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Эл. почта: cis@nt-rt.ru || Сайт: <http://cs.nt-rt.ru/>

DS 350-P



Important information

The operating instructions must be read in full and carefully observed before starting up the device. The manufacturer cannot be held liable for any damage which occurs as a result of non-observance or non-compliance with this manual.

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

The device is destined exclusively for the described application.

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

Features

- Connectable sensors for all required measurement tasks (air flow, air con sump-tion, power consumption, pressure, temperature and many more)
- Up to 24 inputs through extension boxes
- Several loggers can be combined: no need to have long cables from the sensor to the logger
- Third party sensors can be easily connected
- Up to 100 million records in SD card
- Full software package includes:
 - CSM-S for basic analyzes
 - CAA for compressed air audit analyzes
- No time consuming data transfer as data is stored on SD card and can be moved to PC

2. Overview



- 1 SD card slot
- 2 Keyboard for user interface operations
- 3 USB port
- 4 SD card ejector tool
- 5 Battery gauge
- 6 On/Off button



Sensor type	Channel
CS flow/dew point sensors	1+2
Modbus sensor modules	7+8
Process signals	3-6
Pt100	3+4
Pulse	5+6

Sensor and mains connection at the side

Technical data

Casing	Size: 265 x 220 x 150 mm		
Sensor inputs	P4	P6	P8
CS flow/dew point sensors	2x	2x	2x
Modbus sensor modules	2x	2x	2x
Process signal		2x	4x
Pulse			2x
Interface	USB to PC		
Keyboard	4 keys		
Power supply	100 240 VAC / 50 VA, 47-60 Hz		
Display	Graphic display, 220 x 140 pixels, with back light		
Accuracy	Channel 1+2:	see sensor specifications	
	Channel 7+8:	see sensor specifications	
	Channel 3-6:	see technical data process signals	
Internal battery	Rechargeable for up to 8 hours operation. Charging time ~ 3 hours		
Data logger	Data is stored in 4G SD card, up to 100 million values		

Settings	Complete settings can be changed through user interface at DS 350-P
Sensor connector	Round lockable connectors, 5 pole
Operating temperature	0 ... 50 °C
Transport temperature	-20 ... 50 °C
Weight	2400 g

Technical data process signals

Sensor inputs	0-1V, 0-10V 0-20 mA, 4-20 mA Pt100/Pt1000 Pulse
Measuring range	0-20 mA: 0... 21 mA 0-1 V: 0...1.05 V 0-10 V: 0...10.5 V Pt100: -200...+850 °C Pt1000: -200...+850 °C Pulse: 0...100 Hz, High > 5V, Low < 2 V I < 5 mA, V < 30V
Accuracy	0-20 mA: 0.01 mA 0-1 V: 1 mV 0-10 V: 0.01 V Pt100: 0.2 °C Pt1000: 0.2 °C Pulse 1 digit
Resolution	0-20 mA: 0.001 mA 0-1 V: 0.05 mV 0-10 V: 0.5 mV Pt100: 0.1 °C Pt1000: 0.1 °C Pulse: 1 digit

Input impedance	0-20 mA:	~50 Ω
	0-1 V:	60 M Ω
	0-10 V:	1 M Ω
	Pt100:	N/A
	Pt1000:	N/A
	Pulse:	1000R

Sensor excitation 24VDC / 20 W (total available power for sensor supply)

Probe connection and power supply

Please connect all sensors before switching on DS 350-P. CS flow / dew point sensors are detected automatically when connected. The same applies to CS sensor extension modules (power meter, us flow meter, analogue extension) which are connected to channel 7 + 8.

Process signals can not be detected automatically. The user has to select the appropriate sensor type from the sensor selection menu (**Sensors—Select sensor type**).

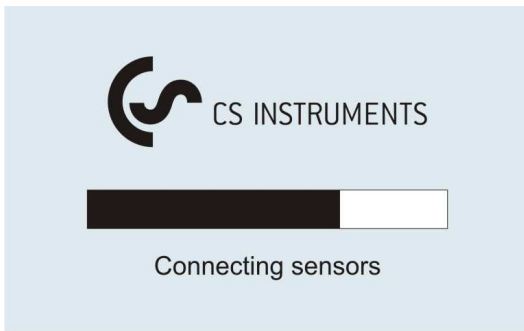
Start DS 350-P

DS 350-P is equipped with an internal rechargeable battery. This battery is intended to supply the system with power during power loss or for short term measurement where a mains supply is inconvenient. However it's recommended to use the mains supply whenever available to ensure a fully charged battery and to ensure a safe and long term measurement.

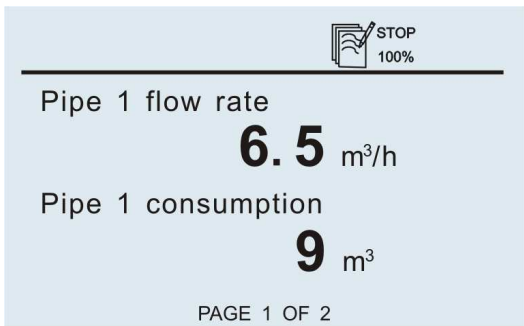


The On/Off switch has following functions when powered off:

1. A short pressing of the button will activate the battery gauge display and the charging status can be read.
2. Keep the button pressed for 2 seconds and the device will start up
3. To switch off the device keep the button pressed for 2 seconds.



When DS 350-P starts up it will display the start-up screen for a few seconds. During this time the sensor connections are established and a few other initialisation tasks are performed.





If there are any sensors connected, DS 350-P will connect to 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 arrow buttons on the key board .

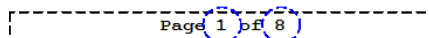
Operation

Description of display icons



One page of measurement value will be shown at a time. User can use  or  key to scroll through all available value.

Page view indication: This “Page view indication” shows the current display measurement value page no., and the total measurement value page count available .



Indicate there are totally 8 page measurement value available.

Indicate the measurement value display page 1 of 8 .

Status icon detail description:



Status icon shows different status of the system.



Low battery icon: it shows when internal battery low. (Please contact service.)



USB connection icon: icon shows when DS 350-P connected to PC via USB .



Logger module status:

- WAIT: Time start condition set, and wait for start logging
- LOG: Logger module is doing data logging
- STOP: Logging is stopped
- DEL: Logger is deleting protocol data
- ERR: Error occur during data logging.

Logger module free memory in percentage , or CYCLE when logger memory in circular mode.



SD card is inserted. Please ensure that this symbol is shown before sating data logging.



The number indicates the sensor terminal connection. If it's inverse this chan-
nel is set to be logged. It will start blinking as soon the logger is activated.



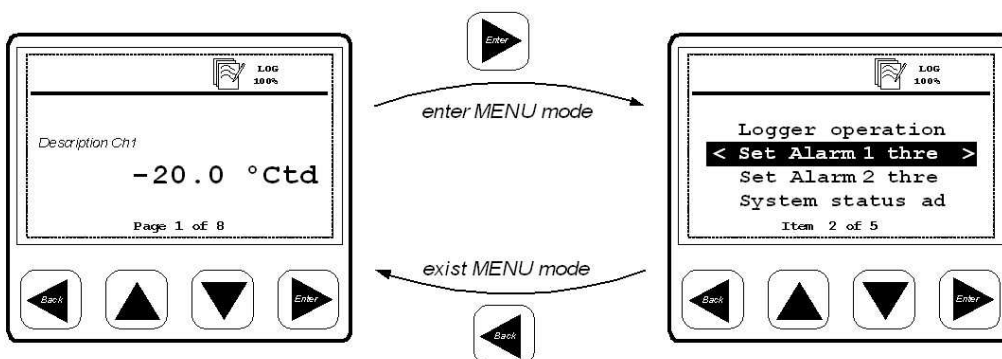
The calibration is expired. It's recommended to re-calibrate the sensor unit.
Contact CS Service






General error indication. Please note down the error codes and contact CS
Service


5.2 Basic key operation

Basic concept for MENU mode key operation



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

-  - use this key to
 - exit the current menu level
 - leave setting state, without saving the changes

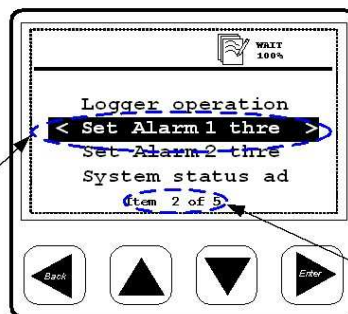
-  - use this key
 - to enter to submenu or next menu level of the current selected menu item
 - use it to confirm the setting change or enable an option in all setting state

Typical menu display layout and keys description :

The current select menu item will be shown in negative color.

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

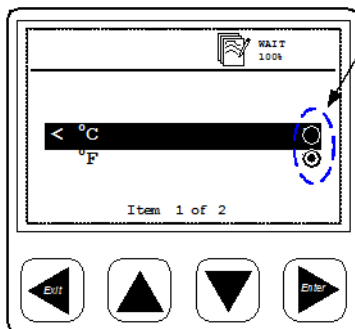
If there is a “>” sign, it means we can go into the submenu



Selectable menu item, it shows 5 items at a time. If the total items in the current menu level is more than 4 items, the menu item should scroll over.

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




Typical display layout for option selection:




The radio button for selecting the option.

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

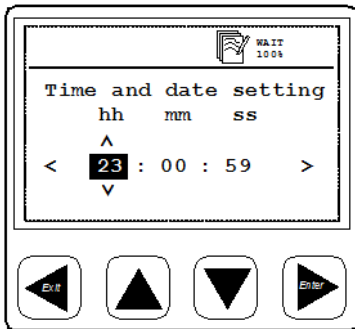
Procedure to select and enable new option

- 1) Use  or  key to select the desired option being enable
- 2) Use the  key to enable the new selected




For leaving the exist option:



- 1) Use the  key to go back to last menu level without enable the selected option.

Typical display layout for altering or adjusting the number setting :



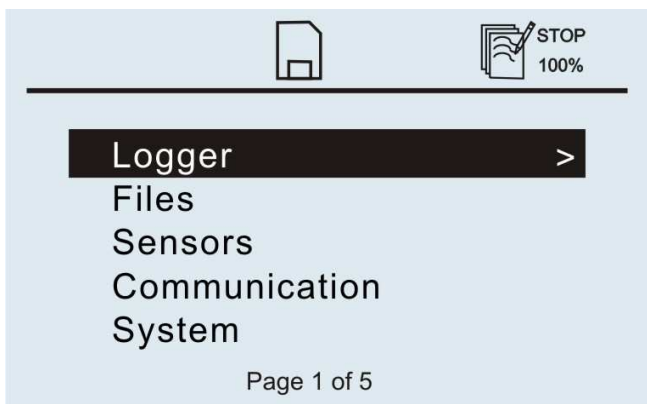
Example: Time and data setting

- 1) Use  and  key adjust the time
- 2) Use  key to move from HOUR -> MINUTE -> SEC
OND setup

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

Operation in detail

By pressing the <Enter> key the menu can be accessed. DS 350-P has following main menus:



Logger
Files
Sensors
Communication
System

Logger

DS 350-P includes a data logger that can record up to 100,000,000 measurement values. In order to configure the logger function and to activate/deactivate it, there are several functions available which are explained below:

Key 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 channel	Those channels which should be recorded with the data logger must be selected first. For example, if Flow is selected to be recorded the flow value of all connected flow sensors will be recorded. Attention: sensors connectable on connector 3..6 are shown as they have been selected in the sensor setting menu.
Set logger memory mode	It can be selected to stop logging when memory is full, or the "wrap around mode" can be chosen, which then will overwrite the oldest values as soon the memory is full.
Set logging rate and averaging	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 350-P 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.
Logger status	Shows the start time and the number of samples recorded up to now. Can only be entered if a logging has been started.
Set time start condition	DS 300-P can be programmed to start at a certain time. Programmed time must be 10 seconds later than the system time.

To ensure a reliable logger operation please ensure following:

- Don't remove the SD card during logging
- Format a NEW SD card before using it
- SD cards with more than 4 GB size should be partitioned to reduce the size to 4 GB.

Files

DS 350-P stores the recorded measurement values on a SD card which is accessible at the front side. In this menu the available functions are as follows:

Recorded files	Lists all recorded files on the SD card. After selecting a particular file, the file information such as start time, location name and samples recorded can be shown. It also allows the deletion of recorded files.
SD card status	Displays the available memory and total memory size
Format SD card	Is used to format the SD card. ATTENTION: formatting will delete the contents on the card completely and it can not be recovered!

Sensors

The following chapter describes the settings related to the sensor itself, which can be changed on the DS 350-P menu. For that purpose select in the menu the function "**Sensors**".

The next screen will show all detected flow/dew point sensors of connector 1 and 2. Sensors of connector 7+8 are also auto-detected as long it's a CS sensor (power meter, US flow meter, analogue extension), but other Modbus sensors are shown as selected from the menu. Connector 3 to 6 show also the selected analogue sensors.

The next chapters describe the available settings of the different sensors.

Flow sensor settings

For CS flows sensors following settings can be made:

- **Set tube diameter:** for flow calculation
- **Set total consumption:** counter can be set to any value
- **Set flow unit:** Selection of the desired flow unit
- **Set consumption unit:** selection of the desired consumption unit
- **Set reference pressure:** in order to calculate the standard flow
- **Set reference temperature:** in order to calculate the standard flow
- **Set gas type:** Select the gas which is measured with the flow sensor.

Note:

Reference pressure and reference temperature are not related to the actual process pressure or temperature. They are used to calculate the standard flow at standard conditions, for example: 1000 hPa, 20 °C.

Changes on the sensor settings are downloaded immediately into the sensor as soon the changes are confirmed by pressing <Enter>.

The gas type can not be changed if the connected sensor was calibrated in “real gas”

CS Flow sensors connected to port 3-6

Flow sensors connectable to the ports 3 ... 6 must be configured first by connecting them to either port 1 or 2. Only these 2 ports are capable to write sensor settings into the sensor. Port 3 and 4 can measure flow only and ports 5 and 6 can measure flow and consumption. To do the settings follow these steps:

- Connect the sensor to port 1 or 2 and perform the settings in the menu as it would remain connected to this port (diameter, units, etc.)
- When finished, select in the menu “copy settings” together with the desired port or terminal (3...6)
- Switch off DS 350-P and move the flow sensor connection to the selected port.
- Done! You will see a “CS flow sensor “ then in the sensor channel list at the selected port with the correct unit and scaling.

In case the destination port is 5 or 6 an additional channel for the counter is added to the channel list.

Through these steps up to 6 CS flow sensor can be configured and operated at one DS 350-P8.

Dew point sensor settings

For CS dew point sensors following settings are available:

- **Set moisture unit:** ($^{\circ}\text{Ctd}$, g/m^3 , g/kg , ppm etc.). Attention: g/m^3 , mg/m^3 , ppm[V] and atmospheric dew point require to enter a reference pressure.
- **Set reference pressure:** required for g/m^3 , mg/m^3 , ppm[V] and atmospheric dew point calculation. The pressure has to be entered as absolute pressure (not gauge pressure!)

For the unit atmospheric dew point and ppm[V] , the line pressure (absolute) has to be entered.

For the unit g/m^3 , mg/m^3 , if the calculate should be done under line pressure conditions, a reference pressure of 1013 hPa has to be entered.

If the calculation should be done for atmospheric conditions, the line pressure (absolute) has to be entered.

Analogue sensor settings

DS 350-P has up to 4 analogue input channels at connector 3 to 6. These channels don't have an automatic sensor detection, the sensors need to be manually selected. Following settings are available:

- **Select sensor type:** Ds 350-P stores up to 15 different analogue sensors which can be selected from the list
- **Show sensor setting:** the details of the sensor settings such as: sensor type, unit, resolution, input scaling and calibration offset can be viewed.

- **One point calibration:** The instrument provides a one-point system calibration, which can eliminate accuracy failures of instrument and sensor. If an accurate reference is available (i.e. Calibration Lab), the system can be calibrated at one point to this reference. The calibration is stored inside the DS 350-P. However this calibration offset is applied to every sensor connected to this particular terminal. If the sensor type is changed, DS 350-P will delete the stored calibration offset.
- **Remove one-point calibration:** is used to delete the calibration offset.

Modbus sensors

DS 350-P can support up to two Modbus sensors connected to connector 7 and 8. For the communication there is a fixed parameter setting which can be viewed in the communication menu. Any third party sensor connected to these inputs need to have its communication parameters set like that.

CS provides following Modbus sensors:

- Power meter CS 110-P
- Liquid flow (US clamp meter) CS 460-P
- 8 channel analogue extension module

CS Modbus sensors are detected automatically (plug & play).

For third party sensors its required to use the configuration software CSC-350 to create the sensor and download it into DS 350-P. After the download this sensor is then available for selection from the menu.

CS power meter CS 110-P

CS 110-P requires a few selections in order to measure. In the sensor menu please select CS 110-P and make following settings.

Sensor type: choose the the right CT type (200A, 500 A, 1000 A)

Sensor status: This menu will provide sensor information about the connection. Please check here for details in case the displayed values are shown as "—.-". Most likely it's caused by a wrong connection of the CTs or Voltages.

These settings are stored permanently inside DS 350-P and need only to be changed if there is a change in these parameters.

Analogue extension module

The analogue extension module offers additional 8 X 0-20 mA channels. Similar to the analogue input channels on connector 3-6, the sensor type can be assigned through the user interface in the menu “Sensors” .

These settings are stored permanently inside DS 350-P and need only to be changed if there is a change in these parameters.

The connection pinning is the same as of the 0-20 mA Signal of connector 3-6.

CS 460 Ultrasound liquid flow meter

There is a separate instruction manual for the operation and installation of the ultrasonic flow meter CS 460. Please refer to manual number **0970 0069**.

Communication

This is a information about the Modbus communication settings. To connect third party sensors, this parameters need to be set at the sensor.

System

- **Setup time/date:** The internal clock can be set
- **Device info:** shows software and hardware version as well as some other device information.
- **LCD contrast:** Contrast of display can be changed
- **Reset:** does a restart of the whole system
- **Language:** The user interface language can be selected here.

Connecting analogue sensors

Signal	Connector 1+2	Signal	Connector 7+8	Signal	Connector 5+6	Connector 5+6
	CS dew point / CS flow sensor		Modbus/RTU		Pulse Active	Pulse Passive
SDI	1	NC	1	I+/ Pulse		
V-	2	V-	2	20mA		
V+	3	V+	3	V+		
NC	4	Data+	4	V-		
NC	5	Data-	5	S+		

Signal	Connector 3+4	Connector 3+4+5+6	Connector 3+4+5+6	Connector 3+4+5+6	Connector 3+4+5+6	Connector 3+4+5+6
	Pt100 Pt1000	CS Amp sensor	Pressure	1V 10V	20mA Active	20mA Passive
I+/ Pulse		1	1	1	1	1
20mA		2	2	2	2	2
V+		3	3	3	3	3
V-		4	4	4	4	4
S+		5	5	5	5	5

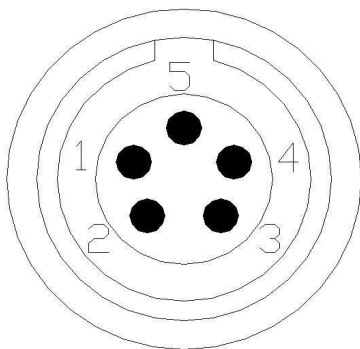
All CS sensors will fit to the designated terminal.

In case the user want to connect other analogue sensors such as Pt100, Pt1000 (3-wire), 0-20 mA, 4-20 mA, 0-1 V and 0-10 V, Pulse types, this can be done through connector 3—6 according to the pinning shown in the table above.

DS 350-P can also supply the external sensor with 24 VDC. Please ensure that the power drawn is within the allowed limits (see next chapter for more details).

If an analogue sensor is not in the selection list found when assigning the sensor type in the sensor setting menu, it's required to use the software **CSC-350**. The software can be downloaded from www.csinstrument.com.

Through this software further analogue sensors which are not included in the standard package can be added into the selection list.



Connector pinning, view to the plug at DS 350-P

CS is offering a 5 m connection cable with open wires (P/N: 0553 0110) which has 5 cores. These 5 cores match with the pins of DS 300-P plug one-to-one, according to the table below.

Pin	1	2	3	4	5
Color code	Brown	White	Blue	Black	Grey

Sensors powered through DS 350-P

DS 350-P can supply 24 VDC to the external sensors and a total power of 20 W. All sensors connected to DS 350-P and supplied by DS 350-P must not exceed this power limit. To determine the power consumption please use the table below:

Sensor	P/N	Power [W]
VA 450 / 452	0695 0453	5.0
VA 400 / 420	0695 4XXX	3.0
CS dew point sensor	0699 0419	1.0
CS Pressure sensor	0694 XXXX	0.5
Analog input extension (8 Ch.)	0554 0080	1.3
Power meter CS 110-P	0554 0034	0.5
US flow meter controller CS 460-P	0554 0070	1.5

Order information

P/N	Description
0560 0550	DS 350-P4, 4 channel data recorder, incl. Software, SD card, power cord, USB cable
0560 0551	DS 350-P6, 6 channel data recorder, incl. Software, SD card, power cord, USB cable
0560 0552	DS 350-P8, 8 channel data recorder, incl. Software, SD card, power cord, USB cable
	Flow sensors
0695 0122	VA 400-M, insertion type flow sensor, DN15 ... DN300, 5m cable with connector
0695 0453	VA 450-M, insertion type flow sensor, DN15 ... DN300, wet & dirty applications
	Dew point sensors
0699 0419	FA 410, -80 ... +20 °Ctd, measuring chamber, 5m cable with connector
	Pressure sensors
0694 1886	0 ... 1.6 MPa, quick connector, 5 m cable with connector
0694 0356	0 ... 4 MPa, quick connector, 5 m cable with connector
	Amp sensors
0554 0504	Clamp on amp sensor, 1000 A, 5 m cable with connector
	Temperature sensor
0604 0100	Pt100 probe, class A, 5 m cable with connector
0554 6003	Compression fitting, 6 mm, G ½" thread, 0.6 MPa
0554 6004	Compression fitting, 6 mm, G ½" thread, 1.6 MPa
	Power meter
0554 0034	Portable power meter CS 110-P, Modbus/RTU, including 4 test leads, 4 test clips, 5 m cable with connector to DS 350-P
0554 0061	Current clamp sensor, 1.8 m cable, 200/1 A, connectable to CS 110-P (1 pieces)

0554 0062	Current clamp sensor, 1.8 m cable, 500/1 A, connectable to CS 110-P (1 pieces)
0554 0063	Current clamp sensor, 1.8 m cable, 1000/1 A, connectable to CS 110-P (1 pieces)
	Liquid flow meter (clamp on ultra sound)
0554 0070	Ultrasonic controller for liquid flow sensor, connectable to DS 350-P, including 5 m connection cable to DS 350-P and to the sensors, stretcher (0554 0076) and coupling agent (0554 0075)
0554 0071	Ultra sound clamp-on sensor with installation device, DN 25...100
0554 0072	Ultra sound clamp-on sensor pair, DN 50...700
	Other sensor / extensions
0554 0080	8 channel analog input extension, connectable to DS 350-P, including 5 m cable with connector
	Accessories
0553 0103	Extension cable, 5m, male - female connectors
0553 0110	5 m connection cable with open wires
0554 0035	Probe case for sensors and accessories (internal compartment can be arranged according to your sensor requirements individually)

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Самара (846)206-03-16
Санкт-Петербург (812)309-46-40
Саратов (845)249-38-78
Севастополь (8692)22-31-93
Симферополь (3652)67-13-56
Смоленск (4812)29-41-54

Сочи (862)225-72-31
Ставрополь (8652)20-65-13
Сургут (3462)77-98-35
Тверь (4822)63-31-35
Томск (3822)98-41-53
Тула (4872)74-02-29
Тюмень (3452)66-21-18
Ульяновск (8422)24-23-59
Уфа (347)229-48-12
Хабаровск (4212)92-98-04
Челябинск (351)202-03-61
Череповец (8202)49-02-64
Ярославль (4852)69-52-93

Киргизия (996)312-96-26-47

Казахстан (772)734-952-31

Россия (495)268-04-70

Эл. почта: cis@nt-rt.ru || Сайт: <http://cs.nt-rt.ru/>

Scope of delivery

- DS 350-P x
- CD with CSM-S and CAA software
- USB cable
- Operation manual
- Sensors according to the order
- Accessories according to the order
- Delivery note

Warranty

CS provides a warranty for this product of 24 months covering the material and workmanship under the stated operating conditions from the date of delivery.

Please report any findings immediately 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 measuring instrument has been opened provided this is not described in the instruction manual for maintenance purposes. This is also the case if the serial number has been changed, damaged or removed.

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 packing costs. Other claims, especially those for damage occurring outside the instrument are not included unless responsibility is legally binding.

ATTENTION: Batteries have a reduced warranty time of 12 months.