

Systems for Measuring and Controlling Oxygen





Oxygen Measuring and Control Device

GSM Series

*** Version 3.0 ***

EC Declaration of Conformity

for

Oxygen Measuring and Controlling Device Type GSM-touch

This device has been designed for industrial purposes in accordance with:

EN 61000-6-4 EN 61000-6-2

It is compliant with the directives: *EMC Directive:* 2014/30/EU Low-voltage Directive: 2014/35/EU RoHs: 2011/65/EU

This device complies with the following standards: EN 61010-1 EN 61000-6-4 EN 61000-6-2 EN 63000

Description of measures taken to assure compliance: Quality management system DIN EN ISO 9001:2015, No. 12 100 27736 TMS

This declaration becomes invalid if changes are made without our consent.

AL

Kirchheim/Teck, 04/05/2023

Place, Date

Signature

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1 Safety Instructions

	Please read these operating instructions carefully before installing and using the device. Improper use of the product will invalidate the warranty!
	The ambient conditions described in the Specifications chapter must be complied with in order to ensure the device's proper functioning and operational safety.
	The device may only be started up and operated by qualified and trained personnel. The operator of the device must ensure that all applicable regulations and guidelines are complied with. These are, among others, the EU Directive on work safety, national work safety legislation, accident prevention regulations, etc.
A	Please ensure that the supply corresponds with the information given on the type plate. All coverings necessary to provide touch protection must be installed. In case the device is interconnected with other devices and/or installations, the consequences must be considered and appropriate precautions taken before switching the device on.
	In some cases, hot parts or surfaces may be unprotected during or after installing or uninstalling the device. Appropriate precautions must be taken to avoid injuries and/or damage.
Ł	In case the device shows defects which suggest that it will not be possible to operate it safely, it must not be put into operation. We recommend to have the device inspected at least once a year at the factory or by a customer service representative.
	Disposal of the device must be performed according to the applicable regulations.

2 Preface

The measuring device serves for recording oxygen partial pressures in gas atmospheres in connection with an oxygen sensor. Such sensors operate at high temperatures. Therefore, precautions must be taken to keep ignitable gas mixtures from reaching the sensor or the device. In case of the sensor ceramic breaking, sample gases may leak or air may enter the sample gas side. Should this occur, applicable measures must be provided for to protect the environment and device parts from damage.

Wrong entries, leaks, corrosion, condensation, etc. may cause damage of the plant and erroneous measurements. It is vital to have all parts of the system maintained regularly.

The oxygen meters and the attachments have been produced and controlled subject to complete quality assurance in accordance with DIN EN-ISO 9001. Installation and operation must be performed subject to compliance with all local and special regulations. These particularly include VDE and DVGW requirements. Depending on the application, a periodic inspection of the measuring device in terms of measuring accuracy and function may be required and must be performed in the course of calibration and inspection procedures after initial commissioning.



3 Introduction

The GSM-touch is a user-friendly measuring instrument for the detection of oxygen partial pressures. The applied measuring principle, with a measuring span of more than 30 decades, allows for the measuring of high concentrations to very small traces.

Therefore, integrated functions facilitate the drawing of conclusions on a variety of technical processes in process engineering.

3.1 Measuring Principle

Oxygen measuring devices are designed to process signals received from an oxygen sensor made of stabilized zirconium dioxide. Zirconium dioxide, a ceramic also referred to as solid state electrolyte, is perfectly suited to serve as an oxygen-ion conductor at high temperatures.

Within a certain temperature range depending on the doping of the material, ion conductors of this type are able to fill vacancies in their crystal lattices with oxygen ions. The oxygen ions form itself on a conductive contact layer, which usually consists of platinum.

Thus, the oxygen concentration in a sample gas is essential for the extent of oxygen activity and accordingly the number of oxygen ions.

The basic structure of a sensor revolves around a solid state electrolyte which is contacted on both sides. One side of the electrolyte is operated by a reference gas, such as air, the other one with sample gas. The mechanical structure of the sensor separates the two gas sides from each other, so that the gases cannot mix.

Depending on the application, the sensors used are either heated or unheated. Unheated sensors are mainly used in the area of the oven, while heated sensors are chosen for applications in which gases with a temperature of less than 600 degrees Celsius are to be measured. (The measuring principle requires a minimum temperature of 500 - 650 degrees Celsius.)

Heated sensors are adjusted to a certain target temperature by means of a temperature controller integrated in the processing electronics. The temperature of heated and unheated sensors is measured by the electronic unit and is an essential element in the calculation of the oxygen oxygen level (oxygen partial pressure).

The value is calculated by means of the following formula:

$$EMK = \frac{R \cdot T}{4 \cdot F} \cdot \ln(\frac{P_1}{P_2})$$

whereby

- $R = 8.31 J/mol \ K$
- T = Temperature in Kelvin
- F = 96493 As/mol
- P1 = Oxygen partial pressure on the reference side with 0.20946 bar
- P2 = Oxygen partial pressure on the sample gas side
- EMF = Electromotive force in Volt

3.2 Measuring Electronics

The GSM-touch measuring device electronics features the following functions:

- ✓ Measuring the oxygen partial pressure
- ✓ Generating alarms
- ✓ Calculating the dew point
- ✓ Calculating the Lambda air factor
- ✓ Calculating redox potentials

The measuring device is operated via a touch screen.

Inputs and outputs are preselected and parameterized by the operator via menus.



3.3 Sensor

The sensor is integrated in the measuring electronics. It consists of the measuring element made of plated zirconium oxide, the heating required to heat up the measuring element to the temperature allowing the measuring operation, as well as the thermocouple for the exact recording of the temperature for the heating controller.

Note:

The heated block will grow hot during operation and warm up the housing due to its design, particularly on the left side. Please make sure that a minimum distance of ca. 50 cm to other objects is adhered to, so that the heat can freely dissipate from and circulate around the device.

Preventive measures, such as controlled case fans, temperature monitoring, and deactivation of the heating in case of excessive temperature will make sure that the housing temperature will not reach inadmissible temperatures.

4 General Layout

4.1 Description of the Measuring Electronics

4.1.1 Main Display



4.1.2 Touch pad and Function buttons



Touch pad for selecting measured values and measuring functions

Buttons for the general handling of the device



4.1.3 Keyboard Entry



4.1.4 Special Buttons



4.2 Description of Sensor

After switching on the device, the sensor will be heated up to measuring temperature within the following 15 minutes. (Attention: Sensor will not deliver viable measured values during this process.)

With the sample gas input open and gas pump activated, the device should display 20.9 % O₂. If required, this value can be corrected. (see "Measured value correction").

After the heating up phase, the sensor is connected with the sample gas. Please note that the maximum flow of sample gas will not exceed the display range of the flow meter. This is particularly important when measuring a gas cylinder with excess pressure.

Exceeding the flow limit may cause disruption of the sensor

4.3 Draft of Flow run



5 Commissioning the Device

5.1 Switching on the Measuring device

After connecting the power cable to the mains, the power switch can be activated.



The display lights up briefly. After ca. 30 seconds, system start information and, after the boot procedure, the standard screen or the measuring instrument screen last activated will be displayed, depending on the default setting.



As long as the sensor temperature is below the target value, the measured value is shown as "- - - ". The info line displays the current status of the heating process on a yellow background.

The diagram area may show a measured value independent from the heating up status.

[A000] Ready					
300000				O2 [ppm]
				2	18
225000					1.0
				68 % Flow manua	ally (Air)
150000				Current value Limit min.	0.20) Lag 02 (0-20) 0.4 mA 16.9 mA 0.0 ppm -30.00 bar 00 ppm 0.00 bar
				Internal file Log start	Menu
75000					
				Pump off	Ċ
30Sec.	60Sec.	90Sec.	<u>12</u> 0Sec.		

After the heating up phase, the measuring unit will display the measured oxygen value. In this case the info area shows: "Ready" while the background colour is green. A stable measured value is reached 15 minutes after the heating up process has been completed.



The start screen may display an alarm message in the info line on a red background. The alarm message can be removed by entering suitable alarm limits (see section "Alarms") and if the measured value lies within these limits.

The measured value is shown independently of alarms and diagram parameters.





The start screen may display an alarm message in the info line on a red background. The alarm message can be removed by entering suitable alarm limits (see section "Alarms") and if the measured value lies within these limits.

The diagram area background will turn red if the measured value is beyond the defined diagram axis. (see section "Format Diagram").

The measured value is shown independently of alarms and diagram parameters.



In case the beeper is activated and an alarm pending, the diagram area will display "Beeper Off"

The button



will acknowledge the beeper and the button fades out.

5.2 Measurement

5.2.1 Sample gas connection

After the starting routine the device is ready for use and can determine the oxygen content in gases. This requires connecting the measured medium with the sample gas port.



5.2.2 Flow

In order to examine the sample gases, they need to be supplied to the measuring instrument. In case the sample gas source has excess pressure, such as a gas cylinder, the gas flow must be reduced to an admissible level by means of a valve or a pressure reducer.

The maximum gas flow must not be exceeded, as otherwise the sensors will be destroyed. We recommend a 60 - 80 % flow.

Note:

Recording the amount of gas flowing is based on a calorimetric principle. Due to the fact, that different gases have different heat transfer properties, the particular characteristic curves for air, argon, forming gas and hydrogen have been stored. The current selection is displayed as text.

O2 [0	2[]	opm]	
3				33	39	
71 % Flow manually (Air)			100 % Flow r	nanua	ally (Arg	gon)
mA Output O2 (0-20) Log O2 (0-20)		mA Output	02 (0-20)	Log O2 (0-20)
Current value 6	5.8 mA 17.7 mA		Limit min	6	5.8 mA	-30.00 bar
Limit max. 10	00 ppm 0.00 bar		Limit max.	Limit max. 1000 ppm		0.00 bar
Internal file Log start	Menu		Internal file Log start			Menu
Pump off	ump off		Pump of	ff		Ċ

The flow is shown in the touch screen. The parameterization is described separately (see Pump parameters: Flow)

In case, the pressure of the sample gas source is too low to feed the sample gases through the measuring instrument, the integrated sample gas pump must be switched on by pressing the "Pump" button (see Pump parameters).



5.2.3 Pump capacity

There are two possible modes for operating the sample gas pump:

Automatic mode	In automatic mode, the capacity of the sample gas pump is controlled. For this purpose, the current indication of the flow meter, which is scaled to 0-100 %, will be compared with the target value. The resulting control deviation will then adjust the pump capacity so that the target value is observed. This should occur independently of the conditions of the gas sampling. <i>Note: This specification may have to be modified to be in accordance with the type of sample gas used. Entry can only be made by CODE from level 1 or higher.</i>
Manual mode	In manual mode, a specific speed is defined as target value. The speed is scaled to 0-100 %. The sample gas pump delivers a certain sample gas flow, depending on the length of the sample gas line and the pressure in the sample gas line. It must be adjusted such that the sample gas flow remains within the permissible limits.

The pump capacity can be set in the "Pump Parameter" menu.

Pressing the button Menu Opens:	General Settings Data Logging Measured value correction	Opera Pump parameters Bus Bus constants	tor settings Alarm history Password Redox temperature	level 0 Alarms Graphic	Analog outputs Date & time	
Pressing the button Pump parameters opens:	O Rota	Pump off Flow (auto) 80 %	Pump setting:	: Air Current value	* = 66 %	Current setting are shown here. These can be changed by pressing the corresponding buttons. <i>Note: The gas type</i> <i>relevant for measuring</i> <i>the flow cannot be</i> <i>changed on this enabling</i> <i>level.</i>
						For this example, the operation mode

	Pump Pump off Flow (auto) 80 % Rotation speed % (manually)	settings	"Automatic" has been chosen. The current flow as well as the target value are displayed.
Pressing the button Flow (auto) 80 % opens:	Flow (auto) 80 80 Min: 10 Max: 100 95 Delete Regulated Row in ::	7 8 9 4 5 6 1 2 3 - 0	A new target value can be entered here.
	Pump Pump off Flow (auto) 80 % Rotation speed % (manually)	Settings	For this example, the operation mode "Manual" has been chosen. The current flow as well as the target value are displayed.
Pressing the button Rotation speed % (manually) opens:	Rotation speed % (manually) 26 2 6 Min: 10 Max: 100 % Delete & X Coord pump speed in 5:	7 8 9 4 5 6 1 2 3 - 0	A new value within the range shown can be entered here.

The set values can be verified in the overview image.



5.3 Cylinder Gases

When measuring synthetic gases, such as nitrogen, argon, helium etc., no further preparations are required for processing the gas. However, pressure must be reduced and the amount fine-tuned.

5.4 Process Gases

5.4.1 General

There is no exact procedure the adherence of which would ensure that all process gases used for technical purposes are correctly prepared and will not harm the measuring device. In principle, process gases are to be kept free of dust, condensate and products capable of condensation. Such components may clog the gas pipes in the sensor and damage the sensor.

5.4.2 Hot process gases

In case hot process gases are the subject of an analysis, the gases will be sucked away from the process and fed into the sensor after having been properly prepared. The suction pipe may be made of metal or ceramic, depending on the temperature.

Due to the small amounts required for the measurement, in most cases no special cooling equipment is necessary. Usually, the process gases cool down to room temperature on their way to the sensor. Pipes must be kept leak-tight!

5.4.3 Special sample gases

There are a number of processes the process gases of which contain gaseous components forming solid or liquid condensates if the temperature falls below a certain threshold. These condensates may precipitate in the sensor's pipe system and impair the measurement or damage the sensor. We recommend to inquire about such components prior to the measurement and filter them out if necessary.

5.4.4 Specific instructions

When deploying condensate separators, especially for water, make sure that the collecting tank is located at the lowest point in the entire pipe system.

Due to the dead volume of condensate containers and filters, delay times must be expected.

5.4.5 Filter system: Structure

The gas preparation system must be adapted to the special task. A standard system includes the following concept:

- 1. Upstream connection of a water separator, potentially with an automatic condensate drainer.
- 2. Coarse filter for the separation of particles sizes above 50 μ . (Use only with high amounts of dust)
- 3. Fine filter for the separation of particle sizes above 5 μ . It is an advantage if this filter immediately closes itself off when steamed up and interrupts the sample gas flow.

5.5 Switching off the Measuring device

It is advisable to keep the device continuously in operation. This will avoid the condensation of steam in heated sensors which may cause corrosion.

In case the device is required to be switched off, the power switch must be turned off and maybe the power plug pulled. Please do not forget to flush the measuring device with air.

5.5.1 Short-term switch-off

In case the device is to be turned on after having been switched off for a short period, please refer to the section "Switching the measuring device on".

5.5.2 Long-term switch-off

Pressing the button		Final request.
opens:	Turn off? Yes No	

Confirmation with Yes opens:	Preparing To shut down! 5 Seconds	The sample gas pump and the fan are switched to run at maximum speed and the sensor is heating turned off.
GSMTouch o	an now be switched off!	Pull the power plug.

6 Selecting the Measured value

By selecting a measured value, several different ways of displaying the measured oxygen partial pressure are available.



After activating the touchpad, the following table displays the available options.

New measu	uring range
Log O2	02
Lambda	O2Red
Dew Point	Redox
	redox graph

Touch the respective button to select the value to be displayed.

6.1 O2



The measured oxygen value is displayed as a percentage. In case the measured value is below 0.1 %, the unit will automatically change to ppm (parts per million).

If the measurement is below 0.1 ppm, the display reads 0.0 ppm. Lower measured values can be taken from the "Log O2" section.



Example of the display showing a 0-240 ppm O_2 trend with band alarm

6.2 Log O2



The display can assume values between 0.0 und -30.0. The value shown is the logarithm of the oxygen partial pressure.



Example of the display showing a 10^{-20} - 10^{0} trend without band alarm

Displaying a logarithmic value allows values stretching over many powers of ten to be displayed as a number consisting of few characters.

Conversation table						
%	bar	ppm	log (x)	10^x		
100	1	1000000	0.00	10^{0}		
10	0.1	100000	-1.00	10-1		
1	0.01	10000	-2.00	10 ⁻²		
0.1	0.001	1000	-3.00	10-3		
0.01	0.0001	100	-4.00	10-4		
0.001	0.00001	10	-5.00	10-5		
0.0001	0.000001	1	-6.00	10-6		
0.00001	0.0000001	0.1	-7.00	10-7		
0.000001	0.00000001	0.01	-8.00	10-8		

The measuring instrument can display values down to 10^{-35} .

6.3 Dew point



Some measurement tasks require an evaluation of the dew point in degrees. This is commonly the case with nitrogen/hydrogen mixtures. There the measured O_2 value is converted into a dew point, based on a known hydrogen proportion. It is necessary to enter the H_2 proportion in the "Gas constants" menu.

Note:

Calculating the dew point is a mathematical function. In case the hydrogen proportion changes or is not available, the dew point cannot be calculated correctly.



Example of the display showing a -100 *to* +100 *degree range trend with band alarm*

6.4 Lambda



With some processes, knowing the Lambda value of a combustion or a gas mixture is important. Lambda is defined as:

Lambda = (combustion air supply)/(theoretically required combustion air)

The calculation requires entering a password in menu line No. 27.

Note:

Calculating Lambda is a mathematical function. In case the C/H value changes or is not available, the Lambda value cannot be calculated correctly.



Example of the display showing a 0 - 10 range trend without band alarm

6.5 O2 Red (O₂ in H₂)



In order to conclude on the oxygen in a mixture which, for example, consists of nitrogen and hydrogen, an oxygen value can be calculated from the measured oxygen partial pressure considering the hydrogen proportion. The calculation uses the hydrogen proportion. In this example it is 1 %. (Changing the hydrogen proportion see "Gas Constants")

Note:

Calculating O2Red is a mathematical function. In case the hydrogen proportion changes or is not available, this value cannot be calculated correctly.



Example of the display showing a 0 - 1000 ppm range trend without band alarm

6.6 Redox



Redox potential is a mathematical function scaled on a 0-1 range. It is calculated from the oxygen partial pressure and the temperature entered in the redox graph or measured externally.



6.7 Redox Graph



The function "Redox Graph" is a tool used in order to display the $M + O_2 \leftrightarrow MO_2$ reaction. In this process, the measured oxygen partial pressure is calculated as redox potential based on the respective entered or externally measured temperature. The redox potential display above the temperature shows the oxidation or oxygen reduction of a metal.







7 Parameterization

7.1 Enabling User levels

On the Main Image page, pressing the button on the Parameter level.

Menu

will switch the display

LEVEL "0" will open for which no CODE is required (This level is active each time the device is switched on)







By pressing the button all entry fields available on this level will appear.





7.2 Level "0"

This level may be accessed by each user without entering a CODE.



From this page all parameters and settings displayed can be changed.

7.2.1 General settings

	General settings	
--	---------------------	--

The respective description is explained in the previous chapter.

7.2.2 Pump Parameters



The respective description can be found in the "Pump Capacity" chapter.

7.2.3 Alarm History





Lists all alarms stating date and time of each alarm.

7.3 Level "1"

This level can be accessed by the user, if the correct CODE is entered. The transparent buttons can only be activated on the next level up.

	Operat	tor settings	level 1	^
General settings	Pump parameters	Alarm history	Alarms	Analog outputs
Data Logging	Bus parameter	Password	Graphic	Date & time
Measured value correction	Gas constants	Redox temperature		

From this page all parameters and settings displayed can be changed.

7.3.1 Settings described on Level 0



7.3.2 Alarms

The alarms refer to the diagram in which they are indicated in red, as well as to the sound alarms, the relay output and the message in the info line.



Pressing the button opens the following overview:

Beeper 3 Alar	rms 🔒
Alarm Beeper Log O2	Alarm O2 Beeper
Alarm Lambda	Alarm O2Red
Alarm Dew Point	Alarm Redox
Alarm H2 measurement internal	Alarm Beeper Flow

This overview shows all alarm functions

Meaning of colours and designations of buttons					
Unit	Alarm	Beeper			
Green = no alarm					
Red = Current alarm	Red = Current alarm	Black = Beeper active			
Grey = Alarm	Grey = Alarm	Grey = Beeper			
deactivated	deactivated	deactivated			

Beeper 3 Intervall (sec)	Beeper is generally inactive, even if it has been set in the submenu.
Pressing the left field	Beeper is generally active, if it has been set in the submenu.


Pressing the right field					Here a break can be
Beeper 3	Beeper pause 3 3	7	8	9	programmed between the beeps within the indicated range
	Min: 0 Max: 10000	4	5	6	Note: == Continuous tone
Beeper 3	Delete • «Continuous tone	1	2	3	
Intervall (sec)	★	-	0		
opens:					

In the following example

Ala



an alarm has been set for Lambda but the beeper remains off. The green text "Lambda" indicates that there is currently no alarm pending referring to the Lambda value display.

Example of the alarm settings for oxygen, "O2".

rm O2 per			
		02	A
	Alarm		Minimum 0 ppm
	Beeper		Maximum 120 ppm
	delayed by 3 Sek.		

Note: All entries referring to $"O_2"$ are given in ppm.

The following settings can be made:

Alarm	An alarm will be given	
Alarm	No alarm will be given	
Beeper	Pressing the button results in:	Beeper
Beeper	Pressing the button results in:	Beeper
delayed by 3 Sek.	If an alarm is given, there is a 3 second delay	
Pressing the button	delayad by 7 8 9 3 7 8 9 3 4 5 6 Delete 2 3 Codery Times in seconds 1 2 Codery Times in seconds - 0	Here a time can be preset within the given range
Minimum 1 ppm	Minimum 0 7 8 9 0 0 7 8 9 0 0 4 5 6 Delete ₹ 1 2 3 02 minimum (n) gape - 0	Here the value can be entered at which the alarm will be given in case the actual value falls below it. Entry is ALWAYS in ppm O ₂ (1 % is equal to 10 000 ppm)
Maximum 120 ppm		Here the value can be entered at which the alarm will be given in case the actual value exceeds it. Entry is ALWAYS in ppm O ₂ (1 % is equal to 10 000 ppm)

Maximum 120	7 8 9	
120		
Min: 0 Max: 1000000 ppm	4 5 6	
Delete 🗙		
O2 maximum in ppm	1 2 3	
↑ ←	- 0	

7.3.3 Analog outputs

There are 2 analog outputs 0/4 to 20 mA available which can be configured independently of each other.



Pressing the button opens the following overview:

Analog outpu Out 1 (20.0mA)	ts Out 2 (19.5mA)			
02	Log O2			
O2 minimum in ppm 0 ppm	LOG minimum in bar -30 bar			
O2 maximum in ppm 1000 ppm	LOG maximum in bar 0 bar			
✓ 0-20 mA 4-20 mA	✓ 0-20 mA 4-20 mA			

This overview shows all key settings of both analog outputs, including the currently delivered mA values.

The following table uses the measurement output "Out 1" as an example for all available settings. These are also valid for measurement output "Out 2".

Pressing the button opens:	Signal source for output 1 Log 02 02 Lambda 02Red Dew Point Redox H2 measurement internal Flow	Here a measurand can be selected from the available options.
		Leaving the menu page (if no changes are required)
For example Pressing the button opens:	Analog outputs Out 1 (20.0mA) O2 O2 O2 Log O2 O2 minimum in ppm 0 ppm LOG minimum in bar -30 bar O2 maximum in ppm 1000 ppm LOG maximum in bar 0 bar V 0-20 mA 4-20 mA	Here the measurement range can be defined.
Pressing the button	02 Minimum in ppm 7 8 9 0 0 7 8 9 0 0 4 5 6 Delete € 1 2 3 cc2 Minimum or ppm c- 0 0	Here the value can be entered at which 0 or 4 mA are to be put out.
Pressing the button	02 Maximum in gem 7 8 9 100 7 8 9 100 100 4 5 6 Delete ≤ 1 2 3 02 Maximum in gem 4 5 6 Delete ≤ 1 2 3 0 ← - 0 0	Here the value can be entered at which 20 mA are to be put out.
Pressing the button	✓ 0-20 mA 4-20 mA	Switch from 4-20 mA to 0- 20 mA

Pressing the button	0-20 mA 🗸 4-20 mA	Switch from 0-20 mA to 4- 20 mA
		Leaving the menu page (if no changes are required)

7.3.4 Data logging

The measured and calculated measured values can be stored as data records. The data carrier can be an external USB stick or the internal SD memory card.

7.3.4.1 Data logging with USB stick

Note: Each new START creates a new file. All individual data records, each one ca. 100 Byte large, will be stored in the file. The maximum number of data records depends on the available capacity on the USB stick and must be estimated by the user.



Pressing the button opens the following overview in case a USB stick was inserted:

Logging interval							
Loggin	ng interval 60 Sek.	Log star	t				
File location:	USB Stick -> 289E-0630						
Filename:	/media/pi/289E-0630/20	23_3_20_14_9_41.txt					



7.3.4.2 Data logging with internal SD Card

Note: The data records will always be stored in the same file. Each new START will overwrite the previous data. A maximum of 50,000 data records can be stored. If this number is reached, the term "MAXIMUM" is entered in the button instead of the current data record number. No additional data records will be stored. The file can be picked up via the network.



Pressing the button opens the following overview:

Logging	A					
Logging interval 60 Sek.						
File location: Interner Speicher (Netzwerk IP 192.168.43.41)						
Filename: /usr/HPS/GSMTOUCH/GSM_Touch_log.txt						



7.3.4.3 Example of a file on USB stick

Example of a text file as it appears on the USB stick. The individual bits of information are separated by a semicolon, acting as the separator.

```
آ 2022_3_16_10_27_33.txt - Editor
Datei Bearbeiten Format Ansicht Hilfe
Nr;Date Time ;LogO2;O2 in ppm;Lambda;O2Red;Taupunkt;Redox;H2%;Alarmcode;Alarm
0; 2022,3,16 10:28:20; -4,63; 23,6; 1; 9999,00; 99; 0; 0; A000; Bereit
1; 2022,3,16 10:28:25; -0,68; 209400,0; 8; 9999,00; 99; 0; 0; A000; Bereit
2; 2022,3,16 10:28:30; -0,68; 209400,0; 8; 9999,00; 99; 0; 0; A000; Bereit
3; 2022,3,16 10:28:35; -18,97; 0,0; 1; 9999,00; 75; 0; 0; A000; Bereit
4; 2022,3,16 10:28:40; -16,60; 0,0; 1; 9999,00; 99; 0; 0; A000; Bereit
5; 2022,3,16 10:28:45; -13,19; 0,0; 1; 9999,00; 99; 0; 0; A000; Bereit
6; 2022,3,16 10:28:50; -11,50; 0,0; 1; 9999,00; 99; 0; 0; A000; Bereit
7; 2022,3,16 10:28:55; -10,03; 0,0; 1; 9999,00; 99; 0; 0; A000; Bereit
8; 2022,3,16 10:29:00; -8,96; 0,0; 1; 9999,00; 99; 0; 0; A000; Bereit
9; 2022,3,16 10:29:05; -7,18; 0,1; 1; 9999,00; 99; 0; 0; A000; Bereit
10; 2022,3,16 10:29:10; -5,21; 6,2; 1; 9999,00; 99; 0; 0; A000; Bereit
11; 2022,3,16 10:29:15; -2,55; 2847,0; 1; 9999,00; 99; 0; 0; A000; Bereit
12; 2022,3,16 10:29:20; -0,68; 209400,0; 8; 9999,00; 99; 0; 0; A000; Bereit
13; 2022,3,16 10:29:25; -0,68; 209400,0; 8; 9999,00; 99; 0; 0; A000; Bereit
```

	Sample file inserted via Excel									
No	Date Time	LogO2	O2 in	Lambda	O2Red	Dew	Redox	H2%	Alarm	Alarm
			ppm			point			Code	
0	2022,3,16	-4.63	23.6	1	9999	99	0	0	A000	
	10:28:20									Ready
1	2022,3,16	-0.68	209400	8	9999	99	0	0	A000	
	10:28:25									Ready
2	2022,3,16	-0.68	209400	8	9999	99	0	0	A000	
	10:28:30									Ready
3	2022,3,16	-18.97	0	1	9999	75	0	0	A000	
	10:28:35									Ready
4	2022,3,16	-16.6	0	1	9999	99	0	0	A000	
	10:28:40									Ready
5	2022,3,16	-13.19	0	1	9999	99	0	0	A000	
	10:28:45									Ready
6	2022,3,16	-11.5	0	1	9999	99	0	0	A000	
	10:28:50									Ready
7	2022,3,16	-10.03	0	1	9999	99	0	0	A000	
	10:28:55									Ready
8	2022,3,16	-8.96	0	1	9999	99	0	0	A000	
	10:29:00									Ready
9	2022,3,16	-7.18	0.1	1	9999	99	0	0	A000	
	10:29:05									Ready
10	2022,3,16	-5.21	6.2	1	9999	99	0	0	A000	
	10:29:10									Ready
11	2022,3,16	-2.55	2847	1	9999	99	0	0	A000	
	10:29:15									Ready
12	2022,3,16	-0.68	209400	8	9999	99	0	0	A000	
	10:29:20									Ready
13	2022,3,16	-0.68	209400	8	9999	99	0	0	A000	
	10:29:25									Ready

7.3.5 Bus Parameters



Pressing the button opens the following overview of all available bus configurations.

Data bus selection								
LAN 뮴	IP= 192.1	.68.43.41						
Modbus UDP	enabled	Start remote	software					
Fieldbus (bus)								
• RS485		Modbus						
Profinet		Powerlink						

Pressing the button Modbus UDP enabled activates	Modbus UDP enabled	Network (LAN) is activated The current IP address is displayed. In this example: IP= 192.168.43.36 (Designation of socket M12 is "古古"
Pressing the button	Modbus UDP enabled	Network (LAN) is deactivated
Pressing the button Start Remote Software activates:	AnyDesk Image: Arbeitsplatz Image: Arbeitsplatz Image: Arbeitsplatz	Here the remote maintenance program "AnyDesk" is activated. A PC with "Any Desk Master" on it can carry out all functions. In order to do this, the Master PC requires the AnyDesk address shown in this example. 2 484 733 377 As soon as the Master starts a session, it must be confirmed on the GSM-touch by pressing the "Accept" button on the AnyDesk input mask.
		AnyDesk is active, until GSM- touch has been separated

Start Remote Software	from the mains.
Fieldbus (bus) RS 485 ASCII Profinet Powerlink	Here the field bus is displayed, the hardware of which has been factory- setting. The user cannot modify the bus. (Connector lable is "bus")
	The data transfer is continuously "9600,8,1,e" without request. (9600 Baud, 8 data bits, 1 stop bit, parity even)

7.3.6 Password



Pressing the button opens the following overview:

Change Password	•
Password Level 1 Access	
Password Level 2 Access	

This overview shows the levels designed for entering a password, however, access is only possible on the next level up after entering the appropriate access CODE.

7.3.7 Diagram

Note: All entries referring to $"O_2"$ are given in ppm.



Pressing the button opens the following overview of all available diagrams.

Graphics p	arameters
Log O2	02
Lambda	O2Red
Dew Point	Redox

The following table shows the parameterization of the "Log O2" diagram as an example. All other diagram settings follow this pattern.

Pressing the button	Graphics parameters Log O2	
X-axis 20 Min.		In this example, 20 minutes are saved.
Pressing the button X-axis 20 Min. opens:		A new target value can be entered here. <i>Note: Any number that is</i> <i>divisible by 4 without a</i> <i>remainder, makes the scale</i>

	X-axis 20 4 Min: 1 Max: 120 Min. Delete X	7 8 9 4 5 6 1 2 3 - 0	easier to read.
Maximum Y-Achse -0 bar			In this example, -20 bar are saved. This means that the oxygen partial pressure was programmed to be 10 ⁰ bar.
Pressing the button Maximum Y-Achse -0 bar opens:	Maximum Y-Achae -0 0 Mini -3.3 Maxi 0 har Delete Messeverfacher, allein in Jar	7 8 9 4 5 6 1 2 3 - 0 .	A new target value can be entered here.
maximum Y-axis -20 bar			In this example, -20 bar are saved. This means that the oxygen partial pressure was programmed to be 10 ⁻²⁰ bar.
Pressing the button maximum Y-axis -20 bar opens:	maximum Y-axis -20 -16 Minis -33 Maac 0 bar Delete Minissurved Value in Isar - copper end	7 8 9 4 5 6 1 2 3 - 0 .	A new target value can be entered here. Note: Any number that is divisible by 4 without a remainder, makes the scale easier to read.

7.3.8 Date & Time



Pressing the button opens the following overview:



The following table shows the parameterization of date and time:

14.3.22 (DD.MM.YY)			The current date is 14 March, 2022
			Exit the menu page without saving
Pressing the button	Date 20.03.23 20.03.23 Delete	7 8 9 4 5 6 1 2 3 0 .	A new target value can be entered here.
13:40:59			The current time is 13:40 and 59 seconds

Pressing the button	248 13142137 17:25:00 Text Delete	7 8 9 4 5 6 1 2 3	A new target value can be entered here.
opens:	Almass 4	1 2 3	

7.4 Level "2"

General	A	
Enable Level 1 Access	Deutsch	
Enable Level 2 Access	Screen Brightness	100 %
Enable Level 3 Access		

Menu

If level 2 has been enabled, the

button opens the following menu.

	Operator settings level 2							
General settings	Pump parameters	Alarm history	Alarms	Analog outputs				
Data Logging	Bus parameter	Password	Graphic	Date & time				
Measured value correction	Gas constants	Redox temperature						

7.4.1 Settings described on Level 1



7.4.2 Correction of a measured value

If necessary, the current measured value can be corrected. In this case it is advisable to make the adjustment after a stable measurement has been achieved and possible errors in measurement can be ruled out.

The reconciliation starts as soon as the menu is called up



Pressing the button opens the following overview:

Measured Val	Measured Value correction					
Log O2	02					
Lambda	O2Red					
Dew Point	Redox					

Each measurand can have its individual correction factors. This is shown on "O2" as an example, which is also valid for all other measurands.

Pressing the button	+	02	ppm Value 2. Offset	correction 4 t 0 t 1		÷	Here the value displayed in the header can be changed by pressing the "+" or "-" button. The change is shown immediately.
Pressing the button	Mini - Delete	0 - 2 20 Max: 20	4	7 4 1 -	8 5 2 0	9 6 3	Here a numeric correction value can be entered, if the increments used for the "+" and "-" are too small.
Pressing the button	Mini Delete	Faktor 1 1.111 0.5 Max: 1.5	¥	7 4 1 -	8 5 2 0	9 6 3	Here a numeric correction value can be entered, if the increments used for the "+" and "-" are too small.

Note:

Corrections should only be made by trained users who are familiar with the calculation functions.

Notes for correcting "O2":

- The additive value is used for correcting oxygen, when the display is adjusted to 20.9 %. In this process the measuring input is kept open with the sample gas pump running, meaning that ambient air is sucked in. The result of the correction is displayed on the right side of the display.
- The multiplicative value will be entered, when the oxygen is corrected with the test gas connected up, and adjusted to the test gas value. (the additive correction value should not be changed with test gas)
- The correction values additive = 0.0 and multiplicative = 1.0 mean: A correction will have no effect.

7.4.3 Gas Constants

The calculation of the dew point is made based on the measured oxygen partial pressure and the known hydrogen proportion in the gas mixture. The hydrogen proportion must be entered as a percentage.

The calculation of the Lambda value is made based on the measured oxygen partial pressure and the gas used for combustion. This requires entering a factor, called the "Gas factor Lambda", which indicates the gas.

Gas	
constants	

Pressing the button opens the following overview for defining the source of the hydrogen proportion.



	Gas constants H2 fixed value 1 %		In the example a fixed value of 1% H ₂ has been used
	H2 mA input 0.0mA ≜ 0.0% H2	H2 parameters min max	
	Gas factor lambda 0.25		
		_	
Pressing the button			Here a new value can be entered within the given range.
opens:			

	H2 fluid value 7 8 9 1 1 7 8 9 1 4 5 6 Delete ☑ 1 2 3 12 certical in get ← - 0 .	
	Gas constants H2 fixed value 10 % H2 mA input current: 0.0mA ≜ 50.0% H2 H2 parameters min max Gas factor lambda 0.25	In the example, the external input for measuring the H2 proportion currently displayed has been activated.
Pressing the button H2 parameters min max opens:	H2 mA Input Percent at minimum mA 50 % Percent at maximum mA 100 % ✓ 0-20 mA 4-20 mA	This menu must be used to configure the required measured. In case an external measuring device has been connected up, the current value is shown, otherwise " ".
✓ 0-20 mA 4-20 mA		Here a measuring input of 0-20 mA is activated.
Pressing the button	0-20 mA 🗸 4-20 mA	Here a measuring input of 0-20 mA is activated.
Pressing the button Percent at minimum mA 0 % opens:	Percent at minimum mA 7 8 9 0 0 4 5 6 Delete ▲ 1 2 3 ★ ← - 0 -	Here a new value can be entered within the given range. This value is the minimum percentage of the external measuring device.

Pressing the button Percent at maximum mA 100 % opens:	Percent at maximum mA 100 100 Min: 0 Max: 100 %	7 8 9 4 5 6 1 2 3 - 0	Here a new value can be entered within the given range. This value is the maximum percentage of the external measuring device.
Gas factor lambda 0.25			In the example a fixed value of 0.25 has been used.
Pressing the button Gas factor lambda 0.25 Opens:	Gas factor lambda 0.25 0.32 Min: 0.1 Max: 1 Delete Kas factor	7 8 9 4 5 6 1 2 3 - 0 .	Here a new value can be entered within the given range.

7.4.4 Password (CODE)



Pressing the button opens the following overview:

Change Password	•
Password Level 1 Access	
Password Level 2 Access	

The factory-set CODE for access can be changed for both levels.

Attention! In case the CODE is lost or forgotten, the original state can only be re-established by resetting the device to factory settings.

The following table uses access level 1 as an example for all available settings. These are also valid for access level 2.

Pressing the button	Password Lavel 1 Access 1234 1234	7	8	9	Here a new CODE can be entered and stored by pressing ENTER button
Password Lever + ALLess	Min: 0 Max: 9999	4	5	6	
opens:	Delete 😵	1	2	3	
Password Level 2 Access	Can only be opened CODE.	d with a	spec	ial	

7.4.5 Redox Temperature



Pressing the button Redox temperature	Redox ten temperature fixed value 950 °C	nperature 💼	In this example, fixed value was selected and a fixed value of 940°C was entered.	
opens:	Temperature mA input 0.0mA ± 900°c	Temperature parameters min max		
Pressing the button	temperature fixed value 950 940	7 8 9	Here a new value can be entered within the given	
temperature fixed value 950 °C	Min: 400 Max: 1200 °C	4 5 6	range.	
opens:	Temperature fixed value for redox	1 2 3		
	^	- 0 .		

	Redox temperature temperature fixed value 900 °C Temperature mA input current: 0.0mA ≜ 900°C Temperature parameters min max	In this example, the external input for measuring the temperature currently displayed has been activated.
Pressing the button Temperature parameters min max opens:	C at minimum mA 900 °C °C at minimum mA 900 °C °C at maximum mA 1000 °C C at maximum mA 1000 °C ✓ 0-20 mA 4-20 mA	This menu must be used to configure the required measured. In case an external temperature measuring device has been connected up, the current value is shown.
✓ 0-20 mA 4-20 mA		Here a measuring input of 0-20 mA is activated.
Pressing the button	0-20 mA 🗸 4-20 mA	Here a measuring input of 0-20 mA is activated.
Pressing the button "C at minimum mA 900 °C opens:	°C at midmum mA 7 8 9 900 7 8 9 450 4 5 6 Delete € 1 2 3 € ← - 0 6	Here a new value can be entered within the given range. This value is the minimum percentage of the external measuring device.
Pressing the button ^{°C at maximum mA 1000 °C} opens:	°C at maximum mA 7 8 9 1000 7 8 9 1020 °C 4 5 6 Delete € 1 2 3 ★ ← - 0 6	Here a new value can be entered within the given range. This value is the maximum percentage of the external measuring device.

7.5 Level "3"

Note:

Only available for factory settings.

8 Connections

The right side panel of the GSM-touch accommodates all available sockets for connecting cables.



Photo of the right side panel of the GSM-touch

8.1 Analog inputs

	View of built-in M12 CODE A socket	Input extern	0/4 - 20 mA from mal transducers
		Pin	Туре
	450	1 2	H ₂ input
		3 4	Temperature
analog in			

8.2 Analog outputs

	View of built-in M12 CODE A jack	Output ()/4-20 mA
		Pin	Туре
	450	<u>1 -</u> 2 +	Output 1
analog out	The second secon	3 - 4 +	Output 2

8.3 Alarm outputs

	View of built-in M12 CODE A socket	Relay Semic 24VA	output onductor relay C/DC, max 2 A)
		Pin	Туре
alarmes	450	1 2	Collective alarm
uluinioo	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	3 4	Maximum alarm
	(O (O) O)	5 6	Minimum alarm
		7 8	Redox alarm

8.4 Data bus

bus	ASO ASO ASO ASO ASO ASO ASO ASO ASO ASO	Field I configur RS422/4 Pin 1 2 3 4	bus depending on ration. Factory setting 85 Function TX+ (+TX1) RX+ (+RX1) TX- (-TX1) RX- (-RX1)
	View of built-in M12 CODE D socket		

8.5 Network

Radia Constraints		LAN connection e. g. with standard cable M12-Ethernet
	View of built-in M12 CODE D socket	

8.6 USB



9 Network

9.1 Connection to an Ethernet network

Attention!

Operating on the WINDOWS platform requires special skills and may only be performed by authorized personnel.

In other countries and languages, the headings and texts may differ from the examples shown.

A connection will be established within the network by means of an Ethernet cable between router and

GSM-touch.

The following instruction is an optional way to find the log file on the SD card in the device. The GSM-touch is not assigned to any specific "Workgroup". (DHCP will assign an IP address). The entries shown are an example and may vary between different PCs and Windows versions.

Now click "Network" in the Windows file explorer and "Connect with disk drive". In this example, this is drive "U".

			\times					
\leftarrow	🤏 Netzlau	fwerk verbinden						
	Welcher	Netzwerkordner soll zugeordnet werden?						
	Bestimmen Sie den Laufwerkbuchstaben für die Verbindung und den Ordner, mit dem die Verbindung bernestellt werden soll:							
	Laufwerk:	U: ~						
	Ordner:	\\gsmtouch\gsm_log \view Durchsuchen						
		Beispiel: \\Server\Freigabe						
		Verbindung bei Anmeldung wiederherstellen						
		Verbindung mit anderen Anmeldeinformationen herstellen						
		Verbindung mit einer Website herstellen, auf der Sie Dokumente und Bilder speichern können						
		Fertig stellen Abbrechen						

(Folder: \\gsmtouch\gsm_log) After confirming by clicking on "Complete", you need to log into the network.

Windows-Sicherheit	Windows-Sicherheit X						
Netzwerkanmeldeinfor	mationen eingeben						
Geben Sie Ihre Anmeldeinformationen ein, um eine Verbindung mit folgendem Netzwerk herzustellen: gsmtouch							
Benutzername							
Kennwort							
Anmeldedaten speichern							
Der Benutzername bzw. das Kennwort ist falsch.							
ОК	Abbrechen						

(User name: gsmtouch; Password: gsmtouch)

Windows-Sicherheit	×						
Netzwerkanmeldeinforr	nationen eingeben						
Geben Sie Ihre Anmeldeinformationen ein, um eine Verbindung mit folgendem Netzwerk herzustellen: gsmtouch							
gsmtouch							
•••••							
Anmeldedaten speichern							
ОК	Abbrechen						

The file "GSM_Touch_log.txt" is listed on the right side of the file manager.

			- 🖌 🖡	Ì X -
Name	Änderungsdatum	Тур	Größe	
GSM_Touch_log.txt	21.03.2001 12:37	Textdokument	5 KB	

The file "GSM_Touch_log.txt" (for file contents see example further up) is now available.

10 Data File Examples

10.1 Field bus RS485

Field bus RS422/485 (9600,8,N,1)									
Log O ₂	ppm O ₂	Lambda	O ₂ Red	Dew point	Redox	Status	CR/LF		

The data flow can be displayed and recorded with PUTTY or HTERM.

PuTTY (inactive)	_	\times
<pre>4.4504;31.3;1.00;9999;100;0.10;ready 4.4504;31.7;1.00;9999;100;0.10;ready 5.455;3.5;1.00;9999;100;0.12;ready 5.455;3.5;1.00;9999;100;0.12;ready 0.685;209400.0;7.99;9999;100;0.02;ready 0.685;209400.0;7.99;9999;100;0.02;ready 0.685;209400.0;7.99;9999;100;0.02;ready 0.685;209400.0;7.99;9999;100;0.02;ready 4.498;31.8;1.00;9999;100;0.10;ready 5.454;3.5;1.00;9999;100;0.12;ready</pre>		

10.1.1 Example with Putty

File Options View Hel	p /	S Flow control
Rx 305 Ref	aet Tx 0 Reset Count 0 + 0 Reset Newline at CR+LF	Show newline characters
Clear received Asci	Hex Dec Bin Save output 💌 Clear at 0 🔹 Newline every 0 🔹 Save output	v errors Newline after . receive pause
Sequence Overview X	Received Data	
	-5.454;3.5;1.00;9699;100;0.13;readyww -5.452;3.5;1.00;9595;100;0.12;readyww -4.495;32.0;1.00;9595;100;0.12;readyww -4.495;32.0;1.00;9595;100;0.10;readyww -4.495;32.0;1.00;9595;100;0.10;readyww -0.685;205400.0;7.95;9595;100;0.00;readyww -4.495;31.8;1.00;9595;100;0.10;readyww -4.495;31.8;1.00;9595;100;0.10;readyww -4.495;31.8;1.00;9595;100;0.10;readyww -4.495;31.8;1.00;9595;100;0.10;readyww	
	Input control	c
	Input options Cear transmitted Acci Hex Dec Bin Send on enter None Sand file DTR RTS	
	Type ASC V	ASend
	Transmitted data	,
	1 5 10 15 20 25 30 35 40 45 50 55 60 65	70 75

10.1.2 Example with HTERM



Enlarged view of HTERM example

10.2 Modbus UDP

10.2.1 Example using SimplyModbus TCP

The following examples have been performed using the SimplyModbus TCP tool.

The bus is a read only tool. Write commands are not supported.

Settings: Slave ID = 1, Function Code for read = 3, results are 32 bit, while "High byte first" and "High word first" apply.

In order to simplify the handover of the measured values, they will only be stored as integers. When read, results need to be multiplied with factors.

Analog measured values								
Register 32bit	Measured value	Factor						
0	Log O2	-0.001						
2	O2 in ppm	1						
4	Lambda	0.001						
6	O2 Red	1						
8	Dew point	1						
10	Redox	0.001						
	Digital values							
Register 16bit	Туре	Meaning						
12	Status	1=Heat up; 2=Ready						
13	Collective alarm	0/1						
14	Max Alarm	0/1						
15	Min Alarm	0/1						
16	Redox alarm	0/1						
17	Alarm Code							
Table: Compation factors								

Table: Correction factors

The read command for register 2 in HEX is:	00	00	00	90	01	03	00	02	00	02

Simply Modbus TCP Client 8.1.2	in the second	میں کاری کریں	ir ka laa da	_		×
mode IP Address Port	copy down 🛞 register #	bytes		notes	clear notes 🛞)
TCP 192.168.43.36 502	32bit INT 2	0000 0E60	3680			
DISCONNECT CONNECTED	32bit INT 3					
Slave ID First Register No. of Regs						
2 byte ID code 0 2 bit registers size						
Request						
00 04 00 00 00 06 01 03 00 02 00 02						
load before send						
SEND response time (seconds) 5,0						
Response fail in 🚽 5,0						
00 03 00 00 00 07 01 03 04 00 00 0E						
Equilibrium expected response bytes	continuously respo	onse time 5,0	0 max 0,0	c	trl-H for	
High word first	time between sends r	esponses 0	avg 0,000	COL	ntext help	
SAVE CFG RESTORE CFG WRITE ABOUT	10,0	failed 3	min <u>0,0</u> reset	SAVE B	YTES bytes	Ð
2022/04/05 08:03:48 < 00 02 00 00 00 05	01 03 02 00 00					^
2022/04/05 08:04:00 >>> 00 03 00 00 00	06 01 03 00 02 00 02					
2022/04/05 08:04:05 < 00 03 00 00 00 07	01 03 04 00 00 0E 6	0				~

In the example, the reading was 3680 ppm

mode IP Address Port I IDECONNECT CONNECTED Slave ID First Register No. of Regs I IDECONNECT CONNECTED Slave ID First Register No. of Regs I IDECONNECT CONNECTED Slave ID First Register No. of Regs I IDECONNECT CONNECTED Super ID IDECONNECT UDe defaults register size IDECONNECT IDECONNECT IDECONNECT UDe defaults IDECONNECT Request IDECONNECT IDECONNECT IDECONNECT IDECONNECT IDECONNECT IDECONNECT CONNECTED IDECONNECT IDECONNECT IDECONNECT IDECONNECT IDECONNECT IDECONNECT IDECONNECT IDECONNECT IDECONNECT IDECONNECT IDECONNECT IDECONNECT IDECONNECT IDECON IDECONNECT IDECONNECT IDECON IDECON IDECON IDECON IDECON IDECON IDECON IDECON IDECON IDECON IDECO	Simply Modbus TCP Client 8.1.2		•			_	- 🗆	×
TCP 192.168.43.36 902 DISCONNECT CONNECTED Slave ID First Register No. of Regs 1 0 1 2 0 1 2 0 1 2 0 1 2 0 1 0000 02.66 3 1 1 0000 02.41 3 1 1 0000 02.42 3 1 1 0000 02.42 3 1 1 0000 02.42 3 1 1 0000 02.42 3 1 1 0000 02.42 3 1 1 0000 02.40 3 1 1 0000 00.02 3 1 1 0000 0000 100 1 1 1 0000 0000 100 1 1 1 1 1 1 3 1 1 1 1 1	mode IP Address Port	copy down 🎯	register#	bytes		notes	dear notes 🤆	ð
DISCONNECT CONNECTED Slave ID First Register No. of Regs 1 0 1 0 2 1 1 0 2 1 1 0 2 1 1 0 2 1 1 0 2 1 1 0 2 1 1 0 1 0 1 0 1 0 2 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 <td>TCP 192.168.43.36 502</td> <td>32bit INT</td> <td>0</td> <td>0000 0976</td> <td>2422</td> <td></td> <td></td> <td></td>	TCP 192.168.43.36 502	32bit INT	0	0000 0976	2422			
Slave ID First Register No. of Regs 1 0 12 1 0 12 2 0000 0400 1024 1 0 12 1 0 12 2 0000 2707 9999 3 132bit INT 3 0000 2707 9999 3 132bit INT 4 0000 0064 100 2 132bit INT 5 0000 0035 53 3 Events History 5 100 100 100 1 12 100 12 100 100 100 100 1 12 100 12 100 12 100 100 100 100 1 12 100 12 100<		32bit INT	1	0000 0EC6	3782			
1 1	Slave ID First Register No. of Regs	32bit INT	2	0000 0400	1024			
2 byte ID code 0		32bit INT	3	0000 270F	9999			
2 byte ID Nunction minus offset register size 3 32bit registers 32bit INT 5 0000 0035 53 Request 32bit INT 6 1 0 0 15 00 00 00 6 01 03 00 00 00 0C 32bit INT 7 1 0 bod before send 5,0 response fail in \$5,0 0 0 1D 00 00 00 1B 10 103 18 00 00 09 5,0 11 1 1 32bit INT 10 1 1 1 1 32bit INT 10 1 1 1 1 1 32bit INT 10 1 1 1 1 1 1 32bit INT 10 1 1 1 1 1 1 1 32bit INT 10 1	Use defaults	32bit INT	4	0000 0064	100			
image: state in the second state in	2 byte ID code	32bit INT	5	0000 0035	53			
I Events I Events <td< td=""><td>32 bit registers</td><td>32bit INT</td><td>6</td><td></td><td></td><td></td><td></td><td></td></td<>	32 bit registers	32bit INT	6					
Regunse Image: State CFG Rest CFG WRITE ABUT Image: State CFG Rest CFG R	Events History	32bit INT	7					
Image: Series of the series		32bit INT	8					
I load before send SEND response time (seconds) fail in 5.0 Nesponse fail in I log l D 0 0 0 0 0 1B 01 03 18 00 00 09 I response fail in I High byte first expected response bytes High byte first expected response bytes SAVE CFG RESTORE CFG WITE ABOUT 2022/04/05 08:37:55 >>> 00 1D 00 00 00 00 00 00 00 00 00		32bit INT	9					
SEND response time (seconds) 5,0 Response fail in \$ 5,0 0 1 D 0 0 0 0 1 B 1 0 1 3 18 0 0 0 0 3 5,0 0 1 D 0 0 0 0 0 1 B 1 0 1 3 18 0 0 0 0 3 5,0 1	load before send	32bit INT	10					
Response fall a) 5,0 Ioo 1D 00 00 00 1B 01 03 18 00 00 09 is send is send Ioo 1D 00 00 00 06 400 00 00 35 is send is send Imax 0,0 0,0 Ctrl H for Imax 0,0 0,0 context help SAVE CFG RESTORE CFG WRITE ABOUT falled 29 min 0,0 2022/04/05 08:37:55 >>> 00 1D 00 00 06 01 03 00 00 00 00 is 00 00 00 is 00 00 00 is 00 00 is 00 00 is 00 00	SEND response time (seconds) 5,0	32bit INT	11					
00 1D 00 00 01 B 01 03 18 00 00 09 isend 05 00 00 02 C6 00 00 4 00 00 02 7 isend 05 00 00 00 64 00 00 03 5 continuously High byte first expected response bytes SAVE CFG RESTORE CFG WRITE ABOUT 10,0 failed 2022/04/05 08:37:55 >>> 00 1D 00 00 00 00 00 00 00 00	Response fail in \$5,0							
76 00 00 05 C6 00 00 04 00 00 02 7	00 1D 00 00 00 1B 01 03 18 00 00 09 🔨							
SAVE CFG RESTORE CFG WRITE ABOUT → 10,0 00 00 00 00 00 00 00 00 00 00 00 00	76 00 00 0E C6 00 00 04 00 00 00 27							
Image: SAVE CFG RESTORE CFG WRITE ABOUT Continuously response time 5,0 max 0,0 Ctrl H for context help SAVE CFG RESTORE CFG WRITE ABOUT failed 29 min 0,0 context help 2022/04/05 08:37:55 >>> 00 1D 00 00 00 00 00 00 00 00 00 00 00 00 00 00	02 00 00 00 00 00 00 35	send						
High word first 57 time between sends responses 0 avg 0,000 context help SAVE CFG RESTORE CFG WRITE ABOUT failed 29 min 0,0 6ear @ 2022/04/05 08:37:55 >>> 00 10.00 0	High byte first expected response bytes	continuous	respo	onse time 5,0) max 0,0		Ctrl-H for	
SAVE CFG RESTORE CFG WRITE ABOUT Image: Table of the set of the	High word first	time betwee	en sends r	esponses 0	avg 0,000	(((((((((((((((((((context help	
2022/04/05 08:37:55 >>> 00 1D 00 00 00 06 01 03 00 00 00 0C		10,0					dear	
2022/04/05 08:37:55 >>> 00 1D 00 00 00 06 01 03 00 00 00 0C	SAVE OF RESTORE OF WRITE ABOUT				reset	SAVE	BYTES byte	s
2022/04/05 08:37:59 >>> 00 1D 00 00 00 00 00 01 03 00 00 00 0C								^
12022/04/05 08:38:04 < 00 ID 00 00 IB 01 03 I8 00 00 09 76 00 00 02 C6 00 00 04 00 00 27 02 00 00 10 12022	2022/04/05 08:37:59 >>> 00 1D 00 00 00 2022/04/05 08:38:04 < 00 1D 00 00 00 1B	6 01 03 00 0 01 03 18 00	00 00 00	6 00 00 0E (C6 00 00 04 00 0	00 00 2	7 OF 00 00	
00 64 00 00 035	00 64 00 00 00 35							~

In the example, the reading included all analog measured values

Simply Modbus TCP Client 8.1.2					- 🗆 ×			
mode IP Address Port	copy down 🎯	register#	bytes	results LOG	notes dear notes 🛞			
TCP 192.168.43.36 502	32bit INT	1	0000 0EFB	3835				
DISCONNECT CONNECTED	32bit INT	2	0000 0400	1024				
Slave ID First Register No. of Regs	32bit INT	3	0000 270F	9999				
	32bit INT	4	0000 0064	100				
Use defaults	32bit INT	5	0000 0035	53				
2 byte ID code	16bit INT	6	0002	2				
32 bit registers	16bit INT	6	0000	0				
Events History	16bit INT	7	0001	1				
Request	16bit INT	7	0000	0				
00 05 00 00 00 06 01 03 00 00 00 12	16bit INT	8	0000	0				
load before send	16bit INT	8	006E	110				
	16bit INT	9						
SEND response time (seconds)	32bit INT	9						
Response Tail in 2.5,0	16bit INT	10						
00 04 00 00 00 27 01 03 24 00 00 09	16bit INT	11						
OF 00 00 00 64 00 00 00 35 00 02 00		,		· · · · · · · · · · · · · · · · · · ·	· · ·			
00 00 01 00 00 00 00 00 6E 🗸 🗸	send				1			
✓ High byte first expected response bytes	continuously	respo	onse time 1 5,0	max 0,0	Ctrl-H for			
High word first	time betwee	n senas ·	failed 4	min 0,0	context hep			
SAVE CFG RESTORE CFG WRITE ABOUT								
					^			
2022/04/05 09:25:54 >>> 00 04 00 00 00 0	6 01 03 00 0	0 00 12						
2022/04/05 09:25:59 < 00 04 00 00 00 27 00 64 00 00 00 35 00 02 00 00 00 01 00 00	01 03 24 00 00 00 00 6E	00 09 7	0 00 00 0E 1	EB 00 00 04 00	00 00 27 02 00 00 V			

In the example, the reading included all analog and digital values

10.2.2 Example using METROTEC Excel-MBAXP

Excel was adjusted in order to ensure a simple connection with GSM-touch and display measured values on the PC.

TCP/IP Connection	n = Open	
Messbereich	Wert	Einheit
Log O2	-1,469	bar
02	33955	ppm
Lambda	1,26	L
O2 Red	9999	-
Taupunkt	100	°C
14	0,03	bar
Status	2	
Datensatz Nr.	27	
Sammel Alarm	0	
Max Alarm	1	
Min Alarm	0	
Redox Alarm	0	

10.2.3 Example using Siemens LOGO! (German version)

Connection is prepared with Siemens Tools, as shown in the following example:

Create new network project



LOGO! by Add new device LOGO! Select version Configure network settings (PI...)

Geräteauswahl			×
Geräteauswahl Logo Logo LoGO! 8.1 & 8.2 (LOGO! 8.F54) LOGO! 8 (0BA8.Standard) LOGO! 0BA7 S7-kompatibles Gerät Modbus-komp. Gerät Modbus-komp. Gerät SimaticPanel LOGO! TDE LOGO! TDE LOGO! TDE LOGO! Slave LOGO! Slave LOGO! 8.1 & 8.2 (LOGO! 8.F54)-Slave LOGO! 8.1 & 8.2 (LOGO! 8.F54)-Slave LOGO! 0BA7 Slave LOGO! 0BA7 Slave	Konfiguration Gerätename: IP-Adresse: Subnetzmaske: Standard-Gateway	LOGO! 8.3_1 192.1 255.255.255.0 192.1	
	ОК	Abbrechen	Hilfe

GSM-touch by Add new device, Select Modbus compatible device Configure network settings (IP...)

	Konfiguration		
1060181&82 (L06018F54)	Gerätename:	GSMtouch	
LOGO! 8 (0BA8.Standard)	IR Advosto-	102.1	
LOGO! OBA7	ir-Auresse.	192.1	
S7-kompatibles Gerāt	Subnetzmaske:	255.255.255.0	
S7-kompatible Geräte	Standard-Gateway	192.1	
Modbus-komp. Geräte			
Modbus-komp. Gerät			
🔄 SimaticPanel			
Siemens HMI			
🔄 LOGO! TDE			
LOGO! TDE 6ED1055-4MH08-0BA1			
LOGO! Slave			
LOGO! 8.3 Slave			
LOGO! 8.1 & 8.2 (LOGO! 8.FS4)-Slave			
LOGO! 8 (0BA8.Standard) Slave			
LOGO! 0BA7 Slave			
	OK	Abbrechen	Hilfe



Insert analog network input module in diagram editor Select parameter remote device Select GSMtouch device Port to 502 Device ID to 1 Modbus Type to HR Modbus address to 2, Register 1 (Log=2 LowWord) + Offset 1 repeat above steps for each module Modbus address to 13, Register 12 (Status) + Offset 1

다. LOGO! 8.3_1 Diagramm ×		
1	1 [Analoger Netzwerkeingang]	×
	Parameter Kommentar	
	Parameter:	
	Wert einlesen von	
	O Lokaler VM (variable Memory)	
	Remote-Gerät	
	Remoto Gerāt	
	Constille Advance COMbauch (102	
	Gerat/IP-Adresse: GSMtouch [192.	
	Gerätetyp: Modbus-komp. Gerät	
	PORT: 502 +	
	EinhID: 1 🗘 🖞	
	Modbus-Typ: HR	
	Modbus-Adresse: 2 🜩 👔	
	OK Abbrechen Hi	lfe

In order to display values on LOGO Display

Insert two analog threshold switches and connect with one analog network input module each Insert a message text module

Pull parameter Ax from both analog threshold switch modules into message text

lt				
Block				Parameter
Suche: Blockname	halter] halter]			Ein 😭 Aus 🚱 Gain 🚱 Offset 🚱 Ax, verstärkt 💽 Aktuelle Zeit Aktuelles Datum Zeitpunkt der Meldetextaktivis Datum der Meldetextaktivis
Tickereinstellung				Meldetext
O Zeilenweise:				🖉 °C 💷 AI ON/OF
🗌 Zeile1 🔛 Zeile2 🔛 Z	Zeile3 🗌 Zeile4	Zeile5	Zeile6	A 8002 - Ax, verstärkt 0 0 0 0
Meldeziel				<mark>л</mark> о
O LOGO! Display O LOGO	! TD 💿 Beide	U Webser	ver	

Insert three open terminal modules and connect with open module outputs. Insert state hi module and connect with EN port of message text module.



Load program in LOGO and start it Display line 1 shows Register 1 (Log=2 LowWord) Display line 2 shows Register 12 (Status)



Result:

As described in chapter "Modbus UDP", the values are transferred with 32 bit in the form of 2 "Word". In addition, in order to simplify the handover of the measured values, they will only be stored as integers. When read, the results must be multiplied with factors such as those listed in the table "Correction factors".

The conversion follows the pattern:

Measured value = (Register_HighWord*65536+Register_LowWord) * Factor Example 1: Register 0 = 0; Register 1 = 625 hence: Log O_2 =(Reg_0 * 65536 + Reg_1)*-0.001 = 625*-0.001 = -0.625 Example_2: ppm O_2 = (Register 2*65536+Register 3)*1=(3*65536*12792)*1=209400 The further processing of the measured values rests with the user.

10.3 PLC

Connecting the device with a PLC requires knowledge about the PLC used. The principle of the data flow can be derived from the examples given. Usually, the administration of numerical formats is already implemented in the PLC, especially for float numbers.

Due to the large variety of products it is impossible to deliver descriptions in this context.

11 Messages in the info line

The info line in the display shows messages in [] + Text. The following table contains explanations of the messages and, if applicable, measures for troubleshooting errors and alarms.

Message	Meaning	Cause
[R000]	Information on the start	
[R001]	Communication error	Contact service
[A000]	Device is ready without alarms	
[A110]	Limit values and alarms as text	Set or remove limit values and alarms
	display	
[A901]	Device temperature too low	Device environment too cold, transfer device
		to a warmer place
[A902]	Device temperature too high	Device environment too warm, transfer
		device to a cooler place
[A911]	Temperature too low	Device may currently be in a heating-up
		phase
[A912]	Temperature too high	Problem: Switch device off, contact service

12 Interfaces

12.1 Analog interfaces

2 analog outputs 0/4-20 mA for the output of measured values. These can be operated simultaneously and independently of each other.

2 analog inputs 0/4-20 mA for external transducers.

12.2 Digital interfaces

Relay for minimum limit Relay for maximum limit Relay for collective alarm Relay for Redox alarm Modbus TCP/UDP RS422/485 LAN

13 Technical data

Measuring range	100 % to 10^{-35} bar O ₂
Environment temperature	0 to 45 degrees Celsius
Measurement accuracy	+/- 0.3 mV of the sensor e.m.f. +/- 2 degrees Celsius +/- 2% of the mA output +/- 2% of the log oxygen partial pressure
Dimensions	210 x 320 x 80 mm (HxWxD) 330 x 320 x 80 incl. handle
Weight	3.5 kg
Electromagnetic compatibility	The device complies with the European Directive 2014/30/EU. The following Generic Standards are satisfied: Emitted interference EN 61000-6-4 Interference immunity EN 61000-6-2 The device can be operated without restrictions in living and industrial environments.
Supply voltage	100 - 240 Volt AC
Heating-up time for sensors	ca. 15 minutes
Response time	ca. 2 seconds
Sample gas temperature	max. 50 °C
Sample gas amount	min. 30 l/h, max. 120 l/h
Humidity	Dew point must not be fallen short of Attention! Forming of condensate
Dust	Dust must be filtered out Filter out solid matter particles larger than 5 μ
2 analog outputs 2 analog inputs	0/4 – 20 mA configurable, floating, connector M12 0/4 – 20 mA configurable, floating, socket M12
3 Relay outputs	configurable for alarms, 1A, 24 V (ohmic) connector M12
Interfaces	Modbus socket M12, USB 2.0 Modbus TCP/UDP connector M12
Software tools used	AnyDesk, Ecxel-MBAXP