

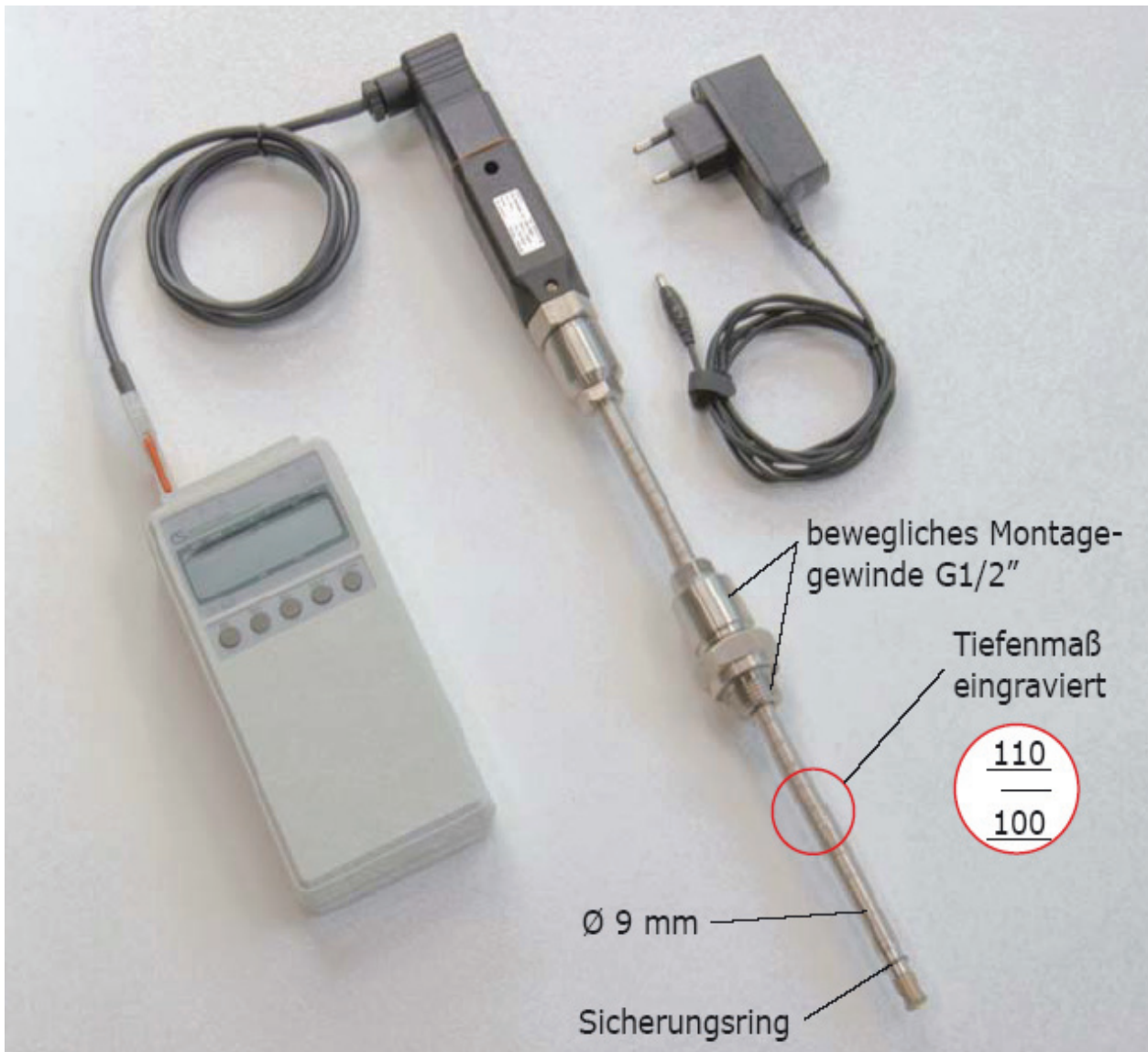
Operating manual



VA 300

Mobile

flow and air consumption measurement
for compressed air and gases



Important information

The operating instructions must be read in full and carefully observed before starting up the device.

The manufacturer cannot be held liable for any damage which occurs as a result of non-observance or non-compliance with this manual.

Should the device be tampered with in any manner other than a procedure which is described and specified in the manual, the warranty is cancelled and the manufacturer is exempt from liability.

The device is destined exclusively for the described application.

CS Instruments offers no guarantee for the suitability for any other purpose and is not liable for errors which may have slipped into this operating manual. They are also not liable for consequential damage resulting from the delivery, capability or use of this device.

Area of application

The CS VA 300 product range is designed for stationary and mobile use in compressed air pipes, air ducts or shafts.

It is used for the measurement and control of flow and air consumption in operating air pressure and other gases.

The principle of measurement is based on the evacuation of heat from an electrically heated sensor into the surrounding air flow.

The measuring devices operate independently of pressure and temperature.

When the sensor is fitted in a pipe, the output signal from the speed of flow is used to calculate the standard volume at 20 °C and 1000 mbar of the medium.

Safety instructions

Must be read before starting up the device!

Warning:

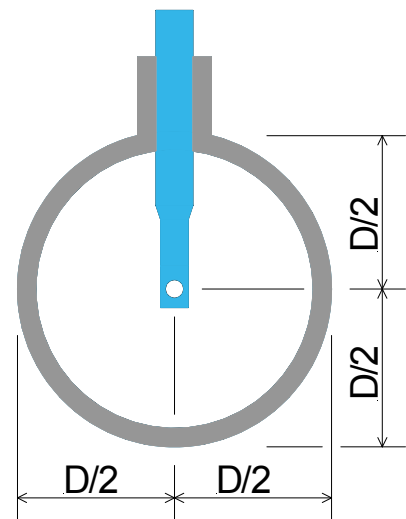
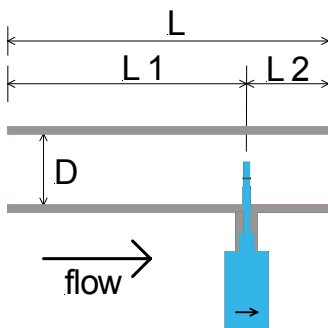
- Do not exceed the pressure range of 50 bar.
- Installation under pressure up to 16 bar is possible without mounting device. When the pressure is between 16 and 50 bar it is needed to use the mounting device.
- Observe the measuring range of the sensor.
- Overheating destroys probes.
- Observe permissible storage, transport and operating temperatures.
- Improper handling or use of force when opening the device cancels all warranty claims.
- Adjustment and calibration work must only be carried out by trained personnel from the field of measuring and control engineering.
- Always observe the direction of flow when positioning the sensor.
- The safety ring on the sensor head must always remain undamaged and sit correctly in the intended groove.
- The screwed fixture must be pressure tight.
- The adapter sleeve must be tightened with a torque of 20 ... 30 Nm.
- Avoid condensation on the sensor element or water drops in the measuring air at all costs as they cause faulty measuring results.
- The values of the inlet and outlet sections must not fall below the specified minimum values as this causes increased deviations in the measuring results.

Determining the point of installation

In order to maintain the accuracy stipulated in the data sheets, the sensor must be inserted in the centre of a straight pipe section with unhindered flow characteristics.

Unhindered flow characteristics are achieved if the sections in front of the sensor (inlet) and behind the sensor (outlet) are sufficiently long, absolutely straight and lack obstructions such as edges, seams, curves etc.

Careful attention must be paid to the design of the outlet section as obstructions can cause counter-flow turbulence as well as turbulence in the direction of the flow.



- L = Length of the entire measurement section
- L1 = Length of inlet section
- L2 = Length of outlet section
- D = Diameter of measurement section

The following table shows the equalising sections necessary in relation to existing obstructions.



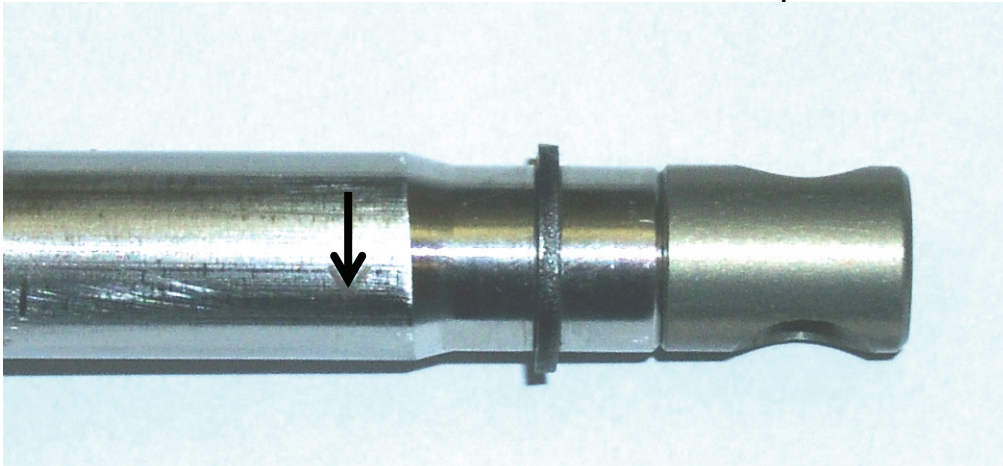
Table of inlet and outlet sections

Flow obstruction before the measurement section	Min. length inlet (L1)	Min. length outlet (L2)
Slight curve (bend < 90°)	12 x D	5 x D
Reduction (Tube narrows towards measurement section)	15 x D	5 x D
Expansion (Rohr expands towards measurement section)	15 x D	5 x D
90° bend or T piece	15 x D	5 x D
2 x 90° bends on one level	20 x D	5 x D
2 x 90° bends 3 dimensional change of direction	35 x D	5 x D
Shut-off valve	45 x D	5 x D

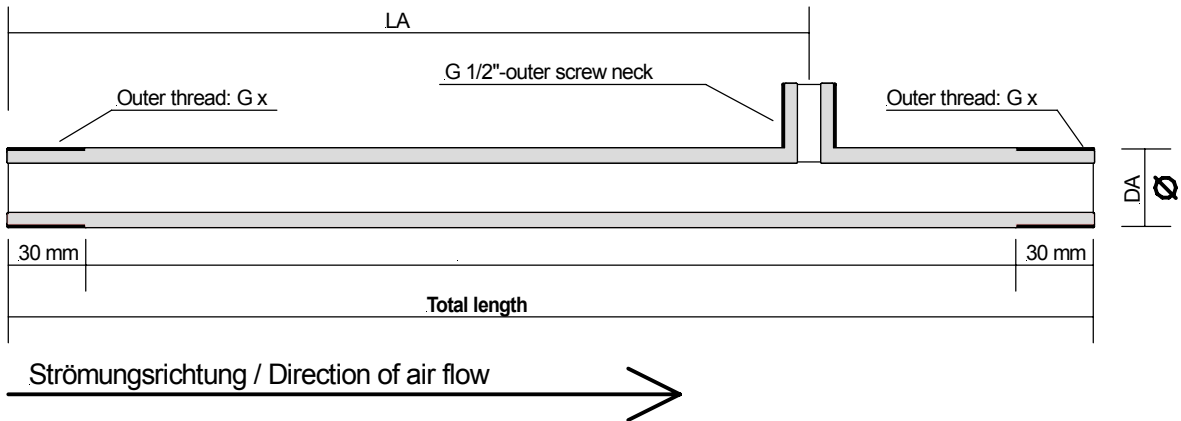
The respective minimum values required are indicated here.
If it is not possible to observe the stipulated equalising sections, considerable deviations in measuring results must be expected.

Installation position

The sensor head must sit in the centre of the pipe.
Observe the direction of flow indicated on the tip of the sensor.

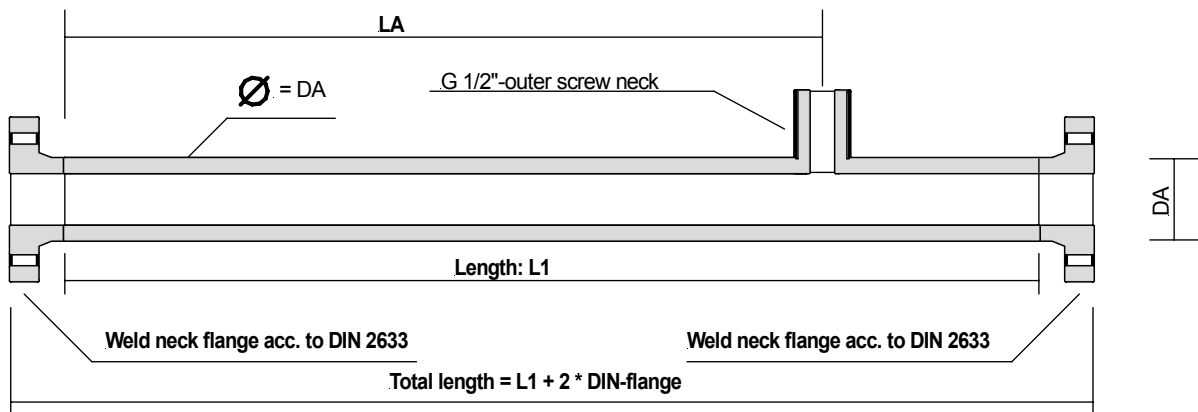


Measurement section for VA 300 probes



Outer dia. DA	Length LA	Thread G x	Pipe	Total length
21.3 mm	350 mm	G 1/2"	21.3 * 2.6 mm, Stahl 1.4301	500 mm
26.9 mm	430 mm	G 3/4"	26.9 * 2.6 mm, Stahl 1.4301	600 mm
33.7 mm	530 mm	G 1"	33.7 * 3.2 mm, Stahl 1.4301	750 mm
42.4 mm	660 mm	G 1 1/4"	42.4 * 3.2 mm, Stahl 1.4301	900 mm
48.3 mm	750 mm	G 1 1/2"	48.3 * 3.2 mm, Stahl 1.4301	1000 mm
60.3 mm	930 mm	G 2"	60.3 * 3.6 mm, Stahl 1.4301	1250 mm
76.1 mm	1170 mm	G 2 1/2"	76.1 * 3.6 mm, Stahl 1.4301	1500 mm

Measurement section for VA 300 probes with flange connection



Outer dia. DA	Length L1	LA	DIN - flange	Pipe	Total length = L1 + 2 * DIN flange
88.9 mm	1750 mm	1330 mm	DN 80 / 88.9	88.9 * 2.0 mm, Stahl 1.4301	1750 + (2*50) = 1850 mm
114.3 mm	2000 mm	1700 mm	DN 100 / 114.3	114.3 * 2.0 mm, Stahl 1.4301	2000 + (2*52) = 2104 mm
139.7 mm	2750 mm	2050 mm	DN 125 / 139.7	139.7 * 3.0 mm, Stahl 1.4301	2750 + (2*55) = 2860 mm
168.3 mm	3000 mm	2450 mm	DN 150 / 168.3	168.3 * 3.0 mm, Stahl 1.4301	3000 + (2*55) = 3110 mm

Assembly instructions

Safety information must be observed.

Assembly is carried out by inserting the connection thread (1/2" thread, SW 27) into the connection piece.

The sensor is then inserted to the required immersion depth and aligned according to the direction of air flow.

A depth gauge engraved on the probe tube will assist you, along with a flow alignment arrow and an aligning aid.

Once the sensor has been aligned, the adapter sleeve must be tightened with the stipulated torque (SW 17).

Attention: Alignment of the sensor must not be modified when tightening the connection thread and adapter sleeve.

If this should occur, check the immersion depth and alignment again and correct if necessary.

The angular deviation should not be greater than $\pm 2^\circ$ in relation to the ideal position as otherwise the measuring accuracy will decrease.

Commissioning

The valid measuring range and delivery configuration are programmed by the manufacturer on the basis of the user's specifications.

The mobile flow and air consumption measuring devices from the VA 300 series function according to the "plug and play" principle. The device is ready for operation as soon as the power supply is connected.

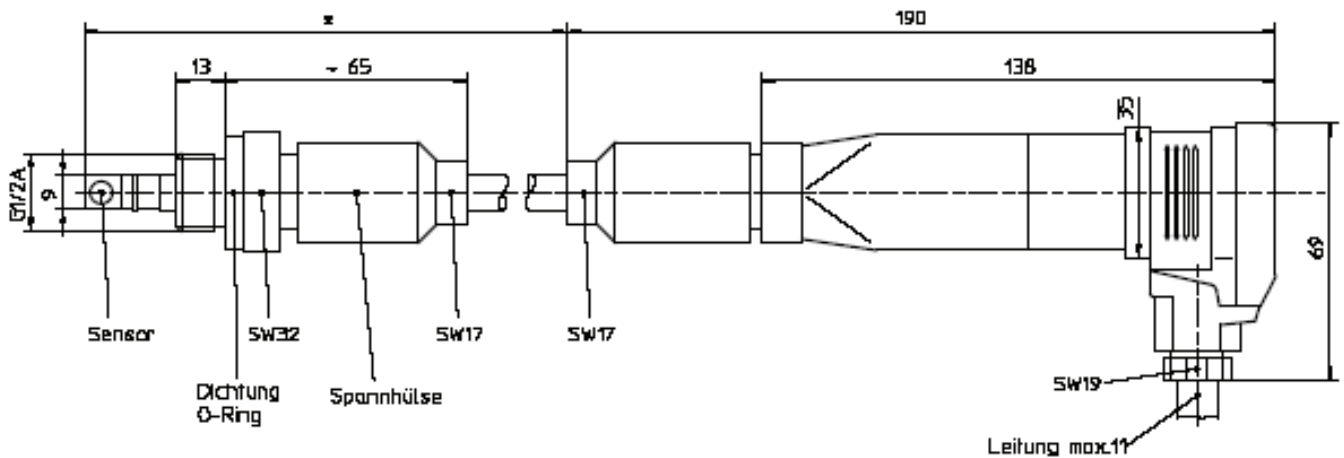
Modifications to the measuring ranges can be carried out with the CS2390-5 handheld instrument.

With mobile flow and air consumption measuring devices, the user will be able to carry out these modifications using the software and RS232 interface.

Flow measuring ranges

Inner diameter		Standard version VA 300 - 80	Max. version VA 300 - 120
Inch	mm	Measuring range from ... to	Measuring range from ... to
1/4"	6	0.8 ... 80 l/min	1.0 ... 110 l/min
1/2"	16.1	2.5 ... 760 l/min	3.5 ... 1100 l/min
3/4"	21.7	0.3 ... 90 m ³ /h	0.4 ... 120 m ³ /h
1"	27.3	0.5 ... 150 m ³ /h	0.6 ... 200 m ³ /h
1 1/4"	36.0	0.9 ... 280 m ³ /h	1.2 ... 360 m ³ /h
1 1/2"	41.9	1.2 ... 370 m ³ /h	1.5 ... 500 m ³ /h
2"	53.1	2 ... 600 m ³ /h	2.5 ... 800 m ³ /h
2 1/2"	71.1	3.5 ... 1100 m ³ /h	5 ... 1500 m ³ /h
3"	84.9	5 ... 1600 m ³ /h	7 ... 2200 m ³ /h
4"	110.3	9 ... 2700 m ³ /h	12 ... 3600 m ³ /h
5"	133.7	13 ... 4000 m ³ /h	18 ... 5300 m ³ /h
6"	162.3	18 ... 5800 m ³ /h	25 ... 8000 m ³ /h
8"		On request	On request

Drawing of VA 300 probe



*
Standard ca. 285mm
andere Längen auf Anfrage

Short instruction for portable applications with CS 2390-5 and VA 300

There is a special version of VA 300 probe which is used to co-operate with CS 2390-5 hand held meter. Stationary probes VA 300 cannot be connected to this instrument.

Measurement values are always referenced to 20 °C und 1000 mbar.

The portable probes can be mounted in any compressed air tube by considering the details from chapter XXX. They will measure the volume flow in m³/h depending on the tube diameter setting in the hand held instrument CS 2390-5.

Start of measurement

1. Plug in the supplied mains adapter and connect it to the mains supply.

Attention:

The operation of the portable probes VA 300 (3300.0081 and 3300.0121) is only possible by using the CS2390-5 with mains supply (2390.2290) or the optional battery pack (0515.1002).

2. Mount probe into the compressed air pipe as described in this instruction manual.

3. Connect VA 300 probe with supplied cable to one of the left probe input of CS 2390-5 (M0, M1, M2). Left connector M0, mid M1 right M2, recommended channel is left M0.

4. Switch on instrument (sliding switch left).

5. Display will show the actual value in m³/h. IN case display shows 0 ---- the probe has been connected to either MA or M2. Use the key **M▲** to select the desired channel.

6. If the display is flashing, the inner diameter is set to DN = 0. Please enter the correct inner diameter of the tube as described under 7.

7. Entering the inner diameter (only possible when m³/h is shown in the Display):

Default setting ex factory:

2" = 53,1 mm

Other diameters are entered as follows:

- Press **FUNCTION** key, display shows **0: 053.1 DN.**
- Press **PROG (▶)** once **053.1 First digit is flashing**
- Use **PROG (▶)** to select the digit to be changed (digit flashes).
- Use the keys **(▼) and (▲)** to enter the desired number.
- Press **PROG (▶)** until all numbers are entered and no digit is flashing anymore.
- Press **M▲ once**. Now the instrument is ready to measure based on the newly entered diameter. The diameter remains set even when the instrument is powered off.

Further menu points:

1. Switch from volume flow to velocity

By pressing the key **M▲** the display will change from **m³/h** to **m/sec** which is the velocity at the point of measurement.

2. Check memory status, screen displays SF 31,1:

Press **FUNCTION** key, screen displays **31,1 SF**, up to 3600 individual measured values are possible.

Delete memory for new measurement with **PROG (▶)** key. **SCLR SF** flashes on the screen
Delete memory by pressing **M▲ CLEAR**, and press **M▲ CLEAR** again to return to measurement menu

3. Alter ZY storage cycle:

Press **FUNCTION** key, the factory setting is a cycle of 00:00:05 ZY, which means that a measured value is stored every 5 seconds. Alterations are made using **PROG (▶)** and **(▲)(▼)** **number** keys. Store with **PROG (▶)** key until no figures are flashing. Return to measurement with **M▲** key.

4. Storing measured values

Store measured values via **Start key**. **(▲)(▲)** appears in the display
Storage is stopped via **Stop** key.

Additional considerations:

Do not change the connected probes as long you have recorded data stored inside the instrument. The instrument cannot distinguish between different probes and will always assume to have the same probes connected as at the start of the first record. Whenever probes have to be changed we recommend to transfer the recorded data to the PC via CS-Soft and then clear the internal memory.

5. Read out recorded data, analyze them with CSSoft Software

Connect RS-232 cable to the right hand connector (black A1) of CS2390 and connect the other end to the COM port of your PC. Start CS-Soft by clicking the icon on the desktop. Please find further instructions in the tutorial of CS-Soft.

If the CS 2390 is connected with a PC it is not possible to change the diameter or other settings.

Measuring ranges in relation to inner pipe diameter

This table is used when the standard VA 300-80 probe is to be used in different pipes.

Inner pipe diameter		Volume flow (final value of meas. range)				max.
Inch	mm	m ³ /h	m ³ /min	l/min	l/s	m/s
1/4"	6.0	4.7	0.08	78.7	1.31	92.7
	10.0	15.1	0.25	251.1	4.19	92.7
	15.0	38.9	0.65	648.6	10.81	92.7
1/2"	16.1	45.6	0.76	760.8	12.68	92.7
3/4"	21.7	89.1	1.48	1484.9	24.75	92.7
1"	25.0	122.2	2.04	2036.3	33.94	92.7
	26.0	132.9	2.21	2214.3	36.90	92.7
	27.3	147.5	2.46	2457.5	40.96	92.7
	28.5	162.0	2.70	2699.6	44.99	92.7
1 1/4"	30.0	180.9	3.01	3014.8	50.25	92.7
	32.8	218.8	3.65	3646.2	60.77	92.7
	36.0	266.3	4.44	4437.6	73.96	92.7
1 1/2"	36.3	270.7	4.51	4511.9	75.20	92.7
	39.3	320.1	5.34	5335.7	88.93	92.7
	40.0	332.5	5.54	5541.4	92.36	92.7
2"	41.9	366.7	6.11	6111.0	101.8	92.7
	43.1	389.4	6.49	6490.4	108.1	92.7
	45.8	441.9	7.37	7365.7	122.7	92.7
	50.0	530.6	8.84	8844.1	147.4	92.7
	51.2	557.1	9.29	9285.1	154.7	92.7
	53.1	600.0	10.00	10000	166.6	92.7
	54.5	632.8	10.55	10546	175.7	92.7
	57.5	707.8	11.80	11797	196.6	92.7
	60.0	773.6	12.89	12892	214.8	92.7
	64.2	888.9	14.81	14814	246.9	92.7

Measuring ranges in relation to inner pipe diameter

This table is used when the standard VA 300-80 probe is to be used in different pipes.

Inner pipe diameter		Volume flow (final value of meas. range)				max.
Inch	mm	m ³ /h	m ³ /min	l/min	l/s	m/s
2 1/2"	65.0	913.5	15.22	15224	253.7	92.7
	70.3	1071.1	17.85	17851	297.5	92.7
	71.1	1095.6	18.26	18260	304.3	92.7
	76.1	1258.2	20.97	20969	349.4	92.7
3"	80.0	1390.4	23.17	23173	386.2	92.7
	81.0	1425.4	23.76	23756	395.9	92.7
	82.5	1480.5	24.67	24674	411.2	92.7
	84.9	1569.8	26.16	26162	436.0	92.7
	90.0	1766.1	29.44	29435	490.6	92.7
4"	100.0	2183.1	36.38	36384	606.4	92.7
	107.1	2507.1	41.78	41784	696.4	92.7
	110.0	2644.7	44.08	44077	734.6	92.7
5"	125.0	3423.3	57.1	57055	950.9	92.7
	133.7	3921.1	65.4	65351	1089.2	92.7
6"	150.0	4941.4	82.4	82356	1372.6	92.7
	159.3	5579.8	93.0	92996	1549.9	92.7
	182.5	7323.4	122.1	122055	2034.3	92.7
	190.0	7947.1	132.5	132451	2207.5	92.7
8"	200.0	8816.2	146.9	146936	2448.9	92.7
	206.5	9398.5	156.6	156642	2610.7	92.7
10"	250.0	13775	229.6	229587	3826.5	92.7
	260.4	14945	249.1	249086	4151.4	92.7
12"	300.0	19836	330.6	330606	5510.1	92.7
	309.7	21139	352.3	352331	5872.2	92.7
	339.6	25418	423.6	423646	7060.8	92.7
	388.8	33317	555.3	555291	9254.9	92.7
	500.0	55101	918.4	918350	15305	92.7
	600.0	79345	1322	1322424	22040	92.7
	700.0	107998	1800	1799966	29999	92.7
	800.0	141058	2351	2350976	39182	92.7
	900.0	178527	2975	2975455	49590	92.7
	1000.0	220404	3673	3673401	61223	92.7

Measuring ranges in relation to inner pipe diameter

This table is used when the **VA 300-120 probe (maximum version)** is to be used in different pipes.

Inner pipe diameter		Volume flow (final value of meas. range)				max.
Inch	mm	m ³ /h	m ³ /min	l/min	l/s	m/s
1/4"	6,0	6,3	0,10	105,0	1,75	123,7
	10,0	20,1	0,33	334,8	5,59	123,7
	15,0	51,9	0,86	864,8	14,4	123,7
1/2"	16,1	60,8	1,01	1012	16,9	123,7
3/4"	21,7	118,8	1,98	1980	33,0	123,7
1"	25,0	162,9	2,72	2715	45,3	123,7
	26,0	177,2	2,95	2952	49,2	123,7
	27,3	196,6	3,28	3277	54,6	123,7
	28,5	215,9	3,60	3407	60,0	123,7
	30,0	241,2	4,02	4020	67,0	123,7
1 1/4"	32,8	291,7	4,86	4862	81,0	123,7
	36,0	355,0	5,92	5917	98,6	123,7
	36,3	359,6	5,94	5925	99,0	123,7
1 1/2"	39,3	426,9	7,11	7114	118,6	123,7
	40,0	443,3	7,39	7389	123,1	123,7
	41,8	486,5	8,11	8109	135,2	123,7
	43,1	519,2	8,65	8654	144,2	123,7
	45,8	588,5	9,81	9809	163,6	123,7
2"	50,0	706,6	11,78	11778	196,3	123,7
	51,2	742,8	12,38	12380	206,3	123,7
	53,1	800,0	13,33	13333	222,2	123,7
	54,5	844,9	14,08	14081	234,6	123,7
	57,5	945,1	15,75	15751	262,5	123,7
	60,0	1032,8	17,21	17213	286,8	123,7
	64,2	1186,8	19,78	19779	329,6	123,7

Measuring ranges in relation to inner pipe diameter

This table is used when the **VA 300-120 (maximum version)** probe is to be used in different pipes.

Meßrohr Innendurchmesser		Volumenstrom (Meßbereichsendwert)				max.
Zoll	mm	m³/h	m³/min	l/min	l/s	m/s
2 1/2"	65,0	1218,0	20,30	20300,4	338,34	123,7
	70,3	1428,2	23,80	23803,6	396,73	123,7
	71,1	1460,9	24,35	24348,4	405,81	123,7
	76,1	1677,7	27,96	27960,9	466,01	123,7
3"	80,0	1854,0	30,90	30900,2	515,00	123,7
	81,0	1900,7	31,68	31677,6	527,96	123,7
	82,5	1974,1	32,90	32901,3	548,36	123,7
	84,9	2093,1	34,89	34885,5	581,42	123,7
4"	90,0	2355,0	39,25	39249,8	654,16	123,7
	100,0	2910,9	48,51	48514,8	808,58	123,7
	107,1	3342,9	55,72	55715,4	928,59	123,7
	125,0	4564,7	76,1	76077,8	1268,0	123,7
5"	133,7	5228,4	87,1	87140,6	1452,3	123,7
	150,0	6588,9	109,8	109814,4	1830,2	123,7
	159,3	7440,1	124,0	124001,5	2066,7	123,7
	182,5	9765,0	162,8	162750,0	2712,5	123,7
6"	190,0	10584,1	176,4	176401,6	2940,0	123,7
	200,0	11727,5	195,5	195458,8	3257,6	123,7
	206,0	12441,7	207,4	207362,3	3456,0	123,7
	206,5	12502,2	208,4	208370,1	3472,8	123,7
8"	260,4	19928,0	332,1	332133,4	5535,6	123,7
	300,0	26449,9	440,8	440831,9	7347,2	123,7
	309,7	28188,0	469,8	469799,9	7830,0	123,7
	339,6	33893,6	564,9	564892,6	9414,9	123,7
12"	388,8	44425,7	740,4	740428,4	12340,5	123,7
	500,0	73472,0	1224,5	1224533,1	20408,9	123,7
	600,0	105799,7	1763,3	1763327,7	29388,8	123,7
	700,0	144005,1	2400,1	2400084,9	40001,4	123,7
12"	800,0	188088,3	3134,8	3134804,8	52246,7	123,7
	900,0	238049,2	3967,5	3967487,3	66124,8	123,7
	1000,0	293888,0	4898,1	4898132,5	81635,5	123,7

Technical data

Measurands:	m ³ /h m/s (The underlying standard is valid: DIN 1945. ISO 1217 at 20°C and 1000 mbar)
measuring range:	see table
Principle of measurement:	calorimetric measurement
Sensor:	2 x PT100
Measuring medium:	Air, gas
Operating temperature:	-30 to 140°C probe tube -30 to 80 °C housing
Operating pressure:	up to 50 bar
Analogue output:	4 to 20 mA for m ³ /h
Pulse output:	1 pulse per m ³ (High signal 24 VDC 2ms)
Power supply: (stationary with flow processor)	230 VDC. 50 to 60 Hz
Power supply: (mobile, probe only)	24 VDC smoothed ± 15%
Accuracy: With measurement section	± 3% of m.v. ± 2% of m.v. (option via 5 point ISO precision calibration) This data is only valid in relation to the measurement section
Accuracy: Without measurement section	± 4 % of m.v. ± 3 % of m.v. (option via 5 point ISO precision calibration) This data is only valid when the correct inner diameter is entered.
Display:	Flow in m ³ /h Velocity in m/s
Selectable units:	m ³ /h (standard factory setting) m ³ /min. l/min. l/s. ft/min. cfm

Service information

Maintenance

The sensor head should be checked regularly for dirt and cleaned if necessary. Should dirt, dust or oil build up on the sensor element, a deviation will occur in the measured value.

A yearly check is recommended. Should the compressed air be heavily soiled, this interval must be shortened.

Cleaning the sensor head

The sensor head can be cleaned by carefully moving it to and fro in warm water with a small amount of washing up liquid. Avoid physical intervention on the sensor (e.g. using a sponge or brush).

If soiling cannot be removed, service and maintenance must be carried out by the manufacturer.

Re: calibration

If no customer specifications are given, then we recommend that calibration is carried out every 12 months. The sensor must be sent to the manufacturer for this purpose.

Spare parts and repair

Spare parts are not available for reasons of measuring accuracy. If parts are faulty, they must be sent to the supplier for repair.

If the measuring device is used in important company installations, we recommend that you keep a spare measuring system ready.

Calibration certificates

Calibration certificates are issued by the manufacturer on request. This is a fee-paying service. Precision is tested with PTB (German National Metrology Institute) volume flow nozzles.

EC Declaration of Conformity

for

**DIRECTIVE 2002/96/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 27. January 2003
on waste electrical and electronic equipment (WEEE)**

and

**DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 27. January 2003
on the restriction of the use of certain hazardous substances in electrical and electronic
equipment (RoHS)**

of the down mentioned instruments from CS Instruments GmbH:

Pressure dew point meter: FA 300 and accessories

Flow- and consumption meter: VA 300 and accessories

CS Messtechnik GmbH as the manufacturer herewith declares that the above instruments and accessories belongs to the category 9 (WEEE 2002/96/EC). Therefore the above instruments do not fall upward aforementioned directive RoHS 2002/95/EC and are not affected by the material restriction. In accordance with directive WEEE 2002/96/EC the measuring instruments specified above are taken back from CS Instruments GmbH to the disposal.

CS Instruments GmbH

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Harrislee, 16. January 2007



Christian Schuldt, Managing Director

This declaration does not guarantee any product characteristics.
Please do also adhere to the safety instructions stated in the enclosed documentation.

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