

Instruction Manual Dräger MSI VARIOx-2 CO₂



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1. Warning

Any use of the MSI VARIOx-2 CO₂ requires a full understanding and strict adherence to these instructions and to the national and international regulations and standards. The instrument is only to be used for the purposes specified here.

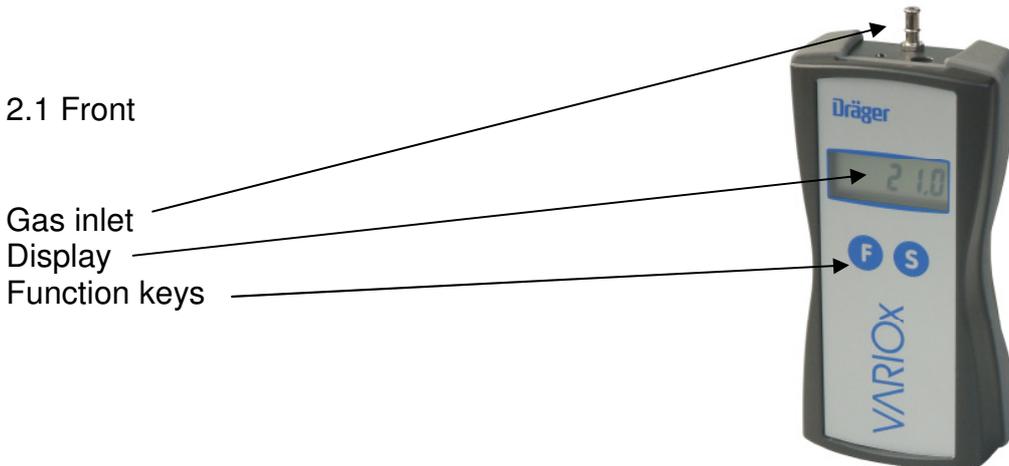
As from 2005 EC specifications for disposal of electric and electronic equipment are valid. These are regulated in the 2002/96/EC directive and respective national law. Essential content is the establishment of special collection and recycling facilities for private users.

Since this device is not registered for private users, it is not allowed to dispose it in this way. For disposal you can send it back to your local Dräger Safety organisation and if requested, get further information concerning this matter from Dräger MSI GmbH.

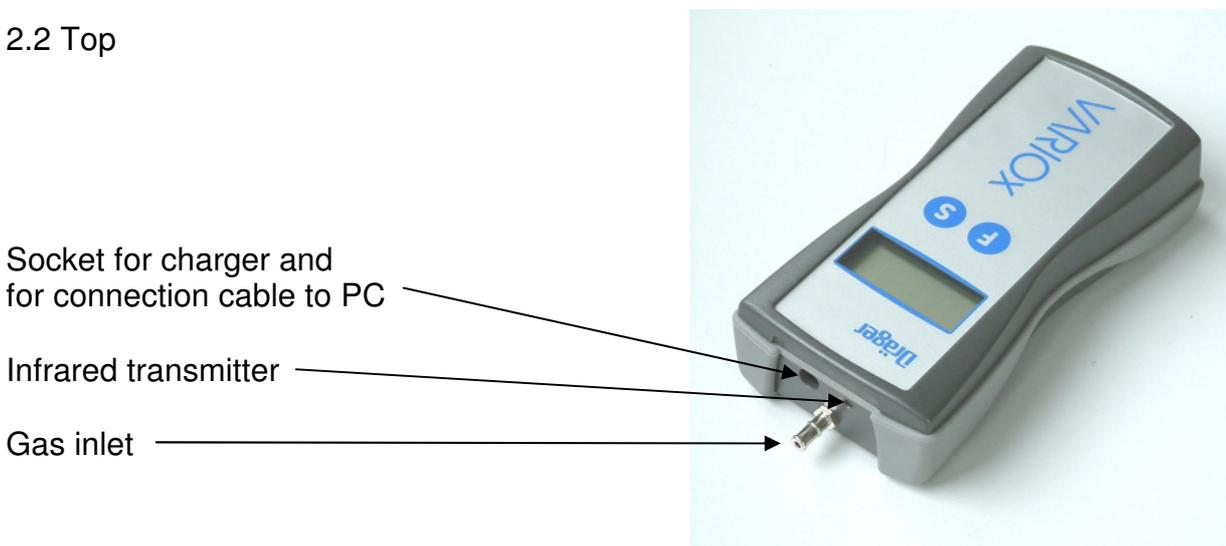
2. The Instrument

The MSI VARIOx-2 CO₂ is an electronic, handheld device to measure the O₂ concentration and to display the calculated CO₂ concentration of burners and auxiliary heaters of cars.

2.1 Front



2.2 Top



3. Function

The internal pump of the MSI VARIOx-2 CO₂ pumps a part of the stack gas to the electro-chemical O₂ Sensor.

The gas is leaving the O₂ sensor and escapes from the Vario-x housing by a small hole in the bottom of the housing.

The CO₂ concentration is calculated from the measured O₂ value by the following formula:

$$\text{CO}_2 = \text{CO}_{2 \text{ max}} * \left(1 - \frac{\text{O}_2}{21}\right)$$

with

CO_{2 max} = 15.4 if you have chosen oil

CO_{2 max} = 13.8 if you have chosen liquid gases (propane)

CO_{2 max} = 11.7 if you have chosen gas

The calculated CO₂ concentration is displayed in Vol. %, it is also possible, to start a printout via the internal IR-transmitter or to send data online to a PC via special RS 232 cable.

The MSI software "DERAS" allows it, to show the actual CO₂ concentration on the PCs monitor and to store it in a data base.

4. Measuring Step By Step

4.1 Preparing the Instrument

First connect the hose of the probe with the gas conditioner. Then connect the gas conditioner with the gas inlet of the MSI VARIOx-2 CO₂.

Make sure that the filter fleece and the drying pearls are in good condition. The filter fleece should not be visibly dirty and the drying pearls should be of orange colour (when saturated the colour is vanished).

Never forget to use the gas conditioner, because particles and liquids will harm the pump and the sensor of the VARIOx-2 CO₂.

Verify that fresh air will be sucked through the probe before switching on.

Switch on the instrument, by pushing the buttons "F" and "S" together for a short while. Now the "Start Mode" (see 4.2) is called.

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4.2 Start Mode

The Instrument starts with a display check. After about 0.5 seconds the display shows "CO-2" and then the fuel type, which has been chosen the last time.

With a short push of the "S" key, the next fuel type may be chosen.

The fuel types you may select are:

- GAS = natural gas or town gas
- OIL = oil or gasoline
- PrP = liquid gas (propane, butane, etc.)

With pushing the "F" key, the shown fuel type is accepted and the instrument will skip to the "Calibration Mode" (see 4.3).

4.3 Calibration Mode

The display shows a count down, which represents the progress of the system check. The system check (including zero point adjustment) lasts 30 seconds, if the instrument has been switched off within the last two hours.

If the VARIOx-2 CO₂ has been switched off for more than 2 hours, the system check may last until 10 minutes, because the O₂ sensor needs time for run in. The run in time is calculated by the instrument and depends on the time, the O₂ sensor has been switched off. If you switch off the VARIOx-2 CO₂, the O₂ sensor keeps switched on for 2 hours, therefore you may restart the VARIOx-2 CO₂ a little later (10 minutes) and the calibration mode is much shorter, may be only a few seconds.

About 30 seconds before the system check is finished, the internal pump starts working.

After the calibration is completed, the instrument will skip to "Measuring Mode" (see 4.4).

4.4 Measuring Mode

The display shows the CO₂ concentration in Vol. %. Put the probe in the stack and fix it by the cone. Change the position of the probe until the tip of the probe is in the middle of the stack.

With a push of the "S" key the actual measured value together with time and date may be send to an IR-printer via IR-data transfer and printed.

Make sure that between the IR-transmitter of the VARIOx-2 CO₂ and the IR-receiver of the printer is intervisibility. During the printing the display reads "Prn". After the printout is finished the actual CO₂ concentration is displayed again.

With pushing the "F" key you may skip to the "Time and Date Display Mode" (see 4.5)

4.5 Time and Date Display Mode

If "Time and Date Display Mode" has been called, the actual time is shown like 16:21, the blinking colon shows that the clock is running.

With pushing the "F" key you may skip to "Calibration Function" (see 4.6).

With pushing the "S" key you may adjust date and time.

The display now shows the hour e.g.:

H 16

With "S" you may alter the hour adjustment.

With pushing "F" the displayed hour is accepted and the display now shows the minutes e.g.:

n :21

With pushing "S" you may alter the minutes adjustment.

With pushing "F" the displayed minutes are accepted and the display shows the year e.g.:

J 07

With pushing "S" you may alter the year adjustment.

With pushing "F" the displayed year is accepted and the display now shows the month e.g.:

n 03

With pushing "S" you may alter the month adjustment.

With pushing "F" the displayed month is accepted and the display now shows the day e.g.:

d 27

With pushing "S" you may alter the day adjustment.

With pushing "F" the displayed day is accepted and you skip to "Calibration Function" (see 4.6).

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4.6 Calibration Function

If "Calibration Function" has been called, the display reads "CAL".

With pushing the "F" button you may skip back to the "Measuring Mode" (see 4.4).

With pushing the "S" key you may start a new calibration of the sensor. Make sure that fresh air is sucked through the probe for a while, before you push "S". After the calibration has been finished the instrument skips automatically to "Measuring Mode" (see 4.4).

4.7 Stop Measuring

Take the probe out of the stack and let the MSI VARIOx-2 CO₂ suck fresh air for about 1 - 2 minutes. Push the "F" key for more than 3 seconds, the display will read "OFF" and then the instrument will become switched off.

Check filter fleece and filter disk, change filter when it is visibly dirty (See 6.1) and replace drying pearls when the orange colour has vanished.

After the VARIOx-2 CO₂ is switched off, the el.-chem. O₂ Sensor keeps switched on for 2 hours. So it is possible, that if you restart the VARIOx-2 CO₂ in this time, the calibration mode lasts only 30 seconds.

4.8 Automatic Switch Off

To save energy, the MSI VARIOx-2 CO₂ switches off after 5 minutes of measuring fresh air. The el. - chem. O₂ sensor keeps switched on for further 2 hours (see 4.3 and 4.6).

5. Technical Data

Display:	LCD; 4-characters
Ambient temperature:	+5 °C ... +40 °C
Storing temperature:	-20 °C ... +50 °C
Gas sampling:	Membrane pump, Flow about 0.3 l/min
Gas conditioner:	contains drying pearls, filter fleece and filter disks
Dimensions (HxWxD):	160 mm x 80 mm x 40 mm, without gas conditioner
Weight:	300 g incl. battery
Battery:	NI-MH rechargeable battery, 1.2 V, 2100 mAh; ca. 8 h operation time Charger: sec. 7.5 V; 0.5 A

Function	Sensor type	Range	Accuracy	Resolution
O ₂ Oxygen	Electro chemical sensor	0 ... 21 Vol. %	0.3 Vol. %	0.1 Vol. %
CO ₂	calculated	depends on fuel type	0.3 Vol. %	0.1 Vol. %

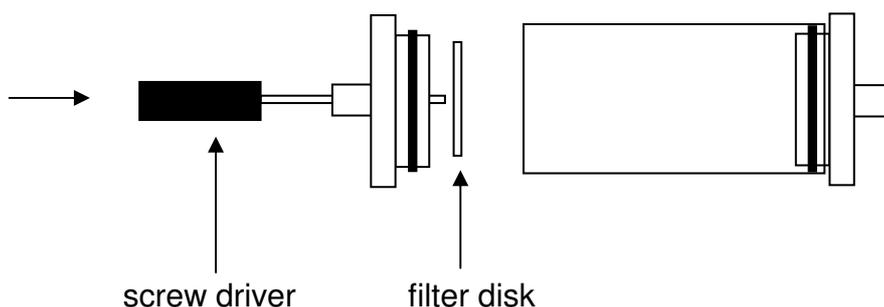
6. Maintenance and Service

6.1 Maintenance

The gas conditioner has to be checked after each measurement.

Replace drying pearls, when the colour of most of the pearls is not orange.

The filter disks and filter fleece must be changed if dirty. For changing the filter disks, use a small screw driver or a paper clip etc.



6.2 Error messages

If there have been errors detected, they are displayed after the system check.

The MSI VARIOx-2 CO₂ detects following errors:

Error Code	Fault	Remedy
E1	O ₂ -Sensor low	New calibration with fresh air / Service
E2	Electronic failure	Service
LO BAT	Low battery	Charge Battery

6.3 Charge Battery

Is LO BAT shown in the upper left corner of the display the NiMH battery of the MSI VARIOx-2 has to be charged with a recommended charger (5600753 or 5600753).

Has the charging been missed the MSI VARIOx-2 is switched off automatically. Is it impossible to switch on the MSI VARIOx-2, caused by undervoltage, the charger must be connected and the switch-on must be repeated !!

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6.4 Service

Dräger MSI GmbH recommends service once a year by authorised service people for check and calibration of the Instrument.

The Electro-chemical O₂ sensor needs replacement after approximately 5 years. The VARIOx-2 checks the sensor during zero calibration.

6.5 Accessories

Plug-in charger 230 V	5600747
Universal plug-in charger 100V - 240 V with different plug adapters	5600753
MSI IR3 Printer with IR data transfer	5600401

6.6 Probes

probe, aluminium, incl. cone (up to 200 °C)	5600291
probe for auxiliary heaters, PTFE, incl. clip (up to 200 °C)	5600518
probe for auxiliary heaters, copper, incl. Clip (up to 200 °C)	5600613
probe, stainless steel (up to 600 °C)	5600608
cone, steel (up to 600 °C) for 5600608	5630131

6.7 Consumables

10 x particle filter disks	5600093
10 x filter fleece	5630250
Drying pearls, blue, 35 g refill	5600519
Paper for IR printer, 5 pcs.	5690151