CS INSTRUMENTS

Catalogue for measuring professionals

2018

Proven and innovative measuring technology for compressed air and gases

Flow

New

Dew point

Chart recorder

New

Pressure

Leakage

Current

Compressed air quality

Chart recorder

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DS 500

Intelligent chart recorder for compressed air and gases

Measurement - control - indication - alarm - recording - evaluation

Advantages at a glance:

- **Clear layout:** 7“ color screen with touch panel...
- **Versatile:** Up to 12 optional sensors can be connected...
- **Suitable for industrial applications:** Metal housing IP 65 or panel mounting
- **Data available though world wide web:** Network-compatible and remote transmission via webserver
- **Intelligent:** Daily/weekly/monthly reports...
- **Mathematical function** for internal calculations
- **Totalizer function** for analogue signals
- **... Saves time and costs during installation**

DS 500 - the intelligent chart recorder of the next generation

From recording of the measured data, indication on a big color screen, alerting, storage up to remote read-out via webserver... this is all possible with DS 500. By means of the CS Soft Basic software alarms can be sent via SMS or e-mail.

All measured values, measured curves and threshold exceeding are indicated. The curve progressions from the beginning of the measurement can be viewed by an easy slide of the finger.

Daily/weekly/monthly reports with costs in € and counter reading in m³ for each consumption sensor are completing the sophisticated system concept.
The big difference to ordinary paperless chart recorders reveals in the easy initiation and in the evaluation of the measured data. All sensors are identified directly and powered by DS 500. Everything is matched and tuned.

Mathematical function for internal calculations, e.g. the typical figures of a compressed air plant:

- costs in € per generated m³ air
- kwh/m³ generated air
- consumption of single lines including summation

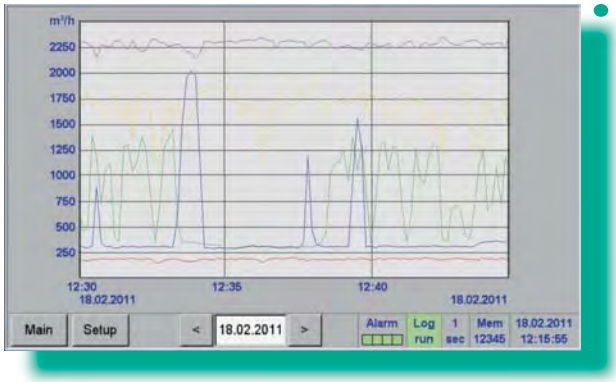
Totalizer function for analogue signals (e.g. 0/4...20 mA, 0...10 V). In case of third-party sensors which e.g. only give a 4...20 mA signal for the actual flow in m³/h a total counter reading in m³ can be generated by means of the totalizer function.
No time consuming studying of the instruction manual**... this saves time.**
Internal voltage supply of all sensors, no wiring of external mains units **... this saves additional costs.**

All important information at a glance

Measured values, statistics, curves with the 7” color screen touch panel

Real time measured values

All measured values can be seen at a glance. Threshold exceeding are indicated in red color.
A „measuring site name“ can be allocated to each sensor.

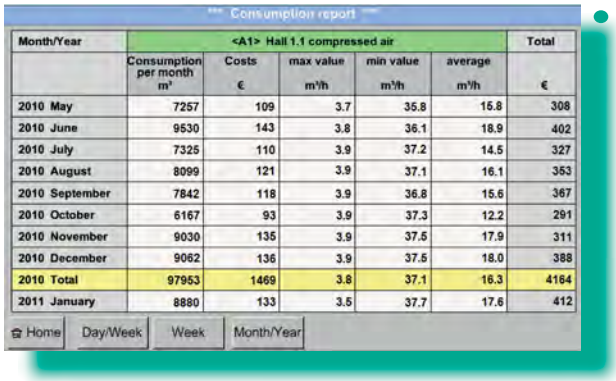


Graphic display

This display replaces the former evaluation of ordinary paper chart recorders and offers lots of advantages. The time axis can be moved by a finger slide. The „zoom function by finger movement“ which enables an analysis of peak values is unique.

Real time measured values and graph

Additionally to the measurement curves the real time value is indicated as well.



Statistics and reports

Different to ordinary chart recorders the DS 500 offers not only the recording of the measured data but also the evaluation of all flow sensors optionally as daily/weekly/monthly report at the push of a button. It is no longer necessary to read-out the counter and transfer the values manually into a list. The reports can be imported to every PC into Excel® by means of a USB stick and after that they can be printed out without any additional software. This saves time and money and simplifies the evaluation enormously.

DS 500

Intelligent chart recorder for compressed air and gases

Versatile:

Up to 12 sensors, incl. all CS sensors (consumption, dew point, pressure, current, KTY, PT 100, PT 1000) are identified automatically by DS 500. Optional analogue sensors (0/4...20mA, 0...1/10/30 V, pulse)

can be configured easily and quickly. Digital sensors can be connected via RS 485, Modbus RTU and SDI.

Flexible:

Network-compatible and worldwide remote data transmission via Ethernet, integrated webserver.

Alarm relay/ fault indication:

Up to 32 threshold values can be configured freely and allocated to 4 different alarm relays. Collective alarms are possible.

Flow sensor
VA 500

Pressure sensor

Dew point sensor
FA 510

Flow meter
VA 520

current/effective power meters

Third party sensors 0/4...20 mA

Third party sensors pulse

Third party sensors 0-1/10 V

Third party sensors RS 485 Modbus RTU

Temperature probe Pt 100

Clamp-on ammeter

Screw-in temperature probe Pt 1000

All sensor inputs are freely allocatable, incl. internal voltage supply.

Flow sensors
for compressed air and gases

- Installation and removal under pressure via standard 1/2” ball valve
- A safety ring avoids the uncontrolled ejection in case of installation/removal under pressure
- Usable for different gases: compressed air, nitrogen, argon, CO2, oxygen

Dew point sensors

- Extremely long-term stable
- Quick adaption time
- Large measuring range (-80° to +20° Ctd)
- For all driers: Desiccant driers, membrane driers, refrigeration driers
- Easy installation under pressure via the standard measuring chamber with quick coupling

Pressure sensors

- Large selection of pressure sensors with different measuring ranges for each measuring purpose
- Quick installation under ressure by quick coupling
- Pressure sensors 0-10/16/40/100/250/400/600 bar overpressure
- Pressure sensors -1 - +15 bar (under-/overpressure)
- Differential pressure 1.5 mbar up to 4.2 bar
- Absolute pressure 0-1.6 bar (abs:)

Temperature sensors

- Large selection of temperature sensors e.g. for measurement of the ambient temperature or gas temperature
- Pt100 (2-wire or 3-wire)
- Pt1000 (2-wire or 3-wire)
- KTY sensors
- Temperature sensors with measuring transducer (4-20 mA output)

Heat meters-/ water and gas meters

- For direct measurement of the heat volume (in kWh)
- Customary heat meters e.g. at heating systems, heat exchangers, district heating networks and so on can be connected to DS 500 either via pulse signals or 4 -20 mA

Current/effective power meters

- CS PM 210 current/effective power meters for panel mounting with external current transformer for big machines and plants
- External current transformers for clamping around the phases (max. 2000 A)
- Measures KW, kWh, cos phi, kVar, kVA
- Data transfer DS 500 via Modbus

By means of the intelligent chart recorder **DS 500**, all measuring data of a compressor station can be recorded, indicated and evaluated.

At **12 freely assignable sensor inputs** all our sensors can be connected as well as any optional third-party sensors and meters **with the following signal outputs:**

4-20 mA, 0-20 mA I 0-1 V / 0-10 V / 0-30 V I Pt 100 (2- or 3-wire), Pt 1000 (2- or 3-wire), KTY I pulse outputs (e.g. of gas meters) frequency output I Modbus protocol.

Technical data DS 500

Dimensions of housing:	280 x 170 x 90 mm, IP 65
Connections:	18 x PG 12 for sensors and supply, alarm relays 1 x RJ 45 Ethernet connection
Version panel mounting:	Cutout panel 250 x 156 mm
Weight:	7.3 Kg
Material:	Die cast metal, front screen polyester
Sensor inputs:	• 4/8/12 sensor inputs for analogue and digital sensors freely allocatable. See options • Digital CS sensors for dew point and consumption with SDI interface FA/VA series, digital third-party sensors RS 485 / Modbus RTU, other bus systems realizable on request. • Analogue CS Sensors for pressure, temperature, clamp-on ammeters pre-configured. • Analogue third-party sensors 0/4...20 mA, 0...1/10/30V, pulse, Pt 100 / Pt 1000, KTY
Power supply for sensors:	24 VDC, max. 130 mA per sensor, integrated mains unit max. 24 VDC, 25 W. In case of version 8/12 sensor inputs, 2 integrated mains units each max. 24 VDC, 25 W.
Interfaces:	USB stick, USB cable, Ethernet / RS 485 Modbus RTU / TCP, SDI other bus systems on request, WEB server optionally
Outputs:	• 4 relays (changeover contact 230 VAC, 6 A), alarm management, relays freely programmable, collective alarm • Analogue otuput, pulse in case of sensors with own signal output looped, like e.g. VA/FA series
Memory card:	Memory size 4 GB SD memory card standard
Power supply:	100...240 VAC / 50-60 Hz, special version 24 VDC
Color screen:	7“ touch panel TFT transmissive, graphics, curves, statistics
Accuracy:	see sensor specifications
Operating temperature:	0...50°C
Storage temperature:	-20...70°C
Optionally:	Webserver
Optionally:	Quick measurement with 10 ms sampling rate for analogue sensors, Max/Min indication per second
Optionally:	Option „energy and flow report“ statistics, daily/weekly/monthly report

Description	Order No.
DS 500 - intelligent chart recorder in basic version (4 sensor inputs)	0500 5000
Option 4 additional sensor inputs for DS 500	Z500 5001
Option 8 additional sensor inputs for DS 500	Z500 5002
Option Integrated webserver	Z500 5003
Option „energy and flow report“ statistics, daily/weekly/monthly report	Z500 5004
Option version for panel mounting	Z500 5006
Option power supply 24 VDC (instead of 100...240 VAC)	Z500 5007
Option „mathematics calculation function“ for 4 freely selectable „virtual“ channels, (mathematical functions: addition, subtraction, division, multiplication)	Z500 5008
Option „Totalizer function for analogue signals“	Z500 5009
External Gateway Profibus	Z500 3008
CS Soft Basic - data evaluation in graphic and table form, reading out of the measured data via USB or Ethernet	0554 7040
CS Soft Network - Database Client/Server Solution (up to 5 DS 500) - database (MySQL) to Server - data evaluation via Client-Software	0554 7041
CS Soft Network - Database Client/Server Solution (up to 10 DS 500) - database (MySQL) to Server - data evaluation via Client-Software	0554 7042
CS Soft Network - Database Client/Server Solution (up to 20 DS 500) - database (MySQL) to Server - data evaluation via Client-Software	0554 7043
CS Soft Network - Database Client/Server Solution (> 20 DS 500) - database (MySQL) to Server - data evaluation via Client-Software	0554 7044

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

Suitable **probes** from the product range:

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:	± 1 % accuracy of full scale	± 0,5 % accuracy of full scale
Standard pressure sensor CS 16 from 0…16 bar	0694 1886	0694 3555
Standard pressure sensor CS 40 from 0…40 bar	0694 0356	0694 3930
Standard pressure sensor CS 1.6 from 0...1.6 bar abs.		0694 3550
Standard pressure sensor CS 10 from 0...10 bar	0694 3556	0694 3554
Standard pressure sensor CS 100 from 0…100 bar		0694 3557
Standard pressure sensor CS 250 from 0…250 bar		0694 3558
Standard pressure sensor CS 400 from 0…400 bar		0694 3559
Precision pressure sensor CS -1...+15 bar, ± 0.5 % accuracy of full scale		0694 3553
Precision differential pressure sensor CS 400, 0...400 mbar differential pressure, 0.075% accuracy of full scale, static pressure max. 40 bar	0694 3560	

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	

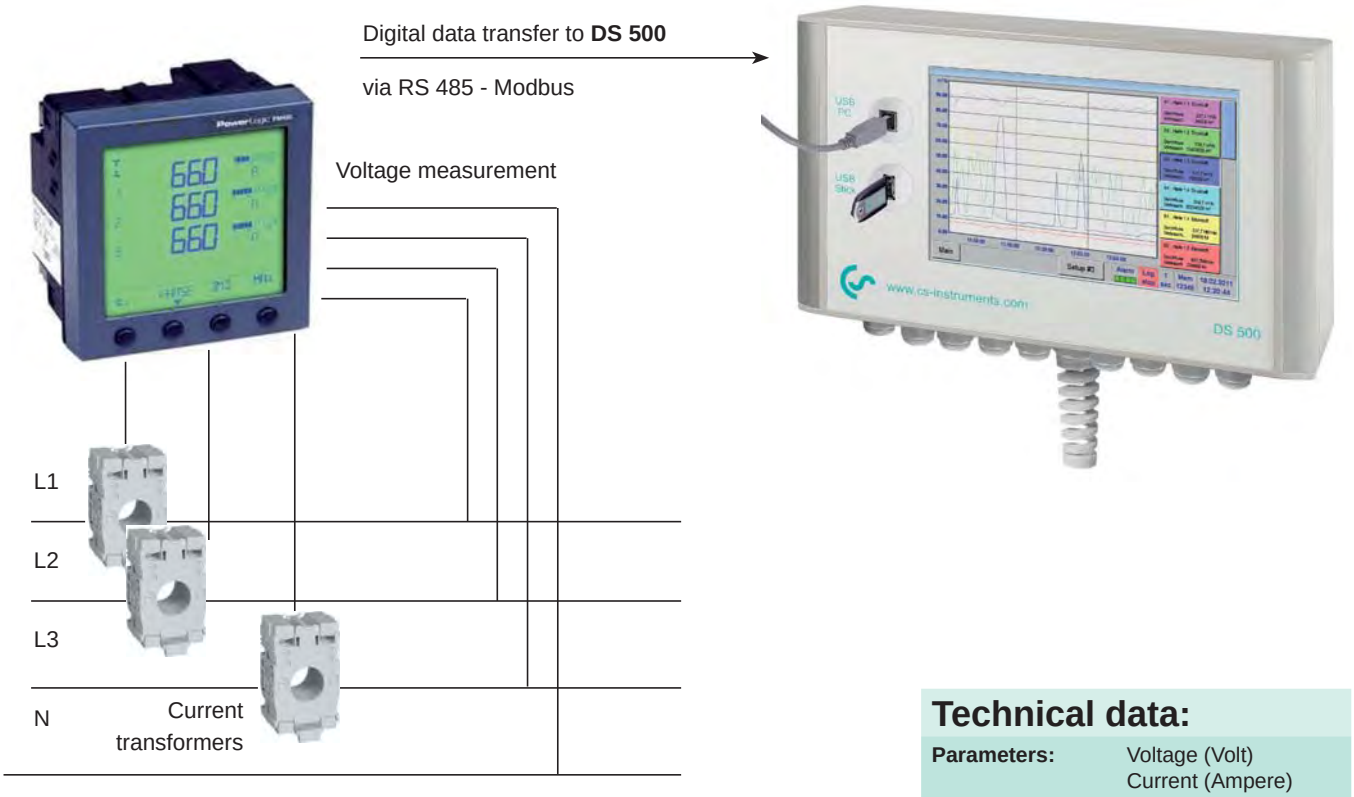
CS PM 210

Current/effective power meter for panel mounting

Measures voltage, current and calculates:

Active power	[kW]
Apparent power	[kVA]
Reactive power	[kVar]
Active energy	[kWh]
cos phi	

All measured data are transferred digitally (Modbus) to DS 500 and can be recorded there.



Description	Order No.
CS PM 210 current/effective power meter for panel mounting, current transformer from 100 A to 2000 A connectable	0554 5353
Current transformer 100/5 A connectable to current/effective power meter for panel mounting (for cables up to Ø 21 mm)	0554 5344
Current transformer 200/5 A connectable to current/effective power meter for panel mounting (for cables up to Ø 21 mm)	0554 5345
Current transformer 300/5 A connectable to current/effective power meter for panel mounting (for cables up to Ø 22 mm)	0554 5346
Current transformer 500/5 A connectable to current/effective power meter for panel mounting (for cables up to Ø 22 mm)	0554 5347
Current transformer 600/5 A connectable to current/effective power meter for panel mounting (for cables up to Ø 22 mm)	0554 5348
Current transformer 1000/5 A connectable to current/effective power meter for panel mounting (for current bar up to 65 x 32 mm)	0554 5349
Current transformer 2000/5 A connectable to current/effective power meter for panel mounting (for current bar up to 127 x 38 mm)	0554 5350
Connection cable to DS 500, 5 m, with open ends	0553 0108
Connection cable to DS 500, 10 m, with open ends	0553 0109

Technical data:

Parameters:	Voltage (Volt) Current (Ampere) Cos phi Active power (kW) Apparent power (kVA) Reactive power (kVar) Active energy (kWh) Supply frequency (Hz) All parameters are transferred digitally to DS 500
Accuracy current measurement:	± 0,5% of 1 to 6 A
Accuracy voltage:	± 0,5% of 50 V to 277 V
Accuracy active energy:	IEC 62053-21 Class 1
Interfaces:	RS 485 (Modbus protocol)
Measuring range:	Voltage measurement max. 480 Volt
Dimensions:	96 x 96 x 69 mm (W x H x D)
Operating temperature:	-5...+55°C

Software

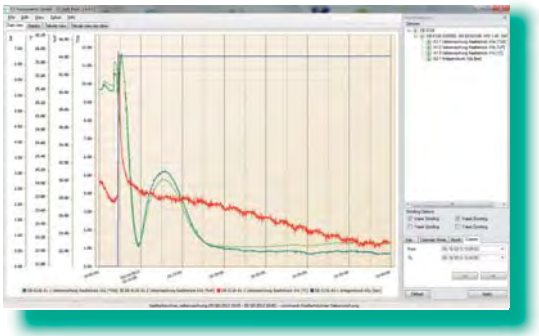
CS Soft Basic - evaluation of measured data for single computers

USB-Stick

Ethernet

The measured data stored in the data logger integrated in DS 500 can be read-out via USB stick.

If DS 500 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.

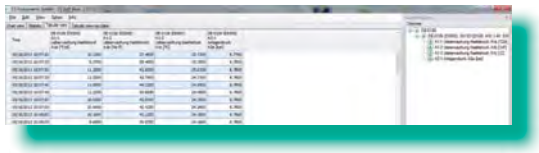


Table view

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.

Connection to Bus system

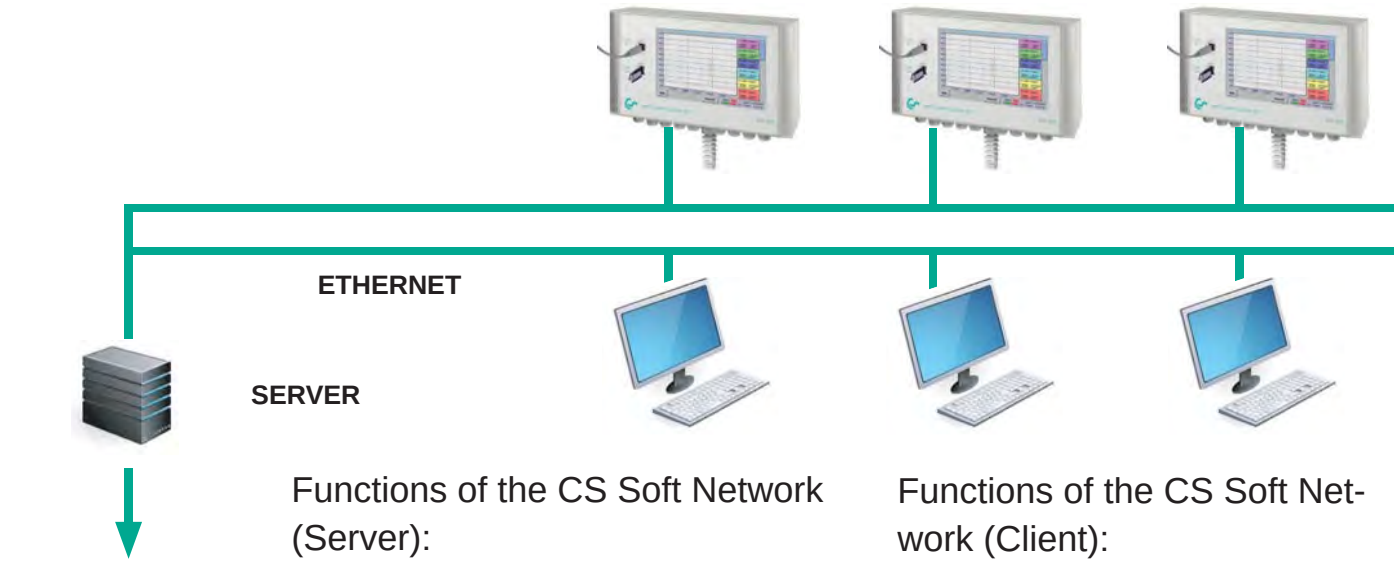
RS 485 network (Modbus RTU)
or Ethernet (Modbus/TCP)

With the „Ethernet / RS 485 - interface“ DS 500 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 500 instrument. When using the Ethernet interface the IP address at DS 500 can be freely adjusted. As an alternative DS 500 waits for the address allocation by a DHCP server.

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.

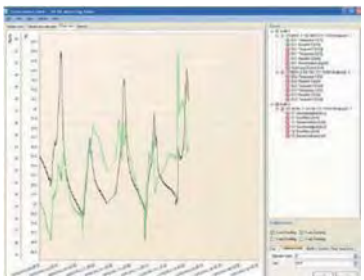


Functions of the CS Soft Network (Server):

- 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 exceeding, moment of alarm exceeding)
- Automatic consumption report

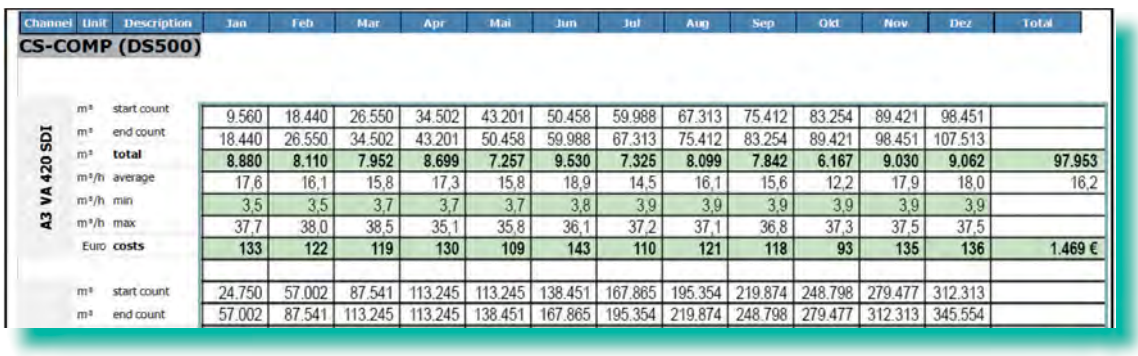


Graphical chart with zoom function

- Selection of the measuring channels to be indicated
- Easy zoom in and zoom out
- Up to 8 y-axis
- Quick access to day, week, month view

View: Current measurement values

- Load background image
- Place/fix window with measurement values
- Red measurement values in case of alarm exceeding



CS-COMP (DS500)

Channel	Unit	Description	Jan	Feb	Mar	Apr	Mai	Jun	Jul	Aug	Sep	Okt	Nov	Dez	Total
A3 VA 420 SDI	m³	start count	9.560	18.440	26.550	34.502	43.201	50.458	59.988	67.313	75.412	83.254	89.421	98.451	
	m³	end count	18.440	26.550	34.502	43.201	50.458	59.988	67.313	75.412	83.254	89.421	98.451	107.513	
	m³	**total**	**8.880**	**8.110**	**7.952**	**8.699**	**7.257**	**9.530**	**7.325**	**8.099**	**7.842**	**6.167**	**9.030**	**9.062**	**97.953**
	m³/h	average	17,6	16,1	15,8	17,3	15,8	18,9	14,5	16,1	15,6	12,2	17,9	18,0	16,2
	m³/h	min	3,5	3,5	3,7	3,7	3,7	3,8	3,9	3,9	3,9	3,9	3,9	3,9	
	m³/h	max	37,7	38,0	38,5	35,1	35,8	36,1	37,2	37,1	36,8	37,3	37,5	37,5	
	Euro	**costs**	**133**	**122**	**119**	**130**	**109**	**143**	**110**	**121**	**118**	**93**	**135**	**136**	**1.469 €**
	m³	start count	24.750	57.002	87.541	113.245	113.245	138.451	167.865	195.354	219.874	248.798	279.477	312.313	
	m³	end count	57.002	87.541	113.245	113.245	138.451	167.865	195.354	219.874	248.798	279.477	312.313	345.554	

Consumption analysis (in connection with option “consumption report”)

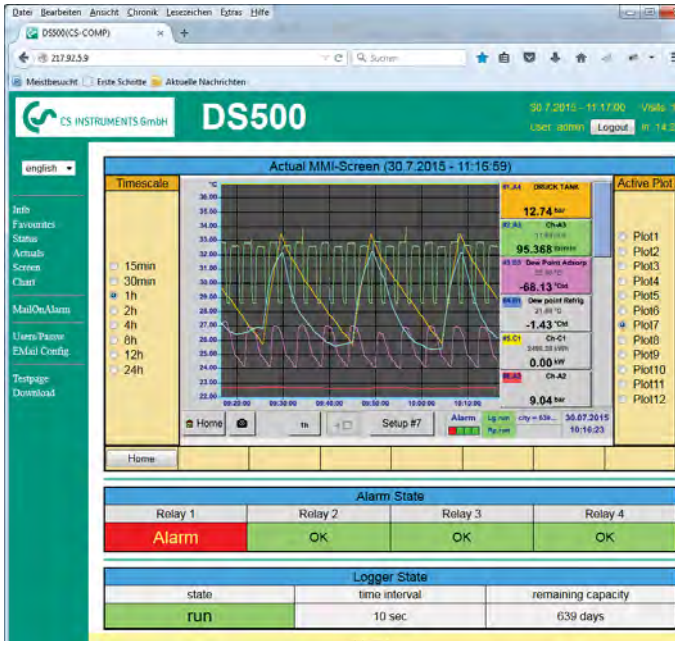
Webserver

The new webserver with extended features for the chart recorders DS 500 and DS 400 is available with immediate effect. Users can get direct access to their measuring values worldwide (current and historic measuring values) and display the measuring values on their smart phone, tablet or computer. For monitoring of threshold values users can receive an automated „alarm E-mail“.

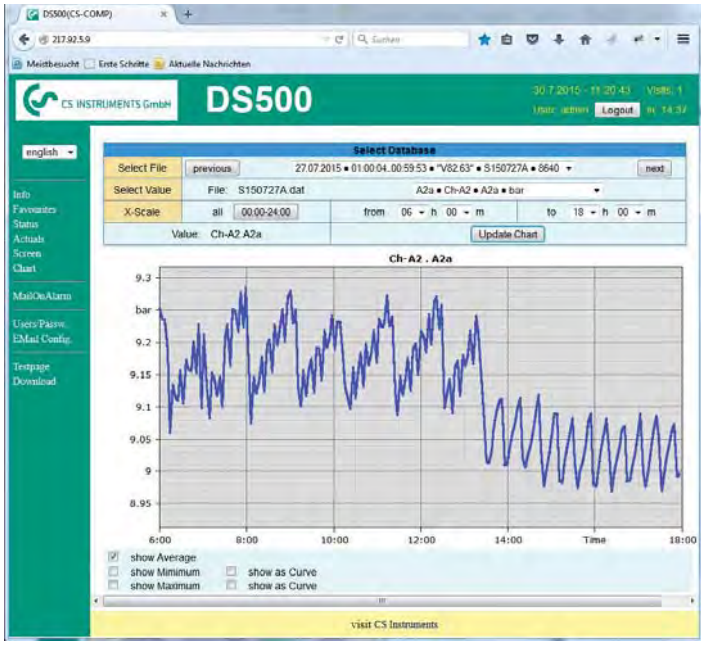
The new webserver can be ordered as an option with each stationary DS 500/400, but also for their mobile counterparts. For using the features of the webservers, the DS 500/400 must be set up with it’s own IP address within the network.

The webserver provides a website, which displays the measuring values. This website can be accessed from any web browser on each smart phone, tablet or computer via it’s unique IP address. This is all possible without the installation of any new or additional software.

View of the real time measuring values (graphic and table view)



View of the historic measuring values as a single chart (time period freely selectable)



Automated „alarm e-mail“ for threshold value exceedance:

Access authorization

Different groups with different users/passwords can be assigned to different access levels.

Starting the data logger

In case of a stopped data logger the group operator or administrator can start the data logger remotely, via the web server.

PS: The new webserver can be retro fitted to any DS 500/ DS 400 already in use.

DS 500 mobile
Intelligent mobile chart recorder

The intelligent mobile chart recorder - energy analysis according to DIN EN ISO 50001

Energy analysis - flow measurement - leakage calculation at compressed air systems

Your advantages at a glance

Easy and clear layout:
Very easy operation via 7“ color display with touch panel

Versatile:
Up to 12 sensors/meters connectable also third-party sensors/meters including power supply

Reliable:
Stores all measured values on a memory card, easy reading-out via USB stick possible

Intelligent energy analysis:
Daily/weekly/monthly evaluations mathematic function for internal calculations, e.g. the typical key data of a compressed air plant:
- costs in € per generated m³ air
- kWh/m³ generated air
- flow of single lines including summation

Easy & intuitional in its operation

Saves time & costs on installation

Technical Data DS 500 mobile - measurement of up to 12 compressors

Technical data DS 500 mobile

Case dimensions:	360 x 270 x 150 mm
Connections:	4 / 8 / 12 sensors and supply, 1 x RJ 45 Ethernet connection
Weight:	4.5 kg
Material:	diecast, front foil polyester, ABS
Sensor inputs:	• 4/8/12 sensor inputs for analogue and digital sensors; freely allocatable. See options • Digital CS sensors for dew point and flow with SDI interface FA/VA series, digital third-party sensors RS 485 / Modbus RTU. • Analogue CS Sensors for pressure, temperature, clamp-on ammeters preconfigured • Analogue third-party sensors 0/4...20 mA, 0...1/10/30V, pulse, Pt 100 / Pt 1000, KTY, counter
Voltage supply for sensor:	• 24 VDC, max. 130 mA per sensor, integrated mains unit, max. 24 VDC, 25 W • In case of version 8/12 sensor inputs 2 integrated mains unit, each max. 24 VDC, 25 W
Interfaces:	USB stick, Ethernet / RS 485 Modbus RTU / TCP, SDI other bus systems on request, webserver optionally, GSM module
Memory card:	Memory size 4 GB SD Memory card
Voltage supply:	100...240 VAC / 50-60 Hz
Color display:	7“ touch panel TFT transmissive graphics, curves statistics
Accuracy:	Please see sensor specifications
Operating temperature:	0...50°C
Storage temperature:	-20...70°C

Description	Order No.
Intelligent chart recorder DS 500 mobile, 4 sensor inputs	0500 5012
Intelligent chart recorder DS 500 mobile, 8 sensor inputs	0500 5013
Intelligent chart recorder DS 500 mobile, 12 sensor inputs	0500 5014
Option „integrated webserver“	Z500 5003
Option „energy and flow report“ statistics, daily/weekly/monthly report	Z500 5004
Option „mathematics calculation function“ for 4 freely selectable „virtual“ channels, (mathematical functions: addition, subtraction, division, multiplication)	Z500 5008
Option „Totalizer function for analogue signals“	Z500 5009
CS Soft Basic - data evaluation in graphic and table form, reading out of the measured data via USB or Ethernet	0554 7040
CS Soft Energy Analyzer for energy and leakage analysis of compressed air stations	0554 7050
Software Upgrade of the already existing CS Soft Basic to CS Soft Energy Analyzer	0554 7045
GSM module for data transfer via the GSM network (mobile network)	on request
Connection cable on mobile instruments, ODU / open ends, 5 m	0553 0501
Connection cable on mobile instruments, ODU / open ends, 10 m	0553 0502
Connection cable for VA/FA series on mobile instruments, ODU/M12, 5m	0553 1503
Extension cable for mobile instruments ODU/ODU, 10m	0553 0504
Connection cable for mobile current/effective power meter	0553 0506
Case of all sensors (dimensions: 500 x 360 x 120 x mm)	0554 6006

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

Intelligent mobile chart recorder DS 500 mobile energy analysis to DIN EN ISO 50001

If we talk about operational costs of compressed air plants we are actually talking about the energy cost 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 the case of well operated and maintained plants.

Does this also apply to your compressed air plant? Which actual costs per generated m³ air do you actually have? Which energy is grind due to the waste heat recovery? What is the total performance balance of your plant? How high are the differential pressures of single filters, how high is the humidity (pressure dew point), how much compressed air is used?...

By means of the new intelligent chart recorder **DS 500 mobile** and the suitable sensors and meters all these questions can be answered easily. For example by means of a long-term measurement over 7 days, data recording and evaluation at the PC.

Touch screen

12 sensor inputs

Including voltage supply for all sensors

USB stick

External GSM module

Ethernet connection

Flow sensors
for compressed air and gases

- Installation and removal under pressure via standard 1/2” ball valve
- A safety ring avoids the uncontrolled ejection in case of installation/removal under pressure
- Usable for different gases: compressed air, nitrogen, argon, CO2, oxygen

Dew point sensors

- Extremely long-term stable
- Quick adaption time
- Large measuring range (-80° to +20° Ctd)
- For all driers: Desiccant driers, membrane driers, refrigeration driers
- Easy installation under pressure via the standard measuring chamber with quick coupling

Pressure sensors

- Large selection of pressure sensors with different measuring ranges for each measuring purpose
- Quick installation under pressure by quick coupling
- Pressure sensors 0-10/16/40/100/250/400/600 bar overpressure
- Pressure sensors -1 - +15 bar (under-/overpressure)
- Differential pressure 1.5 mbar up to 4.2 bar
- Absolute pressure 0-1.6 bar (abs:)

Temperature sensors

- Large selection of temperature sensors e.g. for measurement of the ambient temperature or gas temperature
- Pt100 (2-wire or 3-wire)
- Pt1000 (2-wire or 3-wire)
- KTY sensors
- Temperature sensors with measuring transducer (4-20 mA output)

Heat meters-/ water and gas meters

- For direct measurement of the heat volume (in kWh)
- Customary heat meters e.g. at heating systems, heat exchangers, district heating networks and so on can be connected to DS 500 mobile either via pulse signals or 4 -20 mA

Clamp-on ammeters

- For the analysis of compressors (load and unload times, energy consumption, switch-on / switch-off cycles) the current input of up to 12 compressors is recorded via clamp-on ammeters
- Measuring ranges of the clamp-on ammeters:

0 - 400 A

0 - 1000 A

Current/effective power meters

- Mobile current/effective power meters with 32 A CEE socket and plug for small machines and plants
- Easily to join up into the current circuit by means of an extension cable with 32 A CEE plug
- Measures kW, kWh, cos phi, kVar, kVA
- Data transfer to DS 500 mobile via Modbus

Current/effective power meters

- Mobile current/effective power meters with external current transformer for big machines and plants
- External current transformers for clamping around the phases (100 A or 600 A)
- External magnetic measuring tips for measuring the voltage
- Measures KW, kWh, cos phi, kVar, kVA
- Data transfer DS 500 mobile via Modbus

By means of the mobile chart recorder **DS 500 mobile**, all measuring data of a compressor station can be recorded, indicated and evaluated.

At **12 freely assignable sensor inputs** all our sensors can be connected as well as any optional third-party sensors and meters **with the following signal outputs:**

4-20 mA, 0-20 mA I 0-1 V / 0-10 V / 0-30 V I Pt 100 (2- or 3-wire), Pt 1000 (2- or 3-wire), KTY I pulse outputs (e.g. of gas meters) frequency output I Modbus protocol.

DS 400 mobile

Affordable, mobile chart recorder

Energy analysis - flow measurement - leakage calculation at compressed air systems

- **Flow**
- **Pressure / Vacuum**
- **Temperature**
- **Moisture / Dew point**
- **Optional third-party sensors**

Internal rechargeable Li-Ion batteries, approx. 8 h continuos operation

Easy & intuitional in its operation

Saves time & costs on installation

Your advantages at a glance

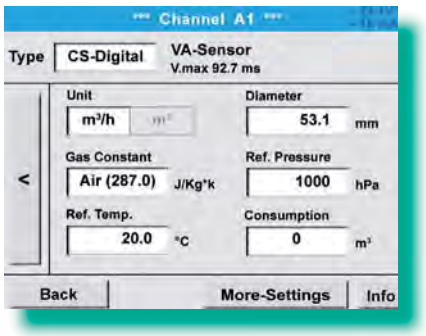
Easy and clear layout:
Very easy operation via 3.5“ color display with touch panel

Versatile:
Up to 4 sensors/meters connectable also third-party sensors/meters including power supply

Reliable:
Stores all measured values on a memory card, easy reading out via USB stick possible

Intelligent energy analysis:
Daily/weekly/monthly evaluations mathematic function for internal calculations, e.g. the typical key data of a compressed air plant:
- costs in € per generated m³ air
- kWh/m³ generated air
- flow of single lines including summation

Easy operation via touch screen

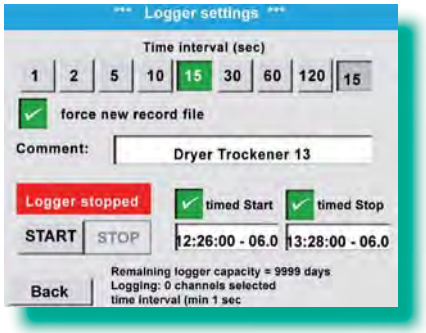


Configuration of flow sensor

The flow sensor VA 500 can be adjusted to the respective inner diameter of the pipe in the menu of DS 400 mobile.
Furthermore, the unit, the gas type as well as the reference conditions can be entered. The counter can be set to „zero“ of 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).

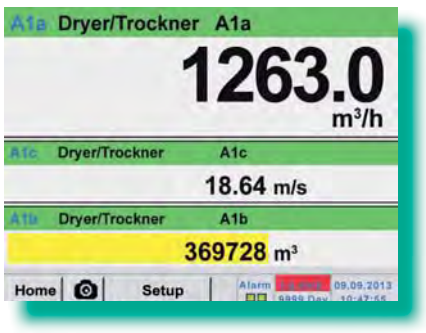


Data logger

Measured values are stored in DS 400 mobile 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. Reading-out 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 mobile shows further parameters like the total flow in m³ and the velocity in m/s

Technical data DS 400 mobile

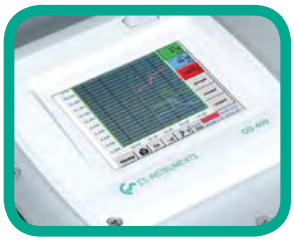
Dimensions:	270 x 225 x 156 mm (W x H x D)
Weight:	2.2 kg
Inputs:	2 x 2 sensor inputs for digital or analogue sensor signals
Interface:	USB (standard), Ethernet (optional)
Power supply:	Internal rechargeable Li-Ion batteries, approx 8 h continuos operation, 4 h charging time
Data logger:	100 million measuring values start/stop time, measuring rate freely adjustable
Options	
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, Pt100, Pt1000

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

Affordable, mobile chart recorder DS 400 mobile

USB stick

Graphic display with touch screen



Up to 4 sensor inputs, including voltage supply for all sensors

Description			Order No.
DS 400 - Mobile chart recorder with graphic display touch screen and integrated data logger	**2 sensor inputs board 1**	**2 sensor inputs board 2**	
	Digital (Z500 4003)	--------	0500 4012 D
	Digital (Z500 4003)	Digital (Z500 4003)	0500 4012 DD
	Digital (Z500 4003)	Analogue (Z500 4001)	0500 4012 DA
	Analogue (Z500 4001)	--------	0500 4012 A
	Analogue (Z500 4001)	Analogue (Z500 4001)	0500 4012 AA
Options			
Option: Integrated Ethernet			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
Further accessories			
CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB or Ethernet			0554 7040
CS Soft Energy Analyzer for energy and leakage analysis of compressed air stations			0554 7050
Connection cable on mobile instruments, ODU / open ends, 5 m			0553 0501
Connection cable on mobile instruments, ODU / open ends, 10 m			0553 0502
Connection cable for VA/FA series on mobile instruments, ODU/M12, 5m			0553 1503
Extension cable for mobile instruments ODU/ODU, 10m			0553 0504
Connection cable for mobile current/effective power meter			0553 0506
Case of all sensors (dimensions: 500 x 360 x 120 x mm)			0554 6006

Digital	Digital	Digital	Digital
m³/h, m³	°Ctd	A, kW/h	optional
			MOD-BUS
Flow sensor	Dew point sensor	Current meters	Third-party sensors with RS 485

Analogue	Analogue	Analogue	Analogue
bar	A	°C	°C
			4...20 mA 0...20 mA 0...10 V Pulse Pt 100 Pt 1000
Pressure sensor	Clamp-on ammeter	Tem-perature sensor	Third-party sensors analogue output

Digital | Digital | Analogue | Analogue

Flow sensors
for compressed air and gases

- Installation and removal under pressure via standard 1/2” ball valve
- A safety ring avoids the uncontrolled ejection in case of installation/removal under pressure
- Usable for different gases: compressed air, nitrogen, argon, CO2, oxygen

Dew point sensors

- Extremely long-term stable
- Quick adaption time
- Large measuring range (-80° to +20° Ctd)
- For all driers: Desiccant driers, membrane driers, refrigeration driers
- Easy installation under pressure via the standard measuring chamber with quick coupling

Pressure sensors

- Large selection of pressure sensors with different measuring ranges for each measuring purpose
- Quick installation under pressure by quick coupling
- Pressure sensors 0-10/16/40/100/250/400/600 bar overpressure
- Pressure sensors -1 - +15 bar (under-/overpressure)
- Differential pressure 1.5 mbar up to 4.2 bar
- Absolute pressure 0-1.6 bar (abs:)

Temperature sensors

- Large selection of temperature sensors e.g. for measurement of the ambient temperature or gas temperature
- Pt100 (2-wire or 3-wire)
- Pt1000 (2-wire or 3-wire)
- KTY sensors
- Temperature sensors with measuring transducer (4-20 mA output)

Heat meters-/ water and gas meters

- For direct measurement of the heat volume (in kWh)
- Customary heat meters e.g. at heating systems, heat exchangers, district heating networks and so on can be connected to DS 400 mobile either via pulse signals or 4 -20 mA

Clamp-on ammeters

- For the analysis of compressors (load and unload times, energy consumption, switch-on / switch-off cycles) the current input of up to 12 compressors is recorded via clamp-on ammeters
- Measuring ranges of the clamp-on ammeters:

0 - 400 A

0 - 1000 A

Current/effective power meters

- Mobile current/effective power meters with 32 A CEE socket and plug for small machines and plants
- Easily to join up into the current circuit by means of an extension cable with 32 A CEE plug
- Measures kW, kWh, cos phi, kVar, kVA
- Data transfer to DS 400 mobile via Modbus

Current/effective power meters

- Mobile current/effective power meters with external current transformer for big machines and plants
- External current transformers for clamping around the phases (100 A or 600 A)
- External magnetic measuring tips for measuring the voltage
- Measures KW, kWh, cos phi, kVar, kVA
- Data transfer DS 400 mobile via Modbus

Analogue | Analogue | Digital | Digital

By means of the chart recorder **DS 400 mobile**, all measuring data of a compressor station can be recorded, indicated, and evaluated.

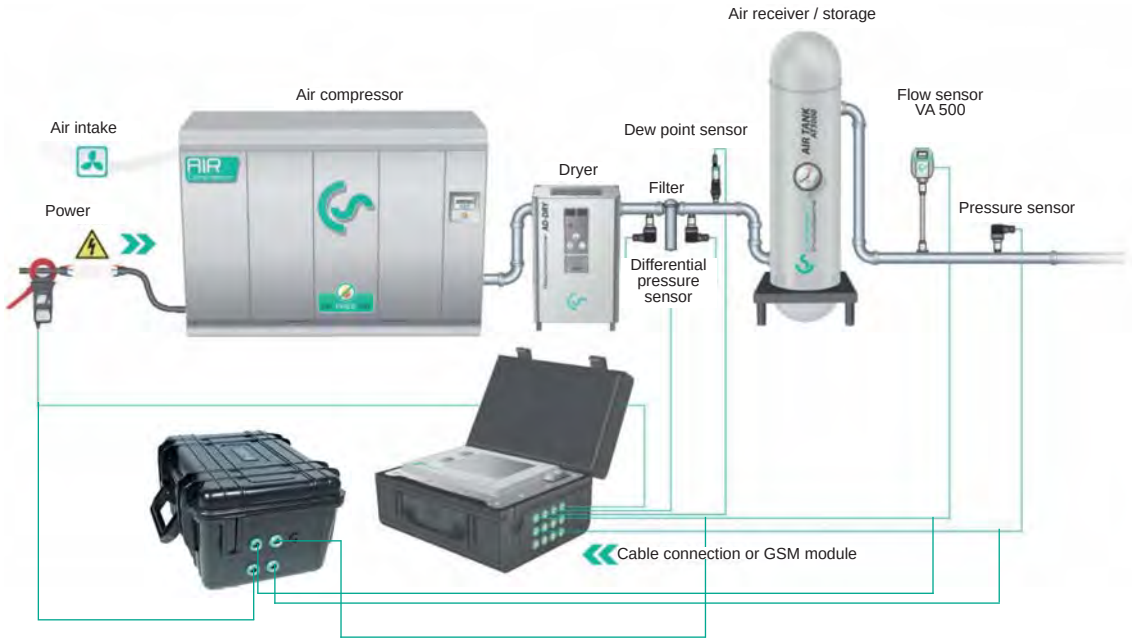
At **digital sensor inputs** all sensors from us like flow sensor, dew point sensor, current/effective power meters and third-party sensors with Modbus RS 485 could be connected.

At **analogue sensor inputs** third party sensors and meters with the following signal output could be connected: 4-20 mA, 0-20 mA | 0-1 V / 0-10 V / 0-30 V | Pt 100 (2- or 3-wire), Pt 1000 (2- or 3-wire), KTY | pulse outputs (e.g. of gas meters) | frequency output | Modbus protocol.

Chart recorder

Step 1:
The measurement

It is a special advantage that up to 12 compressors can be measured with one **DS 500 mobile** at the same time.



Step 2:

1. Compressor analysis (current / power measurement)

The energy consumption of every single compressor is measured by means of a clamp-on ammeter.

The produced compressed air quantity is calculated by the software on the basis of the performance data of the compressor which have to be calculated. The following parameters are calculated additionally.

Energy consumption in kWh, load-, unload-, stop time, compressor load in %, number of load/ unload cycles.

2. System analysis (current measurement and real flow measurement)

The system analysis has the same function like the compressor analysis, however, it additionally offers the possibility to measure the actually produced resp. used quantity of compressed air by means of the flow sensor VA 500.

With the additional „real flow measurement“ the leakages and therefore the cost share of the leakages in comparison to the total costs in € can be determined.

3. Leakage calculation

The leakage calculation is done during the production free time (shutdown, weekend, holidays).

The flow sensor VA 500 measures the supplied quantity of air. During the down time the compressor delivers compressed air in order to keep a constant pressure.

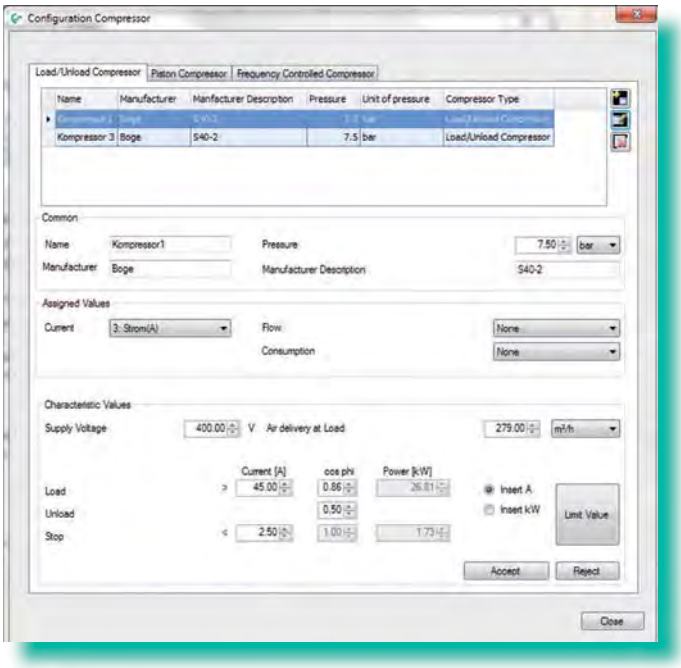
According to statistics even if production is carried out day and night there is at least one short period of time during which all load is switched off. By means of this data the software defines a leakage rate and calculates the incurred leakage costs in €.

Step 3:
Evaluation at the PC with graphics and statistics

3.1 Entry of necessary parameters

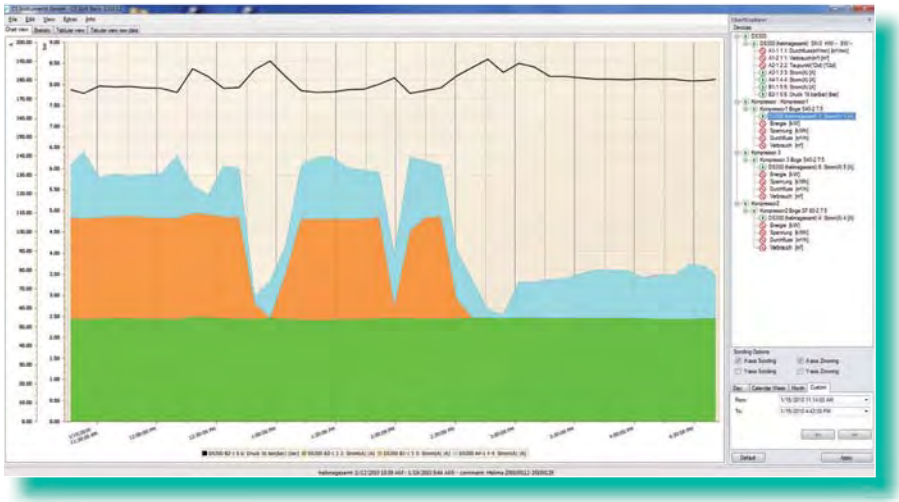
Specific data have to be entered before the analysis is carried out:

- Selection of compressor type (load/idle resp. variable speed drive controlled)
- as well as entry of the performance data according to data sheet
- Period of measurement
- Costs in € for 1 kWh



3.2 Graphic evaluation with day view and week view

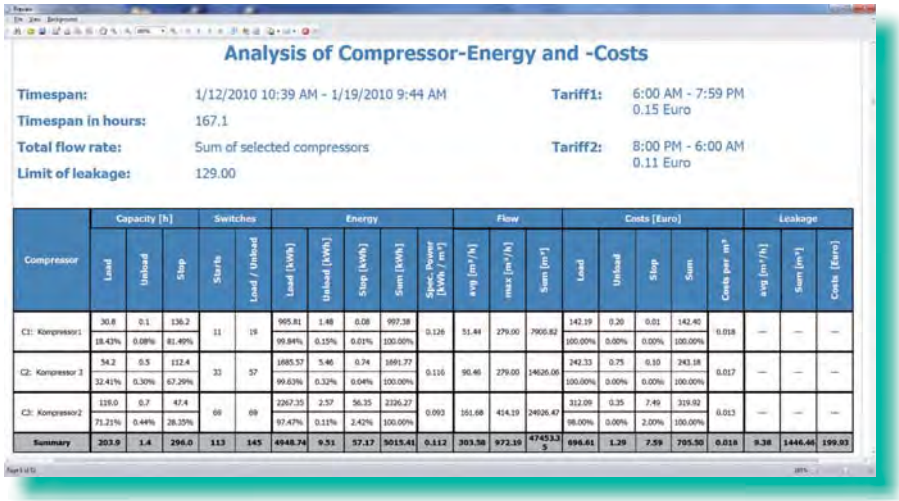
Everything at a glance: The user gets a day and a week view of all stored measured data with his company logo (can be easily integrated) at the touch of a button. By means of the zoom and the cross lines function peak values can be determined.



3.3 Compressed air costs in €/ US$

At the touch of a button the user gets all important data like e.g.

- Energy costs
- Compressed air costs
- Leakage costs in €/ US$
- Compressor data with load / unload time
- Specific energy kWh/m³
- Costs for 1 m³ in €/ US$



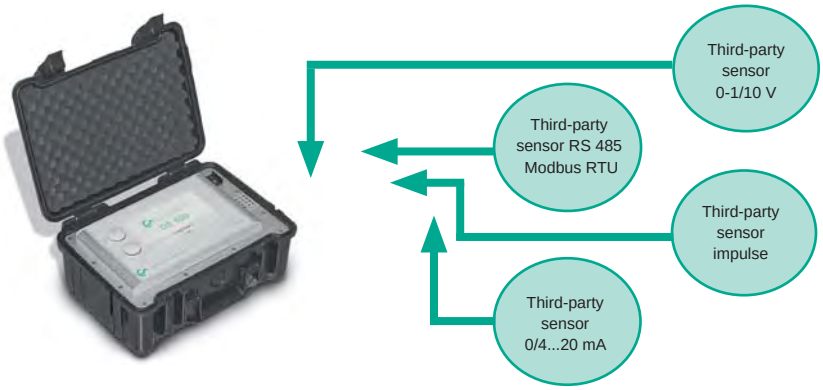
Suitable sensors for **DS 500 mobile & DS 400 mobile**

Flow sensors VA 500:	**Order No.**
Flow sensor VA 500-Max. Version (185 m/s) sensor length 220 mm, incl. 5 m cable to mobile instruments	0695 1124
Flow sensor VA 500 High-Speed Version (224 m/s), sensor length 220 mm, 5 m cable to mobile instruments	0695 1125
Options for VA 500: (see page 81)	
Flow measuring range VA 520 for compressed air:(ISO 1217: 1000 mbar, 20°C)	
Flow meter VA 520, 0,8... 90 l/min, (R 1/4“ DN 8)	0695 0520
Flow meter VA 520, 0,2... 90 m³/h, (R 1/2“ DN 15)	0695 0521
Flow meter VA 520, 0,3... 170 m³/h, (R 3/4“ DN 20)	0695 0522
Flow meter VA 520, 0,5... 290 m³/h, (R 1“ DN 25)	0695 0523
Flow meter VA 520, 0,7... 480 m³/h, (R 1 1/4“ DN 32)	0695 0526
Flow meter VA 520, 1,0... 550 m³/h, (R 1 1/2“ DN 40)	0695 0524
Flow meter VA 520, 2,0... 900 m³/h, (R 2“ DN 50)	0695 0525
Dew point sensors:	
FA 510 dew point sensor for mobile instruments, -80…+20°Ctd, incl. mobile measuring chamber, 5 m cable and perforated cap	0699 1510
FA 510 dew point sensor for mobile instruments, -20...50°Ctd incl. mobile measuring chamber, 5 m cable and perforated cap	0699 1512
Connection cable for VA/FA sensors:	
Connection cable for VA/FA series on mobile instruments, ODU / M12, 5m	0553 1503
Extension cable, 10 m	0553 0504
Calibration certificates for flow / dew point sensors:	
5 point precision calibration for flow sensors including ISO certificate	3200 0001
Precision calibration at -40°Ctd including ISO certificate	0699 3396

Pressure sensors:	**± 1 % accuracy of full scale**	**± 0,5 % accuracy of full scale**
Standard pressure sensor CS 16 from 0…16 bar	0694 1886	0694 3555
Standard pressure sensor CS 40 from 0…40 bar	0694 0356	0694 3930
Standard pressure sensor CS 1.6 from 0...1.6 bar abs.		0694 3550
Standard pressure sensor CS 10 from 0...10 bar	0694 3556	0694 3554
Standard pressure sensor CS 100 from 0…100 bar		0694 3557
Standard pressure sensor CS 250 from 0…250 bar		0694 3558
Standard pressure sensor CS 400 from 0…400 bar		0694 3559
Precision pressure sensor CS -1...+15 bar, ± 0.5 % accuracy of full scale		0694 3553
Precision differential pressure sensor CS 400, 0...400 mbar differential pressure, 0.075% accuracy of full scale, static pressure max. 40 bar	0694 3560	
Pressure calibration certificate, 5 calibration points within the measuring range	3200 0004	

Suitable sensors for **DS 500 mobile & DS 400 mobile**

Temperature sensors:	**Order No.**
Bendable temperature probe PT 100 (2-wire) class A, length: 300 mm, d=3 mm, -70°C to +500°C, connection cable PFA, 2 m with ODU-plug (8 pole) to mobile instruments	0604 0200
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
Cross-band surface temperature probe, thermocouple Type K, with integrated transducer 4…20 mA = 0°C…+180°C, 2 m connection calbe (PVC) with ODU-plug (8-pole) to mobile instruments	0604 0202
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
Temperature calibration certificate 2 measuring points	0520 0180
Connection cables for pressure sensors / temperature sensors:	
Connection cable for pressure, temperature or external sensors on mobile instruments, ODU / open ends, 5 m	0553 0501
Connection cable for pressure, temperature or external sensors on mobile instruments, ODU / open ends, 10 m	0553 0502
Extension cable, 10 m	0553 0504
Mounted Odu plug for connection on mobile instruments	Z604 0104
Clamp-on ammeters:	
Clamp-on ammeter 0...400 A TRMS incl. 5 m connection cable	0554 0511
Clamp-on ammeter 0...1000 A TRMS incl. 5 m connection cable	0554 0519
Calibration certificate for clamp-on ammeter	0554 3333
CS PM 600 Current/effective power meter up to 100 A	0554 5341
CS PM 600 Current/effective power meter up to 600 A	0554 5342
- Mobile current/effective power meter with 3 external current transducers for big machines and plants, - External current transformers for clamping on cables (100 or 600 A), - External magnetic measuring tips for measuring the voltage, -Measures kW, kWh, cos phi, kVar, KVA, - Data transfer for DS 500 mobile / DS 400 mobile via Modbus, incl. connection cable for mobile current/effective power meter to mobile instruments, 5 m	
Current transformer 100A/1A consisting of 3 transformers for mobile instruments	Z554 0001
Current transformer 600A/1A consisting of 3 transformers for mobile instruments	Z554 0002
Current transformer 1000A/1A consisting of 3 transformers for mobile instruments	Z554 0003
Optional third-party sensors connectable:	
e.g. heat meters, current meters, gas meters, water meters and so on. To the 12 freely assignable sensor inputs all our sensors can be connected as well as optional third-party sensors and counters with the following signal outputs: 4-20 mA, 0-20 mA I 0-1 V / 0-10 V / 0-30 V I Pt100 (2- or 3-wire), Pt 1000 (2- or 3-wire), KTY I pulse outputs (e.g. of gas counters) I Frequency output I Modbus protocol	



CS PM 600

Mobile current/effective power meter suitable for DS 500 mobile / DS 400 mobile

Measures voltage, current and calculates:

Active power	[kW]
Apparent power	[kVA]
Reactive power	[kVar]
Active energy	[kWh]
cos phi	

All measured data are transferred digitally (Modbus) to **DS 500 mobile/ DS 400 mobile** and can be recorded there.

Example: Measurement at a compressor

Hinged current transformers

Magnetic voltage measuring tips electrically isolated

Special features:

- Magnetic voltage measuring tips for measuring the voltage during operation
- Hinged current transformers encompass the conductors of the phases L1, L2, L3. This can also be done during operation

Technical data:

Parameters:	Voltage (Volt) Current (Ampere) Cos phi Active power (kW) Apparent power (kVA) Reactive power (kVar) Active energy (kWh) Supply frequency (Hz) All parameters are transferred digital to DS 500 mobile / DS 400 mobile
Accuracy current measurement:	Threshold values for current deviation. Loss angle according to IEC 60044-1. Current deviation in % at rated current in 120 % 1 100 % 1 20 % 1,5 5 % 3
Accuracy active energy:	IEC 62053-21 Class 1
Sensor connections:	3 x current transformers (L1,L2,L3,N) 4 x voltage measurement (L1,L2,L3,N)
Interfaces:	RS 485 (Modbus protocol)
Measuring range:	Voltage measurement max. 400 Volt Current measurement max. 100 A resp. 600 A
Size current transformer:	100 A / 1 A (max.24 mm conductor) 600 A / 1 A (max. 36 mm conductor)
Dimensions case:	270 x 225 x 156 mm (W x H x D)
Operating temperature:	- 10...+40°C

Description	Order No.
CS PM 600 current/effective power meter up to 100 A	**0554 5341**
CS PM 600 current/effective power meter up to 600 A	**0554 5342**
• Mobile current effective power meter with 3 external current transformers for big machines and plants • External current transformers for clamping around the phases (100 A or 600 A) • External magnetic measuring tip for measuring the voltage • measures kW, kWh, cos, phi, kVar, kVA • Data transfer to DS 500 mobile / DS 400 mobile via Modbus • Incl. connection cable for mobile current/effective power meter to mobile instruments, 5 m	
Current transformer 100A/1A consisting of 3 transformers for mobile instruments	Z554 0001
Current transformer 600A/1A consisting of 3 transformers for mobile instruments	Z554 0002
Current transformer 1000A/1A consisting of 3 transformers for mobile instruments	Z554 0003

CS PM 210

Current/ effective power meter for panel mounting

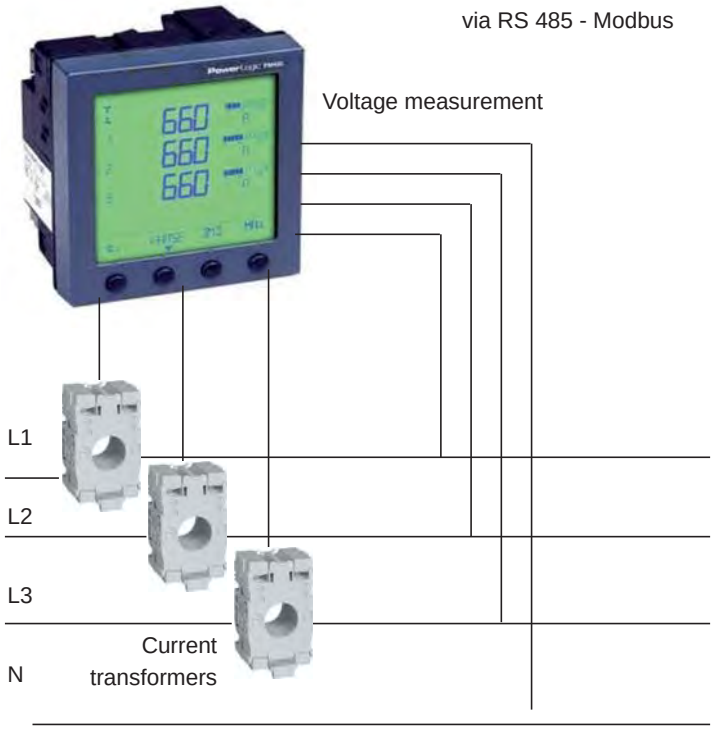
Measures voltage, current and calculates:

Active power	[kW]
Apparent power	[kVA]
Reactive power	[kVar]
Active energy	[kWh]
cos phi	

All measured data are transferred digitally (Modbus) to **DS 500 mobile/ DS 400** mobile and can be recorded there.

Digital data transfer to **DS 500/ DS 400 mobile**

via RS 485 - Modbus



Description	Order No.
CS PM 210 current/effective power meter for panel mounting, current transformer from 100 A to 2000 A connectable	0554 5353
Current transformer 100/5 A connectable to current/effective power meter for panel mounting (for cables up to Ø 21 mm)	0554 5344
Current transformer 200/5 A connectable to current/effective power meter for panel mounting (for cables up to Ø 21 mm)	0554 5345
Current transformer 300/5 A connectable to current/effective power meter for panel mounting (for cables up to Ø 22 mm)	0554 5346
Current transformer 500/5 A connectable to current/effective power meter for panel mounting (for cables up to Ø 22 mm)	0554 5347
Current transformer 600/5 A connectable to current/effective power meter for panel mounting (for cables up to Ø 22 mm)	0554 5348
Current transformer 1000/5 A connectable to current/effective power meter for panel mounting (for current bar up to 65 x 32 mm)	0554 5349
Current transformer 2000/5 A connectable to current/effective power meter for panel mounting (for current bar up to 127 x 38 mm)	0554 5350
Connection cable for pressure, temperature or external sensors on mobile instruments, ODU / open ends, 5 m	0553 0501
Connection cable for pressure, temperature or external sensors on mobile instruments, ODU / open ends, 10 m	0553 0502

Technical data:

Parameters:	Voltage (Volt) Current (Ampere) Cos phi Active power (kW) Apparent power (kVA) Reactive power (kVar) Active energy (kWh) Supply frequency (Hz) All parameters are transferred digitally to DS 500 mobile/ DS 400 mobile
Accuracy current measurement:	± 0,5% of 1 to 6 A
Accuracy voltage:	± 0,5% of 50 V to 277 V
Accuracy active energy:	IEC 62053-21 Class 1
Interfaces:	RS 485 (Modbus protocol)
Measuring range:	Voltage measurement max. 480 Volt
Dimensions:	96 x 96 x 69 mm (W x H x D)
Operating temperature:	-5...+55°C

PI 500

Hand-held instrument for industry

The new PI 500 is an all-purpose hand-held measuring instrument for many applications in industry like e. g.:

- **Flow measurement**
- **Pressure/vacuum measurement**
- **Temperature measurement**
- **Moisture/dew point measurement**

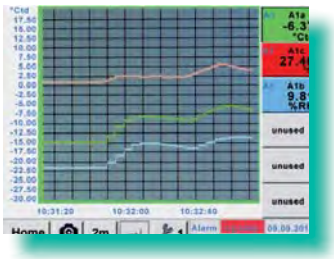
The graphic indication of colored measurement curves is inimitably.

Up to 100 million measured values can be stored with date and name of measuring site. The measured values can be transferred to the computer by means of a USB stick.
The data can be comfortably evaluated with the CS Soft Basic software. Measured data and service reports can be issued easily and quickly. The following sensors can be connected to the freely configurable sensor input of PI 500:

- Pressure sensor (high and low pressure)
- Flow sensors, VA 500/520
- Temperature sensors Pt 100, Pt 1000 / 4...20 mA
- Dew point sensors FA 510
- Effective power meters
- Optional third-party sensors with the following signals: 0...1/10 V, 0/4...20 mA, Pt 100, Pt 1000, pulse, Modbus

Special features:

- **Universal sensor input for lots of common sensor signals**
- **Internal rechargeable Li-Ion batteries (approx. 12h continuous operation)**
- **3.5“ graphic display / easy operation via touch screen**
- **Integrated data logger for storage of the measured values**
- **USB interface for reading out via USB stick**
- **International: Up to 8 languages selectable**



Measurement curves are indicated graphically and thus the user can see at a glance the behavior of the dryer since the start of the measurement.

All physical parameters of moisture measurement are calculated automatically.

It is possible to store up to 100 million measured values. Each measurement can be stored with a comment, e.g. measuring site name. The time interval can be freely determined.

PI 500

Flexible data recording and transfer via USB cable or USB stick

integrated
USB interface

The stored measured data can be easily transferred to the computer via a USB stick or via a USB cable.

The time periods are freely selectable or you just read out the whole memory.

The data can be evaluated by means of the software CS Soft Basic in table and in graphic form.

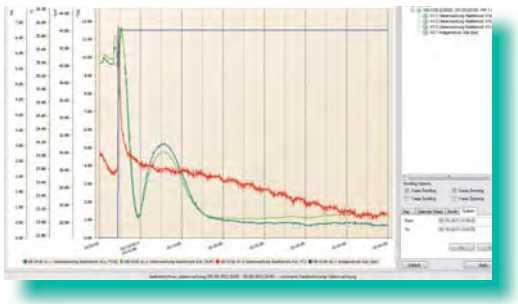
World debut screen shot key

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

By means of the screen shot key the „current screen“ can be stored as an image file and printed out at the computer or edited without any additional software.

Data evaluation in 5 languages by means of CS Soft Basic

Everything at a glance: Table, graph, statistics - at the touch of a button the user gets all necessary information.



Graphic evaluation

All measurement curves are indicated in terms of color. All necessary functions such as zoom, selection/deselection of single measurement curves, freely selectable 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 consolidated to a common file.

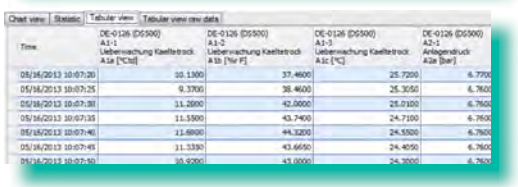


Table view

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

Statistics

All necessary statistic data are visible at a glance.

So the user can quickly see which minimum or maximum measured values occurred at which time and for how long.

PI 500

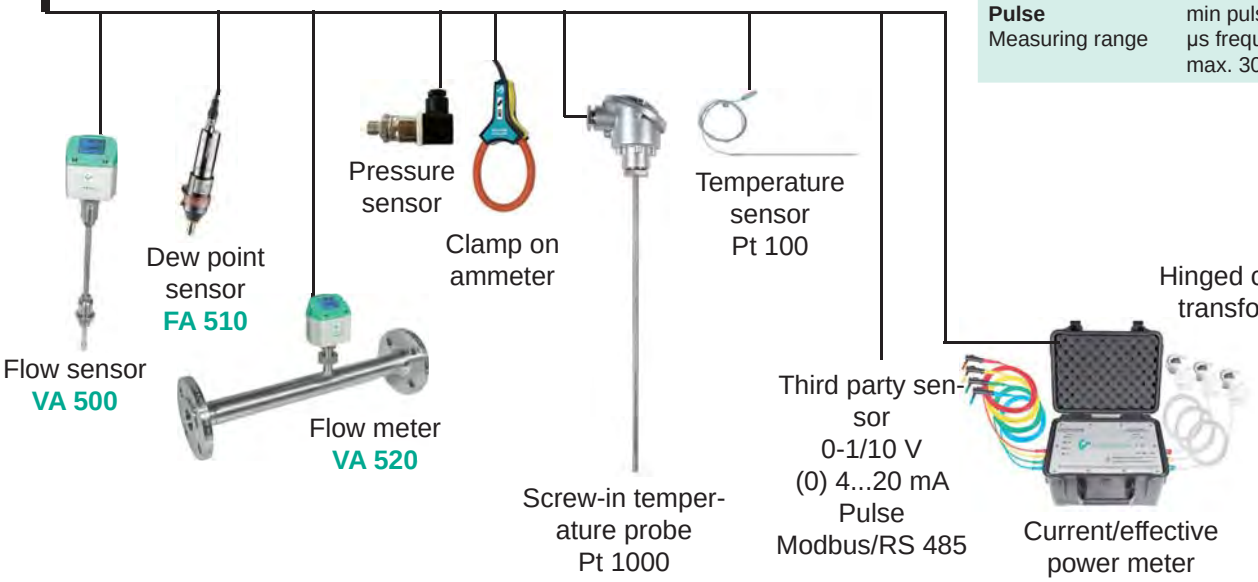
Hand-held instrument with large range of sensors

Description	Order No.
PI500 portable measuring instrument with integrated data logger, incl. power supply	0560 0511
Option for PI 500: “mathematics calculation function” for 4 freely selectable „virtual“ channels	Z500 5107
Option for PI 500: „Totalizer function for analogue signals“	Z500 5106
CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB	0554 7040
Transportation case	0554 6510

Technical data PI 500:

Color screen:	3.5“-Touchpanel TFT transmissive, graphics, curves, statistics
Interfaces:	USB
Power supply for sensors:	Output voltage: 24 VDC ± 10% Output current: 120 mA continuous operation
Current supply:	Internal rechargeable Li-Ion batteries charging time approx. 4 h PI 500 operation: > 4h depending on current consumption of external sensors
Power supply unit:	100 - 240 VAC/50 - 60 Hz, 12 VDC - 1A Safety class 2, only for application in dry rooms
Dimension:	82 x 96 x 245 mm
Material:	Plastic PC/ABS
Weight:	450 g
Operating temperature:	-20...70°C measuring gas temperature 0...50°C ambient temperature
Storage temperature:	-20 to +70°C
EMC:	DIN EN 61326
Sensor inputs:	for connection of pressure sensors, temperature sensors, clamp-on ammeters, third party sensors with 4...20mA, 0-10 V, Pt 100, Pt 1000
Memory size:	4 GB - SD memory card standard

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 **PI 500**

Flow sensors VA 500:	**Order No.**
Flow sensor VA 500 Max. Version (185 m/s) sensor length 220 mm, incl. 5 m cable to mobile instruments	0695 1124
Flow sensor VA 500 High-Speed Version (224 m/s), sensor length 220 mm, 5 m cable to mobile instruments	0695 1125
Options for VA 500: (see page 81)	
Flow measuring range VA 520 for compressed air: (ISO 1217: 1000 mbar, 20°C)	
Flow meter VA 520, 0,8... 90 l/min, (R 1/4“ DN 8)	0695 0520
Flow meter VA 520, 0,2... 90 m³/h, (R 1/2“ DN 15)	0695 0521
Flow meter VA 520, 0,3... 170 m³/h, (R 3/4“ DN 20)	0695 0522
Flow meter VA 520, 0,5... 290 m³/h, (R 1“ DN 25)	0695 0523
Flow meter VA 520, 0,7... 530 m³/h, (R 1 1/4“ DN 32)	0695 0526
Flow meter VA 520, 1,0... 730 m³/h, (R 1 1/2“ DN 40)	0695 0524
Flow meter VA 520, 2,0... 1195 m³/h, (R 2“ DN 50)	0695 0525

Dew point sensors:	
FA 510 dew point sensor for mobile instruments, -80…+20°Ctd, incl. mobile measuring chamber, 5 m cable and perforated cap	0699 1510
FA 510 dew point sensor for mobile instruments, -20…+50°Ctd, incl. mobile measuring chamber, 5 m cable and perforated cap	0699 1512

Connection cable for VA/FA sensors:	
Connection cable for VA/FA series on mobile insruments, ODU / M12, 5m	0553 1503
Extension cable for mobile instruments ODU/ODU, 10m	0553 0504
Calibration certificate for flow / dew point sensors:	
5 point precision calibration with ISO certificate	3200 0001
Precision calibration at -40 °Ctd incl. ISO certificate	0699 3396

Pressure sensors:	**± 1 % accuracy of full scale**	**± 0,5 % accuracy of full scale**
Standard pressure sensor CS 16 from 0…16 bar	0694 1886	0694 3555
Standard pressure sensor CS 40 from 0…40 bar	0694 0356	0694 3930
Standard pressure sensor CS 1.6 from 0...1.6 bar abs.		0694 3550
Standard pressure sensor CS 10 from 0...10 bar	0694 3556	0694 3554
Standard pressure sensor CS 100 from 0…100 bar		0694 3557
Standard pressure sensor CS 250 from 0…250 bar		0694 3558
Standard pressure sensor CS 400 from 0…400 bar		0694 3559
Precision pressure sensor CS -1...+15 bar, ±0.5 % accuracy of full scale		0694 3553
Precision differential pressure sensor CS 400, 0...400 mbar differential pressure, 0.075% accuracy of full scale, static pressure max. 40 bar	0694 3560	
Calibration of pressure sensor 5 points between 0 and 10/16 bar	3200 0004	

Temperature sensors:	
Bendable temperature probe PT 100 (2-wire) class A, length: 300 mm, d=3 mm, -70°C to +500°C, connection cable PFA, 2 m with ODU-plug (8 pole) to mobile instruments	0604 0200
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
Cross-band surface temperature probe, thermocouple Type K, with integrated transducer 4…20 mA = 0°C…+180°C, 2 m connection calbe (PVC) with ODU-plug (8-pole) to mobile instruments	0604 0202
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
Temperature calibration certificate 2 measuring points	0520 0180

Suitable sensors for **PI 500**

Connection cables for pressure sensors / temperature sensors:	Order No.
Connection cable for pressure, temperature or external sensors on mobile instruments, ODU / open ends, 5 m	0553 0501
Connection cable for pressure, temperature or external sensors on mobile instruments, ODU / open ends, 10 m	0553 0502
Extension cable for mobile instruments, ODU / ODU, 10 m	0553 0504
Mounted Odu plug for connection on mobile instruments	Z604 0104
Clamp-on ammeters:	
Clamp-on ammeter 0...400 A TRMS incl. 5 m connection cable	0554 0511
Clamp-on ammeter 0...1000 A TRMS incl. 5 m connection cable	0554 0519
Calibration certificate for clamp-on ammeter	0554 3333
CS PM 600 Current/effective power meter up to 100 A	**0554 5341**
CS PM 600 Current/effective power meter up to 600 A	**0554 5342**
Mobile current/effective power meter with 3 external current transducers for big machines and plants xternal current transformers for clamping on cables (100 or 600 A) External magnetic measuring tips for measuring the voltage Measures kW, kWh, cos phi, kVar, kVA Data transfer to PI 500 via Modbus Incl. connection cable for mobile current/effective power meter to mobile instruments, 5 m	
Current transformer 100A/1A consisting of 3 transformers for mobile instruments	Z554 0001
Current transformer 600A/1A consisting of 3 transformers for mobile instruments	Z554 0002
Current transformer 1000A/1A consisting of 3 transformers for mobile instruments	Z554 0003
Optional third-party sensors connectable:	
e.g. heat meters, current meters, gas meters, water meters and so on. To the freely assignable sensor input all our sensors can be connected as well as optional third-party sensors and counters with the following signal outputs: 4-20 mA, 0-20 mA I 0-1 V / 0-10 V / 0-30 V I Pt100 (2- or 3-wire), Pt 1000 (2- or 3-wire), KTY I pulse outputs (e.g. of gas counters) I Frequency output I Modbus protocol	

Application: **Portable flow measurement** in production in front of machines and plants

Set for dryer monitoring

°Ctd
bar
°C

1 PI 500 portable measuring instrument with integrated data logger, incl. power supply	0560 0511
2 FA 510 dew point sensor for mobile instruments, -80…+20°Ctd incl. mobile measuring chamber, 5 m cable	0699 1510
3 Standard Pressure sensor CS 16 from 0…16 bar, ± 1 % accuracy of full scale	0694 1886
4 Connection cable for pressure, temperature or external sensors to portable instruments, ODU / open ends, 5 m	0553 0501
5 Bendable temperature probe Pt100 Class B, length 300 mm, ø 3 mm, -70…+500°C, 2 m probe connection cable glass fibre/stainless steel with ODU plug 8 pole for portable instruments	0604 0200
6 CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB	0554 7040
7 Transportation case	0554 6510

Set for portable flow measurement

m³/h

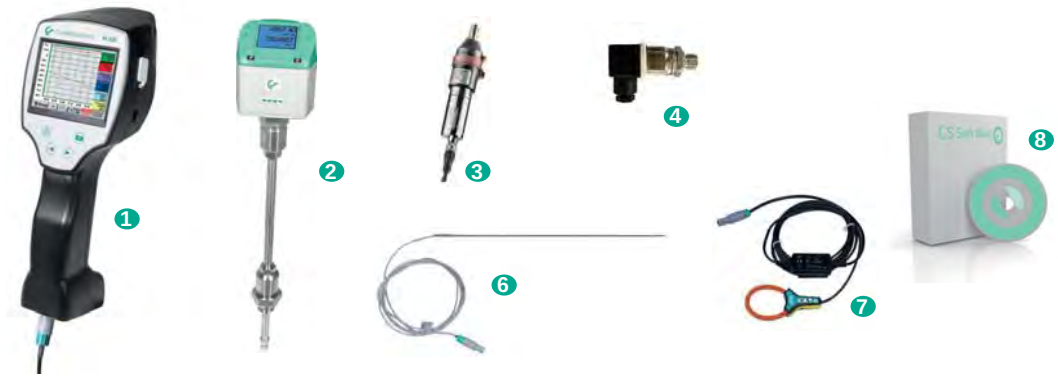
1 PI 500 portable measuring instrument with integrated data logger, incl. power supply	0560 0511
2 Flow meter VA 520, 0,3... 170 m³/h, (R3/4“ DN 20)	0695 0522
3 Connection cable for VA/FA Series on mobile instruments, ODU / M12, 5 m	0553 1503
4 CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB	0554 7040
5 Transportation case	0554 6510

Standard set compressed air

m³/h
°Ctd
bar
°C

1 PI 500 portable measuring instrument with integrated data logger, incl. power supply	0560 0511
2 Flow sensor VA 500 Max. Version (185 m/s) sensor length 220 mm, incl. 5 m cable to portable instruments	0695 1124
3 FA 510 dew point sensor for mobile instruments, -80…+20°Ctd incl. mobile measuring chamber, 5 m cable	0699 1510
4 Standard Pressure sensor CS 16 from 0…16 bar, ± 1 % accuracy of full scale	0694 1886
5 Connection cable for pressure, temperature or external sensors to portable instruments, ODU / open ends, 5 m	0553 0501
6 Bendable temperature probe Pt100 Class B, length 300 mm, ø 3 mm, -70…+500°C, 2 m probe connection cable glass fibre/stainless steel with ODU plug 8 pole for portable instruments	0604 0200
7 CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB	0554 7040
8 Transportation case	0554 6510

Professional set compressed air



m³/h
°Ctd
bar
°C
A

1 PI 500 portable measuring instrument with integrated data logger, incl. power supply	0560 0511
2 Flow sensor VA 500 Max. Version (185 m/s) sensor length 220 mm, incl. 5 m cable to portable instruments	0695 1124
3 FA 510 dew point sensor for mobile instruments, -80…+20°Ctd incl. mobile measuring chamber, 5 m cable	0699 1510
4 Standard Pressure sensor CS 16 from 0…16 bar, ± 1 % accuracy of full scale	0694 1886
5 Connection cable for pressure, temperature or external sensors to portable instruments, ODU / open ends, 5 m	0553 0501
6 Bendable temperature probe Pt100 Class B, length 300 mm, ø 3 mm, -70…+500°C, 2 m probe connection cable glass fibre/stainless steel with ODU plug 8 pole for portable instruments	0604 0200
7 Clamp-on ammeter 0...400 A RMS 10-30 VDC for portable instruments, 3 m cable,ODU 8 pol.	0554 0511
8 CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB	0554 7040
9 Transportation case	0554 6510

Notes:

Energy analysis – flow measurement - leakage calculation

DS 500 mobile – energy analysis according to DIN EN. 16001. 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. For sure this also applies to your compressed air plant! Which actual costs per generated m³ air do you actually have? Which energy is gained due to the waste heat recovery? What is the total performance balance of your plant?

How high are the differential pressures of single filters? How high is the humidity (pressure dew point)? How much compressed air is used?

Although compressed air is one of the most expensive energy resources companies often experience enormous energy losses in this sector.

They are mainly caused by the following factors:

- Disuse of the waste heat
- Leakages of up to 50%
- Missing compressor control systems
- Pressure losses

Lots of plants are not adapted to the actual demand or they are in need of repair. Leak curing programs could save up to about 1.7 million tons of emissions of carbon dioxide per year. (Source: Fraunhofer Institut, Karlsruhe). So there is a considerable amount of possible energy savings slumbering in the compressed air lines of lots of enterprises. In order to open this up the waste heat which occurs during compressed air generation should be used for heating rooms or for hot water generation. Furthermore, it is important to optimize the control of compressed air stations because this will lead to considerable energy savings in any case. Also the restoration of an ailing or no longer suitable compressed air supply will pay off already after a short period of time. Losses due to leakages within the pipe work can cause extreme costs.

This table shows the annual energy costs caused by leakages:

Hole diameter	Air loss at:		Energy loss at:		Costs involved at:	
mm	6 bar (l/s)	12 bar (l/s)	6 bar (kWh)	12 bar (kWh)	6 bar (€)	12 bar (€)
1	1.2	1.8	0.3	1.0	144	480
3	11.1	20.8	3.1	12.7	1,488	6,096
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: Druckluft-Effizient, kW x 0.06 € x 8000 working hours per year)

Energy resources like electricity, water and gas are usually monitored and therefore the costs are transparent. Water consumption, for example, is measured with consumption meters and a water leak is usually found quickly due to the visibility of the leak. Compressed air leaks on the other hand are often not noticed and can „silently“ cause a lot of unnecessary costs, even during production downtime or over the weekend.

It is not unusual to have the compressors 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 %. 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 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 and plants becomes known and transparent for all it is possible to make use of possible savings. When introducing an energy management system according to DIN EN 16001 in the first step all consumers have to be recorded. So the user obtains a survey on the single consumptions. Only this transparency enables a targeted action and a saving of energy.

For compressed air systems this means in the first step to detect leakages and to remove them.

Especially for the complete monitoring and consumption analysis of compressor stations and compressed air lines we developed a portable measuring system, the DS 500 mobile.

DS 500 mobile meets with all requirements for analyzing a compressed air system.

In addition to the evaluation of standard sensors like for example flow, pressure dew point, pressure, differential pressure, absolute pressure and temperature sensors, also the connection of all kinds of third-party sensors like e. g. PT100, PT1000, 0/4..20 mA, 0-1/10 V, pulse, RS 485 Modbus etc. is possible.

One of the main advantages of DS 500 mobile is the possibility to connect not only clamp-on ammeters but also external current meters, water meters or heat meters. So the current costs can be included very accurately in the analysis.

Determination of typical key figures of a compressed air station.

Chart recorder

DS 500 mobile enables an intelligent energy analysis in a quick and easy way. The data will be indicated immediately in the display.

For this purpose just the costs in € per kWh (please consider day and night tariff) have to be entered.

- **By means of a mathematical function typical calculations can be carried out like for example**
- **Costs in € per generated m³ of compressed air**
- **Specific output in kWh/m³**
- **Consumption of single compressed air lines including summation**
- **Indication of Min-Max values, average value**

If the minimum values rise continuously over the years this is a clear signal that the leakage rate increases. This can easily be determined by carrying out the measurements in regular intervals.

Consumption analysis including statistics at the touch of a button

Besides the compressed air also all other energy costs like current, water, vapor etc. can be recorded in this evaluation. This creates transparency.

So all energy and flow meters for compressed air, gas, water, vapor and so on can be recorded and evaluated. The customer gets the costs in €uro. On the big 7“ color display with touch panel all information are visible at a glance. By means of the evaluation software CS Soft Basic all data can be evaluated online at the PC via a USB stick or Ethernet. Additionally to the consumption analysis as daily/weekly or monthly report an alarm can be sent by e-mail or SMS in case of an exceeding of the threshold values. The measured data can be retrieved all over the world via the webserver, GSM module. **How is this done in practice?**

Step 1: Measurement

It is a special advantage that up to 12 compressors can be measured with one DS 500 mobile at the same time.

Step 2: Analysis

2.1) Compressor analysis (current-/power measurement)

The energy consumption of every single compressor is measured by means of a clamp-on ammeter. The produced compressed air quantity is calculated by the software on a basis of the performance data of the compressor which have to be entered.

The following parameters are calculated additionally: Energy consumption in (kWh), load-, unload-, stop time, compressor load in %, number of load/unload cycles, specific energy in kWh/m³, costs for 1 m³ in €.

2.2) System analysis (current measurement and real flow measurement)

The system analysis has the same function like the compressor analysis, however, it additionally offers the possibility to measure the actually produced resp. used quantity of compressed air by means of the flow sensor VA 500.

With the additional „real flow measurement“ the leakages and therefore the cost share of the leakages in comparison to the total costs in € can be determined.

2.3) Leakage calculation

The leakage calculation is done during the production free time (shutdown, weekend, holidays). The flow sensor VA 500 measures the supplied quantity of air. During the down time the compressor delivers compressed air in order to keep a constant pressure.

According to statistics even if production is carried out day and night there is at least one short period of time during which all load is switched off. By means of this data the software defines a leakage rate and calculates the incurred leakage costs in €.

Step 3: Evaluation at the PC with graphics and statistics

3.1) Entry of necessary parameters

Specific data have to be entered before the analysis is carried out:

- **Selection of compressor type (load/idle resp. variable speed drive controlled)**
- **as well as entry of the performance data according to data sheet**
- **Period of measurement**
- **Costs in € for 1 kWh**

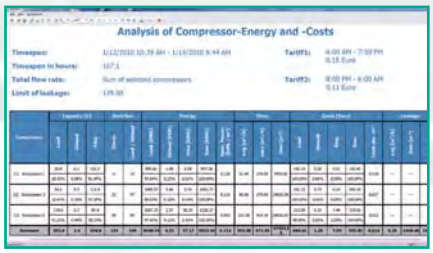
3.2) Graphic evaluation with day view and week view

Everything at a glance: The user gets a day and week view of all stored measured data with his company logo (can be easily integrated) at the touch of a button. By means of the zoom and the cross lines function peak values can be determined.

3.3) Compressed air costs in €

At the touch of a button the user gets all important data like e. g.:

- **Energy costs**
- **Compressed air costs**
- **Leakage costs in €**
- **Compressor data with load/ unload time**
- **Specific energy in kWh/m³**
- **Costs per m³ in €**



4) Measures

Based on these analysis some measures should be carried out in order to optimize the compressed air system. These measures may differ from system to system, however, normally there are the following possibilities:

- Please check whether there are leakages in the compressed air system and localize them. Usually they occur at weld seams and junctions. (50 holes with a diameter smaller than 1 mm may cause costs of 11 000 Euro per year).
- By means of the load/unload analysis and the pressure profile the compressor regulation and adjustment should be optimized. Modern compressor operation systems help to minimize the unload times. (During unload times the compressor takes up about 30 % of the full load energy, however, it does not release any air)
- Please reduce - if possible - the pressure (a pressure reduction of about 100 kPa saves 8 % of the energy).
- Reduce the input temperature (a temperature reduction by about 10 °C can save 3 % of the energy).
- Optimize the pipe system by avoiding unnecessary pressure drops.

DP 500/ DP 510

Portable dew point meters with data logger

The new instruments **DP 500/ DP 510** are the ideal portable service instruments for dew point measurement for all types of driers down to -80°Ctd dew point.

The 3.5“ graphic display with touch screen makes the operation very easy.

The graphic indication of colored measuring curves is unique. Ideal for measurement of the current dew point and for graphic indication of the dew point curve/ the switching behavior of the dryer over a longer period of time.

Up to 100 million measured values can be stored with date and measuring site name. The measured data can be transferred to the computer via USB stick. The data can be evaluated comfortably by means of the software CS Soft Basic.

Measured data and service reports can be issued easily and quickly.

DP 510 additionally disposes of one further freely assignable sensor input.

Apart from the internal dew point measurement one further optional sensor can be connected like for example:

- Pressure sensors
- Flow sensors, VA 500/520
- Temperature sensors Pt 100, 4...20mA
- Further dew point sensors
- Effective power meters
- Optional third-party sensors with the following signals: 0...1/10 V, 0/4...20 mA, Pt 100, Pt 1000, pulse, Modbus

2nd freely assignable sensor input for third-party sensors (only DP 510)

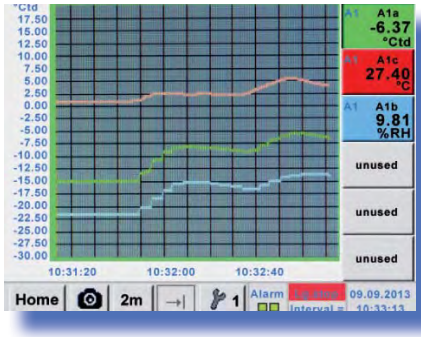
Special features:

- Precise dew point measurement down to -80°Ctd
- Quick response time
- 3.5“ graphic display / easy operation via touch screen
- Integrated data logger for storage of the measured values
- USB interface for reading out via USB stick
- Calculates all necessary moisture parameters like g/m³, mg/m³, ppm V/V, g/kg, °Ctdatm
- 2nd freely assignable sensor input for third-party sensors (only DP 510)
- International: Up to 8 languages selectable

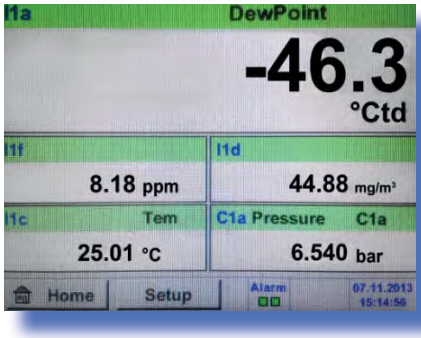
Application ranges:

- Compressed air: Examination of refrigeration, membrane, desiccant driers
- Technical gases: Residual moisture measurement in gases like N2, O2 and so on
- Plastics industry: Examination of granulate driers
- Medical compressed air/breathing air

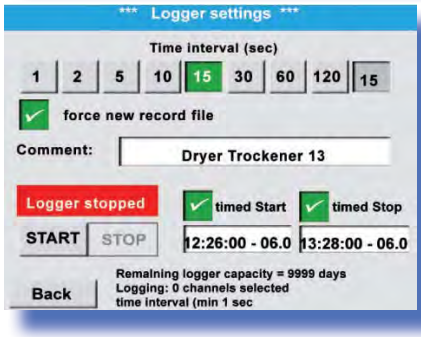
Everything at a glance



Measurement curves are indicated graphically and thus the user can see at a glance the behavior of the dryer since the start of the measurement.



All physical parameters of moisture measurement are calculated automatically.
In case of DP 510 the measured values of the third-party sensor are indicated additionally.



It is possible to store up to 100 million measured values.
Each measurement can be stored with a comment, e.g. measuring site name.
The time interval can be freely determined.

Quick installation by means of measuring chamber and quick connector

Ideal for service technicians - everything in one case

Dry container - for sensor protection and quick adaptation time

Description	Order No.
Set DP 500 in a case - consisting of:	**0600 0500**
- Portable dew point meter DP 500 for compressed air and gases	0560 0500
- Mobile measuring chamber up to 16 bar	0699 4490
- Diffusion-tight PTFE hose with quick connector, length 1 m	0554 0003
- Power supply for DP 500/510	0554 0009
- Control and calibration set 11.3 % RH	0554 0002
- Quick-lock coupling	0530 1101
- Dry container for CS dew point sensors	0699 2500
- Transportation case (small) for DP 500	0554 6500
Further options, not included in the set	
CS Soft Basic - data evaluation in graphic and table form- reading out of the measured data of DP 500/510 via USB	0554 7040
Precision calibration at -40°Ctd or 3°Ctd with ISO certificate	0699 3396
Additional calibration point freely selectable in the range between -80...+20°Ctd	0700 7710
High pressure measuring chamber up to 350 bar	0699 3590
Measuring chamber for atmospheric dew point	0699 3690
Measuring chamber for granulate driers with minimum overpressure	0699 3490
Portable dew point meter DP 500 for compressed air and gases (high pressure version up to 350 bar)	0560 0501

Technical data:

Display:	3.5“ touch screen
Measuring range:	-80...+50°Ctd -20...+70°C 0...100 % rH
Accuracy:	± 0,5°Ctd at -10...+50°Ctd typ. ± 2°Ctd remain. range
Moisture-parameters:	g/m³, mg/m³, ppm V/V, g/kg, °Ctdatm, %RH
Pressure range:	-1...50 bar standard -1...350 bar special version
Interface:	USB interface
Data logger:	2 GB SD memory card (100 million values)
Power supply for sensors:	Output voltage: 24 VDC ± 10 % Output current: 120 mA continuous operation
Power supply:	Internal rechargeable Li-Ion batteries, approx 12 h continuous operation, 4 h charging time
Screw-in thread:	G 1/2“ stainless steel
Surrounding temperature:	0...+50°C
EMV:	DIN EN 61326

DP 500 / DP 510

Flexible data recording and transfer via USB cable or USB stick

The stored measured data can be easily transferred to the computer via a USB stick or via a USB cable.

The time periods are freely selectable or you just read out the whole memory.

The data can be evaluated by means of the software CS Soft Basic in table and in graphic form.

USB-Stick

WORLD DEBUT

Photo key stores current screen as image file

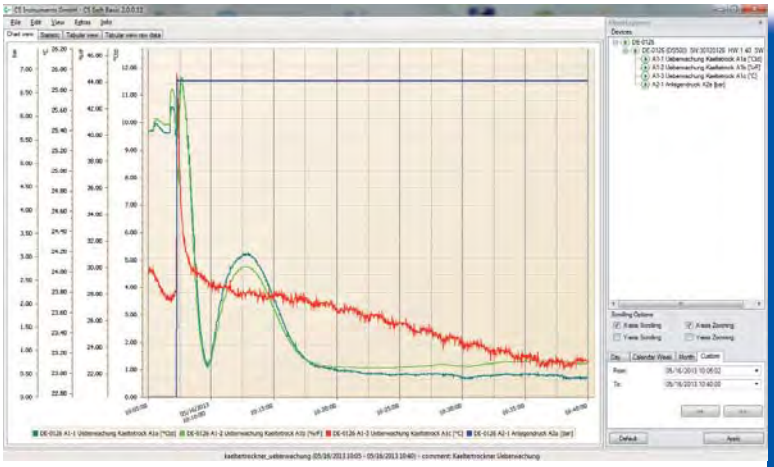
World debut screen-shot key

Ideal for documentation of the measured values/measurement curves on site. Colored measurement curves can be sent by e-mail or integrated into a service report. By means of the screen-shot key the „current screen“ can be stored as an image file and printed out at the computer or edited without any additional software.

In the past mini thermo transfer printers were used frequently. The lifetime of the printout is temporary and it cannot be used in the computer. Therefore the printout was glued onto a paper very often.

Data evaluation in 5 languages by means of CS Soft Basic

Everything at a glance: Table, graph, statistics-
at the touch of a button the user gets all necessary information



Graphic evaluation

All measurement curves are indicated in terms of color. All necessary functions such as zoom, selection/deselection of single measurement curves, freely selectable 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 consolidated to a common file.

Chart view | Statistic | Tabular view | Tabular view raw data

Time	DE-0126 (DS500) A1-1 Ueberwachung Kaeltetrock A1a [°Ctd]	DE-0126 (DS500) A1-2 Ueberwachung Kaeltetrock A1b [%r F]	DE-0126 (DS500) A1-3 Ueberwachung Kaeltetrock A1c [°C]	DE-0126 (DS500) A2-1 Anlagendruck A2a [bar]
05/16/2013 10:07:20	10.1300	37.4600	25.7200	6.7700
05/16/2013 10:07:25	9.3700	38.4600	25.3050	6.7600
05/16/2013 10:07:30	11.2000	42.0000	25.0100	6.7600
05/16/2013 10:07:35	11.5500	43.7400	24.7100	6.7600
05/16/2013 10:07:40	11.6000	44.3200	24.5500	6.7600
05/16/2013 10:07:45	11.3350	43.6650	24.4050	6.7600
05/16/2013 10:07:50	10.9200	43.0000	24.3000	6.7600
05/16/2013 10:07:55	10.6900	42.4250	24.2600	6.7600
05/16/2013 10:08:00	10.1600	41.1200	24.1900	6.7600

Table view

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

Statistic Report

Timespan: 05/16/2013 10:05 - 05/16/2013 10:40

DE-0126

DE-0126 (DS500) *Devicetyp:* 1 *Serialnumber:* 30120126

ID	Value name	Unit	Average	Min	Time of min	Max	Time of max
1	A1-1 Ueberwachung Kaeltetrock A1a	°Ctd	2.432	0.667	05/16/2013 10:30:18	11.604	05/16/2013 10:07:40
2	A1-2 Ueberwachung Kaeltetrock A1b	%rF	25.534	22.428	05/16/2013 10:09:42	44.324	05/16/2013 10:07:42
3	A1-3 Ueberwachung Kaeltetrock A1c	°C	23.553	23.045	05/16/2013 10:38:08	25.924	05/16/2013 10:07:18
4	A2-1 Anlagendruck A2a	bar	6.328	0	05/16/2013 10:05:02	6.768	05/16/2013 10:07:18

Statistics

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

DP 510 Portable dew point meter with data logger and third-party sensor

Performing measuring tasks with one instrument

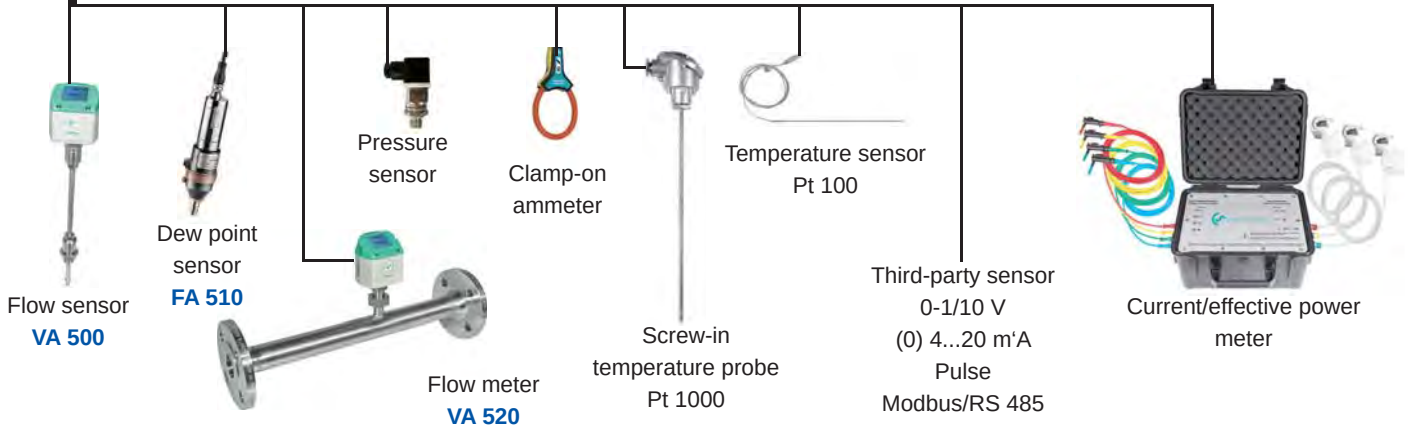
DP 510 disposes of all functions of DP 500 and has an **additional freely assignable sensor input.**

Additionally to the internal dew point measurement one further optional sensor can be connected.

So the user can meet nearly all industrial measuring tasks like for example:

- Separate pressure measurement
- Dew point distance via external temperature sensor
- Compressed air consumption measurement
- Active power in kWh/kW

Description	Order No.
Set DP 510 in a case - consisting of:	**0600 0510**
- Portable dew point meter DP 510 with one additional sensor input	0560 0510
- Mobile measuring chamber up to 16 bar	0699 4490
- Diffusion-tight PTFE hose with quick connector, length 1 m	0554 0003
- Power supply for DP 500/510	0554 0009
- Control and calibration set 11.3 % RH	0554 0002
- Quick-lock coupling	0530 1101
- Dry container for CS dew point sensors	0699 2500
- Transportation case (big) for DP 510 as well as further sensors	0554 6510
Further options, not included in the set	
Option „Mathematics calculation function“ for 4 freely selectable channels, (virtual channels): addition,subtraction, division, multiplication	Z500 5107
Option „Totalizer function for analogue signals“	Z500 5106
CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB stick	0554 7040
Precision calibration at -40°Ctd or 3°Ctd with ISO certificate	0699 3396
Additional calibration point freely selectable in the range between -80...+20°Ctd	0700 7710
High pressure measuring chamber up to 350 bar	0699 3590
Measuring chamber for atmospheric dew point	0699 3690
Measuring chamber for granulate driers with minimum overpressure	0699 3490
Portable dew point meter DP 510 for compressed air and gases (high pressure version up to 350 bar)	0560 0512



Suitable sensors for **DP 510**

Flow sensors VA 500:	**Order No.**
Flow sensor VA 500 Max. Version (185 m/s) sensor length 220 mm, incl. 5 m cable to mobile instruments	0695 1124
Flow sensor VA 500 High-Speed Version (224 m/s), sensor length 220 mm, 5 m cable to mobile instruments	0695 1125
Options for VA 500: (see page 81)	
Flow measuring range VA 520 for compressed air: (ISO 1217: 1000 mbar, 20°C)	
Flow meter VA 520, 0,8... 90 l/min, (R 1/4“ DN 8)	0695 0520
Flow meter VA 520, 0,2... 90 m³/h, (R 1/2“ DN 15)	0695 0521
Flow meter VA 520, 0,3... 170 m³/h, (R 3/4“ DN 20)	0695 0522
Flow meter VA 520, 0,5... 290 m³/h, (R 1“ DN 25)	0695 0523
Flow meter VA 520, 0,7... 480 m³/h, (R 1 1/4“ DN 32)	0695 0526
Flow meter VA 520, 1,0... 550 m³/h, (R 1 1/2“ DN 40)	0695 0524
Flow meter VA 520, 2,0... 900 m³/h, (R 2“ DN 50)	0695 0525
Dew point sensors:	
FA 510 dew point sensor for mobile instruments, -80…+20°Ctd, incl. mobile measuring chamber, 5 m cable and perforated cap	0699 1510
FA 510 dew point sensor for mobile instruments, -20…+50°Ctd, incl. mobile measuring chamber, 5 m cable and perforated cap	0699 1512
Connection cable for VA/FA sensors:	
Connection cable for VA/FA series on mobile instruments, ODU / M12, 5m	0553 1503
Extension cable for mobile instruments ODU/ODU, 10m	0553 0504
Pressure sensors: (further pressure sensors, please see on page 24)	
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:	
Bendable temperature probe PT 100 (2-wire) class A, length: 300 mm, d=3 mm, -70°C to +500°C, connection cable PFA, 2 m with ODU-plug (8 pole) to mobile instruments	0604 0200
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
Cross-band surface temperature probe, thermocouple Type K, with integrated transducer 4…20 mA = 0°C…+180°C, 2 m connection calbe (PVC) with ODU-plug (8-pole) to mobile instruments	0604 0202
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
Temperature calibration certificate 2 measuring points	0520 0180
Connection cables for pressure sensors / temperature sensors:	
Connection cable for pressure, temperature or external sensors on mobile instruments, 5 m	0553 0501
Connection cable for pressure, temperature or external sensors on mobile instruments, 10 m	0553 0502
Mounted Odu plug for connection on mobile instruments	Z604 0104
Clamp-on ammeters:	
Clamp-on ammeter 0...400 A TRMS incl. 5 m connection cable	0554 0511
Clamp-on ammeter 0...1000 A TRMS incl. 5 m connection cable	0554 0519
Calibration certificate for clamp-on ammeter	0554 3333
Current/effective power meter up to 100 A	0554 5341
Current/effective power meter up to 600 A	0554 5342
- Mobile current/effective power meter with 3 external current transducers for big machines and plants, - External current transformers for clamping on cables (100 or 600 A), - External magnetic measuring tips for measuring the voltage, -Measures kW, kWh, cos phi, kVar, KVA, - Data transfer for DP 510 via Modbus, - incl. connection cable for mobile current/effective power meter to DP 510, 5 m	









New

DP 400 mobile with integrated dew point and pressure measurement

For measurement of all humidity parameters under pressure up to 16 bar.

The portable dew point meter with integrated, rechargeable battery has been developed especially for the field use. Besides a highly precise dew point sensor the device also contains a precise pressure sensor up to 16 bar. So in addition to the dew point in °Ctd, the temperature in °C and the line pressure in bar also further moisture parameters (% RH, mg/m³, g/m³) as well as pressure-dependent measuring values (g/kg, ppm v/v, atm. dew point °C) can be calculated.

Sensor protected during transport or storage.

6 mm plug connection for measuring gas / compressed air feed

Option:
2 further sensor inputs (for flow, pressure, dew point, 4...20 mA, Modbus RTU…)

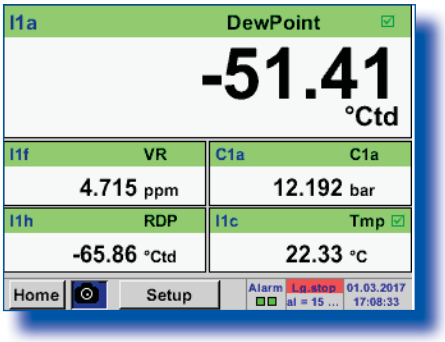
Special features:

- Precise dew point measurement down to -80°Ctd
- Robust case for field use
- Integrated pressure measurement up to 16 bar
- Integrated measuring chamber with integrated dry container protects the dew point sensor during transport and grants a quick adaptation time
- Long-time stable humidity sensor: precise, insensitive against dewing, quick adaptation time
- Optionally available: 2 further sensor inputs for external sensors
- Optionally available: Integrated data logger

Technical data:

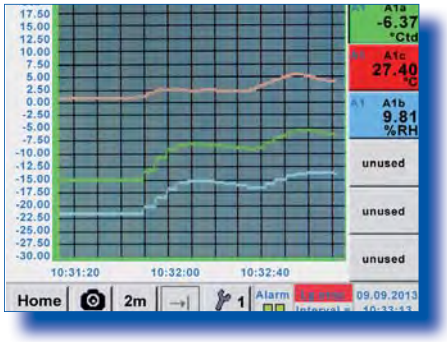
Display:	3.5“ Touch screen
Measuring range:	-80...+50°Ctd -20...+70°C 0...100 % RH 0...16 bar ± 0.5 %
Accuracy:	± 1°C at 20...-20°Ctd ± 2°C at -20...-50°Ctd ± 3°C at -50...-80°Ctd
Humidity parameters:	g/m³, mg/m³, ppm V/V, g/kg, °Ctdatm, % RH
Interface:	USB interface
Option Data logger:	4 GB SD memory card (100 million values)
Voltage supply for external sensors:	Output voltage: 24 VDC ± 10% Output current: 120 mA in long-term use
Current supply:	Internally loadable Li-Ion batteries approx. 12 h continuous operation, 4 h charging time
Connection:	6 mm plug connections
Ambient temperature:	0...+50°C
EMV:	DIN EN 61326

Easy operation via touch screen



Actual measured values

All measured values are visible at a glance.
Exceedance of limit value is indicated in red.
Due to the integrated pressure sensor DP 400 mobile is able to calculate the atmospheric dew point.



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 DP 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.
Read-out of the measured data via USB interface or via the optional Ethernet interface.

Description	Order No.
DP 400 mobile - Portable dew point meter with integrated pressure measurement, incl. transportation bag for teflon hose and power supply	**0500 4505**
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: 2 additional sensor inputs for external sensors (1 x digital sensor Modbus, 1 x analogue sensor)	Z500 4001
CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB stick (Software please see on page 54)	0554 7040
Connection cable for VA/FA series on mobile instruments, ODU / M12, 5m	0553 1503
Connection cable for pressure, temperature or external sensors on mobile instruments, 5 m	0553 0501
Connection cable for pressure, temperature or external sensors on mobile instruments, 10 m	0553 0502
Extension cable for mobile instruments ODU/ODU, 10m	0553 0504

FA 510 / FA 515

New dew point sensors with sophisticated service concept

In addition to the previously common 4...20 mA analogue output the new generation of dew point sensors have a digital RS 485 interface (Modbus-RTU). All values like e. g. dew point, temperature, absolute humidity ... which are measured and calculated by the dew point sensor can be retrieved via the Modbus protocol.

Compared with the previous models the sensor technology and evaluation electronics have been improved once again, especially the integrated temperature compensation. This means: Increased accuracy at different ambient temperatures and an improved resolution of the sensor signal. Like the previous models the new dew point sensors have an excellent long-term stability and show reliable measured values. The sensor element is insensitive against condensation and due to the serial sintered cap made of stainless steel it is protected against direct contact with soiled particles.

The service concept:

One-point-calibration on site

FA 510/515 can be calibrated on site, i. e. during the measuring process, by means of the hand-held instrument DP 510 (reference instrument).

Sensor diagnosis on site

A sensor diagnosis can be carried out on site, i. e. during the measuring process, via the digital RS 485 interface (Modbus-RTU) . The measured data can be read out either by means of the portable instruments DP 510, PI 500, DS 400 mobile, DS 500 mobile or by means of a laptop with CS Service Software. The status of the
residual humidity sensor element is read-out as well as the status of the temperature sensor element and the date of the last calibration.

Changing the sensor settings on site

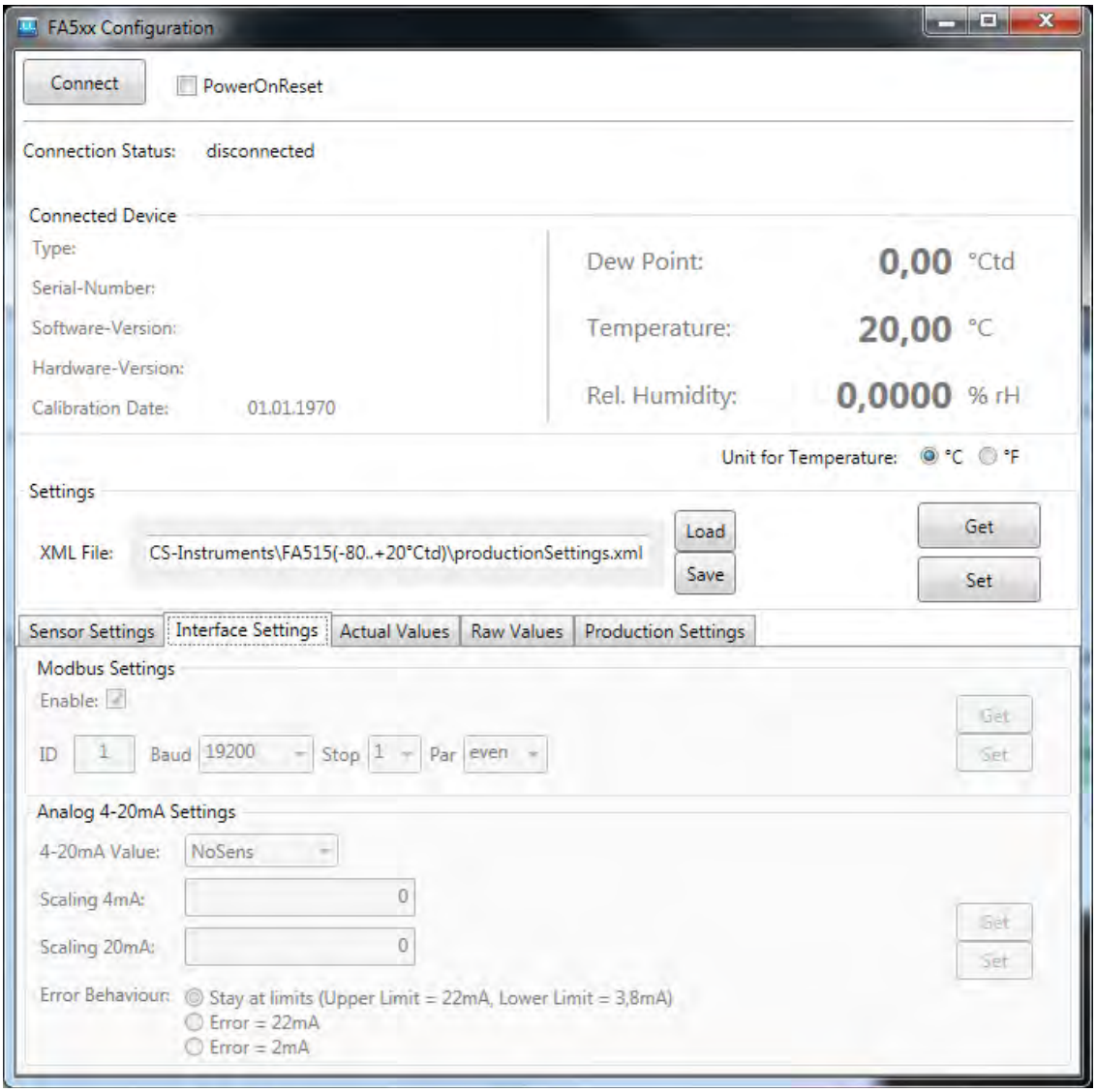
In addition to the sensor diagnosis also the following sensor settings can be done on site by means of a laptop or portable instrument:

- Scaling of the 4...20 mA analogue output
- Allocation of the parameter to the analogue output (e. g. 4...20 mA = 0...10 g/m³)

CS Service Software

The dew point sensors FA 510/ FA 515/ FA 500 can be configured by means of the CS Service Software incl. USB - Modbus interface adapter via the laptop/computer. The following settings can be done by means of the CS Service Software:

- Scaling of the 4...20 mA analogue output
- Allocation of the parameter to the analogue output (z.B. 4...20 mA = 0...10 g/m³)
- Selectable units/parameters: °Ctd, °Ftd, g/m³, mg/m³, ppm$_{v/v}$, g/kg
- Reading out of the firmware version, serial no., date of last calibration
- One-point-calibration (adjustment) of the sensors during the measuring process. For this purpose a reference instrument is required.
- Update of the software inside the sensor (firmware)
- Setting of the Modbus settings like Modbus-ID, baud rate, stop bit, parity



Dew point sensor FA 510/515 from -80 to 20° Ctd

FA 510/515 - the new generation of dew point sensors for residual moisture measurement in compressed air and gases

Typical applications:

- Dew point measurement in the compressed air after desiccant driers/membrane driers
- Residual moisture/ dew point measurement in gases like oxygen, nitrogen, argon ...
- Residual moisture/ dew point measurement after granulate driers in plastics industry

Recommendation:

Mounting with standard measuring chamber for compressed air up to 16 bar
Advantage: Easy installation via quick coupling

Special features:

- Measuring range -80...20°Ctd
- Extremely long-term stable
- Analogue output 4...20 mA
- Condensation insensitive
- Quick response time
- Pressure-tight up to 350 bar (special version)
- **NEW:** Modbus-RTU interface
- **NEW:** Higher resolution of the sensor signal due to improved evaluation electronics
- **NEW:** Sensor diagnosis on site by means of hand-held instrument or CS Service Software

Technical data FA 510/515

Measuring range:	-80...20°Ctd
Accuracy:	± 1°C at 20...-20°Ctd ± 2°C at -20...-50°Ctd ± 3°C at -50...-80°Ctd
Pressure range:	-1...50 bar special version up to 350 bar
Power supply:	24 VDC (16...30 VDC)
Protection class:	IP 65
EMV:	according to DIN EN 61326
Operating temp.:	-20...70 °C
Connection:	M12, 5-pole
PC connection:	Modbus-RTU interface (RS 485)
Analogue output:	4...20 mA = -80...20°Ctd FA 510: 4...20 mA (3-wire) FA 515: 4...20 mA (2-wire)
Burden for analogue output:	< 500 Ω
Screw-in thread:	G 1/2“ optional: UNF 5/8“ NPT 1/2“
Dimensions:	Ø 30 mm, length approx. 130 mm
Via service software:	
Choose units:	% RH, °Ctd, g/m³, mg/m³, ppm V/V
Scaling:	change 4...20 mA

Description	Order No.
FA 510 dew point sensor for desiccant driers -80°...20°Ctd incl. inspection certificate, 4…20 mA output signal (3-wire connection) and Modbus-RTU interface	0699 0510
FA 515 dew point sensor for desiccant driers -80°...20°Ctd incl. inspection certificate, 4…20 mA output signal (2-wire connection) or Modbus-RTU interface	0699 0515
Connection cables:	
Connection cable for VA/FA sensors, 5 m	0553 0104
Connection cable for VA/FA sensors, 10 m	0553 0105
Options for FA 510:	
Option analogue output FA510, Special version 2…10 Volt	Z699 0510
Options for FA 510/515:	
Option max. pressure FA5xx 350 bar	Z699 0515
Option max. pressure FA5xx 500 bar	Z699 0516
Option special scaling FA5xx 4…20 mA=__ … __ g/m³, ppm etc.	Z699 0514
Option connection thread FA5xx, 5/8” UNF	Z699 0511
Option connection thread FA5xx, 1/2“ NPT	Z699 0512
Option surface condition FA5xx, free of oil & grease	Z699 0517
Additional accessories:	
Standard measuring chamber up to 16 bar	0699 3390
High pressure measuring chamber up to 350 bar	0699 3590
Measuring chamber, stainless steel 1.4305	0699 3290
CS Service Software for dew point sensors incl. PC connection set (Modbus to USB Interface)	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
Transformer 100-240 V AC/24 V DC , 0,35 A on top-hat rail	0699 3340
Calibration and adjustment:	
Precision calibration at -40°Ctd or 3° Ctd including ISO certificate	0699 3396
Precision calibration in the range of -80 to 20° Ctd, one additional point, freely selectable	0700 7710

Dew point monitoring DS 52
for desiccant driers

Consisting of:

- Digital process meter DS 52 (0500 0009)

- Standard measuring chamber

- Option alarm unit (buzzer and continuous red light) (Z500 0003)

- Dew point sensor FA 510 (0699 0510)

The measuring range of -80...20°Ctd makes the dew point set DS 52 with alarm the ideal dew point monitor with analogue output 4...20 mA.

The dew point sensor FA 510 is extremely long-term stable and can be installed and removed quickly and easily under pressure by means of the screw able measuring chamber including quick coupling. The dew point set is supplied ready for plug-in, i.e. everything is completely wired. The alarm values can be freely adjusted.

Description	Order No.
Dew point monitoring DS 52 for desiccant driers consisting of:	**0600 5100**
DS 52 LED display in wall housing	0500 0009
FA 510 dew point sensor for desiccant driers -80°...20°Ctd incl. inspection certificate, 4…20 mA output signal (3-wire connection) and Modbus-RTU interface	0699 0510
Standard measuring chamber up to 16 bar	0699 3390
Connection cable for VA/FA sensors, 5 m	0553 0104
Options:	
Power supply 24 VDC (instead of 230 VAC)	Z500 0001
Power supply 110 VAC (instead of 230 VAC)	Z500 0002
Alarm unit mounted at wall housing	Z500 0003
Alarm unit for external mounting with 5 m cable	Z500 0004
Additional accessories:	
Precision calibration at -40°Ctd including ISO certificate	0699 3396
Precision calibration in the range of -80 to 20° Ctd, one additional point, freely selectable	0700 7710

Special features:

- System ready for plug-in: Everything completely wired
- No time-consuming studying of the instruction manual
- 2 alarm contacts (230 VAC, 3 A) pre- and main alarm freely adjustable
- 4...20 mA analogue output
- Option alarm unit: Buzzer and continuous red light

Technical data display DS 52:

Dimensions:	118 x 92 x 93 mm
Display:	LED red, 7 segments, height: 13 mm, 5 digits, 2 LED for alarm relay
Keypad:	4 keys
Input:	4...20 mA
Power supply:	230 VAC, 50/60 Hz; Option: 24 VDC or 110 VAC 50/60 Hz
Alarm outputs:	2 x relay output, changeover contact, 250 VAC, max. 3 A
Operating temperature:	-10...+60 °C (storage temp. -20°C...+80°C)
Alarm thresholds:	freely adjustable
Hysteresis:	2 °Ctd
Analogue output:	4...20 mA = -80...20 °Ctd

Technical data dew point sensor FA 510

Measuring range:	-80...20°Ctd
Accuracy:	± 1°C bei 20...-20°Ctd ± 2°C bei -20...-50°Ctd ± 3°C bei -50...-80°Ctd
Pressure range:	-1...50 bar special version up to 350 bar
Protection class:	IP 65
EMV:	according DIN EN 61326
Operating temp.:	-20...70 °C
Connection:	M12, 5-pole
PC connection:	Modbus-RTU interface (RS 485)
Burden for analogue output:	< 500 Ω
Screw-in thread:	G 1/2“

Dew point sensor FA 510/515 from -20 to 50°Ctd

The dew point sensor FA 510/515 for the typical use in refrigeration driers

The ideal dew point sensor for the monitoring of refrigeration driers with analogue output 4...20 mA

Special features:

- Analogue output 4...20 mA
- Precise, long-term stability
- Quick response time
- Measuring range -20...50°Ctd
- **NEW:** Modbus-RTU interface
- Sensor diagnosis on site by means of hand-held instrument or CS Service Software

Recommendation:

Mounting with standard measuring chamber for compressed air up to 16 bar
Advantage: Easy installation via quick coupling

Description	Order No.
FA 510 dew point sensor for refrigeration driers -20...50°Ctd incl. inspection certificate, 4…20 mA output signal (3-wire connection), and Modbus-RTU interface	0699 0512
FA 515 dew point sensor for refrigeration driers -20...50°Ctd incl. inspection certificate, 4…20 mA output signal (2-wire connection), or Modbus-RTU interface	0699 0517
Connection cables:	
Connection cable for VA/FA sensors, 5 m	0553 0104
Connection cable for VA/FA sensors, 10 m	0553 0105
Options for FA 510:	
Option analogue output FA510, Special version 2…20 Volt	Z699 0510
Options for FA 510/515:	
Option max. pressure FA5xx 350 bar	Z699 0515
Option max. pressure FA5xx 500 bar	Z699 0516
Option special scaling FA5xx 4…20 mA=__ … __ g/m³, ppm etc.	Z699 0514
Option connection thread FA5xx, 5/8“ UNF	Z699 0511
Option connection thread FA5xx, 1/2“ NPT	Z699 0512
Option surface condition FA5xx, free of oil & grease	Z699 0517
Additional accessories:	
Standard measuring chamber up to 16 bar	0699 3390
High pressure measuring chamber up to 350 bar	0699 3590
Measuring chamber, stainless steel 1.4305	0699 3290
CS Service Software for FA/VA sensors incl. PC connection set, USB connection 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
Transformer 100-240 V AC/24 V DC , 0,35 A on top-hat rail	0699 3340
Calibration and adjustment:	
Precision calibration at 3° Ctd including ISO certificate	0699 3396
Precision calibration in the range of -20 to 50° Ctd, one additional point, freely selectable	0700 7710

Technical data FA 510/515

Measuring range:	-20...50°Ctd resp. 0...100% rF
Accuracy:	± 1°C at 0...20°Ctd ± 2°C remaining range
Pressure range:	-1...50 bar special version up to 350 bar
Power supply:	24 VDC (10...30 VDC)
Protection class:	IP 65
EMV:	according to DIN EN 61326
Operating temp.:	-20...70 °C
Connection:	M12, 5-pole
PC connection:	Modbus-RTU interface (RS 485)
Analogue output:	FA 510: 4...20 mA (3-wire) FA 515: 4...20 mA (2-wire)
Burden for analogue output:	< 500 Ω
Screw-in thread:	G 1/2“ optional: UNF 5/8“ NPT 1/2“
Dimensions:	Ø 30 mm, length approx. 130 mm
Via service software:	
Choose units:	% RH, °Ctd, g/m³, mg/m³, ppm V/V
Scaling:	change 4...20 mA

Dew point monitoring DS 52
for refrigeration driers

Consisting of:

- Digital process meter DS 52 (0500 0009)

- Standard measuring chamber

- Option alarm unit (buzzer and continuous red light) (Z500 0003)

- Dew point sensor FA 510 (0699 0512)

The measuring range of -20...50°Ctd makes the dew point set DS 52 with alarm the ideal dew point monitor with analogue output 4...20 mA.

The dew point sensor FA 510 is extremely long-term stable and can be installed and removed quickly and easily under pressure by means of the screw able measuring chamber including quick coupling. The dew point set is supplied ready for plug-in, i.e. everything is completely wired. The alarm values can be freely adjusted.

Description	Order No.
Dew point monitoring DS 52 for refrigeration driers consisting of:	**0600 5120**
DS 52 LED display in wall housing	0500 0009
FA 510 dew point sensor for refrigeration driers -20...50°Ctd incl. inspection certificate, 4…20 mA output signal (3-wire connection), and Modbus-RTU interface	0699 0512
Standard measuring chamber up to 16 bar	0699 3390
Connection cable for VA/FA sensors, 5 m	0553 0104
Options:	
Power supply 24 VDC (instead of 230 VAC)	Z500 0001
Power supply 110 VAC (instead of 230 VAC)	Z500 0002
Alarm unit mounted at wall housing	Z500 0003
Alarm unit for external mounting with 5 m cable	Z500 0004
Additional accessories:	
Precision calibration at 3° Ctd including ISO certificate	0699 3396

Special features:

- System ready for plug-in: Everything completely wired
- No time-consuming studying of the instruction manual
- 2 alarm contacts (230 VAC, 3 A) pre- and main alarm freely adjustable
- 4...20 mA analogue output
- Option alarm unit: Buzzer and continuous red light

Technical data display DS 52:

Dimensions:	118 x 92 x 93 mm
Display:	LED red, 7 segments, height: 13 mm, 5 digits, 2 LED for alarm relay
Keypad:	4 keys
Input:	4...20 mA
Power supply:	230 VAC, 50/60 Hz; Option: 24 VDC or 110 VAC 50/60 Hz
Alarm outputs:	2 x relay output, changeover contact, 250 VAC, max. 3 A
Operating temperature:	-10...+60 °C (storage temp. -20°C...+80°C)
Alarm thresholds:	freely adjustable
Hysteresis:	2 °Ctd
Analogue output:	4...20 mA = -20...50 °Ctd

Technical data dew point sensor FA 510

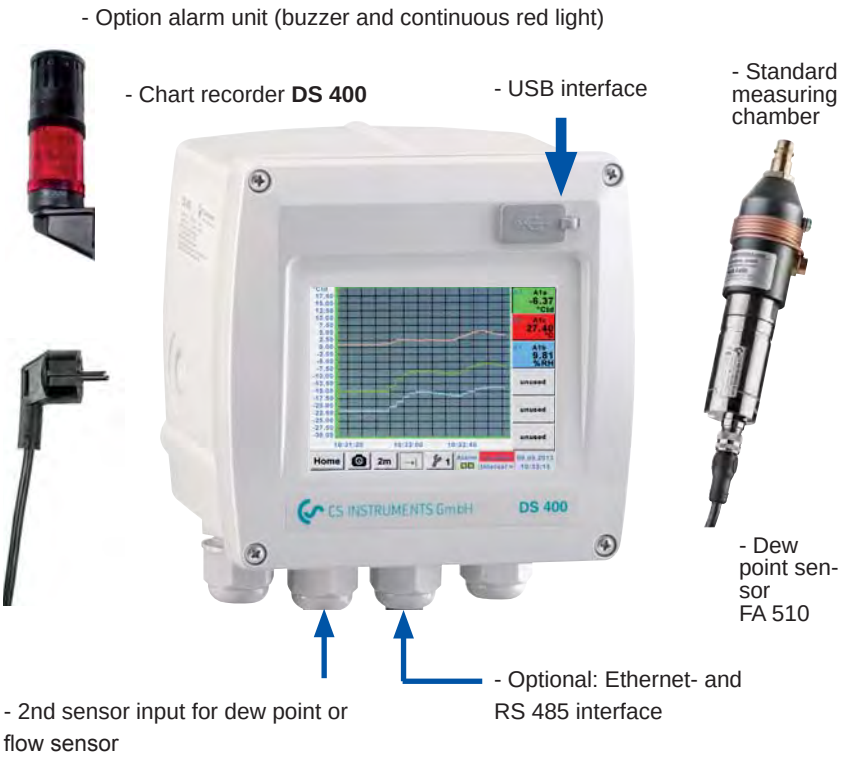
Measuring range:	-20...50°Ctd
Accuracy:	± 1°C at 0...20°Ctd ± 2°C remaining range
Pressure range:	-1...50 bar special version up to 350 bar
Protection class:	IP 65
EMV:	according DIN EN 61326
Operating temp.:	-20...70 °C
Connection:	M12, 5-pole
PC connection:	Modbus-RTU interface (RS 485)
Burden for analogue output:	< 500 Ω
Screw-in thread:	G 1/2“

Dew point monitoring **DS 400**

for stationary dew point monitoring of refrigeration or desiccant driers. The touch screen graphic display enables an intuitive operation and shows the progress of the measured values. 2 alarm relays are available for monitoring of threshold values. Available either with a classic analogue output 4...20 mA or optionally with digital interfaces like Ethernet and RS 485 (Modbus protocol). As a stand-alone solution the measured data stored in the optional data logger can be read-out via USB stick and evaluated by means of the software CS Soft Basic.

Dew point monitoring DS 400

consisting of:



Special features:

- 3.5“ graphic display - easy operation with touch screen
- System ready for plug-in: Everything completely wired
- 2 alarm contacts (230 VAC, 3 A) pre- and main alarm freely adjustable
- **NEW:** An alarm delay can be set for each alarm relay
- 4...20 mA analogue output
- Option: Ethernet and RS 485 interface (Modbus protocol)
- Option: webserver

Option: Integrated data logger

- Recording of the dew point progression of up to 100 million measuring values
- CS Soft Basic for evaluation in graphic and table form. Read-out of the data either via USB stick or via Ethernet

Description	Order No.
Dew point monitoring DS400 for desiccant driers (-80...20° Ctd.)	**0601 0510**
Dew point monitoring DS400 for refrigeration driers (-20...+50°Ctd)	**0601 0512**
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: 2 additional sensor inputs for analogue sensors (pressure sensor, temperature sensor and so on)	Z500 4001
Further accessories	
CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB or Ethernet	0554 7040
Alarm unit mounted at wall housing	Z500 0003
Alarm unit for external mounting with 5 m cable	Z500 0004
Calibration	
Precision calibration at -40 °Ctd or +3 °Ctd including ISO certificate	0699 3396

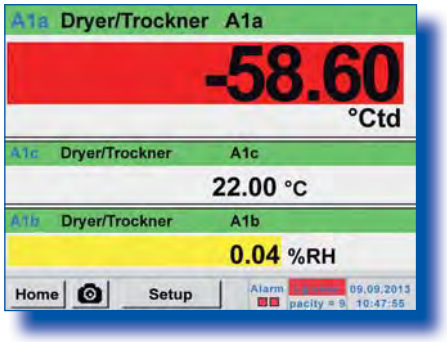
Technical data DS 400

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 sensors
Interface:	USB
Power supply:	100...240 VAC, 50-60 Hz
Accuracy:	please see FA 510
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

Technical data FA 510

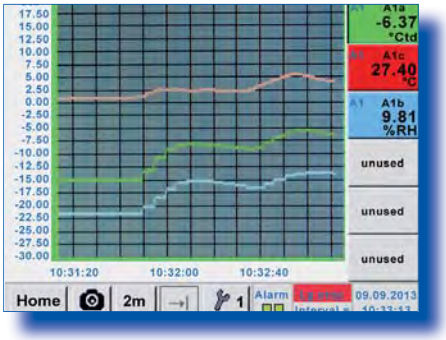
Measuring range:	-80...20 °Ctd resp. -20...50 °Ctd
Accuracy:	± 1 °C at 20...-20 °Ctd ± 2 °C at -20...-50 °Ctd ± 3 °C at -50...-80 °Ctd
Pressure range:	-1...50 bar, special version up to 350 bar

Easy operation via touch screen



Actual measured values

All measured values can be seen at a glance.
Threshold exceeding are indicated in red color.
A „measuring site name“ can be allocated to each sensor.

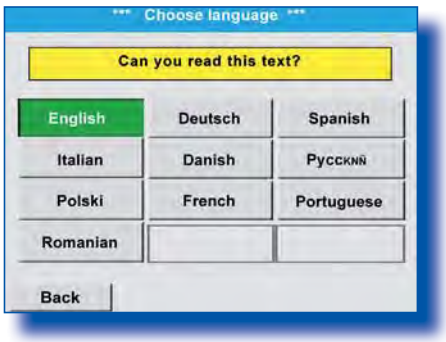


Graphic view

In the graphic view all measured values are indicated as curves.
It is possible to brows 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).

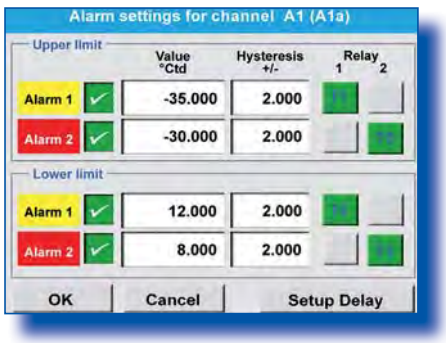
Data logger

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.
Read-out 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.



Adjustment of the alarm relays

Each one of the 2 alarm relays can be allocated individually to a connected sensor. The alarm thresholds and the hysteresis can be freely adjusted.
NEW: It is possible to set an alarm delay for each alarm relay so that the relay is just triggered after that period of time.

DS 400 - Chart recorder

for all relevant parameters of compressed air

Software options:
- Integrated webserver
- Mathematics 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/ effective power meter	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 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 FA 510
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	(0...20mA/4...20mA)
Measuring range	0...20 mA
Resolution	0.0001 mA
Accuracy	± 0.03 mA ± 0.05 %
Input resistance	50 Ω
Voltage signal	(0...1 V)
Measuring range	0...1 V
Resolution	0.05 mV
Accuracy	± 0.2 mV ± 0.05 %
Input resistance	1 MΩ
Voltage signal	(0...10 V / 30 V)
Measuring range	0...10 V
Resolution	0.5 mV
Accuracy	± 2 mV ± 0.05 %
Input resistance	1 MΩ
RTD Pt 100	
Measuring range	-200...850°C
Resolution	0.1°C
Accurancy	± 0.2°C (-100...400°C) ± 0.3°C (further range)
RTD Pt 1000	
Measuring range	-200...850°C
Resolution	0.1°C
Accuracy	± 0.2° (-100...400°C)
Pulse	
Measuring range	min pulse length 500 µs frequency 0...1 kHz max. 30 VDC

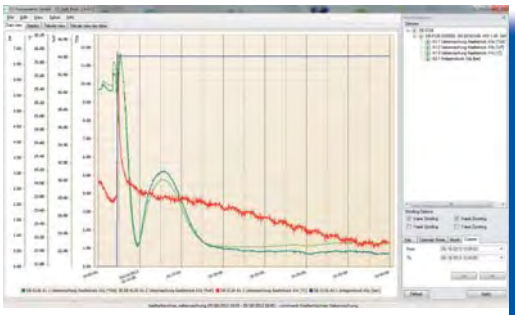
Suitable sensors for DS 400

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 connectable	0554 5353	
Current transformer 100/5 A connectable 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.

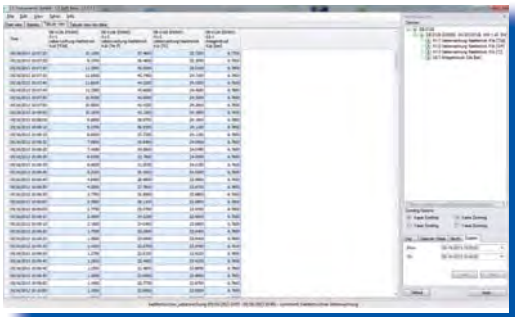
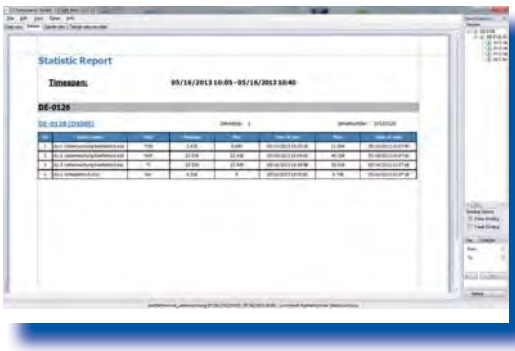


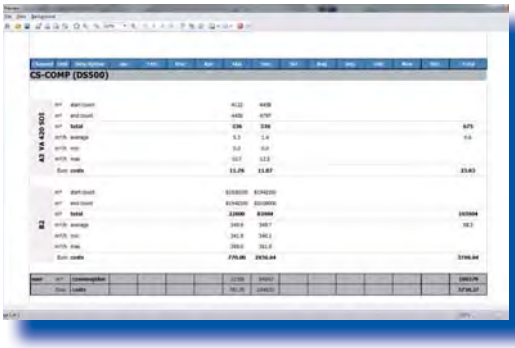
Table view

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.



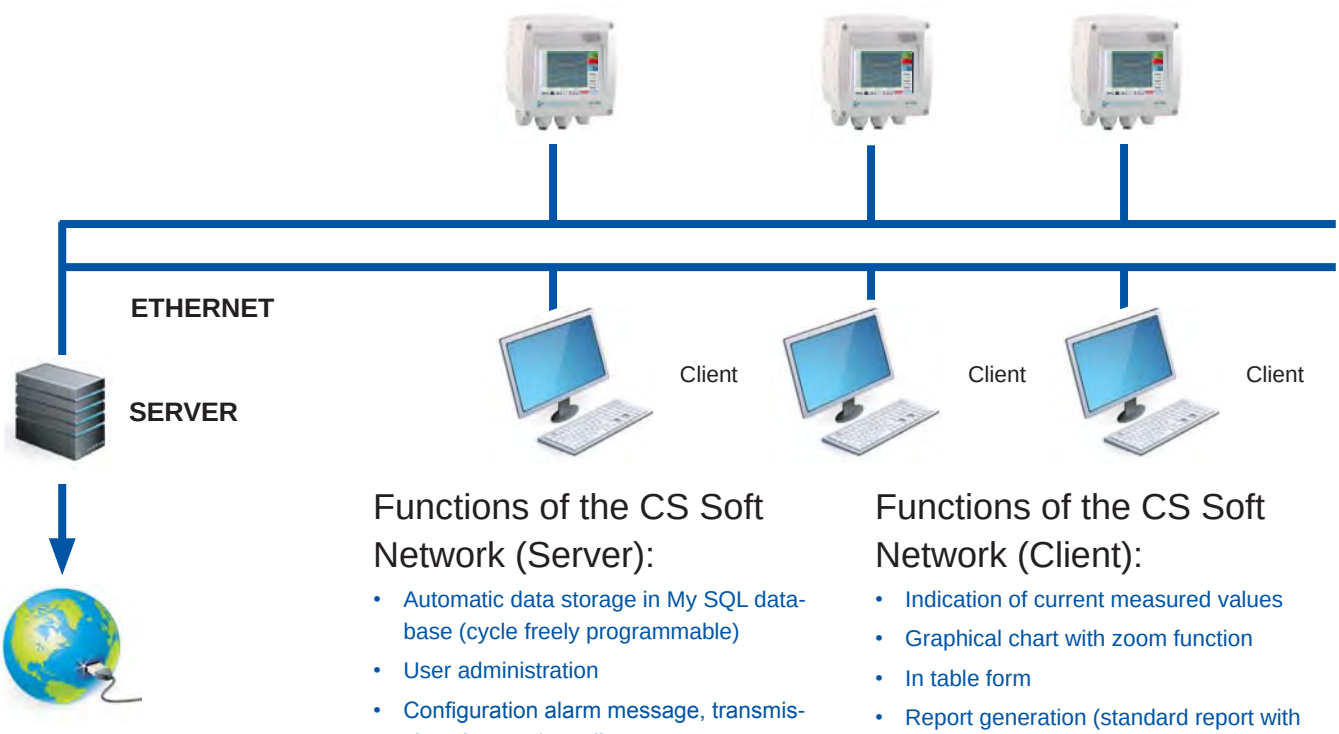
Energy and flow evaluation

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.

Dew point sensor FA 500 from -80 to 20°Ctd

FA 500 is the ideal dew point measuring instrument with integrated display and alarm relay for refrigeration, membrane and desiccant driers.

Special features:

- Integrated display
- Threshold value adjustable via keypad alarm relay (max. 60 VDC, 0.5 A)
- Pressure-tight up to 350 bar (special version)
- Extreme long-term stability
- Quick response time
- 4...20 mA analogue output
- 2 versions: Refrigeration driers and desiccant driers
- **NEW: Modbus-RTU interface**
- **NEW: Higher resolution of sensor signal caused by the improved evaluation electronics**
- **NEW: Sensor diagnosis on site with a portable device or CS Service Software**

The integrated keys enable an easy menu-driven operation

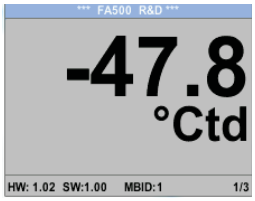
Upper connection:

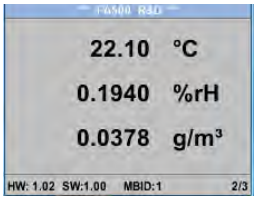
Power supply
4…20 mA output
Modbus-RTU output

Lower connection:

Alarm relay

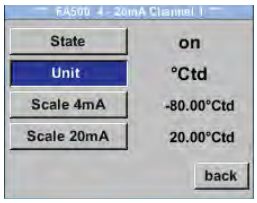
FA 500 – easy operation via keys at the display

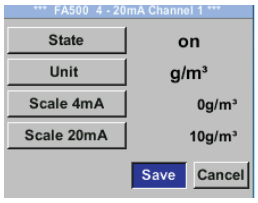




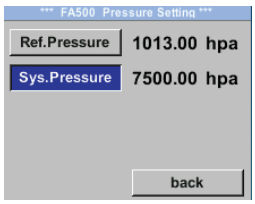
The integrated display shows the dew point in big figures as well as further humidity parameters on two more display pages. By means of the arrow key it can be browsed between the display pages.

The alarm threshold value for the integrated relay can be entered via the keys.
Apart from the alarm threshold it is also possible to enter the hysteresis freely.





The 4…20 mA analogue output can be scaled freely resp. also allocated to one further parameter, e. g. g/m³.



If requested the sensor can also reckon back from the measured pressure dew point to the atmospheric dew point upon entering the system pressure of the compressed air plant and the reference pressure (atmospheric pressure).

Description	Order No.
FA 500 dew point sensor for refrigeration driers, -20...50 °Ctd	0699 0501
FA 500 dew point sensor for desiccant driers, -80...20 °Ctd	0699 0502
FA 500 dew point sensor for desiccant driers, -60...30 °Ctd	0699 0503
Connection cables:	
Connection cable, 5 m	0553 0104
Connection cable, 10 m	0553 0105
Alarm cable, length: 5 m	0553 0106
Alarm cable, length: 10 m	0553 0107
Options for FA 500:	
Option max. pressure FA5xx 350 bar	Z699 0515
Option max. pressure FA5xx 500 bar	Z699 0516
Option special scaling FA5xx 4…20 mA=__ … __ g/m³, ppm etc.	Z699 0514
Option connection thread FA5xx, 5/8“ UNF	Z699 0511
Option connection thread FA5xx, 1/2“ NPT	Z699 0512
Option surface condition FA5xx, free of oil & grease	Z699 0517
M-Bus board for VA500/520 and FA500	Z695 5004
Additional accessories:	
Standard measuring chamber up to 16 bar	0699 3390
High pressure measuring chamber up to 350 bar	0699 3590
CS Service Software for FA/VA sensors incl. PC connection set, USB connection 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
Calibration:	
Precision calibration at -40°Ctd or +3°Ctd including ISO certificate	0699 3396

Technical data FA 500

Measuring range:	-80...20 °Ctd, -60...30 °Ctd, -20...50 °Ctd, resp. 0...100% RH
Accuracy:	± 1°C bei +50...-20°Ctd ± 2°C bei -20...-50°Ctd ± 3°C bei -50...-80°Ctd
Pressure range:	-1...50 bar special version up to 350 bar
Power supply:	24 VDC (18...30 VDC) smoothed
Protection class:	IP 65
EMV:	according to DIN EN 61326
Operating temp:	-20...50 °C
Connection:	2 x M12, 5-pole for ana-logue output, Modbus-RTU and alarm output
PC connection:	Modbus-RTU interface (RS 485)
Output: (3-wire)	4...20 mA = -80...20°Ctd 4...20 mA = -60...30°Ctd 4...20 mA = -20...50°Ctd
Burden for ana-logue output:	< 500 Ω
Alarm relay:	NC, max.60 VDC, 0.5 A
Screw-in thread:	G 1/2“
Dimensions of housing	76,5 x 85 x 75 (WxHxD)

Dew point sensor FA 300-2 Ex
from -80 to 20°Ctd

ATEX

Special features:

- Robust design
- Pressure-tight up to 300 bar
- Long-term stable humidity sensor, approved for years
- 4...20 mA analogue output in 2-wire system
- Further parameters adjustable via software: % RH, g/m³, mg/m³, ppm V/V, g/kg
- CS Service Software for data storage and calibration (no approval for explosive areas)

Technical data FA 300-2 Ex

Measuring range:	Pressure dew point in °Ctd
FA 300-2 Ex:	-80...20 °Ctd = 4...20 mA
Power supply:	24 VDC (10...30 VDC)
Accuracy:	± 0,5 °C at -10...50 °Ctd typical ± 2 °C at -40 °Ctd
Output:	4...20 mA in 2-wire technology
Protection class:	IP 65
EMV:	according to DIN EN 61326
Operating temp.:	-20...70 °C
Storage temp.:	-40...80 °C
Burden for analogue output:	< 500 Ω
Screw-in thread:	G 1/2“ stainless steel
Housing material:	polycarbonate
Sensor protection:	Sintered filter 50 µm stainless steel

FA 300-2 Ex measures the dew point resp. the pressure dew point in explosive areas of Zone 1. Protection class: FA 300-2 Ex: II 2 G Ex ia IIC T4.

With the Atex approval for Zone 1 the established dew point measuring instruments FA 300-2 can now be used in explosive areas of the industry as well.

FA 300-2 Ex may only be used in connection with approved Ex-rated power supplies or safety barriers or galvanic separating elements with max.:

U0 = 30 V max.

I0 = 100 mA max.

P0 = 1 W max.

Description	Order No.
FA 300-2 Ex pressure dew point meter	**0699 3070**
Measuring chamber up to 350 bar	0699 3590
Special scaling Analogue output to other humidity parameters: % RH, g/m³, mg/m³, ppm V/V, g/kg	0699 4004
Intrinsically safe power supply, safety barriers	0554 3071

Mains units

Mains unit in wall housing

Mains unit in wall housing (back view)

Mains unit on DIN rail

Power supply

Description	Order No.
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
Mains unit in wall housing for maximum 4 sensors of the series VA 500/520 100-240 V, 23 VA, 50-60 Hz / 24 VDC, 0.35 A	0554 0111
Mains unit on DIN rail, 100-240 VAC / 24 VDC, 0.35 A	0699 3340
AC adapter plug 100-240 V AC/ 24 V for VA/FA 5xx	0554 0109

Technical data for mains unit in wall housing

Dimensions:	118 x 115 x 98 mm (WxHxD)
Power supply:	100-240 VAC, 23 VA, 50-60 Hz
Output:	24 VDC, 0.35 A
Relay:	2 pieces, change-over contacts, 230 VAC, 3 A

CS Service Software for FA 5xx dew point sensors

For FA/VA sensors including PC connection set, USB adapter and interface adapter to the sensor.

The humidity sensors FA 500, FA 510, can be connected to the PC and the following adjustments can be carried out by means of the CS Service Software:

- Scaling of the 4...20 mA analogue output
- Selecting the units: % RH, °Ctd, g/m³, mg/m³, ppm V/V
- Reading out of: Version no., production date, serial no., date of last calibration
- Adjustment of the alarm limits
- Single-point calibration (adjustment) - for this purpose a reference measuring instrument is required

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

The right measuring chamber for each measuring task:

Standard measuring chamber for compressed air up to 16 bar

Order no.: **0699 3390**

Hight-pressure measuring chamber for compressed air up to 350 bar*

Order no.: **0699 3590**

Measuring chamber for granulate driers

Order no.: **0699 3490**

Measuring chamber for atmospheric dew point

Order no.: **0699 3690**

Measuring chamber stainless steel 1.4305, for dew point measurement in gases/air up to 100 bar

Order no.: **0699 3290**

* In case of pressures higher than 50 bar please order special version of FA 500/ FA 510

Mounting recommendation

The dew point meters can be mounted directly into the air stream.

However, we recommend always to use a screw screw able able measuring chamber.

Screw able measuring chamber

Advantage: Easy installation via fast coupling

Calibration of **dew point sensors**

The calibration range for dew point sensors is -80°... 20° Ctd

It is possible to calibrate our dew point sensors as well as of other manufacturers.
High precision reference measuring instruments with DKD resp. BAM certificate grant an accuracy of up to 0.1 °C dew point.

Special feature

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

Calibration range: from -80 to 20 °Ctd
Accuracy of the DKD reference: 0.1 °Ctd

Control and calibration set

Control and calibration sets guarantee a defined humidity by means of a saturated saline solution.

The control and calibration set is screwed onto the dew point sensor and therefore enables an easy and low-priced possibility for on-site control and calibration down to -20 °C dew point.

Description	Order No.
Recalibration and precision calibration at -40 °Ctd including ISO certificate	0699 3333
Precision calibration in the range -80...20 °Ctd, °Ctd points freely selectable	0700 7710
Control and calibration set 11.3 % RH	0554 0002
Control and calibration set 33 % RH	0554 0004
Control and calibration set 75.3 % RH	0554 0005
Precision calibration at -40 °Ctd or 3°Ctd including ISO certificate	0699 3396
Replacement unit for the period of re-calibration	0699 3900
Dew point sensor in exchange with calibration certificate at -40° Ctd	0699 3990

Dew point measurement in compressed air plants

Today, modern production processes cannot be imagined without compressed air as a versatile and reliable energy source.
Depending on the respective single case different demands are made on compressed air. Meeting a certain moisture degree or dew point/pressure dew point is the basis for a permanent failure-free plants operation.
We developed a pressure dew point multifunction measuring instrument DS 400 with lots of new advantages specially for moisture measurement resp. dew point/pressure dew point measurement in compressed air and gases.

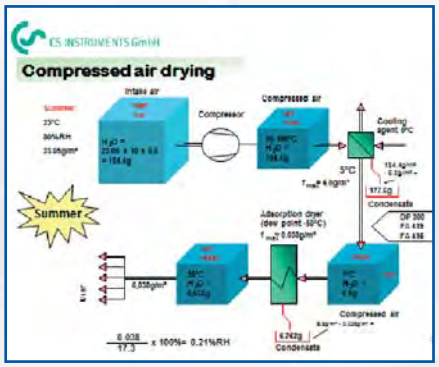
Dew point

Usually compressed air is made from ambient air by using piston or screw compressors and which then has to be dried more or less strongly.

The aim is to produce dry, oil-free and dust particle poor compressed air with the smallest possible efforts. Residual oil and dust particles can be removed by means of complex filter systems. However, moisture has to be reduced by means of driers (refrigeration driers, membrane driers, desiccant driers and so on) which ideally work independent from any load.

How does water get into compressed air?

Air is able to bind more water vapor if the temperature is higher and the volume is bigger. In contrary case it has only a poor capacity to bind water vapor if the air is compressed. A compressor compresses atmospheric ambient air into a fraction of its original volume. At a certain point of the compression process the water content of the air exceeds the decreasing ability of the air to bind water. The air is saturated and part of the water drops out as condensate. By means of an additional decrease of the temperature even more water will condensate. This means that the relative humidity at the end of a compressor will always be at 100 % and that there will be additional water drops in the exit air. The amount of liquid which drops out under pressure can be large. For example a 30 kW compressor releases approximately 20 liters into the compressed air line at a humidity of 60 % and an ambient temperature of 20 °C. In case of big compressors this value will be much higher.



Effects of the moisture content

Depending on the application different demands are made on the compressed air. For each process the observance of a certain moisture content is the condition for a durably failure-free functioning of the whole system. Most of the compressed air lines are made from steel or non zinc-coated steel. Since the corrosion speed strongly increases from a relative humidity of 50 % this value should be exceeded in no case. In the course of time, high moisture will lead to a corrosion in case of non zinc-coated lines. The rust gradually chips off and moves to the sampling points. This leads e. g. to blocked nozzles, defective control elements and production stops.

Expensive repairs and short maintenance intervals are inevitable.

In addition to problems with corrosion and the described results the moisture content has direct influence on the quality of the final products. Which problems may arise in case of too high moisture? In the following please find some of the most occurring samples:

- Hygroscopic products (spices, sugar and so on) agglutinate during transportation through the pneumatic conveying system
- Bubbles occur during varnishing and coating processes
- Drilled holes may get blocked due to dust which is carried along
- In winter control valves freeze in unheated halls

Recommended compressed air qualities

Application	Compressed air quality classes according to DIN ISO 8573-1			
	Particle		Residual flow	
	Class	µm	Class	Dew Point
Respiration air	1	0.1	1-3	-70/-20 °C
Spray guns	1	0.1	2	-40 °C
Medical technology	1	0.1	3-4	-20/+3 °C
Measurement and control techn.	1	0.1	4	+3 °C
Transportation of food and beverages	2	1	3	-20 °C
Sand blasting plants	–		4-3	+3/-20 °C
General factory air	3	5	4	+3 °C
Break-up hammer	4	15	5-4	+7/+3 °C

Tasks of driers

Differently types of driers are used in practice in order to control the problems of too high moisture. In compressed air technology the pressure dew point is the parameter for indicating the dryness of compressed air. The pressure dew point is the temperature at which the moisture which is contained in the compressed air condenses to liquid water (also saturation, 100 % relative humidity). The lower the pressure dew point temperature the smaller is the amount of water vapor contained in the compressed air.

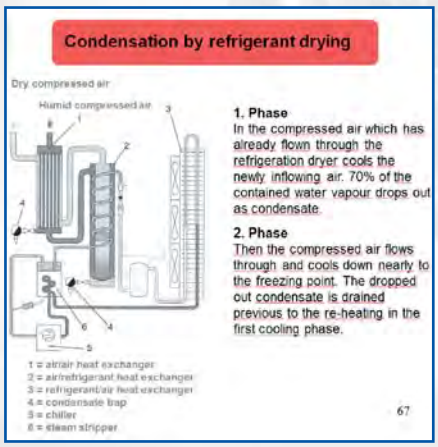
Refrigeration driers for dew point values around + 2 °Ctd

There are different types of compressed air driers; refrigeration driers or desiccant driers are the most commonly used ones. Refrigeration driers cool down the compressed air to approximately 2 to 5 °C. In this case the pressure dew point is also 2 to 5 °C. The excess water vapor condenses and drops out.

After that the air is again heated up to room temperature.

In most cases the refrigeration driers are only monitored by an indication of the cooling temperature. Up to now stationary moisture monitoring systems are only installed in big plants resp. in case of particularly important applications.

However, it is not sufficient if only the cooling temperature is indicated. The following failures my lead to an exaggerated pressure dew point even if the cooling temperature seems to be alright:



- **Condensate in the refrigeration dryer is not drained off (condensate drain defective resp. soiled)**
- **Compressed air bypass in the refrigeration dryer (heat exchanger pipes worn out, corroded and so on)**
- **Compressed air bypass in the bypass line (wet compressed air passes the bypass instead of passing the dryer)**
- **Condensate overload of the refrigeration dryer due to poor condensate pre-separation**

If the refrigeration dryer fails this inevitably leads to considerable problems with condensate in the compressed air line. It is especially problematic (besides the already listed problems) if the condensate can concentrate in blind lines and does not drain automatically.

Condensate in blind lines can only be removed by means of considerable efforts or dried and drained off by means of an extremely large amount of compressed air. This often leads to increased dew point values at very low consumptions without any avoidable problems of the refrigeration dryer. In this case it is quite difficult for the person who is responsible for compressed air to find out in the long-term the reason for the increased dew point values or in the extreme case for the condensate

Desiccant driers for typical dew points around -30...-40°Ctd

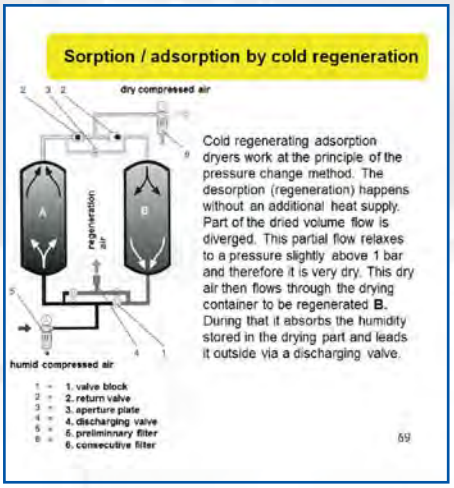
The functioning of the desiccant dryer is based on the principle of the attraction between the two masses. Water vapor is bound (adsorbed) at the surface of a desiccant.

Effective desiccant driers are able to dry compressed air down to a dew point of -40°C and lower.

Regenerative desiccant driers exist of two tanks which are filled with desiccant. In different procedures there is one tank regenerated cold resp. warm while the other one dries the operation air.

Depending on the procedure and the operating conditions the desiccant has to be exchanged in cycles of three to five years.

Certain operating conditions lead to a shortening of the life span of the desiccant:



- **Overload due to too big compressed air consumption**
- **Poor pre-separation of condensate**
- **Oily air**
- **Too long regeneration times of the single tanks**

New: DS 400 dew point measurement with alarm grants process safety

For a safe process procedure it is necessary to monitor the demanded pressure dew points at any time and to get an alarm in case of exceeding of the threshold values.

3.5” graphic display - easy operation with touch screen

DS 400 dew point set

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

Dew point

With the new ”ready for plug-in”

DS 400 dew point sets for refrigeration driers as well as for membrane/desiccant driers down to -80 °Ctd can be monitored easily and safely. The dew point sets 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 dew point set DS 400 consists of the multifunction measuring instrument DS 400 and the dew point sensor FA 510 including measuring chamber for pressure dew point measurement of compressed air and gases up to 16/50/350 bar. For pressures of more than 16 bar please use the high-pressure measuring chamber.

The heart of the dew point sensor is the worldwide proven humidity sensor. In order to get quick and accurate measurements it is necessary that the humidity sensor is continuously flown by the gas (compressed air) to be measured. For this purpose a defined volume flow is blown out at a certain pressure via a capillary line.

The measuring chamber can be connected to the sampling point without any large installation efforts by means of the standard plug nipple for compressed air lines.

The big difference to customary paperless chart recorders is reflected in the simplicity of DS 400 on initiation and evaluation of the measured data.

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.**

By means of the graphic display with zoom function the drying procedure resp. the dew point curve can be seen at a glance and 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 drying behavior.

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.

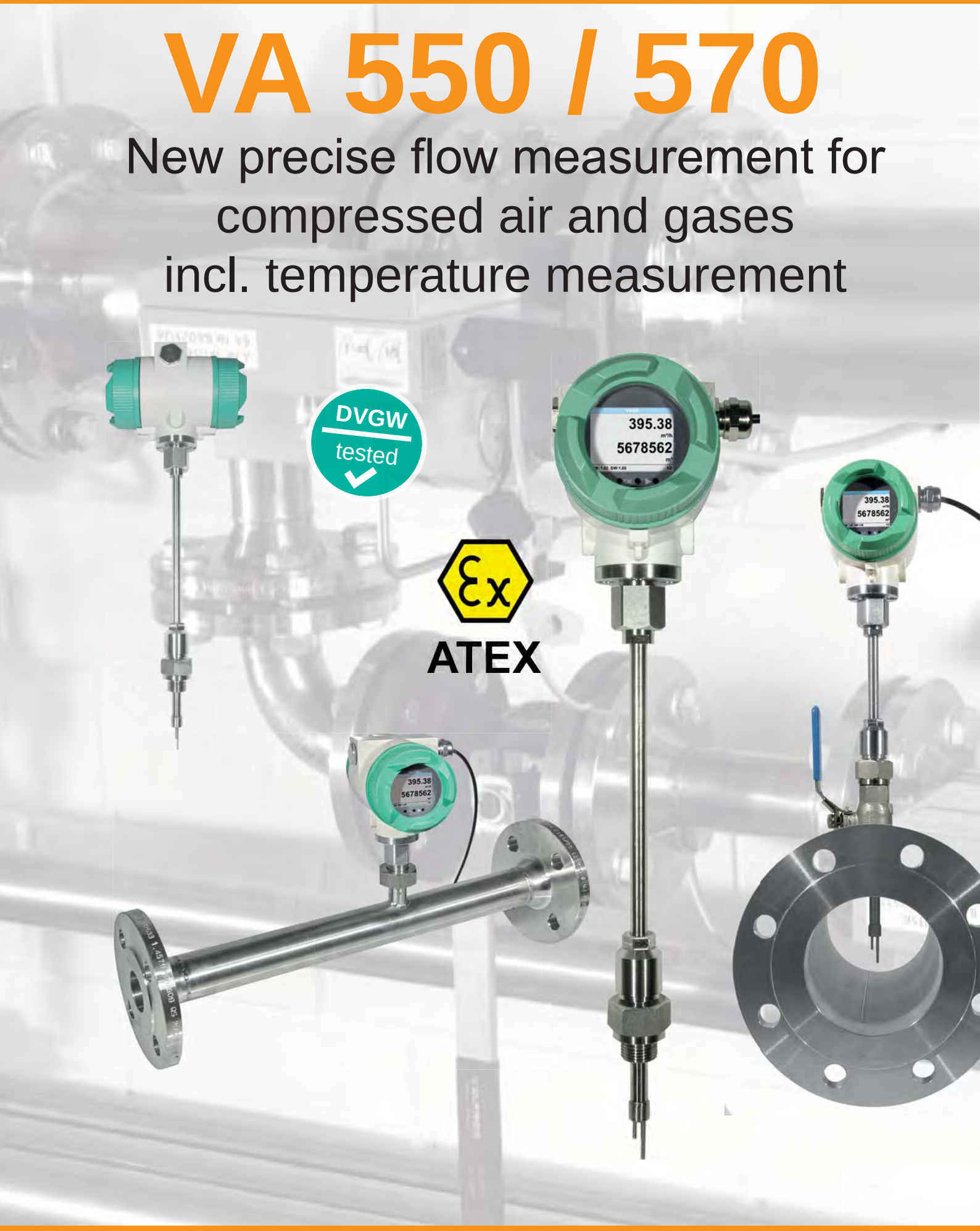
The internal data logger enables the storage of the measured data for several years. The measured data can be evaluated via a USB stick or via Ethernet by means of the comfortable software CS Soft Basic.

Special features:

- 3.5“ graphic display, intuitive operation via touch screen
- Zoom function for accurate analysis of measured values
- Colored measured curves with names
- Mathematical calculation function for calculation of the dew
- point distance (condensate switch)
- 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 550 / 570

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

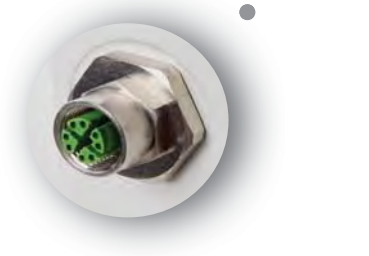


VA 550

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.

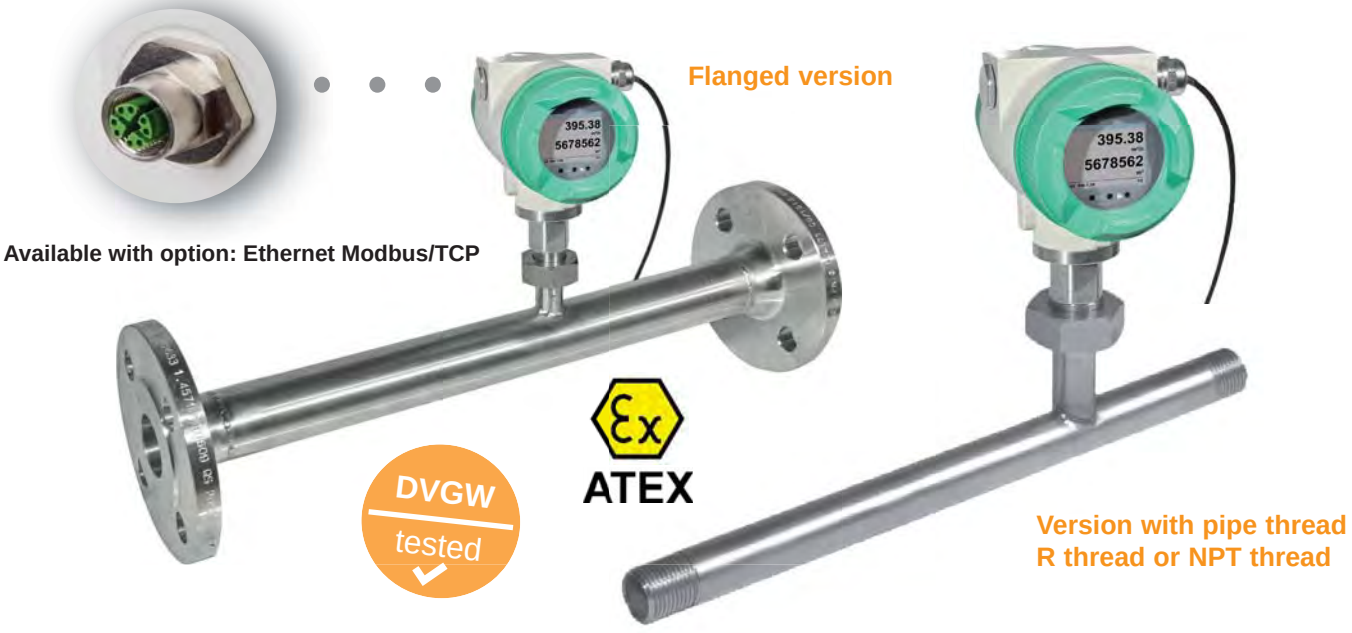
Contrary to the previously used bridge circuit the newly developed evaluation electronics records all measured values digitally. This allows very precise and fast measurements with a wide temperature range of up to 180 °C. The measuring span is 1...1000 and enables therefore measurements in very low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

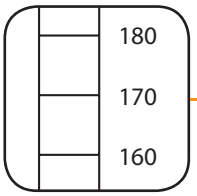
ATEX

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.

Housing IP 67

Outputs:
4...20 mA, pulse, Modbus, M-Bus, Profibus, Ethernet, HART

Engraved depth scale for accurate mounting



Housing twist able, display twist able by 180° (upside down). Settings adjustable via display, consumption counter resetable

All medium-touching parts are made from stainless steel 1,4571

Special mechanical features:

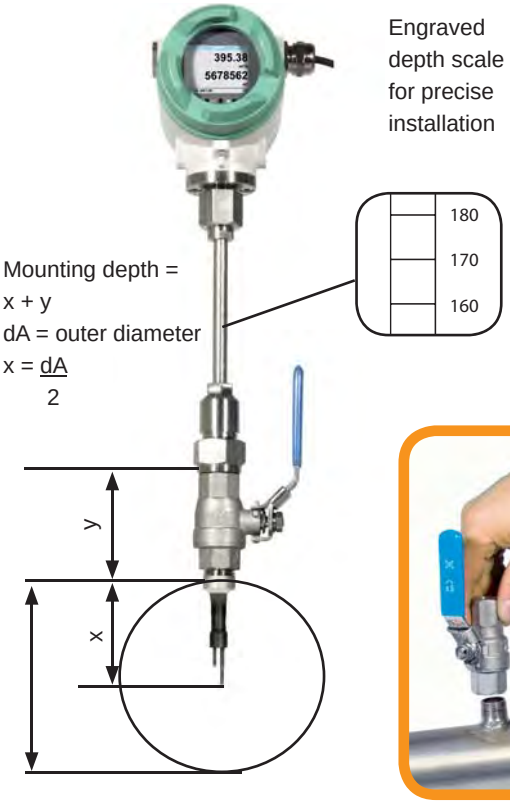
- Robust impact-proof aluminum die cast housing for the outdoor area IP 67
- All medium-touching parts made from stainless steel 1,4571
- As immersion sensor suitable for 3/4“ up to DN 1000
- On request with ATEX approval ATEX II 2G Ex d IIC T4 (up to 120 °C)
- On request with DVGW approval for natural 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



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) Full scale values in Nm³/h *						Max. version (185.0 m/s) Full scale values in Nm³/h *						High-Speed version (224.0 m/s) Full scale values in Nm³/h *						Recommended sensor length
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.

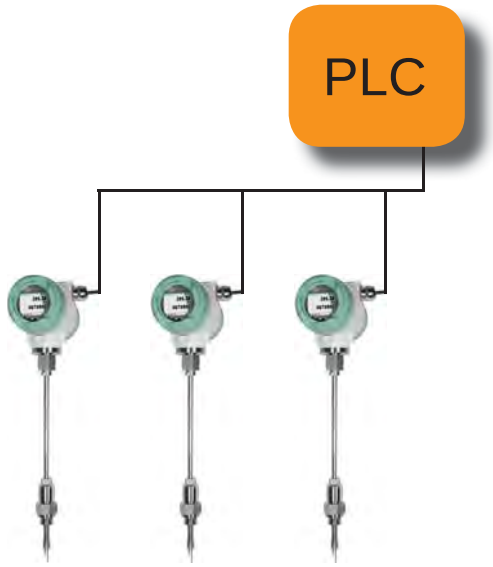
Evaluation with chart recorder DS 500 / DS 400

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

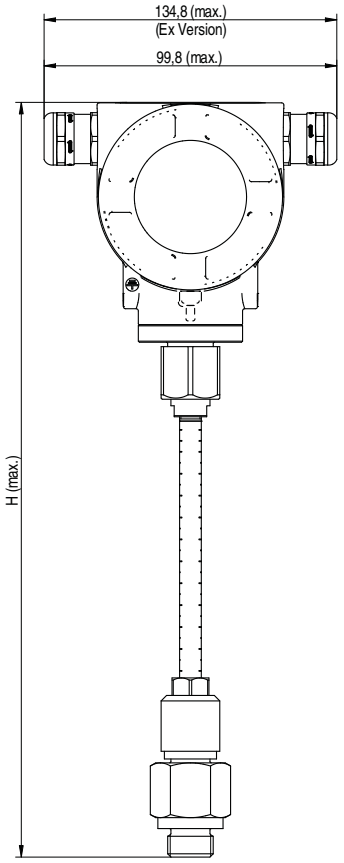
PROFIBUS

M-BUS

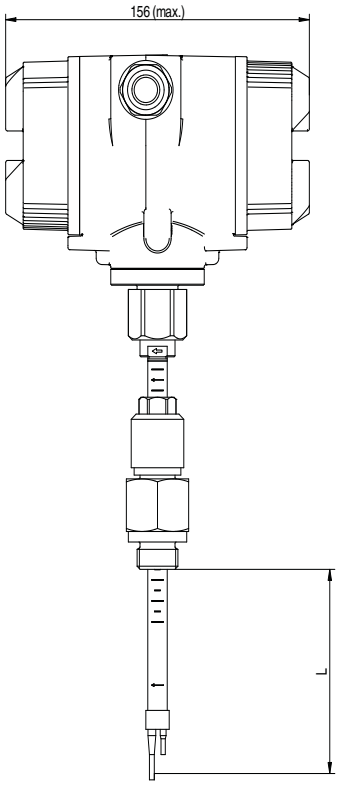
PROFINET

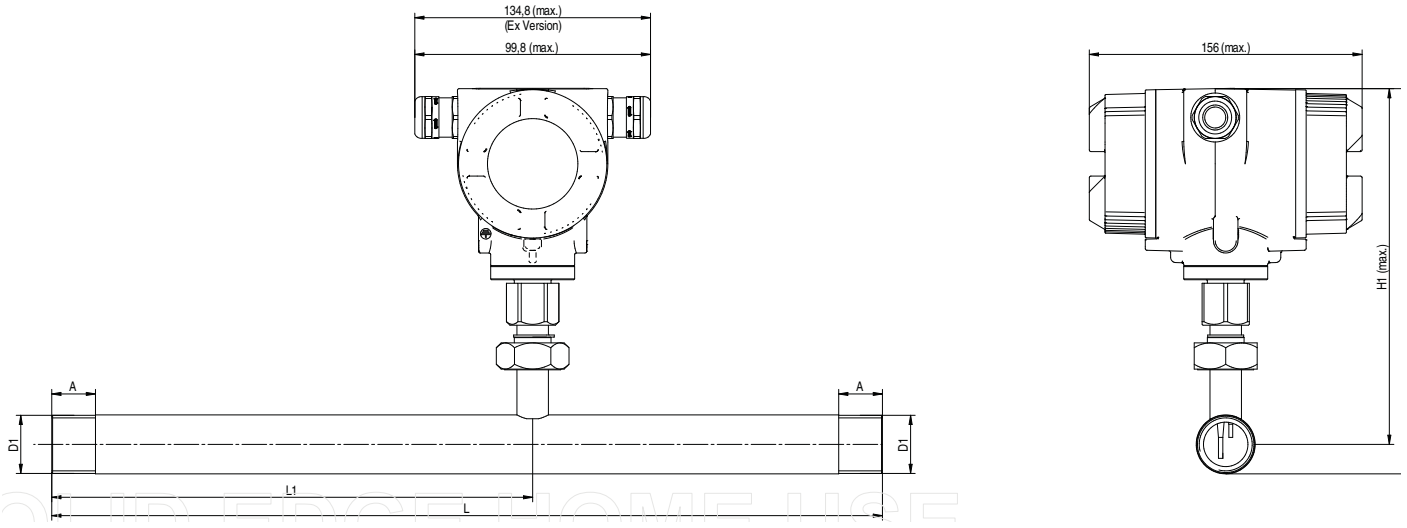
Technical data VA 550/ 570

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

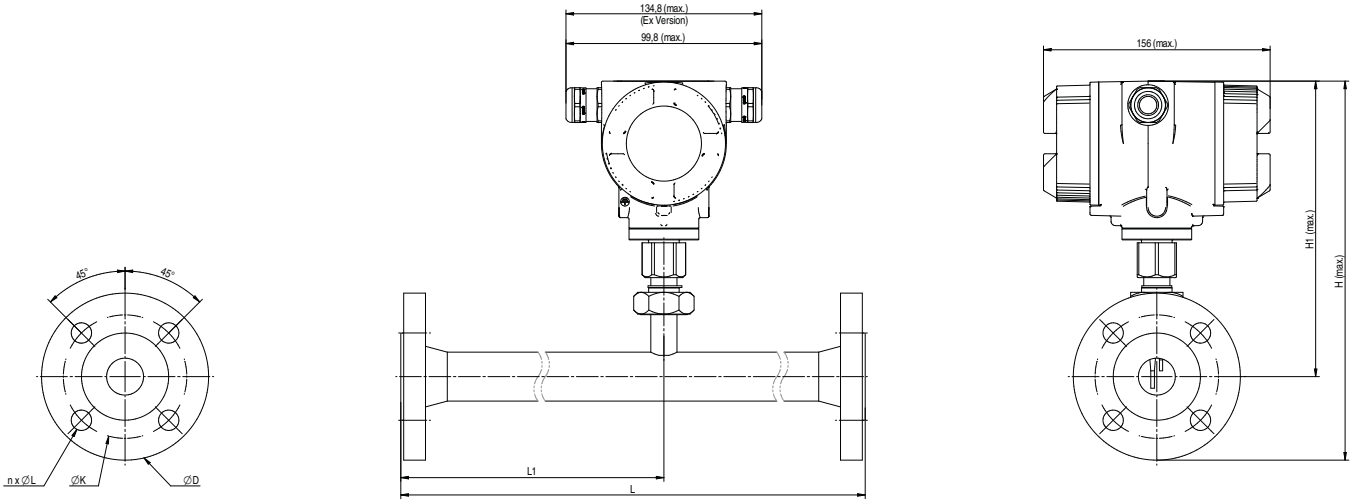


Sensor length	L [mm]	H [mm]
C1	220	441
C2	300	521
C3	400	621
C4	500	721
C5	600	821
C7	160	361





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 galvani-cally 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

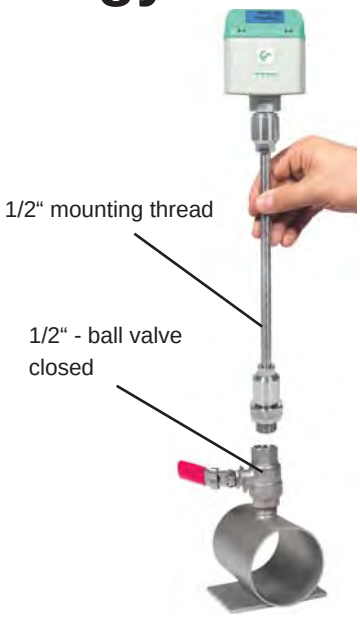
What are the advantages of our **flow measuring technology?**

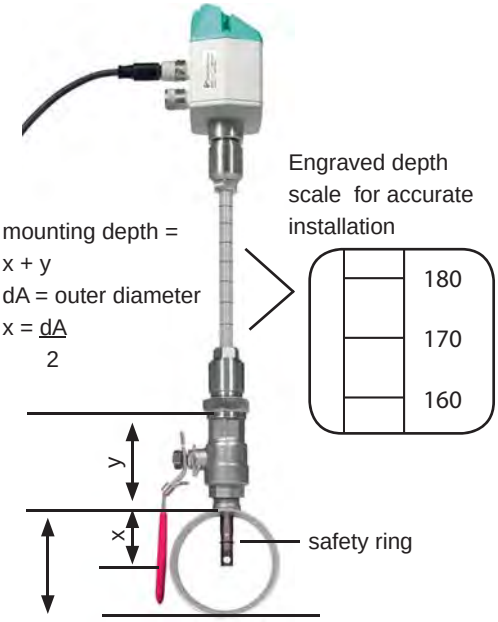
1) Even under pressure, the flow sensor VA 500 is mounted by means of a standard 1/2“ ball valve. During mounting and dismounting the safety ring avoids an uncontrolled ejection of the probe which may be caused by the operating pressure.

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

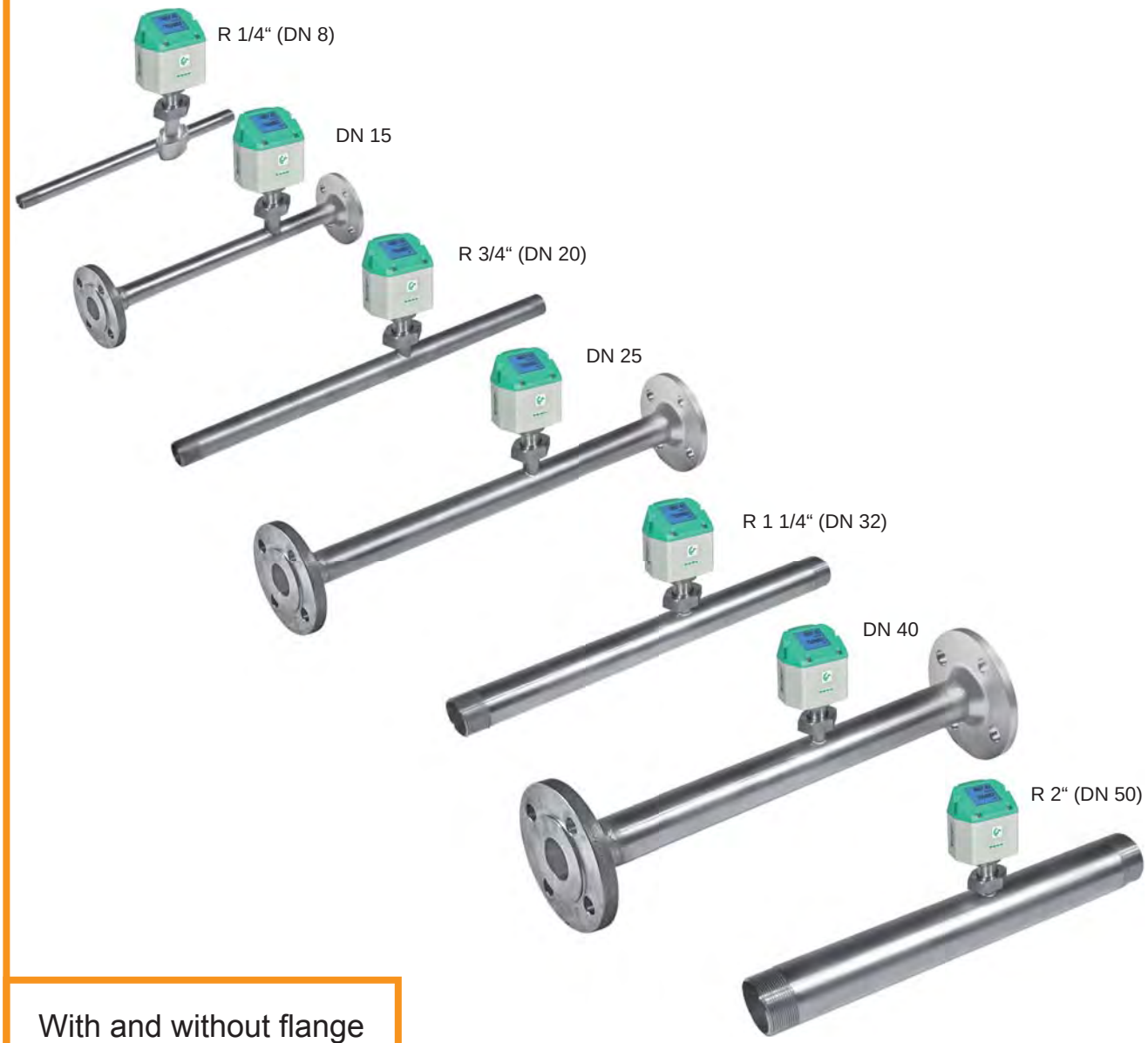
Describtion	Order No.
VA 500 flow sensor in basic version: Standard (92.7 m/s), probe length 220 mm, without display	0695 5001
Options for VA 500:	
Display	Z695 5000
Max. version (185 m/s)	Z695 5003
High Speed version (224 m/s)	Z695 5002
1 % Accuracy of m.v. ± 0,3 % of f.s.	Z695 5005
M-Bus board for 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.

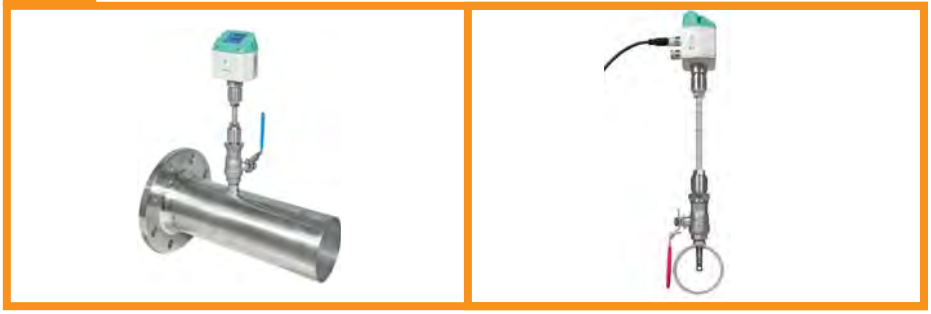
2. Stationary use

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



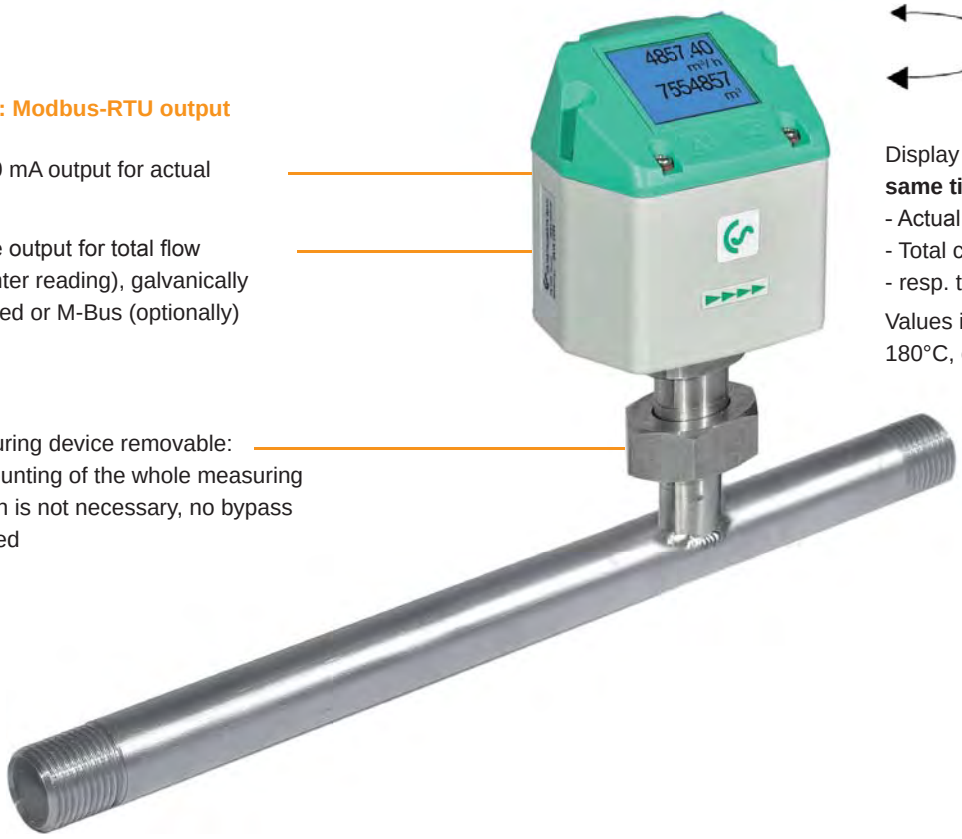
The approved flow sensor VA 500 is available for pipe diameters of 2“ to DN 1000. Its constructively sophisticated design enables the installation into pipes with nominal diameters up to DN 1000 even under pressure. The installation is effected by means of standard 1/2“ ball valve.

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:

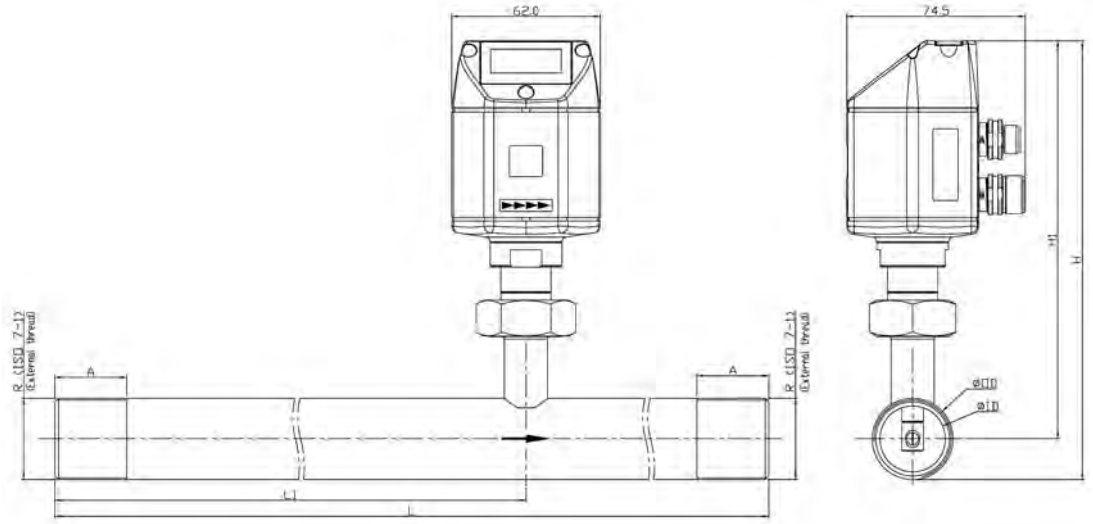
- Reset of counter reading
- selection of units
- zero-point adjustment, leak flow volume suppression

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

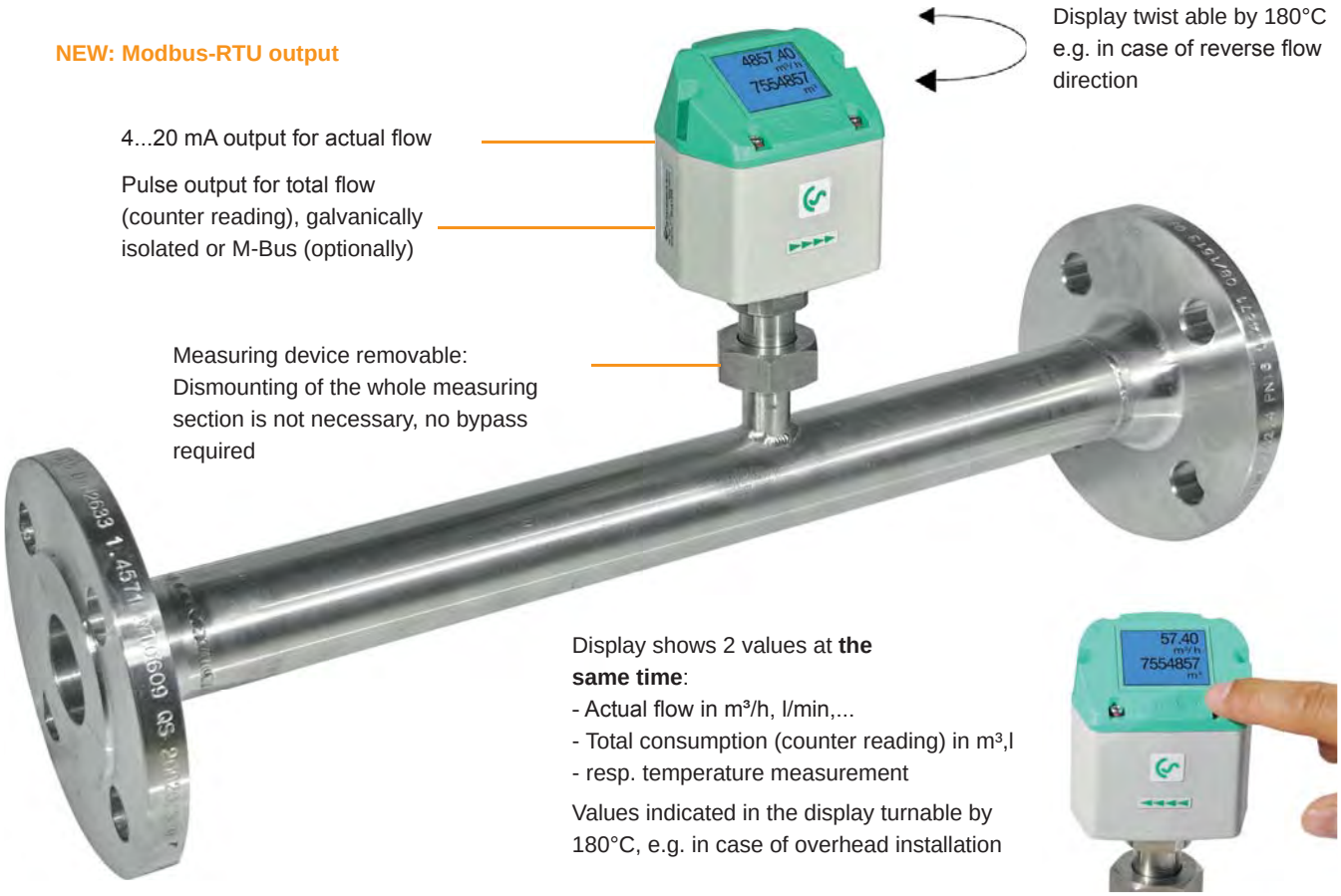
*Attention: Shortened inlet section! Please observe the recommended minimum inlet section (length = 15 x inner diameter) on site!

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:

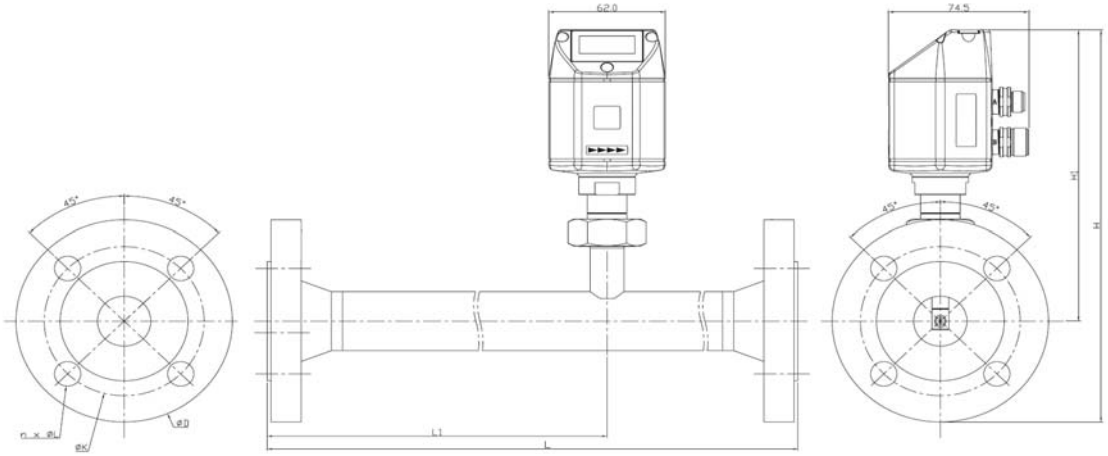
- reset of counter reading
- selection of units
- zero-point adjustment, leak flow volume suppression

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

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

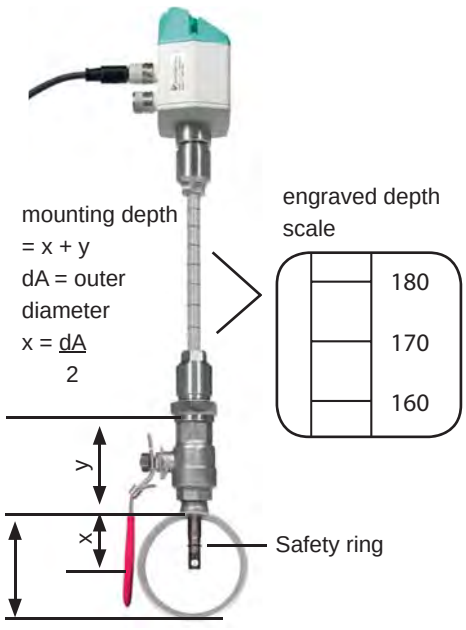
Flow sensor VA 500

- 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)

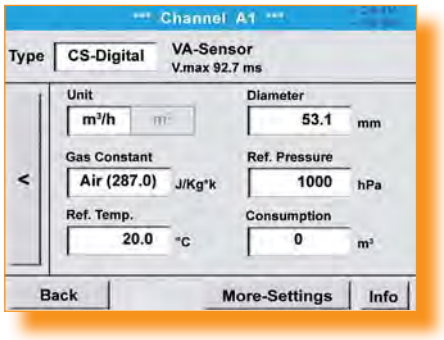
Flow measuring ranges VA 500 for compressed air (ISO 1217:1000 mbar, 20 °C)

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



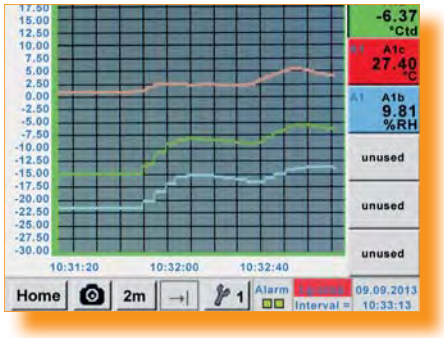
Easy operation via touch screen



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.



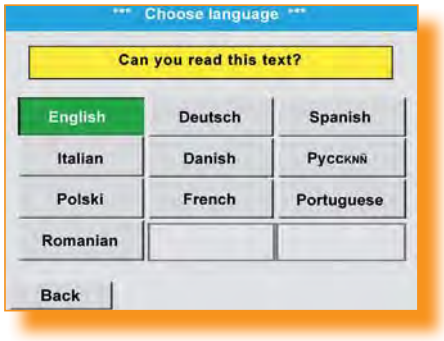
Graphic view

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

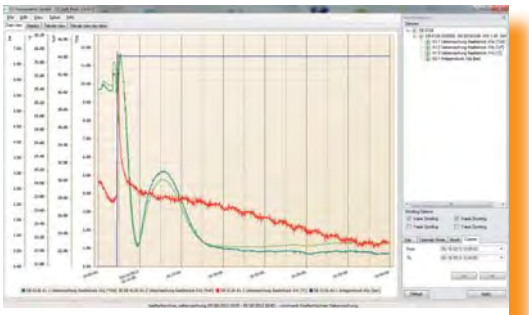
Suitable sensors for DS 400

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.

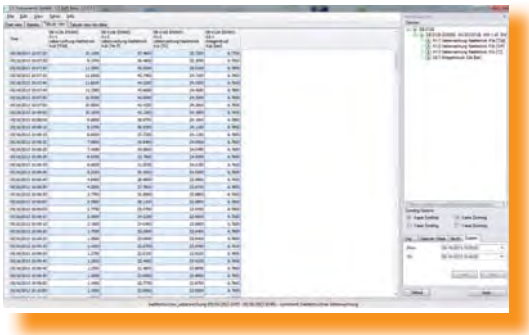
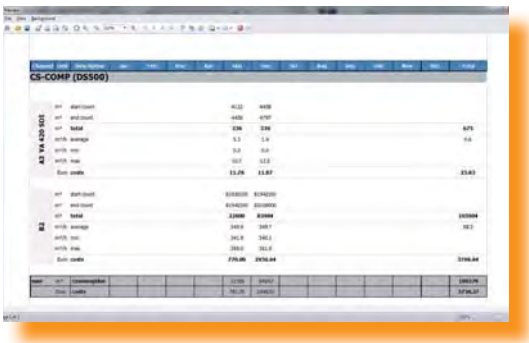


Table view

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.



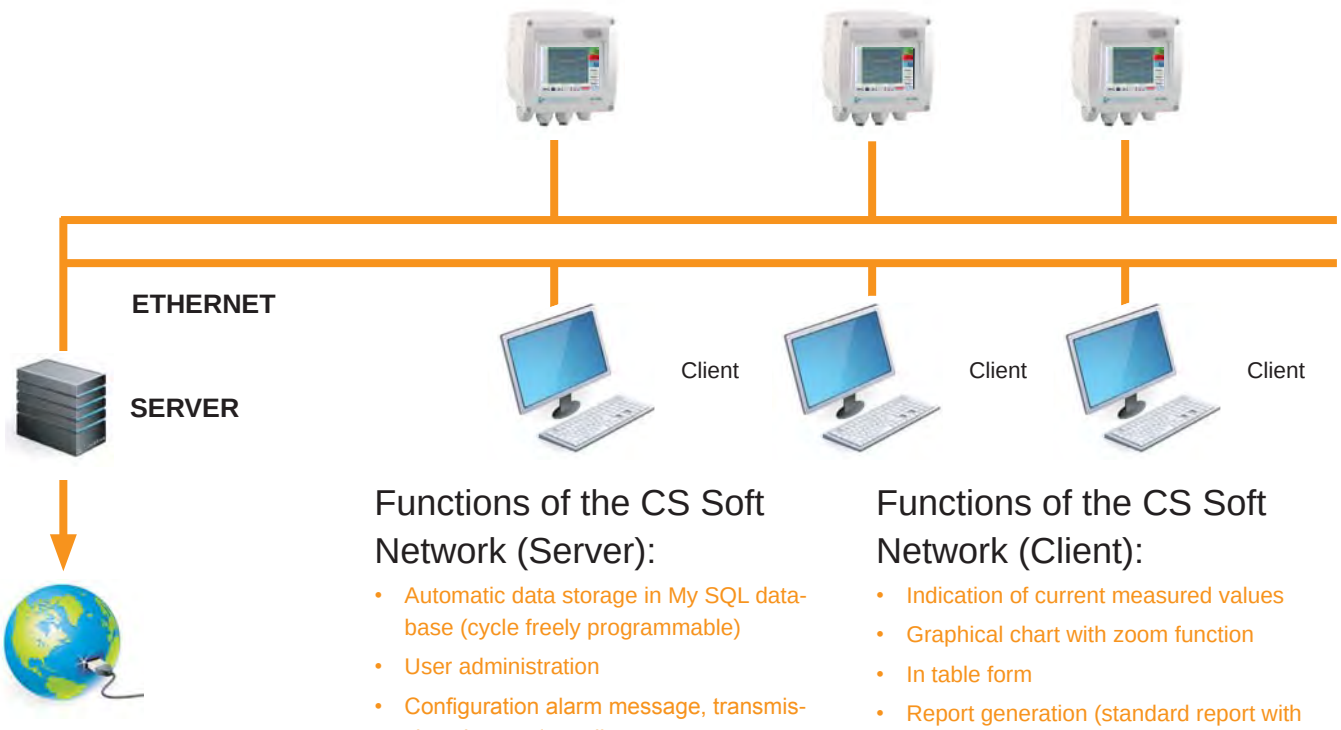
Energy and flow evaluation

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.

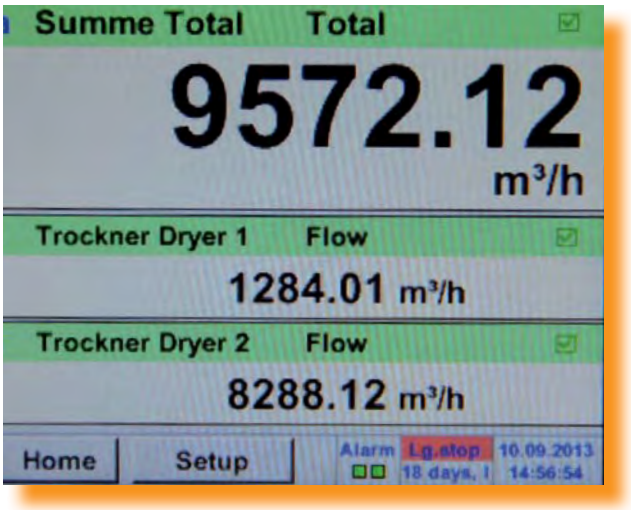
Connection to Bus system

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,...).

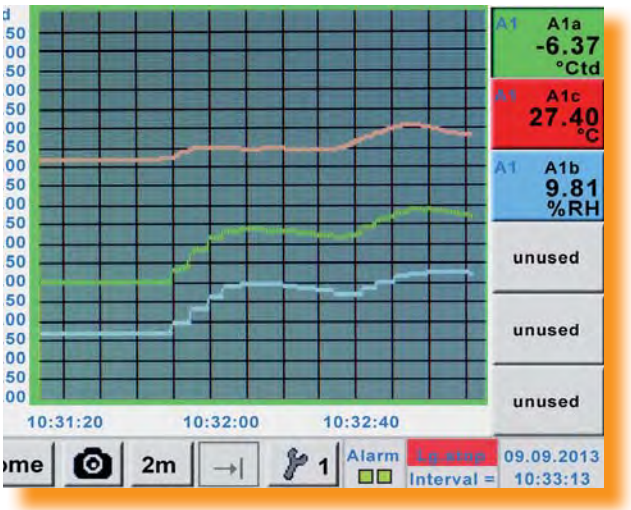
The measured values of all sensors can be retrieved via Modbus protocol. A detailed protocol description is enclosed with each DS 400 instrument. When using the Ethernet interface the IP address at DS 400 can be freely adjusted. As an alternative DS 400 waits for the address allocation by a DHCP server.

Innovations



Summation of several flow sensors

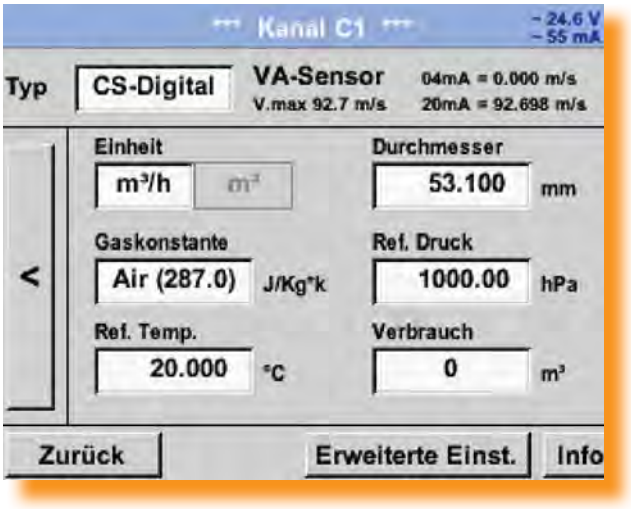
By means of the option „mathematics calculation function“ (order no. Z500 4007) it is possible to calculate mathematically the sum of several connected flow sensors. Of course the new „virtual“ value „sum of all sensors“ can also be indicated graphically and stored in the data logger.



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.

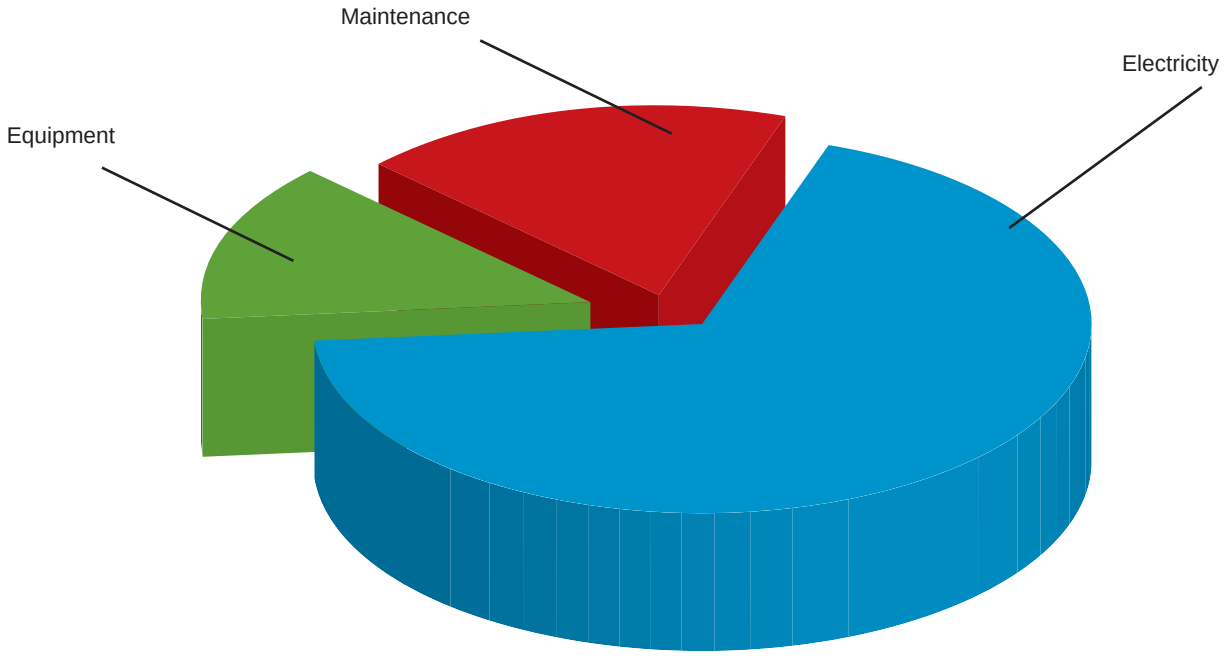
Consumption and **flow measurement**

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

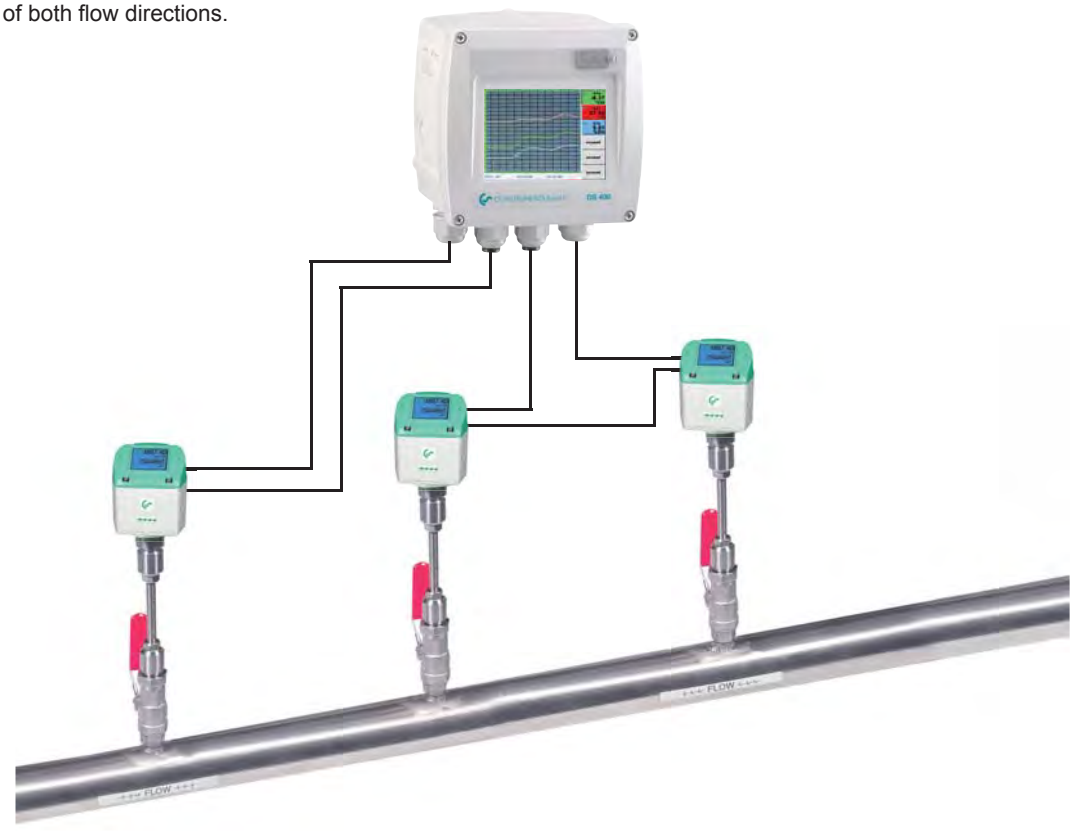
In case the flow direction switch VA 409 indicates the flow direction and forwards this information to the flow sensor VA 500.

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.

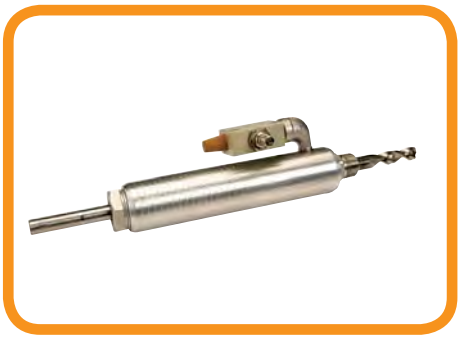
Measuring section 1/2“

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.

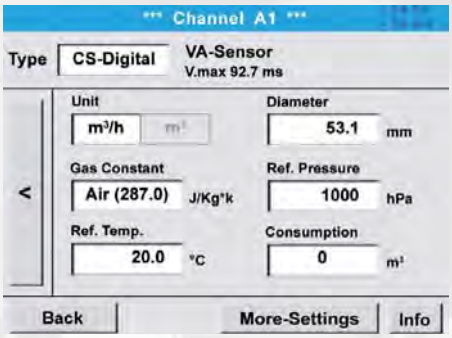
An additional pressure and temperature compensation is not necessary.

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.



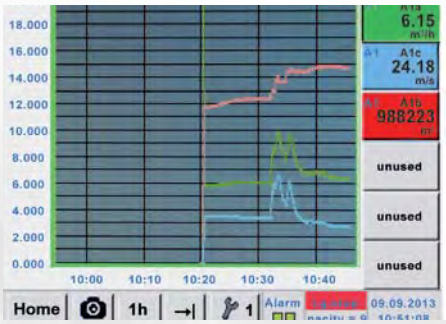
An alarm delay can be set for each relay. This grants that only really long-term exceeding of the threshold values are indicated. Additionally every alarm can be reset.

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.



ware.

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

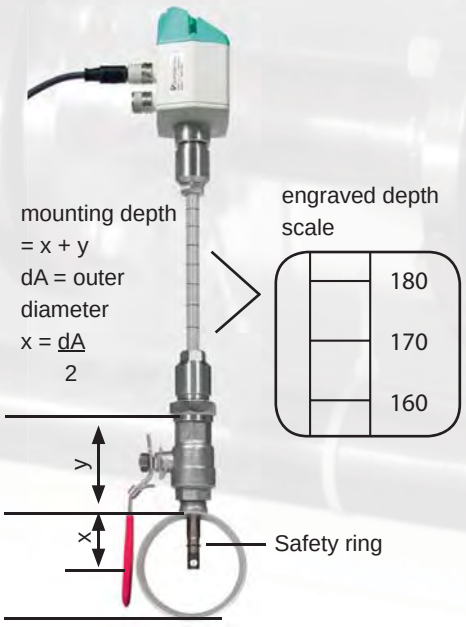
If no 1/2“ ball valve is present to carry out the installation of the VA 500 sensor, we have two possible alternatives to offer:

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.

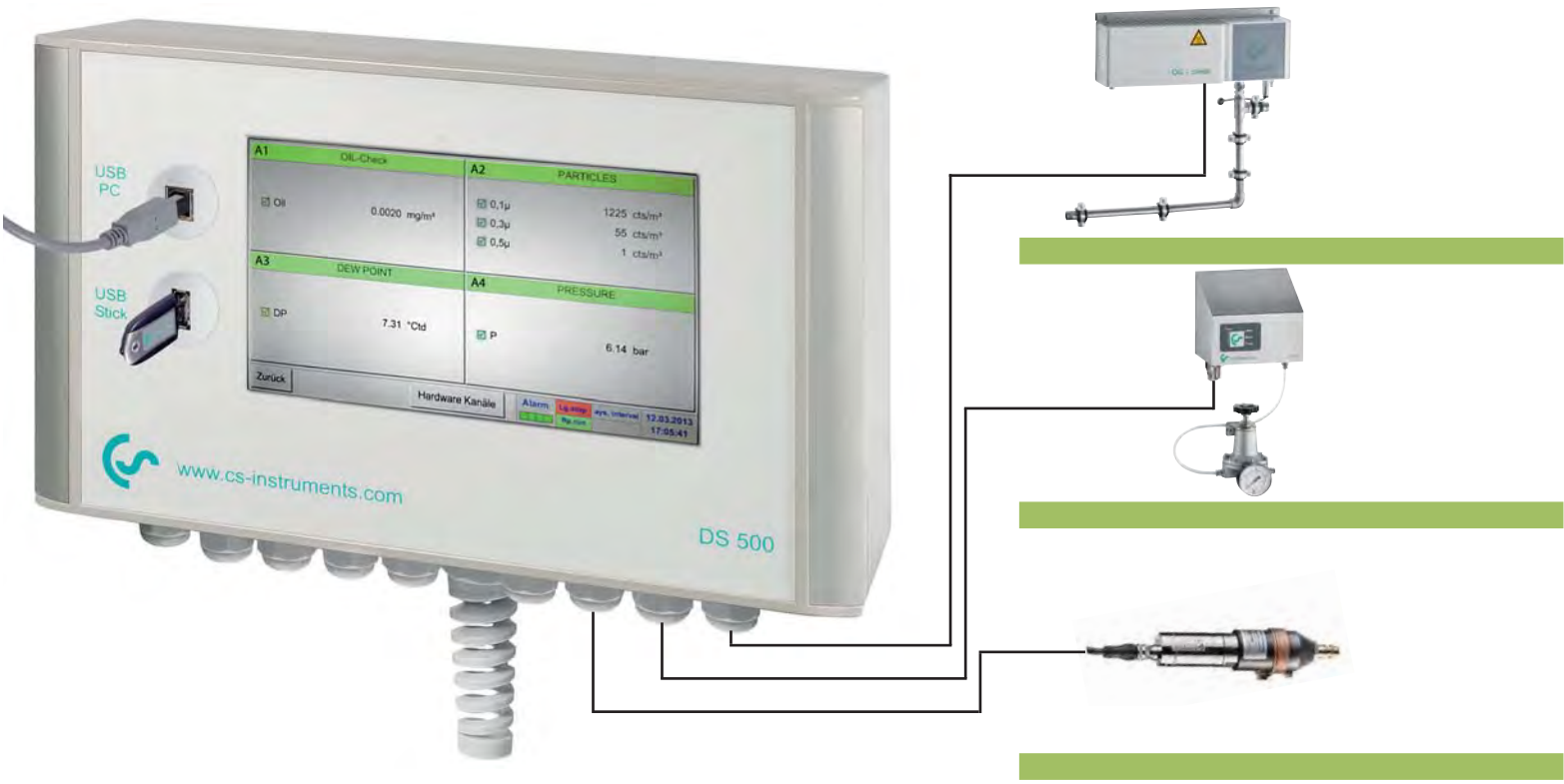
Making use of the specialized drilling jig, it is then possible to drill a whole into the pipe work under load. The filings are caught in a special filter system at the drilling jig. Afterwards the VA 500 probe should be installed as described above.

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



Compressed air quality meas. according to ISO 8573

Residual oil content - particles - moisture



DS 500 - the intelligent chart recorder of the next generation.

The centerpiece of compressed air quality measurement is the chart recorder DS 500. It measures and documents the measured data of the sensors for residual oil content, particles and moisture. The measured values are indicated on the 7“ color screen. The curve progressions from the beginning of the measurement can be viewed by an easy slide of the finger. The integrated data logger stores the measured values safely and reliably. The threshold value can be freely entered for each measured parameter. 4 alarm relays are available for automatic alarm in case of an exceeding of the threshold values. Optionally DS 500 can be upgraded with up to 12 sensor inputs. For connection to a PLC DS 500 has an Ethernet interface as well as a RS 485 interface. The communication is done via the Modbus protocol.

Extract from ISO 8573-1 - threshold values

ISO 8573-1:2010 Class	Solids			Water	Oil
	Maximum number of particles per m³			Pressure dew point vapor	Totalshare in oil (liquid aerosol and mist)
	0.1 - 0.5 µm	0.5 - 1 µm	1 - 5 µm		mg/ m³
0	According to determination by the instruments user, more severe requirements than Class 1				
1	<= 20,000	<= 400	<= 10	<= -70 °C	0.01
2	<= 400,000	<= 6,000	<= 100	<= -40 °C	0.1
3	--	<= 90,000	<= 1,000	<= -20 °C	1
4	--	--	<= 10,000	<= +3 °C	5
5	--	--	<= 100,000	<= +7 °C	--
6	--	--	--	<= +10 °C	--
7	--	--	--	--	--
8	--	--	--	--	--
9	--	--	--	--	--
x	--	--	--	--	--

Residual oil content measurement - OIL check

The residual oil content sensor OIL check measures the vaporous residual oil content in the compressed air. By means of a sample taking a representative part volume flow is taken from the compressed air and led to the OIL check.
Due to the continuous measurement threshold value exceeding will be recognized immediately and remedial actions initiated.

Particle counter PC 400

The highly precise optical particle counter PC 400 measures particles from a size of 0.1 µm and is therefore suitable for monitoring of the compressed air quality class 1 (ISO 8573). The correct function the filtration elements mounted in the compressed air is monitored and possible filter perforations are recognized immediately. The compressed air flow through the particle counter is automatically supervised.

Moisture - dew point sensor FA 510

FA 510 measures the pressure dew point in the compressed air down to -80 °Ctd.
The mounting is effected either directly into the pipe via the G 1/2“ thread or better by means of the measuring chamber which allows a defined stream of about 2 l/min to bypass the sensor. Also in this case the continuous measurement takes care that alert is triggered immediately if the compressed air dryer breaks down.

Technical data DS 500

Dimensions housing:	280 x 170 x 90 mm, IP 65, 7.3 kg
Connections:	18 x PG 12 for sensors and power supply, alarm relay 1 x RJ 45 Ethernet connection
Version panel mounting:	Cutout panel 250 x 156 mm
Weight:	7.3 kg
Material:	Diecast, front keypad: Polyester
Sensor inputs:	4/8/12 sensor inputs for analogue and digital sensors freely assignable, see options. Digital CS sensors for dew point and flow with SDI interface FA/ VA series. Digital third-party sensors RS 485 / Modbus RTU, other bus systems can be realized on request. Analogue CS sensors for pressure, temperature, clamp-on ammeters pre-configured. Analogue third-party sensors 0/4...20 mA, 0...1/10/30 V, pulse, Pt 100 / Pt 1000, KTY
Power supply sensors:	24 VDC, max. 130 mA per sensor, integrated mains unit max. 24 VDC, 25 W In case of version 8/12 sensor inputs 2 integrated mains units each 24 VDC, 25 W
Interfaces:	USB stick, Ethernet / RS 485 Modbus RTU / TCP
Alarm relays:	4 relays (changeover contact 230 VAC, 6 A), alarm management relays freely programmable, collective alarm. Analogue output, pulse in case of sensors with own signal output looped, like e.g. VA/FA Series
Memory card:	Memory size 4 GB SD memory card
Power supply:	100...240 VAC / 50-60 Hz, special version 24 VDC
Color screen:	7“ touch panel TFT transmissive, graphics, curves, statistics
Accuracy:	see sensor specifications
Operating temperature:	0...50 °C
Storage temperature:	-20...70 °C
Optional:	Webserver

Technical data OIL Check

Dimensions:	487 x 170 x 120 mm (W x H x D)
Power supply:	230 VAC 50 Hz ±10% resp. 115 VAC 60 Hz ±10%
Medium:	Compressed air
Noticeable substances	Polyalphaolefins aliphatic hydrocarbons hydrocarbons functional hydrocarbons aromatics
Ambient temp.:	+5 ... +45 °C
Compres.air temp.:	+5 ... +55 °C
Operating over-pres.:	3 bar ... max. 16 bar (ü)*
Meas.gas humidity:	<= 40% rel. humidity
Measuring unit:	mg/m³ (standard cubic meters in accordance with ISO 1217; 1 bar, 20°C, 0% rel. humidity)
Measuring range:	0,0006 - 5 mg/m³ residual oil vapor content
Measuring accuracy:	0.003 mg/m³
Detection limit:	0.0006 mg/m³
Connections:	G 3/8“ internal thread. Please observe install. instructions
Installation requirements:	Vertically** into the rising main pipe via oil and grease free measuring section
Inlet section:	10 x DN (min.200 mm) according to ISO 8573-2
Outlet section:	3 x DN (min. 100 mm) according to ISO 8573-2

* further operating pressures on request
** horizontal mounting on request

Technical data PC 400

Measuring range:	Number of particles per m³ Particle size channels: 0.1...0.5 µm, 0.5...1 µm, 1...5 µm Further particle size channels on request
Flow rate:	28.3 l/min (1 cfm)
Light source:	Laser diode
Interface:	RS 485 (Modbus protocol)
Power supply:	24 VDC, 300 mA
Dimensions:	150 x 200 x 300 mm
Weight:	8 kg

Technical data FA 510

Measuring range:	-80...20 °Ctd
Accuracy:	± 1 °C at 20...-20 °Ctd ± 2 °C at -20...-50 °Ctd ± 3 °C at -50...-80 °Ctd
Pressure range:	-1...50 bar (with measuring chamber 16 bar, special version up to 350 bar)
Protection class:	IP 65
EMV:	according to DIN EN 61326
Operating temp.:	-20...70 °C
Burden:	< 500 Ω
Screw-in thread:	G 1/2“ without meas. chamber

Stationary solution with particle counter PC 400 and DS 400

Description	Order No.
PC 400 particle counter up to 0.1 µm for compressed air and gases incl. pressure reducer, incl. calibration certificate	0699 0040
Connection cable 5 m	0553 0108
DS 400 chart recorder with graphic display and touch screen operation	0500 4000 D
Option: Integrated data logger for 100 million measured values	Z500 4002
Option: Integrated Ethernet and RS 485 interface	Z500 4004
CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB or Ethernet	0554 7040
Alternative version to PC 400 up to 0.1 µm: PC 400 particle counter up to 0.3 µm for compressed air and gases incl. pressure reducer, incl. calibration certificate	0699 0041

Portable solution with particle counter PC 400 and DS 500 mobile

The particle counter fixed onto a portable mounting plate with pedestal

Description	Order No.
PC 400 particle counter up to 0.1 µm for compressed air and gases incl. pressure reducer, incl. calibration certificate	0699 0040
Connection cable for third-party sensors to portable devices, ODU/open ends, 5m	0553 0501
Portable mounting plate with pedestal	0554 6016
Chart recorder DS 500 mobile , 4 sensor inputs	0500 5012
CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB or Ethernet	0554 7040
Alternative version to PC 400 up to 0.1 µm: PC 400 particle counter up to 0.3 µm for compressed air and gases incl. pressure reducer, incl. calibration certificate	0699 0041

Portable solution with particle counter PC 400 in a service case and DS 500 mobile

Description	Order No.
PC 400 particle counter up to 0.1 µm for compressed air and gases incl. pressure reducer, incl. calibration certificate in a service case	0699 0042
Connection cable for third-party sensors to portable devices, ODU/open ends, 5m	0553 0501
Chart recorder DS 500 mobile , 4 sensor inputs	0500 5012
CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB or Ethernet	0554 7040
Alternative solution to PC 400 up to 0.1 µm: PC 400 particle counter up to 0.3 µm for compressed air and gases incl. pressure reducer, incl. calibration certificate in a service case	0699 0043

Re- calibration of particle counter PC 400

Description	Order No.
Re- calibration particle counter PC 400 with Certificate	0699 3304

Stationary solution with OIL-Check and DS 400

Description	Order No.
OIL-Check residual oil content measurement for vaporous residual oil content (DN 20-DN 40), 3-16 bar, measuring range <0.01...5.000 mg/m³, including sampling probe (DN 20-DN 40), inspection certificate, 4...20 mA analogue output. Please order measuring section for sampling separately.	0699 0060
OII-Check measuring section for sampling (DN 20, 3/4“, 16 bar, stainless steel, outer diameter 26.9 mm, outer thread R 3/4“)	4000 2001
Ball valve G 3/8“ incl. connection fittings for installation between sampling probe and OIL-Check, cleaned oil- and grease-free	3300 0004
Connection plug for 4...20 mA analogue output	3300 0005
Connection cable 5 m	0553 0108
DS 400 chart recorder with graphic display and touch screen operation	0500 4000 A
Option: Integrated data logger for 100 million measured values	Z500 4002
Option: Integrated Ethernet and RS 485 interface	Z500 4004
CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB or Ethernet	0554 7040
OIL-Check versions for different pipe diameters: OIL-Check - residual oil content measurement for vaporous residual oil content (DN 50 - DN 80), 3-16 bar, meas.range <0.01...5.000 mg/m³ including sampling probe (DN 50 - DN 80), inspection certificate, 4...20 mA analogue output. Please order meas. section for sampling separately.	0699 0061
OIL-Check - residual oil content measurement for vaporous residual oil content (>DN 80), 3-16 bar, meas.range <0.01...5.000 mg/m³, incl. sampling probe (customer-specific length), insp. certificate, 4...20 mA analogue output. Please order meas. section for sampling separately.	0699 0062
OIL-Check measuring section for sampling (DN 25, 1“), 16 bar, stainless steel, outer diameter 33.7 mm, R 1“	4000 2002
OIL-Check measuring section for sampling (DN 32, 1 1/4“), 16 bar, stainless steel, outer diameter 42.4 mm, R 1 1/4“	4000 2003
OIL-Check measuring section for sampling (DN 40, 1 1/2“), 16 bar, stainless steel, outer diameter 48.3 mm, R 1 1/2“	4000 2004
OIL-Check measuring section for sampling (DN 50, 2“), 16 bar, stainless steel, outer diameter 60.3 mm, R 2“	4000 2005
OIL-Check measuring section for sampling (DN 65, 2 1/2“), 16 bar, stainless steel, outer diameter 76.1 mm, R 2 1/2“	4000 2006
OIL-Check measuring section for sampling (DN 80, 3“), 16 bar, stainless steel, outer diameter 88.9 mm, R 3“	4000 2007
Stainless steel pipe 6x1 mm for horizontal installation, length max. 1000 mm including connection fittings	4000 2008
Replacement unit OIL-Check for the period of re-calibration	0699 3910
Replacement unit OIL-Check with DS 400 for the period of re-calibration	0699 3920
Re- calibration Oil Check with Certificate	0699 3301
Re- calibration and maintenance Oil Check, with Certificate, rate 1 up to 8760 hours of operation	0699 3302
Re- calibration and maintenance Oil Check, with Certificate, rate 2 over 8760 hours of operation	0699 3303

Stationary solution with OIL-Check, particle counter PC 400 and DS 500

Description	Order No.
OIL-Check residual oil content measurement for vaporous residual oil content (DN 20-DN 40), 3-16 bar, measuring range <0.01...5.000 mg/m³, including sampling probe (DN 20-DN 40), inspection certificate, 4...20 mA analogue output. Please order measuring section for sampling separately.	0699 0060
OIL-Check measuring section for sampling (DN 20, 3/4“), 16 bar, stainless steel, outer diameter 26.9 mm, outer thread R 3/4“	4000 2001
Ball valve G 3/8“ incl. connection fittings for installation between sampling probe and OIL-Check, cleaned oil- and grease-free	3300 0004
Connection plug for 4...20 mA analogue output	3300 0005
Connection cable 5 m	0553 0108
PC 400 particle counter up to 0.1 µm for compressed air and gases incl. pressure reducer, incl. calibration certificate	0699 0040
Connection cable 5 m	0553 0108
DS 500 - intelligent chart recorder in basic version (4 sensor inputs)	0500 5000
CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB or Ethernet	0554 7040
OIL-Check versions for different pipe diameters: Optionally available: dew point sensor, pressure sensor, flow sensor	Please see above

Portable solution with OIL-Check, particle counter PC 400 + DS 500 mobile

Description	Order No.
OIL-Check residual oil content measurement for vaporous residual oil content (DN 20-DN 40), 3-16 bar, measuring range <0.01...5.000 mg/m³, including sampling probe (DN 20-DN 40), inspection certificate, 4...20 mA analogue output. Please order measuring section for sampling separately.	0699 0060
OIL-Check measuring section for sampling (DN 20, 3/4“), 16 bar, stainless steel, outer diameter 26.9 mm, outer thread R 3/4“	4000 2001
Mobile transport trolly with wheels	0554 6015
Connection plug for 4...20 mA analogue output	3300 0005
Connection cable for third-party sensors to portable devices, ODU/open ends, 5 m	0553 0501
PC 400 particle counter up to 0.1 µm for compr. air and gases, incl. pressure reducer, incl. calibration certificate	0699 0040
Connection cable for third-party sensors to portable devices, ODU/open ends, 5 m	0553 0501
DS 500 mobile - intelligent chart recorder in basic version (4 sensor inputs)	0500 5012
CS Soft Basic - data evaluation in graphic and table form - reading out of the measured data via USB or Ethernet	0554 7040

Leak detector LD 400 - Highly sensitive leak detector

If gases escape through leaks in piping systems (e.g. untight screwed connections, corrosions and so on) ultrasonic noises are generated. By means of **LD 400** even the smallest leakages which cannot be heard by the human ear and which are not visible due to their size can be detected even from distances of several meters. **LD 400** transforms the inaudible signals into a frequency which can be identified. By means of the comfortable sound-proof headset these noises can be realized even in extremely noisy environments.

The **LD 400 leak detector** is the advancement of the proven LD 300 and it convinces by its obviously refined sensor technology and its improved support in the tracing of leaks.
By means of the integrated laser pointer which serves for target heading the leak can be localized more accurately.

LD 400
meets the requirements of Class I instruments of the **„Standard Test Method for leaks using Ultrasonic“** (ASTM Int. - E1002-05)

Sound-proof headset enables leak detection in extremely noisy environments

Annual energy costs caused by leakages

Hole Ø (mm)	**Loss in air** at 6 bar (l/s)	at 12 bar (l/s)	**Energy loss** at 6 bar kWh	at 12 bar kWh	**Costs p.a.** at 6 bar €	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	6.096
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				(*) kWh x 0.06 € x 8.000 Bh/a		

LD 400 with focus tube and focus tip for precise locating

Applications

Leak detection in:

- **Compressed air lines, gas, vapor and vacuum plants**
- **Refrigerating plants**
- **Door seals**

LD 400 leak detector

Due to a particularly designed acoustic trumpet a better focusing of the acoustic waves is achieved. This acoustic trumpet acts like a directional microphone while interfering ambient noises are cushioned and the accurate localization of the leakages is eased even in areas which are difficult to access. Due to the special design of the acoustic trumpet the use of the laser pointer is not obstructed.
A handy ultrasonic transmitter is available for detecting leaks in depressurized systems. The transmitter is positioned in a way that the sound can access the piping system. The ultrasonic signal passes through smallest holes which then can be detected by means of **LD 400**. Even very small leaks at hatches, doors and windows can be realized.

Special features

- Robustness and the little weight ensure a fatigue-proof use in industrial environments
- Improved detection of leaks with optional acoustic trumpet
- Modern lithium-ion battery with high capacity, external recharger
- Minimum operating time 10 h
- Easy operation via keypad

LD 400 is available either as standalone device or in a complete set.
The set includes a robust impact-proof transportation case which contains all necessary components and accessories.

Description	Order No.
Set LD 400 consisting of:	**0601 0104**
LD 400 Leak detector	0560 0104
Transport case	0554 0106
Sound-proof headset	0554 0104
Focus tube with focus tip	0530 0104
Battery charger	0554 0009
Acoustic trumpet	0530 0109
Accessory, not included in the set: Ultrasonic tone generator	0554 0103

Technical data LD 400

Working frequency:	40 kHz ± 2 kHz
Connections:	3.5 mm stereo jack for headset Power supply socket for connecting a external recharger
Laser:	wave length: 645...660 nm output power: < 1 nW (laser class 2)
Operating duration:	10 hours
Charging time:	approx. 1.5 hours
Operating temp.:	0 to 40 °C
Storage temp.:	-10 °C to 50 °C

New

Affordable differential pressure sensor for testing filter performance

The filter effectiveness is guaranteed by measuring the differential pressure across the filter element (an indication of how much the filter element is soiled). The sensor has a compact design with mounting bracket and sensor socket combined in one.

Typical operation of the differential pressure sensor: Connection with two PE hoses before and after the filter element.

Technical data:

Meas. range:	0 ... 1.6 bar differential pressure
Max. system pressure:	10 bar
Max. overload capability two-way:	15 bar
Max. overload capability one-way:	
+ page	15 bar
- page	10 bar
Bursting pressure:	60 bar
Total error:	2.0 % of full scale
Output:	4 ... 20 mA two-wire
Power supply:	DC 10 ... 30 Vat output 4 ... 20 mA
Operating temperature ambient:	-20 ... +80 °C
Process connections:	2× G 1/8 inner thread including plug-in coupling for 6-mm hose
Electrical connection:	Round plug M12 × 1

Advantages at hand:

- Pressure drops (loss in energy) kept at a minimum
- Filter elements are being exchanged according to the differential pressure specifications of the manufacturer and not by a measure of time (activated carbon filter excluded). This ensures maximum performance of the filter element at all times.

Description	Order No.
Differential Pressure Sensor 1.6 bar diff	**0694 3561**
Connection cable for sensors 5 m with open ends	0553 0108
Connection cable for sensors 10 m with open ends	0553 0109
Connection cable for pressure, temperature or external sensors on mobile instruments, ODU / open ends, 5 m	0553 0501
Connection cable for pressure, temperature, or external sensors on mobile instruments, ODU / open ends, 10 m	0553 0502

The longer a filter element is in use the dirtier it gets, hence, increasing the differential pressure. This has a direct impact on its performance and the energy loss – see diagram below.

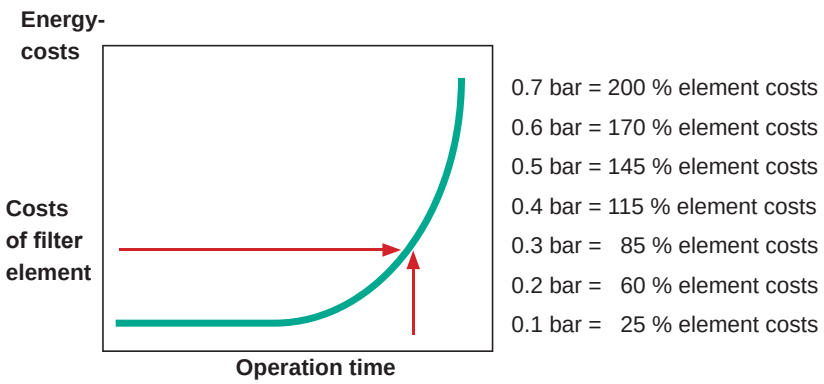


Diagram: Typical differential pressure process, energy costs in relation to filter element

PI 500 Set for mobile measurement

1 PI 500 portable measuring instrument with integrated data logger	0560 0511
2 Differential Pressure Sensor 1.6 bar diff	0694 3561
3 Connection cable for pressure, temperature or external sensors on mobile instruments, ODU / open ends, 5 m	0553 0501

DS 52 Set for stationary measurement

1 DS 52 LED display in wall housing	0500 0009
2 Differential Pressure Sensor 1.6 bar diff	0694 3561
3 Connection cable for sensors 5 m with open ends	0553 0108

DS 52 - Digital process meter

In wall housing for 0 (4)...20 mA signals

With the digital process meter DS 52 in a shapely wall housing the annoying search and the mounting into a suitable plastic housing is no longer necessary. DS 52 disposes of 2 potential-free alarm contacts (switch-over contacts) which can be charged with maximum 230 VAC, 3 A. The alarm limits can be adjusted via the keys.

The display is supplied with 230 VAC and disposes of an internal mains unit which provides a voltage of 24 VDC/100 mA for the sensor. Free screwing clamps are available for forwarding the (0) 4...20 mA signal to superordinate systems.

Special features:

- Integrated in a shapely wall housing
- Suitable for all customary sensors with 0 (4) ...20 mA signal
- Easy operation
- 2 relay outputs (230 VAC, 3 A)

Example of use:

Pressure monitoring with optional alarm unit (buzzer + continuous light)

Example of use:

Temperature monitoring with alarm

Technical data DS 52

Dimensions:	118 x 133 x 92 mm (WxHxD)
Display:	LED, 5 digits, height 13 mm, 2 LED for alarm
Keypad:	4 keys: Enter, Back, Up, Down
Sensor input:	For sensors with 0(4)...20 mA signal. Connectable in 2-/3-4-wire technology
Accuracy:	max. +/- 20 µA, typical +/- 10 µA
Burden:	100 Ω
Sensor supply:	24 VDC, max.100 mA
Voltage supply: (option)	230 VAC, 50/60 Hz or 24 VDC or 110 VAC
Outputs:	2 x relay output, changeover contact,250 VAC, max.3A
Alarm limits:	Freely adjustable via keypad
Hysteresis:	Freely adjustable via keypad
Operation temp.:	-10...+60 °C (storage temp.: -20...+80 °C)
Operation menu:	Lockable by code against third-party access

Description	Order No.
DS 52 LED display in wall housing	0500 0009
Options:	
Supply 24 VDC instead of 230 VAC	Z500 0001
Supply 110 VAC instead of 230 VAC	Z500 0002
Alarm unit mounted at wall housing	Z500 0003
Alarm unit for external mounting	Z500 0004
All-in-one sets:	
DS 52 - all-in-one set for pressure monitoring/ alerting, consisting of DS 52 LED display and pressure sensor 0...16 bar	on request
DS 52 - all-in-one set for temperature monitoring/ alerting, consisting of DS 52 LED display and screw-in temperature probe -50...+500°C	on request

DS 51 - Digital panel meter

For 0 (4)...20 mA signals

The DS 51 digital panel meter disposes of 2 potential-free alarm contacts (change- over adjusted via the keys.

The digital panel meter is supplied wiht 230 VAC and disposes of an internal mains unit which provides the voltage supply of 24 VDC/100 mA for the sensor.

Special features:

- Suitable for all customary sensors with 0(4)...20 mA signal
- Easy operation
- 2 relay outputs (230 VAC, 3 A)

Description	Order No.
DS 51 - digital meter for panel mounting, supply 230 VAC, sensor input for 0(4)...20 mA signal, 2 alarm relays	0500 0006
Options:	
Supply 24 VDC instead of 230 VAC	Z500 0001
Supply 110 VAC instead of 230 VAC	Z500 0002

Technical data DS 51

Dimensions:	96 x 48 mm (WxH) Mounting depth: 95 mm
Display:	LED, 5 digits, height 13 mm, 2 LED for alarm
Keypad:	3 keys: Set, Up, Down
Sensor input:	For sensors with 0(4)...20 mA signal. Connectable in 2-/3-4-wire technology
Accuracy:	max. +/- 20 µA, typical +/- 10 µA
Burden:	100 Ω
Sensor supply:	24 VDC, max.100 mA
Voltage supply: (option)	230 VAC, 50/60 Hz or 24 VDC or 110 VAC
Outputs:	2 x relay output, changeover con-tact,250 VAC, max.3A
Alarm limits:	Freely adjustable via keypad
Hysteresis:	Freely adjustable via keypad
Operation temp.:	-10...+60 °C (storage temp.: -20...+80 °C)
Operation menu:	Lockable by code against third-party access

Notes:

Notes:

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