

Process Gas Chromatograph PGC 102

Manual

Order No. C79000-G5376-C506-5

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NOTE

For clarity reasons this Instruction Manual does not contain all detailed information on all types of chromatograph. It cannot refer to all possible cases in conjunction with installation, operation or repair either.

Should you require further information, or should particular problems occur which are not handled in sufficient depth in this Manual, help can be requested through your local Siemens office or representative.

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We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

Technical data subject to change.

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INSTALLATION

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INSTALLATION LOCATION

You must observe the following information under *Technical data*.

- Permissible ambient temperature
- Permissible relative humidity
- Power supply, power consumption
- Lightning protection
- Gas connections, gas purity
- Purging air, control air

Space requirements

Desktop version

- Sufficient space must remain on the rear panel and the right hand side for maintenance.

Rack version

- We recommend mounting on telescopic rails. Free space of at least 44,5 mm must remain above and below the chromatograph.
- With several chromatographs mounted in one cabinet, forced cooling of the cabinet is essential.
- With fixed mounting: Sufficient space must remain on the rear panel and the right hand side for maintenance.

ASSEMBLY

The following assembly operations are always required:

- Gas lines
- Sample lines
- Exhaust gas lines

- Power cable
- Signal cables

The following assembly operations may be necessary depending on the device version:

- Message printer
- Line recorder
- Valves and Status signals
- Control unit, ChromLAN
- Installation of software (see register *The software*)

Gas lines

- Material: copper or stainless steel 6 mm x 1 mm (1/8"). Only use very clean gas lines. Clean the lines before assembly if necessary
- Route the gas lines up to the chromatograph according to the piping diagram. Connect a shut-off valve upstream of each chromatograph.



CAUTION: Dummy plugs

Leave the dummy plugs on the gas inlets until you are ready to use the chromatograph. The commissioning engineer only connects the gas lines to the chromatograph when he has checked them!

Cleaning the lines

- Flush with a volatile solvent (acetone, hexane, do not use chlorinated hydrocarbons!).
- Then heat the lines whilst flushing with clean inert gas, e.g. five minutes at 200 °C. Purity of inert gas $\geq 99.999\%$.

Gas connectors

All gas connectors to the chromatograph are 1/4" Swagelok connectors.

IMPORTANT:

All device-specific connection diagrams can be found in the register *External piping and wiring diagrams*.

Sample lines

- The sample conditioning unit must be fitted close to the chromatograph so that the connection lines are short.
- The sample line to the chromatograph should have a downward gradient.



CAUTION: Filter is essential

Lifetime of injection valves decreases, if the sample contains solid particles. A filter ahead of the injection valve is essential. We recommend a filter grade

- Liquid sample: 98% for 0,3µm particles
- Gaseous s.: 99,99% for 0,1µm particles.

Siemens sample conditioning units are equipped with appropriate filters!

Exhaust gas lines

All exhaust gases of the chromatograph must be routed into a common exhaust line. The individual exhaust gas lines must have a downward gradient to the common line. Exhaust gas lines must not diminish in size!

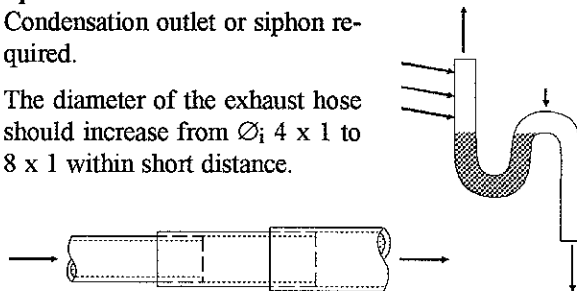
Material of common exhaust line

Stainless steel piping with i.d. of at least 12 mm (1/2") with welded-on nozzles and screwed glands. Minimum gradient 1 : 10.

Special with FID and FPD

Condensation outlet or siphon required.

The diameter of the exhaust hose should increase from $\varnothing_i 4 \times 1$ to 8×1 within short distance.



WARNING: Explosive gases

A separate exhaust gas line is necessary when using H₂ as the carrier gas in order to prevent the production of an explosive H₂/air mixture with the other outlets (e.g. split or cut).



WARNING: Poisonous samples

If the samples contain poisonous components you need exhaust lines for all detectors!



CAUTION: Radioactive!

If the chromatograph is equipped with ECD or HID: ECD and HID are radiators. They are subject to governmental supervision. Observe the regulations!

Route all exhaust gases via a common line out of the chromatograph and away from the position of use.

Observe the maximum operating temperatures of these detectors!

These detectors are marked with the corresponding label.

Power connection

The chromatograph comes along with a power cable with connector. Plug the power cable in the connector on the rear panel and secure the plug against tension using the spring clip.

The fuse must have a rating of 10 A at 230 V. The power switch is located on the front of the chromatograph at the left.

Lightning protection

To protect personnel and equipment, we recommend the installation of appropriate lightning protection equipment in areas where storms occur. Comprehensive protection necessitates the following:

- Lightning conductor
- Earthed metal belts in building to protect against electrostatic charges. This is particularly important at greater altitudes and with dry air.
- Transient suppressors in all lines leading to the chromatograph. These are available e.g. from the company Phoenix Contact.

Fitting the signal cables

All signal cables must be shielded outside the chromatograph and not shielded within the chromatograph. The shield must end at the glands on the rear panel of the chromatograph and is grounded there to the housing.

Cable type

We recommend cable twisted in pairs for TTY or 20 mA-signal lines. Example: ChromLAN, printer and analog outputs.

Connection of local message printer

A local printer can be connected to the interface *SER.1* in order to print results and/or alarms. The printer is connected directly to the PCPU-2.

The driver *UNIDRV1* must be loaded for the interface *SER.1*. DIP switches must be set on the PCPU-2. This is described under *ChromLAN with TTY*.

Your printer manual describes the interface assignment of your printer and how it is set. The printer must satisfy the following requirements:

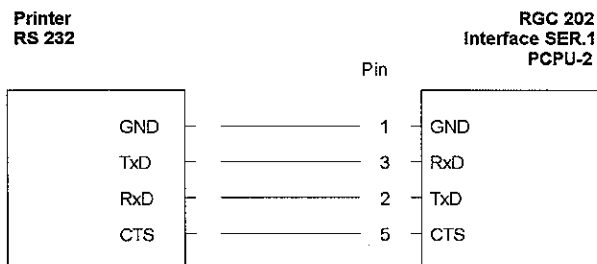
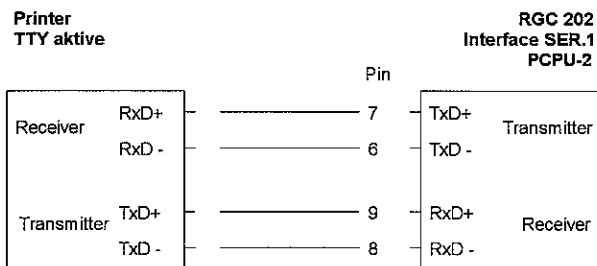
- Protocol X-ON/X-OFF
- Transmission rate 9600 baud
- Active TTY interface, i.e. the printer provides the 20-mA current loop
- Epson- or IBM-compatible

Printer with RS232 interface

If the printer only has an RS232 interface, the PCPU-2 interface *SER.1* can be switched over to RS232. The printer must be connected directly to the PCPU-2. The cable length must be less than 15 m. A DIP switch must be set on the PCPU-2. This is described under *ChromLAN with TTY*.

Printer with Centronics interface

The message printer can be connected to the Centronics interface of the control unit. It only prints if the control unit is switched on.



Connection of line recorder, use of analog outputs

Two analog outputs are present as standard. They are connected to the terminals on the rear panel.

Analog output	Channel	Terminal number	
		Output	Ground
1	A	17	18
2	B	19	20

SIMATIC modules are required for further analog outputs (4 to 20 mA). To connect these modules, refer in this register to *SIMATIC modules: Analog outputs* or in the register *External wiring diagrams*.

Setting of 0 to 20 mA or 4 to 20 mA

The two standard analog outputs can be converted from 4 to 20 mA to 0 to 20 mA. Plug-in jumpers must be repositioned on the connection board. This is described in the register *Function description of electronics*.

Connection of status messages to control room

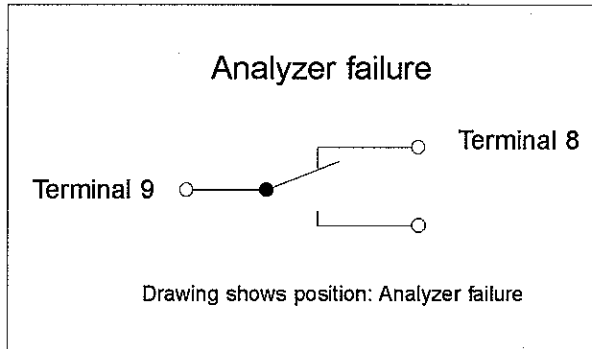
Several status messages of the chromatograph are connected as digital signals to the terminals on the rear panel. More details can be found in the register *External wiring diagrams*.

Analyzer failure

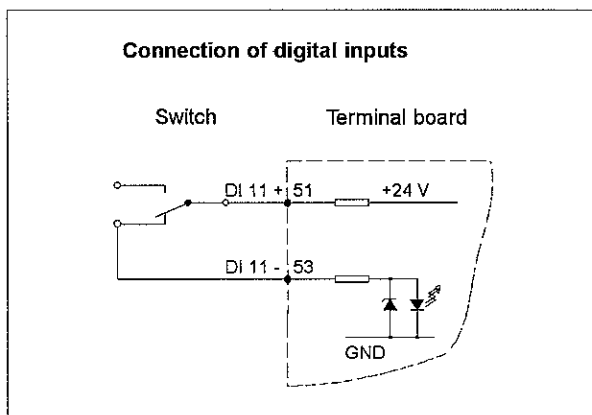
The signal *Analyzer failure* of the chromatograph is connected to the terminals as a floating contact and as well as digital output 24 V (terminal 7). You can connect this signal to a honk or lamp to the control room (see *Operation using keyboard and screen: Status*).

Maintenance request

The second digital output has the meaning *Maintenance request*. You can connect this signal to a lamp or horn in the control room (see *Operation using keyboard and screen: Status*). Please connect directly to the Simatic board.



Digital input	Use + 24 V means	Terminal	
		+	-
1	Peripheral boards faulty	-	-
2	Housing purging o.k.	-	-
3	Housing temperature o.k.	-	-
4	Gas supply o.k.	14	13
5	External unit A not ready	16	15
6	External unit B not ready	-	-
7	Reserved	-	-
8	Reserved	-	-
9	Start	-	-
10	Stop	-	-
11	Not used	-	-
12	Not used	-	-
13	Not used	-	-
14	Not used	-	-
15	Not used	-	-
16	Not used	-	-



Connection of external status signals and digital inputs

The chromatograph monitors the following status signals:

- Carrier gas pressure or supply gases
- Start delay by external device A

The status signals must be present as floating contacts. They are wired directly to the terminals on the rear panel.

16 digital inputs are present if the Simatic digital input/output board is equipped. The first 8 are for internal purposes. This is shown in the accompanying table.

Further monitoring functions can be carried out using BASIC programs.

SIMATIC boards are required for further digital inputs. To connect these modules, refer in this register to *SIMATIC modules: Digital inputs* or in the register *External wiring diagrams*.

Connection of valves and digital outputs

The stream selection valves must be connected to the SIMATIC digital outputs. Depending on the Simatic board 16 or 32 digital outputs are present. The first 8 are for internal purposes. This is shown in the following table.

SIMATIC boards are required for further digital outputs. To connect these modules, refer in this register to *SIMATIC modules: Digital outputs* or in the register *External wiring diagrams*.

Digital output	Use + 24 V means		
1	No device failure (ready)		
2	Ready		
3	Run A		
4	Run B *1		
5	Cooling on		
6	Air flaps moving		
7	Air flaps, direction: open		
8	Heater enable		
9	Available for valves		
10	Available		
11	Available		
12	Available		
13	Available		
14	Available		
15	Available		
16	Available for streams		

*1 = Not available with PGC 102

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SIMATIC modules

We additionally use SIMATIC modules in the chromatograph as signal converters for analog and digital signals. The chromatograph can then, for example:

- Switch valves via digital outputs
- Scan the switches of pressure monitors via digital inputs
- Display results in the control room via analog outputs
- Calculate values from a scale with the analytical result via analog inputs.

The following modules can be used in our chromatographs:

- | | |
|----------------------------------------------------------|----------------|
| ▪ 32 digital outputs 24 V/0.5 A | 6ES5 451-4UA12 |
| ▪ 16 digital outputs 24 V/2 A | 6ES5 453-4UA12 |
| ▪ 16 digital outputs and
16 digital inputs 24 V/0.5 A | 6ES5 482-4UA12 |
| ▪ 32 digital inputs 24 V | 6ES5 430-4UA12 |
| ▪ 8 analog outputs 0 to 20 mA | 6ES5 470-4UA12 |
| ▪ 8 analog outputs 4 to 20 mA | 6ES5 470-4UC12 |
| ▪ 8 analog inputs | 6ES5 460-4UA12 |

All modules occupy one slot in the chromatograph computer, apart from the module 453 which requires two slots.

IMPORTANT:

SIMATIC-modules only function if they are correctly addressed and if their enable input is correctly connected. The following pages show how you must wire the modules.

Inserting or removing modules

Only insert or remove SIMATIC modules with the chromatograph switched off. You thus avoid damaging the modules. In addition, SIMATIC modules do not function if they are inserted when the chromatograph is on.

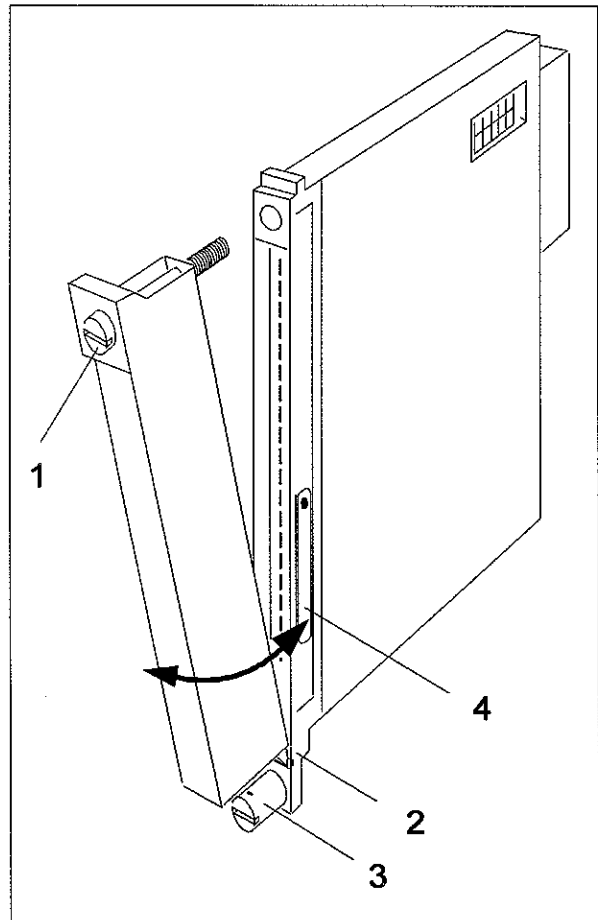
- Loosen the screw (1) on the front plug
- Swing out the top of the front plug and lift out of the bottom bearing (2)
- Rotate locking screw (3) by 90°
- Pull out the module using the handle (4). This handle is hidden. It can be extracted from below using a pointed object.

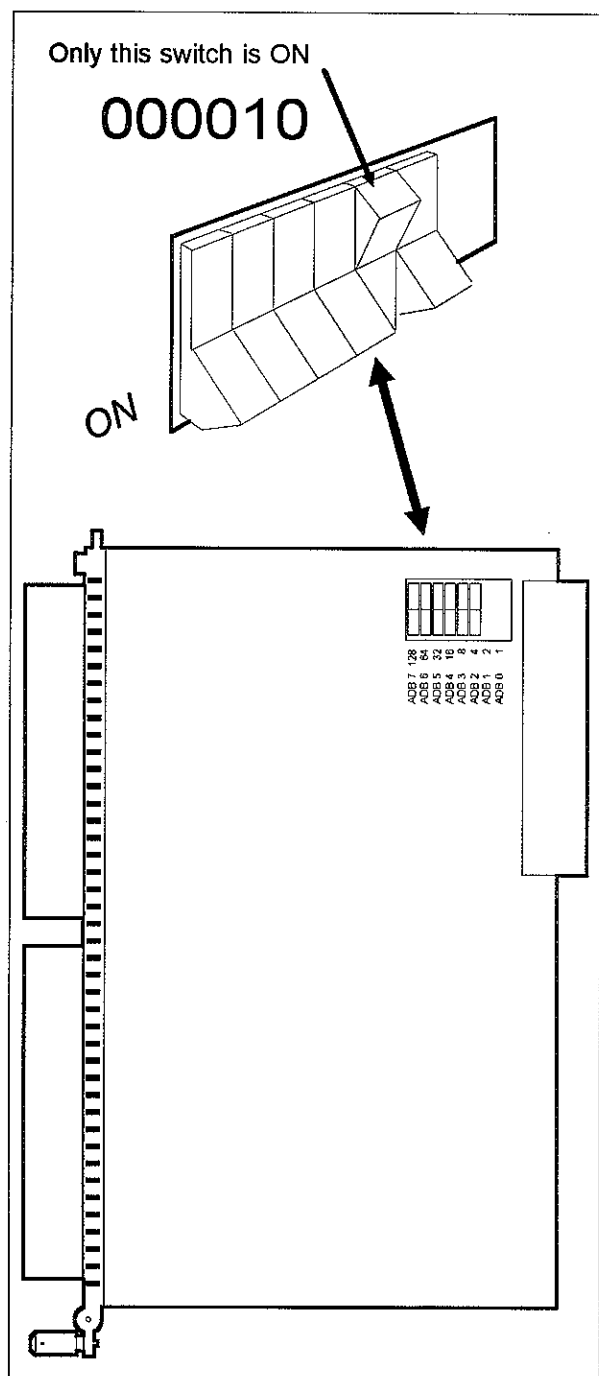
Install in the reverse order.

Electrical isolation

All inputs and outputs are electrically isolated from the module power supply which is applied at the rear. The inputs and outputs are nevertheless not electrically isolated in the chromatograph because the 24 V comes from the chromatograph power pack and all SIMATIC modules are connected to one another via their front panels.

If electrical isolation is required, use a separate module and provide an external voltage of 24 V. Individual floating digital inputs or digital outputs can be implemented using relays.





Module address

The chromatograph computer (PCPU-2) expects SIMATIC modules in a particular address area. The addressing enables several identical SIMATIC modules to be used. The computer identifies the separate modules by means of the set addresses. In addition, output modules only react to write processes and input modules to read processes.

Setting the address switches

All SIMATIC modules have an address switch. The module address is set there according to the following rules:

Address	Address switch (1 = ON, 0 = OFF)	
0	000000	First digital output module
4	000001	Second digital output module
8	000010	Third digital output module
12	000011	Fourth digital output module
0	000000	First digital input module
4	000001	Second digital input module
8	000010	Third digital input module
12	000011	Fourth digital input module
128	100000	First analog output module
144	100100	Second analog output module
160	101000	Third analog output module
176	101100	Fourth analog output module
128	100000	First analog input module
144	100100	Second analog input module
160	101000	Third analog input module
176	101100	Fourth analog input module

- Press the switches with a pointed object, but never with a pencil! Pencils leave behind conductive powder.
- The specified addresses apply to all modules, even if they are not fully configured.
- Identical modules must never be set to the same address. On the other hand, inputs are set to the same address as outputs (see table).
- Special case with module with 16 digital outputs and 16 digital inputs: no other module must have its address. This module responds like one digital output module and one digital input module where the inputs 1 to 16 and the outputs 17 to 32 are faulty.

All addresses are already set if the chromatograph application has been prepared by us.

IMPORTANT:

This description does not apply to chromatographs which have the label *edition II*.

32 digital outputs 24V/0.5 A 6ES5 451-4UA12

The chromatograph already has internal digital outputs on its terminal board. The SIMATIC digital outputs commence with the number 33. In the adjacent Fig., *Output 1* means the first output on this module.

Green lamps indicate when an output is switched on.

Connection of valves

Connect one line directly to the front plug of the digital output module, and the return line to the central ground terminal block.



CAUTION with classified valves

A fuse is required in the positive line. Refer to the conformity certificate of the valve.

Short-circuit/alarm

All outputs are electrically protected against short-circuits. A red lamp lights up if an output is short-circuited, and the module outputs an alarm. This alarm can generate the signal *Device failure* in the chromatograph (see register *Operation with keyboard and screen: Status*).

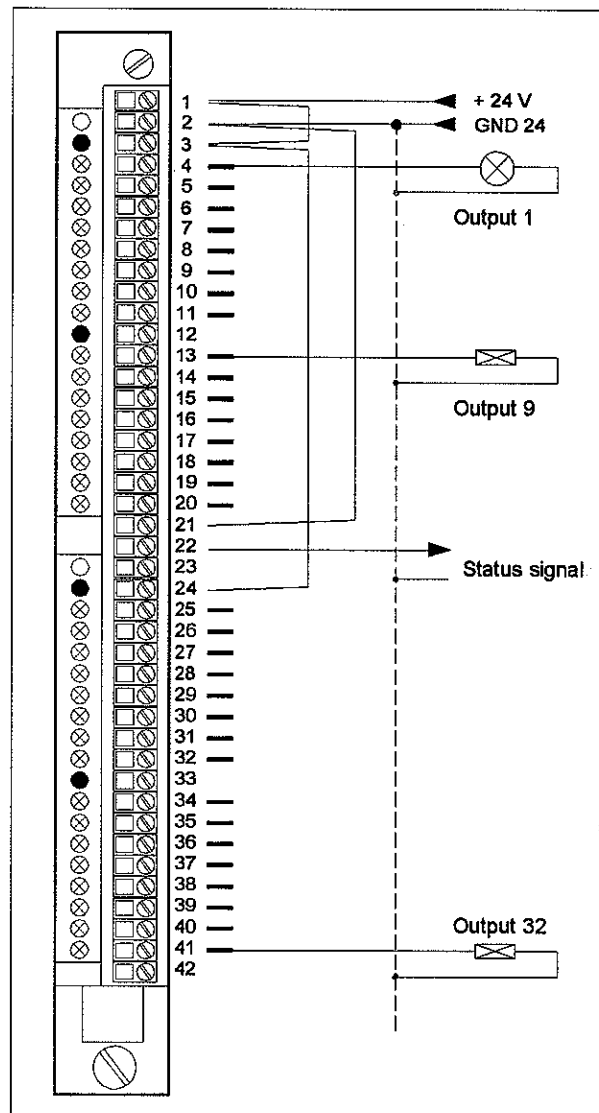
Technical data

If you require detailed technical data, refer to e.g. Catalog *ST 54.1 SIMATIC S5*.

Permissible current	5 mA to 0.5 A
Residual current with OFF	< 0.5 mA
Residual voltage with OFF	< 3 V
Voltage with ON	> $U_{24} - 1.5$ V
Permissible cable length	< 400 m
Slots required	1

Do not connect digital outputs in parallel!

Digital outputs must not be connected in parallel if you wish to switch valves which require more than 0.5 A. A more powerful module must be used.



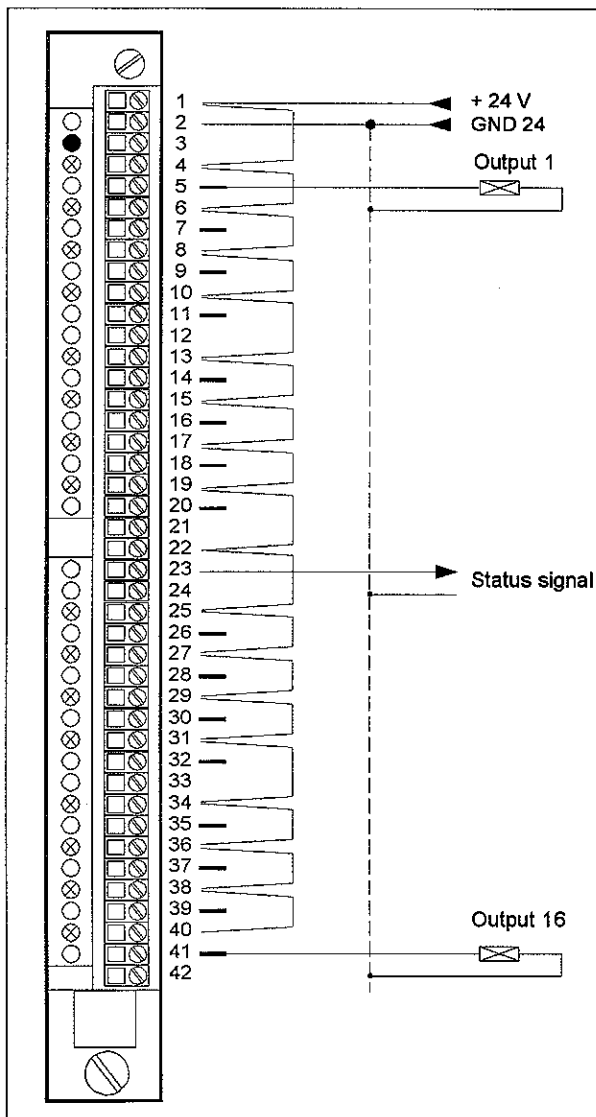
16 digital outputs 24V/2 A 6ES5 453-4UA12

Apart from the technical data, the same comments apply as to the module 6ES5 451-4UA12.

Technical data

If you require detailed technical data, refer to e.g. Catalog *ST 54.1 SIMATIC S5*.

- Permissible current 10 mA to 2 A
- Residual current with OFF < 1 mA
- Residual voltage with OFF < 3 V
- Voltage with ON > $U_{24} - 2.5 \text{ V}$
- Permissible cable length < 400 m
- Slots required 2



16 digital outputs 24V/0.5 A
16 digital inputs
6ES5 482-4UA12

This module responds like one digital output module and one digital input module where the inputs 1 to 16 and the outputs 17 to 32 are faulty.

IMPORTANT:

In addition to the address switch, the module contains a plug-in jumper X20 and a slide switch S2.

Switch S2 must always be in position 1. It switches over between the local bus (position 2) and the S5 bus (position 1).

If the jumper X20 is open, the module is enabled independent of the front plug wiring. If the jumper X20 is inserted, the connection from 1 to 2 is required in the front plug.

Connection of valves

Connect one line directly to the front plug of the module, and the return line to the central ground terminal block.

Connection of switches

Connect one line directly to the front plug of the module, and the return line to the central +24 V terminal block.

Short-circuit/alarm

All outputs are electrically protected against short-circuits. A red lamp lights up if an output is short-circuited, and the module outputs an alarm. This alarm can generate the signal *Device failure* in the chromatograph (see register *Operation with keyboard and screen: Status*).

Technical data

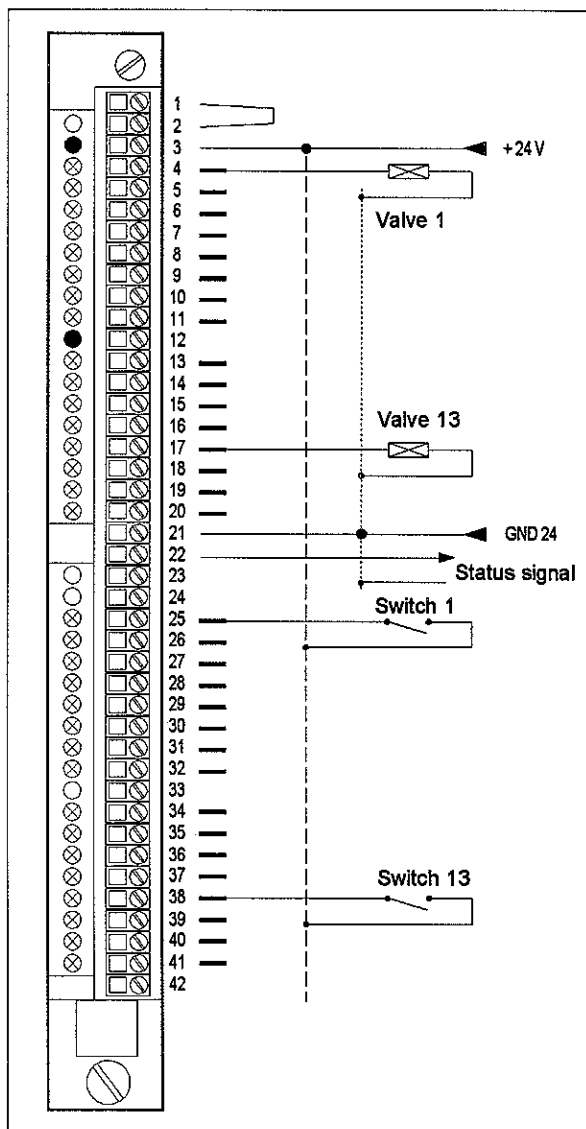
If you require detailed technical data, refer to e.g. Catalog ST 54.1 SIMATIC S5.

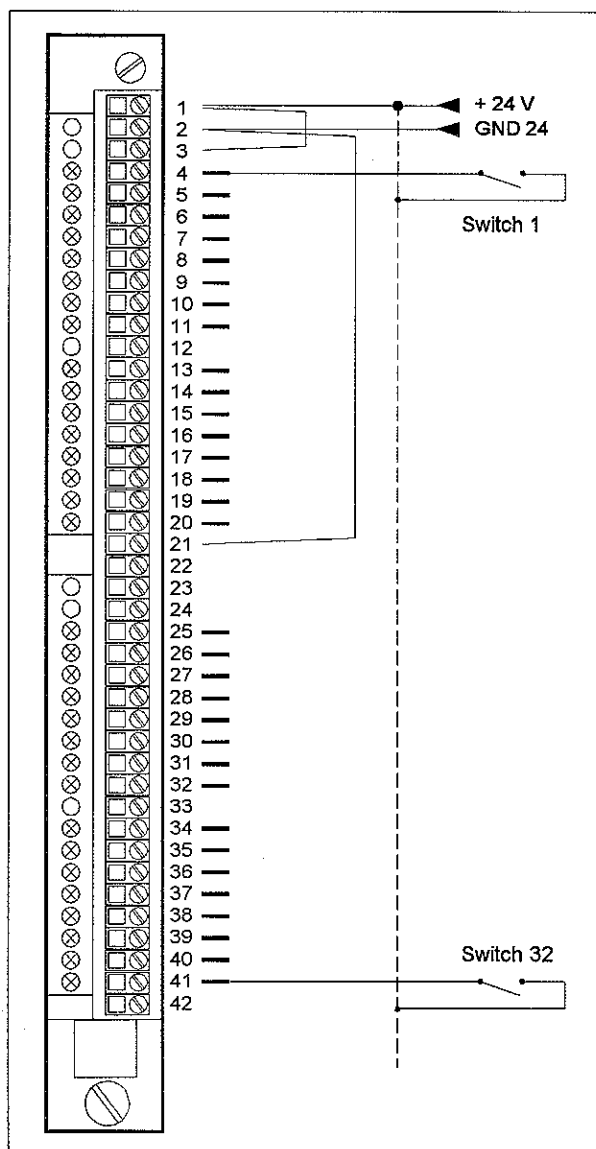
16 digital outputs

- Permissible current 5 mA to 0.5 A
- Residual current with OFF < 0.5 mA
- Residual voltage with OFF < 3 V
- Voltage with ON > U₂₄ - 1.5 V
- Permissible cable length < 400 m

16 digital inputs

- Voltage for signal 0 33 to + 5 V
- Voltage for signal 1 + 13 to + 33 V
- Input current with signal 1 8.5 mA
- Permissible cable length < 50 m
- Slots required 1





32 digital inputs 6ES5 430-4UA12

Digital inputs can be used to import status signals into the chromatograph. Example: carrier gas pressure monitoring.

The signal status of the digital inputs is identified by green lamps on the module.

Connection of switches

Connect one line directly to the front plug of the module, and the return line to the central +24 V terminal block.

Technical data

If you require detailed technical data, refer to e.g. Catalog *ST 54.1 SIMATIC S5*.

32 digital inputs

- Voltage for signal 0 33 to +7 V
- Voltage for signal 1 +13 to +33 V
- Input current with signal 1 7 mA
- Permissible cable length
 - Unscreened < 600 m
 - Screened < 1000 m
- Slots required 1

8 analog outputs

0 to 20 mA: 6ES5 470-4UA12

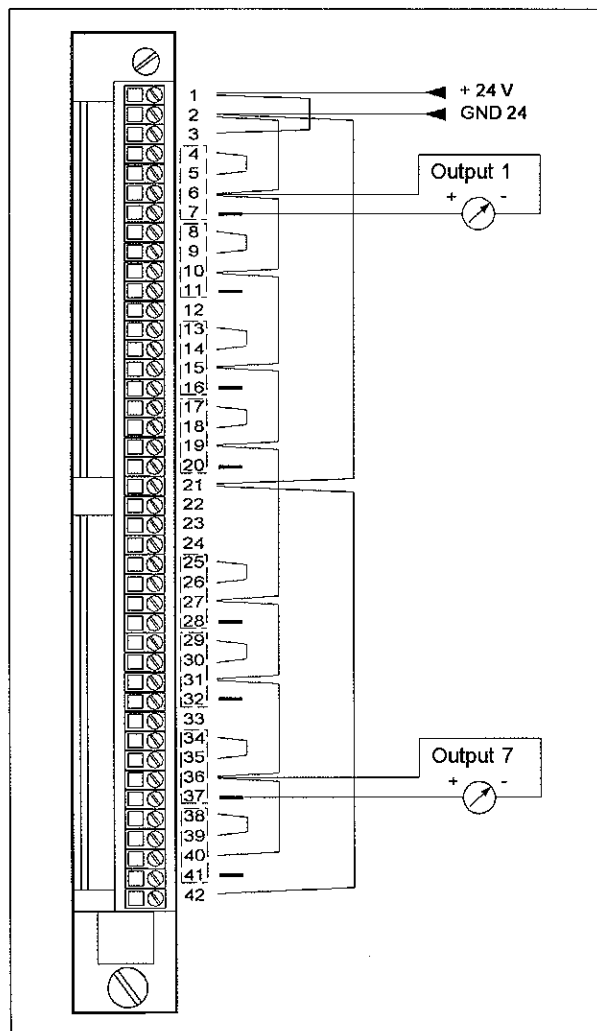
4 to 20 mA: 6ES5 470-4UC12

The chromatographs have two to four analog outputs as standard, e.g. for displaying chromatograms. Additional SIMATIC outputs can be used with BASIC programs, e.g. for recording the trends of component results.

Technical data

If you require detailed technical data, refer to e.g. Catalog *ST 54.1 SIMATIC S5*.

▪ Resolution	10 bits
▪ No-load voltage	18 V
▪ Max. load	300 Ω
▪ Short-circuit-proof	Yes
▪ Permissible cable length	< 200 m
▪ Slots required	1



8 analog inputs 0/4 to 20 mA

6ES5 460-4UA12

The analog inputs can be used to calculate process signals with the results of the chromatograph or to print them out together in a log.

Range submodules

Two range submodules are required for each group of four inputs in addition to the basic module. All unused inputs must be equipped with a range submodule! There are submodules for voltages, currents and temperatures. Only the following range submodules will be described here:

- 0 to 20 mA 6ES5 498-1AA41
- 4 to 20 mA 6ES5 498-1AA71 (four-wire!)

You can find the technical data of the other range submodules in e.g. Catalog *ST 54.1 SIMATIC S5*.

NOTE:

The 4 to 20 mA submodule is also available as a two-wire version. This is only suitable if the sensor is passive and obtains its power supply via the 20-mA line. This is usually not the case.

Setting of mode switches

There are two mode switches on the module. The following setting applies to the current measurement. It may be necessary to set other modes when using other range submodules.

- Mode switch I

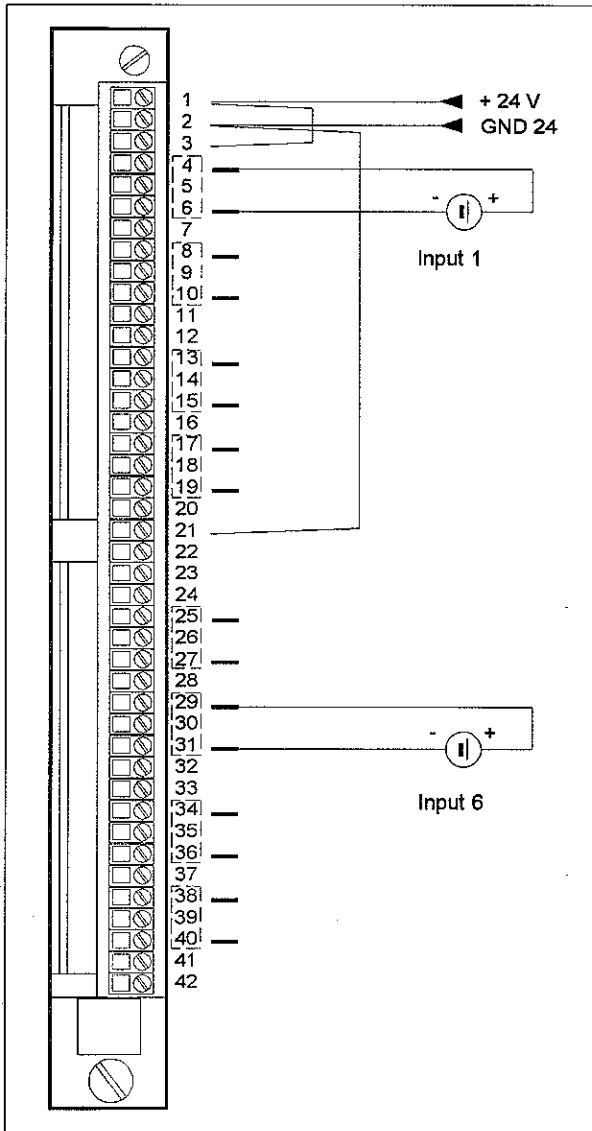
50 Hz mains frequency	01000000
60 Hz mains frequency	00000000
- Mode switch II 10001001

1 means *ON*, 0 means *OFF*. To switch a function *ON* you must press the switch at *ON*. This may be upper or lower position depending on switch model and board version. The print on the board is only valid!

Press the switches with a pointed object, but never with a pencil! Pencils leave behind conductive powder.

IMPORTANT:

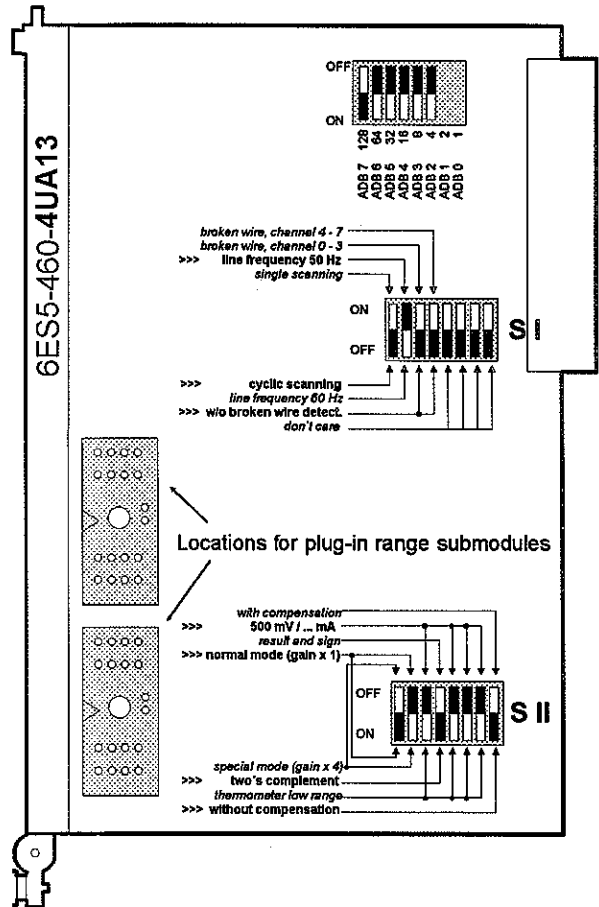
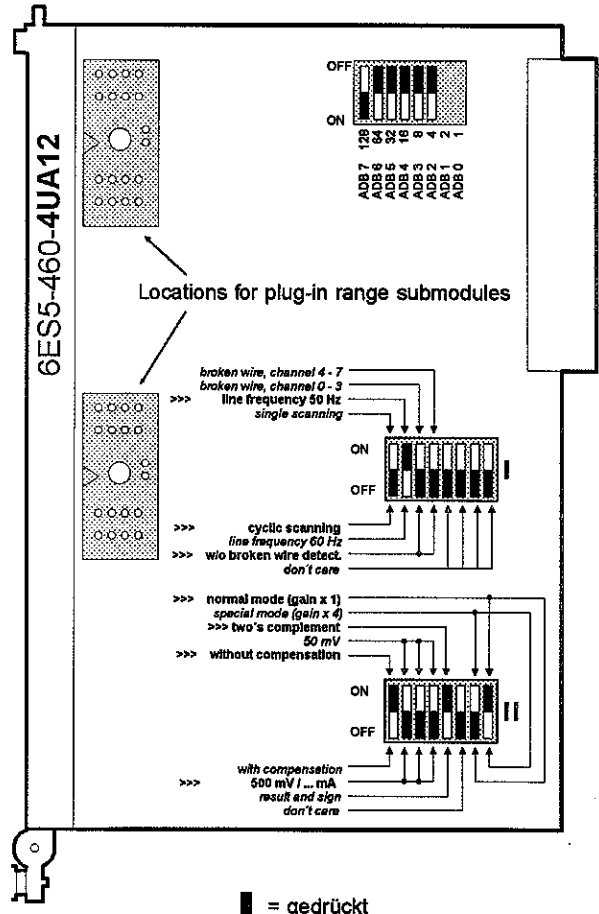
With the board -4UA13 the mode switch S II is rotated 180°! So the lower position is *ON* and the pattern shown above must be reversed: 10010001.



Technical data

If you require detailed technical data, refer to e.g. Catalog *ST 54.1 SIMATIC S5*.

- | | |
|------------------------------|--------------------|
| ■ Rated range | 0/4 to 20 mA |
| Overload range | 0/4 to 40 mA |
| ■ Resolution | 0 mA 0 units |
| | 4 mA 512 units |
| | 20 mA 2048 units |
| ■ Max. input voltage | 18 V |
| ■ Relay multiplexer | |
| Cycle time for 8 inputs | 0.48 s at 50 Hz |
| ■ Integration time | 20 ms at 50 Hz |
| | 16.67 ms at 60 Hz |
| ■ Max. shielded cable length | < 200 m |
| ■ Slots required | 1 |



CONNECTION OF CONTROL UNIT

The control unit is an IBM-compatible personal computer. It can be permanently connected to the chromatograph, or it can be transported from chromatograph to chromatograph and only connected for a short time. In addition, more than one chromatographs can be operated using one control unit if they are in a network.

Every chromatograph has four serial interfaces on the PCPU-2 via which all chromatograph parameters can be accessed:

SER. 1	TTY or RS232
SER. 2	TTY or RS232
SER. 3	RS485 or RS232
SER. 4	RS485 or RS232

- With PGC 302 SER. 1 is connected as a TTY interface, SER. 3 and SER. 4 are connected as RS485 interfaces to the terminal board for fixed wiring.
- With RGC 202 SER. 2 is connected as a RS232 interface to the front of the chromatograph, SER. 3 and SER. 4 are connected as RS485 interfaces to the terminal board for fixed wiring.

Local connection of control unit using prepared RS 232 cable

Connect the plug *PCPU* to the socket *V.24* at the front of the chromatograph (RGC 202) or to the socket *SER.2* at the PCPU respectively (PGC 302). Connect the other end to the socket *com1*: of the control unit.

NOTE:

The cable is included in the delivery if you have ordered the control unit from us together with the chromatograph.

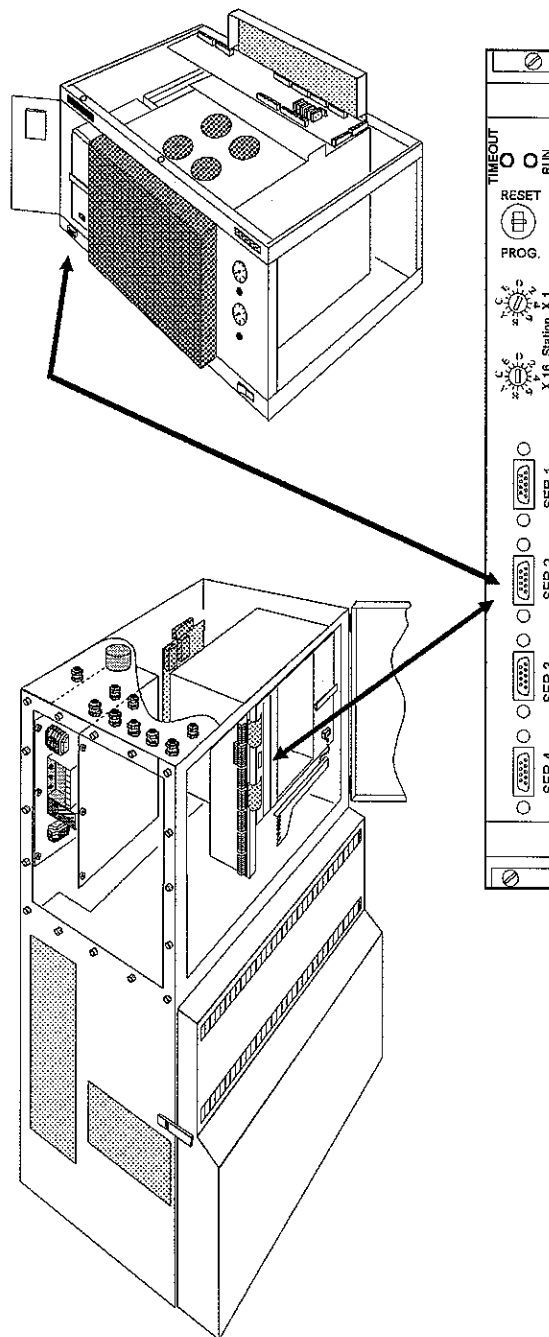


WARNING: Explosion protection

You require permission if you wish to transport a laptop through the potentially hazardous atmosphere or if you wish to open a chromatograph in a division 1 area.

Permanent local installation of control unit

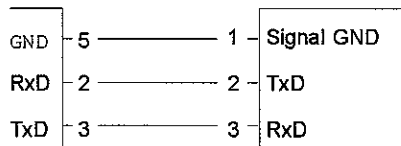
The pin assignments of the RS232 interface are described in your control unit manual. Connect the cable according to the following diagram:



PGC 302
Interface SER.2
9 pin socket

Control unit
RS232 / COM1:
9 pin socket

RGC 202
Socket at front
9 pin socket



Cable:
9 pin D-Sub female <----> 9 pin D-sub male

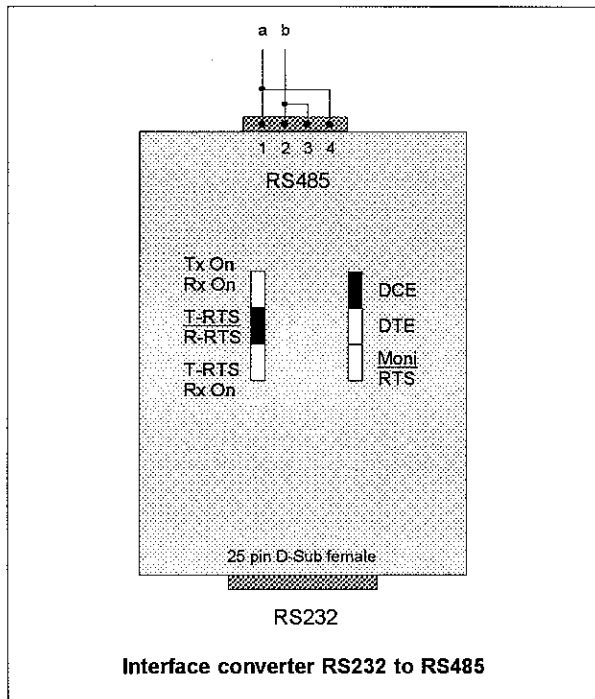
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ChromLAN networks

There are so many possibilities for generating networks with ChromLAN that no generally-applicable rules can be specified here. Anyhow we differentiate TTY networks and RS485 networks. You can find more details on the networking facilities in the register *Software and networking*.

Please also read the following topics on the next pages:

- Pin assignments of PCPU interfaces *SER. 1* to *SER.4*
- Participant number of chromatograph in network
- Loadable interface drivers
- Adjustment of transmission rate (baud rate)

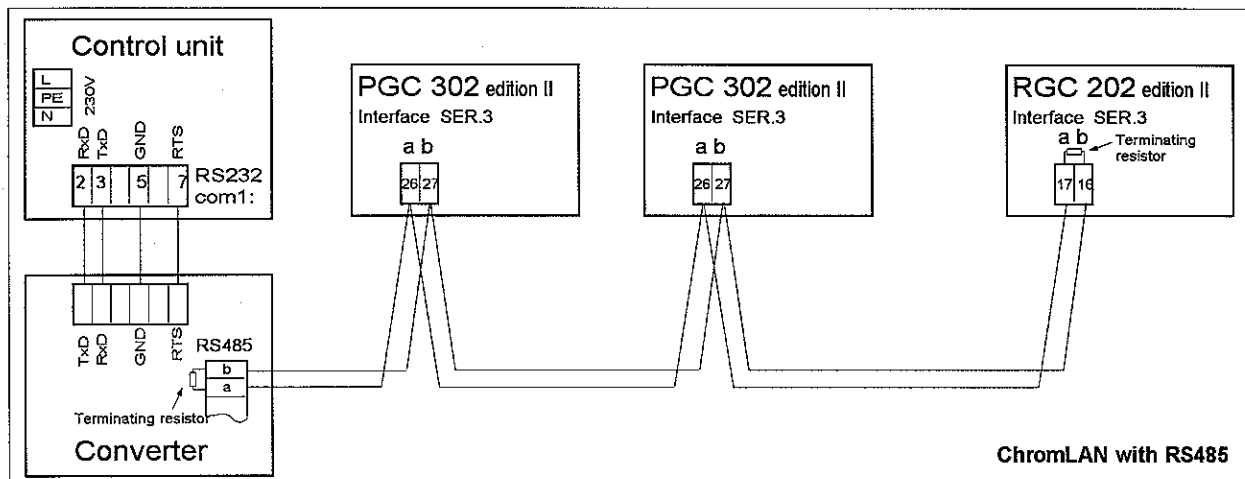


Interface converters

Because the control units do not have RS485 interfaces, the RS232 interface of the control unit must be converted.

- Set switches at the converter as shown in the drawing.
- Connect interface converter to socket *com1:* of the control unit. The cable is included in the delivery of the converter.
- Connect the chromatographs to the converter. The number of chromatographs connected to one converter must not exceed 15. For connection diagram please refer to register *External piping and wiring diagrams*.
- On every chromatograph: adjust rotary switch for participant number in network. All chromatographs must have different participant numbers!
- With RS485 networks: activate terminating resistor on the PCPU-2 of the last chromatograph.
- Connect power cable of the converter or power supply respectively to power socket.

Below is an example of how the control unit, interface converter and chromatographs must be connected together.



Permissible cable length

	RS485	TTY
Permissible cable length	1500 m	9600 Baud: 400 m 4800 Baud: 1000 m 2400 Baud: 2500 m
Recommended cable	shielded, 2 x twisted in pairs 2 x 0,2 ² LiFYCY	shielded, 2 x twisted in pairs 2 x 2 x 0,5 ²

HINWEIS:

The permissible cable length with TTY depends on the baud rate. Note that the maximum distance is only half the value because there is a forward line and a return line!

Pin assignments of PCPU interfaces SER. 1 to SER. 4

Standard	Signal	Pin number on 9-pin plug of PCPU-2 for			
		SER.1	SER. 2	SER. 3	SER. 4
RS232	GND	1	1	1	1
	TxD	2	2	2	2
	RxD	3	3	3	3
	CTS	5	5	5	5
	DCD			6	6
	RTS			7	7
TTY	TxD-	6	6		
	TxD+	7	7		
	RxD-	8	8		
	RxD+	9	9		
RS485	a			8	8
	b			9	9
Voltage	+5V	4	4	4	4

All connectors on PCPU-2 are 9 pin D-Sub, female

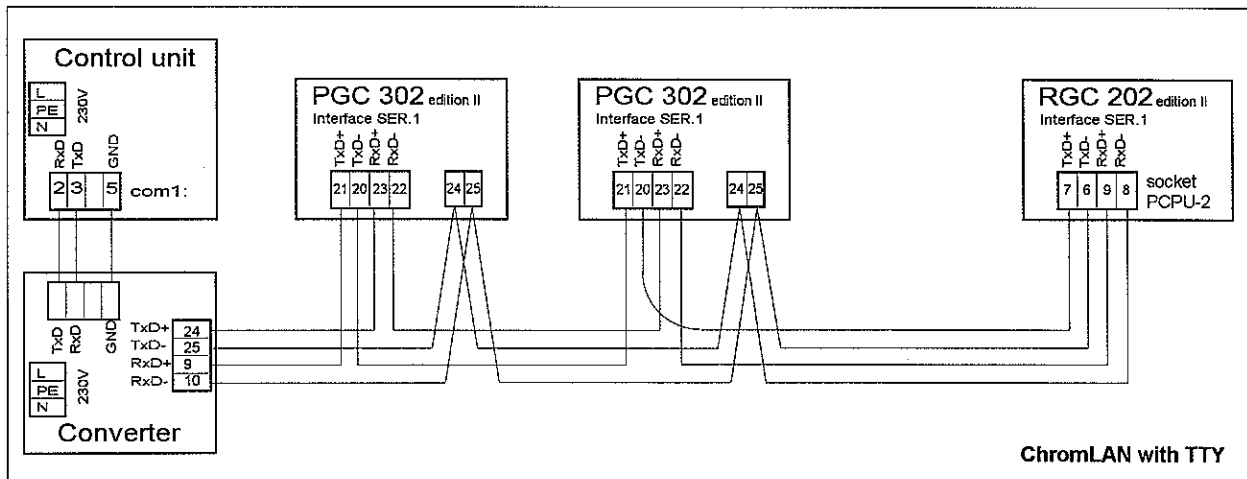
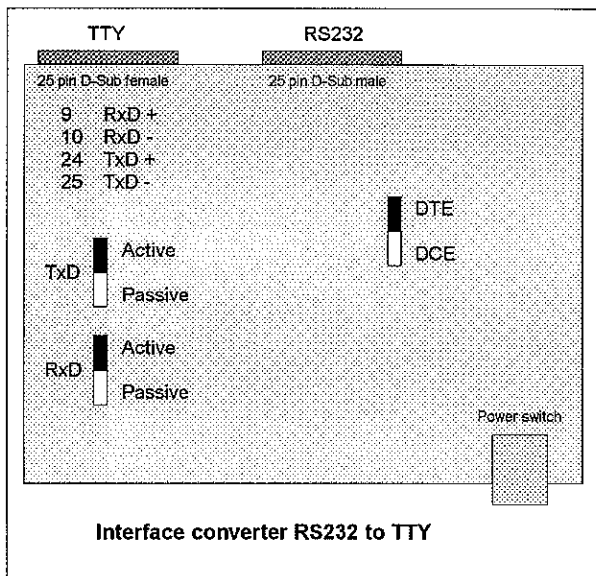
Terminals for interfaces

RS485: SER. 3 and SER. 4

TTY: SER. 1 (PGC 302 edition II only)

Signal		PGC 302 edition II Terminal board			RGC 202 edition II Terminal board	
		SER.1	SER.3	SER.4	SER.3	SER.4
RS485	a		26	28	17	19
	b		27	29	16	18
TTY	TxD-	20				
	TxD+	21				
	RxD-	22				
	RxD+	23				
	Looping points	24				
		25				

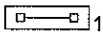
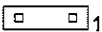
Terminals 24 and 25 are used as connection points for cables which must be looped through.

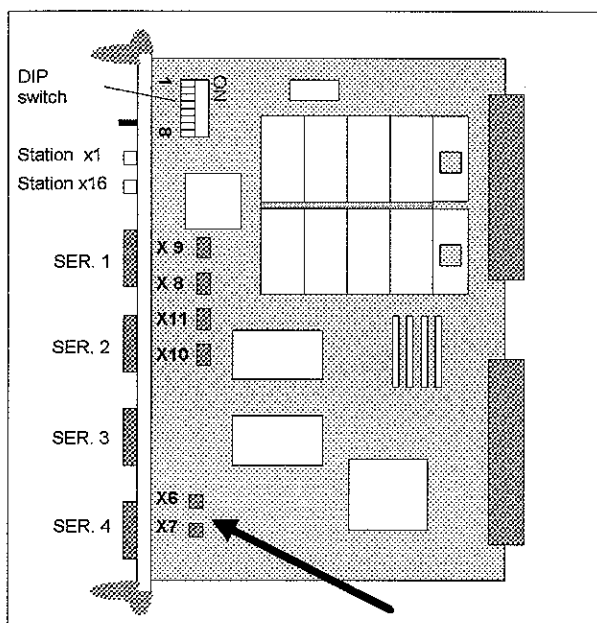


Terminating resistors

RS485 lines must be terminated at both ends with 120-Ω resistors in order to prevent reflections. These resistors are fitted on the interface converter and the PCPU-2. They must be switched on using DIP switches. This is normally carried out on the interface converter of the control unit and on the PCPU-2 of the chromatograph which is farthest away.

PCPU-2 interface	Jumpers
SER. 3	X6
SER. 4	X7

with	without terminating resistor
	



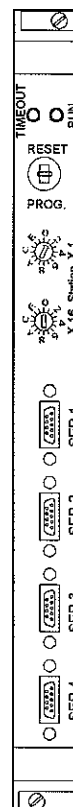
Participant number of chromatograph in network

There are two rotary switches *STATION x1* and *STATION x16* on the PCPU-2. The chromatograph number in the network is set on these switches. Numbers from 1 to 15 are valid.

Always set the switch *STATION x16* to 0, and set a number from 1 to 15 on the switch *STATION x1*. The letters *A, B, C, D, E, F* correspond to the numbers 10 to 15.

Local operation

The participant number in the network is also effective if you wish to operate locally with the laptop. Only exception: if a ChromLAN network is not operated on the interface *SER. 2*, the driver *UNIDRV2* is loaded there. The chromatograph then always has the participant number 1 at the interface *SER. 2*.



CAUTION:

A participant number of 00 must not be set!
The PCPU-2 is in service mode if both switches are set to 0.

Loadable interface drivers

There are loadable drivers for all four interfaces. These are loaded into the PCPU-2 when the control software is programmed. Refer to *The software: Installation of software*.

- Supplied PCPU-2 status without control software:

Interface	Standard	Baud rate
SER. 1	RS232	9600 baud
SER. 2	RS232	9600 baud
SER. 3	RS232	9600 baud
SER. 4	RS232	38400 baud

- Standard drivers loaded:

Interface	Driver	Purpose
SER. 1	UNIDRV1	ChromLAN or printer
SER. 2	UNIDRV2	Laptop, participant number 1
SER. 2	TTYCLAN2	ChromLAN
SER. 3	485CLAN3	ChromLAN
SER. 4	485CLAN4	ChromLAN

With the driver *UNIDRV2*, the chromatograph always has the participant number 1, independent of the switches *Station*.

Setting of SER. 1 and SER. 2 to TTY or RS232

The interfaces *SER. 1* and *SER. 2* can be set to TTY or RS232 using DIP switches on the PCPU-2.

■ Interface SER. 2

Switch	On/off	Meaning
DIP 2	OFF	TTY
DIP 2	ON	RS232

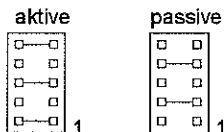
■ Interface SER. 1

Switch	On/off	Meaning
DIP 4	OFF	TTY
DIP 4	ON	RS232

Setting of TTY to active/passive

The interfaces *SER. 1* and *SER. 2* can be operated as TTY interfaces. The plug-in jumpers *X8* to *X11* can be used to set the current source separately for the transmit and receive loops. Also refer to the register *Networking: Various serial interfaces*.

Interface		Jumpers
SER. 1	Transmitter	X8
SER. 1	Receiver	X9
SER. 2	Transmitter	X10
SER. 2	Receiver	X11



The delivered status for both interfaces is *passive*. This setting also acts on the terminals for interfaces A and B.

Setting of SER. 1 for local printer or ChromLAN

If the driver *UNIDRV1* is loaded for the interface *SER. 1*, a DIP switch on the PCPU-2 can be used to set whether a local message printer is connected to this interface or whether a ChromLAN is to be operated there.

Switch	On/off	Meaning
DIP 3	OFF	Local printer
DIP 3	ON	ChromLAN

Adjustment of transmission rate (baud rate)

The transmission rates can be adjusted in three different manners:

Control unit interfaces

The interfaces *com1:* and *com2:* of the control unit can be adjusted using the software installation program. Refer to *The software: Parameterization of control unit*.

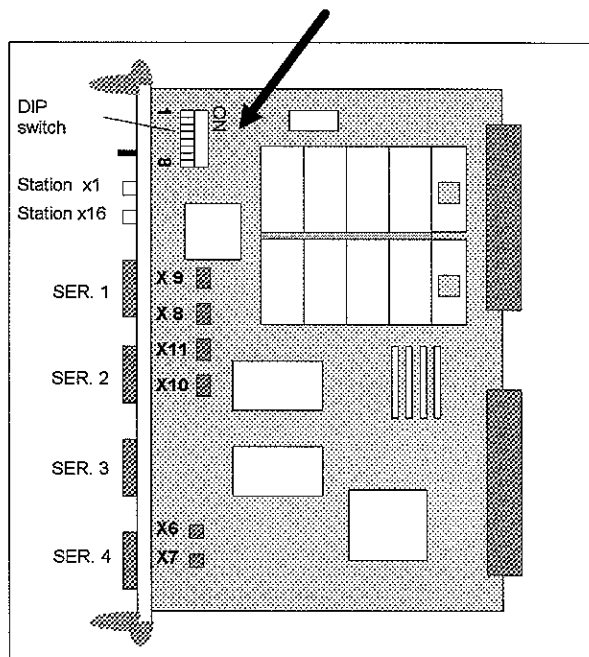
PCPU-2 interfaces SER. 1, 3, 4

The baud rates can only be adjusted using the configuration software. A matching interface driver must be programmed.

PCPU-2 interface SER. 2

The baud rate can only be adjusted on the DIP switch on the PCPU-2. The DIP switches are scanned by the driver software.

Switch	On/off	Meaning
DIP 1	OFF	9600 baud
DIP 1	ON	4800 baud if TTY 38400 baud if RS232



IMPORTANT:

When delivered, the DIP switch is set to 00000000. Switches 5 to 8 must always be switched off in normal operation. Only positions xxxx0000 are permissible when operating the chromatograph.

TECHNICAL DATA

Climatic conditions

- Permissible ambient temperature 5 to 35 °C
- Permissible storage temperature -30 to 70 °C
- Permissible relative humidity
 - With FID, FPD, ECD, HID Max. 80 % at 25 °C
 - Max. 60 % at 35 °C
 - With TCD Max. 90 %
- Protection against dust and humidity to EN 60529 / VDE 0470, part 1 / IEC 529 IP 22

Power supply

- Power supply 230 V +10 % -15 %, 48 to 63 Hz
- Power consumption Max. 1,3 kVA in the heating-up phase
- External mains fuse 10 A

Dimensions and weights

- Dimensions (Desk) in mm (w x h x d) 506 x 353 x 422
- Dimensions (Rack) 483 x 311 x 422
- Weight Approx. 25 kg

Electromagnetic compatibility

- Radiointerference suppression To VDE 0875 / EN 55011 / CISPR 11, limit class B
- EMC To DIN VDE 0843 / IEC 801, Part x
 - Conducted interferences on AC power supply lines
 - To Part 4 (burst) 2 kV
 - To Part 5 (µs pulses), line against line 1 kV
 - To Part 5 (µs pulses), line against earth 2 kV
 - Conducted interferences on signal lines
 - To Part 4 (burst) 1 kV
 - Interference immunity to discharges of static electricity
 - To Part 2 (ESD) 8 kV
 - Interference immunity to fields
 - To Part 3 10 V/m

Safety

- Electric safety DIN VDE 0411 / IEC 1010
- Safety isolation of low-voltage circuits from power supply circuits DIN VDE 0100, part 410
DIN VDE 0106, part 101

Oven

- Number 1
- Air circulation No
- Dimensions (w x h x d) 222 x 232 x 90 mm³
- Max. heating capacity 1200 VA
- Temperature range 60 °C to 180 °C
- Temperature stability at const. ambient temp. ± 0.1 K
- Temperature accuracy ± 3 K
- Temperature gradient along the column ≤± 2 K
- Max. warming-up time 60 min from 20 to 180 °C

Columns and gases

- Column type Packed columns with 3 or 4 mm (1/8") diam.
Capillary columns with 0.20 to 0.53 mm internal diam.
- Column switching Multi-dimensional chromatography with backflushing and live cutting for packed and capillary columns, or with valve switching for packed columns
- Gas connections 1/4"
- Gas purity (minimum requirements) ≥ 99.999 %

Control air and purging air

- Type of gas Compressed air, free of oil, water and dust
- Pressure 4 to 6 bar
Control air at least 2 bar above carrier gas pressure
- Permissible relative humidity Dew point more than 5 K below the lowest ambient temperature

Sample

- Solid particles in liquid samples < 0,3µm
in gaseous samples < 0,1µm

Detectors

FID

- Detection limit for hydrocarbons referred to carbon 2×10^{-12} g/s
- Dynamic response 10^7
- Automatic ignition
- Max. operating temperature 400 °C
- Combustion and carrier gases 20 to 60 ml/min (H₂, N₂, He, Ar)
- Combustion air 0.4 l/min

FPD

- Detection limit for Sulphur 2×10^{-11} g/s
- Detection limit for Phosphorus 9×10^{-13} g/s
- Sulphur characteristic Approx. quadratic
- Linear range for Phosphorus 10^5
- Max. operating temperature 300 °C
- Carrier gas 10 to 40 ml/min (N₂, Ar)
- Combustion gas 60 to 80 ml/min (H₂)
- Combustion air 100 to 150 ml/min

TCD

- Detection limit for Ethane in H₂ at width at half peak height = 6 s 3×10^{-9} g/ml (2 ppm)
- Linear range $\geq 10^4$
- Cell volume, standard/micro 0.35 ml / 70 µl
- Max. operating temperature 200 °C
- Carrier gas 10 to 60 ml/min (H₂, N₂, He, Ar)

ECD

- Detection limit for Lindane 5×10^{-14} g/s
- Linearity $>10^3$
- Max. operating temperature, non-classified 350 °C
- Activity (Ni 63) 370 MBq
- Purging gas and carrier gas (N₂, 95 % argon/5 % methane) Total 15 to 50 ml/min

HID

- Detection limit for Methane 5×10^{-11} g/s
- Linearity $>10^4$
- Cell volume 50 µl
- Max. operating temperature 120 °C
- Activity (Tritium) 15 GBq
- Carrier gas (He 6.0) 30 ml/min

Katalysts

Hydrogenating reactor (Methanizer)

- Catalyst various
- Max. operating temperature 400 °C

O-FID (Combined reactor)

- Detection limit for O₂ 6×10^{-11} g/s
- Linearity $> 10^4$
- Selectivity for O₂ (O/C) 10^6
- Carrier gas 1 to 15 ml/min (He, N₂)
- Hydrogenating gas 30 to 40 ml/min (H₂)

Injection

Liquid injection valve

- Injection volume 0.6 to 9.5 µl
- Vaporization temperature 60 to 400 °C
- Sample pressure 0,1 to 50 barg

Diaphragm valve

- Injection volume 0.2 to 2 ml
- Max. operating temperature 160 °C
- Sample pressure 0,9 to 2 barg below control air pressure

Rotary slide valve

- Injection volume 0.01 to 10 ml possible
- Max. operating temperature 220 °C
- Sample pressure 0 to 20 barg

Electronics

CPU

- **Microprocessor** Intel 80C186-16
- **Clock** 12.5 MHz
- **Dynamic RAM** 512 Kbyte
- **Flash-EPROM** 431 Kbyte
- **Software** Loadable from control unit

Interfaces

- **Number** 2 x TTY or RS 232
2 x RS 485 or RS 232
- **Transmission rate** Up to 38400 baud,
adjustable in software
- **Loadable drivers** RK512, D3964R, Modbus,
message printer, local operation
- **Networking** ChromLAN, redundant also possible
- **Control system coupling** TelepermM (RK512)
Honeywell (Modbus)

Inputs/outputs: basic configuration

- **Digital outputs 24V/0.5 A** 16, 8 of which for optional use
- **Digital inputs** 16, 8 of which for optional use
- **Analog outputs** 2 x 0/4 to 20 mA, 750 Ω max. load,
10-bit resolution
- **Vacant slots** 1 x single width (with one detector)

Extensions: SIMATIC boards

- **32 digital outputs** 24 V / 0.5 A
- **16 digital outputs** 24 V / 2 A, double width
- **32 digital inputs** 24 V
- **16 digital outputs and 16 digital inputs** 24 V / 0,5 A
24 V
- **8 analog outputs** 0 to 20 mA or 4 to 20 mA
300 Ω max. load, 10-bit resolution
- **8 analog inputs** 0/4 to 20 mA, 12-bit resolution
input impedance 25 Ω

Recommended control unit

- **IBM-compatible personal computer** Desktop or Laptop
- **Processor** 80386SX or larger
- **Clock** ≥ 33 MHz
- **Hard disk** ≥ 40 MB
- **Floppy disk drive** 3.5" / 1.44 MB
- **Grafic adapter** VGA, EGA, CGA
- **Interfaces** 2 x serial
1 x parallel
- **RAM** ≥ 640 kB
- **Operating system** MS-DOS 6.2
- **Mouse** For chromatogram operations

Control

- **Sample streams** Max. 32
- **Sample sequence** 32 lines, sample enable list
- **Analytical method** One in the chromatograph
Any number in the control unit
- **Time events program** 2 x 55 lines
- **Clock time program** 16 lines
for valves and BASIC programs
- **Chromatogram on the recorder** 2 channels
- **Status display** Freely selectable using status form for
digital output *Alarm*,
digital output *Maintenance request*
and for printer
Approx. 80 individual messages: Controllers, detectors,
analysis control, gas supply,
housing temperature, BASIC programs,
peripherals, automatic updating
- **Status output 24 V/0,4 A** Run
- **Failure signal** floating contact, max. 1 A/60 V
- **Status input 24 V** External start,
external device not ready, Gas supply

Two-channel evaluation

- **Evaluation procedure** Area normalization
External standard
100 % for all peaks in the component list
100 % for all measured peaks
Internal standard
- **Chromatogram display** On the screen
Mouse operation
Peak markers, names, retention times
Zoom with pilot chromatogram
- **Peak recognition** Automatic, can be parameterized
- **Peak separation** Perpendicular or tangent
- **Component list** 2 x 64 components
- **Results** ASCII file
- **Raw data** Compressed for storage of chromatogram
Uncompressed for new calculation in control computer
- **Result log** Optional design using BASIC
- **Trend recording** With BASIC and analog outputs
- **Calibration** Manual,
automatic updating
- **BASIC, possible applications** Calculation of results,
determination of status,
calculation of external signals
via analog and digital inputs