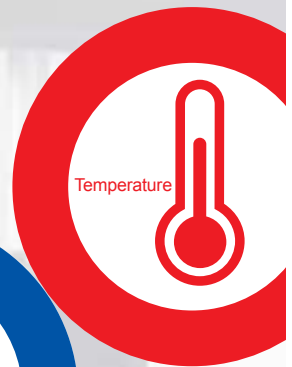
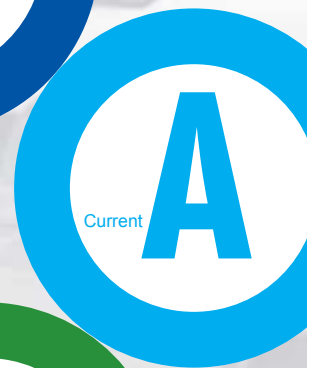




CS INSTRUMENTS GmbH

Proven and innovative  
measuring technology for  
compressed air and gases

# Catalogue for measuring professionals 2011/2012





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Dew point

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|--|--|--------|

Extract from the customers list:





## Confidence is good – measuring is better

### Approved and innovative measuring technology of CS Instruments GmbH

Welcome to the new CS Instruments catalogue 2011/2012 drawn up for measuring professionals.

Increasing energy costs force many enterprises to use possible savings in case of different kinds of energy like compressed air, electrical energy, gas, cooling energy/

thermal energy, ... For this purpose the consumptions and the costs within an enterprise have to be transparent.

CS Instruments GmbH accommodated this trend with its newly developed intelligent chart recorder DS 500. Up to 12 energy counters (current counters, heat meters,

water meters, gas meters etc.) can be connected to DS 500 and evaluated automatically.

Daily, weekly or monthly reports give a quick survey on the consumption and the cost savings of saving measures which have been carried out.



Picture:

**DS 500**

(For details please see pages 4 to 11)

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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" colour screen with touch panel...
- **Versatile:** Up to 12 optional sensors can be connected...
- **Easy:** Very easy operation, automatic sensor identification...
- **Reliable:** Stores all measured values reliably, 4 alarm relays for threshold exceedings...
- **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...
- **... Saves time and costs during installation**

### DS 500 — the intelligent chart recorder of the next generation

For more than 20 years CS Instruments has been developing, manufacturing and marketing measuring instruments for compressed air and gases. Our long-term practical experience in measurement and control technology was implemented in the new DS 500.

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

or e-mail. On the big 7" colour screen with touch panel all information are available at a glance. The operation is very easy. All measured values, measured curves and threshold exceedings 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 m<sup>3</sup> 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.

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.**



## Technical data DS 500

|                                 |   |
|---------------------------------|---|
| <b>Dimensions of housing</b>    | 280 x 170 x 90 mm, IP 65  |
| <b>Connections</b>              | 18 x PG 12 for sensors and supply, alarm relays<br>1 x RJ 45 Ethernet connection  |
| <b>Version panel mounting</b>   | Cutout panel 250 x 156 mm   |
| <b>Weight</b>                   | 7.3 kg  |
| <b>Material</b>                 | Die cast metal, front screen polyester  |
| <b>Sensor inputs</b>            | 4/8/12 sensor inputs for analogue and digital sensors freely allocatable. See options<br><br>Digital CS sensors for dew point and consumption with SDI interface FA/VA 400 Series,<br>Digital third-party sensors RS 485 / Modbus RTU, other Bus systems realizable on request<br><br>Analogue CS sensors for pressure, temperature, clamp-on ammeters preconfigured<br><br>Analogue third-party sensors 0/4 ..20 mA, 0..1/10/30V, pulse, Pt 100 / Pt 1000, KTY |
| <b>Power supply for sensors</b> | 24 VDC, max. 130 mA per sensor, integrated mains unit max. 24 VDC, 25 W<br>in case of version 8/12 sensor inputs 2 integrated mains units each max.24 VDC, 25 Watt  |
| <b>Interfaces</b>               | USB stick, USB cable, Ethernet / RS 485 Modbus RTU / TCP, SDI other bus systems on request, WEB server optionally   |
| <b>Outputs</b>                  | 4 relays (changeover contact 230 VAC, 6 A), alarm management, relays freely programmable, collective alarm<br><br>Analogue output, pulse in case of sensors with own signal output looped, like e. g. VA/FA Series  |
| <b>Memory card</b>              | Memory size 2 GB SD memory card standard, optionally up to 4 GB   |
| <b>Power supply</b>             | 100...240 VAC / 50-60 Hz, special version 24 VDC  |
| <b>Colour screen</b>            | 7" touch panel TFT transmissive, graphics, curves, statistics   |
| <b>Accuracy</b>                 | see sensor specifications   |
| <b>Operating temperature</b>    | 0...50°C  |
| <b>Storage temperature</b>      | -20...70°C  |
| <b>Optionally</b>               | Web server  |
| <b>Optionally</b>               | Quick measurement with 10 ms sampling rate for analogue sensors, Max/Min indication per second  |
| <b>Optionally</b>               | Option "consumption 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 "consumption report" statistics, daily/weekly/monthly report  | Z500.5004 |
| Option "quick measurement with 10 msec sampling rate" for analogue sensors   | Z500.5005 |
| Option version for panel mounting  | Z500.5006 |
| Option power supply 24VDC (instead of 100...240 VAC)   | Z500.5007 |
| CS Soft Basic for DS 500 - data evaluation in graphic and table form, reading out of the measured data of one DS 500 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

|                       |   |
|-----------------------|---|
| <b>Current signal</b> | (0...20mA/4...20mA)<br>internal or external power supply      |
| Measuring range       | 0...20 mA   |
| Resolution            | 0.0001 mA   |
| Accuracy              | ± 0.003 mA ± 0.05 %   |
| Input resistance      | 50 Ω  |
| <b>Voltage signal</b> | (0...1 V)   |
| Measuring range       | 0...1 V   |
| Resolution            | 0.05 mV   |
| Accuracy              | ± 0.2 mV ± 0.05 %   |
| Input resistance      | 100 kΩ  |
| <b>Voltage signal</b> | (0...10 V / 30 V)   |
| Measuring range       | 0...10 V  |
| Resolution            | 0.5 mV  |
| Accuracy              | ± 2 mV ± 0.05 %   |
| Input resistance      | 1 MΩ  |
| <b>RTD Pt 100</b>     |   |
| Measuring range       | -200...850° C   |
| Resolution            | 0.1° C  |
| Accuracy              | ± 0.2° C (-100...400° C)<br>± 0.3° C (further range)          |
| <b>RTD Pt 1000</b>    |   |
| Measuring range       | -200...850° C   |
| Resolution            | 0.1° C  |
| Accuracy              | ± 0.2° (-100...400° C)  |
| <b>Pulse</b>          |   |
| Measuring range       | min pulse length 100 µs<br>frequency 0...1 kHz<br>max. 30 VDC |



# Multifunction

## DS 500

Intelligent chart recorder for compressed air and gases

### Versatile:

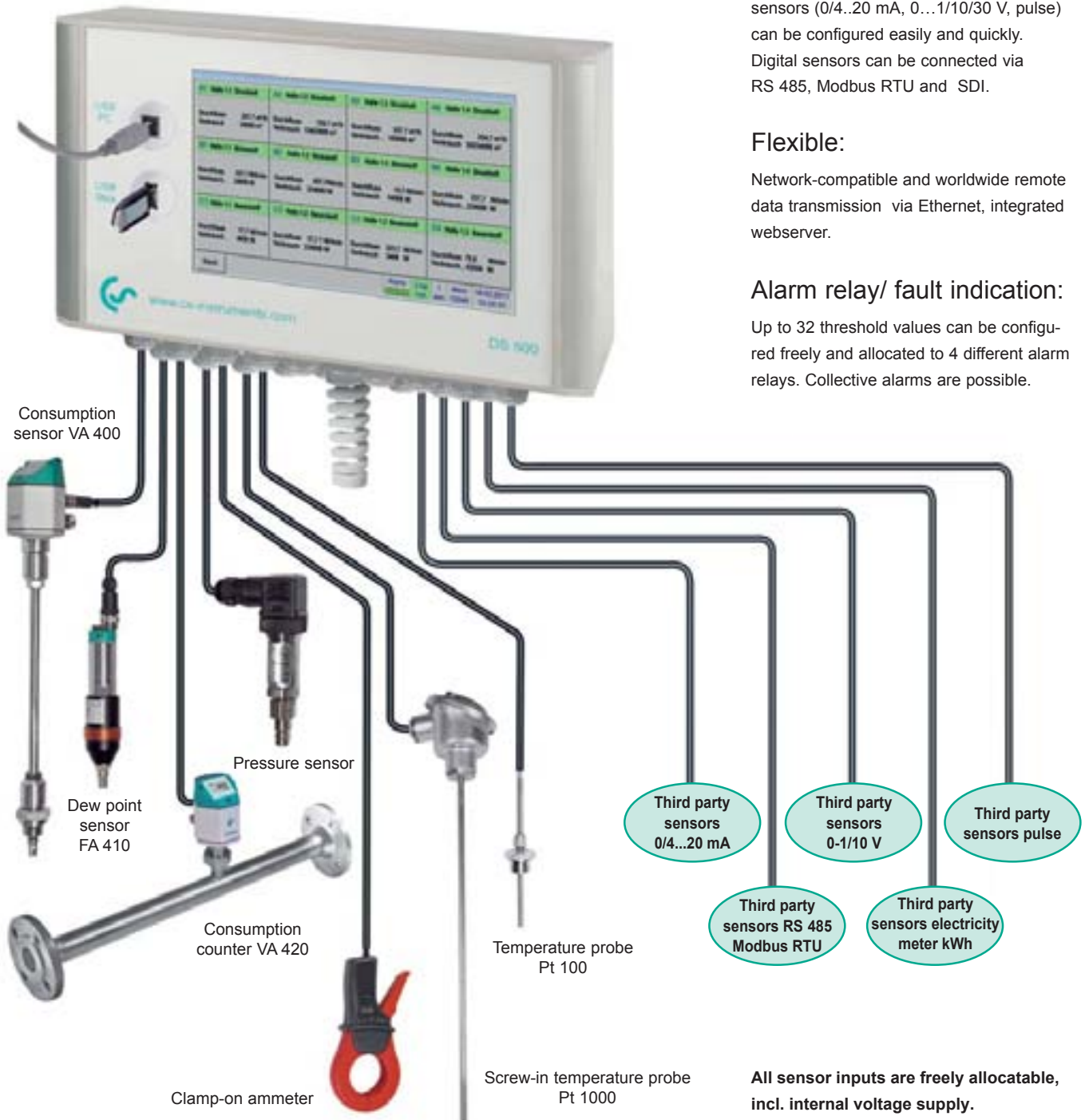
Up to 12 sensors, incl. all CS sensors (consumption, dew point, pressure, current, KTY, PT 100, PT 1000) are identified automatically by DS 500. Optional analogue sensors (0/4...20 mA, 0...1/10/30 V, pulse) can be configured easily and quickly. Digital sensors can be connected via RS 485, Modbus RTU 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.













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



MULTIFUNCTION

## Suitable probes from the CS Instruments product range

| Consumption sensors VA 400:   | Order no. |  |
|---|-----------|--|
| VA 400 consumption sensor in basic version:<br>Standard (92.7 m/s), sensor length 220 mm, without display                                 | 0695 4001 |  <br>Consumption     |
| Option for VA 400:  |           |  |
| Max. version (185 m/s)  | Z695 4003 |  |
| HighSpeed version (224 m/s)   | Z695 4002 |  |
| Sensor length 120 mm  | ZSL 0120  |  |
| Sensor length 160 mm  | ZSL 0160  |  |
| Sensor length 300 mm  | ZSL 0300  |  |
| Sensor length 400 mm  | ZSL 0400  |  |
| Consumption counters VA 420:  |           |  |
| Consumption counter VA 420 with integrated measuring section (R 1/4" DN 8)  | 0695 0420 |  <br>Consumption    |
| Consumption counter VA 420 with integrated measuring section (R 1/2 DN 15)  | 0695 0421 |  |
| Consumption counter VA 420 with integrated measuring section (R 3/4" DN 20)   | 0695 0422 |  |
| Consumption counter VA 420 with integrated measuring section (R 1" DN 25)   | 0695 0423 |  |
| Consumption counter VA 420 with integrated measuring section (R 1 1/4" DN 32)   | 0695 0426 |  |
| Consumption counter VA 420 with integrated measuring section (R 1 1/2" DN 40)   | 0695 0424 |  |
| Consumption counter VA 420 with integrated measuring section (R 2" DN 50)   | 0695 0425 |  |
|   |           |  |
| Dew point sensors:  |           |  |
| FA 410 dew point sensor, -80°...20°Ctd incl. inspection certificate   | 0699 0410 |  <br>Dew point   |
| FA 415 dew point sensor, -20°...50°Ctd incl. inspection certificate   | 0699 0415 |  |
| Standard measuring chamber for compressed air up to 16 bar  | 0699 3390 |  |
| Connection cables for VA 400, VA 420, FA 410 and FA 415:  |           |  |
| Connection cables for consumption sensors / dew point sensors:  |           |  |
| Connection cable 5 m  | 0553 0104 |  |
| Connection cable 10 m   | 0553 0105 |  |
| Pressure sensors:   |           |  |
| Standard pressure sensor CS 16, 0...16 bar, ± 1 % accuracy of full scale  | 0694 1886 |  <br>Pressure    |
| Standard pressure sensor CS 40, 0...40 bar, ± 1 % accuracy of full scale  | 0694 0356 |  |
| Standard pressure sensor CS 1,6 absolute, 0...1,6 bar abs., ± 1 % accuracy of full scale  | 0694 3551 |  |
| Standard pressure sensor CS 100, 0...100 bar, ± 1 % accuracy of full scale  | 0694 3557 |  |
| Standard pressure sensor CS 250, 0...250 bar, ± 1 % accuracy of full scale  | 0694 3558 |  |
| Standard pressure sensor CS 400, 0...400 bar, ± 1 % accuracy of full scale  | 0694 3559 |  |
| Precision pressure sensor CS, -1...+15 bar, ± 0.5 % accuracy of full scale  | 0694 3553 |  |
|   |           |  |
| Temperature probes:   |           |  |
| Screw-in temperature probe Pt 100, class A, length 300 mm, Ø 6 mm, with measuring transducer 4...20 mA = -50...+500°C (2-wire-technology) | 0693 0002 |  <br>Temperature |
| Temperature probe cable Pt 100, Class A, length 300 mm, Ø 6 mm, -50...+180 °C, 5 m probe connection cable with open ends                  | 0604 0102 |  |
| Temperature probe cable Pt 100, Class A, length 150 mm, Ø 6 mm,, -50...+180 °C, 5 m probe connection cable with open ends                 | 0604 0100 |  |
| Clamp screwing 6 mm, G1/2", VA clamping, pressure-tight up to 10 bar  | 0554 6004 |  |
|   |           |  |
| Connection cables for pressure sensors / temperature probes:  |           |  |
| 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 0507 |  <br>Current     |
| <b>Optional third-party sensors 0/4...20 mA, 0...1/10/30 V, PT 100 / PT 1000, KTY, pulse, RS 485 Modbus connectable.</b>                  |           |  |



# Multifunction

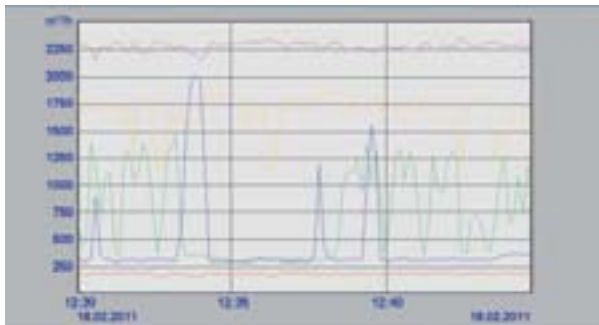
## All important information at a glance:

Measured values, statistics, curves with the 7 inch colour screen touch panel

|   |  |  |  |
|---|--|--|--|
| <b>A1 Hall 1.1 Compressed air</b>         | <b>A2 Hall 1.2 Compressed air</b>          | <b>A3 Hall 1.3 Compressed air</b>        | <b>A4 Hall 1.4 Compressed air</b>          |
| Flow 237.7 m³/h<br>Consumption 34006 m³   | Flow 729.7 m³/h<br>Consumption 13423009 m³ | Flow 537 m³/h<br>Consumption 155006 m³   | Flow 254.7 m³/h<br>Consumption 55234006 m³ |
| <b>B1 Hall 1.1 Nitrogen</b>               | <b>B2 Hall 1.2 Nitrogen</b>                | <b>B3 Hall 1.3 Nitrogen</b>              | <b>B4 Hall 1.4 Nitrogen</b>                |
| Flow 337.7 NI/min<br>Consumption 24009 NI | Flow 657.7 NI/min<br>Consumption 234006 NI | Flow 15.7 NI/min<br>Consumption 34006 NI | Flow 237.7 NI/min<br>Consumption 234006 NI |
| <b>C1 Hall 1.1 Oxygen</b>                 | <b>C2 Hall 1.2 Oxygen</b>                  | <b>C3 Hall 1.3 Oxygen</b>                | <b>C4 Hall 1.4 Oxygen</b>                  |
| Flow 17.7 NI/min<br>Consumption 4009 NI   | Flow 37.7 NI/min<br>Consumption 234006 NI  | Flow 223.7 NI/min<br>Consumption 3406 NI | Flow 75.8 NI/min<br>Consumption 43554 NI   |

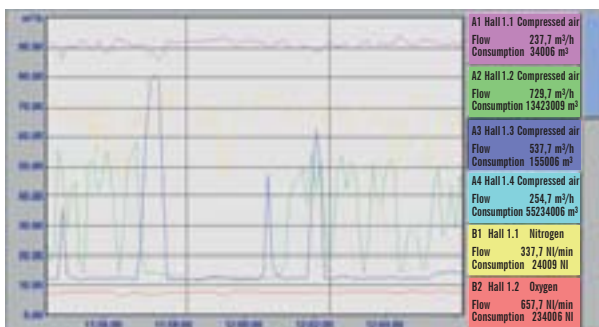
### Real time measured values

All measured values can be seen at a glance. Threshold exceedings are indicated in red colour. 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.

| Month/Year        | Consumption per month m³ | Costs €     | max value m³/h | min value m³/h | average m³/h | Total       |
|-------------------|--------------------------|-------------|----------------|----------------|--------------|-------------|
| 2010 May          | 7267                     | 109         | 3.7            | 36.9           | 16.9         | 358         |
| 2010 June         | 8930                     | 143         | 3.8            | 36.1           | 18.9         | 402         |
| 2010 July         | 7328                     | 110         | 3.8            | 37.3           | 14.8         | 327         |
| 2010 August       | 8099                     | 121         | 3.8            | 37.1           | 16.1         | 343         |
| 2010 September    | 7842                     | 118         | 3.8            | 36.9           | 16.9         | 337         |
| 2010 October      | 8187                     | 93          | 3.8            | 37.3           | 12.2         | 291         |
| 2010 November     | 9030                     | 138         | 3.8            | 37.8           | 17.8         | 315         |
| 2010 December     | 8062                     | 120         | 3.8            | 37.6           | 18.0         | 339         |
| <b>2010 Total</b> | <b>87963</b>             | <b>1489</b> | <b>3.8</b>     | <b>37.1</b>    | <b>16.3</b>  | <b>4164</b> |
| 2011 January      | 8888                     | 133         | 3.8            | 37.7           | 17.8         | 412         |

### 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 consumption 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.



## Flexible data transfer for each application

### 1. Data transfer via USB stick or USB cable

If no Ethernet-/Bus connection is existing or if the installation would be too costly the recorded data can be stored onto a USB

stick and transferred to the PC. DS 500 will automatically identify the USB stick. The user will be guided through the menu

"Read-out data". The data stored in the USB stick can be comfortably evaluated at the PC by means of the **CS Soft Basic**.



CS Soft Basic

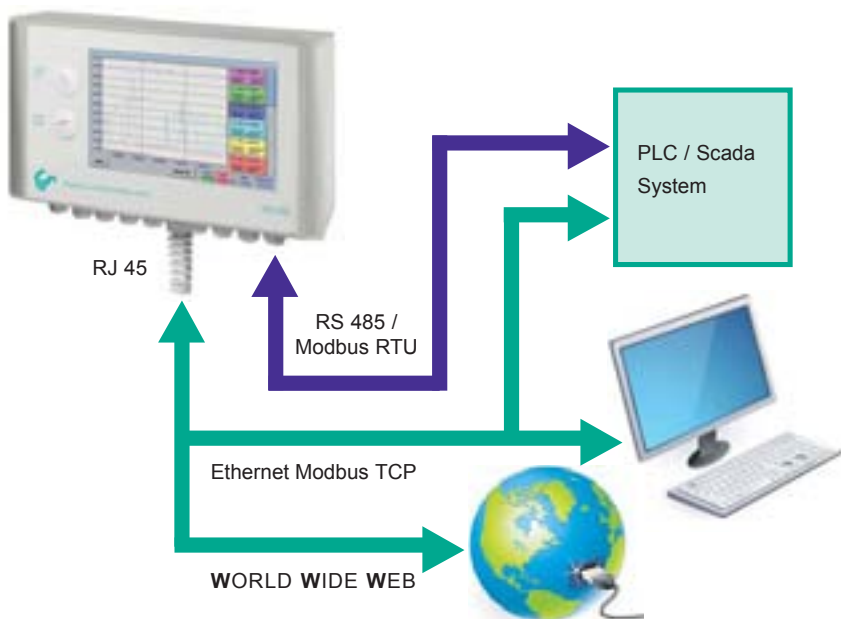


### 2. Data transfer, remote maintenance and consumption analysis via webserver and integrated Ethernet interface, Modbus, RS 485...

The current measured data and the stored measured data can be transferred via Ethernet or RS 485 (Modbus).

The integrated webserver enables the user to read out the measured data via internet. For the evaluation of the data at the PC the user can dispose of the comfortable and

versatile CS Soft Basic, which leaves nothing to be desired. Threshold exceedings can be sent via SMS and e-mail.



DS 500 can be connected via Ethernet/RS 485 to customers' own systems (PLC, Scada).

By means of the CS Soft Basic the data can be evaluated comfortably.

As an alternative the web server in DS 500 can be addressed via any web browser. Current measured values and consumption statistics can be transferred via the web server.



## Transparent measurement data any time at any PC

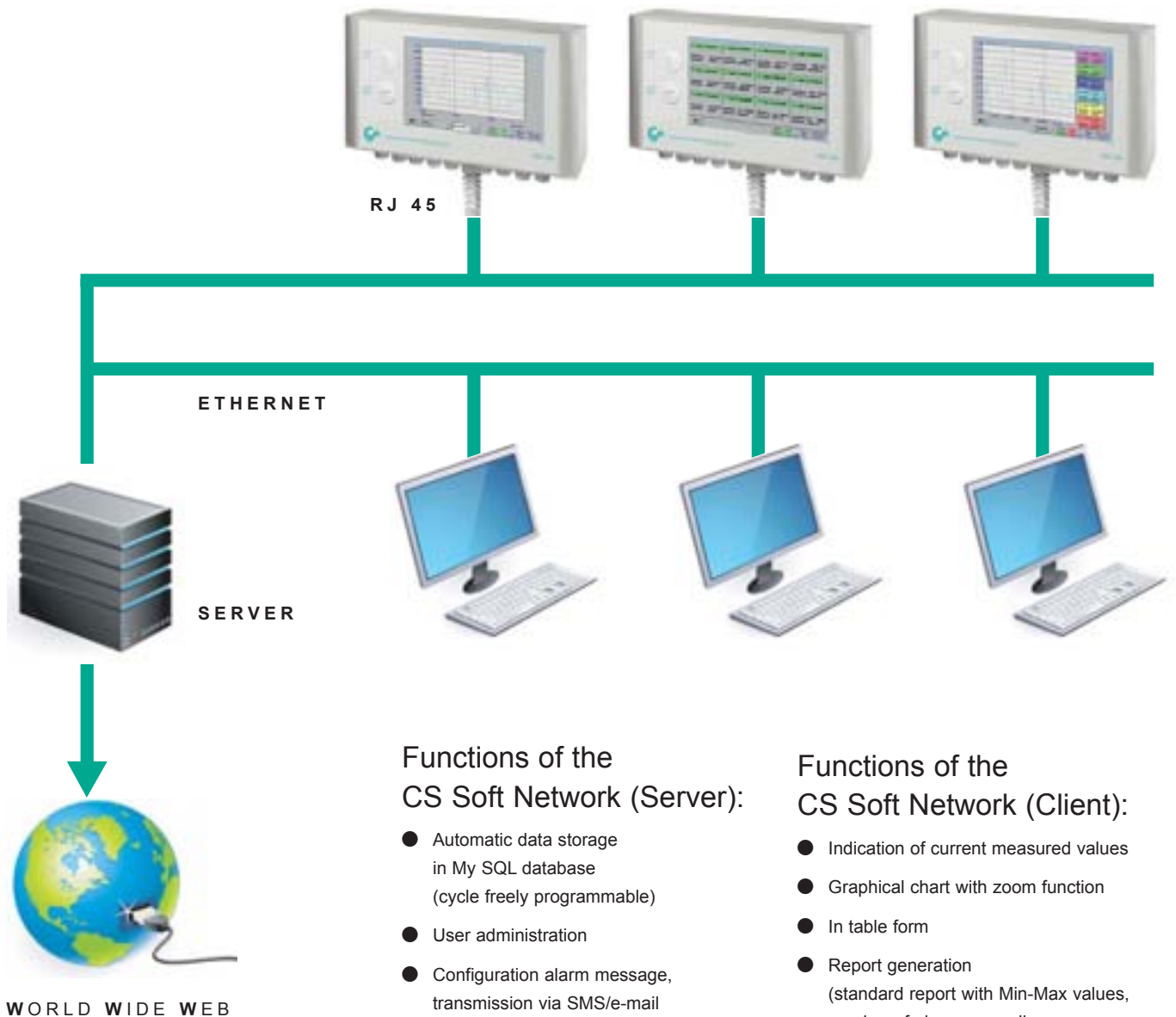
### CS Soft Network Database Client/Server Solution

By means of the CS Soft Network Database Client/Server Solution an optional number of DS 500/DS 300 instruments can be evaluated via Ethernet. The software stores the measured data of all DS 500/DS 300 cyclically (cycle freely adjustable) 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 300.

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



## View:

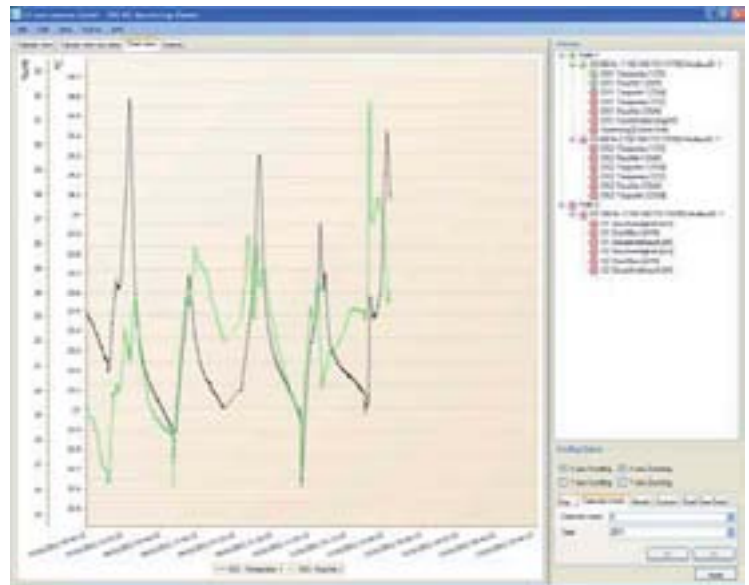
### Current measurement values

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



### 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



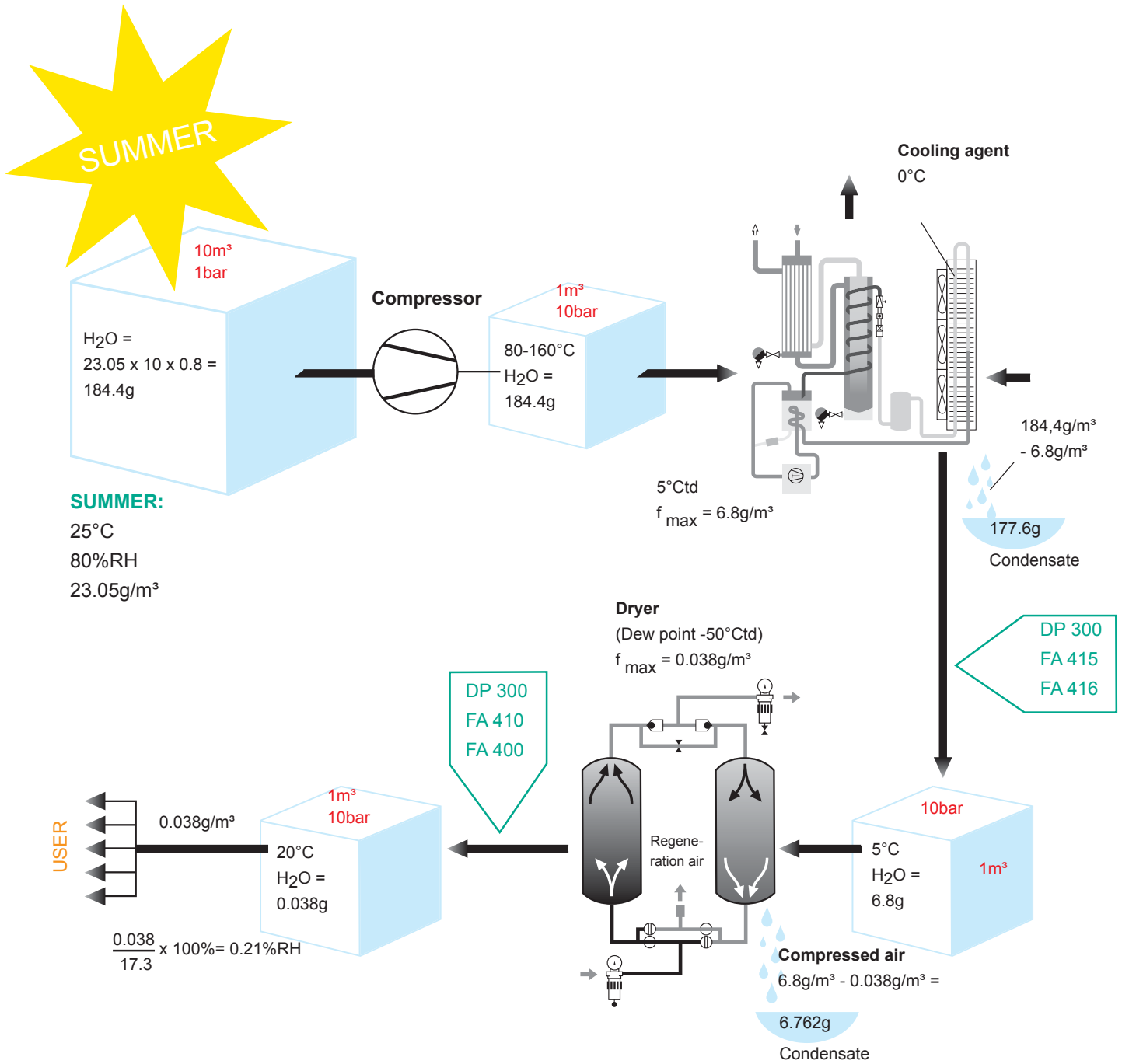
|            |        |            | Unit       |                     | Jan 10              | Feb 10 | Mar 10 | Apr 10  | May 10  | Jun 10  | Jul 10  | Aug 10  | Sep 10  | Oct 10  | Nov 10  | Dec 10  | Sum 2010 |         |
|------------|--------|------------|------------|---------------------|---------------------|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|---------|
| Hall 1     | DS 500 | Channel A1 | m³         | Counter beginning   | 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         | Counter end         | 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         | Monthly consumption | 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 consumption | 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. value          | 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. value          | 37,7                | 38,0   | 38,5   | 35,1    | 35,8    | 36,1    | 37,2    | 37,1    | 36,8    | 37,3    | 37,5    | 37,5    |          |         |
|            |        |            | €          | Costs               | 133                 | 122    | 119    | 130     | 109     | 143     | 110     | 121     | 118     | 93      | 135     | 136     | 1.469 €  |         |
|            |        |            | Channel A2 | m³                  | Counter beginning   | 24.750 | 57.002 | 87.541  | 113.245 | 113.245 | 138.451 | 167.865 | 195.354 | 219.874 | 248.798 | 279.477 | 312.313  |         |
|            |        |            | Machine 2  | m³                  | Counter end         | 57.002 | 87.541 | 113.245 | 113.245 | 138.451 | 167.865 | 195.354 | 219.874 | 248.798 | 279.477 | 312.313 | 345.554  |         |
|            |        |            |            | m³                  | Monthly consumption | 32.252 | 30.539 | 25.704  | 0       | 25.206  | 29.414  | 27.489  | 24.520  | 28.924  | 30.679  | 32.836  | 33.241   | 320.804 |
|            |        |            | m³/h       | Average consumption | 64,0                | 60,6   | 51,0   | 0,0     | 50,0    | 58,4    | 54,5    | 48,7    | 57,4    | 60,9    | 65,2    | 66,0    |          |         |
|            |        |            | m³/h       | Min. value          | 11,4                | 11,5   | 11,5   | 0,0     | 11,6    | 11,7    | 14,7    | 14,7    | 14,8    | 14,8    | 14,8    | 14,8    |          |         |
|            |        |            | m³/h       | Max. value          | 97,4                | 94,2   | 95,5   | 94,5    | 94,2    | 95,6    | 95,6    | 95,8    | 100,7   | 97,4    | 95,2    | 96,2    |          |         |
|            |        |            | €          | Costs               | 484                 | 458    | 386    | 0       | 378     | 441     | 412     | 368     | 434     | 460     | 493     | 499     | 4.812 €  |         |
| Sum Hall 1 |        |            |            | m³                  | Monthly consumption | 41.132 | 38.649 | 33.656  | 8.699   | 32.463  | 38.944  | 34.814  | 32.619  | 36.766  | 36.846  | 41.866  | 42.303   | 418.757 |
|            |        |            |            | € Costs             | 617                 | 580    | 505    | 130     | 487     | 584     | 522     | 489     | 551     | 553     | 628     | 635     | 6.281    |         |
|            |        |            |            | m³/h                | Average consumption | 81,6   | 76,6   | 66,8    | 17,3    | 64,4    | 77,3    | 69,1    | 64,7    | 72,9    | 73,1    | 83,1    | 83,9     |         |

### Consumption analysis (in connection with option "consumption report")



# Dew point

## Typical procedure of compressed air drying with dew point measurement





## Portable dew point meter DP 300

Relative humidity, temperature and dew point measurement with one instrument

The portable dew point meter DP 300 is the ideal instrument for service and is supplied in a convenient case.

Thanks to the internal rechargeable battery it measures quickly and reliably for a duration of up to 15 hours.



### Special feature

- Large measuring range to  $-80\text{ }^{\circ}\text{C}_{\text{td}}$  for all dryers (adsorption, membrane, refrigeration dryers)

### Technical data DP 300

|                             |  |
|-----------------------------|--|
| <b>Display single line:</b> | dew point ( $^{\circ}\text{C}_{\text{td}}$ resp. $^{\circ}\text{F}$ )<br>relative humidity (% RH)<br>temperature ( $^{\circ}\text{C}$ resp. $^{\circ}\text{F}$ )<br>freely selectable                      |
| <b>Display functions:</b>   | Max, Min,<br>state of battery  |
| <b>Measuring range:</b>     | $-80\text{...}50\text{ }^{\circ}\text{C}_{\text{td}}$<br>$-20\text{...}70\text{ }^{\circ}\text{C}$<br>0 to 100 % RH  |
| <b>Pressure range:</b>      | $-1$ to 50 bar standard<br>$-1$ to 350 bar<br>high-pressure version  |
| <b>PC connection:</b>       | SDI interface  |
| <b>Accuracy:</b>            | $\pm 0,5\text{ }^{\circ}\text{C}_{\text{td}}$ at $-10\text{...}50\text{ }^{\circ}\text{C}_{\text{td}}$<br>typical $\pm 2\text{ }^{\circ}\text{C}_{\text{td}}$ at $-40\text{ }^{\circ}\text{C}_{\text{td}}$ |
| <b>Power supply:</b>        | internal rech. batteries<br>(4 x 1,5 NiMh AAA)<br>for approx. 15 h<br>continuous operation   |
| <b>Operating temp:</b>      | $-20\text{...}70\text{ }^{\circ}\text{C}$  |
| <b>EMC:</b>                 | DIN EN 61326   |
| <b>Screw-in thread:</b>     | G 1/2" stainless steel   |
| <b>Housing:</b>             | polycarbonate  |

| Description   | Order no.        |
|---|------------------|
| <b>Set DP 300 consisting of:</b>  | <b>0600 6000</b> |
| Portable dew point meter DP300 up to 50 bar incl. rechargeable battery                  | 0560 6000        |
| Mobile measuring chamber up to 16 bar   | 0699 4490        |
| Diffusion-tight teflon hose 1 m with fast coupling at both ends                         | 0554 0003        |
| Power supply 24 VDC, 230 VAC for rech. battery load and long-term meas.                 | 0554 0001        |
| Control and calibration set 11.3 % RH   | 0554 0002        |
| Quick-lock coupling   | 0530 1101        |
| Dry container for DP 300  | 0699 2500        |
| Transport case  | 0554 6002        |
| <b>Additional accessories, not included in the set:</b>                                 |                  |
| Portable dew point meter DP 300 up to 350 bar including rech. battery                   | 0560 6001        |
| High-pressure measuring chamber up to 350 bar   | 0699 3590        |
| Precision calibration at $-40\text{ }^{\circ}\text{C}_{\text{td}}$ with ISO certificate | 0699 3396        |
| Measuring chamber for atmospheric dew point   | 0699 3690        |
| Measuring chamber for granulate dryers for minimum over pressure                        | 0699 3490        |
| Measuring chamber for respiratory air bottles up to 350 bar                             | 0699 3790        |
| Control and calibration set 33 % RH   | 0554 0004        |
| Control and calibration set 75.3 % RH   | 0554 0005        |



## FA 410 from -80 to 20 °C<sub>td</sub>

FA 410 – the ideal dew point sensor for monitoring membrane and adsorption dryers

Typical use in compressed air dryers/granulate dryers at very low dew points down to -80 °C.

### Recommendation:



Mounting with standard measuring chamber for compressed air up to 16 bar

**Advantage:** Easy installation via fast coupling.

### Special features

- Measuring range -80...20 °C<sub>td</sub>
- Extremely long-term stable
- Analogue output 4...20 mA
- Condensation insensitive
- Quick response time
- Pressure-tight up to 350 bar (special version)



| Technical data FA 410              |  |
|------------------------------------|--|
| <b>Measuring range:</b>            | -80...20 °C <sub>td</sub> resp. -20...50 °C <sub>td</sub>  |
| <b>Accuracy:</b>                   | ± 1 °C at 20...-20 °C <sub>td</sub><br>± 2 °C at -20...-50 °C <sub>td</sub><br>± 3 °C at -50...-80 °C <sub>td</sub>    |
| <b>Pressure range:</b>             | -1...50 bar<br>special version up to 350 bar   |
| <b>Power supply:</b>               | 24 VDC (16...30 VDC)   |
| <b>Protection class:</b>           | IP 65  |
| <b>EMC:</b>                        | according to DIN EN 61326  |
| <b>Operating temp:</b>             | -20...70 °C  |
| <b>Connection:</b>                 | M12, 5-pole  |
| <b>PC connection:</b>              | SDI interface  |
| <b>Analogue output:</b>            | 4...20 mA = -80...20 °C <sub>td</sub> resp.<br>4...20 mA = -20...50 °C <sub>td</sub>                                   |
| <b>Burden for analogue output:</b> | < 500 Ohm  |
| <b>Screw-in thread:</b>            | G1/2"  |
| <b>Dimensions:</b>                 | Ø 30 mm, length approx. 130 mm   |
| <b>Via service software:</b>       | - choose units: % RH, °C <sub>td</sub> , g/m <sup>3</sup> , mg/m <sup>3</sup> , ppm V/V<br>- scaling: change 4...20 mA |
| <b>Special version:</b>            | 4...20mA, 2-wire technology  |

| Description  | Order no.. |
|--|------------|
| FA 410 dew point sensor, -80°...20°C <sub>td</sub> incl. inspection certificate  | 0699 0410  |
| FA 410 dew point sensor, -20°...50°C <sub>td</sub> incl. inspection certificate  | 0699 0412  |
| <b>Connection cables:</b>  |            |
| Connection cable, length: 5 m  | 0553 0104  |
| Connection cable, length: 10 m   | 0553 0105  |
| <b>Options for FA 410:</b>   |            |
| Option special version up to 350 bar   | 0699 4003  |
| Option output in mg/m <sup>3</sup> , g/kg, oder %RH, special scaling 4...20 mA   | 0699 4004  |
| <b>Additional accessories:</b>   |            |
| Standard measuring chamber up to 16 bar  | 0699 3390  |
| High-pressure measuring chamber up to 350 bar  | 0699 3590  |
| Measuring chamber for respiratory air bottles up to 350 bar  | 0699 3790  |
| CS Service Software for FA/VA 400 sensors including PC connection set, USB adapter and interface adapter to the sensor as well as CSM-S for data recording, please see page 21 | 0554 2005  |
| Mains unit in wall housing 100-240 V, 10 VA, 50-60 Hz/24 VDC, 0.35 A   | 0554 0108  |
| Mains unit on DIN rail 100-240 VAC / 24 VDC, 0.35 A  | 0699 3340  |
| <b>Calibration:</b>  |            |
| Precision calibration at -40 °C <sub>td</sub> including ISO certificate  | 0699 3396  |
| Precision calibration at 3 °C <sub>td</sub> including ISO certificate  | 3200 0003  |
| 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  |

## Dew point set DS 52 for adsorption dryers

### Dew point set DS 52

consisting of:

- Digital process meter DS 52



### 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

|                               |   |
|-------------------------------|---|
| <b>Dimensions:</b>            | 118 x 92 x 93 mm  |
| <b>Display:</b>               | LED red, 7 segments, height: 13 mm, 5 digits, 2 LED for alarm relay |
| <b>Keypad:</b>                | 4 keys  |
| <b>Input:</b>                 | dew point sensor FA 410   |
| <b>Power supply:</b>          | 230 VAC, 50/60 Hz;<br>Option: 24 VDC or 110 VAC 50/60 Hz            |
| <b>Alarm outputs:</b>         | 2 x relay output, changeover contact, 250 VAC, max. 3 A             |
| <b>Operating temperature:</b> | -10...+60 °C (storage temp. -20 °C...+80 °C)                        |
| <b>Alarm thresholds:</b>      | freely adjustable   |
| <b>Hysteresis:</b>            | 2 °Ctd  |
| <b>Analogue output:</b>       | 4...20 mA = -80...20 °Ctd   |

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 410 is extremely long-term stable and can be installed and removed quickly and easily under pressure by means of the screwable 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.

### Technical data dew point sensor FA 410

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

| Description   | Order no.        |
|---|------------------|
| <b>Dew point set DS 52 for adsorption dryers consisting of:</b> | <b>0600 0420</b> |
| DS 52 LED digital process meter in wall housing                 | 0500 0007        |
| FA 410 dew point sensor (-80...20 °Ctd)                         | 0699 0410        |
| Standard measuring chamber up to 16 bar                         | 0699 3390        |
| Connection cable for VA/FA Series, 5 m with M12 plug            | 0553 0104        |
| <b>Options:</b>   |                  |
| 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        |
| <b>Additional accessory:</b>                                    |                  |
| Precision calibration at -40 °Ctd including ISO certificate     | 0699 3396        |



## FA 415 / FA 416 from -20 to 50 °C<sub>td</sub>

The dew point sensors FA 415/416 for the typical use in refrigeration dryers



### FA 415 dew point sensor

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

#### Special features

- Analogue output 4...20 mA
- Precise, long-term stability
- Quick response time
- Measuring range -20...50 °C<sub>td</sub>



### FA 416 condensate switch

For reliable alarm signal in case of condensation with alarm relay and LED

#### Special features

- Dew point distance freely adjustable
- Alarm in case of condensation
- LED alarm signal
- Quick response time

### Technical data FA 415/416

|                                    |  |
|------------------------------------|--|
| <b>Measuring range:</b>            | -20...50 °C <sub>td</sub><br>resp. 0...100% RH   |
| <b>Accuracy:</b>                   | ± 1 °C at 0...20 °C <sub>td</sub><br>± 2 °C remaining range  |
| <b>Pressure range:</b>             | -1...16 bar  |
| <b>Power supply:</b>               | 24 VDC (10...30 VDC)   |
| <b>Protection class:</b>           | IP 65  |
| <b>EMC:</b>                        | according to DIN EN 61326  |
| <b>Operating temp.:</b>            | -20...70 °C  |
| <b>Connection:</b>                 | M12, 5-pole  |
| <b>PC connection:</b>              | SDI interface  |
| <b>Screw-in thread:</b>            | G1/2"  |
| <b>Dimensions:</b>                 | Ø 30 mm, length 130 mm   |
| <b>Output FA 415:</b>              | 4...20 mA = -20...50 °C <sub>td</sub>  |
| <b>Burden for analogue output:</b> | < 500 Ohm  |
| <b>Output FA 416:</b>              | Relay NO max. 60 VDC, 0,5 A, ex factory 12 °C <sub>td</sub><br>resp. in case of condensation, dew point distance freely adjustable |

| Description   | Order no. |
|---|-----------|
| FA 415 dew point sensor   | 0699 0415 |
| FA 416 condensate switch  | 0699 0416 |
| <b>Connection cables:</b>   |           |
| Connection cable, length: 5m  | 0553 0104 |
| Connection cable, length: 10m   | 0553 0105 |
| <b>Additional accessories:</b>  |           |
| Standard measuring chamber up to 16 bar   | 0699 3390 |
| CS Service Software for FA/VA 400 sensors including PC connection set, USB adapter and interface adapter to the sensor as well as CSM-S for data recording, see page 21 | 0554 2005 |
| Mains unit in wall housin 100-240 V, 10 VA, 50-60 Hz/24 VDC, 0.35 A   | 0554 0108 |
| Mains unit on DIN rail 100-240 VAC / 24 VDC, 0.35 A   | 0699 3340 |
| <b>Calibration:</b>   |           |
| Precision calibration at 3 °C <sub>td</sub> including ISO certificate   | 3200 0003 |
| 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 |

### Recommendation:



Mounting with standard meas. chamber for compressed air up to 16 bar

**Advantage:** Easy installation via fast coupling.

## Dew point set DS 52 for refrigeration dryers

### Dew point set DS 52

consisting of:

- Digital process meter DS 52



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 415 is extremely long-term stable and can be installed and removed quickly and easily under pressure by means of the screwable 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.

### 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:                 | dew point sensor FA 415   |
| Power supply:          | 230 VAC, 50/60 Hz;<br>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 415

|                         |   |
|-------------------------|---|
| Measuring range:        | $-20...50$ °Ctd   |
| Accuracy:               | $\pm 1$ °C at $0...20$ °Ctd<br>$\pm 2$ °C remaining range |
| Pressure range:         | $-1...16$ bar   |
| Protection class:       | IP 65   |
| EMV:                    | according to DIN EN 61326                                 |
| Operating temp.:        | $-20...70$ °C   |
| Connection:             | M12, 5 pole   |
| PC connection:          | SDI interface   |
| Burden analogue output: | < 500 Ohm   |
| Screw-in thread:        | G 1/2" without meas.chamber                               |

| Description   | Order no.        |
|---|------------------|
| <b>Dew point set DS 52 for refrigeration dryers, consisting of:</b> | <b>0600 0425</b> |
| DS 52 LED digital process meter in wall housing                     | 0500 0007        |
| FA 415 dew point sensor ( $-20...50$ °Ctd)                          | 0699 0415        |
| Standard measuring chamber up to 16 bar                             | 0699 3390        |
| Connection cable for VA/FA Series, 5 m with M12 plug                | 0553 0104        |
| <b>Options:</b>   |                  |
| Power supply 24 VDC (instead of 230 VAC)                            | Z500 0001        |
| Power uspply 110 VAC (instead of 230 VAC)                           | Z500 0002        |
| Alarm unit mounted at wall housing                                  | Z500 0003        |
| Alarm unit for external mounting with 5 m lead                      | Z500 0004        |
| <b>Additional accessory:</b>  |                  |
| Precision calibration at 3°Ctd including ISO certificate            | 3200 0003        |



## Dew point set FA 410

Ready for upgrading with data logger, ethernet interface and 2<sup>nd</sup> sensor input

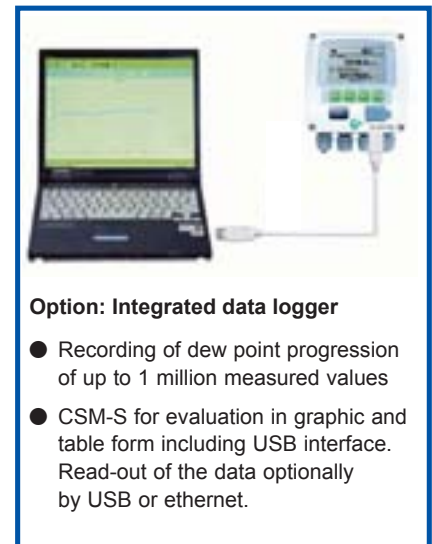
### Dew point set FA 410

consisting of:



### 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
- Optical alarm: Red flashing
- Parallel indication % RH, °C, °C<sub>td</sub>



### Technical data DS 300

|                               |  |
|-------------------------------|--|
| <b>Dimensions:</b>            | 118 x 115 x 93 mm, IP 65 (wall housing)<br>92 x 92 x 70 mm, IP 65 (panel mounting) |
| <b>Inputs:</b>                | 2 digital inputs for FA 410 resp. VA 400   |
| <b>Interface:</b>             | USB  |
| <b>Keypad:</b>                | 4 keys   |
| <b>Power supply:</b>          | 100...240 VAC, 50-60 Hz  |
| <b>Accuracy:</b>              | see FA 410 page 6  |
| <b>Alarm outputs:</b>         | 2 relays, 230 VAC, 3 A   |
| <b>Operating temp.:</b>       | 0...50 °C  |
| <b>Transport temperature:</b> | -20...70 °C  |
| <b>OPTIONS</b>                |  |
| <b>Data logger:</b>           | 1 million meas. values start/stop time, meas. rate freely adjustable               |

| Description   | Order no. |
|---|-----------|
| Dew point set FA 410 for adsorption dryers (-80...20 °Ctd)                  | 0600 0410 |
| Dew point set FA 410 for refrigeration dryers (-20...50 °Ctd)               | 0600 0412 |
| <b>Option:</b>  |           |
| Integrated data logger for 1 million measured values                        | Z500 3001 |
| Ethernet interface  | Z500 3005 |
| Alarm unit mounted at wall housing  | Z500 0003 |
| Alarm unit for external mounting with 5 m cable                             | Z500 0004 |
| <b>Additional accessories:</b>  |           |
| CSM-S for data evaluation in graphic and table form including USB interface | 0554 7011 |
| Precision calibration at -40 °Ctd including ISO certificate                 | 0699 3396 |
| Precision calibration at 3 °Ctd including ISO certificate                   | 3200 0003 |
| 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 |

## FA 400 from $-80$ to $20^{\circ}\text{C}_{\text{td}}$

FA 400 is the ideal dew point measuring instrument with integrated display and alarm relay for refrigeration, membrane and adsorption dryers

It replaces the worldwide proven instrument FA 200.  
The threshold value can be easily adjusted via the keypad.



Alarm adjustable via keypad

### Special features

- $-80\text{...}20^{\circ}\text{C}_{\text{td}}$
- 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 dryers and adsorption dryers



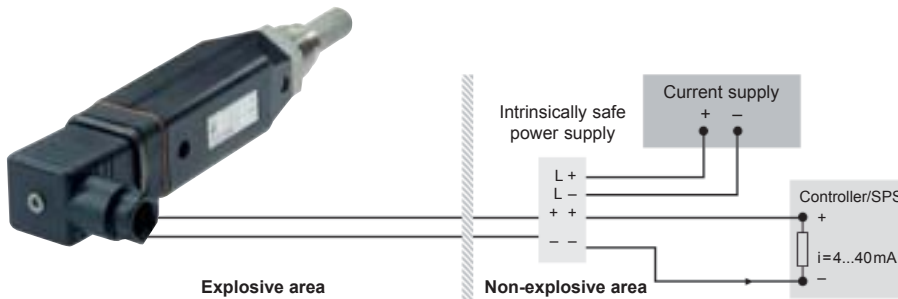
| Description   | Order no. |
|---|-----------|
| FA 400 dew point sensor for refrigeration dryers, $-20\text{...}50^{\circ}\text{C}_{\text{td}}$   | 0699 0401 |
| FA 400 dew point sensor for adsorption dryers, $-80\text{...}20^{\circ}\text{C}_{\text{td}}$  | 0699 0402 |
| FA 400 dew point sensor, replacement of FA 200, $-60\text{...}30^{\circ}\text{C}_{\text{td}}$   | 0699 0403 |
| <b>Connection cables:</b>   |           |
| Connection cable, length: 5m (power supply and analogue output)   | 0553 0104 |
| Connection cable, length 10m (power supply and analogue output)   | 0553 0105 |
| Alarm cable, length: 5m   | 0553 0106 |
| Alarm cable, length: 10m  | 0553 0107 |
| <b>Options for FA 400:</b>  |           |
| Special version FA 400 up to 350 bar  | 0699 4003 |
| Special scaling, output in ppm V/V, % RH, $\text{mg}/\text{m}^3$  | 0699 4004 |
| <b>Additional accessories:</b>  |           |
| Standard measuring chamber up to 16 bar   | 0699 3390 |
| CS Service Software for FA/VA 400 sensors including PC connection set, USB adapter and interface adapter to the sensor as well as CSM-S for data recording, see page 21 | 0554 2005 |
| Mains unit in wall housing 100-240 V, 10 VA, 50-60 Hz/24 VDC, 0.35 A  | 0554 0108 |
| Power supply 100-240 VAC/24 VDC, 0.35 A for FA/VA 400 Series, 2 m cable   | 0554 0107 |
| <b>Calibration:</b>   |           |
| Precision calibration at $-40^{\circ}\text{C}_{\text{td}}$ including ISO certificate  | 0699 3396 |
| Precision calibration at $3^{\circ}\text{C}_{\text{td}}$ including ISO certificate  | 3200 0003 |
| 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 |

### Technical data FA 400

|                                     |   |
|-------------------------------------|---|
| <b>Measuring range:</b>             | $-80\text{...}20^{\circ}\text{C}_{\text{td}}$ , $-60\text{...}30^{\circ}\text{C}_{\text{td}}$ , $-20\text{...}50^{\circ}\text{C}_{\text{td}}$ resp. 0...100% RH   |
| <b>Accuracy:</b>                    | $\pm 1^{\circ}\text{C}$ at $20\text{...}20^{\circ}\text{C}_{\text{td}}$<br>$\pm 2^{\circ}\text{C}$ at $-20\text{...}50^{\circ}\text{C}_{\text{td}}$<br>$\pm 3^{\circ}\text{C}$ at $-50\text{...}80^{\circ}\text{C}_{\text{td}}$ |
| <b>Pressure range:</b>              | -1...50 bar<br>special version up to 350 bar  |
| <b>Power supply:</b>                | 24 VDC<br>(16...30 VDC) smoothed  |
| <b>Protection class:</b>            | IP 65   |
| <b>EMV:</b>                         | according to DIN EN 61326   |
| <b>Operating temp.:</b>             | $-20\text{...}50^{\circ}\text{C}$   |
| <b>Connection:</b>                  | 2 x M12, 5-pole for analogue output and alarm output  |
| <b>PC connection:</b>               | SDI interface   |
| <b>Output:</b>                      | 4...20 mA = $-80\text{...}20^{\circ}\text{C}_{\text{td}}$<br>4...20 mA = $-60\text{...}30^{\circ}\text{C}_{\text{td}}$<br>4...20 mA = $-20\text{...}50^{\circ}\text{C}_{\text{td}}$   |
| <b>Burden for analogue output:</b>  | < 500 Ohm   |
| <b>Alarm relay:</b>                 | NO, max. 60 VDC, 0.5 A  |
| <b>Screw-in thread:</b>             | G1/2"   |
| <b>Dimensions:</b>                  | $\varnothing$ 65 mm, length 160 mm  |
| <b>Output signals via software:</b> | % RH, $^{\circ}\text{C}_{\text{td}}$ , $\text{g}/\text{m}^3$ , $\text{mg}/\text{m}^3$ , ppm V/V   |



## FA 300 Ex -80 to 20 °C<sub>td</sub>



### 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/m<sup>3</sup>, mg/m<sup>3</sup>, ppm V/V, g/kg
- CS Service Software for data storage and calibration (no approval for explosive areas)

### Technical data FA 300-2 Ex

|                                    |   |
|------------------------------------|---|
| <b>Measuring range:</b>            | Pressure dew point in °C <sub>td</sub>  |
| <b>FA 300-2 Ex:</b>                | -80...20 °C <sub>td</sub> = 4...20 mA   |
| <b>Pressure range:</b>             | -1...300 bar  |
| <b>Power supply:</b>               | 24 VDC (10...30 VDC)  |
| <b>Accuracy:</b>                   | ± 0,5 °C at -10...50 °C <sub>td</sub><br>typical ± 2 °C at -40 °C <sub>td</sub> |
| <b>Output:</b>                     | 4...20 mA in 2-wire technology  |
| <b>Protection class:</b>           | IP 65   |
| <b>EMC:</b>                        | according to DIN EN 61326   |
| <b>Operating temp.:</b>            | -20...70 °C   |
| <b>Storage temp.:</b>              | -40...80 °C   |
| <b>Burden for analogue output:</b> | < 500 Ohm   |
| <b>Screw-in thread:</b>            | G1/2" stainless steel   |
| <b>Housing material:</b>           | polycarbonate   |
| <b>Sensor protection:</b>          | 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: I 2G Ex ia II C 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.: U<sub>0</sub> = 30 V max.  
I<sub>0</sub> = 100 mA max.  
P<sub>0</sub> = 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  | 0699 4004 |
| Analogue output to other humidity parameters:<br>% RH g/m <sup>3</sup> , mg/m <sup>3</sup> , ppm V/V, g/kg |           |
| Intrinsically safe power supply, safety barriers   | 0554 3071 |

## Mains units



Mains unit in wall housing ▶

Mains unit in wall housing ▲

Mains unit on DIN rail ▶

Power supply ▲

### Mains unit in wall housing:

#### Special features:

- Detachable screwing clamps for easy wiring
- Galvanic separation of the pulse output of consumption sensors VA 400/410
- 2 relay outputs (230 VAC, 3 A) for alarm signal amplification at dew point sensors FA 400, FA 416
- Live parts protected untouchably in housing

### Technical data for mains unit in wall housing

|                      |  |
|----------------------|--|
| <b>Dimensions:</b>   | 118 x 133 x 92 mm (WxHxD)                    |
| <b>Power supply:</b> | 100-240 VAC, 10 VA, 50-60 Hz                 |
| <b>Output:</b>       | 24 VDC, 0.35 A                               |
| <b>Relay:</b>        | 2 pieces, change-over contacts, 230 VAC, 3 A |

| Description   | Order no. |
|---|-----------|
| Mains unit in wall housing for sensors of the Series VA/FA, 100-240 V, 10 VA, 50-60 Hz / 24 VDC, 0.35 A | 0554 0108 |
| Mains unit on DIN rail, 100-240 VAC / 24 VDC, 0.35 A  | 0699 3340 |
| Power supply 100-240 VAC/24 VDC, 0.35 A for Series VA/FA 400, 2 m cable                                 | 0554 0107 |

## Accessories for dew point measurement and calibration

### CS Service Software

for FA/VA 400 sensors including PC connection set, USB adapter and interface adapter to the sensor as well as CSM-S for data recording.

The humidity sensors FA 400, FA 410, FA 415, FA 416 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, °C<sub>td</sub>, g/m<sup>3</sup>, mg/m<sup>3</sup>, 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



By means of the CSM-S the measured data can be read out online at the PC. It can be stored and evaluated in graphic and in table form.



### The right measuring chamber for each measuring task:



**Standard measuring chamber** for compressed air up to 16 bar  
Order no. **0699 3390**



**Measuring chamber for atmospheric dew point**  
Order no. **0699 3690**



**High-pressure measuring chamber** for compressed air up to 350 bar\*  
Order no. **0699 3590**



**Measuring chamber for respiratory air bottles** up to 350 bar\*  
Order no. **0699 3790**



**Measuring chamber for granulate dryers** up to 250 mbar  
Order no. **0699 3490**

\* in case of pressures higher than 50 bar please order special version FA 400 / FA 410.

#### Mounting recommendation

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

However, we recommend always to use a screwable measuring chamber.



#### Screwable measuring chamber

Advantage: Easy installation via fast coupling



## Calibration of dew point sensors

The calibration range for dew point sensors is  $-80...+20^{\circ}\text{C}_{\text{td}}$

It is possible to calibrate dew point sensors of CS Instruments as well as of other manufacturers. High precision reference measuring instruments with DKD resp. BAM certificate grant an accuracy of up to  $0.1^{\circ}\text{C}$  dew point.



Calibration range:  $\text{from } -80 \text{ to } 20^{\circ}\text{C}_{\text{td}}$   
Accuracy of the DKD reference:  $0.1^{\circ}\text{C}_{\text{td}}$

### Special feature

- Due to the digital data transfer only the dew point sensor has to be calibrated, enabling the display unit DS 300 to stay on-site at all times.



### 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  $-20^{\circ}\text{C}$  dew point.

| Description  | Order no. |
|--|-----------|
| Recalibration and precision calibration at $-40^{\circ}\text{C}_{\text{td}}$ including ISO certificate                               | 0699 3333 |
| Precision calibration in the range $-80...+20^{\circ}\text{C}_{\text{td}}$ , $^{\circ}\text{C}_{\text{td}}$ 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 |



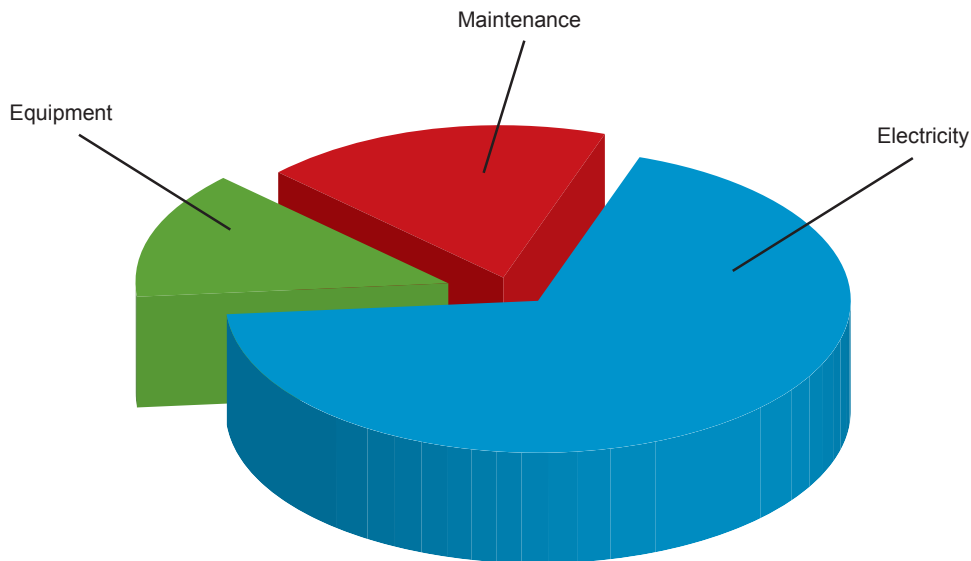
## Consumption and flow measurement

### 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, Fraunhofer 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 300** (please see page 40) **will be payed off after 4 leakages**

Cost distribution in compressed air systems:



Example for a calculation of leakage costs at different pressures:

| Leak Ø (mm) | Air loss at 6 bar (l/s) | Air loss 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                 | 6,96                   |
| 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                 |

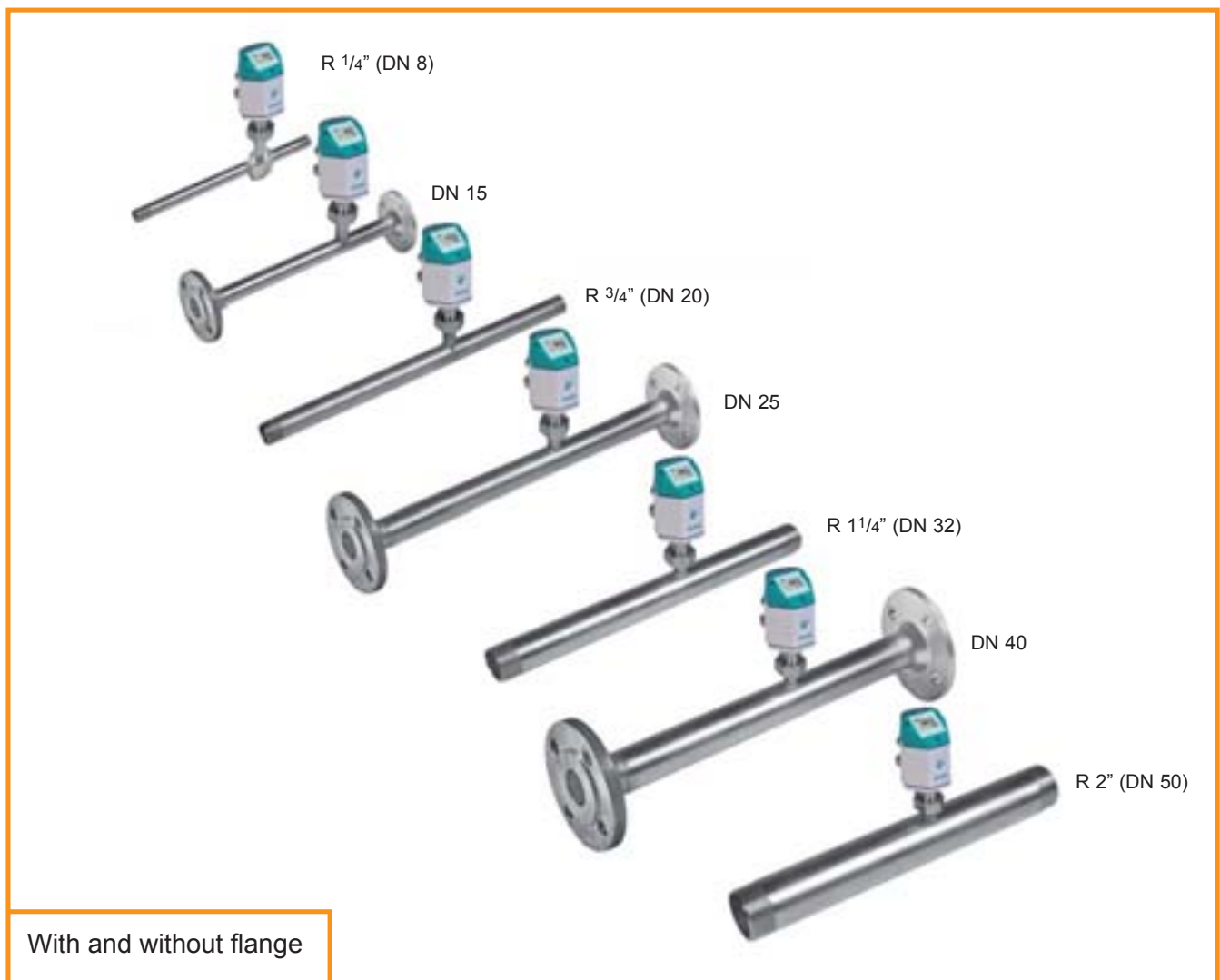
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## VA 420

# NEW

The affordable consumption counter for compressed air and gases



### Intelligent solutions for accurate consumption measurement for compressed air and gases

The new affordable consumption counters VA 420 work according to the approved calorimetric measuring principle. In this process a heated sensor is cooled down by the gas circulating around it. The flow-dependent cooling-down is used as a

measuring effect while the degree of cooling-down is directly depending on the passing air resp. gas mass. Therefore, an additional pressure and temperature compensation is not necessary.

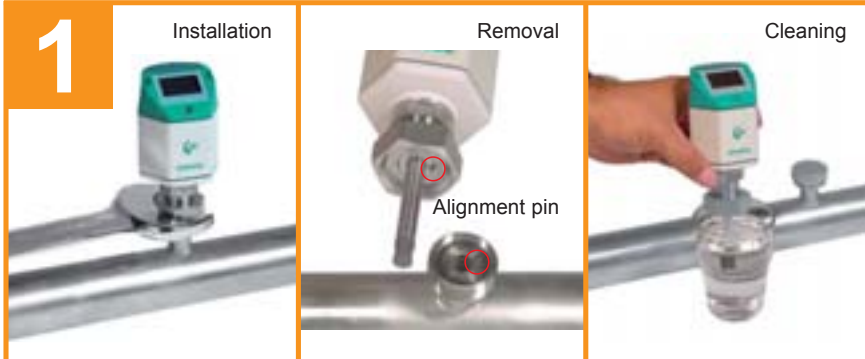
Due to its compact design it is possible to monitor all compressed air systems from the compressor to the smallest compressed air tool (1/4" to 2 inch) with the new affordable consumption counter VA 420. VA 400 consumption sensors are available

for larger pipe diameters from DN 50 to DN 300. Apart from compressed air also other gases like e. g. nitrogen, oxygen and CO<sub>2</sub> can be measured.

The installation of the compressed air counters VA 420 can be done easily and quickly. A special advantage is the removable measuring device. The measuring device can be demounted quickly and easily for calibration or cleaning purposes without removing the complete measuring section.



## Removal of the measuring device without complete dismantling of the measuring section



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 compressed air counters which may

cause errors in measurement or even a total breakdown. The compressed air counters 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 counters with integrated measuring section the "measuring device" cannot be removed. For this reason an expensive bypass line is necessary.

**New.** The design of **VA 420** enables the removal and cleaning of the "measuring device" with e. g. soap water without any dismantling 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.

## 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 consumption.  
Pulse output (galvanically separated) for the total consumption.

## Mobile use



By means of quick couplings the compressed air counter 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 consumption 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 300 mobile.

## Solution for large pipe diameters



The approved consumption sensor VA 400 is available for pipe diameters of 2" to DN 300. Its constructively sophisticated design enables the installation into pipes with nominal diameters up to DN 300 even under pressure. The installation is effected by means of a standard 1/2" ball valve.



## VA 420 – The advantages at a glance

4...20 mA output for actual consumption

Pulse output for total consumption  
(counter reading)

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).



Display twistable by 180°

Display shows 2 values:  
Actual consumption in m<sup>3</sup>/h, l/min,...  
Total consumption  
(counter reading) in m<sup>3</sup>, l

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



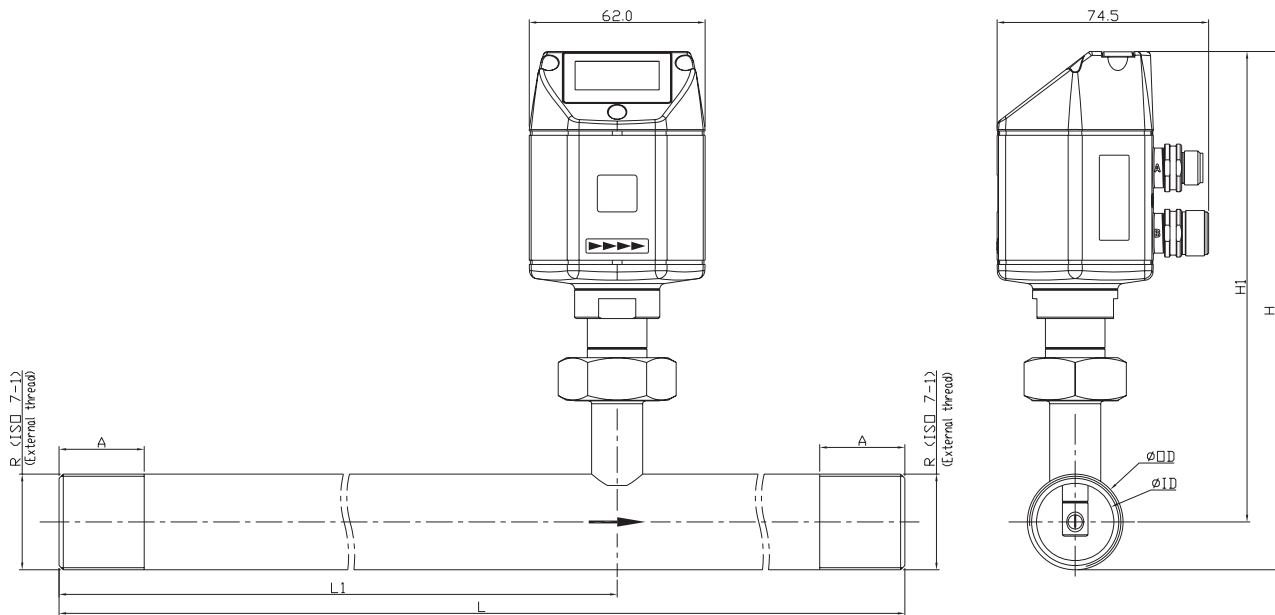
At the touch of a button:  
– reset of counter reading  
– selection of units

## Application-technological features of the consumption counters VA 420:

- Easy and affordable installation
- Units freely selectable via keypad m<sup>3</sup>/h, m<sup>3</sup>/min, l/min, l/s, kg/h, kg/min, kg/s, cfm
- Compressed air counter up to 1,999,999,999 m<sup>3</sup>. Resettable 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
- Gas types adjustable via software (nitrogen, oxygen, CO<sub>2</sub>, nitrous oxide, argon)

## Application range of VA 420:

- 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, CO<sub>2</sub>, oxygen, argon, nitrous oxide
- Flow measurement at nitrogen generators



### Flow measuring ranges VA 420 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 | L <sub>1</sub> mm | H mm  | H <sub>1</sub> mm | A mm |
|-------------------|--------------------|--------------------|---------------------------|------|-------------------|-------|-------------------|------|
| R 1/4"            | 13.7               | 8.5                | 0.8 90 l/min              | 194  | 137               | 174.7 | 165.7             | 15   |
| R 1/2"            | 21.3               | 16.1               | 0.2 90 m <sup>3</sup> /h  | 300  | 210               | 176.4 | 165.7             | 20   |
| R 3/4"            | 26.9               | 21.7               | 0.3 170 m <sup>3</sup> /h | 475  | 275               | 179.2 | 165.7             | 20   |
| R 1"              | 33.7               | 27.3               | 0.5 290 m <sup>3</sup> /h | 475  | 275               | 182.6 | 165.7             | 25   |
| R 1 1/4"          | 42.4               | 36.8               | 0.7 480 m <sup>3</sup> /h | 475  | 275               | 186.9 | 165.7             | 25   |
| R 1 1/2"          | 48.3               | 41.8               | 1.0 550 m <sup>3</sup> /h | 475* | 275               | 189.9 | 165.7             | 25   |
| R 2"              | 60.3               | 53.1               | 2.0 900 m <sup>3</sup> /h | 475* | 275               | 195.9 | 165.7             | 30   |

\* Attention: Shortened inlet section! Please observe the recommended minimum inlet section (length = 10 x inner diameter) on site.

| Description  | Order no.              | Order no.              |
|--|------------------------|------------------------|
|  | Stainless steel 1.4404 | Stainless steel 1.4301 |
| VA 420 with integrated 1/4" measuring section  | 0695 1420              | 0695 0420              |
| VA 420 with integrated 1/2" measuring section  | 0695 1421              | 0695 0421              |
| VA 420 with integrated 3/4" measuring section  | 0695 1422              | 0695 0422              |
| VA 420 with integrated 1" measuring section  | 0695 1423              | 0695 0423              |
| VA 420 with integrated 1 1/4" measuring section  | 0695 1426              | 0695 0426              |
| VA 420 with integrated 1 1/2" measuring section  | 0695 1424              | 0695 0424              |
| VA 420 with integrated 2" measuring section  | 0695 1425              | 0695 0425              |
| Option: High-pressure version PN 40  |                        | Z695 0411              |
| Special measuring range VA 420 according to customer's requirements  |                        | Z695 4006              |
| <b>Connection cables:</b>  |                        |                        |
| Connection cable 5 m (power supply, analogue output)   |                        | 0553 0104              |
| Connection cable 10 m (power supply, analogue output)  |                        | 0553 0105              |
| Pulse cable for consumption sensors with M12 plug, length 5 m  |                        | 0553 0106              |
| Pulse cable for consumption sensors with M12 plug, length 10 m   |                        | 0553 0107              |
| <b>Further accessories:</b>  |                        |                        |
| Closing cap for meas. section VA 420 (Material: Aluminium)   |                        | 0190 0001              |
| Closing cap for meas. section VA 420 (Material: Stainless steel 1.4404)  |                        | 0190 0002              |
| CS Service Software for FA/VA 400 sensors including PC connection set, USB interface and interface adapter to the sensor as well as CSM-S for data recording |                        | 0554 2005              |
| Mains unit in wall housing 100-240 V, 10 VA, 50-60 Hz/24VDC, 0.35 A  |                        | 0554 0108              |
| Mains unit 100-240 VAC / 24 VDC, 0.35 A for VA/FA 400 Series, 2 m cable  |                        | 0554 0107              |
| 5 point precision calibration with ISO certificate   |                        | 3200 0001              |

### Technical data VA 420

|   |  |
|---|--|
| <b>Parameters:</b>                        | m <sup>3</sup> /h, l/min (1000 mbar, 20 °C) in case of compressed air resp. Nm <sup>3</sup> /h, NI/min (1013 mbar, 0 °C in case of gases |
| <b>Adjustable via keypad:</b>             | m <sup>3</sup> /h, m <sup>3</sup> /min, l/min, l/s, ft/min, cfm, m/s, kg/h, kg/min   |
| <b>Meas. principle:</b>                   | calorimetric measurement   |
| <b>Sensor:</b>                            | 2 x silicium chip  |
| <b>Meas. medium:</b>                      | air, gases   |
| <b>Gas types adjustable via software:</b> | air, nitrogen, argon, nitrous oxide, CO <sub>2</sub> , oxygen  |
| <b>Meas. range:</b>                       | see table at the left  |
| <b>Accuracy:</b>                          | ±1.5% of m.v., ±0.05% of f.s. On request: Special calibration via 5 point ISO calibration certificate                                    |
| <b>Operating temp.:</b>                   | -30...80 °C  |
| <b>Operating press.:</b>                  | up to 16 bar<br>Optional up to PN 40   |
| <b>Analogue output:</b>                   | 4...20 mA for m <sup>3</sup> /h resp. l/min  |
| <b>Pulse output:</b>                      | 1 pulse per m <sup>3</sup> resp. per liter galvanically separated  |
| <b>PC connection:</b>                     | SDI interface  |
| <b>Power supply:</b>                      | 24 VDC smoothed ± 15 %   |
| <b>Burden:</b>                            | < 500 Ohm  |
| <b>Housing:</b>                           | polycarbonate  |
| <b>Meas. section:</b>                     | stainless steel, 1.4301 or 1.4404  |
| <b>Mounting thread meas. section:</b>     | R 1/4", R 1/2", R 3/4", R 1", R 1 1/4", R 1 1/2", R 2" external thread   |



## VA 420 – The advantages at a glance

4...20 mA output for actual consumption

Pulse output for total consumption (counter reading)

Measuring device removable:

Dismounting of the whole measuring section is not necessary, no bypass required.



Display twistable by 180°

Display shows 2 values:  
Actual consumption in m<sup>3</sup>/h, l/min,...  
Total consumption (counter reading) in m<sup>3</sup>, l

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

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:

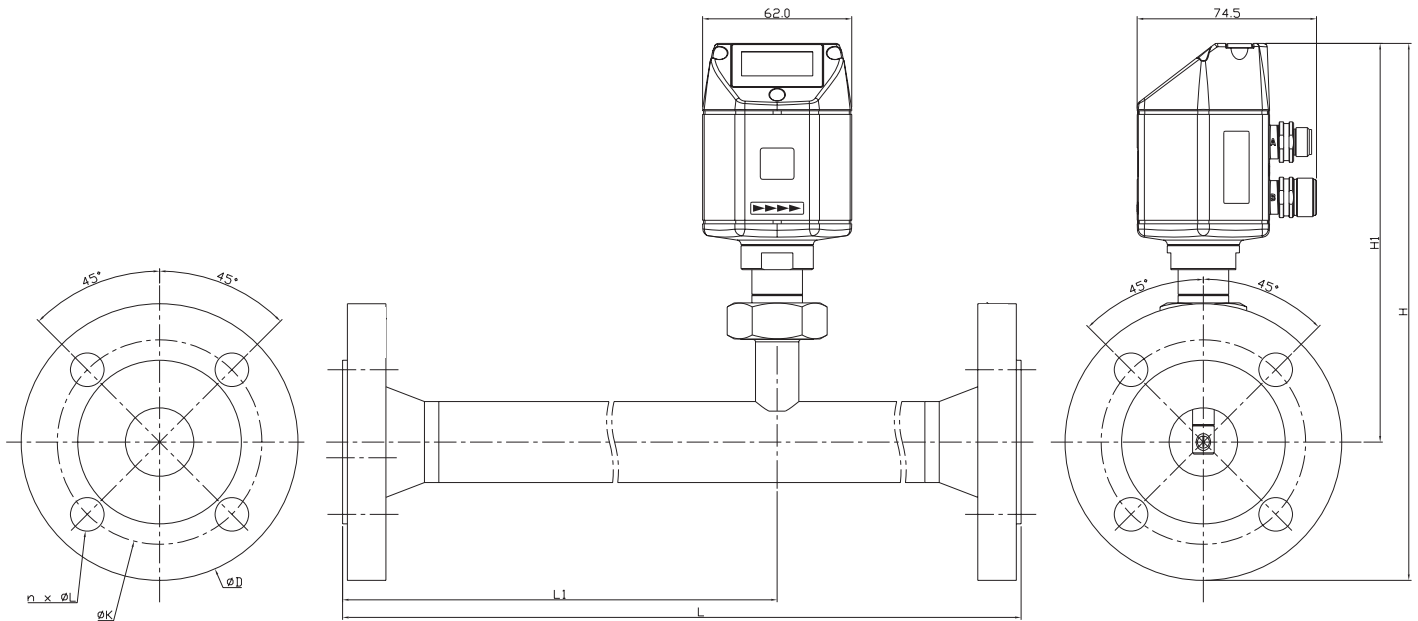
- reset of counter reading
- selection of units

### Application-technological features of the consumption counters VA 420:

- Easy and affordable installation
- Units freely selectable via keypad m<sup>3</sup>/h, m<sup>3</sup>/min, l/min, l/s, kg/h, kg/min, kg/s, cfm
- Compressed air counter up to 1,999,999,999 m<sup>3</sup>. Resettable 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
- Gas types adjustable via software (nitrogen, oxygen, CO<sub>2</sub>, nitrous oxide, argon)

### Application range of VA 420:

- Compressed air balancing, compressed air consumption measurement
- Leakage air / leak rate determination
- Flow measurement of process gases like e. g. nitrogen, CO<sub>2</sub>, oxygen, argon, nitrous oxide
- Flow measurement at nitrogen generators



### Flow measuring ranges VA 420 for compressed air (ISO 1217: 1000 mbar, 20°C)

| Measur. section | Outer pipe dia. mm | Inner pipe dia. mm | Measuring range from to   | L mm | L <sub>1</sub> mm | H mm  | H <sub>1</sub> mm | Flange ØD | DIN EN 1092-1 ØK | n x ØL |
|-----------------|--------------------|--------------------|---------------------------|------|-------------------|-------|-------------------|-----------|------------------|--------|
| DN 15           | 21.3               | 16.1               | 0.2 90 m <sup>3</sup> /h  | 300  | 210               | 213.2 | 165.7             | 95        | 65               | 4 x 14 |
| DN 20           | 26.9               | 21.7               | 0.3 170 m <sup>3</sup> /h | 475  | 275               | 218.2 | 165.7             | 105       | 75               | 4 x 14 |
| DN 25           | 33.7               | 27.3               | 0.5 290 m <sup>3</sup> /h | 475  | 275               | 223.2 | 165.7             | 115       | 85               | 4 x 14 |
| DN 32           | 42.4               | 36.8               | 0.7 480 m <sup>3</sup> /h | 475  | 275               | 235.7 | 165.7             | 140       | 100              | 4 x 18 |
| DN 40           | 48.3               | 41.8               | 1.0 550 m <sup>3</sup> /h | 475* | 275               | 240.7 | 165.7             | 150       | 110              | 4 x 18 |
| DN 50           | 60.3               | 53.1               | 2.0 900 m <sup>3</sup> /h | 475* | 275               | 248.2 | 165.7             | 165       | 125              | 4 x 18 |

\* Attention: Shortened inlet section! Please observe the recommended minimum inlet section (length = 10 x inner diameter) on site.

| Description  | Order no. |
|--|-----------|
| VA 420 with integrated DN 15 measuring section with weld neck flange   | 0695 2421 |
| VA 420 with integrated DN 20 measuring section with weld neck flange   | 0695 2422 |
| VA 420 with integrated DN 25 measuring section with weld neck flange   | 0695 2423 |
| VA 420 with integrated DN 32 measuring section with weld neck flange   | 0695 2426 |
| VA 420 with integrated DN 40 measuring section with weld neck flange   | 0695 2424 |
| VA 420 with integrated DN 50 measuring section with weld neck flange   | 0695 2425 |
| Option: High-pressure version PN 40  | Z695 0411 |
| Special measuring range VA 420 according to customer's requirements  | Z695 4006 |
| <b>Connection cables:</b>  |           |
| Connection cable 5 m (power supply, analogue output)   | 0553 0104 |
| Connection cable 10 m (power supply, analogue output)  | 0553 0105 |
| Pulse cable for consumption sensors with M12 plug, length 5 m  | 0553 0106 |
| Pulse cable for consumption sensors with M12 plug, length 10 m   | 0553 0107 |
| <b>Further accessories:</b>  |           |
| Closing cap for meas. section VA 420 (Material: Aluminium)   | 0190 0001 |
| Closing cap for meas. section VA 420 (Material: Stainless steel 1.4404)  | 0190 0002 |
| CS Service Software for FA/VA 400 sensors including PC connection set, USB interface and interface adapter to the sensor as well as CSM-S for data recording | 0554 2005 |
| Mains unit in wall housing 100-240 V, 10 VA, 50-60 Hz/24VDC, 0.35 A  | 0554 0108 |
| Mains unit 100-240 VAC / 24 VDC, 0.35 A for VA/FA 400 Series, 2 m cable  | 0554 0107 |
| 5 point precision calibration with ISO certificate   | 3200 0001 |

### Technical data VA 420

|   |   |
|---|---|
| <b>Parameters:</b>                        | m <sup>3</sup> /h, l/min (1000 mbar, 20°C) in case of compressed air resp. Nm <sup>3</sup> /h, NI/min (1013 mbar, 0°C) in case of gases |
| <b>Adjustable via keypad:</b>             | m <sup>3</sup> /h, m <sup>3</sup> /min, l/min, l/s, ft/min, cfm, m/s, kg/h, kg/min  |
| <b>Meas. principle:</b>                   | calorimetric measurement  |
| <b>Sensor:</b>                            | 2 x silicium chip   |
| <b>Meas. medium:</b>                      | air, gases  |
| <b>Gas types adjustable via software:</b> | air, nitrogen, argon, nitrous oxide, CO <sub>2</sub> , oxygen   |
| <b>Meas. range:</b>                       | see table at the left   |
| <b>Accuracy:</b>                          | ±1.5% of m.v., ±0.05% of f.s.<br>On request: Special calibration via 5 point ISO calibration certificat                                 |
| <b>Operating temp.:</b>                   | -30...80 °C   |
| <b>Operating press.:</b>                  | up to 16 bar<br>Optional up to PN 40  |
| <b>Analogue output:</b>                   | 4...20 mA for m <sup>3</sup> /h resp. l/min   |
| <b>Pulse output:</b>                      | 1 pulse per m <sup>3</sup><br>resp. per liter<br>galvanically separated   |
| <b>PC connection:</b>                     | SDI interface   |
| <b>Power supply:</b>                      | 24 VDC smoothed ± 15 %  |
| <b>Burden:</b>                            | < 500 Ohm   |
| <b>Meas. section:</b>                     | stainless steel, 1.4404   |
| <b>Flanges:</b>                           | Weld neck flange according to DIN EN 1092-1<br>Groove-faced and tongue-faced flange on request  |



## Compressed air analyzer DS 300 mobile

Energy analysis – consumption measurement – leakage calculations at compressed air systems



The measuring instrument **DS 300 mobile enables the analysis of compressed air stations**. Up to 4 clamp-on ammeters measure the current consumption of every single compressor. Optionally also 4 pressure sensors, temperature sensors or any other analogue sensors can be connected.

In addition, the DS 300 mobile measures the discharged compressed air in  $\text{m}^3/\text{h}$ ,  $\text{m}^3$  and the dew point temperature in  $^{\circ}\text{Ctd}$  at the same time.

The integrated data logger stores up to 1 million measured values.

The **CS analysis software** enables the graphical and statistical evaluation of the stored data at the PC.

From the stored current values it is possible to calculate the costs **in € for the energy consumption (kWh)** as well as the load and idle times of every single compressor including switch-on/switch-off cycles.

The costs per  $\text{m}^3$  and the total costs per year in € are calculated from the actually consumed quantity of compressed air. A special leakage calculation determines the cost share of the leakages in comparison to the total costs in €.

**For documentation of the measured values** the user gets a DIN A 4 graphics printout for each compressor in a day view and in a week view at the touch of a button.

The additional printout with the statistical values contains all necessary data for a complete analysis of the compressor stations (see page 32).

Complex Excel® calculations and the issuing of reports are no longer necessary. Each service company can issue a report for the end customer with their own logo and additional information.

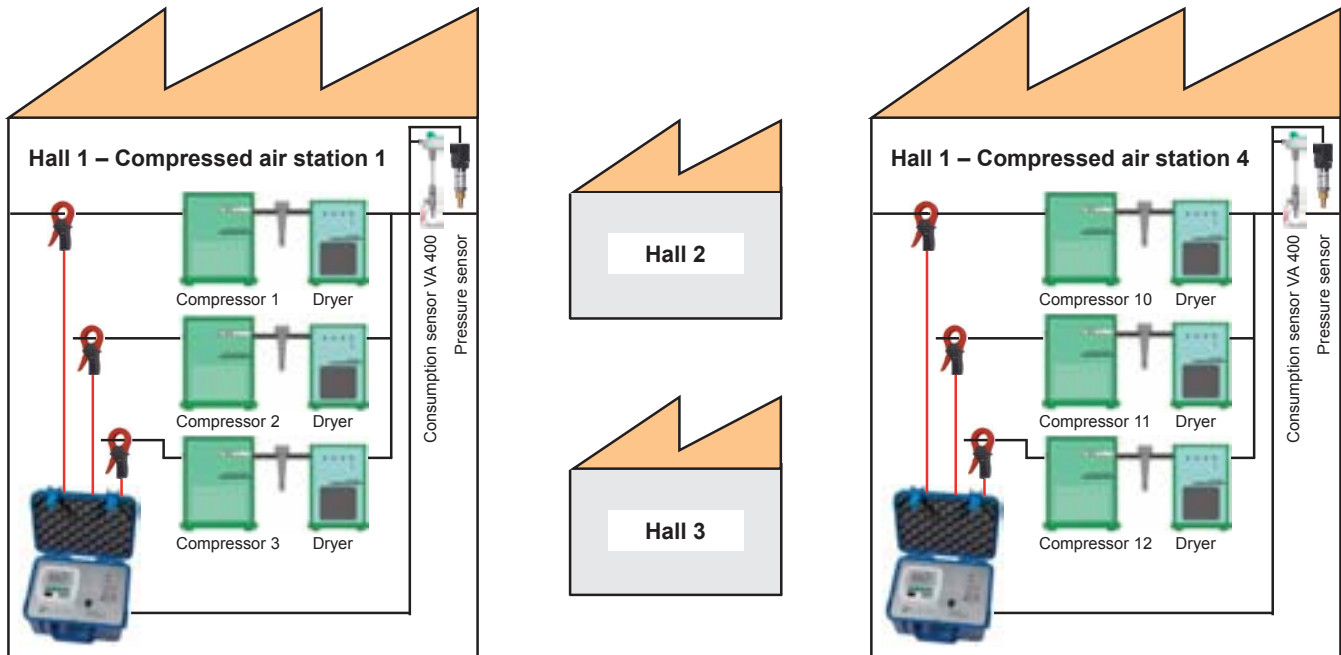


## Step 1: Current measurement of up to 12 compressors

A special advantage is that up to 12 compressors can be measured at the same time with 3 DS 300 mobile.

So compressed air stations which are often far away from each other can be measured separately and then

summarized synchronously in one evaluation at the PC.



## Step 2: Analysis of the measured values at the PC

### 1 Compressor analysis (current 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 entered.

The following parameters are calculated additionally: Energy consumption in (kWh), load-, idle-, stop time, compressor load in %, number of loads/load removal (load cycles).

### 2 System analysis (current consumption measurement and real consumption 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 consumption sensor VA 400.

With the additional "real consumption 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 consumption sensor VA 400 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 €.



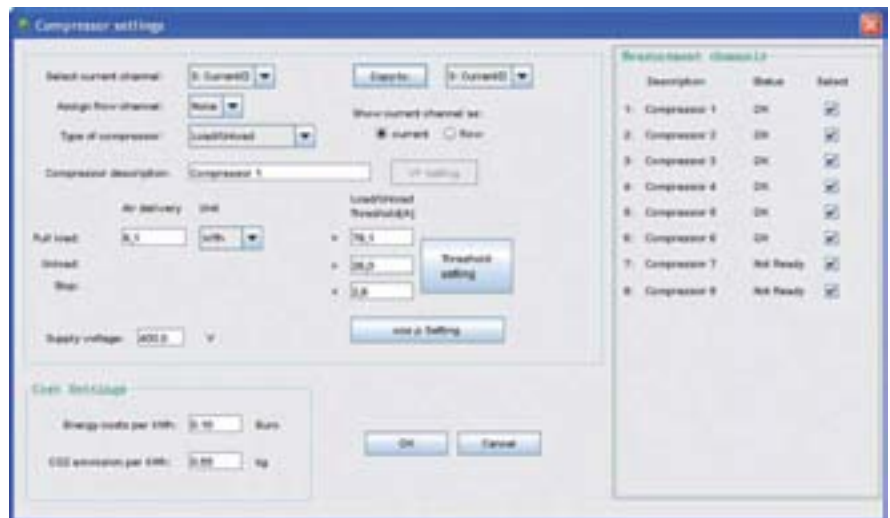
## Step 3:

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 1kWh



### 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 crosslines 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/ idle times

| Parameter                          | Real         | Best        | Worst       | Target |
|------------------------------------|--------------|-------------|-------------|--------|
| <b>System Analysis</b>             |              |             |             |        |
| 1. Load/Idle time                  | 187.5 %      | 187.5 %     | 187.5 %     |        |
| 2. Load analyzer                   |              |             |             |        |
| 3. Full load time (h:m)            | 30.8 (16%)   | 119.0 (61%) | 54.2 (29%)  |        |
| 4. Unload time (h:m)               | 3.1 (2%)     | 3.8 (2%)    | 3.8 (2%)    |        |
| 5. Stop time (h:m)                 | 1.36.2 (81%) | 47.2 (25%)  | 112.8 (61%) |        |
| 6. Number of starts                | 11           | 38          | 33          |        |
| 7. Number of load/unload cycles    | 32           | 118         | 87          |        |
| <b>Energy</b>                      |              |             |             |        |
| 8. Full load energy (kWh)          | 999.8        | 2070.5      | 1887.1      | 1887.5 |
| 9. Unload energy (kWh)             | 1.8          | 4.4         | 3.4         | 11.4   |
| 10. Stop energy (kWh)              | 3.2          | 58.7        | 3.8         | 58.8   |
| 11. Total energy consumption (kWh) | 1004.7       | 2073.6      | 1894.4      | 1957.7 |
| 12. Specific power (kWh/m³)        | 0.117        | 0.132       | 0.113       | 0.122  |
| <b>Costs</b>                       |              |             |             |        |
| 13. Full load costs (Euro)         | 99           | 207         | 188         | 188    |
| 14. Unload costs (Euro)            | 0            | 0           | 0           | 0      |
| 15. Stop costs (Euro)              | 0            | 0           | 0           | 0      |
| 16. Total costs (Euro)             | 99           | 207         | 188         | 188    |
| 17. Costs per m³ (Euro)            | 0.0118       | 0.0131      | 0.0113      | 0.0122 |
| <b>Air delivery</b>                |              |             |             |        |
| 18. Average flow (m³/min)          | 0.8          | 2.2         | 1.8         | 4.7    |
| 19. Max flow (m³/min)              | 4.83         | 8.13        | 4.83        | 17.4   |



## DS 300 mobile – Easy operation without any instruction manual

The DS 300 mobile convinces due to its sophisticated operational concept which is similar to the self-explanatory operation of modern mobile phones.

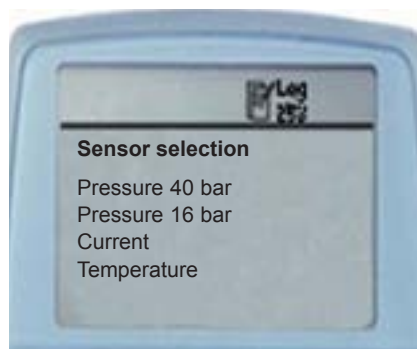
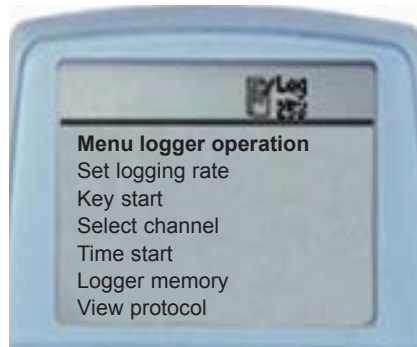
By using the **<Enter>** key the user enters the menus, by using the **<Back>** key each step can be cancelled. Selection is done by the **<arrow up>** and **<arrow down>** key.

All important parameters can be adjusted on-site via the keypad.

In the menu "logger operation" e. g. the measuring rate (freely adjustable as of one second) and the start time are fixed.

Under **"view protocol"** the user gets the min-, max- and average values of the stored protocols. In the menu **"sensor selection"** the connectable sensors are selected.

So it can be decided on-site with which sensors the measurement should be carried out.



| Description  | Order no. |
|--|-----------|
| DS 300-P6 mobile, with data logger for 1 million measured values including 2 digital inputs and 4 analogue inputs in a robust case | 0500 3226 |
| DS 300-P4 mobile, with data logger for 1 million measured values including 2 digital inputs and 2 analogue inputs in a robust case | 0500 3225 |
| Consumption sensor VA 400 max. version (185 m/s) incl. certificate, 5 m cable  | 0695 0122 |
| Option for VA 400: HighSpeed version (224 m/s)   | Z695 4002 |
| FA 410 dew point sensor from -80...20 °Ctd incl. mobile measuring chamber, 5 m cable   | 0699 0411 |
| Precision pressure sensor CS 16 (0...16 bar)   | 0694 3555 |
| Connection cable for pressure probe, 5 m, with ODU plug for DS 300 mobile  | 0553 0110 |
| Clamp-on ammeter 0...1000 A TRMS, 5 m cable, incl. ODU plug  | 0554 0506 |
| CS Analysis Software for leakage and cost calculation incl. CSM-S for data evaluation in graphic and table form                    | 0599 2011 |
| Case for all sensors (dimensions: 500 x 360 x 120 mm)  | 0554 6006 |
| <b>Further accessories:</b>  |           |
| CSM-S for data evaluation in graphic and table form incl. USB interface  | 0554 7011 |
| Extension cable 5 m for probes   | 0553 0103 |
| Connection cable for third-party sensors (open ends), 5 m, with ODU plug for DS 300 mobile   | 0553 0110 |

### Technical data DS 300 mobile:

- 2 digital inputs for FA 410 / VA 400 dew point and consumption
- 4 analogue inputs with DS 300-P6 resp. 2 analogue inputs with DS 300-P4 for connection of clamp-on ammeters, pressure sensors, temperature sensors
- Easy sensor recognition and selection
- USB interface
- 4 keys operation, self-explanatory
- 100-240 VAC, 50-60 Hz, add. internal rechargeable batteries for 4 hours operation time
- 0-50°C operation temperature
- -20...70°C transport temperature
- Data logger for 1 million meas. values
- Logging cycle freely adjustable from 1 second up to 1 hour
- Data logging at the touch of a button or with variable time start
- Housing dimensions: 280 x 230 x 155 mm
- Weight 2.3 kg

### Technical data FA 410:

|                           |   |
|---------------------------|---|
| <b>Measuring range:</b>   | -80...20 °Ctd   |
| <b>Accuracy:</b>          | ± 1 °C at 20...-20 °Ctd<br>± 2 °C at -20...-50 °Ctd<br>± 3 °C at -50...-80 °Ctd |
| <b>Pressure range:</b>    | -1...50 bar   |
| <b>Protection class:</b>  | IP 65   |
| <b>Operation temp.:</b>   | -20...70 °C   |
| <b>Screw-in thread:</b>   | G1/2"   |
| <b>Dimensions:</b>        | Ø 30 mm,<br>Length: ca. 130 mm  |
| <b>Via DS 300 mobile:</b> |   |
| Select units:             | % RH, °Ctd, g/m <sup>3</sup> , g/kg,<br>mg/m <sup>3</sup> , ppm V/V             |

### Technical data VA 400:

|   |  |
|---|--|
| <b>Parameters:</b>                          | m <sup>3</sup> /h Standard,<br>nach DIN 1945, ISO 1217<br>20 °C, 1000 mbar                             |
| <b>Via DS 300 mobile selectable:</b>        | m <sup>3</sup> /h, m <sup>3</sup> /min, l/min, l/s,<br>ft <sup>3</sup> /min, cfm, m/s, kg/h,<br>kg/min |
| <b>Via DS 300 mobile selectable:</b>        | Diameter for volume<br>flow calculation,<br>counter resettable   |
| <b>Meas. principle:</b>                     | Calorimetric measurement   |
| <b>Meas. medium:</b>                        | Air, gases   |
| <b>Gas types selectable via instrument:</b> | Air, nitrogen,<br>argon, CO <sub>2</sub> ,<br>oxygen   |
| <b>Accuracy:</b>                            | ± 4 % m. v.<br>± 3 % m. v. via 5 point<br>ISO precision calibration                                    |
| <b>Operation temp.:</b>                     | -30...110 °C probe tube<br>-30...80 °C housing   |
| <b>Operat. pressure:</b>                    | Up to 50 bar   |
| <b>Probe tube:</b>                          | Stainless steel, 1,4301<br>Mounting length 220 mm,<br>Ø 10 mm  |
| <b>Mounting thread:</b>                     | G1/2"  |
| <b>Diameter housing:</b>                    | 65 mm  |



## What are the advantages of the consumption measuring technology of CS Instruments?

- 1 Even under pressure, the consumption probe VA 400 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 400 is available in the following probe lengths: 120, 160, 220, 300, 400 mm.

So the consumption probes 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 400 with probe length 220 mm has a maximum mounting depth of 220 mm.

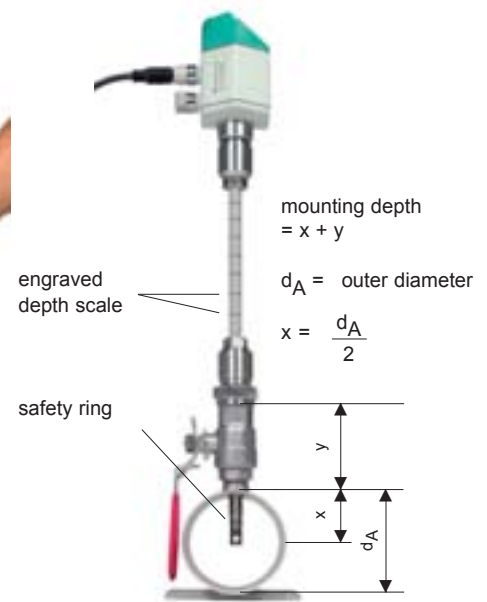
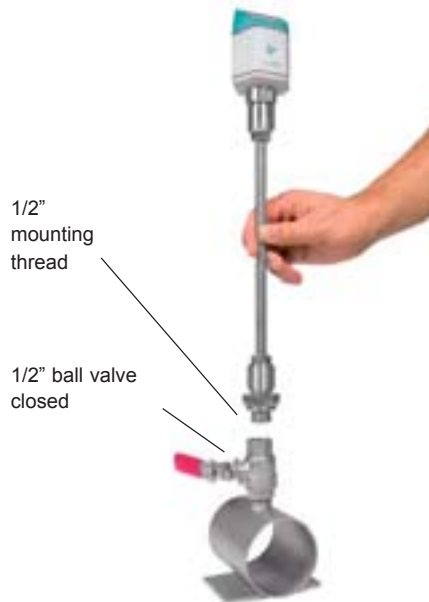
- 2 If there is no suitable measuring site with a 1/2" ball valve present there are two simple possibilities to set up a measuring point:

**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.



**A** Screw neck

**B** Spot drilling collar

Drilling under pressure

**Flow measuring ranges VA 400 for compressed air (ISO 1217: 1000 mbar, 20°C)**

| Inner diameter of pipe |       | VA 400 Standard<br>(92.7 m/s) | VA 400 Max.<br>(185.0 m/s)   | VA 400 HighSpeed<br>(224.0 m/s) |
|------------------------|-------|-------------------------------|------------------------------|---------------------------------|
| Inch                   | mm    | Meas. ranges<br>from ... to   | Meas. ranges<br>from ... to  | Meas. ranges<br>from ... to     |
| 1/2"                   | 16.1  | DN 15                         | 2.5...760 l/min              | 3.5...1516 l/min                |
| 3/4"                   | 21.7  | DN 20                         | 0.3...89 m <sup>3</sup> /h   | 0.4...178 m <sup>3</sup> /h     |
| 1"                     | 27.3  | DN 25                         | 0.5...148 m <sup>3</sup> /h  | 0.6...295 m <sup>3</sup> /h     |
| 1 1/4"                 | 36.0  | DN 32                         | 0.9...280 m <sup>3</sup> /h  | 1.2...531 m <sup>3</sup> /h     |
| 1 1/2"                 | 41.8  | DN 40                         | 1.2...365 m <sup>3</sup> /h  | 1.5...728 m <sup>3</sup> /h     |
| 2"                     | 53.1  | DN 50                         | 2...600 m <sup>3</sup> /h    | 2.5...1198 m <sup>3</sup> /h    |
| 2 1/2"                 | 71.1  | DN 65                         | 3.5...1096 m <sup>3</sup> /h | 5...2187 m <sup>3</sup> /h      |
| 3"                     | 84.9  | DN 80                         | 5...1570 m <sup>3</sup> /h   | 7...3133 m <sup>3</sup> /h      |
| 4"                     | 110.0 | DN 100                        | 9...2645 m <sup>3</sup> /h   | 12...5279 m <sup>3</sup> /h     |
| 5"                     | 133.7 | DN 125                        | 13...3912 m <sup>3</sup> /h  | 18...7808 m <sup>3</sup> /h     |
| 6"                     | 159.3 | DN 150                        | 18...5560 m <sup>3</sup> /h  | 25...11097 m <sup>3</sup> /h    |
| 8"                     | 200.0 | DN 200                        | 26...8786 m <sup>3</sup> /h  | 33...17533 m <sup>3</sup> /h    |
| 10"                    | 250.0 | DN 250                        | 40...13744 m <sup>3</sup> /h | 52...27429 m <sup>3</sup> /h    |
| 12"                    | 300.0 | DN 300                        | 60...19815 m <sup>3</sup> /h | 80...39544 m <sup>3</sup> /h    |



## VA 400

### Consumption sensor for compressed air and gases

The new VA 400 for consumption measurement of compressed air and gases in a robust housing with and without display with actual consumption in m<sup>3</sup>/h and counter in m<sup>3</sup>.

#### Special features

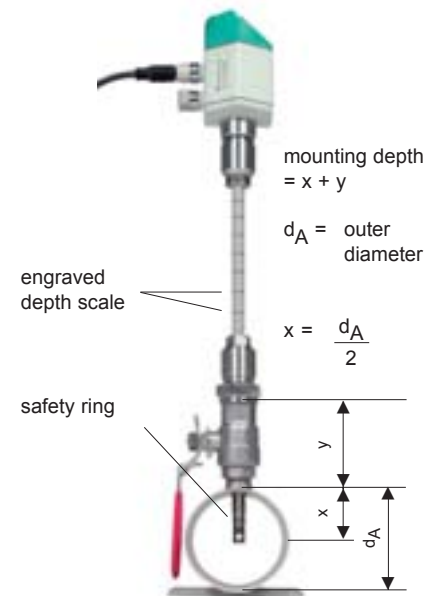
- Integrated display for m<sup>3</sup>/h und m<sup>3</sup>
- Depth scale for accurate installation
- Usable from 1/2" to 12" (DN 300)
- Easy installation under pressure
- 4...20 mA analogue output for m<sup>3</sup>/h resp. m<sup>3</sup>/min
- Pulse output for m<sup>3</sup>
- Inner diameter adjustable via keypad
- Consumption counter resettable



Inner diameter adjustable via keypad

flexible mounting thread G1/2"

safety ring Ø 11.7 mm



#### Technical data VA 400

|   |   |
|---|---|
| <b>Parameters:</b>                        | m <sup>3</sup> /h, l/min (1000 mbar, 20 °C) in case of compressed air resp. Nm <sup>3</sup> /h, NI/min (1013 mbar, 0 °C) in case of gases |
| <b>Adjustable via software:</b>           | m <sup>3</sup> /h, m <sup>3</sup> /min, l/min, l/s, ft/min, cfm, m/s, kg/h, kg/min.   |
| <b>Adjustable via keypad:</b>             | diameter for volume flow calculation, counter resettable  |
| <b>Meas. principle:</b>                   | calorimetric measurement  |
| <b>Sensor:</b>                            | 2 x silicium chip   |
| <b>Meas. medium:</b>                      | air, gases  |
| <b>Gas types adjustable via software:</b> | air, nitrogen, argon, helium, CO <sub>2</sub> , oxygen  |
| <b>Meas. range:</b>                       | see table page 34   |
| <b>Accuracy:</b>                          | ± 4 % m.v.<br>± 3 % m.v. via 5 point ISO precision calibration  |
| <b>Operating temp.:</b>                   | -30...110 °C probe tube<br>-30...80 °C housing  |
| <b>Operating pressure:</b>                | up to 50 bar  |
| <b>Analogue output:</b>                   | 4...20 mA for m <sup>3</sup> /h resp. l/min; on request: scaling for cfm, m <sup>3</sup> /min, l/min, l/s, ft/min, m/s                    |
| <b>Pulse output:</b>                      | 1 pulse per m <sup>3</sup> , signal high 24 VDC, for 30 ms  |
| <b>PC connection:</b>                     | SDI interface   |
| <b>Power supply:</b>                      | 24 VDC  |
| <b>Burden:</b>                            | < 500 Ohm   |
| <b>Housing:</b>                           | polycarbonate   |
| <b>Probe tube:</b>                        | stainless steel, 1,4301 mounting length 220 mm, Ø 10 mm   |
| <b>Mounting thread:</b>                   | G1/2"   |
| <b>Diameter housing:</b>                  | 65 mm   |

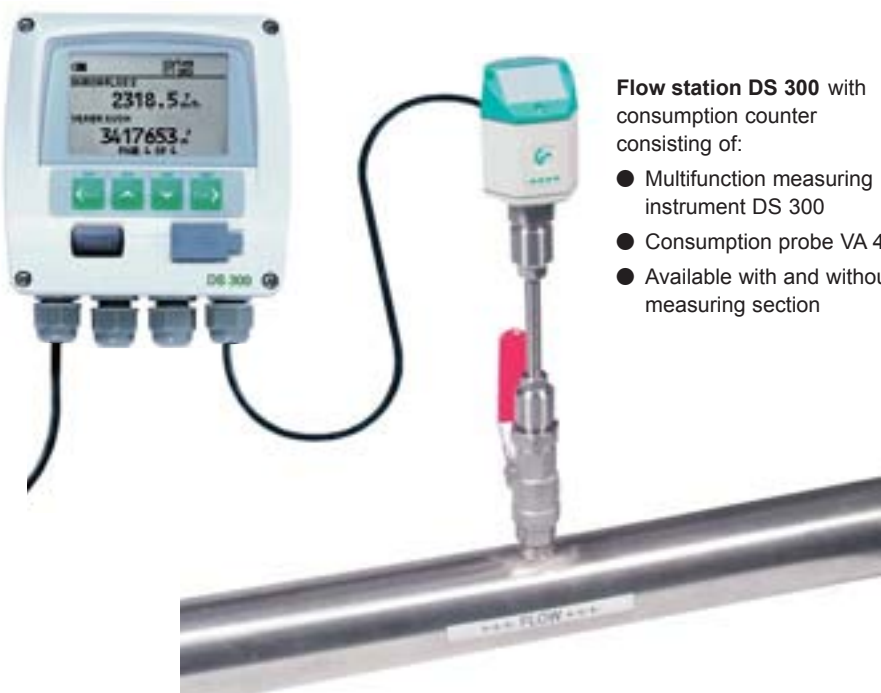
| Description  | Order no.   |
|--|-------------|
| VA 400 consumption sensor in basic version: Standard (92.7 m/s), probe length 220 mm, without display  | 0695 4001   |
| <b>Options for VA 400:</b>   |             |
| Display  | Z695 4000   |
| Max. version (185 m/s)   | Z695 4003   |
| HighSpeed version (224 m/s)  | Z695 4002   |
| Probe length 120 mm  | ZSL 0120    |
| Probe length 160 mm  | ZSL 0160    |
| Probe length 300 mm  | ZSL 0300    |
| Probe length 400 mm  | ZSL 0400    |
| <b>Connection cables:</b>  |             |
| Connection cable, 5 m (power supply, analogue output, pulse output)  | 0553 0104   |
| Connection cable, 10 m (power supply, analogue output, pulse output)   | 0553 0105   |
| <b>Additional accessories:</b>   |             |
| CS Service Software for FA/VA 400 sensors incl. PC connection set, USB adapter and interface adapter to sensor as well as CSM-S for data recording | 0554 2005   |
| Mains unit in wall housing 100-240 V, 10 VA, 50-60 Hz/24 VDC, 0,35 A   | 0554 0108   |
| External wall display multifunction measuring instrument DS 300  | see page 36 |
| 5 point precision calibration with ISO certificate   | 3200 0001   |



## Flow station DS 300 with consumption counter

DS 300 displays the actual value (m<sup>3</sup>/h, m<sup>3</sup>/min) and the total consumption. A 4...20 mA output for m<sup>3</sup>/h and a pulse output for m<sup>3</sup> are available for routing to a superior building management system (PLC)

The large measuring range of the consumption sensors enable the recordings of high consumptions (e. g. on weekdays) and the determination of leakages of a few litres/min (e. g. weekends).



**Flow station DS 300 with consumption counter** consisting of:

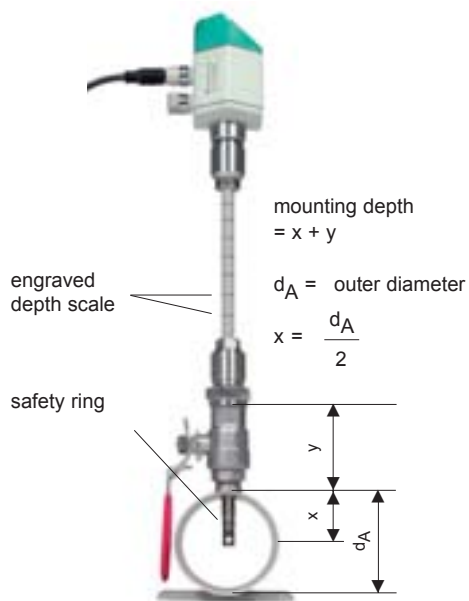
- Multifunction measuring instrument DS 300
- Consumption probe VA 400
- Available with and without measuring section

### Special features

- Usable from 1/2" to 12" (DN 300)
- All-in-one solution, small installation expenditure
- 2 displays, actual flow and total consumption
- Easy installation and removal of the sensor under pressure
- Highest accuracy due to 5 point precision calibration
- Output 4 to 20 mA for m<sup>3</sup>/h, pulse output for m<sup>3</sup>
- Easy handling:
  - Inner diameter freely adjustable in DS 300
  - 2 alarm values freely adjustable
  - Optical display in case of alarm
  - Consumption counter resettable
- Dew point sensor connectable

Flow measuring ranges VA 400 for compressed air (ISO 1217: 1000 mbar, 20°C)

| Inner diameter of pipe |       |        | VA 400 Standard<br>(92.7 m/s) | VA 400 Max.<br>(185.0 m/s)   | VA 400 HighSpeed<br>(224.0 m/s) |
|------------------------|-------|--------|-------------------------------|------------------------------|---------------------------------|
| Inch                   | mm    | DN     | Meas. ranges<br>from ... to   | Meas. ranges<br>from ... to  | Meas. ranges<br>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 m <sup>3</sup> /h    | 0.4...178 m <sup>3</sup> /h  | 0.7...215 m <sup>3</sup> /h     |
| 1"                     | 27.3  | DN 25  | 0.5...148 m <sup>3</sup> /h   | 0.6...295 m <sup>3</sup> /h  | 1.1...357 m <sup>3</sup> /h     |
| 1 1/4"                 | 36.0  | DN 32  | 0.9...280 m <sup>3</sup> /h   | 1.2...531 m <sup>3</sup> /h  | 2.5...644 m <sup>3</sup> /h     |
| 1 1/2"                 | 41.8  | DN 40  | 1.2...365 m <sup>3</sup> /h   | 1.5...728 m <sup>3</sup> /h  | 3.0...882 m <sup>3</sup> /h     |
| 2"                     | 53.1  | DN 50  | 2...600 m <sup>3</sup> /h     | 2.5...1198 m <sup>3</sup> /h | 4.6...1450 m <sup>3</sup> /h    |
| 2 1/2"                 | 71.1  | DN 65  | 3.5...1096 m <sup>3</sup> /h  | 5...2187 m <sup>3</sup> /h   | 7...2648 m <sup>3</sup> /h      |
| 3"                     | 84.9  | DN 80  | 5...1570 m <sup>3</sup> /h    | 7...3133 m <sup>3</sup> /h   | 12...3794 m <sup>3</sup> /h     |
| 4"                     | 110.0 | DN 100 | 9...2645 m <sup>3</sup> /h    | 12...5279 m <sup>3</sup> /h  | 16...6391 m <sup>3</sup> /h     |
| 5"                     | 133.7 | DN 125 | 13...3912 m <sup>3</sup> /h   | 18...7808 m <sup>3</sup> /h  | 24...9453 m <sup>3</sup> /h     |
| 6"                     | 159.3 | DN 150 | 18...5560 m <sup>3</sup> /h   | 25...11097 m <sup>3</sup> /h | 43...13436 m <sup>3</sup> /h    |
| 8"                     | 200.0 | DN 200 | 26...8786 m <sup>3</sup> /h   | 33...17533 m <sup>3</sup> /h | 50...21230 m <sup>3</sup> /h    |
| 10"                    | 250.0 | DN 250 | 40...13744 m <sup>3</sup> /h  | 52...27429 m <sup>3</sup> /h | 80...33211 m <sup>3</sup> /h    |
| 12"                    | 300.0 | DN 300 | 60...19815 m <sup>3</sup> /h  | 80...39544 m <sup>3</sup> /h | 100...47881 m <sup>3</sup> /h   |



Installation even under pressure via customary 1/2" ball valve



#### Option: Integrated data logger

- Automatic recording of the compressed air consumption
- Quantifying of leakages, compressed air consumption in production-free times, e. g. weekends
- Memory for 1 million measured values



#### Option: 2 additional sensor inputs

- For connection of pressure sensors, temperature sensors, clamp-on ammeters  
Sensors please see page 41

| Description   |                                | Order no.    |           |
|---|--------------------------------|--------------|-----------|
| <b>Flow station DS 300 for installation into existing pipelines</b><br>(diamater freely adjustable at DS 300):<br>Flow station DS 300 consisting of:<br>Multifunction measuring instrument DS 300 and consumption probe VA 400 in basic version: Standard (92.7 m/s), probe length: 220 mm  |                                |              |           |
|   |                                | 0600 4005    |           |
| <b>Flow station DS 300 including measuring section (stainless steel)</b><br>Flow station DS 300 consisting of:<br>Multifunction measuring instrument DS 300 and consumption probe VA 400 in basic version: Standard (92.7 m/s), probe length: 220 mm incl. measuring section with ball valve made from stainless steel 1,4301; up to DN 65 (2 1/2") with external thread, from DN 80 (3") with flange according to DIN 2633 |                                |              |           |
| External thread   | Pipe (outerø x wall thickness) | Total length | Order no. |
| G 1/2"  | 21.3 x 2.6 mm                  | 500 mm       | 0601 0261 |
| G 3/4"  | 26.9 x 2.6 mm                  | 600 mm       | 0601 0262 |
| G 1"  | 33.7 x 3.2 mm                  | 750 mm       | 0601 0263 |
| G 1 1/4"  | 42.4 x 3.2 mm                  | 900 mm       | 0601 0264 |
| G 1 1/2"  | 48.3 x 3.2 mm                  | 1000 mm      | 0601 0265 |
| G 2"  | 60.3 x 3.6 mm                  | 1250 mm      | 0601 0266 |
| G 2 1/2"  | 76.1 x 3.6 mm                  | 1500 mm      | 0601 0267 |
| From DN 80 with flange DIN 2633   |                                |              |           |
| DN 80/88.9  | 88.9 x 2.0 mm                  | 1850 mm      | 0601 0268 |
| DN 100/114.3  | 114.3 x 2.0 mm                 | 2104 mm      | 0601 0269 |
| DN 125/139.7  | 139.7 x 3.0 mm                 | 2860 mm      | 0601 0270 |
| DN 150/168.3  | 168.3 x 3.0 mm                 | 3110 mm      | 0601 0271 |
| <b>Options for multifunction measuring instrument DS 300</b>  |                                |              |           |
| Integrated data logger for 1 million measured values  |                                | Z500 3001    |           |
| RS 485 interface for connection of up to 32 instruments DS 300  |                                | Z500 3002    |           |
| 2 additional sensor inputs for connection of pressure sensors, temperature sensors, clamp-on ammeters, third-party sensors with 4...20 mA, 0...10 V, Pt 100   |                                | Z500 3003    |           |
| Ethernet interface  |                                | Z500 3005    |           |
| <b>Options for consumption probe VA 400</b>   |                                |              |           |
| Max. version (185 m/s)  |                                | Z695 4003    |           |
| High Speed version (224 m/s)  |                                | Z695 4002    |           |
| Probe length 120 mm   |                                | ZSL 0120     |           |
| Probe length 160 mm   |                                | ZSL 0160     |           |
| Probe length 300 mm   |                                | ZSL 0300     |           |
| Probe length 400 mm   |                                | ZSL 0400     |           |
| <b>Accessory</b>  |                                |              |           |
| CSM-S for data evaluation in graphic and in table form including USB interface  |                                | 0554 7011    |           |

### Technical data VA 400

|  |  |
|--|--|
| <b>Parameters:</b>                     | m <sup>3</sup> /h Standard, acc. to DIN 1945, ISO 1217 20°C, 1000 mbar                           |
| <b>Adjustable via DS 300:</b>          | m <sup>3</sup> /h, m <sup>3</sup> /min, l/min, l/s, ft <sup>3</sup> /min, cfm, m/s, kg/h, kg/min |
| <b>Meas. principle:</b>                | calorimetric measurement   |
| <b>Sensor:</b>                         | 2 x silicium chip  |
| <b>Meas. medium:</b>                   | air, gas   |
| <b>Gas types select. via software:</b> | air, nitrogen, argon, helium, CO <sub>2</sub> , oxygen   |
| <b>Meas. range:</b>                    | see table page 34  |
| <b>Accuracy:</b>                       | ± 4 % m.v.<br>± 3 % m.v. via 5 point ISO precision calibration                                   |
| <b>Operating temp.:</b>                | -30...+110°C probe tube<br>-30...+80°C housing   |
| <b>Operating press.:</b>               | up to 50 bar   |
| <b>Analogue output:</b>                | 4...20 mA  |
| <b>Burden:</b>                         | < 500 Ohm  |
| <b>Pulse output:</b>                   | 1 pulse per m <sup>3</sup>   |
| <b>Probe tube:</b>                     | stainless steel 1.4301   |
| <b>Mounting thread:</b>                | G 1/2"   |
| <b>Housing diameter:</b>               | 65 mm  |

### Technical data DS 300

|                               |  |
|-------------------------------|--|
| <b>Dimensions:</b>            | 118 x 115 x 93 mm, IP 65 (wall housing)<br>92 x 92 x 70 mm, IP 65 (panel mounting) |
| <b>Inputs:</b>                | 2 digital inputs for VA 400 resp. FA 410   |
| <b>Interface:</b>             | USB  |
| <b>Keypad:</b>                | 4 keys   |
| <b>Power supply:</b>          | 100-240 VAC, 50-60 Hz  |
| <b>Accuracy:</b>              | see VA 400   |
| <b>Alarm outputs:</b>         | 2 relays, 230 VAC, 3 A   |
| <b>Operating temp.:</b>       | 0...50 °C  |
| <b>Transport temperature:</b> | -20...70 °C  |

#### OPTIONS

|                                    |   |
|------------------------------------|---|
| <b>Data logger:</b>                | 1 million meas. values start/stop time, meas. rate freely adjustable  |
| <b>RS 485 interface:</b>           | up to 32 x DS 300 connectable evaluation at the PC with CS Soft Network   |
| <b>2 additional sensor inputs:</b> | for connection of pressure sensors, temperature sensors, clamp-on ammeters, third-party sensors with 4...20 mA, 0 bis 10 V, Pt100 |



## VA 409

### Flow direction switch for compressed air systems

The new 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 consumption sensors VA 400/VA 420 or to a separate building management system (mbs). Two LEDs show the flow direction.

In connection with 2 consumption sensors VA 400/VA 420 incoming and outflowing 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

|  |  |
|--|--|
| <b>Detection range recognition flow direction:</b> | < 0.1 m/s referred to 20°C and 1000 mbar   |
| <b>Measuring principle:</b>                        | calorimetric measurement   |
| <b>Sensor:</b>                                     | Pt 30/Pt 700/Pt 330  |
| <b>Measuring medium:</b>                           | air, gases   |
| <b>Operating temp.:</b>                            | 0...50 °C probe tube<br>-20...70 °C housing  |
| <b>Operating pressure:</b>                         | up to 16 bar   |
| <b>Power supply:</b>                               | 24 VDC, 40 mA  |
| <b>Power input:</b>                                | max. 80 mA up to 24 VDC  |
| <b>Protection class:</b>                           | IP 54  |
| <b>EMV:</b>  | acc. to DIN EN 61326   |
| <b>Connection:</b>                                 | 2 x M12, 5-pole, plug A and plug B   |
| <b>2 potential-free contacts:</b>                  | 2 x U max. 60 VDC, I max 0.5 A (normally closed); on request: Normally open                      |
| <b>Housing:</b>                                    | polycarbonate  |
| <b>Probe tube:</b>                                 | stainless steel, 1,4301, length 160 mm, Ø 10 mm, safety ring Ø 11.5 mm, longer probes on request |
| <b>Mounting thread:</b>                            | G 1/2"   |
| <b>Diameter housing:</b>                           | 65 mm  |
| <b>Flow direction:</b>                             | 2 LEDs   |

| Description   | Order no. |
|---|-----------|
| Flow direction switch VA 409                          | 0695 0409 |
| Mains unit in wall housing                            | 0554 0108 |
| Connection cable VA/FA Series 400, 5 m with M12 plug  | 0553 0104 |
| Connection cable VA/FA Series 400, 10 m with M12 plug | 0553 0105 |



## Flow station DS 300 with direction indication in one direction

By connecting the flow direction switch VA 409 to the flow station DS 300 only the consumption in one direction is measured. So it is guaranteed that the back-flowing compressed air is not counted twice.

### Special features

- precise consumption 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 300 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 station DS 300.

Each of both flow stations DS 300 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 stations DS 300 are used for precise consumption measurement of both flow directions.

### Special features

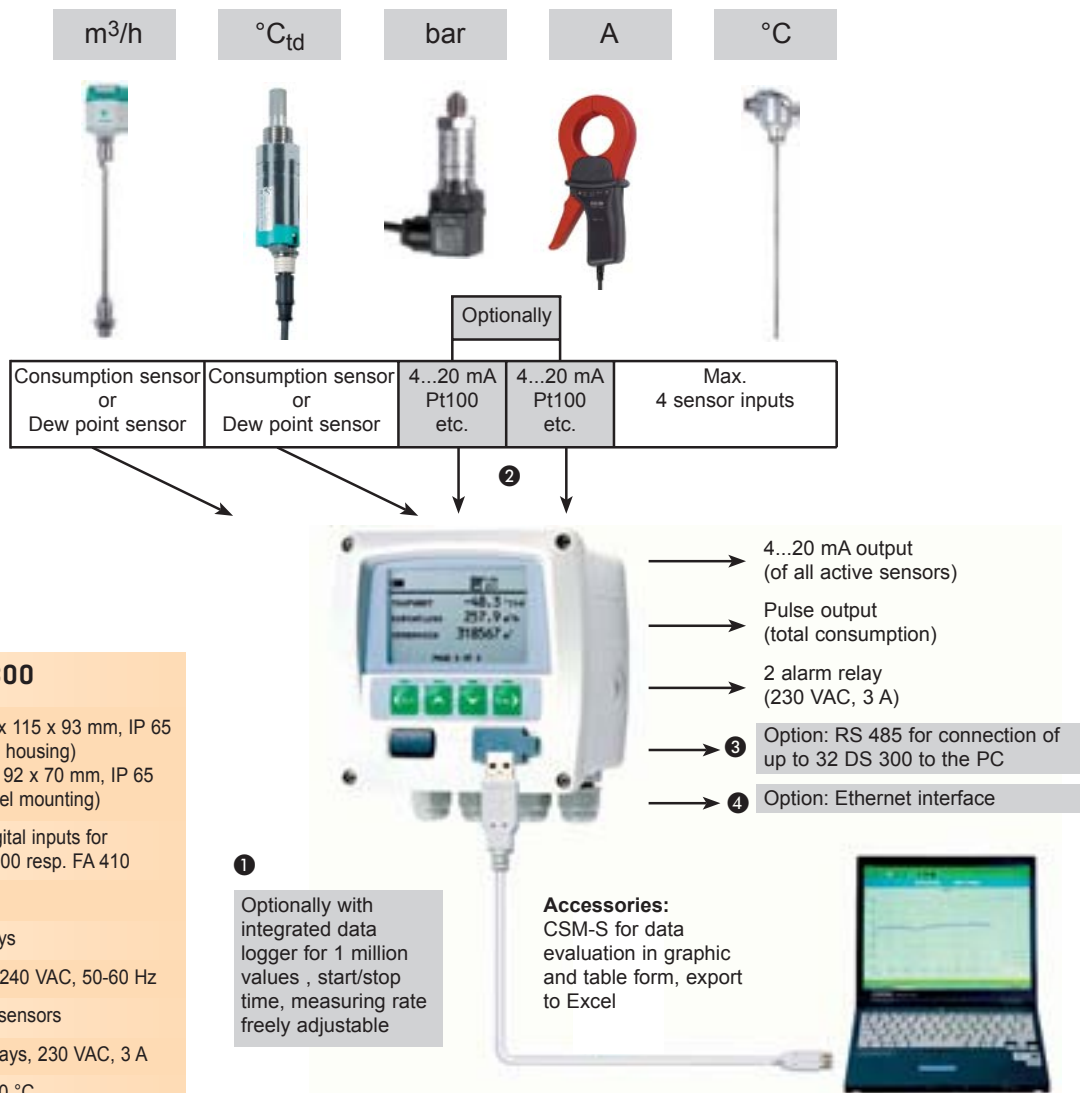
- precise consumption measurement in both directions
- separate indication of the actual consumption ( $\text{m}^3/\text{h}$  resp.  $\text{m}^3/\text{min}$  etc...) separate summing of the total consumption ( $\text{m}^3$  resp. l)
- forwarding of the analogue output and of the pulse output for the respective flow direction





Dew point Pressure Current Temperature

## DS 300 multifunction measuring instrument for all relevant parameters for compressed air



### Technical data DS 300

|                                    |  |
|------------------------------------|--|
| <b>Dimensions:</b>                 | 118 x 115 x 93 mm, IP 65 (wall housing)<br>92 x 92 x 70 mm, IP 65 (panel mounting)   |
| <b>Inputs:</b>                     | 2 digital inputs for VA 400 resp. FA 410   |
| <b>Interface:</b>                  | USB  |
| <b>Keypad:</b>                     | 4 keys   |
| <b>Power supply:</b>               | 100-240 VAC, 50-60 Hz  |
| <b>Accuracy:</b>                   | see sensors  |
| <b>Alarm outputs:</b>              | 2 relays, 230 VAC, 3 A   |
| <b>Operating temp.:</b>            | 0...50 °C  |
| <b>Transport temperature:</b>      | -20...70 °C  |
| <b>OPTIONS</b>                     |  |
| <b>Data logger:</b>                | 1 million meas. values start/stop time, meas. rate freely adjustable   |
| <b>RS 485 interface:</b>           | up to 32 x DS 300 connectable, evaluation at the PC in graph. and table form by means of CS Soft Network                         |
| <b>2 additional sensor inputs:</b> | for connection of pressure sensors, temperature sensors, clamp-on ammeters, third-party sensors with 4...20 mA, 0 to 10 V, Pt100 |

| Description   | Order no. |
|---|-----------|
| DS 300 multifunction measuring instrument with 2 inputs for consumption and dew point sensors (without sensors)   | 0500 3000 |
| <b>Option 1</b><br>Integrated data logger for 1 million measured values   | Z500 3001 |
| <b>Option 2</b><br>2 additional sensor inputs for connection of pressure sensors, temperature sensors, clamp-on ammeters, third-party sensors 0...10 V, Pt100 | Z500 3003 |
| <b>Option 3</b><br>RS 485 interface for connection of up to 32 DS 300 instruments   | Z500 3002 |
| <b>Option 4</b><br>Ethernet interface   | Z500 3005 |
| CSM-S for data evaluation in graphic and table form including USB cable   | 0554 7011 |
| CS Soft Network - Database Client/Server Solution (up to 5 DS 300)  | 0554 7041 |



Dew point  Pressure  Current  Temperature 

## DS 300 multifunction measuring instrument

### Suitable probes at a glance

| Description   | Order no.  |
|---|------------|
| <b>Consumption probes:</b>  |            |
| VA 400 consumption probe in basic version:<br>Standard (92.7 m/s), probe length 220 mm, without display                                       | 0695 4001  |
| <b>Options for VA 400:</b>  |            |
| Max. version (185 m/s)  | Z695 4003  |
| HighSpeed version (224 m/s)   | Z695 4002  |
| Probe length 120 mm   | ZSL 0120   |
| Probe length 160 mm   | ZSL 0160   |
| Probe length 300 mm   | ZSL 0300   |
| Probe length 400 mm   | ZSL 0400   |
| <b>Dew point sensors:</b>   |            |
| FA 410 dew point sensor, -80°...20°Ctd including inspection certificate   | 0699 0410  |
| FA 410 dew point sensor, -20°...50°Ctd including inspection certificate   | 0699 0412  |
| Connection cables for VA 400, FA 410:   |            |
| Connection cable, length: 5 m, to DS 300  | 0553 0104  |
| Connection cable, length: 10 m, to DS 300   | 0553 0105  |
| Connection cable, length: 5 m, with ODU plug to DS 300 mobile version   | 0553 0111  |
| <b>Pressure sensors:</b>  |            |
| Precision pressure sensor CS 16, 0...16 bar, ± 0.5 % accuracy of full scale   | 0694 3555  |
| Precision pressure sensor CS 40, 0...40 bar, ± 0.5 % accuracy of full scale   | 0694 3930  |
| Precision pressure sensor CS 1.6 absolute, 0...1.6 bar abs.,<br>± 0.5 % accuracy of full scale  | 0694 3550  |
| Precision pressure sensor CS -1...15 bar, ± 0.5 % accuracy of full scale  | 0694 3553  |
| Standard pressure sensor CS 16, 0...16 bar, ± 1 % accuracy of full scale  | 0694 1886  |
| Standard pressure sensor CS 40, 0...40 bar, ± 1 % accuracy of full scale  | 0694 0356  |
| Standard pressure sensor CS 1.6 absolute, 0...1.6 bar abs.,<br>± 1 % accuracy of full scale   | 0694 3551  |
| Standard pressure sensor up to 100 bar / 250 bar / 400 bar  | on request |
| <b>Connection cables for pressure sensors:</b>  |            |
| Connection cable, length: 5 m, to DS 300  | 0553 0108  |
| Connection cable, length : 10 m, to DS 300  | 0553 0109  |
| Connection cable, length: 5 m, with ODU plug to DS 300 mobile version   | 0553 0110  |
| <b>Temperature probes:</b>  |            |
| Screw-in temperature probe Pt 100, Class A, length 300 mm, Ø 6 mm,<br>with measuring transducer 4...20 mA = -50...+500 °C (2-wire technology) | 0693 0002  |
| Indoor/outdoor temperature probe Pt 100, Class A, -50...+100 °C   | 0604 0101  |
| Indoor/outdoor temperature probe Pt 100, Class A with measuring<br>transducer 4...20 mA = -50...+100 °C (2-wire technology)                   | 0693 0001  |
| <b>Connection cables for temperature probes:</b>  |            |
| Connection cable, length: 5 m, to DS 300  | 0553 0108  |
| Connection cable, length: 10 m, to DS 300   | 0553 0109  |
| Connection cable, length: 5 m, with ODU plug to DS 300 mobile version   | 0553 0110  |
| Temperature probe cable Pt 100, Class A, length 300 mm, Ø 6 mm,<br>-50...+180 °C, 5 m probe connection cable with open ends                   | 0604 0102  |
| Temperature probe cable Pt 100, Class A, length 150 mm, Ø 6 mm,<br>-50...+180 °C, 5 m probe connection cable with open ends                   | 0604 0100  |
| Clamp screwing 6 mm, G 1/2", PTFE clamping ring, pressure-tight up to 6 bar   | 0554 6003  |
| Clamp screwing 6 mm, G 1/2", VA clamping ring, pressure-tight up to 10 bar  | 0554 6004  |
| <b>Clamp-on ammeters:</b>   |            |
| Clamp-on ammeter 0...1000 A TRMS incl. 5 m connection cable with open ends  | 0554 0507  |



• FA 410



• Pressure sensor



• Screw-in  
temperature probe



• Clamp-on ammeter



• VA 400



• Temperature probe cable



• Indoor/outdoor  
temperature probe



• Clamp screwing



## DS 300 – Connection to BUS systems



The right **housing** for each application



- Ethernet interface



- For panel mounting  
Mounting dimensions: 92 x 92 x 70 mm



- For wall mounting



- Easy wall mounting

The following **BUS systems** can be realised:

- M-Bus
- Profibus DP Slave
- Modbus/RTU (RS 485)
- Modbus/RTU - Modbus/TCP (Ethernet)
- Modbus/RTU over TCP (Ethernet)
- Modbus/TCP (Ethernet)

| Description  | Order no. |
|--|-----------|
| Options for multifunction measuring instrument DS 300              |           |
| Integrated data logger for 1 million measured values               | Z500 3001 |
| RS 485 interface for connection of up to 32 DS 300 instruments     | Z500 3002 |
| Ethernet interface   | Z500 3005 |
| <b>Accessories</b>   |           |
| CS Soft Network - Database Client/Server Solution (up to 5 DS 300) | 0554 7041 |



## DS 300 – sophisticated operational concept

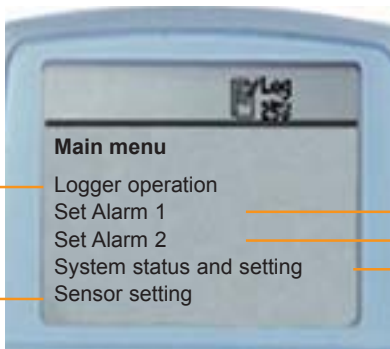


DS 300 convinces due to its sophisticated operational concept which is similar to the self-explanatory operation of modern mobile phones.

By using the **<Enter>** key the user enters the menus,

by using the **<Back>** key each step can be cancelled. Selection is done by the **<arrow up>** and **<arrow down>** key.

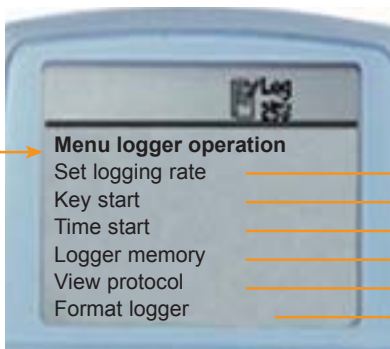
All important parameters can be set on-site via the keypad.



**Main menu**

- Logger operation
- Set Alarm 1
- Set Alarm 2
- System status and setting
- Sensor setting

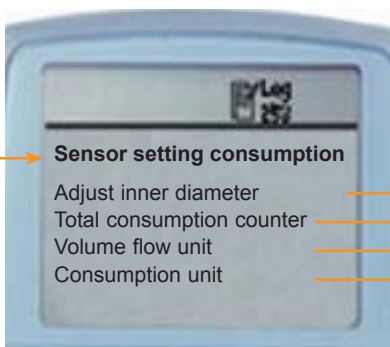
- Enter threshold value alarm relay 1 (not in case of DS 300 mobile version)
- Enter threshold value alarm relay 2 (not in case of DS 300 mobile version)
- Set date / time



**Menu logger operation**

- Set logging rate
- Key start
- Time start
- Logger memory
- View protocol
- Format logger

- The measuring rate can be freely adjusted between 1 second up to 59 minutes 59 seconds
- Logger starts at the push of a button / stops at the push of a button
- Logger starts at a defined date / time
- Shows the available recording time in hours, minutes
- Retrieving of stored protocols with Min, Max, average values
- Deletion of the whole memory content



**Sensor setting consumption**

- Adjust inner diameter
- Total consumption counter
- Volume flow unit
- Consumption unit

- Inner diameter freely adjustable. Important for calculation in m<sup>3</sup>/h
- Reset of total consumption counter to zero
- Volume flow unit freely selectable: m<sup>3</sup>/h, m<sup>3</sup>/min, l/min, l/s, cfm
- Consumption unit: m<sup>3</sup>, l, c



## Useful accessories: Measuring sections



• Measuring section 1/2"



• Measuring section 1/4"

### Measuring sections for precise measurements

Meas. section made of stainless steel 1.4301 incl. ball valve, up to DN 65 (G2 1/2") with external thread, from DN 80 with weld neck flange according to DIN 2633.

| External thread                 | Pipe (outerø x wall thickness) | Total length | Order no. |
|---------------------------------|--------------------------------|--------------|-----------|
| G 1/4"                          | 20.0 x 7.0 mm                  | 180 mm       | 4000 0006 |
| G 1/2"                          | 21.3 x 2.6 mm                  | 500 mm       | 4000 0015 |
| G 3/4"                          | 26.9 x 2.6 mm                  | 600 mm       | 4000 0020 |
| G 1"                            | 33.7 x 3.2 mm                  | 750 mm       | 4000 0025 |
| G 1 1/4"                        | 42.4 x 3.2 mm                  | 900 mm       | 4000 0032 |
| G 1 1/2"                        | 48.3 x 3.2 mm                  | 1000 mm      | 4000 0040 |
| G 2"                            | 60.3 x 3.6 mm                  | 1250 mm      | 4000 0050 |
| G 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 (see page 45) 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 recommended for installation from 10 to 50 bar | 0530 1105 |



## Useful accessories: Spot drilling collars

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 (page 44) 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 026 - 030 mm, Length: 100 mm,* | 0500 0447     |
| 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 |

\* incl. 1/2" ball valve

## 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

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



## Calibration of consumption sensors and flow stations

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



### Special feature

- Due to digital data transfer only the consumption sensor has to be calibrated, enabling the display unit DS 300 to stay on-site at all times.

Calibration range: from 0 to 4,000 m<sup>3</sup>/h under pressure

Accuracy of the reference: between 0.5 and 1 % of the meas. 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  |

## Compressed air analysis seminar: $m^3/h$ , $^{\circ}C_{td}$ , $^{\circ}C$ , A, bar...



Basics in theory for humidity and consumption measurement

Practical measurements and evaluation of the measuring results

### Hands-on seminar on compressed air analysis:

- Compressed air quality according to ISO 8573
- Practical applications: Which compressed air quality is needed?
- Methods of compressed air drying and compressed air processing
- Moisture measurement in compressed air
- Costs of compressed air consumption
- Consumption measurement

### Target groups / participants

- Quality assurance employees
- Application planners
- Measurement and control technicians
- Maintenance employees



## LD 300 leak detector

If gases escape through leaks ultrasonic noises are generated. By means of the LD 300 leakages can be detected in the ultrasonic range even from distances of several meters. LD 300 transforms the inaudible signals into a frequency which can be identified by means of the provided sound-proof headset. In depressurized systems an ultrasonic tone generator can be used of which the signal travels through smallest openings.



**Sound-proof headset enables** leak detection in extremely noisy environments



**Focus tube** with focus tip avoids influence by ambient noise and enables precise locating of leakages

### Annual energy costs caused by leakages

| Hole Ø (mm) | Loss in air (l/s) |           | Energy loss (kW/h) |           | Costs p.a. (€) |           |
|-------------|-------------------|-----------|--------------------|-----------|----------------|-----------|
|             | at 6 bar          | at 12 bar | at 6 bar           | at 12 bar | 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](http://www.druckluft.effizient.de)

(\*) kW x 0.06 € x 8.000 Bh/a

### Applications:

#### Leak detection in:

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



**Holding device** of LD 300 at the telescope bar

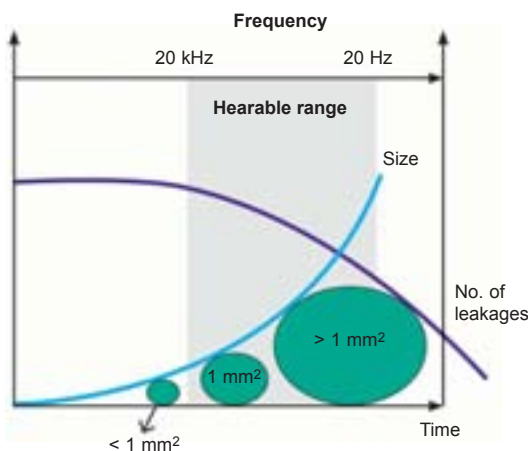
The **telescope bar** helps locating leakages in pipelines up to a height of 6 m



# LD 300 leak detector

## 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, Fraunhofer 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 = 270 EUR/year. The LD 300 will be payed off after 4 leakages.**



- hole size increases over time
- the human ear can only hear leakages which are bigger than 1 mm<sup>2</sup> at 7 bar
- until they are noticed 10 small leaks may cause a loss of 7,000 Euro/year



| Description                                  | Order no.        |
|--|------------------|
| <b>Set LD 300 leak detector</b>              | <b>0601 0103</b> |
| consisting of:                               |                  |
| LD 300 leak detector                         | 0560 0102        |
| Ultrasonic sensor                            | 0605 0001        |
| Sound-proof headset                          | 0554 0102        |
| Focus tube with focus tip                    | 0530 0101        |
| Cable for ultrasonic sensor                  | 0553 0101        |
| Battery charger                              | 0554 0001        |
| Transport case                               | 0554 0101        |
| <b>Accessories, not included in the set:</b> |                  |
| Ultrasonic tone generator                    | 0554 0103        |
| Telescope bar 3 x 120 cm                     | 0530 0102        |



The integrated laser facilitates the detection of leaks.

### Technical data LD 300

|                            |   |
|----------------------------|---|
| <b>Working frequency:</b>  | 40 kHz ± 2 kHz  |
| <b>Connections:</b>        | 1) 4-pole connection for headset and battery charger<br>2) 3.5 mm stereo socket for sensor and cable connection |
| <b>Laser:</b>              | wave length: 655...660 nm<br>output power: 0.4...0.5 mW   |
| <b>Power supply:</b>       | internal NIMH rech. battery   |
| <b>Operating duration:</b> | approx. 6 hours without laser,<br>approx. 4 hours with laser  |
| <b>Charging time:</b>      | approx. 1.5 hours   |
| <b>Operating temp.:</b>    | 0 to 40 °C  |
| <b>Storage temp.:</b>      | -10 to 50 °C  |
| <b>Telescope:</b>          | 3 x 120 cm  |



## DS 52 – digital process meter

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

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

| Description  | Order no.  |
|--|------------|
| DS 52 – digital process meter in wall housing, supply 230 VAC, sensor input for 0(4)...20 mA signal, 2 alarm relays                      | 0500 0008  |
| <b>Options:</b>  |            |
| Supply 24 VDC instead of 230 VAC   | Z500 0001  |
| Supply 110 VAC instead 230 VAC   | Z500 0002  |
| Alarm unit mounted at wall housing   | Z500 0003  |
| Alarm unit for external mounting   | Z500 0004  |
| <b>All-in one sets:</b>  |            |
| 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 with 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 |
| <b>Options:</b>  |           |
| Supply 24 VDC instead of 230 VAC   | Z500 0001 |
| Supply 110 VAC instead of 230 VAC  | Z500 0002 |

### Technical data DS 51

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







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