CW-800

CO_2 / Water Determinator

ELTRA

Elemental analysers

OPERATION MANUAL

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OPERATION MANUAL CW - 800

1 INSTALLATION
1.1 Setting up
1.2 Front panel illustration
1.3 Mains power connection
1.4 Data Interface
1.5 Nitrogen connections
1.6 Adjusting the gas flow
1.7 Adjusting the furnace temperature

2 ANALYSIS
2.1 Working procedure
2.2 Operating the sample loading/removing mechanism
2.3 Operating modes

3 MAINTENANCE
3.1 General information
3.2 Installing and removing the reagent tubes
3.3 Filling the reagent tubes
3.4 Replacing the O-Rings
3.5 Cleaning the dust trap
3.6 Replacing the combustion tube

4 DESCRIPTION OF THE FUNCTIONS
4.1 Measuring principle
4.2 Gas flow system
4.3 Infrared cell
4.4 Furnace

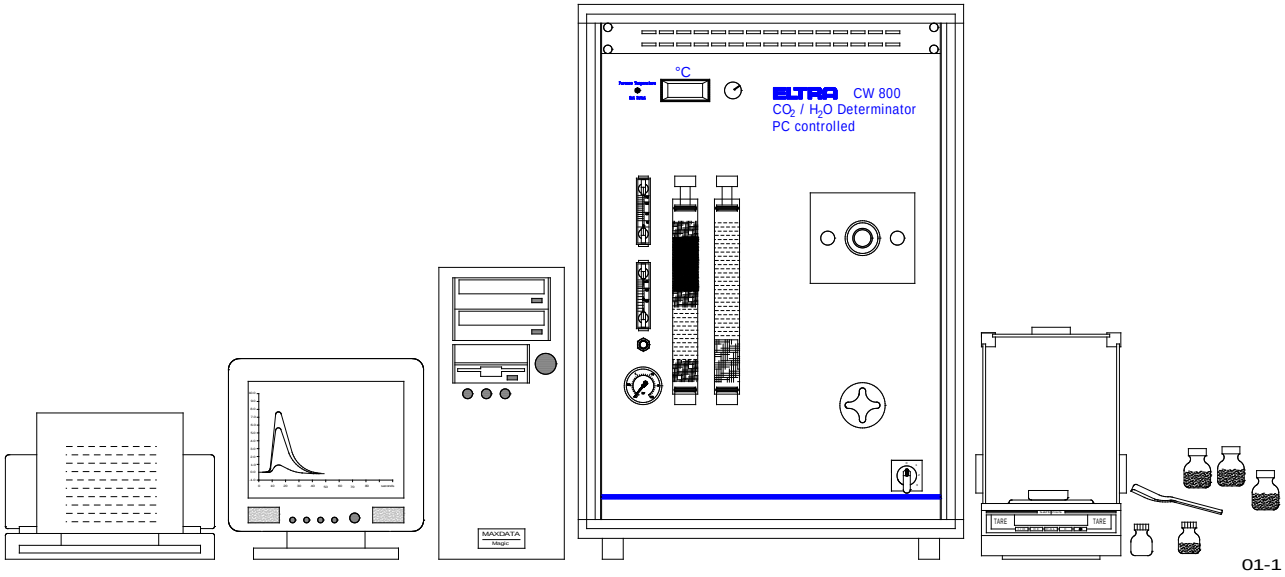
5 MISCELLANEOUS
5.1 Ordering numbers
5.2 Packing
5.3 CW-800 Pre-installation guide

1 INSTALLATION

1.1 Setting up

Since the analyser weighs about 65 kg it should be placed on a suitably stable surface. The balance should also be placed free of vibration. The balance can be placed in any position, although positioning it to the right of the analyser has proved to be best suited. The balance can of course also be placed on a weighing table next to the analyser.
There are no special requirements for setting up the printer and computer; they can be placed on a normal desk.

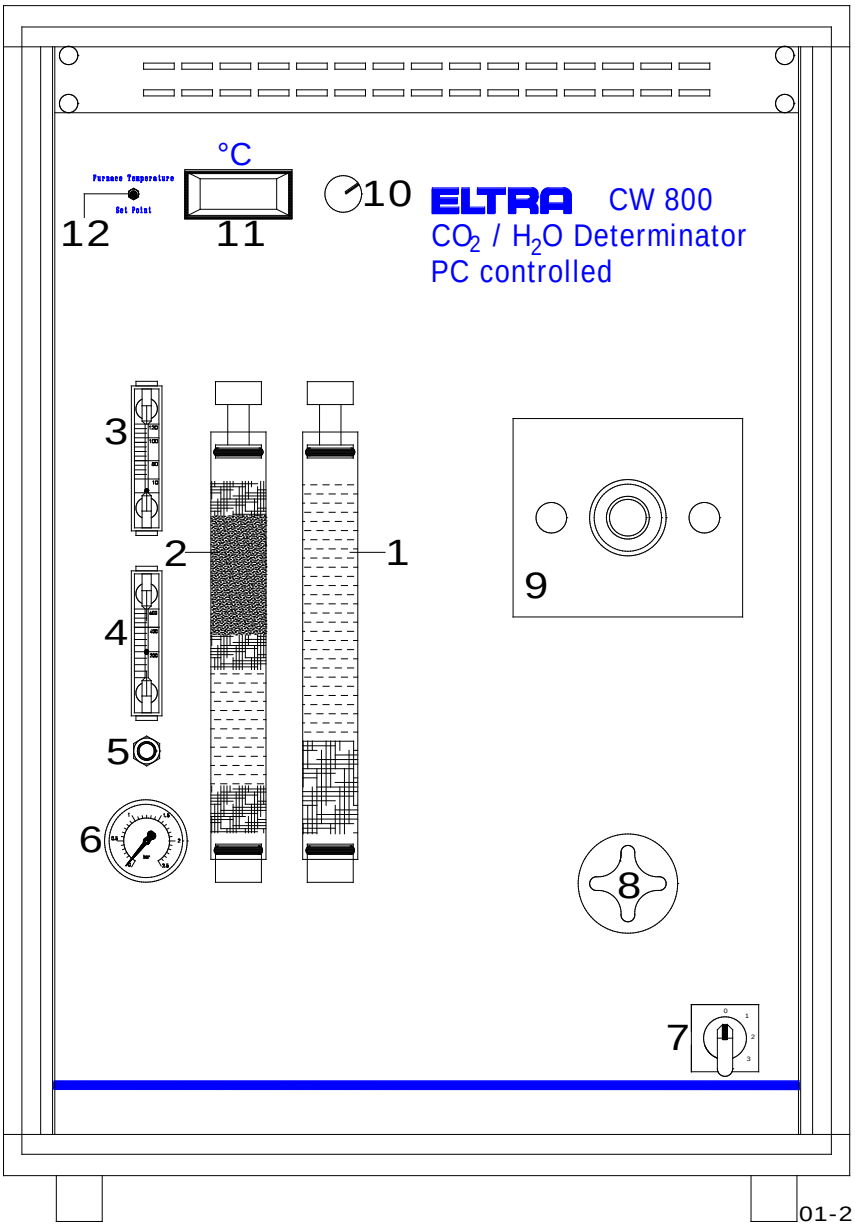
Below is an example of installation:



Although the analyser's operating environment does not necessarily need to be air conditioned, it is advisable to keep the room temperature between **18°C** and **30°C**.

Under no conditions should the device be placed in direct sunlight !
Avoid places exposed to the wind of air conditioners or to the wind blowing through open windows or doors.

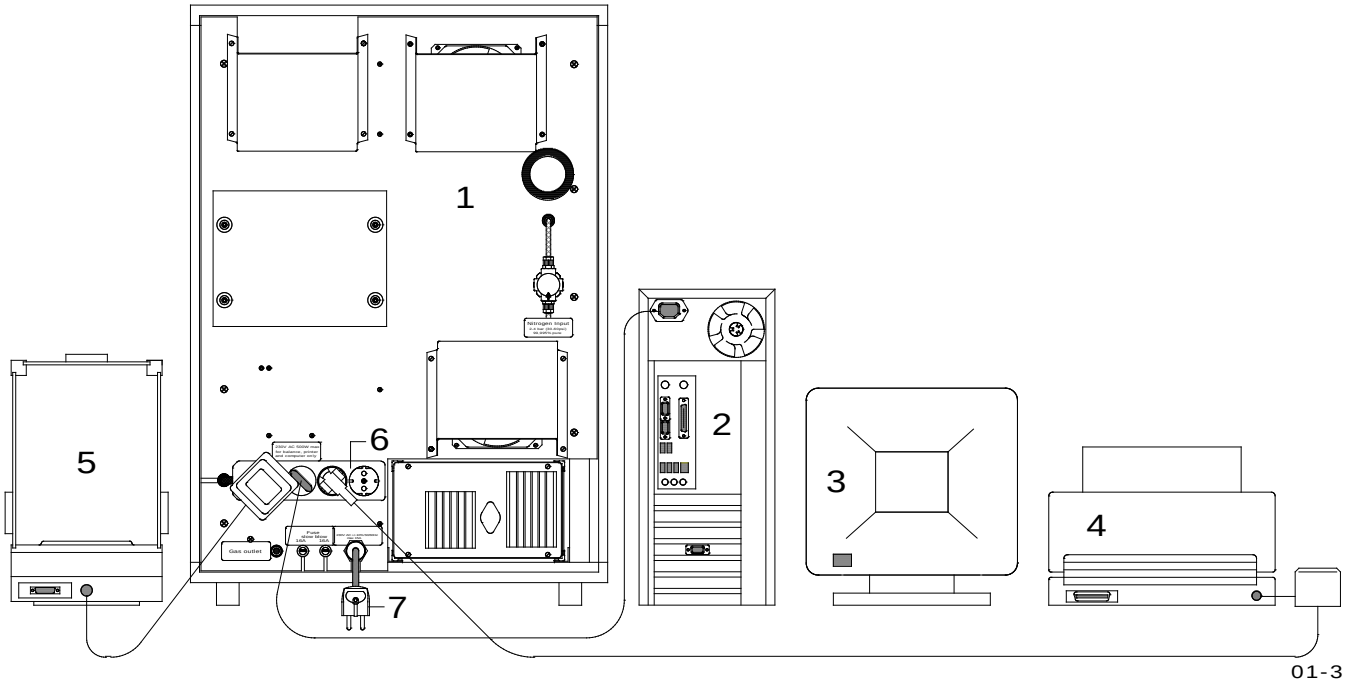
1.2 Front panel illustration



1. Moisture trap
2. Carrier gas purification
3. Carrier gas flow meter
4. Furnace inlet flow
5. Furnace inlet flow adjustment
6. Pressure gauge
7. Mains power switch
8. Dust trap cock
9. Combustion boat insertion and removing mechanism
10. Temperature adjustment knob
11. Actual / Set-point temperature display
12. Actual / Set-point temperature switch

1.3 Mains power connection

Since the infrared cell requires about **1 hour** to reach a stable operating temperature, it is advisable to connect the analyser to the **mains power** first and switch on before further installation work is carried out.
This waiting time is only necessary when **installing** the analyser. Since it is normally not switched off, and is always in operating temperature.



1..Analyser
2..Computer
3 Monitor
4 Printer
5 Balance
6 Quad socket
7 Analyser mains plug

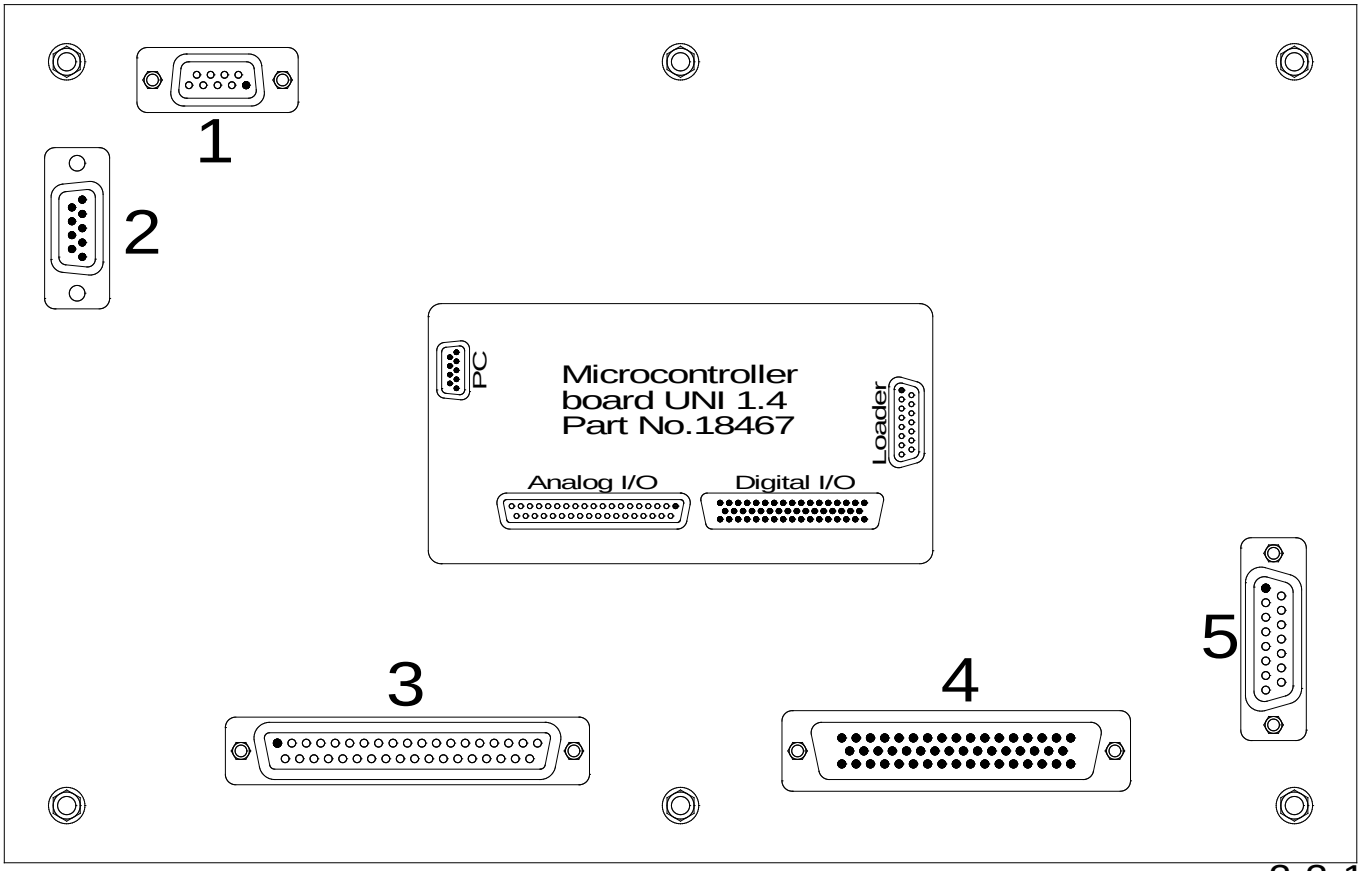
At first only the analyser **(1)** is plugged in and switched on. Turn the main switch to **position 1** (stand-by condition). See 1.2 .

The switch is situated on the front-side of the device. On the back of the device two mains cables are mounted.

All the mains cables should be connected to the quad mains power socket **(6)** **as shown in the schematic above**.

The computer **(2),** the printer **(4)** and the balance **(5)** should be plugged into the **quad socket (6)**

1.4 Data Interface



2-3-1

Rear side of UNI 1.3 board:

1 Pear serial interface
2 PC connection
3 Analog input/output signals
4 Digital input/output signals
5 Autoloader connection

When all the units are connected to the mains power, then data connections can be made. The plugs are all different from each other, so that they cannot be interchanged. The required data cables are included if the additional units are supplied. These are adapted to the interfaces when the analysers are put into operation in our company.

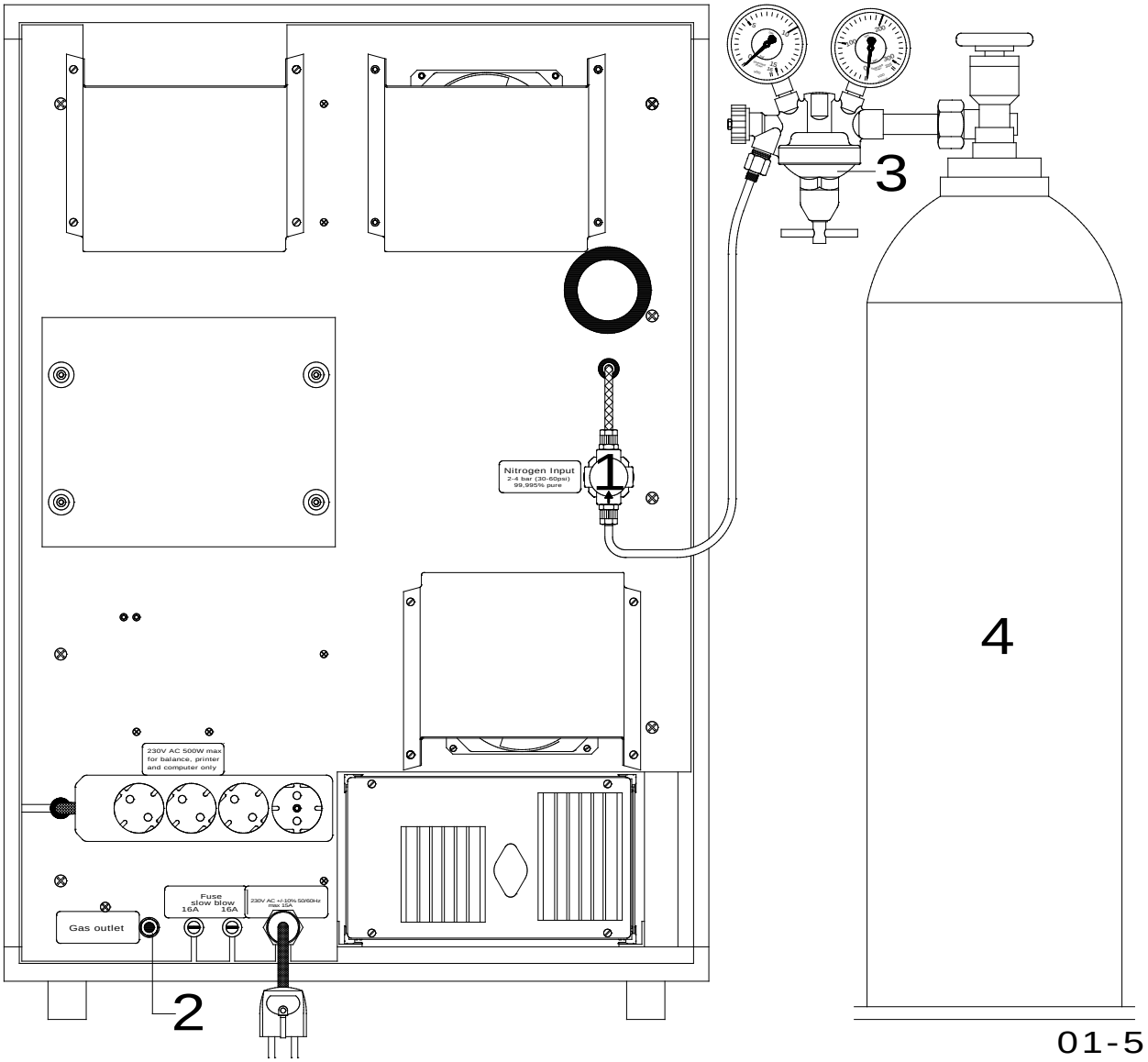
As the **balance** transfers the weight to the PC, its serial interface must be programmed.

The **computer** is already provided with an operating system and software for controlling the analyser.

NOTE: For all instructions on operating the PC software refer to the Help-function of the software.

1.5 Nitrogen connections

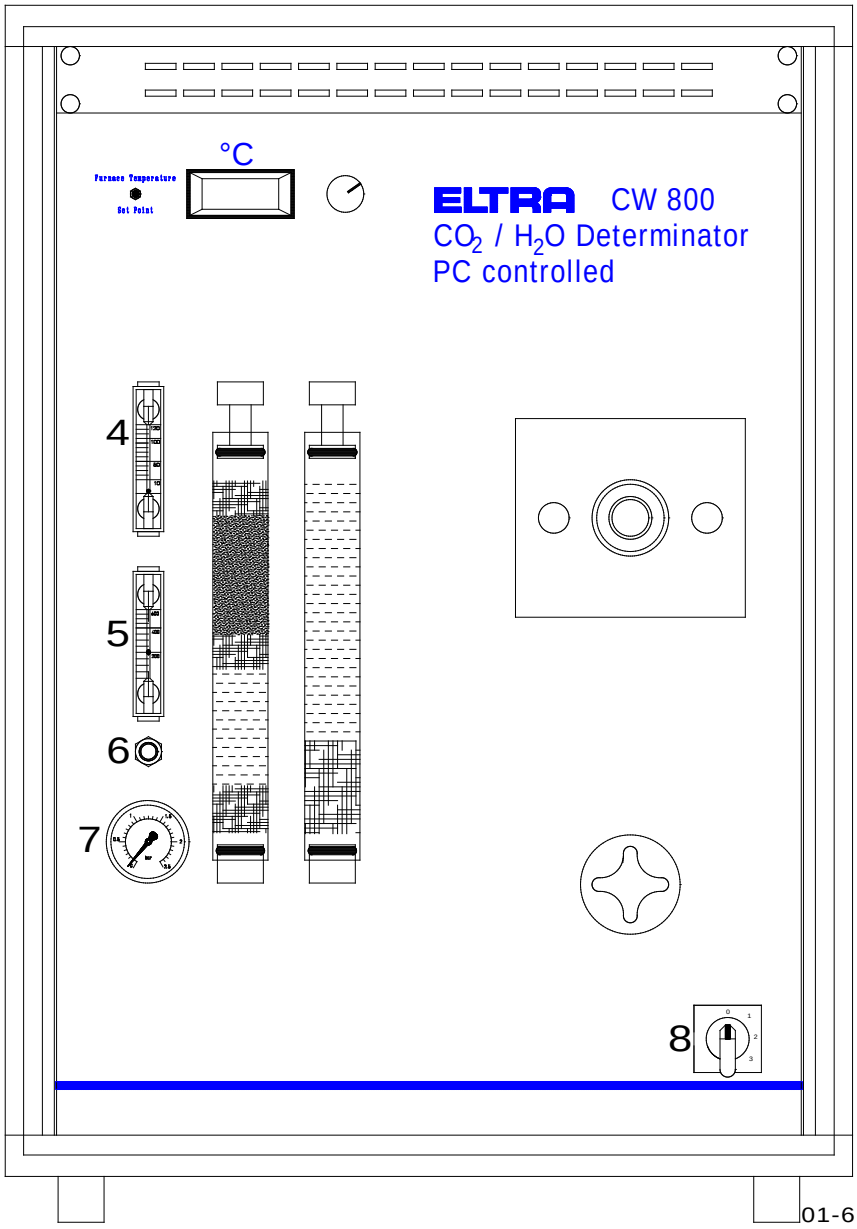
The necessary tube for connecting the analyser to the **nitrogen** supply is shipped with the device.



The tube connects the device through the fitting **(1)** of the internal pressure regulator with the **nitrogen** bottle, or **nitrogen** supply, through a pressure regulator **(3)**. This connection must be very secure, given that the operating pressure in the tube is **2** to **4 bar** (30 to 60 psi).

The tube connection **(2)** is the exhaust for the gas flow system. If desired, the exhaust can be channelled through a tube into the open air.

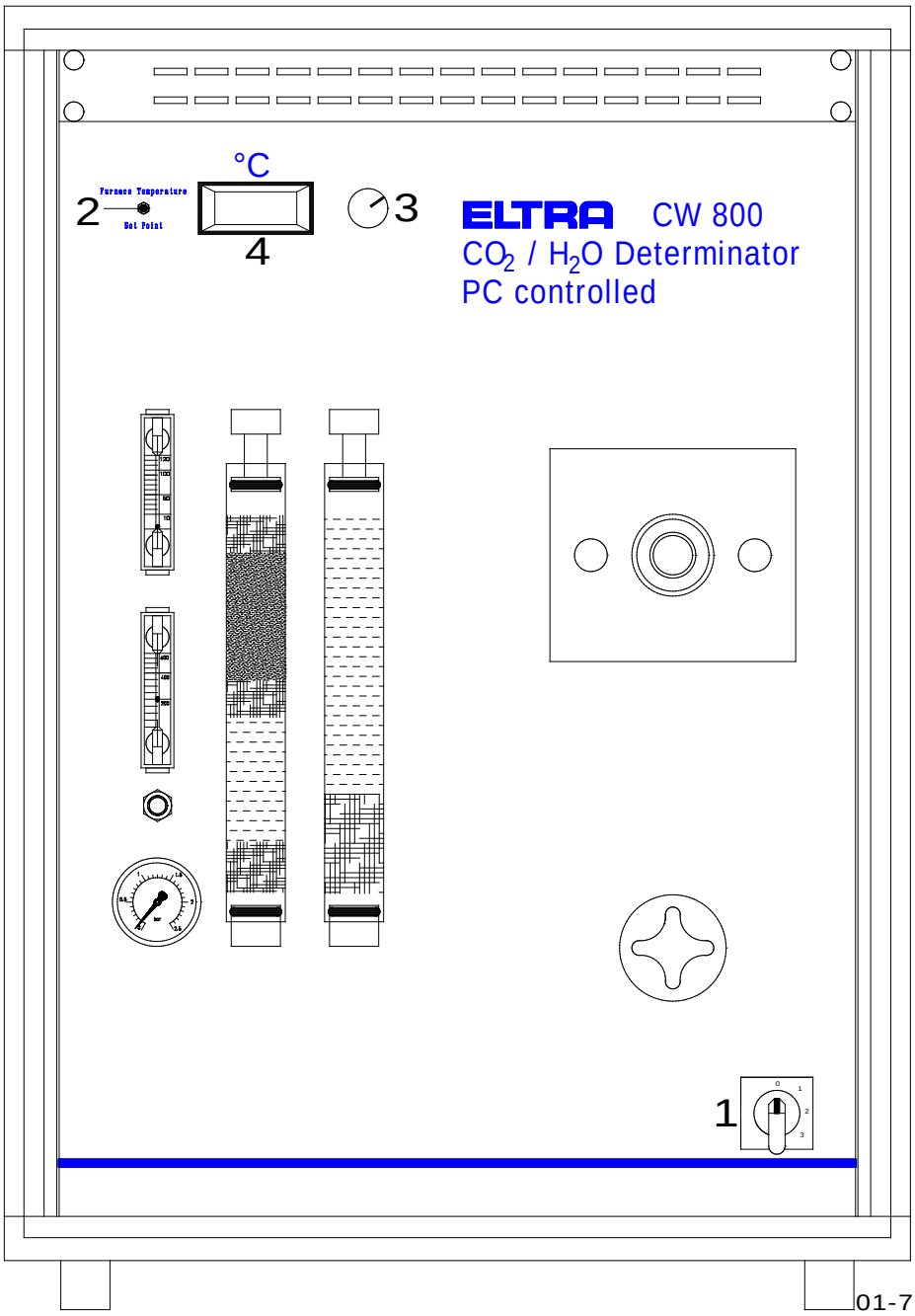
1.6 Adjusting the gas flow



- The analyser is connected to the **nitrogen** supply. See **1.5**.
- Adjust **2 to 4 bar** (30 to 60 psi) on the pressure regulator of the **nitrogen** supply (nitrogen cylinder).
- Set the mains power switch **(8)** of the analyser to position **3**.
- Read **1,5 bar** on the pressure gauge **(7)**.
- Adjust the restrictor **(6)** to read about **200 l/h** on the flow meter **(5)**.

The pump in the analyser is now in operation and the flow of about **120 l/h** is displayed on the upper flow meter **(4)** This flow is electronically regulated. An external adjustment is neither necessary nor possible.

1.7 Adjusting the furnace temperature



- Set the mains power switch **(1)** to **setting 2**.
- Set the switch **(2)** to **"set point"** position.
- Set **1000** on the display **(4)** by turning the potentiometer **(3)**.
- Set the switch **(2)** to **"furnace temperature"** position.
- The display **(4)** shows now the current furnace temperature.
- Normal operation temperature for the **CW-800** is **1000°C**.

2 ANALYSIS

2.1 Working procedure

The **CW-800** is designed to analyse a wide range of materials. The sample weight, the accelerator and the sensitivity of the analyser are different, depending on the properties of the respective material during combustion.

Therefore, the analysis methods are varied too. As different materials decompose differently, the chosen sample weight, the possible accelerators, the procedure for the insertion of the sample into the furnace and, finally, the sensitivity of the infrared cell will all be different. The user of the device can receive from us free advice regarding the different methods involved for different materials**.** The sensitivity of the device's infrared cell is optimised by us, free of charge, for each purpose.
In the following, the procedures are described for the analysis of lime samples.

Before making analyses, ensure the following:

- The temperature of the analyser is stable **(at least one to two hours on setting 1)**. See **2.3** .
- The moisture trap is checked and, if necessary, the **magnesium perchlorate** is replaced, see **3.3** .
- The incoming nitrogen supply has a pressure of **2-4 bar** / 30 to 60 psi.
- The mains switch was set to **setting 2** for the time sufficient for the furnace to heat up and to reach stable operating temperature. See **1.7** .
- The mains switch is set to **position 3** for the pump to start to work and the gas flow then circulates. It takes about 10-15 minutes until the analyser is ready for function.

Procedure of analysis:

1. Sample must be weighed before analysis. Place the empty ceramic boat on the balance and tare it. Put about 300 mg of the sample in the boat. The weight must be entered manually in the corresponding field of the software on the PC or be read from the balance, if the balance is connected to the analyser. The reading of the weight from the balance can be performed many times, if necessary, for example, for correction of falsely entered weight.

CAUTION:
Only the sample weight should be transferred to the PC with the weight transfer button and in no event the weight with the accelerator.

NOTE: For all instructions on operating the PC software refer to the Help-function of the software.

2. Start the analysis.
3. As soon as the “analysis” indication appears in the status window of the software, pull the boat insertion and removing mechanism out of the furnace, place the ceramic boat with the sample on a shovel and immediately push it back into the furnace. See **2.2** .

The analysis then runs automatically, so that no more handling is necessary. The infrared cell signals can be observed and followed on the display bars or on the PC screen.

At the end of the analysis, the measurement results appear on the display of PC. All analysis data, such as date, time, sample description, results, channels numbers, analysis time and others are saved on the hard disk of the PC and can be recalled later for review, report creation, calibration, print out or for any other purpose.

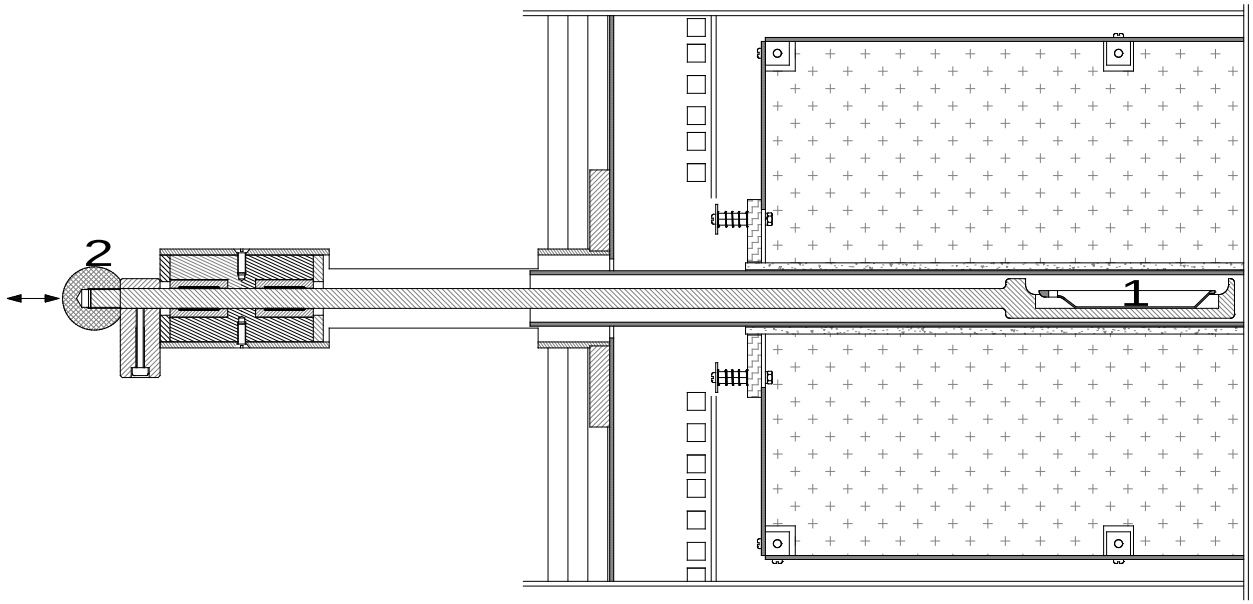
Note:

- The combustion boat should be removed immediately after the end of the analysis. The sample loading/removing mechanism should be always kept inserted into the furnace. It is taken out only to remove/place the boat on it.
- The ceramic boats, used for analyses may contain blanks (mainly H_2O), which will affect the accuracy and repeatability of the results. To eliminate the blanks, the boats must be preheated at the temperature of appr. 700 °C for 30 minutes. Keep the boats in the exsiccator to avoid their saturation with moisture from the air.
- If the message “waiting for stability” appears in the status window of the software, it is essential to wait until it disappears, and only then perform the sample loading operations.
- The sample weight should be reduced when the **IR-cell** is saturated. However when the weight is lower than **100 mg**, the accuracy will be reduced, due to the samples being not homogeneous, and due to lower weighing accuracy.

2.2 Operating the sample loading/removing mechanism

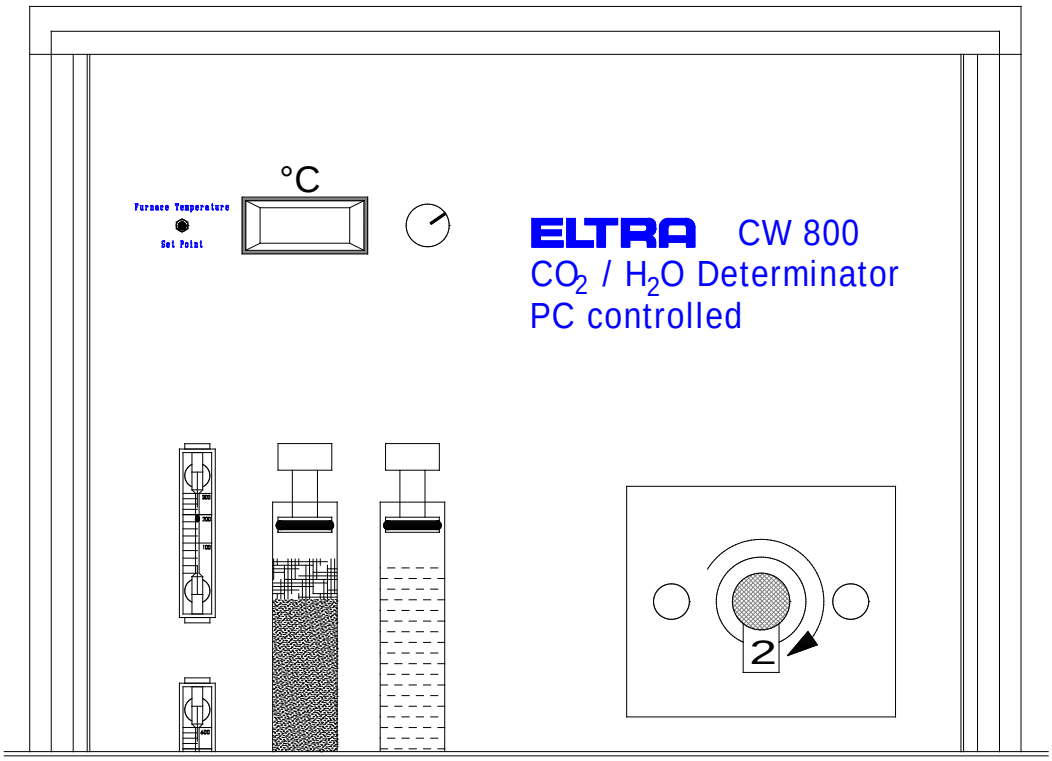
CW-800 features sample loading/removing mechanism, which eases the operation of the analyser.

- To insert the sample for analysis in ceramic boat **(1)** or to remove it after analysis, move the mechanism in horizontal direction against stop, holding it by the handle **(2)**.



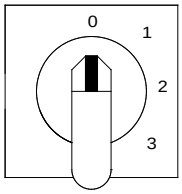
- To dispose the ceramic boat after analysis, rotate the mechanism around the horizontal axis, **when it is removed out of the furnace**. The bucket must be placed nearby the instrument or held with hand, for the hot boat to fall in. The balancing weight **(2)** ensures, that the ceramic boat always stays on the shovel, when moving the mechanism in/out of the furnace.

NOTE: Do not rotate the mechanism with the boat on the shovel, while it is being inserted in the furnace!

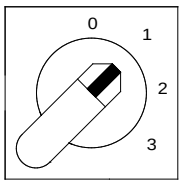


2.3 Operating modes

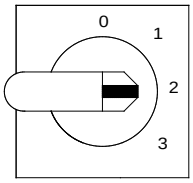
The mains switch of the analyser has 4 positions:



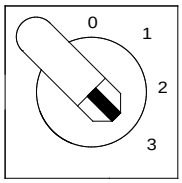
0 - Off. Analyser is switched off.



1 - Stand by. The thermostatic control of the IR-cell is on, furnace is switched off and there is no gas consumption.



2 - Furnace on. The furnace is switched on and heating up, while the gas flow is still disabled.



3 - Operation. All systems of the analyser are in operating modes.

In case the instrument was switched off (**pos. 0**), it should be switched on **pos. 1** for at least **1 hour**, in order for the IR-cell to reach the stable operating temperature.

When beginning the work, the mains switch is set first to **pos. 2**, for the furnace to reach the operating temperature. Usually it takes about 30 minutes. Then the mains switch is set to **pos**.**3** for about **15 minutes** before starting the first analysis. It can be set to pos. 3 in a moment when furnace not yet reached its operating temperature, but needs still about 15 minutes to do it. Air, and any moisture which has entered the analyser is expelled by the **nitrogen flow**. The slight influence which the **nitrogen flow** has on the temperature of the **infrared cell** is balanced out.

During work breaks, e.g. **lunch breaks**, the mains switch remains on **position 3**. During **longer** interruptions, e.g. after finishing work for the day, the mains switch is set to **position 1** (standby). The analyser's thermostatic control is then still working and no long warm-up time is needed, when re-starting the analyser. Energy consumption and wear are negligible on standby.

The analyser may only be switched off **(pos. 0)** when it is not used for several days or weeks. The analyser is designed for long term use, so that no **damage** results.

3 MAINTENANCE

3.1 General information

The content of the **right glass** tube on the analyser's front should be **replaced** every **100 analyses**.

The chemicals in the **left glass** tube on the analyser's front are for purifying the carrier gas. The depleting of these chemicals depend on the purity of the carrier gas used.
The **CO_2** absorber in the **upper half** of the glass tube changes it's colour from black to grey after saturation.
The moisture trap in the **lower half** doesn't change it's colour. When the particles at the upper end of this column doesn't move when knocking on the glass, a replacement is necessary. See **3.2** and **3.3**.

Remark:
According to our experience in most cases when users report deviation of the results, the problem is solved by replacing the **magnesium perchlorate**. This means that the **importance** of the condition of the chemicals used, are **underestimated**.

CAUTION:

There are special developed chemical qualities and accelerators for analysis devices!

Anhydrone, ascarite, iron phosphate, among others. Normal commercially available materials of this type either fall short or are entirely useless for this purpose.

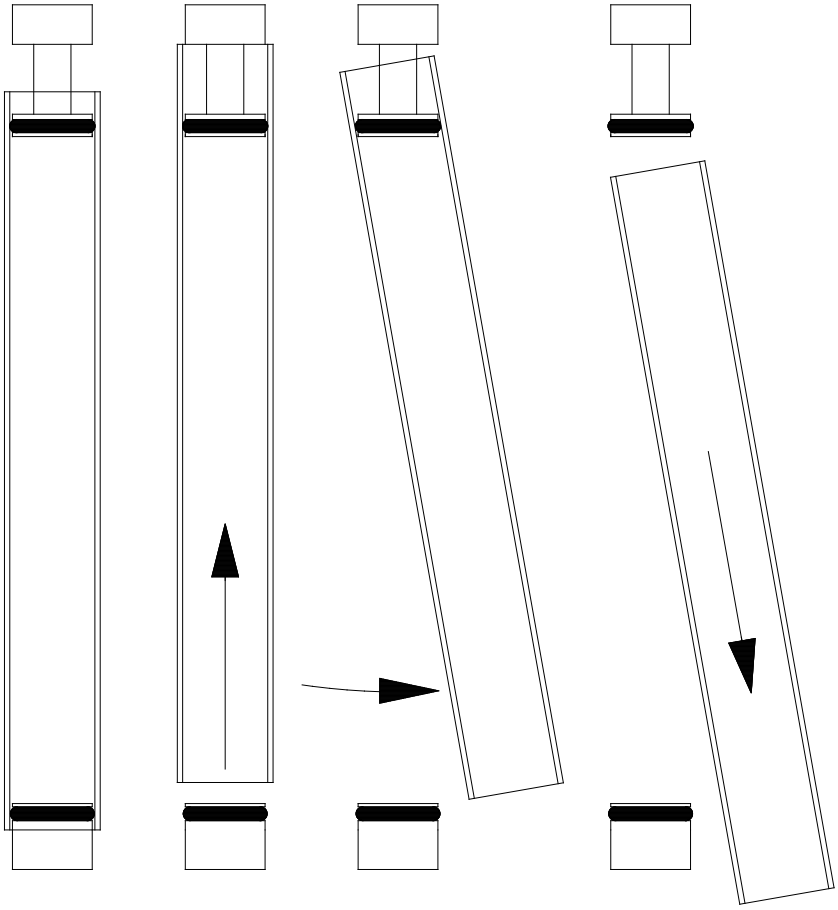
Normal **magnesium perchlorate**, for example, causes memory effects and therefore, not repeatable results. A further typical effect is that the analysis takes too long and often never comes to an end. This effect also occurs with **magnesium perchlorate** of suitable quality if it is saturated. Normal sodium hydroxide binds **CO_2** quite inadequately at room temperature. The special quality, on the other hand, reacts quite well at room temperature and has at the same time an indicator.

The **glass tubes** and **O-rings** should be greased only with **high vacuum grease**. Ordinary silicon grease is inadequate.

It is left to the user to test normal materials. The device will not be thereby damaged. When there are indeed problems, the proper quality materials should be used, and these should be in absolutely unsaturated condition, before technical service is called.

The chemical containers must be immediately and quite securely closed, so that they are not saturated with **CO_2** or **moisture**.

3.2 Installing and removing the reagent tubes



To replace the reagent tubes:
The reagent tubes are first lifted, then swung to one side, detached diagonally downwards and emptied.

IMPORTANT:
The dimensions for filling the glass tubes given in the schematic of **3.3** should be respected in all cases.
When, for example, there is a rest of quartz wool in the bottom of the glass tube, it is possible that dust, forming **magnesium perchlorate** can fall through and block the fitting below or this can damage the analyser and the infrared cell.

NOTE:
Before the reagent tubes are fitted, both the O-rings and the inner ends of the tubes are lubricated with **high vacuum silicon grease**.

The components are refitted in reverse order.

3.3 Filling the reagent tubes

The following chemicals are used :

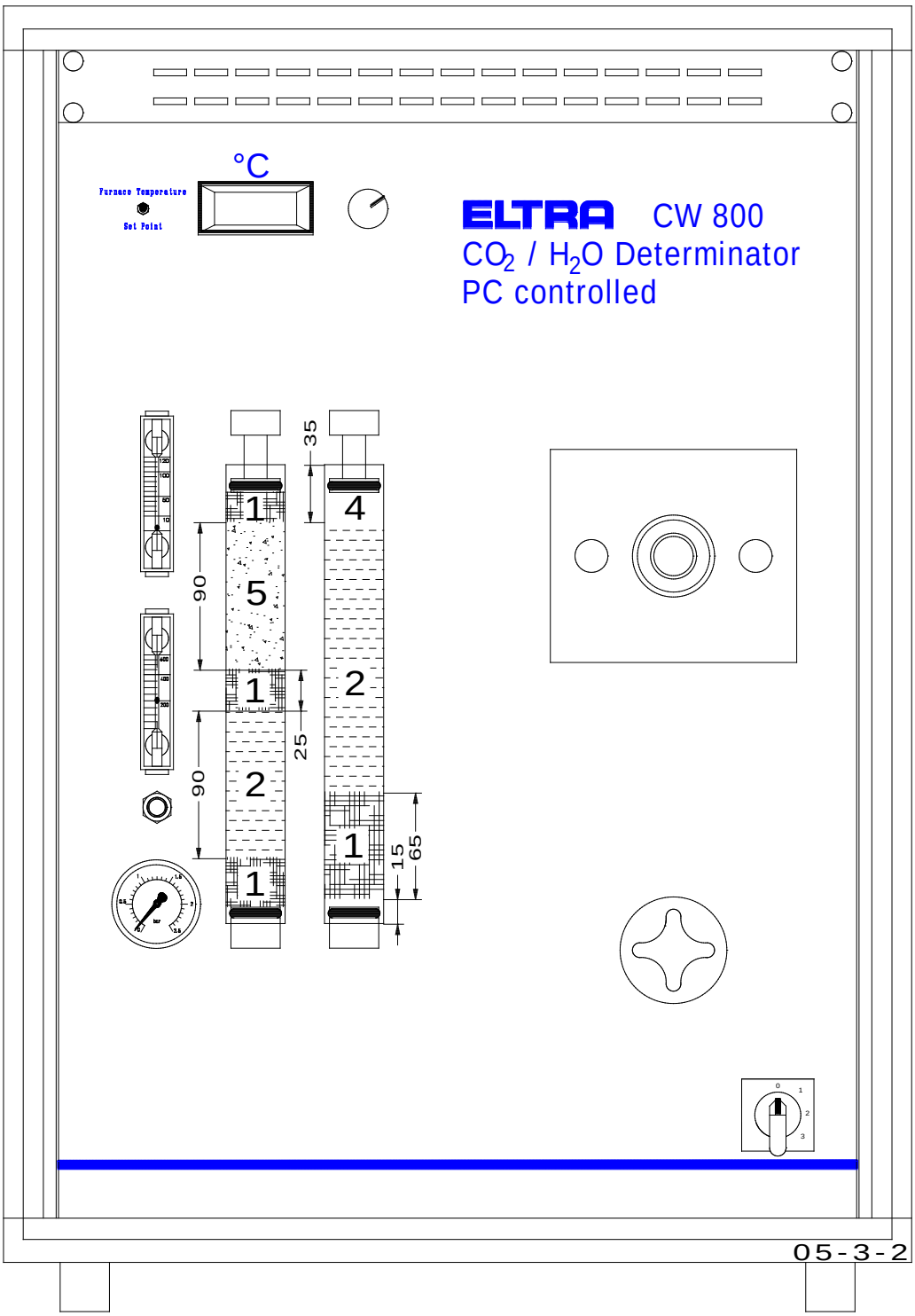
Magnesium perchlorate (anhydrone)	as moisture absorber
Sodium hydroxide	as CO_2 absorber

The chemicals are replaced when they are saturated. See **3.1**.
It is not possible to dry the **magnesium perchlorate** and use it again, as it is chemically changed after reacting with the moisture. If the absorber particles do not move (e.g. tapping on the glass), then this is a sign that the **magnesium perchlorate** is saturated. It is essential to change the absorber before it is completely solid. The saturation of the sodium hydroxide is changing its colour **(it turns to light grey)**.

Since different samples could be analysed, it is hard to give a precise number of analyses that can be made before the contents of the reagent tubes should be replaced. In addition, the saturation level of the absorber are at highest at the gas entry point and fall off toward the exit. For example, the first absorber after the furnace **(thick glass tube)** would be changed more often than the **second**; or the top half of the first absorber should be replaced. A clear sign of total saturation is when the absorber's particles do not move freely when the glass tube is tapped. Under any circumstances neglect the changing of the absorbers until it is completely hard. Normally, the moisture absorbers should be checked after **30 to 40 analyses.**

Please refer to the following schematics to identify the glass tubes on the analyser. In addition to the reagents in the glass tube, fill the bottom end of the tube with **annealed quartz wool**. One should pay attention that the quartz wool should be only as **thick** as necessary, otherwise the flow of gas can be **choked**. Under no conditions should the amount of quartz wool be less than that given in the following schematics, since fine particles of **magnesium perchlorate** can pass through the wool and collect itself at the bottom of the tube, causing severe damage.

It should be pointed out that **magnesium perchlorate** is a very strong **oxidative material**. At both ends of the glass tube, you should leave sufficient space for the gas connections to be fitted. The free space at the tube ends serves as sealing space. They must be cleaned after filling. The **O-rings** must be cleaned as well. Both the **O-rings** as well as the **sealing** areas of the tube must be greased with **high vacuum silicon grease.** This eases the assembly as well as the disassembly and further improves the seal. The assembly of the tubes follows in reverse order from the procedure given in **3.2**.
Make sure that the O-rings are completely sealed around the glass tubes.



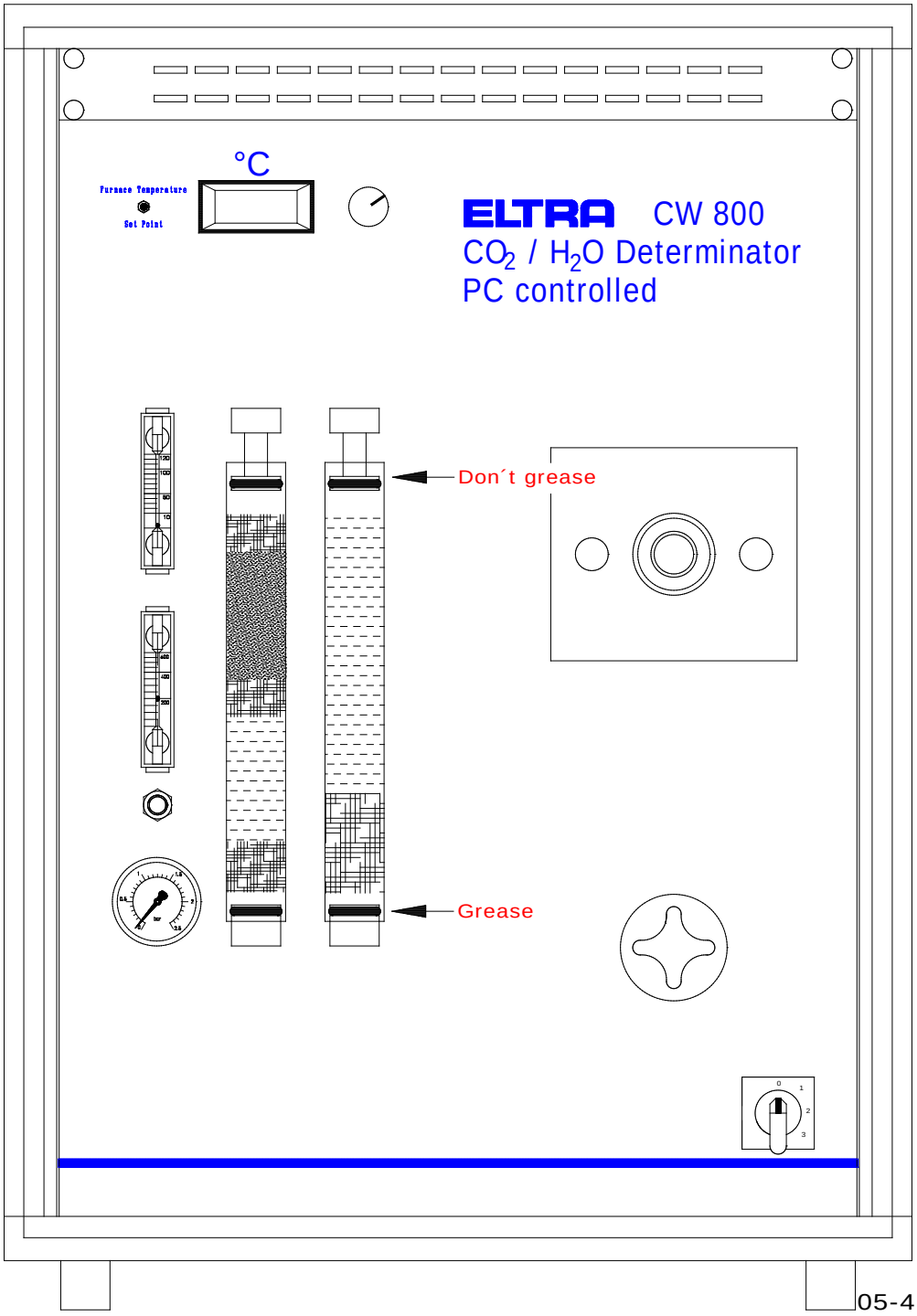
Each filling quantity carries a tolerance of ± 20 %

1	Glass wool	90331
2	Magnesium perchlorate (anhydrone)	90200
4	Free (empty)	
5	Sodium hydroxide (ascarite)	90210

3.4 Replacing the O-Rings

The **O-rings** are only replaced when they can no longer adequately seal, due to severe damage or age. When removing the **old** O-rings, be ensure that the sealing areas of the fittings are not damaged. The groove in which the old O-rings sat must be cleaned, so that it is completely **free of grease**.

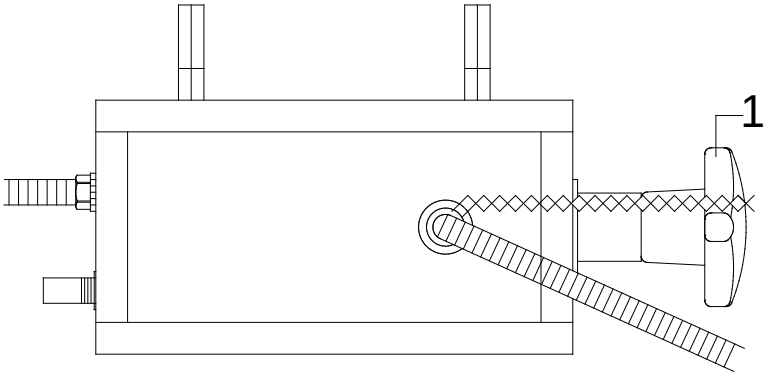
The new O-rings should under **no-circumstances** be greased before installing, but **only** after installation. Otherwise, **the O-rings will turn with the glass tubes** when trying to remove them.



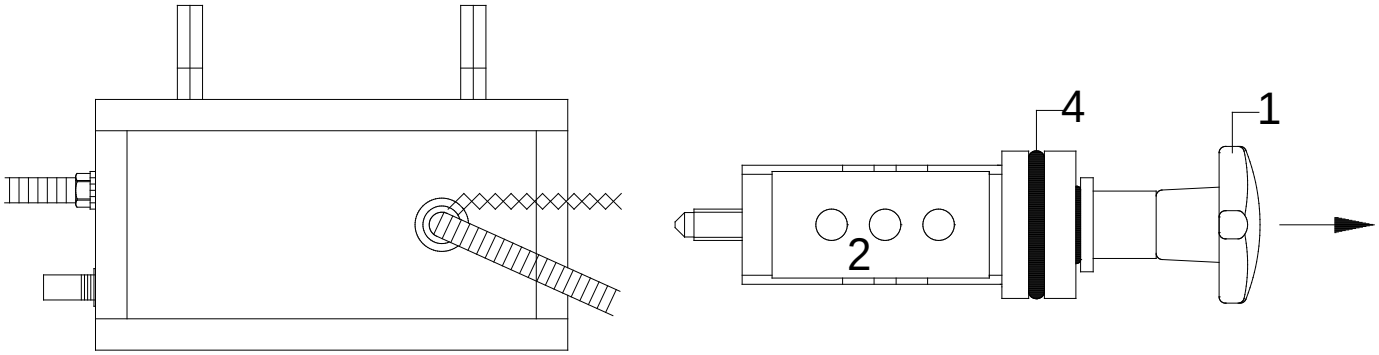
3.5 Cleaning the dust trap

The dust which may come out of the furnace with the carrier gas is trapped in the **dust filter**. The amount of dust caused by the **CW** analysis is extremely **low**, compared to combustion analyses, so that the big volume filter used, should be changed about every **5000** analyses.
NOTE: Once the filter block is disassembled for checking, **the new paper filter element should be used in any case**. Filter is sealed by pressing it from both sides, which causes its deformation and it may not provide proper sealing after being used once.

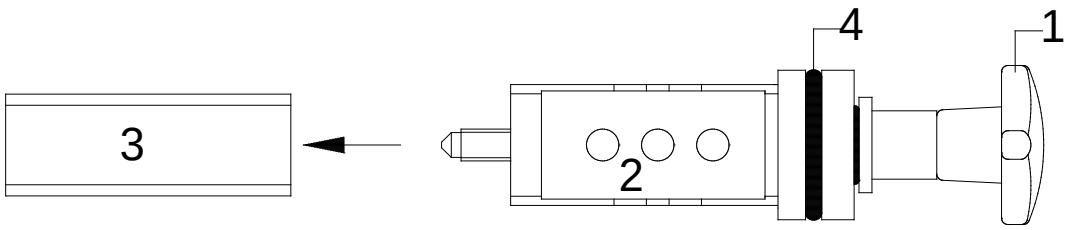
1. Turn the cock **(1)** counter clockwise for about 10 turns.



2. Pull the cock **(1)** and remove the filter assembly out of the housing.



3. Remove the filter **(3)** out of the cylinder **(2)**.



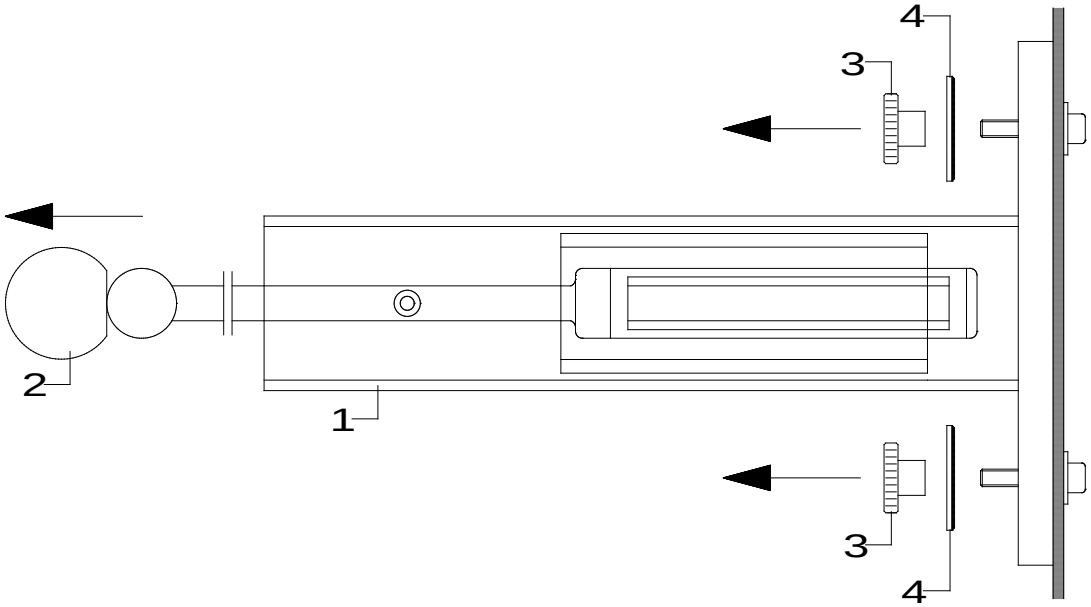
4. Enter a new filter **(3)** into the cylinder **(2)**.
5. Lubricate the O-ring **(4)**.
6. Assemble again in reverse order.

3.6 Replacing the combustion tube

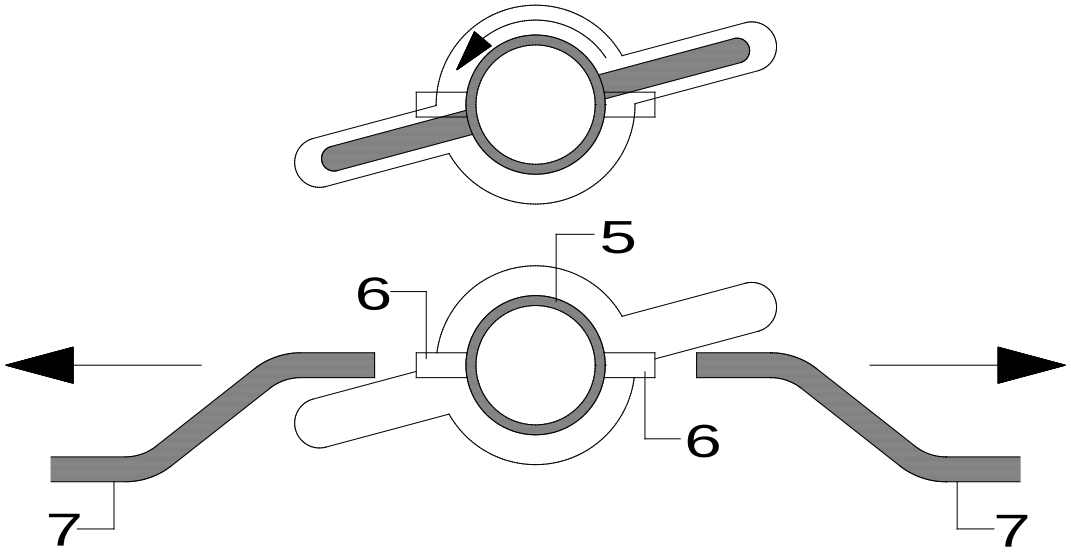
The combustion tube must be replaced, when it is broken.

ATTENTION! The metal parts of sample loading mechanism, the combustion tube, the furnace housing may be hot, if the furnace was in operation recently! **Let the furnace cool down before changing the combustion tube. For safety reasons, set the mains switch of the analyser to pos. 0 and pull the mains plug out of the mains socket!**

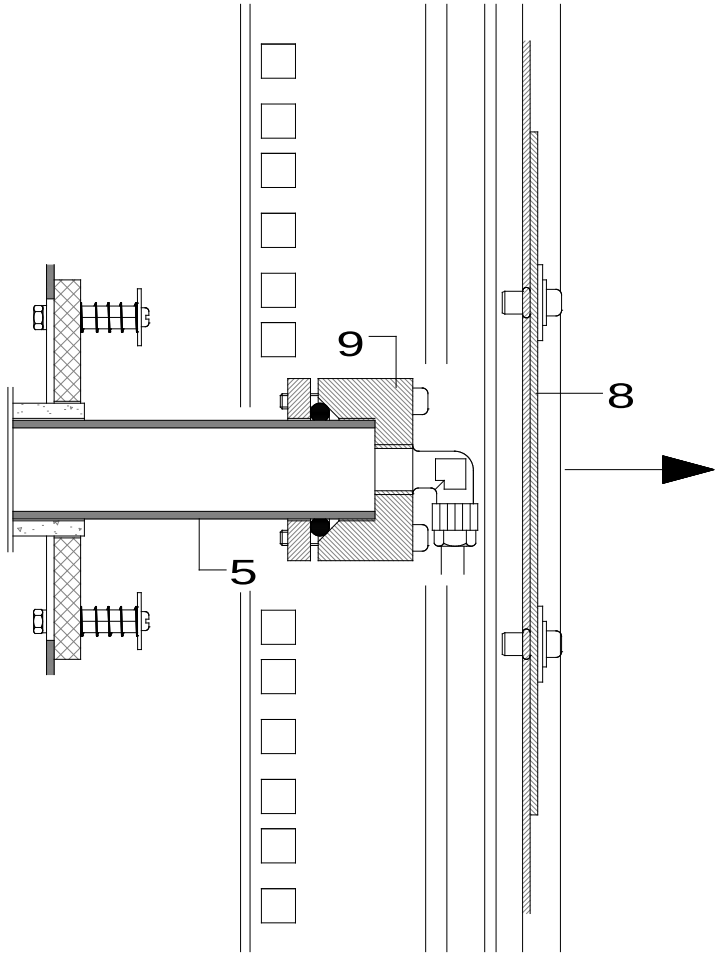
1. Pull the sample loading mechanism out of the furnace using the knob **(2)**.
2. Hold the sample loading mechanism **(1)** with one hand, unscrew the nuts **(3)**, remove them as well as the washers **(4)** with other hand.
3. Detach the sample loading mechanism from the front panel of the analyser.



4. Rotate the combustion tube **(5)** to align the combustion tube fittings **(6)** with cut in the front panel of the analyser.
5. Pull the combustion tube approx. 5 cm out of the furnace, so that the fittings **(6)** are at about 1-2 cm distance from the front panel, outside the analyser.
6. Pull off the rubber tubes **(7)** from the combustion tube fittings **(6)**.



7. Open the panel **(8)** of the analyser.
8. Open and pull the connector **(9)** from the combustion tube **(5)**.
9. Pull the combustion tube out of the furnace.



Install new combustion tube in reverse order.

- Take care to push the new combustion tube into the furnace carefully, horizontally, without applying force, otherwise the tube can break.
- Grease the front fittings **(6)** of the combustion tube to be able to put the rubber tubes on it. Apply minor quantity of grease, otherwise the tubes may fall off by themselves later.
- Align the sample loading mechanism to the combustion tube, so that the shovel of the mechanism does not touch the combustion tube when it is inserted and rotated!

4 DESCRIPTION OF THE FUNCTIONS

4.1 Measuring principle

The measuring method is based on the principle of sample fusion and the analysis of the gases given off, through infrared absorption.

The moisture traps ensure that a dry gas mixture is supplied to the **CO_2** infrared cell.

The infrared cell signals are selective and correspond to the **CO_2** or **H_2O** concentration in the gas mixture. These signals are electronically linearized, integrated, divided by the sample weight and the percentages of **CO_2** and **H_2O** are digitally displayed.

Since the sample weight is taken into account, the results are not dependent on the weight. For this purpose, the sample is weighed before being analysed and entered into the analyser. If necessary, blank values can also be entered; the software takes them into account when determining the results.

The operating software running on the connected PC ensures comprehensive analyser control and convenient operation, providing the operator with all the necessary features for running analyses and handling the results.

4.2 Gas flow system

The **nitrogen** supply is connected to the inlet **(1)** of the gas system. Pure **nitrogen** is available in steel bottles. The purity **99.95%** is fully sufficient. **Impurities** in the nitrogen are extracted in the attached trap **(8)**. The upper half of the trap is filled with a **CO_2** absorber and the lower half with a **moisture** absorber. **Magnesium perchlorate** (anhydrone) acts as a **H_2O** absorber. **Sodium hydroxide** acts as a **CO_2** absorber, preferably with an indicator, so that the degree of saturation can be seen from the coloration.

The **nitrogen** inlet pressure should be **2 to 4 bar**, which is then regulated inside the analyser to **1.5 bar**, as shown on the pressure gauge **(5)**.

A pressure switch **(4)** shuts its contact at around **1 bar** (15 psi) and switches the pump on **(18)**. This will ensure that no air will come into the gas flow system.

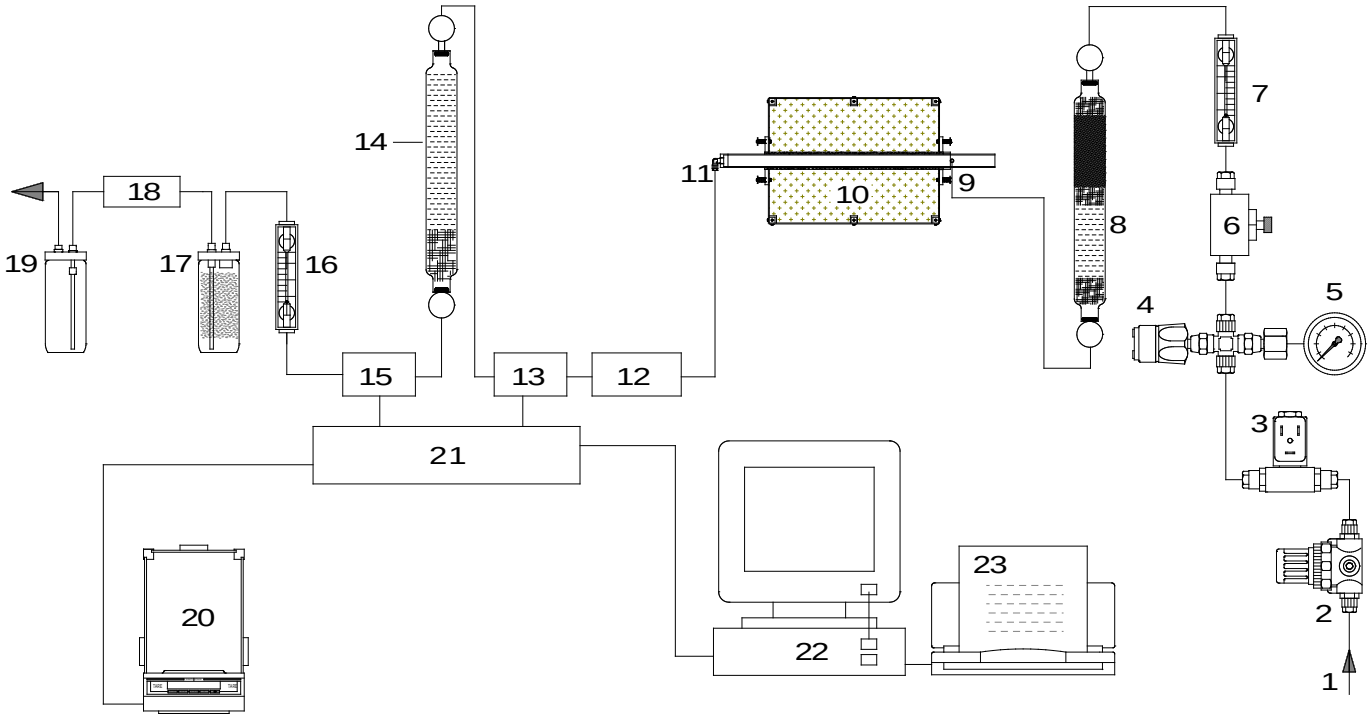
With the help of the flow adjustment **(6)** the inlet flow will be held to a level of at least **200 l/h**. The flow rate can be read on the lower flow meter **(7)** on the front panel. This flow rate level is fed into the furnace inlet. This tube has two inlet fittings **(9)**.

The sample in the combustion boat is fed into the furnace **(10)**. At the furnace outlet, the combustion exhausts, **simultaneously** with the **nitrogen.** It is sucked by the lower pressure created by the pump, and is fed out at a flow rate of **120 l/h**.

This **flow,** out of the furnace is **lower** than the flow rate that comes into the (open) inlet. The difference is expelled from the furnace inlet. This prevents air from entering the combustion area.

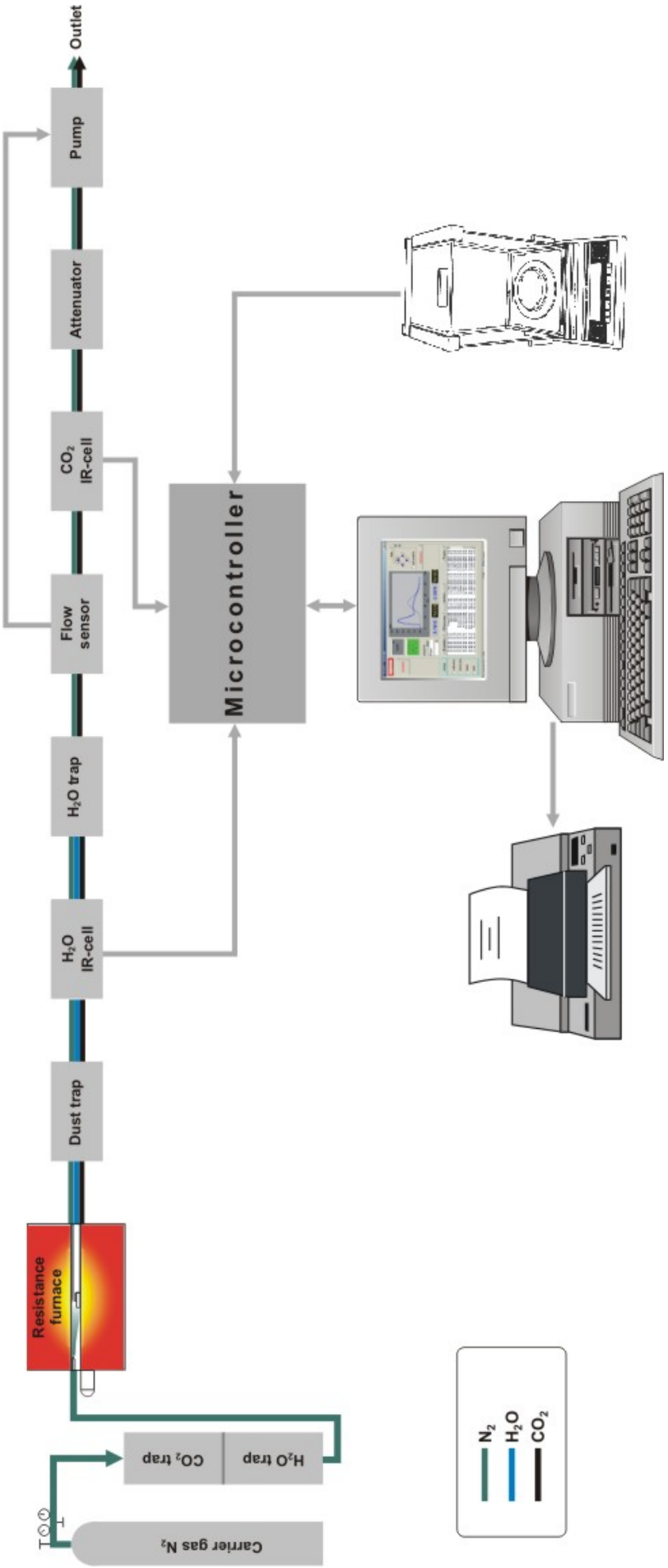
A tube **(11)** connects the furnace outlet with the dust trap **(12)** and **H_2O** detector **(13)**. The moisture is then trapped in the **H_2O** trap **(14).** The dried gas will pass through the **CO_2** detector **(15)**.

Finally, the gas is fed through the upper flow meter **(16)** on the front side of the analyser. The displayed value must be constant **120 l/h**. The flow is maintained by a pump **(18)**, which is electronically controlled, the gas flow is monitored by the flow sensor. In order to prevent a **pulsation** caused by the membrane oscillators of the pump, damping spaces **(17, 19)** are installed before and after the pump. See **diagram next page**.



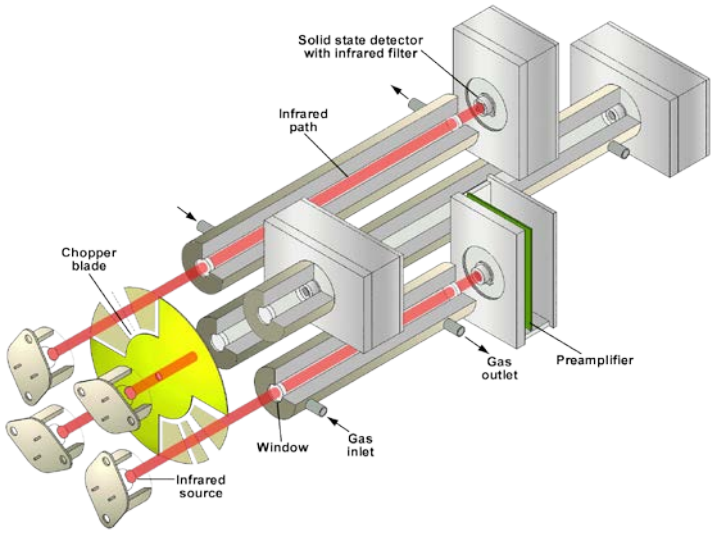
1. Carrier gas inlet
2. Pressure regulator
3. Nitrogen stop valve
4. Pressure switch
5. Pressure gauge
6. Flow adjustment
7. Carrier gas flow meter
8. Carrier gas purification
9. Furnace inlet
10. Furnace
11. Furnace outlet
12. Dust trap
13. H_2O IR-detector
14. Moisture trap
15. CO_2 IR-detector
16. Gas flow meter
17. Attenuation volume before the pump
18. Gas pump
19. Attenuation volume after the pump
20. Balance
21. Microcontroller
22. Computer
23. Printer

Gas flow diagram:



4.3 Infrared cell

The measuring principle is based on the infrared radiation absorbing property of many gases. Each of these gases absorbs specific characteristic spectral wavelengths of infrared radiation. The absorption spectrum is determined by the number, configuration and type of the atoms in the gas molecules.



An infrared source is electrically heated and radiates broad-band infrared radiation. The light is interrupted by a rotating chopper blade, resulting in an alternating light. The chopper is crystal controlled, so that the chopper frequency is highly stable. The infrared radiation then passes through the measuring IR-paths, through which a mixture of combustion gases and carrier gas flows.

Depending on the composition of the gas mixture, certain frequencies of the infrared spectrum are absorbed. The rate of absorption depends on the concentration of the gases.

As the infrared beam leaves the IR-path, it passes through an infrared filter, which only allows a narrow band of infrared radiation to pass. This narrow band must correspond to the IR wavelength for which the sample gas shows its maximum absorption capacity.

The intensity of the radiation after the filter thus corresponds to the concentration of a specific gas in the path. The beam finally strikes a solid state infrared detector, which emits an electrical signal, in proportion to the intensity of the beam.

Since the beam is interrupted by the rotating chopper, as mentioned above, the detector receives an alternating signal. Temperature and aging influences of the detector, as well as noise, are thereby suppressed.

The signal thus obtained is amplified and rectified, so that it leaves the infrared cell as a d.c. value.

The infrared cells of the CW-800 do not require any manual zero adjustments. The zero and sensitivity adjustments of the infrared cells are permanently and automatically controlled by the electronics. The detectors utilize solid state sensors combined with infrared filters. The sensors are not gas filled, thus eliminating long term problems due to gas leakage.

The lengths of all four cells can be individually optimised to obtain maximum precision for the target analyses levels of each customer. Each of the cells can be installed with infrared absorption lengths ranging between 1 mm and 320 mm.

The infrared cell rack is temperature controlled, so that the sample gas which flows through it, is kept at a constant temperature

4.4 Furnace

The furnace is a resistance furnace. The heating element is a **resistance wire**. The maximum furnace temperature is **1000°C** is fully sufficient for CO_2/H_2O extraction from the sample.

The furnace is fully **electronically controlled** and has therefore no transformer. The electronic controls the temperature and, at the same time, limits the maximum current during the warming up period. The set point of the temperature is manually adjustable and is shown on the digital display to within **1 °C**.

The actual value is measured by a **PtRh-Pt- thermocouple**. Both signals are fed to the differential input of an extremely sensitive amplifier. The output signals of this amplifier controls the power electronic, so that the actual value (and therefore the temperature) is exactly the same as the temperature setting.

A further **sensor** reads the environmental temperature and corrects the reference point of the thermocouple, so that variations in the environmental temperature have no influence on furnace temperature.

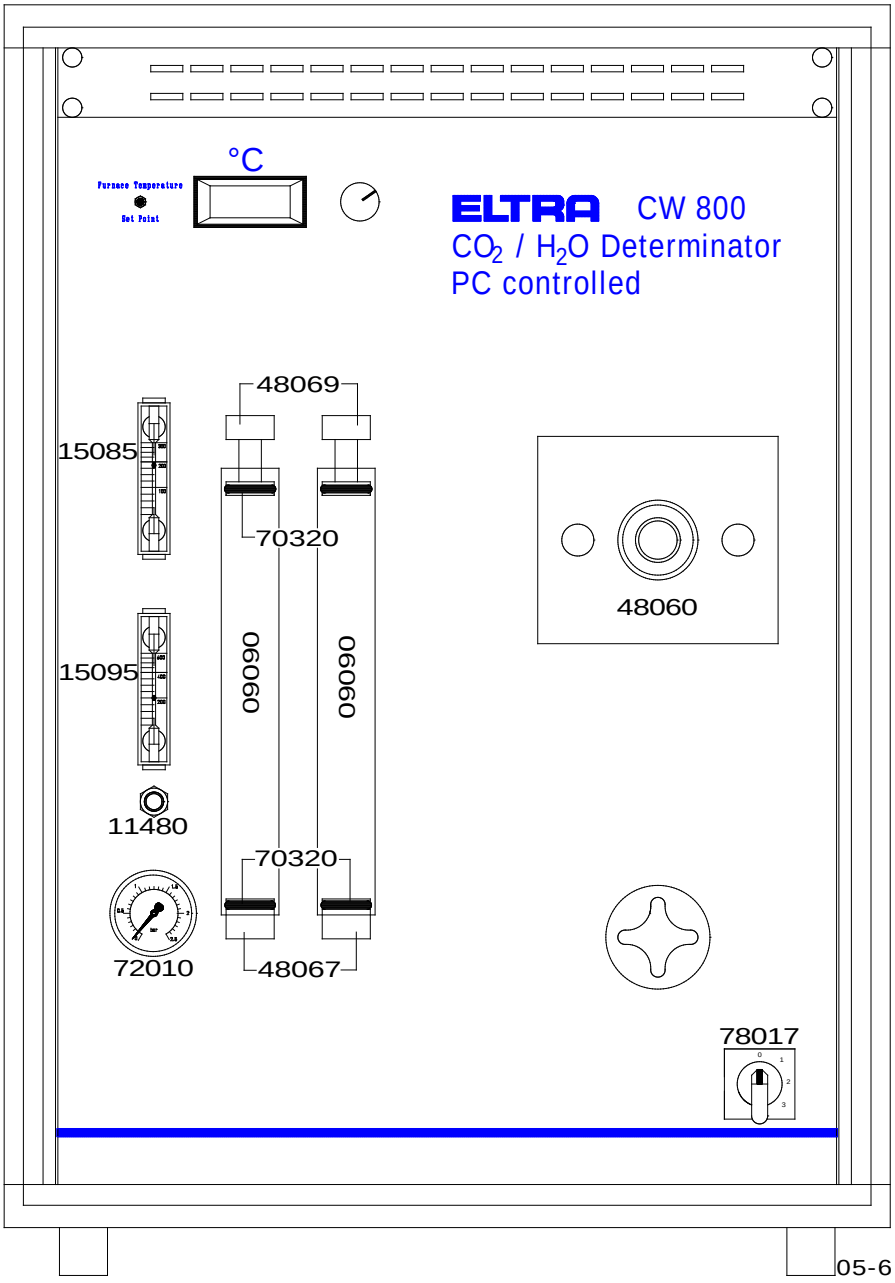
The controlling electronic supplies the heating element with continuous power through phase angle control. This helps ensure that the temperature is held constant, in contrast to the normal **Off / On regulation**. Therefore, the temperature can be **digitally displayed** within **1°C** without up or down variations.

The automatic current limit prevents exceeding the allowed maximum power of the heating element. This is mainly required when turning on the furnace when it is still **cold**, or when **raising** the **temperature** setting while the furnace is **hot**. Since the current limit operates fully automatically, no **manual** adjustment is needed.

5 MISCELLANEOUS

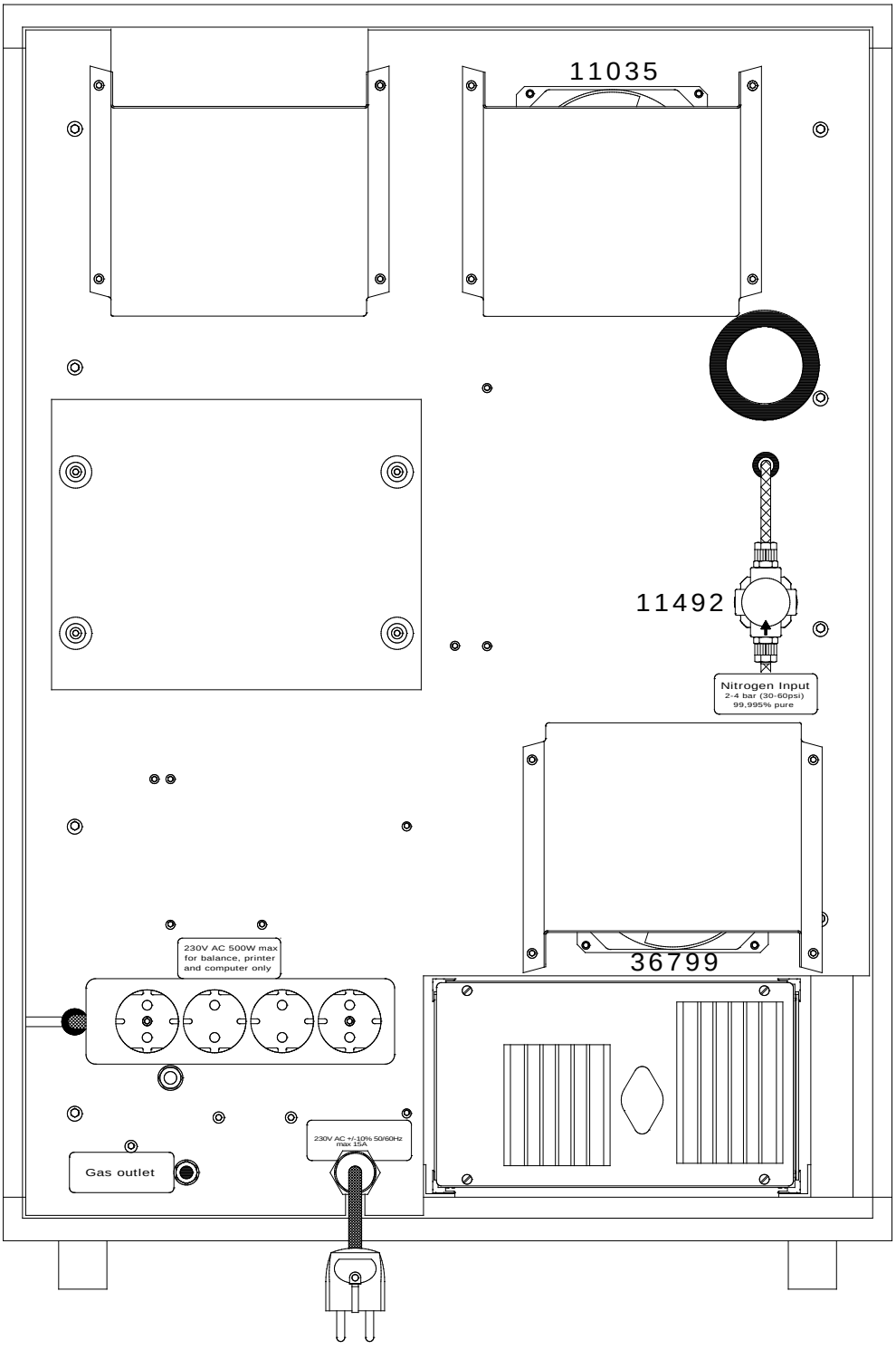
5.1 Ordering numbers

Front side:



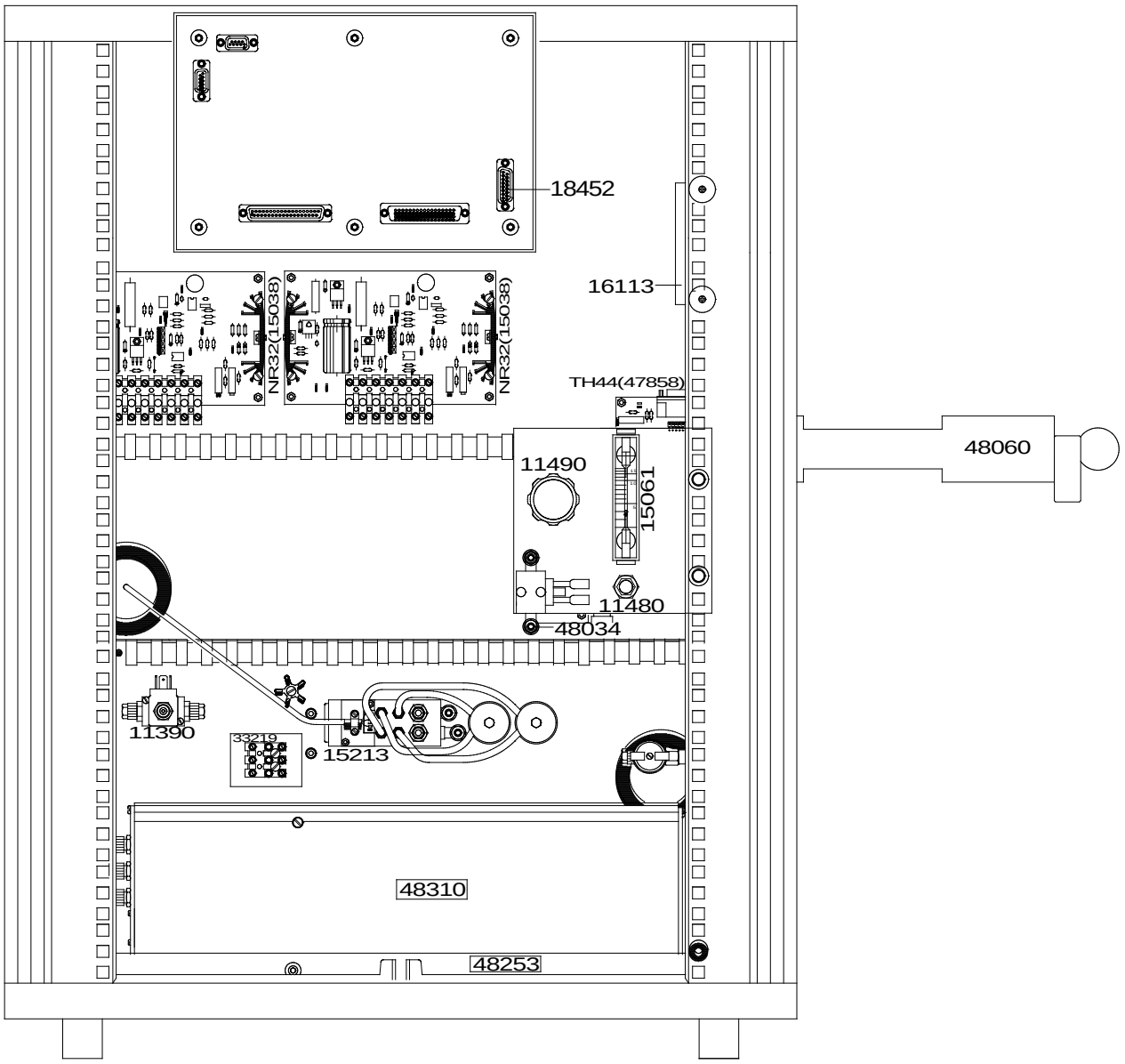
11480	Adjustable restrictor
15085	Flow display 130l/h
15095	Flow display 600l/h
35320	Bubble glass
48060	Combustion boat insertion and removing mechanism
70230	O-ring
72010	Pressure gauge
78017	Mains power switch

Rear side:



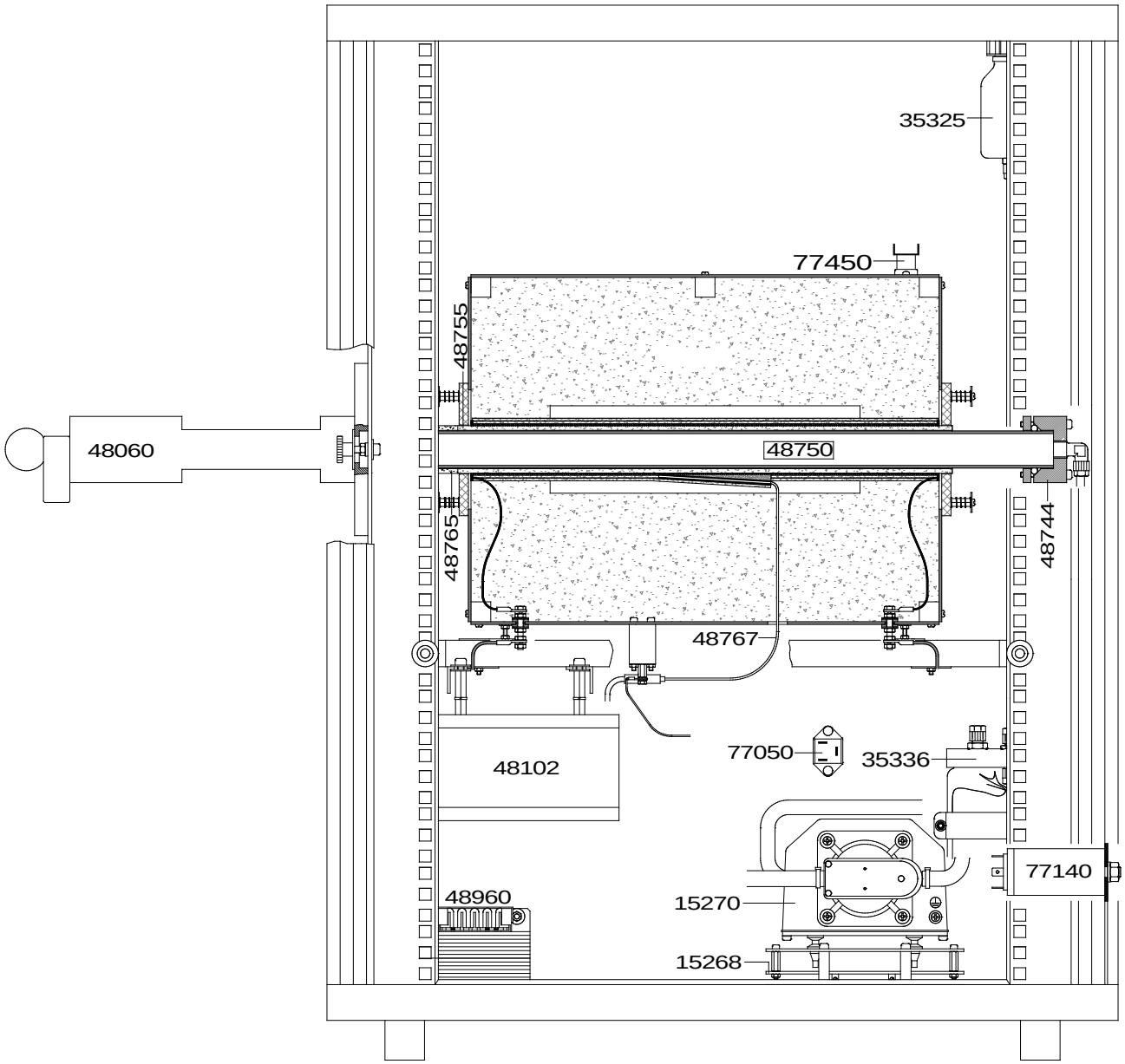
11035 Cooling fan
11492 Pressure regulator
36799 Cooling fan

IR-cell side:



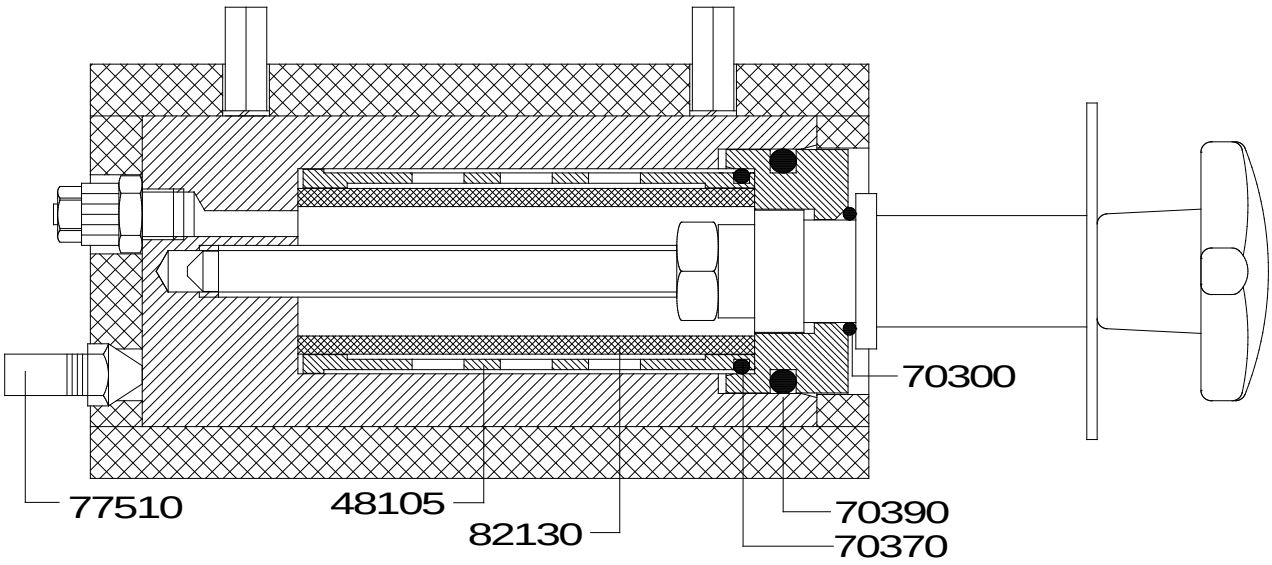
11390	Nitrogen stop valve
11480	Adjustable restrictor
11490	Pressure regulator
15038	2x control board NR 32
15061	Flow display 15l/
15099	Flow control board FC 21
15213	Flow sensor
16113	Power supply
18452	Microcontroller board UNI
36904	Temperature control board TH 44
48034	Valve
48060	Combustion boat insertion and removing mechanism
48310	IR-cell

Pump side:



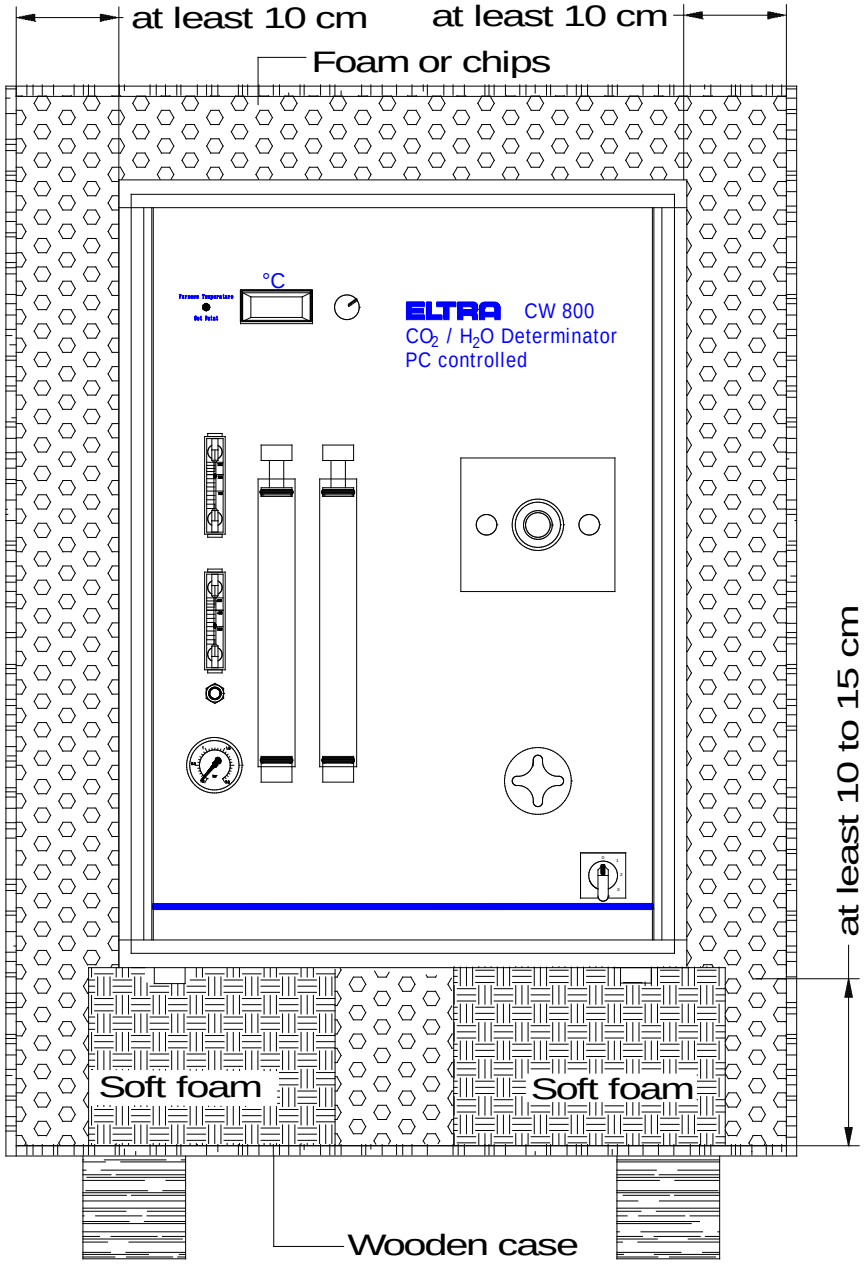
15268 Pump board
15270 Gas pump
35061 Pump support
35325 Attenuator volume
35336 Attenuator volume
48060 Combustion boat insertion and removing mechanism
48102 Dust trap
48750

Dust trap:



48105	Filter support
70300	O-ring
70370	O-ring
70390	O-ring
77510	Heater
82130	Filter

5.2 Packing



Before packing, the analyser and the furnace must be wrapped in plastic foil, to protect them from moisture and dust, and then to be placed in a wooden case. The wrapped analyser and furnace, should be surrounded by a layer of **foam (chips)** of at least **10cm**, in order to avoid any **damage** due through transport.

Especially the foam where the analyser and furnace are put on, is very important. It should be neither too hard nor too soft. When the foam is too soft, the analyser will practically touch the wood. Fix the foam on the bottom of the wooden case by gluing.

The analyser and furnace should be wrapped in plastic foil, especially when you use chips or any other kind of material in small pieces.
The glass tubes must be empty.

5.3 CW-800 Pre-installation guide

Following requirements apply, when installing the Analyser Eltra CW-800:

Carrier gas	Nitrogen 99.99% pure; 2 - 4 bar (30 - 60 psi)
Mains power supply	230 VAC ±10%, 50/60 Hz; 20 A fuse
Analyser dimension	55 x 80 x 85 cm (WHD)
Analyser weight	ca. 65 Kg

CEE-Plug 230V, 32A

The balance should rest on a vibration free support.

Connection for nitrogen should have outer diameter R¼". (The tubes, supplied together with the analyser, carry a connector with G¼" inner diameter).

Approved methodologies to which ELTRA instruments conform

ASTM (ANALYTICAL SOCIETY FOR TESTING MATERIALS)

Metals

Instruments	Method	Elements	Materials
CS-2000 CS-800	ISO-9556	C	Steel & Iron
CS-2000 CS-800	ISO-4935	S	Steel & Iron
CS-2000 CS-800 ON-900 ONH-2000	ASTM E-1019	C, S, N, O	Steel, Iron, Nickel/Cobalt Alloys
CS-2000 CS-800 ON-900 ONH-2000	E-1587	C, S, N, O	Refined Nickel
ON-900 ONH-2000	E-1409	O	Titanium and Titanium Alloys
ON-900 ONH-2000	E-1569	O	Titanium
ON-900 ONH-2000	E-1937	N	Titanium and Titanium Alloys
OH-900 ONH-2000	E-1447	H	Titanium and Titanium Alloys
CS-2000 CS-800 CS-500	E1915-97	C, S	Metal Bearing Ores and Related Materials (f.e. tailings, waste rock)
CS-800 CS-2000	UOP-703-98	C,S	Catalysts

Organics

Instruments	Method	Elements	Materials
CS-2000 CS-500	ASTM D-1552	S	Oils & Petroleum Products
CS-2000 CS-500	D-4239	S	Coal & Coke
	D-5016	S	Coal & Coke Ash
CS-2000 CS-500	D-1619	S	Carbon Black
CS-2000 CS-500	PN-93 G-04514/17	S	Coal & Coke
CS-2000 CS-500	DIN EN 13137	TOC	Waste
CS-2000 CS-800 CS-500	ISO-10694	TC/TOC	Soil samples