

# INSTALLATION AND OPERATION MANUAL

Adiabatic humidification system  
Condair **MLP**

# Thank you for choosing Condair

Installation date (MM/DD/YYYY):

Commissioning date (MM/DD/YYYY):

Site:

Model:

Serial number:

## **Manufacturer**

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# 1 General information

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## 1.1 Foreword

This manual has been written to ensure the safe use, performance and longevity of the equipment, and is intended for use by engineers and properly trained technical personnel. Please read this manual thoroughly before specifying, designing or installing an ML-System from Condair A/S. Keep for future reference.

As our policy is one of continuous research and development, we reserve the right to amend, without notice, the specifications provided in this document. Condair A/S does not guarantee nor accept liability for the accuracy of information in this document.

This installation and operation manual is supplemented by various separate items of documentation (installation drawings, technical specifications etc.). Where necessary, appropriate cross-references are made to these publications in this installation and operation manual.

### Guide to symbols used in this manual



**CAUTION!**

Instructions relating to the correct operation of the unit

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**WARNING!**

Instructions relating to safety

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## 1.2 Health and safety

Installation, maintenance, repair work or decommissioning should only be carried out by appropriately qualified and properly trained technical personnel. The users are responsible for ensuring their suitability. The customer is responsible for ensuring that the installation of the equipment complies with all local regulations.

Any risks or hazards relating to the system, including during installation and maintenance, should be identified by a competent health and safety representative who is responsible for introducing effective control measures.

All ideograms, signs and markings applied to the unit must be observed and kept in a readable state.



**Always isolate all supplies to the system before commencing any maintenance or repair.**



**Due to health risks, the silicate content in the supply water – in any form – must not exceed 12 mg/l.**

If the silicate content of the supply water is higher a silicate filter must mandatory be installed in the water supply line before the humidifier by the customer.

For product specific limitations for silicate please observe the required preconditions for the water supply.

## 1.3 Hygiene

Please observe the local health and safety executive's technical guidance on the control of Legionellosis in water systems.

The user is responsible for ensuring that the water system complies with local regulations, bye-laws and guidelines (such as the HSE ACoP L8, VDI 6022, ISO 22000, HACCP or equivalent). If inadequately maintained, water systems, of which any humidifier is a part, can support the growth of microorganisms, including the bacterium that causes Legionnaires' disease.

The MLP is produced according to the ISO 22000 standards, which means that we have considered all aspects of this equipment to reduce the risk of Legionnaires' disease and other similar conditions. However, the user is responsible for ensuring that the installation, operation and maintenance work on the equipment is performed in a manner ensuring that the system stays clean!

Any risks or hazards relating to the system, including during installation and maintenance, should be identified by a competent health and safety representative who is responsible for introducing effective control measures.



**WARNING!**

**The MLP must be installed, operated and maintained in accordance with this manual. Failure to do so could result in contamination that might cause Legionnaires' disease, which can be fatal..**



**WARNING!**

**To prevent water stagnation and microbial contamination, the MLP power supply should be left switched on. If the system is switched off for more than 48 hours, the pipework and system must be disinfected as per the instructions, and a full risk assessment must be undertaken to ensure safe operation.**

### 1.3.1 Guidelines to ensure your system stays clean and prevent the growth of Legionella

- Carry out a risk assessment of the water system using a competent person, and implement an appropriate monitoring and control programme.
- Initiate procedures for checking the UV system, cleaning tanks, changing filters, disinfection etc.
- The MLP must be connected to a clean, potable mains water supply.
- Enter into a service contract that suits your company.
- Stop the system if polluted drinking water is found in your area.
- Avoid water temperatures between 25°C and 45°C, which favour the growth of Legionella.
- Do not stop the system unless it is faulty or leaking (avoid water stagnation)
- Refrain from closing nozzles or sections, unless there is leakage or a fault (avoid water stagnation)
- Disinfect the high-pressure system at least once a year and after every maintenance or repair.  
Always carry out a complete system disinfection if it has been turned off for more than 48 hours
- Have water samples taken and tested for harmful bacteria at least once a year.
- Conduct follow-up measurements until the system is clean if bacteria have been detected in the system.

### 1.3.2 The Condair service team can help

Condair has expert technicians who can provide:

- Bacteriological troubleshooting on site \*
- Cleaning and disinfecting
- Preventive maintenance
- Repair and fault finding
- Training and guidance

\*Condair uses a fast method for measuring bacterial activity in the water; the approved and patented BactiQuant. Once the water sample has been taken, we can read the bacteriological quality of the water within 30 minutes, and disinfect the system if necessary.

Condair follows the guidelines in VDI 6022 for CFU counts in humidifiers. The CFU count in the humidification water must not exceed 150 CFU/ml, corresponding to a maximum BQ value of 40.

Please contact your local Condair representative for further information about our services.

## 1.4 Intended use

The MLP is intended for adiabatic humidification and cooling. Any other, or further, application is not considered use for the intended purpose. Condair A/S cannot be made liable for any damage or injury attributable to inattentive, inappropriate, negligent or incorrect operation of the equipment, whether or not caused deliberately.

Operation of the equipment in the intended manner requires that all the information in this installation and operation manual be observed (in particular the safety instructions).

Potential dangers related to the MLP



**WARNING!**

**Risk of electric shock! A person may come in contact with live parts when the pump station/control unit is open. Touching live parts may cause severe injury or death.**

**Prevention: Before carrying out any work on the system, disconnect power and water supply.**



**WARNING!**

Poorly maintained humidification systems may endanger health be hazardous.

Prevention: read, understand and follow maintenance guidelines to ensure your system stays safe.



**WARNING!**

**High pressure! The pump station delivers water at 70 bar. Inappropriately fastened hoses may be forced out of the screw connections when pressurised. Never loosen hoses or screw connections in a pressurised system.**

## 1.5 Ensure safe operation

If it is suspected that safe operation has been compromised, the MLP should immediately be shut down and secured against accidental power-up.

Shut down the MLP if:

- MLP components are damaged, worn or very soiled.
- The MLP does not work correctly.
- Joints, pipes or hoses are leaking.

No modifications must be made on the MLP without the manufacturer's consent. All persons working with the MLP must report any alterations made to the MLP to the owner immediately.

Use only original accessories and spare parts available from your Condair representative.

## **1.6 Warranty**

MLP parts are covered by a two-year warranty from the invoice date with the exception of the replacement parts listed in the routine maintenance section. Failure to observe the manufacturer's installation and maintenance recommendations and instructions will invalidate the warranty. Condair A/S cannot be made liable for damage or injury attributable to failure to observe the manufacturer's installation and maintenance recommendations and instructions.

## **1.7 Delivery and storage**

To ensure consistent quality, each MLP is tested and preserved before leaving the factory. If put into storage prior to use, the MLP must be covered and protected from physical damage, dust, frost and rain. It is recommended that the MLP be kept in its transit packaging for as long as possible prior to installation.

Inspection upon receipt: remove the transit packaging and inspect the unit to ensure that no damage has occurred during transit. Any visible damage must be reported to your Condair distributor immediately. If the unit is put into storage, the packaging should be replaced.

## **1.8 Correct method of lifting**

Lifting or handling must only be carried out by trained and qualified personnel. Ensure that the lifting operation has been properly planned and risk-assessed, and that all equipment has been checked by a skilled and competent health and safety representative.

The customer is responsible for ensuring that operators are trained in handling heavy goods, and to enforce the relevant lifting regulations. Refer to the weights and measures section for system weight.

## **1.9 Disposal**

You must observe local laws and regulations when disposing of your MLP at the end of its working life. The PAHT pump and piping is constructed from stainless steel which may be fully recycled.

## 1.10 Inlet water – quality guide

The quality of the water being used in the MLP system should be checked prior to system commissioning. If the inlet water does not meet the quality specified in the preconditions table, it may be necessary to install additional water treatment.

Table 1: Inlet water quality guide

Water supply	Reverse Osmosis or Demineralized Water max. 150 CFU/ml (no pathogens)
Conductivity	5-50 $\mu$ S/cm
Silt Index (SDI)	max.1
TDS	max. 35 mg/l
Silicates in any form	max. 12 mg/l
KMnO <sub>4</sub>	max. 10 mg/l
NTU	max. 1
Temperature	max. 15 °C
Fe	max. 0.2 mg/l
Mn	max. 0.05 mg/l
Max. Hardness	max. 1 °dh
Free chlorine	max. 0.1 mg/l

### Water monitoring

The MLP water system must be monitored for hygiene as part of the maintenance programme. Please refer to the maintenance section for further guidance.

### Disinfection

Depending on the system hygiene, it is advised that preventative disinfection fluid be added to the MLP water tank at an appropriate frequency, but at least once a year.

Condair A/S recommends adding the disinfection fluid SANOSIL S010 AG 5% (our code: 155404000) to the tank, desired concentration 0.1%. DISIFIN is safe, non-toxic and eco-friendly which provides a prophylactic, disinfection dose and is effective against all types of microorganisms, including Legionella and E.coli.

Please read the Maintenance section for more information on disinfection.

If you are in any doubt about the suitability of water quality, please contact your Condair distributor who will be happy to support you.

## 2 Product overview

### 2.1 MLP description

The MLP series is a high-pressure pump station for direct room humidification it's developed by Condair A/S with focus on reliable and hygienic humidification solutions.

The MLP comes in five basic models, MLP 100, 300, 500, 800 and 1000. The number indicates the maximum continuous water outlet (high-pressure) @ 65 bar. If a larger capacity than 1000 l/h is needed the MLP's is made in versions with double or triple high pressure pumps called e.g. MLP 2x800 or MLP 3x1000.

All components exposed to water are made of corrosion-resistant material. All hoses are steel-reinforced and drinking water-approved.

The high-pressure pump is directly mounted on the electric motor. Power is supplied to the 3-phase asynchronous motor via a magnet-operated protective motor switch. The high-pressure pump is protected against dry running by a pressure switch in the inlet manifold. A temperature sensor monitors the temperature inside the pump and protects it from overheating.

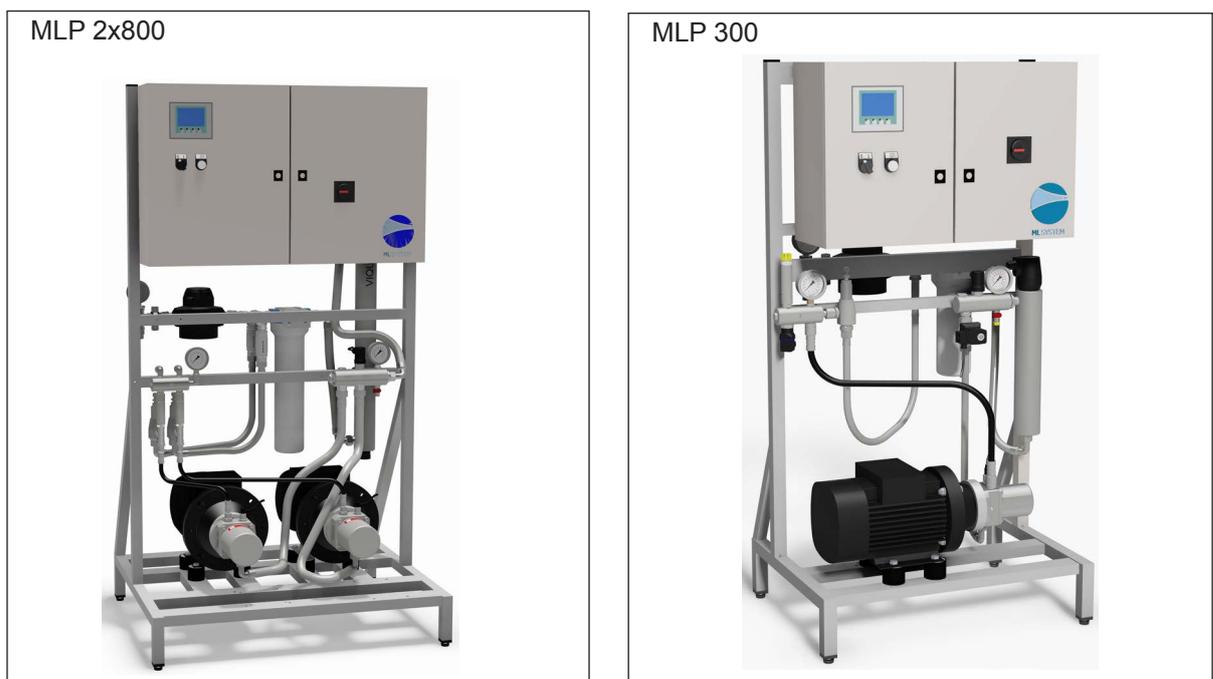


Fig. 1: MLP Models

## 2.2 Control Unit

The control unit consists of a touch display and a PLC mounted in the IP 65-rated electrical cabinet as well as a power board for control of the high-pressure pump and connection terminals for power supply (208...480 V/3N~/50-60 Hz).

From the touch screen, the operator can easily change humidity set point in each section, adjust alarm limits and view hour counters, logged alarms, trend curves, etc.

The pump station is electrically wired at the factory. At the installation site, main power supply, humidity signal, external safety chain, step valves and additional options must be electrically connected to the control unit.

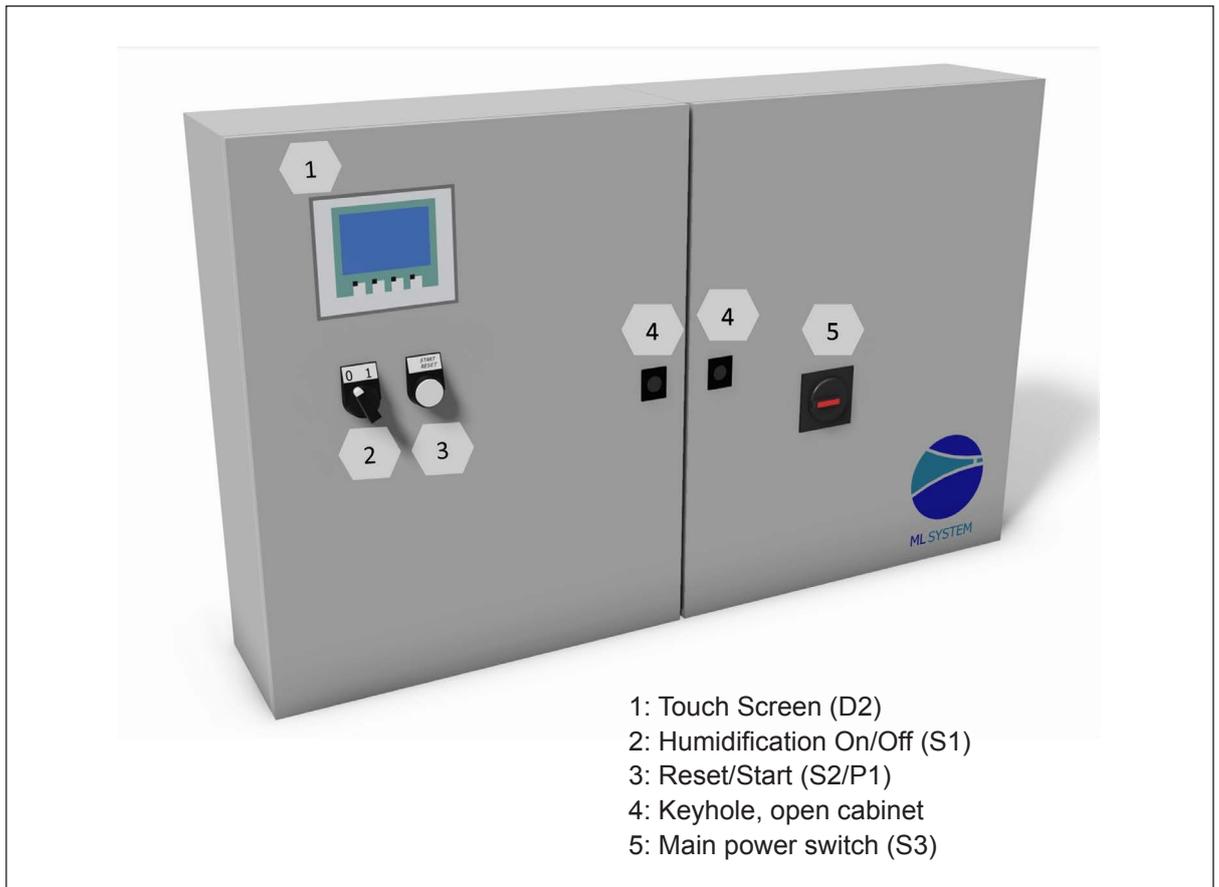


Fig. 2: Control unit

## 2.3 MLP 100/300 Overview

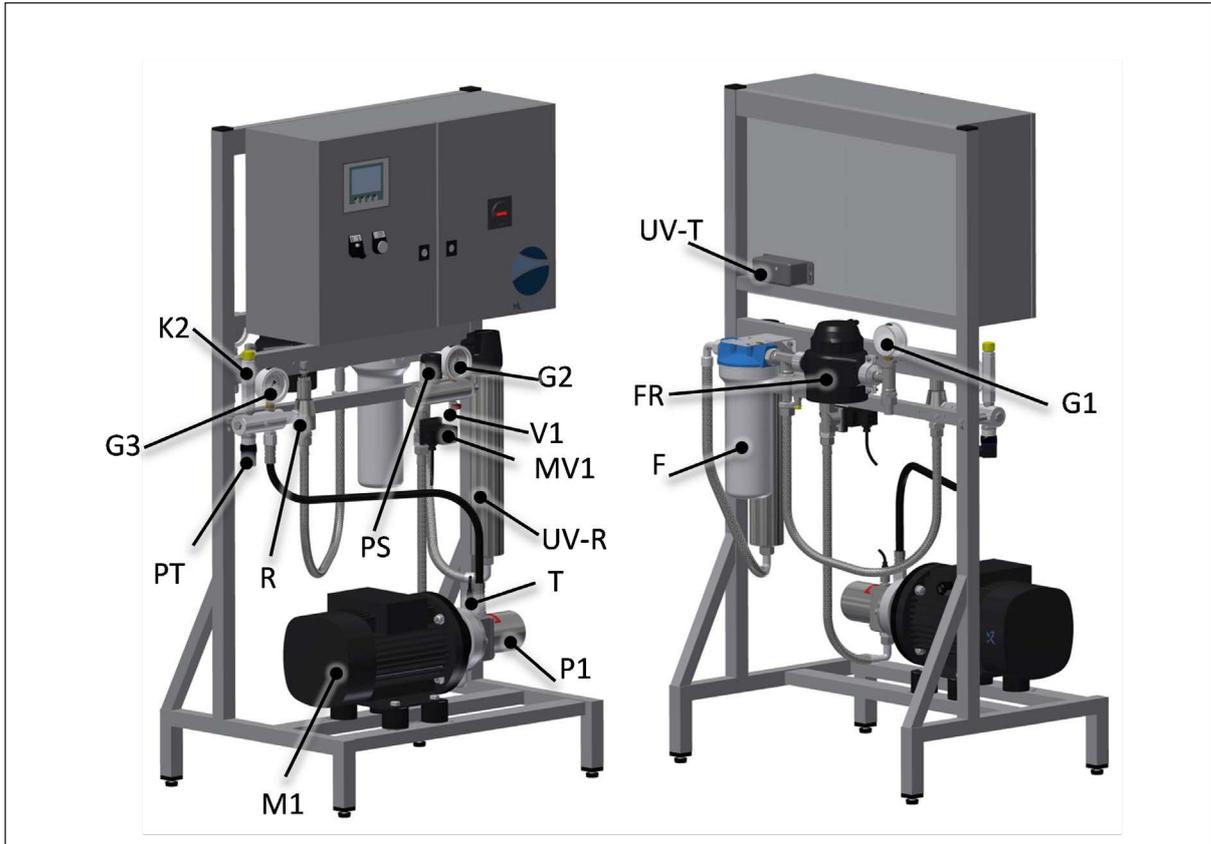


Fig. 3: MLP 100/300 Overview

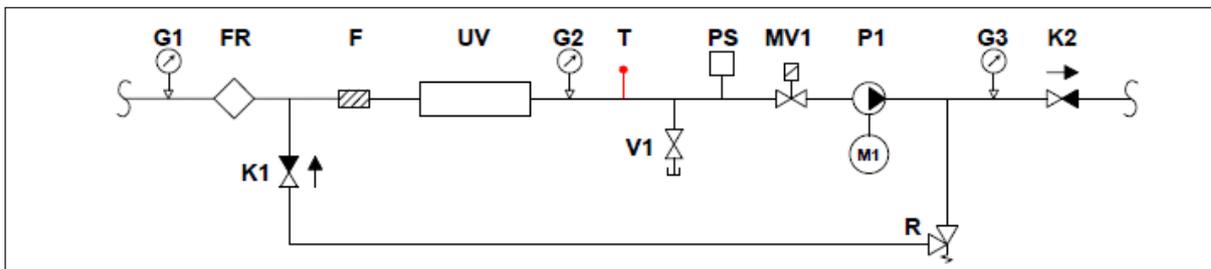


Fig. 4: Hydraulic diagram MLP 100/300

F	Filter 10", 1 µm	MV1	ON/OFF valve 1/2" 0-10 bars
FR	Water meter	P1	PAH high-pressure pump 70 bars
G1	Pressure gauge, 0-10 bars	PS	Pressure switch
G2	Pressure gauge, 0-10 bars	PT	Pressure transmitter (Option)
G3	Pressure gauge, high-pressure 0-160 bars	R	Pressure reduction
K1	Check valve	T	Thermostat
K2	Check valve	UV	UV system
M1	Motor, high pressure pump	V1	Test water tap

Table 2: Legend MLP 100/300 Overview

## 2.4 MLP 500 Overview

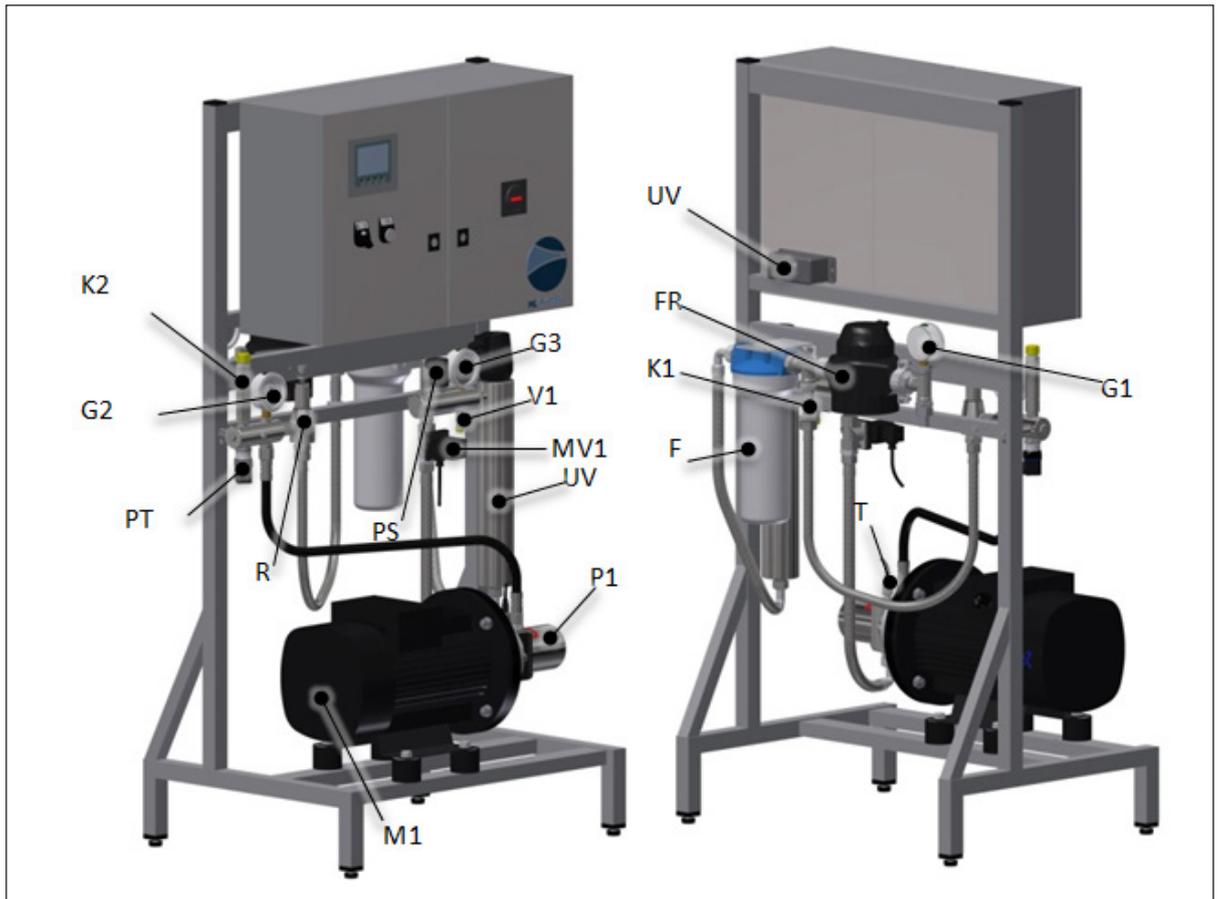


Fig. 5: MLP 500 Overview

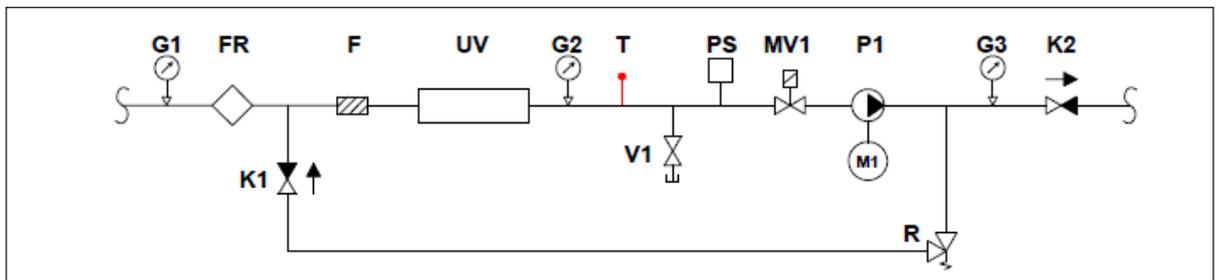


Fig. 6: Hydraulic diagram MLP 500

F	Filter 10", 1 µm	MV1	ON/OFF valve 1/2" 0-10 bars
FR	Water meter	P1	PAH high-pressure pump 70 bars
G1	Pressure gauge, 0-10 bars	PS	Pressure switch
G2	Pressure gauge, 0-10 bars	PT	Pressure transmitter (Option)
G3	Pressure gauge, high-pressure 0-160 bars	R	Pressure reduction
K1	Check valve	T	Thermostat
K2	Check valve	UV	UV system
M1	Motor, high pressure pump	V1	Test water tap

Table 3: Legend MLP 500 Overview

## 2.5 MLP 2x800 overview

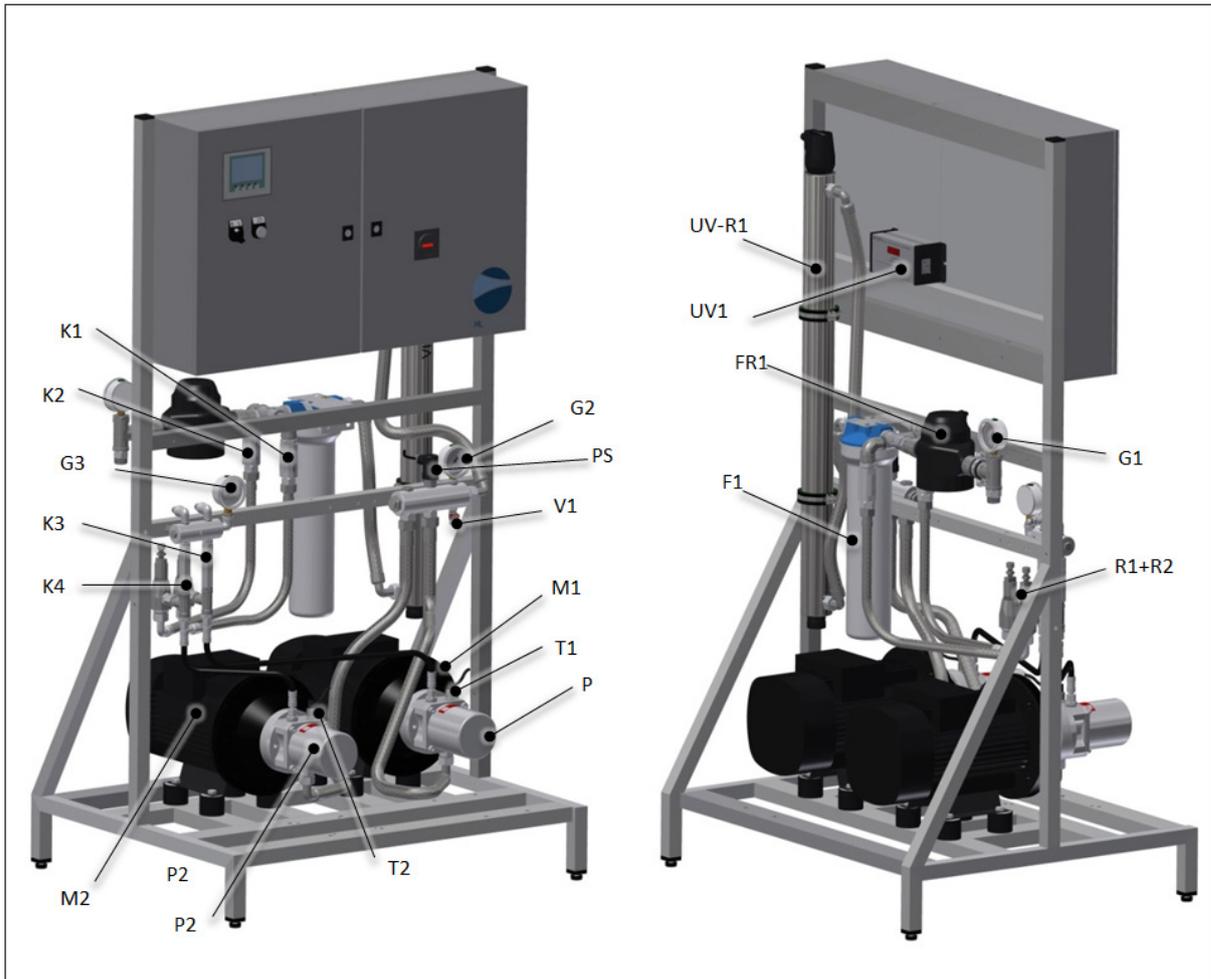


Fig. 7: MLP 2x800 Overview

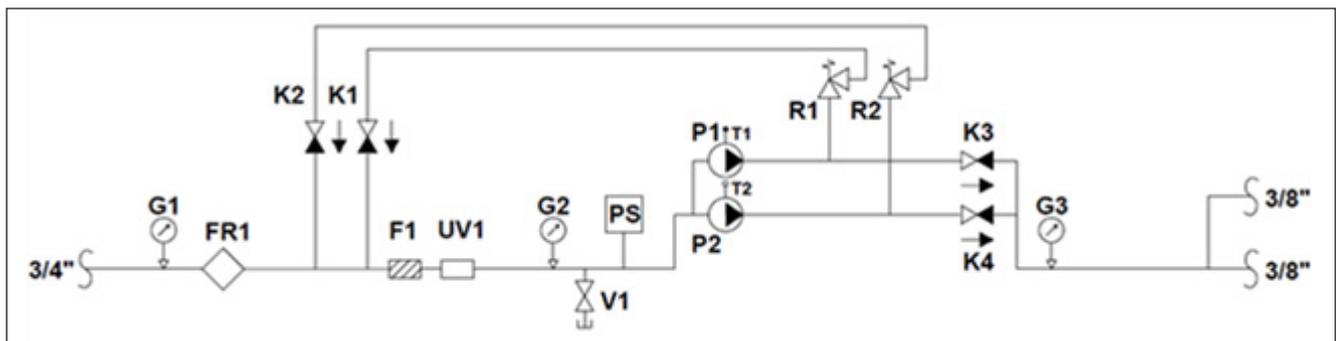


Fig. 8: Hydraulic diagram MLP 2x800

F1	Filter 10", 1 $\mu$ m	K3+K4	Check valve
FR1	Water meter	P1+P2	PAH high-pressure pump 70 bars
G1	Pressure gauge, 0-10 bars	PS	Pressure switch
G2	Pressure gauge, 0-10 bars	R1+R2	Pressure reduction
G3	Pressure gauge, high-pressure 0-160 bars	T1+T2	Thermostat
K1+K2	Check valve	UV1	UV system
		V1	Test water tap

Table 4: Legend MLP 2x800 Overview

## 2.6 Principal installation diagram

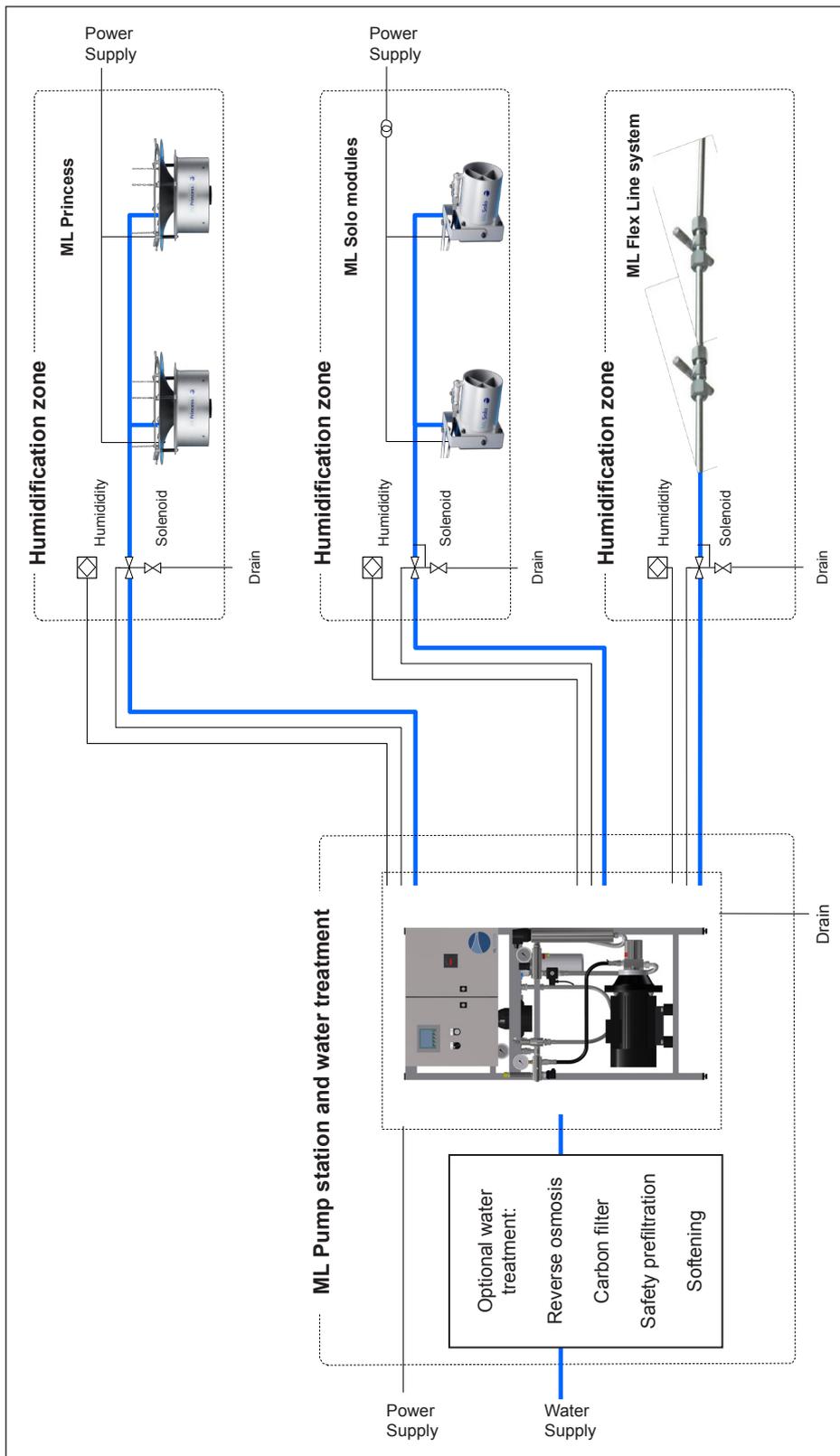


Fig. 9: Principal installation diagram

## 2.7 Inlet water quality requirements

The quality of water being used in the MLP system should be checked prior to system commissioning. Condair A/S recommends that the MLP system be connected to a clean, potable (drinking water quality) mains water supply.

Table 5: Inlet water quality requirements

Water supply	Reverse Osmosis or Demineralized Water max. 150 CFU/ml (no pathogens)
Conductivity	5-50 µS/cm
Silt Index (SDI)	max. 1
TDS	max. 35 mg/l
Silicates in any form	max. 12 mg/l
KMnO <sub>4</sub>	max. 10 mg/l
NTU	max. 1
Temperature	max. 15 °C
Fe	max. 0.2 mg/l
Mn	max. 0.05 mg/l
Max. Hardness	max. 1 °dh
Free chlorine	max. 0.1 mg/l

## 2.8 Optional equipment for MLP

Choosing the right water treatment is essential for successful humidification. In the ML-System programme, there is a large variety of water treatment and optional equipment to choose from. The ML-System is designed to be customised to meet the specifications, be it essential water treatment or features. It is possible to combine ML Systems, water treatment and optional equipment in numerous combinations and it is thus impossible to describe all of them here. In the following, the most commonly used ancillary and optional equipment for the MLP system is listed.

Optional and ancillary equipment can be divided into the three following main groups:

**MLP options:** Added features which are intergraded into the controller of the MLP or placed on its frame, e.g. conductivity and hardness alarm, BAS integration, ultra-pure water (mixed bed), CIP system, CO<sub>2</sub> adding, damping water outlet, holding tanks (RTN). Options cannot be retrofitted and must therefore be listed when ordering

**Water treatment:** Stand-alone systems for improving the water quality in order to meet the inlet water quality requirements for the MLP, e.g. booster pump, non-return valve, silt/pre-filter, carbon filter and softener. See separate Water treatment / RO manual for further information.

**High-pressure building installation:** Added features and optional equipment – e.g. fan speed controller, flow monitor, temperature read-out. Options for the high-pressure building installation will be described in the I/O manual for the high-pressure building installation. See separate High-pressure equipment manual for further information.

## 2.9 MLP options list

Options cannot be retrofitted and must therefore be listed in connection with order placement.

Table 6: MLP options list

Fan control (Prepare of the control board)	Prepares the control board with terminals I/O for connecting a fan control box.
Fan control box (1-4 zones)	Start/stop fans in each zone between humidification cycles. Only possible if the control board has been prepared for the accessory.
Overheating protection of the high-pressure pump (flow/temp-dependent)	Dumps excess water via a solenoid valve if the temperature or flow through the pump comes outside the permissible limit.
PLC webserver access	Access to the PLC's homepage from a standard browser. Displays the operating status and humidity for each zone.
Humidity logger	Logs the humidity in each zone every 15 minutes (1 year back). Data is stored in a .csv comma-separated values file, which can be accessed on a SD card or the PLC's webserver.
BAS/BMS integration Modbus TCP/IP	Displays the operating humidity and alarm status of the system via a TPC/IP protocol.
Backup high-pressure pump	The pump station is fitted with an extra high-pressure pump for redundancy, automatic changeover.
Status relay	Potential-free relays for (ready, running, warning, error).
Pulse generator for water meter	The water meter is equipped with a pulse emitter which can be linked to tele-reading systems, the PLC and to M-Bus networks.

## 2.10 MLP accessories list

Accessories can be retrofitted.

Table 7: MLP accessories list

Pulse generator for water meter, retrofit kit	The water meter is equipped with a pulse emitter which can be linked to tele-reading systems, the PLC and to M-Bus networks.
ML control box for induct system	ML satellite unit for connecting and controlling an induct system from an MLP or an MLP pump station.
Satellite box (4 zones)	Ads 4 additional zones (humidity I/O and zone valve terminals) to an existing ML-System.
Satellite box (8 zones)	Ads 8 additional zones (humidity I/O and zone valve terminals) to an existing ML-System.
Humidity logger retrofit kit	Logs the humidity in each zone every 15th minute one year back. Data is stored in a .csv comma-separated values file.
Alarm lamp	Alarm flash which can be placed up to 100 m from the pump, connects to an alarm output.
Modbus TCP/IP Gateway IP translator	Easy setup op Modbus TCP/IP communication to BAS as IP addresses can be chosen by the costumer on site.
Remote alarm SMS	Sends a SMS via a prepay SIM-card if the system goes in alarm and when the alarm is cancelled.
Remote alarm email	Sends an email if an alarm is triggered in the system and when the alarm is cancelled. Up to 25 recipients.
BAS/BMS integration Modbus TCP/IP, retrofit kit	Displays the operating humidity and alarm status of the system via a TPC/IP protocol.

## 2.11 Rating plate and markings

The rating plate is placed in the upper left corner on the side of the control unit (when facing the front).



Fig. 10: Rating plate

A label with the internal order number and electrical schematic diagram number is placed on the inside of the left-hand cabinet hatch (when facing the front) on the control unit.

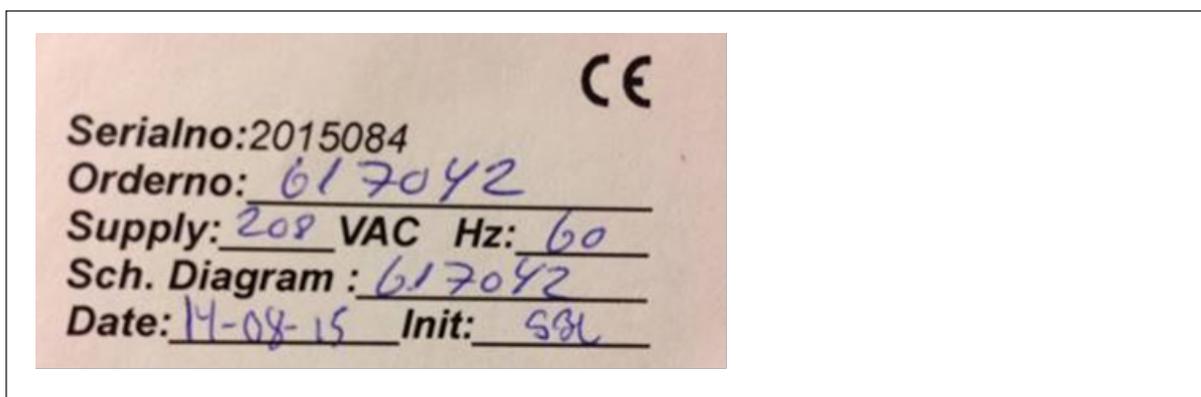


Fig. 11: Label with the internal order number and electrical schematic diagram number

## 2.12 Electrical schematic diagrams

A copy of the electrical schematic diagrams is placed on the backside of the hatch inside the control panel.

# 3 Installation

## 3.1 Important notes on installation

### Qualification of personnel

All installation work must be performed only by persons familiar with the ML-System pump station and sufficiently qualified for such work. All work on electric installations must only be performed by adequately qualified electricians.

### Safety

The pump station and any control units may only be connected to the mains after all installation work has been completed. All statements relating to correct positioning and installation must be followed and complied with. When installing components of the MLP, use the materials and hoses supplied with the unit. In case of doubt, please contact your Condair supplier.



**Do not retighten/unscrew hoses while the system is pressurised!**



**Do not use oil, grease, glue, Teflon, silicon, O-ring lubrication, etc. when assembling pipes or hose connections.**

**All of the above products can act as food for bacteria and are thus pose health risks.**

**Only approved lubricant: Dish soap.**

**Wash your hands before or wear clean gloves while assembling parts in direct contact with water. Keep dust covers on pipes and hoses until just before assembly..**



**Do not fasten the pump station or hoses/pipes to vibrating installations.**

## 3.2 Tools needed for installation work

- Screwdriver set
- Bubble level
- Polygrip pliers
- Wire cutters
- Spanner set
- Tape measure
- Marker
- Box cutter

## 3.3 Positioning the pump station

### Please observe the following on positioning and installation:

- The pump station must be installed only in a location with a drain in the floor.
- The site must be freely accessible with sufficient space for convenient operation and maintenance (min. free space around pump station: laterally 0.5 m, 0.8 m front / back).
- The pump station is designed for operation in a frost-free and dry environment, never outdoors.
- Do not install the pump station in exposed locations or locations with heavy dust loads.
- The pump station is designed for installation on a load-bearing floor.

Before installing the MLP it is important to consider placement of additional water treatment equipment in the room ( e.g. Carbon filter, softener, RO). Please note that the combination/size of water treatment systems will vary from one installation to the next due as a result of water quality and regulatory requirements in the given location.

Start by examining the types of water treatment systems to be installed and read their installation instructions as regards location and any requirements for supply and drainage.

Mark the location of the different systems in the room and note any missing supply or drains for the systems. Make sure you have the necessary fixing equipment available: cable ties, cable trays, screws and wall anchors.

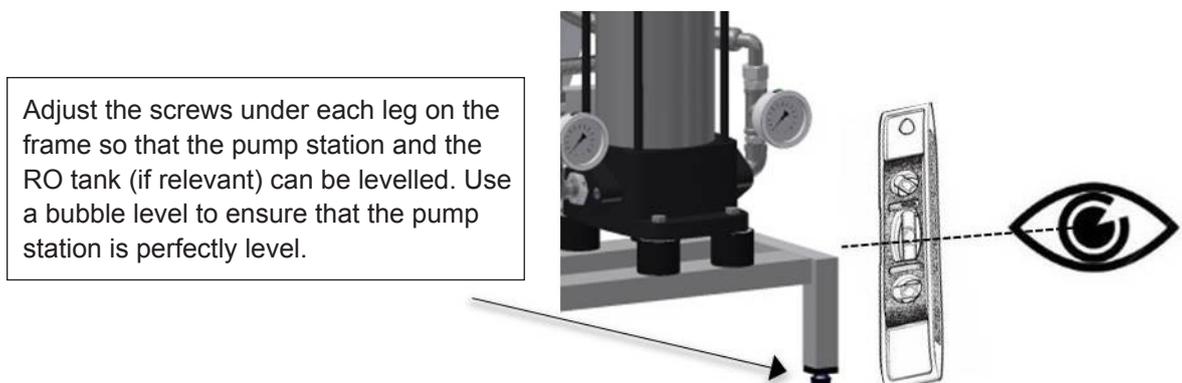


Fig. 12: Adjusting the pump station

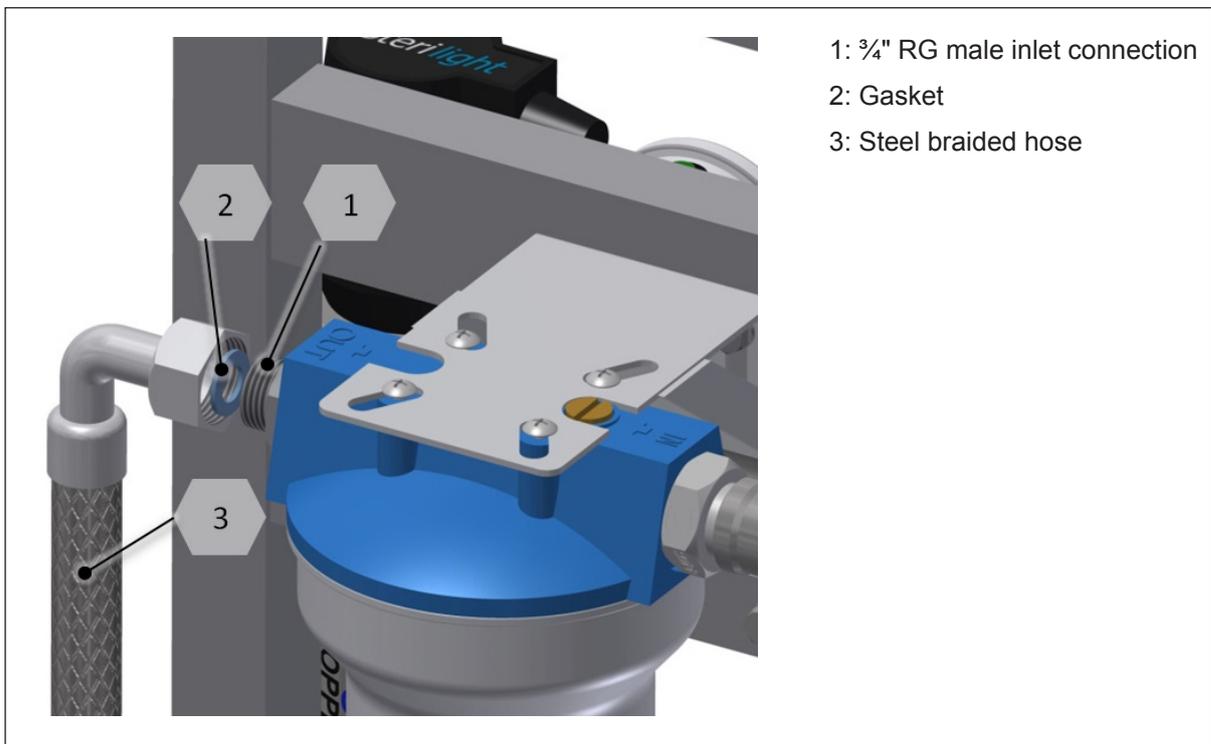
### 3.4 Water connection



**WARNING!**

**Do not open and fill hoses, pumps, filters or tanks with water if the system is not to be started immediately after installation (48 hours). Stagnant water acts as a breeding ground for potentially dangerous micro-organisms.**

Before connecting the MLP to the water supply it must be ensured that the incoming water is as clean as possible. This is done by running a hose from the supply to the drain and open the shut-off valve completely. Let the water run to drain for at least ten minutes. Shut off the water again and connect MLP to the water supply with the supplied hose (3/4", 1.5 m). Condair recommends that the incoming water is tested for bacterial contamination please contact Condair for further information on the subject.



*Fig. 13: Water connection*

## 3.5 Electrical installation



**DANGER!**  
Danger of electric shock!

**Installations and electrical connection must only be done by trained technicians and according to local standards**

**High voltages, danger of electric shock! Touching live parts may cause severe injury or death.**

All connections must be made according to the electrical documentation which is found inside the control unit of the electrical cabinet / main box.

### Notes on electrical installation

- Installation must be carried out according to local rules and regulations
- The electrical installation (power supply, humidity control) must be carried out according to the wiring diagram supplied with the unit and the applicable local regulations. All information given in the wiring diagrams must be followed and observed.
- All cables must be run into the control unit via the cable openings and the use of cable glands.
- Make sure the cables do not rub against vibrating parts.
- The supply voltage must comply with the voltage in the wiring diagram.
- Study the system set-up part to get an overview.
- The pump station comes with a 3 m rubber coated power cable.
- Power consumption and size of pre-fuse can be found chapter with product data

## 4 Commissioning

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The system start-up must be carried out or monitored by persons approved and trained by Condair. Errors in the start-up phase may ultimately result in illness, injury and death of humans..



When fitting water filters, RO membranes, hoses and other components in direct contact with water please, wear sterile gloves or touch only the packing paper to keep the filter bacteria-free.

Remember to wash your hands!



Commissioning of the pump should be the last thing performed at an installation site. When the pump has run with water and the preservation fluid (windscreen wash) has been flushed out, it should always be kept on (summer and winter) in order to keep the system hygienically clean by allowing it to run its automatic flushing and UV routine.

### 4.1 Tools and materials for commissioning work

- Screwdriver set (remember small screwdriver for terminals)
- Polygrip pliers
- Spanner set
- Conductivity Meter
- BQ water analyses set ML part: 155600010
- Multi-meter (Volt, Amp)

## 4.2 Inlet filter

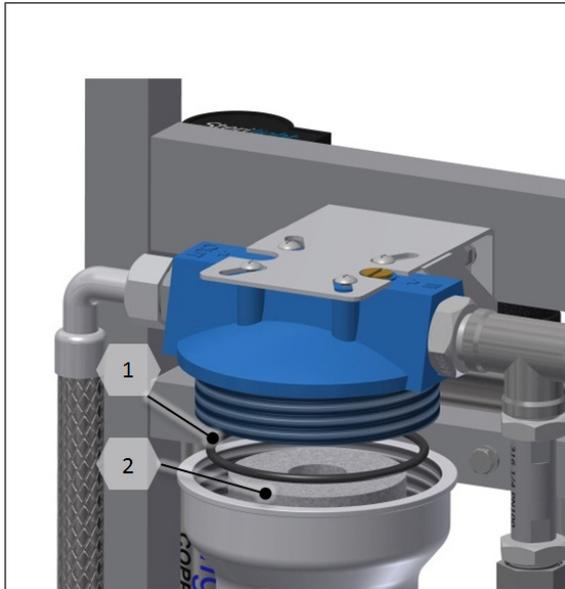


Fig. 14: Inlet filter housing and filter

### Insert filter:

- Unscrew the filter housing [1] using a filter wrench.
- Insert the filter [2], and make sure that it is centered on the guide knob at the bottom of the filter housing.
- Tighten the filter as much as possible by hand and then use the filter wrench to tighten approx. 1/4 turn.
- Slowly open the water supply
- If the filter housing is hard to tighten or leaks, unscrew it and check that the filter is centered, the O-ring is undamaged and the sealing surface is smooth and free of dirt.

*Note: Do not touch the filter with your bare hands (slide it out of the packing directly into the filter housing).*

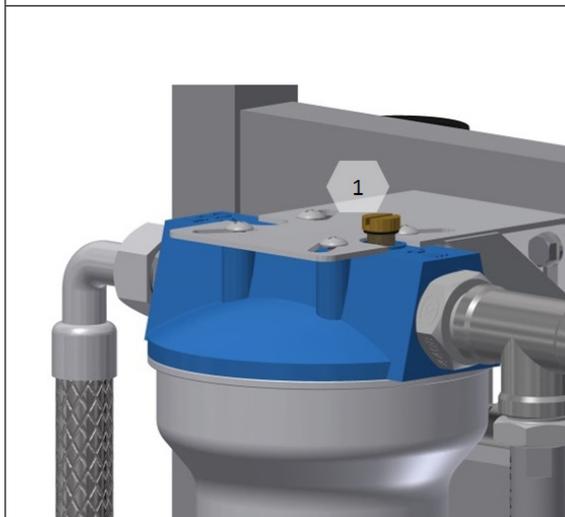


Fig. 15: Air-vent screw, inlet filter

### Airing filter:

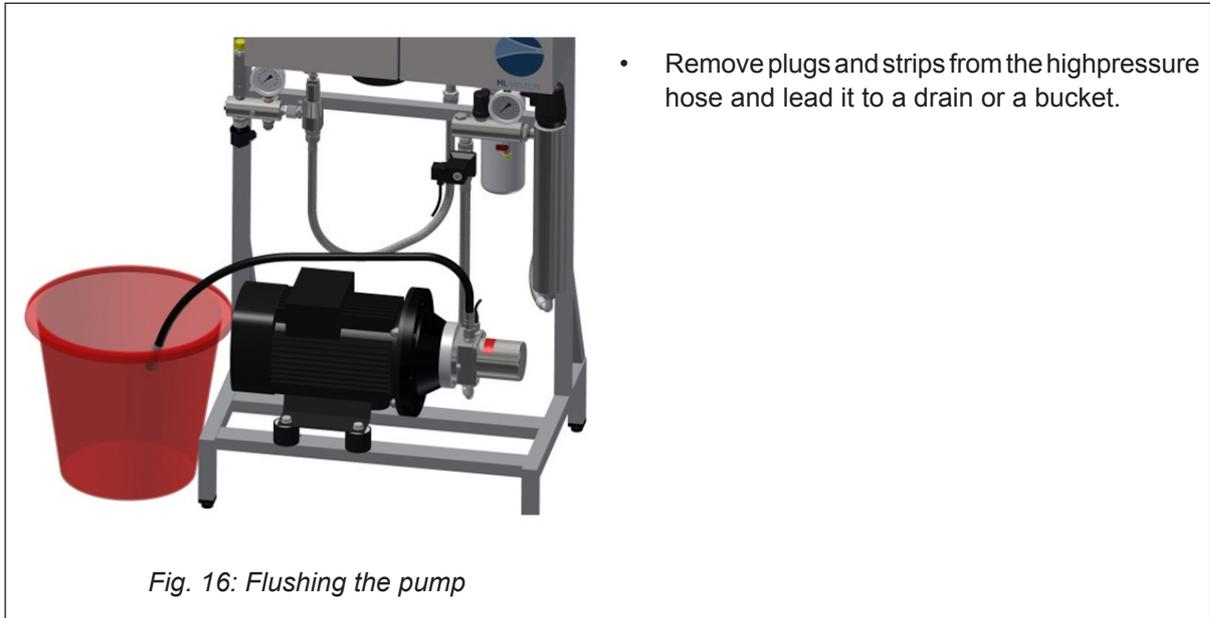
- Slowly open the water supply (tap) to the MLP RO
- Bleed the filter by loosening the air-vent screw [1] on the filter top until water leaks continuously.
- Retighten the air-vent screw.

### 4.3 Prepare for pump flush



**CAUTION!**

The first time a new pump and/or RO membrane is to be used, it is important to flush out any preservation fluids so that they do not end up in the high-pressure system.



*Fig. 16: Flushing the pump*

Before the pump is started for the first time, the controller must be set up.

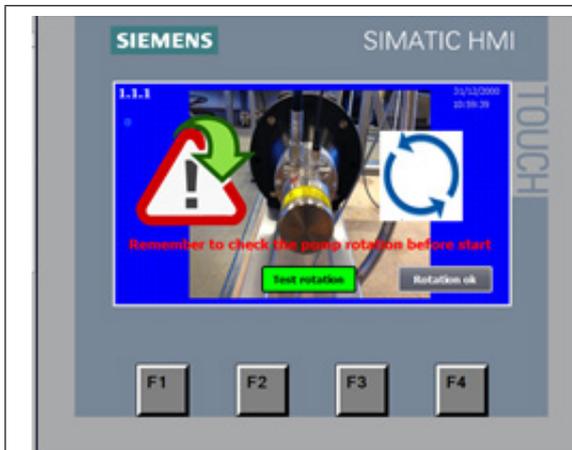
## 4.4 Basic set-up of the controller



Fig. 17: Control unit

- 1: Touch Screen (D2)
- 2: Humidification On/Off (S1)
- 3: Reset/Start (S2/P1)
- 4: Keyhole, open cabinet
- 5: Main power switch (S3)

- Put S1 in OFF position
- Start the controller by turning the power switch S3 in ON position
- The display lights up the start center → ▶ START



### 1.1.1

Every time the system is switched on after a power break, you will see a screen that tells you to control the pump rotation.

Verify that the pump rotation is correct.

A push on the Test rotation starts the high-pressure pump for 5 seconds, so that the rotation can be observed according to the arrows on the pump.

When the rotation control has passed it is possible (by customer's responsibility) to skip this screen in the future (It can be deselected in screen 1.6).

Upon completion of rotation control, press Rotation ok.

A technician pin will be required; 197



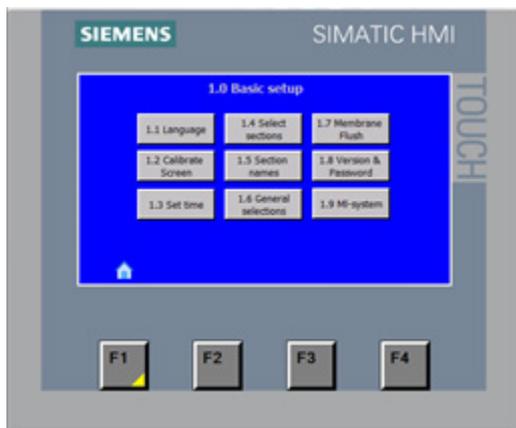
### 1.1

Select language by pressing the flag.

Select the units to use in the screens.

- Litre/hour
- Lb/hour
  
- Celsius
- Fahrenheit

Press the right arrow (F4) to continue.



### 1.0

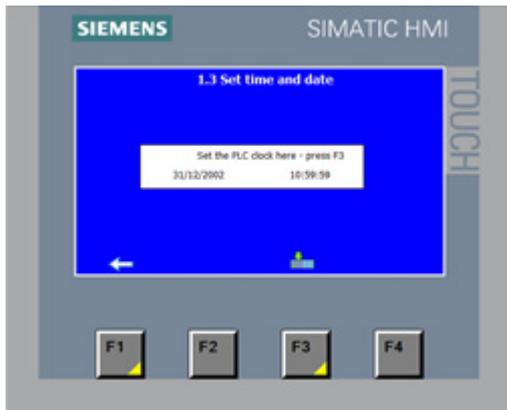
The Basic setup page provides access to pages and selectable functions:

- 1.1-Choice of language
- 1.2-Calibration of screen
- 1.3-Set time and date
- 1.4-Selection of active sections
- 1.5-Selection of names for the sections
- 1.6-General selections (settings)
- 1.7-Membrane flush
- 1.8-Version and change passwords (factory settings)
- 1.9-ML-System (factory settings)

Once you have made your selection(s), press Home (F1) to continue.

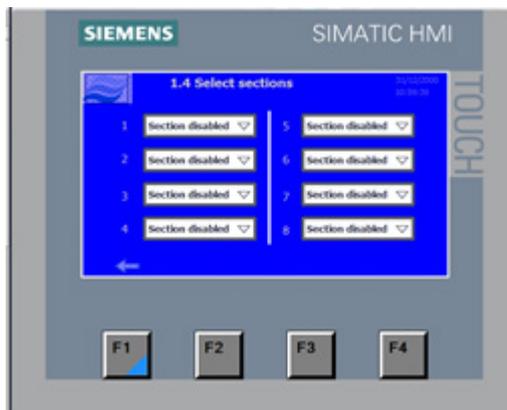
### 1.2

Calibrate Screen: Adjusts the viewing angle, so you can stand upright and operate the screen. When calibrating, do not lean forward in order to get a better view. You will not get the desired effect.



### 1.3

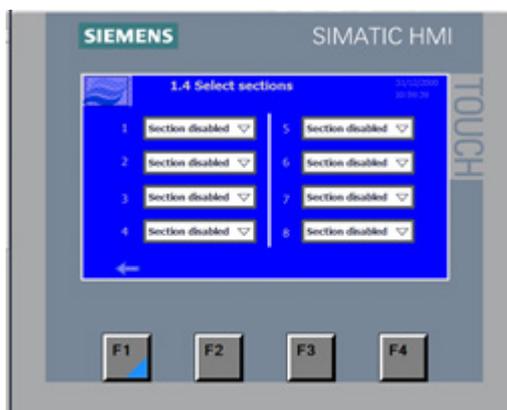
Time/date can be set (stored in the screen only).  
 Note: Remember to press F3 to set the PLC clock



### 1.4

Select which section (zones) is active.  
 A section is defined as a humidity sensor and a valve set connected to the controller

- Section disabled
- Section enabled



### 1.5

Selection of user-defined section names.  
 You can use up to 8 characters to define each section.

Default is 1-2-3...11-12



## 1.6

General selection between options and setups for the general pump station. Please note that some of the options require hardware that has to be ordered together with the pump.

Master pin will be required; 8599

Standard setting is the top choice in the drop-down menus.

Here also shown in bold:

- No CIP function
- CIP function
  
- No fan control
- Aut fan control
- Constant fan control
  
- No EC monitoring
- EC monitoring
- EC monitoring +RV/CO2
- EC monitoring +MB+CO2
  
- No pressostat 3
- Pressostat 3
  
- Aut reset disabled (inlet water low pressure)
- Aut reset enabled (inlet water low pressure)
  
- 1 section – valve set
- 1 section – no valve set
  
- Humidity controlled (20-80% RH)
- Direct controlled (0-10 V)
- % controlled (0-100%)
  
- No Logging
- Logging selected
  
- Rotation check enabled (1.1.1)
- Rotation check disabled (1.1.1)



### 1.7

Select MLP size and select 1-4 or 1-8 sections. This selection is pre-set from factory according to the controller hardware.

Changing password is only possible with the master password.

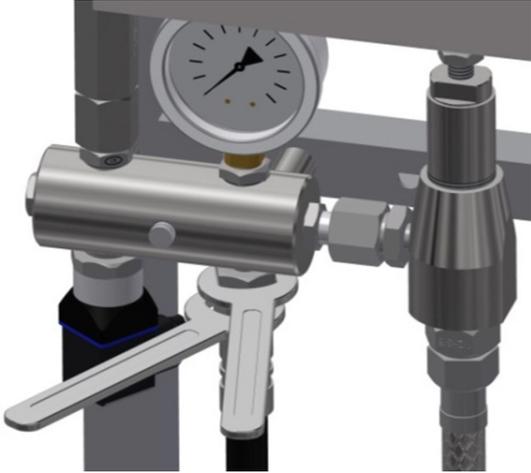
## 4.5 Pump flush procedure

Venting and flushing the high-pressure pump:



Force the HP pump to run by adjusting the set point in a section to 75%.

Let the HP pump flush for 10 minutes.



Turn S1 (on/off switch) to off position, and connect the HP discharge hose to the high-pressure manifold.

Note: It is important to use two wrenches, otherwise there is a danger of the glue breaks and high-pressure manifold leaks.

*Fig. 18: Connecting HP discharge hose*

Leave the main switch turned on and the S1 (on/off switch) in off position. This way the system will perform a flush routine that together with the UV lamp will help keeping the system clean.

# 5 Operation

Every person operating the MLP's controller must have read and understood this manual.

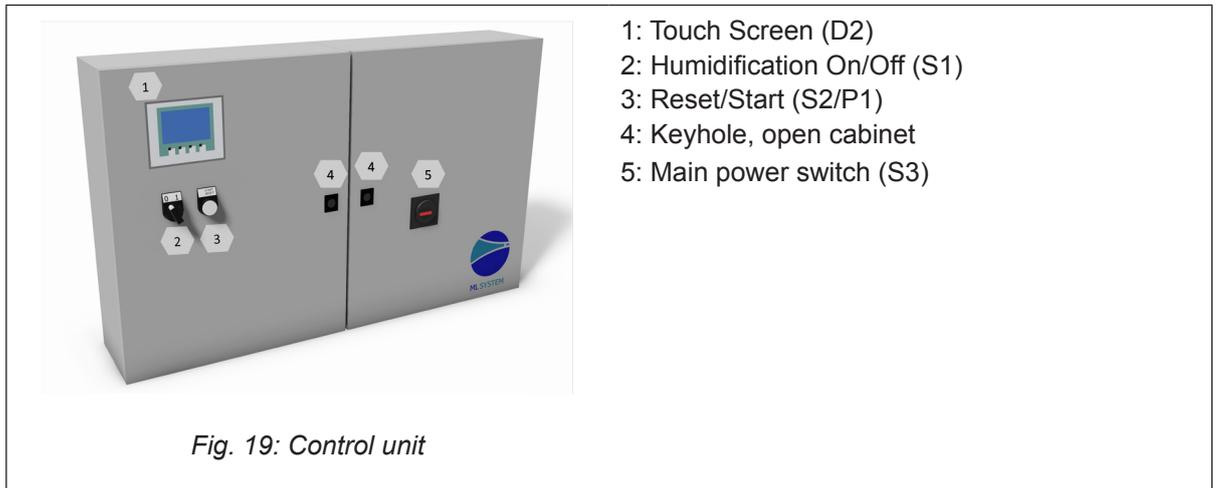
Knowing and understanding the contents of the manuals is a basic requirement for protecting the personnel against any kind of danger, to prevent faulty operation and to operate the unit safely and correctly.

All safety notes in the installation and operation manual for the MLPRO must be observed and adhered to.

All work described in this controller manual may only be carried out by properly trained personnel which is authorised by the customer.

If you have questions after reading this documentation, please contact your Condaire representative who will be happy to assist you.

## 5.1 Overview control unit



## 5.2 Equipment protection

### Pressure switch (inlet water)

The MLP has a pressure switch which monitors the inlet water pressure.

If the inlet water pressure drops, the controller will stop the pump, thus protecting it against dry running. If the water pressure drops, the screen will display 'PM Water pressure too low'.

### Max. hygrostat to protect against excessive humidification

A max. hygrostat can be connected to the control unit. If humidity levels rise to a value that exceeds the value set on the max. hygrostat, the system stops and the alarm lamp flashes. The system will not restart until the alarm is acknowledged by pressing 'Alarm reset'.

### Temperature switch

The high-pressure pump is protected against overheating by a temperature circuit that measures the current temperature in the pump. The temperature limits can be set individually.

If the temperature exceeds 50°C, the pump will stop immediately and must be reactivated via the reset button once the temperature has dropped again.

### Description of touch screen

The screen has four F keys. Each of the keys is used to navigate between the different screen images. When these are used, the individual key function is indicated in the description directly above the key.

The actual touch screen can be operated by gently tapping the relevant screen 'buttons' with your finger.

If you want to change a numerical value, press the relevant number key. This will make a numerical keyboard appear on which the new value can be entered. Remember to enter any comma that may be needed.

Any incorrect entry can be deleted using the Backspace button. Once a new value has been entered, press Enter at the bottom right of the image using the numerical keyboard.

### **Protection against unwanted changes**

On the display, the control unit settings are password-protected against unwanted changes. The different user groups have different passwords and different rights.

User (no password) can read operational information and alarms.

User 1 (password 1234) as above + changes of set points.

Technician (password 197) as above + changes of operational parameters and choice of membrane rinse.

Master (password 8599) as above + selectable options, reset to factory settings.

Technician xxxx, as above + factory / service menu.

Additionally, there are areas of the screen that are protected by extra passwords, to which only the ML System has access.

When a password is required in order to change parameters, a screen will appear where the password can be entered. Once the password has been entered, the system is unlocked for five minutes.

## **5.3 Alarm messages**

This page shows alarms and operational messages. The alarm display contains information about when an alarm was triggered and when it was reset. The page shows active alarms and previous alarms. Please note that the system does not have a backup memory, which means that previous alarms will be lost in case of power failure.

### **Max.Hygrostat Sect. 1...12**

Max. hygrostat in the current section has dropped out due to excessive humidity. The system has stopped and must be restarted once the humidity level has dropped.

### **Water pressure too low**

The water pressure on the water inlet to the pump station is too low.

### **Sensor error Section 1...12**

The signal from one of the humidity sensors is outside the expected interval of 20 to 80% RH. In order to ensure that it will be possible to start up the system in very dry conditions, the 20% limit is reduced to 5% RH for the first 10 minutes after the system is switched on. If an alarm is triggered, only the affected sections will be stopped.

### **Pump too hot**

The water is too hot – above 50°C. The system has stopped and must be restarted once the temperature has dropped.

### **Thermal relay error**

The protective motor switch for the high-pressure pump is disengaged. Engage the relay and try restarting.

**UV lamp error**

There is an error on the UV lamp

**CIP dosing time alarm (option)**

The CIP weight has not given a signal within the expected time

**CIP weight error (option)**

The CIP weight gives an incorrect signal

**CIP overdosing last day (option)**

The CIP self-monitoring system is defect due to possible overdosing. Please call for service

**Operational message display****The pump will start automatically after delay.**

The pump has been paused, e.g. after disinfection. The pump will start automatically after the expiry of the set time.

**Service**

The pre-set service interval has been reached. The system must be serviced!

**UV lamp error**

The UV bulb or ballast is broken.

**UV lamp soon to be changed**

Warning 3 weeks prior to UV lamp change / service.

**UV lamp error too old**

Replace UV lamp and reset service interval.

## 5.4 Controller menu



2.0

Normal operation page

Shows up to four sections at a time. The names of the section changes colour according to the current status.

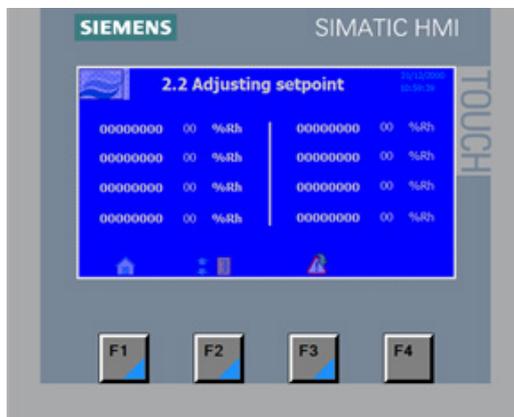
- White – normal inactive
- Green – active section – humidification is on
- Yellow flash – humidity out of range
- Red flashing – alarm on the section

Humidity, set point and load for each section.

Just tap the set point to go to the set point adjust screen.

If an alarm or message is triggered, a bar will appear across the screen, showing the message.

Access to the menu page – the alarm page – the page for other displays and to the page for section 5-8.



2.2

Changes of set points for the individual section.



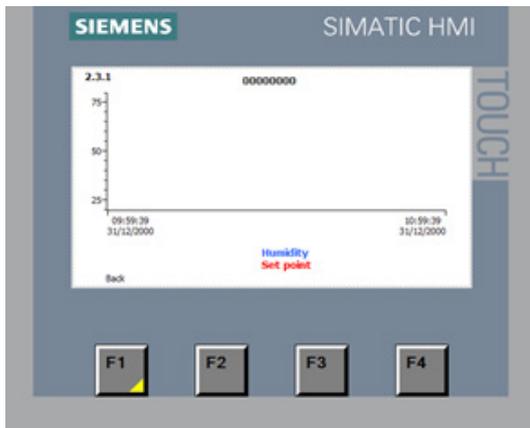
### 2.3

Shows the pump temperature and the actual flow – calculated after the setting for each section.

If the EC option is selected, lines for the actual EC monitoring will also be displayed.

Hour counter – select between pumps and each section.

Access to the Trend curve for each section.

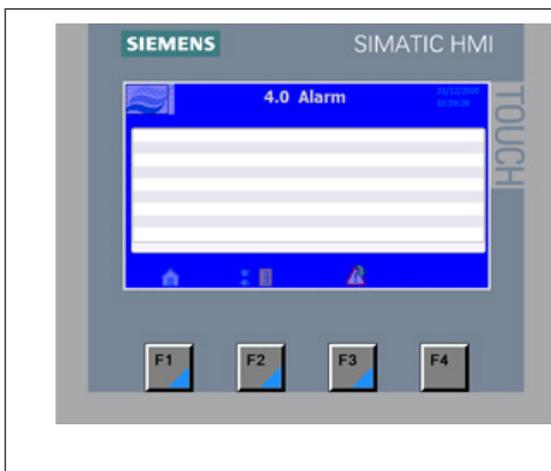


### 2.3.1

Graphic display of humidity development in the relevant section for the last hour.

Please note that this function will be reset when the power to the screen is cut.

## 5.4.1 Alarms and user messages



### 4.0

All alarms and operational messages are shown, showing the time at which they occurred and the time when the alarm stopped.

Please note that the alarm log will be reset after a power cut.

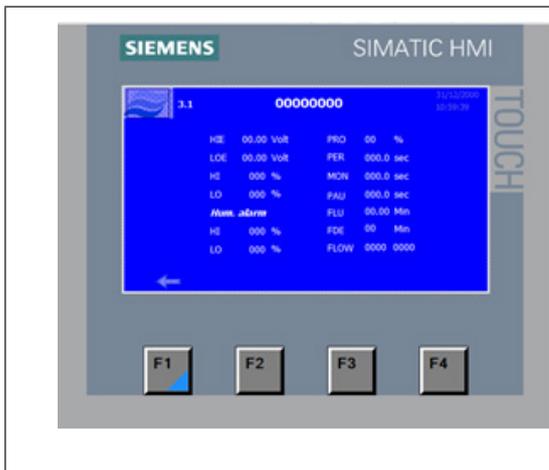
## 5.4.2 Parameter change menu



### 3.0

Menu for the pages where the different parameters can be changed.

## 5.4.3 Settings for section parameters



### 3.1

Section parameters for sensor scaling and regulator settings

These values should be changed by Condair's technicians only.

Hum.Alarm

Set the HI and LO. The alarm appears if the humidity becomes lower than the pre-set value in HI or lower than the pre-set value in LO.

## 5.4.4 Pump

The screenshot shows the '3.9 Pump setup' screen on a SIMATIC HMI. The screen is divided into several sections:

- Pressostat del:** 005.0 sec
- Max.SP:** 96 %/h
- Start after disinfection:** Delay: 00
- Pump Temperature:**
  - Actual Temp: 000.0000
  - Temp.lim1: 28 °C - 82 °F
  - Temp.lim2: 28 °C - 82 °F
  - Temp.lim3: (dropdown menu)
- UV monitoring:**
  - UV set: 0000 / 0000
  - UV lamp: 000 days left

At the bottom of the screen, there are four function keys labeled F1, F2, F3, and F4. A 'UV reset' button is also visible in the bottom right corner of the main display area.

3.9  
Pump alarm settings

These values should be changed by Condair's technicians only.

## 5.4.5 Conductivity monitoring, humidity logging and CIP (options)



3.10

EC controller set point

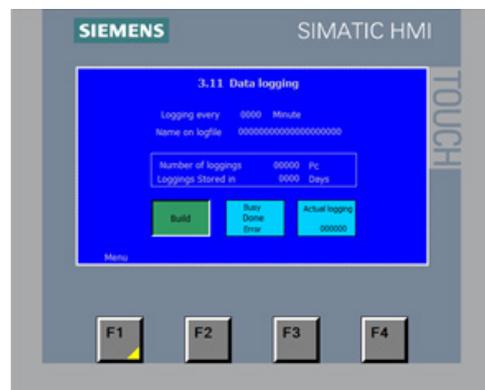
These values should be changed by Condair's technicians only.



3.10.1

Scaling EC sensors

These values should be changed by Condair's technicians only.



3.11

For detailed description in the logging option, read Condair document TI086.

	<p>3.11.1 Build a log file</p>
	<p>3.12 Select the days you want to run a CIP function – CIP on days (one or two days each week)  Select the CIP start time.  Select the dosing amount (can only be selected in intervals of 5 ml per 50 litres of water)</p>

## 5.5 Weekly inspection

During operation, the MLP and the humidification system have to be inspected weekly. On this occasion, check the following:

- Entire humidification system for leakage
- Electric installation for damage
- Operating display for warning or error messages
- UV filters
- Pressure drop over filters
- Water treatment systems such as carbon filter, softener, RO

If the inspection reveals any irregularities (e.g. leakage, error indication) or any damaged components take the MLP out of operation. Have a qualified specialist or Condair service technician correct the damage or malfunction.

Fill in the 'Service form for weekly monitoring of humidifying systems' provided in the appendix of this manual. Failing to do so could affect your warranty

# 6 Maintenance

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## 6.1 Important notes on maintenance

### Qualification of personnel

All maintenance work must be carried out only by well-qualified and trained personnel authorised by the owner.

Maintenance and repair of the electrical installation of the Condair MLP must be carried out only by qualified personnel (e.g. electrician) who are aware of possible dangers and implications.

It is the owner's responsibility to verify proper qualifications of the personnel.

### General note

The instructions and details for maintenance work must be followed and upheld.

Only the maintenance work described in this documentation may be carried out.

Only use original ML-System spare parts to maintain the warranty on the system.

### Safety

Before maintenance is initiated, the MLPRO must be taken out of operation in accordance with instructions in section "Taking the MLPRO out of operation" and protect against unintentional switching on.

The MLPRO must be cleaned and disinfected at the intervals described in this manual and the cleaning work has to be carried out correctly by trained and instructed personal.



### **WARNING!**

Poorly maintained humidification systems may endanger health. Therefore it is mandatory to observe the specified maintenance intervals and to carry out maintenance work in strict accordance with the instructions.

---

## 6.2 Maintenance work

To ensure safe, hygienic and economic operation of the MLPRO, vital components must be checked and maintained periodically according to the table below. The maintenance intervals and maintenance work stated below are guideline values. Local conditions, quality of the water, etc. could influence the maintenance intervals. After having carried out the maintenance work, fill in the maintenance checklist, sign it and reset possible maintenance indications. The relevant personnel are fully liable for any maintenance work not carried out.

Service, to be carried out	Half year	Each year	Every 2 years	Every 4 years
<b>Review of the system</b>				
Testing of the system's overall function	X	X	X	X
Meter reading of water consumption (if present)	X	X	X	X
Reading of pump running hours	X	X	X	X
Logbook registration	X	X	X	X
Control weekly monitoring checklist	X	X	X	X
<b>Water treatment system / incoming water</b>				
Analysis of water hardness (in case of water softening)	X	X	X	X
<b>Pump unit</b>				
Replacement of filters	X	X	X	X
Check the condition of the pump (pressure & noise)	X	X	X	X
Testing of solenoid valves and replacement if necessary	X	X	X	X
Change gasket kit in high pressure relive		X	X	X
Functional testing of max hygostat circuit	X	X	X	X
Functional testing of high pressure gauge	X	X	X	X
Functional testing of pressure switch (pressostat)	X	X	X	X
Service inspection of PAHT pump (age 2 years or 8000 running hours)			X	X
Testing of ON/OFF valve and replacement if necessary	X	X	X	X
<b>UV system</b>				
Functional testing of UV systems	X	X	X	X
Cleaning of quartz glass on UV systems	X	X	X	
Replacement of UV-lamp		X	X	X
Replacement of quartz glass				X
<b>Humidity sensors</b>				
Testing and adjusting of humidity sensors. Replaced if +/- 10% deviation	X	X	X	X
Checking of max humidity controller (max hygostat)	X	X	X	X
<b>Control units</b>				
Analysis and testing of programming	X	X	X	X
Transfer relay replacement		X	X	X
Testing of contact K1 and replacement if necessary		X	X	X
<b>Hygiene</b>				
Extraction of water sample from pump (Bacterie test)	X	X	X	X
Desinfection of the system	X	X	X	X

## 6.3 Preventive spare parts chart

<b>MLP recommended preventive/critical spare parts list, 4 year maintenance cycle</b>																
<b>Pump serial number from 2014001 to 2015999</b>																
<b>ML-System</b>		MLP 100	MLP 300	MLP 500	MLP 800	MLP 1000	MLP 2*800	MLP 2*1000	MLP 3*800	MLP 3*1000	Technical lifetime	every (1/2) year	every (1st) year	every (2end) year	every (4th) year	
		Pcs needed														
Designation	Part number															
<b>Water filter</b>																
Filter 1 micron 20"	104550000			1	1	1	1	1	1	1	6 months	X	X	X	X	
Filter 1 micron 9 7/8"	104560000	1	1								6 months	X	X	X	X	
O-ring for water filter	430020050	1	1	1	1	1	1	1	1	1	24 months			X	X	
<b>UV Filter</b>																
S287RL – UV lamp for S1Q-PA	104594000	1									12 months		X	X	X	
14 W S287 RL for new with Ballast in head	104594500	1	1								12 months		X	X	X	
19 W S2Q-PA/2 light pipe	104595000		1	1							12 months		X	X	X	
26 W S5Q-PA/2 light pipe	104596000				1	1					12 months		X	X	X	
39 W S8Q-PA/2 light pipe	104597000						1	1	1	1	12 months		X	X	X	
12 W QS-212 Quartz	104582000	1									48 months				X	
19 W QS-330 Quartz	104583000		1	1							48 months				X	
26 W QS-463 Quartz	104584000				1	1					48 months				X	
39 W / 46 W QS-810 Quartz	104586000						1	1	1	1	48 months				X	
<b>Electrical control system</b>																
Print frame relay	680010177	1	1	1	1	1	2	2	2	2	12 months		X	X	X	
Contactore (K1) Siemens	349010205	1	1	1	1	1	2	2	2	2	48 months				X	
<b>PAHT Pump (max 8000h)</b>																
Service kit PAH 2	104466001	1									8000h/24 months			X	X	
Service kit PAH 4/6.3	104466002		1	1							8000h/24 months			X	X	
Service kit PAH 10/12.5	104466003				1	1	2	2	2	2	8000h/24 months			X	X	
<b>PAH coupling</b>																
Service kit coupling PAH 2/4	240020071										48 months					
Service kit coupling PAH 6.3	240020072										48 months			X	X	
Service kit coupling PAH 10/12.5	240020073										48 months			X	X	
<b>Pressure regulator</b>																
Service kit	104481000	1	1	1	1	1	1	1	1	1	12 months		X	X	X	
<b>On/off valve</b>																
On/off valve	106521000	1	1	1	1	1	1	1	1	1	48 months				X	
<b>Valve at manifold</b>																
Check valve 1/4"	510020000	1	1								24 months			X	X	
Check valve 3/8"	510020005			1	1	1	2	2	4	4	24 months			X	X	
<b>Disinfection</b>																
Sanosil S010 Ag (1 liter bottle)	155405000	1	1	1	1	1	2	2	2	2		X	X	X	X	
<b>Water sample</b>																
Water sample	155605000	1	1	1	1	1	1	1	1	1		X	X	X	X	



## 6.5 Troubleshooting

### Qualification of personnel

Have faults eliminated by qualified and trained personnel only. Malfunctions caused by the electrical installation must only be repaired by authorised personnel (e.g. electrician).

Repair work on the high-pressure pump may only be carried out by your Condair representative's service technician.

### Safety

When eliminating faults, the MLP must be taken out of operation and prevented from further inadvertent operation.

Make sure the power supply to the MLP is disconnected (test with a voltage tester) and that the stop valve in the water supply line is closed.

### 6.5.1 Malfunction with error indication

Error message	Cause	Remedy
<b>Max. humidistat</b>	Max. humidistat has been tripped, due to high humidity	Check that ventilation is on Set point is correct Incoming set point signal OK
	Max. humidistat defect or incorrectly set	Change max. humidistat Set correct rel. humidity, e.g. 85% RH
	Max. humidistat circuit damaged or not installed correctly	Check circuit for faults Check settings for max. humidistat in controller are correct If no max. humidistat, a jumper must be installed over terminals (4 & 4+)
<b>Inlet water pressure too low</b>	The inlet water pressure is too low	Check the inlet pressure at maximum flow for pump station according to product data
	The Inlet water pressure is too low for short periods (if inlet pressure and flow seems ok when measured)	Check the water installation for periodically high consumption e.g. cleaning, tank filling and maintenance work
	Defect Inlet pressure switch [PS]	Replace pressure switch
<b>Sensor error</b>	Humidity sensor missing or defect	Install humidity sensor
	Wiring to humidity sensor damaged or incorrectly installed	Replace wiring according to electrical diagram
	Humidity outside range (below 20% RH or above 80% RH)	Check the humidity at sensor and reset if below 20% RH
	Sensor scaling is wrong	Scale the sensor correctly in the controller

<b>Error message</b>	<b>Cause</b>	<b>Remedy</b>
<b>Stop - Pump too hot</b>	Water flow through high-pressure pump too low	Check flush valve MV5 at step valve block opens and nozzle are not clogged
	Ambient temperature too high at pump location (max. 25°C)	Lower ambient temperature in pump room (max. 25°C)
	Incoming water too warm	Lower inlet water temperature (max. 15°C)
	Inlet pressure / flow missing	Defect inlet valve [MV1] Water supply blocked / closed
	Damaged thermostat or cable [T]	Change thermostat and cable
	High-pressure pump defect	Locate cause of failure, e.g. running hours exceeded 8,000, particles / dirt in system, missing water pressure, defect inlet valve. Change pump when cause of failure has been established and corrected

### 6.5.2 Resetting the error indication

Press the reset button underneath the touch screen.

Note: If the fault has not been eliminated, the error indication reappears after a short while.

### 6.5.3 Malfunction without error indication

The following table provides malfunctions that do not issue messages, notes on the cause of malfunction and information on how to eliminate the source of trouble.

<b>Malfunction</b>	<b>Cause</b>	<b>Remedy</b>
<b>Water's dripping from modules/flex/nozzles</b>	Defect / clogged nozzles	Replace nozzles
	Zone valves defect / leaking	Repair valves
	Air in system	Air the entire system
	Pressure too low	Check / repair PAHT pump
	Water below 5 yS/cm	Adjust RO
<b>Condair MLP humidifies permanently.</b>	Nominal humidity value too high.	Reduce nominal humidity value.
	Ambient humidity very low.	No measures to be taken, just wait.
	The internal controller is activated, although an external controller is connected	Deactivate internal controller.
<b>Maximum humidification capacity not reached.</b>	Air change too high	Contact your Condair supplier.
	Defective zone valves	Check the function of valves
	Hygostat defect	Check calibration and function
	Spray nozzles clogged.	Remove nozzles and replace them
	Hoses to nozzle pipes are leaking or disconnected, or nozzle pipes are leaking.	Check hoses/nozzle pipes and seal, as required
<b>Control unit is switched on but the display of the control unit does not show anything.</b>	Service switch in power supply line is off.	Set service switch in power supply line to On position.
	Fuses of the power supply line blown	Have an electrician replace fuses of the power supply line.
	Fuse of control unit blown	Have an electrician replace fuse of the control unit.
	Display or control board defective	Have a Condair service technician replace the display or the control board.

# 7 Product data

	MLP100	MLP300	MLP500	MLP800	MLP1000	MLP 2X800	MLP 2X1000	MLP 3X800	MLP 3X1000
Capacity = water consumption [L/h] 50 Hz	10-100	30-265	35-440	60-790	90-1000	60-1580	90-2000	60-2370	90-3000
Capacity = water consumption [L/h] 60 Hz	12-120	36-318	42-528	72-948	108-1200	72-1896	108-2400	72-2844	108-3600
Weight [kg]	50-65	55-70	65-80	75-95	85-100	155-170	160-175	175-190	180-200
Dimension w x d x h [mm]	660x500x1300	660x500x1300	660x500x1300	660x500x1300	660x500x1300	820x700x1600	820x700x1600	1400x700x1600	1400x700x1600
Water supply dynamic pressure [bar]	1...4	1...4	1...4	1...4	1...4	1...4	1...4	1...4	1...4
Pipe inlet "RG"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	3/4"	2x3/4"	2x3/4"
Pipe outlet "RG"	1/4"	1/4"	3/8"	3/8"	3/8"	2x3/8"	2x3/8"	4x3/8"	4x3/8"
Sound level [dB(A)]	<75	<80	<80	<80	<80	<80	<80	<80	<80
<b>50Hz</b>									
Electrical conn. 3-phased	<b>Un = 220-240 V</b>								
Absorbed Power [kW]	1.2	1.5	2.4	3.3	4.2	6.3	8.0	8.9	11.6
Pre fuse	16 A	16 A	16 A	16 A	20 A	25 A	32 A	50 A	50 A
Electrical conn. 3-phased	<b>Un = 308-415 V</b>								
Absorbed Power [kW]	1.2	1.5	2.4	3.3	4.2	6.3	8.0	8.9	11.6
Pre fuse	16 A	16 A	16 A	16 A	16 A	20 A	20 A	25 A	32 A
<b>60Hz</b>									
Electrical conn. 3-phased	<b>Un = 208-277 V</b>								
Absorbed Power [kW]	1.1	1.8	2.3	4.0	4.0	7.4	7.4	11.2	11.2
Pre fuse	16 A	16 A	16 A	16 A	20 A	32 A	32 A	50 A	50 A
Electrical conn. 3-phased	<b>Un = 400-480 V</b>								
Absorbed Power [kW]	1.4	2.1	2.6	3.6	4.4	6.8	8.4	9.7	12.5
Pre fuse	16 A	16 A	16 A	16 A	16 A	20 A	20 A	25 A	25 A

## 8 Declaration of conformity



### EC - Declaration of Compliance

**Manufacturer:**

Condair A/S  
Parallelvej 2  
8680 Ry

**We hereby declare, that the following pump systems for humidification purposes:**

ML RO 100; ML RO 300; ML RO 500; ML RO 800; ML RO 1000; ML RO 1500;  
HP 100; HP 200 VFD; HP 300; HP 500; HP 500 VFD; HP 800; HP 800 VFD; HP 1300 VFD  
HP RO 100; HP RO 200 VFD; HP RO 300; HP RO 500; HP RO 500 VFD; HP RO 800; HP RO 800 VFD  
MLP 100; MLP 300; MLP 500; MLP 800; MLP 1000; MLP 2x800; MLP 2x1000; MLP 3x800; MLP 3x1000  
MLP RO 100; MLP RO 300; MLP RO 500; MLP RO 800  
MLP HRO 100; MLP HRO 300  
MLPD 300; MLPD 500; MLPD 1000;  
MLPG 100; MLPG 300; MLPG 500; MLPG 800; MLPG 1000;

**are manufactured in accordance with the following EC directives:**

- 2006/42/EC, Directive on machinery
- 2014/30/EC, EMC (ElectroMagnetic Compatibility) Directive
- 2014/35/EC, The low voltage directive
- 2011/65/EC, ROHS Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

**The following harmonized standards have been applied:**

- EN ISO 12100:2011, Safety of machinery – General principles for design – Risk assessment and risk reduction
- EN ISO 13849-1:2008, Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design.
- EN 55022:2011+AC, Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement
- EN 60204-1:2006 + amendments, Safety of machinery – Electrical equipment of machines – Part 1: General requirements

**The following international standards and technical specifications are used:**

- IEC 60034-1 ed. 12.0, Rotating electrical machines - Part 1: Rating and performance
- IEC 60034-5 ed. 4.1, Rotating electrical machines - Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) – Classification
- IEC 60034-6 ed. 2.0, Rotating electrical machines - Part 6: Methods of cooling (IC Code)
- IEC 60034-8 ed. 3.1, Rotating electrical machines - Part 8: Terminal markings and direction of rotation
- IEC 60320 ed. 2.1, Appliance couplers for household and similar general purposes - Part 1: General requirements

DK-Ry, November 26, 2015



Lasse Andresen, Technical Manager

Condair A/S  
Parallelvej 2, DK-8680 Ry  
Tel. +45 8788 2100  
www.condairsystems.dk

## 9 Appendices

### Modbus TCP/IP Gateway IP translator (option)

Connect the MODBUS TCP/IP, to a sub net for Condair PLC.

Allan Bradley 9300-ENA

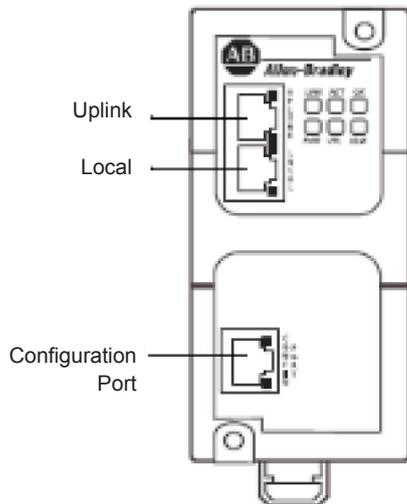
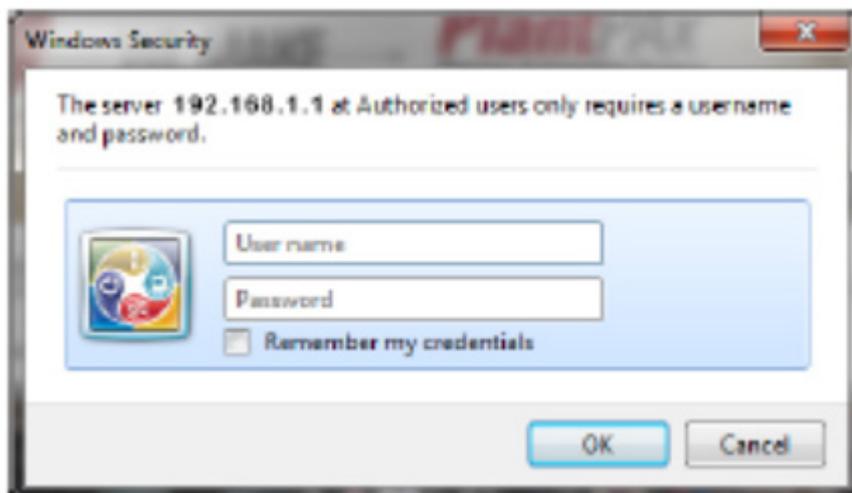


Fig. 20: Allan Bradley 9300-ENA

Change your IP on your PC's **network interface controller** to **192.168.1.3** and the **Subnet mask** to **255.255.255.0**

**Connect to the Allan Bradley 9300-ENA Unit according to the following steps:**

1. Open a browser window
2. Enter the default IP address of 192.168.1.1 in the address bar, press Enter, and note the following defaults
  - \*Username should be left blank
  - \*password is PASSWORD



**Allen-Bradley 9300-ENA**

Expand Minimize

Home

- Basic Configuration
- Network
- Security
- Miscellaneous
- Applications
  - 1:1 NAT
  - Discovery
- System
  - Backup/Restore
  - Performance
  - Restart/Reset
  - Support
  - Upgrade Firmware

Network Configuration

**Uplink Interface (Public)**

IP Address: 10.20.30.1

Subnet Mask: 255.255.255.0

Default Gateway: 0.0.0.0

Allow Configuration: Disabled

**Local Interface (Private)**

IP Address: 192.168.100.200

Subnet Mask: 255.255.255.0

Allow Configuration: Disabled

**Configuration Interface**

DHCP Client: Enabled (No response from DHCP server!)

Assigned IP Address: 192.168.1.1 (default)

Assigned Subnet Mask: 255.255.255.0 (default)

Apply Changes Discard

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UPLINK  
LOCAL  
CONFIG

Public IP address for the module.  
Change the IP to fit to the network for the CTS/BMS system.

**Allen-Bradley 9300-ENA**

Expand Minimize

Home

- Basic Configuration
- Network
- Security
- Miscellaneous
- Applications
  - 1:1 NAT
  - Discovery
- System
  - Backup/Restore
  - Performance
  - Restart/Reset
  - Support
  - Upgrade Firmware

Configuration Basic Example Advanced Example Factory Cells Example

Network Address Translation

1:1 NAT: Enabled

Network Address Translation Rules

Active	Public IP (Range)	Private IP (Range)	Comment	Edit / Del
<input checked="" type="checkbox"/>	10.20.30.5	192.168.100.220	MODBUS to PLC	
	<a href="#">New IP Address</a>	<a href="#">New IP Address Range</a>		

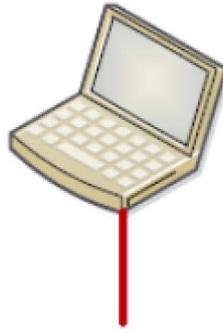
Apply Configuration applied successfully

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Public IP address for the MODBUS connection. Change the IP to fit to the network for CTS/BMS system.

Use this address in the MODBUS connection as server/slave address.

Example net 10.20.30.xx



10.20.30.10

GW = None (no L3 switch or router)



10.20.30.1 (Public IP)

GW = None (no L3 switch or router)

1:1 NAT rules	
Public	Private
10.20.30.5	192.168.100.220



192.168.100.200 (Private IP)

**IMPORTANT!!!!**  
The machine's new gateway is the IP address of the ENA private port (192.168.100.200)

Public address of the machine is 10.20.30.5



PLC  
192.168.100.220



Touch screen

GW = 192.168.100.200

<b>MLP Modbus TCP/IP</b>	<b>Technical data</b>		
	TD139GB-00	25-02-02	LJ

### MODBUS communication TCP/IP

ML-System humidification controls with PLC control is available with an option that allows connection to CTS / BMS systems via Modbus TCP / IP.

The physical connection is made with a standard Ethernet cable that connects the PLC controller with a standard RJ45 connector.

The option includes changes in the software, and a list of setup and the addresses of parameters to be transferred between the PLC system and CTS / BMS.

The connection gives actual humidity for each section and general information on the system status. And it is possible to change setpoint from the BMS system. In addition, there is also a current "status" integer that describes the plant's operational status so alarms can be transferred to the BMS.

**The Modbus TCP / IP connection is set up with ML-System's PLC as Server/(slave) – and the BMS as a client/(master).**

IP PLC: 192.168.135.220 Subnet mask 255.255.255.0  
Connect ID 1  
Port 502  
MB Data addresses 40001 – 40033  
Data format Integer (int)

Setpoint 1	R	Integer	40001	%RH
Setpoint 2	R	Integer	40002	%RH
Setpoint 3	R	Integer	40003	%RH
Setpoint 4	R	Integer	40004	%RH
Setpoint 5	R	Integer	40005	%RH
Setpoint 6	R	Integer	40006	%RH
Setpoint 7	R	Integer	40007	%RH
Setpoint 8	R	Integer	40008	%RH
Setpoint 9	R	Integer	40009	%RH
Setpoint 10	R	Integer	40010	%RH
Setpoint 11	R	Integer	40011	%RH
Setpoint 12	R	Integer	40012	%RH
Humidity 1	W	Integer	40013	%RH
Humidity 2	W	Integer	40014	%RH
Humidity 3	W	Integer	40015	%RH

Humidity 4	W	Integer	40016	%RH
Humidity 5	W	Integer	40017	%RH
Humidity 6	W	Integer	40018	%RH
Humidity 7	W	Integer	40019	%RH
Humidity 8	W	Integer	40020	%RH
Humidity 9	W	Integer	40021	%RH
Humidity 10	W	Integer	40022	%RH
Humidity 11	W	Integer	40023	%RH
Humidity 12	W	Integer	40024	%RH
Tank level	W	Integer	40025	%
Actual flow	W	Integer	40026	l/h (lb/h)
EC Ro	W	Integer	40027	µS
EC MB1	W	Integer	40028	µS
EC MB2	W	Integer	40029	µS
EC tank	W	Integer	40030	µS
Status mode	W	Integer	40031	
On/Off	W	Boolean	40032.1	
alarm general	W	Boolean	40032.2	
Level in tank ok	W	Boolean	40032.3	
Water pressure low	W	Boolean	40032.4	
Pump overheated	W	Boolean	40032.5	
Pump2 overheated	W	Boolean	40032.6	
tank overfull	W	Boolean	40032.7	
UV error	W	Boolean	40032.8	
UV age warning	W	Boolean	40032.9	
UV age alarm	W	Boolean	40032.10	
Sensor error	W	Boolean	40032.11	
MaxHyg error	W	Boolean	40032.12	
Cip Alarm	W	Boolean	40032.13	
EC RO alarm	W	Boolean	40032.14	
EC MB1 alarm	W	Boolean	40032.15	
EC MB2 alarm	W	Boolean	40032.16	
EC tank high alarm	W	Boolean	40033.1	
EC tank low alarm	W	Boolean	40033.2	
Too many pump stopped	W	Boolean	40033.3	
Internal setpoint	W	Boolean	40033.4	
Not used	W	Boolean	40033.5	
Not used	W	Boolean	40033.6	

Not used	W	Boolean	40033.7	
Not used	W	Boolean	40033.8	
Not used	W	Boolean	40033.9	
Not used	W	Boolean	40033.10	
Not used	W	Boolean	40033.11	
Not used	W	Boolean	40033.12	
Not used	W	Boolean	40033.13	
Not used	W	Boolean	40033.14	
Not used	W	Boolean	40033.15	
Not used	W	Boolean	40033.16	

<b>Set point</b>	<b>Technical data</b>		
	TD020GB-00	10-12-14	JLJ/KK

The ON-time for the pump, when the humidity is between setpoint and (setpoint - proportional band), can be calculated after the formula:

$$T(\text{on}) = \text{Period time} \times (1 - (\text{humidity level} - \text{Setpoint} + \text{Pro.band})/\text{Pro.band})$$

**Example:** Period time: 3 min., Setpoint: 80% RH, Pro.band: 30%, Minimum ON-time 0,2 min.

**With the values from the example above the ON-time for 78, 70 og 60% RH is calculated:**

If the humidity level in the room is 78% RH, the ON-time for the pump is:

$$T(\text{on}) = 3 \times (1 - (78 - 80 + 30)/30) = 3 \times (1 - 0,933) = 0,20 \text{ min.} = 12 \text{ sec.}$$

If the humidity level in the room is 70% RH, the ON-time for the pump is:

$$T(\text{on}) = 3 \times (1 - (70 - 80 + 30)/30) = 3 \times (1 - 0,667) = 1,00 \text{ min.}$$

If the humidity level in the room drops to 60% RH, the ON-time for the pump is:

$$T(\text{on}) = 3 \times (1 - (60 - 80 + 30)/30) = 3 \times (1 - 0,333) = 2,00 \text{ min.}$$

**New Proportional band:** If the proportional band in the above example is reduced to 20% instead, the ON-time for the pump will change quicker when the humidity drops in the room.

Period time: 3 min., Setpoint: 80% RH, **Pro.band:** 20%, Minimum ON-time 0,2 min.

If the humidity level in the room is 78% RH, the ON-time for the pump is:

$$T(\text{on}) = 3 \times (1 - (78 - 80 + 20)/20) = 3 \times (1 - 0,90) = 0,30 \text{ min.} = 18 \text{ sec.}$$

If the humidity level in the room is 70% RH, the ON-time for the pump is:

$$T(\text{on}) = 3 \times (1 - (70 - 80 + 20)/20) = 3 \times (1 - 0,50) = 1,50 \text{ min.}$$

If the humidity level in the room drops to 60% RH, the ON-time for the pump is:

$$T(\text{on}) = 3 \times (1 - (60 - 80 + 20)/20) = 3 \times (1 - 0,0) = 3,00 \text{ min. (100%).}$$

If the humidity level in the room drops below 60% RH, (setpoint - pro. band) the pump will run all the time - Minimum OFF-time (PAU).

Note that the running time of the pump changes quicker when the proportional band is lower.

New Period time: If the period time is changed, the ON- and OFF-times will change accordingly.

Example: Period time in the example changes from 3 to 5 min.

Period time: 5 min., Setpoint: 80% RH, Pro. band: 20%, Minimum ON-time 0,2 min.

If the humidity level is 70% RH, the ON-time for the pump will be:

$$T(\text{on}) = 5 \times (1 - (70 - 80 + 20)/20) = 5 \times (1 - 0,50) = 2,50 \text{ min.}$$

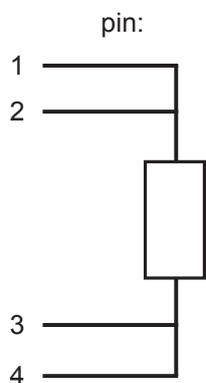
<b>ML TS-PT1000</b> <b>Temperature sensor</b>	<b>Technical data</b>		
	TD136GB-00	15-03-11	MLK/KK

- TS-PT1000 is a PT1000 temperature sensor mounted in stainless steel AISI304 housing
- M12 sensor connector.
- Accuracy:            +/-0.3 °C @ 0 °C  
                              +/-0.7 °C @ 80 °C
- 3 types of thread available:
  - M6
  - 1/8" pipe thread
  - 1/4" pipe thread

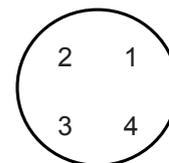


## Connection

PT1000 sensor element:



pin numbering, M12 socket



## Environment:

Degree of protection:	IP65 (IEC 60529) installed with correct M12 connector
Temperature, operation:	-30 °C to 80 °C
Temperature, stock:	-30 °C to 85 °C

## Mechanical specifications

Length:	41.7 mm
Hex width, M6 & 1/8":	14 mm
Hex width, 1/4":	19 mm
Material, housing:	Stainless steel, AISI 304
Material, M12 socket:	Noryl, black
Weight:	M6 & 1/8": 12 g. 1/4": 21 g.

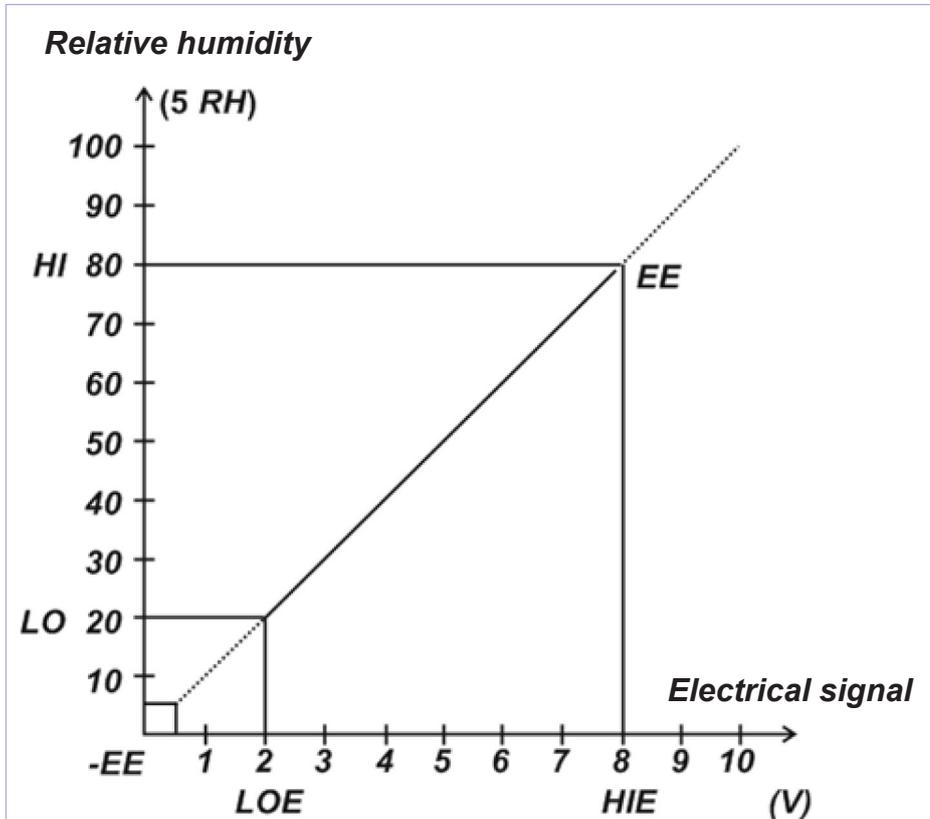
## Accessories

---

2 m cable with M12 connector  
Gasket

Note: cable colours: 1 = brown; 2 = white; 3 = blue; 4 = black

<b>Electrical settings in the Humidity Regulator</b>	<b>Technical data</b>		
	TI031GB-01	27.11.15	LAA/KK

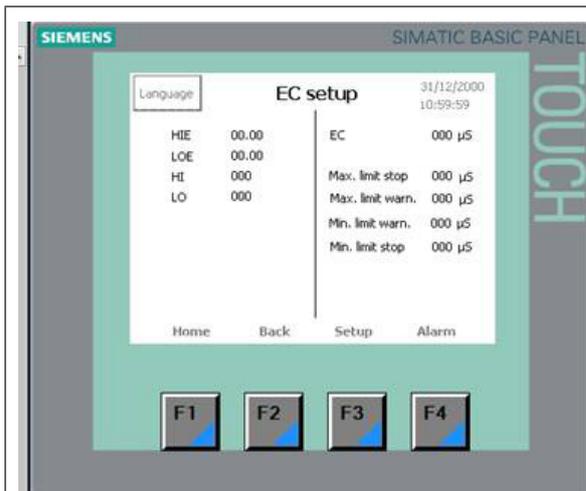


- HIE: Highest electrical input
- LOE: Lowest electrical input
- HI: Highest reading in display
- LO: Lowest reading in display

0-10 minutes after switch on LOE is 0.5 V and LO is 5 % RH  
 After 10 minutes LOE changes to 2 V and LO to 20 % RH

## Overview of calibration for conductivity sensors and converters (amplifiers)

Sensor	Converter	Item: CS-100 Conductivity sensor std. sensitivity ML nr: 655.050.023	Item: CS-101 Conductivity sensor high sensitivity ML nr: 655.050.026	Item: CS-110 Conductivity sensor, std. sens. long ML nr: 655.050.024	Item: CS-111 Conductivity sensor, high sens. long ML nr: 655.050.027	Item: CS-120 Conductivity sensor std. sens. 3/4" ML nr: 655.050.029	Item: CS-121 Conductivity sensor high sens. 3/4" ML nr: 655.050.028
ML – CMR ML nr. 655.010.050 	ML – CMR ML nr. 655.010.052 	Range: 0-60 $\mu$ S HIE - 10.00 Volt LOE - 0.00 Volt HI - 60 $\mu$ S LO - 0 $\mu$ S	Range: 0-20 $\mu$ S HIE - 10.00 Volt LOE - 0.00 Volt HI - 20 $\mu$ S LO - 0 $\mu$ S	Range: 0-60 $\mu$ S HIE - 10.00 Volt LOE - 0.00 Volt HI - 60 $\mu$ S LO - 0 $\mu$ S	Range: 0-20 $\mu$ S HIE - 10.00 Volt LOE - 0.00 Volt HI - 20 $\mu$ S LO - 0 $\mu$ S	Range: 0-45 $\mu$ S HIE - 10.00 Volt LOE - 0.00 Volt HI - 45 $\mu$ S LO - 0 $\mu$ S	Range: 0-20 $\mu$ S HIE - 10.00 Volt LOE - 0.00 Volt HI - 20 $\mu$ S LO - 0 $\mu$ S
		Range: 0-600 $\mu$ S HIE - 10.00 Volt LOE - 0.00 Volt HI - 600 $\mu$ S LO - 0 $\mu$ S	Range: 0-20 $\mu$ S HIE - 10.00 Volt LOE - 0.00 Volt HI - 200 $\mu$ S LO - 0 $\mu$ S	Range: 0-600 $\mu$ S HIE - 10.00 Volt LOE - 0.00 Volt HI - 600 $\mu$ S LO - 0 $\mu$ S	Range: 0-200 $\mu$ S HIE - 10.00 Volt LOE - 0.00 Volt HI - 200 $\mu$ S LO - 0 $\mu$ S	Range: 0-450 $\mu$ S HIE - 10.00 Volt LOE - 0.00 Volt HI - 450 $\mu$ S LO - 0 $\mu$ S	Range: 0-200 $\mu$ S HIE - 10.00 Volt LOE - 0.00 Volt HI - 200 $\mu$ S LO - 0 $\mu$ S



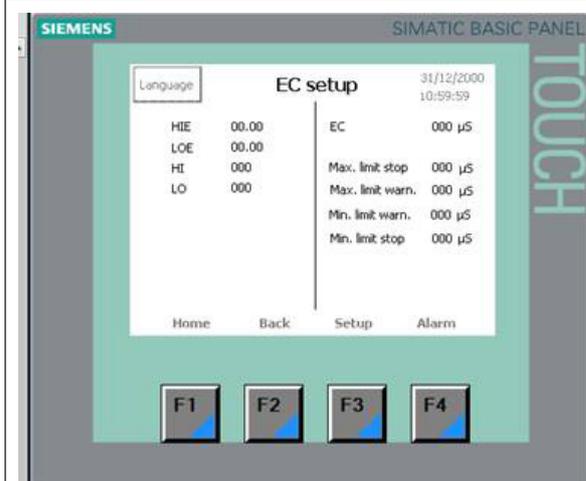
HIE, Input standard values, from chart, Overview of calibration for conductivity sensors and converters (amplifiers)

LOE, Input standard values, from chart, Overview of calibration for conductivity sensors and converters (amplifiers)

HI, Input standard values, from chart, Overview of calibration for conductivity sensors and converters (amplifiers)

LO, Input standard values, from chart, Overview of calibration for conductivity sensors and converters (amplifiers)

If the sensor needs calibration, adjust HI up or down until EC value is correct



Setting the Alarm's and Warnings example, this sensor is chosen :

HIE	-	10.00 Volt
LOE	-	0.00 Volt
HI	-	60 µS
LO	-	0 µS

Max limit stop 50 µS  
 Max limit warn 40 µS  
 Min. Limit warn 10 µS  
 Min. Limit stop 5 µS

This setting will give a warning if µS value goes to 40 or 10 µS and stop the pump if µS value goes to 50 or 5 µS

Max limit stop 100 µS  
 Max limit warn 40 µS  
 Min. Limit warn 10 µS  
 Min. Limit stop 0 µS

This setting will give a warning if µS value goes to 40 or 10 µS and never stop the pump

# ML-system - Condair a/s

## Monitoring of humidity and status signals:

As an option the PLC system can through an integrated website be connected to the customer's computer over TCP/IP so that the client can access a page, that shows the status of the system with monitoring of the current humidity in each section.

This page can be opened with most standard browsers - We have tested.

The website in the PLC:

The screenshot displays the webserver application interface for the MLPRO 100-800 system. The header includes the title 'MLPRO 100-800 Webserver Applikation' and the Condair logo. A left sidebar contains contact information for Condair A/S. The main content area is titled 'Overview System - \*\* Update by pressing F5 \*\*' and features two data sections: 'Pump system value' and 'Humidity section'. The pump section shows a current flow of 650 l/h and a tank level of 20 liter, with an 'Operation warning!' indicator. The humidity section lists eight sections with their respective relative humidity values.

Pump system value	
Current flow:	650 l/h
Tank Level:	20 liter
Operation warning!	

Humidity section	
Section 1:	31 %RH
Section 2:	32 %RH
Section 3:	33 %RH
Section 4:	34 %RH
Section 5:	35 %RH
Section 6:	36 %RH
Section 7:	37 %RH
Section 8:	38 %RH

# ML-system - Condair a/s

The system displays the current humidity as the page opens - most browsers will then update every 10 seconds. - But you can also manually refresh at any movement by pressing F5.

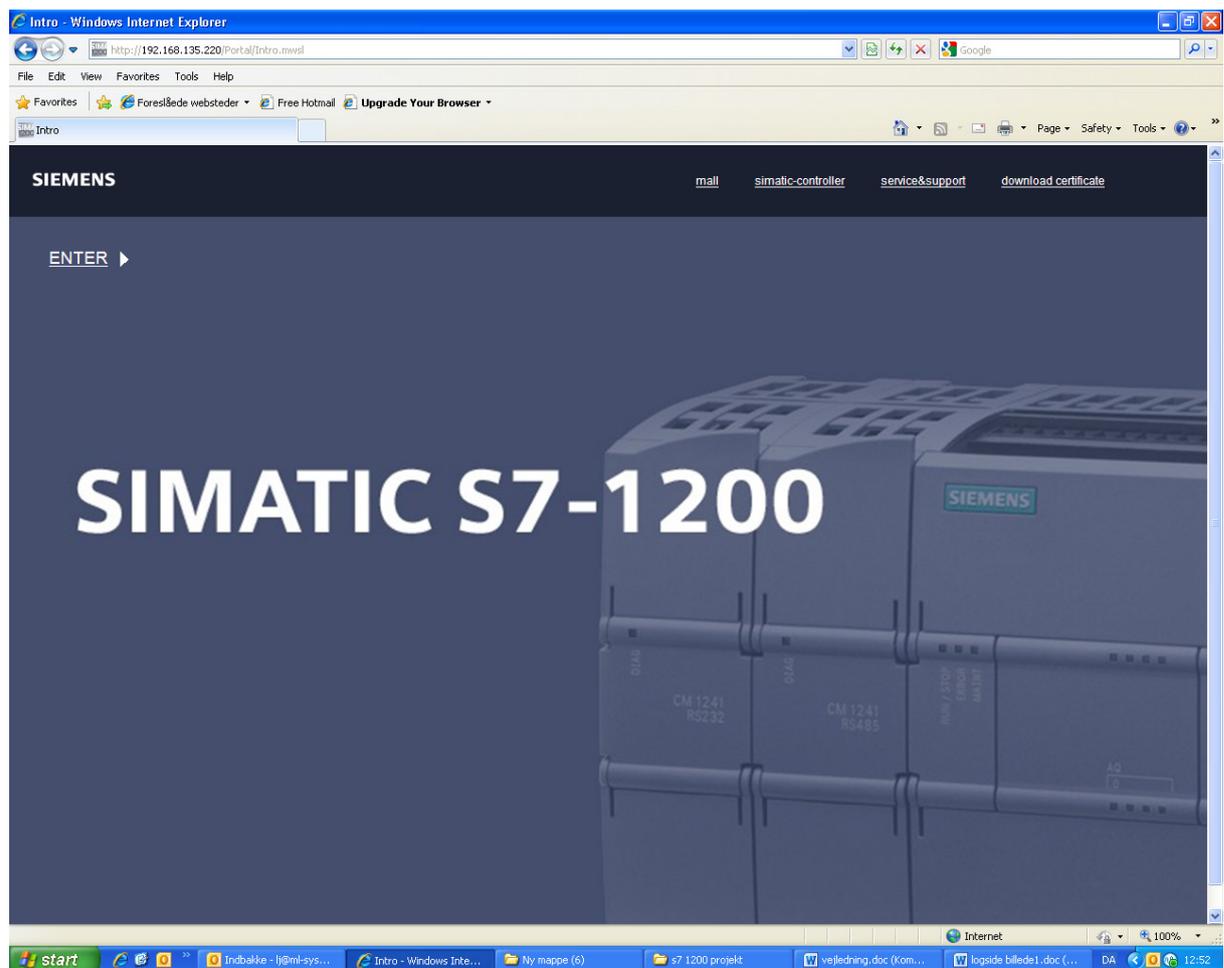
Also shown is a pump station operating status:

- Humidification stopped
- Humidification active
- One or more operating warnings – System still running
- One or more operating alarms – System stopped

In order to obtain access to the data, use an Ethernet connection directly to the PLC system data switch located in the control unit to the left of the PLC system.

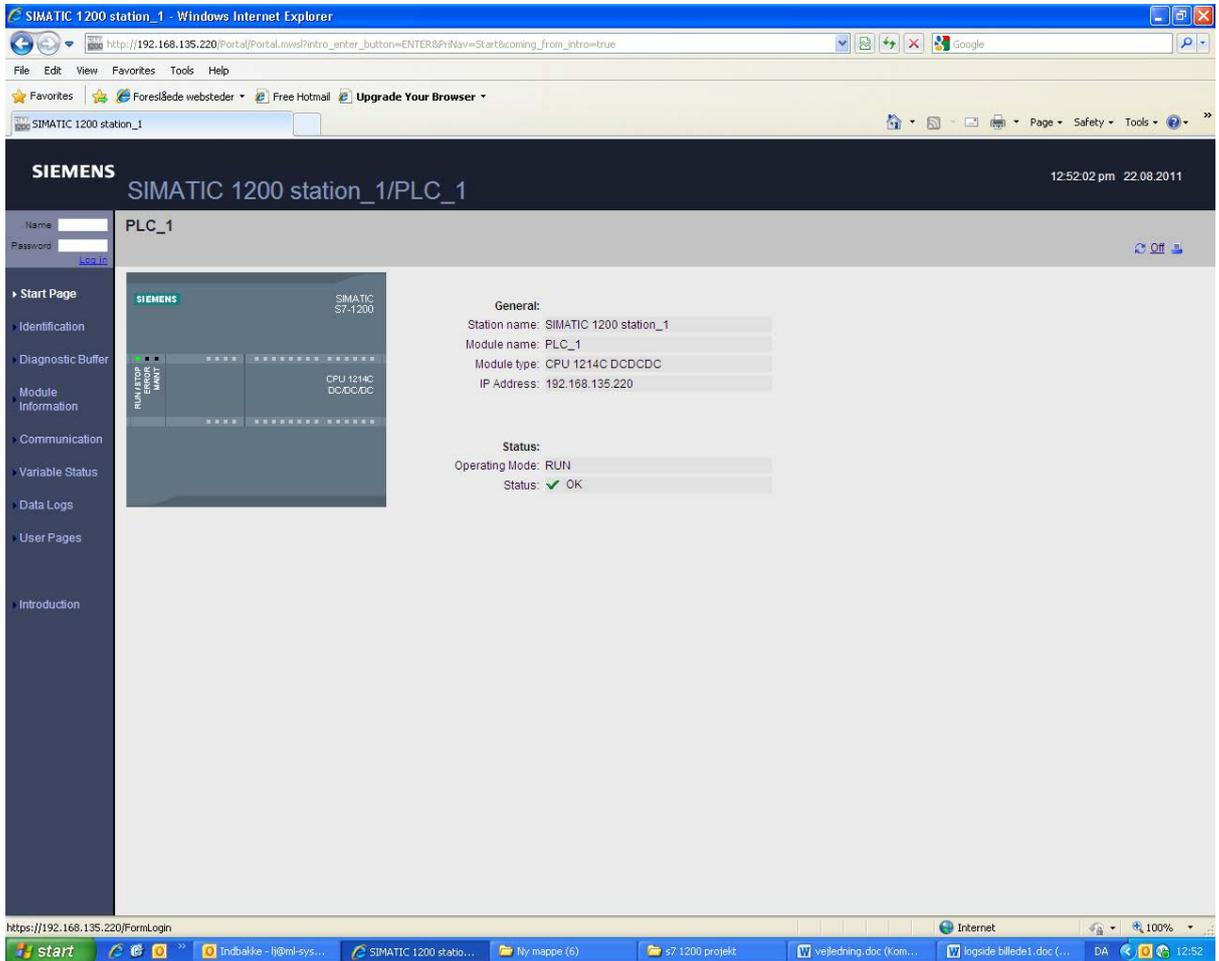
Use a standard web browser and enter the PLC fixed IP address xxx.xxx.xxx.xxx in the address field. This can be done through the company's internal Ethernet network – with separate cable or with a laptop directly into the switch. Perhaps, use a router to get going at this address.

(It is important here to remember that the PC must be located in the same virtual network as the PLC does).

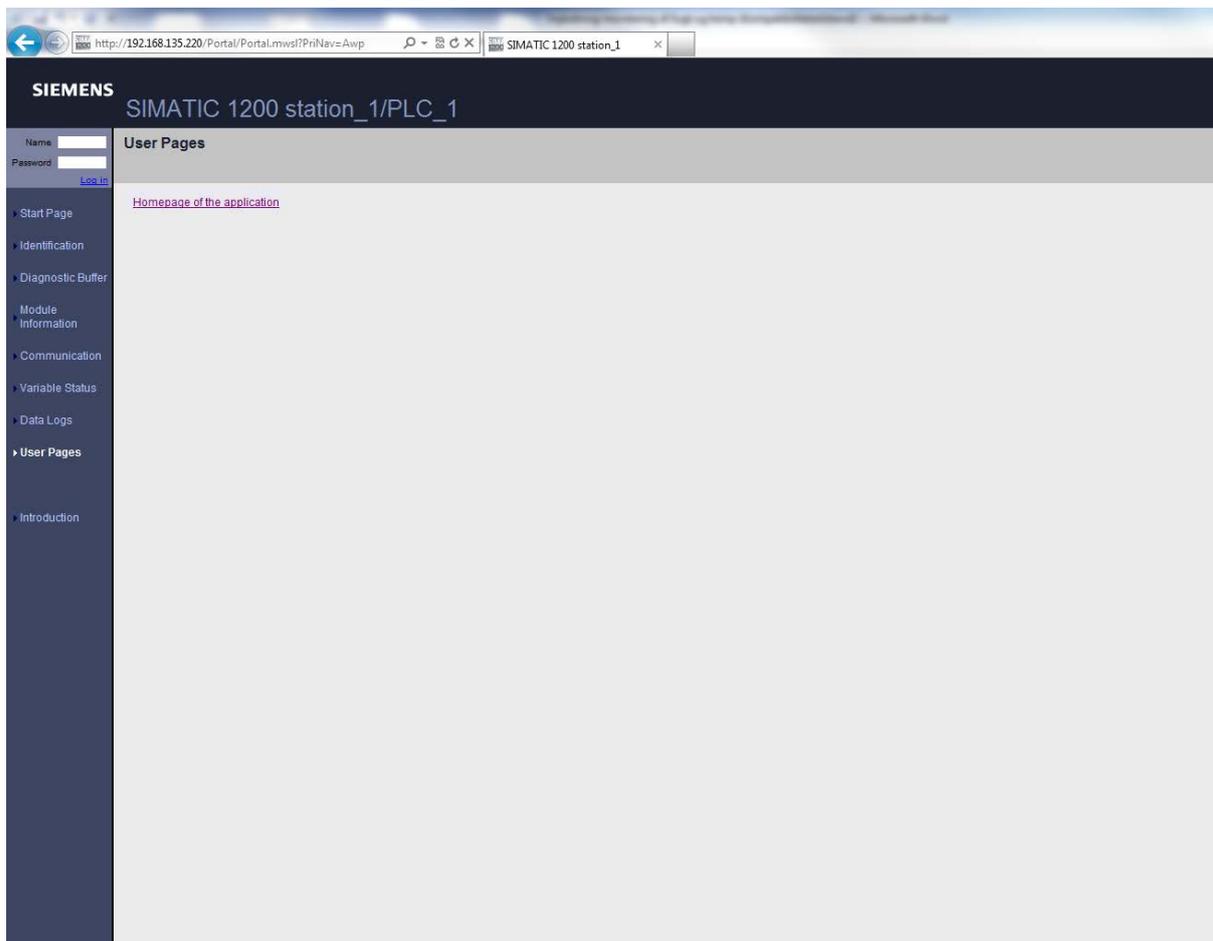


# ML-system - Condair a/s

After entering the correct IP address - the following picture appears. Start by downloading and installing Siemens security certificate (download and follow the onscreen instructions). Then press Enter



Press User Pages in the boxes in left side of the screen



Press on the Home Page of the application

The website now opens and update.

To make future connections easier, make a shortcut for example to your desktop.



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