

AquiTron

MSR Range

AT-DGC

Digital Gas Controller
For Refrigerant Gas Sensing



**INSTALLATION
& OPERATION
INSTRUCTIONS**



aquilar
leak detection solutions



AT-DGC

Digital Gas Controller For Refrigerant Gas Sensing

Please read instructions carefully and keep them in a safe place (preferably close to the module) for future reference. These instructions must be followed carefully to ensure correct operation.

A. GENERAL INFORMATION

The AT-DGC is used for the monitoring and warning of toxic and combustible freon refrigerants with a wide range of possible measurements. Numerous adjustable parameters and set-points permit individual adaptation to many applications. The AT-DGC is designed in accordance with the standard EN 50545-1. It can monitor and manage up to 96 digital gas sensors (128 MAX with expansions). Four adjustable alarm thresholds are provided per sensor.

B. PRODUCT INFORMATION

POWER REQUIREMENTS

90/230 V AC 50/60 Hz; 24 V DC - 20 % + 20 %

REMOTE INTERFACE

Relay (max. 32) 250 V AC/DC, 5 A, potential-free

Relay (max. 96) via AT-SC-SB2 250 V AC/DC, 5 A, potential-free (Please see page 10 for wiring configuration)

Fault Relay (1) 250 V AC, 5 A, potential-free, normally open contact

Type: SPDT

Rating: 5 A at 250Vac/24 Vdc

MODBUS Interface RS485/19200 Baud

TLS Protocol (TC/IP) Transmission of current and average values, alarm and relay status, and analog output states

LC-DISPLAY

7 Two lines, 16 characters each, illuminated

ENCLOSURE

RAL 7035 (Light Grey) Polycarbonate IP65UL 94

COMPATIBLE SENSORS

Digital AT-SC Sensors (Gas Specific)

APPROVALS

EMC Directives 2014/30/EU

Low Voltage Directive 2014/35/EU

IEC/EN 61010-1:2010 EN 50271

EN 50290 Type I IEC/EN 61508-1-3

EN 50402 IEC/EN 62990-1:Type SM

EN 50104 EN 14624 EN378

 Unit 30, Lawson Hunt Industrial Park,
Broadbridge Heath, Horsham, West Sussex,
RH12 3JR

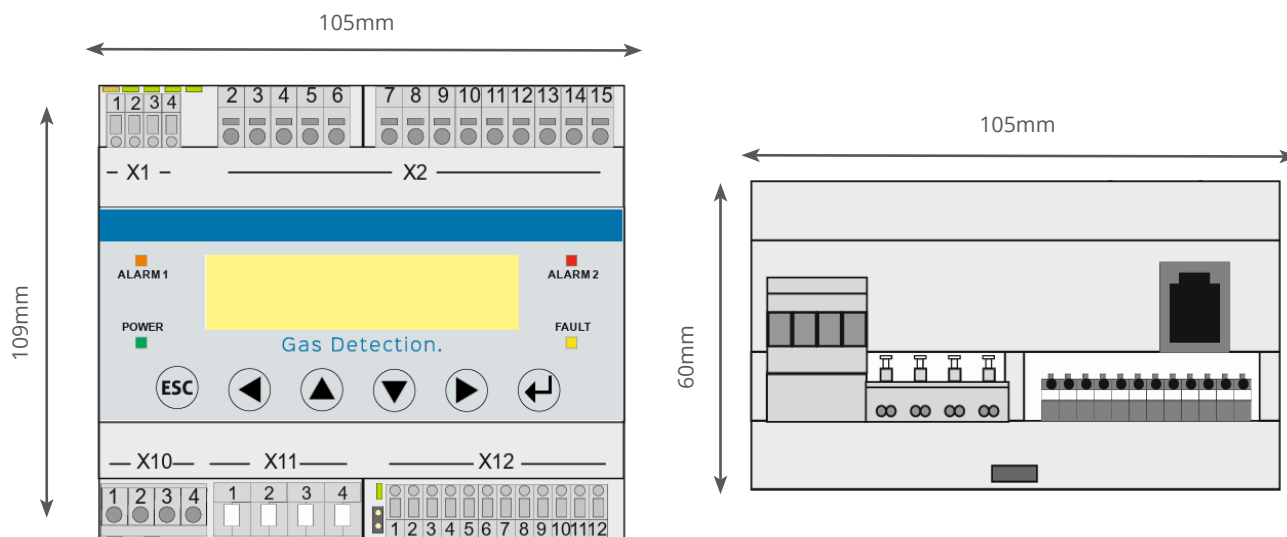
 +44 (0) 1403 216100

 info@aquilar.co.uk

 www.aquilar.co.uk

AT-DGC Digital Gas Controller

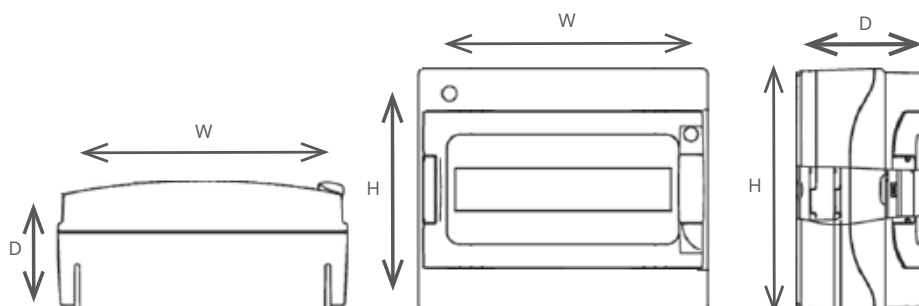
C. BOARD LAYOUT



X1	Status LED Relays
X2	Digital outputs 2-3=Fault Relay 4-15 Alarm Relays
X10	1-4=power 24vdc=1 0vdc=2 3-4=NC
X11	1-4=power
X12	1-2=Field bus 3-6=Analog input 7-8=Analog output 9-12=digital input

D. HOUSING DIMENSIONS

Width - 314mm
Height - 263mm
Depth - 143mm



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AT-DGC Digital Gas Controller

1 GENERAL

These instructions explain the basics of dimensioning, laying and terminating of the cables as well as the commissioning of the AT-DGC Gas Controller. During installation, wiring, electrical security, environmental conditions and fire protection must be considered. This user manual also includes the installation and commissioning of digital sensors (AT-SC).

1.1 SAFETY

The user manual must be carefully read, understood and followed by all persons who install, use, maintain and check the product. The product can fulfil its intended functions only if it is installed, used, maintained, cared for and checked in accordance with the instructions provided by Aquilar Ltd. Undated references to standards always refer to the current edition. Due to on-going product development, Aquilar Ltd reserves the right to change specifications without notice. The information contained herein is based upon data considered to be accurate. However, no guarantee or warranty is expressed or implied concerning the accuracy of these data.

1.2 RESPONSIBILITY INSTALLER AND OPERATOR

It is the installer and operator's responsibility to ensure that the AT-DGC and sensor devices are installed and used in compliance with all international, national and local regulations and requirements. The device must be checked for correct functionality by a qualified person before measurement operation is started. The AT-DGC devices have been tested for functionality by the manufacturer before delivery. During commissioning, a documented functional test is also required. The installation should only be carried out by trained individuals, taking into account the current safety procedures for control installations.

The required equipotential bonding connections (also e.g. secondary potential to ground) or grounding measures are to be carried out according to the respective project requirements. It must be ensured that no ground loops are created in order to avoid undesired interference in the measurement electronics.

The requirements of EN 60079-29-2 (gas detectors - selection, installation, use and maintenance of devices for the measurement of combustible gases and oxygen) as well as the requirements of EN/IEC 62990-2 (gas detectors - selection, installation, use and maintenance of devices for the measurement of toxic gases and vapours) must be observed for installation, operation and maintenance.

1.3 SERVICES

It is recommended that AT-DGC and sensor devices should be inspected on a regular basis. Performance deviations can be corrected based on regular maintenance. Recalibration and parts replacement can be performed in the field by a qualified technician using the appropriate tools. Regular maintenance is to be carried out according to the instructions. UL 2017 recommends that these checks should be performed weekly.

The AT-DGC system's test and diagnostic routines, which run continuously in the background. These monitor the controller function, the communication to the connected sensors and the function of the AT-SC sensors. Through this complete self-monitoring, internal and external errors are reliably detected. A detected fault immediately triggers the fault signal relay. The fault signal relay operates in energized mode and detects an operating voltage failure. Periodic maintenance includes checking the operating and status messages on the AT-DGC system, including accumulated maintenance messages. The maintenance requirements for the gas sensors are specified in their respective data sheets.

1.4 DISPOSAL OF DEVICES



If applicable. In accordance with Directive 2012/19/EU, the device must not be disposed of as municipal waste. Contact your organisation for any questions on disposal/guidelines on waste disposal of electrical equipment.

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2 INTENDED USE

These installation instructions are only valid for the following

- AT-DGC Digital Gas Controller
- AT-SC Digital Sensor and AT-SC-SB2 Digital Board

For operation, the AT-DGC user guidelines and corresponding documentation must also be read, understood and followed. For connected sensors of the AT-SC, the user manuals for the corresponding sensors must also be followed.

The AT-DGC Digital-Gas-Controller is used for monitoring, detection and warning of toxic and combustible gases and vapors in the ambient air. The AT-DGC fulfills the requirements according to the European Standard EN 50545-1 for the stationary monitoring of carbon monoxide (CO), nitrogen dioxide (NO₂) and combustible gases in underground garages, tunnels, go-cart race courses etc.

The AT-DGC also meets the requirements according to EN 378, VBG 20 and the guidelines "Safety requirements for ammonia (NH₃) refrigeration systems. The AT-DGC can be used as well for monitoring other gases and measuring values. The intended sites are all areas being directly connected to the public low voltage supply, e.g. residential, commercial and industrial ranges as well as small enterprises. The AT-DGC may only be used in ambient conditions as specified in the Technical Datasheet. The AT-DGC **must not** be installed in potentially explosive atmospheres.

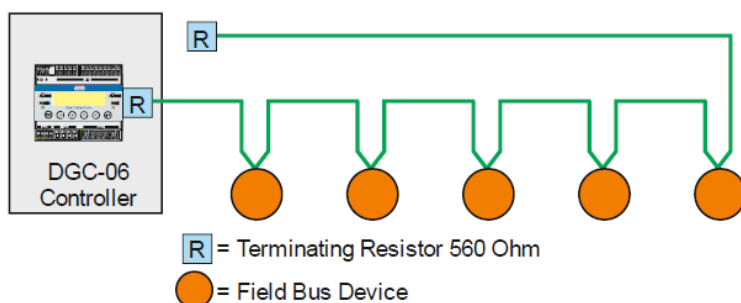
3-3.1 INSTALLATION OF FIELD BUS CABLE

For simple and fast installation of the field bus cable, the AT-DGC please use twisted pair communication cable for operating power voltage supply and connection.

When using this cable, you have to pay attention to the following factors:

- Bus Communication
- Physical Capacity

The installation of the field bus cable for the AT-SC Sensors has to be executed only in line topology. **Branch lines are not allowed.** For reliable communication the cable length should not exceed 900 m per network segment. The cable length is also limited essentially by the physical load capacity. [Section 3.5](#) gives examples for the cable lengths in dependence of connected field devices; they must be adhered to in any case.



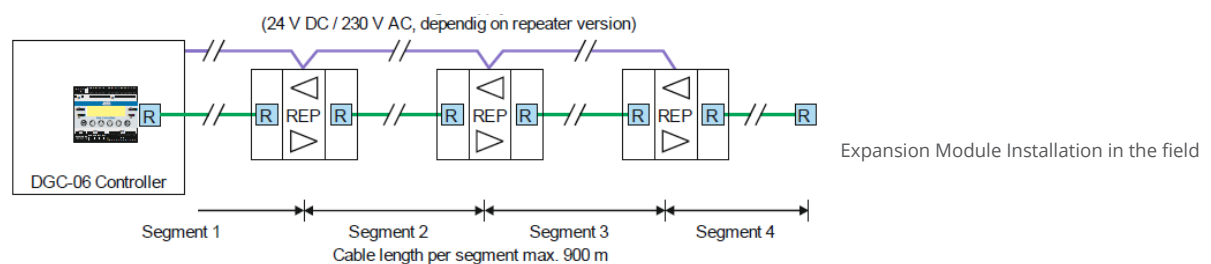
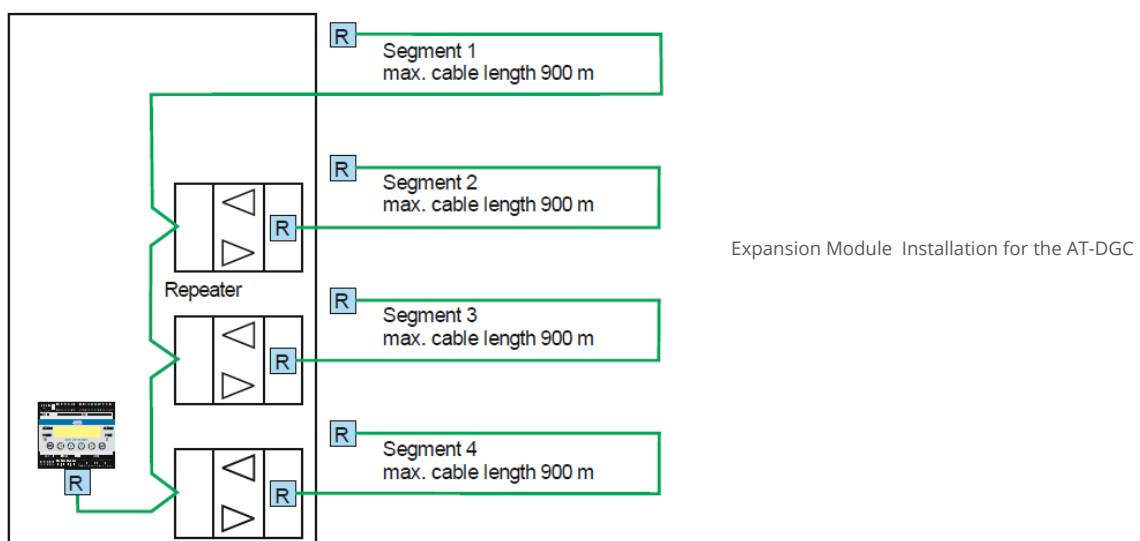
Correct Field Bus wiring example

AT-DGC Digital Gas Controller

3.2 USE OF EXPANSION MODULES

Larger networks are divided into several network segments. The maximum cable lengths apply to one network segment with a terminal resistor at the beginning and at the end of the field bus line. Expansion modules are used for connecting the segments. Expansion modules amplify the data signals, not making any difference between desired and interfering signals.

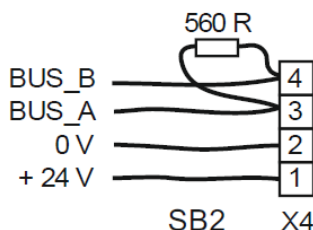
Only a maximum of 7 expansion modules are allowed per system to enable a secure transfer. These can be installed both in the AT-DGC controller and in the field. For the field installation you additionally need to feed the operating voltage (24 V DC) in order to supply the devices of the subsequent segments.



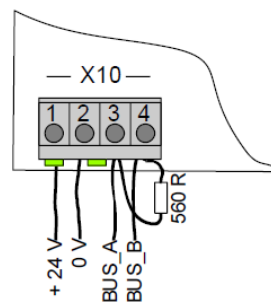
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3.3 TERMINATION

Each segment needs an ohmic terminating resistor of 560 Ω each at both cable ends. These terminating resistors are already integrated in the AT-DGC system at the field bus outgoing lines. A terminating resistor is inserted at the field bus end between the terminals of BUS_A and BUS_B. Please check that only one resistance is active at each of the both bus ends.



Terminating Resistor at the Last Field Bus Device (AT-SC-SB2 Sensor Board Example)



Terminating Resistor at the Last Field Bus Device Expansion Module Example

3.4 PHYSICAL LOAD CAPACITY OF THE BUS CABLE

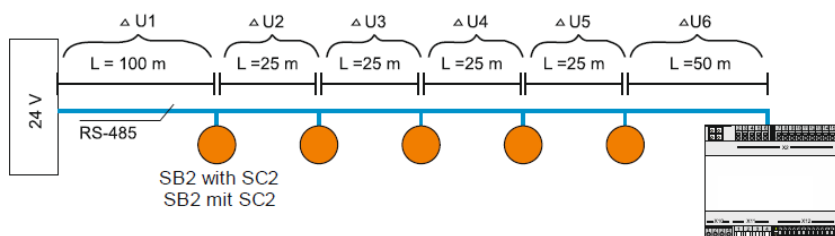
The AT-DGC field bus devices work with a nominal operating voltage of 24 V DC via the shared 4-wire Twisted Pair Cable (0.5 mm²). Therefore, the cable length must be pre determined for each segment depending on the total power of the connected fieldbus devices in order to ensure the required minimum terminal voltage of 16 V DC for the AT-SC-SB2 board and 19.5 V DC for all other fieldbus devices.

Note: The operating voltage supply of the expansion modules mounted in the field are executed via a separate line, because due to the higher power requirement of the modules the allowable voltage drop in the bus cable only permits relatively short cable lengths. As an option, the module can be supplied via an external power supply unit. Each additional power pack is then only connected to the system with 0 V DC. + 24 V DC is only applied to the respective module and not connected to the + 24 V DC of the system.

3.5 CALCULATION OF THE CABLE LENGTH

For calculations please refer to the "Power Length" excel document. Please note the maximum length of installation using the AT-DGC is 900metres. As described above, the field bus cable is only laid in line topology. You have to consider 3 possibilities for a voltage drop in the bus cable

- Line topology with no return line of the cable
- Line topology with return line of the cable
- Voltage supply of 24 V DC directly in the field



Example Voltage Drop at the field bus cable

	ΔU_1 (V)	ΔU_2 (V)	ΔU_3 (V)	ΔU_4 (V)	ΔU_5 (V)	ΔU_6 (V)	U_{min} (V)
SB2 with SC2-Tox	0.288	0.058	0.044	0.029	0.015	---	23.57
SB2 with SC2-Tox & SC2-Ex	2.088	0.418	0.313	0.209	0.105	---	20.87
SB2 with SC2-Tox & SC2-Ex & EP-06	2.592	0.544	0.439	0.334	0.230	0.252	19.610
PolyXeta® 2 PX2 & SX1	2.592	0.486	0.324	0.162	---	---	20.44

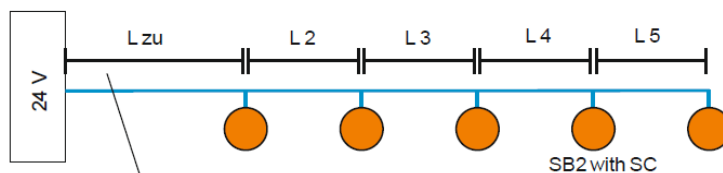
Example for Cable Lengths

AT-DGC Digital Gas Controller

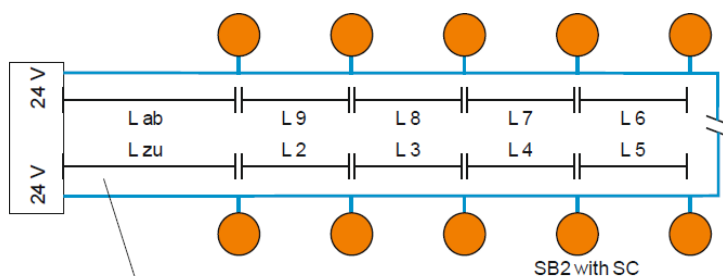
3.6 TECHNICAL DATA FOR CALCULATION OF INDIVIDUAL FIELD BUS CABLE LENGTHS

Type Version	Current	DT6	SGC6/SCM6 without relays	SGC6/SCM6 with relays	DC6/ MGC6	PX2	GC-06	EP-06	REP-06
Basic	(mA)	6	8	16	55	40	130	70	30
Analog Output	22	/							//
WAO	5					/	/	/	/
Display	10						/	/	/
SC2/SX1/SSAX1 Sensor Head									
Electrochemical (-E11XX)	2						/	/	/
Catalytic (-P34XX)	50						/	/	/
Infrared (-I-XXXX)	13 ¹						/	/	/
Semiconductor (-SXXXX)	40						/	/	/
MPSTM (-MXXXX)	25						/	/	/
AT6 Sensor Head									
Electrochemical (-E11XX)	24	/				/			/
Catalytic (-P34XX)	72	/				/			/
Infrared (-I-XXXX)	35 ²	/				/			/
Semiconductor (-SXXXX)	62	/				/			/
MPSTM (-MXXXX)	40	/				/			/
Total Current (mA)									

For fast project planning these two examples show with/without return lines and cable length measurements



Twisted Wire Pair



Twisted Wire Pair

AT-DGC Digital Gas Controller

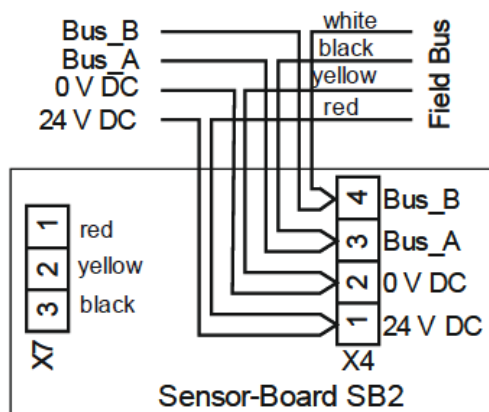
SB2 & SC2-Tox (pcs)	SB2 & SC2-Tox & SC2-Ex (pcs.)	Feed Line L zu (m)	Return Line L ab (m)	Delta L2; L3... (m)	Total Length (m)
Without Return Line					
28	0	50	0	25	750
26	0	100	0	25	750
24	0	150	0	25	750
0	11	50	0	25	350
0	10	100	0	25	375
0	9	150	0	25	375
With Return Line					
48	0	50	50	25	1300 ⚠
48	0	100	100	25	1400 ⚠
48	0	150	150	25	1500 ⚠
0	22	50	50	25	700
0	20	100	100	25	750
0	19	150	150	25	775

Examples of cable lengths with/without return line



Cable Length of max 900m Exceeded from the main AT-DGC Controller

3.7 TERMINAL CONNECTION OF THE FIELD BUS CABLE



Maximum length of the local bus cable including sensor head cable=15m

AT-DGC Digital Gas Controller

4-4.1 ELECTRICAL CONNECTION WIRING

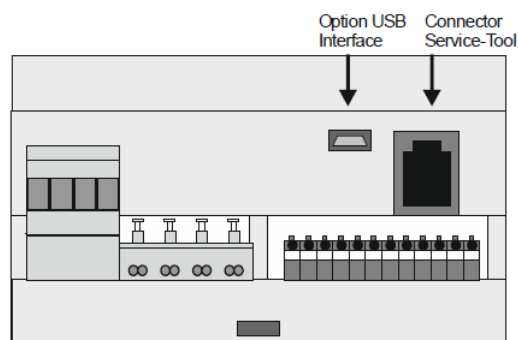
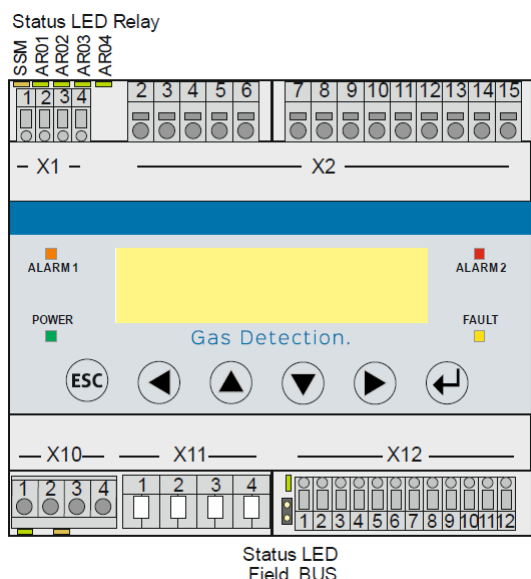
The technical requirements and regulations for wiring, electrical security, fire protection, as well as project specific and environmental conditions must be observed when mounting the AT-DGC

We recommend the following cable sizes:

- Power supply 1.5 mm²
- Alarm message 1.5 mm²
- Sensor / field bus J-Y(St)Y 4 core twisted pair 2x2 x 0.8LG



The recommendation does not consider local conditions such as fire protection



The field bus is connected directly to X10 or X11 (power supply), X12 of the AT-DGC controller.

The correct polarity must be observed. The alarm signals are also connected directly to the AT-DGC controller at X2 using spring type terminals.

For looping through the signals, there are 2 terminal points at the outgoing terminals of X2. The alarm signals are potential-free changover contacts. The relay contacts are drawn in the circuit diagram without voltage. The individually parameterized relay mode (de-energized/energized) must be taken into account. The exact position of the terminals for the sensors and alarm relays is shown in the diagram.

Notes for installation according to UL2017 The minimum length of individual wires of the field cables must be 153 mm. Field cables must be mounted and fixed in such a way that they can withstand a pull of 4.5 kg for 1 minute without showing any signs of damage. Field cable for high-voltage circuits must not be smaller than 18 AWG and the insulation, if made of rubber or thermoplastic, must be at least 0.8 mm.

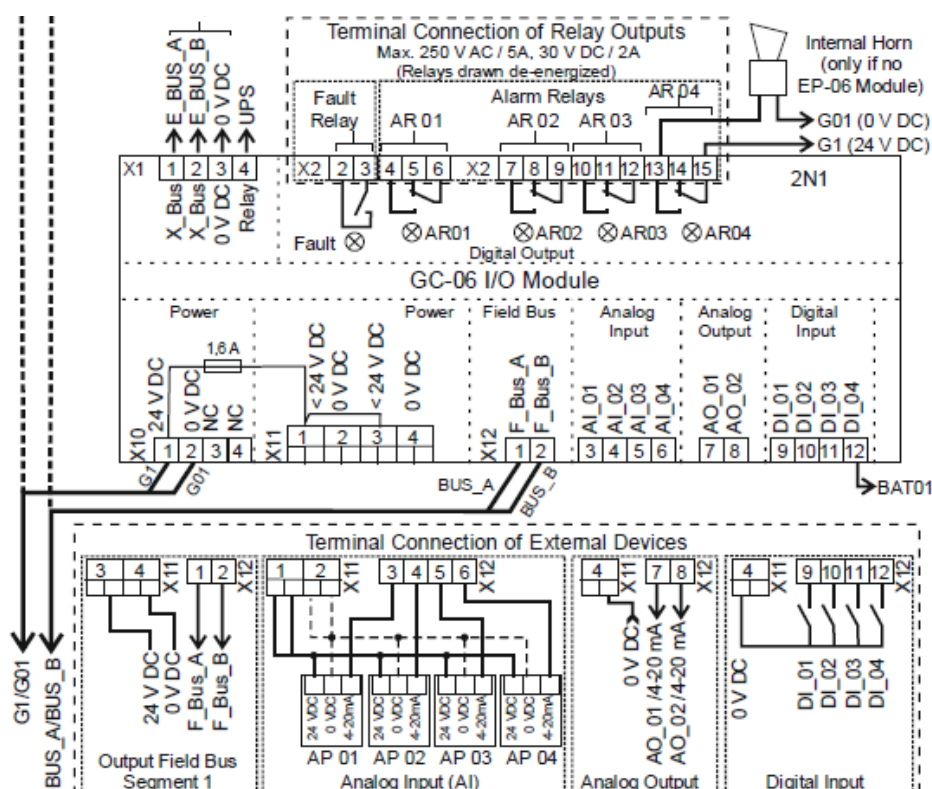
Specifications subject to change without notice.

AT-DGC Digital Gas Controller

5.2 CONNECTION DIAGRAM

The connection diagram contains all components for the maximal configuration of the AT-DGC controller. Depending on the version single components may be lacking on the AT-DGC.

When choosing the supply 110/230 V AC you have to make sure that a switch or a circuit breaker is provided in the building automation especially for the AT-DGC. It must be installed in an easily accessible area near the AT-DGC and has to be marked as a disconnecting device. The switch or circuit breaker has to comply with the requirements IEC 60947-1 and IEC 60947-3.



Note: Cable for field bus digital input:
 Max Power supply 28VDC, max current 1A supervised
 Min. Wire size 20 AWG (0,5mm) typical cable impedance 72 Ohm
 Recommended cable type: Twisted pair
 Max. Cable Length 900m for Field Bus
 Field Bus: Connect only AT-SC Gas sensor Series
 Digital Input: Connect only units with potential-free contact

AT-DGC Digital Gas Controller

6. COMMISSIONING

For fast and comfortable commissioning, we recommend using this procedure to prevent problems in the field bus communication wiring and installation.

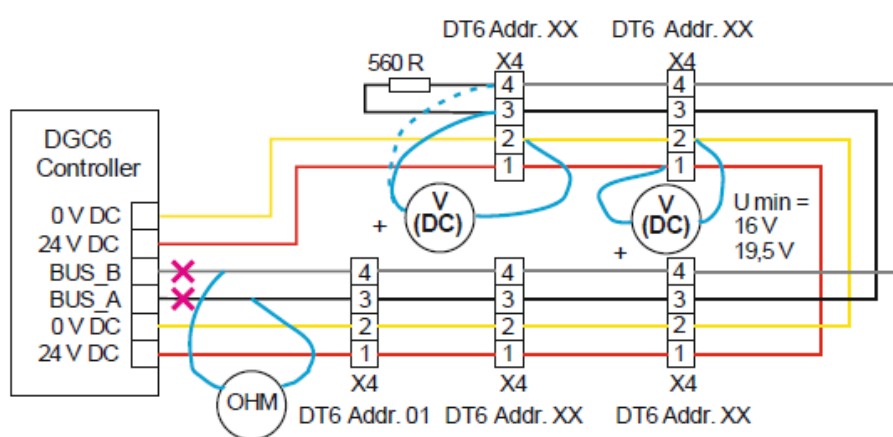
6.1 OPTICAL CHECK

- Right cable type used
- Cable topology and cable length
- Correct mounting height of the sensors according to definition of the sensor's user manual
- Correct connection at each Sensor-Board according to the Figure 10 to Figure 11
- Termination with 560 Ω at the beginning and at the end of each segment
- Pay special attention so that the polarities of BUS_A and BUS_B are not reversed
- Correct connection of the analog sensors (consider 2-/3-wire connection)

R (Total) (Ω)	Cause	Troubleshooting
< 560	Short-circuit	Look for short-circuit in the field bus cable.
Infinite	Open-circuit	Look for interruption in the field bus cable.
> 560 < 640	Cable is o.k.	--

6.2 CHECK SHORT CIRCUIT/INTERRUPTION/CABLE LENGTH OF FIELD BUS

This procedure corresponds to each single segment. The field bus cable must be laid at the connector terminal block of the Sensor-Board for this testing. Disconnect the field bus wires from the AT-DGC controller. Connect a multimeter to the loose wires and measure the total loop resistance as below



Measurements at the Field Bus Cable

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6.3 CHECK VOLTAGE AND BUS POLARITY OF THE FIELD BUS

- The connector X4 has to be plugged into each Sensor-Board
- Switch operating voltage on at the AT-DGC central controller
- The green LED at the fieldbus device lights up weakly when operating voltage is applied (voltage indicator)
- Check operating voltage and bus polarity at each fieldbus device
- $U_{min} = 16 \text{ V DC}$
- Every other field bus device: $U_{min} = 19.5 \text{ V DC}$
- Measure tension BUS_A against 0 V DC and BUS_B against 0 V DC
- $UBUS_A = \text{ca. } 0.5 \text{ V} > UBUS_B$
- $UBUS_B = \text{ca. } 2\text{--}4 \text{ V DC}$ (depending on the number of fieldbus devices and on the cable length)

6.4 ADDRESSING OF THE SENSOR BOARD

After checking the field bus successfully, a basic communication address has to be assigned to each AT-SC-SB2 via the hand held service tool. With this basic address, the data of the Sensor assigned to input 1 is sent via the field bus to the AT-DGC. Any further SC sensor connected/registered on the Sensor-Board automatically gets the next address. An automatic link connection is established when the Service-Tool is connected to the service tool jack of the AT-SB2. If this connection is OK, you can read the current address in the menu "Address". **Please note addressing is configured prior to receiving your system, if adjustments need to be made you will require the AT-MSR-PT tool**

0 = Address of new AT-SB2

XX = Current SB2 Address (permissible address range 1–96)



AT-MSR-PT Hand Held Service-Tool

6.5 REGISTRATION/ASSIGNMENTS OF THE SENSORS AT-SC AT THE SENSOR BOARD

The AT-SC-SB2 board recognizes the AT-SC sensor physically connected from the gas type and the measuring range which are factory-integrated in the AT-SC address bit. By selecting the signal type, the BUS input is activated.

In the 2nd step, assigning the gas type and defining the measurement range connects the AT-SC to the input. The detailed description of the registration / assignment of the AT-SC sensor can be taken from the datasheet.

6.6 RELEASE OF THE DT6 ADDRESSES IN THE AT-DGC

The assigned address is now activated at the SP mode in the "DP Parameter" menu of the AT-DGC.

All other parameters in this menu must be adjusted to the sensor registered at this address. The AT-DGC (master) sends a request to each registered address in sequence that is answered by the AT-SC-SB2 with all relevant data. The continuous response ping is signalled by a flashing pulse of the status LED on the board. The cycle time is approximately 7–8 seconds.



Caution: The AT-DGC system cannot prevent double or multiple assignment of SB2 addresses by a technician. However, the AT-DGC detects 2 or more identical SB2 addresses on a system. The fault message is activated and a plain text message "**communication error**" of the affected address is displayed. You must then assign a new, free address to the affected AT-SC-SB2 board.

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6.7 COMMUNICATION ERROR

Communication errors at commissioning are nearly always due to mistakes in wiring, connecting to the terminals and in terminating as well as in assigning the AT-SC-SB2 addresses.

Therefore, the following checks have to be made:

- Bus line reconnected after measurement of the loop resistance
- AT-DGC in operating mode
- Check the operating voltage at all devices on the field bus SB2: $U_{min} = 16 \text{ V DC}$ Every other field bus device: $U_{min} = 19,5 \text{ V DC}$
- Check bus leads for short-circuit or interruption
- Check polarity of the field bus (BUS_A – BUS_B)
- Check termination. Terminating resistance of 560Ω at the beginning and at the end of the segment
- Check cable topology of the field bus. Only line topology <> No branch lines
- Check cable length in dependence of the load

6.8 COMMISSIONING/ADDRESSING OF EP-06 MODULE (EXPANSION MODULE)

The AT-DGC can manage up to 7 Expansion Modules with each 2 digital inputs, 4 alarm relays and 4 analog outputs.

A communication address (01 to 07) is assigned to each expansion module with the help of the AT-MSR-PT. With this address the expansion module communicates via the field bus with the AT-DGC. This address also defines the input and output numbers of the expansion module in the system. When connecting the AT-MSR-PT to the Service-Tool jack of the module, there will be an automatic connection and if correct, the current expansion address is displayed in the "Address" menu.

0 = address of new expansion module

XX = current expansion address (permissible address range 1–7)

Module Address	Analog Input AP	Alarm Relay AR	Analog Output AO	Module
	01-04	01-04	01-02	GC-06
1	05-08	05-08	03-04	EP-06
2	09-12	09-12	05-06	EP-06
3	13-16	13-16	07-08	EP-06
4	17-20	17-20	09-10	EP-06
5	21-24	21-24	11-12	EP-06
6	25-28	25-28	13-14	EP-06
7	29-32	29-32	15-16	EP-06

6.9 ADJUSTMENT OF SYSTEM PARAMETERS

At commissioning the alarm relays must be assigned to the alarms for each measuring point. For all other parameters the values are set to defaults, which can be changed at any time if necessary.

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7 CALIBRATION

New sensors are always delivered factory-calibrated.

This is documented by the calibration label indicating date and calibration gas. Calibration of the SC sensor during commissioning is only necessary if the calibration date is no longer up to date (see datasheet AT-SC for more information). For the calibration of the sensor there is an automatic routine in the calibration menu of the AT-MSR-PT. As long as the calibration menu is open, the AT-SC Sensor does not issue alerts. You will need a zero gas and a calibration gas, the calibration adapter and an extraction set.

 **Caution:** Prior to calibration the sensor must be connected to the power supply for stabilization and running in period. This running-in period depends on the sensor element and can be taken from the User Manual of the corresponding Sensor.

8-8.1 PARTNER PROTECTION CODES

To prevent access to the sensitive parameter and calibration data by 3rd parties, every customer receives his own internal partner ID PID (AT-DGC, AT-MSR-PTI). The hand held tool automatically checks the PID of the respective device when turned on. Only if both PID are the same, the communication will be possible

If the PID does not match, the AT-MSR-PT gives the following message:

NO ACCESS AUTHORIZATION

The AT-DGC can only communicate with units of the same PID. The unit response is not accepted and a communication error is issued for each incorrect PID responses

8.2 PLANT PROTECTION

The system protection is intended for end customers who want to look after their AT-DGC systems themselves (calibration or/and parameterisation). For this purpose, the end customer is provided with a special end customer tool (STL6 service tool) with system identification, which is only valid for this system

This enables end customers to carry out commissioning or maintenance on AT-DGC systems themselves. For this purpose, the buyer = first installer of the system receives a system identification number (AID) on request from the manufacturer. This can be entered on the AT-MSR-PT allowing access to this system. Each AT-DGC (master) receives its own unique serial number and an installation identification number (AID) upon delivery. This AID is part of the communication between AT-DGC and its modules

AT-DGC Digital Gas Controller

9 USER MANUAL

The AT-DGC Controller is a measuring, warning and control system for the continuous monitoring of different toxic or combustible gases and vapours as well as of Freons refrigerants. The AT-DGC is suitable for the connection of up to 96 digital sensors (AT-SC) with the AT-SC-SB2 boards via the 2-wire bus. The total number of connected sensors, however, may not exceed 128 sensors.

Up to 4 programmable alarm thresholds are available for each sensor. For binary transmission of the alarms there are up to 32 relays with potential-free change-over contact and up to 96 signal relays. A number of integrated parameters enables the data of various requirements in the gas measuring. Configuration is menu-driven via the keypad.

Prior to commissioning, please read the guidelines for wiring and commissioning of the hardware.

9.1 RESTART (DIAGNOSTIC AND WARM-UP STAGE)

The device is designed in a way that it generally runs through all internal device tests in the AT-SC-SB2 board and in the connected sensor head(s) after each power-up. That means that the processor's internal components and the associated program and working memories as well as other components of the input and output units are tested. This process takes approximately 0.5 seconds.

When all diagnostics have been successful, the warm-up phase of the sensor element starts.

The warm-up is necessary for the sensor element in the sensor head to assume a stable state after return of the voltage without triggering a pseudo alarm. The duration of the warm-up phase depends on the type of sensor used and can be read from the datasheet of the AT-SC. Depending on the types connected, the longest sensor warm-up time must be entered as "Power ON Time" in the controller.

During the warm-up phase, the yellow LED flashes every 2 seconds and "Power ON Time" appears in the display.

9.2 MEASURING MODE

In normal operating mode = measuring mode, there are no faults, the gas concentration of the active sensors is continuously polled, checked for plausibility and output on the analog output (if available).

The gas concentrations are shown scrolling on the LC display. The gas signal is checked with each measurement cycle, if it is $\geq$ alarm threshold (alarm evaluation for increasing concentration) respectively $\leq$ alarm threshold (alarm evaluation for falling concentration) and if exceeding respectively falling below, the alarm relay are triggered and the alarm LED flashes (light red for alarm 1, dark red for alarm 2). The set alarm can be read out in the alarm status menu. If the value falls below / exceeds the alarm threshold minus / plus the set hysteresis again, the alarm is automatically cancelled.

In the "latching" mode, the alarm must be cleared manually directly on the unit that triggered the alarm after the gas-free condition has been determined. It is imperative to set this function for combustible gases with catalytic bead sensors that show a decreasing signal when the gas concentration is too high.

The AT-DGC also continuously monitors itself, its outputs and the communication to all activated sensors and modules.

9.3 SPECIAL MODE

In Special Mode, the measurements are slightly delayed for the operation side, but there is no alarm evaluation. The special status is indicated on the display and it always activates the fault relay. The yellow LED on the display is flashing. The controller takes the Special Mode in the following cases:

- Accumulated fault of one or more activated devices
- Run-in operation after power recovery (Power-On)
- Special Mode activated by the user
- Reading out or changing of parameters by the user
- Manual override of an alarm/signal relay in the alarm status menu or via digital inputs

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Digital Gas Controller

9.3.1 MAINTENANCE AND CALIBRATION MODE

The operator can activate the Special Mode on the internal display. This mode includes commissioning, calibration, testing, repair and decommissioning. The fault signal relay goes into the "Error" status. In fault-free operation, it is additionally signalled in the display in the fault status with 'Service active' and by the flashing yellow LED. If faults are present, the yellow LED remains continuously on and the message is suppressed by the active faults.

In Special Mode, the gas concentration query is slightly delayed, but without alarm evaluation. During maintenance and calibration mode, the entire system can be set to Special Mode or only individual sensors or groups of sensors. In all cases, the alarms of a sensor are maintained during Special Mode, but no new alarms are generated.

The operator can exit the Special Mode after completion of work; if there are no further entries or operations, the unit will automatically return to the Measuring Mode after 15 minutes.

9.3.2 FAULTS

The AT-DGC includes a diagnostic module for the continuous monitoring of the relevant functions and parameters as well as a processor-independent watchdog. Due to these measures, the unit is set to the safe mode "Fault" in case of an internal or external error, e.g., communication error to one of the active bus participants or an analog signal is outside the permissible range ($< 3.0 \text{ mA}$ $> 21.2 \text{ mA}$). The fault is indicated by the statically lit yellow LED and in the display. The fault signal relay goes into the "Fault" status, the analog output gives $\leq 2 \text{ mA}$ (only with AO setting CF/AF) if the set source contains the faults.

The error is output as plain text in the error status menu. If there are 2 or more errors on a bus, the errors are output including a cumulative, bit-coded error code. If the error directly affects the measured value, the error is also displayed instead of the measured value.

After the cause has been eliminated, the AT-DGC independently switches to the measuring mode. It is not necessary to acknowledge the error message*. The errors that occurred and were automatically acknowledged are stored in the technician's menu and must be acknowledged manually.

*** Exception: Error code 0x8020h (AO setting CF/AF, see chapter 5.8.4.9): Short circuit or interruption at the analog output.**

- **Disconnect the device from the voltage source and reconnect OR**
- **Activate Special Mode on the display or in the PCE06-Software and set the analog output current to 4 mA using the AO test function.**

9.4 UPS FUNCTION

No parameter settings are required for the UPS functionality. The operating voltage will already be set to 27.2 V DC by the manufacturer if the AT-DGC is ordered with the UPS function. Subsequently, the function can be activated by setting the operating voltage on the power supply unit to $> 27 \text{ V}$ and switching off and on the operating voltage (restart).

The UPS function can also be deactivated by setting the operating voltage to 24 V DC and switching the operating voltage off and on again. In the event of a mains failure, the complete AT-DGC system is supplied without interruption via the battery-buffered UPS.

The AT-DGC continuously monitors the operating voltage (24 V DC) and detects, if $> 27 \text{ V}$ (battery charging voltage), the supply via a UPS. The UPS function is permanently activated.

In the event of a mains failure, the battery voltage immediately drops to a value $< 25.5 \text{ V}$ due to the load.

The AT-DGC detects the mains failure by the drop of the operating voltage and generates the mains failure message.

9.4.1 UNDERVOLTAGE MONITORING

The AT-DGC checks the status of the batteries every 60 minutes. If the battery voltage is missing, the fault-signal relay is activated and the message "UPS error" is displayed in the "System Errors" menu. The AT-DGC automatically acknowledges the message when the battery voltage is restored. This function is not active in the "Service" operating mode.

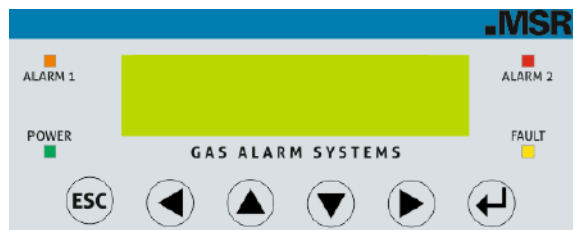
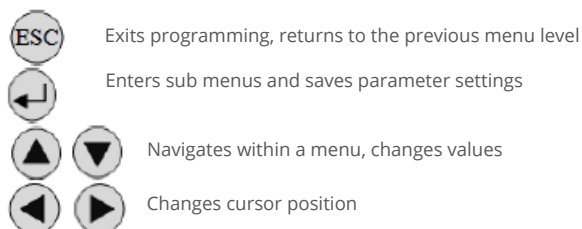
9.4.2 DEEP DISCHARGE PROTECTION

If the battery voltage drops further due to the load, the AT-DGC disconnects the supply from the batteries at $< 19.2 \text{ V}$ to avoid a deep discharge. The AT-DGC system is no longer supplied with operating voltage. The fault signal relay signals: AT-DGC not in operation. When the mains supply is restored, the AT-DGC automatically returns to normal and charging operation.

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10-10.1 OPERATING INSTRUCTIONS DISPLAY

The complete configuration and service are made via keypad user interface in combination with the LC display screen. Security is provided via 4 code levels against unauthorized intervention.

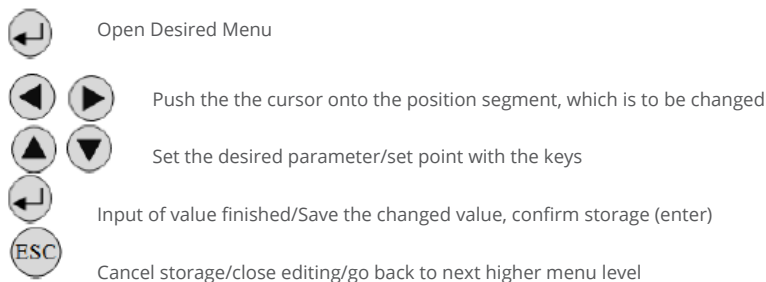


10.1.1 STATUS LED

The status LEDs indicate the operating stage:

Light Red	Flashing = Alarm 1 or more alarms are pending
Dark Red	Flashing = Alarm 2 and higher priority alarms are pending
Green	Continuous = Operating Voltage
	Flashing = Maintenance Due
Yellow	Continuous = Malfunction, sensor manually locked
	Flashing = Operation in special mode, restart or warm up phase/de energized state

10.1.2 SETTING/CHANGING OF PARAMETERS AND SET POINTS



10.2 CODE-LEVELS

According to the regulations of all national and international standards for gas warning systems, all inputs and changes are protected by a 4-digit numeric code (= password) against unauthorized intervention. The menu windows of status messages and measuring values are visible without entering a code

The release of a code level is cancelled if no button is pushed within 15 minutes

The code levels are classified in order of priority: Code level 1 has top priority

10.2.1 CODE-LEVEL 1 (CODE NOT CHANGEABLE)

Code level 1 is intended for the service technician of the installer to change parameters and set-points. This password allows working on all settings. For opening the parameter menus, you must first activate the Special Mode

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10.2.2 CODE-LEVEL 2 (CODE LEVEL NOT CHANGEABLE)

With code level 2, it is possible to lock / unlock transmitters temporarily. This password is only given to the end user by the installer in problem situations. In order to lock/unlock the sensors you must first activate the Special Mode after code release.

10.2.3 (CODE IS SETTABLE IN THE DISPLAY PARAMETER MENU)

Inactive in delivery state, activated by entering a value. Same as code-level 1, only changing the maintenance password is not possible.

Normally the code is only known to the service technician who has last changed it since it can be changed individually via

10.2.4 CODE-LEVEL 4 (PASSWORD 1234, CODE NOT CHANGEABLE)

Code level 4 allows the operator

- to set date and time,
- to configure and to operate the data logger option

after activation of the Special Mode

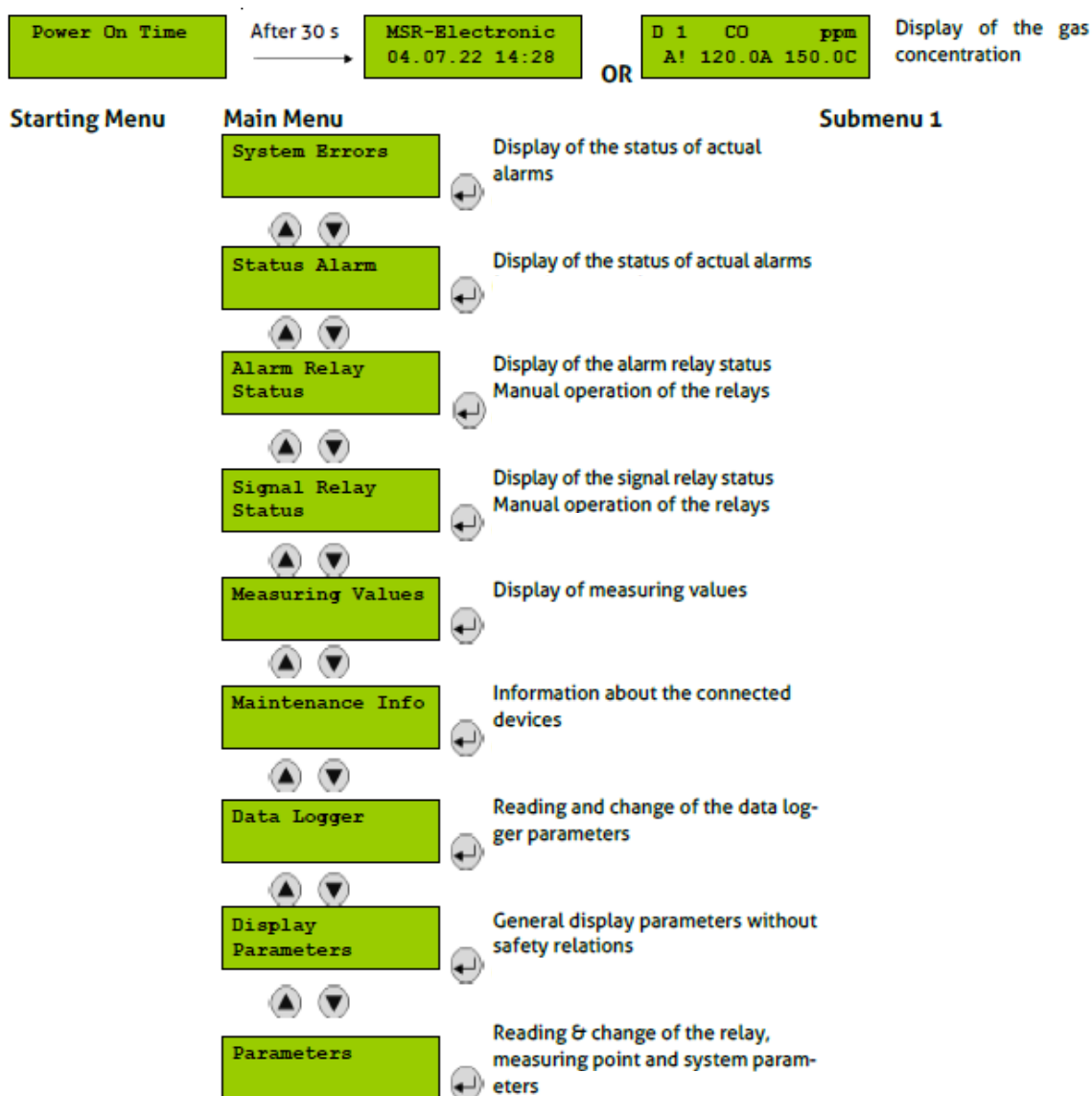
- to read all parameters
- to operate the manual test function of the alarm relays (functional test of the connected units),
- to operate the manual test function of the analog outputs (functional test of the connected units).

AT-DGC Digital Gas Controller

11 MENU OVERVIEW

The Gas-Controller AT-DGC is operated via a menu structure. The operating menu contains the levels:

- Starting menu with date and time if no MP is registered, otherwise scrolling display of the gas concentrations of all registered sensors in 5-second intervals. When ESC is pressed, the start menu with date and time is displayed for 10 seconds. If a submenu is not exited with ESC, the AT-DGC Display View returns to the starting menu after 15 minutes. When maintenance message is active, the service telephone number is displayed in the starting menu.
- Main menu
- Submenus 1–4



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11.1 FAULT MANAGEMENT

The integrated fault management records the first 99 faults with date and time stamps in the menu "System Errors". Additionally, a record of the faults occurs in the "Error memory", which can be read by anyone, but only reset by the service technician.

A pending fault activates the fault indication relay. The yellow LED (Fault) starts to light up; the fault is displayed in plain text with date and time in the menu "System Errors".

In case of the fault of a connected sensor the alarms defined in the menu "MP Parameter" are activated in addition.

11.1.2 ACKNOWLEDGE A FAULT

In accordance with the regulations of gas measurement technology, accumulated faults are automatically acknowledged. Automatic acknowledgement of a fault is possible after the cause has been eliminated.

11.1.3 ERROR MEMORY

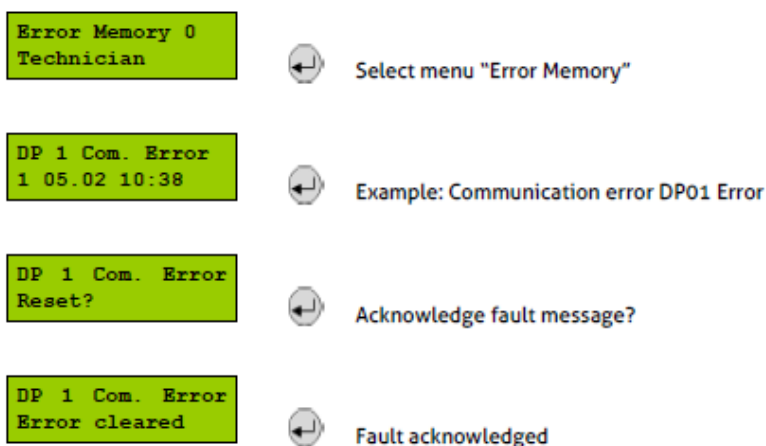
The menu "Error Memory" in the main menu "System Error" is visible without password.

In the error memory, the first 99 faults that have occurred and have already been acknowledged in the menu "System Error" are listed for the service technician in a power failure safe way. These can only be deleted by the code level 1/3.



Caution: At each maintenance, this memory should be read, relevant faults tracked and entered in the maintenance book, and then the memory cleared.

The errors are provided with a consecutive number. After an error has been cleared, all other errors automatically move up.



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11.1.4 SYSTEM MESSAGES AND ERRORS

The devices connected via the analog interface can only report their malfunction by signal under-range or overrange. The reason for signal underrange mostly comes from bad, wrong or missing signal wiring that is the reason for the error. The following system error messages of the analog interface are detected and recorded.

“AP 0X Overrange” Current signal at analog input > 21.2 mA

Cause: Short-circuit at analog input, analog sensor not calibrated, or defective.

Solution: Check cable to analog sensor, make calibration, replace sensor.

“AP 0X Underrange” Current signal at analog input < 3.0 mA

Cause: Wire break at analog input, analog sensor not calibrated, or defective.

Solution: Check cable to analog sensor, make calibration, replace sensor.

Digital sensors, sensor boards, expansion modules and the controller are equipped with extensive self-monitoring systems and diagnostic functions. They enable detailed errors/causes and help the installers and operators to quickly determine the cause. These errors can only be transmitted when the connection to the controller is intact.

“DP 0X Sensor” (0x8001) Sensor element of the sensor- diagnostic function reports an error.

Cause: Sensor pins broken, mechanical or electrical damage

Solution: Exchange sensor head.

“DP 0X ADC Error” (0x8002) Monitoring of the amplifier and AD converter circuits at the input.

Device reports an error.

Cause: Mechanical or electrical damage of the amplifiers.

Solution: Replace device.

“DP 0X Voltage” (0x8004) Monitoring of the sensor and/or process power supply.

Device reports an error.

Cause: Mechanical or electrical damage of the power supply.

Solution: Measure tension if too low, replace device.

“DP 0X CPU Error” (0x8008) Monitoring of the processor function – reports an error.

Cause: Mechanical or electrical damage of the processor.

Solution: Replace device.

“DP 0X EE Error” (0x8010) Monitoring of the data storage – reports an error.

Cause: Electrical damage of the memory or configuration error.

Solution: Check configuration, replace device.

“DP 0X I/O Error” (0x8020) Power ON or monitoring of the in/outputs of the processor – reports an error.

Cause: During restart, electrical damage of the processor or of circuit elements.

Solution: Wait until Power On is over, replace device.

“DP 0X Overtemp.” (0x8040) Ambient temperature outside specification. At high ambient temperatures at the edge of the specification, the error is only generated after 24 hours.

Cause: Too high/low ambient temperature

Solution: Protect the device from direct sunlight or check climatic conditions.

“DP 0X Overrange” (0x8200) Signal of sensor element in the sensor is out of range.

Cause: Sensor not calibrated correctly (e.g. wrong calibration gas), defective.

Solution: Recalibrate sensor, replace it.

“DP 0X Underrange” (0x8100) Signal of sensor element in the sensor is out of range.

Cause: Wire break at sensor element input, sensor drift too high, defective.

Solution: Recalibrate sensor, replace it.

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The controller monitors the communication between request and response. If the reply is too late, incomplete or incorrect, the controller recognizes the following errors and reports them.

“SB 0X Com. Error” (0x9000) Communication error from central unit to SB2 0X

Cause: Bus line interrupted or short circuit, DP 0X registered at the controller, but not addressed. SB2 0X defective.

Solution: Check line to SB2 0X, check SB2 address or MP parameters, replace sensor.

“DP 0X Com. Error” (0xB000) Communication error of SB2 to DP 0X sensor

Cause: Bus line between SB2 and sensor interrupted or short circuit, DP 0X registered at the controller, but not configured at SB2, wrong gas type, DP 0X defective.

Solution: Check line to DP 0X, check sensor address or parameters, replace sensor.

“EP 0X Com. Error” (0x9000) Communication error to Expansion Module 0X

Cause: Bus line interrupted or short circuit, expansion module 0X registered at the controller, but not addressed or addressed incorrectly, EP-06 0X module defective.

Solution: Check line to Expansion Module 0X, check module address, replace module.

“Service” (0x0080) System maintenance is due

Cause: Maintenance date exceeded.

Solution: Perform the maintenance.

“DP XX locked” “AP XX locked” This MP input is locked (MP is physically present, but locked by the operator)

Cause: Operator intervention

Solution: Eliminate the cause of a possible fault and then unlock the MP.

“UPS Error” (0x8001) UPS does not work correctly, can only be signalled by the AT-DGC.

Cause: Defective UPS – too high or too low voltage, battery disconnected

Solution: Connect battery, replace UPS

“Power Fail” (0x8004) can only be signalled by the AT-DGC.

Cause: Power failure or fuse tripped.

Solution: Check power supply or fuses.

“XXX EC: 0xXXXX” Occurs, if there are several errors from one measuring point.

Cause: Several causes

Solution: See the specific errors

11.2 STATUS ALARM

Display of the currently pending alarms in plain text, sorted by MP addresses. Only those measuring points are displayed, where at least one alarm is active. If no alarms are active, the text ‘No alarms’ is output. The alarms are generated either in the controller (alarm) or directly on site in the sensor / module (local alarm).

Interventions are possible in this menu item only for the acknowledgment of latching alarms. Pending alarms cannot be acknowledged.

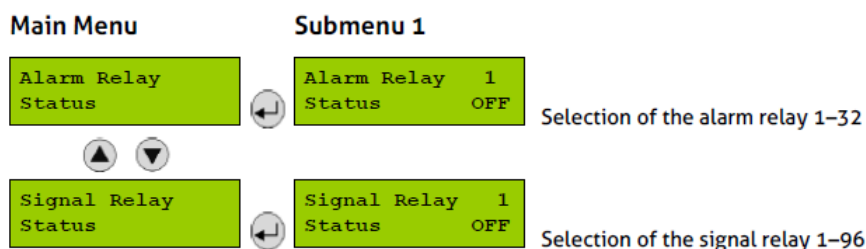


Symbol	Description	Function
AP X	Measuring Point	Analog measuring point X = 1–32, where an alarm is pending.
DP X	Measuring Point	Digital measuring point X = 1–96, where an alarm is pending.
'A1	Alarm status	'A1 = Local alarm 1 active (generated by the device of the SB2 group)
A1		A1 = Alarm 1 active (generated in the GC-06 module)
"A1		"A1 = Latching mode of Alarm 1 active (local/central - no distinction)

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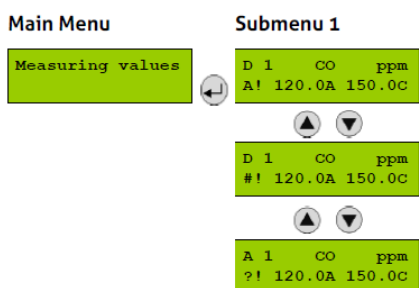
11.3 STATUS RELAY

Reading of the current status of alarm and signal relays. Only used relays are displayed. The manual operation (test function) of the alarm and signal relays is done in the Parameters menu.



11.4 MEASURING VALUES

This menu displays the measured value with gas type and unit for registered sensors. If the alarm evaluation is defined via the average, the display shows the current value (C) and additionally the average value (A).



Symbol	Description	Function
DX	Measured value	Measured value from digital sensor with MP address with X = 1-96
AX	Measured value	Measured value from analog sensor at analog input with AX = 1-32
CO	Gas type	Measured value from bus sensor with MP address with X = 1-96
ppm	Gas unit	See chapter 5.8.3.3
A	Average value	See chapter 5.8.3.3
C	Current value	Arithmetic average (30 measured values within the time unit)
A!	Alarm	Current value of gas concentration
#	Maint. info	MP has triggered an alarm
\$	Local mode	Local Special Mode is active.
?	ConfigError	MP has a mismatched configuration.
Error	Fault MP	Communication error, or signal out of the measuring range
Locked	MP locked	MP was temporarily blocked by the operator.

The information ConfigError has priority to maintenance information and Special Mode information. Alarm information is always displayed, normally with "A!", but if ConfigError, Special Mode or maintenance information are active, only with "!".

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11.5 MAINTENANCE INFORMATION

A control of the maintenance intervals required by law (SIL) or by the customer is integrated in the GC-06 system. When changing the maintenance intervals, you have to observe legal and normative regulations and the manufacturer's specifications. A change only becomes effective after a calibration because the maintenance counter is reset.

System Maintenance Message

At commissioning or after successful maintenance, the date for next due maintenance of the whole system has to be entered. When this date has been reached at 9 a.m., the maintenance message is activated. The system maintenance message appears in the maintenance info main menu from soft-ware version 1.02.13 of the AT-DGC display. In all previous versions, it is generated as an error message in the error status.

Sensor Maintenance Message

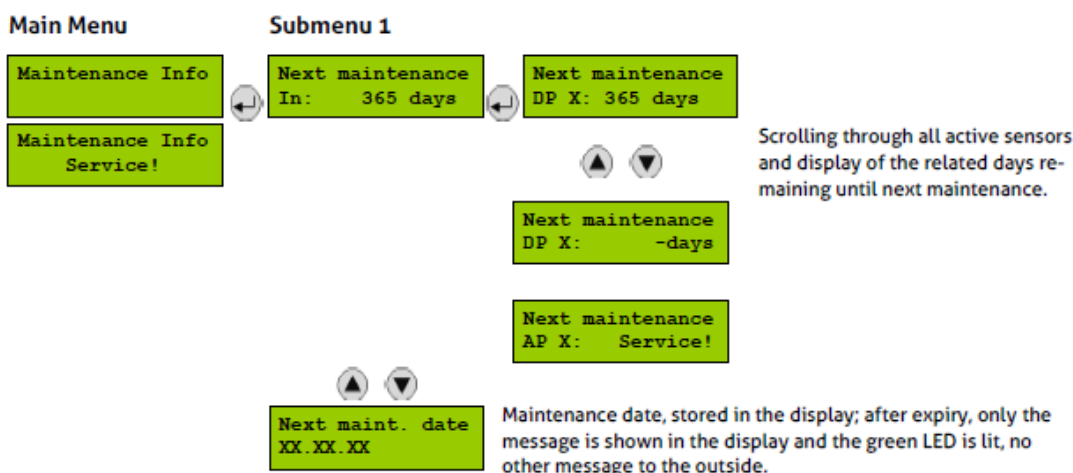
Sensors need regular calibration for complying with the specified accuracy and reliability. In order to avoid complex manual documentation, the sensors store their run time between the calibration intervals continuously and permanently. If the run time since the last calibration exceeds the sensor maintenance interval stored in the sensor, a maintenance message is sent to the central control. The maintenance message is reset during a calibration and the timer for the next maintenance is re-started. The remaining maintenance days are also increased to the set calibration interval.

Device reaction with pending maintenance message

The maintenance signal can be set to each of the active relays in the menu Relay Parameters. In this way, one or more relays can be activated in case of maintenance (see chapter

In case of a pending maintenance message, the phone no. of the service company appears in the main menu and the green LED flashes in the rhythm of 3 s ON : 1 s OFF.

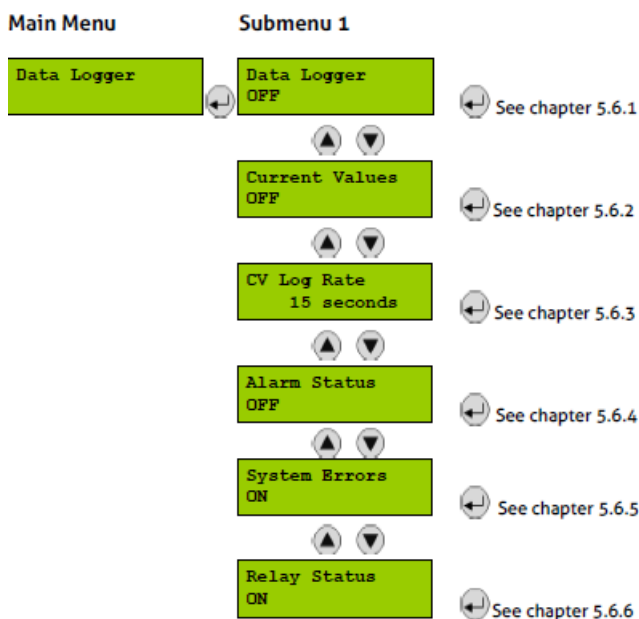
The maintenance message can only be cleared by removing the cause - changing the maintenance date in the event of a system maintenance message, or calibration or replacement of the sensors in the event of a sensor maintenance message. In order to distinguish between the sensor maintenance messages and the system maintenance message and to get a quick allocation of the serviceable sensors, the measured value in the menu item Measured Values gets the maintenance prefix "#". As additional information, a separate window displays the time (in days) when the next sensor is due for maintenance in the Maintenance Info. If several sensors are connected, the shortest time is always displayed. In the submenu, you can scroll through the display of all active measuring points to determine the sensors where the maintenance is due soon. The largest representable number is 889 days (127 weeks / 2.5 years). If the next maintenance is due in an even longer period, the time display is still limited to 889 days. If the data is not available, the time is displayed with "- days" or, if maintenance is pending, with plain text "Service!".



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11.6 MENU DATA-LOGGER

Connect an USB device at the USB connector of the AT-DGC module to use the data logger function. This USB device may be for example an USB stick version 2.0 (not all types have been tested). In this menu, the parameters for the long-term recording of the USB device are set.



11.6.1 DATA-LOGGER SWITCH ON/OFF

Starting the logger function

Symbol	Description	Default	Function
OFF	Turned off	OFF	OFF = Data Logger function is turned off. ON = Data Logger function is turned on.

Note:

This function only works with an USB device.

If this function is active, the USB device mustn't be removed, otherwise data may be lost!! (Like with Windows – safe removal of USB devices)

If the data logger files have to be created on the USB stick first, it takes up to 2 seconds. During this time, the values are not recorded.

11.6.2 CURRENT VALUES

This menu displays the measured value with gas type and unit for registered sensors. If the alarm evaluation is defined via the average, the display shows the current value (C) and additionally the average value (A).

Release of the current value recording of all active measuring points on the USB device in a CSV file. The file name is generated by the system and can't therefore be determined manually.

The name of the file is structured as follows: CVMMDD.csv, with MM standing for the current month and DD standing for the current day.

The interval time can be set in seconds, minutes, hours and days. If the interval time is specified in seconds or minutes, a file is created every day. If the interval time is specified in hours or days, the file is written up to the maximum number of 10,000 and only then a new file is started. This means files won't be too big to be edited by PC programs.

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Internal structure of the file

(The headlines and column numbers are only for easy explanation and aren't written in the file.)

Column 1	2	3	4	5	6	7	...	98	99	100	Etc.
		1	2	3	4	5	...	96	97	98	x
Date	Time	DP1	DP2	DP3	DP4	DP5	...	DP96	AP1	AP2	
19_09_27	08_54_33	0	20	20	28	-	...	-	0	0	
19_09_27	08_54_44	0	20	20	28	-	...	-	25	29	
19_09_27	08_54_54	0	20	20	28	-	...	-	25	29	
19_09_27	08_55_05	0	20	20	28	-	...	-	25	29	
19_09_27	08_55_16	0	20	20	28	-	...	-	25	29	
19_09_27	08_55_27	0	20	20	28	-	...	-	25	29	
19_09_27	08_55_37	0	20	20	28	-	...	-	25	29	
19_09_27	08_55_49	0	20	20	28	-	...	-	25	29	
19_09_27	08_55_59	0	20	20	28	-	...	-	25	29	
19_09_27	08_56_10	0	20	20	28	-	...	-	25	29	
19_09_27	08_56_20	0	20	20	28	-	...	-	0	29	

The 1st column gives the time; from the 2nd column on, the current values of all registered measuring points at this time are written. Inactive measuring points within the recorded measuring points are marked by a dash -. Values less than 0 stand for an error status of the measuring point.

0x8100 = Underrange of sensor measuring point

0x8200 = Overrange of sensor measuring point

0x9000 = Communication error of sensor board measuring point

0xB000 = Communication error of sensor measuring point

Each error is marked by the prefix 0x. In this way the file keeps a fixed structure and can be evaluated with Excel and graphed according to the chronological progress.

11.6.3 CV LOG RATE

Setting of the time interval in which the current values of all registered MP are stored.

Symbol	Description	Default	Function
15	Time	15	Time interval between 2 entries in the CSV file (1-9999, with the time interval depending on the time unit)
seconds	Time unit	seconds	Time interval in - seconds - minutes - hours - days

The current actual values are always written at the end of a cycle. If the interval time has not yet expired at this point, they are not written until the next cycle. This can cause discrepancies between 2 entries. If they are to be written in each cycle, the interval time must be set to less than 5 s.

11.6.4 ALARM STATUS

Setting of the time interval in which the current values of all registered MP are stored.

Symbol	Description	Default	Function
OFF	Alarm Status	OFF	OFF = Alarms are not stored. ON = Alarms are stored.

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Release of the alarm recording for all active measuring points on the USB device into a separate CSV file for alarms and faults.

The name of the file structured as follows:

AEMMDD.csv, with MM standing for the current month and DD standing for the current day.

Every day, a new file with the current date is generated. This makes sure that the files won't be too big to be still edited by established PC programs.

Internal structure of the file

(The headlines are not written in the file.)

Time	MP	Gas	Coming/ Going	CV	AV	A1	A2	A3	A4
09_49_47	DP 02	CO	+	84	84	A1	A2		
09_49_47	AP 03	CO	+	194	194	A1	A2	A3	A4
09_50_02	DP 02	CO	-	20	20				
09_50_02	AP 03	CO	-	20	20				

1. Column: Time
2. Column: MP Address
3. Column: Gas Type
4. Column: Information Coming (+) / Going (-)
5. Column: Current Value
6. Column: Average Value
- 7.-10. Column: Active Alarms.

All active alarms of the MP are always written if there is any change of an alarm. The reset of an alarm is documented by an empty column. This shows how long the alarm has been active.

11.6.5 ERROR STATUS

Setting of the time interval in which the current values of all registered MP are stored.

Release of the fault recording for all active measuring points on the USB device in the common CSV file for alarms and faults.

1. Column: Current time
2. Column: Error Source
3. Column: Error Code
4. Column: Action: + = Error occurred
- = Error acknowledged.
5. Column: Time and date when the error has occurred
6. Column: Plain text of the error code. If several errors are coded so you can read multiple entries here.

Current time	Source	Error code	+ Error present - Error absent	Error date (month day) Time (hours minutes)	Error text
10_22_28	DP 79	0x8100	+	03_30 10_20	Underrange
13_48_28	DP 79	0x8100	-	03_30 13_46	Underrange

Every internal restart of the system (system reset) is also documented in the current day file. Frequent reboots (several times per day) may point to a technical problem. When activating fault records, a CSV file including the error bits of the units connected to the field bus is also written (from version 1.02.13). One data record per cycle is always saved.

The name of this file is structured as follows:

EBMMDD.csv, where EB stands for Error Bits, MM for the current month and DD for the current day.

Internal structure of the file

Current time	System Er- ror Bits	SB2 Address 1 Error Bits	SB2 Address 2 Error Bits	...	SB2 Address 96 Error Bits	GC-06 Error Bits with regard to own module	EP-06 Address 1 Error Bits	...	EP-06 Address 7 Error Bits
10_22_28	0x0000	0x0000	0x0000	...	0x0000	0x0000	0x0000	...	0x0000
13_48_28	0x0000	0x0000	0x0000	...	0x0000	0x0000	0x0000	...	0x0000

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11.6.6 RELAY STATUS

Symbol	Description	Default	Function
OFF	Relay status	OFF	OFF = Relay states are not stored. ON = Relay states are stored.

Release of the relay states recording for all relays on the USB device in the CSV file.

The name of this file is structured as follows:

RLMMDD.csv: RL = relay, MM = current month, DD = current day

Internal structure of the file

(The headlines are not written in the file.)

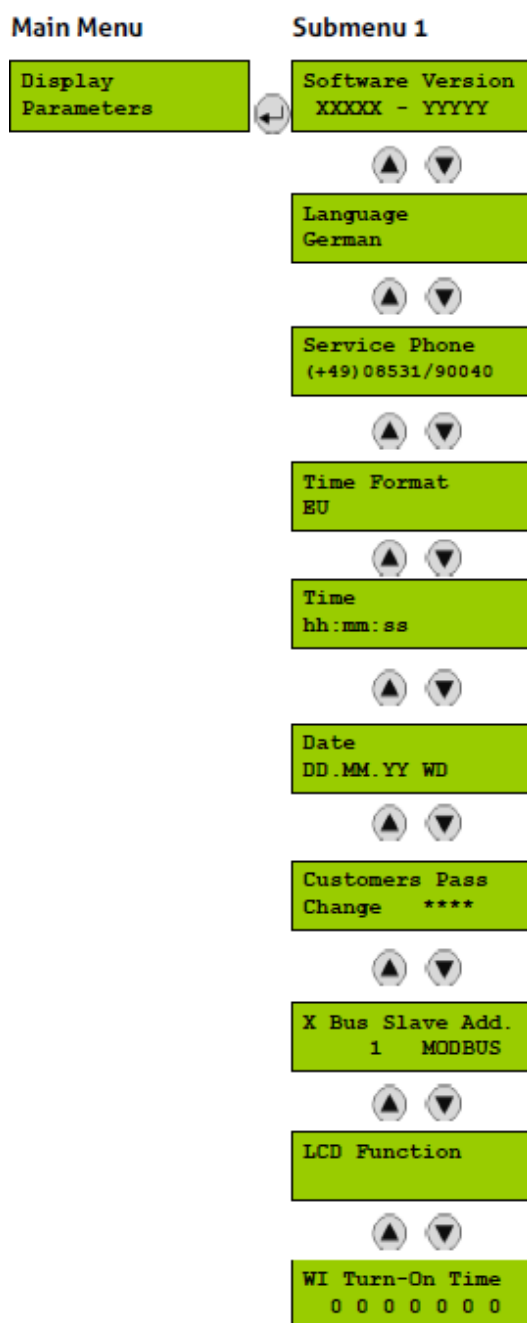
Current time (Column 1/A)	SR1 (Column 2/B)	...to...	SR96 (Column 97/CS)	AR1 (Column 98/CT)	...to...	Bis AR32 (Column 129/DY)
10_22_28	1		0	0		1
13_48_28	0		0	0		0

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11.7 DISPLAY PARAMETER

In the menu Display Parameters, you can find the general, security irrelevant parameters of the Gas-Controller GC-06. These parameters can be changed during the operation mode of the controller.

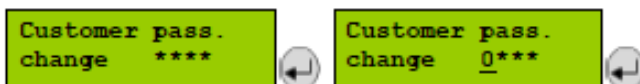


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11.7.1 CUSTOMER PASSWORD

Storage of an individual customer password for changing parameters (see Chapter 4.2.3, code level 3). Changing the password only with code level 1. This menu item only appears if code level 1 is enabled.

Enter new customer password.



11.7.2 X-BUS SLAVE ADDRESS

(Only existing, if X-Bus function is available)

Symbol	Description	Default	Function
Address	Slave address at the X-Bus interface	1	Input of the slave address at the X-Bus. In addition to the address, the available option appears. Currently only Modbus available: Standard Baud Rate 19200 (pay attention to the additional documentation of the protocol)

11.7.3 LCD FUNCTION

Testing the LCD hardware: For about 2 seconds, all the LEDs are lit. All points are displayed on the LCD.

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11.7.4 WEEKLY TIMER

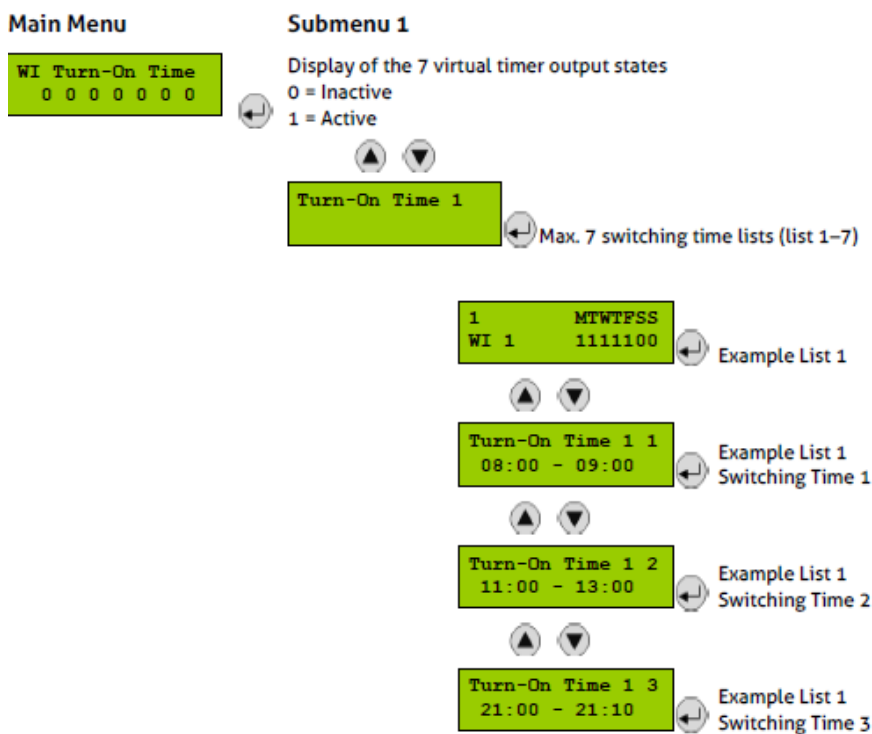
This menu item is used to set switching times of the weekly timer and their assignment to virtual switching output channels (WI - Watch Input - in the Relay Parameters). Via these 7 individual switch-ing output channels, each relay (alarm and signal relay) can be activated in addition to the switching commands from the alarm processing (OR function, the safety-relevant functions therefore remain unaffected).

Application examples: Forced ventilation 1x 1 h per week with low occupancy or lighting control. An external-OFF option is not implemented for safety reasons.

- Only one override function (via digital inputs or timer channel) is possible per relay.
- An active external OFF function (e.g. of fireman's switches) blocks the external ON control of e.g. the timer channel

The weekly timer can only be operated on the AT-DGC display. In the weekly timer main menu, all 7 switching states are displayed, 0 = Inactive, 1 = Active.

Pressing the Enter key takes you to the settings menu where you can select which of the 7 lists to edit. Each list contains the submenu for the switching output channel (WI 1-7) and weekday assignment as well as the 3 other submenus with the corresponding ON and OFF switching times.



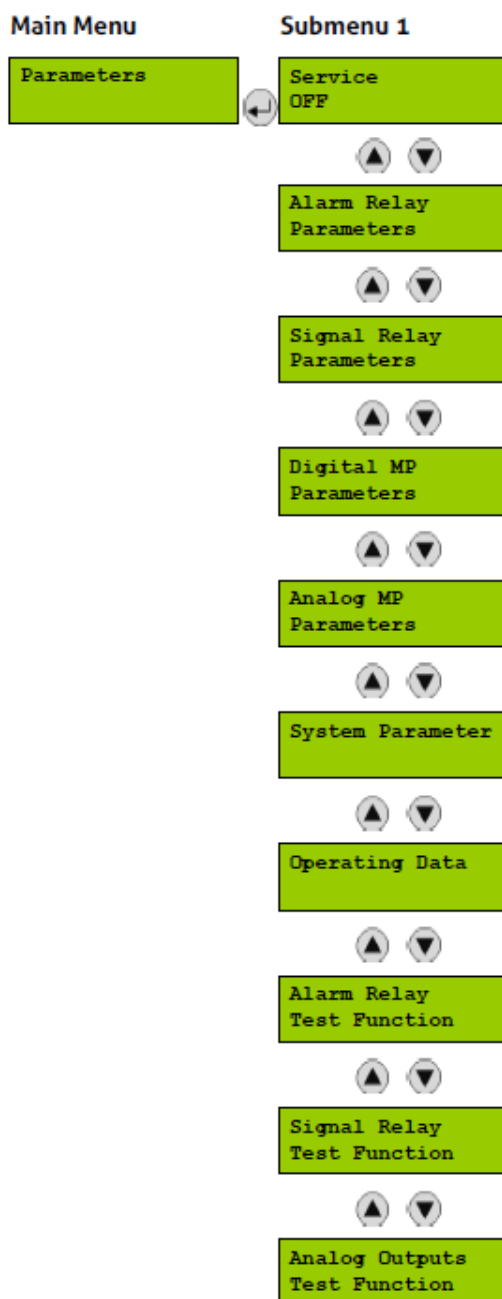
The time 00:00 - 00:00 is considered inactive.

It is therefore possible to set up to 7 different switching times with 1 WI and 3 time intervals each. A maximum of 7 days with one WI each or each weekday can be configured differently. The 3 different times can be set only over the time of 1 day - 24 hours (no yearly timer).

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11.8 PARAMETER

In the menu Parameters you can find the parameter functions of the AT-DGC Controller.



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11.8.1 SERVICE

Service and maintenance work must not be conducted when the AT-DGC is in the normal measuring mode. For service and maintenance work on the AT-DGC, the operating mode “Special Mode” must be activated first. Only then may changes be made to the safety-relevant parameters. The Special Mode is activated by the Service ON function. After setting, the text “Please wait...” is output. The readjustment can take up to 8 seconds (cycle time).

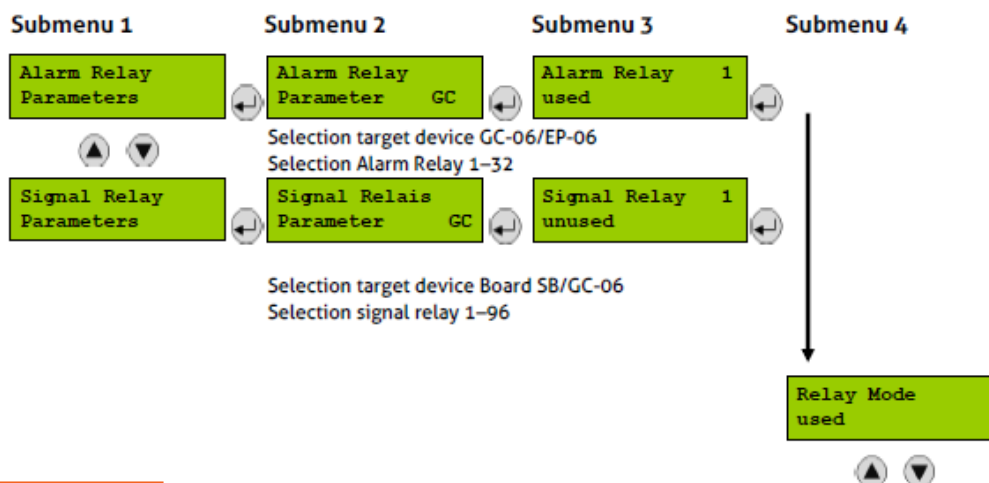
Further parameters menu items are therefore only accessible in the Service ON state. The Service ON state is reset to normal operation mode either automatically 15 minutes after the last key press or manually in the menu by the operator. Sensors can't be switched into the Special Mode from the controller. It can only be done directly at the sensor using the AT-MSR-PT service tool. Sensors in the Special Mode are not included in the alarm evaluation.

11.8.2 RELAY PARAMETER

Reading and changing of the parameters separately for each relay.

The display of the AT-DGC can display not only the parameters from the basic board, but also those from local devices such as the SB2.

However, the parameters from the local devices cannot be adjusted from the AT-DGC



11.8.2 RELAY MODE

Definition of the relay mode.

Symbol	Description	Default	Function
Used	Mode	Used	Used Unused
			= Relay is registered on the controller and can be used = Relay is not registered on the controller

11.8.2 RELAY OPEARTION MODE

Definition of the relay operation mode

The terms energized / de-energized for this item come from the terms open-circuit and closed-circuit principle used for safety circuits. Here, however, not the relay contact circuit is meant (as a changeover contact, optionally available in the 2 principles), but the activation of the relay coil.

The LEDs attached to the modules show the 2 states in analogy. (LED off -> relay de-energized)

Symbol	Descrip-	Default	Function
De-energ.	Mode	De-energized	De-energized Energized
			= Relay (and LED) de-energized if no alarm active = Relay (and LED) permanently energized, if no alarm active

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11.8.3 RELAY FUNCTION FLASHING

Definition of the relay function

The function "Flashing" represents a connection option for warning devices to improve visibility. If "Flashing" is set, this mustn't be used as a safe output circuit anymore. A combination of relay mode energized with flashing operation makes no sense and is therefore suppressed.

Symbol	Description	Default	Function
Yes	Function	Yes	Yes = Relay function flashing at alarm (= time fixed 1 s) impulse:break = 1:1 No = Relay function static ON at alarm

11.8.4 SIGNAL SOURCE

Note:

For the alarm relays of the AT-DGC module, the menu item "Signal Source" is not available, as the AT-DGC does not allow overriding control. The alarm relays on the expansion modules and the signal relays on the SB2 boards must be configured to "Remote", if the AT-DGC is to control these relays (AR/SR). The signal source determines whether the relay is controlled by an alarm in the I/O board (local) or from the control centre (remote).

Symbol	Description	Default	Function
Local	Signal source	Local	Local = The relay is controlled based on the local settings and alarms. Remote = The relay is controlled by the control panel.

11.8.5 ALARM TRIGGER QUANTITY

In some applications it is necessary that the relay switches only at the nth alarm. Here you can set the number of alarms necessary for relay tripping.

11.8.6 HORN FUNCTION (NOT SAFE OUTPUT CIRCUIT BECAUSE RESETTABLE)

The horn function is considered active if at least one of the 2 parameters (time or assignment to digital input) is set. The horn function retains its functionality even for alarms in latching mode.

Symbol	Description	Default	Function
Recurrence	Reset mode	0	0 = Reset of the relay after time having run out via DI (external) or by pushbuttons 1 = After reset of the relay, time starts. At the end of the set time, the relay is activated again (recurrence function).
Time		120	Enter time for reset function or recurrence function in s 0 = no reset function
DI		0	Assignment, which digital input resets the relay.

Horn function resettable:

The activated horn can be reset with this function.

The following possibilities to acknowledge are available for the alarm relay as horn relay:

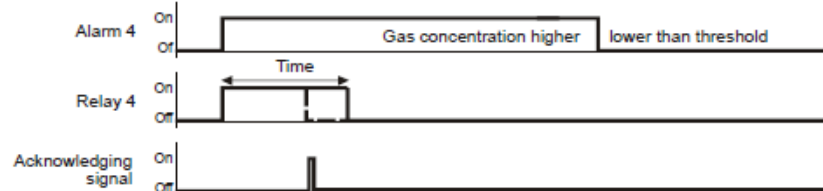
- By pressing the left button (ESC). Only available in main menu.
- Automatic reset at the end of the pre-set time (active if value > 0).
- By a physically available internal/external pushbutton (assignment of the appropriate digital input DI 1-n).

Due to fixed polling cycles, external buttons must be pressed for a few seconds before results. After acknowledgment, the horn remains permanently reset until a new alarm is registered for this relay function.

Alarm or relay 4 is only an example in the following function diagrams and applies in analogy to all alarms/relays.

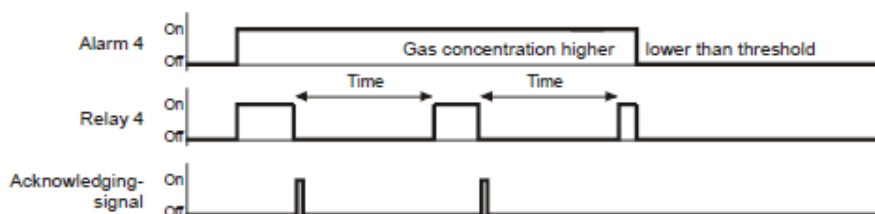
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Acknowledge the horn relay:



Recurrence of the horn relay:

After an alarm has been triggered, the horn will remain active until a reset action is done. After acknowledgment of the horn relay (via a button or externally via digital input) a timer starts. When this time has run out and the alarm is still acting, the horn relay is set again. This process is repeated endlessly as long as the associated alarm remains active.



Internal horn (option)

Depending on the version, the internal horn of the DGC-06 is connected to alarm relay 4 of the AT-DGC module or to the open collector output of the 1st EP-06 module. If an alarm relay with selected horn function is activated by a gas alarm, the open collector output of the 1st expansion module is automatically activated and the internal horn sounds. For the AT-DGC Controller without module, the alarm relay 4 must be defined as horn relay.

11.8.7 EXTERNAL OVERRIDE OF ALARM/SIGNAL RELAY VIA DI

Assignment of a digital input for external switching on or off of the alarm relay.

DI = Digital hardware input DI1 to DI4 of the AT-DGC (DI1–DI4).

Manual switching of the alarm relays via DI does not trigger the Special Mode, as this is an intended and configured functionality. The use of the override should be used with caution, particularly the function of setting “external OFF”. This external OFF function has priority over a gas alarm ON command or a timer channel ON command. If External ON and External OFF are configured simultaneously to the same relay and both are active at the same time, so in this state, only the External OFF command is executed. In this mode, too, the relays work respecting the parameter settings “Static/Flash” and “Energized/De-energized”.

11.8.8 DELAY MODE OF ALARM/SIGNAL RELAY

Definition of the switch-on and switch-off delay of the relays

Symbol	Description	Default	Function
0 s	Switch-ON Delay Time	0	Alarm / Signal Relay is only activated at the end of the defined time. 0 s = No delay
0 s	Switch-OFF Delay Time	0	Alarm / Signal Relay is only deactivated at the end of the defined time. 0 s = No delay

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11.8.9 OR OPERATION OF FAULT TO ALARM/SIGNAL RELAY

Enables the Fault OR operation of the current alarm/signal relay.

If the OR operation for this relay is set to active = Yes, all device faults will activate the relay in addition to the alarm signals. In practice, this ORing will be used if, for example, fans should run or warning lights should be activated in case of device malfunction, since the fault message of the central control is not permanently monitored.

Note:

Exceptions are all errors of the measurement point because the MPs can be assigned to each alarm separately in the menu MP Parameters. This exception is used to build up targeted zone related signalling in case of MP errors, which should not affect other zones.

Symbol	Description	Default	Function
No / Yes	No assignment / Activated assignment	No	No = Alarm and/or signal relay is not affected when a device fault occurs. Yes = Alarm and/or signal relay switches to the alarm state when a device fault occurs.

11.8.10 OR OPERATION OF MAINTENANCE TO ALARM/SIGNAL RELAY

Enables the Maintenance OR operation of the current alarm/signal relay.

If the OR operation for this relay is set to active = Yes, the relay will be activated in addition to the alarm signals when at least one maintenance message is pending. In practice, this ORing will be used if, for example, fans should run when the sensor accuracy is not ensured anymore because of missing calibration (therefore pending maintenance message) or warning lights should be activated, since the maintenance information of the central control is not permanently monitored.

Note:

When the maintenance message is activated, the reset of the control can only be done by calibrating the sensors or a disabling this OR function.

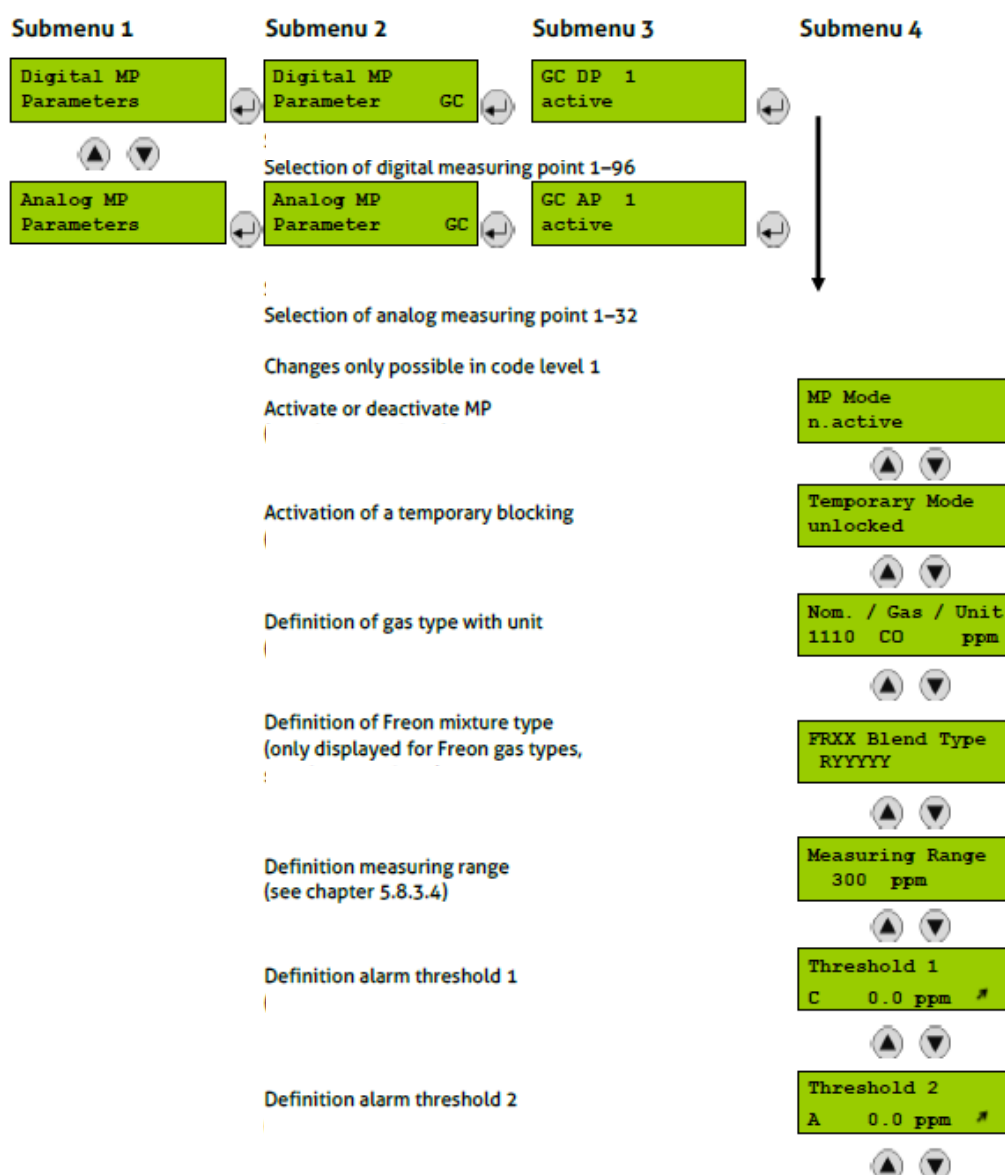
Symbol	Description	Default	Function
No / Yes	No assignment / Activated assignment	No	No = Alarm and/or signal relay is not affected when a maintenance message occurs. Yes = Alarm and/or signal relay switches to the alarm state when a maintenance message occurs.

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11.9 MP PARAMETER

For reading and changing measuring point parameters for each bus and analog sensor including registration of MP and assignment of the alarm relays. The display of the AT-DGC can display not only the parameters of the base board, but also those from local devices such as the EP-06 module or SB2. However, the parameters from the local devices cannot be adjusted from AT-DGC.



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Definition alarm threshold 3

Threshold 3
A 0.0 ppm #


Definition alarm threshold 4

Threshold 4
A 0.0 ppm #


Hysteresis

Hysteresis
0.0 ppm


Delay time for alarm ON

Delay ON time
0s


Delay time for alarm OFF

Delay OFF time
0s


Average value overlay

AV-Overlay
No


Definition of latching mode

Alarm - 1234
Latching - 0000


Assign MP fault to alarm

Alarm - 1234
Fault - 0000


Assign alarm to alarm relay

A1 A2 A3 A4
0 0 0 0


Assign MP signal to analog output

Analog Output
x y


11.9.1 ACTIVATE-DEACTIVATE MP

Deactivation shuts the registered / not registered sensor down in its function, which means that there is no alarm or fault message at this measurement point. Existing alarms and faults are cleared with deactivation. Deactivated sensors do not output a collective fault message.

Symbol	Description	Default	Function
active	MP Mode	Not active	active = Measuring point activated at the GC-06. not active = Measuring point not activated at GC-06.

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11.9.2 LOCK OR UNLOCK MP

In the temporary Lock Mode, the function of the registered sensors is put out of service, which means that there is no alarm or fault message at this measuring point. Existing alarms and faults are cleared with the locking. If at least one sensor is blocked in its functionality, the collective fault message is activated after expiry of the internal fault delay time, the yellow fault LED is continuously lit and a message appears in the menu System Errors.

Symbol	Description	Default	Function
unlocked	Lock mode	unlocked	unlocked = MP free, normal operation locked = MP locked, error message only on the display

11.9.3 SELECTION GAS TYPE WITH UNIT

Selection of the desired and connected gas sensor type (connection possible as digital sensor SC, or analog sensor MC). The selection contains all necessary information for the AT-DGC, and is also used for comparing the real, digital data with the settings.

This feature increases the user and operating security. The unit is assigned to each gas sensor type and automatically entered during selection.

MSR Type	Sensor head type SC2, SX1, SSAX1, MC2	Gas type	Formula	Measuring range ¹	Unit
1105	E1105-XX	Acetylene*	C ₂ H ₂	0–100	% LEL
1110	E1110-XX	Carbon monoxide	CO	0–300	ppm
1125	E1125-XX	Ammonia	NH ₃	0–300	ppm
1129	E1129-XX	Nitrogen monoxide	NO	0–100	ppm
1130	E1130-XX	Nitrogen dioxide	NO ₂	0–30	ppm
1135	E1135-XX	Bromine*	Br ₂	0–2	ppm
1147	E1147-XX	Phosgene*	COCl ₂	0–1	ppm
1150	E1150-XX	Methanol*	CH ₃ OH	0–250	ppm
1160	E1160-XX	VOC	VOC	0–5	ppm
1181	E1181-XX	Chlorine dioxide*	ClO ₂	0–1	ppm
1182	E1182-XX	Hydrogen fluoride*	HF	0–10	ppm

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MSR Type	Sensor head type SC2, SX1, SSAX1, MC2	Gas type	Formula	Measuring range ¹	Unit
1183	E1183-XX	Hydrogen cyanide	HCN	0–100	ppm
1184	E1184-XX	Hydrogen arsenide*	AsH ₃	0–1	ppm
1185	E1185-XX	Formaldehyde	CH ₂ O	0–10	ppm
1186	E1186-XX	Hydrogen chloride	HCL	0–20	ppm
1187	E1187-XX	Phosphine*	PH ₃	0–5	ppm
1188	E1188-XX	Silane*	SiH ₄	0–50	ppm
1189	E1189-XX	Ethylene	C ₂ H ₄	0–200	ppm
1190	E1190-XX	Ozone	O ₃	0–5	ppm
1191	E1191-XX	Hydrogen peroxide	H ₂ O ₂	0–10	ppm
1192	E1192-XX	Nitrous oxide*	N ₂ O	0–2000	ppm
1193	E1193-XX	Chlorine	CL ₂	0–20	ppm
1194	E1194-XX	Hydrogen	H ₂	0–1000	ppm
1195	E1195-XX	Oxygen	O ₂	0–25	% vol
1196	E1196-XX	Sulphur dioxide	SO ₂	0–100	ppm
1197	E1197-XX	Hydrogen sulphide	H ₂ S	0–200	ppm
1198	E1198-XX	Fluorine*	F ₂	0–2	ppm
1199	E1199-XX	Ethylene oxide	C ₂ H ₄ O	0–10	ppm
2020	2020-XX	FR LFL	R32 R454b R455a R1234yf R1234ze	0–50	%LEL
2053	2053-XX	Xylene*	C ₈ H ₁₀	0–300	ppm
2059	2059-XX	FR01*	R12	20–2000	ppm
2061	2061-XX	FR02	R23 R508b	20–2000	ppm
2063	2063-XX	FR03	R452a R454b R454c R455a R513a R515b R1233zd R1234yf R1234ze	20–2000	ppm
2064	2064-XX	FR04	R123	20–2000	ppm
2066	2066-XX	FR05*	R11	20–2000	ppm
2070	2070-XX	FR06	R22 R401a R401b R402a R402b R403a R408a R409a R411a	20–2000	ppm

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MSR Type	Sensor head type SC2, SX1, SSAX1, MC2	Gas type	Formula	Measuring range ¹	Unit
2077	2077-XX	FR07	R134a R407a R416a R417a R422a R422d R427a R437a R438a R449a R407f R450a	20–2000	ppm
2080	2080-XX	FR08	R125 R32 R404a R407c R410a R434a R507a R448a R452b R143a	20–2000	ppm
2125	S2125-X	Ammonia	NH ₃	0–3000	ppm
2189	S2189-X	Ethylene	C ₂ H ₄	0–1000	ppm
3400	P3400-A	Methane	CH ₄	0–100	% LEL
3402	P3402-A	LPG	LPG	0–100	% LEL
3405	P3405-A	Acetylene*	C ₂ H ₂	0–100	% LEL
3408	P3408-X	Ammonia	NH ₃	0–100	% LEL
3410	P3410-A	Ethylene	C ₂ H ₄	0–100	% LEL
3415	P3415-A	Cyclohexane	C ₆ H ₁₂	0–100	% LEL
3420	P3420-A	Ethane	C ₂ H ₆	0–100	% LEL
3425	P3425-A	Ethanol	C ₂ H ₅ OH	0–100	% LEL
3427	P3427-A	Ethyl acetate	C ₄ H ₈ O ₂	0–100	% LEL
3430	P3430-A	Benzene	C ₆ H ₆	0–100	% LEL
3435	P3435-A	n-hexane	C ₆ H ₁₄	0–100	% LEL
3440	P3440-A	Hydrogen	H ₂	0–100	% LEL
3448	P3448-A	Butyl acetate	C ₈ H ₁₂ O ₂	0–100	% LEL
3450	P3450-A	Methanol	CH ₃ OH	0–100	% LEL
3458	P3458-A	Methyl ethyl ketone MEK	C ₄ H ₈ O	0–100	% LEL
3460	P3460-A	n-butane	C ₄ H ₁₀	0–100	% LEL
3468	P3468-A	Isobutanol/Isobutyl alcohol	C ₄ H ₁₀ O	0–100	% LEL
3470	P3470-A	n-octane	C ₈ H ₁₈	0–100	% LEL
3472	P3472-A	Cyclopentane	C ₅ H ₁₀	0–100	% LEL
3473	P3473-A	Methyl acetate	C ₃ H ₆ O ₂	0–100	% LEL
3475	P3475-A	n-pentane	C ₅ H ₁₂	0–100	% LEL
3480	P3480-A	Propane	C ₃ H ₈	0–100	% LEL
3480	P3480-C	Propane	C ₃ H ₈	0–5000	ppm
3481	P3481-B	Propene	R1270	0–30	% LEL
3482	P3482-A	Isopropyl alcohol	C ₃ H ₈ O	0–100	% LEL
3485	P3485-A	Acetone	(CH ₃) ₂ CO	0–100	% LEL
3490	P3490-A	Toluene	C ₇ H ₈	0–100	% LEL

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MSR Type	Sensor head type SC2, SX1, SSAX1, MC2	Gas type	Formula	Measuring range ¹	Unit
3491	P3491-A	n-heptane	C ₇ H ₁₆	0-100	% LEL
3493	P3493-A	Xylene	C ₈ H ₁₀	0-100	% LEL
3494	P3494-A	Butadiene	C ₄ H ₆	0-100	% LEL
3495	P3495-A	Nonane	C ₉ H ₂₀	0-100	% LEL
3496	P3496-A	Petrol vapours	Petrol	0-100	% LEL
3497	P3497-A	Styrene*	C ₈ H ₈	0-100	% LEL
3498	P3498-A	JP8*	JP8	0-100	% LEL
I184	I184	Sulphur hexafluoride*	SF ₆	0-3000	ppm
I200	I200-A	IR-R32	R32	0-100	% LEL
I400	I400-A	IR-methane	CH ₄	0-100	% LEL
I400	I400-B	IR-methane	CH ₄	0-100	% vol
I464	I464-X	Carbon dioxide	CO ₂	0-2000	ppm
I464	I464-X	Carbon dioxide	CO ₂	0-5	% vol
I480	I480-X	IR-propane*	C ₃ H ₈	0-100	% vol
I480	I480-B	IR-propane	C ₃ H ₈	0-100	% LEL
I564	I564	Carbon dioxide*	CO ₂	0-2000	ppm
I564	I564	Carbon dioxide*	CO ₂	0-5	% vol
M200	M200-B	MPS-R32	R32	0-100	% LEL
M203	M203-B	MPS-R454b*	R454b	0-100	% LEL
M205	M205-B	MPS-R1234ze*	R1234ze	0-100	% LEL
M400	M400-A	MPS-methane	CH ₄	0-100	% LEL
M405	M405-A	MPS-acetylene	C ₂ H ₂	0-100	% LEL
M408	M408-B	MPS-ammonia	NH ₃	0-30	% LEL
M440	M440-A	MPS-hydrogen	H ₂	0-100	% LEL
M480	M480-A	MPS-Propane	C ₃ H ₈	0-100	% LEL
M499	M499-B	MPS-DMC	C ₃ H ₆ H ₃	0-30	% LEL
S164	I-S1164-X	Carbon dioxide	CO ₂	0-5	% vol
S164	I-S1164-X	Carbon dioxide*	CO ₂	0-2000	ppm
S400	S400-A	IR-methane	CH ₄	0-100	% LEL
S480	S480-A	IR-propane	C ₃ H ₈	0-100	% LEL
5XXX		TVOC group*	TVOC		ppm
5XXX		TVOC group*	TVOC		% vol
D184		Sulphur hexafluoride*	SF ₆	0-1000	ppm
EXT	Possible connection of sensors with 4-20 mA signal	Temperature	TEMP		°C
EXT		Temperature	TEMP		°F
EXT		Humidity	Humidity		% r. H.
EXT		Pressure	Press.		mbar
EXT		TOX	TOX		ppm
EXT		Combustible	Comb.		% LEL
EXT		External	Extern		%
EXT		Digital ²	Digital		%

Table 33: Gas Types

* Currently not available

¹ Different measuring ranges are possible, but not shown here.

² The use with measuring range value: 1 results in a binary value output of the values 0 or 1.

This menu item is available in GC-06 MP Parameters. It only appears if a Freongroup is selected as the gas type. The actual Freon designation is then entered in the second line. These Freons are entered in the above table under the Freon groups in the FORMULA column.

FRXX Blend Type
RYYYY

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11.9.4 MEASURING RANGE DEFINITION

The measurement range must be adapted to the working range of the connected gas sensor.

For additional control by the installer, the settings in the AT-DGC must mandatorily match with the used sensors. If the types of gas and/or measurement ranges of the sensor do not agree with the settings of the AT-DGC, the error "EEPROM / configuration error" is generated, and the collective fault message is activated.

The range also affects the display of the measured values, alarm thresholds and hysteresis. For measuring ranges <10 3 decimals places, <100 2 decimal places, <1000 one decimal place are displayed. For measuring ranges ≥ 1000, the display is without decimal place. The resolution and accuracy of the calculation are not affected by the different measuring ranges. The measuring range can only be set with the 2 left digits (internal scaling). The maximum adjustable value of the measuring range is 20,000.

11.9.5 THRESHOLDS/HYSTERESIS

For each measuring point 4 alarm thresholds are available for free definition. If the gas concentration is higher than the set alarm threshold, the associated alarm is activated. If the gas concentration falls below the alarm threshold inclusive hysteresis the alarm is again reset. In the mode "Alarm at falling" the corresponding alarm is set in case of falling below the set alarm threshold and reset again when exceeding the threshold plus hysteresis. The display depends on the set measuring range. Unused alarm thresholds must be defined with 0, in order to avoid undesired alarms. Higher-level alarms automatically activate the lower-level alarms.

The thresholds and hysteresis are only accepted if a few simple rules are observed:

- The thresholds must be ≤ measuring range, for measuring range 20,000 not more than 16,000.
- For increasing thresholds, the threshold values must also be indicated in ascending order.

Symbol	Description	Default	Function
C	Evaluation	C	C = Alarm evaluation by current value of MP A = Alarm evaluation by average value of MP
80 ppm	Threshold 1	40	Gas concentration > Threshold 1 = Alarm 1
	Threshold 2	80	Gas concentration > Threshold 2 = Alarm 2
	Threshold 3	100	Gas concentration > Threshold 3 = Alarm 3
	Threshold 4	120	Gas concentration > Threshold 4 = Alarm 4
	Hysteresis	15	Gas concentration < (Threshold X – Hysteresis) = Alarm X OFF
↗		↗	↗ = Alarm release at increasing concentrations ↘ = Alarm release at falling concentrations

11.9.6 DELAY FOR ALARM ON AND/OR OFF FOR CURRENT VALUE EVALUATION

Definition of delay time for alarm ON and/or alarm OFF. The delay applies to all alarms of an MP with current value evaluation, not with average value overlay

Symbol	Description	Default	Function
0 s	CV Alarm ON delay	0	Gas concentration > Threshold: Alarm is only activated at the end of the fixed time (s). 0 s = No delay
0 s	CV Alarm OFF delay	0	Gas concentration < Threshold: Alarm is only deactivated at the end of the fixed time (s). 0 s = No delay

11.9.7 AVERAGE OVERLAY FUNCTIONALITY

The alarm evaluation of the operation mode "Average" is overridden by the current value, if this exceeds the alarm threshold defined in the menu "System Parameters AV Overlay". The overlay is delayed by the time factor entered in the local menu. The function of the average overlay is only evaluated for the gas type CO and is activated here

Symbol	Description	Default	Function
Yes	AV Overlay	Yes	Yes = Average overlay active (for CO) No = Average overlay not active

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11.9.8 LATCHING MODE ASSIGNED TO ALARM

In this menu you can define, which alarms should work in latching mode.

Symbol	Description	Default	Function
Alarm - 1 2 3 4 Latching - 0 0 0 0	Latching alarms	0 0 0 0	0 = No latching 1 = Latching

11.9.9 MP FAULT ASSIGNED TO ALARM

In this menu you can define, which alarms should be activated by a fault at the measuring point.

Symbol	Description	Default	Function
Alarm - 1 2 3 4 Fault - 1 1 0 0	MP Fault	1 1 0 0	0 = Alarm not ON at MP fault 1 = Alarm ON at MP fault

11.9.10 ALARM ASSIGNED TO ALARM/SIGNAL RELAY

Each of the 4 alarms can be assigned to any physically existing alarm relay AR1–AR32 or signal relay SR1–SR96. Unused alarms are not assigned to any alarm relay.

Symbol	Description	Default	Function
0	A1 A2 A3 A4	0 0 0 0	RX = Assignment of the alarms A1–A4 to signal relay SR1–SR96 X = Assignment of the alarms A1–A4 to alarm relay AR1–AR32

11.9.11 MP SIGNAL ASSIGNED TO ANALOG OUTPUT

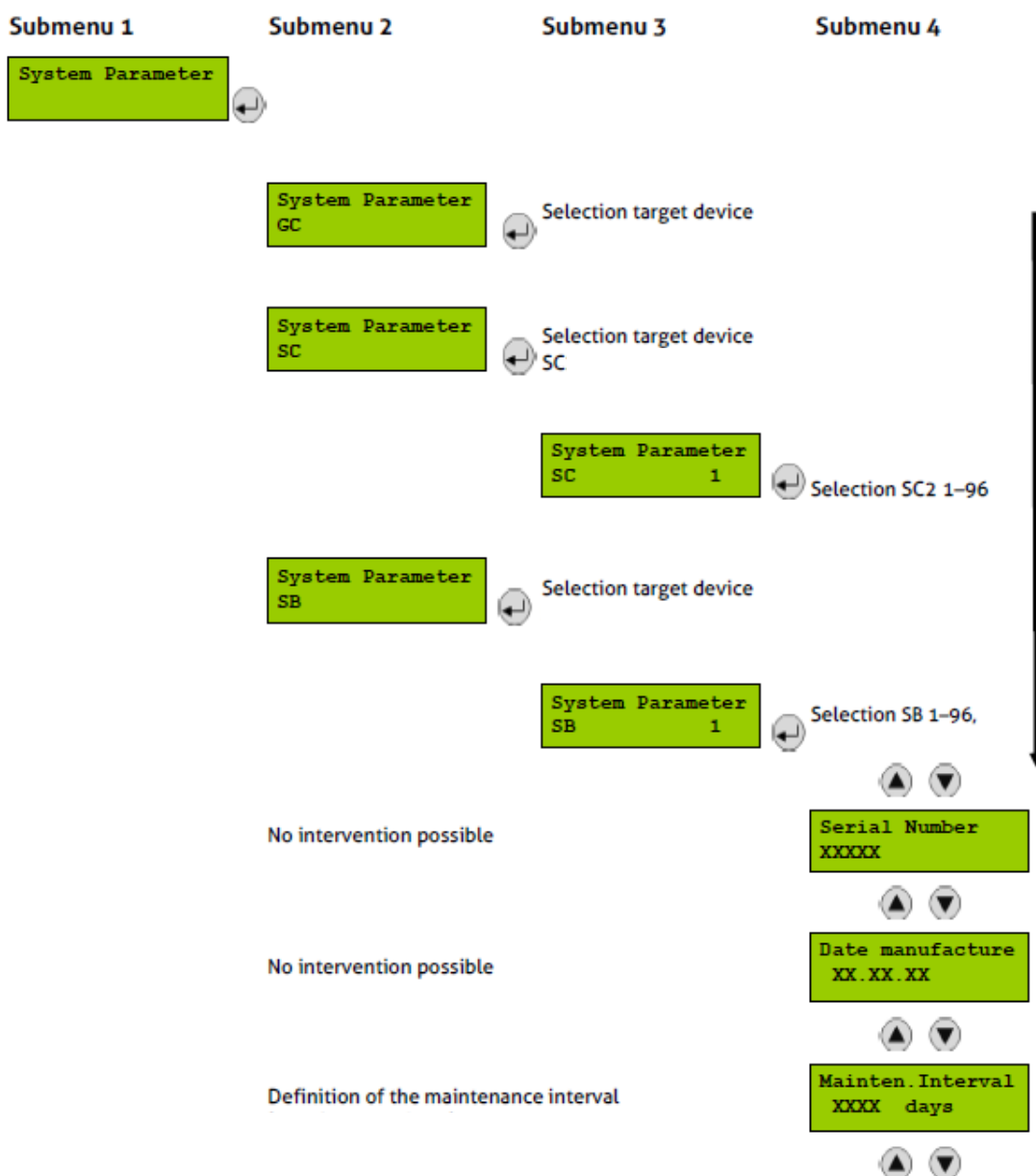
The measuring point signal (current or average value) can be assigned to one of the max. 16 analog outputs. The same assignment to different outputs (8) generates a functional duplication. This is often used to control remote devices in parallel (supply fan in the basement, exhaust fans on the roof). After the analog output has been assigned and activated, this output must also be physically connected so that the output current can also flow (min. jumper against 0 or maximum load 500 Ω), since the AT-DGC compares the setpoint current with the actual current and an IO device error is output in case of deviation.

Symbol	Description	Default	Function
x y	Analog Output	x y	x = MP Signal is assigned to analog output x, (activates output control -> signal can be used). y = MP Signal is assigned to analog output y, (activates output control -> signal can be used). 0 = MP Signal isn't assigned to any analog output When the AO is inactive, the output monitoring is inactive. The AO becomes active when the MP parameter is set to at least 1 MP and the output signal is set to > 0 in the system parameter.

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12 SYSTEM PARAMETERS

The display of the GC-06 can display not only the parameters from the base board, but also those from local devices such as the expansion module or SB group and the SC. Depending on the type of unit, some menu items are not displayed, however, the parameters from the local devices cannot be adjusted from the AT-DGC.



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Definition of average overlay

AV Overlay
0s 0 ppm



Definition of average time

Average Time
900s



Definition of power on time in s

Power On Time
5s



Definition of deadband

Deadband
0 %



Setting of the collective fault via an external DI

Activate Failure
DI 0



Selection of special function

Special Function
Standard



Selection of UPS function

UPS
active



Selection of analog output function

AO Function



Selection of the relay duplication

R-Multiplication

12.1 MAINTENANCE INTERVAL

The maintenance interval of the controller is set here. If 0 is set, this function is disabled.

Symbol	Description	Default	Function
XXXX	Maintenance Interval		Entry of the interval between 2 services in days

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12.2 AVERAGE VALUE FUNCTION

The AT-DGC calculates the average value for each active measuring point out of 30 measurements within the time unit defined in the menu "AV Time". This average is available in addition to the current value for alarm evaluation. The selection which value should be used for evaluation is defined separately for each alarm in the menu "Alarm Threshold X". In average mode, the average value is indicated in the menu "Measuring Values" next to the current value.

The alarm evaluation of the control mode "Average Value" is overlaid by the current value, when the current value exceeds the alarm threshold defined in the menu "AV-Overlay". The overlay is delayed by the time factor defined in this menu. The average overlay function is only available for the gas type CO (VDI 2053 functionality). Average value overlay function is not available for AT-SC, I/O-Boards and expansion modules.

12.3 POWER ON TIME

Gas sensors need a running-in period, until the chemical process of the sensor reaches stable conditions. During this running-in period the current signal can lead to an unwanted triggering of a pseudo alarm. Therefore, the Power On time is started at the Gas-Controller after you have switched on the power supply. While this time is running out, the Gas-Controller does not output alarms nor analog signals. The UPS function is not active. The Power On status occurs on the 1st line of the starting menu.

During the Power On phase, the AT-DGC is in Special Mode and does not perform further functions beside the starting diagnostic procedures. A count-down Power On Time in seconds(s) is shown on the display.

12.4 DEADBAND

The noise of the measured value around the zero point can be suppressed by activating a deadband (factory setting: deadband Off) with a range of max. 5 % or 10 % of the measuring range. The suppression also affects the analog output because the measured value must not assume a different display depending on the output. When opening the calibration mode, the deadband function switches off automatically. The dead band on AT-DGC only affects the 4 own analog inputs. This function is not available with AT-SC.

12.5 FAULT ACTIVATION BY EXTERNAL DIGITAL INPUT

The collective fault output can be triggered by an external digital input in addition by using the ORing operation. This is only available with the AT-DGC.

12.6 SPECIAL FUNCTION

The following special functions are available with the AT-DGC

Symbol	Description	Default	Function
Standard Zone function	Function	Standard	Standard function of GC-06 Combination of the MP alarm signals into alarm zones

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12.7 RELAY MULTIPLICATION

With the relay multiplication table, it is possible in the AT-DGC to assign additional relay to an alarm. This corresponds to the source alarm situation per entry. The additional relay (OUT) follows the alarm status of the source (IN) but uses its own relay parameters to allow different needs of the doubled relay. For example, the source relay can be configured as a safety function in open-circuit principle, but the doubled relay can be declared with flashing function or as a horn function. There is a maximum of 20 entries for IN relays and OUT relays. Thus, it is possible, for example, to multiply one relay to 20 others or to double max. 20 relays. In the column IN (source), you can assign to an alarm in the menu MP Parameters. In the OUT (target), and enter the relay needed in addition.

Please Note:

Manual intervention in the menu Relay Status or override in external ON or OFF by external DI do not count as alarm status and only affect the IN relay. If this is also desired for the OUT relay, it has to be configured separately for each OUT relay.

Number	Description	Default	Function
0-32	IN AR Relay	0	0 = Function off
0-96	IN SR Relay		X = Relay X should be multiplied (information source).
0-32	OUT AR Relay	0	0 = Function off
0-96	OUT SR Relay		X = Relay X (target) should switch together with IN relay.

Example 1:

3 relay contacts are needed with the same effect of relay 3, (see assignment of the relays in chapter MP Parameters.)

Entry: 1: IN AR3 OUT AR7

Entry: 2: IN AR3 OUT AR8

If relay 3 is activated via an alarm, relays AR3, AR7 and AR8 switch at the same time.

In	Out
1: AR 3	AR 7
1: AR 3	AR 8

Example 2:

2 relay contacts each are needed from 3 relays (for ex. AR7, AR8, AR9).

Entry: 1: IN AR7 OUT AR12 (Relay 12 switches simultaneously with relay 7.)

Entry: 2: IN AR8 OUT AR13 (Relay 13 switches simultaneously with relay 8.)

Entry: 3: IN AR9 OUT AR14 (Relay 14 switches simultaneously with relay 9.)

This means that relay AR12 switches with AR7, AR13 with AR8 and AR14 with AR9.

The 2 examples can be mixed up, too.

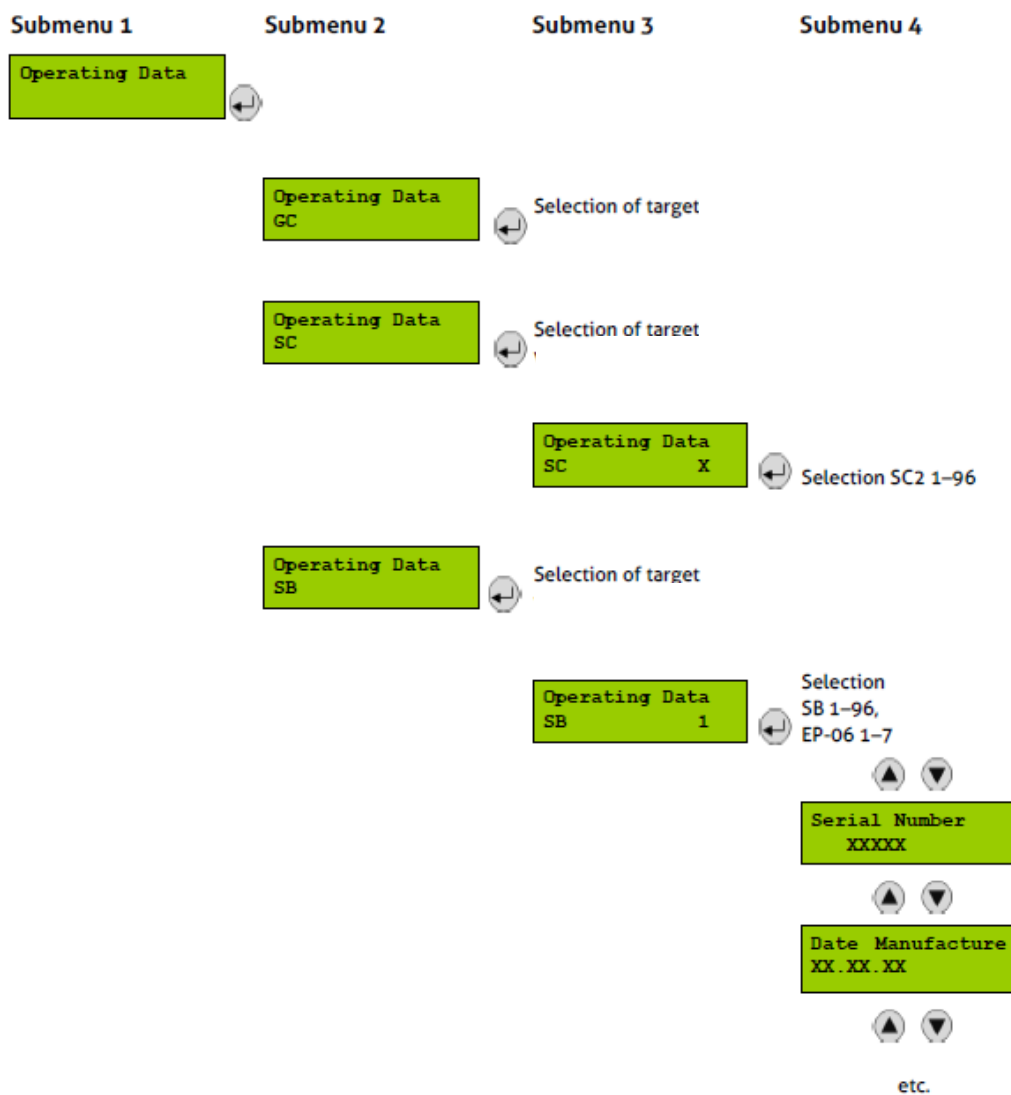
This menu item is available in SB2 with only 2 entries and is not available in SC2 and EP-06.

In	Out
1: AR 3	AR 8
1: AR 3	AR 8
3: AR 9	AR 14

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13 OPERATING DATA/TROUBLESHOOTING

No intervention is possible in the Operating Data. Viewing the operating data helps with troubleshooting.



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13.1 OPERATING DATA DIGITAL SENSORS

Reading the operating data from a AT-SC at the AT-DGC can take a few seconds, as it is queried via the local devices.

Headline	Value	Description
Software Version	XXXXX	Software Version
Operating Days	XXXX days	Days of operation since the SC2 has been switched on for the first time
Gas Conc. Counter	XXXX 10%MR/day	Gas concentration counter Counts the gas concentration on the SC2 in the unit 10 % of the measuring range per day.
Operating Days Expected	XXXX days	Expected service life of the sensor element, depending on the previous gas concentration and calibrations
Min. Temperature	XX °C	Minimum temperature ever registered by SC2
Max. Temperature	XX °C	Maximum temperature ever registered by SC2
Last Tool Number	XXXX	Tool number of the Service-Tool STL06 the calibration was last carried out with
Number of Calib.	XXX	Number of calibrations on the SC2, factory calibration is not included
Zero Gain	XXXX XXXXX	Currently set zero offset and gain factor on the SC2
Sensitivity	XXX %	Sensitivity of the sensor element during the last calibration
Maintenance Days Last	XXXX	Remaining days until maintenance during the last calibration
Operating Days Last	XXXX	Operating days during the last calibration
Maintenance Days Currently	XXXX	Current number of remaining days until next maintenance
Max. Curr. Value	XXXX	Maximum current value measured, with unit

13.2 OPERATING DATA SB2 SENSOR BOARD/AT-DGC

Reading the operating data from a AT-SC at the AT-DGC can take a few seconds, as it is queried via the local devices.

Headline	Value	Description
Serial Number	XXXX	Serial number
Date of Production	XX.XX.XX	Date of production
Operating Days	XXXX days	Days of operation since the SB/EP-06 has been switched on for the first time
Min. Temperature	XX °C	Minimum temperature ever registered by SB/EP-06
Max. Temperature	XX °C	Maximum temperature ever registered by SB/EP-06
Last Tool Number	XXXX	Tool number of the Service-Tool STL06 the calibration was last carried out with.
Analog Output 1 Offset	XXXX	Shows the currently set offset of the 1 st analog output at the SB/EP-06
Analog Output 2 Offset	XXXX	Shows the currently set offset of the 2 nd analog output at the EP-06
Analog Input X	/	Selection of operating data per maximum 3 analog inputs on MSB2 or maximum 4 analog inputs of EP-06.

MP X

Headline	Value	Description
Number of Calib.	XXX	Number of calibrations on the AI X, factory calibration is not included
Zero Gain	XXXX XXXXX	Currently set zero offset and gain factor on the AI X
Sensitivity	XXX %	Sensitivity of the AI during the last calibration, related to the connected device
Maintenance Days Last	XXXX	Remaining days until maintenance during the last calibration
Operating Days Last	XXXX	Operating days during the last calibration
Maintenance Days Currently	XXXX	Current number of remaining days until next maintenance
Max. Curr. Value	XXXX	Maximum current value measured, with unit

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13.4 TEST FUNCTION OF THE ANALOG OUTPUTS

This feature is only available in Special Mode.

With the test function you can enter the value (in mA) that should be physically output.

The test function via the AT-DGC can only be applied for overridable analog outputs

If an analog output is not assigned anywhere, it is displayed as inactive and cannot be tested.

Submenu 1

Analog Output
Test Function

Submenu 2

AO 1 Preset
2.00mA 0.00mA

AO 1 Preset
4.02mA 12.00mA

AO 1 Preset
12.00mA 12.00mA

On the left, the current set point of the AO is shown. On the right, there is the default value entered by the operator.

After confirming the AO accepts the predetermined value and outputs it physically. As the current set point is transmitted again and again, the confirmation appears in the display at the left.

The warranty is valid for 5 years against all manufacturing defects. Installation instructions must be strictly observed, please refer to Aquilar Terms and Conditions available on this [link](#).

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Unit 30, Lawson Hunt Industrial Park,
Broadbridge Heath, Horsham, West Sussex,
RH12 3JR

+44 (0) 1403 216100

info@aquilar.co.uk

www.aquilar.co.uk