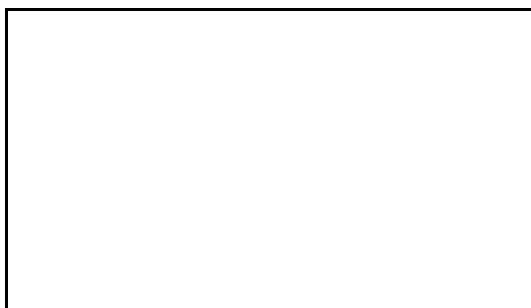


Operating Manual

Autoloader CS800/CS2000



Original

ELTRA
ELEMENTAL ANALYSERS

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1 Operating the machine

1.1 General information

The loader is supplied after testing without being completely dismantled. It is only detached from the analyser and the arm (3) with the fingers (6) (See figure arm installation) are removed for safety reasons. Therefore, an adjustment after installation may not be needed however the adjustments are described below. They may be necessary for accurate readjustment.

1.1.1 Loader models

There are 3 standard loader models available:

130-crucibles version, 104-crucibles version and 36-crucibles version.

The difference between these models is the form of the loader's platform, i.e. the size of the loader. There is no difference with regard to loader arm, arm support and drive, lasers/sensors, chain drive, pneumatics and electronics. Therefore the adjustments, described in this manual are valid for all models.

1.1.2 Space requirements

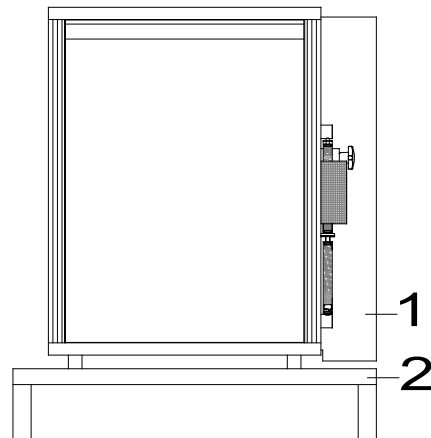


Fig. 1: Loader positioning

Keep sufficient space to the right of the analyser (minimum 86 cm) to place the loader.

It is suggested to place the analyser in a position where the front end of the furnace cover (1) aligns with the front end of the desk (2).

NOTICE

Under no conditions should the analyser and loader be placed in direct sunlight or be exposed to the wind of air conditioners or to the wind blowing through open windows and doors.

1.1.3 Connecting and disconnecting plastic tubes

To connect the tube, simply push it into the fitting as far as it would go.

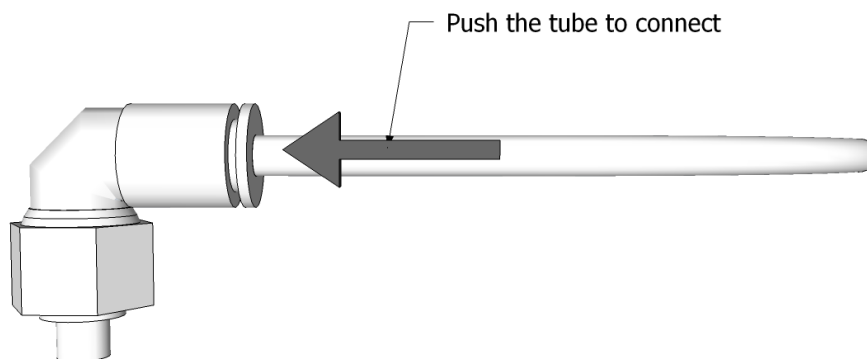


Fig. 2: Plastic tube connecting

To disconnect the tube, first press the plastic ring of the fitting up to the metal ring, keep it properly pressed and pull the tube.

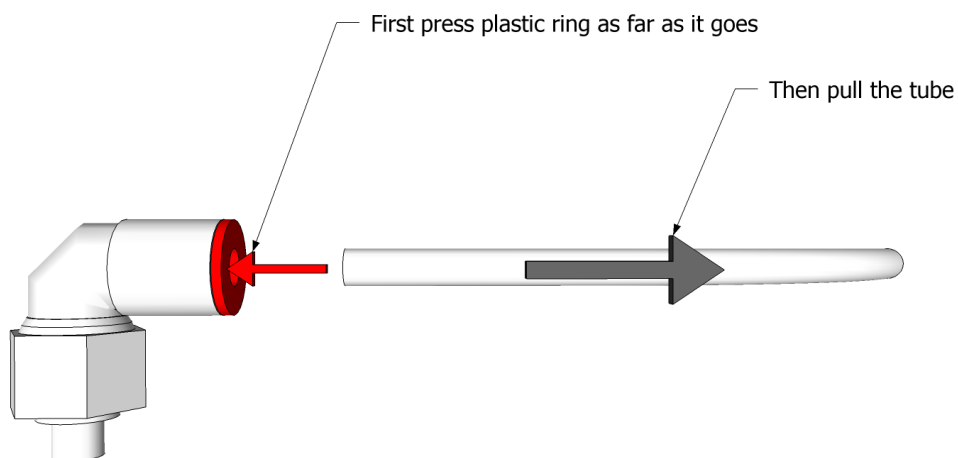


Fig. 3: Plastic tube disconnecting

To reinstall the loader do this:

- The analyzer is switched off (Mains power switch on position 0).
There is no compressed air supply to the analyser.

1.2 Mechanical connection to the analyzer

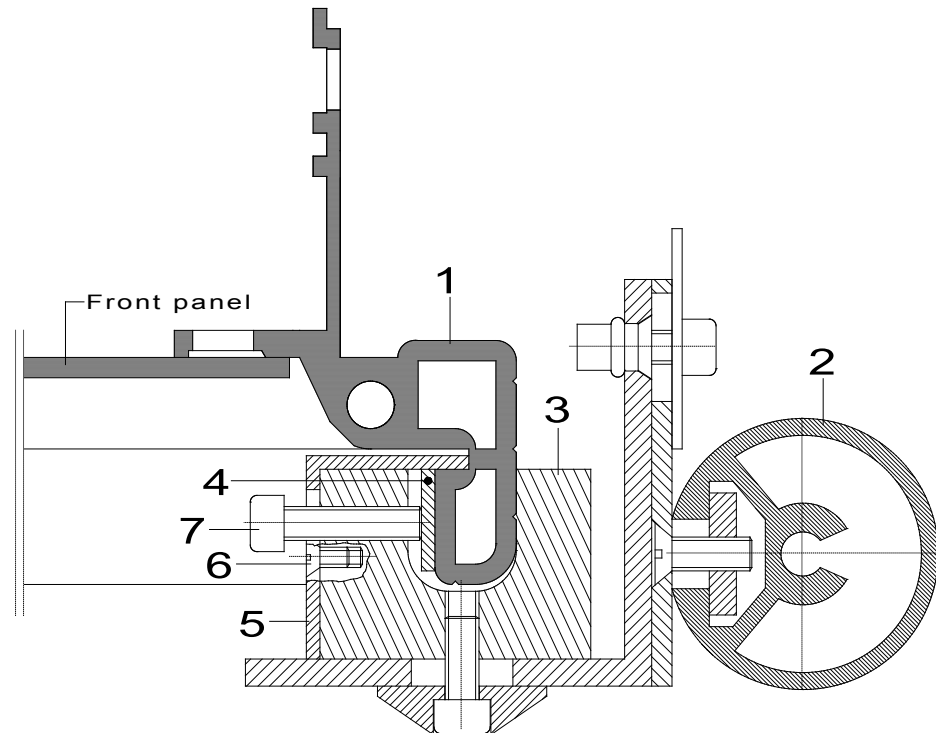


Fig. 4: Autoloader reinstallation (Top view)

- Before starting reinstallation take a look at the plastic tubes and bear in mind the way they are supported with the screw (7). Make sure to lay them the same way during reinstallation.
- Place the loader to the right of the analyzer. The part (1) is the vertical bar (profile) of the front right corner of the analyzer's cabinet (top view of cross section). For further orientation: The round part (2) is the left front foot of the loader.
- The loader is positioned in a way that the vertical rod (3) is pushed towards the cabinet so that the cabinet's corner rod (1) is inside the vertical rod (3).
- The blade (4) is inserted between the rod (3) and the cabinet rod (1).
- The angle rod (5) is installed and fixed with the screws (6).
- Then the screws (7) are fixed so that a solid, stable mechanical connection between analyzer and loader is made.

1.3 Chain motor belt adjustment

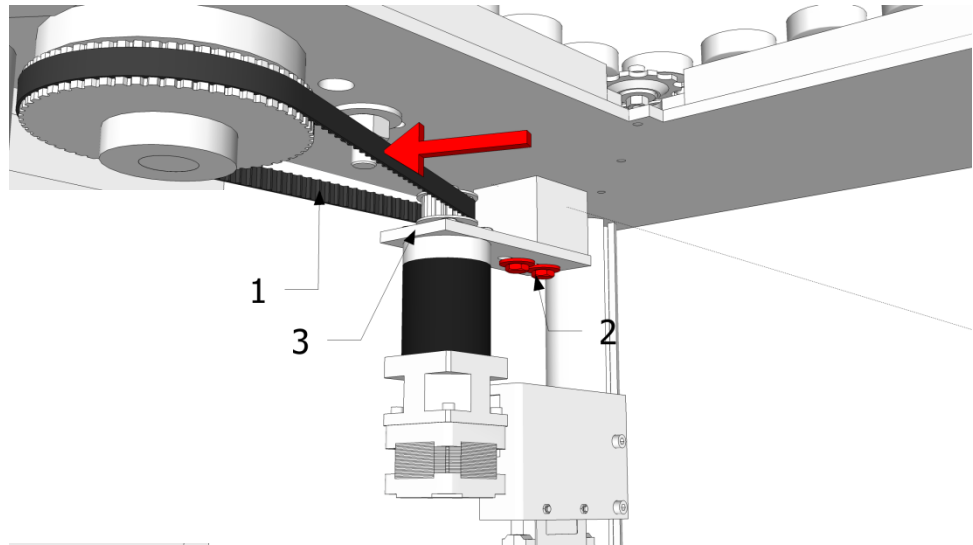


Fig. 5: Belt tension check

The toothed belt of the chain motor is located underneath the left-hand section of the loader's platform. The mechanical tension of the toothed belt (1) can be checked by applying the force to the belt, as shown on the picture by the red arrow.

If an adjustment is necessary, loose the two screws (2) push the plate (3) to the back in order to create an appropriate tension of the belt (1) and drive the screws. After fixing the screws, check the tension of the belt (1) again.

In case of replacing the belt, the adjustment is made the same way.

1.4 Chain adjustment

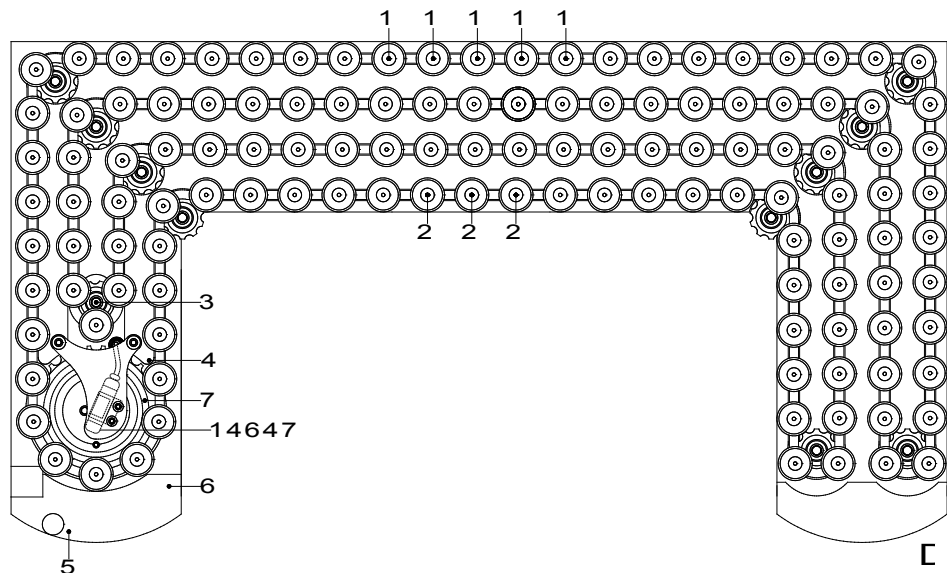


Fig. 6: Chain tension adjustment
1467-Horizontal laser

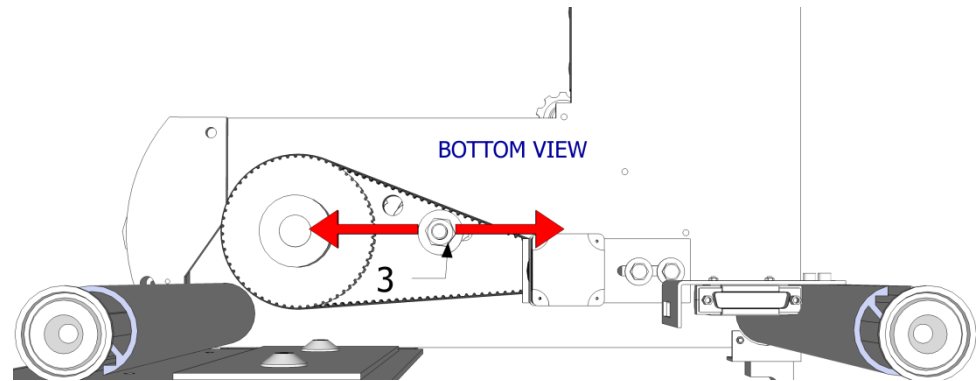


Fig. 7: Chain tension adjustment (Bottom view)

The loader is supplied with the adjusted chain tension. If necessary, check the tension of the chain as follows:

- Press and hold several crucible trays (1) of the rear row on the platform so that they cannot move.
- Move a few trays (2) of the front row to the left and to the right. They should move for about 1 mm. If not, loose the screw underneath the toothed wheel (3) and adjust by moving it back and for.
- Fix the screw (3) and check again.

NOTICE

A too strong tension can lead to a blockage when the crucibles are moved by the motor. If the chain plays too much, bent elements of the chain can block at the indicated point (4). Therefore keep about 1 mm play as described above.

- Pull the front part (5) for about one or two millimetres. The turning point is (6). When you release it, it should return back pressing the crucible tray, which is at pick up position, to the wheel (7) behind the tray. This is to make sure that each crucible when at pick up position is always at the same place.

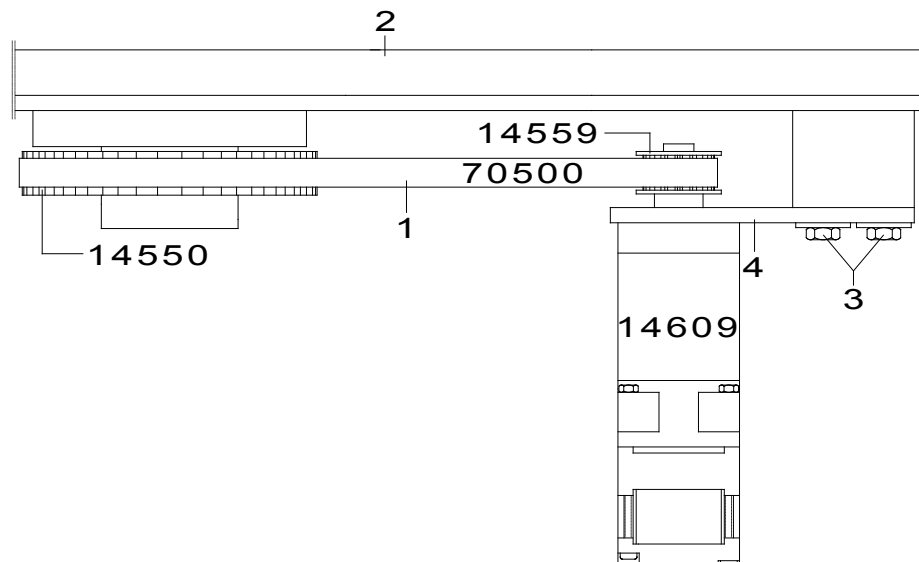


Fig. 8: Autoloader bottom view

- 14609-Gear motor
- 14550-Gear wheel
- 14559-Gear wheel
- 70500-Belt for drive

1.5 Finger adjustment

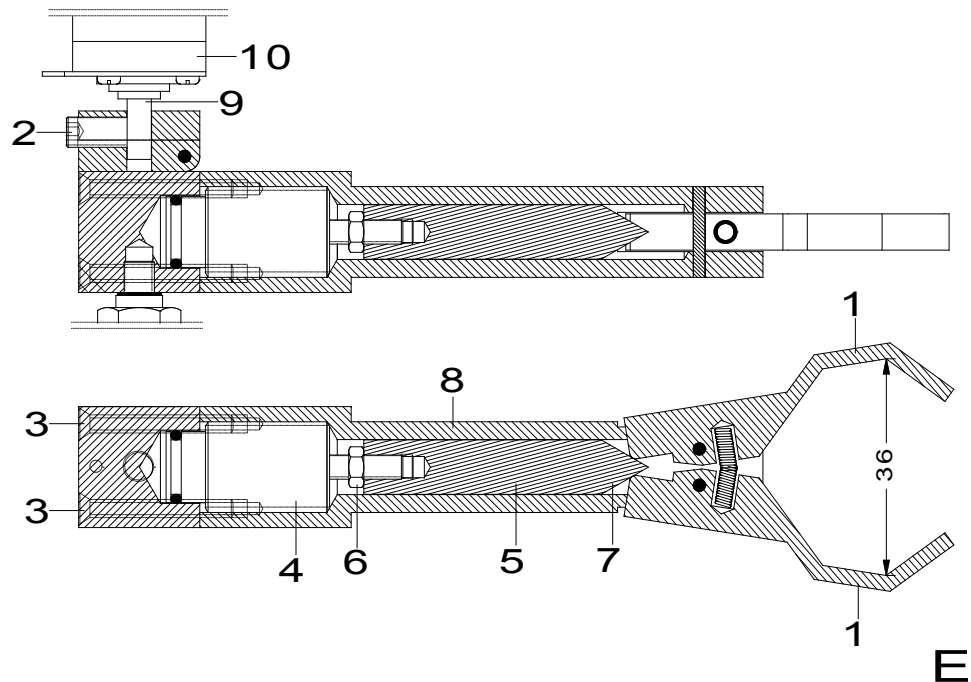


Fig. 9: Finger adjustment

The maximum distance inside the fingers (1) should be about 36 mm.

For adjusting:

- Loose the screw (2).
- Move the assembly (E) down to take it off the shaft (9) of the motor resp. off the gear box (10).
- Unscrew the four screws (3).
- Remove the piston (4) with the plunger (5).
- Loose the nut (6).
- Screw the plunger (5) to the piston (4) clockwise for making the finger (1) distance bigger.
- Fix the nut (6) again.
- Unscrew the plunger (5) from the piston (4) (counter clockwise) for reducing the distance between the fingers (1).
- Fix the nut (6) again.
- Make sure that the plunger (5) is clean.
- Make sure that also the inside surface of the arm (8) is clean from dust, grease etc.

1.6 Arm installation

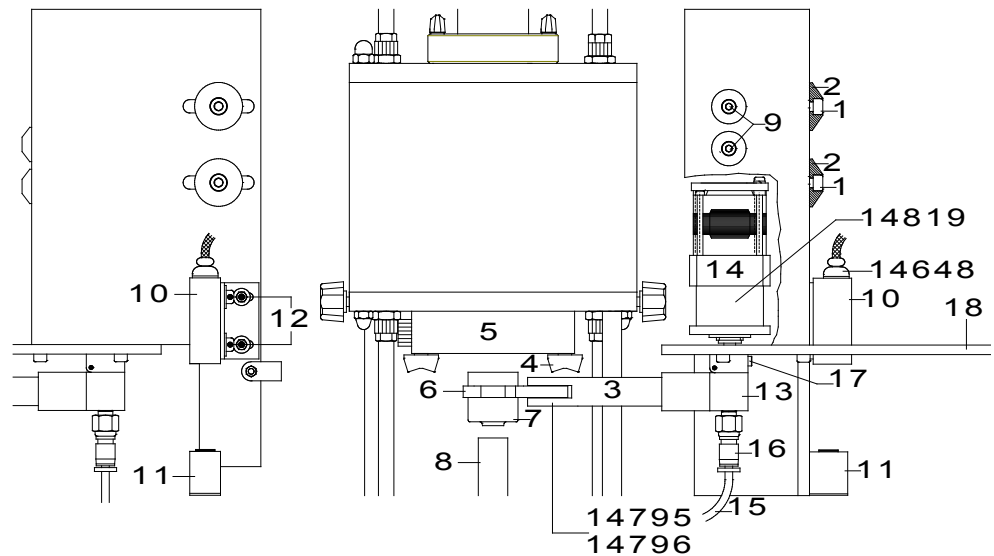


Fig. 10: Arm installation

14648-Vertical laser

14795-Finger assembly for Loader CS800/2000

14796 Finger assembly for Loader Helios

14819-Finger motor

- Pass the low end of the spring (8) (see figure pneumatic connections), through the hole of the cubic support (13) of the arm (3). The upper end of the spring is already fixed during manufacturing.
- Install the assembly of the arm (3) and the fingers (6) by driving the screw (17) to fix this assembly on the shaft of the gear motor (14). Handle with care considering the thin shaft of the gear and the small screw (17) for fixing. Make sure that the screw will press the flat side of the gear's shaft.
- Push upwards the plastic tube (15) into the fitting (16).

1.7 Electrical and pneumatic connections

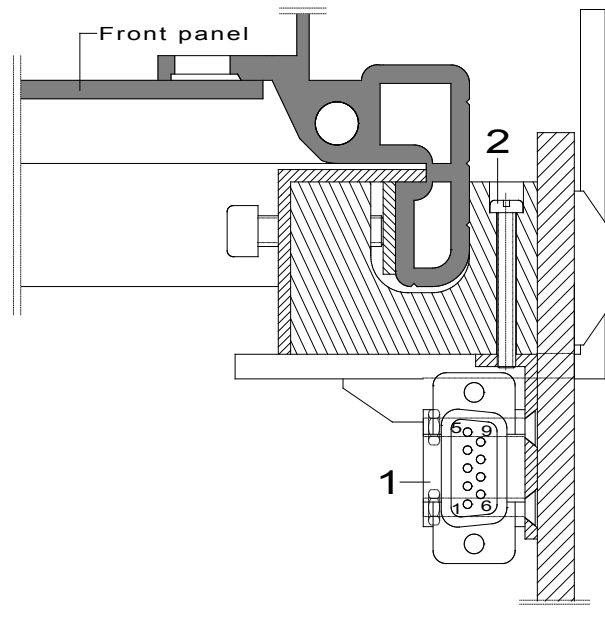


Fig. 11: Electrical connection: Motor arm

- Install the 9-pin socket (1)
- Fix with the screws (2).
- Plug in the 9-pin connector (1) of the finger's motor into the 9-pin socket; see figure electrical circuit (1).

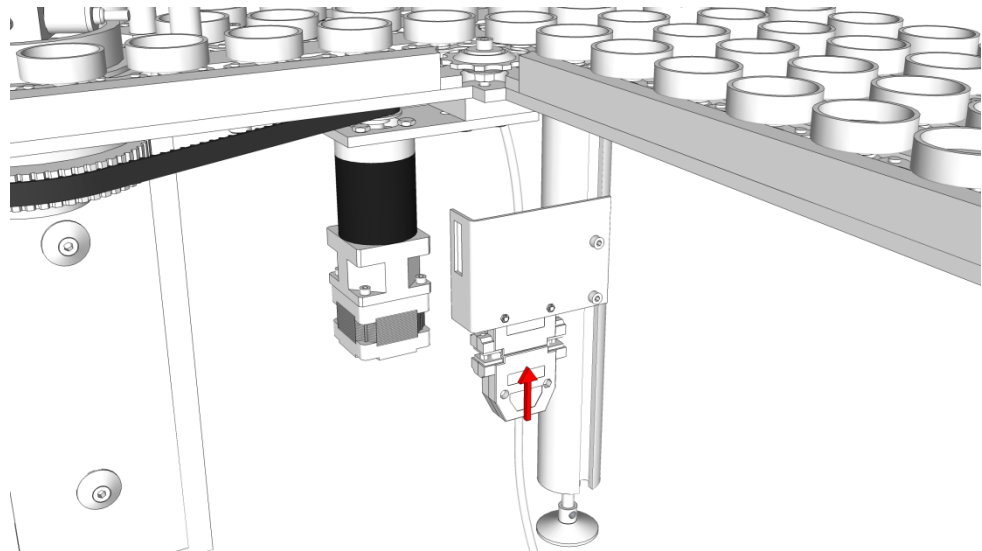


Fig. 12: Electrical connection: the 25-pin plug

- Locate the electrical cable with a 25-pin plug, coming out of the analyzer. Plug it in the 25-pin socket, as on the picture above.

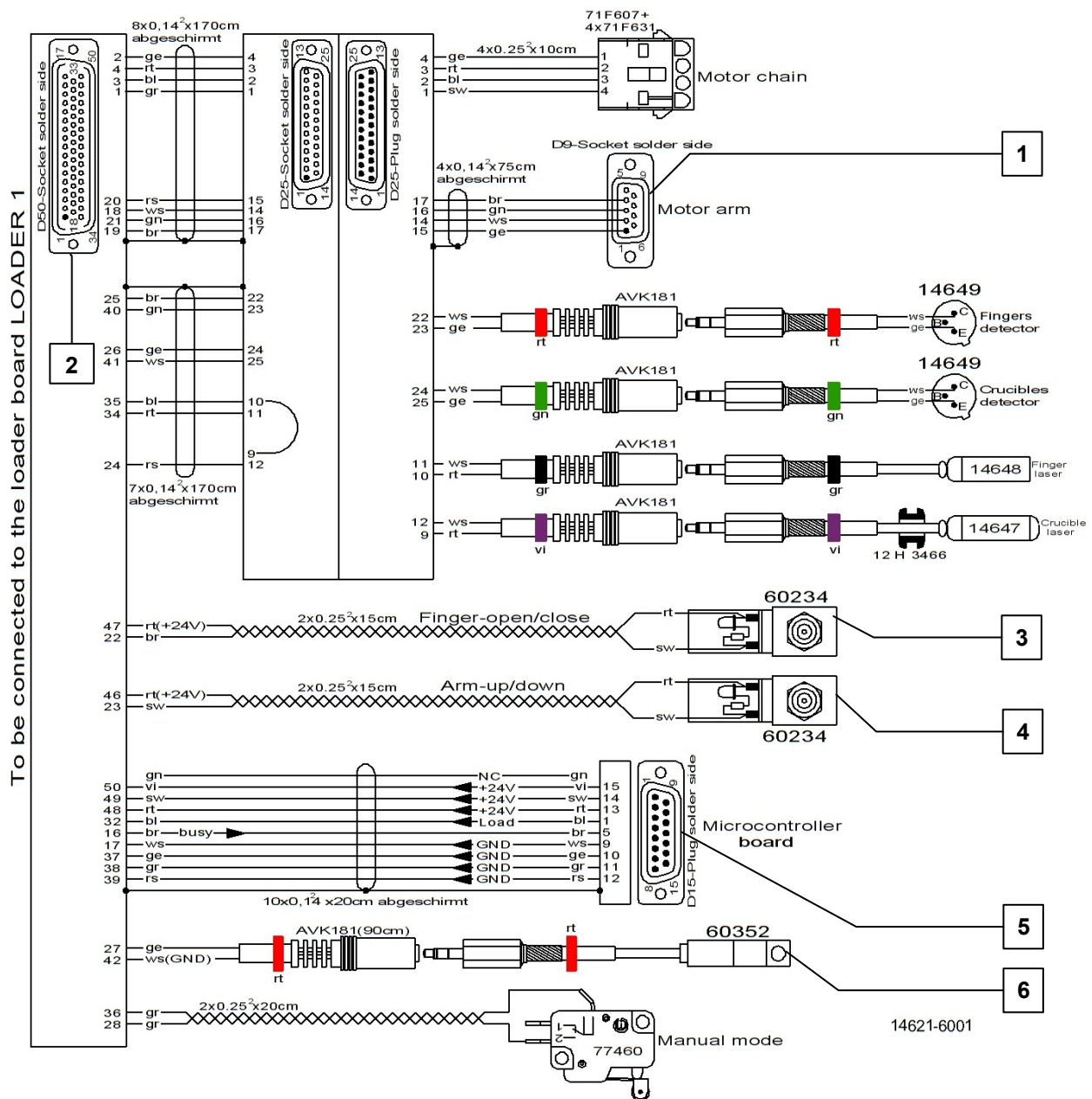


Fig. 13: Electrical circuit (14621-6001)

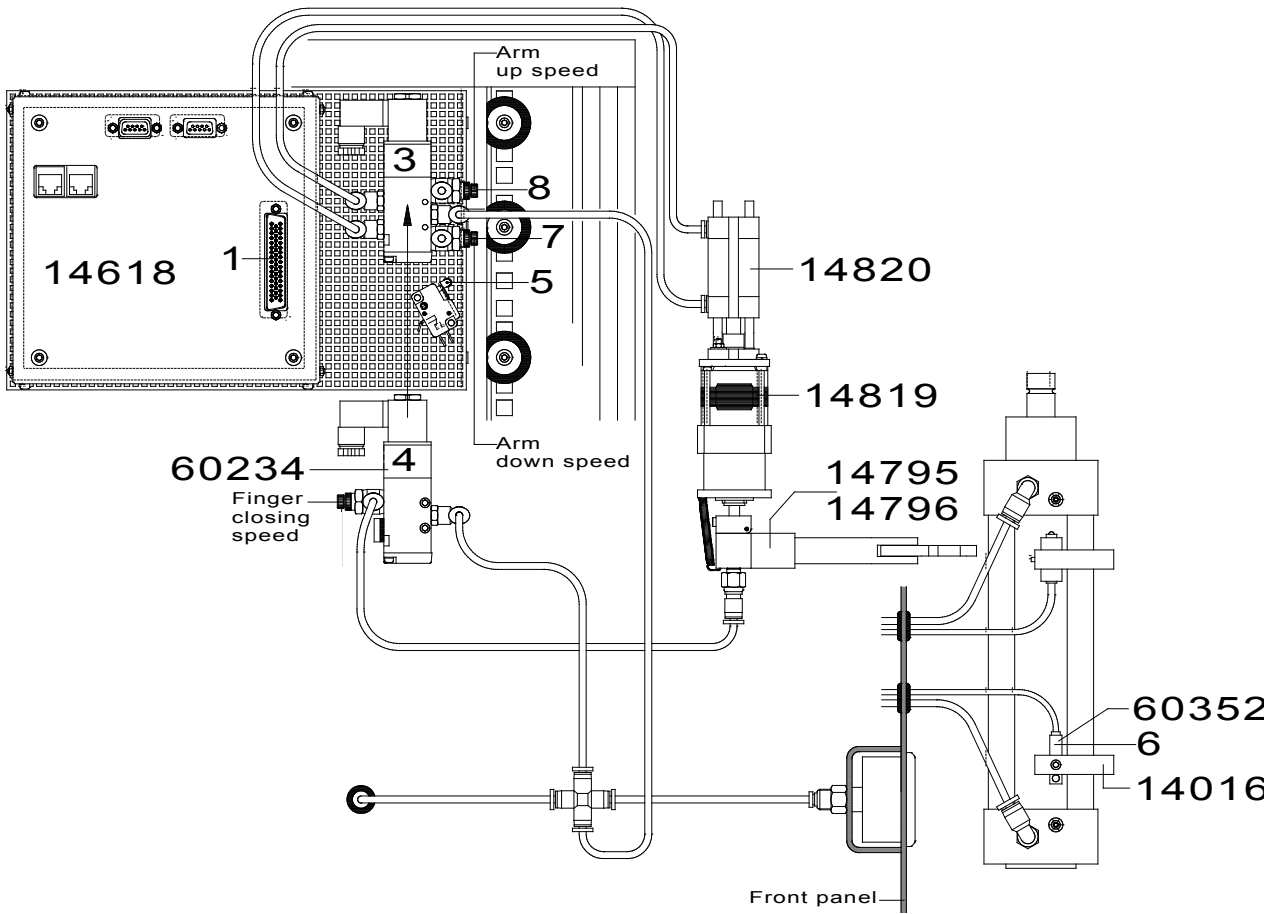


Fig. 14: Pneumatic connections

- 14016-Sensor holder
- 14618-Loader board
- 14795-Finger assembly for Loader CS800/2000
- 14796-Finger assembly for Loader HELIOS
- 14819-Finger motor
- 14820-Finger pneumatic cylinder
- 60234-Pneumatic valve
- 60352-Sensor

- Install the magnetic switch (6) at the low end of the pneumatic cylinder as shown in figure pneumatic connections.
- Connect the 50-pin plug (2) of the loader see figure electrical circuit, to the 50-pin plug (1) on the Loader board.
- Connect the 15-pin plug (5) of the loader; see figure electrical circuit, to the 15-pin plug on the UNI board.
- Connect the compressed air plastic tubes as shown in figure pneumatic connections.

1.8 Up/Down adjustment of the arm

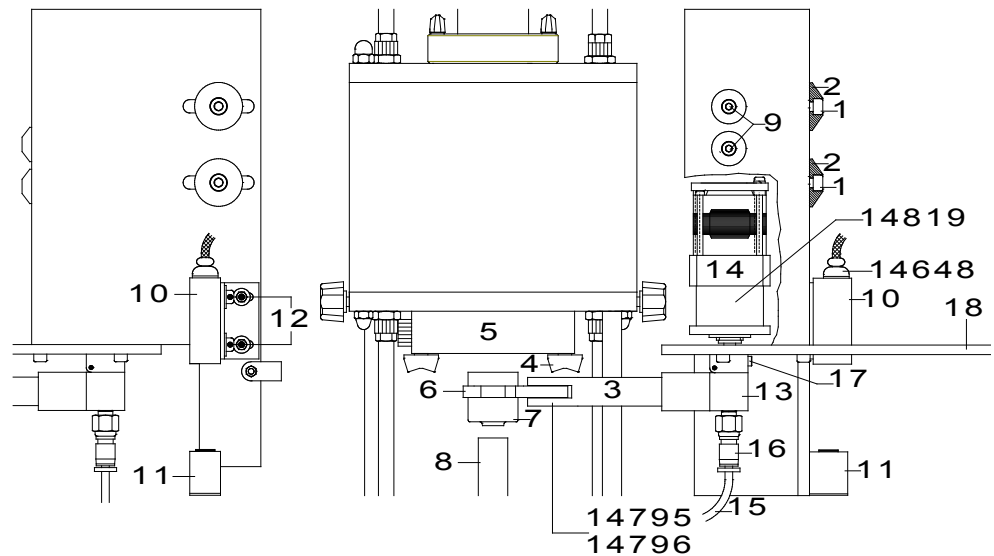


Fig. 15: Arm installation

- Apply compressed air to the analyzer. The fingers (6) resp. the arm (3) will go to the UP position.
- Turn the arm (3) manually and position it underneath the wing nut (4).
- Adjust with the screws (9) the height of the arm (3) to be a maximum of only 1 mm underneath the winged nut (4). But even if the arm may touch this nut, the adjustment is still O.K. The arm will not turn up to the nut (4) when in operation.

NOTICE

Make sure that the wing nut (4) is properly fixed.

- Check whether the arm (3) is still in proper horizontal position.
- Check and if necessary adjust the position of the fingers (6) to hold the crucible (7) in coaxial position to the pedestal (8) by readjusting the screws (9) resp. by moving the arm (3) to the left and to the right and the screws (1) by moving back and for.

1.9 Single step operation for mechanical adjustments

- Press the adjust button (5) see figure pneumatic connections, and keep it pressed.
- Turn the mains power switch of the analyzer from position 0 to position 1.
- Release the adjust button immediately after the first beep of the beeper on the loader's electronic board.

1.10 Vertical laser



CAUTION

Eye injury
Laser beam

- Laser beam has high energy and can injure your eyes.
- **Don't look directly into the laser beam.**

V0075

Now the vertical laser (10) for sensing the home position of the arm (3) is continuously ON. This can be seen by looking at the sensor (11) underneath the laser (10), see figure arm installation.

If the laser (10) is ON and there is no beeping to hear, it means that the sensor (11) is sensing the laser beam.

Interrupt the beam between the laser (10) and the sensor (11) to verify the correct functioning of sensor (11) and beeper.

If the laser (10) is ON and the beeper is beeping, although the beam is not interrupted, this means that the beam doesn't hit the sensor (11). The beeper signalizes this condition. In this case the laser (10) should be mechanically adjusted so that the beam will be in the middle of the sensor (11). The beeper will stop beeping.

It is not enough if simply the beeping stops. Make sure that the beam is in the middle of the sensor.

1.11 Horizontal laser



V0075

Eye injury Laser beam

- Laser beam has high energy and can injure your eyes.
 - **Don't look directly into the laser beam.**
-

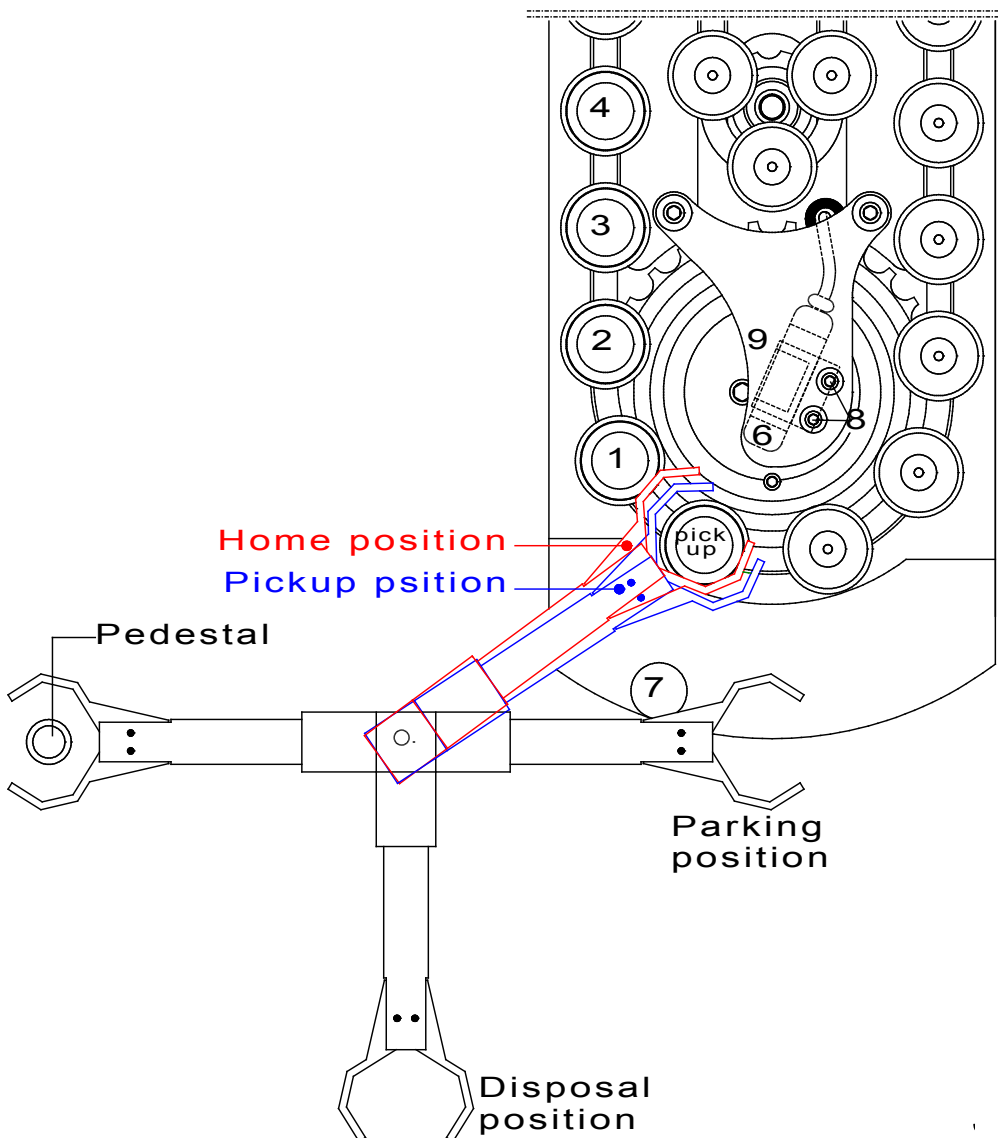


Fig. 16: Loader steps

- Press the adjust button (5) of image pneumatic connections again for only about one second.

Now the horizontal laser (6) for sensing the position of the crucibles (1 to 4) is continuously ON. This can be seen by looking at the sensor (7) in front of the laser (6).

⚠ CAUTION

Don't look directly into the laser beam.

If the laser (6) is ON and there is no beeping to hear, it means that the sensor (7) is sensing the laser beam. For this, make sure that there is no crucible or anything else between the laser (6) and the sensor (7) preventing the beam from reaching the sensor (7).

- Interrupt the beam between the laser (6) and the sensor (7) to verify the correct functioning of detector and beeper.

If the laser (6) is ON and the beeper is beeping, although the beam is not interrupted, this means that the beam doesn't hit the detector (7). The beeper signals this condition. In this case the laser (6) should be mechanically adjusted

so that the beam will be in the middle of the sensor (7). In case of proper adjustment the beeper will stop beeping.

The adjustment is made by loosening the screws (8) and by turning and moving the laser (6) until the beeping stops. If necessary, pull up or press down the blade (9) for vertical adjustment.

NOTICE

It is very essential to adjust the laser for the whole beam to reach the detector. If you see a part of the beam hitting the aluminium detector housing around the detector's hole, readjust until you don't see any laser radiation on the aluminium housing.

1.12 Single step cycles

- Place about 10 crucibles into the trays of the chain starting from the left front tray (1) continuing to the left. (Crucibles 2, 3, 4 etc), see figure loader steps.
- Press the adjust button (5) see image pneumatic connections again for only approx. one second. This will cause the arm to move to the home position (vertical laser) and to return back and stay at the parking position.

From now on, after each short pressing of the adjust button, the loader will make one single step, following the sequence of the steps in analysis mode. The single step mode gives time for mechanical adjustments.

The sequence of the steps that follow now after each short pressing of the adjust button (5) of figure pneumatic connections is as follows:

1. The crucibles move so that the first crucible (1) stops at the crucible pick-up position.
2. The fingers move first to the home position and then to the crucible pick-up point.
3. The fingers move to the parking position.
4. The fingers (6) move to the position over the pedestal (8), see figure arm installation.

1.13 Finger position over the pedestal

Now the mechanical adjustment of the position of the fingers (6) can be made.

For better orientation place a crucible (7) on to the pedestal (8). To move the fingers (6) to the left and to the right, slightly loose the screws (9). The adjustment of the finger (6) to the direction back and forth is done with the screws (1). Take care to keep the height of the arm (3) as advised before, i.e. about 1 mm underneath to the wing nut (4).

Fingers down. Now you can adjust the fingers position even more accurately.

1.14 Finger Up/Down speed

The downwards speed of the fingers can be adjusted by the left hand adjustable restrictor (7) see image pneumatic connections. The upwards speed of the fingers can be adjusted with the restrictor (8). After adjusting, fix the knurled nuts.

1. Fingers close and take the crucible. If the adjustment of the fingers (6) position is coaxial to the pedestal (8) resp. to the crucible (7), the crucible will not move in horizontal direction when the fingers close.

The closing speed of the fingers can be adjusted with the adjustable restrictor (9) see image pneumatic connections.

2. Fingers up.
3. Fingers turn to the disposal position.
4. The fingers open and the crucible is dropped.

5. The arm goes first to the home position and then it turns back to the pick-up position
6. Fingers down.

1.15 Crucible position on the platform

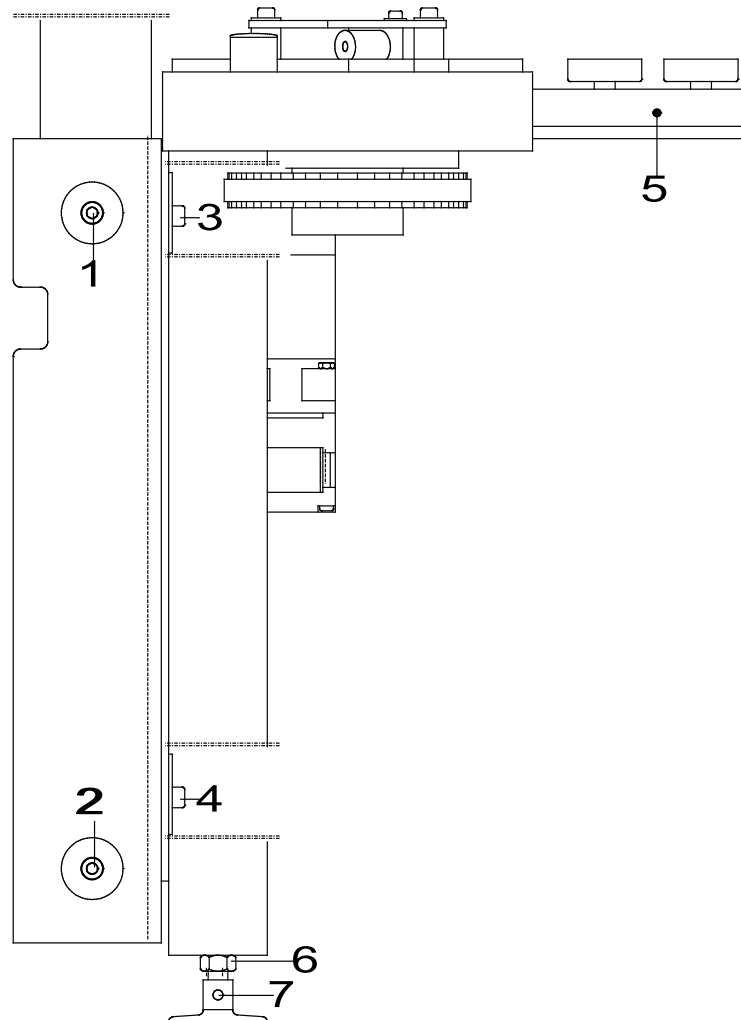


Fig. 17: Loader front view

Now the position of the crucible has to be adjusted to be coaxial to the fingers. For moving the crucible to the left and to the right, slightly loose the screws (1) and (2) and shift the whole platform (5) accordingly. For moving the platform back and for, loose the screws (3) and (4).

1. Fingers close. Again, if the crucible doesn't move when the fingers close, the crucible is at the right place.
2. Fingers up.
3. Parking position.

1.16 Height of the platform

1. The fingers turn to the pedestal. Check the distance between the top of the Pedestal and the bottom of the crucible to be 12.5 mm. If it is only approx. 12.5 mm, don't try to adjust accurately, rather go to the next step.
2. Fingers down. While pressing, watch carefully the crucible. If the height of the crucibles platform is correct, the crucible should just touch the pedestal. If the crucible has a distance to the pedestal, the crucibles platform has to be

lowered by the same distance. If the crucible knocks on the pedestal and the arm turns up from the horizontal position, the crucibles platform has to be lifted higher. For moving the platform up and down, loose the screws (1) and (2) see image autoloader front view. Loose the nut (6) of the foot (7) and turn the foot by inserting a thin screwdriver or a piece of wire into the hole of the foot (7). Turn clockwise to lower the platform with the crucible, turn counter clockwise to move the platform higher. Fix the nut (6) and the screws (1) and (2).

3. Fingers open.
4. Fingers up.
5. First home and then pick-up position.
6. Parking position.

1.17 Repeating the single step cycle

The next pressing of the adjust button will start the next cycle i.e. the arm will go to position 1 again. It is advisable to make a couple of cycles with single step to make sure that the mechanical adjustments described before, are accurate, if not readjust.

1.18 Non stop cycles

In some cases the automatic repetition of complete cycles is required. For example in case of a continuous test of the loader by placing 130 empty crucibles for the loader to run 130 cycles in unattended operation. Also at exhibitions the nonstop mode without combustion is required. This is obtained by keeping the switch pressed already before switching on the power, and by keeping it pressed as long as the cycles have to run.

To do this:

- Place 130 empty crucibles on the loader (or any other required quantity of crucibles) starting from the left front tray (1) continuing to the left (crucibles 2, 3, 4 etc.) See figure loader steps.
- In order to avoid the need of continuous manual pressing of the button, it can be mechanically fixed in pressed position before switching on the analyzer, by mechanically fixing of the button (5) using a rubber ring, see figure pneumatic connections.
- The analyzer is switched from position 0 to position 1 of the mains power switch.
- After the last crucible is taken from the platform, the loader will turn the chain for a while, looking for any more crucibles. If no crucible is found, the chain will stop turning. The loader electronics will signalize the missing crucibles by triple beeping. See error messages.

1.19 Error messages

The loader electronic board contains a buzzer for signaling errors. The number of beeps in a row specifies the problem according to the table below.

No. of beeps	Error description
1	The beam of the vertical laser cannot be detected. Defective laser or detector, dirt in between, arm in between.
2	The beam of the vertical laser is continuously detected. Error of the finger's motor.
3	No crucible on the loader although the loader received the command to load the next crucible.

4	The beam of the horizontal laser cannot be detected. Defective laser or detector, crucibles don't move due to blockage, defective motor etc.
5	The furnace is not opened for the loader to place a crucible on to the pedestal. Error in the piston control or piston sensor.
6	The fingers didn't take the crucible. The crucible blocks in its tray, no compressed air, faulty laser or sensor etc.
7	The loader received the command for loading but the furnace is not open, or the piston came down with big delay.
8	One dispenser empty
9	One dispenser empty.
∞	Infinitive number of beeps in manual mode. Piston sensor disadjusted(low end of furnace cylinder).

1.20 Final installation after adjusting

Install the plate (18) , after you made sure that the loader is properly adjusted and in full functional condition. (See figure arm installation)

1.21 Maintenance

The loader is maintenance free. It is only advisable when there are no crucibles on the loader, from time to time to blow away with compressed air any possible dust or grains from the platform to make it free of any dust and particles.

1.22 Analysis mode

To change over from this adjusting software to the analysis mode of the loader's software, do this:

1. Switch off the power by setting the analyser's mains power switch to position 0 (zero).
2. Now the loader is in analysis mode and not in single step mode which is described before.
3. A couple of seconds later switch on to position 1. Don't press this time the adjust button.
4. Restore the oxygen supply to the analyser.
5. Set the power switch to position 2.
6. Connect the balance and the PC to the analyser. See operation manual electrical connections.

1.23 Crucibles disposal

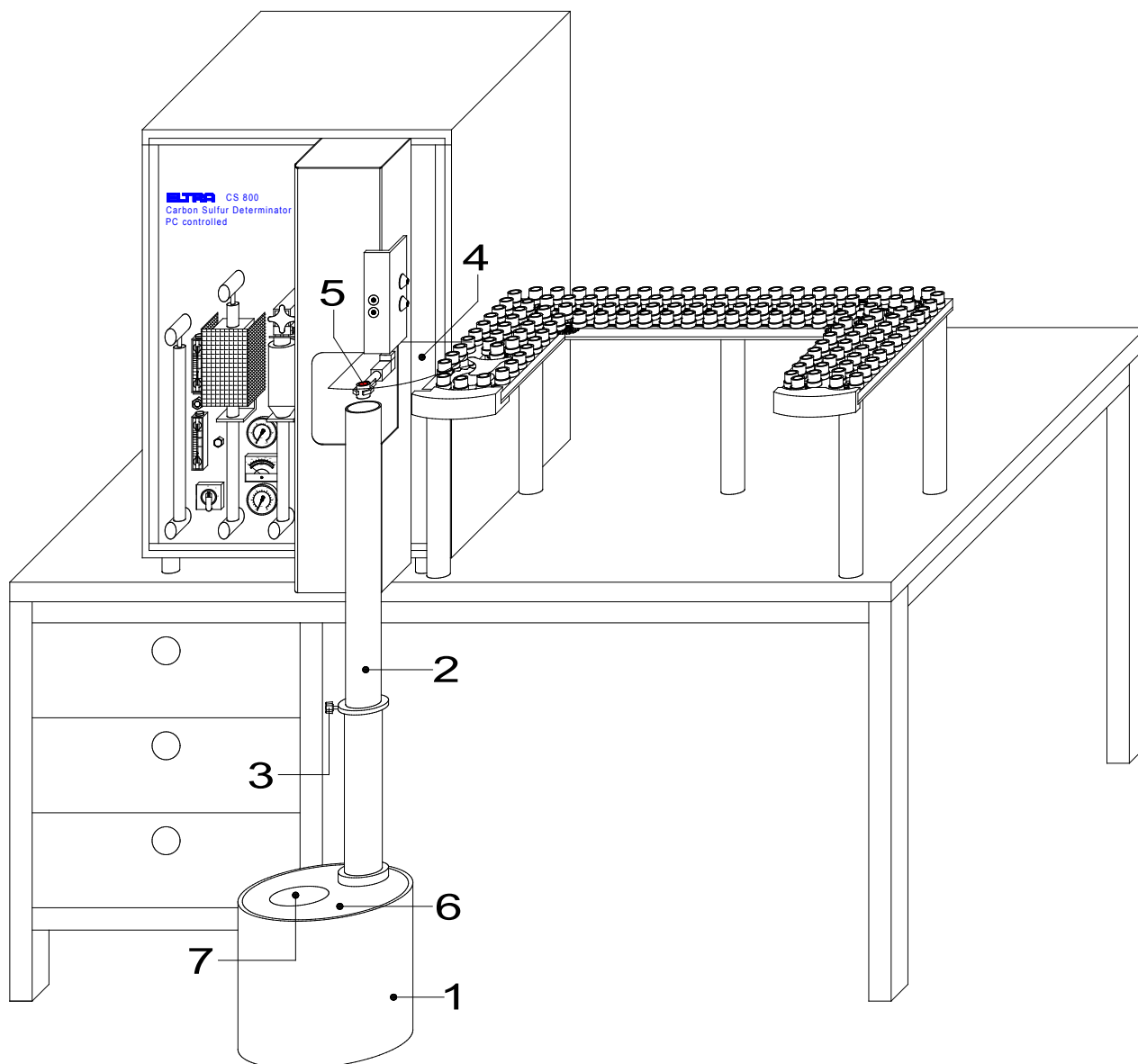


Fig. 18: collecting receptacle

1. Place the collecting receptacle (1) on the floor, as shown.
2. Adjust the height of the tube (2) with the winged nut (3) so that the top of the tube (2) has a distance of about 5.5 to 6 cm from the plastic plate (4).
3. Position the drum (1) in a way that the middle of the tube (2) is underneath the marker (5) that sticks on the plastic plate (4). (disposal position)
4. The tube (2) is eccentric to the lid (6). The drum (1) can be turned to the most convenient direction and the middle of the tube (2) still remains underneath the marker (5).
5. The window (7) allows a view of the level of crucibles in the drum.

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