Medclair

DU2000-M1

User Manual

Revision: A2

2023-02-15

Content

1. General

This document is a User Manual for the central N2O destruction unit DU2000-M1.

Intended use:
The CDU is only intended to handle gases where the concentration of VOC (volatile organic compound) is below 100 ppm.
The CDU is only intended to handle gases where the concentration of halogenated hydrocarbons of the type other anaesthetic gases is below 1 ppm.

The destruction unit purifies a degree of minimum 96 % of the collected nitrous oxide.

The purification is performed through a catalytic process during which the collected nitrous oxide is decomposed into oxygen and nitrogen, which are the main components of normal air.

1.1. Energy saving with unique technique

Medclair has developed a unique technology for heat exchange and isolation of DU2000, which recovers the input energy and minimises the energy consumption. Our technical solution is based upon a high degree of energy recovery, few moving parts and a stable and reliable catalytic process. This gives a unit with a high degree of purification, secure operation and low operating costs.

1.2. Monitoring of the process

The process can be supervised using a standard web browser. Continuous measurements are made of nitrous oxide concentration, in/out from the destructor, gas flow, temperatures and energy consumption. Measurement data is presented as compiled average values per hour, day and month.

1.3. Easy installation

DU2000 is delivered as a turnkey product which secures an easy and quick installation. The only necessary installation work is to connect DU2000 to electricity and ventilation.

1.4. No daily supervision

DU2000 doesn’t need daily supervision. From a user point of view DU2000 can be compared with a ventilation unit.

1.5. Long operation

All components used in DU2000 have been chosen to get a reliable unit that can be in operation continuously over several years without any need for repair.

2. Installation – Service - Security

2.1. Installation

The nitrous destructor is delivered as a compact ready built unit. Medclair AB takes responsibility for installation and commissioning of the unit. The customer is responsible for necessary piping between wards and exhaust system, circuit breaker and ventilation for connection to the destructor.
The CDU must be located in a space that is designed with ventilation so that the temperature in the room never exceeds +35°C

Warning! The destructor is not certified to the medicine directive and may not be installed close to susceptible equipment. The unit is certified according to the standard 61000-6-4 (EMC, Emission from equipment in industry environment)

2.2. Service

Only qualified personnel educated by Medclair AB are allowed to perform service for DU2000.

Warning! Performing service without having qualification and correct protective equipment is associated with health hazards and can result in personal injury.

2.3. Security information

Information regarding signs and symbols. The following signs and symbols for security information are used for particularly critical parts in the user manual.

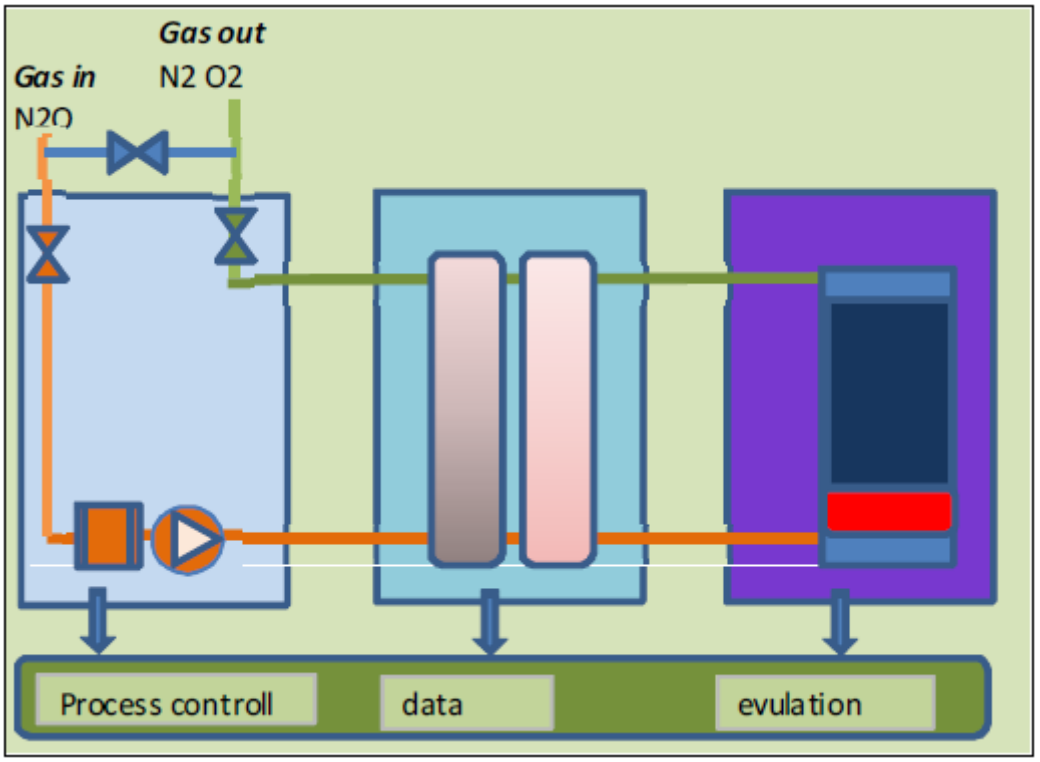
Warning! Directs attention to a possible dangerous situation that can cause serious physical injury if instructions aren't followed.

Careful! Directs attention to a possible dangerous situation that can cause physical or material damage on DU2000 or the surroundings.

Above notices have to be carefully followed! They refer to special facts that have to be observed in order to guarantee secure, correct and effective handling of the destruction unit.

3. Process description

The nitrous comes to the system via a filter and is then pushed forward by the built in fan through a heat exchanger (preheated) and then into the catalyst for purification/destruction. The purified gas is then passing through the heat exchanger again, this time to be cooled down before being let out into the ventilation system. The catalyst process splits the nitrous oxide (N2O) into oxygen (O2) and nitrogen (N2) which is 99% of the content in the air that we breathe.



Number of catalysts	1
Power supply	400 VAC 50Hz 3fas
Current	10A max
Rated power	3kW
Gas flow	0-30 m3/h
Normal system pressure	Approx 2500 Pa
Normal working temperature	Approx 450-480 °C
Normal outlet temperature	Approx 80-120 °C
Overheating protection	600 °C
Measurements (LxWxH)	900x800x1900 mm
Pipe connection	Ø35 mm

4. Controller

The controller regulates the electric heater in order to obtain the correct temperature in the catalyst. It is also controlling the fan to get an optimal gas flow and minimal energy consumption in the destructor.

4.1. Start

1. Turn the switch placed on the cabinet from från 0 to 1. Valves in the destructor will set the unit in by-pass until the correct operation temperature is reached.
- By-pass makes the incoming gas pass through the destructor and be sent out to the ventilation outlet.

2. When the operation temperature is reached the valves will close the by-pass and the gas will now be passed through the catalyst for purification/destruction. The green indication will be lit to show that the destructor is now in operation.

4.2. Shutdown

1. Turn the switch placed on the cabinet from från 1 to 0. This will stop the process and the valves will set the destructor in by-pass.

Warning!

Break of power to the destructor
To break the power to the destructor, switch of power via the circuit breaker placed besides the destructor.

The destructor is now almost without internal power.
Note! Voltage is still present in the internal chipsets in the unit (PLC) because of the built in UPS.

If it is needed to get the unit totally powerless the inbuilt UPS has to be disconnected. This is done in the control cabinet.
NOTE! Only authorised personnel are allowed to perform this activity**.**

5. Alarm

5.1. Alarm handling

If an alarm is generated by the destructor and the alarm does not switch off automatically: - Try to reset the alarm - If this fails, contact Medclair AB. Alarm equalising can be performed via the touch screen at the destructor or from the operator central if the destructor has been connected via modbus.

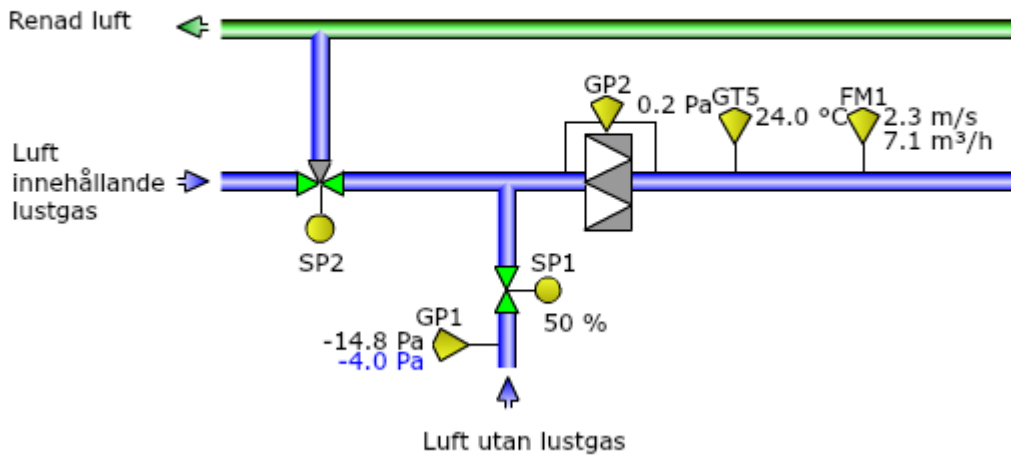
Type of alarm	Explanation	Measure
A- alarm (destruction unit stops)		
Overheat. Proc.	Overheating in process	Contact Medclair AB
Overheat. Elb.	Overheating in el‑battery	Contact Medclair AB
Low Flow	Low Flow in FM 1	Contact Medclair AB
C-alarm (destruction unit works with unchanged efficiency)		
Filter guard	High pressure GP 2	Contact Medclair AB
Low value destruction unit	Analyser	Contact Medclair AB

6. Functions

The functionality of DU2000 is contained in one single unit, below is a short description of the different functional units.

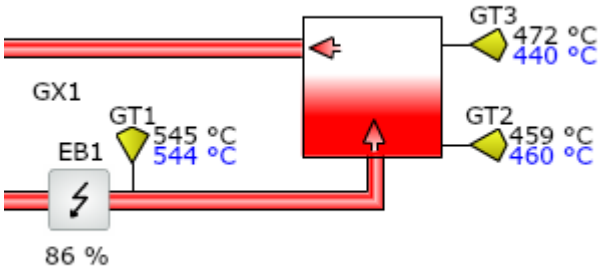
6.1. Fan

The fan functionality consists of a fan, dust filter and a damper system that controls the by-pass of incoming gas in case of an outage.



6.2. Catalyst

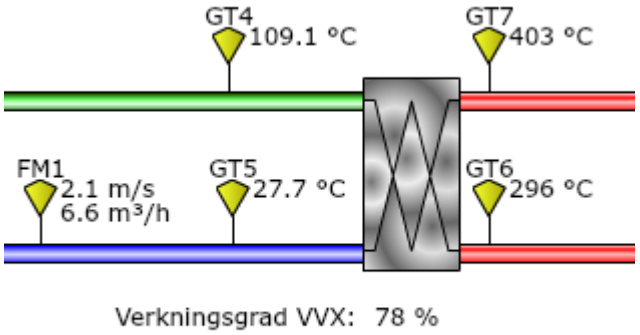
The catalyst functionality consists of the catalyst, heater and temperature sensors.



Medclair

6.3. Heat recovery

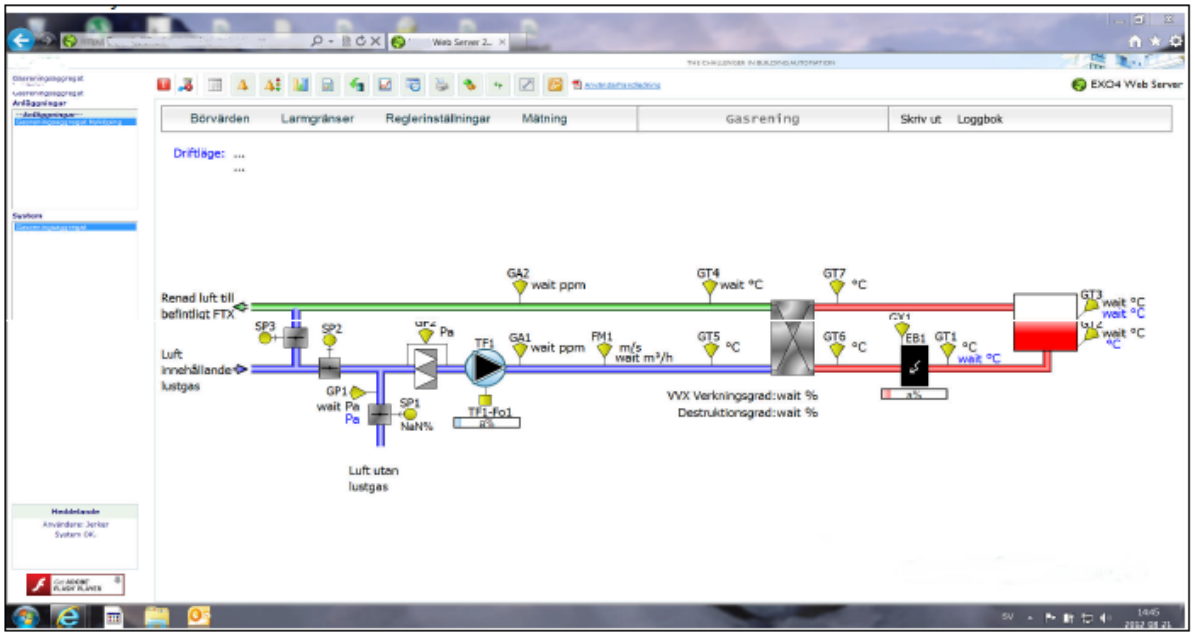
The energy from the process is recovered by a high temperature heat exchanger made from stainless steel. The heat exchanger contains a number of temperature sensors to determine the efficiency of the recycled energy.



Verkningsgrad VVX: 78 %

7. Control system

All information regarding the destructor's operation can be visualised remotely, either via a web browser or by having the operator central connected via the built in modbus interface. When connected via a web browser the flowchart below will be shown after log in.



7.1. Designation in the main page (See figure above for location)

SP1-2	Dampers for setting the destructor in bypass mode
GP1	Pressure sensor placed in the dilution duct which secures that all gas makes its way to the catalyst
GP2	Pressure sensor measuring the pressure drop over the dust filter
FM1	Flowmeter measuring the gas flow through the catalyst
TF1	Frequency controlled fan adapting the incoming flow to the flow generated from the maternity wards
GA1-2	Sockets for measuring nitrous level (ppm) before and after the catalyst
GT1-7	Temperature sensors for control of the process

7.2. Measurement values

All measurement values are shown in real time in the flow chart.

7.3. Graphical presentation

Statistics in the form of graphics can be shown for a selection of parameters.

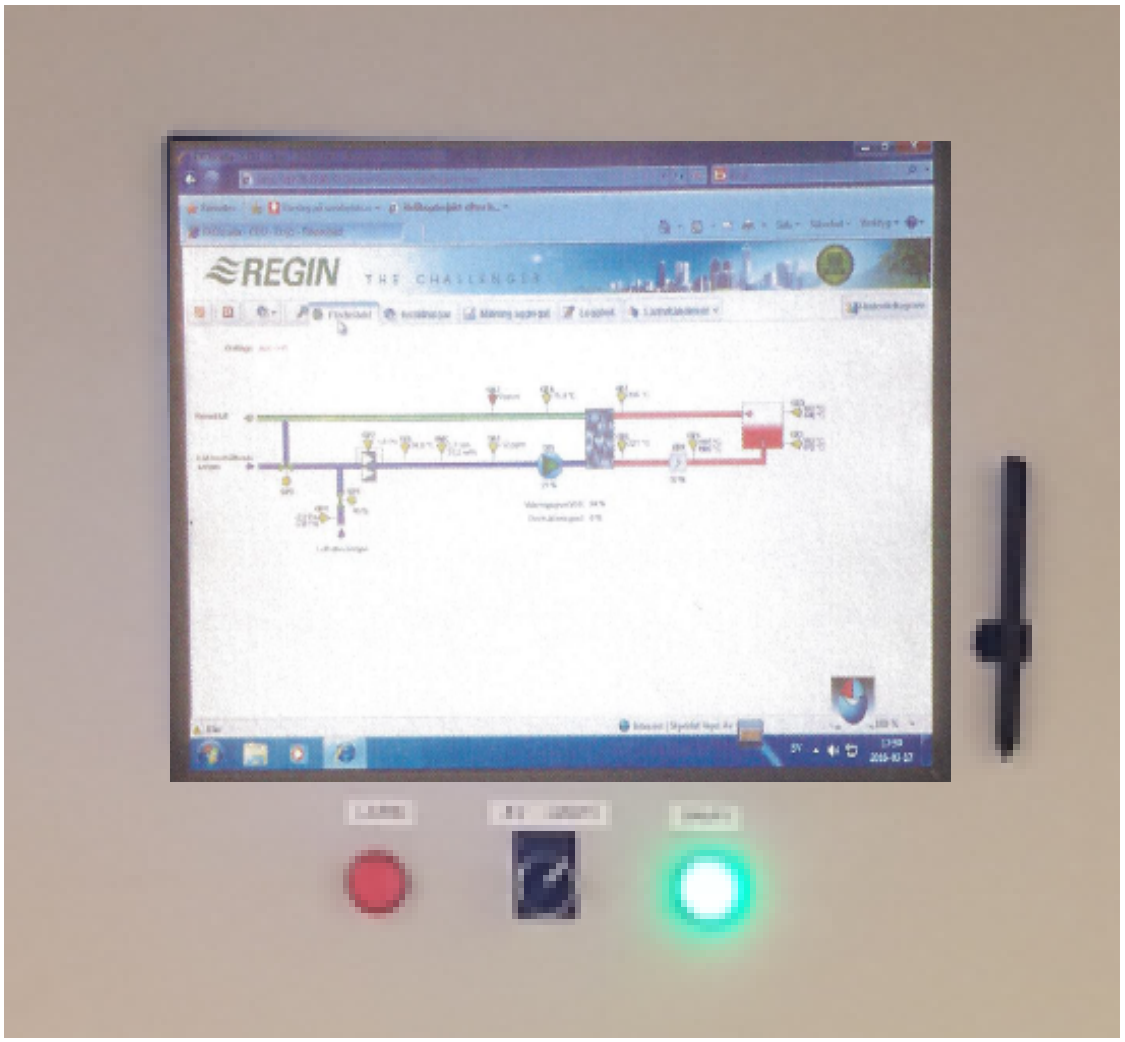
- Temperature, N2O Analysis, Pressure/flowmeters, Energy consumption.

8. Control cabinet

The control cabinet contains signal transducers, DUC, UPS and other electronic equipment needed for supervision of the destructor functionality.

The front of the cabinet, figure below, contains:

1. Touch screen that can be used for supervision of the destructor status
2. Switch for start/stop of the destruction unit
3. Green indication that indicates that the unit is in operation
4. Red indication that indicates that the unit has stopped and an alarm has been generated

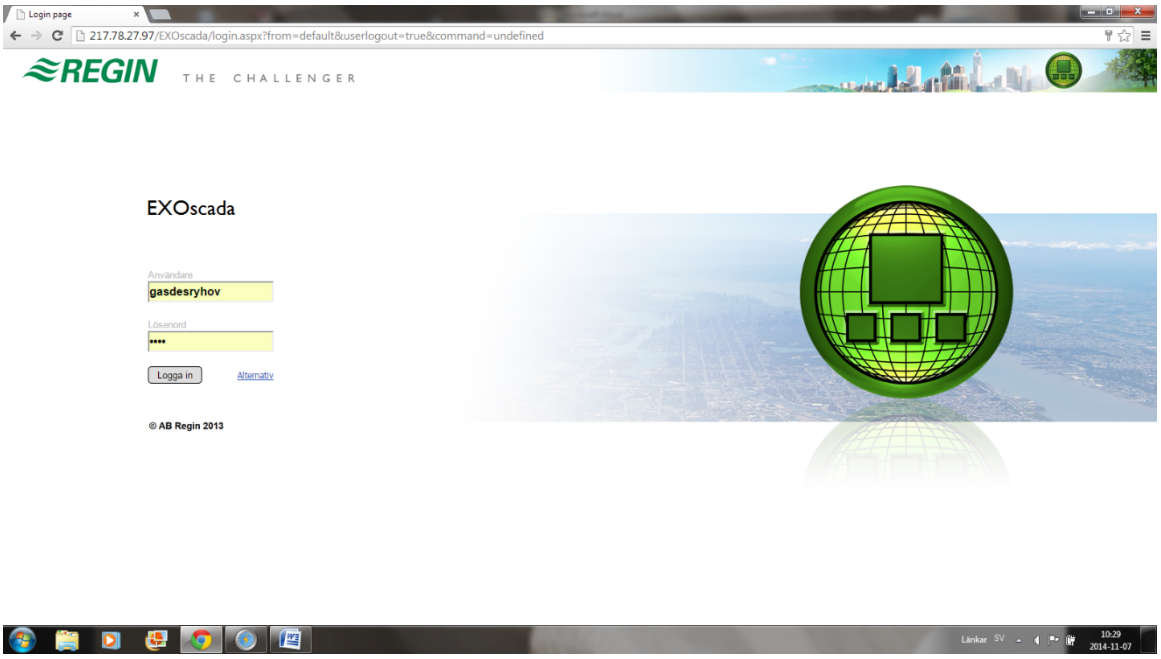


- *DU2000-M1 is equipped with a touch screen*

9. Selection of measurement data

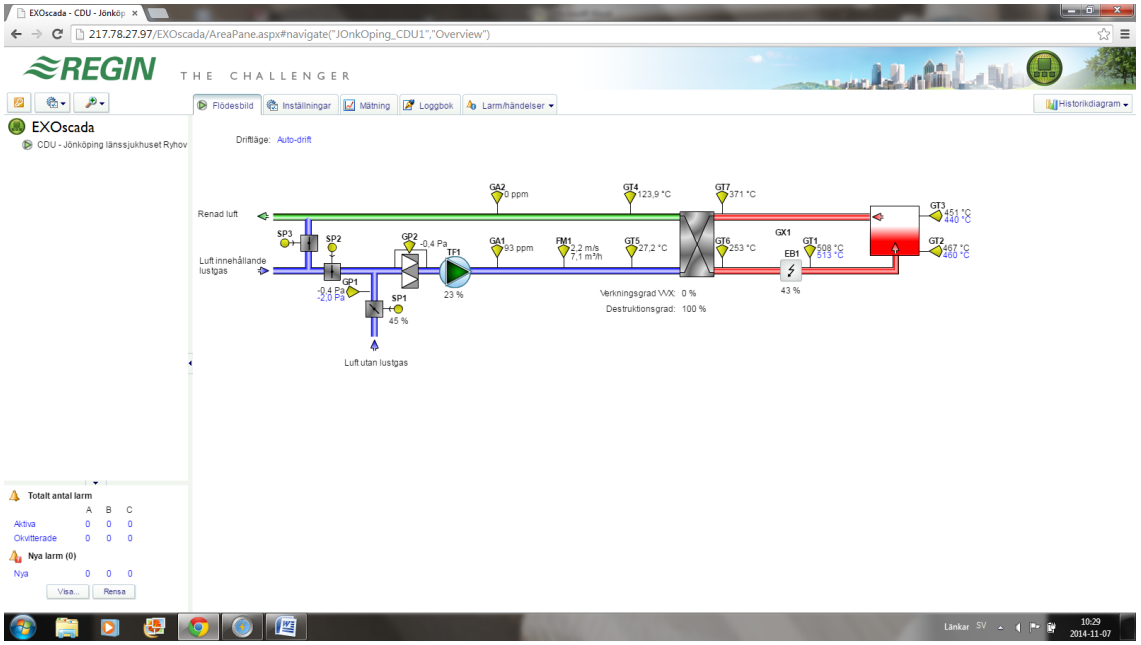
9.1. Log in

Following link shall be used in the web browser in order to reach the login page.
217.78.27.97/EXOscada/login.aspx?from=default&userlogout=true&command=undefined
Below is a picture of the login page where user and password shall be inserted.



9.2. Main page

After log in a flow chart and alarm status for the nitrous oxide destructor will be shown. The flow chart contains all available measurement points for the unit.



The page contains the following tabs.

Flow chart	Gives an overview of the process and the measurement points
Settings	Shows the settings made for the unit. Modifications of the values shown may only be performed by authorised personnel.
Measurements	Shows the measurement values specified for the unit. Normally energy consumption, gas in/out Log book Here personal notes can be inserted Alarms/actions This tab contains the following choices:
Log book	A place that can be used for personal notes
Alarms/Actions	This tab contains the following choices:
Alarm status	Shows the actual alarm status
Alarm history	Alarm history with date, time, priority and explaining text
Action log	Action log according to predefined filter (onset, off) with date, time, priority and explanatory text.
User log	Shows activities made by user with date, time and explanatory text.

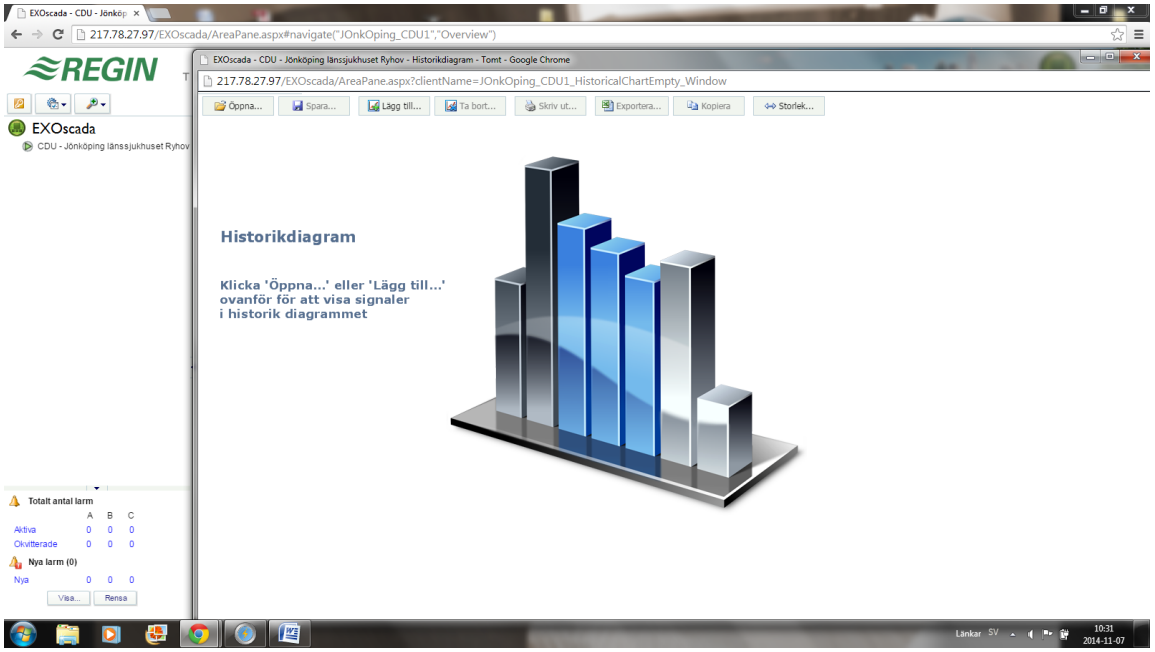
It is also possible to define your own measurements history information from a selection of different measurement points by using the tab (function) ”Historical Diagram” which is found in the upper right corner of the page.

9.3. Historical diagram

Beneath the tab “Historical Diagram” a user can choose specific measurement points from the process and get a graphical diagram showing variations over time. It is also possible to export the information to Excel. How to use this functionality is described in the following sections.

9.4. Defining measurement points

First click the tab ”Historical Diagram”. The information below will be shown on the screen.

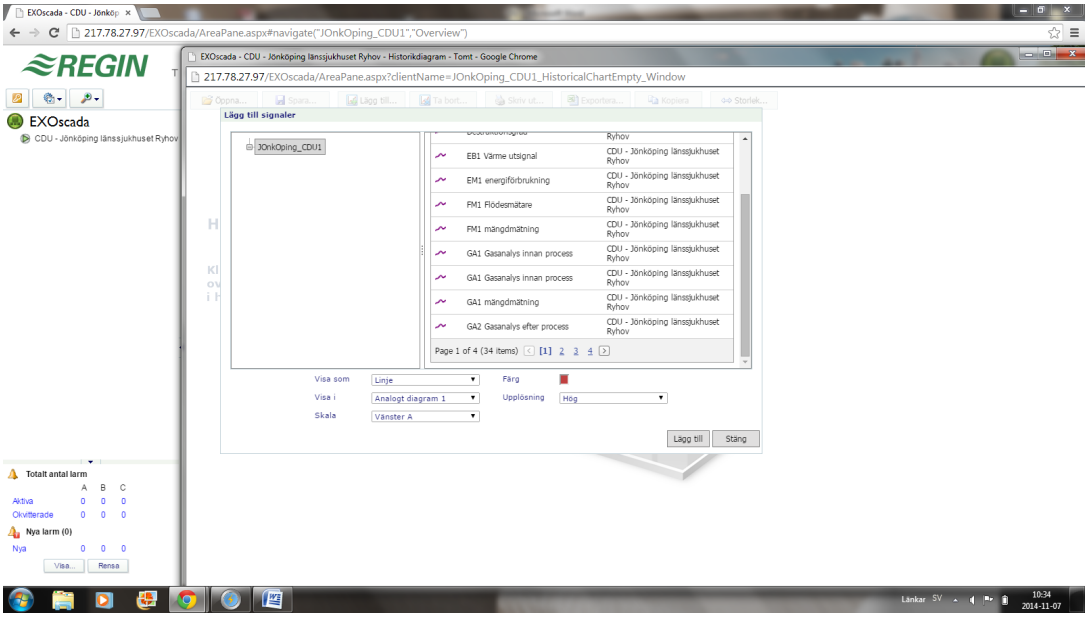


The start page contains the following choices.

Open	Used to open an saved history diagram
Save	Saves a defined history diagram for future use
Add	Used to add measurement points to be shown in the diagram
Delete	Deletion of added measurement points
Print	Print out of the diagram diagram
Export	Exports measurement values to excel for later use
Copy	Copy a saved history diagram for editing
Size	Changing the screen resolution

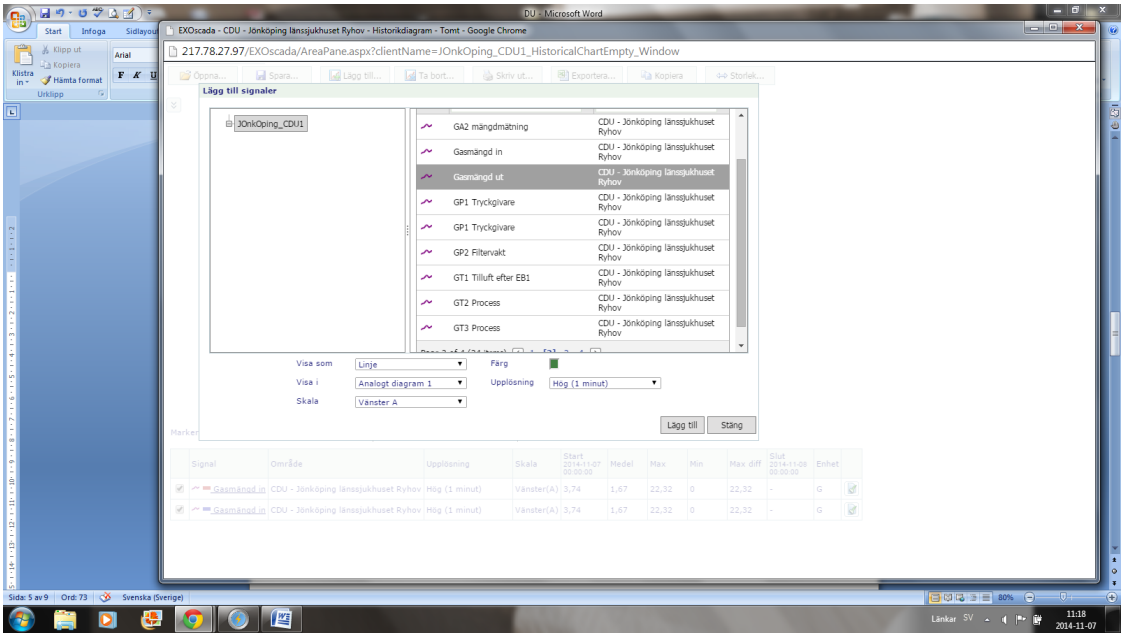
Below is an example on how to create a historical diagram, we have chosen to look at the measurement points:
Gas in
Gas out

”Click” on ”Add”. A new page with a menu of choices will then be shown.



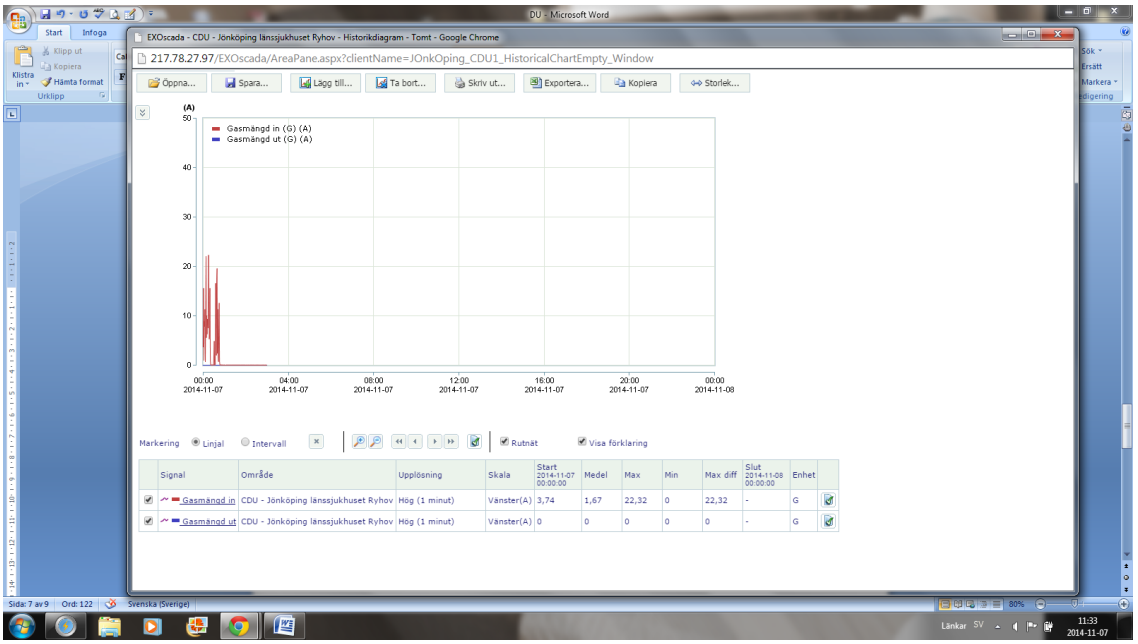
When the measurement point of interest is found, mark it and then click “Add” to add it to the list that you want the system to present.
If another measurement point is to be added, repeat the action above.
NOTE: It is only possible to add one measurement point at a time.

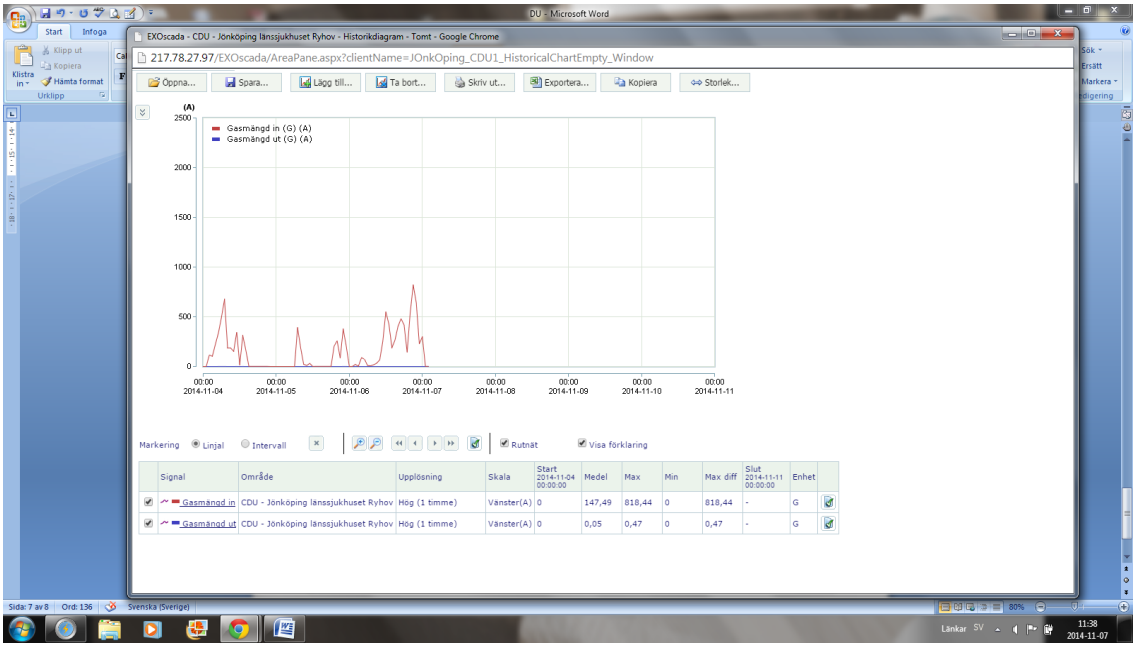
Below the screen after choosing ”Gas in” and ”Gas out is shown.
- The measurement points that have been selected can be seen at the bottom of the page.



When you have made your choices click on the button “Close”.

A historical diagram will now be presented on the screen from the choices that have been made. It is now possible to refine the information to show the time interval that is of interest. The scale can be changed by clicking the value of the Y scale.

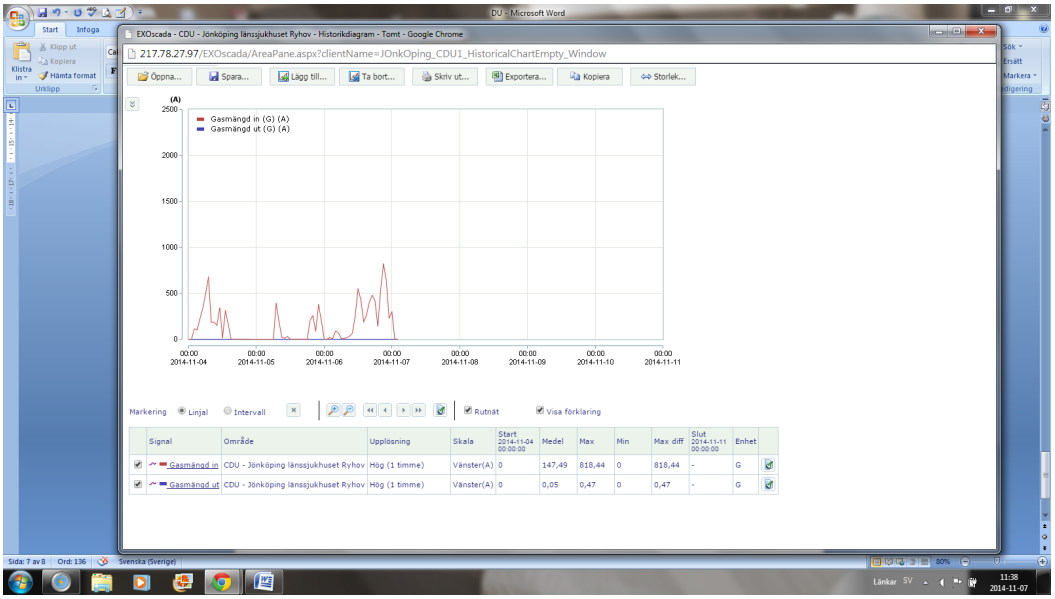




Medclair

9.5. Export to Excel

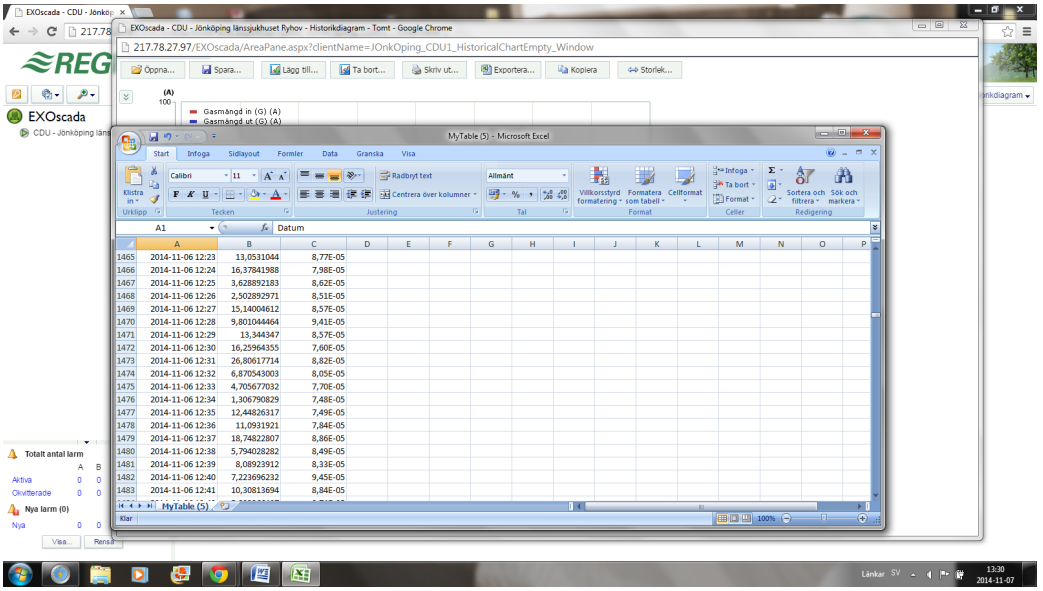
Below is an example of exporting information to an Excel sheet.



Click on the function: “Export”.

For security reasons the system will ask if you really want to open this file now, choose: “Yes”. Excel will now open and the information will be presented as numbers for the measuring points chosen.

Below is an export example for gas in/out, the columns shown are date, time, “gas in and gas out”.



Medclair

Medclair, founded in 2013, is a Swedish research and development company with leading-edge expertise in process gas purification, gas measurement, ventilation and control. We solve healthcare and environmental challanges through innovation.