ADT MINI TC

ON-LOAD DEHYDRATION / FILTRATION OF TAP-CHANGERS

FOR VERY HEAVY WORKING CONDITIONS

ON POWER RECOVERY OF DIELECTRIC STRENGTH

LIFE EXTENSION OF TAP-CHANGERS

REMOTE PROCESS CONTROL AND MONITORING

EASY CHECK OF FUNCTION VIA YOUR HANDY

ON-LINE DIELECTRIC SCREENING

EASY VERIFICATION BY LAB RESULTS

PLUG & PLAY INSTALLATION

MINIMUM SUPERVISION AND/OR MAINTENANCE

C:\MANUAL\ADT MINI TC \ VERSION 2020

Fa. Ing. Altmann ARS Altmann Group, Machova 142, 344 01 Domazlice, Czech Republic, European Union
Tel:+420-379 738 778, Fax:+420-379 738 775, Cell phone:+420-602 362 157 email:altmann@iol.cz, www.ars-altmann.com;

Drying & Filtration of tap-changers

The presence of moisture and particles in a tap-changer, to whatever degree, actually decreases its reliability and life-expectation.

The online drying and filtration of its oil inventory can substantially reduce that deterioration.

The **ADT Mini TC** focuses on a preventative- or an online use on tap-changers with more than 1 ppm of water content in oil and with particle contamination.

The **quick estoration of safe dielectric conditions, life-extending features, and remote control** also form part of this concept.

The system is especially suitable for drying and filtration of tap-changers situated in narrow, hardly accessible spaces.

Main features

- **Easy and safe installation and commissioning: all procedures are computer-controlled to avoid any human lapses and errors**
- **No disconnection of the tap-changer, not even during the installation (Plug & Play design)**
- **No air venting after installation: hydraulic interconnections to a tap-changer oil filling are set under vacuum and subsequently rinsed by oil**
- **The reduction of moisture- and particles content to the level of a new tap-changer**
- **Quick restoration of dielectric strength of oil**
- **No impact on the insulating oil properties and DGA**
- **Direct check of dehydration efficiency based on the amount of removed water: calculated as the product of difference input-output water content in oil (2 x humidity sensors) x precise volumetric reading of oil throughflow**
- **Easy and safely replacement of adsorbent / filtration cartridges and both filters without a potential oil spill: the oil is removed before replacement and forced back to the oil filling of Tap-changer**
- **Easy control of function by SMS via your handy**
- **Remote monitoring & control of drying process: all relevant data are recorded and displayed (printed) as easy comprehensive diagrams**
- **Calculation of actual value of dielectric strength (Ud-value) of oil during the whole dehydration**
- **Easy verification of simulated Ud-values by lab reading(s) by means of Verification diagram**

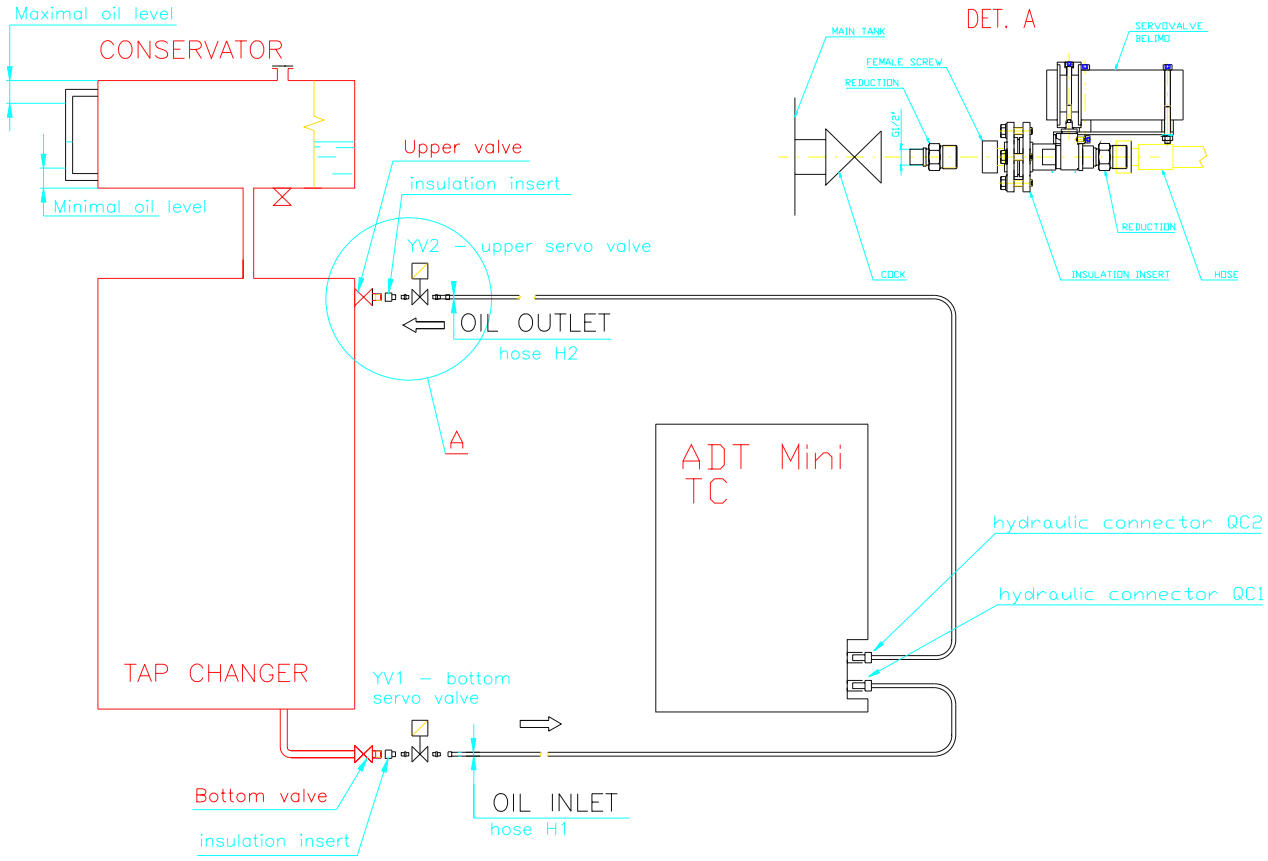
Specification

Power supply voltage	1 phase 230 VAC (or on demand)
Power supply frequency	50 (60) Hz
Power consumption:	200 W
Oil throughput	7.5 m^3 per day maximum
Outlet water content	5 ppm nominal , 1 ppm minimum
Outlet filtering grade	1 µm
Absorption capacity	2.6 kg of water
Installation options	mobile unit / permanently installed
Dry weight (without oil)	183 kg
Operating weight (oil filled)	200 kg
Dimensions	700x600x1240 (mm)
Hydraulical connection	2 x flexible 1/2“ hose
Communication:	Faxmodem,GSM modem, LAN link, SMS

The Installation

Fa. Ing. Altmann ARS Altmann Group, Machova 142, 344 01 Domazlice, Czech Republic, European Union
Tel:+420-379 738 778, Fax:+420-379 738 775, Cell phone:+420-602 362 157 email:altmann@iol.cz, www.ars-altmann.com;

The design od ADT Mini TC enables its easy and safe installation and commisioning in situ within ca 10 minutes.



..

All electrical, hydraulic, and communication connectors are in the niche situated at the right side of ADT Mini TC.

It enables its quick:

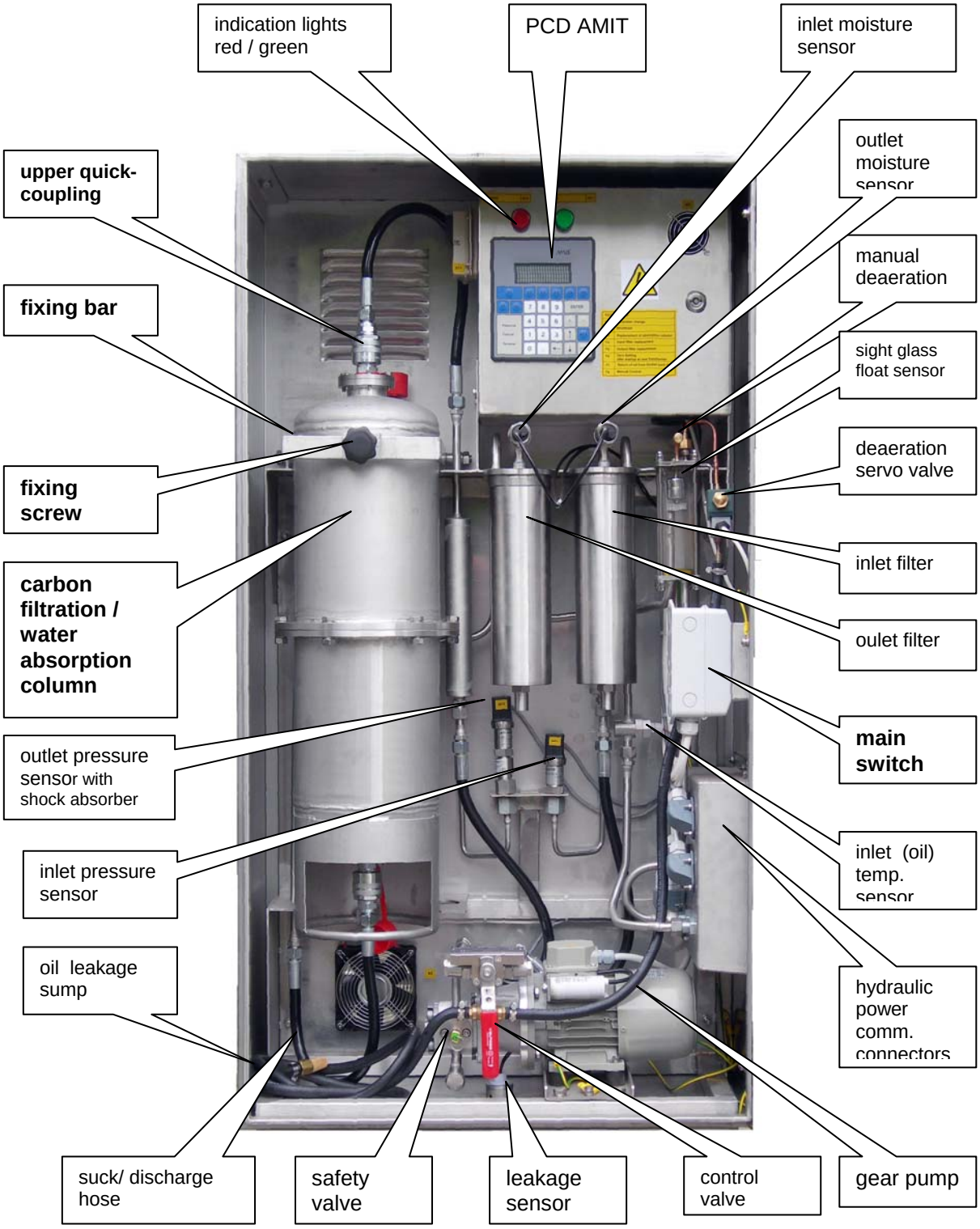
- hydraulic interconnection with a tap-changer via the quick-couplings
- interconnection with power supply and both spring-loaded safety valves Belimo situated on a tap-changer
- installation of the GSM aerial
- interconnection to a control room via data line

The Commissioning

After setting the main switch ON, the requested kind of operation and communication is preset.

The further commissioning then consists of steps depicted via the display of the PCD Amit. The PCD checks the specific action on its correctness, and via the display immediately indicates the proper motion.

Fa. Ing. Altmann ARS Altmann Group, Machova 142, 344 01 Domazlice, Czech Republic, European Union
Tel:+420-379 738 778, Fax:+420-379 738 775, Cell phone:+420-602 362 157 email:altmann@iol.cz, www.ars-altmann.com;



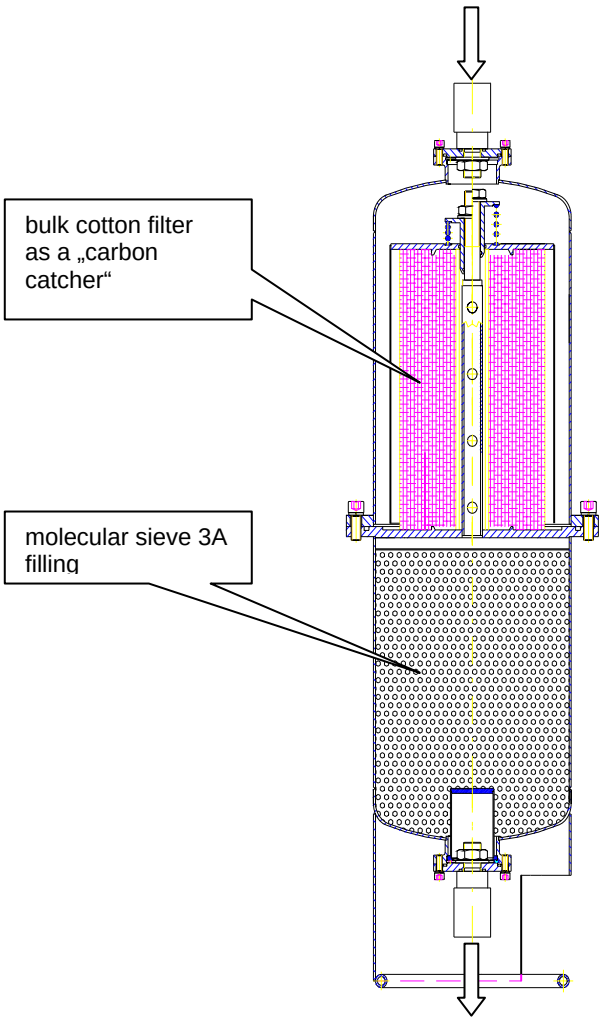
Internal layout of main components in ADTmini TC (open door)

The ADT Mini TC design enables quick and easy repair (or a replacement) of all its essential parts in situ.

The central part, the combination "carbon catcher" and water absorber, situated in one column, then enables its easy and quick replacement in situ.

The worn internal parts of the column: the cotton cartridge in its upper part and the molecular sieve in its bottom, See picture under, is then, under optimal conditions, performed in the shop.

Fa. Ing. Altmann ARS Altmann Group, Machova 142, 344 01 Domazlice, Czech Republic, European Union
Tel:+420-379 738 778, Fax:+420-379 738 775, Cell phone:+420-602 362 157 email:altmann@iol.cz, www.ars-altmann.com;



The advantages of the combi column overhaul in a shop:

- no or minimal moisture and dust contamination within the procedure
- independent overhaul according to real conditions:
  - if carbon clogged: only the replacement of the cotton filter is necessary
  - if exhausted: only the replacement of molecular sieve is necessary
- after the replacement(s) the colum is flushed with oil to avoid the clogging of output fine filter or the contamination of a tap-changer oil filling.
- the column, sealed via quick couplings, can be stored for an unlimited time.
- the operation costs: the price of the cotton cartridge and the new molecular filling represents ca 1/3 price of standard cartridges with the same capacity.
- the eco aspects : only worn parts are replaced. The exhausted molecular sieve can be 100-times reclaimed via heating at 350C.

PARAMETRIC REMOTE CONTROL

Regardless of how efficient any method might be - the first law for any treatment is :

the water- and particle removal of contaminants from a tap-changer has to be safe and effective

To achieve these targets, the ADT Mini TC can be programmed directly (manually) via the terminal of PCD, by the PC or laptop.

This way offers remote monitoring and optimization of dehydration.

The OPTIM D2L software for the communication is part of the delivery.

The easy check of ADT-function can be performed by your handy anywhere and anytime: via SMS.

The advanced evaluation of the effectivity of dehydration

For a better understanding of the long-term trends of dehydration effectivity of the ADT Mini and a change of the dielectric behavior of the tap-changer within the treatment two new procedures are used:

- the **DL** (**D**ehydration **L**og)
- the **DSL** (**D**ielectric **S**trength **L**og)

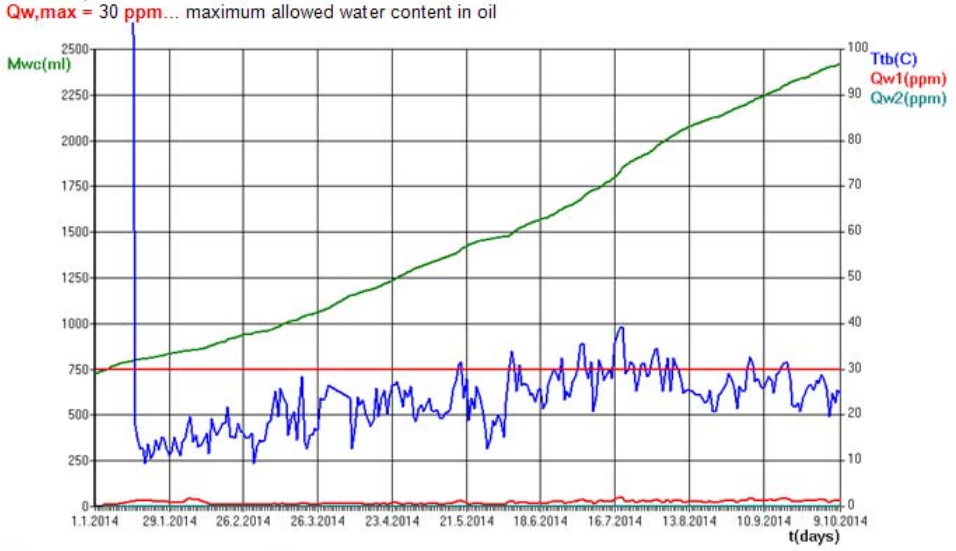
Both procedures are started by clicking on the DL or the DSL buttons in the Main window. and by clicking on the OK button , the final, printable output of the DL procedure is shown

ADT 2012 Dehydrator - Main Data Log
OPTIM D2L (Dehydration Dielectric Log)
Procedure: DL (Dehydration Log)
© Ing. Altmann, 2013

Transformer Location:	**xxxx**
Transformer Serial Number:	
ADT 2012 Serial Number:	**xxxx**

Time-period of evaluation : 01.01.2014 - 09.10.2014

Norm requested value Qw,max - red horizontal line
Qw,max = 30 ppm... maximum allowed water content in oil



Mwc amount of removed water (ml)
Qw1 input value of water content in oil (ppm)
Qw2 output value of water content in oil (ppm)
Ttb transformer temp. bottom (C)

ATTENTION.
Water content in oil Qw exceeded allowed Qw,max-limit:

Day	Qw(ppm)

Remarks & Recommendations

Date of evaluation: 10.10.2014
Replacement of temperature sensor at 11.1 2014

A new kind of assessment can be used now for the online diagnostic of dielectric behavior of the Tap-changer

DSL – Dielectric Strength Log

This new approach enables the DSL online to calculate the theoretical (maximum attainable) value of the dielectric strength of oil (the Ud,t –value) based on the direct measuring of the water content in the oil (the Qw1-value).

And the following steps are similar as before :

- requested time-range of data (Data File , Start , End)
- tap-changer Location, tap-changer S/N and VS-06 S/N
- Minimum allowable dielectric strength of the oil (Ud,min)

these can be directly and easily entered from the keyboard.

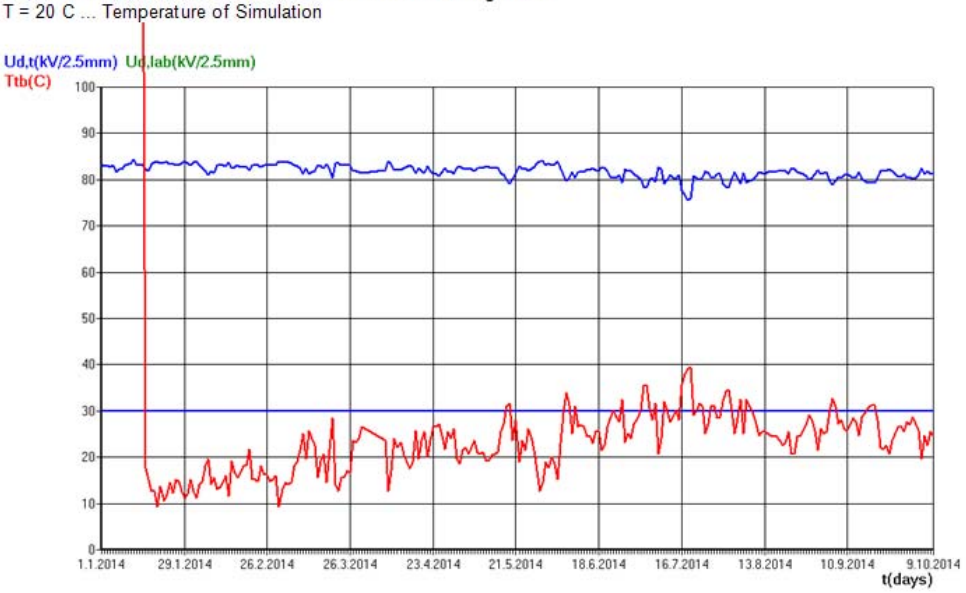
The DSL procedure enables substantially more detailed insight into dielectric behavior of a given tap-changer especially the change of the dielectric strength versus the temperature of the tap-changer.

ADT 2012 Dehydrator - Main Data Log
OPTIM D2L (Dehydration Dielectric Log)
Procedure: DSL (Dielectric Strength Log)
© Ing. Altmann, 2013

Transformer Location:	**xxxx**
Transformer Serial Number:	
ADT 2012 Serial Number:	**xxxx**

Time-period of evaluation : 01.01.2014 - 09.10.2014

Norm requested value Ud,min - **blue** horizontal line
Ud,min = 30 **kV/2.5mm**... minimal allowed dielectric strength in oil
T = 20 C ... Temperature of Simulation



Ud,t ... Theoretical Dielectric Strength of oil (kV/2.5mm)
Ttb ... Transformer temperature bottom (C)
Ud,lab ... lab reading(s) of dielectric strength of oil (kV/2.5mm)

ATTENTION.
Dielectric Strength of oil Ud,t decreased under allowed Ud,min-limit:

Number of lab verifications: 0

Day	Ud,t(kV/2.5mm)

Remarks & Recommendations

Date of evaluation: 10.10.2014
Replacement of temperature sensor at 11.1 2014

For the relevant diagnostic results, the accuracy of the Ud,t-simulation for the given time-period must always be correspondingly verified:

- by the quantitative comparison of the Ud,t-value and the Ud,lab-value at the same time.

The simulated Ud,t-value has to be compared with the Ud,lab- value at the same sampling time (the time when the oil for the lab Ud-reading has been sampled at the Tap-changer).

The final result of the DSL-procedure is the quantitative verification by means of the Verification Table and the Verification Diagram.