

Instructions Software GMS_2CH_HP gas mixing system

Contents

Software control program GMS_2CH_HP	1
Program start	1
Settings - Gas consumption	2
START / STOP	4
Profile table - automatic operation	5
Data table and storage.....	7
Graph 24h	7
Info	8
TCP server	9



All volumes displayed in this software and stored in MS Excel files refer to 0°C and 1013.25 hPa.

Software control program GMS_2CH_HP

The software is used from 7 tabs.



The buttons :

HELP – software opens this software manual.

HELP – hardware opens the instruction manual : installation, maintenance, calibration.

Exit program : the GMS_2CH_HP **must** be shut down by clicking this button - DO NOT finish the program in another way !



After finishing the operation close all valves at the gas containers !

Program start

When the program is started a window shows the progress at starting the program :



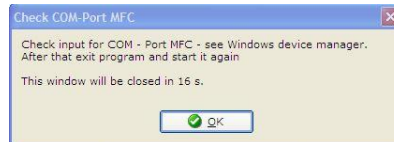
Settings - Gas consumption

COM-Ports on this PC : lists all serial ports (COM – Ports) available on the PC.

COM-Port GMS_2CH : shows the COM - port connected to the GMS_2CH_HP. This value is read from the WINDOWS registry.



At the first time when the system is started normally this field is empty. An error messages is displayed :



In this case the user has to key in the COM port number. By clicking on the blue *INFO* button the WINDOWS device manager is opened where all COM ports are listed under Ports (COM & LPT). The GMS_2CH_HP port is listed as USB-to-Serial Com Port COM x. The number x has to be entered in the program.



USB Serial Port (COM10)

Save data here : these entries stipulate the parameters for data storage. By clicking the button next to *Save data here ...* : a dialog is opened to enter the path for data storage. The complete path is displayed *Path for data storage*.

Denotation : the data are stored as MS EXCEL (.xlsx) worksheet. The filename is combined from this prefix and the actual date and time automatically.

Data storage : shows the complete data path where the data are stored as MS EXCEL (.xlsx) worksheet – not editable.

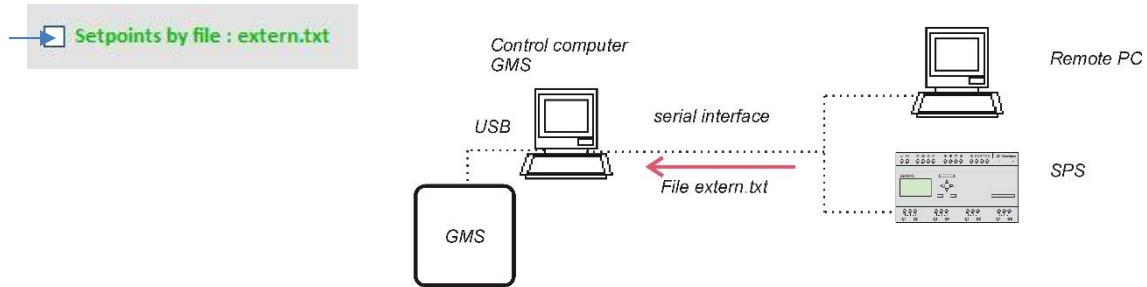
Save data automatically as .. (at STOP) : by activation of this check box the data are stored automatically at STOP.

Save data automatically .. after XXX minutes : when this check box is activated the data are stored after xxx minutes.

Time interval for data storage : in this field the time interval for the data storage can be set in seconds. To do this, the checkbox must be activated (see 'Data').

Consumed volume of gas : shows the gas consumption for channel 1 and 2. So the user can see if it is necessary to exchange the gas container to prevent an empty gas bottle. If the gas container is exchanged the *arrow button* should be clicked to set the consumption to zero.

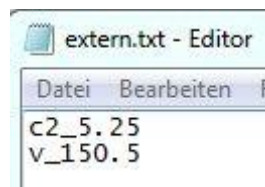
Setpoints by file : extern.txt : if activated by the check mark, this function enables the GMS to be controlled by a remote PC :



The setpoints for the gas mixing system can be specified externally via a text file and operation can be started. The file can be opened, changed (edited) and saved without restrictions, e.g. with the Windows editor program. When activating setpoint specifications through the external file, the file is queried at intervals of 1 second. If the file contains the specified characters, the setpoints are set.



The operation of the GMS via START or via the profile file is only possible again when the external setpoint setting is deactivated again.



The text file must have the following structure:

Name : extern.txt

Path : in the directory (installed during installation) C:\ProgramData\QCAL .

Content :

Text (ASCII).

A dot must be used as decimal separator, c_ and v_ written in lower case.

1st line : c2_xxxx.xx for the target concentration **channel 2** in %vol or in ppm.

2nd line : v_yyy.yyy for the total volume flow in standard milliLitres / minute

If the function is activated, the content of this file is queried in 1-second intervals.

After reading out the file :

1. the setpoint values specified by the setpoints from the .txt file are set.
2. the contents are deleted
3. the transfer is confirmed with a time stamp in the file zeit.txt (zeit = time). The time stamp and the setpoints are appended to the file. The file zeit.txt must also be in the directory C:\ProgramData\QCAL. Both txt – files are installed at the setup of the GMS software.
4. if the file extern.txt sets the total flow to zero (v_0) the GMS will stop the operation (corresponds to CLICK on STOP button). The GMS remains in the 'external file' operation mode.

Example :

#2020-09-18 16:03:39#,15.25,1000 : (Set point 15.25 %vol - 1000 NmL/min on 18/09/2020 at 16:03:39)

When operating through the external file, the software displays



Operation via external file is running ...



If the configuration has been changed it is necessary to click the button *Save configuration in WIN registry*.

Pressure limit : the GMS_2CH_HP measures the pressure at the gas outlet via the two flow controllers as **absolute pressure**. This input can be used to set a limit value for the maximum pressure. If this is exceeded, operation is stopped.
Set pressure limit : sets this limit value and saves it.



START / STOP

The screenshot shows the 'START / STOP' configuration window in the GMS_2CH software. The window is titled 'GMS_2CH version 6.1' and 'Ready...'. It features a menu bar with 'Settings - Gas consumption', 'Data', 'Graph 24h', 'START / STOP - select gases', 'Profile table', 'INFO - Maintenance', and 'TCP server'. There are 'Help' and 'Exit Program' buttons in the top right. A status bar at the bottom indicates 'ready...'. The main area is divided into several sections:

- Input:**
 - 1 - Select gases - confirm with check box:
 - Gas Channel 1: N2 - nitrogen (checked), Min: 0.50 Max: 500.00
 - Gas Channel 2: CO2 - carbon dioxide (checked), Min: 0.50 Max: 500.00
 - Min. / Max. : Flow in Ncm³ / Minute (Nml/Min)
 - 2 - Setpoint for total flow:
 - Total flow: 500 mLiter/Minute (0°C, 1013 mbar)
 - 3 - Key in setpoint for concentration 2:
 - Concentration 2: 0 Vol% CO2-carbon dioxide
 - Automatic STOP after : 50 minutes (checkbox is unchecked)
- Flow Setpoints:**
 - Flow MFC 1: [] Ncm³/Min
 - Flow MFC 2: [] Ncm³/Min
- ACTUAL values:**
 - Concentration 2: [] Vol% CO2-carbon dioxide
 - TOTAL flow: [] Nml/Min
 - Flow MFC 1: [] Ncm³/M N2-nitrogen
 - Flow MFC 2: [] Ncm³/M CO2-carbon dioxide
 - Pressure outlet CH1: 958 hPa (mbar) abs
 - Pressure outlet CH2: 957 hPa (mbar) abs

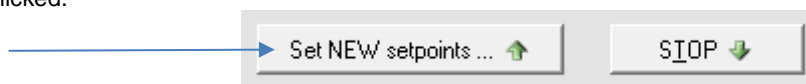
At the bottom, there are fields for 'Start time' and 'Running time' (minutes), and 'Start' and 'STOP' buttons. A status bar at the very bottom shows 'ready...'.

For manual operation mode it is necessary to enter data in the frame *Input* :

1. **Select gases** : for channel 1 and 2 the type of gas has to be selected from the drop-down list boxes.
 -  After changing gas type it is necessary to click the check box for confirmation. A green check mark shows the change of gas type. The descriptions change automatically.
2. **Setpoint for total flow** : this is for input of the total flow in standard cm³.
3. **Setpoint for concentration 2** : here the gas concentrations for the channel must be set in the unit percent volume or in ppm, corresponding to the displayed unit . The range depends on the flow limits of the MFCs.
4. **Min, Max** : (right of the fields) show the limits for each channel.
 -  If a value is entered that is outside these limits, an error message appears
5. **Automatic STOP after ... minutes** : if the check box is activated (check mark) the gas dosing is stopped after XXX minutes automatically.

For start of operation the **START** button has to be clicked.


During operation the setpoints for concentration and total gas flow can be changed, if the button *New setpoints ... set* is clicked.



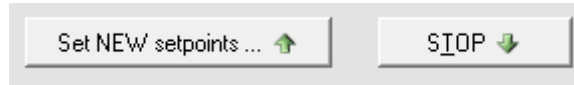
Setpoints Flow : shows the flow setpoints for MFC 1 and 2.
-> not editable.

Actual values : shows the (calculated) values for

- Concentration 2
- total gas flow
- actual flow for each channel and gas notation.

- Pressure outlet CH1 , CH2 : show the actual pressures (absolute pressures) in hPa (=mbar(a)) at the gas outlet.  If the limit value is exceeded, operation is stopped.

STOP : a click on this button stops operation (gas flow).



Start time and Running time : show a) date and time of start and b) expired time in minutes from start.

Start time : Run time : minutes

Settings - Gas consumption | Data | Graph 24h | **START / STOP - select gases** | Profile table | INFO Maintenance | TCP server

Input :


1 - Select gases - confirm with check box :

Gas Channel 1 : N2 - nitrogen Min: 0,50 Max: 500,00


Gas Channel 2 : CO2 - carbondioxide Min: 0,50 Max: 500,00


Min. / Max. : Flow in Ncm³ / Minute (NmL/Min)

2 - Setpoint for total flow :

Total flow :  mLiter/Minute (0°C, 1013 mbar)

3 - Key in setpoint for concentration 2 :

Concentration 2 :  Vol% CO2-carbon dioxide


 Automatic STOP after : minutes

Flow Setpoints :

Flow MFC 1 : Ncm³/Min

Flow MFC 2 : Ncm³/Min

ACTUAL values :

Concentration 2 : 9,940 Vol% CO2-carbon dioxide 

TOTAL flow : 49,9 NmL/Min



Flow MFC 1 : Ncm3/M N2-nitrogen

Flow MFC 2 : Ncm3/M CO2-carbon dioxide

Pressure outlet CH1 : hPa (mbar) abs

Pressure outlet CH2 : hPa (mbar) abs

Start time : Running time : minutes

... in operation B +00957 +022.08 +005.70 +004.98 +005.00 CO2

Display during operation

Profile table - automatic operation

This functions allow to run a concentration – time – profile automatically. The gas for each channel is indicated at the footer of the table.

This profile is a MS EXCEL worksheet - profile - in the GMS_2CH_HP.xlsx file. It can be changed by opening the EXCEL table (only the yellow cells are editable).

Settings - Gas consumption | Data | Graph 24h | START / STOP - select gases | Profile table | INFO Maintenance | TCP server

Conc2 Vol%	Time/min	Vtotal / NmL/min
2	2	100
4	2	100
6	2	100
8	2	100
10	2	100
12	2	100
14	2	100
16	2	100
18	2	100
20	2	100
30	2	100

CO2-carbon dioxide | Timeinterval/Min | Total Flow / NmL/Min

Total time: 22,0 minutes Profile running ...

Start Profile ↑ Open MS EXCEL table

Stop Profile ↓ IMPORTANT: Read table

Start time: 10.02.2025 09:21:06

Running time: 0,3 minutes

Remaining time: 21,7 minutes

Gas 1: N2-nitrogen

Gas 2: CO2-carbon dioxide

ACTUAL values:

Total flow: 99,90 Ncm³/Min

Concentration 2: 1,952 Vol%



For this operation mode the flow limits for each MFC have to be observed : Flow1 and Flow2 must be within the calibrated range of the flow controllers.

	A	B	C	D	E	F	G	H	I	J	K
	conc_2Vol%	time/minutes	Total Flow/NmLiter/minute	StepP	Total time :	1,00 h		Flow1/Ncm ³ /m	Flow2/Ncm ³ /m	1 vol/cm ³	2 vol/cm ³
2	3	10	50	1	Total Vol 1	3,0 NLiter 1		48,5	1,5	485	15
3	2,5	10	50	2	Total Vol 2	0,1 NLiter 2		48,75	1,25	487,5	12,5
4	2	10	50	3				49	1	490	10
5	1,5	10	50	4				49,25	0,75	492,5	7,5
6	1	10	50	5				49,5	0,5	495	5
7	0	10	50	6				50	0	500	0
8				7							



The inputs are not checked automatically - they have to be checked when editing the profile table !



Only yellow fields can be edited - the others are locked.

Empty rows in the table are defined as end of the table.

Open MS EXCEL file : opens the file GMS_2CH_HP.xlsx. this file is stored in the directory : ProgramData / QCAL. The profile worksheet can be changed



After changing the profile worksheet the EXCEL file must be saved and closed. By clicking IMPORTANT - Read EXCEL file the changes are read by the GMS_2CH_HP program.



The program does not read the table automatically.

Start profile starts operation. Operation is finished

- when the last record in the EXCEL table is finished (followed by an empty row) or
- when Stop profile is clicked by the user.

The actual record set is marked in blue.

Gas 1, 2 : shows the actual gas notations for each channel.

Actual values : shows the concentration and total flow.
 Total time, Start time, Run time, Remaining time : show the corresponding times.

Data table and storage

Date	Time	RunTime...	Conc. CO2-carbo...	Total Flow	Press.OUT	Flow 1 N2-nitrogen	Flow 2 CO2-carbo...	Err	StepP
10.02.2025	09:24:17	0,1	9,894	99,660	958	89,800	9,860		0
10.02.2025	09:24:18	0,1	9,908	99,720	959	89,840	9,880		0
10.02.2025	09:24:19	0,1	9,926	99,740	958	89,840	9,900		0
10.02.2025	09:24:20	0,2	9,940	99,800	958	89,880	9,920		0
10.02.2025	09:24:21	0,2	9,956	99,840	958	89,900	9,940		0
10.02.2025	09:24:23	0,2	9,954	99,860	958	89,920	9,940		0
10.02.2025	09:24:24	0,2	9,972	99,880	958	89,920	9,960		0
10.02.2025	09:24:25	0,2	9,972	99,880	958	89,920	9,960		0
10.02.2025	09:24:26	0,3	9,972	99,880	958	89,920	9,960		0
10.02.2025	09:24:27	0,3	9,970	99,900	958	89,940	9,960		0
10.02.2025	09:24:29	0,3	9,970	99,900	958	89,940	9,960		0
10.02.2025	09:24:30	0,3	9,988	99,920	958	89,940	9,980		0
10.02.2025	09:24:31	0,3	9,988	99,920	958	89,940	9,980		0
10.02.2025	09:24:32	0,4	9,970	99,900	958	89,940	9,960		0
10.02.2025	09:24:33	0,4	9,968	99,920	958	89,960	9,960		0
10.02.2025	09:24:34	0,4	9,986	99,940	958	89,960	9,980		0
10.02.2025	09:24:36	0,4	9,984	99,960	958	89,980	9,980		0

minutes %Vol NmL/Min mbar(a) NmL/Min NmL/Min

save NOW as MS EXCEL *.xlsx Delete data

... in operation B +00958 +022.74 +011.45 +009.98 +010.00 CO2

This table shows all data - measured and calculated data during operation.

StepP : if the profile mode is used, the values show the number of the step in the profile. When manual START / STOP mode is used : StepProfile = 0.



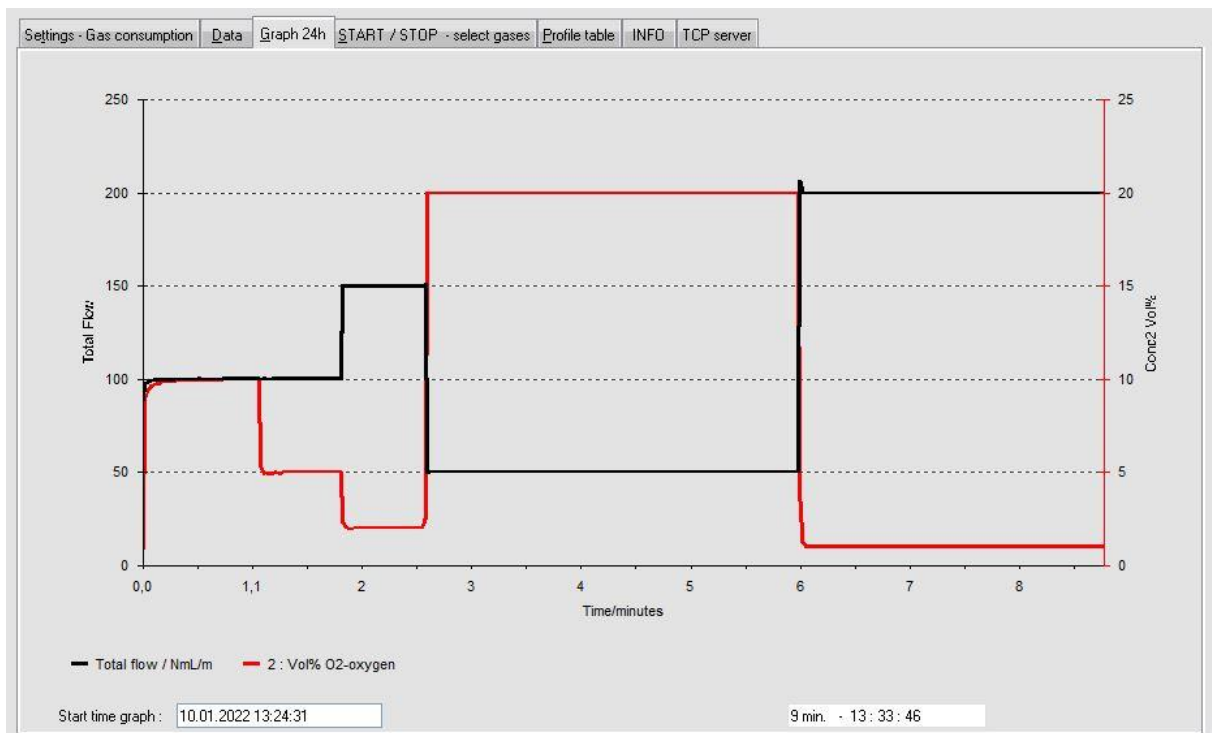
This table can be stored by clicking : save NOW as MS Excel *.xls. The program stores the data as *.xlsx file.



This table can be deleted by *Delete Data* after confirmation.

Graph 24h

This tab shows the concentration for gas 2 and the total flow as graphs.
 The graphs renew every 24 hours automatically.



Info

This tab shows informations for the GMS_2CH_HP and the gases it is calibrated for :

Settings - Gas consumption | Data | Graph 24h | START / STOP - select gases | Profile table | INFO Maintenance | TCP server

Serial No.: 2025 277 | Delivery: FEB-2025

Informations - (click button) :

- Safety DataSheet CO2
- Safety DataSheet air
- Safety DataSheet O2
- Safety DataSheet N2

Tare flow - set to zero - (click button) :

Gas inlet and outlet must be OPEN to atmosphere !

- CHANNEL 1
- CHANNEL 2

Click on Safety DataSheet : opens the corresponding Safety Data Sheet, which provides important informations about the gas.

Tare flow – set to zero Channet 1 / 2 :

This function resets (tars) the zero point for the flow rate.



As displayed : gas inlet and outlet must be open to atmosphere to ensure that NO GAS can actually flow through this channel. When the GMS is in operation this functions are disabled.

TCP server

With the functions of this menu item it is possible to operate the GMS_2CH via a TCP internet server and to exchange data. The GMS_2CH computer is the client, name, IP address of this PC are indicated in the corresponding fields.

The (local) port of the client is defined by the input in the field ' port '. **It should be different from the remote port**

- 1.) The remote IP address and the remote port of the Remote Server must be entered by the user. It also can be stored by clicking 'Save settings for TCP'
- 2.) By clicking ' Connect with TCP server -> the PCs are connected.

3.) By clicking 'Disconnect server' the connection is closed.

4.) By clicking 'Save settings for TCP' the connection settings are stored and set the next time.

Protocol :

Data sent by the client :

1. At Start / Start profile / New setpoints : "QC_Year_Month_Day_Hour_Minute_Second_Flow(1)_ Flow(2).
Flow(1, 2) : values for setpoints for flow on channel 1, 2 in NmL/minute
2. At Stop : "QC_STOPPED_Year_Month_Day_Hour_Minute_Second"
3. At error messages : "QC_STOPPED_ERROR NO GAS_Year_Month_Day_Hour_Minute_Second"
4. If Send data – Interval is activated the client sends data at the specified time interval.

Format :

For manual start :

"QC_Data_actual date and time_total flow_concentration 2_ error messages (if applicable)"

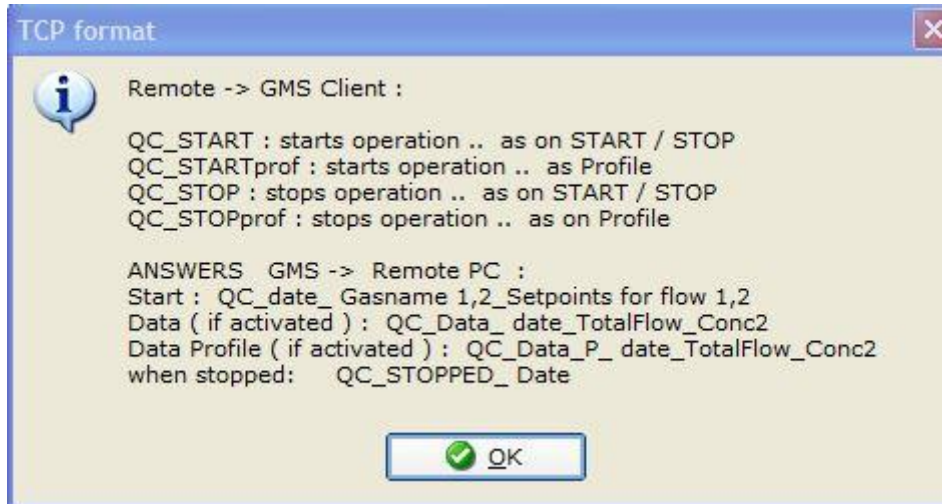
For profile start :

"QC_Data_P_actual date and time_total flow_concentration 2_ error messages (if applicable)"

Instructions sent by the server :

1. To start the operation with actual indicated setpoints : "QC_START"
2. To start the operation with the profile from the profile table : "QC_STARTprof"
3. To stop the operation : "QC_STOP"

Clicking on the button TCP protocol ? displays the send/receive protocol information :



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QCAL Messtechnik GmbH
Guardinstr. 143
81375 München
Germany