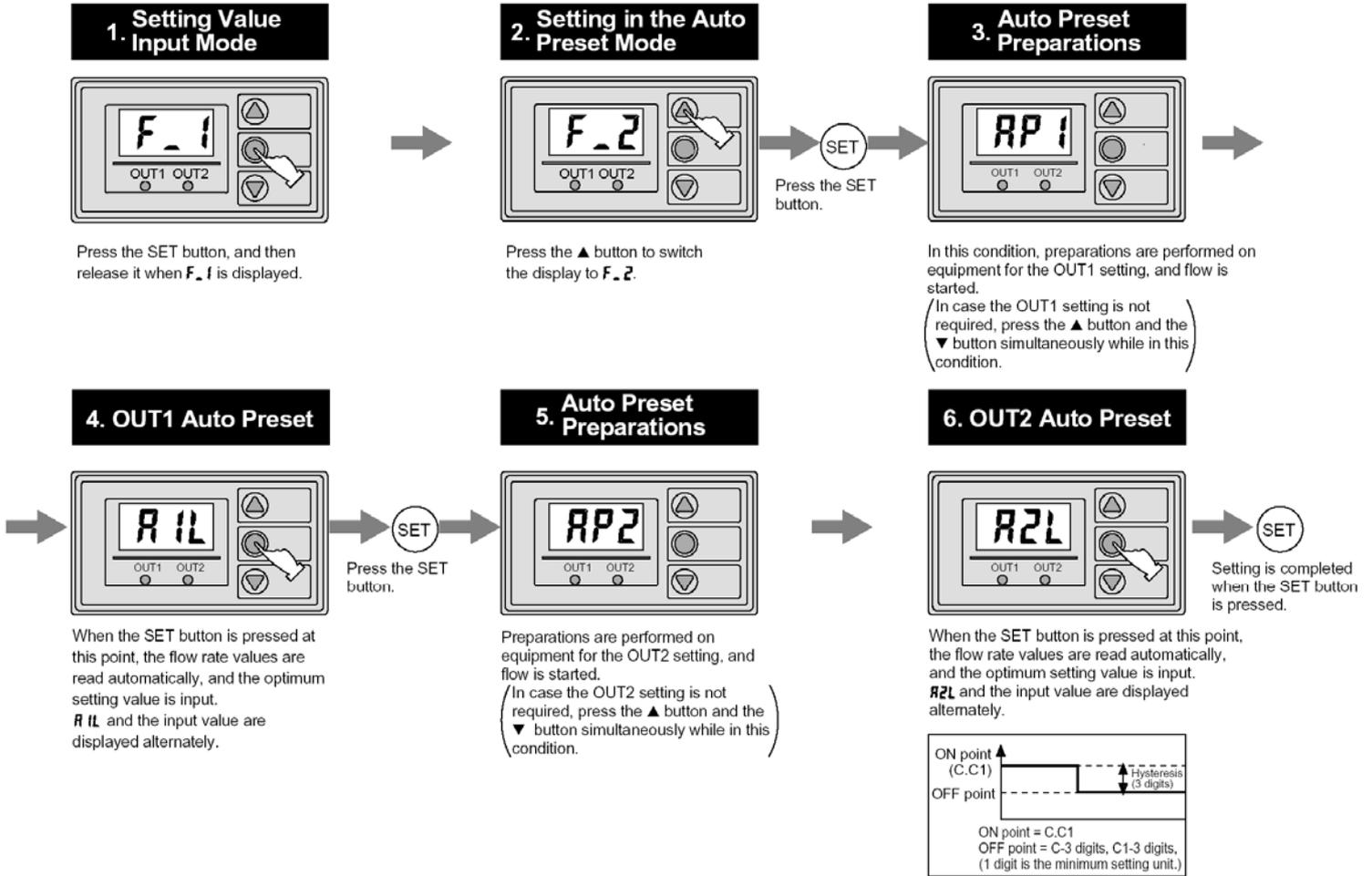


Display changes to input of OUT2 setting value (2).
The setting value and $P_{.4}$ (or $n_{.4}$) are displayed alternately.

▲ Button: Increases the setting value
▼ Button: Decreases the setting value

SET
Setting is completed when the SET button is pressed.

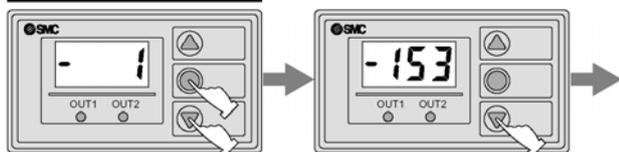
8.2.4. Flow rate setting mode (auto preset)



8.2.5. Other functions

• Accumulated flow function

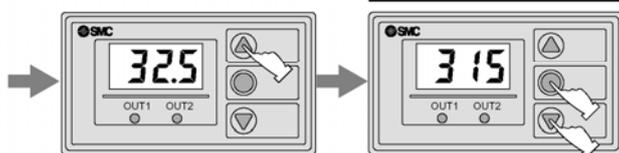
Start of Accumulation



Accumulation start
Press the SET button while pressing the ▼ button. The - mark blinks and accumulation begins.

The value can be accumulated to 999999, but normally only the lower 3 digits are displayed. Press the ▼ button to confirm the upper 3 digits.

Stopping Accumulation

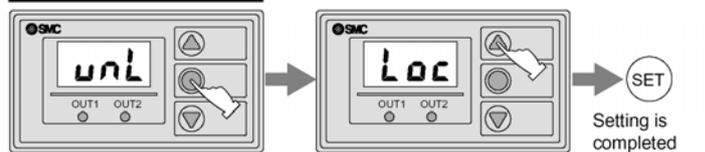


By pressing the ▲ button, the real-time flow rate can be confirmed during accumulation.

Press the SET button while pressing the ▼ button. The display holds the value accumulated up to the present and stops. To start further accumulation from this point, press the SET button while pressing the ▼ button. The display can be cleared by pressing the ▲ button and the ▼ button simultaneously for 2 seconds or more.

• Key lock mode ----- Prevents misoperation of buttons.

Start of Key Locking

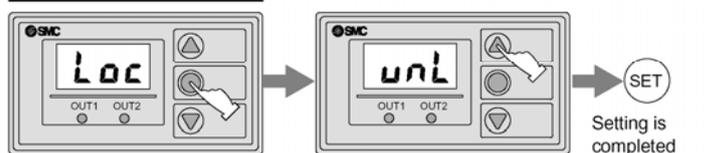


Press the SET button continuously for 3 seconds or more. The display changes from F. I to d. I, and when it shows unL, release the SET button.

Using the ▲ button, set the display to Loc.

Setting is completed when the SET button is pressed.

Release of Key Locking



Press the SET button continuously for 3 seconds or more. Release the SET button when the display shows Loc.

Using the ▲ button, set the display to unL.

Setting is completed when the SET button is pressed.

• Switching the flow rate range of the remote type (for air)

Flow Rate Range Switching



When the SET button is pressed continuously for 4 seconds or more, the display changes as shown in Table 3.

Press the ▲ button to match with the flow rate range being used.

Setting is completed when the SET button is pressed.

Table 3

Display	Flow rate range
10L	1 to 10 L/min
50L	5 to 50 L/min
10L	10 to 100 L/min
20L	20 to 200 L/min
50L	50 to 500 L/min

8.3. Error Connection

LED display	Problem	Corrective action
Er 1	A current of more than 80mA is flowing to OUT1.	Check the load and wiring for OUT1.
Er 2	A current of more than 80mA is flowing to OUT2.	Check the load and wiring for OUT2.
Er 4	The setting data has changed due to some influence.	Perform the RESET operation, and set all data again.
---	The flow rate is over the flow rate measurement range. (For air only)	Reduce the flow rate until it is within the flow rate measurement range, using an adjustment valve, etc.

9. Technical Information

Method of measurement:	calorimetric principle
Mounting position:	any position, flow in direction of arrow
Measuring ranges:	1...10 l/min; 10...100 l/min (switchable to CFMx 10 ⁻²); 20...200 l/min; 5...50 l/min; 50...500 l/min (switchable to CFMx 10 ⁻¹) air at 0 °C; 1013 mbar or 20 °C; 1013 mbar)
Accuracy:	±5 % of f. s.
Repeatability:	±1 % of f. s. (DVK-...01/DVK-...05) ±2 % of f. s. (other types)
Temperature characteristic:	±3 % of f. s. (15 – 35 °C) ±5 % of f. s. (0 –50 °C)
Operating pressure:	-0.5...+5.0 bar (DVK-...01/DVK-...05) testing pressure 10 bar -0.5...+7.5 bar (DVK-...10 / 20 / 50) testing pressure 10 bar
Pressure loss at full scale:	see table
Operating temperature:	0...50 °C

Material:	
Connections:	ADC \triangleq aluminium die casting
Sensor and housing:	PPS/lead-glass/PtIr/FeNi/OFC
Sieve:	stainless steel
Gasket:	NBR
Response time:	1 s
Connections:	G $\frac{1}{4}$; G $\frac{3}{8}$; G $\frac{1}{2}$
Display:	3-digit 7-segment LCD, 90° rotatable
Totalizing:	0...999999 (litres or ft ³ x 10 ⁻¹), resettable
Supply:	12...24 V _{DC} , max. 170 mA
Outputs:	2 x PNP open collector, 80 mA
Switching indication:	2 x LED (OUT 1: green, OUT 2: red)
Minimum switching adjustment:	0.5 % of max. range value
Hysteresis:	adjustable
Shock resistance:	490 m/s ² in X-, Y-, Z-direction (3 x each direction)
Vibration resistance:	10...500 Hz at amplitude <1.5 mm or acceleration of 98 m/s ² in X-, Y-, Z-direction (2 hours per direction)
Protection:	IP 65
Weight:	< 290 g (without connecting lead) (G $\frac{1}{4}$; G $\frac{3}{8}$; G $\frac{1}{2}$)

10. Order Codes

Example: **DVK-12 01R08**

Description	Model	Measuring range/connection	Output
Flow meter compact version	DVK-12...	01R08 = 1-10 l/min; G $\frac{1}{4}$ 05R08 = 5-50 l/min; G $\frac{1}{4}$ 10R10 = 10-100 l/min; G $\frac{3}{8}$ 20R10 = 20-200 l/min; G $\frac{3}{8}$ 50R15 = 50-500 l/min; G $\frac{1}{2}$	3PP = 2x PNP switching outputs
Flow meter sensor unit *	DVK-22...		
Display unit for DVK-22 panel mounting	DVK-42...		

*A display unit DVK-22 is required for the sensor unit DVK-42. Alternatively, 4-20 mA output is available on request.

Accessories: Electrical connection

Description	Model
M12x1 box with 2 m cable	ZUB-KAB-12K002
M12x1 box with Quickon-connector	ZUB-KAB-12Q000

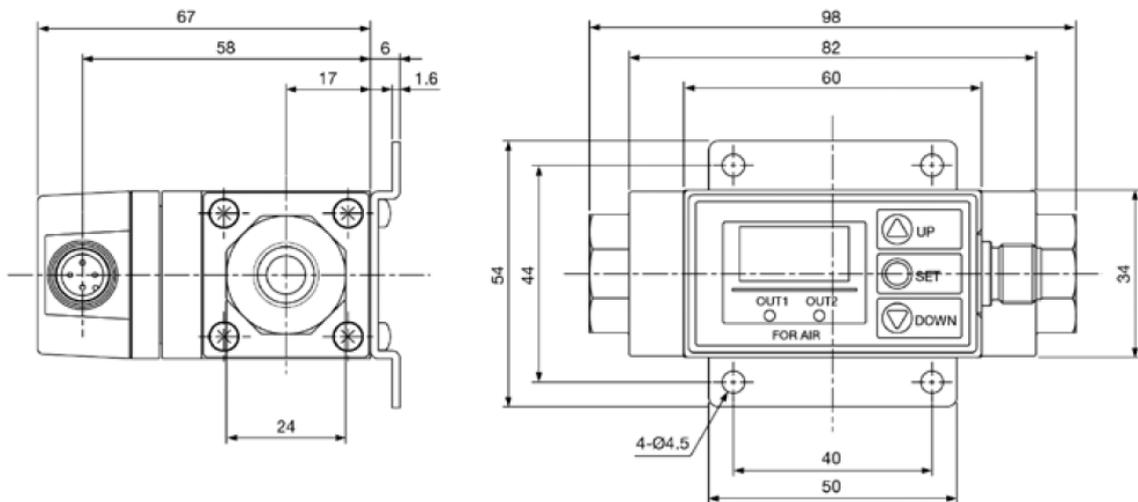
Pressure loss

Model	DVK-...01	DVK-...05	DVK-...10	DVK-...20	DVK-...50
ME (l/min)	10	50	100	200	500
Pressure loss (mbar)	12	30	100	200	450

11. Dimensions

[mm]

Compact design DVK-1201..., DVK-1205...

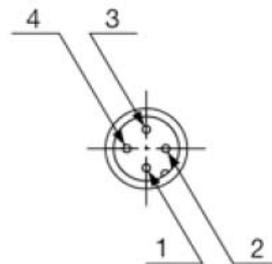


Electrical connection

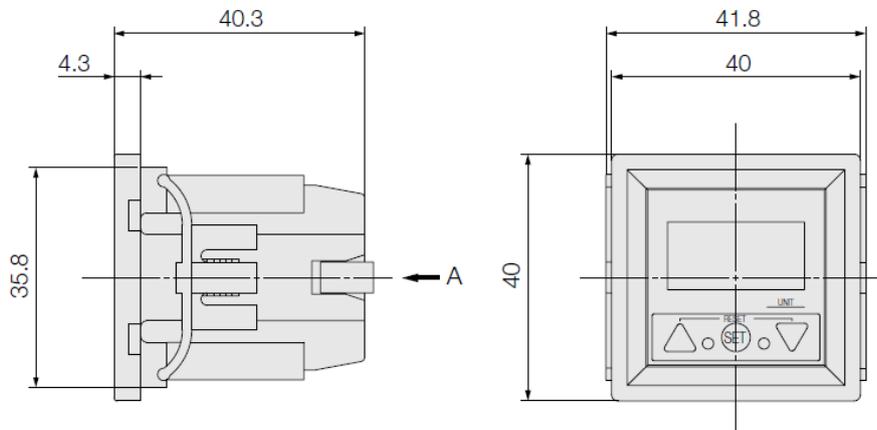
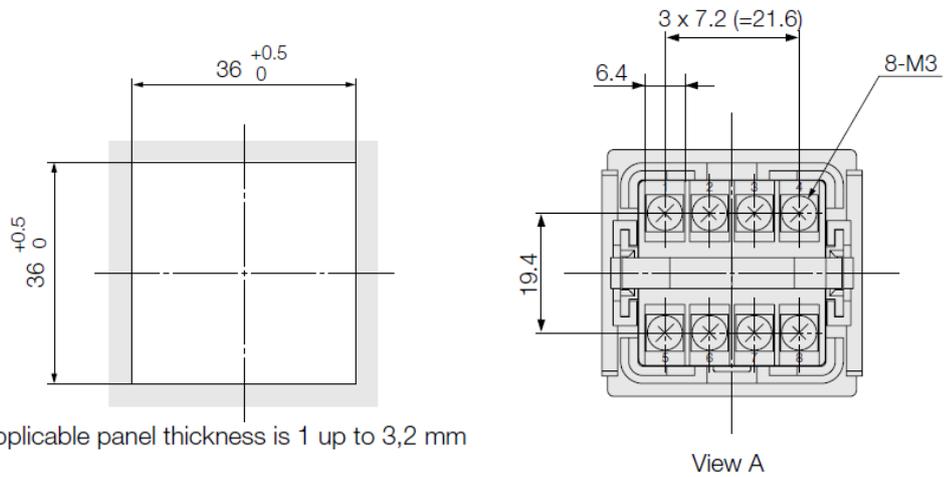
Pin numbers

Connector thread M12

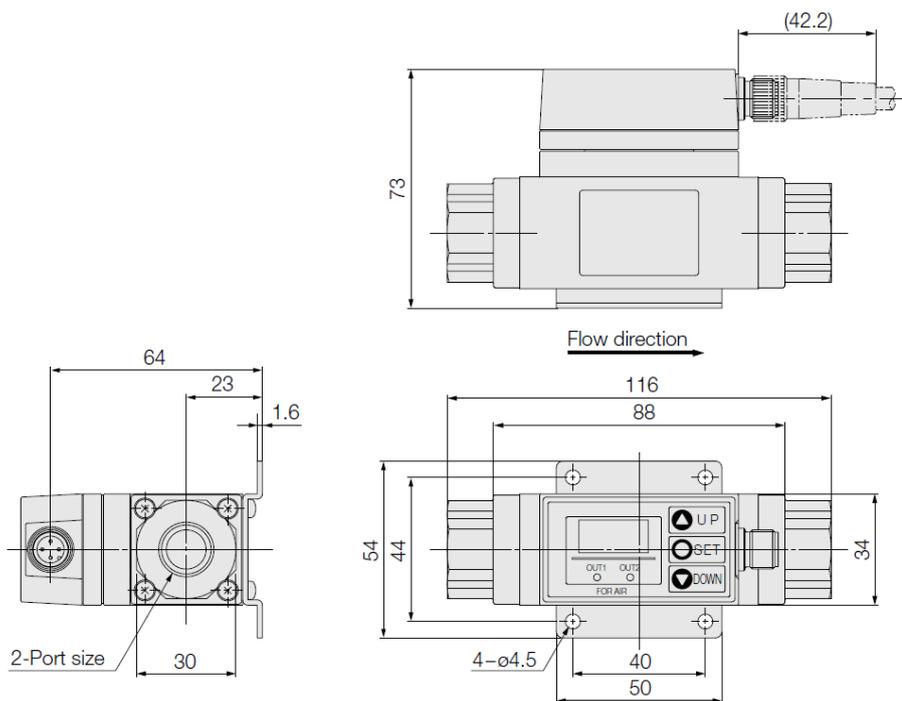
Numbers	Pin name
1	DC (+)
2	OUT 2/analogue output
3	DC (-)
4	OUT 1



Display unit DVK-42 for panel mount

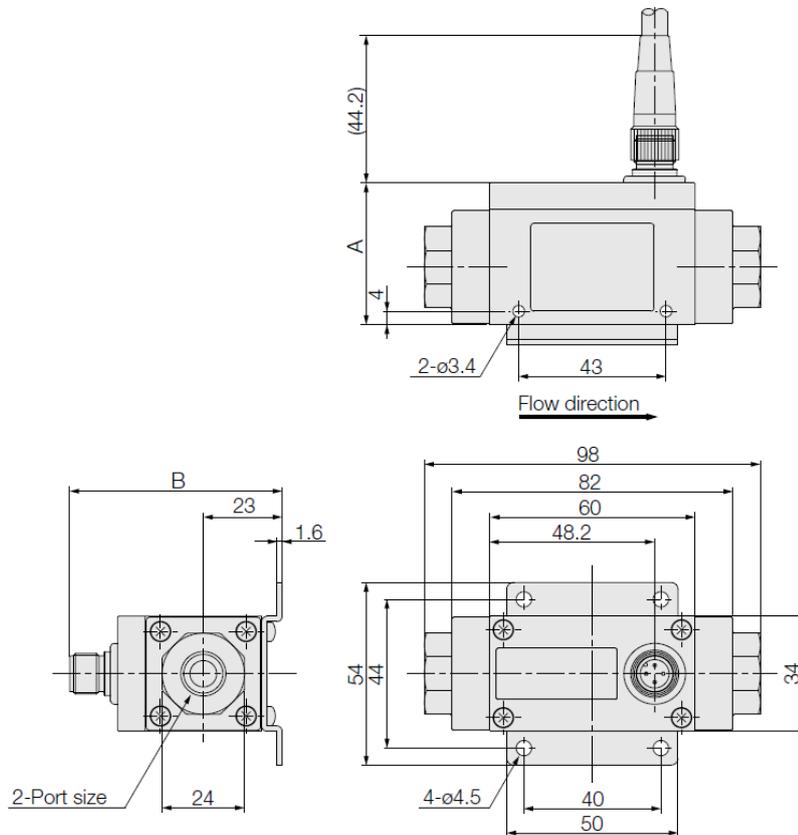


Compact design DVK-1210..., DVK-1220..., DVK-1250...



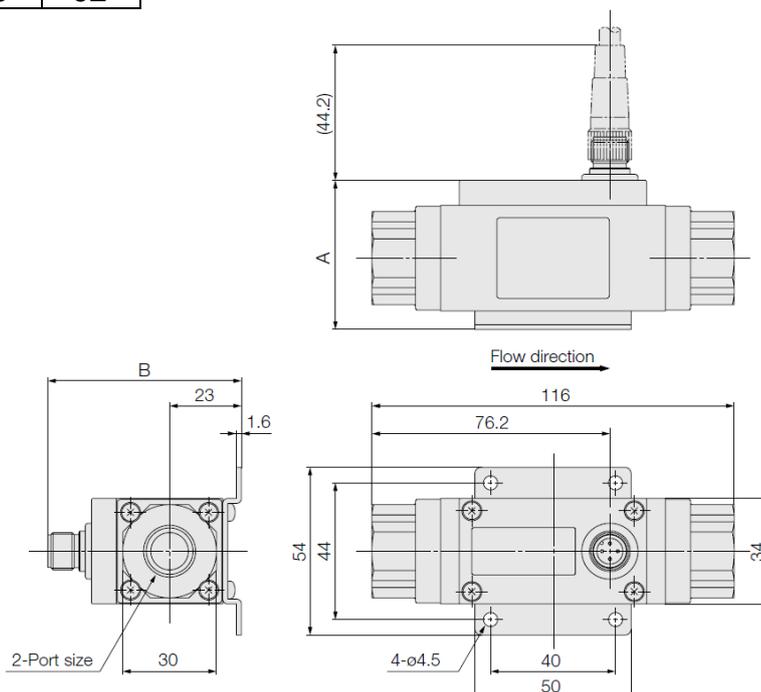
Separate design DVK-2201..., DVK-2205...

A	B
42	62



Separate design DVK-2210..., DVK-2220..., DVK-2250...

A	B
48	62



12. EU Declaration of Conformance

We, KOBOLD-Messring GmbH, Hofheim-Ts, Germany, declare under our sole responsibility that the product:

Calorimetric Flow Meter, Monitor, Totalizer Model: DVK

to which this declaration relates is in conformity with the standards noted below:

EN 61000-6-2:2005 Electromagnetic compatibility (EMC) - Part 6-2:
Generic standards - Immunity for industrial environments

EN 55011:2009+A1:2010 Industrial, scientific and medical equipment - Radio-
frequency disturbance characteristics - Limits and methods of measurement

EN 50581:2012 Technical documentation for the assessment of electrical
and electronic products with respect to the restriction of hazardous substances

Also, the following EC guidelines are fulfilled:

2014/30/EU Electromagnetic compatibility
2011/65/EU RoHS



H. Peters
General Manager



M. Wenzel
Proxy Holder

Hofheim, 08 Dec. 2020