

Rapid Thermal Processor AS-One 150

Installation Manual



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1. CONSTRUCTOR'S FOREWORD

This manual contains original instructions for the manufacturer of the machine.

	 WARNING
	<p>SAFETY INSTRUCTIONS</p> <p>The user must carefully read the following instructions.</p> <p>The user is responsible for installing the system in safe conditions and in an environment that complies with the local regulation.</p>

The Annealsys system can be used for various applications. Many different types of gases can be used in the system; consequently, the user must take all the necessary precautions to prevent hazardous mixtures occurring inside the process chamber.

The customer must be aware of the effects of process gases and vapors used during the process and their consequences on the machine, accessories and vacuum pump. All manuals must be carefully read in order to check the conditions of operations.

The constructor declines all responsibility for any incidents caused by insufficient precautions or handling errors, and their consequences.

The constructor specifies that the Annealsys machine has no protection against any possible toxic emanations. Upon request AS-One system can be provided with a hood.

The responsibility for installing the machine in an environment which complies with the relating legislation is left entirely to the initiative and charge of the user, who is considered to be aware of the effects of the gases that he uses, as well as those of the decomposition products and gases generated by the processes in operation.

The user shall be responsible for connecting the exhaust line and the pump exhaust of the system to a gas scrubbing installation which is compatible with the process gases and gas flows and that complies with local regulation.

The user is responsible for ensuring that supply pipes and cables as well as exhaust are routed in such a way to eliminate trip hazard. Also, floor surface is to be suitable and must reduce as far as possible any slip hazard for the operator or others in the vicinity of the machine. Adequate lighting and any fire suppression system is also the responsibility of the user

The constructor also specifies that the quartz, ceramic, graphite parts, heating elements and all parts in contact with vacuum or process gases must only be handled with gloves to avoid any pollution and possible future damage.

All maintenance and servicing work should be carried out by skilled personnel and, where specified, in relation with Annealsys Customer Service Department.

If applicable, the EC declaration of conformity is available in the installation manual and the user's manual.

2. SAFETY INSTRUCTIONS

The signal words for the safety instructions and labels are DANGER, WARNING and CAUTION.



DANGER is the signal word used to indicate an imminently hazardous situation that, if not avoided, will result in death or severe injury.








WARNING is the signal word used to indicate a potentially hazardous situation which, if not avoided, could result in death or severe injury.



CAUTION is the signal word used to indicate a potentially hazardous situation which, if not avoided, could result in moderate or minor injury. It may also be an alert against unsafe practices.

2.1 Pictogram definitions

	<p>Hot surface Burn hazard while touching hot parts. This label warns the user from eventual burning hazards.</p>
	<p>Electricity, Electrical hazard Contact may cause electric shock or burn This label warns the user of eventual electrical hazards</p>
	<p>Toxic material, poison This label warns the user from the danger and lethal risks involved when using toxic or corrosive chemicals</p>
	<p>Pinch hazard Possible pinch hazard with mechanical moving parts. This label warns the user of eventual mechanical hazards</p>
	<p>General warning This label warns the user from eventual hazards with possible injury or damage to the system.</p>

2.2 Isolation instructions

Prior to any maintenance activities isolate electrical supply, compressed air and process gases as per the instructions described in the technical manual of the machine.

2.3 Personnel qualifications

All installation or maintenance operations should only be carried out by persons who have suitable technical training and the necessary experience.

Make sure the appropriate safety gear is worn when handling or working on hazardous areas of the system.

2.4 Definitions

2.4.1 Exhaust


Exhaust refers to the process chamber and vacuum pump outlets which may release hazardous products depending upon the process gases that are used and the possible process by-products.

2.4.2 Venting


Venting refers to the air ventilation of the mainframe and of the gas cabinet in order to evacuate hot air or possible hazardous products in case of a leak on a gas line or a vacuum line.

2.5 Safety information


2.5.1 Burn hazard

	⚠ WARNING
	<p>BURN HAZARD Substrate and quartz parts may be at high temperature. After manual heating of after a process both substrate and quartz parts may still be at high temperature. Wait for sufficient cool down of the substrate for unloading.</p>


2.5.2 Electrical shock hazard

	⚠ WARNING
	<p>ELECTRICAL SHOCK HAZARD The power supply line and the furnace circuit breakers must be switched off and locked before starting maintenance operations. These operations must be carried out by trained and authorized technicians only.</p>


2.5.3 High leakage current

	⚠ WARNING
	<p>HIGH LEAKAGE CURRENT The system has an earth leakage current exciding 10 mA. Earth connection is essential before connecting supply</p>


2.5.4 Hazardous voltage with machine power off

	⚠ DANGER
	<p>HAZARDOUS VOLTAGE PRESENT WITH MACHINE POWER OFF When the main circuit breaker is switched off, some wires remains live (still with hazardous voltage). These wires are in the power cable and between the main terminal and the main circuit breaker. They are marked with red sleeves.</p>


2.5.5 Adjustment of sensors

	⚠ WARNING
	<p>ELECTRICAL SHOCK HAZARD</p> <p>Some parts inside the system may remain powered-up to perform some adjustment or tuning procedures. These operations must be carried out by trained and authorized technicians only.</p>

2.5.6 Eyes damage


	⚠ WARNING
	<p>POSSIBLE EYE DAMAGE</p> <p>The lamp furnace emits strong visible and infrared light during operations. The system enclosure protects operator against strong light. All panels and shields must be installed during furnace operations</p> <p>Never look furnace light through the furnace lid This may lead to eye damage.</p>


2.5.7 Crushing hazards


	⚠ DANGER
	<p>CRUSHING HAZARDS</p> <p>Some parts inside the system are moving and may lead to crushing hazard. These are typically the reactor pneumatic closing and locking systems. Keep hands clear of moving parts. Lock-out / tag-out before servicing</p>


3. PROCESS GASES

The gas panel is installed inside the system chassis and on the backside of the process chamber.

	⚠ DANGER
	<p>DANGEROUS GASES</p> <p>Some process gases are extremely dangerous or toxic. Refer to the technical manual for the procedure to supply and purge the gas lines with hazardous process gases if any. All operations on gas lines must be carried out by trained people with sufficient knowledge of the process gases and the potential hazards.</p>

	⚠ WARNING
	<p>TOXIC GASES</p> <p>Some gases are toxic and inhaling them should be avoided. Take steps to ascertain whether or not the gases being used are known toxic substances. Refer to the Material Safety Data Sheets covering the gases in question</p>

	⚠ WARNING
	<p>FIRE AND EXPLOSION RISKS</p> <p>Some gases are dangerous as they are spontaneously flammable or can lead to highly explosive mixtures. Take steps to ascertain whether or not the gases being used are known dangerous substances. Refer to the Material Safety Data Sheets covering the gases in question</p>

	⚠ WARNING
	<p>OPERATIONS ON GAS PANEL</p> <p>The installation manual only describes the connection of the gas lines to the machine. Refer to the technical manual for operation to be performed on the gas lines. Do not fill the gas lines with process gases before checking the correct procedures in the technical manual. All operations on gas lines must be carried out by trained people with sufficient knowledge of the process gases and their potential hazards.</p>

3.1 Process gases major hazards



The following table indicates the major hazards for each process gas to be used with the furnace as it is delivered.

These data are given for information only.

Gas safety issues must be checked with the gas safety data sheets and the gas suppliers.



Gas line	Gas nature	Major hazards
1	N ₂	Major hazards: High Pressure and Suffocation Toxicity (Am. Conf. Of Gov. Ind. Hygienists ACGIH 2000 Edition): Simple Asphyxiant Flammability limits in air (STP conditions) : Non-flammable Odor: None
2		
3		
4		
5		
Purge	N ₂	Major hazards: High Pressure and Suffocation Toxicity (Am. Conf. Of Gov. Ind. Hygienists ACGIH 2000 Edition) : Simple Asphyxiant Flammability limits in air (STP conditions): Non-flammable Odor: None

3.2 Gases, chemicals and process by-products

	 WARNING
	<p>SAFETY INSTRUCTIONS</p> <p>The user must carefully read the following instructions. The user is responsible for installing the system in safe conditions and in an environment that complies with the local regulation.</p>

The responsibility for installing the machine in an environment which complies with the relating legislation is left entirely to the initiative and charge of the user, who is considered to be aware of the effects of the gases and chemical that he uses, as well as those of the decomposition products and gases generated by the processes in operation.

The user shall be responsible for connecting the exhaust line and the pump exhaust of the system to a gas scrubbing installation which is compatible with the process gases and gas flows and that complies with local regulation.

	 WARNING
	<p>TOXIC PRODUCTS</p> <p>Even if your machine is not connected to hazardous gas or chemical source some process by-products might be toxic. Take steps to avoid contact with toxic materials during the cleaning process. Refer to local regulation for cleaning materials and equipment disposal. There are companies with expertise of cleaning parts of annealing and deposition machines that can perform this type of maintenance.</p>

4. INITIAL VERIFICATION: VISIBLE DEFECTS

The condition, compliance, absence of visible defect and number of goods must be checked on delivery, in the presence of the carrier; the Client is responsible for the costs and risks relative to the verification. Any visible defect or non-compliance of goods must be stated on the carrier documents with sufficient reserves (non-visible defects) at the reception of the goods.

Any complaint, reservation or dispute should be stated on the documents provided and confirmed to Annealsys in writing (fax, e-mail or registered letter with a reply slip) **WITHIN 8 DAYS of delivery** of the goods, and to the carrier within the period set out in the transport contract. Annealsys is not responsible under any circumstances for damage or loss caused by the transport of the goods.

The Client must provide proof of the reality of the defects observed (pictures). Annealsys reserves the right to carry out, directly or through an authorized representative, observations, verification and possible repairs on the spot.

Any failure to observe these conditions will mean that goods have been received without reserve.

Any return of goods as a result of a visible defect must be agreed expressly and in advance by Annealsys. After agreement goods will either be replaced by identical goods or repaired by Annealsys.

5. UNPACKING

Unpack the system very carefully and check with the part list that you unpack all the parts from the crate.

In order to descend the machine from the crate pallet is possible to take the AS-One from one side with a forklift. The forks should be long enough to take the mainframe profiles on both sides of the machine.

The center of gravity is more on the front of the machine than on the rear (see hereunder), so the forklift driver must take care of a good balance of the load on the forks.

All parts from the following list must only be handled with gloves to avoid any pollution:

- Halogen lamps
- Quartz parts (window, pins, etc.)
- Graphite and silicon coated graphite parts
- Vacuum fittings
- Gas fittings and components

6. GENERAL FEATURES

The AS-One is a cold wall, bench top rapid thermal processor. It has been specially developed to meet the requirements of universities, research laboratories, quality control and small-scale production. The high reliability guarantees low cost of ownership.

The system is a floor standing system. This configuration offers smaller footprint and better access for service.

The cold wall chamber technology provides high process reproducibility under ultra-clean and contamination-free environment. High cooling rates and low memory effect of the process chamber are key features.

The AS-One rapid thermal processor main features are:

- Stainless steel cold wall chamber
- Single quartz window
- Infrared halogen lamp furnace
- Optical pyrometer
- Fast digital PID temperature controller
- One purge gas line
- Up to 5 process gas lines with digital mass flow controller (optional)
- Vacuum valve
- Vacuum gauge
- Optional vacuum pump
- Full PC control

7. DIMENSIONS AND WEIGHT OF THE SYSTEM

- Dimensions without computer (mm): 530 (W) x 800 (D) x 1425 (H)
- Weight: 217 kg

8. ENVIRONMENTAL CONDITIONS FOR THE FURNACE

8.1 Environmental conditions for utilization of the furnace

The system is designed for indoor use only.

- Temperature: 15°C to 35°C
- Humidity: < 60%
- Altitude: Up to 1000 m above sea level

8.2 Environmental conditions for storage of the furnace

Environmental conditions for storage of the furnace:

- Temperature: -20°C to 55°C
- Humidity: 0% to 95% (without condensation)

In rooms with moist or aggressive atmospheres, the machine must be airproof shrink-wrapped in a plastic bag together with a bag of desiccant.

If the machine is transported in temperatures less than 0°C, check carefully that the water circuit has been completely emptied.

9. FACILITIES TO BE PROVIDED BY THE CUSTOMER

9.1 Electrical supply

The AS-One RTP system can be delivered for different power voltage supply. Refer to your system specifications to check the power supply voltage.


The maximum power will not vary function of the supply voltage but the maximum current will vary in order to provide necessary power to the lamps.

The short circuit current rating (SCCR) of the machine is 10 kA

9.1.1 3x220V (± 10%) + Ground

The current interrupting capacity (also known as amperes interrupting capacity, or AIC) of the equipment main disconnect (general circuit breaker) is 35,000 Amperes.

- | | |
|-------------------------------------------------------|-------------------------------------|
| • Voltage: | 3 x 220V (± 10%) + Ground, 50/60 Hz |
| • Maximum power: | 34 kW |
| • Maximum current for 3x220V: | 89 A |
| • Maximum current for 3x200V: | 98 A |
| • Recommended power line circuit breaker: | 125A, D curve, 3 poles |
| • Power cable: | 4 x 25 mm ² |
| • Short circuit current rating (SCCR) of the machine: | 10 Ka |

	⚠ WARNING
	<p>OVERVOLTAGE PROTECTION</p> <p>The system might be damaged by abnormal overvoltage. The power supply of the machine must be protected against overvoltage due to lightning and switching surges.</p>

9.2 Cooling water

- | | |
|-----------------------------------------|------------------------|
| • Flow*: | 12 l/min |
| • Pressure drop in the cooling circuit: | in the range of 2 bars |
| • Minimum inlet pressure: | 2 bars |
| • Maximum inlet pressure: | 4 bars |
| • Maximum outlet pressure: | 1 bar |
| • Minimum inlet temperature: | 2°C over the dew point |
| • Maximum inlet temperature: | 25°C |
| • Maximum outlet temperature: | 70°C |
| • Filtration: | ≤ 25 μm |
| • Calcium hardness: | < 50 ppm |
| • pH: | 6.5 < pH < 8 |
| • Resistivity: | 1k ≤ ρ ≤ 1000k ohm.cm |

** The cooling water flow may be reduced depending on the process conditions. The system is equipped with a flow controller that is set to 4 l/min. If water flow is lower the system cannot operate. If the water flow is between 4 l/min and 12 l/min the system may operate but is subject to overheating alarm if long or high temperature processes have to be performed.*



9.3 Compressed air

- | | |
|-------------|-------------------------------|
| • Pressure: | 6 bars (6.10 ⁵ Pa) |
| • Flow: | 0.1 m ³ /h |
| • Quality: | Dry and oil free |

9.4 Process gases

- | | |
|--------------------------------------------------------------|------------------------------|
| • Pressure for process gas lines with mass flow controllers: | 1 bar (1.10 ⁵ Pa) |
| • Maximum flow: | Typical 2,000 sccm |

9.5 Purge gas

	 WARNING
	<p>PURGE GAS LINE PRESSURE Do not supply the purge gas line with a pressure over 1 bar. This could lead to overpressure inside the process chamber and breakage of the quartz window.</p>

- Gas nature: N₂ or Argon only
- Pressure: 1 bar (10⁵ Pa)
- Maximum flow: 2,000 sccm

9.6 Ballast gas (optional)

- Gas nature: N₂ or Argon only
- Pressure: 1 bar (1.10⁵ Pa)
- Maximum flow: 10 slm

10. ENVIRONNEMENTAL IMPACT

10.1 Consumption of the machine

10.1.1 Electricity

The maximum consumption of 30 kW is recorded during fastest ramps rates. For a typical process for 5 minutes at 1000°C there is an energy of the order of 2,250,000 Joules (2130 BTU). The machine is typically used for few processes a day.

10.1.2 Water

There is no continuous consumption. The water valve is open only during the process. The typical duration of a method with the cooling cycle is 10 minutes.

10.1.3 Compressed air

There is no continuous consumption of compressed air. The compressed air is used only for the opening and closing of valves and optionally small cylinders (fast cooling option for example).

10.1.4 Process gases

Gases depend on the user configuration refer to the gases safety data sheets (MSDS) for environmental information.

10.1.5 Chemical precursors

Not applicable.

10.1.6 Ballast for exhaust and vacuum pump (option)

Automatic nitrogen ballast is activated for the dilution of hazardous gases in the exhaust line or in the vacuum pump. The typical dilution flow is 10 slm. The user should take necessary step for the treatment of the diluted process gases with a gas abatement system that complies with the local regulation.

10.1.7 Connections of exhausts (pump and gas line)

The reactor exhaust and the exhaust of the vacuum pump must be connected to the ventilation system or gas abatement system of the laboratory. The environmental conditions are different for each user depending on the gases that are used. Consult Safety Data Sheets (MSDS) of gas and contact your local Security Office to take the necessary precautions.

The amounts of gases used and processes depend on the frequency of use of the machine.

10.1.8 Thermal load

The thermal load of the AS-One 100 is typically: 3500 Watts (12000 BTU/h).

If the hot air outlet of the machine is connected to the laboratory extraction then the thermal load is less than 1 kW (3415 BTU/h). This heat load associated with the use of the machine in laboratory environment generally does not require the modification of existing air conditioning.

10.2 Recyclability

10.2.1 Bill of material (manufacturing and shipping)

Electrical and electronic components of the machine are selected in compliance with environmental standards. The chamber and the gas lines are made of stainless steel.

The packages are mostly wooden crates and respect standards of the country of dispatch.

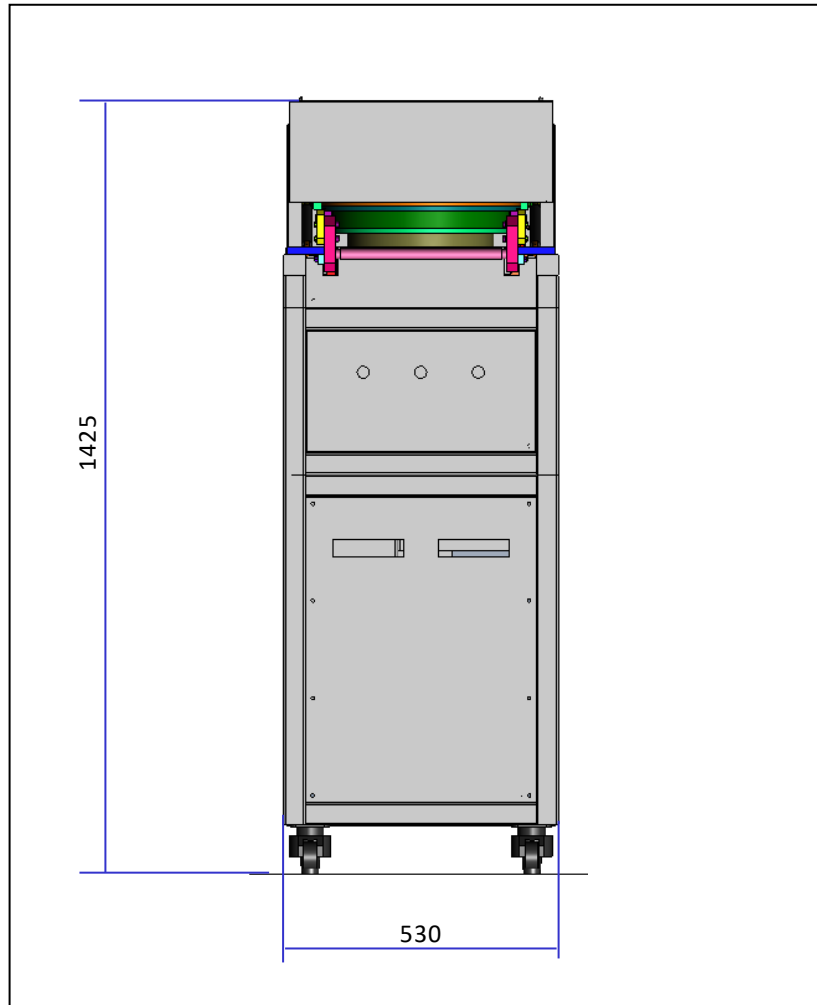
10.2.2 Resumption of equipment at end of life

Annealsys may propose recovery equipment at end of life in ways that will be defined at the time of recovery. The machine will be dismantled by a certified business and electronic waste will be treated according to the standards in force at the time of resumption of the machine.

The recycling cost of the machine is not included in the selling price and must be bear by the customer.

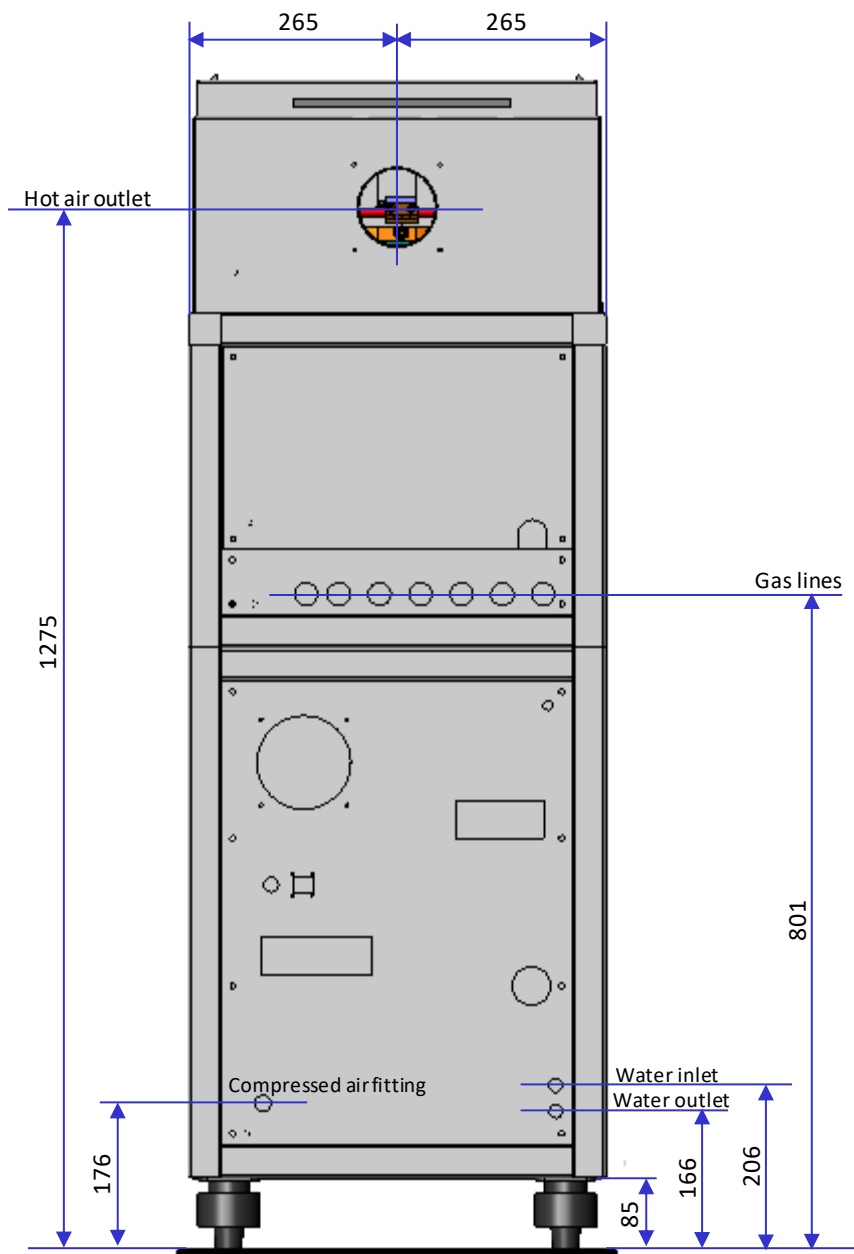
11. SYSTEM LAYOUT

11.1 Front view

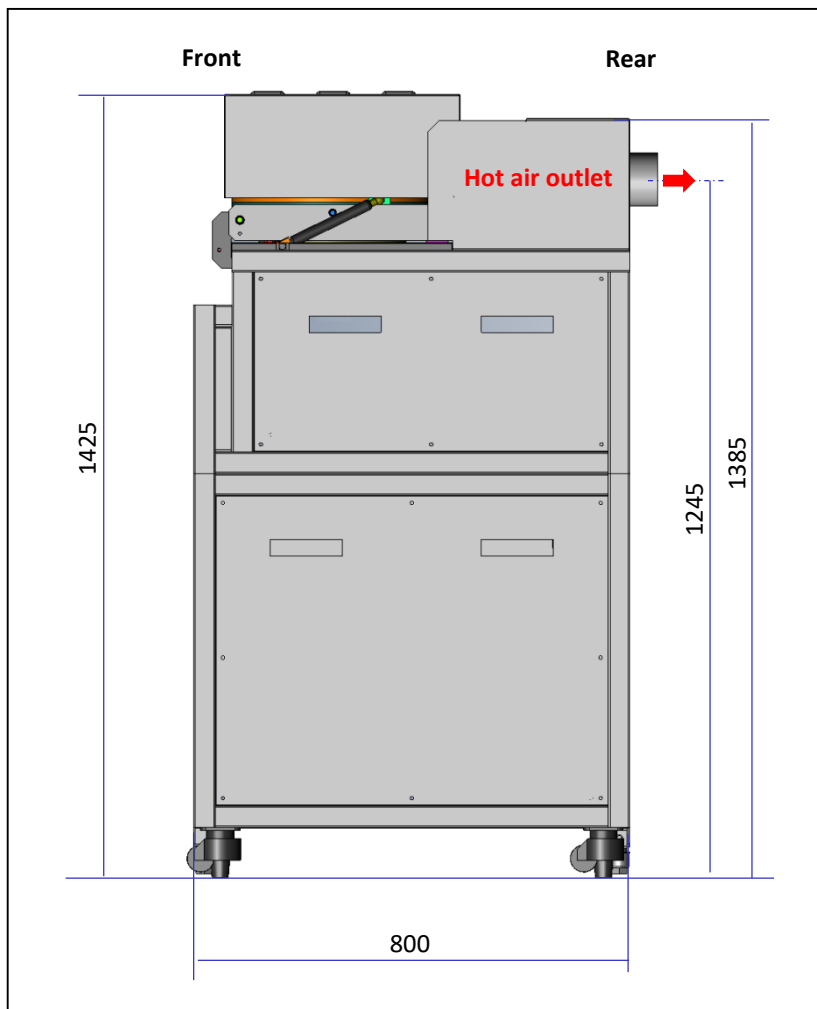


11.2 Rear view

Rear view of the CE version (different circuit-breaker for the UL version)

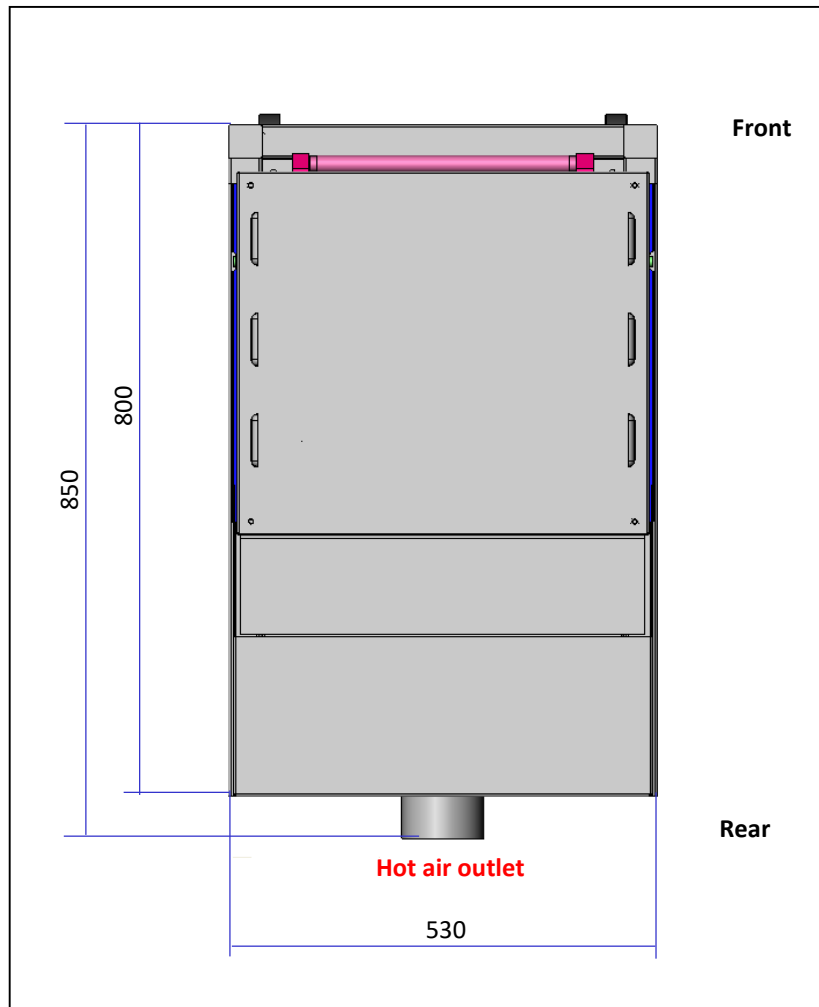


11.3 Side view



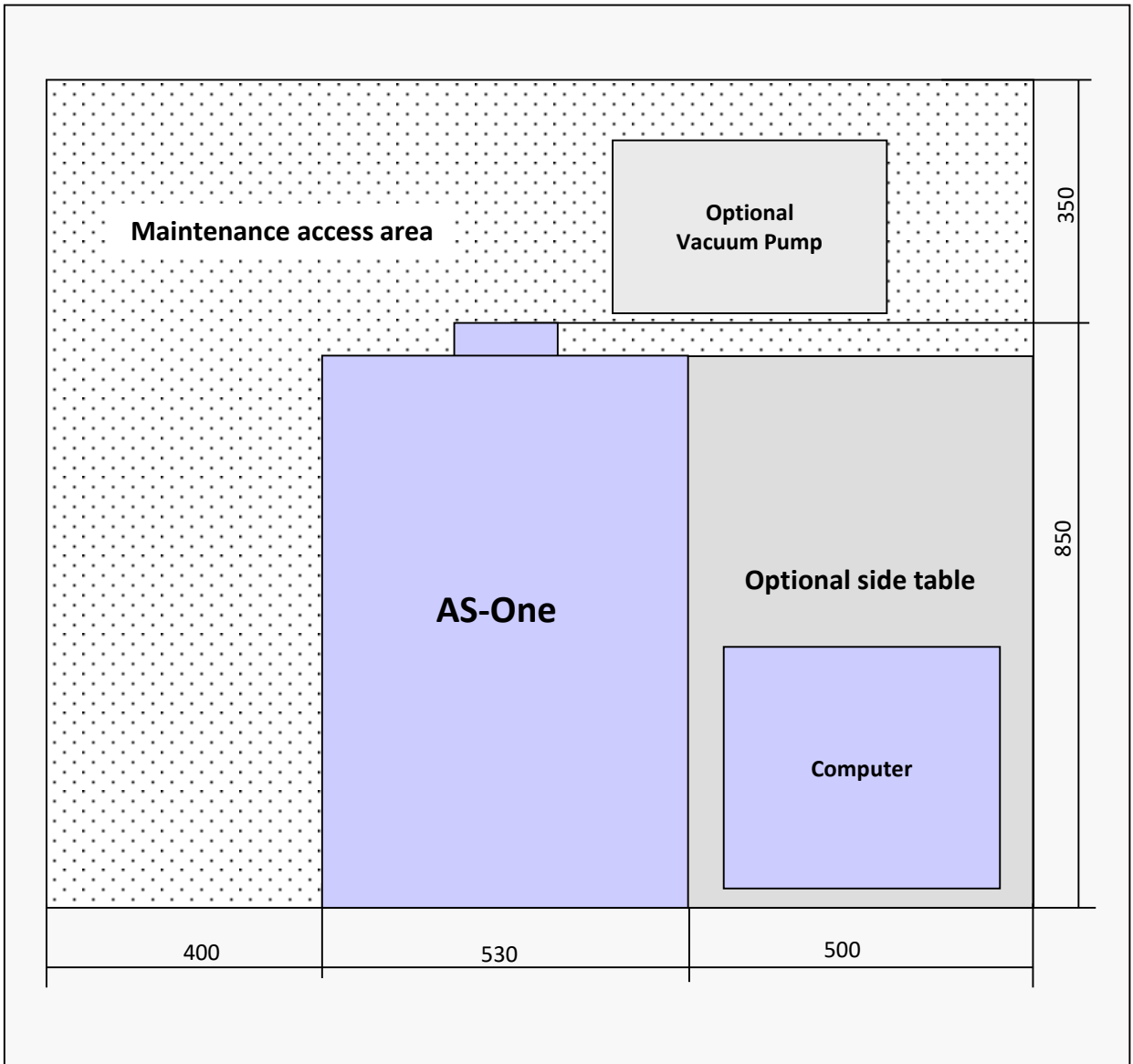
Note: The maximum system height when process chamber is open is 1640 mm (64.5 inches)

11.4 Top view



11.5 Maintenance area

AS-One: Maintenance area



12. REQUIRED PARTS FOR THE INSTALLATION OF THE MACHINE

The required parts for the installation of the machine are listed hereunder:

12.1 Machine installation

The machine installation does not require any special parts except if it is installed in an earthquake zone. In this case the machine must be attached to the ground with special brackets (not provided). The brackets can be attached to the lower aluminum beam profiles of the machine using the special nuts that can be installed inside the grooves.

12.2 Computer installation

If the machine is not provided with the side table for the computer the customer must provide a table to install the computer.

See paragraph 14.2 for the ergonomic installation of the computer.

12.3 Power cable

Provide a 4 x 25 mm² (AWG 3 or AWG4) power cable to connect the machine to the power supply of the facilities. If separated wires are used the minimum cross sectional area of the protective conductor must be 16 mm² (AWG 5)

The length of the cable depends of the distance between the machine and the power connection on the wall.

12.4 Water

To connect the water the necessary parts are two threaded 3/8 BSPP female barbed hose nipple for 10 mm (or 3/8) inner diameter hose. You also need 3/8 or 10 mm ID hoses to supply the cooling water to the machine. Length depending upon facilities.

12.5 Compressed air

Provide 3/8OD plastic tube to connect compressed air to the double ferrule fitting on the system back side.

12.6 Process gases

You need ¼-inch OD stainless steel tube to connect the gas lines to the double ferrule fittings of the gas lines. As an alternative plastic tube can be used for none hazardous gases. 6 mm OD tube may also be used but will require changing the ferrules inside the inlet fittings of the gas lines of the machine.

For the exhaust line you can use the same tubing.

If the system is equipped with a ballast line, use the same tubing for the connection of this line.

12.7 Hot air outlet


To connect the air outlet of the furnace use a 150 mm diameter metallic duct pipe. The temperature of the hot air may reach 100°C. Do not use plastic duct pipe to connect it.

The hot air can be evacuated into the room if there is no venting system available.

12.8 Vacuum pump

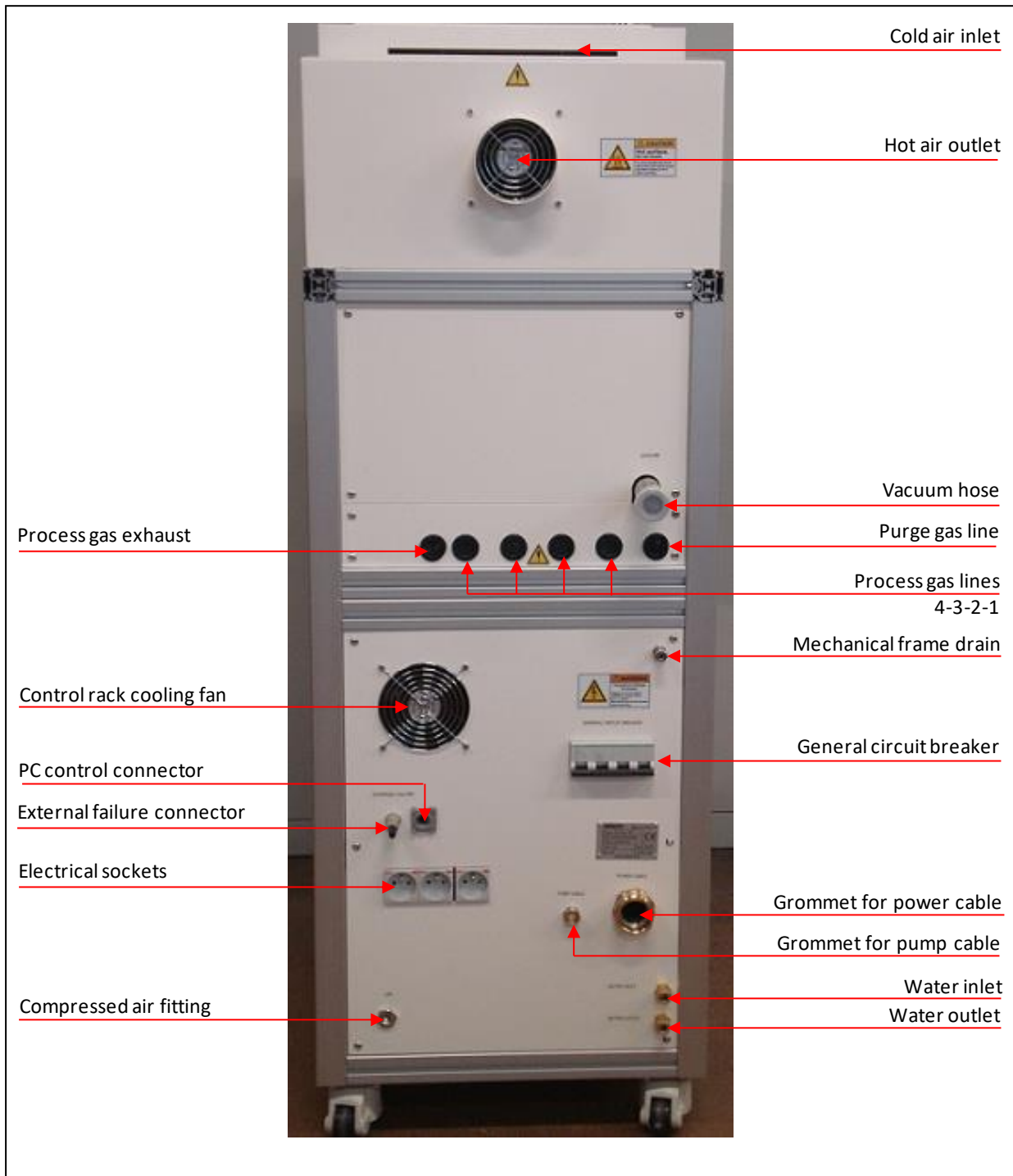
If the vacuum pump is provided with the machine it comes with necessary cable for the electrical power supply from the machine as well as the stainless steel hoses to connect the pump to the vacuum line of the machine.


If the pump is not going to be installed beside the machine additional cable and stainless steel hoses may be required. Contact Annealsys support for further information.

	<p style="text-align: center;">⚠ CAUTION</p> <p>The outlet fitting of the vacuum pump must be connected with a tube which is at least at the same diameter than the vacuum pump fitting and without any restriction on the line. The inner diameter must not be less than 16 mm.</p>
-----------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

The extraction flow rate of the line connected to the vacuum pump exhaust must be at least equal to the nominal flow of the vacuum pump.

13. CONNECTIONS



	<p>⚠ CAUTION</p>
	<p>Power sockets on the rear side of the machine. The power sockets are energized after EMO activation They must be used only for connecting the PC and for Annealsys Service apparatus. Socket rating: 230V/ 12A Max.</p>

14. INSTALLATION

14.1 Mechanical installation

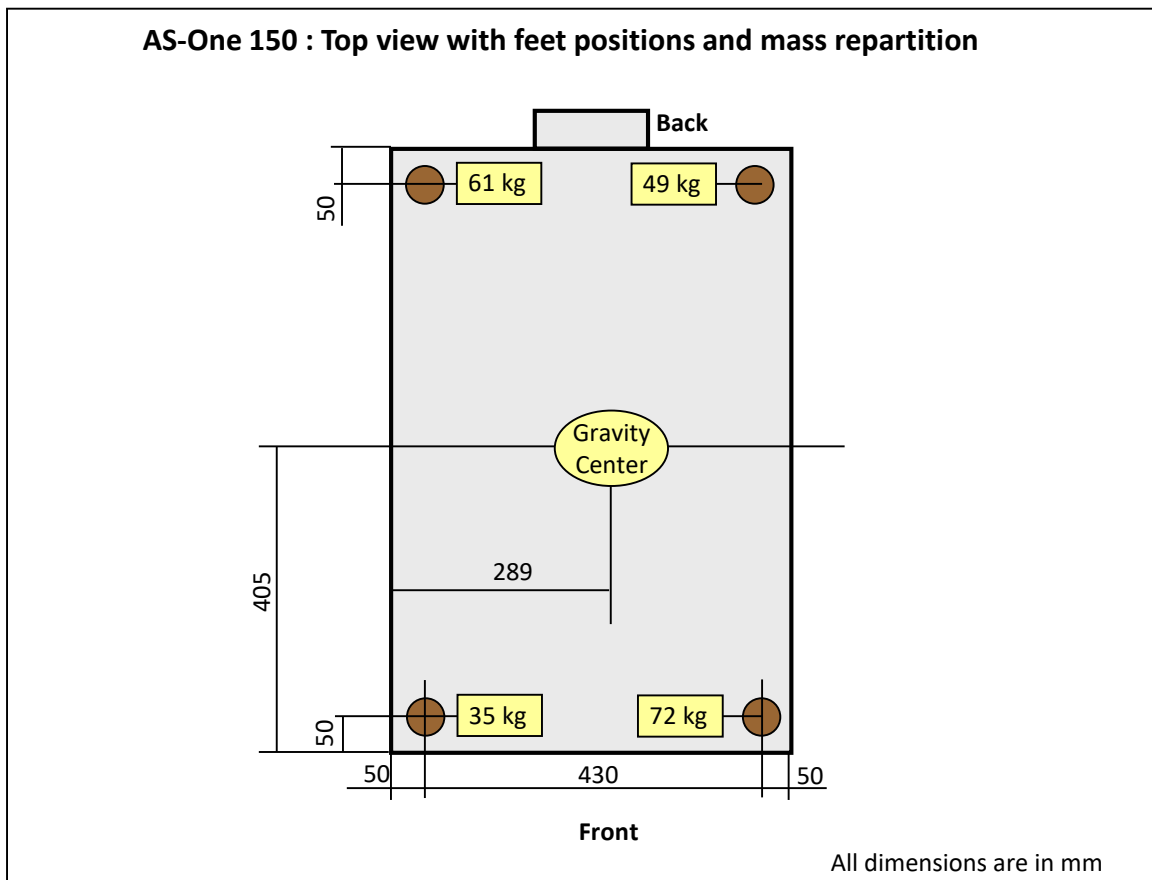
14.1.1 AS-One RTP system

Install the system on a flat and stable surface. There are 4 wheels with adjustable feet under the RTP which are located 50 mm from the front and from the backside of the system.

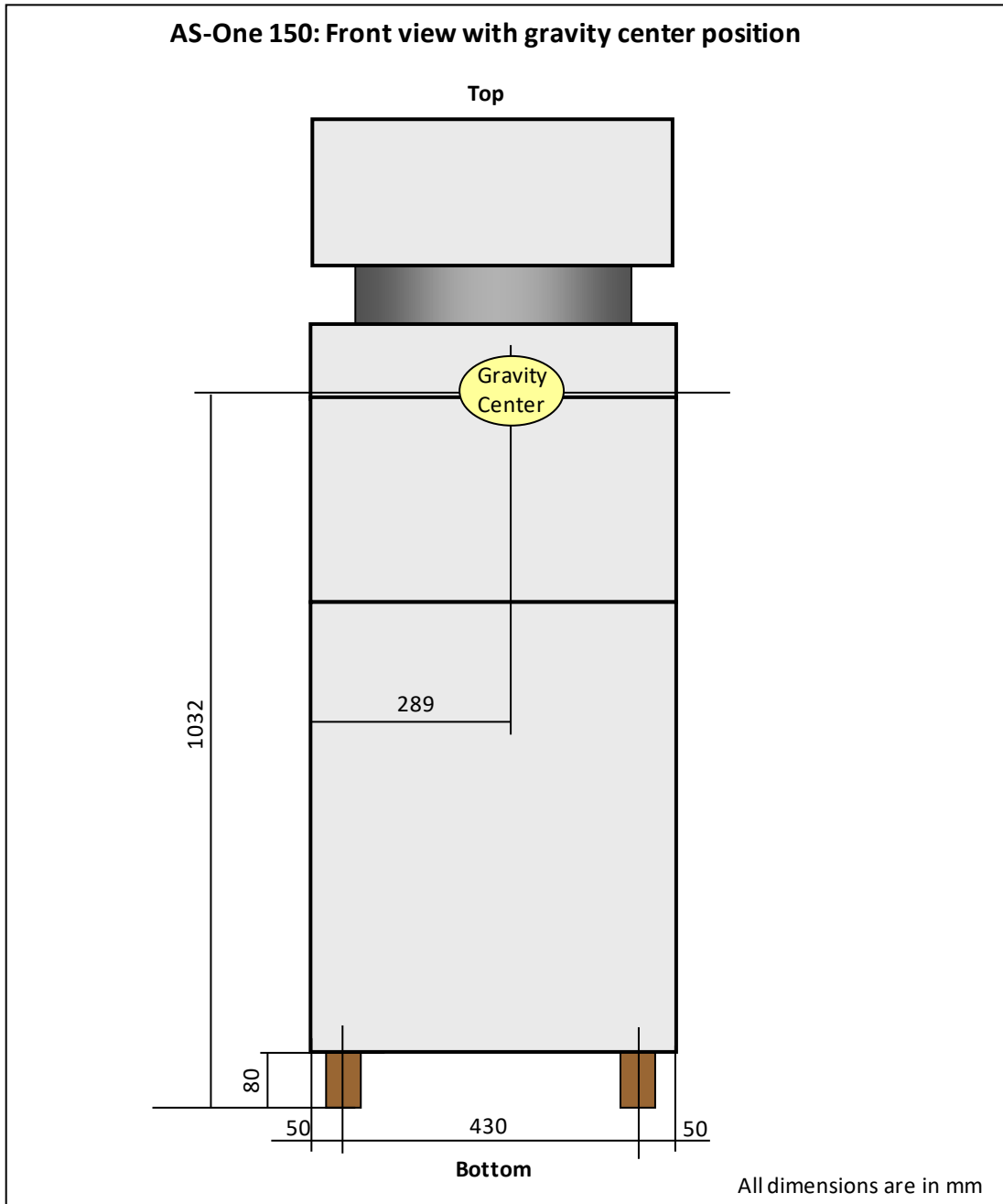
If necessary adjust the feet in order to have the system in a horizontal and stable position.

14.1.2 Feet position and mass repartition

The feet position and the mass repartition including the position of the gravity center are described on the following drawings.



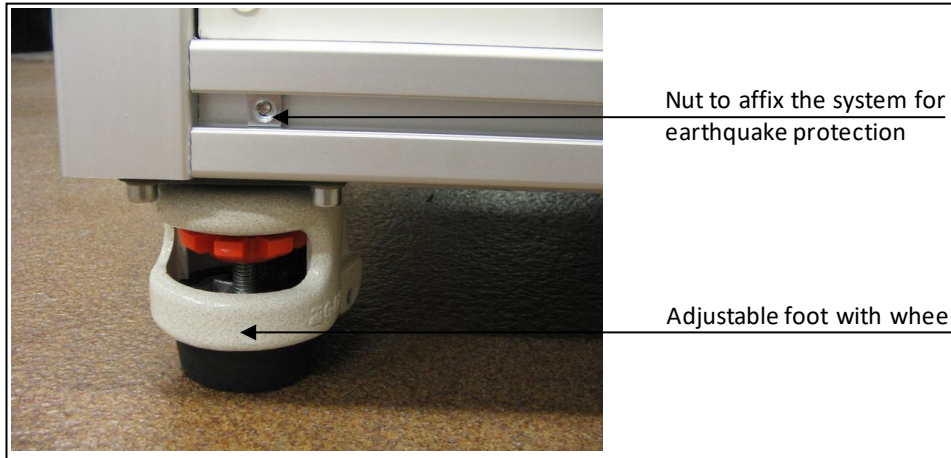
The user is responsible for the installation of the system in a way that will prevent risks in case of earthquake.



14.1.3 Earthquake protection

The AS-One is provided with 4 M6 nuts that can be installed in the frame grooves inside the lower aluminum profiles and close to each foot of the system.

These nuts can be used to affix the system and ensure that it will not move in case of earthquake.



14.2 Computer

Install the computer close to the system.

Floor standing version can be supplied with computer table upon request.

The computer is a desktop type unless the laptop version has been ordered. The typical dimensions of the tower are:

- Width: 20 cm (8 inches)
- Depth: 50 cm (19 inches)
- Height: 36 cm (14 inches)

The tower can be placed under the AS-One table.

There also a keyboard of 46 cm x 15 cm (18 inches x 6 inches) along with a mouse. The cable lengths are standard 1.1 m (43 inches).

The typical dimensions of the laptop computer are:

- Width: 34 cm (14 inches)
- Depth: 32 cm (13 inches)
- Height: 30 cm (12 inches)

The computer can be connected to European plugs located on the rear panel of the AS-One.

If you want to plug the computer to 110V/120V existing outlets from the cleanroom you may need to change the input power switch on the back of the CPU. The monitor can usually be plug to any different voltages without change of the configuration.

The Ethernet communication cable is also connected to the rear panel of the AS-One.

In order to comply with SEMI-S8 recommendations for ergonomic use of the furnace the following rules must be respected for the installation of the monitor and the keyboard.

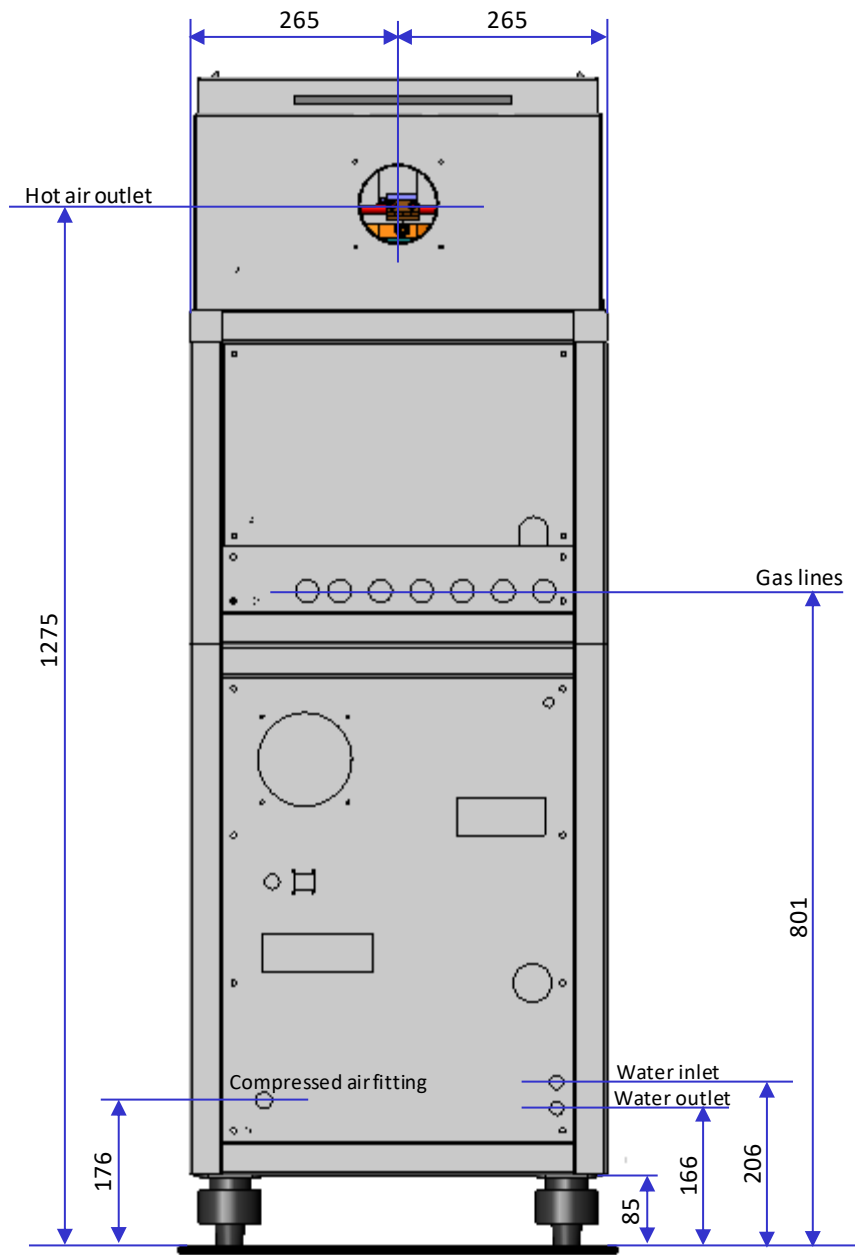
Operator position	Monitor installation	Keyboard installation
Standing	Put center of monitor between 1320 and 1470 mm (52 and 58 inches) above the floor. Table height is approximately between 1070 and 1220 mm (42 to 48 inches) above the floor.	Put keyboard height between 970 and 1020 mm (38 and 40 inches) above the floor.
Seating	Put center of monitor between 940mm and 1190 mm (37 and 47 inches) above floor. Table height is approximately between 690 and 940 mm (27 to 37 inches) above the floor.	Put keyboard height between 710 and 760 mm (28 and 30 inches) above floor.

The user is responsible for ensuring the following ergonomic requirements:

- Work surface edge radius where the operator can assume a static posture in contact with the edge is 6.4 mm (.25-inch) minimum
- Vertical leg clearance is minimum 673 mm (26.5 inches)
- Horizontal leg clearance, depth at knee level, is minimum 508 mm (20 inches)
- Horizontal leg clearance, depth at foot level, is minimum 660 mm (26 inches) with 254 mm (10 inches) minimal vertical foot clearance.
- Horizontal leg clearance is minimum 610 mm (24 inches)
- Thickness of work surface is maximum 51 mm (2 inches)

14.3 Connections

14.3.1 Position of the connections




Dimensions are in mm

*** The horizontal position of the gas lines fittings depends on the system version:**

Horizontal position of the fittings from the left side of the drawing (right side the machine) in mm							
Version	Purge line	Gas line 1	Gas line 2	Gas line 3	Gas line 4	Gas line 5	Exhaust
Double ferrule fittings 4 lines	82.5	142.5	202.5	262.5	322.5	332.5	362.5
Double ferrule fittings 5 lines	82.5	132.5	182.5	232.5	282.5	332.5	377.5

14.3.2 Safety warning

	⚠ WARNING
	<p>UNINTENDED RELEASES The user must carefully read connection instructions. Wrong or incorrect connection may lead to unintended released of hazardous gazes or vapors</p>

All the fluid circuits are tight and designed with different fittings to limit connections errors.

A special care must be taken to avoid connection of compressed air to one of the process gas lines or to the purge gas line. This may lead to some dangerous gas mixture during the process (hydrogen and air for example) or to overpressure inside the process chamber (Compressed air is supplied at 6 bars when process gases are supplied at 1 bar).

The system is designed to avoid dangerous gas or vapor releases. It is the responsibility of the user to check that the piping between the facilities and the system are correctly connected and supported.

14.3.3 Water

The water inlet and outlet fittings are brass male 3/8 ISO conical.

Use ISO 3/8 female fittings and 3/8 or 10 mm ID hoses to supply the cooling water to the machine.


14.3.4 Compressed air

The compressed air fitting is different for North America (USA and Canada) and other countries.

- North America: The system is provided with a double ferrule fitting for 3/8OD tube
- Other countries: The system is provided with a fitting to connect a 8 mm OD plastic tube

Both air fittings versions are union male fittings installed on bulkhead union female 1/4 ISO and can be replaced to change the connection type. The new fittings must remain different from the gas fittings to avoid any wrong connection or wrong route and to eliminate trip hazard.

14.3.5 Process gases

	⚠ WARNING
	<p>Toxic gases Some gases are toxic and inhaling them should be avoided. Take steps to ascertain whether or not the gases being used are known toxic substances. Refer to the Material Safety Data Sheets covering the gases in question</p>

The gas lines are built with filter inside the RTP system.

Remove backside upper panel to access to the gas panel. Just cut the plastic caps to pass the tubes inside the cabinet and connect it on the shut-off valves.

The purge gas line must be supplied only with a neutral gas: nitrogen or argon.

14.3.5.1 Standard version with double ferrule fittings

The gas lines and exhaust line are provided with ¼-inch (Swagelok) double ferrule fittings. The gas tubes should be connected directly on the shut-off valve inside the system.

14.3.6 Ballast for exhaust and vacuum pump

The machine may be equipped with an optional ballast gas line for the dilution of hazardous process gases. The ballast line is installed as an additional gas line at location of gas line 8.


The gas ballast line is provided with ¼-inch double ferrule fittings. The gas tube should be connected directly on the shut-off valve inside the machine.

The gas ballast line is built with filter inside the AS-One system.

Just cut the plastic cap to pass the tube inside the cabinet and connect it on the shut-off valve.

The gas ballast line must be supplied only with a neutral gas: usually nitrogen.

14.3.7 Utilization of hydrogen


	⚠ WARNING
	<p>Hydrogen The system is compatible with the utilization of pure or diluted hydrogen. However to hydrogen must be diluted to a maximum concentration of 4% at system exhaust and vacuum line to avoid any hazardous conditions and explosion.</p>

In order to operate under safe conditions the hydrogen must be diluted in the exhaust and the vacuum line to a maximum concentration of 4%.

The system can be provided with a ballast line upon request. Supply the ballast line with nitrogen. The ballast line is equipped with a nitrogen ballast flow sensor and interlock.

If the RTP furnace is not equipped with a ballast line the user is responsible for the installation of the ballast according to the local regulation.

14.3.8 Gas exhaust line

	⚠ WARNING
	<p>Process gas exhaust line The gas exhaust is only used if process is performed at atmospheric pressure; otherwise gases are evacuated to the vacuum pump. If process reactions create exhausts which are possibly toxic, the exhaust line must be connected to a venting system or a gas scrubbing system that complies with the local regulation.</p>

14.3.8.1 Pressure in the exhaust line

The exhaust line of the machine is equipped with a built-in 1 PSI (69 mbar) check valve. The pressure in the line connected to the machine should not be above the atmospheric pressure otherwise the system will not be able to evacuate the gas from the process chamber.

Annealsys recommend that the exhaust line is below the atmospheric pressure in order to evacuate gas even in case of leak on the line. A pressure between 5 and 20 mbar below the atmospheric pressure in the exhaust line is recommended.

Do not connect the exhaust line to a venting or a gas abatement system that generates a pressure below 20 mbar. This may lead to vacuum the process chamber and would not allow the reactor to open to unload the substrate.

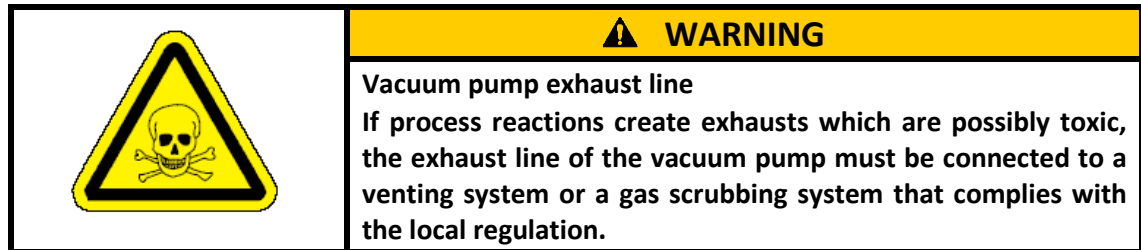
14.3.8.2 Temperature of the gas at the exhaust

Temperature of the gas at the exhaust line will not exceed 30°C (86°F).

14.3.9 Vacuum

The system is delivered with a KF25 stainless steel vacuum valve installed inside the cabinet. Use a KF25 hose to connect the vacuum valve directly to your vacuum pump. If Annealsys supplies the vacuum pump it will come with necessary stainless steel hose to connect it to the furnace.

Stainless hose can be provided by Annealsys upon request.



If the vacuum pump is provided by Annealsys it is electrically supplied by the RTP furnace. Connect the cable to the terminal inside the system close to the power terminal. The pump cable goes through the small gland on the rear side panel.

Terminals are 1, 2 and ground.

14.3.10 Hot air outlet

Connect the air outlet of the furnace to a venting system using a 150 mm diameter duct pipe.

The air outlet duct is located 1295 mm from feet base and in the center of the rear. It is for a 150 mm ID pipe connection and the length is 50 mm

Specifications:

- Minimum air venting flow: 360 m³/h (210 CFM)
- Maximum temperature of the hot air: 100°C (212°F)

The hot air can be evacuated into the room if there is no venting system available.

14.3.11 Venting fan for control cabinet

The air from the fan of the control cabinet is evacuated on the system backside.

Upon request it can be connected to cleanroom venting system as well with an optional duct. The location is 605 mm from feet base and 130 mm from the left side of the rear.



14.3.12 Mechanical frame drain

The mechanical chassis is equipped in its lower part with a steel tray which collects water in case of leakage on the reactor. The tray protects the electric module installed in the lower part of the machine.

A ¼ inch double ferrule fitting drain labeled "mechanical frame drain" on the rear of the machine allows evacuating the water that could flow in case of leakage.

It is not necessary to connect it to a laboratory or clean room drain. It is normally not used and the water will flow only if a large water leak occurs inside the machine.

14.3.13 Electrical connection check

	 WARNING
	<p>Electrical screw terminals The screw terminals connections might be loosen due to shipment. They must be tight check prior to connecting the power cable or to power on the machine</p>

The electrical connections inside the machine are made using spring terminal as much as possible.

The screw terminals are strongly tightening to insure good contact. Anyway during the shipment the vibration may cause loosening of the electrical screw terminals. So the screw terminal connections must be check prior to connecting the power cable or to power on the machine.

14.3.14 Power cable

The system is provided with a general circuit breaker installed on the rear panel and that has the following specifications:

Version	Voltage rating (system voltage)	Standard	Current rating	Current interrupting capacity (amperes interrupting capacity: AIC)
AS-One 150	3x220V	UL	125 A	35 kA

The circuit breaker is provided with a padlockable system.



Use a power cable and a circuit breaker for the protection of the power line according to the information from paragraph 8.1.

The power cable goes into the back of the AS-One through the big gland on the rear left side. The power wires are screwed to the bottom of the large terminal block located inside the furnace.



Connect the power cable in the following way:

- Remove the left side lower panel of the system.
- Connect the 3 phase wires on the 3 terminals L1, L2, L3.
- Connect the neutral wire on the blue terminal (for 3 x 400V + N + Ground only)
- Connect the Ground to the yellow/green terminal close to the gland
- Reinstall left side lower panel

	 WARNING
	<p>Make sure that the power line is off and the general circuit breaker on the rear side of the system remains off until our engineer comes for start-up.</p>

14.3.15 Computer

The AS-One is provided with 3 current plugs on the rear panel for the mains cable of the computer and the display unit. The third plug can be used for connecting the optional printer.

The communication between the AS-One and the computer is assured by a TCP/IP communication line. Connect the 3 m long LAN cable between the PC network board and the RJ45 connector on the backside of the AS-One.


14.3.16 External failure socket

One external failure female socket (EXF1) is installed on the rear side of the system.

This connector can be used to connect external safety interlocks like ventilation system, gas detection system, gas abatement system, etc.

The external failure socket is supplied with 24VDC. This is a safety loop interlock that stops the system when it is open.

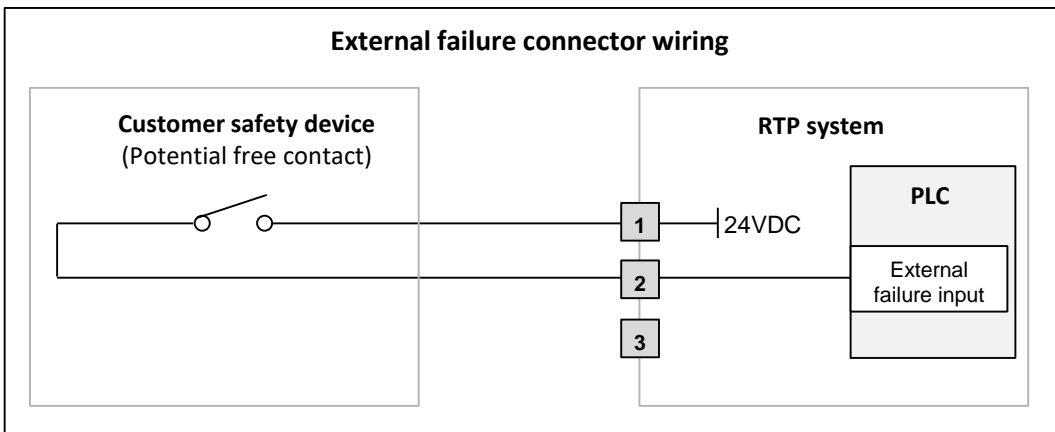
The system is supplied with the external failure connector with shunt between terminals 1 and 2. This connector must be installed on the socket in order to operate the machine if it is not connected to an external safety system.

	⚠ CAUTION
	<p>The external safety loop is supplied with 24 VDC. Only potential free contact must be connected to the external failure connector. Connecting to a non-free potential may lead to serious damage of the equipment</p>

Connector wiring information:

Terminal	Function
1	24V
2	Signal to PLC
3	Not used

In case of external alarm, then the contact opens between pin 1 and 2 of the connector. The system automatically generates an alarm, stops the process and closes all the vacuum and gas valves. The safety sequence starts immediately.



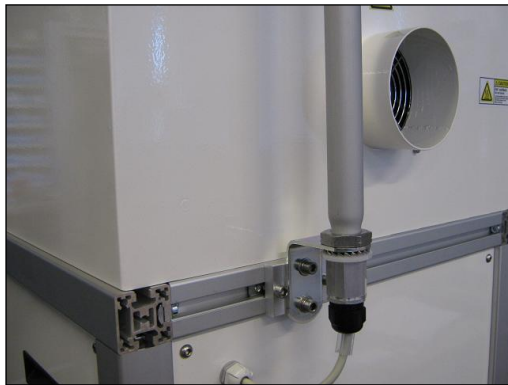
14.4 Signal tower (option)

Optionally, the system includes a signal tower with 4 functions. The default configuration is:

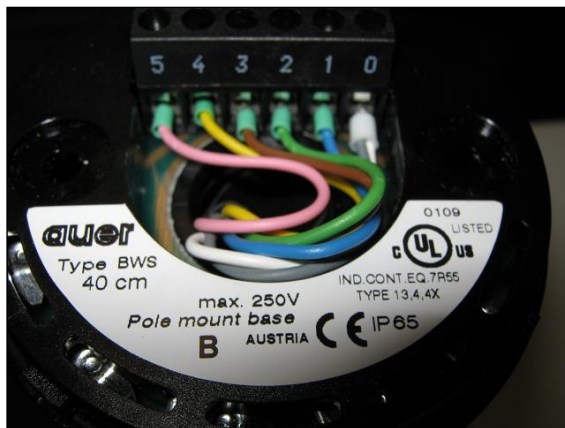
- RED: system in ALARM (buzzer rings as well)
- YELLOW: system is IDLE
- GREEN: system is Running or Cooling after recipe
- ALL LIGHTS OFF: system is MANUAL mode

The signal tower is installed on the backside of the tool. It is dismantled for the shipment and must be reinstalled for operations.

The signal tower is attached to one of the rear horizontal aluminum profile. Two nuts are inserted in the profile to attach the tower holder. Attach the signal tower as shown on the picture.



The cable is installed on the rear side of the AS-One. It is connected in the lower part of the signal tower. The green cover must be removed by turning it from the black base. Then the cable is connected as indicated on the picture hereunder:



Reinstall the plastic parts with the lamps. The system is now ready for operation.


15. SYSTEM SHUT DOWN

The system shut-down is performed using the following procedure:

- Shut down software and switch off the computer
- Switch-off the system
- Equipment electrical isolation and verify isolation
- Fluids isolation (compressed air, process gases and water)

15.1 Software shut-down

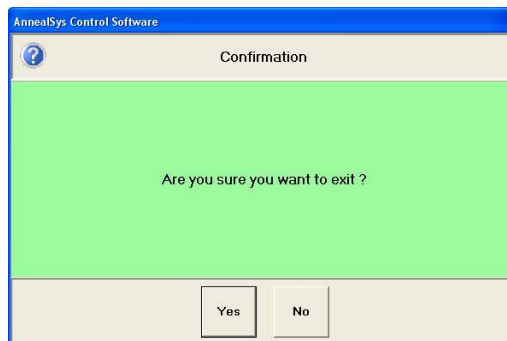
If the system is equipped with a turbo pump stop the turbo pump using the manual mode before system shut-down. If the software is temporary shut-down but not the system, then the turbo pump can remain running.

	<p>⚠ CAUTION</p>
	<p>TURBO PUMP CONTROL If the furnace is equipped with a turbo pump and if the furnace is going to be stopped, then the turbo pump must be stopped using the manual mode before switching off the furnace. The PC software can be shut-down without stopping the turbo pump if the furnace is not going to be switched off.</p>

The software can be shut-down using the "Shut-down" button in the main navigation bar or by a right click on the mouse.

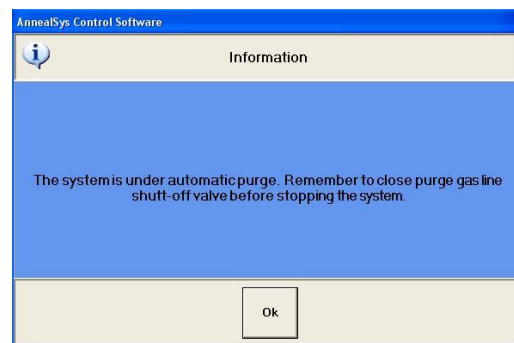
The PC software can be stopped even if the machine is running. Nevertheless it is recommended to switch off the PC and the machine.

The system will ask for shut-down confirmation:



Confirm by "Yes" to exit.

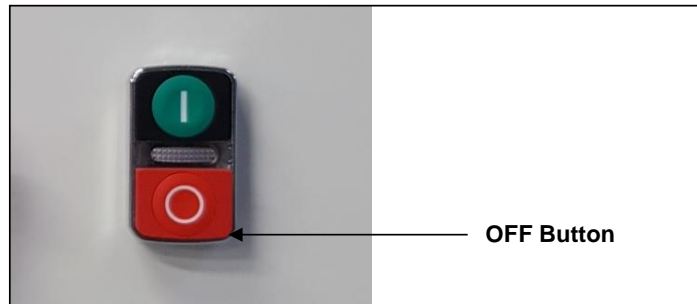
If the system is equipped with a normally open purge valve the software will then display the following message:



When the system is switched-off the purge valve will open and the reactor will remain under purge gas flow as long as it is switched-off. The manual shut-off valve of the purge gas line must be closed when the system is switched-off. See gas line isolation procedure hereunder.

15.2 Switch-off the system

Switch-off the system by pressing the red OFF button on the front panel or any other location if available on the machine depending on the version



15.3 Shut down computer

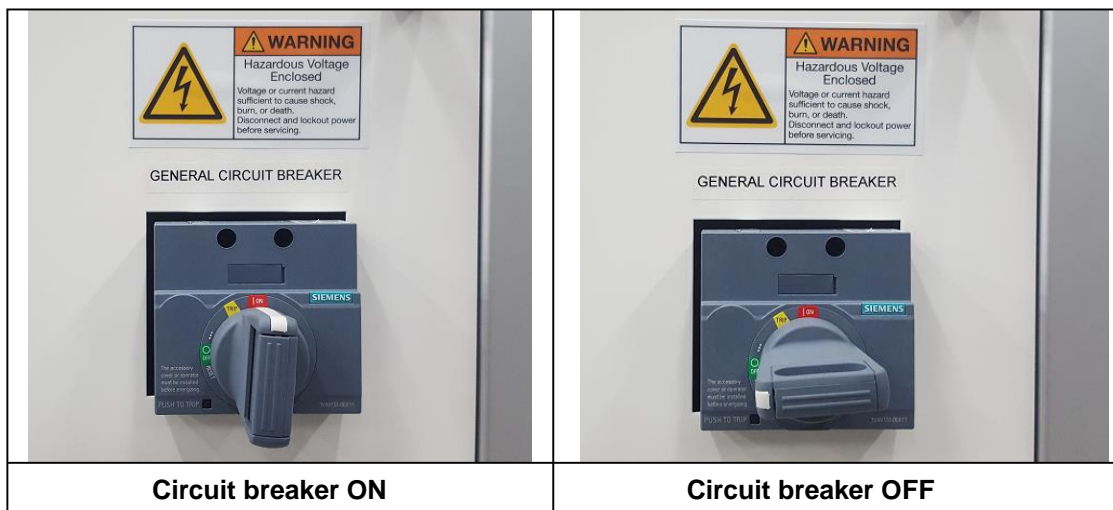
The computer is usually supplied by the sockets installed on the system front side or backside. When the general circuit breaker is switched off these sockets are de-energized.

The computer must be shut down before switching off the general circuit breaker and isolating the system.

15.4 Equipment isolation 3x220V version

The equipment can be isolated using the general circuit breaker on the backside panel.

Turn the handle to the left side (white part on top the circuit breaker is ON).



Lockout of the circuit breaker:

The circuit breaker can be lockout when it is in off position. Push the small plastic slider to open the hole for the installation of a padlock.




15.5 Stored energies

The power blocks include power capacitors but they are equipped with resistors to dissipate stored energy. It takes less than 2 seconds to relieve the stored energy. The power blocks can be dismantled without risk after the system has been isolated.

15.6 Verify isolation

In addition of the general circuit breaker it is recommended to isolate the equipment supply line and to check that there is no more energy by measuring the voltage on the supply cable terminal.



	⚠ WARNING
	<p>Electrical shock hazard If the power line is not isolated the supply cable terminal and wired to the main circuit breaker will remain energized. The service operations must be carried out by trained and authorized technicians only.</p>

If the power line remains energized the isolation of the system from the general circuit breaker can be checked on control circuit breaker and power contactor inlets.

15.7 Isolation of process gases

The gas panel is provided with shut-off valves on the purge gas line inlet and on the inlet of each process gas lines.

These valves are labelled SVP for the purge shut-off valve and SVGx for each process gas line where x is the gas line number.

15.7.1 Version with valves with VCR fittings

When the rotating handle is in the direction of the tubing the valve is open. When it is turned 90° and perpendicular to the tubing the valve is closed. See position on the following picture.



15.7.2 Version with valves with double ferrule fittings

When the rotating handle is in the direction of the tubing the valve is open. When it is turned 90° and perpendicular to the tubing the valve is closed. See position on the following picture.



15.8 Isolation of water cooling

The machine comes with a solenoid valve that isolates the water inlet when this valve is closed and when the system powered off.

Please note that the water outlet is not isolated and that water may enter into the water circuit through the water outlet if the system is connected to a close closed loop cooling circuit or a chiller.

If the water circuit must be isolated on the outlet side a valve must be added by the customer on the water outlet.

16. EMO AND INTERLOCKS

16.1 Emergency switch-off

The system is equipped with an Emergency switch (EMO) on the front panel of the machine.

This switch shut down the machine when it is pushed. It can be activated at any time in case of emergency. There is no risk for the tool even if it is switched-off during a heating cycle.

Turn the EMO red button in the clockwise direction to release it.

16.2 PLC watchdog

The PLC is equipped with a watch dog interlock that controls an internal contact.

When the operator closes the rear panel general circuit breaker, the PLC runs a diagnostic routine that takes several seconds. When the initialization cycle is completed the alarm indicator turns to red and the system can be switched on using the green push button. The alarm can be reset after powering up the system by clicking on the alarm indicator on the software screen. Otherwise it will be automatically reset when the first process is performed.

Each time the system is switched off (by the red push button); the alarm indicator turns to red to inform the user of a system power off.

If there is any diagnostic problem of the PLC when the system is running then the watch dog interlock is activated and the power is automatically shut-down by hardware interlock in series with the off and EMO buttons.

16.3 Temperature controller watchdog

Annealsys has developed a state of the art PID digital temperature controller to offer an outstanding temperature control whatever the process conditions.

This temperature controller is equipped with a watch dog interlock that controls an internal contact.

If there is any diagnostic problem of the temperature controller when the system is running then the watch dog interlock is activated and the power is automatically shut-down by hardware interlock in series with the off and EMO buttons.

16.4 Hardware interlocks

There are some hardware interlocks that automatically switch off the power contactor in case of alarm. When power contactor is off there is no more power to the lamps. Other sub-systems (including cooling) are still powered on. These interlocks are also software interlocks.

The hardware interlocks that are necessary to operate the power contactor are:

- Thermal switch on the lamp reflector (overheating interlock)
- Thermal switch on the reflector lid (overheating interlock)
- Water flow switch
- External interlock #1

16.5 Software interlocks and alarms

Software interlocks and alarms are described in the software manual.

Software interlocks prevent an action to start in case the requested conditions are not met.

Software alarms generate a safety sequence in case the conditions to perform an action are no more met.

17. ANNEALSYS SUPPORT CONTACT INFORMATION

Annealsys and our representatives will do our best to support you in case of any issue with the system.

For any customer support request please provide the following information:

- System type
- Serial number of the machine
- Substrate type: wafer size and material, susceptor with or without lid, etc.
- Type of temperature control sensor: thermocouple or pyrometer
- Location of temperature control sensor: Center, edge, into susceptor hole, etc.

The best way to provide information to Annealsys for support is to generate the zip diagnostic file from the software and to email it to support@annealsys.com. The diagnostic file includes all necessary information to investigate on any issue you may have with the machine.

You can also just send a process historical file: ".his" file (not screen copy) for simple issue related to one process.

It is also possible to contact us by phone and fax:

- Phone: +33 467 20 23 63
- Fax: + 33 467 20 26 89

You can of course contact our local representative for local support. Check information on Annealsys web-site: <http://www.annealsys.com/contact-us/distributors/>

If you need to return some parts for repair we will provide a RMA number and a return form.

Parts must be shipped to:

Annealsys
139 rue des Walkyries
34000 Montpellier
France

Revision history

Revision History			
Document Title	AS-One 150 Installation manual		
Filename	ASOne150_Install_Manual_EN_V2-25.docx		
Version Number	2.25		
Author	Franck Laporte		
Version	Brief Description of Changes	Date of Issue	Initials
2.00	Document contains original instructions of the manufacturer Additional information for external failure socket Update of power connection The EC declaration of conformity is added	December 16, 2012	FLA
2.01	Positions of rear side connections is added	December 20, 2012	FLA
2.02	Environmental Impact	October 25, 2013	FLA
2.03	Annealsys CT	May 26, 2014	FLA
2.04	Mechanical frame drain	August 7, 2015	FLA
2.05	Mainframe width increased to 530 mm Option external reactor unlock interlock New logo	January 12, 2016	FLA
2.06	QDP40 Interface	April 16, 2016	FLA
2.07	New address	December 2, 2016	FLA
2.08	Storage conditions	January 30, 2017	FLA
2.09	Pressure drop in the cooling circuit	February 9, 2017	FLA
2.10	Correction of circuit breaker rating for version 150	February 16, 2017	FLA
2.11	Required parts for the installation of the machine	February 28, 2017	FLA
2.12	Recycling cost of the machine	March 18, 2017	FLA
2.13	Water resistivity specification	May 12, 2017	FLA
2.14	Annealsys customer support contact information	October 3, 2017	FLA
2.15	hBN RTCVD version	October 9, 2017	FLA
2.16	Correction of the hot air exhaust duct diameter and flow	October 27, 2017	FLA
2.17	Correction of currents at paragraph 12.3.12	August 6, 2018	FLA
2.18	Update of the unpacking information	January 3, 2019	FLA
2.19.	Update of the CE declaration	March 11, 2019	FLA
2.20	Update of constructor's foreword Update of safety instructions	April 27, 2019	FLA
2.21	Height of system when chamber is open Short circuit courant rating (SCCR) EMO and interlocks	July 15, 2019	FLA
2.22	Update of 220V main breaker isolation	October 22, 2019	FLA
2.23	Update of the gas ballast line Update of the pressure in the exhaust line	May 19, 2020	FLA
2.24	Requirement for protection against overvoltage	July 3, 2020	FLA
2.25	Electrical connections check Information and warning about the 230V power sockets Clarification between exhaust and venting Version with remote gas cabinet	October 23, 2020	FLA
2.26	Correction of the gas inlet positions	April 16, 2021	FLA