ATMION™

WIDE-RANGE-MANOMETER

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Manual

ATMION™ Wide Range Manometer

Standard Version and Compact Version

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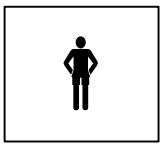
1. Safety

1.1 Basic Safety Instructions

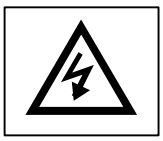
- All servicing and repairing works must be done by qualified personnel.
- Follow the instructions for servicing and repairing works.
- Observe all safety regulations (EN 61010).

1.2 Signs



Qualified personnel only!

Attention, danger!



Attention, electric danger!

User information!

1.3 General Regulations and Warranty

VACOM GmbH warrants that the *ATMION*™ Wide Range Manometer will be free of defects in material and / or workmanship for a period of one year. During the warranty period, VACOM GmbH will correct any defects in material or workmanship free of charge.
The warranty covers only normal use. VACOM GmbH does not warrant or cover damage of the gauge caused by misuse, such as breaking of the Pirani wire, burning out of the filaments, or bending of the gauge body. The warranty basically does not cover any consequential damage. This warranty cannot cover any work or change carried out by the customer, which extend the normal use of the *ATMION*™ Wide Range Manometer.
The *ATMION*™ has to be sent back in the original packing and the return shipment has to be pre-paid by the customer. Transport damage will not be covered by the warranty. VACOM GmbH reserves the right to decide on replacement or reconditioning of the *ATMION*™ Wide Range Manometer.

In order to be entitled to warranty, the *ATMION*™ Wide Range Manometer has to be sent back in the original packing.

2. Description

2.1 In General

The *ATMION*™ Wide Range Manometer provides pressure measurement in the range from $1 \cdot 10^{3}$ to $1 \cdot 10^{-10}$ mbar (760 to $7.6 \cdot 10^{-11}$ Torr) by combining a heat loss sensor based on the Pirani principle with a Bayard-Alpert ion gauge. The Wide Range Manometer is supplied as Standard Version or as Compact Version. The difference of both versions is based on the different construction of the gauges. The sketch below gives an overview of both versions.

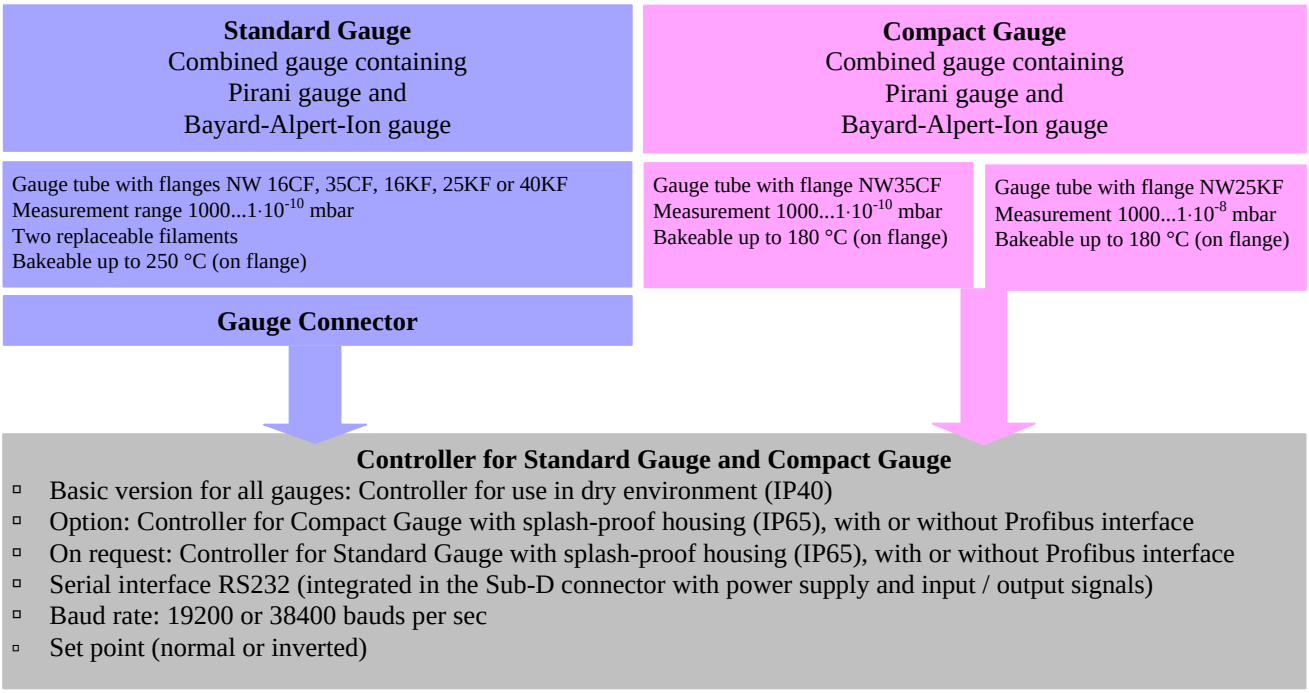


Figure 1 – Versions and options of ATMION™ Wide Range Manometer

Each gauge is mounted into a tube and is additionally protected by a grid. Both tube and grid offer the following advantages:

- Mechanical protection of the gauge
- Constant electrical ambient potential, i.e. defined sensitivity
- High measuring accuracy and reproducibility of results
- Protection against direct contamination
- Application in plasma processes possible

The *ATMION*™ Wide Range Manometer switches from Pirani gauge to the Bayard-Alpert ion gauge at a pressure of $1 \cdot 10^{-2}$ mbar. At a pressure of $1 \cdot 10^{-1}$ mbar, the *ATMION*™ switches from Bayard-Alpert ion gauge to Pirani gauge. Please note this for process control.

The *ATMION*™ Controller is directly mounted onto the *ATMION*™ Gauge. The power supply of the controller is 24 VDC / 1.5 A. The output signal is an analog signal between 0 V and 10V (logarithmic with 0.625 V per decade).
The pressure value is calibrated for nitrogen and must be corrected by a calibration factor for other gases.

Explosion hazard!
Do not use the *ATMION*™ Wide Range Manometer to measure the pressure of explosive or combustible gases or gas mixtures. The ion gauge filaments operate at high temperature.

Inside the manometer, voltages up to 400 V at 20 mA are generated.

2.2 Measuring Principle

The *ATMION*™ Wide Range Manometer combines a Pirani gauge with a Bayard-Alpert ion gauge.

The **Pirani gauge** is based on the principle that the heat loss of a thin wire, heated by an electrical current, depends on the pressure and the gas type. Different processes contribute to the heat loss:

a) Heat conductance of the gas
b) Convection of the gas
c) Heat radiation
d) Heat conduction into the wire connection

Items c) and d) are disturbance variables which limit the measuring range of the Pirani gauge towards low pressure. To keep these variables as small and constant as possible, a very thin wire is used as sensor and the operating temperature of the wire is kept constant. For this purpose, a Wheatstone bridge measures the resistance of the wire, and its resistance is kept constant by a control circuit. The power supplied to the wire is measured.
Below 10 mbar, the pressure dependency of the heat loss is predominated by the heat conduction through the gas. Above 100 mbar, convection of the gas is the most important process.
Measured results are mainly falsified by dirt deposition on the Pirani wire and by an increase of the ambient temperature which both modify the heat loss of the Pirani wire. Shocks and vibrations lead to an increased heat emission of the Pirani wire and thus to the display of an apparently higher pressure.

The **Bayard-Alpert ion gauge** uses the ionisation of the gas atoms or molecules by electrons. Electrons are emitted from a heated cathode and are accelerated by the grid. Inside the grid, the electrons ionise the gas. The ions are collected and measured as a collector current. The collector current is proportional to the gas pressure over a wide range. But due to the different ionisation probability of atoms and molecules the collector current is dependent on the gas type.
Towards low pressure, the measuring range is restricted by the X-ray limit and by gas emission from the tube itself. For gauges with a geometry used for the *ATMION*™ Wide Range Manometer, this limit is typically several 10^{-11} mbar. The high pressure limit is set to 10^{-1} mbar to protect the gauge against burning out. At this pressure, the manometer switches to the Pirani gauge. The accuracy of

the measured values of the Pirani gauge will deviate from that specification for a short period until the thermal equilibrium has been reached. This is due to the gauge warming as a result of the cathode heating.

A locking period protects the ion gauge!
When the *ATMION*™ Gauge is switched automatically from the ion gauge to the Pirani gauge by an increase of the pressure, the ion gauge can be reactivated by lowering the pressure to $1 \cdot 10^{-2}$ mbar and after a locking period of 5 sec.

Deposits in the Bayard-Alpert ion gauge (increased gas emission in the gauge tube) will result in displaying too high pressure values and fluctuations of the pressure display. In this case, it is recommended to heat up and clean the gauge by degassing at low pressure ($1 \cdot 10^{-5}$ mbar or less) by means of electron bombardment. The pressure display during degassing serves for information about the cleaning process only. The displayed value does not have the accuracy specification of the *ATMION*™ Gauge. Degassing the gauge largely eliminates contamination again.
If electrons or ions generated by other processes in the vacuum system impinge upon the ion collector or if the electrons generate further ions, the measured value might be considerably falsified. The use of a grid protecting the gauge can remedy this effect.
Strong magnetic fields, such as those generated by ion getter pumps, result in diffraction of electron trajectories and thus possibly in measuring errors. In this case, it is useful to increase the distance between the *ATMION*™ Gauge and the magnet or to shield the gauge.

2.3 Correction Factors of Different Gases

The measuring principles applied by the *ATMION*™ Wide Range Manometer are gas-type dependent. Consequently, the composition of the gas has to be determined to extract the real pressure from the displayed pressure value.

2.3.1 Correction Factors for the Ion Gauge

For the Bayard-Alpert ion gauge, the real pressure can be calculated by multiplying the displayed pressure value by a correction factor if the composition of the gas is known. The correction factors of two frequently used gases – Helium and Argon – have been determined for the *ATMION*™ Gauge **(☞🖹 Table 1)**. Please contact VACOM GmbH if you need correction factors of further gases.

Gas	Correction factor
Helium (He)	5.0
Argon (Ar)	0.7
Nitrogen (N_2)	1.0
Air	1.0

Table 1 – Correction factors for the ion gauge

2.3.2 Correction Curve for Pirani Gauge

For Pirani gauges, it is principally impossible to determine correction factors that are independent of pressure. The correction can be performed by means of the correction curves as shown in ☞🖹 **Figure 2.**

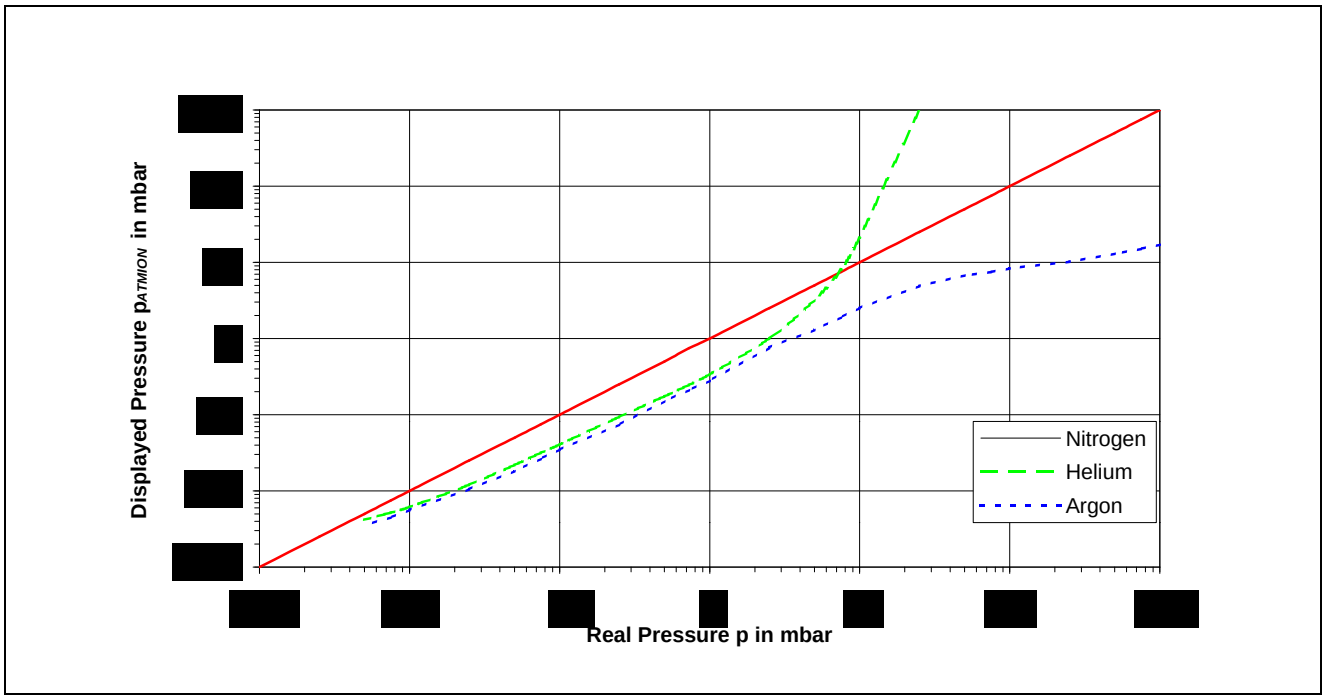


Figure 2 – Correction curves for the Pirani gauge

2.4 The *ATMION*™ Controller

The basic version of the *ATMION*™ Controller should only be used in dry environment. Optionally, an *ATMION*™ Controller with splash-proof enclosure (IP65) is supplied for the Compact *ATMION*™ Gauge. For the Standard *ATMION*™ Gauge, a splash-proof version could be available on request.
The *ATMION*™ Controller is plugged onto the *ATMION*™ Gauge. A screw collar ring tightens the plug connection **(☞🖹 Figure 3 / Figure 4).**

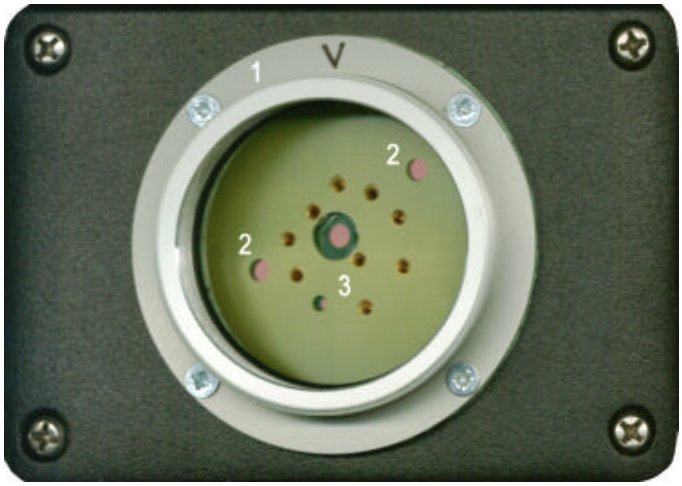


Figure 3 – Front view of the ATMION™ Controller

(1) Plug connection for the *ATMION*™ Gauge
(2) 2 guide holes
(3) 10 connectors (female)

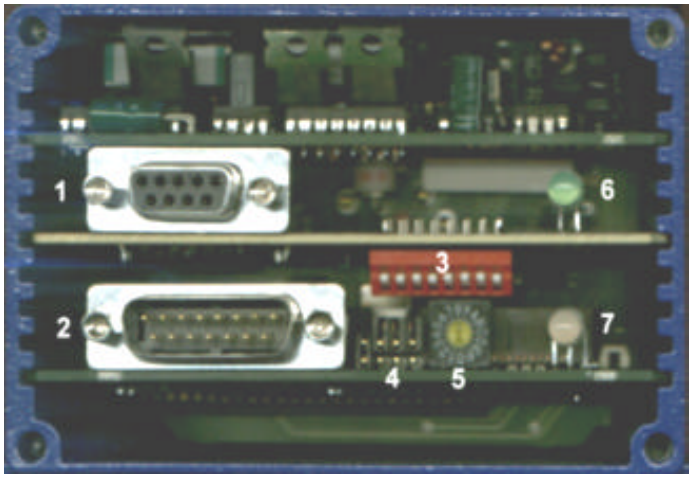
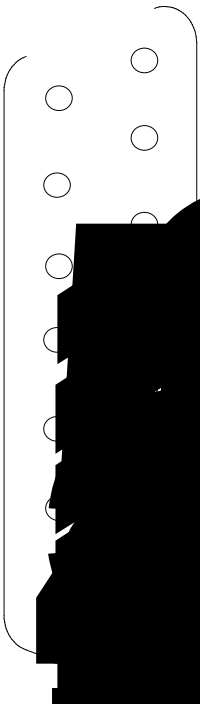


Figure 4 – Rear view of the ATMION™ Controller after removing the rear cover

(1) Profibus Interface (option)
(2) Connector for power supply, signal, and RS 232 interface
(3) Address switches of Profibus interface (option)
(4) Jumpers of parameter setting
(5) Fine adjustment of sensitivity
(6) Indicating LED (green) of Profibus interface (option)
(7) Indicating LED of operation and error mode (red, green, yellow)

The 15 pin Sub-D connector on the rear of the *ATMION*™ Controller is used for the power supply of the *ATMION*™ Wide Range Manometer and for data transmission **(☞🖹 Figure 4 / Figure 5)**. The LED indicates the operation mode of the *ATMION*™ Gauge.



▫	PIN 1	Input	External control ON/OFF, high level 24V is required to control the *ATMION*™ via PIN 4, 5, 6
▫	PIN 2	Output	Send TxD / RS 232
▫	PIN 3	Input	Read RxD / RS 232
▫	PIN 4	Input	Control 1 (in combination with PIN 1 and PIN 5 for adjustment of the Pirani gauge), **(☞🖹 Table 2)**
▫	PIN 5	Input	Control 2 (in combination with PIN 1 and PIN 4 for adjustment of the Pirani gauge), (☞🖹 Table 2)
▫	PIN 6	Input	Start of degassing, ON to high level 24 V
▫	PIN 7	Input	Power supply 24 VDC
▫	PIN 8	Input	Power supply 24 VDC
▫	PIN 9	Output	Status of degassing or of set point **(☞🖹 Table 3)**
▫	PIN 10	Output	Selected filament (high level 24 VDC = filament 1 low level 0 VDC = filament 2)
▫	PIN 11	Input	Ground connection
▫	PIN 12	Input	Ground connection
▫	PIN 13	Output	Reserved
▫	PIN 14	Output	Output of pressure value (analog output signal, logarithmic)
▫	PIN 15	Output	Analog ground

***Figure 5 – Pin reservation of the Sub-D connector* "Power supply/Signal"**

Open to analog control	Control 1	Control 2	Function
1	1	0	Pirani gauge only
1	0	0	Auto mode
1	1	1	Adjustment of Pirani gauge to atmosphere
1	0	1	Adjustment of Pirani gauge to vacuum

Table 2 – Function of Control 1 and Control 2

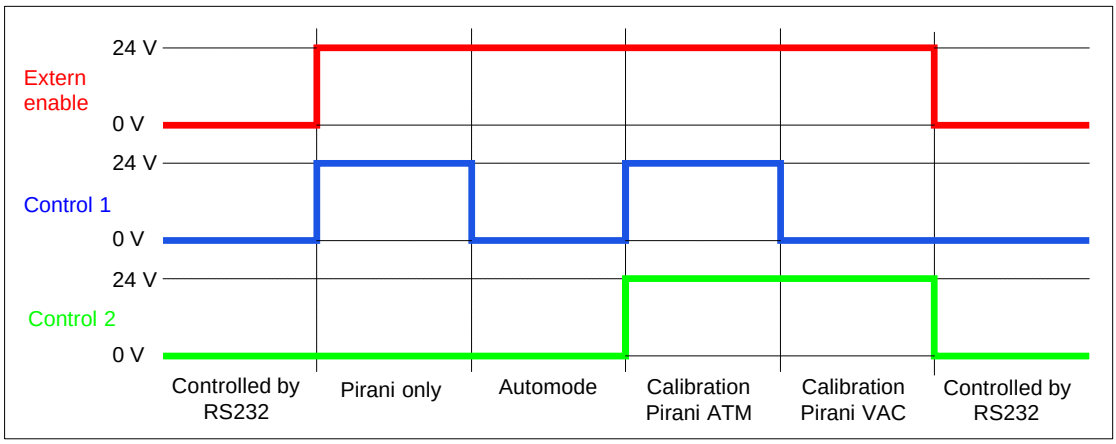


Figure 6 – Function of Control 1 and Control 2

Function	Set point, normal	Set point, inverted
On	1	0
Off	0	1

Table 3 – Output level of set point output

The LED **"Mode"** indicates the following operation modes of the *ATMION*™ Gauge:

- Red ⇒ Pirani gauge working
- Green ⇒ ion gauge working
- Yellow blinking ⇒ safety turn-off of ion gauge (high pressure), Pirani gauge working
- Red blinking ⇒ Pirani gauge defective
- Green blinking (frequency of 2 Hz) ⇒ degassing

The set-up of the operation parameters **(☞🖹 Table 4)** is defined by the position of the jumpers J1 to J4 **(☞🖹 Figure 7)** of the *ATMION*™ Controller. Before changing the jumper position, the power supply of the *ATMION*™ Controller has to be turned off and the rear cover of the controller has to be removed. Any change of the jumper position is valid from the next turn-on.

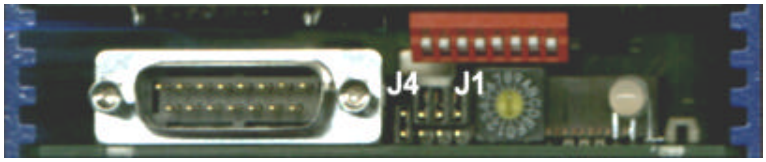


Figure 7 – Jumpers for operation parameters (rear cover of the ATMION™ Controller removed)

Jumper	Function	OFF (open)	ON (closed)
J1	Transistor output of degas status or set point	Status of degassing (factory-installed)	Set point
J2	Transistor output of set point normal or inverted	Normal set point (factory-installed)	Inverted set point
J3	Automatic change of emission current of ion gauge for low pressure suppressed	Automatic change of emission current at a pressure between 10^{-5} and 10^{-6} mbar (factory-installed)	Low emission current only (for pressure higher than 10^{-6} mbar)
J4	Baud rate of *ATMION*™ Controller	19200 bauds per sec (factory-installed)	38400 bauds per sec

Table 4 – Operation parameters of the ATMION™ Controller defined by the jumper positions

2.5 Serial Interface RS 232

The *ATMION*™ Wide Range Manometer can be monitored via a serial interface RS 232 that is integrated within a 15 pins Sub-D connector (☞🗎 **Figure 5)**. For PC application, an adapter with separate output of the serial interface is optionally available.

2.5.1 Parameters

- String: 8 data bits; 1 stop bit; no parity; no protocol
- Baud rate: 19200 or 38400 bauds per sec
- End of string indicated by **<CR>**

2.5.2 Commands

The most important functions of the *ATMION*™ Wide Range Manometer can be directly transmitted as RS 232 commands.

Command	Function
RV	Readout of pressure
RS	Readout of status bits
RP	Readout of low (on) and high (off) set points – logarithmic output with hexadecimal notation. Conversion to pressure value in mbar: $\mathbf{p = 10^{(Output/4096-12)}}$ or ☞🗎 **Table 8**
RA	Readout of jumper positions
RT	Readout of operation time of filament 1 and filament 2 in hours (00000 00000)
RB	Readout of status bits SPC 3 (Profibus interface only)
SD	Start of degassing, turns off automatically after 2 min
SC****	Setting of control bits
SP**** ****	Setting of low (ON) and high (OFF) set points – logarithmic input with hexadecimal notation. Conversion of pressure in mbar to input: **Input = 49152 + 4096 · log (pressure)** or ☞🗎 **Table 8**
SA****	Overwriting jumpers (all jumpers have to be set to 0 or 1, but only the parameters of jumpers J1 to J3 are written, baud rate can only be modified by jumper J4)
SX1	Start of repetitive output of pressure value and service data every 500 ms
SX0	Stop of repetitive output of pressure value and service data

Table 5 – Important readout and write commands

2.5.2.1 Readout of pressure 'RV'

The actual pressure can be read out by entering **'RV'** **<CR>**. The output string contains the information about the measuring mode and the pressure value:

- Status: **P** = Pirani gauge **D** = Degas
  I1 = Filament 1 of ion gauge **E** = Error
  I2 = Filament 2 of ion gauge
- Pressure: **0.00E±00** = measured pressure value in mbar

For example: **I2_8.21E-06** (ion gauge), **P_5.3E+01** (Pirani gauge)

2.5.2.2 Definition of control bits – SC

Bit	Active	Name	Description
0	1	**AUTORANGE**	Change between Pirani and ion gauge automatically (condition factory-installed)
1	1	**PIRANI**	Only valid for AUTORANGE = 0: Pirani gauge only, ion gauge is deactivated
2	1	**IG**	Only valid for AUTORANGE = 0: ion gauge only, Pirani gauge is activated only in case of safety turn-off of the ion gauge
3	1	**AUTOFIL**	Change between filament 1 and filament 2 automatically (condition factory-installed)
4	1	**FIL1**	Only valid for AUTOFIL = 0: filament 1 is selected, filament 2 is deactivated Setting is only possible if Pirani gauge is activated
5	1	**FIL2**	Only valid for AUTOFIL = 0: filament 2 is selected, filament 1 is deactivated Setting is only possible if Pirani gauge is activated
6	1	**DEGAS**	Start of degassing, automatically stopped after 2 min
7	1	**E_STROM**	Selection of low emission current
8	1	**SP_MAN**	Only valid for closed jumper J1: output level of PIN 9 can be set manually
9	1	**SP_OUT**	Only valid for closed jumper J1 and SP_MAN = 1: setting of output level of PIN 9
10	1	**SP_AUTO**	Only valid for closed jumper J1 and SP_MAN = 0: output level of PIN 9 is pressure dependent, pressure condition is defined by the set point function
11	1		Not available
12	1	**R_ERROR**	Setting is only possible if PIRANI = 1 and AUTORANGE = 0: reset of error bit of ion gauge
13	1	**VAK**	Zero-adjustment of Pirani gauge at vacuum pressure
14	1	**ATM**	Adjustment of Pirani gauge to atmospheric pressure
15	1		Not available

Table 6 – Control bits of ATMION™ Controller

Examples

The *ATMION*™ Wide Range Manometer selects the Pirani or ion gauge and the filaments of the ion gauge automatically: **`SC_0009`<CR>**

	ATM	VAK	R_ERROR	EXT_ENABLE	SP_AUTO	SP_OUT	SP_MAN	E_STROM	DEGAS	FIL2	FIL1	AUTO FIL	IG	PIRANI	AUTO RANGE
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
0				0				0				9			

Start of the Degas function of the ion gauge: **`SC_0049`<CR>**

	ATM	VAK	R_ERROR	EXT_ENABLE	SP_AUTO	SP_OUT	SP_MAN	E_STROM	DEGAS	FIL2	FIL1	AUTO FIL	IG	PIRANI	AUTO RANGE
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1
0				0				4				9			

The *ATMION*™ Wide Range Manometer selects the Pirani or the ion gauge automatically, and filament 2 of the ion gauge is selected: **`SC_0021`<CR>**

	ATM	VAK	R_ERROR	EXT_ENABLE	SP_AUTO	SP_OUT	SP_MAN	E_STROM	DEGAS	FIL2	FIL1	AUTO FIL	IG	PIRANI	AUTO RANGE
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
0				0				2				1			

2.5.2.3 Definition of status bits – RS

Bit	Active	Name	Description
0	1	**AUTORANGE**	Mode of auto range activated
1	1	**PIRANI**	Only Pirani gauge is activated, read out of pressure
2	1	**IG**	Only ion gauge is activated, read out of pressure
3	1	**AUTOFIL**	Mode of AUTOFIL is activated
4	1	**FIL1**	Filament 1 is selected
5	1	**FIL2**	Filament 2 is selected
6	1	**DEGAS**	Degas activated
7	1	**E_STROM**	Low emission current is selected
8	1	**SP_MAN**	Output level of PIN 9 can be set manually
9	1	**SP_OUT**	Output level of PIN 9 (1 indicates 24V)
10	1	**SP_AUTO**	Set point function or output of degas status activated
11	1	**EXT_ENABLE**	External control enabled
12	1	**R_ERROR**	Error bit of ion gauge
13	1	**VAK**	Zero-adjustment of Pirani gauge at vacuum pressure activated
14	1	**ATM**	Adjustment of Pirani gauge to atmospheric pressure activated
15	1	**LEBENSBIT**	Test bit of *ATMION*™ sent every 500 msec

Table 7 – Status bits of ATMION™ Wide Range Manometer

Example

The dialogue is as follows if the *ATMION*™ Wide Range Manometer is operated in following mode: auto range, ion gauge is activated, automatic selection of filaments, filament 1 is activated.

Command **`RS`<CR>** inquires the status.

Generated reply will be: **“001D“**.

2.5.3 The *ATMION*™ Service Programme

The *ATMION*™ Service Programme is supplied for simple tests and service of the *ATMION*™ Wide Range Manometer. It can be downloaded free of charge from **http://www.vacom.de**.
The service programme supports all RS 232 commands of ☞🖹 **Section 2.5**.
For running the *ATMION*™ System with a PC, the input of the power supply and the RS 232 interface have to be separated. This can be easily done by taking the optionally available PC adapter and a modem cable.

2.5.3.1 Set-up of the PC interface

After having installed the *ATMION*™ Service Programme **"atmion-4.exe"**, the programme starts with page **COM-Anschluß-Einstellungen**. The interface of the PC **(☞🖹 Figure 8)** has to be selected and the baud rate has to be set to the baud rate of the *ATMION*™ Controller **(☞🖹 Section 2.5.1)**. „OK" continues the programme. It opens the main page **ATMION-Monitor** **(☞🖹 Figure 9)**.

Figure 8 – Set-up of the COM interface

2.5.3.2 Operation of the ATMION™ Service Programme

On the main page **Monitor für ATMION** **(☞🖹 Figure 9)** of the service programme commands can be entered and the status of the *ATMION*™ Wide Range Manometer is shown.

Section „Steuern ATMION"

The 13 most important control bits **(☞🖹 Table 6)** can be activated by mouse click. The software prevents impossible combinations. A click on **"Steuerwort senden"** sends the command to the *ATMION*™ Controller.

Section „Status ATMION"

All 16 status bits **(☞🖹 Table 7)** are shown. Grey letters indicate deactivation, black letters indicate active states. The display of the test bit of the *ATMION*™ is blinking green while data transmission. The measured pressure is shown in the line indicated **„** Druck **".**

Section „Befehl“

Read and write commands **(☞🗎 Table 5)** can be entered here. A mouse click on **“Senden“** sends each command to the *ATMION*™ Controller.

Section „Monitor Senden“

This section shows all sent commands and sent control bits.

Section „Monitor Empfang“

This section shows the data resent by the *ATMION*™ Controller. A click on **“Start“** starts the data transmission every 500 ms. These data are stored in file **C:\atmionlog.txt** and can be used for further evaluation. A click on **“Stop“** stops the data output.

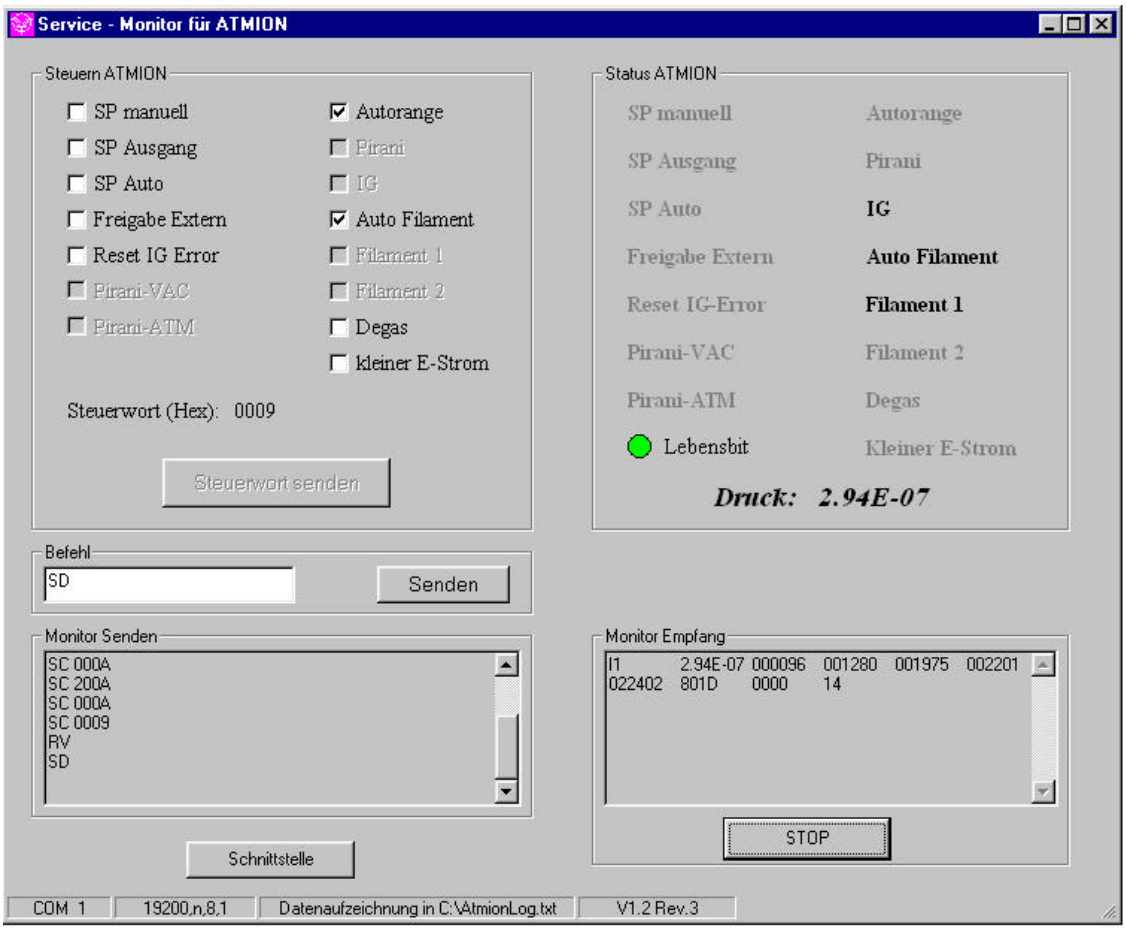


Figure 9 – Programme page “ATMION™ - Monitor“

It is possible to return to interface page **COM-Anschluß-Einstellungen** by mouse click on **“Schnittstelle“ (☞🗎 Section 2.5.3.1).**

3. Assembly and Operation

3.1 Visual Control

The *ATMION*™ Gauge is mounted inside a stainless steel tube. Additionally, the flange of the tube is covered by a grid to protect the gauge. Nevertheless, handle it with care. Avoid touching all components intended for the vacuum area.
All gauges and controllers are individually inspected and carefully packed before delivery. After unpacking, check the *ATMION*™ Wide Range Manometer visually for mechanical damages caused by transportation. If you find any damage, please contact VACOM GmbH immediately. Complaints submitted after putting the manometer into operation or later than 5 working days after receipt cannot be accepted.

3.2 Assembly

Usually, the *ATMION*™ Gauge and the *ATMION*™ Controller are jointed together when they are delivered. The *ATMION*™ Wide Range Manometer can be mounted directly to the vacuum system in any position. Otherwise, the *ATMION*™ Gauge can be mounted to the vacuum system. Subsequently, plug the controller and tighten it with the screw collar ring.
Do not mount the gauge directly beside the venting valve. Despite automatic cathode switch-off, the cathode might be damaged when the vacuum system is vented.

The *ATMION*™ Wide Range Manometer can be monitored by:

- The optionally available *ATMION*™ Display Unit
- PC via serial interface and any power supply 24 VDC / 1.5 A (power supply and PC adaptor with separate serial interface RS232, 9 pin Sub-D connector are optionally available)
- Analog system control (24 VDC) and any power supply 24 VDC / 1.5 A

3.3 Set Point Function

The *ATMION*™ Wide Range Manometer provides one internal set point function that is activated by the jumper set-up and is adjustable by the serial interface.
Jumper J2 activates the set point function and J3 defines if the set point is operated as normal or as inverted set point **(☞🗎 Figure 7 / Table 4)**. The pressure values have to be defined via serial interface **(☞🗎 Section 2.5 / Table 5)**. ☞🗎 **Table 8** shows the conversion between pressure value and input value.
Alternatively, the *ATMION*™ Display Unit supplies **(☞🗎 Manual *ATMION*™ Display Unit)** up to 4 set point functions.

Pressure in mbar	Conversion of pressure to input: Input = 49152 + 4096 · log (Pressure)	Input value in hexadecimal notation for definition of set point
1.00E+03	61440	F000
5.00E+02	60207	EB2F
1.00E+02	57344	E000
5.00E+01	56111	DB2F
1.00E+01	53248	D000
5.00E+00	52015	CB2F
1.00E+00	49152	C000
5.00E-01	47919	BB2F
1.00E-01	45056	B000
5.00E-02	43823	AB2F
1.00E-02	40960	A000
5.00E-03	39727	9B2F
1.00E-03	36864	9000
5.00E-04	35631	8B2F
1.00E-04	32768	8000
5.00E-05	31535	7B2F
1.00E-05	28672	7000
5.00E-06	27439	6B2F
1.00E-06	24576	6000
5.00E-07	23343	5B2F
1.00E-07	20480	5000
5.00E-08	19247	4B2F
1.00E-08	16384	4000
5.00E-09	15151	3B2F
1.00E-09	12288	3000

Table 8 – Conversion of pressure values to input values in hexadecimal notation for set point definition

3.4 Cleaning of the *ATMION*™ Gauge

Deposits at the ion gauge can falsify the displayed pressure value. In that case, it is recommended to clean the ion gauge by degassing. The degassing cleans the ion gauge by electron bombardment. The procedure can be carried out at a pressure lower than 10^{-5} mbar. The frequency of the degassing depends on the degree of contamination during the process and the operation time. It is recommended to degas the ion gauge regularly every 1 to 4 weeks.

The degassing can be started by:

- The control input PIN 6 of the 15 pin Sub-D connector **(☞🖹 Figure 5)**
- The function **“DEGAS“** of the *ATMION*™ Display Unit **(☞🖹 Manual *ATMION*™ Display Unit)**
- Input of **“Degas“** or command **“SD“** at the *ATMION*™ Service Programme **(☞🖹 Section 2.5.3)**
- Input of command **“SD“** at the serial interface **(☞🖹Table 5)**

The degassing ends automatically after 2 min or in case of a too high pressure. The degassing can be repeated if the time has not been long enough.

3.5 Bakeout of the *ATMION*™ Gauge

The maximum baking temperature is different for the Standard and Compact Version of the A*TMION*™ Gauge. The following values indicate the maximum temperature allowed on the flange of the gauge tube (flange with the protection grid for Standard Version):

- *ATMION*™ Gauge Standard Version max. 250 °C
- *ATMION*™ Gauge Compact Version max. 180 °C

The Gauge Connector of the Standard *ATMION*™ Gauge, the pin connector of the Compact *ATMION*™ Gauge and the Controller contain electronic devices that are not allowed to exceed temperatures above 60 °C!

For saving the electronic devices, the *ATMION*™ Controller and the Gauge Connector of the Standard *ATMION*™ Gauge can be removed by the following procedure:

- ☞ Unplug the *ATMION*™ Controller
- ☞ Open the screw collar ring which tightens the gauge and the controller **(☞🖹 Figure 17)**
- ☞ Extract the gauge out of the controller

Do not turn the gauge. The pins of the gauge could be cracked by turning and could damage the electronics if they are lost inside the controller!

- ☞ At *ATMION*™ Gauge Standard Version: open the three screws (M3) and unplug the Gauge Connector **(☞🖹 Figure 17)**

Assembly after baking in opposite order.

3.6 Filaments of the Ion Gauge

The *ATMION*™ Gauge has two filaments for insuring a longer lifetime of the ion gauge.
It is factory-installed that filament 1 is selected automatically. Filament 2 is only taken automatically if filament 1 has burned out.
The sequence can only be changed by deactivating the automatic selection and by choosing filament 1 or 2 manually (☞🖹 **Figure 5 / Table 6)**. However, please pay attention that the automatic selection of the second filament is not activated in the case of burn-out. The filament has to be selected manually again.

Display and selection of the filaments:

- **“FIL 1“** or **“FIL 2“** at *ATMION*™ Display Unit **(☞🗎 Manual *ATMION*™ Display Unit)**
- **“Filament 1“** or **“Filament 2“** and **“I1“** or **“I2“** at the *ATMION*™ Service Programme **(☞🗎 Section 2.5.3)**
- Output signal PIN 10 of the 15 pin Sub-D connector **(☞🗎 Figure 5)**

At the Standard Version of the *ATMION*™ Gauge, it is possible to replace the filaments.
At the Compact Version of the *ATMION*™ Gauge, the complete gauge has to be replaced when both filaments have burned out.

You should ask for replacement filaments or replacement gauge when the first filament is burned out.

3.7 Exchange of Filaments of Standard *ATMION*™ Gauge

At the Standard Version of the *ATMION*™ Gauge, it is possible to replace the filaments.

If the customer replaces the filament himself, VACOM GmbH cannot warrant the original accuracy of the ion gauge. If the original accuracy is required, the *ATMION*™ Gauge should be replaced or be repaired by VACOM GmbH.

The disassembly of the *ATMION*™ Gauge is described in ☞🗎 **Section 3.8.**

Exchange of filaments:

- ☞ Unplug the controller and remove the gauge from the vacuum system
- ☞ Open the screw collar ring which tightens the gauge and the controller **(☞🗎 Figure 17)**
- ☞ Extract the gauge out of the controller

Do not turn the gauge. The pins of the gauge could be cracked by turning and could damage the electronics if they are lost inside the controller!

- ☞ Open the three screws (M3) and unplug the Gauge Connector
- ☞ Put the gauge on flat ground with the flange on bottom and the pin connector on top
- ☞ Open the screws (M6) which tighten the gauge tube
- ☞ Carefully remove the gauge tube and the copper seal straight along the axis of the gauge

Do not tilt the gauge tube. Otherwise the ion gauge or the Pirani wire can be destroyed.

- ☞ Put the gauge on flat ground with the pin connector on bottom
- ☞ Open the screws of the barrel connector and pull out the burned filaments (tweezers!)
- ☞ Take the new filaments out of their case with a pair of tweezers
- ☞ Insert the new filaments into the barrel connector and tighten them with new screws
- ☞ Remove the stabilising wire that connects the filaments just above the screw (pincers!)
- ☞ Take a new copper seal
- ☞ Carefully insert the gauge into the gauge tube
- ☞ Tighten the gauge tube with the screws (M6)
- ☞ Plug the Gauge Connector and tighten it with the screws (M3)
- ☞ Insert the gauge into the controller (see the guiding mark!)
- ☞ Tighten the screw collar ring
- ☞ Attach the *ATMION*™ Wide Range Manometer to the vacuum system.

3.8 Exchange of the *ATMION*™ Gauge

The exchange of the *ATMION*™ Gauge (Standard and Compact Version) is carried out by the following procedure:

- ☞ Unplug the controller and remove the gauge from the vacuum system
- ☞ Open the screw collar ring which tightens the gauge and the controller **(☞🗎 Figure 17)**
- ☞ Extract the gauge out of the controller

Do not turn the gauge. The pins of the gauge could be cracked by turning and could damage the electronics if they are lost inside of the controller!

- ☞ If the replacement gauge is an *ATMION*™ Gauge with increased accuracy:
  Find the value for fine adjustment of sensitivity on the *ATMION*™ Gauge and remember it
- ☞ Insert the new gauge into the controller (see the guiding mark!)
- ☞ Tighten the screw collar ring
- ☞ Attach the *ATMION*™ Wide Range Manometer to the vacuum system
- ☞ Find the value for fine adjustment of sensitivity on the *ATMION*™ Gauge
- ☞ Open the rear cover of the *ATMION*™ Controller
- ☞ Find the fine adjustment **(☞🗎 Figure 4)** of the sensitivity
  - turn it to position "**7**" in case of *ATMION*™ Gauge with standard accuracy
  - turn it to the indicated position in case of *ATMION*™ Gauge with increased accuracy
- ☞ Close the controller
- ☞ Complete the assembly

After exchanging the *ATMION*™ Gauge, you should adjust the Pirani gauge to ensure proper operation (☞🗎 Section 3.9).

3.9 Adjustment of the Pirani Gauge

The *ATMION*™ Gauge is delivered adjusted. However, it is necessary to re-adjust the Pirani gauge if it is displaced at transport, after longer operation, or after exchange of the *ATMION*™ Gauge. Depending on your equipment, different adjustment procedures are possible. However, it is common for all procedures that the Pirani gauge is adjusted to atmospheric pressure **and** to the zero value at a pressure below 10^{-4} mbar.

3.9.1 Adjustment via *ATMION*™ Display Unit

Adjustment of Pirani gauge to 1000 mbar (atmospheric pressure)

- ☞ Unplug the *ATMION*™ Display Unit or turn off the power switch. Wait at least 5 sec. Press the cursor key ←. Keep the cursor key pressed when turning on the power supply. The *ATMION*™ Display Unit is in the menu of Pirani adjustment. The display is blinking.

- ☞ Press cursor key ↑. The Pirani gauge will be automatically adjusted to atmospheric pressure. The display and the *ATMION*™ Wide Range Manometer turn off after 5 sec. The complete *ATMION*™ system restarts automatically in the normal display and measure mode.

Zero adjustment of Pirani gauge at a pressure below 10^{-4} mbar

- ☞ Unplug the *ATMION*™ Display Unit or turn off the power switch. Wait at least 5 sec. Press the cursor key ←. Keep the cursor key pressed when turning on the power supply. The *ATMION*™ Display Unit is in the menu of Pirani adjustment. The display is blinking.

- ☞ Press cursor key ↓. The Pirani gauge will be automatically adjusted to zero. The display and the *ATMION*™ Wide Range Manometer turn off after 5 sec. The complete *ATMION*™ system restarts automatically in the normal display and measure mode.

Both adjustments are independent on each other. It is possible to do the procedures at different times.

3.9.2 Adjustment via Serial Interface RS 232 or Profibus Interface

The adjustment via serial interface RS 232 or Profibus interface can be done by entering the corresponding control bits **(☞🖹 Section 2.5 / Table 6 and Manual *ATMION*™ Profibus Interface).**

Adjustment of Pirani gauge to 1000 mbar (atmospheric pressure)

- ☞ Vent gauge (1000 mbar)
- ☞ Input of `SC_0002`
  ⇒ The *ATMION*™ Gauge works in the Pirani mode and measures the actual pressure value
- ☞ Input of `SC_4002`
  ⇒ Automatic correction of the displayed value
- ☞ Input of `SC_0002`
  ⇒ The *ATMION*™ Gauge works in the Pirani mode, the corrected pressure value is stored

Zero adjustment of Pirani gauge at a pressure below 10^{-4} mbar

- ☞ Evacuate the *ATMION*™ Gauge to a pressure below 10^{-4} mbar
- ☞ Input of `SC_0002`
  ⇒ The *ATMION*™ Gauge works in the Pirani mode and measures the actual pressure value
- ☞ Input of `SC_2002`
  ⇒ The zero value of the Pirani gauge is corrected automatically
- ☞ Input of `SC_0002`
  ⇒ The *ATMION*™ Gauge works in the Pirani mode, the corrected pressure value is stored
- ☞ Input of `SC_0009`
  ⇒ The *ATMION*™ Gauge switches automatically to the ion gauge (Mode AUTORANGE and AUTOFIL).

3.9.3 Adjustment via control input or external system control

The adjustment via external control (24 VDC) uses the input PIN 4 and PIN 5 of the 15 pin Sub-D connector **(☞🗎 Figure 5)**. To enable these inputs, the input PIN 1 must be set to high level 24 VDC. The following procedure has to be done, ☞🗎 **Figure 10** shows schematically the whole procedure:

Adjustment of Pirani gauge to 1000 mbar (atmospheric pressure)

- ☞ Vent gauge (1000 mbar)
- ☞ Connect PIN 1 with PIN 7 or 8 (power supply 24 VDC)
  ⇒ The inputs Control 1 and Control 2 are enabled
- ☞ Connect PIN 4 (Control 1) with PIN 7 or 8 (power supply 24 VDC)
  ⇒ The *ATMION*™ Gauge works in the Pirani mode and measures the actual pressure value
- ☞ Additionally connect PIN 5 (Control 2) with PIN 7 or 8
  ⇒ Automatic correction of the displayed value
- ☞ Disconnect PIN 5 (Control 2) from PIN 7 and 8
  ⇒ The *ATMION*™ Gauge works in the Pirani mode, the corrected pressure value is stored
- ☞ PIN 4 (Control 1) remains connected with PIN 7 or 8 (power supply 24 VDC)

Zero adjustment of Pirani gauge at a pressure below 10^{-4} mbar

- ☞ Evacuate the *ATMION*™ Gauge to a pressure below 10^{-4} mbar
- ☞ PIN 4 (Control 1) still remains connected with PIN 7 or 8 (power supply 24 VDC)
  ⇒ The *ATMION*™ Gauge works in the Pirani mode and measures the actual pressure value
- ☞ Disconnect PIN 4 (Control 1) from PIN 7 and 8
- ☞ Connect PIN 5 (Control 2) with PIN 7 or 8 (power supply 24 VDC)
  ⇒ The zero value of the Pirani gauge is corrected automatically
- ☞ Disconnect PIN 5 (Control 2) from PIN 7 and 8
- ☞ Connect PIN 4 (Control 1) with PIN 7 or 8 (power supply 24 VDC)
  ⇒ The *ATMION*™ Gauge works in the Pirani mode, the corrected pressure value is stored
- ☞ Disconnect PIN 4 (Control 1) from PIN 7 and 8
  ⇒ The *ATMION*™ Gauge switches automatically to the ion gauge
- ☞ Disconnect PIN 1 from PIN 7 and 8
  ⇒ The inputs Control 1 and Control 2 are disabled.

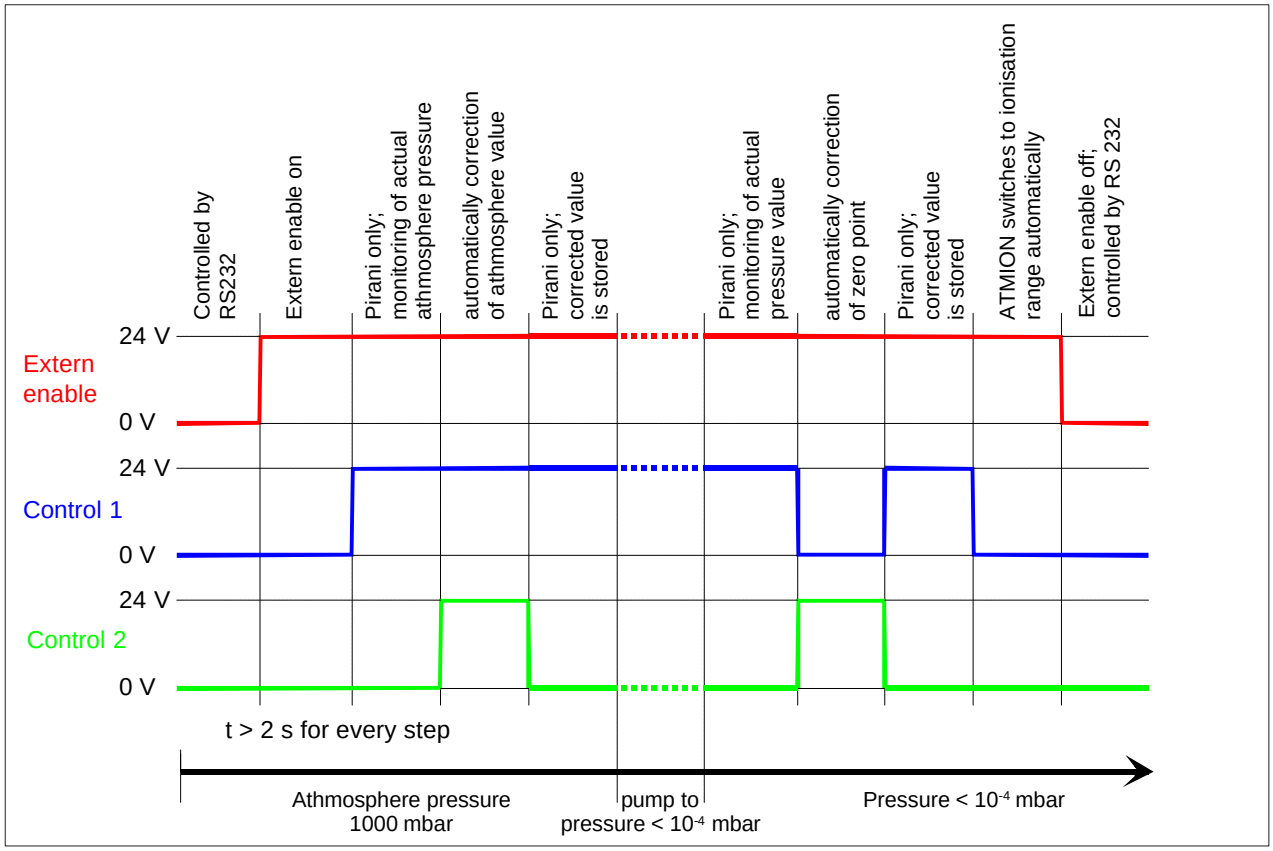


Figure 10 – Adjustment via analog control inputs

4. Specifications and Options

4.1 Technical Data

Power supply:	24 VDC ± 10 %
Consumption:	Max. 0.6 A / 15 W during start of ion gauge
	Max. 0.4 A / 10 W at normal operation
	Max. 0.9 A / 22 W during degas
Interface:	RS 232
	Profibus interface (option)
Analog control:	Input / Output 24 VDC
Analog output signal:	0...10 VDC logarithmic, 0.625 V per decade
	Algorithm: $U = 0.625 \cdot \log (p / 10^{-12}$ mbar)
Set point function:	Transistor output, max. 24VDC, max 1.5 A
Ambient temperature:	Max. 40 °C
Cathode material:	Yttria coated Iridium
Emission current:	25 µA or 2 mA, 20 mA during degas

Vacuum flanges:

Standard *ATMION*™ Gauge NW:	16CF, 35CF, 16KF, 25KF, and 40KF
Compact *ATMION*™ Gauge NW:	35CF, 25KF

Preferred measuring range:

Standard *ATMION*™ Gauge	$1000...10^{-10}$ mbar
Compact *ATMION*™ Gauge, NW35CF:	$1000...10^{-10}$ mbar
Compact *ATMION*™ Gauge, NW25KF:	$1000...10^{-8}$ mbar

Measuring accuracy:

Pirani gauge:	± 25 % ($10...10^{-2}$ mbar)
Ion gauge:	± 15 % ($10^{-2}...10^{-8}$ mbar)

Baking temperature (at flange):

Standard *ATMION*™ Gauge:	max. 250 °C
Compact *ATMION*™ Gauge:	max. 180 °C

4.2 Accessories

- *ATMION*™ Display Unit, rack version, 230 VAC / 115 VAC, 4 set points
- *ATMION*™ Display Unit, 24 VDC, 2 set points
- Power supply 24 VDC / 1.5 A for *ATMION*™ Display Unit
- Connection cable between display unit and controller
- *ATMION*™ PC Software for control and data record (on request)
- *ATMION*™ Service Programme free of charge
- *ATMION*™ PC Adapter for separate output of serial interface RS 232
- Connection cable between PC adapter and serial interface of PC
- Power supply 24 VDC / 1.5 A, for PC operation

4.3 Additional Manuals

- Manual of Profibus-DP *ATMION*™ Standard and Compact Version
- Manual of *ATMION*™ Display Unit

4.4 Analog Output Signal

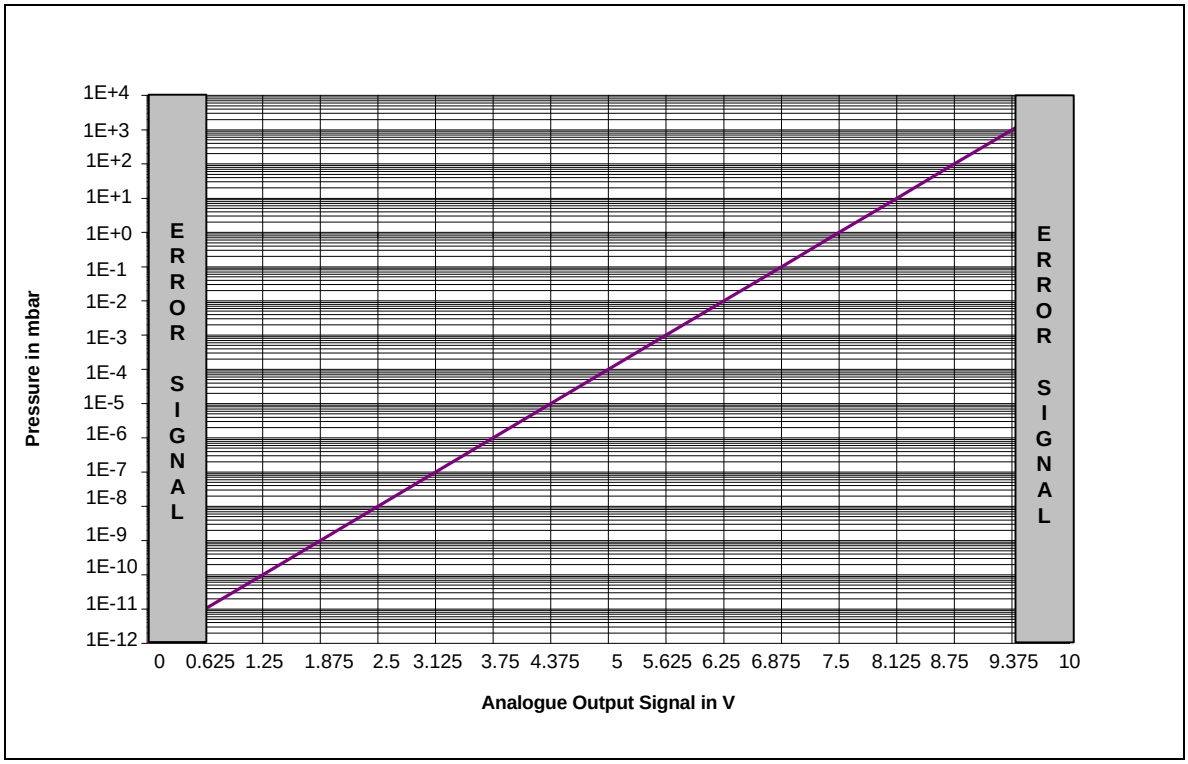


Figure 11 – Analog output signal

4.5 Pin Reservation of the *ATMION*™ Gauge

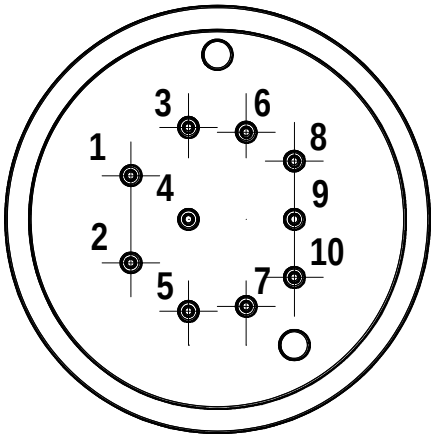


Figure 12 – Pin reservation of the ATMION™ Gauge

- PIN 1 Pirani wire
- PIN 2 Pirani wire
- PIN 3 Anode grid
- PIN 4 Collector
- PIN 5 Anode grid
- PIN 6 Pirani input
- PIN 7 Pirani output
- PIN 8 Filament 1
- PIN 9 Filament common
- PIN 10 Filament 2

4.6 Dimensions of the *ATMION*™ Wide Range Manometer Standard Version

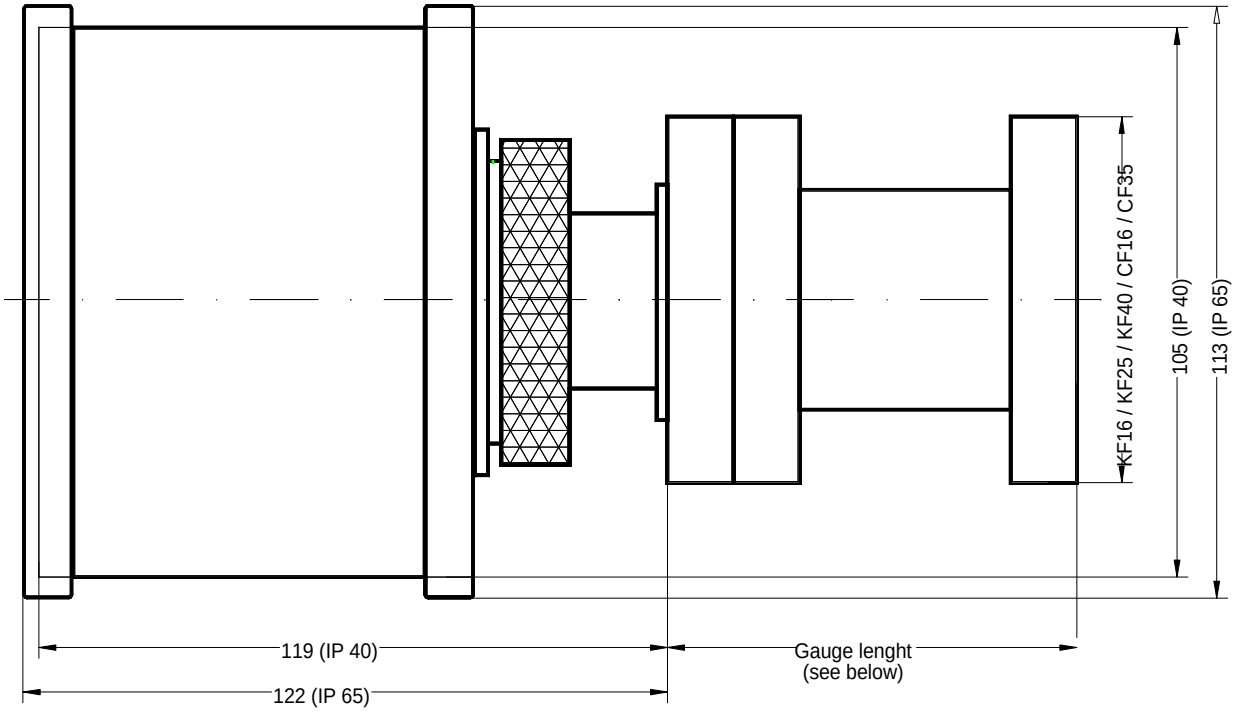


Figure 13 – ATMION™ Wide Range Manometer Standard Version (top view), with flange NW 35CF

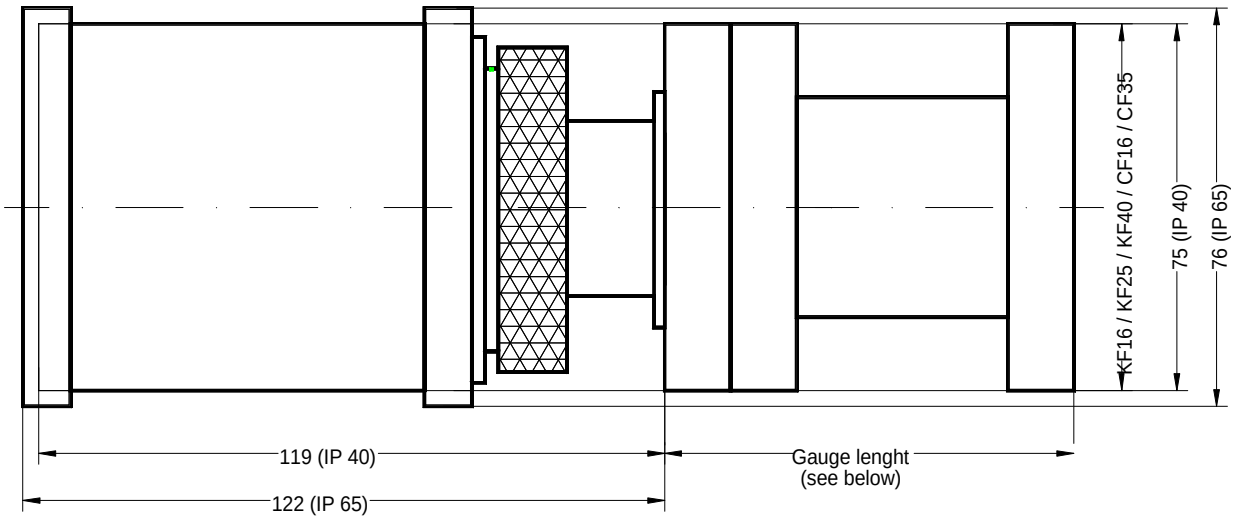


Figure 14 – ATMION™ Wide Range Manometer Standard Version (side view), with flange NW 35CF

Length of the *ATMION*™ Wide Range Manometer Standard Version for different flanges:

- With flange NW16CF: 110 mm
- With flange NW35CF: 80 mm
- With flange NW16KF or NW25KF: 110 mm
- With flange NW40KF: 85 mm

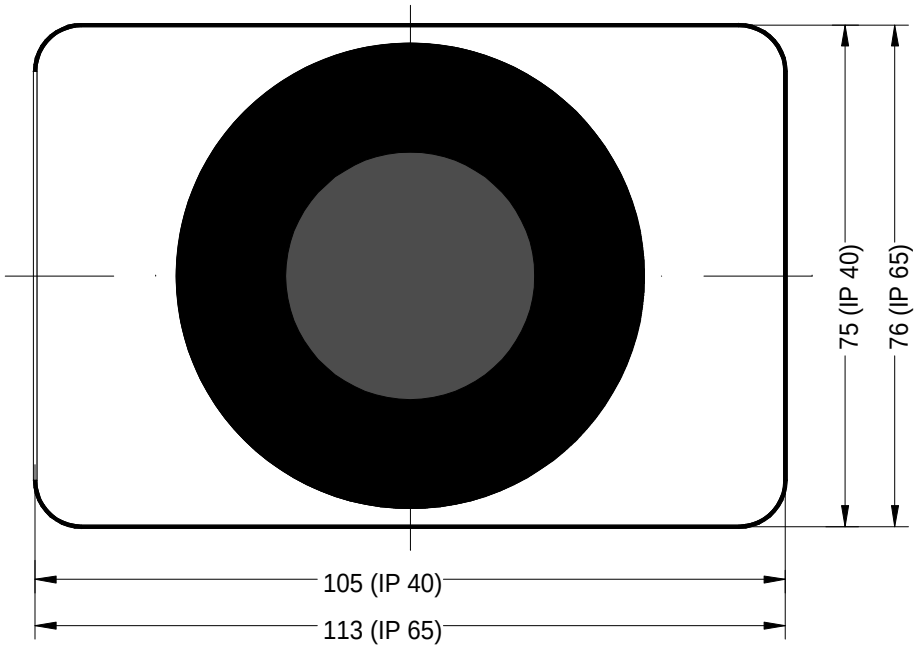


Figure 15 – ATMION™ Wide Range Manometer Standard Version (front view on flange)

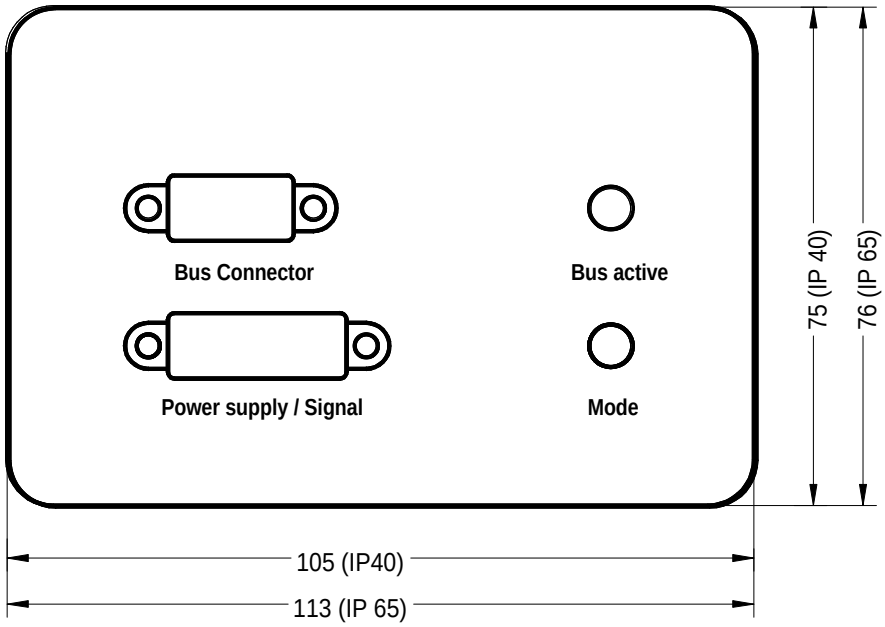


Figure 16 – ATMION™ Wide Range Manometer Standard Version (rear view on controller)

4.7 Construction of *ATMION*™ Wide Range Manometer Standard Version

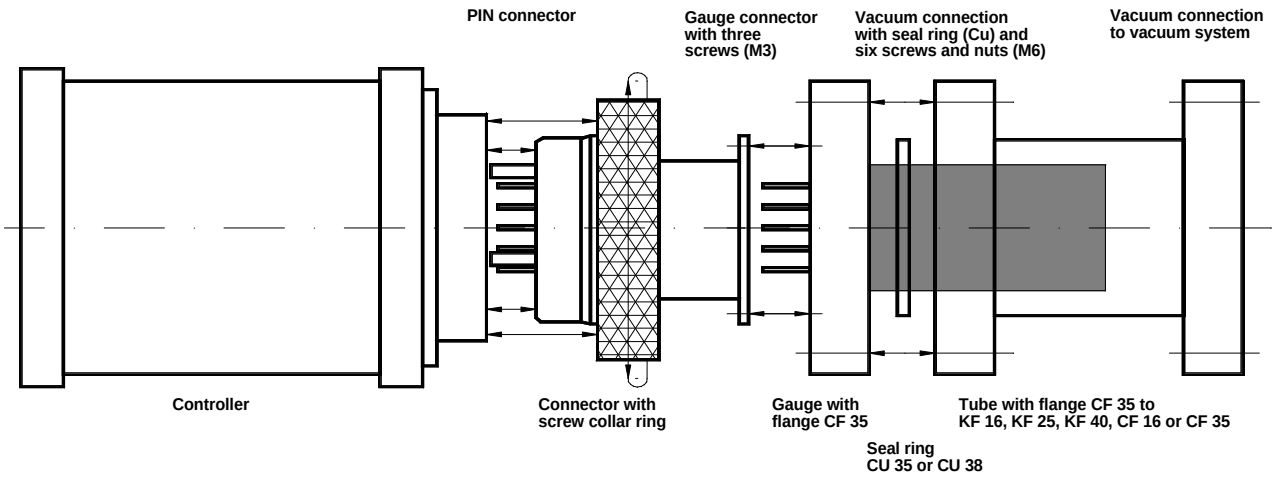


Figure 17 – Construction of the ATMION™ Wide Range Manometer Standard Version

4.8 Dimensions of the *ATMION*™ Wide Range Manometer Compact Version

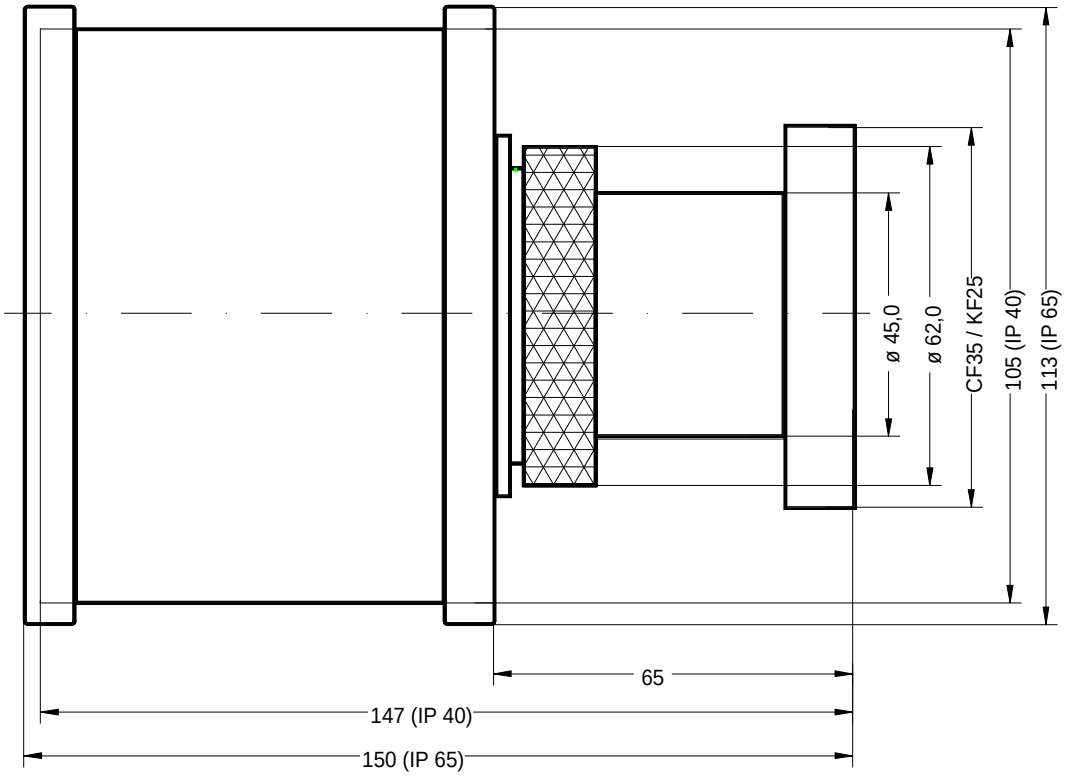


Figure 18 – ATMION™ Wide Range Manometer Compact Version (top view), with flange NW 35CF

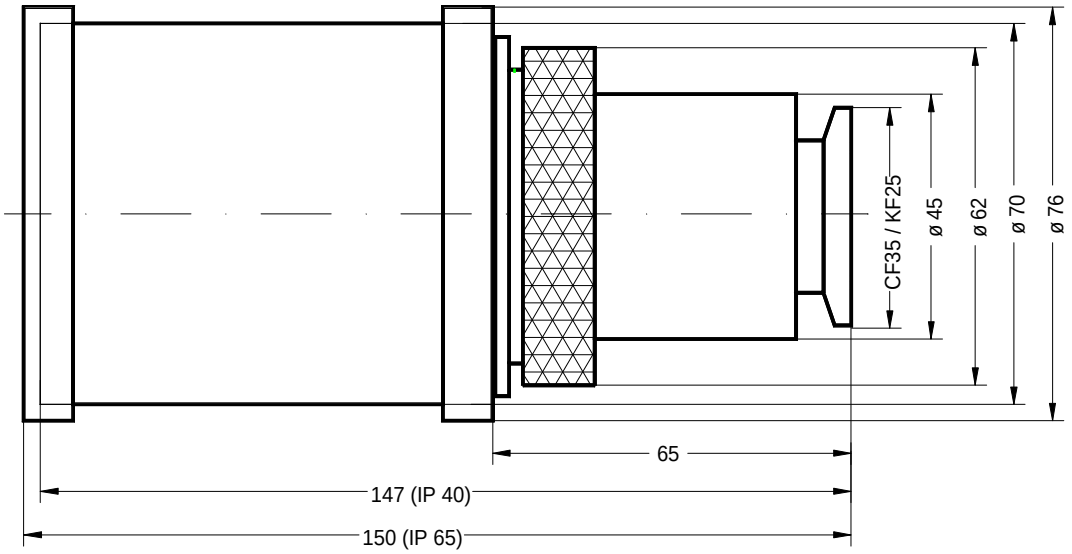


Figure 19 – ATMION™ Wide Range Manometer Compact Version (side view), with flange NW 25CF

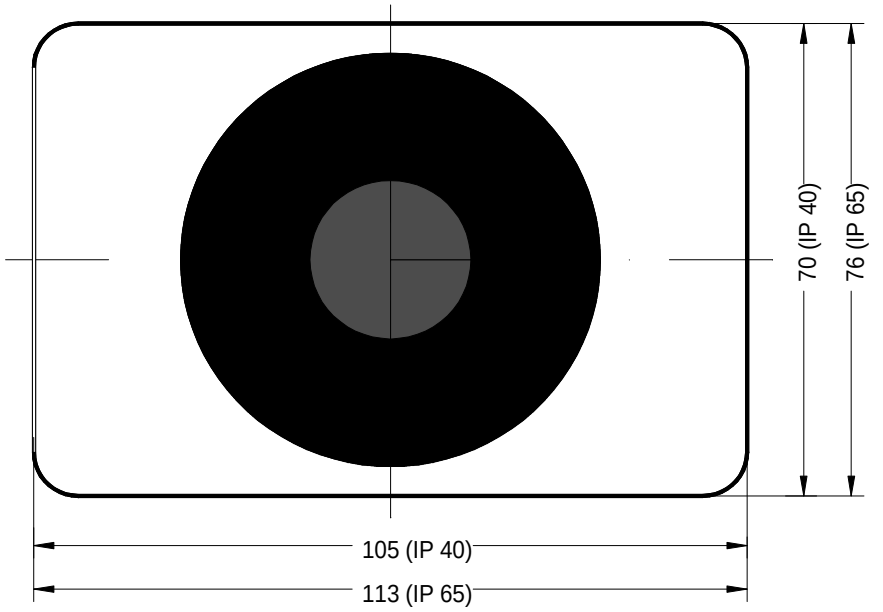


Figure 20 – ATMION™ Wide Range Manometer Compact Version (front view on flange)

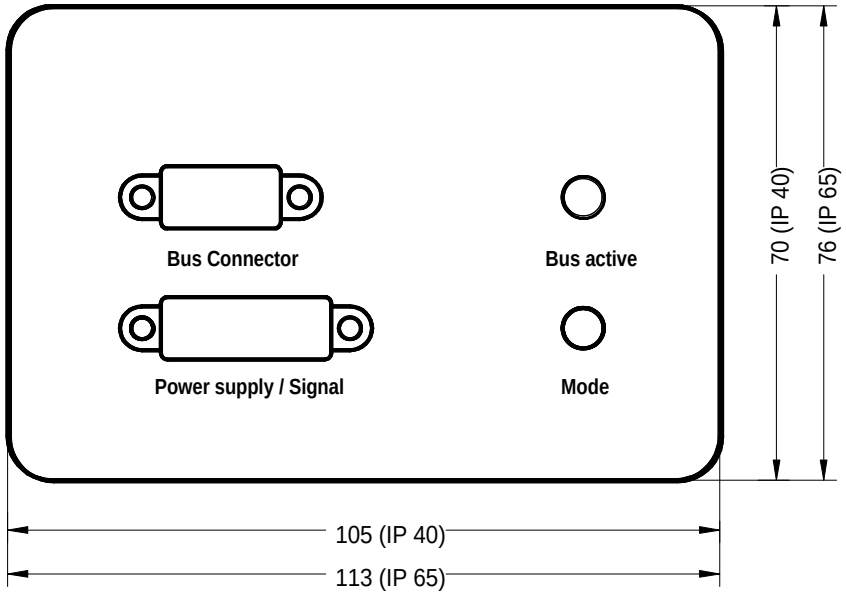


Figure 21 – ATMION™ Wide Range Manometer Compact Version (rear view on controller)

VACOM

VACOM
Steuerungsbau
und Service GmbH

CE-Konformitätserklärung für *ATMION*™ - Wide Range Manometer

(CE-Declaration of Conformity for ATMIONÔ - Wide Range Manometer)

---

1. Hersteller des Vakuummeßgerätes ***ATMION***™ - Wide Range Manometer ist die Firma
*(Producer of the vacuum measuring system **ATMIONÔ** - Wide Range Manometer is the firm)*

   VACOM
   Steuerungsbau und Service GmbH
   Schreckenbachweg 8
   D-07743 Jena

2. Bei dem mit ***ATMION***™ - Wide Range Manometer bezeichneten Gerät handelt es sich um ein Vakuummeßgerät. Das Gerät erfüllt die Anforderungen folgender EU-Richtlinien:
*(The **ATMIONÔ** - Wide Range Manometer is a vacuum measuring system. The system meets the demands of the following EU-Directives:)*

   - 93/68/EWG Kennzeichnungsrichtlinie *(Registration Directive)*
   - 73/23/EWG Niederspannungsrichtlinie *(Low Voltage Directive)*
   - 89/336/EWG EMV-Richtlinie *(Electromagnetic Compatibility Directive)*

Peter Storch
Geschäftsführer
(Managing Director)

VACOM
Steuerungsbau und Service GmbH
Schreckenbachweg 8
D-07743 Jena

Jena, 12. Juni 2000

.....
Peter Storch

Return of Vacuum Equipment – Procedure

Introduction

Before you return your equipment you must warn your supplier if the substances you used (and produced) in the equipment can be dangerous. You must do this to comply with health and safety at work laws.

You must complete the Declaration of Contamination on the next page and send it to your supplier before you dispatch the equipment. If you do not, your supplier will assume that the equipment is dangerous and he will refuse to accept it. If the Declaration is not completed correctly, there may be a delay in processing your equipment.

Guidelines

Take note of the following guidelines:

- Your equipment is **'uncontaminated'** if it has not been used or if it has only been used with substances that are not dangerous. Your equipment is **'contaminated'** if it has been used with any dangerous substances.
- If your equipment has been used with radioactive substances, you must decontaminate it before you return it to your supplier. You must send independent proof of decontamination (for example a certificate of analysis) to your supplier with the Declaration of Contamination. Phone your supplier for advice.
- We recommend that contaminated equipment is transported in vehicles where the driver does not share the same air space as the equipment.

Procedure

Use the following procedure:

1. Equipment in a thick polythene bag. If you do not have a polythene bag large enough to contain the equipment, you can use a thick polythene sheet.
2. Turn to the next page(s), photocopy and then complete the Declaration of Contamination.
3. Remove all traces of dangerous gases: pass an inert gas through the equipment and any accessories which will be returned to your supplier. Drain all fluids and lubricants from the equipment and its accessories.
4. Disconnect all accessories from the equipment. Safely dispose the filter elements from any oil mist filters.
5. Seal up all of the equipment's inlets and outlets (including those where accessories were attached). You may seal the inlets and outlets with blanking flanges or heavy gauge PVC tape.
6. Seal contaminated equipment. If the equipment is large, strap the equipment and its accessories to a wooden pallet. Preferably, the pallet should be no larger than 510 mm x 915 mm(20"x35"); contact your supplier if you cannot meet this requirement.
7. Contact your supplier and obtain a Return Authorisation Number for your equipment.
8. If the equipment is too small to be strapped to a pallet, pack it in a suitable strong box.
9. If the equipment is contaminated, label the pallet (or box) in accordance with laws covering the transport of dangerous substances.
10. Fax or post a copy of the Declaration of Contamination to your supplier. The Declaration must arrive before the equipment.
11. Give a copy of the Declaration to the carrier. You must tell the carrier if the equipment is contaminated.
12. Seal the original Declaration in a suitable envelope; attach the envelope securely to the outside of the equipment package. **WRITE YOUR RETURN AUTHORISATION NUMBER CLEARLY ON THE OUTSIDE OF THE ENVELOPE OR ON THE OUTSIDE OF THE EQUIPMENT PACKAGE.**

Declaration of Contamination of Vacuum Equipment and Components

The repair and/or service of vacuum equipment and components will only be carried out if a correctly completed declaration has been submitted. Non-completion will result in delay. The manufacturer could refuse to accept any equipment without a declaration.

This declaration can only be completed and signed by authorised and qualified staff.

1. Description of Vacuum Eqipment & Components	**2. Reason for Return**
- Equipment type/model:	
- Code No.:	
- Serial No.:	
- Invoice No.:	
- Delivery date	

3. Condition of the Vacuum Equipment and Components

- Has the equipment been used?
  yes ☐ no ☐
- What kind of pump oil/liquid was used? _____
- Is the equipment free from potentially harmful substances?

yes ☐ (go to Section 5) no ☐ (go to Section 4)

4. Process related Contamination of Vacuum Equipment and Components:

- toxic	yes ☐	no ☐
- corrosive	yes ☐	no ☐
- explosive*)	yes ☐	no ☐
- biological hazard*)	yes ☐	no ☐
- radioactive*)	yes ☐	no ☐
- other harmful substances	yes ☐	no ☐

*)Vacuum equipment and components which have been contaminated by biological explosive or radioactive substances, will not accepted without written evidence of decontamination!

Please list all substances, gases and by-products which may have come into contact with the equipment:

Trade name Product name Manufacturer	Chemical name (or symbol)	Dangerous material class	Measures if spillage	First aid in case of human contact
1.				
2.				
3.				
4.				
5.				

5. Legally Binding Declaration

I hereby declare that the information supplied on this form is complete and accurate. The despatch of the contaminated vacuum equipment and components will be in accordance with the appropriate regulations covering Packaging, Transportation and Labelling of Dangerous Substances.

Name of organisation or company: _____
Address: _____ Post Code: _____
Tel.: _____
Fax: _____ Telex: _____
Name: _____
Job title: _____
Date: _____ Company stamp:

Legally binding signature: _____