VA 550 / 570

New precise flow measurement for compressed air and gases incl. temperature measurement

VA 550

Precise flow measurement for compressed air and gases

Application range:

- **Ideal also for the outdoor area**
- **Compressed air measurement and distribution**
- **Leakage measurement of compressed air and gases**
- **Flow measurement of gases like e. g. nitrogen, argon, carbon dioxide, oxygen and so on**
- **Flow measurement in vacuum systems**
- **Flow measurement of explosive gases like natural gas, methane, propane, hydrogen with ATEX approval**
- **Flow measurement of corrosive, acid gases like e. g. biogas with different gas mixtures**
- **Measurement of oxygen and natural gas at gas burners**
- **Flow measurement of gas mixtures like e. g. forming gas**

Available with option: Ethernet Modbus/TCP

VA 550 immersion sensor

ATEX

DVGW tested

*** German Technical and Scientific Association for Gas and Water**

Applicable in all sectors like e. g.:

- Chemistry, petrol chemistry
- Natural gas, methane...
- Pharmaceutical industry
- Food production
- Breweries
- Diaries
- Power plants
- Semiconductor/ electronics
- Automotive industry

The new flow sensors VA 550/ 570 work according to the calorimetric measuring principle. Therefore an additional temperature and pressure compensation is not necessary.

Due to its robust design, the aluminum die cast housing, the robust sensor tip made from stainless steel 1,4571, the new VA 550/ 570 are suitable for demanding industrial applications. An ATEX version is available for applications in explosive areas. For flow measurement e. g. of natural gas there is a version with a DVGW admission.

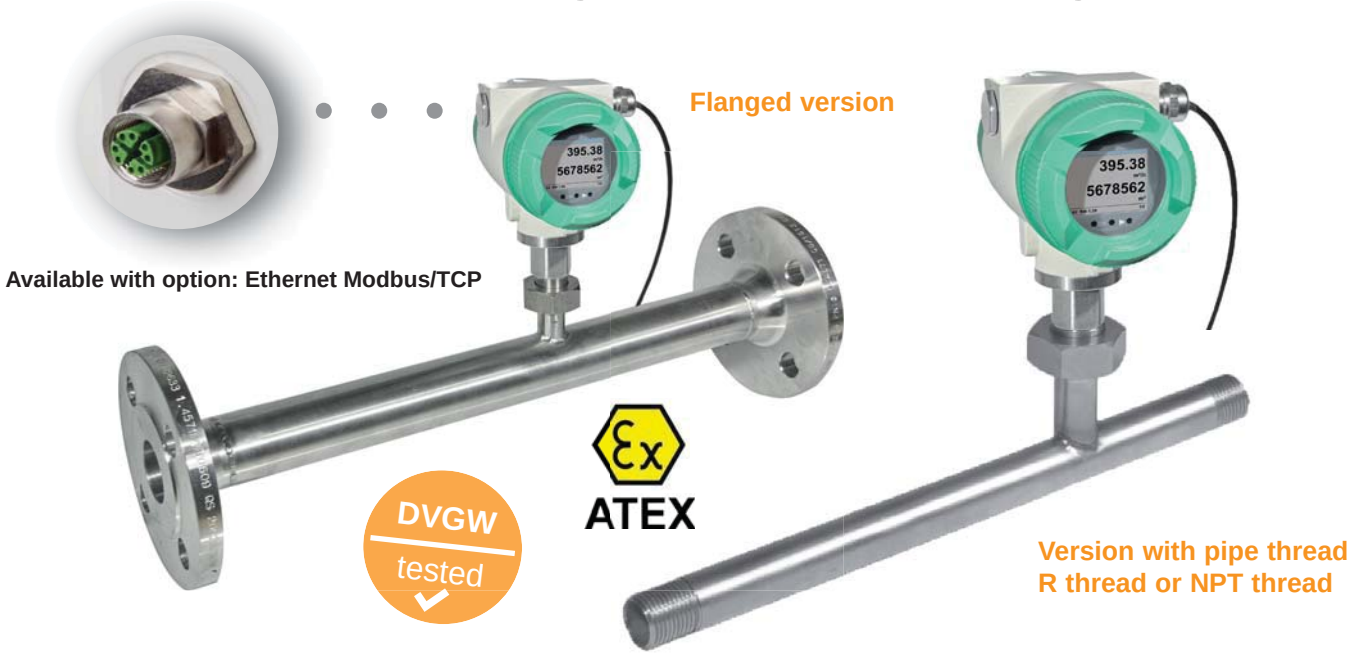
Contrary to the previously used bridge circuit the newly developed evaluation electronics records all measured values digitally. This allows very precise and fast measurements with a wide temperature range of up to 180 °C. The measuring span is 1...1000 and enables therefore measurements in very low as well as in very high flow speeds of up to 224 m/s.

VA 550/ 570 has an integrated Modbus output as a standard with which all parameters like Nm³/h, Nm³, Nm/s, Nl/min, Nl/s, kg/h, kg/min, ft/min, °C etc. can be transferred. All parameters can be adjusted directly at the instrument (via display) or via the PI 500 hand-held measuring instrument resp. the Service Software. Of course there are also 1 x 4...20 mA analogue output available for the flow and a galvanically isolated pulse output for the total consumption.

A remote diagnosis can be carried out via Modbus and all relevant parameters can be checked and changed if necessary. So it is possible to change e. g. the gas type, the inner diameter, the scaling and so on or the zero point resp. the leak flow volume suppression in case of changed process conditions.

Via remote diagnosis and status update e. g. temperature exceeding, failures of the sensor or the calibration date can be determined.

VA 570 - with integrated measuring section



VA 570 is supplied with an integrated measuring section. The measuring sections are available in flanged version or with R resp. NPT thread.

A special feature is the removable measuring head. So the measuring unit can be removed easily and quickly for calibration or cleaning purposes without having to dismount the measuring section intricately. During this period the measuring section is sealed by a closing cap (accessory).

The screwing with centering device ensures that the sensor is positioned accurately in the center when screwing it into the measuring section furthermore it grants an exact positioning in the flow direction. This avoids unnecessary measuring faults.

Flow measuring ranges VA 570

			Full scale values in Nm³/h					
Inch	Inner pipe diameter (mm)	DN	Air	N2	Ar	O2	CO2	Methane natural gas (CH4)
R 1/2“	16.1	DN 15	0.2...90	0.2...80	0.2...140	0.2...85	0.2...90	0.2...50
R 3/4“	21.7	DN 20	0.3...170	0.3...155	0.3...275	0.3...165	0.3...175	0.3...105
R 1“	27.3	DN 25	0.5...290	0.5...260	0.5...460	0.5...280	0.5...290	0.5...170
R 1 1/4“	36.0	DN 32	0.7...530	0.7...485	0.7...830	0.7...505	0.7...525	0.7...310
R 1 1/2“	41.9	DN 40	1.0...730	1.0...650	1.0...1140	1.0...695	1.0...720	1.0...430
R 2“	53.1	DN 50	2.0...1195	2.0...1060	2.0...1870	2.0...1140	2.0...1185	2.0...705
	68.9	DN 65	4.0...2050	3.0...1820	6.0...3205	3.0...1955	4.0...2030	2.0...1210
	80.9	DN 80	5.0...2840	5.0...2610	9.0...4440	5.0...2710	5.0...2810	3.0...1680

If you want to measure the flow of a special gas mixture please contact us. On request we are quite pleased to offer a real gas calibration under process conditions.

Measuring ranges of further gases like: Nitrous oxide (N2O), helium (He), propane (C3H8), biogas* (CH4/CO2 60/40) on request!

Measuring head removable | Screwing with centring device | Easy cleaning of the sensor system

VA 550 - immersion sensor

Flow sensor for heavy duty industrial applications incl. temperature measurement.

ATEX

The immersion sensor VA 550 is the ideal flow sensor for installation into existing compressed air resp. gas lines from 3/4“ up to DN 1000.

Special mechanical features:

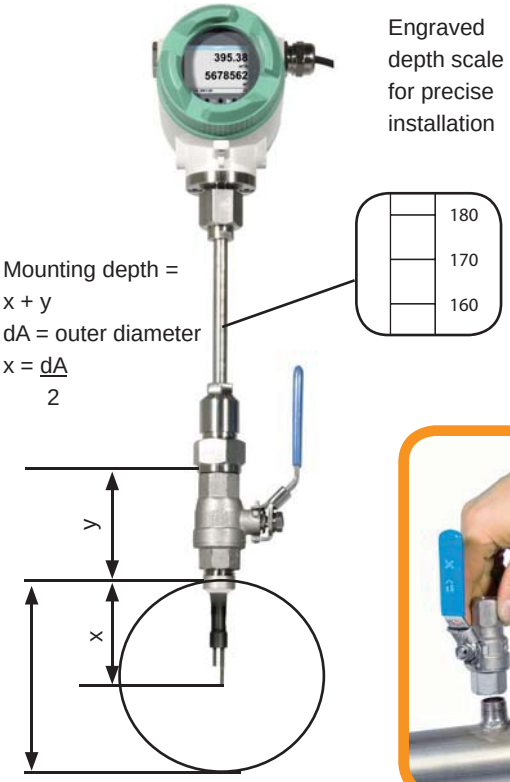
- Robust impact-proof aluminum die cast housing for the outdoor area IP 67
- All medium-touching parts made from stainless steel 1,4571
- As immersion sensor suitable for 3/4“ up to DN 1000
- On request with ATEX approval ATEX II 2G Ex d IIC T4 (up to 120 °C)
- On request with DVGW approval for natural gas (up to 16 bar)
- Pressure range up to 50 bar, special version up to 100 bar
- Temperature range up to 180 °C
- No moving parts, no wear out
- Sensor tip very robust, easy to clean
- Easy mounting and dismounting under pressure via 1/2“ ball valve
- Housing twist able, display twist able by 180°
- Safety ring for mounting and dismounting under pressure
- Depth scale for precise installation

Special measurement technology features:

- 4 values in the display: Flow, total consumption, velocity, temperature. Units freely adjustable.
- Min/max values and daily/hours/minutes average values. Time for averaging adjustable
- All measured values, settings like gas type, inner diameter, serial number and so on retrievable via Modbus RTU
- Comprehensive diagnosis functions readable at the display or remote access via Modbus like e. g. exceeding of max/min values °C, calibration cycle, error codes, serial number. All parameters readable and adjustable
- Notification in case of exceeding of the calibration cycle
- Standard version accuracy 1.5 % of m.v. ± 0.3 % of f.s.
- Precision version accuracy 1.0 % of m.v. ± 0.3 % of f.s. up to 40 calibration points with certificate
- Measuring span of 1 : 1000 (0.1 up to 224 m/s)
- Configuration and diagnosis via display, hand-held instrument PI 500, PC service software on-site
- Gas type (air, nitrogen, oxygen, argon and so on) freely adjustable via PC service software or external device DS 400, DS 500, PI 500
- Reference conditions °C and mbar/hPa freely adjustable
- Zero-point adjustment, leak flow volume suppression
- Pressure loss negligible
- Flow measurement in both directions via flow direction switch

Easy mounting/dismounting of **VA 550** under pressure

- without disconnection of the line - without emptying the line



Engraved depth scale for precise installation

Mounting depth =
x + y
dA = outer diameter
x = dA / 2

If there is no suitable measuring site with 1/2“ ball valve there are two simple possibilities to set up a measuring point:

A Weld on a 1/2“ screw neck and screw on a 1/2“ ball valve

B Mount spot drilling collar including ball valve

By means of the drilling jig it is possible to drill under pressure through the 1/2“ ball valve into the existing pipeline. The drilling chips are collected in a filter. Then the sensor can be mounted.

A Screw neck

Order no.: 3300 0006

B Spot drilling collars

Order nos.: please see page 99

Drilling under pressure with CS drilling jig

Order no.: 0530 1108

Measuring ranges flow VA 550 - immersion sensor

Inner diameter of pipe			Standard version (92.7 m/s)						Max. version (185.0 m/s)						High-Speed version (224.0 m/s)						Rec-om-mend-ed sen-sor length
			Full scale values in Nm³/h *						Full scale values in Nm³/h *						Full scale values in Nm³/h *						
Inch	mm	DN	Air**	N2	Ar	O2	CO2	Methane nat. gas (CH4)	Air**	N2	Ar	O2	CO2	Methane nat. gas (CH4)	Air**	N2	Ar	O2	CO2	Methane nat. gas (CH4)	
1/2“	16.1	DN 15	45	40	71	43	45	26	90	80	142	86	90	53	110	98	172	105	109	65	160 mm
3/4“	21.7	DN 20	89	79	139	85	88	52	177	158	278	169	176	105	215	191	336	205	213	127	
1“	27.3	DN 25	122	108	191	116	120	72	243	216	381	232	241	144	295	262	461	281	292	174	
1 1/4“	36.0	DN 32	266	236	416	254	263	157	531	472	830	506	526	314	643	572	1006	613	636	380	
1 1/2“	41.9	DN 40	366	324	570	348	361	215	728	647	1138	694	720	430	881	784	1378	841	872	521	
2“	53.1	DN 50	600	533	938	572	593	354	1197	1064	1872	1141	1185	708	1450	1289	2267	1382	1434	857	
2 1/2“	71.1	DN 65	1095	974	1712	1044	1083	647	2186	1944	3418	2085	2164	1293	2647	2354	4139	2524	2619	1566	220 mm
3“	84.9	DN 80	1569	1395	2454	1497	1553	928	3133	2786	4897	2987	3101	1852	3793	3373	5931	3617	3753	2244	
4“	110.0	DN 100	2644	2351	4134	2522	2616	1563	5278	4693	8251	5033	5224	3121	6391	5683	9992	6094	6322	3780	
5“	133.7	DN 125	3921	3477	6115	3730	3870	2312	7807	6942	12205	7444	7727	4617	9453	8406	14779	9014	9352	5591	
6“	159.3	DN 150	5579	4942	8691	5302	5500	3287	11096	9867	17347	10581	10982	6562	13436	11948	21006	12812	13292	7947	300 mm
8“	200.0	DN 200	8816	7809	13733	8378	8690	5193	17533	15590	27409	16718	17353	10368	21229	18879	33190	20244	21002	12557	
10“	250.0	DN 250	13742	12216	21483	13106	13595	8124	27428	24389	42877	26153	27147	16220	33211	29534	51921	31669	32855	19644	
12“	300.0	DN 300	19836	17613	30972	18895	19601	11713	39544	35162	61817	37706	39138	23384	47880	42579	74856	45657	47367	28322	

* Nm³/h according to DIN 1343: 0°C, 1013.25 hPa for gases
** ISO 1217: 20°C, 1000 hPa for air

Measuring ranges of further gases like: Nitrous oxide (N2O), helium (He), propane (C3H8), biogas* (CH4/CO2 60/40) on request!

If you want to measure the flow of a special gas mixture please contact us. On request we are quite pleased to offer a real gas calibration under process conditions.

Configuration of VA 550 via PC Service Software

In general all configurations can be done via the integrated display. For sensors without display there is a PC Service Software available. The following adjustments can be carried out directly at the display resp. by means of the PC Service Software:

- Adjustment of inner diameter of pipe
- Selection of gas type
- Selection of units: e.g. m³/h, m³/min, l/min, kg/s,...
- Reset of counter
- Setting of reference conditions (reference temperature/pressure)
- Zero point adjustment / leak flow volume suppression
- Scaling of 4...20 mA output / setting of pulse weight
- Adjustment of Modbus settings

Configuration of VA 550 on-site via hand-held instrument PI 500

For configuration of VA 550 on-site or in the outdoor area where the work with a laptop is hardly possible we recommend to use the hand-held instrument PI 500.
By means of PI 500 all sensors without display can be configured via the menu navigation in the hand-held instrument.
The adjustment possibilities are the same ones as indicated above with PC Service Software or via integrated display.
The lithium-ion battery integrated in PI 500 grants the power supply of the sensor also on-site during the configuration.

Mobile measurement with hand-held measuring instrument PI 500

Together with the hand-held instrument PI 500 the sensor VA 550 can also be used as a portable measuring solution.
PI 500 has an integrated data logger for long-term storage.
The data can be exported to a USB stick.
Furthermore, additional sensors can be connected to PI 500 like e. g. pressure sensors, dew point sensors, temperature sensors and optional third-party sensors with the following signals: 0...1/10 V, 0/4...20 mA, Pt 100, Pt 1000, pulse, Modbus.

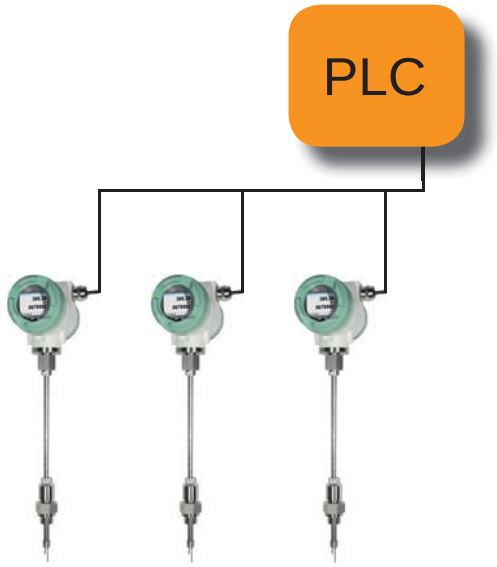
Evaluation with chart recorder DS 500 / DS 400

For applications without process control or if additional data loggers are required VA 550 can also be operated with the chart recorders DS 500 or DS 400.

It is possible to connect up to 12 sensors to one DS 500 and up to 4 sensors to one DS 400. The data logger (for up to 100 million measured values) can be evaluated via USB stick or via Ethernet interface.

Operation / configuration also in explosive areas

The optical keys integrated in the display also function through the glass pane. Advantage: The sensor VA 550 can also be configured in explosive areas without having to open the housing. In case of conventional keys the housing has to be opened for operation. In an explosive area this is often not possible.



Modbus interface integrated as a standard

Modern building management systems require modern sensors with digital Modbus interface.
In case of the flow sensors VA 550 the measured values like:

- Volume flow in Nm³/h, Nm³/min and so on
- Gas/air temperature
- Additional average value calculations: For all parameters freely adjustable from 1 minute to 1 day, e. g. 1/2 hours average value, average day value

as well as diagnosis values like:

- Date of the last calibration
- Maximum temperature which was reached
- Sensor diagnosis, error codes

can be accessed via the Modbus RTU protocol.

Ethernet
Modbus-TCP

Ethernet M12 Port, X-coded

Optionally: Connection to different Bus systems

There are different options available for connection to modern Bus systems:

- Profibus DP interface
- Profinet interface
- Ethernet interface (Modbus-TCP) / PoE
- M-BUS

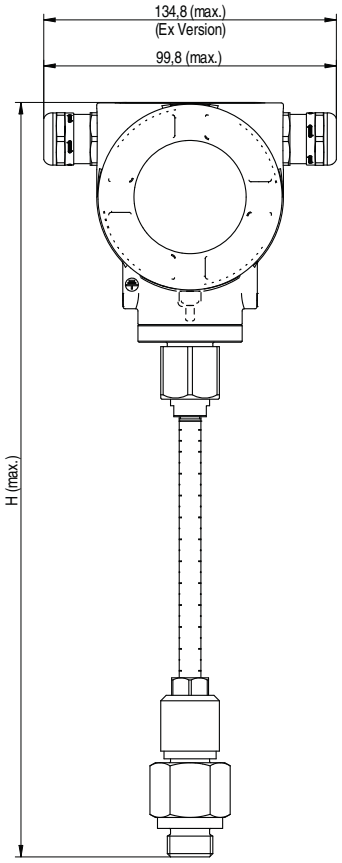
PROFIBUS

M-BUS

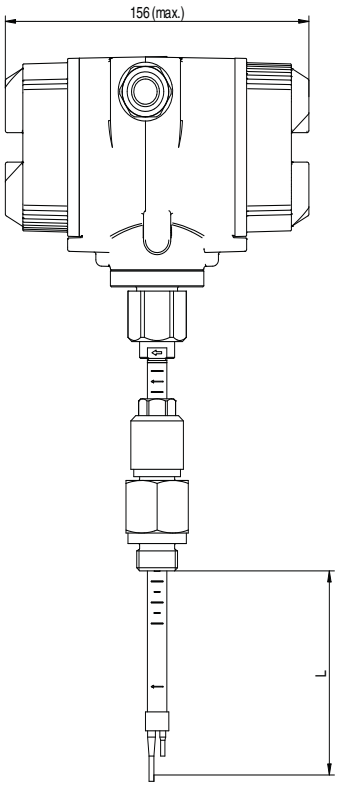
PROFINET

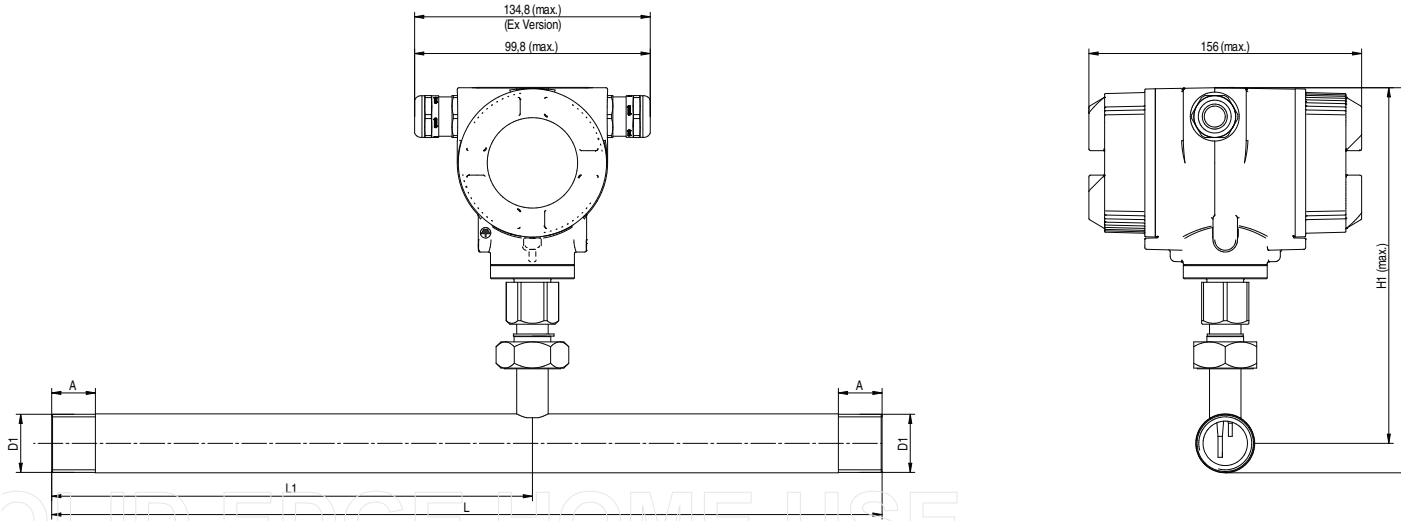
Technical data VA 550/ 570

Measuring range VA 550:	0.1...92,7 Nm/s, standard version* 0.1...185 Nm/s, max. version* 0.1...224 Nm/s, high speed version* * measuring ranges Nm³/h for different pipe diameters and gases, see table flow measuring ranges * all measured values referred to DIN 1343 standard conditions 0 °C and 1013 mbar ex factory
Accuracy: accuracy class (m.v.: of meas. value) (f.s.: of full scale)	± 1.5 % of m.v. ± 0.3 % of f.s. on request ± 1.0 % of m.v. ± 0.3 % of f.s.
Accuracy indications	referred to ambient temperature 22°C ± 2°C, system pressure 6 bar
Repeatability:	0.25 % of m.v. in case of correct mounting (mounting aid, position, inlet section)
Measuring principle:	Thermal mass flow sensor, the measuring effect is based on the cooling down of a heated sensor PT 45 by bypassing gas. The ambient temperature is measured with a PT 100. An additional pressure and temperature compensation is not necessary.
Response time:	t90 < 3 s
Operating temperature range probe tube/display unit:	-40...180 °C probe tube -40...70°C display unit -40...120°C for ATEX version
Adjustment possibilities via display, external hand-held meter PI 500, PC Service Software, remote diagnosis:	Nm³/h, Nm³/min, Nl/min, l/s, ft/min, cfm, kg/h, kg/min, inner diameter, reference conditions °C/°F, mbar/hPa, zero-point correction, leak flow volume suppression, scaling of analogue output 4...20 mA, pulse/alarm, error codes and so on
Adjustment possibilities via external device DS 400, DS 500	Gas type
Outputs:	Standard: Modbus RTU, 4...20 mA activ (not galv. isolated), galvanically isolated pulse (pulse weight freely selectable), alarm relais (max. 48 VDC, 0.5A) Optional: 2 x 4...20 mA outputs galvanically isolated Ethernet Interface (Modbus/TCP) Profibus DP Profinet 2 x 4...20 mA outputs passive M-Bus
Burden:	500 Ohm
Additional average value calculation:	for all parameters freely adjustable from 1 minute up to 1 day, e. g. 1/2 hours average value, average day value
Protection class :	IP 67
Material:	Housing aluminium die cast, probe tube stainless steel 1,4571
Screw-in thread:	G 1/2“ ISO 228, NPT 1/2“, R 1/2“, PT 1/2“ available
Operating pressure VA 550:	50 bar; in special version 100 bar (For DVGW approval max. 16 bar)
Operating pressure VA 570:	16 bar; in special version 40 bar
Power supply:	18...36 VDC, 5 W
Approval:	ATEX II 2G Ex d IIC T4, DVGW

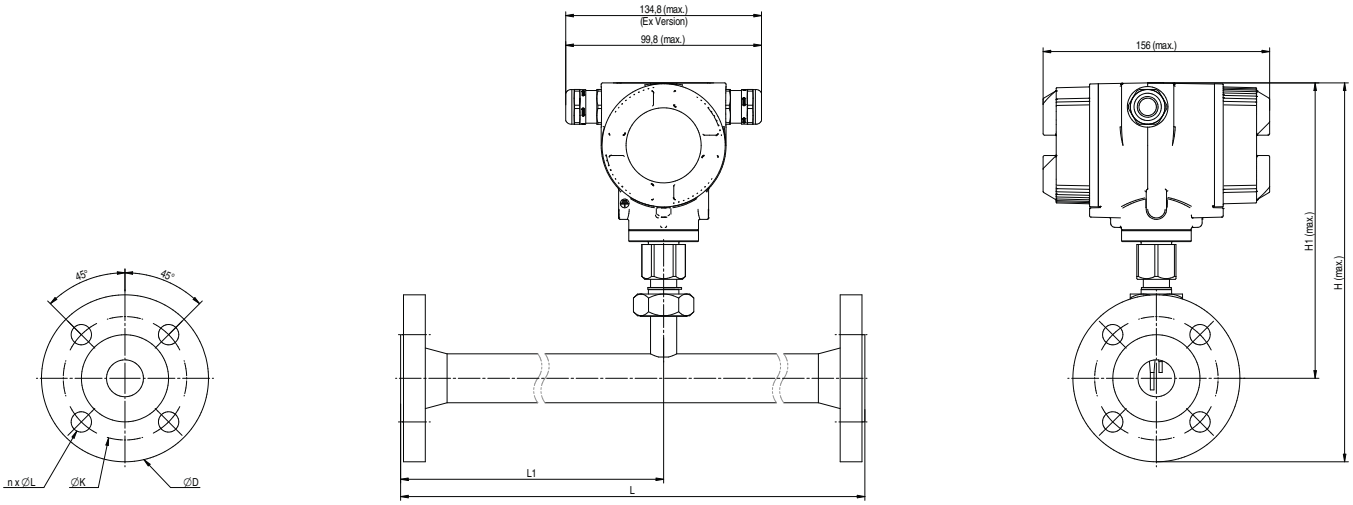


Sensor length	L [mm]	H [mm]
C1	220	441
C2	300	521
C3	400	621
C4	500	721
C5	600	821
C7	160	361





VA 570 - threaded version							
Connection thread	**Outer pipe diam. mm**	**Inner pipe diam. mm**	**L mm**	**L1 mm**	**H mm**	**H1 mm**	**A mm**
R 1/2“	21.3	16.1	300	210	176.4	165.7	20
R 3/4“	26.9	21.7	475	275	179.2	165.7	20
R 1“	33.7	27.3	475	275	182.6	165.7	25
R 1 1/4“	42.4	36.0	475	275	186.9	165.7	25
R 1 1/2“	48.3	41.9	475*	275	186.9	165.7	25
R 2“	60.3	53.1	475*	275	195.9	165.7	30
*Attention: Shortened inlet section! Please observe the recommended minimum inlet section (length = 15 x inner diameter)							



VA 570 - flanged version									
							Flange DIN EN 1092-1		
Measuring section	**Outer pipe diam. mm**	**Inner pipe diam. mm**	**L mm**	**L1 mm**	**H mm**	**H1 mm**	**Ø D**	**Ø K**	**n x Ø L**
DN 15	21.3	16.1	300	210	213.2	165.7	95	65	4 x 14
DN 20	26.9	21.7	475	275	218.2	165.7	105	75	4 x 14
DN 25	33.7	27.3	475	275	223.2	165.7	115	85	4 x 14
DN 32	42.4	36.0	475	275	235.7	165.7	140	100	4 x 18
DN 40	48.3	41.9	475*	275	240.7	165.7	150	110	4 x 18
DN 50	60.3	53.1	475*	275	248.2	165.7	165	125	4 x 18
DN 65	76.1	68.9	475*	275	268.2	175.7	185	145	8 x 18
DN 80	88.9	80.9	475*	275	275.7	175.7	200	160	8 x 18
*Attention: Shortened inlet section! Please observe the recommended minimum inlet section (length = 15 x inner diameter)									

VA 570 with measuring section

Example order code: A 1 | B 1 | C 1 | D 1 | E 1 | F 1 | G 1 | H 1 | I 1 | J 2 | K 1 | R 1

Outer thread measuring section		
A1	R outer thread	A1
A2	NPT outer thread	A2
A3	Flange version	A3

Option display		
B1	with integrated display	B1
B2	without display	B2

Option signal output / Bus connection		
C1	2 x 4...20 mA analogue output galv. isolated, pulse output RS 485 (Modbus-RTU)	C1
C2	Profibus DP, 2 x 4...20 mA analogue output galv. isolated, pulse output RS 485 (Modbus-RTU)	C2
C3	Profibus DP, RS 485 (Modbus-RTU), pulse output (no analogue outputs)	C3
C4	1 x 4..20mA analogue output not galvanically isolated,pulse output, RS485 (Modb.RTU)	C4
C5	Ethernet-Interface (Modbus/TCP), 1 x 4…20 mA analogue output (not galvanically isolated), pulse output, RS 485 (Modbus-RTU)	C5
C7	2 x 4...20 mA analogue output passive, pulse output RS 485 (Modbus-RTU)	C7
C8	M-Bus	C8
C9	Ethernet-Interface PoE (Power over Ethernet) (Modbus/TCP), 1 x 4…20 mA analogue output (not galvanically isolated), pulse output, RS 485 (Modbus-RTU)	C9

Calibration		
D1	no real gas calibration - gas adjustment via gas constant	D1
D2	real gas calibration in the gas type as selected below	D2

Gas type		
E1	compressed air	E1
E2	nitrogen (N2)	E2
E3	argon (Ar)	E3
E4	carbon dioxide (CO2)	E4
E5	oxygen (O2)	E5
E6	nitrous oxide (N2O)	E6
E7	natural gas (NG)	E7
E8	helium (He)	E8
E9	propane (C3H8)	E9
E10	methane (CH4)	E10
E11	biogas (Methan 50% : CO2 50%)	E11
E12	hydrogen (H2)	E12
E90	further gas / please indicate gas type (on request)	E90
E91	gas mixture / please indicate mixture ratio (on request)	E91

Reference conditions		
F1	20°C, 1000 hPa	F1
F2	0°C, 1013,25 hPa	F2
F3	15°C, 981 hPa	F3
F4	15°C, 1013,25 hPa	F4

Maximum pressure		
G1	16 bar	G1
G2	40 bar	G2

Surface condition		
H1	standard version	H1
H2	special cleaning - oil and grease free (e. g. for oxygen applications and so on)	H2
H3	Silicone free version including special cleaning oil and grease free	H3

Accuracy class		
I1	± 1.5% of measured value (standard)	I1
I2	± 1% of measured value (precision)	I2

Maximum gas temperature at the sensor tip		
J1	up to 120°C gas temperature (only for ATEX version)	J1
J2	up to 180°C gas temperature (standard version)	J2

Approvals		
K1	Non-explosive area - no approval	K1
K2	ATEX II 2G Ex d IIC T4	K2
K3	DVGW approval (for natural gas)	K3

Special measuring range		
R1	Special measuring range (Please indicate in case of order)	R1

VA 550 Immersion sensor

Example order code: A 1 | B 2 | C 1 | D 1 | E 1 | F 1 | G 1 | H 1 | I 1 | J 1 | K 2 | L 1 | M 1 | R1

Measuring range (see table)		
A1	Standard version (92,7 m/s)	A1
A2	Max version (185 m/s)	A2
A3	High-Speed version (224 m/s)	A3

Screw-in thread		
B1	G 1/2“ outer thread	B1
B2	1/2“ NPT outer thread	B2
B3	PT 1/2“ outer thread	B3

Mounting length / shaft length		
C1	220 mm	C1
C2	300 mm	C2
C3	400 mm	C3
C4	500 mm	C4
C5	600 mm	C5
C7	160 mm	C7

Option display		
D1	with integrated display	D1
D2	without display	D2

Option signal outputs / bus connection		
E1	2 x 4...20 mA analogue output galv. isolated, pulse output RS 485 (Modbus-RTU)	E1
E2	Profibus DP, 2 x 4...20 mA analogue output galv. isolated, pulse output RS 485 (Modbus-RTU)	E2
E3	Profibus DP, RS 485 (Modbus-RTU), pulse output (no analogue outputs)	E3
E4	1 x 4..20mA analogue output not galvanically isolated,pulse output, RS485 (Modb.RTU)	E4
E5	Ethernet-Interface (Modbus/TCP), 1 x 4…20 mA analogue output (not galvanically isolated), pulse output, RS 485 (Modbus-RTU)	E5
E7	2 x 4...20 mA analogue output passive, pulse output RS 485 (Modbus-RTU)	E7
E8	M-Bus	E8
E9	Ethernet-Interface PoE (Power over Ethernet) (Modbus/TCP), 1 x 4…20 mA analogue output (not galvanically isolated), pulse output, RS 485 (Modbus-RTU)	E9

Calibration		
F1	no real gas calibration - gas adjustment via gas constant	F1
F2	real gas calibration in the gas type as selected below	F2

Gas type		
G____	Compressed air **G1,** nitrogen (N2) **G2,** argon (Ar) **G3,** carbon dioxide (CO2) **G4,** oxygen (O2) **G5,** nitrous oxide (N2O) **G6,** natural gas (NG) **G7,** helium (He) **G8,** propane (C3H8) **G9,** methane (CH4) **G10,** biogas (methane 50% : CO2 50%) **G11,** hydrogen (H2) **G12,** further gas / please indicate gas type (on request) **G90,** gas mixture / please indicate mixture ratio (on	G__

Maximum pressure (above 10 bar, please use high-pressure protection!)		
H1	50 bar	H1
H2	100 bar	H2
H3	16 bar	H3

Surface condition		
I1	Standard version	I1
I2	Special cleaning - oil and grease free (e.g. for oxygen applications and so on)	I2
I3	Silicone free version including special cleaning oil and grease free	I3

Accuracy class		
J1	± 1,5% of measured value (standard)	J1
J2	± 1% of measured value (precision)	J2

Maximum gas temperature at the sensor tip		
K1	up to 120°C gas temperature (only for ATEX version)	K1
K2	up to 180°C gas temperature (standard version)	K2

Approvals		
L1	Non-explosive area - no approval	L1
L2	ATEX II 2G Ex d IIC T4	L2
L3	DVGW approval (for natural gas)	L3

Reference conditions		
M1	20°C, 1000 hPa	M1
M2	0°C, 1013,25 hPa	M2
M3	15°C, 981 hPa	M3
M4	15°C, 1013,25 hPa	M4

Special measuring range		
R1	Special measuring range (Please indicate in case of order)	R1

Order number VA 550

Description	Order no.
VA 550 flow sensor, measuring head in robust aluminium die cast housing	0695 0550 + order code A_...M_

Order number VA 570

Description	Order no.
VA 570 flow sensor with integrated 1/2“ measuring section	0695 0570 + order code A_...K_
VA 570 flow sensor with integrated 3/4“ measuring section	0695 0571
VA 570 flow sensor with integrated 1“ measuring section	0695 0572
VA 570 flow sensor with integrated 1 1/4“ measuring section	0695 0573
VA 570 flow sensor with integrated 1 1/2“ measuring section	0695 0574
VA 570 flow sensor with integrated 2“ measuring section	0695 0575
VA 570 flow sensor with integrated DN 15 measuring section with weld neck flange	0695 2570
VA 570 flow sensor with integrated DN 20 measuring section with weld neck flange	0695 2571
VA 570 flow sensor with integrated DN 25 measuring section with weld neck flange	0695 2572
VA 570 flow sensor with integrated DN 32 measuring section with weld neck flange	0695 2573
VA 570 flow sensor with integrated DN 40 measuring section with weld neck flange	0695 2574
VA 570 flow sensor with integrated DN 50 measuring section with weld neck flange	0695 2575
VA 570 flow sensor with integrated DN 65 measuring section with weld neck flange	0695 2576
VA 570 flow sensor with integrated DN 80 measuring section with weld neck flange	0695 2577
Closing cap for measuring section in aluminium	0190 0001
Closing cap for measuring section stainless steel 1.4404	0190 0002

Further accessories

Description	Order no.
Connection cable for sensors 5 m with open ends	0553 0108
Connection cable for sensors 10 m with open ends	0553 0109
Ethernet connection cable length 5 m, M12 plug x-coded (8 poles) to RJ 45 plug	0553 2503
Ethernet connection cable length 10 m, M12 plug x-coded (8 poles) to RJ 45 plug	0553 2504
Mains unit in wall housing for maximum 2 sensors of the series VA/FA 5xx, 100-240 V, 23 VA, 50-60 Hz / 24 VDC, 0.35 A	0554 0110
ISO calibration certificate at 5 measuring points	3200 0001
Additional calibration point for volume flow (point freely selectible)	0700 7720
CS Service Software VA 550 incl. interface cable to PC (USB) and power supply - for configuration / parametrization of VA 550	0554 2007
As a portable hand-held instrument for configuration of VA 550/570 on-site we recommend to use the **PI 500**:	
PI 500 portable hand-held instrument with integrated data logger	0560 0511
CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB or Ethernet	0554 7040
Transportation case	0554 6510
High-pressure protection f. installation from 10 to 100 bar (for VA 550)	0530 1115
High-pressure protection f. installation from 10 to 16 bar DVGW (for VA 550)	0530 1116
PNG cable screwing - standard VA 550/570	0553 0552
PNG cable screwing – for ATEX version VA 550/570	0553 0551

VA 500/ 520

Flow sensors for compressed air and gases incl. temperature measurement

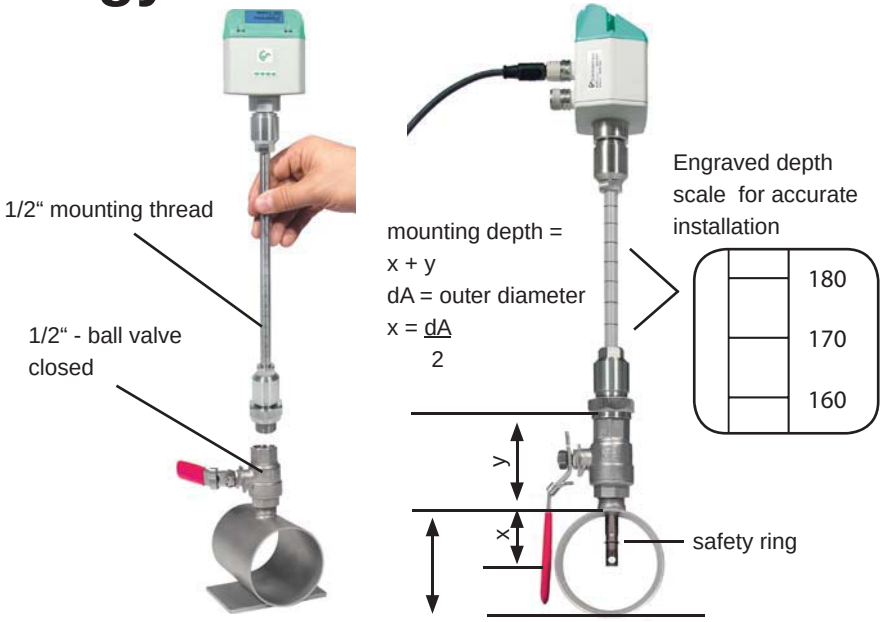
What are the advantages of our **flow measuring technology?**

1) Even under pressure, the flow sensor VA 500 is mounted by means of a standard 1/2“ ball valve. During mounting and dismounting the safety ring avoids an uncontrolled ejection of the probe which may be caused by the operating pressure.

For the mounting into different pipe diameters VA 500 is available in the following probe lengths: 120, 160, 220, 300, 400 mm.

So the flow sensors are being mounted into existing pipelines with inner diameters of 1/2“ upwards.

The exact positioning of the sensor in the middle of the pipe is granted by means of the engraved depth scale. The maximum mounting depth corresponds with the respective probe length. Example: VA 500 with probe length 220 mm has a maximum mounting depth of 220 mm.



A Screw neck

B Spot drilling collar

Drilling under pressure

2) If there is no suitable measuring site with a 1/2“ ball valve present there are two simple possibilities to set up a measuring point:

A Weld on a 1/2“ screw neck and screw on a 1/2“ ball valve

B Mount spot drilling collar incl. ball valve (see accessories)

By means of the drilling jig it is possible to drill under pressure through the 1/2“ ball valve into the existing pipeline. The drilling chips are collected in a filter. Then the probe can be mounted as described under point A.

3) Due to the large measuring range of the probe even extreme requirements to the consumption measurement (high volume flow in small pipe diameters) can be met. The measuring range is depending on the pipe diameter - see table on the right hand side.

Flow measuring ranges VA 500 for compressed air (ISO 1217:1000 mbar, 20 °C)

Inner diameter of pipe			**VA 500 Standard** (92.7 m/s)	**VA 500 Max.** (185.0 m/s)	**VA 500 High-Speed** (224.0 m/s)
Inch	mm		Measuring range from to	Measuring range from to	Measuring range from to
1/2“	16.1	DN 15	2.5...760 l/min	3.5...1516 l/min	6.0...1836 l/min
3/4“	21.7	DN 20	0.3...89 m³/h	0.4...178 m³/h	0.7...215 m³/h
1“	27.3	DN 25	0.5...148 m³/h	0.6...295 m³/h	1.1...357 m³/h
1 1/4“	36.0	DN 32	0.9...280 m³/h	1.2...531 m³/h	2.5...644 m³/h
1 1/2“	41.9	DN 40	1.2...366 m³/h	1.5...732 m³/h	3.0...886 m³/h
2“	53.1	DN 50	2...600 m³/h	2.5...1198 m³/h	4.6...1450 m³/h
2 1/2“	71.1	DN 65	3.5...1096 m³/h	5...2187 m³/h	7...2648 m³/h
3“	84.9	DN 80	5...1570 m³/h	7...3133 m³/h	12...3794 m³/h
4“	110.0	DN 100	9...2645 m³/h	12...5279 m³/h	16...6391 m³/h
5“	133.7	DN 125	13...3912 m³/h	18...7808 m³/h	24...9453 m³/h
6“	159.3	DN 150	18...5560 m³/h	25...11097 m³/h	43...13436 m³/h
8“	200.0	DN 200	26...8786 m³/h	33...17533 m³/h	50...21230 m³/h
10“	250.0	DN 250	40...13744 m³/h	52...27429 m³/h	80...33211 m³/h
12“	300.0	DN 300	60...19815 m³/h	80...39544 m³/h	100...47881 m³/h

VA 500 - Flow sensor for compressed air and gases

The new VA 500 for flow measurement of compressed air and gases, optionally with display for flow in m³/h and total flow in m³.
Contrary to the previously used bridge circuit the newly developed evaluation electronics records all measured values digitally. This leads to a better accuracy also in case of large measuring spans of 1:1000.

Inner diameter adjustable via keypad

Special features:

- RS 485 interface, Modbus-RTU as a standard
- Incl. temperature measurement
- Integrated display for m³/h and m³
- Usable from 1/2“ to DN 1000
- Easy installation under pressure
- 4...20 mA analogue output for m³/h resp. m³/min
- Pulse output for m³ or M-Bus (optionally)
- Inner diameter adjustable via keypad
- Consumption counter resetable
- Adjustable via keys at the display: Reference conditions, °C and mbar, 4...20 mA scaling, pulse weight

Describtion	Order No.
VA 500 flow sensor in basic version: Standard (92.7 m/s), probe length 220 mm, without display	0695 5001
Options for VA 500:	
Display	Z695 5000
Max. version (185 m/s)	Z695 5003
High Speed version (224 m/s)	Z695 5002
1 % Accuracy of m.v. ± 0,3 % of f.s.	Z695 5005
M-Bus board for VA500/520 and FA500	Z695 5004
Probe length 120 mm	ZSL 0120
Probe length 160 mm	ZSL 0160
Probe length 300 mm	ZSL 0300
Probe length 400 mm	ZSL 0400
Probe length 500 mm	ZSL 0500
Probe length 600 mm	ZSL 0600
Connection cables:	
Connection cable, 5 m	0553 0104
Connection cable, 10 m	0553 0105
Further accessories:	
CS Service Software for FA/VA 500 sensors incl. PC connection set, USB interface and interface adapter to the sensor	0554 2007
Mains unit in wall housing for maximum 2 sensors of the series VA/FA 5xx, 100-240 V, 23 VA, 50-60 Hz / 24 VDC, 0.35 A	0554 0110
AC adapter plug 100-240 V AC/ 24 V for VA/FA 500/520	0554 0109
External wall display chart recorder DS 400	0500 4000
5 point precision calibration with ISO certificate	3200 0001
M12 – T plug for VA 500/520 to connect several sensors to a M-Bus network or Modbus network.	020000823

Technical data VA 500

Parameters:	m³/h, l/min (1000 mbar, 20°C) in case of compressed air resp. Nm³/h, Nl/min (1013 mbar, 0°C) in case of gases
Units adjustable via keys at display:	m³/h, m³/min, l/min, l/s, ft/min, cfm, m/s, kg/h, kg/min
Adjustable via keypad:	diameter for volume flow calculation, counter resettable
Meas. principle:	calorimetric measurement
Sensor:	Thermal mass flow sensor
Meas. medium:	air, gases
Gas types adjustable via external devices DS 400, DS 500, PI 500	air, nitrogen, argon, nitrous oxide, CO2, oxygen
Meas. range:	see table measuring ranges page 80
Accuracy: (m.v.: of meas. value) (f.s.: of full scale)	± 1.5 % of m.v. ± 0.3 % of f.s. on request ± 1.0 % of m.v. ± 0.3 % of f.s.
Operating temp.:	-30...110 °C probe tube -30...80 °C housing
Operating pressure:	up to 50 bar
Digital output:	RS 458 interface, Modbus RTU, M-Bus (optionally)
Analogue output:	4...20 mA for m³/h resp. l/min; on request: scaling for cfm,m³/min, l/min, l/s, ft/min, m/s
Pulse output:	1 pulse per m³ resp. per liter galvanically separated
Power supply:	18...36 VDC, 5 W
Burden:	< 500 Ω
Housing:	polycarbonate (IP 65)
Probe tube:	stainless steel, 1.4301 mounting length 220 mm, Ø 10 mm
Mounting thread:	G 1/2“

VA 520

The affordable flow meter for compressed air and gases incl. temperature measurement

With and without flange

Intelligent solutions for accurate flow measurement for compressed air and gases

The new affordable flow sensors VA 520 work according to the approved calorimetric measuring principle. An additional pressure and temperature compensation is not necessary. Contrary to the previously used bridge circuit the newly developed evaluation electronics records all measured values digitally. This enables very precise and fast measurements. Due to the new evaluation electronics all VA 520 have an integrated Modbus output as a standard. So all parameters can be transferred via Modbus.
Due to its compact design it is possible to monitor all compressed air systems from the compressor to the smallest compressed air tool (1/4“ to 3 inch) with the new affordable flow sensor VA 520.
VA 500 flow sensors are available for larger pipe diameters from DN 50 to DN 1000. Apart from compressed air also other gases like e.g. nitrogen, oxygen and CO2 can be measured.

Removal of the measuring device without complete dismounting of the measuring section

1.

In most cases the compressed air is not free from oil, condensate, dirt and particles. In the course of time this leads to a soiling of the flow meters which may cause errors in measurement or even a total breakdown. The flow sensors which have been on the market up to now generally cannot be cleaned and will be exchanged if they are soiled. In case of compressed air meters with integrated measuring section the „measuring device“ cannot be removed. For this reason an expensive bypass line is necessary. The design of **VA 520** enables the removal and cleaning of the „measuring device“ with e.g. soap water without any dismounting of the measuring section. A closing cap grants a continuous use of the line for the duration of the cleaning. A bypass line is not necessary. The alignment pin grants an accurate installation of the measuring device.

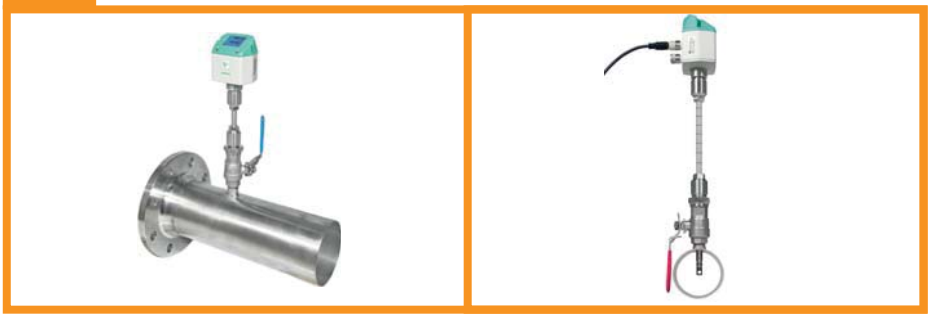
2. Stationary use

For stationary use there are the following outputs available for the data transfer to a building management system or PLC:
4...20 mA for actual flow.
Pulse output (galvanically separated) for the total consumption.

3. Mobile use

By means of quick couplings the flow sensor can be integrated quickly into the feed hose of a machine. During the shutdown of the machine it is possible to determine the leak rate, the actual flow can be obtained when the machine is running. The power supply is effected via the power socket by means of the mains unit. For data recording over a longer period of time we recommend to use the compressed air analyzer DS 400 mobile.

4. Solution for large pipe diameters



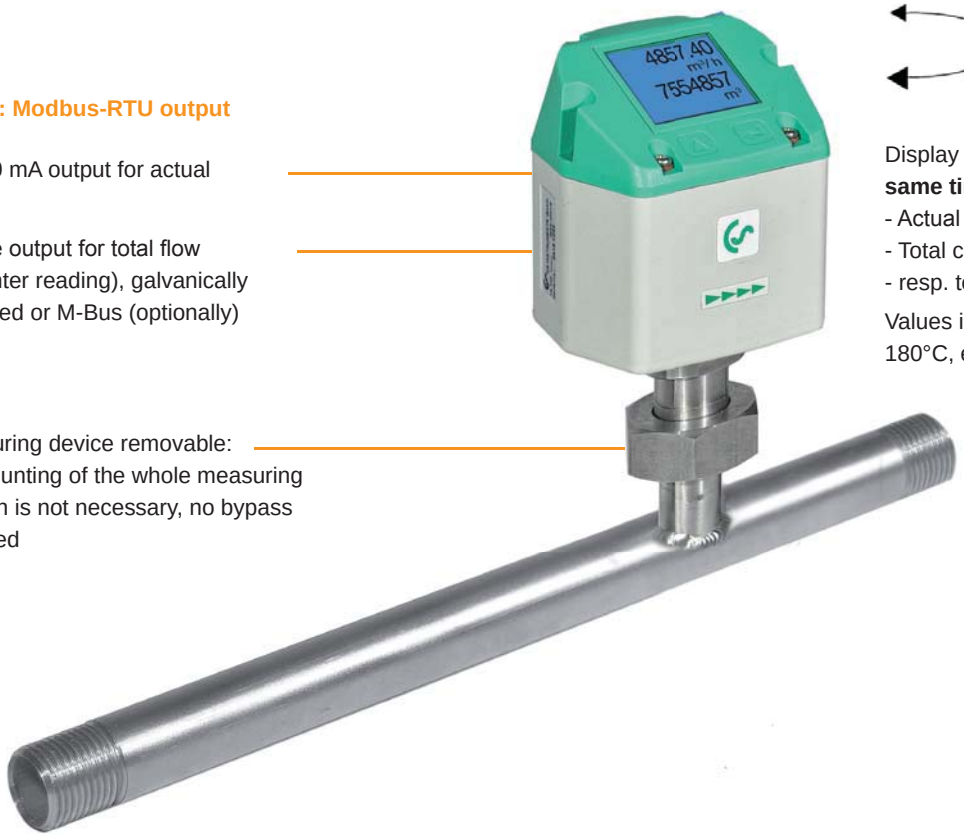
The approved flow sensor VA 500 is available for pipe diameters of 2“ to DN 1000. Its constructively sophisticated design enables the installation into pipes with nominal diameters up to DN 1000 even under pressure. The installation is effected by means of standard 1/2“ ball valve.

VA 520 - The advantages at a glance

NEW: Modbus-RTU output

4...20 mA output for actual flow

Pulse output for total flow (counter reading), galvanically isolated or M-Bus (optionally)



Display twist able by 180°C e.g. in case of reverse flow direction

Display shows 2 values at **the same time**:
- Actual flow in m³/h, l/min,...
- Total consumption (counter reading) in m³,l
- resp. temperature measurement

Values indicated in the display turnable by 180°C, e.g. in case of overhead installation

Measuring device removable: Dismounting of the whole measuring section is not necessary, no bypass required

Screw-in thread:
Easy installation into the existing pipeline due to integrated measuring section (suitable for 1/4“, 1/2“, 3/4“, 1“, 1 1/4“, 1 1/2“ or 2“ lines)

High measuring accuracy due to defined measuring section (inlet and outlet section)

At the touch of a button:

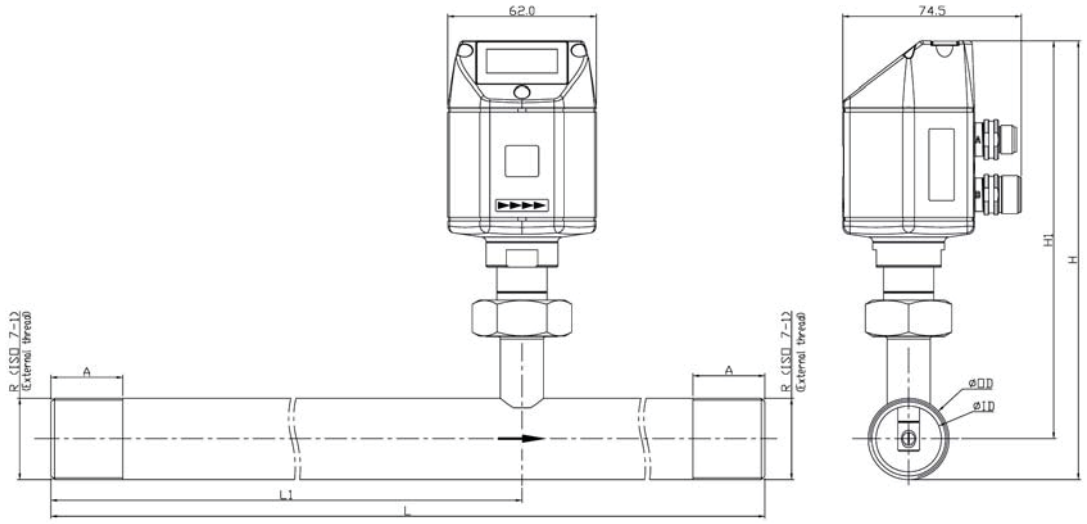
- Reset of counter reading
- selection of units
- zero-point adjustment, leak flow volume suppression

Application-technological features of the flow sensors VA 520:

- The integrated Modbus interface enables the connection to superordinate control systems like energy management systems, building management systems, SPS, SCADA, ...
- Easy and affordable installation
- Units freely selectable via keys at the display 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. Reset able to „zero“ via keypad
- Analogue output 4...20 mA, pulse output (galvanically separated)
- High measuring accuracy also in the lower measuring range (ideal for leakage measurement)
- Negligibly small loss of pressure
- Calorimetric measuring principle, no additional pressure and temperature measurement necessary, no mechanically moved parts
- Comprehensive diagnosis functions can be read out at the display or by remote access via Modbus-RTU like e. g. exceeding Max./Min values °C, calibration cycle, error codes, serial number. All parameters can be read out and changed via Modbus

Application range of VA 520:

- Compressed air balancing, compressed air consumption measurement
- Leakage air/leak rate determination
- Mobile compressed air measurement in front of single machines / plants
- Flow measurement of process gases like e.g. nitrogen, CO2, oxygen, argon, nitrous oxide
- Flow measurement at nitrogen generators



Flow measuring ranges VA 520 for compressed air (ISO 1217:1000 mbar, 20 °C)

Connection thread	Outer pipe dia. mm	Inner pipe dia. mm	Measuring range from	to	L mm	L1 mm	H mm	H1 mm	A mm
R 1/4“	13.7	8.9	0.8	90 l/min	194	137	174.7	165.7	15
R 1/2“	21.3	16.1	0.2	90 m³/h	300	210	176.4	165.7	20
R 3/4“	26.9	21.7	0.3	170 m³/h	475	275	179.2	165.7	20
R 1“	33.7	27.3	0.5	290 m³/h	475	275	182.6	165.7	25
R 1 1/4“	42.4	36.0	0.7	530 m³/h	475	275	186.9	165.7	25
R 1 1/2“	48.3	41.9	1.0	730 m³/h	475*	275	186.9	165.7	25
R 2“	60.3	53.1	2.0	1195 m³/h	475*	275	195.9	165.7	30

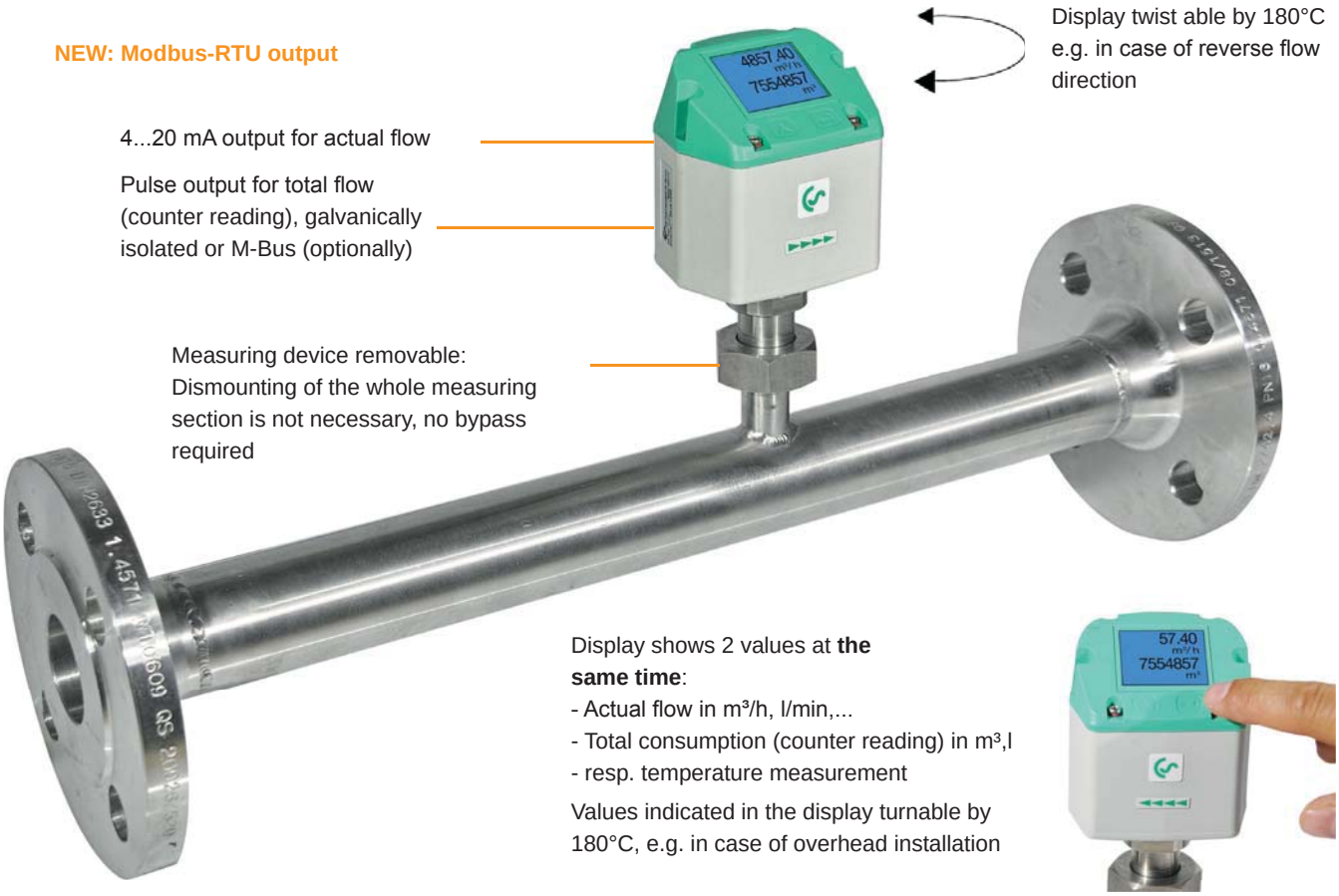
*Attention: Shortened inlet section! Please observe the recommended minimum inlet section (length = 15 x inner diameter) on site!

Description	Order No. Stainless steel 1.4571	Order No. Stainless steel 1.4301
VA 520 flow sensor with integrated 1/4“ measuring section	0695 1520	0695 0520
VA 520 flow sensor with integrated 1/2“ measuring section	0695 1521	0695 0521
VA 520 flow sensor with integrated 3/4“ measuring section	0695 1522	0695 0522
VA 520 flow sensor with integrated 1“ measuring section	0695 1523	0695 0523
VA 520 flow sensor with integrated 1 1/4“ measuring section	0695 1526	0695 0526
VA 520 flow sensor with integrated 1 1/2“ measuring section	0695 1524	0695 0524
VA 520 flow sensor with integrated 2“ measuring section	0695 1525	0695 0525
Option High-pressure version PN 40		Z695 0411
Option 1 % Accuracy of m.v. ± 0,3 % of f.s.		Z695 5005
Special measuring range VA 520		Z695 4006
M-Bus board for VA500/520 and FA500		Z695 5004
Connection cables:		
Connection cable 5 m		0553 0104
Connection cable 10 m		0553 0105
Pulse cable for flow sensors with M12 plug, length 5 m		0553 0106
Pulse cable for flow sensors with M12 plug, length 10 m		0553 0107
Further accessories:		
Closing cap for meas. section (Material: Aluminium)		0190 0001
Closing cap for meas. section (Material: Stainless steel 1.4404)		0190 0002
CS Service Software for FA/VA sensors incl. PC connection set, USB interface and interface adapter to the sensor		0554 2007
Mains unit in wall housing for maximum 2 sensors of the series VA/FA 5xx, 100-240 V, 23 VA, 50-60 Hz / 24 VDC, 0.35 A		0554 0110
AC adapter plug 100-240 V AC/ 24 V for VA/FA 500/520		0554 0109
5 point precision calibration with ISO certificate		3200 0001
M12 – T plug for VA 500/520 to connect several sensors to a M-Bus network or Modbus network.		020000823

Technical data
VA 520

Parameters:	m³/h, l/min (1000 mbar, 20°C) in case of compressed air resp. Nm³/h, Nl/min (1013 mbar, 0°C) in case of gases
Units adjustable via keys at display:	m³/h, m³/min, l/min, l/s, ft/min, cfm, m/s, kg/h, kg/min
Meas. principle:	calorimetric measurement
Sensor:	Thermal mass flow sensor
Meas. medium:	air, gases
Gas types adjustable via external device DS 400, DS 500, PI 500	air, nitrogen, argon, nitrous oxide, CO2, oxygen
Meas. range:	see table at the left
Accuracy: (m.v.: of meas. value) (f.s.: of full scale)	± 1.5 % of m.v. ± 0.3 % of f.s. on request ± 1.0 % of m.v. ± 0.3 % of f.s.
Operating temp.:	-30...80 °C
Operating pressure:	up to 16 bar optional up to PN 40
Digital output:	RS 485 interface, Modbus-RTU, M-Bus (optionally)
Analogue output:	4...20 mA for m³/h resp. l/min
Pulse output:	1 pulse per m³ resp. per liter galvanically separated
Power supply:	18...36 VDC, 5 W
Burden:	< 500 Ω
Housing:	polycarbonate
Meas. section:	stainless steel, 1.4301 or 1.4571
Mounting thread meas. section:	R 1/4“, R 1/2“, R 3/4“, R 1“, R 1 1/4“, R 1 1/2“, R 2“ external thread.

VA 520 - The advantages at a glance



Easy installation into the existing pipeline due to integrated measuring section and weld neck flange (according to EN 1092-1 PN 40)

High measuring accuracy due to defined measuring section (inlet and outlet section)

At the touch of a button:

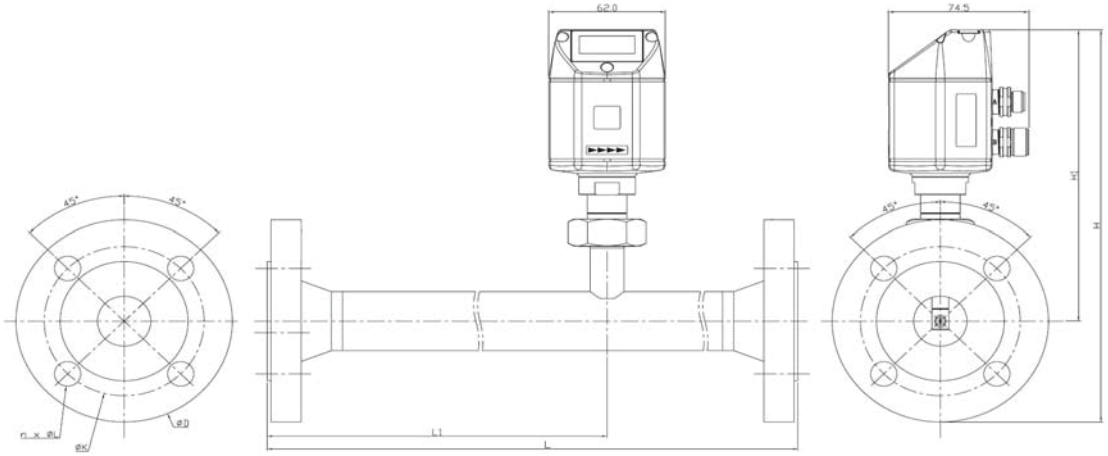
- reset of counter reading
- selection of units
- zero-point adjustment, leak flow volume suppression

Application-technological features of the flow sensors VA 520:

- The integrated Modbus interface enables the connection to superordinate control systems like energy management systems, building management systems, SPS, SCADA, ...
- Easy and affordable installation
- Units freely selectable via keys at the display 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. Reset able to „zero“ via keypad
- Analogue output 4...20 mA, pulse output (galvanically separated)
- High measuring accuracy also in the lower measuring range (ideal for leakage measurement)
- Negligibly small loss of pressure
- Calorimetric measuring principle, no additional pressure and temperature measurement necessary, no mechanically moved parts
- Comprehensive diagnosis functions can be read out at the display or by remote access via Modbus-RTU like e. g. exceeding Max./Min values °C, calibration cycle, error codes, serial number. All parameters can be read out and changed via Modbus

Application range of VA 520:

- Compressed air balancing, compressed air consumption measurement
- Leakage air/leak rate determination
- Flow measurement of process gases like e.g. nitrogen, CO2, oxygen, argon, nitrous oxide
- Flow measurement at nitrogen generators



Flow measuring ranges VA 520 for compressed air (ISO 1217:1000 mbar, 20 °C)									Flange DIN EN 1092-1		
Mea-suring section	Outer pipe dia. mm	Inner pipe dia. mm	Measuring range from	to	L mm	L1 mm	H mm	H1 mm	ØD	ØK	n x ØL
DN 15	21.3	16.1	0.2	90 m³/h	300	210	213.2	165.7	95	65	4 x 14
DN 20	26.9	21.7	0.3	170 m³/h	475	275	218.2	165.7	105	75	4 x 14
DN 25	33.7	27.3	0.5	290 m³/h	475	275	223.2	165.7	115	85	4 x 14
DN 32	42.4	36.0	0.7	530 m³/h	475	275	235.7	165.7	140	100	4 x 18
DN 40	48.3	41.9	1.0	730 m³/h	475*	275	240.7	165.7	150	110	4 x 18
DN 50	60.3	53.1	2.0	1195 m³/h	475*	275	248.2	165.7	165	125	4 x 18
DN 65	76.1	68.9	4.0	2050 m³/h	475*	275	268.2	175.7	185	145	8 x 18
DN 80	88,9	80,9	5,0	2840 m³/h	475*	275	275,7	175,7	200	160	8 x 18
*Attention: Shortened inlet section! Please observe the recommended minimum inlet section (length = 15 x inner diameter) on site											

Description	Order No.
VA 520 flow sensor with integrated DN 15 measuring section with weld neck flange	0695 2521
VA 520 flow sensor with integrated DN 20 measuring section with weld neck flange	0695 2522
VA 520 flow sensor with integrated DN 25 measuring section with weld neck flange	0695 2523
VA 520 flow sensor with integrated DN 32 measuring section with weld neck flange	0695 2526
VA 520 flow sensor with integrated DN 40 measuring section with weld neck flange	0695 2524
VA 520 flow sensor with integrated DN 50 measuring section with weld neck flange	0695 2525
VA 520 flow sensor with integrated DN 65 measuring section with weld neck flange	0695 2527
VA 520 flow sensor with integrated DN 80 measuring section with weld neck flange	0695 2528
Option High-pressure version PN 40	Z695 0411
Option 1 % Accuracy of m.v. ± 0,3 % of f.s.	Z695 5005
Special measuring range VA 520	Z695 4006
M-Bus board for VA500/520 and FA500	Z695 5004
Connection cables:	
Connection cable 5 m	0553 0104
Connection cable 10 m	0553 0105
Pulse cable for flow sensors with M12 plug, length 5 m	0553 0106
Pulse cable for flow sensors with M12 plug, length 10 m	0553 0107
Further accessories:	
Closing cap for meas. section (Material: Aluminium)	0190 0001
Closing cap for meas. section (Material: Stainless steel 1.4404)	0190 0002
CS Service Software for FA/VA sensors incl. PC connection set, USB interface and interface adapter to the sensor	0554 2007
Mains unit in wall housing for maximum 2 sensors of the series VA/FA 5xx, 100-240 V, 23 VA, 50-60 Hz / 24 VDC, 0.35 A	0554 0110
AC adapter plug 100-240 V AC/ 24 V for VA/FA 500/520	0554 0109
5 point precision calibration with ISO certificate	3200 0001
M12 – T plug for VA 500/520 to connect several sensors to a M-Bus network or Modbus network.	020000823

Technical data VA 520

Parameters:	m³/h, l/min (1000 mbar, 20°C) in case of compressed air resp. Nm³/h, Nl/min (1013 mbar, 0°C) in case of gases
Units adjustable via keys at display:	m³/h, m³/min, l/min, l/s, ft/min, cfm, m/s, kg/h, kg/min
Meas. principle:	calorimetric measurement
Sensor:	Thermal mass flow sensor
Meas. medium:	air, gases
Gas types adjustable via external device DS 400, DS 500, PI 500	air, nitrogen, argon, nitrous oxide, CO2, oxygen
Meas. range:	see table at the left
Accuracy: (m.v.: of meas. value) (f.s.: of full scale)	± 1.5 % of m.v. ± 0.3 % of f.s. on request ± 1.0 % of m.v. ± 0.3 % of f.s.
Operating temp.:	-30...80 °C
Operating press.:	up to 16 bar Optional up to PN 40
Digital output:	RS 485 interface, Modbus-RTU, M-Bus (optionally)
Analogue output:	4...20 mA for m³/h resp. l/min
Pulse output:	1 pulse per m³ resp. per liter galvanically separated
Power supply:	18...36 VDC, 5 W
Burden:	< 500 Ω
Housing:	polycarbonate (IP 65)
Meas. section:	stainless steel 1.4571
Flanges:	Weld neck flange according to DIN EN 1092-1, Groove-faced and tongue-faced on request

DS 400 Flow station for compressed air and gases

Flow measuring ranges VA 500 for compressed air (ISO 1217:1000 mbar, 20 °C)					
Inner diameter of pipe			**VA 500 Standard** (92.7 m/s)	**VA 500 Max.** (185.0 m/s)	**VA 500 HighSpeed** (224.0 m/s)
Inch	mm		Measuring range from to	Measuring range from to	Measuring range from to
1/2“	16.1	DN 15	2.5...760 l/min	3.5...1516 l/min	6.0...1836 l/min
3/4“	21.7	DN 20	0.3...89 m³/h	0.4...178 m³/h	0.7...215 m³/h
1“	27.3	DN 25	0.5...148 m³/h	0.6...295 m³/h	1.1...357 m³/h
1 1/4“	36.0	DN 32	0.9...280 m³/h	1.2...531 m³/h	2.5...644 m³/h
1 1/2“	41.9	DN 40	1.2...365 m³/h	1.5...728 m³/h	3.0...886 m³/h
2“	53.1	DN 50	2...600 m³/h	2.5...1198 m³/h	4.6...1450 m³/h
2 1/2“	71.1	DN 65	3.5...1096 m³/h	5...2187 m³/h	7...2648 m³/h
3“	84.9	DN 80	5...1570 m³/h	7...3133 m³/h	12...3794 m³/h
4“	110.0	DN 100	9...2645 m³/h	12...5279 m³/h	16...6391 m³/h
5“	133.7	DN 125	13...3912 m³/h	18...7808 m³/h	24...9453 m³/h
6“	159.3	DN 150	18...5560 m³/h	25...11097 m³/h	43...13436 m³/h
8“	200.0	DN 200	26...8786 m³/h	33...17533 m³/h	50...21230 m³/h
10“	250.0	DN 250	40...13744 m³/h	52...27429 m³/h	80...33211 m³/h
12“	300.0	DN 300	60...19815 m³/h	80...39544 m³/h	100...47881 m³/h
.....					

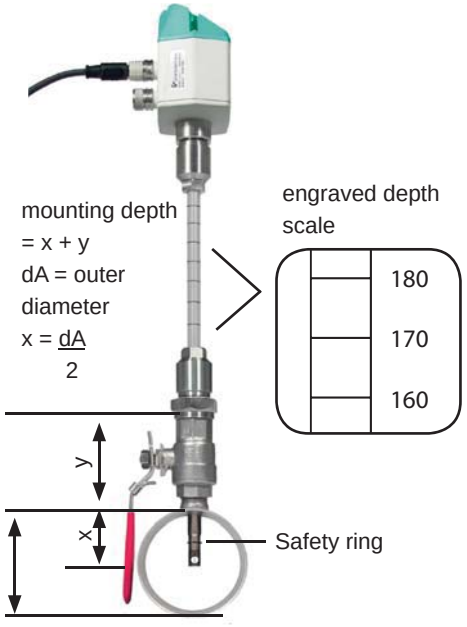
Description	**Order No.**
Flow measurement DS 400 for installation into existing pipelines consisting of: Chart recorder DS 400 and flow sensor VA 500 in basic version, Standard (92,7 m/s), sensor length 220 mm	0601 4006
Options for DS 400	
Option: Integrated data logger for 100 million measured values	Z500 4002
Option: Integrated Ethernet and RS 485 interface	Z500 4004
Option: 2 additional sensor inputs for analogue sensors (pressure sensors, temperature sensors etc.)	Z500 4001
Option: Integrated webserver	Z500 4005
Options for flow sensor VA 500 (see page 81)	
Max. version (185 m/s)	Z695 5003
High Speed version (224 m/s)	Z695 5002
Option 1 % Accuracy of m.v. ± 0,3 % of f.s.	Z695 5005
Sensor length 120 mm	ZSL 0120
Sensor length 160 mm	ZSL 0160
Sensor length 300 mm	ZSL 0300
Sensor length 400 mm	ZSL 0400
Further accessories	
CS Soft Basic - data evaluation in graphic and table form - reading out of measured data via USB or Ethernet	0554 7040
Calibration	
5 point precision calibration including ISO certificate	3200 0001

Chart recorder DS 400

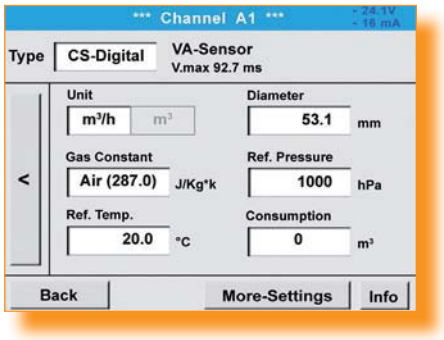
- 3.5“ graphic display with touch screen - shows the progression of the measured values in graphic form
- 2 sensor inputs for flow sensors/ dew point sensors
- USB interface for reading out the data logger via USB stick
- 2 additional sensor inputs for pressure sensors, current meters and so on
- Option: Data logger for 100 million measured values (2 GB SD card)
- Option: Ethernet and RS 485 interface (Modbus protocol)
- Option: Webserver
- Option: CS Soft Basic - comfortable evaluation of the measured data

Flow sensor VA 500

- Easy installation and removal under pressure via 1/2“ ball valve
- Several gas types - freely adjustable at DS 400
- Usable from 1/2“ to 12“ DN 1000
- Diameter freely adjustable at DS 400
- Output for 4...20 mA for m³/h
- Pulse output for m³ (total flow)



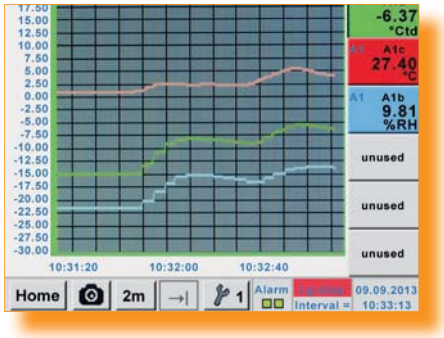
Easy operation via touch screen



Configuration of flow sensor

The flow sensor VA 500 can be adjusted to the respective inner diameter of the pipe in the menu of DS 400.

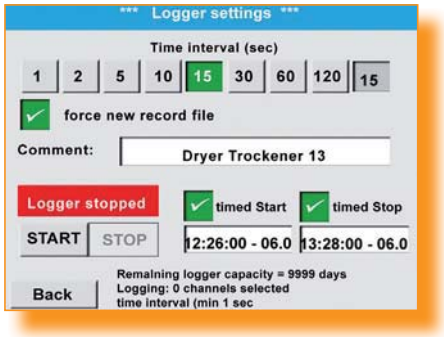
Furthermore, the unit, the gas type as well as the reference conditions can be entered. The counter can be set to „zero“ if required.



Graphic view

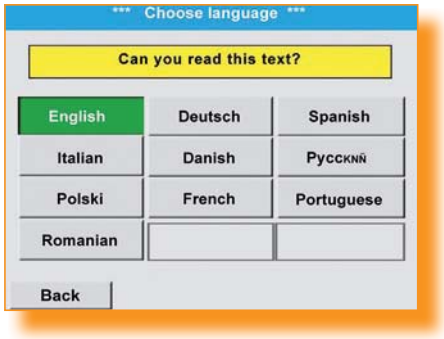
In the graphic view all measured values are indicated as curves.

It is possible to browse back on the time axis by a slide of the finger (without data logger maximum 24 h, with data logger back to the start of the measurement).



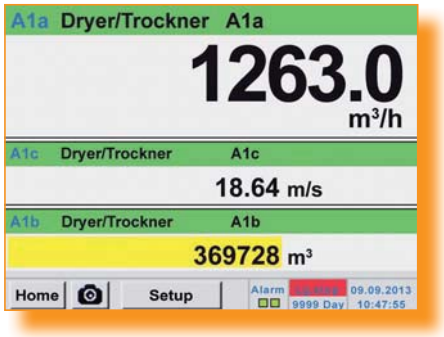
Data logger

Measured values are stored in DS 400 by means of the option „integrated data logger“. The time interval can be freely set. Furthermore there is the possibility to fix the starting time and the end time of the data recording. Readout of the measured data via USB interface or via the optional Ethernet interface.



Selection of the language

DS 400 „speaks“ several languages. The required language can be selected by means of the select button.



All relevant parameters at a glance

In addition to the flow in m³/h DS 400 shows further parameters like the total flow in m³ and the velocity in m/s.

Technical data VA 500

Parameters:	m³/h, l/min (1000 mbar, 20°C) in case of compressed air resp. Nm³/h, Nl/min (1013 mbar, 0°C) in case of gases
Units adjustable via keys at display:	m³/h, m³/min, l/min, l/s, ft/min, cfm, m/s, kg/h, kg/min
Adjustable via keypad:	diameter for volume flow calculation, counter resettable
Meas. principle:	calorimetric measurement
Sensor:	Thermal mass flow sensor
Meas. medium:	air, gases
Gas types adjustable via external device DS 400, DS 500, PI 500	air, nitrogen, argon, nitrous oxide, CO2, oxygen
Accuracy: (m.v.: of meas. value) (f.s.: of full scale)	± 1.5 % of m.v. ± 0.3 % of f.s. on request ± 1.0 % of m.v. ± 0.3 % of f.s.
Operating temp.:	-30...110 °C probe tube -30...80 °C housing
Operating pressure:	up to 50 bar
Digital output:	RS 458 interface, Modbus RTU, M-Bus (optionally)
Analogue output:	4...20 mA for m³/h resp.l/min; on request: scaling for cfm,m³/min, l/min, l/s, ft/min, m/s
Pulse output:	1 pulse per m³ resp. per liter galvanically separated
Power supply:	18...36 VDC, 5 W
Burden:	< 500 Ω
Housing:	polycarbonate
Probe tube:	stainless steel, 1.4301 mounting length 220 mm, Ø 10 mm
Mounting thread:	G 1/2“

Technical data DS 400

Dimensions:	118 x 115 x 98 mm IP 54 (wall housing) 92 x 92 x 75 mm (panel mounting)
Inputs:	2 digital inputs for VA 500/520
Interface:	USB
Power supply:	100...240 VAC, 50-60 Hz
Accuracy:	please see VA 500
Alarm outputs:	2 relays, (pot.-free)
Options:	
Data logger:	100 million measuring values start/stop time, measuring rate freely adjustable
2 additional sensor inputs:	for connection of pressure sensors, temperature sensors, clamp-on ammeters, third-party sensors with 4...20 mA 0 to 10 V, Pt 100, Pt 1000

DS 400 - chart recorder

for all relevant parameters of compressed air

Software options:
- Integrated webserver
- Mathematic calculation function
- Totalizer function

Hardware options:
- Integrated data logger
- Ethernet / RS 485 interface
- additional sensor inputs (digital or analogue) selectable

Standard equipment:
- USB interface
- 3.5“ graphic display with touch screen
- Integrated mains unit for supply of the sensors
- 4...20 mA output of all connected active sensors
- Pulse output (for total consumption) in case of flow sensors
- 2 alarm relays (pot.-free switch-over contacts, max. 230 V, 3 A)

The 2 sensor inputs board 1 and 2 can be selected according to the required sensors:

Digital	Digital	Digital	Digital	Analogue	Analogue	Analogue	Analogue
m³/h, m³	°Ctd	A, kW/h	optional	bar	A	°C	°C
			MOD BUS				4...20 mA 0...20 mA 0...10 V Pulse Pt 100 Pt 1000
Flow sensor	Dew point sensor	Current meters	Third-party sensors with RS 485	Pressure sensor	Clamp-on ammeter	Temperature sensor	Third-party sensors analogue output

Description			Order No.
DS 400 - Mobile chart recorder with graphic display and touch screen	2 sensor inputs board 1	2 sensor inputs board 2	
	Digital (Z500 4003)	--------	0500 4000 D
	Digital (Z500 4003)	Digital (Z500 4003)	0500 4000 DD
	Digital (Z500 4003)	Analogue (Z500 4001)	0500 4000 DA
	Analogue (Z500 4001)	--------	0500 4000 A
	Analogue (Z500 4001)	Analogue (Z500 4001)	0500 4000 AA
Options			
Option: Integrated data logger for 100 million measured values			Z500 4002
Option: Integrated Ethernet and RS 485 interface			Z500 4004
Option: Integrated webserver			Z500 4005
Option: „Mathematics calculation function“ for 4 freely selectable channels, (virtual channels): addition, subtraction, division, multiplication			Z500 4007
Option: „Totalizer function for analogue signals“			Z500 4006
External Gateway PROFIBUS for RS 485 interface connection			Z500 3008
Further accessories			
CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data of DS 400 via USB or Ethernet			0554 7040
CS Soft Network - Database Client/Server Solution (up to 5 DS 400) - database (MySQL) to Server - data evaluation via Client-Software			0554 7041
CS Soft Network - Database Client/Server Solution (up to 10 DS 400) - database (MySQL) to Server - data evaluation via Client-Software			0554 7042
CS Soft Network - Database Client/Server Solution (up to 20 DS 400) - database (MySQL) to Server - data evaluation via Client-Software			0554 7043
CS Soft Network - Database Client/Server Solution (>20 DS 400) - database (MySQL) to Server - data evaluation via Client-Software			0554 7044

Technical data DS 400

Dimensions:	118 x 115 x 98 mm IP 54 (wall housing) 92 x 92 x 75 mm (panel mounting)
Inputs:	2 digital inputs for FA 510 resp. VA 500/520
Interface:	USB
Power supply:	100...240 VAC, 50-60 Hz
Accuracy:	please see VA 500
Alarm outputs:	2 relays, (pot.-free)
Options:	
Data logger:	100 million measuring values start/stop time, measuring rate freely adjustable
2 additional sensor inputs:	for connection of pressure sensors, temperature sensors, clamp-on ammeters, third-party sensors with 4...20 mA 0 to 10 V, Pt 100, Pt 1000

Input signals	
Current signal internal or external power supply Measuring range Resolution Accuracy Input resistance	(0...20mA/4...20mA) 0...20 mA 0.0001 mA ± 0.03 mA ± 0.05 % 50 Ω
Voltage signal Measuring range Resolution Accuracy Input resistance	(0...1 V) 0...1 V 0.05 mV ± 0.2 mV ± 0.05 % 1 MΩ
Voltage signal Measuring range Resolution Accuracy Input resistance	(0...10 V / 30 V) 0...10 V 0.5 mV ± 2 mV ± 0.05 % 1 MΩ
RTD Pt 100 Measuring range Resolution Accurancy	 -200...850°C 0.1°C ± 0.2°C (-100...400°C) ± 0.3°C (further range)
RTD Pt 1000 Measuring range Resolution Accuracy	 -200...850°C 0.1°C ± 0.2° (-100...400°C)
Pulse Measuring range	 min pulse length 500 µs frequency 0...1 kHz max. 30 VDC

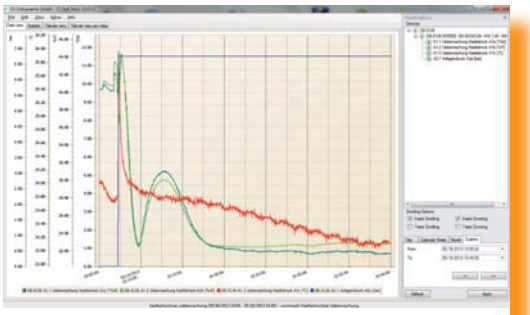
Suitable sensors for DS 400

Flow sensors VA 500:	Order No.	
VA 500 flow sensor in basic version: Standard (92.7 m/s), sensor length 220 mm, without display	0695 5001	
Options for VA 500: (see page 81)		
Flow meters VA 520:		
Flow meter VA 520 with integrated measuring section, (R 1/4“ DN 8)	0695 0520	
Flow meter VA 520 with integrated measuring section, (R 1/2“ DN 15)	0695 0521	
Flow meter VA 520 with integrated measuring section, (R 3/4“ DN 20)	0695 0522	
Flow meter VA 520 with integrated measuring section, (R 1“ DN 25)	0695 0523	
Flow meter VA 520 with integrated measuring section, (R 1 1/4“ DN 32)	0695 0526	
Flow meter VA 520 with integrated measuring section, (R 1 1/2“ DN 40)	0695 0524	
Flow meter VA 520 with integrated measuring section, (R 2“ DN 50)	0695 0525	
Dew point sensors:		
FA 510 dew point sensor, -80...+20 °Ctd incl.inspection certificate	0699 0510	
FA 510 dew point sensor, -20…+50°Ctd, incl.inspection certificate	0699 0512	
Standard measuring chamber for compressed air up to 16 bar	0699 3390	
Connection cables for flow sensors / dew point sensors:		
Connection cable 5 m	0553 0104	
Connection cable 10 m	0553 0105	
Pressure sensors: (further pressure sensors on page 9)		
Standard pressure sensor CS 16 from 0…16 bar, ± 1 % accuracy of full scale	0694 1886	
Standard pressure sensor CS 40 from 0…40 bar, ± 1 % accuracy of full scale	0694 0356	
Temperature sensors:		
Screw-in temperature probe PT 100 class A, length: 300 mm, d=6mm, with integrated transducer 4…20 mA = -50°C…+500°C (2-wire)	0604 0201	
Outdoor temperature probe, PT 100 class B (2-wire) in wall housing (82x55x33 mm), temperature range: -50°C to +80°C	0604 0203	
Indoor temperature probe, PT 100 class B (2-wire) in wall housing (82x55x33 mm), temperature range: -50°C to +80°C	0604 0204	
Temperature probe PT 100 class A (4-wire) with cable, length: 300 mm, d=6 mm, -70°C to +260°C, 5 m connection cable (PFA) with open ends	0604 0205	
Temperature probe PT 100 class A (4-wire) with cable, length: 100 mm, d=6 -70°C to +260°C, 5 m connection cable (PFA) with open ends	0604 0206	
Temperature probe PT 100 class A (4-wire) with cable, length: 200 mm, d=6 -70°C to +260°C, 5 m connection cable (PFA) with open ends	0604 0207	
Surface temperature probe, magnetic, magnet dimensions 39x26x25 mm, PT 100 class B (2-wire), -30 to +180°C, 5 m connection cable (PFA) with open ends	0604 0208	
Clamp screwing 6mm; G 1/2“ PTFE clamp ring pressure tight up 10 bar material: stainless steel, temperature range: max. +260°C	0554 0200	
Clamp screwing 6mm; G 1/2“ stainless steel clamp ring pressure tight up to 16 bar, material: stainless steel, temperature range: max. +260°C	0554 0201	
Connection cables for pressure sensors / temperature sensors:		
Connection cable 5 m	0553 0108	
Connection cable 10 m	0553 0109	
Clamp-on ammeters:		
Clamp-on ammeter 0...1000 A TRMS incl. 5 m connection cable with open ends	0554 0518	
Clamp-on ammeter 0...400 A TRMS incl. 3 m connection cable with open ends	0554 0510	
Current / effective power meter (further current transformer please see on page 10)		
CS PM 210 current/effective power meter for panel mounting, current transformer from 100 A to 2000 A connectible	0554 5353	
Current transformer 100/5 A connectible to current/effective power meter for panel mounting (for cables up to Ø 21 mm)	0554 5344	
Current transformer 500/5 A connectible to current/effective power meter for panel mounting (for cables up to Ø 21 mm)	0554 5347	
Connection cable to DS 400, 5 m, with open ends	0553 0108	
Connection cable to DS 400, 10 m, with open ends	0553 0109	

CS Soft Basic - evaluation of measured data for single computers

The measured data stored in the data logger integrated in DS 400 can be read-out via USB stick.

If DS 400 has the optional Ethernet interface the measured data can also be read-out over big distances via the computer network



Graphic evaluation

All measurement curves are indicated in different colors. All necessary functions like free zoom, selection/deselection of single measured curves, free selection of time periods, scaling of the axis, selection of colors and so on are integrated:
This view can be stored as a pdf file and sent by e-mail. Different data can be merged in one million file.

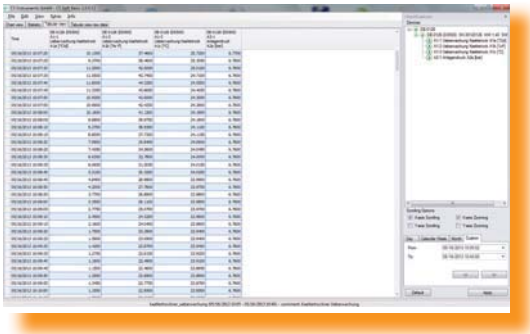
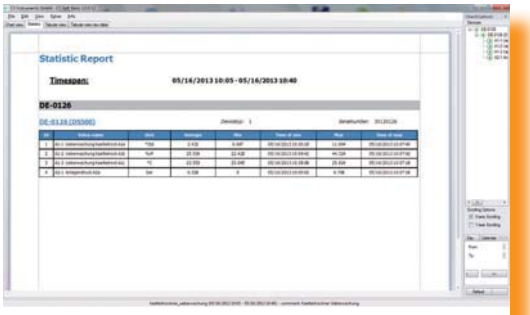


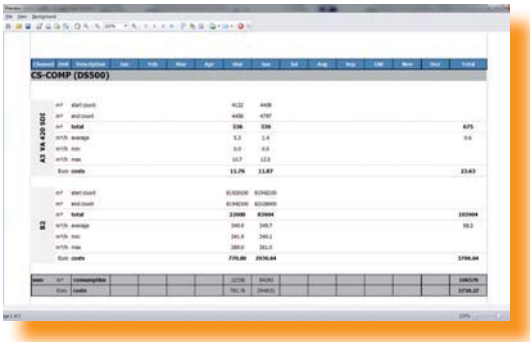
Table view

All measured points are listed with the exact time interval. The desired measuring channels with the measuring site name can be selected via the diagram explorer.



Statistics

All necessary statistics data are apparent at a glance. So the user can quickly see which minimum or maximum measured values occurred at which time and for how long.



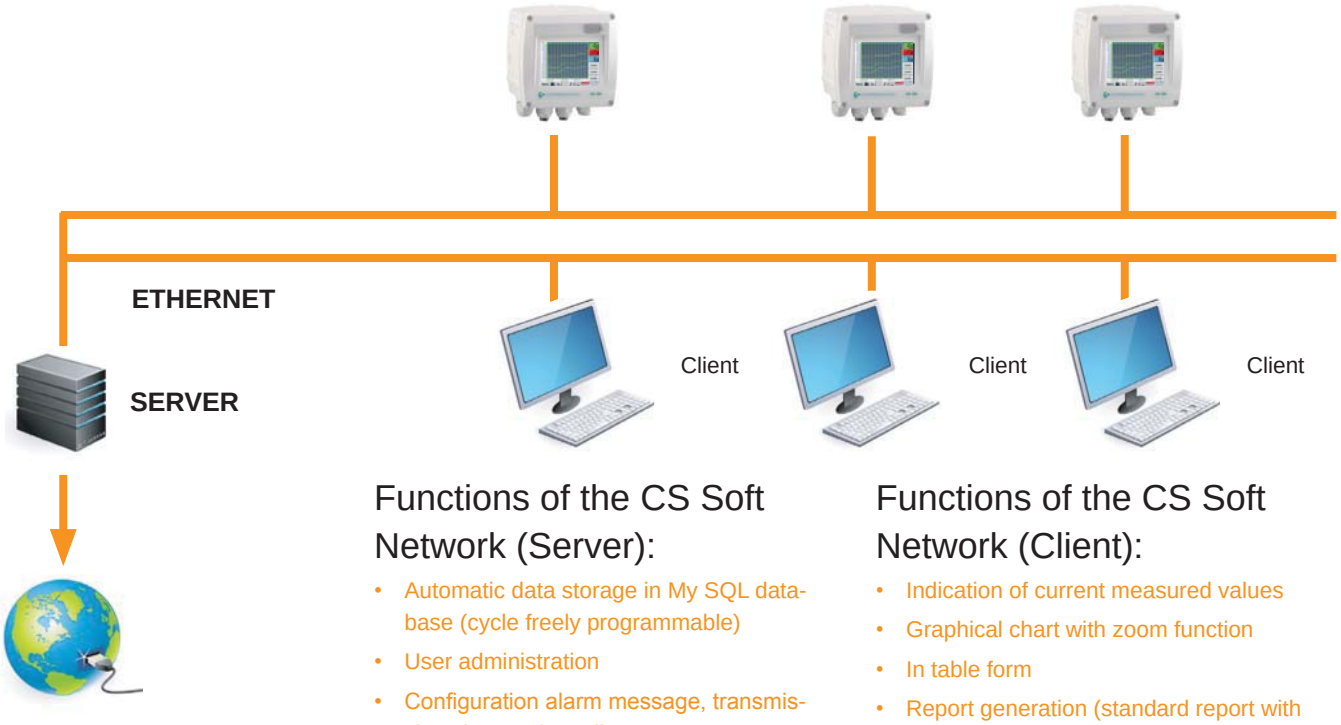
Energy and flow evaluation

The software carries out on energy and flow analysis for all connected flow sensors optionally as daily, weekly or monthly report.

CS Soft Network - evaluation of the measured data for several computers in the network

By means of the CS Soft Network an optional number of DS 500/ DS 400 instruments can be evaluated via Ethernet. The software stores the measured data of all DS 500 / DS 400 cyclically (cycle freely selectable) in a SQL database on the server. In case of an exceeding of the stored alarm values the software automatically sends an SMS or an e-mail. Furthermore, different user levels can be defined in the server software so that single staff members only can access the measured data of certain DS 500 / DS 400.

The evaluation of the measured data can be carried out by means of the client software from each PC within the company.



Functions of the CS Soft Network (Server):

- Automatic data storage in My SQL database (cycle freely programmable)
- User administration
- Configuration alarm message, transmission via SMS/e-mail
- Configuration backup generation

Functions of the CS Soft Network (Client):

- Indication of current measured values
- Graphical chart with zoom function
- In table form
- Report generation (standard report with Min-Max values, number of alarm exceedings, moment of alarm exceeding)
- Automatic consumption report

Access to the measured values via the webserver

With the option „Webserver“ (order no. Z500 4005) DS 400 can be contacted without any special software from each web browser (eg. Mozilla Firefox ®, Microsoft Internet Explorer ®).

The access can also be done via the World Wide Web. The webserver indicates the actual measured values of all sensors as well as the status of the alarm relays and the logger status in the web browser.

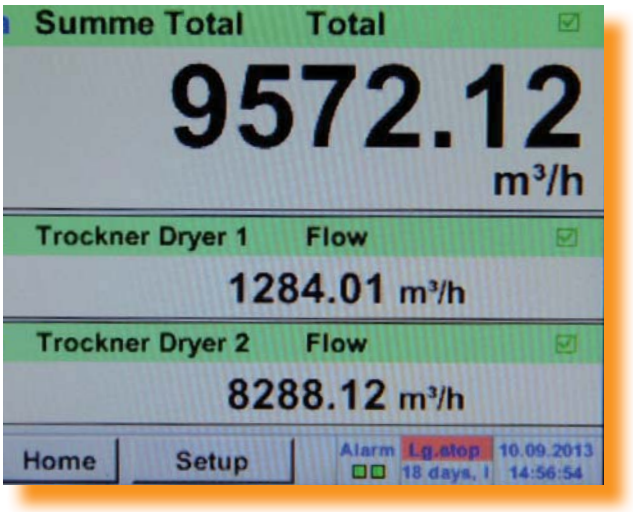
Connection to Bus system

RS 485 network (Modbus RTU)
or Ethernet (Modbus/TCP)

With the option „Ethernet / RS 485 - interface“ (order no. Z500 4004) DS 400 can be connected to customer-owned Bus system (e.g. PLC, building management system BMS, central control system, SCADA,...).

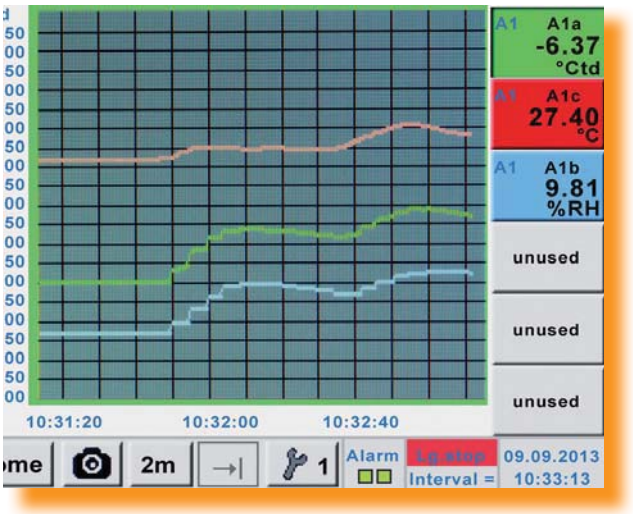
The measured values of all sensors can be retrieved via Modbus protocol. A detailed protocol description is enclosed with each DS 400 instrument. When using the Ethernet interface the IP address at DS 400 can be freely adjusted. As an alternative DS 400 waits for the address allocation by a DHCP server.

Innovations



Summation of several flow sensors

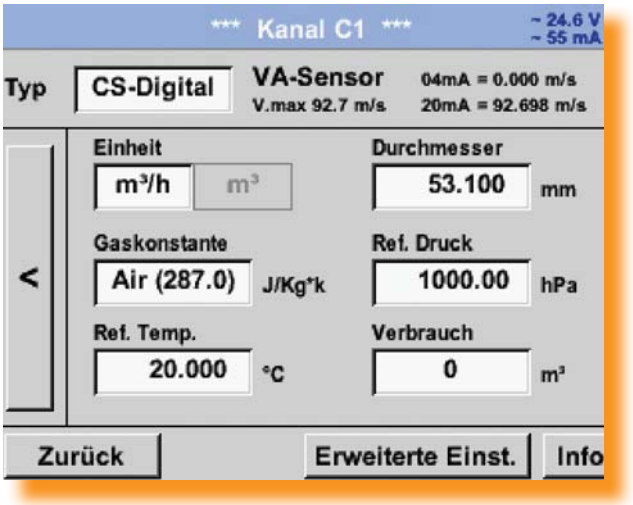
By means of the option „mathematics calculation function“ (order no. Z500 4007) it is possible to calculate mathematically the sum of several connected flow sensors. Of course the new „virtual“ value „sum of all sensors“ can also be indicated graphically and stored in the data logger.



Screen-shot function

By means of the print key it is possible to store the actual screen as an image file onto the internal SD card or on a USB stick and print it out at the PC without any additional software.

This is ideal for documentation of the measured values/ measured curves on-site. Colored measured curves can be sent as image files by e-mail or integrated into a service report.



Totalizer function

Lots of low-priced flow sensors which are available on the market just have a 4...20 mA analogue output for the current flow in liters/min or m³/h. An output signal for the recording of total flow readings is not integrated.

By means of the option „totalizer function“ DS 400 can integrate the analogue signal and generate a total flow reading in m³ or liters from the measured actual flow. The total flow reading can be set to zero in the user menu at any time.

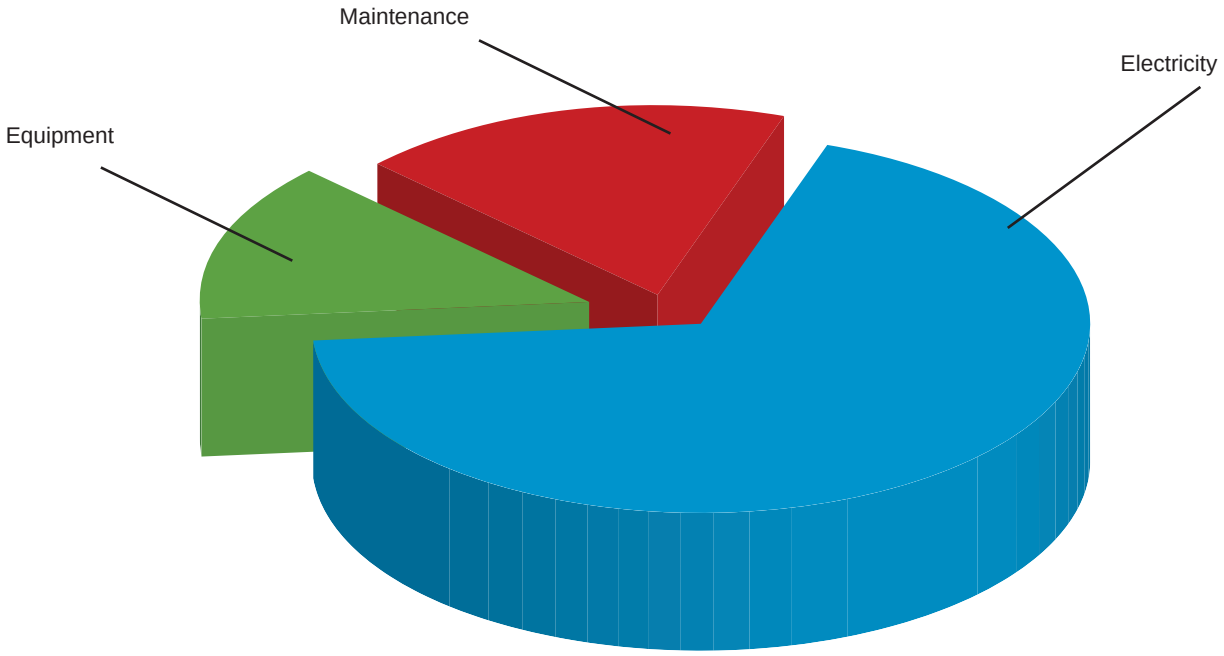
Consumption and **flow measurement**

Cost saving

In Germany 60,000 compressed air plants use 14,000,000,000 kWh electrical energy per year. 15 to 20 % could be easily saved (Peter Radgen, Frauenhofer Institut, Karlsruhe). Most of these costs are caused by leakages in the compressed air system.
The air „escapes“ unused. **1 leak with a diameter of 1 mm causes costs of** approximately 270 EUR/year

The leak detector LD 400 will be paid off after 4 leakages (please see page 94-95)

Cost distribution in compressed air systems:



Example for a calculation of leakage costs at different pressure:

Leak Ø (mm)	Air loss at 6 bar (l/s)	Air los at 12 bar (l/s)	Energy loss kWh at 6 bar	Energy loss kWh at 12 bar	Costs € p.a. at 6 bar	Costs € p.a. at 12 bar
1	1.2	1.8	0.3	1.0	144	480
3	11.1	20.8	3.1	12.7	1,488	6,960
5	30.9	58.5	8.3	33.7	3,984	16,176
10	123.8	235.2	33.0	132.0	15,840	63,360

Source: www.druckluft-effizient.de

VA 409 Flow direction switch for compressed air systems

The thermal flow direction switch VA 409 with direction indication serves for determination of the flow direction of compressed air and gases especially in closed circular pipelines.

By means of VA 409 with flow direction indication the flow direction of the compressed air can be determined quickly and safely. Compared with the former mechanical paddle flow switches VA 409 is able to detect even the smallest changes in the flow direction quickly and without any mechanical movement.

The direction information in form of a potential-free contact (normally closed max. 60 VDC, 0.5 A) is transferred to the flow sensors VA 5xx or to a separate building management system (mbs). Two LEDs show the flow direction.

In connection with 2 flow sensors VA 5xx incoming and out flowing compressed air in closed circular pipelines can be measured precisely.

Special features

- detects smallest changes <0.1 m/s referred to 20 °C and 1000 mbar
- no mechanical wear parts
- easy installation under pressure

Technical data VA 409

Detection range recognition flow direction:	< 0.1 m/s referred to 20°C and 1000 mbar
Measuring principle:	calorimetric measurement
Sensor:	Pt 30/ Pt 700/ Pt 330
Measuring medium:	air, gases
Operating temp.:	0...50°C probe tube -20...70°C housing
Operating pressure:	up to 16 bar
Power supply:	24 VDC, 40 mA
Power input:	max. 80 mA up to 24 VDC
Protection class:	IP 54
EMV:	acc.to DIN EN 61326
Connection:	2 x M12, 5-pole, plug A and plug B
2 potential-free contacts:	2 x U max. 60 VDC, I max 0,5 A (normally closed); on request: Normally open
Housing:	polycarbonate
Probe tube:	stainless steel, 1,4301, length 160 mm, Ø 10 mm, safety ring Ø 11.5 mm, longer probes on request
Mounting thread:	G 1/2“
Diameter housing:	65 mm
Flow direction:	2 LEDs

Description	Order No.
Flow direction switch VA 409	0695 0409
Mains unit in wall housing for maximum 2 sensors of the series VA/FA 5xx, 100-240 V, 23 VA, 50-60 Hz / 24 VDC, 0.35 A	0554 0110
Connection cable, 5 m	0553 0104
Connection cable, 10 m	0553 0105

Flow station DS 400
with direction indication in one direction

By connecting the flow direction switch VA 409 to the flow sensor VA 500 only the flow in one direction is measured. So it is guaranteed that the back-flowing compressed air is not counted twice.

Special features

- precise flow measurement in one direction
- when doing the cost calculation of the compressed air it is avoided that back flowing compressed air is counted twice

Flow station DS 400
with flow direction indication in both directions

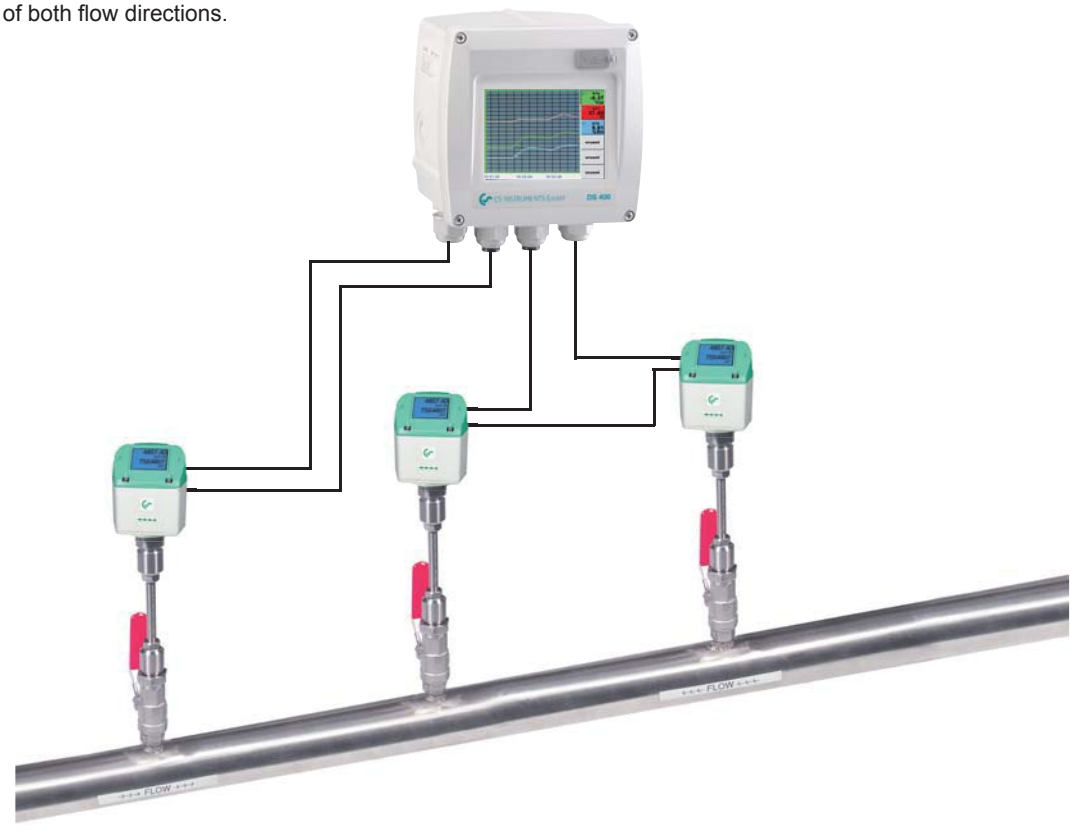
In case the flow direction switch VA 409 indicates the flow direction and forwards this information to the flow sensor VA 500.

Each of both flow sensors VA 500 exclusively measures the flow in one direction. The flow direction switch VA 409 is mounted in the middle between both flow stations in order to avoid flow turbulences.

For this reason two flow sensors VA 500 are used for precise flow measurement of both flow directions.

Special features

- precise consumption measurement in both directions
- separate indication of the actual flow (m³/h resp. m³/min etc...) separate summing of the total flow (m³ resp. l)
- forwarding of the analogue output and of the pulse output for the respective flow direction



Useful accessories:
Measuring sections

Measuring sections for precise measurements

Measuring section made of stainless steel 1.4301 incl. ball valve, up to DN 65 (R2 1/2“) with external thread, from DN 80 with weld neck flange according to DIN 2633.

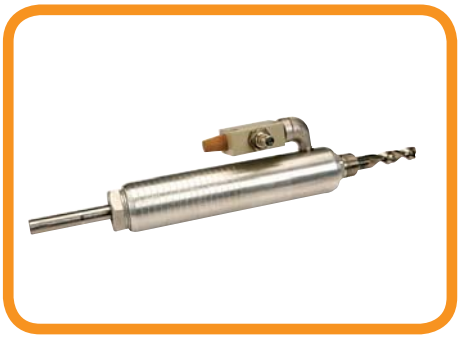
Measuring section 1/2“

Measuring section 1/4“

External thread	Pipe (outerØ x wall thickness)	Total length	Order no.
R 1/2“	21.3 x 2.6 mm	500 mm	4000 0015
R 3/4“	26.9 x 2.6 mm	600 mm	4000 0020
R 1“	33.7 x 3.2 mm	750 mm	4000 0025
R 1 1/4“	42.4 x 3.2 mm	900 mm	4000 0032
R 1 1/2“	48.3 x 3.2 mm	1000 mm	4000 0040
R 2“	60.3 x 3.6 mm	1250 mm	4000 0050
R 2 1/2“	76.1 x 3.6 mm	1500 mm	4000 0065
from DN 80 with flange DIN 2633			
DN 80/88.9	88.9 x 2.0 mm	1850 mm	4000 0080
DN 100/114.3	114.3 x 2.0 mm	2104 mm	4000 0100
DN 125/139.7	139.7 x 3.0 mm	2860 mm	4000 0125
DN 150/168.3	168.3 x 3.0 mm	3110 mm	4000 0150

Drilling jig for drilling under pressure

By means of a special drilling device a measuring site with 1/2“ ball valve can be easily set up within a few minutes.
As an alternative to the welding of the 1/2“ fitting also a spot drilling collar can be used.



Drilling jig

High-pressure protection

Drilling under pressure

Description	Order No.
Drilling jig incl. drill (Ø 13 mm)	0530 1108
High-pressure protection f. installation from 10 to 50 bar (for VA400/500)	0530 1105
High-pressure protection f. installation from 10 to 100 bar (for VA 550)	0530 1115
High-pressure protection f. installation from 10 to 16 bar DVGW (for VA 550)	0530 1116

Useful accessories:
Spot drilling collars for compressed air pipes

If there is no measuring site with 1/2“ ball valve present it can be set up by means of spot drilling collars.

The spot drilling collar is imposed onto the pipe and tightened via thread rods. The enveloping rubber gasket is pressure-tight up to 10 bar. By means of the drilling jig it is possible to drill through the 1/2“ ball valve into the existing pipe.

Important: Please indicate the exact outer diameter of the existing pipe when placing the order resp. please select the suitable spot drilling collar from the adjoining list.

Spot drilling collar

Description	DN	Order no.
Spot drilling collar for pipe Ø 032 - 036 mm, Length: 100 mm*		0500 0446
Spot drilling collar for pipe Ø 036 - 040 mm, Length: 100 mm*		0500 0448
Spot drilling collar for pipe Ø 040 - 044 mm, Length: 150 mm*		0500 0449
Spot drilling collar for pipe Ø 044 - 051 mm, Length: 200 mm*		0500 0610
Spot drilling collar for pipe Ø 048 - 055 mm, Length: 200 mm*	40	0500 0611
Spot drilling collar for pipe Ø 052 - 059 mm, Length: 200 mm*		0500 0612
Spot drilling collar for pipe Ø 057 - 064 mm, Length: 200 mm*	50	0500 0613
Spot drilling collar for pipe Ø 063 - 070 mm, Length: 200 mm*		0500 0614
Spot drilling collar for pipe Ø 070 - 077 mm, Length: 200 mm*	65	0500 0615
Spot drilling collar for pipe Ø 075 - 083 mm, Length: 200 mm*		0500 0616
Spot drilling collar for pipe Ø 082 - 090 mm, Length: 200 mm*		0500 0617
Spot drilling collar for pipe Ø 087 - 097 mm, Length: 200 mm*	80	0500 0618
Spot drilling collar for pipe Ø 095 - 104 mm, Length: 200 mm*		0500 0619
Spot drilling collar for pipe Ø 102 - 112 mm, Length: 200 mm*		0500 0620
Spot drilling collar for pipe Ø 108 - 118 mm, Length: 200 mm*	100	0500 0621
Spot drilling collar for pipe Ø 118 - 128 mm, Length: 200 mm*		0500 0622
Spot drilling collar for pipe Ø 125 - 135 mm, Length: 200 mm*		0500 0623
Spot drilling collar for pipe Ø 133 - 144 mm, Length: 200 mm*	125	0500 0624
Spot drilling collar for pipe Ø 145 - 155 mm, Length: 250 mm*		0500 0625
Spot drilling collar for pipe Ø 151 - 161 mm, Length: 250 mm*	150	0500 0626
Spot drilling collar for pipe Ø 159 - 170 mm, Length: 250 mm*		0500 0627
Spot drilling collar for pipe Ø 168 - 180 mm, Length: 250 mm*		0500 0628
Spot drilling collar for pipe Ø 180 - 191 mm, Length: 250 mm*	175	0500 0629
Spot drilling collar for pipe Ø 193 - 203 mm, Length: 300 mm*		0500 0630
Spot drilling collar for pipe Ø 200 - 210 mm, Length: 300 mm*		0500 0631
Spot drilling collar for pipe Ø 209 - 220 mm, Length: 300 mm*	200	0500 0632

*inkl. 1/2“ ball valve

*not applicable for copper and plastic piping

Thickness meter
CS 0495

The entry of the correct inner diameter is essential for an accurate consumption measurement.

The thickness meter CS 0495 enables a quick, easy and accurate measurement of the wall thickness of pipes. So the determination of the inner diameter becomes very easy.

Description	Order No.
Thickness meter CS 0495 including case and calibration block	0560 0495

Technical data CS 0495

Meas. range:	1.5...200 mm, 0.06...8 Inch
Meas. principle:	ultrasonic
Measured materials:	steel, cast iron, aluminium, copper, brass, zinc, quartz glass, polyethylene, PVC, grey iron, nodular cast iron
Calibration block:	included in shipment
Resolution:	0.1 mm
Accuracy:	± (0.5 % n+ 0.1)
Power supply:	4 x 1.5 V AA (UM-3) batteries
Dimensions:	160 x 68 x 32 mm
Weight:	208 g

CS Service Software for VA 5xx sensors:

... including PC connection set, USB adapter and interface adapter to the sensor.

The flow sensors VA 5xx can be connected to the PC and the following adjustments can be carried out by means of the CS Service Software:

- Selection of the gas type (compressed air, CO2, N2O, N2, O2, NG, Ar, CH4)
- Selection of the units for flow, velocity, temperature, consumption
- Selection of units: m³/h, Nm³/h, m³/min, Nm³/min, ltr/h, Nltr/h, ltr/min, Nltr/min, ltr/s, Nltr/s, cfm, SCFM, kg/h, kg/min, kg/s
- Adjustment of the reference temperature, reference pressure
- Zero-point adjustment, low flow cut-off adjustable
- Modbus and M-Bus settings
- Scaling of the 4...20 mA analogue output
- Reading out of: Version number, production date, serial number, date of last calibration
- Adjustment of alarm limits
- Single-point calibration (adjustment) – for this purpose a reference measuring instrument is required
- Offset settings (flow offset, temperature offset)
- Reset to factory defaults
- Transfer of updates to the sensor (firmware update, language update)

Description	Order No.
CS Service Software for FA/VA sensors incl. PC connection set, USB connection and interface adapter to the sensor	0554 2007

Calibration of **flow sensors** and **flow stations**

In the CS calibration laboratory for flow sensors it is possible to calibrate our flow measuring instruments as well as of other manufacturers. High precision reference measuring instruments grant an accuracy of up 0.5 % of the measured value.

Special features

- Due to digital data transfer only the flow sensor has to be calibrated, enabling the display unit DS 400 to stay on-site at all times

Calibration range:	from 0 to 4,000 m³/h under pressure
Accuracy of the reference:	between 0.5 and 1 % of the measured value

Description	Order No.
Recalibration and 5 point precision calibration of flow sensor with ISO certificate	0695 3333
Volume flow, freely selectable measuring points	on request
Real gas calibration	3200 0015

Measurement of compressed air consumption can help reducing energy costs

Each factory needs compressed air, however, often it is not realized that compressed air is one of the most expensive types of energy. Therefore, the intelligent use of compressed air holds an enormous potential for saving energy. In most cases the user mainly concentrates on the production, i. e. on the compressors. In order to save energy very often new compressors, control systems or heat recovery systems are installed.

If we talk about operational costs of compressed air plants we are actually talking about the energy costs as they make up about 70 to 80 % of the total costs of a compressed air plant.

Depending on the size of the plant this means considerable operating costs. Even in smaller plants this may quickly add up to 10,000 to 20,000 € per year. This is an amount which can be considerably reduced – even in case of well operated and maintained plants.

In case of a three shift operation with 200 kW compressor performance a bad compressed air distribution can create redundant energy costs of more than 50,000 € per year.

This mainly concerns to the elimination of leakages and the correct diameters of the compressed air lines for minimization of the pressure losses.

Energy resources like electricity, water or gas are usually monitored and therefore the costs are transparent.

Contrary to compressed air, a water leak is usually found quickly due to the visibility of the leak and therefore they are eliminated immediately. Compressed air leaks are often not noticed and can ”silently” cause a lot of unnecessary costs, even during production downtime or over the weekend.

Also during that time compressors are running continuously in order to establish a constant pressure within the system. In case of compressed air systems which have grown during the years the leakage rate can be between 25 and 35 per cent.

They are the busiest consumers of compressed air, working all around 365 days a year.

Not included are the hidden costs of producing clean and dry compressed air. Refrigeration and desiccant driers are producing dry air with high running costs involved. Air that is then later lost through leaks within the system.

At constantly rising energy costs these potential energy savings have to be implemented in order to stay competitive within the market. Only if the consumption of single machines or plants becomes known and transparent for all it is possible to make use of possible savings.

However, often any knowledge about the leak ratio is missing. In the following we show you how you can easily determine the leakage amounts in your company.

Formerly the simple but inaccurate container method was applied very often

A simplified determination of the leakages is possible by means of the emptying of the tank.

For carrying out this measurement you just need a clock and a manometer.

Furthermore you should know the storage volume of the tank as well as of the compressed air system.

For measurement first the tank and the compressed air system are set to the upper cut-out pressure value. All compressed air consumers have to be switched off.

Then the compressor is switched off and there will be no compressed air feeding into the system.

Now the time T is measured which passes by until there is a pressure drop of 1 to 2 bar due to the leakages.

The pressure drop between which the measurement is taking place can be selected freely.

However, in practice the described method is very time-consuming, not adequate and inaccurate due to the following reasons:

Storage volume, distribution pipelines cannot be determined exactly.

The accuracy of the differential pressure measurement and time measurement has to be observed

During pressure drop the compressed air volume cools down and therefore it changes the volume flow reference value

An online measurement with consumption record is not possible

This method belongs to the so-called indirect measurements, like also the method of the load and unload measurement during which the current intake is measured by means of clamp-on ammeters and calculated back to the volume flow over the technical data of the compressor.

These indirect methods are antiquated and not suitable to detect leakages in the lower measuring range.

Determination of compressed air leakages with modern flow meters

A modern compressed air consumption measurement resp. leakage measurement should be able to measure the real compressed air flow and also the smallest leakages quickly and reliably and record them.

New: Flow measurement DS 400 for compressed air and gases

Worldwide unique with 3.5 inch, graphic display with touch screen and print function.

With the new ”ready for plug-in” flow measurement DS 400 the current flow in m³/h, l/min etc. as well as the consumption in m³ or l can be measured.

The new flow station works according to the approved calorimetric measuring principle.

The heart is the flow sensor which has been proven and tested for years. It is characterized by a new thermally more efficient sensor structure which shown a higher chip temperature in case of same electrical connection values. Compared to other calorimetric measuring instruments the sensor has a considerably lower mass and therefore a faster response time.

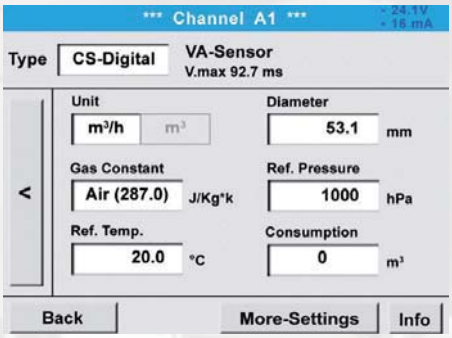
An additional pressure and temperature compensation is not necessary.

The advantage is that the customer can use the flow sensors in different pressures and temperatures without any further compensation.

Apart form compressed air also other gases like e. g. oxygen, CO2, argon, natural gas and helium can be measured.

Flow measurement DS 400 will be supplied completely wired. Therefore a time consuming studying of the instruction manual is not necessary.

Exceeding of threshold values can be reported optically and acoustically. 2 relays for pre- and main alarm are freely adjustable.



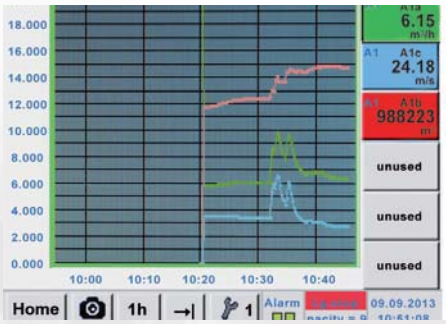
An alarm delay can be set for each relay. This grants that only really long-term exceeding of the threshold values are indicated. Additionally every alarm can be reset.

The intuitive operation with the 3.5 inch touch screen graphic display with zoom function and print key is worldwide unique in this price class.

The graphic display with zoom function shows the actual flow, the peak values and the leakage at a glance, the values are stored in the data logger.

So the user can take a look at the stored measuring curves also without any computer at any time on site. This grants a quick and easy analysis of the compressed air or gas consumption.

By means of the print key the actual screen can be stored as an image file to the internal SD card or to a USB stick and printed out at the computer without any additional software.



Ideal for documentation of the measured values/ curves on site. Colored measured curves can be sent by e-mail as image files or integrated into a service report.

The internal data logger enables the storage of the measured data for several years. The measured data can be evaluated via a USB stick of via Ethernet by means of the comfortable software CS Soft Basic.

Particularly comfortable is the consumption analysis at the touch of a button. The CS Soft Basic automatically draws up daily, weekly and monthly reports.

Special features:

- 3.5“ graphic display, intuitive operation via touch screen
- Zoom function for accurate analysis of measured values
- Consumption analysis with daily/ weekly/monthly reports
- Colored measured curves with names
- Mathematical calculation function e. g. addition of several consumers to a total consumption or energy costs per kWh/m³
- Print key: Optional indications can be stored as image
- files directly on a USB stick and sent by e-mail
- without any software
- 2 alarm contacts for exceeding of threshold values

- Freely adjustable alarm delay for both alarm contacts
- With reset function
- Up to 4 sensor inputs for: Further flow sensors, dew point, pressure, temperature, consumption, active power meters, optional third-party sensors can be
- Connected: Pt100/1000, 0/4..20 mA, 0-1/10 V,
- Modbus, pulse
- Integrated data logger 2 GB
- USB, Ethernet interface, RS 485
- Webserver

VA 500 flow sensor for compressed air and gases

The installation of the VA 500 flow sensor is carried out by means of a 1/2“ ball valve and can be done under load of the system. The safety ring prevents the instrument from being pushed out by the operating pressure.

For the installation at different pipe diameters, the VA 500 can be ordered at special lengths: 120, 160, 220, 300, 400 mm. Therefore it is possible to use the VA 500 flow sensor from inner pipe diameters of 1/2“ up to 12” and bigger.

The exact positioning of the sensor is carried out with the aid of the engraved depth scale at the sensors shaft. The maximum insertion depth is therefore determined by the sensor length. Please see picture to determine the sensor length required.

Measuring site

If no 1/2“ ball valve is present to carry out the installation of the VA 500 sensor, we have two possible alternatives to offer:

A 1/2“-thread needs to be welded onto the pipe work and the ball valve is then threaded on.

B A spot drilling collar can be ordered and installed.

Making use of the specialized drilling jig, it is then possible to drill a whole into the pipe work under load. The filings are caught in a special filter system at the drilling jig. Afterwards the VA 500 probe should be installed as described above.

The VA 500 measuring range allows for measurements in almost all possible applications. Even high flow rates in small pipe diameters can be measured.