CS INSTRUMENTS GmbH

Instruction manual

DS 300 mobile version

Multi-channel display and data logger

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CS INSTRUMENTS GmbH

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Introduction

Dear CS customer,

You have made the right decision by choosing a measuring instrument from CS Instruments GmbH. Thousands of customers buy our high standard products every year. There are a few good reasons for doing so:

- The cost-performance ratio - reliable quality at a fair price.
- We have the ideal solutions for your measuring tasks based on our expert experience gained over 20 years.
- Our high quality standard.
- Of course, our instruments carry the CE symbol required by the EU.
- We issue calibration certificates and hold seminars.
- Also after the purchase we do not leave you out in the cold - we offer a good after sales service.

CE measuring instrument conforms with **DIN EN 61326**

1. Instruments description

- Energy analysis
- Consumption measurement
- Leakage calculation

The all-rounder DS 300 mobile version in a robust case is the ideal multifunction measuring instrument for the mobile use. The internal rechargeable battery enables mains-independent measurements of up to 4 hours.

Up to 6 parameters can be recorded at the same time (consumption, pressure dew point, current consumption, pressure, temperature …).

Special features:

- All relevant measured data at a glance:
  - Actual air consumption in m³/h or m³/min
  - Total air consumption in m³
  - Pressure dew point in °Ctd
  - Line pressure in bar
  - Current consumption in A
  - Temperature in °C
- Data logger for 1 million measured values
- Min-, Max-, average values attainable on-site without any PC
- The data transfer to the PC is effected via USB interface

2. Technical data

Case	Dimensions: 265 x 220 x 150 mm
Sensor inputs	2 channel version: 2 inputs for consumption and dew point sensors no analogue inputs 4 channel version: 2 inputs for consumption and dew point sensors, 2 additional inputs for analogue sensors 0/4…20 mA 6 channel version: 2 inputs for consumption and dew point sensors, 4 additional inputs for analogue sensors 0/4…20 mA
Interface	USB to PC
Keypad	4 keys
Voltage supply	100 …. 240 VAC / 50-60 Hz / 10 VA internal rechargeable battery (4 hours battery life) charging time: 10 hours
Display	Graphic display, 160 x 100 pixels, with back light
Accuracy	Dew point: see sensor specifications Consumption: see sensor specification Pressure: 0.5 % F.S. Current: 5 % < 25 A 2 % > 100 A 1 % > 250 A 0…20 mA: 0.01 mA 0…10 V: 0.01 V Pt100: 0.5 °C Pt1000: 0.5 °C
Measuring range	Dew point: see sensor specifications Consumption: see sensor specifications Pressure: 0…16/40 bar Current: 0…500 A Pt100: -200…600 °C Pt1000: -200…600 °C
Sensor connections	ODU connection plug, 5-pole
Operating temperature	0 ... 50 ºC
Transport temperature	-20 ... 70 ºC
Weight	2400 g
Data logger	▪ Up to 1,000,000 values ▪ Programmable start time or manual start ▪ Measuring rate: 1 s ... 1 h freely adjustable ▪ Average value, Min./Max. value depending on protocol

3. Key features of DS 300 mobile version

- Graphic display for easy user interface
- Flexible power supply: 100…240 V AC/ 50…60Hz resp. internal rechargeable battery
- 2 sensor inputs for CS consumption and dew point sensors (sensor connection 1 + 2)
- USB interface
- Data logger function for up to 1,000,000 values
- PC software for easy configuration and evaluation of the data
- Analogue input module (0…20 mA, 0…10 V, Pt100, Pt1000) (sensor connection 3, 4, 5 and 6)

4. Calibration/adjustment

At CS Instruments
According to DIN ISO certification of the measuring instruments we recommend to calibrate and if applicable to adjust the instruments regularly at the manufacturer. The calibration intervals should comply with your internal specificaton. According to DIN ISO we recommend a calibration interval of one year for the instrument DS 300 including probes.

5. Safety instructions

Observe measuring ranges of the sensors!

Observe the admissible storage and transportation temperature as well as the permitted operating temperature (e. g. protect the instrument from direct insolation).

The manufacturer cannot be held liable for any damage which occurs as a result of non-observance or non-compliance with these instructions. Should the device be tampered with in any matter other than a procedure which is described and specified in the manual, the warranty is cancelled and the manufacturer is exempt from liability.

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

We offer you to take back the instruments DS 300, which you would like to dispose of.

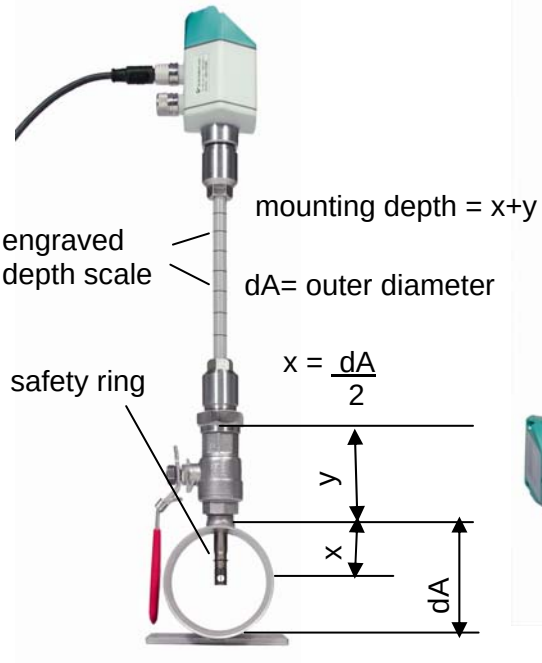
Adjustments and calibrations should only be carried out by qualified employees from the measurement and control technology branch.

6. DS 300 mobile version with VA 400 consumption sensor

Please read carefully before starting the device!

1. Do not exceed pressure range > 50 bar
2. Observe flow direction of the sensor
3. Adapter sleeve must be tightened with a torque of 20-30 Nm
4. Observe minimum values for the inlet section (15 x inner diameter) and for the outlet section (5 x inner diameter)

For further information please see instruction manual VA 400.



Initiation

1. Connect consumption sensor VA 400 to channel 1 or 2
2. Switch on the instrument (DS 300 will recognize the consumption sensor VA 400 automatically)
3. The following parameters will be indicated: Flow in m³/h, m³/min, consumption in m³ resp. l, velocity in m/s

Necessary adjustments via keypad DS 300 (see page 16)

- **Adjust inner diameter of the pipe** (menu sensor adjustment/consumption)
  → DS 300 automatically calculates the respective values for m³/h, m³/min and so on.

- Reference temperature and reference pressure (factory setting 20 °C, 1000 hPa):
  All volume flow values (m³/h) and consumption values indicated in the display are related to 20 °C, 1000 hPa (according to ISO 1217 intake condition)
  0 °C and 1013 hPa (= standard cubic meter) can also be entered as a reference.
  Do not enter the operation pressure or the operation temperature under reference conditions!

6.1 Technical data consumption sensor VA 400

Accuracy with measuring section	± 3 % m.v. ± 2 % m.v. via 5 point ISO precision calibration
Units freely selectable	m³/h, m³/min, l/min, l/s, ft/min, cfm, kg/h, kg/min, kg/s
Inlet length	15 x inner pipe diameter
Outlet	5 x inner pipe diameter
Ball valve 1/2"	stainless steel 1.4301
Operating temperature	-20 to 70 °C
Storage temperature	-40 to 80 °C
3 measured value per VA 400	Flow in m³/h resp. m³/min, consumption in m³ bzw. l, velocity in m/s

6.2 Measuring ranges consumption sensor VA 400

Tube inner diameter			**VA 400 Max.** (185,0 m/s)	**VA 400 HighSpeed** (224,0 m/s)
Inch	**mm**		**Measuring range from ... to**	**Measuring range from ... to**
1/4“	6	DN 6	1.0 ... 157 l/min	2.0 ... 190 l/min
1/2“	16.1	DN 15	3.5 ... 1516 l/min	6.0 ... 1836 l/min
3/4“	21.7	DN 20	0.4 ... 178 m³/h	0.7 ... 215 m³/h
1“	27.3	DN 25	0.6 ... 295 m³/h	1.1... 357 m³/h
1 1/4“	36.0	DN 32	1.2 ... 531 m³/h	2.5 ... 644 m³/h
1 1/2“	41.8	DN 40	1.5 ... 728 m³/h	3.0 ... 882 m³/h
2“	53.1	DN 50	2.5 ... 1198 m³/h	4.6 ... 1450 m³/h
2 1/2“	71.1	DN 65	5 ... 2187 m³/h	7 ... 2648 m³/h
3“	84.9	DN 80	7 ... 3133 m³/h	12 ... 3794 m³/h
4“	110.0	DN 100	12 ... 5279 m³/h	16 ... 6391 m³/h
5“	133.7	DN 125	18 ... 7808 m³/h	24 ... 9453 m³/h
6“	159.3	DN 150	25 ... 11097 m³/h	43 ... 13436 m³/h
8“	200.0	DN 200	33 ... 17533 m³/h	50 ... 21230 m³/h
10“	250.0	DN 250	52 ... 27429 m³/h	80 ... 33211 m³/h
12“	300.0	DN 300	80 ... 39544 m³/h	100 ... 47881 m³/h

DIN 1945/ ISO 1217: 20°C, 1000mbar

5 point precision calibration with ISO certificate: order no. 3200 0001
special version for oxygen measurement: order no. 3200 0010

7. DS 300 mobile version with FA 410 dew point sensor

Please read carefully before starting the device!

1. Attention: Do not exceed pressure range of > 50 bar with standard version. (Up to 350 bar in case of special version).
2. Important: Before installation briefly bleed the compressed air in order to remove condensate and particles. This prevents soiling of FA 410. Standing air leads to long measuring times.

Initiation

1. Connect dew point sensor FA 410 to channel 1 or 2
2. Switch on the instrument (DS 300 will recognize the dew point sensor FA 410 automatically)
3. The following parameters will be indicated: dew point in °Ctd, temperature in °C, relative humidity in % RH

7.1 Technical data dew point sensor FA 410

Measuring range	-80 to 20 °Ctd
Pressure range	-1 to 50 bar standard
Accuracy	± 0.5 °Ctd (-10 to 50 °Ctd) typical ± 2 °Ctd at -40 °Ctd
Operation temperature	-20 to 70 °C
Storage temperature	-40 to 80 °C
Screw-in thread	G1/2" stainless steel
3 measured value per FA 410	Dew point in °Ctd, temperature in °C, relative humidity in % RH

8. Sensor connection

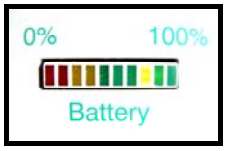
Sensor connections (factory settings):

1 Consumption sensor resp. dew point sensor
2 Dew point sensor resp. consumption sensor
3 Analogue sensor
4 Analogue sensor
5 Analogue sensor
6 Analogue sensor

7 Power supply 100-240 VAC

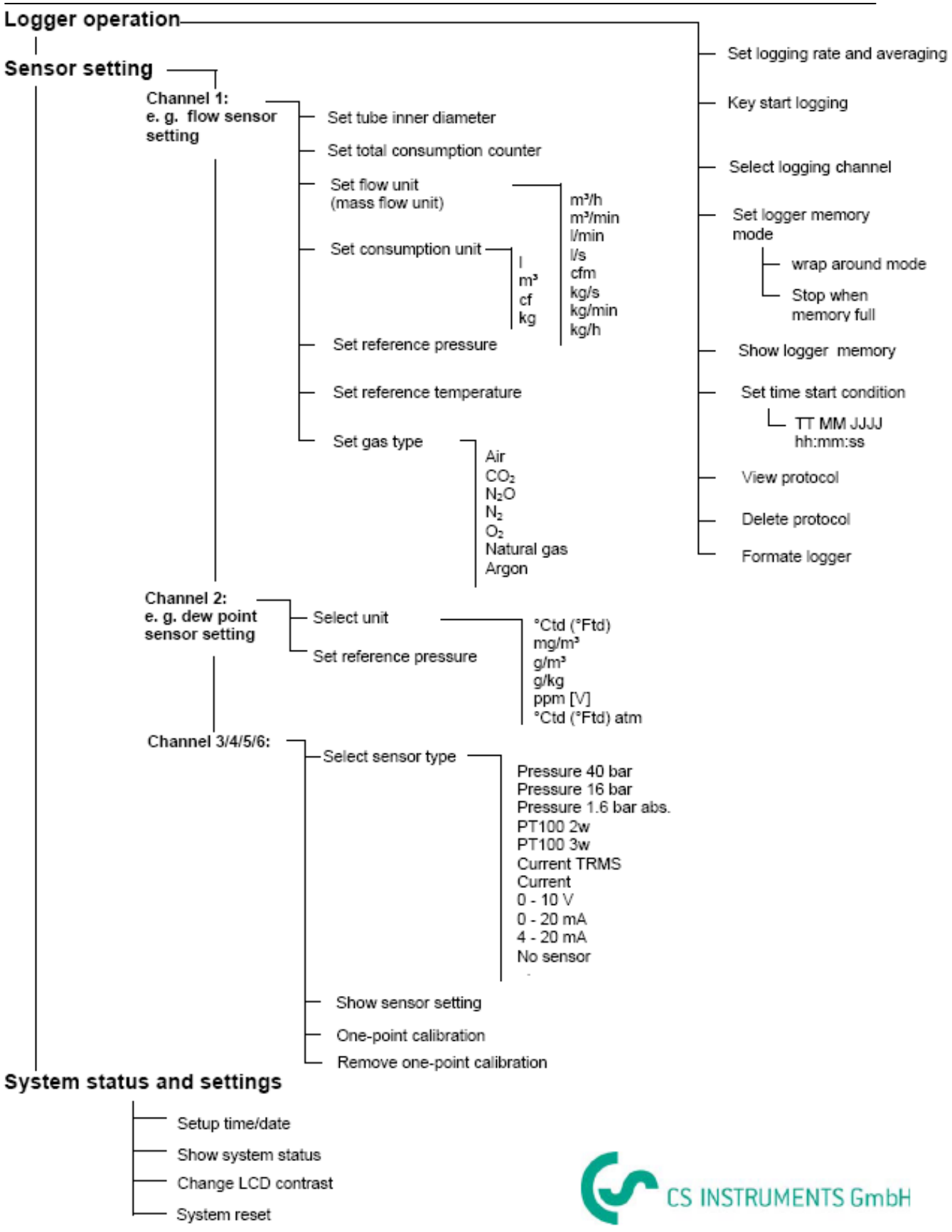
9. Flexible current supply (100… 240 VAC / 50…60 Hz)

In case of fully loaded rechargeable battery (green LED at the right hand side) (approx. 6 hours charging time)



the operation life will be maximum 4 hours without any mains supply. In case of plugged-in mains supply the rechargeable batteries will be loaded also if the instrument is switched off.

10. Survey operation menu (with "Enter" one menu level down and return with "Back")



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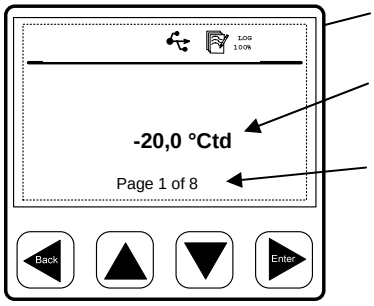
11. Operation

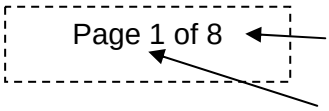
11.1 Description of the display icons



Status display, please see below for detailed description of the different status icons.

Always one page of measurement values will be indicated. The customer can use ▲ or ▼ in order to scroll through all available values.

Page view indication:
This "page view indication" shows the current page number of measurement values as well as the total no of pages of measurement value pages which are available.



Indicates that there are in total 8 pages of measurement values available

Indicates that currently page 1 of 8 measurement values pages is displayed

Status icon - detailed description

These icons show the system status. For easier handling the position of each icon should be fixed.

1) USB connection icon: This icon shows that DS 300 mobile version is connected to a PC via USB

2) Logger module status icon

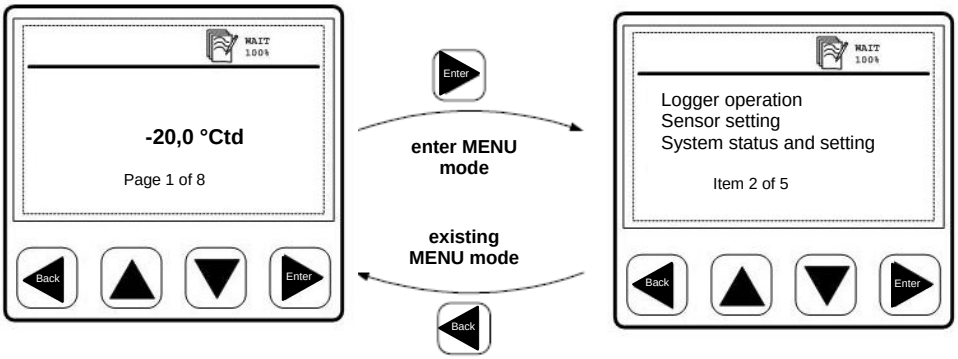
Logger module status
WAIT: Time start conditions set, waiting for the sart of logging
LOG: Logger module is logging data
STOP: Logging is terminated
DEL: Logger is deleting protocol data
ERR: Error during data logging
Logger module free memory in percentage or CYCLE when logger memory is in circular mode

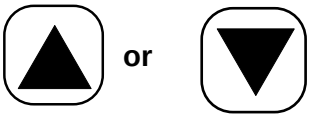
1:

Shows during logging which channel is logged currently. Logged channels are indicated by inverse blinking. Channel selection please see point "Logger operation", "Select channels".

11.2 Operation of the main keys

Basic concept for MENU mode key operation





- use these keys to browse and select different items in the menu and scroll through different pages of measurement values display
- use these keys to alter or adjust the setting option or numbering

- use this key to exit the current menu level
- use it to leave all setting state without saving the change

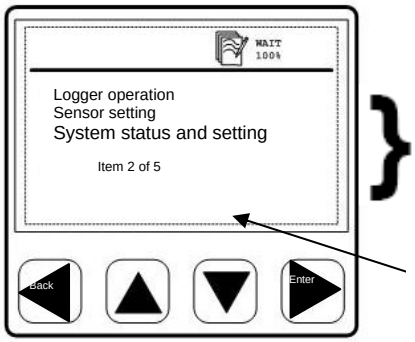
- use this key to enter the submenu or next menu level of the currently selected menu item
- use it to confirm the setting change or enable an option in all setting state

Typical menu display layout and deys description:

The currently selected menu item will be shown in negative colour.

If there is a "<" sign it means we can exit the current menu or go up one level from the current menu level.

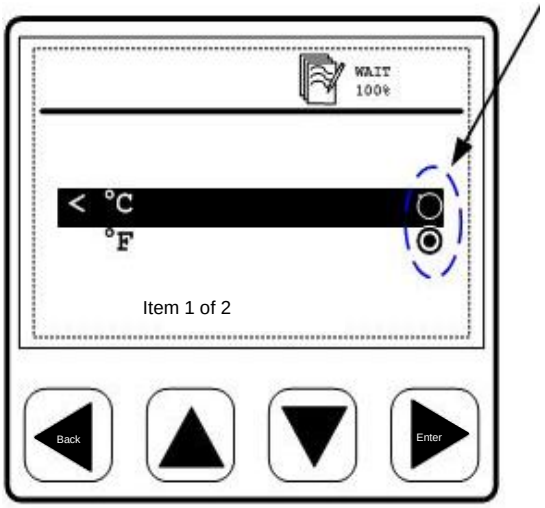
If there is a ">" sign it means we can go into the submenu of the currently selected menu.



Selectable menu item, it shows 4 items at a time. If the total items in the current menu level is more than 4 items the menu should scroll over.

It tells how many items exist in the current menu and which no. of items is currently selected.

Typical display layout for option selection:



The radio button for selecting the units (°C/°F)

- ○ - Radio button style for de-selected item
- ◉ - Radio button style for selected item

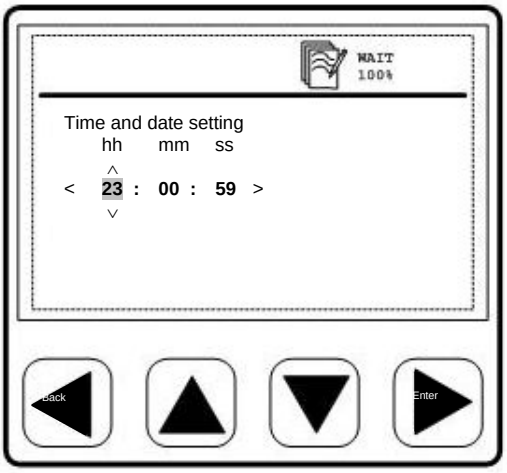
Procedure:

1) Use ▲ or ▼ key in order to select the desired option
2) Use ► key to activate the selected option

For leaving this option:

1) Use the ◄ key to go back to the last menu level without activating the selected option

Typical display layout for altering or adjusting the number setting:



Example: Time and date setting

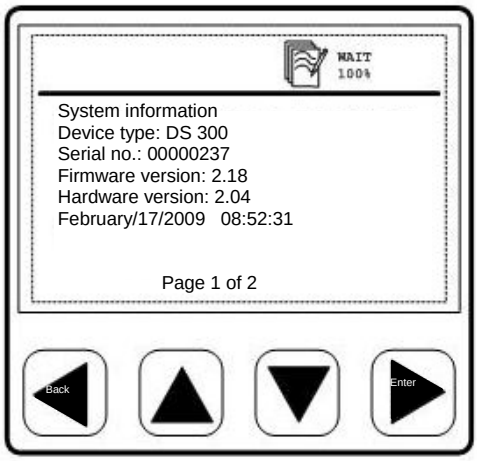
1) Use ▲ and ▼ key to adjust the time

2) Use ► key to move from HOUR to MINUTE to SECOND

3) After the SECOND setting press the ► key to finalize and store the setup or press ◄ to exit from the "Time and date setting" menu and without saving the new setting

Powered on device

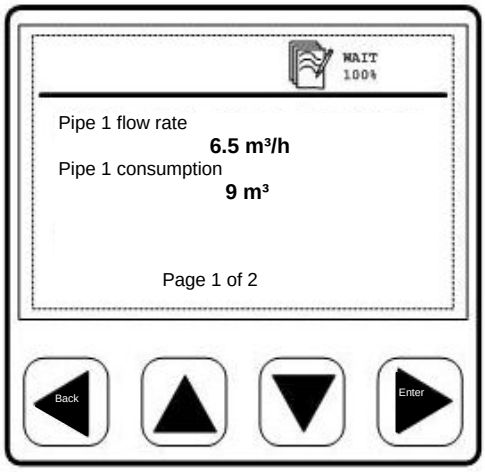
If DS 300 mobile version is powered on the display will show the following system information for approximately 5 seconds:



The system information is helpful for any service inquiries in order to identify the specific model and version.

This information can be called up at any time in the menu point "System status and settings" under "System status".

Real-time measured values:



DS 300-P4 and -P6 has 2 digital sensor inputs, channel 1 and 2, for consumption or dew point sensors of CS Instruments.

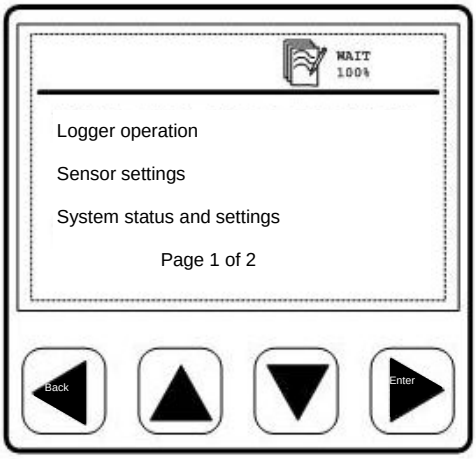
Additionally DS 300-P4 has 2 analogue inputs (channel 3 and 4), DS 300-P6 has 4 analogue inputs for pressure sensors, temperature sensors or clamp-on ammeters of CS Instruments (channel 3, 4, 5 and 6).

If the sensors are connected to the right channels according to the DS 300 configuration, DS 300 will recognize them automatically and start to display real time measurement values acquired from those sensors. The measurement values may be displayed on more than one page. To see another page, just press the

▲ or ▼ button.

The operation in detail

By means of the "Enter" key the menu can be accessed. DS 300 mobile version has the following main menus:



Logger operation

DS 300 includes a data logger. In order to configure the logger function and to activate/deactivate it there are several functions available:

Measuring rate	**Set logging rate and averaging option** The logging rate defines the interval data should be recorded in the memory. It will record from every activated channel a sample. The averaging option can be used to calculate an average value. I.e. DS 300 is measuring every 1 second and if the logging rate is 10 seconds, it will calculate an average value out of the last 10 measurement values and store it as a recorded sample.
Manual start	**Start/stop logging** Starts or stops the data recording. Whenever a new recording is started a new file is created in the memory.
Select logging channels	Select those channels which should be recorded in a file. Channels which are not selected are not stored. The selection is effected by placing a checkmark.
Set logger memory mode	There are following possibilities: 1. "Wrap aound mode" - if the memory is full the first measured values will be overwritten. 2. "Stop if the memory is full"
Show logger memory	Shows the status and the size of the available memory

Time start	**Set time, start conditions** DS 300 can be programmed to start at a certain time.
Show protocol	Single protocols (files) can be deleted or the whole memory can be freed. DS 300 will show the available protocols with date, number of channels and number of recorded values per channel.
Delete protocol	Deletes the selected protocol
Format logger	Deletes the internal logger

11.3 Sensor settings

11.3.1 Consumption and dew point sensors

The consumpiton and dew point sensors of CS Instruments are automatically recognized at channel 1 or 2.

11.3.1.1 Setting of consumption sensor VA 400

(Attention: Please adjust inner diameter of the pipe!)

For CS consumption sensors the following settings can be made:

- **Set inner diameter**: For calculation of volume flow, consumption and flow
- **Set total consumption counter**: Counter can be re-set to zero or set to any value
- **Enter volume flow unit**: Selection of the desired flow unit
- **Adjust consumption unit**: The consumption unit is fixed by selecting the volume flow unit
- **Adjust reference pressure**: In order to calculate the standard volume flow *
- **Adjust reference temperature**: In order to calculate the standard volume flow *
- **Adjust gas type**: Adjust the gas type in which measurement is carried out

* **Please observe**:

The reference pressure and the reference temperature are not referred to the current process pressure or process temperature. They are used in order to calculate the standard volume flow in case of standard conditions, e. g. 1000 hPa, 20 °C.

Changes of the sensor settings are immediately stored in the sensor as soon as they are confirmed with <Enter>.

11.3.1.2 Setting of dew point sensor FA 410

In this menu the dew point unit can be selected. The following units are preset ex factory: Dew point in °Ctd, temperature in °C and relative humdity in % RH

- **Setting of the humitidy unit**: (ºCtd, g/m3, g/kg, ppm etc.) Attention: ppm (V/V) and g/kg require the input of a reference pressure (absolute line pressure)
- **Setting of the reference pressure**: Required for ppm (V/V) and g/kg (absolute line pressure)
- For the **atmospheric dew point** please set the absolute line pressure. In case of this measuring unit the dew point under atmospheric conditions is calculated by means of the absolute line pressure.

11.3.2 CS Analogue sensors (pressure sensor, clamp-on ammeter, temperature sensor, …)

DS 300 mobile version has 2 resp. 4 analogue input channels. The analogue input channels are not automatically recognized so the analogue sensor for the respective channel has to be selected. The analogue inputs are preconfigured ex factory, however they can be freely adjusted via the keypad.

For this purpose the menu point "sensor setting", cannel 3 to 6 has to be selected. The following options are available:

"Select sensor":	In case of DS 300 mobile version there is a list of 6 sensors ready for selection. Please choose the required sensor. In order to complete the list with customer-specific sensors these customer-specific sensors can be defined by means of the software "DS 300-P configuration tool" and transferred to DS 300 mobile.
"Show settings":	In this point the sensor-specific data are indicated.
"Calibration offset":	Here possible zero-point errors of sensor and DS 300 can be adjusted. Typical example: One point calibration of a pressure sensor . The adjustment value stays stored in DS 300 in the respective measuring channel.
"Delete calibration offset":	Here the measured value entered under "calibration offset" can be deleted.

11.3.3 Connection of non-CS analogue sensors

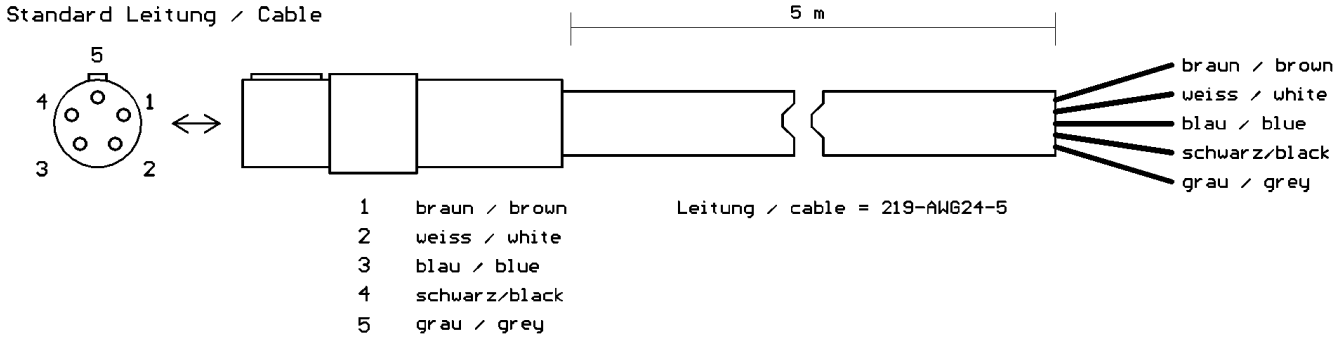
Own analogue sensors 0/4…20 mA, 0…1/10V, Pt100, Pt1000 can be connected to the input channels 3, 4, 5 and 6. For this purpose the specific sensor datea have to be stored in DS 300 by means of the DS 300 mobile version configuration software.

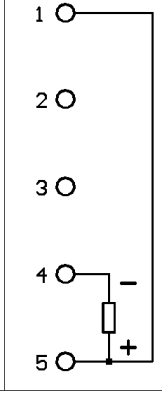
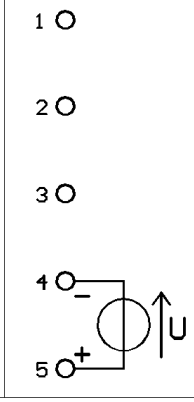
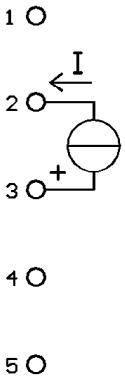
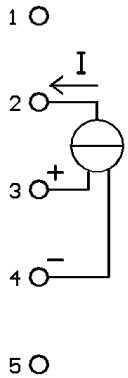
Attention: Maximum current supply 12 VDC / 25 mA! If the non-CS analogue sensors have a higher current consumption please use an own power supply!

Connection cables:

CS Instruments offers connection cables with open ends. Order no. 0553 0110, cable length: 5 m.

Connection scheme:



Analog sensor		3-wire	2-wire	2-wire	3-wire
Pin	Farbe/colour	PT 100 PT 1000	0-1 V DC 0-10 V DC	4-20 mA DC	0/4-20 mA DC
1	braun / brown				
2	weiss / white				
3	blau / blue				
4	schwarz/black				
5	grau / grey				

Attention: DS 300 mobile version is configured on our premises. If you connect your own analogue sensors DS 300 has to be configured newly by means of the ***DS 300 configuration software***.

11.3.4 System status and settings

Setup time/date	The internal clock can be set.
Show system status	For service inquiries this screen contains important information.
Change LCD contrast	Contrast of display can be changed.
System reset	In case sensors have been changed it's recommended to use this function in order to update system settings.

12. Warranty

If you have reason for complaint we will of course repair any faults free of charge if it can be proven that they are manufacturing faults. The fault should be reported immediately after it has been found and within the warranty time guaranteed by us. Excluded from this warranty is damage caused by improper use and non adherence to the instruction manual.

The warranty is also cancelled once the instrument has been opened - as far as this has not been mentioned in the instruction manual for maintenance purposes - or if the serial number in the instrument has been changed, damaged or removed.

The warranty time for DS 300 is 12 months. If no other definitions are given the accessory parts have a warranty time of 6 months. Warranty services do not extend the warranty time.

If in addition to the warranty service necessary repairs, adjustments or similar are carried out the warranty services are free of charge but there is a charge for other services such as transport and packaging costs. Other claims, especially those for damage occurring outside the instrument, are not included unless responsibility is legally binding.

After sales service after the warranty time has elapsed
We are of course there for you even after the warranty time has elapsed. In case of malfunctions please send us the instrument with a short-form description of the fault. Please do not forget to indicate your telephone number so that we can call you in case of any questions.

13. Scope of delivery

- DS 300 mobile version in a robust case, as per your order
- Power cable
- Shoulder strap
- Instruction manual

14. Order information

Description	Order no.
DS 300-P2 mobile version with data logger for 1 million measured values including 2 digital inputs, *without* analogue inputs, in a robust case	0500 3101
DS 300-P4 mobile version with data logger for 1 million measured values including 2 digital inputs and 2 analogue inputs, in a robust case	0500 3225
DS 300-P6 mobile version with data logger for 1 million measured values including 2 digital inputs and 4 analogue inputs, in a robust case	0500 3226
Consumption sensor VA 400, max. version (185 m/s), length 220 mm including 5 m cable and certificate	0695 0122
HighSpeed version of consumption sensor (224 m/s)	Z695 4002
Sensor length 300 mm	ZSL 0300
Sensor length 400 mm	ZSL 0400
Special version for oxygen measurement	3200 0010
FA 410 dew point sensor, -80…+20 °Ctd incl. mobile meas. chamber and 5 m cable	0699 0411
Standard measuring chamber up to 16 bar	0699 3390
Measuring chamber for granulate driers for minimum over pressure	0699 3490
Precision pressure sensor CS 16 (0…16 bar) accuracy < 0.5 % *	0694 3555
Precision pressure sensor CS 40 (0…40 bar) accuracy < 0.5 % *	0694 3930
Precision pressure sensor CS 1.6 absolute (0…1.6 bar absolute) accuracy < 0.5 % *	0694 3550
Precision pressure sensor CS 16 (0…16 bar) accuracy < 1 % *	0694 1886
Precision pressure sensor CS 40 (0…40 bar) accuracy < 1 % *	0694 0356
Precision pressure sensor CS 1.6 absolute (0…1.6 bar absolute) accuracy < 1 % *	0694 3551
Clamp-on ammeter 0…1000 A AC incl. 5 m connection cable with ODU plug	0554 0504
Screw-in temperature probe Pt100, Class A, length 300 mm, -50…+500 °C *	0693 0002
Temperature probe cable Pt100, Class A, length 150 mm	0604 0102
Temperature probe cable Pt100, Class A, length 300 mm	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
Connection cables:	
Connection cable for VA/FA Series 400 5 m with ODU plug	0553.0111
Connection cable for probes 5 m with ODU plug (for pressure sensors and temperature probes)	0553.0110
Extension cable 5 m for DS 300 mobile version with ODU plug	0553.0103
***Software**:*	
CS Soft Professional, data evaluation in graphic and table form with USB cable	0554 7010
CS Analysis Software for leakage and cost calculation including CS Soft Professional software	0599 2011
Calibration of consumption/dew point sensors:	
Dew point: Precision calibration at -40 °Ctd incl. ISO certificate	0699 3396
Dew point: Precision calibration at 0°C and 10 °Ctd incl. ISO certificate	3200 0003
Consumption: 5-point precision calibration with ISO certificate	3200 0001
Real gas calibration	auf Anfrage

* Attention: Sensor without any connection cable! Please order connection cable separately.

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Contact

- **Advice**
- **Sale**
- **Service**

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