General instruction manual - Dry cleaning

*Perchloroethylene*

General regulations
Installation
Operation
Use
Maintenance

To preserve for future references
Manufacturer's address

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0. Contents

1. Use allowed and in conformity with the existing rules........................................... 5
  1.1 Safety symbols ............................................. 5
  1.2 Use allowed ................................................ 5
  1.3 Other risks .................................................. 5
  1.4 Minimum requirements for operator and operating personnel................................. 5
  1.5 Noise ................................................................ 5
  1.6 Conformity ...................................................... 5

2. Safety at Work ......................................................... 6
  2.1 General safety information ................................ 6
  2.2 Checks ........................................................... 7
  2.3 Obligation of the owner company ................. 7
  2.4 First Aid .......................................................... 7
  2.5 Chemical characteristics ................................. 7
    2.5.1 Max. concentration at the place of work ....... 7
  2.6 Dangers for health ........................................... 7
  2.7 Personal protective equipment ......................... 8
  2.8 Important precautions ...................................... 8
  2.9 Behaviour in case of failure ............................. 8
    2.9.1 Interruption of a cleaning cycle ................... 8
  2.10 Waste disposal .............................................. 9
  2.11 Restrictions on employment ............................ 9

3. Installation place requirements ........................................... 10
  3.1 Prescriptions .................................................. 10
  3.2 Installation place ............................................ 10
  3.3 Base ................................................................ 10
  3.4 Fixing ............................................................ 10

4. Transport and packing instructions ........................................... 11
  4.1 Warnings on delivery ....................................... 11
  4.2 Transport ........................................................ 11
    4.2.1 Domestic transport with trailer-truck ............ 11
    4.2.2 International transport with trailer-truck or container ................................... 12
    4.2.3 Transportation by sea ................................... 12
  4.3 Hauling with forklift ....................................... 12
    4.3.1 Characteristics of the forklift ....................... 12
    4.3.2 Procedure to unfasten the transport pallet .... 13
  4.4 Positioning of the machine................................. 13
  4.5 Packing .......................................................... 14

5. Standard accessories ................................................... 14

6. Operations prior to setting at work ...................... 15
  6.1 Compressed air connection ............................... 15
  6.2 Cooling water connection ................................ 15
  6.3 Electrical connection ........................................ 16
  6.4 Steam connection ........................................... 16
  6.5 Diagram of steam/condensate connection .......... 17
  6.6 Automatic greasing device for the rotating seals ................................................... 18

7. First setting at work ................................................. 19
  7.1 Check prior to setting at work ............................. 19
  7.2 Filling with solvent .......................................... 19
  7.3 Filling spin filters ............................................ 20
  7.4 Filling water tank with solvent ......................... 20
  7.5 Filling still boiler ............................................ 21
  7.6 Filling drying boiler ......................................... 21
  7.7 Filling still/drying boiler ................................... 22
  7.8 Heating with an external steam generator ........... 22
  7.9 Heating with steam/electric circuit .................... 22
  7.10 Parameter-check of the refrigeration system .... 22
    7.10.1 Drying phase ........................................... 23
  7.10.2 Cool down phase ......................................... 23
  7.10.3 Adjustment of the pressostatic valve for refrigeration system ......................... 23
  7.10.4 Cool down phase with bypass of the pressostatic valve (optional) ..................... 23
  7.10.5 Adjustment of the bypass valve ...................... 23

8. Operation ............................................................... 24
  8.1 Cycles ................................................................ 24
    8.1.1 Loading of the garments ......................... 24
    8.1.2 Choice of the cleaning program .............. 24
    8.1.3 Cleaning .................................................. 24
      8.1.3.1 Precleaning ......................................... 24
      8.1.3.2 Main cleaning ...................................... 24
    8.1.4 Extraction .................................................. 24
    8.1.5 Drying ....................................................... 25
      8.1.5.1 Main drying ........................................ 25
      8.1.5.2 Cool down ........................................... 25
    8.1.6 Adsorption ................................................ 26
      8.1.6.1 With multisolver ................................... 26
      8.1.6.2 Without multisolver ................................ 26
    8.1.7 Unloading the garments .............................. 27
    8.1.8 Solvent care .............................................. 27
      8.1.8.1 Filtration ............................................ 27
      8.1.8.2 Distillation .......................................... 27
      8.1.8.3 Separation ........................................... 27

9. Description and maintenance ........................................ 28
  9.1 General maintenance instructions ................. 28
    9.1.1 Cleaning ................................................. 28
    9.1.2 Checks and maintenances to be performed when necessary ......................... 28
    9.1.3 Daily checks and maintenances .................... 28
    9.1.4 Weekly maintenances ................................ 28
    9.1.5 Monthly maintenances ................................ 28
    9.1.6 Half-yearly maintenances .............................. 28
    9.1.7 Yearly maintenance and repair .................... 28
  9.2 Components description and specific maintenances ........................................... 29
    9.2.1 Solvent tanks ............................................. 29
    9.2.2 Drum, drum housing ................................... 29
    9.2.3 Drum operation ......................................... 29
    9.2.4 Inverter ................................................... 30
    9.2.5 Loading door ............................................ 30
    9.2.5.1 Maintenance procedure ............................ 30
    9.2.6 Air duct (Air circulation) ............................ 30
    9.2.7 Button trap/air filter .................................. 30
      9.2.7.1 Maintenance procedure ........................... 30
        9.2.7.1.1 Removal of distillation sludge (still without bipot) ....................... 30
        9.2.7.1.2 Air filter and button trap (mod. A) ................................... 30
        9.2.7.1.3 Air filter and button trap (mod. B) ................................... 31
    9.2.8 Drying control device ................................ 32
    9.2.9 Self-cleaning button trap with basket .......... 33
    9.2.9.1 Maintenance procedure ............................ 33
    9.2.9.2 Maintenance procedure for mod. Industria .... 33
    9.2.10 Cyclone separator .................................... 34
    9.2.10.1 Maintenance procedure ......................... 34
    9.2.11 Refrigeration system .................................. 35
    9.2.12 Still ....................................................... 37
      9.2.12.1 Maintenance procedure ......................... 37
        9.2.12.1.1 Removal of distillation sludge (still without bipot) 37
        9.2.12.1.2 Removal of distillation sludge (still with bipot) .................... 38
      9.2.12.2 Storage container replacement ................ 39
      9.2.12.3 Distillation of tank contents ................... 39
    9.2.13 Still condenser ......................................... 39
9.2.14 Water separator ................................................ 40
  9.2.14.1 Maintenance procedure .................................. 40
  9.2.14.2 Discharge of waste water from the water tank ...... 40
  9.2.14.3 Discharge of waste water from the water tank (CE model) ........................................ 40
  9.2.14.4 Cleaning the water separator ......................... 41
    9.2.14.4.1 Discharge the water from the separator ....... 41
    9.2.14.4.2 Discharge solvent from the separator .......... 41
9.2.15 Spin filter ..................................................... 41
  9.2.15.1 Regenerating spin filters without powder ......... 42
  9.2.15.2 Regenerating spin filters with powder .......... 42
9.2.16 Post cartridge filter ......................................... 42
  9.2.17 Still drying .................................................. 43
  9.2.18 Industrial Still drying ..................................... 43
  9.2.19 Still funnel .................................................. 44
    9.2.19.1 Procedure ............................................. 44
9.2.20 OE Distillation ............................................... 44
9.2.21 Back drum cleaning ......................................... 45
9.2.22 Pump prefilter ............................................... 45
  9.2.22.1 Maintenance procedure ............................... 45
9.2.23 Soap pump .................................................... 45
9.2.24 Soap funnel ................................................... 45
    9.2.24.1 Procedure ............................................. 45
9.2.25 Impregnation device ........................................ 46
    9.2.25.1 Replace agent tank .................................. 46
    9.2.25.2 Impregnation device spray nozzle ............... 46
    9.2.25.3 Filling spray pump ................................. 46
9.2.26 Compressed air treatment unit ........................... 47
  9.2.26.1 Maintenance procedure ............................... 47
9.2.27 Air compressor ............................................... 47
  9.2.27.1 Maintenance procedure: ................................ 47
9.2.28 Carbon funnel ............................................... 47
9.2.29 Multisolver .................................................... 48
  9.2.29.1 Multisolver regeneration ............................ 48
9.2.30 Solvent concentration measurement system .......... 48
9.2.31 Still boiler .................................................... 49
    9.2.31.1 Emptying still boiler ................................ 49
    9.2.31.2 Topping up still boiler ............................. 49
9.2.32 Drying boiler .................................................. 49
    9.2.32.1 Emptying drying boiler ............................. 49
    9.2.32.2 Topping up drying boiler ........................... 49
9.2.33 Still/drying boiler ........................................... 50
    9.2.33.1 Emptying still boiler ................................ 50
    9.2.33.2 Topping up still boiler ............................. 50
9.2.34 Solvent cooling with refrigeration system .......... 50
9.2.35 Heating with steam/electric circuit ................. 51
9.2.36 Electric panel .................................................. 51
9.2.37 Panelling ..................................................... 51
9.2.38 Solvent spill tray ........................................... 51
9.2.39 Filter at water inlet ........................................ 51
    9.2.39.1 Maintenance procedure ............................. 51
9.2.40 Filter at steam inlet ....................................... 51
    9.2.40.1 Maintenance procedure ............................. 51
10. Daily setting at work ............................................ 52
  10.1 Operation modes not allowed ............................ 52
  10.2 Machine startup .............................................. 52
  10.3 Cleaning programs ............................................ 53
  10.4 Switching off the machine ................................. 53
11. Machine marking and warning notices ................. 54
1. Use allowed and in conformity with the existing rules

1.1 Safety symbols
- This symbol is printed beside any safety instructions suitable to avoid risks for the people's health and life and to the environment.
- This symbol is printed beside any safety instructions suitable to avoid risks for the machine showing the proper use.
- This symbol is printed beside any safety instructions suitable for a better use of the machine.

1.2 Use allowed

The dry cleaning machine should only be used according to the existing rules. It should only be used for cleaning garments or fabrics for which it has been expressly designed. The only solvent agent allowed is stabilized Perchloroethylene at 99.9%.

The nominal load of the cage have to be respected and shall not be overcharged.

It is strictly forbidden to dry-clean garments/ fabrics containing solvents with a low flash point, thus causing an explosive atmosphere. Also introducing solvents or liquids which may alter the features of Perchloroethylene, causing an explosive atmosphere or developing foam or carcinogenic features are strictly forbidden.

The machine should also be used following the start-up, control and repair directions (operating instructions).

Any other use than the one above mentioned is not allowed. In this case the manufacturer is not liable for any damage occuring.

This operating instructions is integral part of the machine supply and should be delivered to the new owner in case of resale.

1.3 Other risks

In spite of all precautions, further risks, such as potential ones not appearing, electric power, steam, hot fluids, unhealthy and polluting vapours, or dangers occuring in a non visible side of the machine or the control panel may occur.

1.4 Minimum requirements for operator and operating personnel

The customer should be skilled enough to use and maintain the dry cleaning equipment operating with solvent. The operator may either follow a training for dry cleaning engineers or attend a training course officially recongnized or held by a trade-union.

1.5 Noise

The noise level of this machine is lower than 80 dB(A). Depending from the working room features, it is possible that the noise level rises to a value that can cause deafness. In this case the machine operators have to be protected by appropriate protection measures.

1.6 Conformity

The dry cleaning machine is projected and built on the basis of the present state of the art and in conformity with the following EEC Rules and normatives:

- Machine directive 98/37/EC
- Electromagnetic compatibility directive 2004/108/CE.
- Low Voltage directive 2006/95/EC.
- Safety of machinery EN ISO 12100 part 1 and part 2.
- Electrical equipment of industrial machines EN60204 part 1.
2. Safety at Work

2.1 General safety information

The dry cleaning machine, subsequently called machine is a state-of-the-art item and is safe to run. Despite this, the machine may involve hazards when used by non-skilled personnel or beyond the scope of proper use.

- Read the operating instructions manual of the machine and the control and programming and safety instructions before unpacking, installing, carrying out repair and maintenance. And follow them carefully!
- The machine shall be operated following all local safety and accident preventing rules in force; these should be carefully followed!
- This machine uses perchloroethylene for solvent. This solvent may be hazardous to health and the environment. Handle with care!
- The machine’s controls have to be interlocked with a forced ventilation system that does not allow to run the machine unless the ventilation system is ON.
- Never sleep in the workroom itself, or in other rooms in its vicinity, not being separated by doors.
- Never eat, drink or smoke in the workroom, do not store food in such premises.
- Never use ovens, fire, or open flames in the workroom; these sources of heat tend to absorb solvent vapors and transform them into an extremely poisonous substance.
- Escape of important quantities of solvent or solvent vapor is deemed a notifiable shutdown, i.e. such malfunction has to be reported to the authorities in charge, trade inspection, fire department, 1st and 2nd class water inspection.
- The machine may be run and serviced by skilled and trained personnel only.
- Before carrying out any maintenance and/ or repair, it is required to disconnect power from the machine, by turning the main switch off and locking it (with a padlock, for instance) to avoid any accidental starting.
- The operator shall immediately advise any changes carried out on the machine concerning safety.
- The operator shall only start up the machine if in perfect working conditions.
- Read the instructions and warning plates on the machine.
- Immediately replace the instructions and warning plates and/or writings damaged or removed.

- In all ordinary and extraordinary maintenance operations always wear the protection gloves and the breathing set (the type approved). Dispose of the filter used, in conformity with the existing rules!
- In case of danger, turn the main switch off (fig. 1) immediately.

![Fig. 1 Main switch](image)

- Disconnect machine with main switch whenever work is discontinued.
- The protection devices shall never be modified, bypassed or removed, unless when repairing.
- Maintenance and repair shall only be carried out by skilled authorized personnel. In this case it is necessary to take into account the dangers concerning the operations on electrical or cryogenic systems.
- On completion of servicing and maintenance work, re-assemble all safety equipment in place.
- Spare parts have to comply with the manufacturer's specifications; use genuine ILSA parts only.
- In case of injury, accidents or skin irritations, immediately call for a doctor.

![Avoid any contact with surfaces labeled with this symbol, because they may reach high temperatures and lead to risk of burns.](image)

![Avoid also the contact with the piping colored in red (steam piping) because they reach high temperatures and could cause burns.](image)
2.2 Checks

- The operator shall check that the machine is gasproof, every day, by means of a special device (a suitable leak finder).
- Before startup make sure that the machine, all safety devices and protections have been assembled properly.
- After first operation of the machine, proper function has to be checked every day, since absence of water, air and electricity might cause trouble, even if the machine's other parameters are ok.
- **Annual inspection:**
  - The machine has to be inspected for safe condition by an authorized expert annually.
  - If national or local regulations about emission limits for the machine are in force, such figures have to be complied with. Inspection has to be performed once a year.

**We recommend to conclude a service agreement with your local service center.**

2.3 Obligation of the owner company

- The owner company shall draw up operating instructions of the equipment in conformity with the EEC Rule 89/655 and make them observed by all personnel.
  (for example: protection gloves, mask, ecc.)
- **The present operating instructions has to be supplemented by instructions reflecting in-force national regulations about prevention of accidents and protection of the environment !**
- The owner of the machine has to nominate personnel for running and servicing the machine; such personnel has to receive instruction lessons by a service engineer during first operation of the system. During this job, the personnel has to be made familiar with recommendations about safety at work and possible hazards involved. Such instruction courses to be repeated annually.
- The owner shall make sure that no unauthorized people approach the machine.
- Responsibilities for operation and service clearly and definitely have to be stipulated by the owner and complied with by all personnel, in order to avoid trouble with competencies.
- The solvent has to be tested regularly to its pH-value and the condition of the stabilisator. Please contact your solvent supplier in order to get informed about how to test the solvent and what you need for testing the solvent (for example a test-set).
- The possible exhaust air of the active carbon unit has to be vented without polluting the workroom, e.g. to the outside
- The owner company shall keep the machine working place clean and tidy, following the instructions and effecting all checks.

2.4 First Aid

- Do not administer liquids or induce vomitino if subject is unconscious.
- Inhalation:
  - Provide adequate ventilation.
  - Move the subject away from contaminated area as quickly as possible, into quiet, cool and well-ventilated area.
  - If necessari, carry out heart-lung resuscitation or administer oxygen.
  - In case of indisposition, consult a doctor.
- Skin contact:
  - Remove shoes, socks and contaminated garments and wash the affected skin with soap and water.
- Eye contact:
  - Wash eyes with running water for 10 minutes, keeping eyelids well open.
  - In case of contact lenses, remove after 1-2 minutes.
  - In case of symptoms, consult a doctor.
- Ingestion:
  - Do not induce vomiting.
  - CALL A DOCTOR IN ALL CASES.

2.5 Chemical characteristics

Perchloroethylene (C₂Cl₄) belongs to the group of chlorinated hydrocarbons. The colorless fluid dissolves in water to a minor extent only. Its characteristic smell is detected at a minimum concentration of 5 ppm of air (threshold). Since the human nose rapidly adapts its threshold level to the actual situation, this threshold limit increases within a few minutes (up to 50 ppm).

2.5.1 Max. concentration at the place of work

- Threshold value / mean value (time), (TLV-TWA): 25 ppm.
- Threshold value / momentary value (TLV-STEL): 100 ppm.

2.6 Dangers for health

- Breathing high concentrations will be caustic for eyes and respiratory apparatus:
  - anesthetic
  - may cause headache, vertigo and disorder of the central nervous system.
- Breathing vapors will decrease tolerance of alcohol (road traffic).
- Effects on the central nervous system, similar to narcotics, can cause unconsciousness, high concentrations may be lethal.
- Persons having been exposed to PERC permanently, may suffer from diseases of liver and kidneys.
2.7 Personal protective equipment

- Ventilation: Keep solvent concentration in the air under the exposure limit values indicated in 2.5.1. To respect this provision a ventilation system with an adequate room exchange rate could be necessary.
- Respiratory protection: At concentrations higher than the exposure limit values, use adequate respiratory protection (gas mask with organic vapour filter according to EN141).
- Hand protection: Use gloves made from neoprene, nitril or butyl rubber or other impermeable material.
- Eye protection: In case of maintenances and solvent handling, use safety goggles and face shield.
- Skin protection: Use working garments.

2.8 Important precautions

- Take precautions against static charge.
  - Solvent accepts static charge; discharge may cause spontaneous decomposition.
- Take standard precautions as usual when handling chemicals.
- Keep solvent containers closed, apply durable markings, store in places so designated, protect against sun heat.
- Do not drop below drying time required for the merchandise cleaned; parts should contain as little as possible of residual solvent.
- Inspect machine for leaks daily, in particular the air filter, the lint filter, gauge glasses, distilling device, loading door, cleaning door and fan housing.
- Repair leaks without delay or report to in-house service department.
- Do not clean the still unless solvent is cold (temperature less than 40°C / 104°F); we propose to do this job early in the morning before the machine is turned on.
- Keep ventilating systems clean and serviceable all the time.

2.9 Behaviour in case of failure

Should a large quantity of solvent be discharged or solvent vapours be emitted:

- Interrupt energy supply.
- Provide for adequate ventilation.
- Avoid eye- and skin contact.
- Solvent must not get into the sewer, surface- and ground-water or soil.
- Collect with absorbent (sand, soil, diatomite, universal absorbent, saw dust, oil absorbent) and dispose of.
- Inform the service department in charge.

2.9.1 Interruption of a cleaning cycle

The loading door is interlocked with a guard locking device that prevents from accidentally opening while the machine is operating. An additional interlocking device prevents the operation of the machine if the loading door is open or incorrectly closed.

If the drying and deodorization phases have not been completed properly due to a faulty condition (e.g. service failure, overload of work, pump failure, etc), please operate as follows to open the loading door with a tool and to remove the work from the cage:

- Disconnect power from the machine by turning the main switch off.
- Provide for adequate ventilation of the work room.
- Wear protective gloves and mask.
- Put a M5 screw into the guard locking device as shown in (fig. 2 - pos. A).
- Use a screwdriver to lever up the locking device as shown in (fig. 2 - pos. B).
- Once unlocked the locking device, open the loading door by the handle.
- Remove garments from cage and put into a seal container.
- Eliminate the cause of the failure and put the machine back into operation.
- Remember to remove the M5 screw from the guard locking device before starting a new cleaning cycle.
2.10 Waste disposal

Solvent-laden waste, contact water, distilling residues and filters have to be collected in special containers so designated. Seal such containers and dispose of as hazardous waste IAW local regulations.

Never mix with household litter!

2.11 Restrictions on employment

- Youngsters under 16 may work with perchloroethylene under strict supervision only and as far as inevitable under the scope of their professional education.
- Pregnant and breast-feeding women may work with perchloroethylene only, if the trigger level is not exceeded.
3. Installation place requirements

3.1 Prescriptions

The dry cleaning machine shall be installed only in closed and dry places. All existing accident preventing rules and the EEC rule 89/655 concerning the improvement of safety and operators' health while working shall be observed.

- If a ventilation system should be necessary, the machine shall be connected to the ventilation system and shall be started up only when ventilated.
- The ventilation should ensure:
  - that air is changed at a rate - measured in m³/h - 60 times as much as the nominal load of the machine in kg or
  - have to ensure an exchange of the room air at least 5 times an hour.
- Within an area of 5 m around the dry cleaning machine where solvents are used no hot objects shall be stored, or direct flames, either, on which solvents may be decomposed.
- The floor of the installation place shall not be of an absorbent material and shall be solvent-proof.
- Install the machine only, if the noise level in a distance of 1 m is lower than 85 dB(A).

Inform your co-workers on this prohibition at regular intervals.

3.2 Installation place

Room temperature
To ensure optimal working of the machine, the room temperature shall be 18-35°C.

3.3 Base

As a base, an industrial flat floor is enough. The installation place shall be protected against shocks and vibrations. Make sure that the installation place meets the maximum load requirements on the floor. The static and dynamic maximum load of the cleaning cycle with the selected distillation module, is calculated with the solvent tank bearing surface. Take into account the vibrations generated by tumble-drying. If necessary, disconnect the machine from the bottom. This is necessary when installing on an upper floor.

Before installing the machine always call for a civil consulting engineer.

3.4 Fixing

For safety reasons the entire machine also requires a solvent tank as a base. The solvent tanks are anchored to the floor by means of through screws, reinforced with anchor bolts, heavy-duty pins or with expansion stay rods - M 12/M16. In order to secure the machine on the solvent tank it is necessary to use fastening elements with a minimum tensile strength of 1500N.
4. Transport and packing instructions

4.1 Warnings on delivery

The machine is usually delivered on pallets or wooden plugs and packed in wooden cases or cages wrapped in a polyethylene film.

- Immediately unpack the machine in front of the carrier and make sure that it is not damaged because of transportation. Confirm any damage on the waybill.
- Immediately fill the list of the damage caused by transportation and send it enclosed with the original waybill, or write down the damage in the bill of lading.
- Do not receipt the consignments not checked yet.
- Should the consignment be not immediately unpacked because of several reasons, receipt it with the following reservation: "the consignment has not been checked yet, the receipt is released with reservation"!
- Do not throw away the pack of the parts damaged during transport!

4.2 Transport

Loading and unloading of the machine should be carried out by a fork truck. If another lifting equipment is intended to be used, on the upper part of the machine suitable supports are available. In some machine configurations it could be necessary to add a cable attachment to balance the weight. This different type of handling has to be indicated when ordering the machine, so that the required attachments can be predisposed.

While unloading and handling make sure that:

- the lifting equipment is strong enough and possible ropes are rugged enough to be hooked to suitable devices.
- the fork truck is hooked to the front side of the machine only, lifting it few centimeters and move it carefully to the installation place.

4.2.1 Domestic transport with trailer-truck

The machine is fastened to a wooden pallet, chosen adequately by dimensions and weight of the machine. The pallet is attached to the corner of the solvent basin of the machine, by 4 through bolts. It is wrapped with polyethylene foil and the foil secured with pressure sensitive adhesive tape (Fig. 3). While handling, the machine has to be ensured against displacement and turning over.

Fig. 3 Packing with pallet + nylon

Never make the machine slide on the floor, it may turn upside down.
4.2.2 International transport with trailer-truck or container

The machine is fastened to a wooden pallet, chosen adequately by dimensions and weight of the machine. The pallet is attached to the corner of the solvent basin of the machine, by 4 through bolts. It is wrapped with polyethylene foil, the foil secured with pressure sensitive adhesive tape and placed in a closed wooden crate (Fig. 4).

While handling, the machine has to be ensured against displacement and turning over.

4.2.3 Carriage by sea

The machine is fastened to a wooden pallet, chosen adequately by dimensions and weight of the machine. The pallet is attached to the corner of the solvent basin of the machine, by 4 through bolts. It is wrapped with polyethylene foil, the foil secured with pressure sensitive adhesive tape, placed in a closed wooden crate tarred where lifting points are indicated (taken under the bed by steel cables or by lifting with nets), and all warnings to follow for the protection of the product (storing in the hold or not…) (Fig. 5).

While handling, the machine has to be ensured against displacement and turning over.

4.3 Hauling with forklift

4.3.1 Characteristics of the forklift

The capacity of the forklift has to be chosen adequately to the dimensions and weight of the machine and the fork length shall not be less than 2000 mm (Fig. 6).

Fig. 4 Packing with pallet + nylon + open wooden crate

Fig. 5 Packing with pallet + nylon + closed wooden crate

Fig. 6 Specifications of the forklift
4.3.2 Procedure to unfasten the transport pallet

1) Solvent tray of the machine
2) Spacer
3) Fork
4) Pallet
5) Floor
6) Slit

Fig. 7 Lift machine at its front end

1. Remove the throughbolts from the pallet.
2. Lift machine at its front end by putting the fork of the forklift under the upper border of the solvent tray as shown in (Fig. 7 - Pos. A) or by putting the fork into the front slits of the solvent tray as shown in (Fig. 7 - Pos. B) and insert spacers at the extremities of the machine.
3. Repeat the operations at the rear end of the machine.
4. Now the machine is positioned on four spacers and could be lifted with the forklift to remove the wooden pallet.

4.4 Positioning of the machine

After removing the transport pallet from the machine, it is possible to move the machine to the site of installation (Fig. 8).

To fix the machine to the floor, proceed as follows:
1. Put the machine on four spacers at the ends of the solvent tray (Fig. 9 – Pos. A).
2. Lift the machine at its front end as shown in (Fig. 9 – Pos. B) and remove the spacers.
3. Lower the front end of the machine carefully to the floor (Fig. 9 – Pos. C).
4. Repeat the operations at the rear end of the machine (Fig. 9 – Pos. D/E/F).

⚠ Lift and lower the fork of the forklift very carefully.

Fix now the machine to the floor, respecting the instructions in chapter 7.
4.5  Packing

Bolt machine to wooden pallet and wrap with polyethylene foil. Secure foil with pressure sensitive adhesive tape and pack machine in wooden crate.

- Make sure all packs display appropriate markings and symbols. As far as possible use standardized symbols (Fig. 10).

5. Standard accessories

- Operating instructions ILSA.
- Operating instruction “Computer”.
- Hydraulic, pneumatic and electric scheme.
6. Operations prior to setting at work

Do not try to open the loading door since it is locked until the machine is connected electrically and pneumatically.

Check that:
- the installation place is well ventilated with a suitable system.

Before service technicians carry out any procedures, the customer should perform the following operations:

- Machine installation, alignment and fixation.
- Carry out connection to the compressed air.
- Carry out connection to cooling water inlet.
- Carry out connection at the water outlet.
- Carry out connection at the steam inlet, if required.
- Carry out connection at the condensate outlet, if required.
- Electrical connection.

6.1 Compressed air connection

The connection of the compressed air maintenance unit (Fig. 11 - Pos 36) takes place at the points indicated on the drawing (Fig. 11 - Pos. 21). The machine requires an external compressed air connection of min. 6 bar of prefiltered air and without traces of water for the control of the pneumatic valves.

Maximum working pressure allowed: 6 bar.

The compressed air system should supply an air capacity of minimum 50 l/min.

6.2 Cooling water connection

The connection of cooling water to the waterworks supply is carried out in the points shown on the machine by the following blu label:

A non-return valve in the cooling water pipe is mandatory. Water pressure available at the machine should be constant 2.5 bar.

The maximum pressure allowed is 5 bar.

Cooling power of the machine depends on water inlet temperature; we hence recommend not to exceed a temperature of 25°C.

If supply and drain lines are routed over long distances, pressure drop in the pipe cannot be neglected. When defining pipe diameters, always go by the "plus 1 increment rule", which means the pipe is one increment bigger than the fitting.

Example:
water inlet fitting on machine: 1/2"
pipe diameter: 3/4"

The outlet of cooling water is carried out in the points shown on the machine by the following blu label:

Cooling water return is warm, but does not show impurities. The cooling water may be used over again within limits or discharged to the sewer system according to the existing rules!
6.3 Electrical connection

The machine is supplied ready to be set at work. Connection is carried out according to the connection diagram.

- Check that the local rated voltage, the frequency and the protection device correspond to the data on the machine serial plate and the technical data. The machine should not be connected if there are any deviations.

![Electrical connection must be performed by an authorized electrician.]

- Connection is carried out according to the connection diagram.

![The supply of current to the machine must be carried out by means of a main switch installed on the exterior (not provided).]

- When the machine is equipped with a frequency inverter, the main power supply to the machine has to be protected by an **Universal current sensitive FI-protective switch**, as indicated by the manufacturer of the frequency inverter.

  - The tripping current should be 300 mA or more, in order to avoid a premature triggering of the inverter by discharge currents.

  - **Strictly observe this connection instructions of the manufacturer !**

- The supply of current is carried out in the rear by the insertion of cables in the control panel and connection to terminals L1, L2, L3, N e PE according to the terminal wiring diagram.

- Connect a normally opened contact of the work room ventilation to the proper terminals in the electrical panel of the machine, to interlock the machine with the work room ventilation.

- Protect the machine from accidental connection (disconnecting the main switch and locking it with the suitable device, e.g., a padlock).

![A service technician must be present to set the machine at work the first time.]

- By operating the main switch the machine’s electrical system is connected to the power mains.

6.4 Steam connection

In the absence of electric heating, steam connection takes place in the points shown on the machine by the following blu label:

![STEAM INLET]

- The steam pipe must be fastened to the upper part of the central steam pipe with a 180° curve, so that the condensate from the central steam pipe does not enter the machine.

- The steam pressure should be approximately 4.5 bar in the machine. At a higher pressure it is necessary to connect a pressure reducing valve upstream.

  - The maximum working pressure allowed is 4.5 bar.

![The steam temperature should never exceed 149°C otherwise there is risk of decomposition of the solvent.]

- The connection of the condensate takes place in the points shown on the machine by the following blu label:

![CONDENSATE DISCHARGE]

- Make sure that there is enough room for the still cleaning door and room at the bottom for the collection container.

![Avoid the contact with the piping colored in red (steam piping) because they reach high temperatures and could cause burns.]

- Avoid any contact with the piping colored in red (steam piping) because they reach high temperatures and could cause burns.
6.5 Diagram of steam/condensate connection

- **Main steam pipes**
  - Have to be sized accordingly to the piping of the machine!
  - Lay the connection pipes above the machine (bear in mind the height of the machine).
  - The charges for machine connections are the responsibility of the customer.
  - Fit the pipes with a cock and filter.

- **Steam pipes**
  - Connect the steam pipes with 180° to the upper part of the main steam pipe.

- **Condensate pipes**
  - Connect the condensate pipes with 180° curves to the condensate manifold.

- **Discharging of the steam pipes**
  - The discharge points are necessary upstream of every change in an upwards direction, in the lowest points and at the pipe ends. The discharge pipes are connected to the adjacent condensate manifold.
6.6 Automatic greasing device for the rotating seals

A special greasing device is assembled on the hub of the drum. This device has to be activated at the first commissioning of the machine.

- Screw the blue plastic screw onto the greasing device.
- Use a screw driver to pull off the ring of the plastic screw by turning in clockwise direction.

The greasing device is activated after pulling off the ring. The duration of this device depends from the ambient temperature of the installation place. Substitute it at latest after 24 month. We suggest to substitute it after 18 month.

- Don’t remove the screw of the greasing device after its activation.
- Don’t remove the greasing device before it is empty.
- Don’t damage the greasing device after its use. It contains dangerous substances.
- Don’t burn the greasing device.

![Greasing device](image-url)
7. First setting at work

The machine should first be set at work only by an engineer of the service department.

It is then required to train the customer’s personnel adequately.

If the machine is first set at work by any other people than engineers, persons, things and environment may be damaged!

Safety recommendations

- Do not inhale vapours.
- While working, wear protective clothes, gloves and masks.

The machine should only be used by skilled personnel after reading the operating instructions, trained by an engineer and meeting all legal requirements.

7.1 Check prior to setting at work

Before filling the machine with solvent, the following checks should be performed in order to exclude the possibility of failures or damages.

- Check the soundness of: clamps, couplings, plugs, compressed air pipes. Replace them if necessary.
- Check that all doors are gasproof, and make sure they are sealed in the event of leaks.
- Check the presence of the lint filter basket and air filter.
- Make sure wires are properly connected in the control panel (only authorized electrician).
- Check the rotation of the rotating filter shaft (facing front, it should turn clockwise).
- Clean the filters located at the steam inlet in the heater and distiller.

7.2 Filling with solvent

Use correct solvent only!

The required quantity of solvent to put into the machine is indicated on the table “Technical data”.

- Place the solvent drum behind the machine.
- Open the solvent container.
- Insert the solvent suction pipe until it reaches the bottom.
- It is necessary to connect an air balance pipe between the solvent container and the machine.

Press the following buttons in this sequence:

1. Manual control connection
2. Delivery to tank 1
3. Solvent pump

- Open the valve VM2 of the solvent suction pipe until the container is empty. By keeping the container at a slant, it may be emptied out completely.
- Close the valve VM2.
- Seal the empty container tight and replace it with a full one.

Repeat this operation until the machine is filled with required quantity of solvent.

It is not necessary to pump the contents of the tank 1 in tank 2, since the solvent is distributed to all tanks by an internal passage.

- After filling all the tanks, close the valve VM2 and disconnect the manual control.
7.3 Filling spin filters

Press the following keys:

- Manual control connection
- Intake from tank 1
- Filtration through filter 1
- Delivery to tank 1
- Solvent pump

When the solvent enters the tank the spin filters are full. By disconnecting the manual control, the operation is concluded!

In subsequent regenerations, the spin filters are filled by the tank of the recovered solvent.
- Check that there is a sufficient amount of solvent in the tank, and add some if necessary.

Repeat the procedure for filter 2:

- Filtration through filter 2

7.4 Filling water tank with solvent

Press the following keys:

- Manual control connection
- Intake from tank 2
- Solvent pump

- Open the solvent filling valve of the water tank VM6.
- Fill water tank with solvent, until solvent gets to the solvent tanks.
- Close the solvent filling valve of the water tank VM6.

Disconnect manual control.

Check that solvent level in the water tank is always at the level mark on the sight glass. Otherwise there is risk that water will enter the solvent tanks.
7.5 Filling still boiler

Only in electric versions!

The still with in-built electric boiler offers the possibility of having a steam still even when there is no central boiler available.

The boiler should be filled with water when installing the machine.

Fig. 14 Still with electric boiler

1) Electric resistance
2) Exhaust valve VM17
3) Filling valve VM15
4) Valve to discharge boiler VM18
5) Leveling valve VM16
6) Pressure gauge
7) Pressure switch
8) Exhaust
9) Safety valve

• Open the manual valves VM15, VM16 and VM17. Wait until water flows out from valve VM16.
• Close the manual valve VM15 and VM16.
• Turn on the boiler and wait until the pressure gauge reads 4.5 bar.
• Close the manual valve VM17. This valve lets out all air contained in the boiler and piping during the filling process.
• The boiler is now ready for operation. The pressure switch is set at 5 bar and turns the electric heater on and off with varying pressure ($\Delta p = 0.7$ bar).
• The thermostat is set at 180°C (when the electric heater is exposed due to lowering water level) and indicates a warning message on the machine computer in the event of water shortage. This should always be done after the boiler has cooled down.

7.6 Filling drying boiler

Only in electric versions!

The electric drying boiler offers the possibility of having an additional steam heater even when there is no central boiler available, so that no electric heater is required.

The boiler should be filled with water when installing the machine.

Fig. 15 Drying boiler

1) Electric resistance
2) Pressure gauge
3) Pressure switch
4) Filling valve VM19
5) Exhaust valve VM21
6) Valve to discharge boiler VM22
7) Safety valve
8) Water level valve VM20

• Open the manual valves VM19, VM20 and VM21. Wait until water flows out from valve VM20.
• Close the manual valve VM19 and VM20.
• Turn on the boiler and wait until the pressure gauge reads 4.5 bar.
• Close the manual valve VM21. This valve lets out all air contained in the boiler and piping during the filling process.
• The boiler is now ready for operation. The pressure switch is set at 5 bar and turns the electric heater on and off with varying pressure ($\Delta p = 0.7$ bar).
• The thermostat is set at 180°C (when the electric heater is exposed due to lowering water level) and indicates a warning message on the machine computer in the event of water shortage. This should always be done after the boiler has cooled down.
7.7 Filling still/drying boiler

The in-built electric boiler offers the possibility of having a steam still and steam heater even when there is no central boiler available.

The boiler should be filled with water when installing the machine.

- Check that valve VM17 is open.
- Open the manual valves VM15, VM16. Wait until water flows out from valve VM16.
- Close the manual valve VM15 and VM16.
- Turn on the boiler and wait until the pressure gauge reads 4.5 bar.
- The manual valve VM17 have to stay open. This valve lets out all air contained in the boiler and piping during the filling process and always when program n. 10 is operated.
- The boiler is now ready for operation. The pressure switch is set at 5 bar and turns the electric heater on and off with varying pressure ($\Delta p = 0.7$ bar).

- The thermostat is set at 180°C (when the electric heater is exposed due to lowering water level) and indicates a warning message on the machine computer in the event of water shortage. This should always be done after the boiler has cooled down.

7.8 Heating with an external steam generator

Only in steam versions!

When the machine is supplied by an external steam generator, it is necessary to use anti-corrosive-products in the water supply of the external steam generator.

7.9 Heating with steam/electric circuit.

Version equipped with still boiler and connection to steam circuit generated outside.

Always restore the water level in the still boiler (chapter “Filling still boiler”), before changing from operation by steam generated outside to operation with electric boiler of the machine.

7.10 Parameter-check of the refrigeration system

To control the proper operation of the refrigeration system, the working pressures of the high pressure gauge and the low pressure gauge during drying phase and reduction phase have to be checked.

The proper pressure scale (Fig. 17) is the black one in the centre. The other scales show temperatures corresponding to the indicated pressure, for various types of gases.
7.10.1 Drying phase

The high pressure gauge of the refrigeration system (Fig. 17 - Pos. 1) shows, during the normal drying conditions, a working pressure of about 22 - 23 bar. This value is reached a few minutes after the beginning of the drying phase.

The low pressure gauge (Fig. 17 - Pos. 2) during the normal drying conditions, shows a working pressure of about:

- 4-5 bar for R22
- 5-6 bar for R404A

7.10.2 Cool down phase

The pressure of the high pressure gauge of the refrigeration system (Fig. 17 - Pos. 1) during normal cool down conditions don't changes and shows a working pressure of about 22 - 23 bar.

The pressure of the low pressure gauge of the refrigeration system during cool down phase decreases slowly. The low pressure gauge at the end of the cool down phase shows a working pressure of about:

- 2-3 bar for R22
- 3-4 bar for R404A

7.10.3 Adjustment of the pressostatic valve for refrigeration system

If the working pressures don't correspond to the values indicated before, it is necessary to adjust the pressostatic valve of the refrigeration system (Fig. 18 - Pos. 1).

Screwing the adjusting knob (Fig. 18 - Pos. 1) of the pressostatic valve, a pointer moves on the graduated scale. Moving from 1 to 5 increases the pressure of the refrigeration system and the water quantity decreases. Moving from 5 to 1 decreases the pressure of the refrigeration system and the water quantity increases.

The indication on the pressure gauge is not immediately. You have to wait approximately 1 minute to achieve a balanced pressure and to be able to read the correct value.

7.10.4 Cool down phase with bypass of the pressostatic valve (optional)

Excluded plants of small dimensions or particular machines, the cool down phase takes place with bypass of the pressostatic valve.

During cool down phase, in normal operation conditions, the pressure of the high pressure gauge (Fig. 17 - Pos. 1) decreases slowly. The high pressure gauge at the end of the cool down phase shows a working pressure of approx. 15 bar.

The pressure of the low pressure gauge (Fig. 17 - Pos. 2) also decreases slowly and shows at the end of the cool down phase a working pressure of about 1,5 - 2 bar.

7.10.5 Adjustment of the bypass valve

If the working pressures don't correspond to the values indicated before, it is necessary to adjust them through the bypass valve VM23 (Fig. 19 - Pos. 3).

Slightly open or close the bypass valve, to achieve at the end of the cool down phase a high pressure of 15 bar. Consequently the pressure indicated on the low pressure gauge is about 1,5 - 2 bar.

A non proper adjustment of the bypass valve causes a wrong operation of the refrigeration system. And if the refrigeration system don't works correctly it causes a bad operation of the machine and damages to the refrigeration system could not be excluded.
8. Operation

The machine has been designed for cleaning garments and/or fabrics. The only solvent agent allowed is stabilized Perchloroethylene at 99.9 %.

8.1 Cycles

Cleaning cycles are all factory-programmed and stored in user-programmable computer. They all can be modified according to the specific need of the customer. Once the cleaning machine has been loaded with garments it can be started in manual or automatic mode as programmed. When the program has started (also in manual mode), the loading door of the machine and all service doors will be automatically locked. They will be unlocked only after the reduction phase.

The operating cycles basically consists of the following phases:

1) Loading of the garments
2) Choice of the cleaning program
3) Cleaning
   - Precleaning
   - Main cleaning
4) Extraction
5) Drying
   - Main drying
   - Cool down
6) Adsorption
   (with multisolver)
   (without multisolver)
7) Unloading the garments
8) Solvent care
   - Filtration
   - Distillation
   - Separation

8.1.1 Loading of the garments

Open the loading door and fill in the garments respecting the maximum load indicated in the technical data of the machine. Close the loading door.

8.1.2 Choice of the cleaning program

The cleaning programs has to be chosen according to the machine type and to the type of garments to be cleaned.

For example:

Machines with two solvent tanks
- 1-bath from tank 1 “dark”.
- 2-bath from tank 1 + 2 “dark”.
- 1-bath from tank 2 “light”.

Gentle cycles.

Machines with three solvent tanks
- 1-bath from tank 1 “dark”.
- 2-bath from tank 1 + 3 “dark”.
- 1-bath from tank 2 “light”.
- 2-bath from tank 2 + 3 “light”.

Gentle cycles.

8.1.3 Cleaning

8.1.3.1 Precleaning

For very soiled garments a precleaning is carried out. Solvent is aspired from tank (usually from tank 1) and pumped to the drum to perform a first cleaning, where soluble substances (grease, oil, etc.) and, with possible addition of chemical products, insoluble substances (salts, perspiration and urine, sugar and starch, etc.) are removed. At the end of this phase the solvent could be discharged to the still or to the tank.

8.1.3.2 Main cleaning

Usually solvent is aspired from the clean tank (tank with the distilled solvent). In this phase solvent circles from the drum through the filters back to the drum, by means of the solvent pump. In this way the solid part of the soil is transported by the solvent (particles, fluff of the garments, etc) and filtered through the various filters that are present along the circuit. At the end of the cleaning the solvent could be discharged to tank 1 or perhaps also to the still.

8.1.4 Extraction

The extraction is done to extract the solvent retained in the garments after cleaning. This is achieved by exploiting the centrifugal forces from the accelerated drum revolutions. The centrifugal forces pushes the garments against the perforated drum part. The solvent unlike to the garments passes through the perforation, falls into the drum housing, and from there aspired from the solvent pump could be pumped to tank 1 or perhaps also to the still.

8.1.5 Drying

After the cleaning phase the garments have to be dried and could be treated by addition of chemical products through the spray pump.
8.1.5.1 Main drying
By means of a special fan, air is made to circulate through proper heaters and conveyed to the garments inside the drum (Fig. 20). Here the air yields part of its heat and the solvent evaporates from the garments. The air now saturated with solvent then passes through a "cooler" where the solvent may condense by separating. Before the cooler there is a filter that serves to remove lint and other impurities in the circulating air. The condensed solvent in the cooler can be then recovered in the separator. After passing through the cooler and being released of solvent, the air is again conveyed to the heaters where the cycle described above is started again. These heating and cooling cycles of air are repeated until the load is completely dry.

8.1.5.2 Cool down
With high temperatures there is a greater saturation of solvent. For this reason the air is heated during the drying stage in order to be able to condense, then recuperate a great amount of solvent. During the drying cycle there is a progressive decrease in the concentration of the solvent inside the drum while the garments are being dried. With reduced concentrations of solvent it is no longer possible to extract solvent further by continuing to heat the air, but rather it is necessary to subcool it. This “subcooling” (Fig. 21) is carried out during the cool-down stage. During this stage the heaters are not in operation or cut out from the circuit of air circulating through the drum, and the air is completely conveyed to the cooler where low temperatures are achieved.
8.1.6 Adsorption

8.1.6.1 With multisolver
An adsorption stage (Fig. 22) is carried out after the cool-down stage and before the loading door is released. This is done so the residual solvent concentration inside the drum goes below the minimum values established in the laws prevailing in many European countries.

![Fig. 22 Adsorption with multisolver](image)

1) Active carbon
2) Heat exchanger
3) Fan
4) Drum
5) Air filter

By means of suitable valves air is conveyed through the drum, to the active-carbon-unit, and then back to the drum. This closed circulation carries on until solvent concentration goes below prescribed limit values. Then, the loading door is released. After a certain number of adsorption cycles the active carbons have to be regenerated.

8.1.6.2 Without multisolver
If the machine is not equipped with multisolver, then a carbon funnel is mounted (Fig. 23).

![Fig. 23 Adsorption with carbon funnel](image)

1) Active carbon
2) Drum
3) Fan
4) Air filter

With this type of filter the adsorption stage is not carried out in closed circuit as for the multisolver, but the air aspirated from the drum is blown through the carbon filter to the outside.
8.1.7 Unloading the garments
After the adsorption stage the loading door is released and could be opened.

8.1.8 Solvent care
During a cleaning phase the solvent removes from the garments dirt, that itself also has to be removed from the solvent to guarantee optimal cleaning results during time.

8.1.8.1 Filtration
Along the solvent circuit there are filters with specific characteristics that holds back the transported not dissolved soil.

Button trap
Placed straightaway at the outlet of the drum before the solvent pump. Usually composed of a metallic net with wide-mesh. Is used to hold back objects as: buttons, coins, needles, etc.

Spin filter
The spin filter disks are composed of a special fine-mesh fabric that can trap impurities up to 28 μm. The solvent crosses the filter disks, the dirt is trapped by the special fabric and the solvent so cleaned leaves then the filter.

Cartridge filter
The post cartridge filter is additional to the spin filters. It uses one or more filtering cartridges generally with active-carbon and in this case it also decolours the solvent.

8.1.8.2 Distillation
It is used to remove the soluble substances (grease, oil, etc.) (Fig. 24). The solvent is heated up to the evaporation temperature of 121 °C. By evaporating the solvent leaves the distillation sludge on the bottom of the still. The solvent vapours are conveyed through the riser pipe to the distillation condenser, where the vapours are condensed through a cooled coil.

8.1.8.3 Separation
The separator is used to remove water. The solvent condensed in the still condenser during distillation and in the air channel during drying and cool down is recovered in the separator. In the condensate there is not only solvent but also water that generally is used in the cleaning aids and in any case present through the natural humidity of the ambient.
Since the solvent is heavier and has a poor solubility, in the separator it divides from the water. The solvent rises to the bottom, while the water goes to the top. By means of suitable valves and circuits it is possible to discharge the water into a storage container and recover the solvent in the tanks.
9. Description and maintenance

9.1 General maintenance instructions

Safety recommendations:

- The use of solvent may irreversibly damage the health.
- Do not inhale vapours.
- While working, wear protective clothes, gloves and masks.
- Before carrying out any maintenance and/or repair, it is required to disconnect power from the machine, by turning the main switch off and locking it (with a padlock, for instance) to avoid any accidental starting.

The checks herein indicated concerns the whole dry cleaning machine series using perchloroethylene. The necessity whether to carry out or not the single checks depends from the specific machine configuration. The intervals are purely as an indication and could differ in relation to the ambient and working conditions of the machine.

9.1.1 Waste disposal
Take into account the environment tolerance, the health risks, the waste disposal directions and law requirements.
- Follow the solvent manufacturer’s directions!
- Dispose of the solvent, the remaining lint and air filter residuals, as well as the distillation mud and the separator waste water, in conformity with the existing rules!

9.1.2 Checks and maintenances to be performed when necessary
- Clean the filter at the inlet of the cooling water.
- Clean the filter at the steam inlet.
- Top-up electric boilers with water.
- Regenerating spin filters.
- Multisolver regeneration.
- Substitute activ carbon in carbon funnel.
- Storage container replacement.

9.1.3 Daily checks and maintenances
- Check and clean the air filter several times a day.
- Check and clean the button trap basket several times a day.
- Check and clean the cyclone separator several times a day.
- Remove the distillation sludge.
- Remove condensate from the compressed air treatment unit.
- Discharge of waste water from the water tank.
- Clean the gaskets of the loading door and maintenance doors with a wet cloth.

If the gaskets are deformed or damaged and the tightness is no longer guaranteed, please substitute them immediately. This concerns especially the thermal stressed gaskets as for example the still door gasket.
- Control the filling level of the commercial containers.
- Check the machine to verify the presence of gas leaks.

9.1.4 Weekly maintenances
- Cleaning the water separator.
- Cleaning additional safety air filter.
- Clean pre-filter of the solvent pump.
- Verify consumptions
  Modified machine settings, not proper use of the machine or malfunctions could lead to high energy consumptions, therefore verify periodically:
  - water consumption
  - power consumption
  - solvent consumption
  - waste water
  - and distillation sludge.
- If considerable differences respect to those of the first setting at work should arise, please inform immediately the technical service authorized by ILSA.

9.1.5 Monthly maintenances
- Clean spray nozzle filter.
- Remove condensate from air compressor.

9.1.6 Half-yearly maintenances
- Empty completely the still boiler and drying boiler, in order to remove every possible lime residue and impurity.

9.1.7 Yearly maintenance and repair
- The dry cleaning machine should be yearly checked by an ILSA authorized engineer!

The operator/s of the machine should not carry out any maintenance or repair on their own! Should maintenance or repair be carried out by unskilled personnel, accidents may occur, health may be damaged, along with the environment and things!
- We suggest you to conclude a maintenance agreement with a technical service company authorized by ILSA.
9.2 Components description and specific maintenances

9.2.1 Solvent tanks
The tanks are a sturdy base for the machine. The bottom is tilted from the front of the machine to the rear. As the intake point is located in the rear and the pumping end in the front there is a continuous cleaning flow toward the intake end. There is thus a reduction in the concentration of impurities deposited in the tank. Large graduated-level flanges are located in the front of the machine. The flow of solvent entering the tank is conveyed toward these flanges, and in this way the window is cleaned well. Lighting of the tank is unnecessary, since the glass is also washed and the solvent level is completely visible inside the tank. These flanges also function as openings for cleaning or inspection of the tank. For filling up the tanks with solvent or to top-up the tanks, please refer to chapter “7.2 Filling with solvent”.

9.2.2 Drum, drum housing
With a filling ratio of 1:20, there is a drum volume of 20 litres for every kg of garments. Thanks to the correct ratio between the diameter and the depth of the drum, basic conditions are provided for a mechanical action of effective cleaning and short drying time. The optimal perforation of the drum ensures a delicate treatment of the load during extraction. Thanks to the perforated cleaning tabs the resistance of the drum is reduced during cleaning and the cleaning effect is heightened. The drum housing has a flat front wall, while the air injection duct for drying is located on the exterior. In this way no masses of lint may form in this area. The drum is supported in the drum housing by a shaft fitted in a proper hub with bearings.

9.2.3 Drum operation
The drum movement takes place through drive belts driven by a compact motor (cleaning and extraction motor). The central motor has a IP 54 protection rating.

9.2.4 Inverter
By request or for particular configurations an inverter could be present on the central motor. With the aid of the inverter, the cleaning and extraction speed may be regulated in continuous mode. Because of this regulation the most appropriate speed for the fabrics being cleaned can be selected. It is thus possible to obtain a more delicate treatment for the garments. The inverter also enables the regulation of the acceleration ramp by setting the time to reach maximum speed. There is consequently a balanced distribution of the garments in the drum by reducing the machine vibrations. The adjustment of the rotation speed of the drum is done by the computer, that is fitted on the front panel of the machine. To modify the factory-programmed standard parameters, please refer to the instruction manual for the machine computer. The frequency inverter is factory-programmed with the standard parameters and do not needs any further intervention from the operator.

When the machine is equipped with a frequency inverter, the main power supply to the machine has to be protected by an Universal current sensitive FI-protective switch, as indicated by the manufacturer of the frequency inverter. The tripping current should be 300 mA or more, in order to avoid a premature triggering of the inverter by discharge currents. Strictly observe this connection instructions of the manufacturer!

Contact an authorized skilled technician for every extra-ordinary maintenance on the frequency inverter!
9.2.5 Loading door

With a appropriate diameter the door allows quick loading and unloading of the drum. The door is equipped with a sealing mechanism that prevents the loading and maintenance doors from accidentally opening while the machine is operating. In addition, the door and the maintenance doors are fitted with a microswitch that prevents the machine from operating with door or maintenance covers open (accident prevention specification).

9.2.5.1 Maintenance procedure
Clean the gasket of the loading door and the edge of the loading door liner with a wet cloth.

9.2.6 Air duct (Air circulation)
The air duct is built in stainless alloy steel and allows for easy maintenance. Minimum flow resistance, precise conveyance, and an excellent design of the flow rate of circulated air are all factors that ensure complete and rapid drying. In the air duct are placed the components necessary for the drying process such as fan, heat exchangers, filters and valves.

9.2.7 Button trap/air filter
In the button trap the solvent leaving the drum is filtered in order to separate threads, metal objects, etc. The solvent passes through the button trap and is sucked in by the circulation pump. The polyurethane foam air filter prevents the air cooler from becoming obstructed with lint or dust.

Following are indicated the maintenance procedures of different types of air filters and button traps. Identify through the illustrations the one present in your machine.

9.2.7.1 Maintenance procedure
Clean the gasket and edges of the maintenance doors of the button trap and air filter with a wet cloth.

Do not open while the machine is operating!
Check and clean the air filter, safety air filter (if available) and button trap several times a day.

9.2.7.1.1 Air filter and button trap (mod. A)

Maintenance procedure, air filter
- Press the release door button.
- Open the maintenance door (Fig. 26 - Pos. 1).
- Remove the air filter (Fig. 26 - Pos. 2).
- Clean the air filter with an aspirator.
- When it is clean reinsert the air filter (do not reuse the filter if it is damaged)!
- Close the maintenance door (Fig. 26 - Pos. 1).

Maintenance procedure, button trap
- Press the release door button.
- Open the maintenance door (Fig. 27 - Pos. 1).
- Remove the button trap basket (Fig. 27 - Pos. 2).

When removing residuals from the basket, make sure that they do not fall into the button trap housing. Remove them immediately should this happen!

- Clean the button trap basket carefully with a brush or aspirator.
- Insert the clean button trap basket.
- Close the maintenance door (Fig. 27 - Pos. 1).
9.2.7.1.2 Air filter and button trap (mod. B)

Maintenance procedure,
- Press the release door button on computer.
- Open the maintenance door (Fig. 28 - Pos. 1).
- Remove the air filter (Fig. 28 - Pos. 2).
- Remove the button trap basket (Fig. 28 - Pos. 3)
- Clean the air filter with an aspirator.
- Clean the button trap carefully with a brush or aspirator.
- Insert the clean button trap basket.
- When it is clean reinsert the air filter (do not reuse the filter if it is damaged)!
- Close the maintenance door.

When removing residuals from the basket, make sure that they do not fall into the button trap housing. Remove them immediately should this happen!

Fig. 28 Button trap and air filter

9.2.7.1.3 Air filter and button trap (mod. C)

Maintenance procedure, air filter
- Press the release door button on computer.
- Open the maintenance door (Fig. 29 - Pos. 1).
- Remove the air filter (Fig. 29 - Pos. 2).
- Clean the air filter with an aspirator.
- When it is clean reinsert the air filter (do not reuse the filter if it is damaged)!
- Close the maintenance door (Fig. 29 - Pos. 1).

Maintenance procedure, button trap
- Press the release door button.
- Open the maintenance door (Fig. 30 - Pos. 1).
- Remove the button trap basket (Fig. 30 - Pos. 2).

When removing residuals from the basket, make sure that they do not fall into the button trap housing. Remove them immediately should this happen!

- Clean the button trap basket carefully with a brush or aspirator.
- Insert the clean button trap basket.
- Close the maintenance door (Fig. 30 - Pos. 1).

Fig. 29 Air filter

Fig. 30 Button trap
9.2.7.1.4 **Air filter and button trap (mod. D)**

**Maintenance procedure**
- Press the release door button.
- Open the maintenance door (Fig. 31 - Pos. 1).
- Remove the air filter (Fig. 31 - Pos. 2).
- Remove the safety air filter (Fig. 31 - Pos. 3).

![Fig. 31 Air filter, safety air filter and button trap](image1)

When removing residuals from the basket, make sure that they do not fall into the button trap housing. Remove them immediately should this happen!

- Remove the button trap basket (Fig. 31 - Pos. 4).
- Clean the air filter with an aspirator.
- Clean the button trap basket and the safety air filter carefully with a brush or aspirator.
- Insert the clean button trap basket.
- Insert the clean safety filter in filter housing.
- When it is clean reinsert the air filter (do not reuse the filter if it is damaged)!
- Close the maintenance door.

![Fig. 32 Additional safety air filter](image2)

- **Tighten knobs.**

9.2.8 **Drying control device**

The drying control device (Fig. 33) determines the drying time regardless of the type and quantity of garments.

The drying process is terminated automatically when garments optimum drying is achieved.

![Fig. 33 Drying control device](image3)

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**9.2.7.2 Additional safety air filter**

- Press the release door button.
- Unscrew the knobs (Fig. 32 - Pos. 4).
- Remove the safety air filter (Fig. 32 - Pos. 5)
- Clean the air filter with an aspirator.
- When it is clean reinsert the air filter *(do not reuse the filter if it is damaged)*!
9.2.9 **Self-cleaning button trap with basket**

By request or for particular configurations a self-cleaning button trap could be present. 

The selfcleaning button trap (Fig. 34/35), permits a continuous cleaning of the filtering surface and the simultaneous recovery of dirt and lint in a suitable removable basket, which is completely dried during the cycle, avoiding in this way the risk of solvent emission during maintenance.

The dirty solvent from the drum (Fig. 34 - Pos. 3 e Fig. 35 - Pos. 4) passes through the filtering surface of the button trap, where the dirt and lint is trapped. The filtering surface is cleaned by a brush (Fig. 34 - Pos. 5 e Fig. 35 - Pos. 2) which is controlled by an electric gearsmotor (Fig. 34) or a pneumatic mechanism.

The trapped dirt and lint removed by the brush is conveyed to the upper limit of the filtering surface: by injecting solvent through a spray nozzle (Fig. 34 - Pos. 2 e Fig. 35 - Pos. 5) the dirt is removed from the brush and recovered in the basket (Fig. 34 - Pos. 3 e Fig. 35 - Pos. 4).

During the backmovement, the brush is raised up in order to avoid that the dirt is pressed on the filtering surface.

During the drying phase, a hot air stream leads through the button trap, to ensure a complete drying of the button trap itself. The air is then conveyed to the refrigeration buffer where the solvent is recovered.

At the end of the drying phase, it is possible to remove the basket by opening the maintenance door without solvent emissions.

9.2.9.1 **Maintenance procedure**

Operate on the lever upon the filter cover and open it. 
Extract the air filter. Extract the basket (Fig. 34 - Pos. 3) clean by a brush. Once cleaned put it again in its seat, put again the air filter after cleaned it. (see par. 9.2.7.1.4 a pag. 32)and close again the maintenance cover.

9.2.9.2 **Maintenance procedure for mod. Industria.**

Unscrew the knobs which fasten the maintenance door (Fig. 35 - Pos. 6), lift the lid, remove the basket (Fig. 35 - Pos. 4) and clean with a brush or aspirator. When it is clean reinset in the proper housing and tighten the maintenance door.
9.2.10 Cyclone separator

By request or for particular configurations a cyclone separator could be present (Fig. 36).

The cyclone separator is a system which removes lint from the air stream. Dried lint is recovered in a special container away from the machine circuit to avoid emission of harmful vapours when the lint is removed.

In the intake side of the air channel the lint is aspirated through a pipe and conveyed to the cyclone that separates lint and dust from the air. The filtered air is put back in circulation and reused.

At the end of the drying phase, it is possible to empty the impurity container without (Fig. 36 - Pos. 2) solvent emissions.

Empty the impurity container once a day or when the lint reaches the upper sight glass.

9.2.10.1 Maintenance procedure

- Uncouple container (Fig. 36- Pos. 2).
- Empty container.
- Reassemble container.
9.2.11 Refrigeration system

The refrigeration system is a closed circuit, in which a gas (freon) circulates without any contact to the external ambient.

A compressor pumps the gas by increasing the pressure and conveys the gas to the condensation bank where it yields heat to the ambient by liquefying.

Afterwards the gas passes the water-cooled condensator where it completes the condensation and is transformed into liquid.

The water-cooled condensator operates also as tank for the freon.

As next step the expansion valve is crossed, with consequently evaporation inside the evaporation bank. In this way the pressure of the freon goes down and at the same time the external ambient is cooled.

Due to the closed circuit, the gas is aspired by the compressor and the cycles restarts from the beginning.

Fig. 37 Working principle of the refrigeration system

1) Evaporation bank
2) Condensation bank
3) Condenser and freon tank
4) Compressor
5) Expansion valve
6) Air flow to evaporation bank (warm air)
7) Air flow from evaporation bank (cold air)
8) Air flow to condensation bank (cold air)
9) Air flow from condensation bank (warm air)
10) Freon - liquid
11) Freon - gas
12) Air flow
13) Outlet water (warm water)
14) Inlet water (cold water)
15) Freon - gas
9. Description and maintenance

1) Evaporation bank
2) Condensation bank
3) Condenser
4) Compressor
5) Solenoid valves
6) Solvent inlet
7) Cooling coil
8) Solvent outlet
9) High pressure switch
10) High pressure gauge
11) Low pressure gauge
12) Low pressure switch
13) Water outlet
14) Water inlet
15) Filter
16) Sight glass
17) Aeroquip-fittings
18) Check valve
19) Option: Solvent cooling with cooling system
20) Heat exchanger
21) Pump down

Fig. 38 Cooling system components
9.2.12 Still

The still (Fig. 39) is built in stainless steel, is fitted at the bottom with a double chamber for the heating steam, is thermally insulated and equipped with a illuminated sight glass.

9.2.12.1 Maintenance procedure

- Remove the distillation mud in the morning before setting at work and collect it in the suitable container.
- After each regeneration of the filter clean the still the following morning.

The sludge must be treated in accordance with the rules in force.

9.2.12.1.1 Removal of distillation sludge

(still without bipot)

Fig. 40 Accessories for still without bipot

- The manual and automatic operation controls must be off.
- Sludge should only be removed when the still is not hot, temperature lower than 40°C (it is advisable to carry out this operation in the morning, after the end of the startup program).
- Wear protective gloves and mask.
- Place the dump tray (Fig. 40 - Pos. 2) underneath the still drain valve VM13 (Fig. 39 - Pos. 4).
- With a suitable tool remove the plug of the still drain valve VM13 (Fig. 39 - Pos. 5).
- Open the still drain valve VM13 (Fig. 39 - Pos. 4) and collect sludge in a container.
- Close the still drain valve and lock it with the plug VM13 (Fig. 39 - Pos. 4).
- Open the still door (Fig. 39 - Pos. 2) by unscrewing the lock nut (Fig. 39 - Pos. 3) using a suitable tool.
- Scrape off still bottom with the cleaning rod supplied (Fig. 40 - Pos. 1). Convey residuals into the dump tray.
- Clean the gasket and edges of the maintenance door with a wet cloth.
- Close the still door and tighten the lock nut fully with the tool.
- Fit the cover onto the dump tray.
9.2.12.1.2 Removal of distillation sludge (still with bipot)

The still cleaning device with pump allows the still to be emptied and the residuals to be sent to a suitable container at the same time, all in gasproof conditions and with no emissions.

⚠️ Before emptying, the heating of the still shall be disconnected.

Before starting the emptying process the dry cleaning machine should not be in operation neither in manual nor in automatic function.

Still with bipot pump and incorporated scraper
- Wear gloves and a protective mask.
- Open the manual valve VM14 (Fig. 41 - Pos. 2).
- Start the bipot pump (Fig. 41 - Pos. 5) by activating the key [X].
- Looking through the still window (Fig. 41 - Pos. 1), move the scraper (Fig. 41 - Pos. 3) so that the residuals are conveyed into the discharge valve (Fig. 41 - Pos. 4).
- The sludge pump (Fig. 41 - Pos. 5) pumps the residuals towards the sludge container.
- This process is prolonged until the switch is disconnected.
- Upon this disconnection, all the pneumatic valves are closed. This also happens when the dry cleaning machine is started.
- At the end of the process close the manual valve VM14 (Fig. 41 - Pos. 2).
- When the maximum filling level of the storage container is reached (Fig. 42 - Pos. 97), the overflow protection is activated (Fig. 42 - Pos. 96) so that the signal lamp is lit indicating maximum filling level to the operator.

Still with bipot pump and manual scraper
- Wear gloves and a protective mask.
- Open the manual valve VM14 (Fig. 41 - Pos. 2).
- Start the bipot pump by activating the key and wait until all the liquid sludge has been aspirated.
- Open the still door only when the still is not hot, temperature lower than 40°C (it is advisable to carry out this operation in the morning, after the end of the startup program).
- Open the still door by unscrewing the lock nut using a suitable tool.
- Scrape off still bottom with the cleaning rod supplied (Fig. 40 - Pos. 1). Convey residuals into the discharge valve (Fig. 41 - Pos. 4).
- Clean the gasket and edges of the maintenance door with a wet cloth.
- Close the still door and tighten the lock nut fully with the tool.
9.2.12.2 Storage container replacement

Replace the special cover of the container (Fig. 42 - Pos. 95) with a normal cover (empty barrel cover) and close the storage container.

The safety devices should not be bypassed or put out of operation!

After the newly provided storage container has been placed on the floor tank and all connections have been assembled or closed properly, a safety/gasproof check must be performed at the next emptying process!

The removal of the storage container with its tank must be carried out by a waste disposal company.

9.2.12.3 Distillation of tank contents

The proper and complete distillation of the tank contents guarantees a high quality of solvent in the tank.

Example:

- Manual control connection
- Delivery to tank 1
- Intake from tank 1
- Solvent pump
- after ca. 1 minute connect the delivery to the still
- If the content of the tank is almost completely pumped into the still, disconnect the button "delivery to tank 1"
- Press the button (off).

9.2.13 Still condenser

From the still, solvent vapour and water steam are conveyed to the still condenser through the riser pipe and condensed by the internal coil, then cooled down to working temperature.

Condensed liquid is conveyed to the water separator through the solvent drain pipe of the condenser. The condenser coil is water cooled and fed directly with no cooling water regulation if the machine is connected to a cooling tower. If water is supplied from the waterworks, water consumption is optimized thanks to a flow control valve (thermostatic valve).
9.2.14 Water separator

The separator is composed of a separation chamber and a water tank (Fig. 43). In this device the fluids condensed in the still condenser and in the air channel during drying are separated: solvent and water. Separation is possible as water and solvent have a poor reciprocal solubility. The effect of separation is based on the different density of the water (1 kg/dm$^3$) and the solvent (1,6 kg/dm$^3$). In the separator the solvent rises to the bottom, while the water goes to the top. To avoid water from entering the tanks, the solvent flows there by means of a siphon. The water forming in the separation chamber is conveyed to the water tank by an overflow pipe.

9.2.14.1 Maintenance procedure

Clean the gasket and edges of the maintenance doors with a wet cloth.

9.2.14.2 Discharge of waste water from the water tank

- After every cycle the waste water is discharged automatically from the water tank.
- In addition through the manual valve VM11 (Fig. 43 - Pos. 8) it is possible to discharge manually the waste water from the water tank.

9.2.14.3 Discharge of waste water from the water tank (CE model)

- Once a day drain waste water through the discharge valve VM11 (Fig. 44 - Pos. 8) from the water tank.
- Close immediately the discharge valve.
- If necessary, perform this operation several times a day.

1) Water separator
2) Water tank
3) Perchloroethylene
4) Water
5) Inlet from still condenser
6) Inlet from drying cooler
7) Outlet solvent VM8
8) Outlet solvent VM9
9) Waste water discharge VM10
10) Waste water discharge VM11
11) Filling water tank with solvent VM6

Fig. 44 Water separator with water tank

Check the waste water discharged from the water tank. In this way the quantity produced by the machine is verified and it is possible to avoid that too much solvent enters the purification system with machine malfunctions.

This waste water contains solvent and must be purified by means of a purification system or disposed of as special waste in compliance with the rules in force!

Check that solvent level in the water tank is always at the maximum level mark on the sight glass. Otherwise there is the risk that water will enter the tank.

Do not open the drain valve with the machine operating!
If solvent level is above the maximum level mark, this means that there is a limited amount of waste water in the water tank. **Do not discharge water yet.** The solvent settling at the bottom of the water tank is automatically conveyed to the solvent tank by means of siphon.

### 9.2.14.4 Cleaning the water separator

This maintenance procedure should be performed in the morning after the end of the startup program and after cleaning the still. To clean the water separator, it is necessary to pump the solvent into the still (after discharging the water).

*If cleaning is carried out too late a bad odour may result.*

#### 9.2.14.4.1 Discharge the water from the separator

- Open the valve VM10 (Fig. 44 - Pos. 9) and collect waste water in a container.
- Close the valve VM10 (Fig. 44 - Pos. 9) after that no more water flows out from the valve itself.
- Purify waste water with the suitable system or dispose of it in conformity with the rules in force.

#### 9.2.14.4.2 Discharge solvent from the separator

1. Press the button (on)
2. Press the button (on)
3. Press the button (on)

- Open the drain valve VM8 (Fig. 44 - Pos. 7)
- Empty the separator by checking the flow of solvent through the still sight glass.
- Close drain valve VM8 (Fig. 44 - Pos. 7).

Press the button “From Tank 2” for 10 seconds (in order to drain the residual solvent out of the pipes).

- Open the maintenance door of the water separator.
- Clean the separator with a wet cloth.
- Close the maintenance door.
- This operation terminates the maintenance procedure of the water separator and the machine is ready for operation.

### 9.2.15 Spin filter

During the cleaning process the dirt on garments is dissolved (traces of food, dust, etc.), then carried away by the solvent. Through the filtration of the solvent the dirt is removed from the cleaning bath. The spin filter disks (Fig. 45) are composed of a special fine-mesh fabric that can trap impurities.

![Diagram of spin filter](image)

The solvent crosses the filter disks, the dirt is trapped by the special fabric and the solvent so cleaned leaves the filter through the hollow shaft. The filtering pressure increases with the increase of dirt on the filter disks. The filter should be regenerated once a filtering pressure of 1.5 bar, indicated by the gauge located on the filter itself (Fig. 45 - Pos. 8), is reached.
9.2.15.1 Regenerating spin filters without powder

Regenerate the filter when the pressure is $\geq 1.5$ bar or at least after 20 cycles.

Do not open the spin filter. Cleaning is carried out automatically by a computerized program!

The contents of the spin filter is drained to the still, while rotating at the same time the filter disks and filling the filter with fresh solvent. Centrifugal action throws off the soil as the filter disks are washed off by the solvent. The regenerating procedure has strictly to be observed, to have the filter always in excellent conditions and to have less filter regenerations.

For this reason we recommend to use the proper program, saved in the machine computer, to regenerate the filter. Only in this way you could be sure that all requested operations are carried out correctly.

Two types of programs are available:

Separate program
- The machine should be in operation (main switch on, steam, cooling water, compressed air open).
- Select the program for regenerating spin filters on the computer and carry out the program.
- The regeneration program is now functioning automatically.

Combined program
(cleaning process with one bath including the filter regeneration):
- Load the machine with garments.
- Close the loading door.
- Select the program for a combined procedure and carry out the program.
- During the execution of the cleaning program also the filter is regenerated.

9.2.15.2 Regenerating spin filters with powder

- The machine should not be in operation and the drum should be empty.
- Open loading door.
- Place the required amount of filtering powder inside the drum, as indicated by the supplier of the filtering powder.
- Close the loading door.
- Turn on the machine.
- Select the program for regenerating spin filters on the computer and carry out the program.
- The regeneration program is now functioning automatically.

9.2.16 Post cartridge filter

By request or for particular configurations a post cartridge filter could be present (Fig. 46 - Pos. 22). The post cartridge filter is additional to the spin filters without powder. It uses one or more active-carbon filtering cartridges and decolours the solvent.

National regulations requiring or forbidding the use of these types of filters may exist, for example the 2.BImSchV in Germany!

It is installed at the outlet of the spin filter. It may be operated either manually or pneumatically according to the different models.

Saturation is indicated by the gauge located on the filter (Fig. 46 - Pos. 24) and takes place at a pressure of 1.5 - 1.8 bar. When the cartridge filters are saturated, the filtering cartridges has to be replaced.

Dispose of cartridges in accordance with the rules in force!

9.2.16.1 Changing cartridge filters

Change the post cartridge filter when the pressure is $\geq 1.5$ bar.

- The machine should be switched off.
- Discharge the solvent from the cartridge filters by opening the filter 1 discharge valve VM28 (if present) and the the filter 2 discharge valve VM54 (if present).
- Let the filter empty out for approx. 12 hours.
- Wear protective gloves and mask
- Open the filter cover with a tool.
- Remove the old cartridge and insert a new one.
- Close the filter cover with a tool.
- Close the discharge valves VM28 and VM54.
- Fill the filter with solvent as indicated in the chapter “First setting at work”.

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9.2.17 Still drying
By request or for particular configurations the still drying could be present (Fig. 47). This system ensures to extract the solvent contained inside the still at the end of distillation, before cool down.

![Diagram of Still drying](image)

1) Hot air from the air duct
2) Mixture of air/solvent vapours
3) Still condenser
4) Airflow, back to air duct
5) Distillation sludge
6) Mixture solvent condensate/air
7) Separator

To extract solvent, hot air is blown by the fan into the still. The air helps the evaporation of the residual solvent, that is conveyed through the riser pipe to the still condenser, where it condenses. The condensate is then recovered in the separator.
The cooled air instead is aspired by the fan, to repeat again the cycle.

9.2.18 Industrial Still drying
By request or for particular configurations the industrial still drying could be present (Fig. 48). This system allows to reduce the contents of solvent in the distillation sludge.

To reduce the solvent quantity in the distillation sludge, a mixture of air/solvent vapours are blown through the distillation sludge. By means of a turbine the mixture of air/solvent vapours are aspirated through an air/liquid separator at the solvent outlet of the distillation condenser.
The air from the distillator, passing by the still chimney and the condenser, leads back through an injection nozzle to the distillation sludge inside the still. By this aeration of the sludge, solvent is released and evaporated. The solvent vapours are condensed in the condenser and fed to the water separator.

![Diagram of Industrial still drying](image)

1) T-fitting
2) Pneumatic valve
3) Maintenance door
4) Turbine
5) Still condenser
6) Air/liquid separator
7) Separator
9.2.19 Still funnel

By request or for particular configurations a still funnel could be present. The still funnel (Fig. 49 - Pos. 2) permits antifoaming additives to be fed into the still.

9.2.19.1 Procedure

- Add the neutralizing additive after cleaning the still.
- Undo the still funnel plug (Fig. 49 - Pos. 1).
- Add the neutralizing additive into the funnel (see supplier's instruction for quantity).
- Refit and tighten the still funnel (Fig. 49 - Pos. 1).
- Open the manual valve VM53 (Fig. 49 - Pos. 3) for the still funnel and check - through the sight glass - that the additive flows into the still.

9.2.20 OE Distillation

By request or for particular configurations the OE distillation could be present. The difference to the normal distillation is an additional heat exchanger (Fig. 50 - Pos. 17) and a solvent pump (Fig. 50 - Pos. 19) for the circulation of the cold solvent.

Thanks to this special heat exchanger and the use of cold solvent to condensate the solvent vapours a large amount of water is saved as well as electric energy during the distillation process. When there is enough solvent in the dirty-solvent tank (Fig. 50 - Pos. 24), the solvent pump delivers automatically dirty-solvent through the heat exchanger to the still (Fig. 50 - Pos. 12).

In the heat exchanger the vapours of the distilled solvent are used to preheat the solvent that is delivered by the solvent pump to the distillation. The solvent vapours are condensed partially in the heat exchanger, then the liquid solvent goes to the still condenser (Fig. 50 - Pos. 18), where it is cooled down further more.
9.2.21 Back drum cleaning
By request or for particular configurations the back drum cleaning could be present. The solvent is aspirated through the pump from the clean tank and injected at a high pressure directly against the rays of the drum and indirectly against the back plate of the drum housing (Fig. 51). The big flow-rate of the solvent flush guarantees the cleaning of the whole rear wall of the drum thus preventing deposits of lint. In short times low solvent concentrations in the drum are reached and the drying effectiveness improved. The system activates automatically by selecting the proper computer function.

9.2.22 Pump prefilter
By request or for particular configurations the pump prefilter could be present. It is used to protect the solvent pump against foreign bodies as buttons, coins, needles and so on that has not been trapped by the button trap.

9.2.22.1 Maintenance procedure
- Unscrew the 4 knobs.
- Remove the filter and clean with a brush or aspirator.
- Reinsert the filter.
- Tighten the knobs.

9.2.23 Soap pump
By request or for particular configurations one or more pneumatic pumps to introduce additives could be present (Fig. 52). The cleaning additive is sucked from a tank by means of a pneumatic dosing pump, then conveyed directly into the suction pipe of the solvent circulation pump. The required dose for each piston stroke must be regulated on the piston dosing pump according to the scale indicated on the pump. In the programming of the “soap pump” function the number of piston strokes must be determined.

9.2.24 Soap funnel
By request or for particular configurations a soap funnel could be present (Fig. 53). It permits to introduce products to improve the quality of cleaning, where the introduction occurs by gravity and aspiration through the solvent pump.

9.2.24.1 Procedure
- Unscrew lid.
- Introduce product up to complete filling of the funnel.
- Tighten lid.
- Check product level at regular intervals.
9.2.25 Impregnation device

By request or for particular configurations the impregnation device (Fig. 54), that is used to treat cleaned garments, could be present. Through a spray pump the additive is sucked from the agent tank, mixed with solvent and pumped into the drum. The additive is sprayed on the garments with the spray nozzle fitted inside the drum. The product quantity could be set by the machine computer.

At the end of the impregnation phase the spray nozzle is flushed with solvent, that is also programmable through the machine computer.

9.2.25.1 Replace agent tank

- Check the filling level in the impregnation agent tank.
- Restore the doping fluid punctually, otherwise air is absorbed.
- Should air be sucked in, remove the air from the spraying pump with the knurled knob.
- Tighten the knurled knob.

9.2.25.2 Impregnation device spray nozzle

- The machine should not be in operation.
- Wear gloves and a protective mask.
- Open loading door.
- Unfasten the nozzle ring nut (Fig. 55 - Pos. 1).
- Remove the spray head (Fig. 55 - Pos. 2).
- Remove the filter with the two gaskets (Fig. 55 - Pos. 3).
- Clean the filter.
- Fit the spray head on again with an inclination of approximately 60° with respect to the vertical axis.
- Tighten the ring nut.

9.2.25.3 Filling spray pump

During the first setting at work of the machine or if air is aspired, it could be necessary to fill the spray pump for its regular operation:

- The machine should not be in operation.
- Remove piping from fitting (Fig. 56).
- Connect a provisional piece of piping to the fitting (Fig. 56) and insert into the agent tank.
- In manual mode activate the spray pump and wait until the soap is pumped back to the agent tank.
- Deactivate the spray pump.
- Now the air has been discharged from the spray pump and a regular operation is possible.
- Remove the provisional piece of piping from the fitting (Fig. 56) and reconnect the piping that was connected originally.
- Ensure a proper Tightening of the fitting (high pressure in the piping).
9.2.26 Compressed air treatment unit
Adjusts the pressure of the air to switch the valves that are present in the plant, dehumidifies the air and lubricates the valves (Fig. 57).

9.2.26.1 Maintenance procedure
Filter: Remove the condensate from the cup and clean the filter every day.
- Close the supply of compressed air to the machine.
- Turn the ring nut (Fig. 57 - Pos. 36a) on the condensate discharge valve.
- Collect the drainage in a container.
- Disassemble the filter cup (Fig. 57 - Pos. 36b).
- Clean the filter with a proper cloth.
- Reassemble the filter cup (Fig. 57 - Pos. 36b).

Lubricator: oil level maintenance
- Disassemble the lubricator cup (Fig. 57 - Pos. 36c).
- Add oil (with maximum viscosity of 3,5° Engler at 50°C - e.g. Energol HLP 22 (BP), Spinesso 22 (Esso), Mobil DTE 22 (Mobil), Tellus 22 (Shell), ecc.) to the maximum level shown on the indicator outside (Fig. 57 - Pos. 36d).
- Reassemble the lubricator cup (Fig. 57 - Pos. 36c).
- The adjustment of the lubrication is factory done and doesn't need any further adjustment. In case of need, rotate the adjustment screw on the top counter clockwise and open completely (about 6 turns). Then close in clockwise direction for about 3 turns, that's it.
- Open the supply of compressed air to the machine.

9.2.27 Air compressor
If no air compressor unit is available in the installation place of the machine, it is possible to have a built-in air compressor up to model 320.

9.2.27.1 Maintenance procedure:
Discharge at least once per month the condensate. Open valve VM78 (Fig. 58 - refer to arrow) until no more liquid flows out. Then close valve.

9.2.28 Carbon funnel
If the machine is not equipped with multisolver, a carbon funnel is mounted (Fig. 59) to purify the air before and during the loading door opening. The granulated carbon has to be substituted in regular intervals according to the instructions written on the carbon funnel itself.

9.2.28.1 Maintenance procedure:
- Remove lid from funnel.
- Take out bag with the carbon.
- Empty carbon in proper container.
- Fill bag with new carbon.
- Fit bag with carbon into funnel.
- Remount lid.

Fig. 57 Filter-Reducer-Lubricator
Fig. 58 Built-in air compressor
Fig. 59 Carbon funnel

Dispose of in conformity with the rules in force!
9.2.29 Multisolver

By request or for particular configurations the Multisolver could be present. Through the Multisolver it is possible to carry out an adsorption stage. This is done so the residual solvent concentration inside the drum goes below the minimum values established in the laws prevailing in many European countries.

When the solvent concentration in the air, at the outlet of the Multisolver exceeds 0.5 g/m³ or after a certain number of adsorption cycles indicated by the machine computer, the active carbons have to be regenerated. By regenerating, the solvent that has been trapped during the adsorption stage is extracted from the active carbon filters.

9.2.29.1 Multisolver regeneration

The regeneration of the active carbons (Fig. 60) takes place in a closed circuit. Through the main fan placed in the air duct or through an external turbine (depending of the model) the air is leaded through the heat exchanger. Here the air is heated up and then conveyed to the active carbons wherein the solvent evaporates. Then the air reaches a condensator where the solvent is recovered. This cycle repeats until complete regeneration of the active carbon filters.

For regeneration:
- The machine must be operating (main switch on, steam, cooling water and compressed air open).
- Select the program for Multisolver-Regeneration on the computer and carry out the program.
- The regeneration program is now functioning automatically.
- When the regeneration program has terminated automatically, the machine must be turned off (main switch off, steam, cooling water and compressed air closed).

The cool down of the active carbons takes approximately 12 hours. During this time an operation with the cleaning machine is not possible, considering the solvent concentration inside the drum can’t go below the limit values established by law. It is suggested to execute the regeneration in the late afternoon or just before week-end.

9.2.30 Solvent concentration measurement system

It is a measurement and control system. It measures the solvent concentration in the machine, in the ambient of the work room and after the active carbon unit. It helps to avoid solvent emissions in the work room. During drying and cool down stages the drying process is continuously controlled. The loading door and all maintenance doors are locked until the solvent concentration inside the drum drops under the limits as laid down by the current laws.

The control of the active carbon unit of the dry cleaning machine allows to saturate the active carbons optimal. In this way the active carbon regeneration is reduced to a minimum.

The measurement system measures:
- the ambient air
- the solvent concentration beyond the active carbon unit (Multisolver)
- the solvent concentration at the outlet of the drum at the end of the machine cycle.

For use and maintenance please refer to the proper manual.
9.2.31 Still boiler
By request or for particular configurations a still with built-in electric boiler could be present (Fig. 61) which offers the possibility of having a steam still even when there is no central boiler available.

Be sure that the pressure of the steam circuit is 0 bar and that the temperature is below 40°C.

9.2.31.1 Emptying still boiler
Position a container underneath the boiler drain valve VM18.
Open the manual valves VM17 and VM18.
Wait until the boiler is empty.
Then close both valves VM17 and VM18.

9.2.31.2 Topping up still boiler
Refer to chapter “Filling still boiler” for topping up the still boiler.

9.2.32 Drying boiler
By request or for particular configurations a electric boiler for drying could be present (Fig. 62) which offers the possibility of having an additional steam heater even when there is no central boiler available.

Be sure that the pressure of the steam circuit is 0 bar and that the temperature is below 40°C.

9.2.32.1 Emptying drying boiler
Position a container underneath the boiler drain valve VM22.
Open the manual valves VM21 and VM22.
Wait until the boiler is empty.
Then close both valves VM21 and VM22.

9.2.32.2 Topping up drying boiler
Refer to chapter “Filling drying boiler” for topping up the drying boiler.
9.2.33 Still/drying boiler

By request or for particular configurations a still/drying electric boiler could be present (Fig. 63). 

![Diagram of Still/drying boiler]

1) Exhaust
2) Exhaust valve VM17
3) Inlet steam pneumatic valve to the drying battery Y10
4) Inlet steam manual valve to the drying battery VM25
5) Filling valve VM15
6) Safety valve
7) Valve to discharge boiler VM18
8) Leveling valve VM16
9) Electric resistance
10) Pressure gauge
11) Pressure switch
12) Drying battery

Fig. 63 Still/drying boiler

Be sure that the pressure of the steam circuit is 0 bar and that the temperature is below 40°C.

9.2.33.1 Emptying electric boiler

Position a container underneath the boiler drain valve VM18.
Open the manual valves VM17 and VM18.
Wait until the boiler is empty.
Then close both valves VM17 and VM18.

9.2.33.2 Topping up still boiler

Refer to chapter “Filling still boiler” for topping up the still boiler.

9.2.34 Solvent cooling with refrigeration system

By request or for particular configurations the solvent cooling with refrigeration system could be present (Fig. 64). 

It consists of a proper heat exchanger that assures that the solvent sent to the drum could be cooled down to temperatures less than 10 °C. Throug the machine computer, the solvent temperature can be set on the desired value.
The cooler is placed in the solvent flow, after the pump, so it is possible to cool down solvent coming from any tank.
Delicate garments can be cleaned without problems at every moment of day.

![Diagram of Solvent cooling]

1) Drum
2) Refrigerated solvent
3) Cooler
4) Warm solvent
5) Solvent tank
6) Solvent pump

Fig. 64 Solvent cooling
9.2.35 Heating with steam/electric circuit.

If the machine is equipped with heating system steam/electric still:

- Always restore the water level in the still boiler (chapter “Filling still boiler”), before changing from operation by steam generated outside to operation with electric boiler of the machine.

9.2.36 Electric panel

Mounted vertically or on the upper part of the machine. Has a protection rating of IP54. Provided with door with keylock and frontal access for easy maintenance. All components (contactors, thermics, relays, etc.) are installed on the mounting plate. All cables and connectors are marked with reference code. Emergency button is fitted on the door of the electric panel.

9.2.37 Panelling

The panelling of the machine, further than for the aesthetic side has also the function to protect the operators from risks during normal machine operation.

9.2.38 Solvent spill tray

Set at the base of the machine and predisposed with fixing holes to anchor the machine to the floor. Available in different dimensions and capacities in relation to the machine and the different modules. Its function is to avoid the spreading of solvent into the ambient in case of machine leaks.

9.2.39 Filter at water inlet

Is used to filter the water from the waterworks supply (Fig. 65 - Pos. 1), preventing impurity to enter the cooling circuit of the machine.

9.2.39.1 Maintenance procedure

- Unscrew lock nut using a suitable tool (Fig. 65 - Pos. 2).
- Remove filter and clean with a brush.
- Reassemble filter and tighten the lock nut.

9.2.40 Filter at steam inlet

Is used to filter the steam at the inlet, preventing impurity to enter the heating circuit of the machine.

9.2.40.1 Maintenance procedure

- Unscrew lock nut using a suitable tool.
- Remove filter and clean with a brush.
- Reassemble filter and tighten the lock nut.
10. Daily setting at work

10.1 Operation modes not allowed

Follow these instructions to avoid damaging persons, things or environment!

- The dry cleaning machine may only be set at work with PERC solvent \((C_2Cl_4)\). Otherwise, bad smell may be produced, components may be corroded and cleaning may be inaccurate. All damage arising from this misuse are not covered by the guarantee.
- Only such additives, as cleaning strengtheners, doping media, etc. that do not cause an explosive atmosphere, do not lower the flash point and are exclusively employed with PERC solvent may be used in the dry cleaning machine. The use and quantity of additives are fixed by the solvent supplier’s directions.
- Additives and liquids containing solvents, that compromise the safe and proper operation of the dry cleaning machine may not be used. Otherwise an explosive atmosphere could be created, the active carbon units could be damaged, additional deposition of solvent in the contact water, bad smell could be produced, ecc. All damage arising from this misuse are not covered by the guarantee.
- It is forbidden to add water exceeding the mixing quantity allowed. Otherwise bad smell will be produced, components may be corroded and cleaning may be inaccurate. All damage arising from this misuse are not covered by the guarantee.
- The dry cleaning machine may only be started up if in perfect conditions, in conformity with the existing rules and absolutely gasproof. Otherwise accidents may occur, health, environment and things may be damaged, for which only the owner is liable.
- The dry cleaning machine should never be started up with bypassed or misworking safety devices. All ports (i.e. soap funnel, distiller feeding funnel, water separator funnel, distillation residual collector, solvent filling valve and waste water discharging valve in the water tank) should be closed. Otherwise, vapours or solvent may be discharged, which may be dangerous for health, things and environment.
- To protect the solvent pump and the hydraulic system, the dry cleaning machine should never be started up without any button trap basket.
- To avoid clogging of the air circulation especially in the heat exchangers of the cooling system, the dry cleaning machine should only be started up when an air filter is fitted!
- The solvent has to be tested regularly to its pH-value and the condition of the stabiliser. Please contact your solvent supplier in order to get informed about how to test the solvent and what you need for testing the solvent (for example a test-set).
- Such garments or textiles that can damage during the cleaning cycle due to the following reasons, shall not be cleaned:
  - incompatibility of parts of textiles or accessories with the used solvent,
  - mechanical action due to the rotation of the drum,
  - penetration of parts of textiles or accessories into the drum perforation or into the opening between the drum and drum collar,
  - sensivity of parts of textiles or accessories with the drying temperature.
- The owner has to check the compatibility of the selected cleaning cycle with the garments or textiles charged into the machine.
- Otherwise damages are arising to the garments or textiles introduced to the machine, for which only the owner is liable.

The owner is responsible for the proper working and maintenance of the dry cleaning machine.

- The machine can only be used by skilled personnel meeting all law requirements, after reading the operating instructions manual, trained by the service department engineers.
- The dry cleaning machine may only clean items and garments suitable to be cleaned with solvent.

10.2 Machine startup

Before setting at work or before every shift, check that:

- the waste water has been discharged from the separator tank
- the solvent level is correct
- the pressure of the filters are below the permitted limit values
- the residuals have been removed from the still
- the neutralizer has been added to the still
- the delivery of cooling water is open
- the outlet of cooling water is open
- the compressed air or the compressor are activated
- the steam feed is open (in steam-heated machines)
- the condensate discharge is functioning
- the distillation is on

In the morning, at the beginning of work

- Open the steam source.
- Open the cooling water supply to the machine.
- Open the compressed air source.
- Power on by turning the main switch on.

Then perform the daily maintenance procedures.
Display is flashing:
Loading door or a maintenance door is still open, please close.
When display has stopped flashing it is possible to proceed.

- After the first cleaning cycle and during distillation, check that the machine is gasproof, once a day at least.
- When loading the machine, please note that the maximum weight and capacity at full load may never be exceeded.

10.3 Cleaning programs

The machine is equipped with a control unit that may be programmed according to need. For safety reasons, the cleaning programs must be insert and modified exclusively by skilled personnel!

The standard programs for cleaning and maintenance are factory programmed.

10.4 Switching off the machine

- After conclusion of the cleaning cycle, stop solvent delivery to the still.
- Wait till the still is empty, controlling through the still sight glass.
- If present, activate still drying.
- Switch off the still.
- Switch off the main switch on the electric panel to turn the machine off.
- Stop steam delivery to the machine.
- Stop cooling water delivery to the machine.
- Stop compressed air delivery to the machine.
- Stop the supply of current to the machine by switching off the unit main switch of the plant.
11. Machine marking and warning notices

This chapter is containing a reproduction of the labels of the machine, so if these are lost or damaged they can be replaced correctly.

**AIR FILTER**
Check the air filter after every cycle and clean if necessary. Open only when the machine is not in operation and after completed drying.

This label is attached on the maintenance door of the air filter.

**BUTTON TRAP FILTER**
Check the basket after every cycle and clean if necessary. Open only when the machine is not in operation and after completed drying.

This label is attached on the button trap housing.

**STILL CLEANING**
Clean the still when the machine is not in operation and with the still at room temperature.

This label is attached on the maintenance door of the still.

**WATER TANK**
**IMPORTANT!**
Filling the water tank with solvent, until it will be recovered into the tank. Make attention at the level showed by the sight glass: this level will be the same for all the successive cycles.

Only for machines with CE type separator tank
This label is attached on the housing of the water tank.

**SEPARATOR**
Clean at least once a week. Do not open during operation.

This label is attached on the housing of the separator.

**STILL LIGHT**
This label is attached near the still light switch.

**WATER WITH PERCHLOROETHYLENE**
Only for machines using perc as solvent!
This label is attached on the housing of the water tank.

**ACTIV CARBONS**
Change after 40 cycles

Only for machines with activ carbon funnel!
This label is attached on the housing of the activ carbon funnel.

**AIR FILTER**
Clean once a week

Only for machines with air filter turbine!
This label is attached near the air filter turbine.
## 11. Machine marking and warning notices

| **ATTENTION!** Clean the pump filter | **STEAM PRESSURE**  
4 - max. 4.5 bar  
max. 150 °C  |
|---|---|
| Only for machines with pump filter!  
This label is attached on the housing of the pump filter. | This label is attached on the housing of the still. |
| **WATER INLET** | **WATER OUTLET**  
This label is attached near the water inlet.  
This label is attached near the water outlet. |
| **STEAM INLET** | **CONDENSATE DISCHARGE**  
This label is attached near the steam inlet.  
This label is attached near the condensate discharge. |
| **AIR PRESSURIZED INLET** | **CAUTION**  
Before carrying out any maintenance it is required to disconnect the power  
This label is attached on the main drive protection. |
| This label is attached near the compressed air treatment unit. | |
| **MAXIMUM LEVEL** |  
This label is attached on the sight glass of the still and water tank. |