EN-US - english US

Instructions for installation and operation

FS 211

¼“ to 2“

Sample image
Values will be shown in cfm

Dear customer,

Thank you for deciding in favour of the flow sensor. Please read these installation and operating instructions carefully before mounting and starting up the flow sensor and follow our directions. Perfect functioning of the flow sensor and thus safe operation can only be guaranteed when the provisions and notes stipulated here are strictly adhered to.

Contents

1 Safety advice

Please check whether or not these instructions correspond to the device type!

Please adhere to all advice given in these operating instructions. They include basic information which needs to be observed during installation, operation and maintenance. Therefore, it is vital for the technician and the responsible operator /skilled personnel to read these operating instructions prior to installation, start-up and maintenance.

The operating instructions must be accessible at all times at the place of application of the flow sensor.

In addition to these operating instructions, local and national regulations need to be observed, where required.

If you have any queries regarding these instructions or the device, please contact BEKO TECHNOLOGIES GMBH.

Danger!

Compressed air!

Risk of serious injury or death through contact with quickly or suddenly escaping compressed air or through bursting plant components.

Measures:

- Do not exceed the maximum operating pressure (see type plate)!
- Use pressure-resistant installation material only!
- Make sure that persons or objects cannot be hit by escaping compressed air!

Danger!

Supply voltage!

Contact with non-insulated parts carrying supply voltage involves the risk of an electric shock resulting in injuries and death.

Measures:

- Observe all regulations in effect during electrical installation (e.g. VDE 0100)!
- **Carry out maintenance works only when the device is de-energized!**
- Any electrical works must only be carried out by authorized and skilled personnel.

Danger!

Inadmissible operating parameters!

Under-running or exceeding the limit values involves risks for persons and the material and malfunction and service failures may occur.

Measures:

- Do not exceed the maximum operating pressure (see type plate)!
- Make sure that the flow sensor is operated only within the permissible limit values indicated on the type plate.
- Exact compliance with the performance data of the flow sensor in connection with the case of application.
- Do not exceed the permissible storage and transport temperature.
- Carry out service and calibration measures at regular intervals).

Further safety advice:

- During installation and operation, the national regulations and safety instructions in force also need to be observed.
- The flow sensor must not be employed in hazardous areas.

Caution!

Malfunction in the flow sensor

Through incorrect installation and poor maintenance, a malfunction may occur in the flow sensor, which may affect the measuring results and lead to misinterpretations.

2 Field of application

- The flow sensor is a consumption measuring device for measurements within the permissible operating parameters (see Chapter “Technical data”).
- The flow sensor measures the following parameters:
  - Volume flow
  - Consumption
  - Velocity

  The volume flow is set by default to m³/h, the consumption to m³ and the velocity to m/s.
- As standard, the flow sensor performs measurements in air

  Upon customer request, the sensor can be programmed to other gases by BEKO TECHNOLOGIES GMBH: nitrogen, argon, helium, carbon dioxide
- The flow sensor is employed mainly in compressed-air plants
- The flow sensor is not suitable for the employment in hazardous areas.

3 Special advantages

- Easy and cost-effective installation
- Units freely selectable via the keys m³/h, m³/min, l/min, l/s, kg/h, kg/min, kg/s, cfm
- Compressed-air counter up to 1.999.999.999 m³. Can be reset to “zero” via the keyboard
- Analogue output 4...20 mA, pulse output (galvanically insulated)
- High measuring accuracy, also in the lower measuring range (perfect for leak measurement)
- Insignificant compressed-air loss
- Calorimetric measuring principle, no additional pressure and temperature measurement required, no mechanically moving parts

4 Technical data

CE	
Measured parameters	Flow, consumption and velocity Reference setting in the factory: DIN 1945/ ISO 1217 (68°F/ 14.5psi)
Units	Standard settings: m³/h, m³ und m/s With the display menu, other units can be adjusted. Volume flow: m³/min, l/min, l/s, cfm Mass flow: kg/s, kg/min, kg/h Consumption: l, cf, kg
Measuring principle	Calorimetric measurement
Sensor	Pt45, Pt1000
Measuring medium	Air, gases
Application temperature	32... 122 °F
Air humidity of the measuring medium	Max. 90% rh (no drops of water)
Operating pressure	Up to 232 psi
Material housing Material sensor tube	Plastics PC + ABS Stainless steel 1.4301
Material measuring section	Version with a connection thread: stainless steel 1.4301 or 1.4404 Version with a flange: stainless steel 1.4404
Sealing measuring unit/measuring section	O-ring (0.08 x 0.83 inches) Material: P990/ NBR 90
Protection class	IP65
Dimensions	See dimension drawings page 8 and 9
Mounting thread	NPT 1/4", NPT 1/2", NPT 3/4", NPT 1", NPT 1 1/4", NPT1 1/2", NPT 2” ASME/ANSI B1.20.1

Power supply	12 to 30 VDC Supply via the power supply plug or the DD 109
Power consumption	max. 80 mA at 24 VDC

Analogue output:	4... 20 mA (load < 500 ohm), accuracy: 0.06 mA Scale: ¼“: 4… 20mA ≙ 0… 3.2cfm ½“: 4… 20 mA ≙ 0… 53cfm ½“: 4… 20 mA ≙ 0… 99.9cfm 1“: 4… 20 mA ≙ 0… 169.5cfm 1 ¼““: 4… 20 mA ≙ 0… 282.5cfm 1 ½“: 4… 20 mA ≙ 0… 324.9cfm 2“: 4… 20 mA ≙ 0… 529.7cfm
Pulse output	1 pulse per ft³, pulse output potential-free, Switching capacity max. 30VDC, 20 mA (pulse lengths see page 12)

Accuracy	± 1,5% of measured value ± 0,05 % of max. measuring value

5 Measuring ranges in air

Pipe size	**Pipe inner Ø**	**Pipe size**		Consumption
	inch		Measuring range from ... to	Standard setting
1/4“	0.33	DN 8	0.03 … 3.18 cfm	ft³
1/2“	0.63	DN 15	0.12 … 52.98 cfm	ft³
3/4“	0.85	DN 20	0.18 ... 100.07 cfm	ft³
1“	1.07	DN 25	0.29 ... 170.71 cfm	ft³
1 1/4“	1.45	DN 32	0.41 ... 282.56 cfm	ft³
1 1/2"	1.65	DN 40	0.59 ... 323.77cfm	ft³
2“	2.09	DN 50	1.18 ... 529.80 cfm	ft³

Reference standard DIN 1945/ ISO 1217: 1000mbar /20°C; type of gas: air

6 Upper range values for different gases

		1/4"	**1/2"**	**3/4"**	**1"**	**1 1/4"**	**1 1/2"**	**2"**
		Analogue output 20mA	Analogue output 20mA	Analogue output 20mA	Analogue output 20mA	Analogue output 20mA	Analogue output 20mA	Analogue output 20mA
		[cfm]	[cfm]	[cfm]	[cfm]	[cfm]	[cfm]	[cfm]
Reference standard DIN1945/ ISO 1217: 68°F, 14.5 Psi (reference at the adjustment of the probes)								
Air		**3.18**	**52.98**	**100.07**	**170.71**	**282.56**	**323.77**	**529.80**
Adjustment to DIN 1343: 32°F, 14.69 Psi								
Air		**2.82**	**27.72**	**91.24**	**156.00**	**259.01**	**297.28**	**485.65**
Argon	Ar	4.94	48.51	156.00	264.90	441.50	503.31	824.14
Carbon dioxide	CO_2	3.00	29.46	97.13	167.77	276.67	317.88	523.92
Nitrogen	N_2	2.82	27.72	88.30	150.11	250.18	285.50	470.94

Note:

The area outside the pipe (the zone next to the probe) must not be a hazardous area.

7 Mounting instructions

The following table shows the required inlet sections depending on the existing disturbance/disruption of flow.

Table of the additionally required inlet sections

Obstruction to flow **upstream** of the measuring section	Minimum length inlet section (L1)	Minimum length outlet section (L-L1)
Slight curvature (elbow < 90°)	**12 x D**	**5 x D**
Reduction (pipe narrows towards the measuring section)	**15 x D**	**5 x D**
Reduction (pipe narrows towards the measuring section)	**15 x D**	**5 x D**
90° elbow Or T-piece	**15 x D**	**5 x D**
2 elbows à 90° At the same level	**20 x D**	**5 x D**
2 elbows à 90° Three-dimensional change in direction	**35 x D**	**5 x D**
Shut-off valve	**45 x D**	**5 x D**

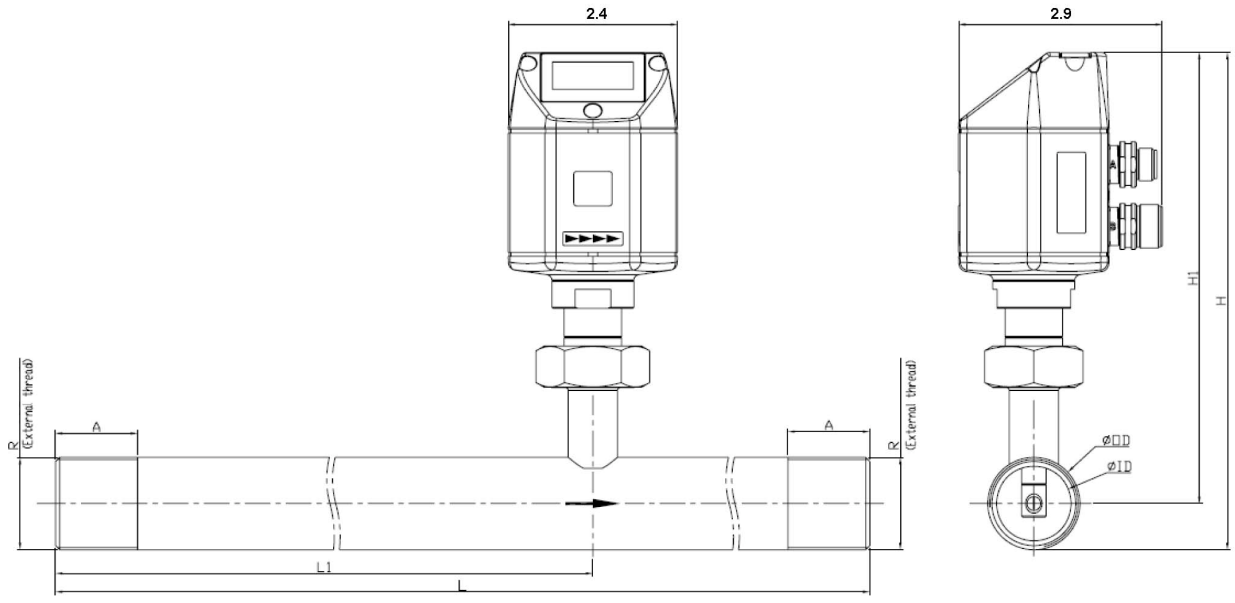
The values indicated are the required minimum values. In the event that the indicated calming sections cannot be provided, elevated to significant deviations of the measuring results must be taken into account.

Caution:

The measuring sections of the FS 211 meter with 1 1/2" and 2" measuring sections have reduced inlet and outlet sections. Please allow for the recommended inlet and outlet sections.

Dimensions see page 9.

8 Measuring section with threaded-end fitting

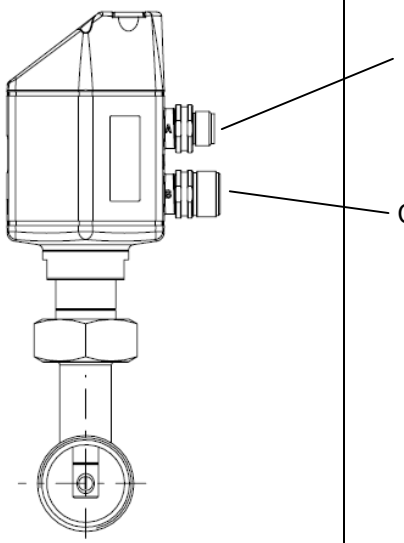


OD= outer pipe diameter, ID= inner pipe diameter

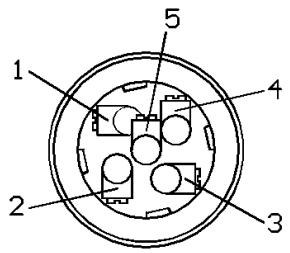
Pipe size	Pipe size	OD (inch)	ID (inch)	L (inch)	L1 (inch)	H (inch)	H1 (inch)	R	A (inch)
1/4"	DN 8	0.02	0.33	7.64	5.39	6.93	6.52	NPT 1/4"	0.59
1/2“	DN 15	0.03	0.63	11.81	8.27	6.94	6.52	NPT 1/2“	0.79
3/4“	DN 20	0.04	0.85	18.70	10.83	7.06	6.52	NPT 3/4“	0.79
1“	DN 25	0.05	1.07	18.70	10.83	7.19	6.52	NPT 1“	0.98
1 1/4"	DN 32	0.07	1.42	18.70	10.83	7.36	6.52	NPT 1 1/4"	0.98
1 1/2“	DN 40	0.07	1.65	18.70	10.83	7.48	6.52	NPT 1 1/2“	0.98
2“	DN 50	0.09	2.09	18.70	10.83	7.71	6.52	NPT 2“	1.18

9 Electrical connection

Caution: Connections which are not required (NC) must not be connected to potential and/or earth. Cut-off the lines and insulate them.



9.1 Terminals connecting plug M12



Terminals (view from the terminal side)

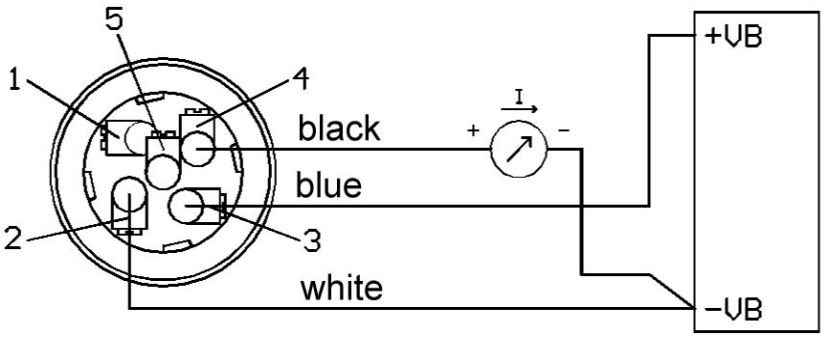
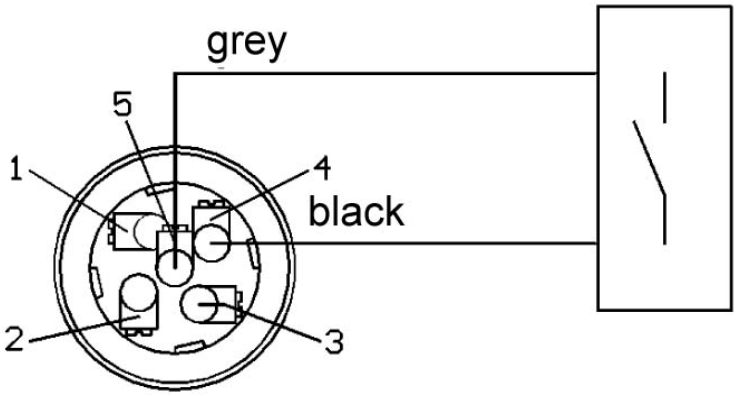
9.2 Terminal assignment connecting plug M12

	Pin 1	**Pin 2**	**Pin 3**	**Pin 4**	**Pin 5**
Connecting plug A	NC (SDI)	-VB	+VB	+I 4… 20 mA	NC
Colours connector cables	brown	white	blue	black	grey
Connecting plug B	NC (SDI)	NC	NC	Pulse isolated	Pulse isolated
Colours connector cables	brown	white	blue	black	grey

Caution: Connections which are not required (NC) must not be connected to potential and/or earth. Cut off the lines and insulate them.

9.3 Legend terminal assignment

-VB	Negative supply voltage 0V
+VB	Positive supply voltage 12... 30 VDC smoothed
+I	Current signal 4… 20 mA – current through-flow
Pulse	Pulse for consumption
NC	Must not be connected to potential and/ or earth. Please cut off the lines and insulate them.

	Connecting plug A
	Connecting plug B

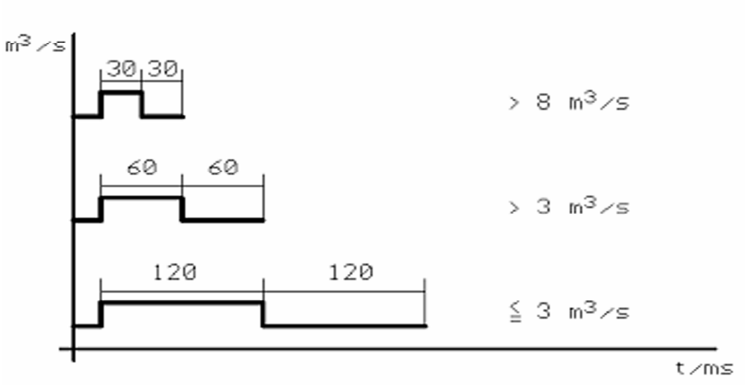
10 Pulse output signal indication

Pulse lengths are released depending on the consumption.

Pulses, one pulse per adjusted unit of consumption, are internally collected in the probe and released in one-second cycles, see below.

Pulse: An insulated contact is available. For the duration of the pulse, this contact is closed. Max. switching capacity: 30 VDC, 20 mA (semi-conductor relay galvanically insulated through optocouplers).

10.1 Consumption-depending pulse lengths

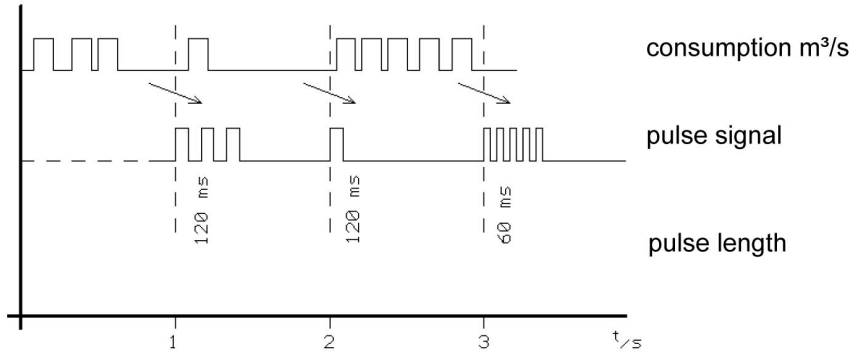


Max. 36 pulses can be released per second

Caution: When the max. flow is exceeded, signals are no longer transmitted. In this case, please set the units e.g. from l/min to m³/h

Pulse length [ms]	[m³/h]	[m³/min]	[l/min]	[cfm]	[kg/h]	[kg/min]	[kg/s]
120	10.800	180	180	180	10.800	180	3
60	21.600	360	360	360	21.600	360	6
30	39.600	660	660	660	39.600	660	11
10	129.600	2.160	2.160	2.160	129.600	2.160	36
Max. flow	**129.600**	**2.160**	**2.160**	**2.160**	**129.600**	**2.160**	**36**

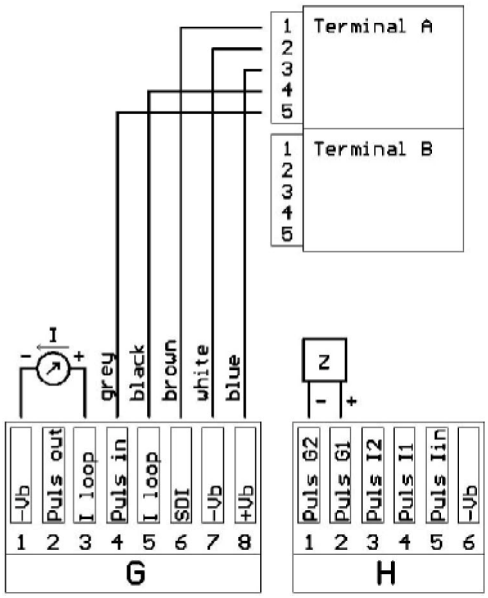
10.2 Pulse collector internal



The number of cfm are summed up and released after one second

11 Connection to the DD 109 data display unit

11.1 Connection flow sensors to the data display unit

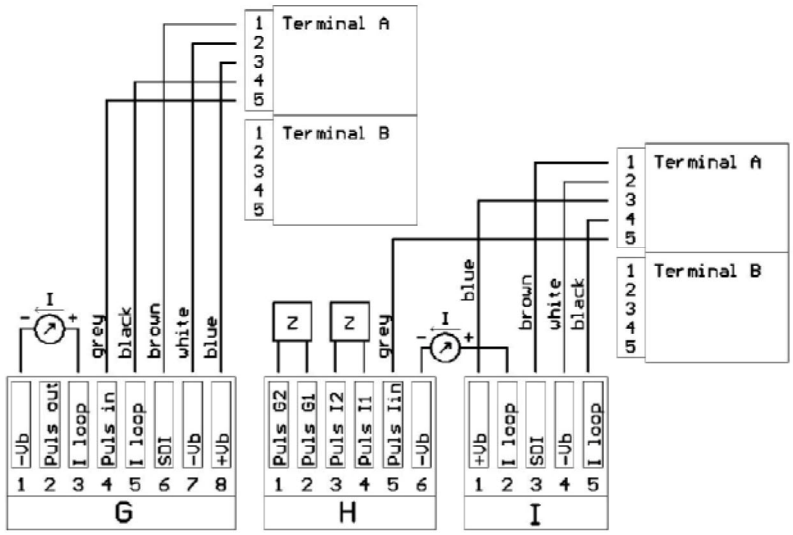


FS 211
Connection ”G”

Analogue output connection “G”

Pulse counter:
Connection “H”

11.2 Connection of two flow sensors to the data display unit



FS 211 1
Connection “G”
Analogue output connection “G”

Pulse counter:
Connection “H”

FS 211 2
Connections “I” and “H”
Analogue output connections “I” and “H”

Pulse counter:
Connection “H”

Note:

To configure the sensor at the DD109 display unit, the configuration software and a USB cable (2x A-plug) is necessary. The configuration software is part of the optional SW 109 software, and is also available as a free download at http://www.bekousa.com.

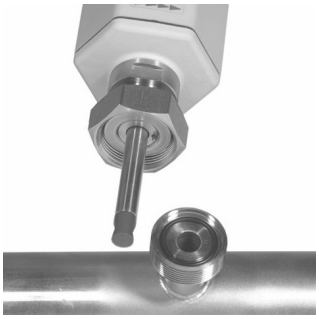
12 Maintenance

In most cases, the compressed air is not free from oil, condensate, dirt and particles. In the course of time, this leads to contamination of the meters and to measuring errors.
The construction allows the removal and cleaning of the measuring unit without the need to remove the measuring section.
For the maintenance period, a cover cap is optionally available.
Cover cap: aluminium order no. 0190.0001, stainless steel order no. 0190.0002

12.1 Removal and installation of the measuring unit

Removal of the measuring unit:

- depressurize the line
- Unfasten the measuring unit using an SW 36 wrench
- Carefully lift the measuring unit without damaging the dowel pin
- O-ring (21x2) mm can remain in the slot
- Fasten the cover cap (optional)



Installation of the measuring unit:

- depressurize the line
- Unscrew the cover cap
- Check the O-ring and slot for damages and contaminations and re-insert the O-ring
- Carefully insert the measuring unit, and pay special attention to the position of the dowel pin
- Fasten the measuring unit using an SW 36 wrench

12.2 Cleaning the sensor

The sensor can be cleaned by carefully swaying it in distilled water or isopropanol.

If the contaminations are too strong, an examination and service measures undertaken by the manufacturer is required.

Note:
Do not touch the surface of the sensor plate.
Avoid any mechanical impact on the sensor (e.g. through a sponge or brush).

13 Calibration/ adjustment

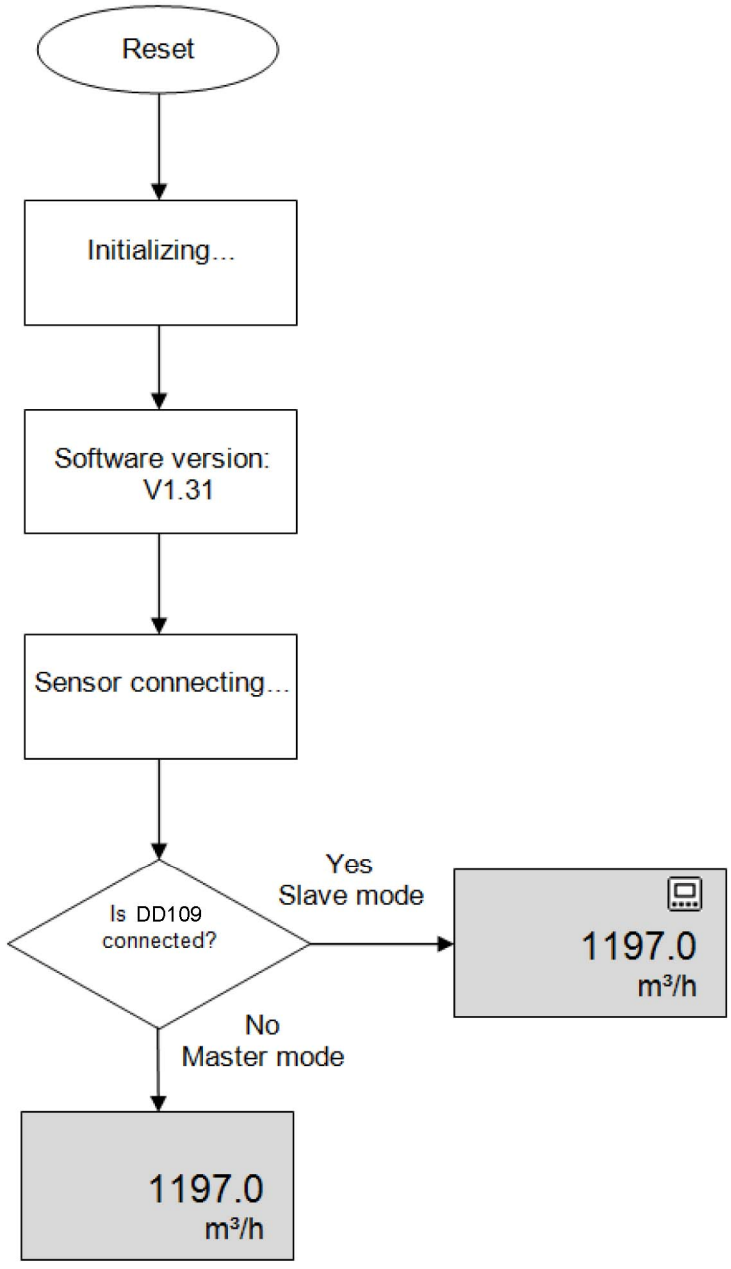
We recommend having the measuring device calibrated annually by the manufacturer and adjusted, if required.

Please take note of the enclosed manufacturer's calibration certificate.

14 Display handling

14.1 Display self-test

Subsequent to the connection of the FS 211, the display undergoes a self-test and indicates the current values afterwards.



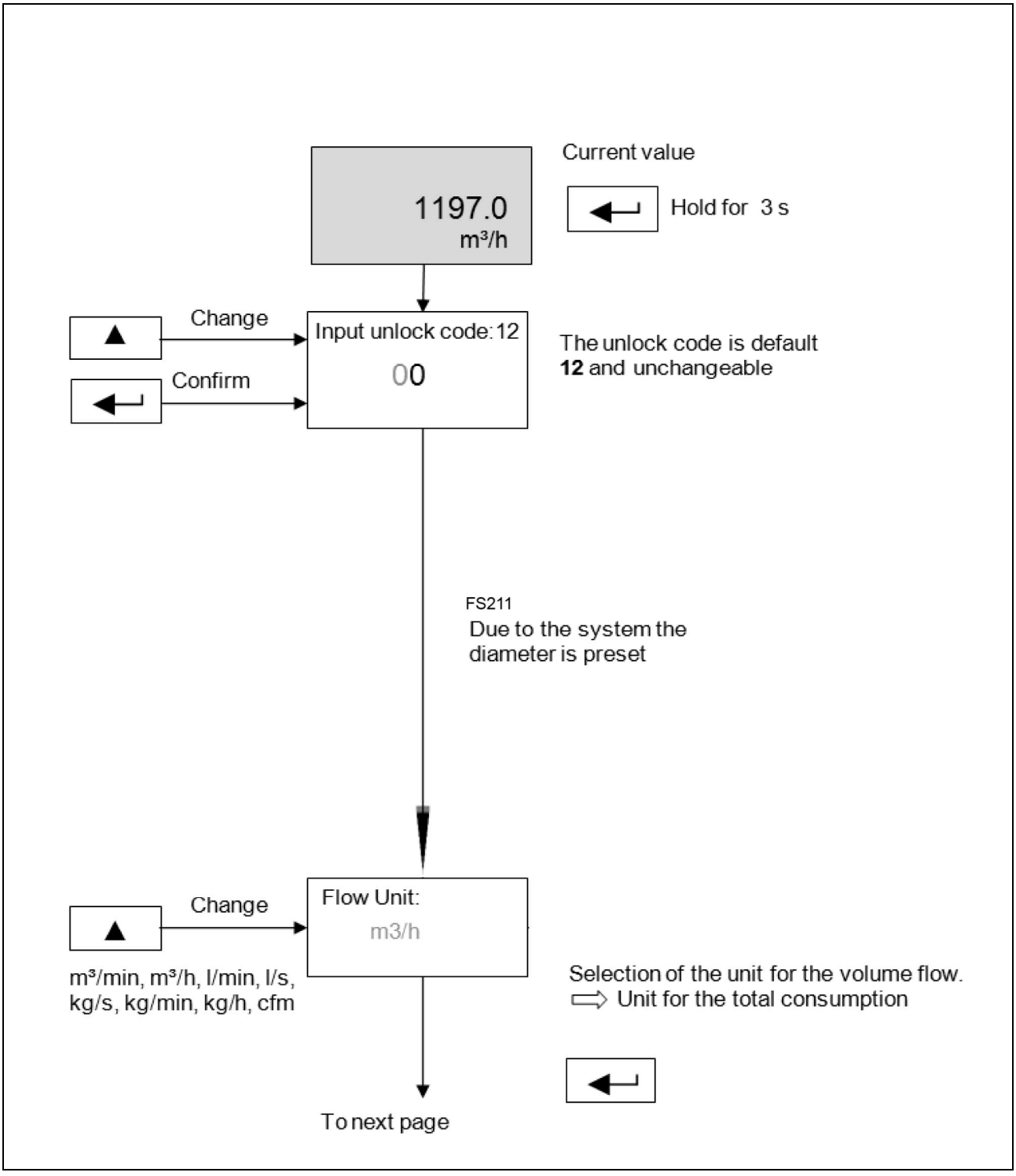
Slave mode
Modifications of the settings only possible via DD 109

Master mode
Modifications of the settings via the buttons of the FS 211

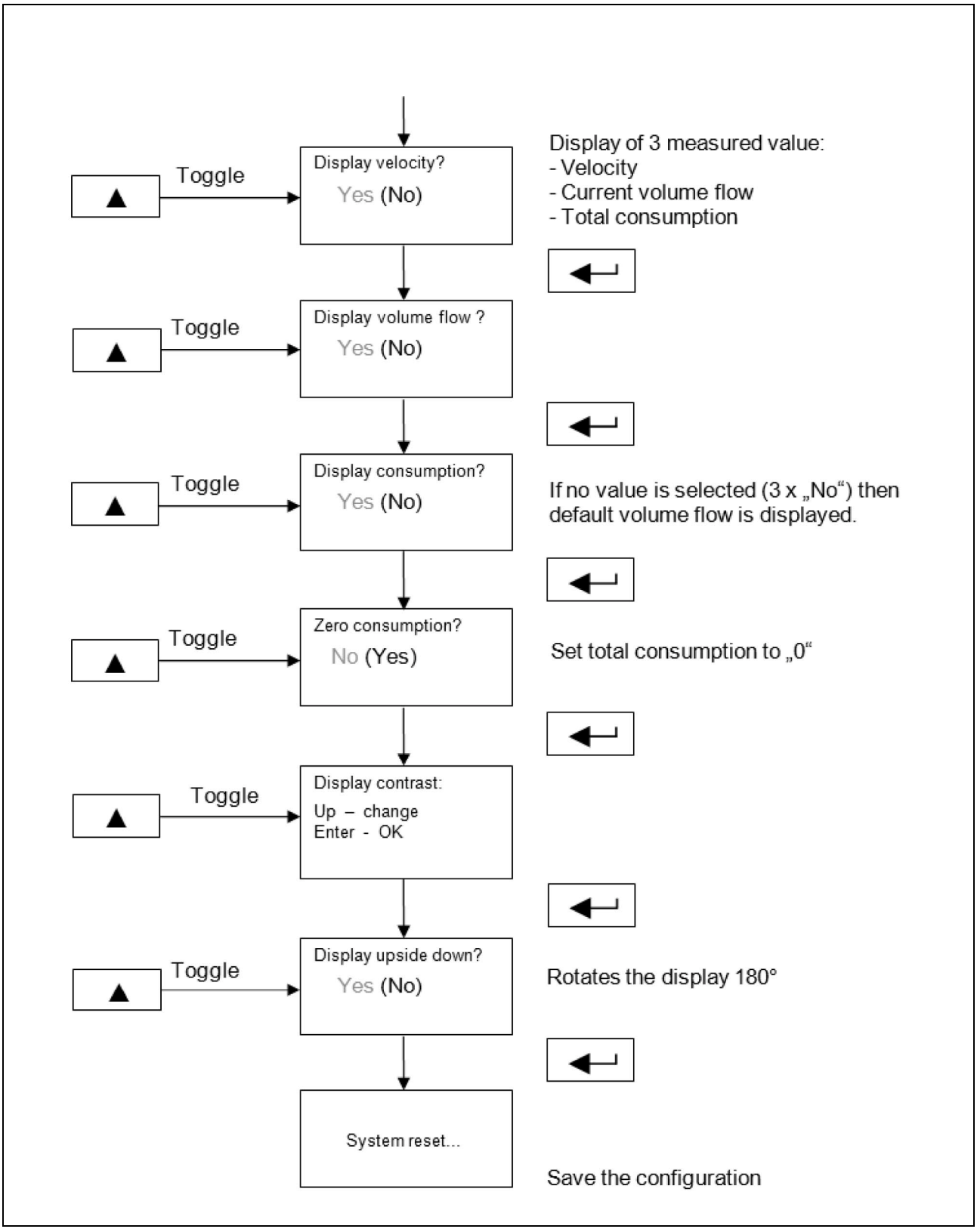
14.2 Configuration settings

To modify the configuration, press the Enter key for three seconds. Subsequent to the entry of the unlock code, the menu starts with the request to enter the volume-flow measuring unit. The unit starts flashing and can be modified with the “Up“ key. The selected unit is confirmed by pressing Enter.

Configuration menu:



Configuration menu:



You can leave the menu prior to completion of the programming by pressing the Enter key for 3 s. After approximately 20 sec. without touching a key, the display will automatically switch back to the online mode. Settings which were modified until that moment will be activated.

15 Declaration of Conformity

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EG-Konformitätserklärung

Wir erklären hiermit, dass die nachfolgend bezeichneten Produkte in der von uns gelieferten Ausführung den Anforderungen der einschlägigen Normen entsprechen:

Produktbezeichnung:	FS211 ¼", ½", ¾", 1, 1 ¼", 1 ½", 2"
Spannungsversorgung:	12 - 30 VDC
max. Betriebsdruck:	16 bar
Produktbeschreibung und Funktion:	Sensor zur Messung des Volumenstroms in Druckluftsystemen

Niederspannungs-Richtlinie 2006/95/EG
Mit einer Nennspannung von max. 30 VDC fällt das Produkt nicht in den Anwendungsbereich der Niederspannungsrichtlinie (dort Artikel 1).

EMV-Richtlinie 2004/108/EG
Angewandte Normen:

Störaussendung:
EN 61326-1: 2006-10 + EN 61326-1/Ber.1: 2008-07

Störfestigkeit:
EN 61326-1: 2006-10 + EN 61326-1/Ber.1: 2008-07

Die Produkte sind mit dem abgebildeten Zeichen gekennzeichnet:

CE

Diese Erklärung bezieht sich nur auf die Produkte in dem Zustand, in dem sie in Verkehr gebracht wurden; nicht vom Hersteller angebrachte Teile und/oder nachträglich vorgenommene Eingriffe bleiben unberücksichtigt.

Neuss, 18.03.2011

BEKO TECHNOLOGIES GMBH

i.V. Christian Riedel
Leiter Qualitätsmanagement

Archiving: \\Beko11\qma\Bescheinigungen_QMA-Info\Messtechnik\FS211\FS211_ec_decl_de_2011_03.doc

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www.beko.de

EC Declaration of Conformity

We hereby declare that the products indicated hereafter, in the delivered performance, comply with the stipulations of the relevant standards:

Product designation:	FS211 ¼“, ½“, ¾“, 1, 1 ¼“, 1 ½“, 2“
Voltage supply:	12 - 30 VDC
Max. operating pressure:	16 bar
Product description and function:	Sensor for the measurement of the volume flow in compressed-air systems

Low-Voltage Directive 2006/95/EC
With a nominal voltage of max. 30 VDC, the product does not fall within the scope of the Low-Voltage Directive (Article 1).

EMC Directive 2004/108/EC
Standards applied:

Emitted interference:
EN 61326-1: 2006-10 + EN 61326-1/Ber.1: 2008-07

Immunity to interference:
EN 61326-1: 2006-10 + EN 61326-1/Ber.1: 2008-07

The products are labeled with the sign shown below:

CE

This declaration only refers to the products in the condition in which they have been placed into circulation. Parts which have not been installed by the manufacturer and/or modifications which have been implemented subsequently remain unconsidered.

Neuss, 18 March 2011

BEKO TECHNOLOGIES GMBH

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Original operating instructions in German.
Translation of the original operating instructions.
Subject to technical changes / errors excepted.
FS 211_manual_en_2011_06