

# Service Manual

# Temperature Calibrators

JOFRA ETC-125 A / 400 A / 400 R

© Copyright 2003 AMETEK DENMARK A/S





# List of contents

---

|            |   |           |
|------------|---|-----------|
| <b>1.0</b> | <b>General</b> .....                          | <b>5</b>  |
| 1.1        | Introduction .....                            | 5         |
| 1.2        | Safety instructions.....                      | 7         |
| <b>2.0</b> | <b>Maintenance</b> .....                      | <b>9</b>  |
| 2.1        | Adjusting and calibrating the instrument..... | 9         |
| 2.2        | Caring for the instrument after use .....     | 17        |
| <b>3.0</b> | <b>Repairs</b> .....                          | <b>19</b> |
| 3.1        | Trouble shooting .....                        | 20        |
| 3.2        | Dismantling the instruments .....             | 25        |
| 3.2.1      | Dismantling the ETC-125 A .....               | 25        |
| 3.2.2      | Dismantling the ETC-400 A .....               | 31        |
| 3.2.3      | Dismantling the ETC-400 R.....                | 36        |
| 3.3        | Replacement of spare parts - ETC-125 A .....  | 42        |
| 3.3.1      | Replacement of controller unit.....           | 42        |
| 3.3.2      | Replacement of key pad unit.....              | 43        |
| 3.3.3      | Replacement of power inlet.....               | 43        |
| 3.3.4      | Replacement of SMPS PCB.....                  | 44        |
| 3.3.5      | Replacement of Power PCB.....                 | 44        |
| 3.3.6      | Replacement of fan .....                      | 45        |
| 3.3.7      | Replacement of Pt100 sensor .....             | 46        |
| 3.3.8      | Replacement of well unit .....                | 46        |
| 3.4        | Replacement of spare parts - ETC-400 A .....  | 47        |
| 3.4.1      | Replacement of controller unit.....           | 47        |
| 3.4.2      | Replacement of key pad unit.....              | 48        |
| 3.4.3      | Replacement of power inlet.....               | 48        |
| 3.4.4      | Replacement of Power PCB.....                 | 49        |
| 3.4.5      | Replacement of ribbon cable.....              | 49        |
| 3.4.6      | Replacement of fan .....                      | 50        |
| 3.4.7      | Replacement of Pt100 sensor .....             | 50        |
| 3.4.8      | Replacement of well unit .....                | 51        |
| 3.5        | Replacement of spare parts - ETC-400 R .....  | 52        |
| 3.5.1      | Replacement of controller unit.....           | 52        |

|            |                                       |           |
|------------|---------------------------------------|-----------|
| 3.5.2      | Replacement of key pad unit .....     | 53        |
| 3.5.3      | Replacement of power inlet .....      | 53        |
| 3.5.4      | Replacement of Power PCB .....        | 54        |
| 3.5.5      | Replacement of ribbon cable .....     | 54        |
| 3.5.6      | Replacement of fan .....              | 55        |
| 3.5.7      | Replacement of Pt100 sensor .....     | 55        |
| 3.5.8      | Replacement of target unit .....      | 56        |
| <b>4.0</b> | <b>Spare parts and drawings .....</b> | <b>57</b> |
| 4.1        | Spare parts .....                     | 57        |
| 4.2        | Exploded view – ETC-125 A .....       | 61        |
| 4.3        | Exploded view – ETC-400 A .....       | 62        |
| 4.4        | Exploded view – ETC-400 R .....       | 63        |
| 4.5        | Wiring diagram – ETC-125 A .....      | 64        |
| 4.6        | Wiring diagram – ETC-400 A / R .....  | 65        |

# 1.0 General

---

## 1.1 Introduction

This service manual applies to the following instruments:

- **Jofra ETC-125 A**
- **Jofra ETC-400 A**
- **Jofra ETC-400 R**

All calibrators are produced from quality components by skilled staff.

Each calibrator passes several tests during assembly and undergoes a final inspection and test following a calibration procedure laid down by our technical staff.



### **Caution...**

If you decide to check and/or re-calibrate the calibrator, you must **always** use certified test equipment only and ensure proper contact between the test probe and the well of the calibrator.

Operating guidelines and technical specifications are outlined in the user- and reference manual order no. 123943. Please note that the user part of the manual is multilingual and the reference part is in English only.

## Technical assistance

The following information regarding testing and repair was correct at the time of issue. Do not hesitate to contact our service department or your local distributor, however, if you have further queries.

**AMETEK DENMARK A/S**  
**Gydevang 32- 34**  
**DK-3450 Allerød**

**Phone: +45 48 16 80 00**  
**Fax: +45 48 16 80 80**



### **Note...**

Please note that we would be very interested in hearing from you if you have any ideas or suggestions for changes to our products.

## 1.2 Safety instructions



### **Read this manual carefully before doing any maintenance on the instruments!**

Please follow the instructions and procedures described in this manual in order to maintain the instruments correctly and to avoid any personal injuries and/or damage to the instruments.



### **Warning**

- The calibrator is designed for **interior use only** and should **not be used in risk-prone areas**, where vapour or gas leaks, etc. may constitute an explosives hazard. Neither should the calibrator be operated in an excessively dusty or dirty environment.
- **Never** use heat transfer fluids such as silicone, oil, paste, etc. These fluids may penetrate the calibrator and cause damage or create poisonous fumes.
- **Do not** operate this instrument without a properly grounded, properly polarized power cord.
- **Do not** use this instrument for any application other than calibration work.
- The calibration instruments should only be used by **TRAINED PERSONNEL**.



### **Caution – Hot surface**

This symbol is engraved in the well of the ETC-400 A and in the grid plate of the ETC-125 A and ETC-400 R.

**Do not touch** the grid plate, the well or the target unit – they may be very hot.



## Note...

- The product liability **only** applies if the instrument is subject to a manufacturing defect. This liability becomes void if the service personnel fails to follow the maintenance instructions set out in this manual or uses unauthorised spare parts.
- The instrument must **not** be exposed to draughts.



## 2.0 Maintenance

---

### 2.1 Adjusting and calibrating the instrument

You are advised to return the calibrator to Ametek Denmark A/S or an accredited laboratory at least once a year for calibration and adjustment.

Alternatively, you can calibrate/adjust the calibrator yourself. You will need a calibrated, traceable sensor and thermometer with an accuracy better than  $\pm 0.1^{\circ}\text{C}$  /  $\pm 0.18^{\circ}\text{F}$ . Ensure that the ambient temperature is  $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$  /  $73.4^{\circ}\text{F} \pm 5.4^{\circ}\text{F}$ .

To calibrate/adjust the instrument five different temperatures are needed. These are all present in the various types of instruments.

The calibration temperatures are:

|           |    |   |
|-----------|----|---|
| ETC-125 A | 1. | $-8^{\circ}\text{C}$ / $17.6^{\circ}\text{F}$ |
|           | 2. | $0^{\circ}\text{C}$ / $32^{\circ}\text{F}$    |
|           | 3. | $50^{\circ}\text{C}$ / $122^{\circ}\text{F}$  |
|           | 4. | $100^{\circ}\text{C}$ / $212^{\circ}\text{F}$ |
|           | 5. | $125^{\circ}\text{C}$ / $257^{\circ}\text{F}$ |

|               |    |   |
|---------------|----|---|
| ETC-400 A / R | 1. | $50^{\circ}\text{C}$ / $122^{\circ}\text{F}$  |
|               | 2. | $100^{\circ}\text{C}$ / $212^{\circ}\text{F}$ |
|               | 3. | $200^{\circ}\text{C}$ / $392^{\circ}\text{F}$ |
|               | 4. | $300^{\circ}\text{C}$ / $572^{\circ}\text{F}$ |
|               | 5. | $400^{\circ}\text{C}$ / $752^{\circ}\text{F}$ |

Prepare to adjust/calibrate the instrument by using the setup shown in Fig. 1. Here the ETC-400 A is shown as an example :



### Caution...

- **Do not touch** the tip of the sensor when it is removed from the insertion tube/well – it may be very hot.

#### ETC-125 A only

- The well and the insertion tube **must** be clean before use.
- The insertion tube must **never** be forced into the well. The well could be damaged as a result, and the insertion tube may get stuck.

#### ETC-400 R only

- **Do never** allow any foreign material to come in contact with the target unit surface, as the emission factor of the target unit might change.
- **Do not** use any kind of detergent to clean the target unit surface. The coating might be damaged. Dust can be blown off with clean air.

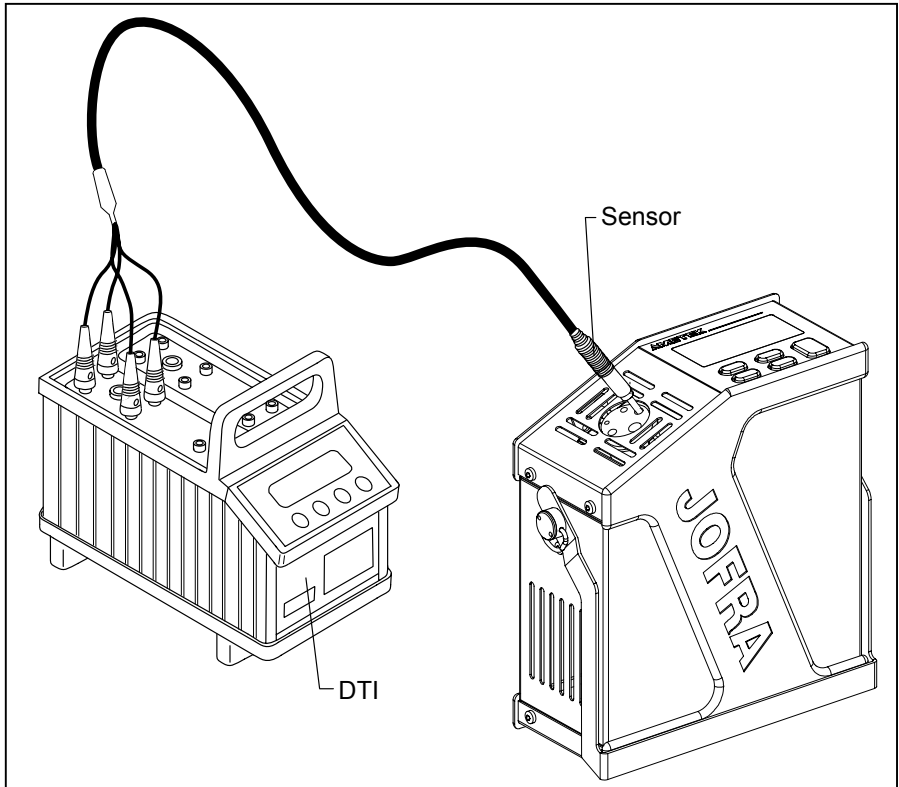
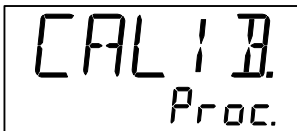


Fig 1.

① To enter the service mode, switch on the instrument on the on/off power control switch while holding down the **ESC MENU**.

② Press **▲** or **▼** until Calib.Proc. is reached:



③ Press **↩** to accept.

The instrument will now heat up/cool down to reach the first calibration temperature:



To exit the service mode, switch the instrument off and on again using the power control switch.

- ④ Once the calibrator is stable, you need to enter the reference temperature found using the reference thermometer. The calibration temperature is suggested as a reference point:




This procedure is repeated for TEMP.2, TEMP.3, TEMP.4 and TEMP.5.

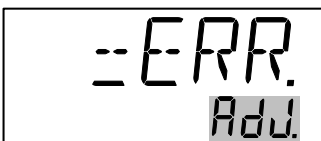
All five calibration temperatures and associated reference temperatures have now been entered.

The instrument will now check whether the reference temperatures which have been entered are within the permitted tolerances.

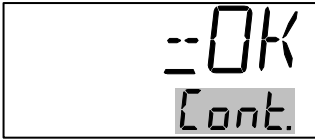
Permitted tolerances:

- ETC-125 A / 400 A / 400 R :  $\pm 0,2^{\circ}\text{C}$  /  $0.36^{\circ}\text{F}$

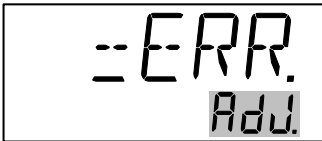
If the instrument detects excessive deviations for one or more steps, it will show a screen reading =ERR. in the top of the display. The text Adj. will flash in the bottom of the display to indicate that an adjustment is required. Accept by pressing  :








If the calibrator is found to be within the permitted tolerances, the instrument will display the text =OK at the top of the display. The text Cont. will flash in the bottom of the display to indicate that you may continue without adjustments:





If the calibration results in the message ERR. Adj., the following options are available:



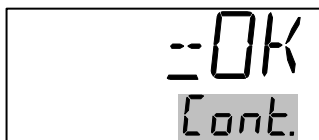
- Press  to cancel the function and return to service mode.
- Press  to go back to a previous screen and press  to repeat an adjustment step when it is shown on the display.
- Press  to toggle between Adj. and Cont. on the display.
- Press  when Adj. is flashing to calculate a new set of coefficients. Next, repeat the entire calibration/adjustment procedure.





If the new coefficients deviate by more than 4% from the standard values, the instrument will display an ERROR 2 in the display. The calculated coefficients will be ignored:





- Press  to cancel the function and return to service mode,
- or
- press  to repeat the entire calibration procedure. If the coefficients are within the permitted tolerances, the instrument will start a calibration.

If the display reads OK Cont., the following options are available:





- Press  to toggle between Adj. and Cont. on the display.
- Press  to cancel the Adj. or Cont. and return to service mode.
- Press  when Cont. is flashing to accept the calibration. Next, enter a new calibration date.
- Press  when the display reads Adj. to calculate new coefficients even though the calibration was within the permitted tolerances. A new calibration procedure will start.

⑥ Adjust the date by toggling through the available days, months and years. Begin by selecting the required day as shown below:

Press  or  to select the required day in the interval 1-31.



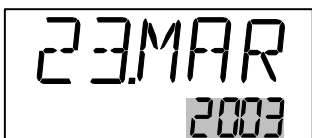
⑦ Press  to accept your selection.


⑧ Press  or  to select the required month from JAN / FEB / MAR / APR / MAY / JUN / JUL / AUG / SEP / OCT / NOV / DEC.



⑨ Press  to accept your selection.

⑩ Press  or  to select a year between 1998 – 2025.



- ⑪ Press  to accept your selection. The day will be adjusted if necessary to ensure the legality of the date. Finally, the day, month and year will flash:



- ⑫ Press  to accept the date.

or

press  to cancel the whole selection.

- ⑬ Switch the instrument off and on again using the power control switch and cool down the instrument.



## 2.2 Caring for the instrument after use

- ① The following routine must be observed before the instrument is switched off:



### Over 100°C/212°F

If the calibrator has been heated up to temperatures above 100°C/212°F, you must wait until the instrument reaches a temperature **below 100°C/212°F** before you switch it off.

### Below 0°C/32°F (applies only to ETC-125 A)

If the calibrator has reached a temperature below 0°C/32°F, ice crystals may form on the insertion tube and on the well. This, in turn, may cause verdigris to form on the material. To prevent this from happening, simply heat up the calibrator to 50°C/122°F.

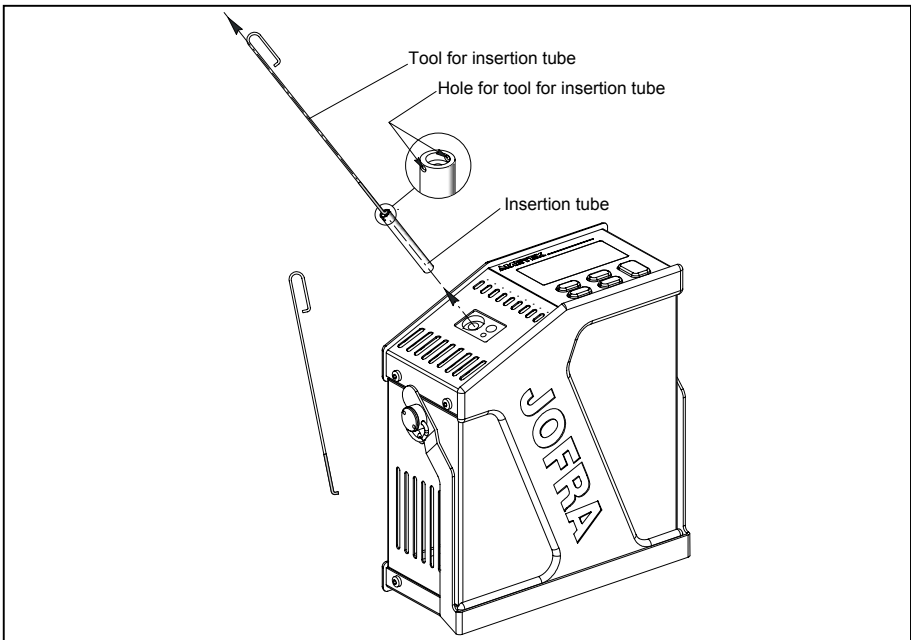


Fig. 2

② **Applies only to ETC-125 A**

Remove the insertion tube from the calibrator using the tool for insertion tube as shown in Fig. 2.

③ Switch off the calibrator using the power control switch.



**Caution...**  
(applies only to ETC-125 A)

- The insertion tube must **always** be removed from the calibrator after use.  
The humidity in the air may cause verdigris to form on the insertion tube inside the instrument. There is a risk that the insertion tube may become stuck if this is allowed to happen.
- The insertion tube **must** be removed to avoid damage to the instrument if the calibrator is to be transported long distances.



**Warning**

Ensure that the instrument has cooled down to a temperature **below 100°C/212°F** before packing it in any kind of container.

## 3.0 Repairs

---



### Warning

The calibrator **must** be switched off before any attempt is made to service the instrument.



### Note...

Ametek Denmark's liability ceases if:

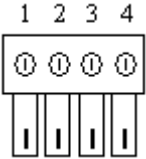
- Parts are replaced/repared using spare parts which are not identical to those recommended by the manufacturer.
- non-original parts are used in any way when operating the instrument.

Ametek Denmark's liability is restricted to errors which originated in the factory.

### 3.1 Trouble shooting

#### Error: No light in display – ETC-125 A

---

| Likely cause:             | Solution:  |
|---------------------------|--|
| Defective fuses:          | Check the fuse on the SMPS PCB inside the calibrator. If defective, replace POWER SUPPLY.  |
| Supply to CONTROLLER PCB: | Check the supply on the POWER PCB – 11-13V on CN2 terminal 3(+) and terminal 4 (-). <ul style="list-style-type: none"><li>• If supply voltage is 11-13V, replace CONTROLLER PCB and re-calibrate the unit.</li></ul> <div style="text-align: center;"><p>The diagram shows a 4-pin connector with terminals labeled 1, 2, 3, and 4. Terminals 3 and 4 are connected to a common ground rail, indicated by vertical lines extending downwards from the bottom of the connector housing.</p></div> <ul style="list-style-type: none"><li>• If supply voltage is lower than 11V, replace SMPS PCB.</li></ul> |

#### Error: No light in display - ETC-400 A / R

---

| Likely cause:           | Solution:  |
|-------------------------|--|
| Defective fuses:        | <ul style="list-style-type: none"><li>• Check fuses on the POWER PCB inside the calibrator. If defective, replace fuses.</li><li>• Check heating element. If defective, it can damage the fuses.</li></ul> |
| Defective ribbon cable: | Check ribbon cable between controller and power PCB.   |

Supply to CONTROLLER PCB:

Check the supply – minimum 11V on CN1(Controller) or CN4(power PCB) terminal 8(+) and terminal 1,3,5,7,9(-).

- If supply voltage is 11-13V, replace CONTROLLER PCB and re-calibrate the unit.
- If supply voltage is lower than 11V, replace POWER PCB.

**Error:**



- all models

**Likely cause:**

The measured temperature is out of range:

**Solution:**

Check RTD sensor.

At 23°C the impedance should be 109 ohm  $\pm$ 3 ohm. If RTD sensor is OK, replace CONTROLLER PCB and re-calibrate the unit.

- Otherwise, replace RTD sensor and re-calibrate the unit.

**Error:**



- all models

**Likely cause:**

The new coefficients calculated by the unit in the CALIB. Proc. deviate by more than 4% from the standard values. The calculated coefficients will be ignored:

**Solution:**

Check the accuracy of the reference thermometer used for calibration and repeat the calibration/adjustment procedure.

If the calibrator shows ERROR 0002 again, the internal RTD sensor or the CONTROLLER PCB is defective.

**Error:**



- all models

---

**Likely cause:**

Defective CONTROLLER PCB:

**Solution:**

Replace the CONTROLLER PCB and re-calibrate the unit.

**Error: Fan does not work - all models**

---

**Likely cause:**

Fan obstructions:

**Solution:**

Remove any obstructions.

Supply for fan:

Check the supply on CN2 terminal 1(+) and terminal 2(-) on the POWER PCB.

- If supply voltage is 5-13V, replace fan.
- If supply voltage is lower than 5V, replace POWER PCB.

**Error: Temperature instability - all models**

---

**Likely cause:**

Defective RTD:

**Solution:**

Replace RTD with normal resistor (110-140 ohm). If instability stops replace RTD else replace Controller PCB.

Defective CONTROLLER PCB:

Replace the CONTROLLER PCB and re-calibrate the unit.

**Error: Calibrator only cool or heat - ETC-125 A**

---

| <b>Likely cause:</b>       | <b>Solution:</b>   |
|----------------------------|--|
| Defective Peltier element: | <ul style="list-style-type: none"><li>• Replace WELL.</li></ul>  |
| Defective POWER PCB:       | <ul style="list-style-type: none"><li>• If relay K1 dos not pull when temperature is set from max. to min. or opposite. Replace POWER PCB.</li></ul> |

**Error: Calibrator does not heat - ETC-400 A / R**

---

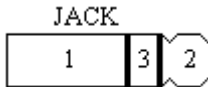
| <b>Likely cause:</b>               | <b>Solution:</b>  |
|------------------------------------|---|
| Defective heating elements:        | <p>Check resistant of the heating elements</p> <ul style="list-style-type: none"><li>• Approx. 44 ohm for 115V version.</li><li>• Approx. 177 ohm for 230V version.</li></ul> |
| Defective over-temperature sensor: | <p>Check that relay K1 has been pulled.</p> <p>If the relay has not been pulled, check that the over-temperature sensor has been mounted and is OK.</p>                       |
| Defective POWER PCB:               | <p>If the sensor is OK, change the POWER PCB.</p>   |
| Defective CONTROLLER PCB:          | <p>Set the calibrator to max. temperature and measure the voltage on the POWER PCB on CN4 between terminal 6(+) and terminal 1,3,5,7,9(-).</p>                                |

If the voltages are less than 4V, change CONTROLLER PCB and re-calibrate the calibrator. If not, change the POWER PCB.

**Error: RS232 interface can not be initialized. The display on the calibrator does not show “REMOTE” - all models**

**Likely cause:**

The connection between PC and calibrator is not correct:

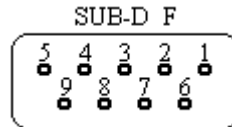


Defective CONTROLLER PCB:

**Solution:**

- Check that the calibrator is connected to the selected RS232 COM port.
- Check serial cable:

| Jack |     | SUB-D |
|------|-----|-------|
| 1    | GND | 5     |
| 2    | Tx  | 2     |
| 3    | Rx  | 3     |



Replace the CONTROLLER PCB and re-calibrate the calibrator.

**Error: The emission factor of the target unit has changed – ETC-400 R**

**Likely cause:**

The target unit surface has been damaged due to physical contact with foreign material or solvent.

**Solution:**

Replace target unit.



## 3.2 Dismantling the instruments



### Caution...

Remember to disconnect the instrument from the mains supply before it is dismantled.

Necessary tools:

- Wire cutter
- Special tool for removal of handle, part number 124139
- Flat screw driver
- Torx – T10
- Small wrench

### 3.2.1 Dismantling the ETC-125 A

#### A. Removal of top plate with display and keyboard unit.

Remove the 4 top screws and gently loosen the plate from the side where the heating well is located.

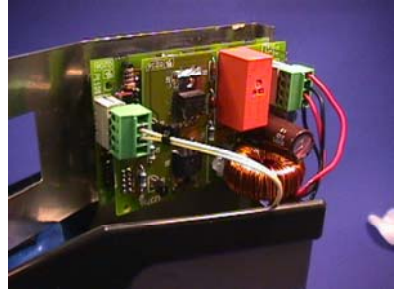
During assembly the plate is mounted in reverse order. First adjust the side with the keyboard and then the side where the heating well is located.

Carefully raise the plate to expose the 3 wires connecting the top plate and the Controller PCB.



Disconnect the 3 connectors.

The top plate can now be completely removed.



### **Caution...**

It is possible to reconnect the cables incorrectly during assembly. Ensure that the CN2 on the Controller Board and CN2 on the Power Board are assembled correctly. They can be accidentally switched.

### **B. Removal of handle.**

Remove the 2 screws holding the handle in place by using a special tool, part number 124139.



### **Caution...**

Loctite has been applied to the screw for a better fit. When assembling the handle, the thread must be greased with Loctite.

### **C. Removal of bottom plate.**

Remove the 4 mounting screws from the bottom plate. The plate can now easily be removed.

**D. Removal of front plate.**

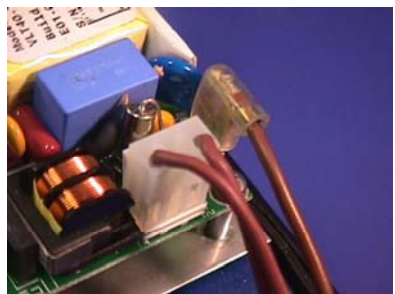
Carefully remove the front plate by pulling it sideways away from the instrument.



**E. Removal of back plate.**

Carefully remove the back plate by pulling it away from the instrument.

Remove the cable which connects the power inlet to the Switch Mode Power Supply PCB, by disconnecting the 3-poled connector located on the SMPS PCB. Finally the flag connector is disconnected.



## F. Removal of SMPS PCB.

Disconnect the 6-poled connector on the SMPS PCB.

Then unscrew the 4 mounting screws and carefully remove the underlying Mylar foil.



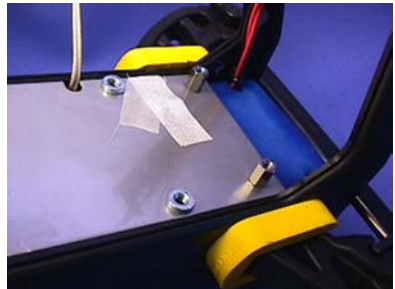
### Caution...

During assembly please ensure that the upper 2 screws are holding the rubber side panels together. So in order to mount the screws properly, the rubber side panels have to be pressed firmly together.

Remember that it is **important** to place a piece of protecting Mylar foil between the SMPS PCB and the cables, which are located underneath the SMPS PCB.

## G. Removal of rubber side panels.

Remove the 2 screws placed behind the SMPS PCB.



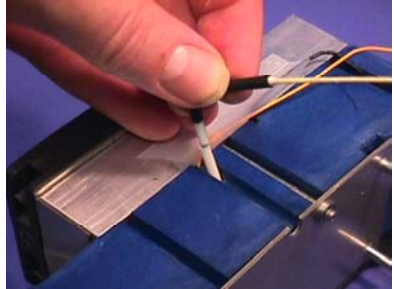
### Caution...

During assembly the rubber side panels must be pressed firmly together in order to get the screws mounted correctly.

## H. Removal of Pt100 sensor.

When the rubber side panels are dismantled, carefully retract the Pt100 sensor from the instrument.

The Pt100 sensor may stick somewhat as it is mounted into a heat sink compound.



## I. Removal of well unit.

When the Pt100 sensor and the black insulation plug have been dismantled the well unit will be accessible.

## J. Removal of Power PCB.

Remove the 3 mounting screws from the Power PCB. The Power PCB is carefully removed from the Controller PCB.

Notice that the Power PCB is connected to the Controller PCB by means of connectors mounted on the PCBs.



## **K. Removal of fan.**

The instrument is placed on its side with the fan facing upwards.

Remove the 2 screws attaching the fan to the instrument. Take care that the spring washers stay on the screws, while removing the screws.

Avoid further disassembly of the well unit.



### 3.2.2 Dismantling the ETC-400 A

#### A. Removal of top plate with display and keyboard unit.

Remove the 4 top screws and gently loosen the plate from the side where the heating well is located.

Carefully raise the plate to expose the 2 wires connecting the top plate and the PCB Controller.

During assembly the plate is mounted in reverse order. First adjust the side with the keyboard and then the side where the heating well is located

Disconnect the 2 connectors.

The top plate can now be completely removed.



## B. Removal of handle.

Remove the 2 screws holding the handle in place by using a special tool, part number 124139.



## Caution...

Loctite has been applied to the screw for a better fit. When assembling the handle, the thread must be greased with Loctite.

## C. Removal of bottom plate.

Remove the 4 mounting screws from the bottom plate. The plate can now easily be removed.

## D. Removal of front plate.

Carefully remove the front plate by pulling it sideways away from the instrument.

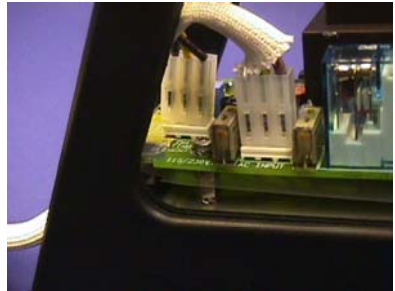




## E. Removal of back plate.

Remove the cable which connects the power inlet to the Power PCB by disconnecting the connector marked “AC input” (CN3) on the Power PCB.

Now remove the back plate by carefully pulling it away from the instrument.



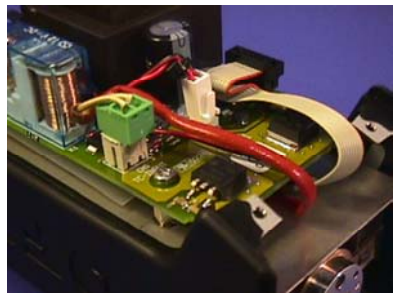
### Caution...

It is possible to reconnect the cables incorrectly during assembly. Ensure that CN1 and CN3 (on the Power PCB) are assembled correctly.

## F. Removal of Power PCB.

Disconnect all cables connected to the Power PCB.

Remove the 4 mounting screws.



### Caution...

During assembly it is very important to place the Power PCB correctly.

- The Power PCB must be placed with the high voltage part facing downwards (this end contains CN1 and CN3).
- Check that connector CN1 (heating element) and connector CN3 (AC input) are placed correctly.
- Ensure that all cables, running under the Power PCB, are placed under the protecting Mylar foil.

## G. Removal of fan.

Remove the 4 screws attaching the fan to the well unit.

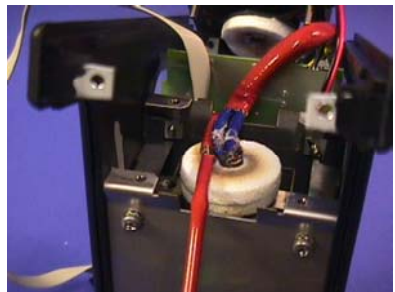
Disconnect the CN1/FAN connector from the Power PCB.

The cable can now carefully be retracted from beneath the protecting Mylar foil on the backside of the Power PCB.



## H. Removal of Pt100 sensor.

When the fan is dismantled and the bottom of the well unit is visible, carefully retract the Pt100 sensor from the instrument.



### Caution...

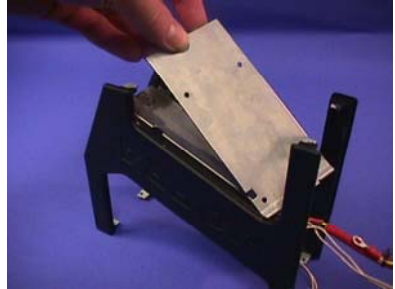
When replacing the Pt100 sensor, it is very important that the connectors mounted on the sensor, are under no circumstances to be dismantled. Should the connectors be mounted incorrectly, there is a risk that the over heating protection system will not work

## I. **Removal of well unit.**

When the Power PCB has been dismantled the detachable plate, now visible, can easily be removed.

The other plate is dismantled by removing the 4 screws attaching the plate to the instrument.

The well unit is now accessible.



### 3.2.3 Dismantling the ETC-400 R

#### A. Removal of top plate with display and keyboard unit.

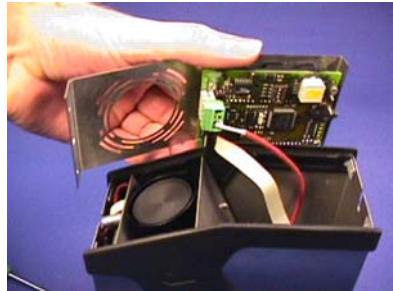
Remove the 4 top screws and gently loosen the plate from the side where the target unit is located.

Carefully raise the plate to expose the 2 wires connecting the top plate and the PCB Controller.

During assembly the plate is mounted in reverse order. First adjust the side with the keyboard and then the side where the target unit is located

Disconnect the 2 connectors.

The top plate can now be completely removed.



**B. Removal of handle.**

Remove the 2 screws holding the handle in place by using a special tool, part number 124139.



**Caution...**

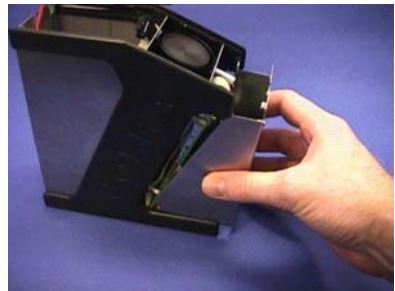
Loctite has been applied to the screw for a better fit. When assembling the handle, the thread must be greased with Loctite.

**C. Removal of bottom plate.**

Remove the 4 mounting screws from the bottom plate. The plate can now easily be removed.

**D. Removal of front plate.**

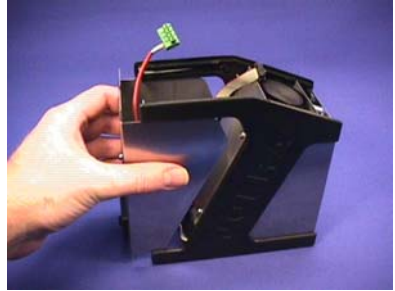
Carefully remove the front plate by pulling it sideways away from the instrument.



## E. Removal of back plate.

Remove the cable which connects the power inlet to the Power PCB by disconnecting the connector marked “AC input” (CN3) on the Power PCB.

Now remove the back plate by carefully pulling it away from the instrument.



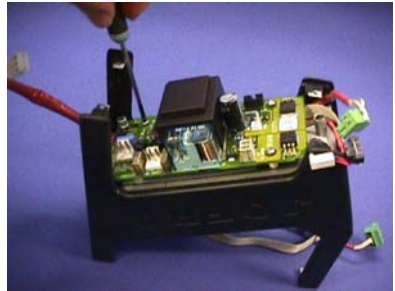
### Caution...

It is possible to reconnect the cables incorrectly during assembly. Ensure that CN1 and CN3 (on the Power PCB) are assembled correctly.

## F. Removal of Power PCB.

Disconnect all cables connected to the Power PCB.

Remove the 4 mounting screws.





## Caution...

During assembly it is very important to place the Power PCB correctly.

- The Power PCB must be placed with the high voltage part facing downwards (this end contains CN1 and CN3).
- Check that connector CN1 (heating element) and connector CN3 (AC input) are placed correctly.
- Ensure that all cables, running under the Power PCB, are placed under the protecting Mylar foil.



## G. Removal of fan.

Remove the 4 screws attaching the fan to the target unit.

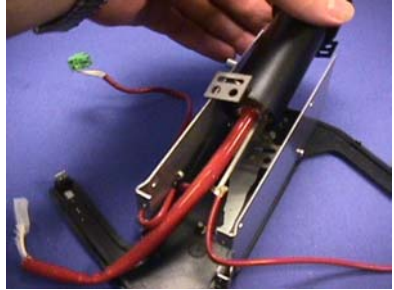
Disconnect the CN1/FAN connector from the Power PCB.

The cable can now carefully be retracted from beneath the protecting Mylar foil on the backside of the Power PCB.



## H. Removal of Pt100 sensor.

When the fan is dismantled and the bottom of the target unit is visible, carefully retract the Pt100 sensor from the instrument.



### Caution...

When replacing the Pt100 sensor, it is very important that the connectors mounted on the sensor, are under no circumstances to be dismantled. Should the connectors be mounted incorrectly, there is a risk that the over heating protection system will not work





## Caution...

Take care not to scratch the coated surface of the target unit.

### I. Removal of target unit.

When the Power PCB has been dismantled the detachable plate, now visible, can easily be removed.

The other plate is dismantled by removing the 4 screws attaching the plate to the instrument.

The target unit is now accessible.



## Caution...

During assembly it is very important that the holes in the target unit, the inner heating shield and the outer heating shield are in alignment to allow insertion of extern sensor.



### 3.3 Replacement of spare parts - ETC-125 A

Compare exploded view in Chapter 4.0, page 61.



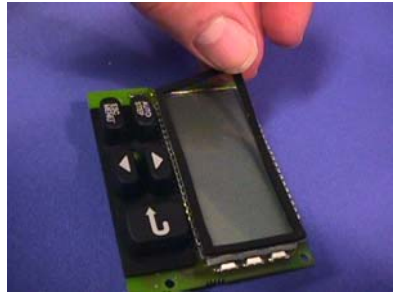
#### Caution...

**Always** calibrate the instrument after every dismantling and every time the instrument has been opened.

#### 3.3.1 Replacement of controller unit

(exploded view, page 61, pos. 2)

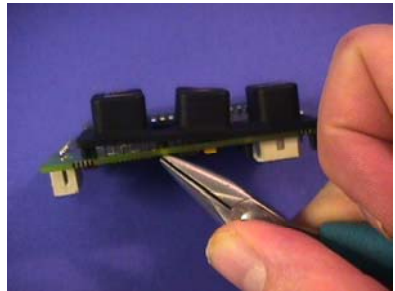
1. Follow dismantling instructions A and J.
2. Remove the screws attaching the controller to the top plate.
3. Clean the back side of the display window to remove any dust and remains from the rubber dust sealing.
4. Remove the plastic protection from the display window on the new controller unit.
5. Mount the new rubber dust sealing on the display window.
6. Mount the new controller unit onto the top plate.
7. All DIP switches are set in ON mode.
8. Reassemble the instrument in reverse order.



### 3.3.2 Replacement of key pad unit

(exploded view, page 61, pos. 1)

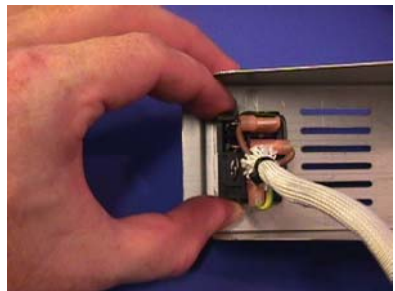
1. Follow dismantling instructions A and J.
2. Remove the screws attaching the controller to the top plate.
3. Remove the rubber key pads from the controller unit by pulling them off.
4. The new rubber key pads are mounted onto the controller unit by pulling the rubber pins through the holes in the controller PCB. Pliers can be used.
5. Clean the back side of the display window to remove any dust.
6. Mount the controller unit onto the top plate.
7. Reassemble the instrument in reverse order.



### 3.3.3 Replacement of power inlet

(exploded view, page 61, pos. 8)

1. Follow dismantling instructions A through E.
2. Remove the power inlet by squeezing the barbs on the back side of the power inlet and pushing at the same time.
3. Mount the new power inlet. Check that the "I" on the power control switch is turned upwards.
4. Reassemble the instrument in reverse order.



### 3.3.4 Replacement of SMPS PCB

(exploded view, page 61, pos. 3)

1. Follow dismantling instructions A through F.
2. Replace the SMPS PCB.
3. Reassemble the instrument in reverse order.



#### **Caution...**

During assembly it is very important to place the SMPS PCB correctly.

- The SMPS PCB must be placed with the high voltage part facing downwards.
- Ensure that all cables, running under the SMPS PCB, are placed under the protecting Mylar foil.

### 3.3.5 Replacement of Power PCB

(exploded view, page 61, pos. 5)

1. Follow dismantling instructions A and J.
2. Replace the Power PCB.
3. Reassemble the instrument in reverse order.

### 3.3.6 Replacement of fan

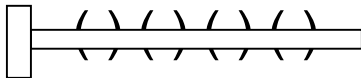
(exploded view, page 61, pos. 7)

1. Follow dismantling instructions A through E followed by procedure K.
2. Mount spacer, if necessary, in the new fan.
3. Mount the new fan, so that the text on the fan is facing towards the cooling plate and placing the wire on the same side as the Pt100 sensor.



#### Note...

Please note that if the spring washers have been removed from the screws during dismantling they **must** be remounted in pairs facing each other as shown on the drawing below.



4. Both screws are tightened until they are just touching the stack of spring washers. Finally the screws are tightened one at a time by a half turn. Repeat until all screws have been tightened an additional 4 half turns in all.
5. Reassemble the instrument in reverse order.

### 3.3.7 Replacement of Pt100 sensor

(exploded view, page 61, pos. 6)

1. Follow dismantling instructions A through H.
2. Carefully retract the old sensor from the instrument and replace it with the new one. Ensure that it is placed as deep down as possible.
3. Reassemble the instrument in reverse order.



#### **Caution...**

Remember that it is necessary to calibrate the instrument after the reassembling.

### 3.3.8 Replacement of well unit

(exploded view, page 61, pos. 4)

1. Follow dismantling instructions A through I.
2. Reassemble the instrument in reverse order.



#### **Caution...**

During assembly it is very important to place the SMPS PCB correctly.

- The SMPS PCB must be placed with the high voltage part facing downwards.
- Ensure that all cables, running under the SMPS PCB, are placed under the protecting Mylar foil.

## 3.4 Replacement of spare parts - ETC-400 A

Compare exploded view in Chapter 4.0, page 62.



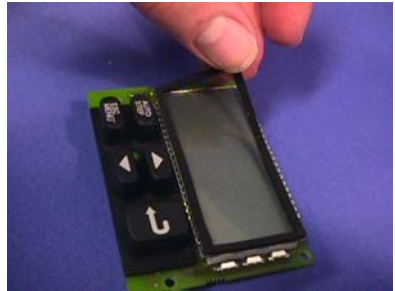
### Caution...

**Always** calibrate the instrument after every dismantling and every time the instrument has been opened.

### 3.4.1 Replacement of controller unit

(exploded view, page 62, pos. 1)

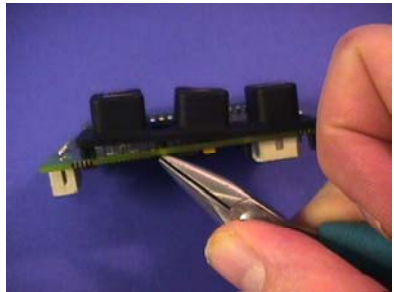
1. Follow dismantling instruction A.
2. Remove the screws attaching the controller to the top plate.
3. Clean the back side of the display window to remove any dust and remains from the rubber dust sealing.
4. Remove the plastic protection from the display window on the new controller unit.
5. Mount the new rubber dust sealing on the display window.
6. Mount the new controller unit onto the top plate.
7. DIP switch 1 is set in OFF mode and switch 2 – 4 are set in ON mode.
8. Reassemble the instrument in reverse order.



### 3.4.2 Replacement of key pad unit

(exploded view, page 62, pos. 1)

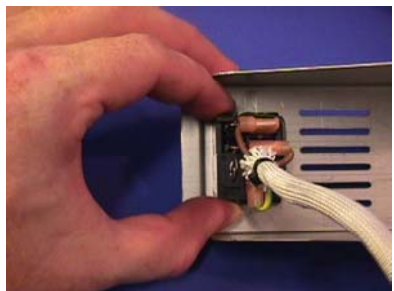
1. Follow dismantling instruction A.
2. Remove the screws attaching the controller to the top plate.
3. Remove the rubber key pads from the controller unit by pulling them off.
4. The new rubber key pads are mounted onto the controller unit by pulling the rubber pins through the holes in the controller PCB. Pliers can be used.
5. Clean the back side of the display window to remove any dust.
6. Mount the controller unit onto the top plate.
7. Reassemble the instrument in reverse order.



### 3.4.3 Replacement of power inlet

(exploded view, page 62, pos. 8)

1. Follow dismantling instructions A through E.
2. Remove the power inlet by squeezing the barbs on the back side of the power inlet and pushing at the same time.
3. Mount the new power inlet. Check that the "I" on the power control switch is turned upwards.





4. Ensure that the mains cable inside the instrument is fed around the fan.
5. Reassemble the instrument in reverse order.

### 3.4.4 Replacement of Power PCB

(exploded view, page 62, pos. 5)

1. Follow dismantling instructions A through F.
2. Replace the Power PCB.
3. Reassemble the instrument in reverse order.



### 3.4.5 Replacement of ribbon cable

(exploded view, page 62, pos. 3)

1. Follow dismantling instructions A through F.
2. Remove the Mylar foil beneath the Power PCB.
3. Replace the ribbon cable.
4. Remount the Mylar foil to protect the cables placed beneath the Power PCB.



#### **Caution...**

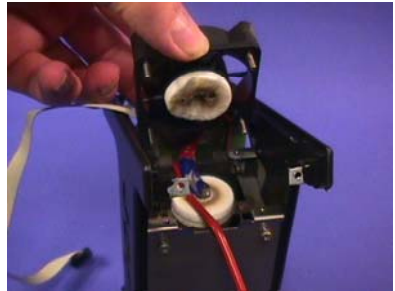
The ribbon cable must be placed correctly. Avoid contact with the fan.

5. Remount the Power PCB and the connectors.
6. Reassemble the instrument in reverse order.

### 3.4.6 Replacement of fan

(exploded view, page 62, pos. 7)

1. Follow dismantling instructions A through G.
2. Mount the new fan, so that the felt pad is facing towards the heating block in the well unit and the wire is facing towards the Power PCB.
3. Reassemble the instrument in reverse order.



### 3.4.7 Replacement of Pt100 sensor

(exploded view, page 62, pos. 6)

1. Follow dismantling instructions A through H.
2. Carefully retract the old sensor from the instrument and replace it with the new one. Ensure that it is placed as deep down as possible.
3. Then bend the wires in a way so that the 4-poled connector is led to the Controller and the 2-poled connector is led to the Power PCB.
4. Reassemble the instrument in reverse order.



### 3.4.8 Replacement of well unit

(exploded view, page 62, pos. 4)

1. Follow dismantling instructions A through I.
2. Replace the well unit. Check that the Hot-surface-symbol on top of the well is facing the correct way.
3. Check that the insulation felt pads are placed correctly in the bottom of the well unit.
4. Reassemble the instrument in reverse order.



## 3.5 Replacement of spare parts - ETC-400 R

Compare exploded view in Chapter 4.0, page 63.



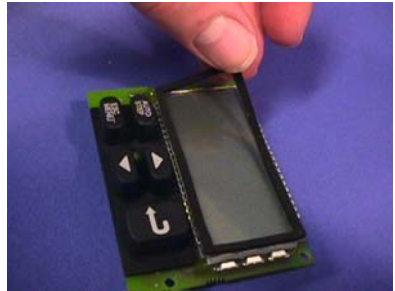
### Caution...

- **Always** calibrate the instrument after every dismantling and every time the instrument has been opened.
- Take care not to scratch the coated surface of the target unit.

### 3.5.1 Replacement of controller unit

(exploded view, page 63, pos. 1)

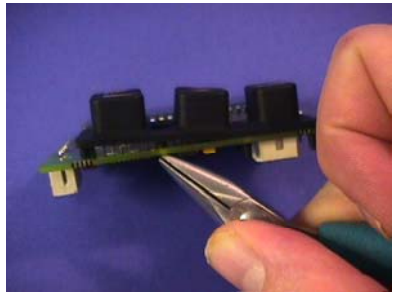
1. Follow dismantling instruction A.
2. Remove the screws attaching the controller to the top plate.
3. Clean the back side of the display window to remove any dust and remains from the rubber dust sealing.
4. Remove the plastic protection from the display window on the new controller unit.
5. Mount the new rubber dust sealing on the display window.
6. Mount the new controller unit onto the top plate.
7. DIP switch 2 is set in OFF mode and switch 1, 3 and 4 are set in ON mode.
8. Reassemble the instrument in reverse order.



### 3.5.2 Replacement of key pad unit

(exploded view, page 63, pos. 1)

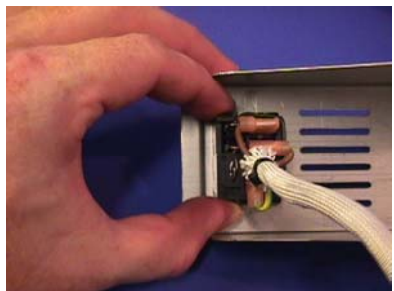
1. Follow dismantling instruction A.
2. Remove the screws attaching the controller to the top plate.
3. Remove the rubber key pads from the controller unit by pulling them off.
4. The new rubber key pads are mounted onto the controller unit by pulling the rubber pins through the holes in the controller PCB. Pliers can be used.
5. Clean the back side of the display window to remove any dust.
6. Mount the controller unit onto the top plate.
7. Reassemble the instrument in reverse order.



### 3.5.3 Replacement of power inlet

(exploded view, page 63, pos. 8)

1. Follow dismantling instructions A through E.
2. Remove the power inlet by squeezing the barbs on the back side of the power inlet and pushing at the same time.
3. Mount the new power inlet. Check that the "I" on the power control switch is turned upwards.



4. Ensure that the mains cable inside the instrument is fed around the fan.
5. Reassemble the instrument in reverse order.

### 3.5.4 Replacement of Power PCB

(exploded view, page 63, pos. 5)

1. Follow dismantling instructions A through F.
2. Replace the Power PCB.
3. Reassemble the instrument in reverse order.



### 3.5.5 Replacement of ribbon cable

(exploded view, page 63, pos. 3)

1. Follow dismantling instructions A through F.
2. Remove the Mylar foil beneath the Power PCB.
3. Replace the ribbon cable.
4. Remount the Mylar foil to protect the cables placed beneath the Power PCB.



#### **Caution...**

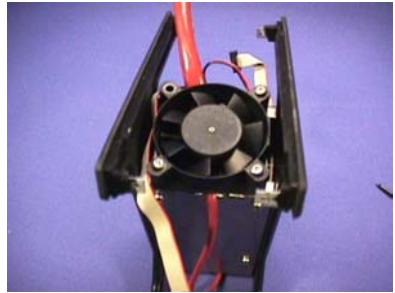
The ribbon cable must be placed correctly. Avoid contact with the fan.

5. Remount the Power PCB and the connectors.
6. Reassemble the instrument in reverse order.

### 3.5.6 Replacement of fan

(exploded view, page 63, pos. 7)

1. Follow dismantling instructions A through G.
2. Mount the new fan and reassemble the instrument in reverse order.



### 3.5.7 Replacement of Pt100 sensor

(exploded view, page 63, pos. 6)

1. Follow dismantling instructions A through H.
2. Carefully retract the old sensor from the instrument and replace it with the new one. Ensure that it is placed as deep down as possible.
3. Then bend the wires in a way so that the 4-poled connector is led to the Controller and the 2-poled connector is led to the Power PCB.
4. Reassemble the instrument in reverse order.



#### **Caution...**

The 2-poled wire is attached to the outer heating shield by means of a strip.

### 3.5.8 Replacement of target unit

(exploded view, page 63, pos. 4)

1. Follow dismantling instructions A through I.
2. Make sure that the holes in the target unit, the inner heating shield and the outer heating shield are in alignment to allow insertion of extern sensor.
3. Reassemble the instrument in reverse order.





## **4.0 Spare parts and drawings**

---

### **4.1 Spare parts**

All parts listed in the lists of spare parts can be obtained from the factory through our dealer (see exploded views).

Please contact your dealer for assistance if you require parts which do not appear on the lists.

---

## List of spare parts – ETC-125 A

---

| <b>Pos.</b>                         | <b>Spare parts</b>                | <b>Number</b> |
|-------------------------------------|-----------------------------------|---------------|
| (Compare exploded view section 4.2) |                                   |               |
| 1                                   | Key pad                           | 124180        |
| 2                                   | Controller PCB                    | 124178        |
| 3                                   | Swich Mode Power Supply, complete | 124199        |
| 4                                   | Well unit, complete               | 124201        |
| 5                                   | Power PCB                         | 124198        |
| 6                                   | Pt100 sensor                      | 124202        |
| 7                                   | Fan, complete                     | 124204        |
| 8                                   | Power inlet incl. wire            | 124203        |
| -                                   | Rubber foot for bottom, black     | 60N131        |
| -                                   | Screw set, complete               | 124197        |

---

## List of spare parts – ETC-400 A

---

| <b>Pos.</b>                         | <b>Spare parts</b>            | <b>Number</b> |
|-------------------------------------|-------------------------------|---------------|
| (Compare exploded view section 4.3) |                               |               |
| 1                                   | Key pad                       | 124180        |
| 2                                   | Controller PCB                | 124178        |
| 3                                   | Ribbon cable                  | 123975        |
| 4                                   | Well unit type 11 – 115V      | 124185        |
| 4                                   | Well unit type 11 – 230V      | 124183        |
| 4                                   | Well unit type 12 – 115V      | 124189        |
| 4                                   | Well unit type 12 – 230V      | 124187        |
| 4                                   | Well unit type 21 – 115V      | 124193        |
| 4                                   | Well unit type 21 – 230V      | 124191        |
| 5                                   | Power PCB – 115V              | 124181        |
| 5                                   | Power PCB – 230V              | 124179        |
| 6                                   | Pt100 sensor                  | 124194        |
| 7                                   | Fan, complete                 | 124196        |
| 8                                   | Power inlet incl. wire        | 124195        |
| -                                   | Rubber foot for bottom, black | 60N131        |
| -                                   | Screw set, complete           | 124197        |

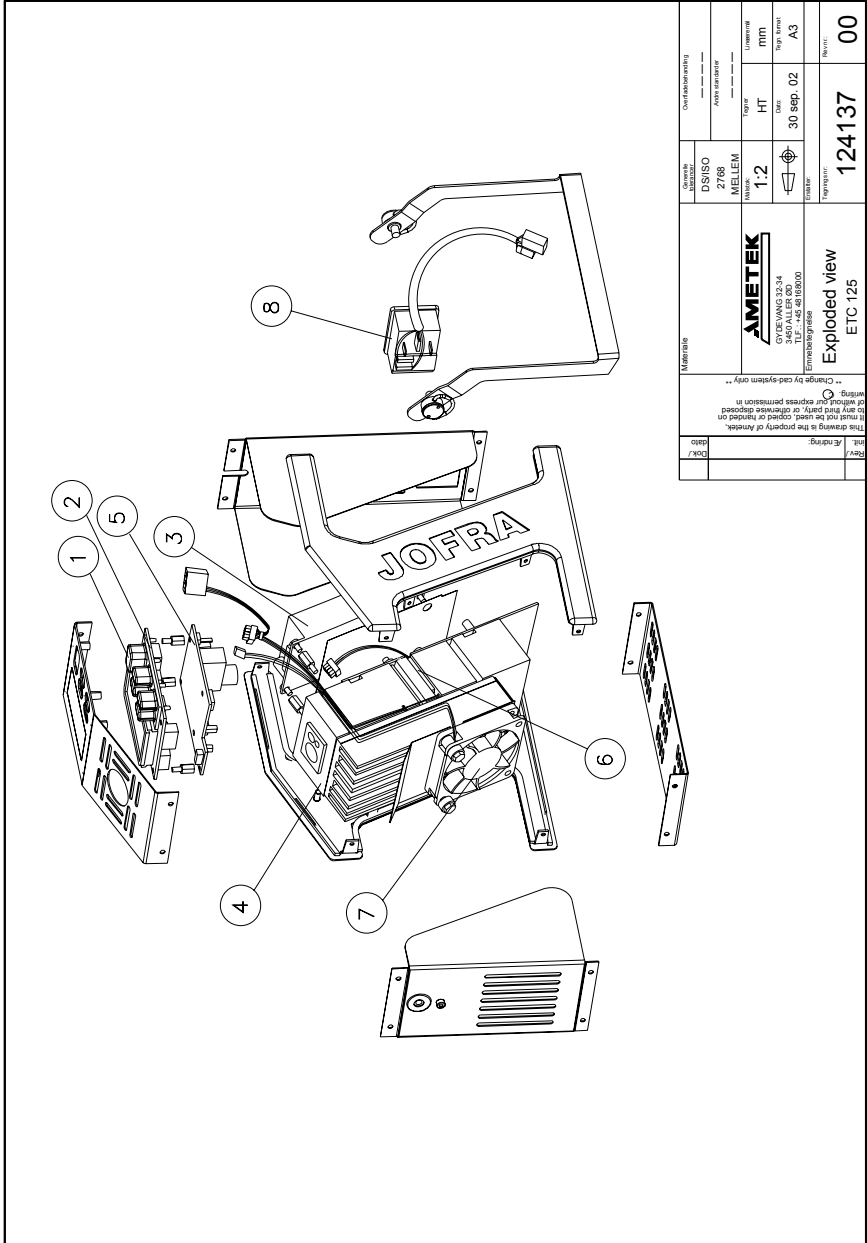
---

## List of spare parts – ETC-400 R

---

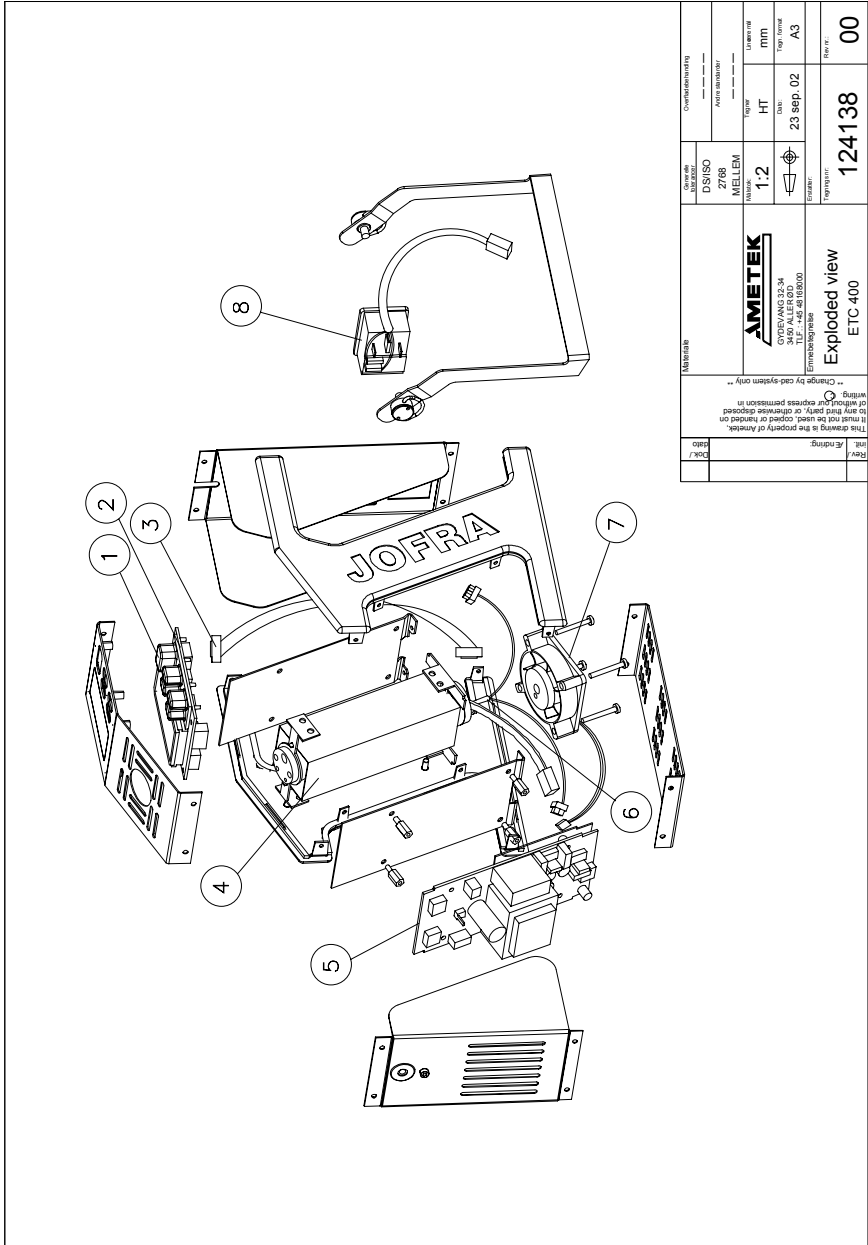
| <b>Pos.</b>                         | <b>Spare parts</b>            | <b>Number</b> |
|-------------------------------------|-------------------------------|---------------|
| (Compare exploded view section 4.4) |                               |               |
| 1                                   | Key pad                       | 124180        |
| 2                                   | Controller PCB                | 124178        |
| 3                                   | Ribbon cable                  | 123975        |
| 4                                   | Target unit, 115V, complete   | 124271        |
| 4                                   | Target unit, 230V, complete   | 124272        |
| 5                                   | Power PCB – 115V              | 124181        |
| 5                                   | Power PCB – 230V              | 124179        |
| 6                                   | Pt100 sensor                  | 124273        |
| 7                                   | Fan, complete                 | 124274        |
| 8                                   | Power inlet incl. wire        | 124195        |
| -                                   | Rubber foot for bottom, black | 60N131        |
| -                                   | Screw set, complete           | 124197        |

# 4.2 Exploded view – ETC-125 A



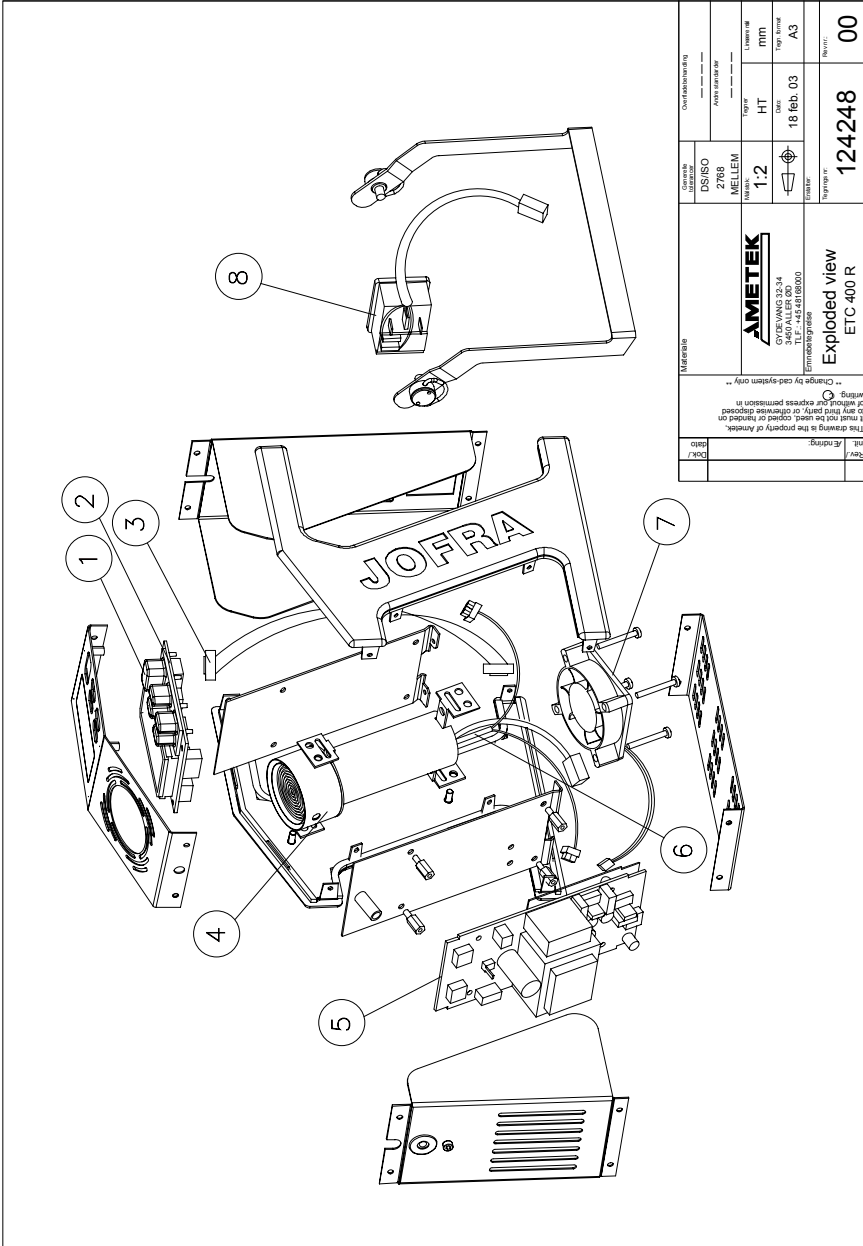
|  |  |  |  |
|--|--|--|--|
| DATE   |  | DATE   |  |
| REV.   |  | REV.   |  |
| OK   |  | OK   |  |
| DATE   |  | DATE   |  |
| This drawing is the property of Ametek.<br>It must not be loaned, copied or printed<br>or otherwise disposed of without the express permission<br>of Ametek. |  | ** Change by cad system only **  |  |
| MAREKIN<br>AMETEK<br>CYBE WANG 322-34<br>385 FULLER RD<br>WILMINGTON, DE 19800<br>E-mail: ametek@ametek.com  |  | OVERALLS<br>DS/SO<br>IZ/IS<br>IZ/LEM<br>MAREKIN<br>1:2<br>HT<br>30 sep. 02<br>mm<br>A3<br>124137<br>Exploded view<br>ETC-125 |  |
|  |  | 00   |  |

# 4.3 Exploded view – ETC-400 A



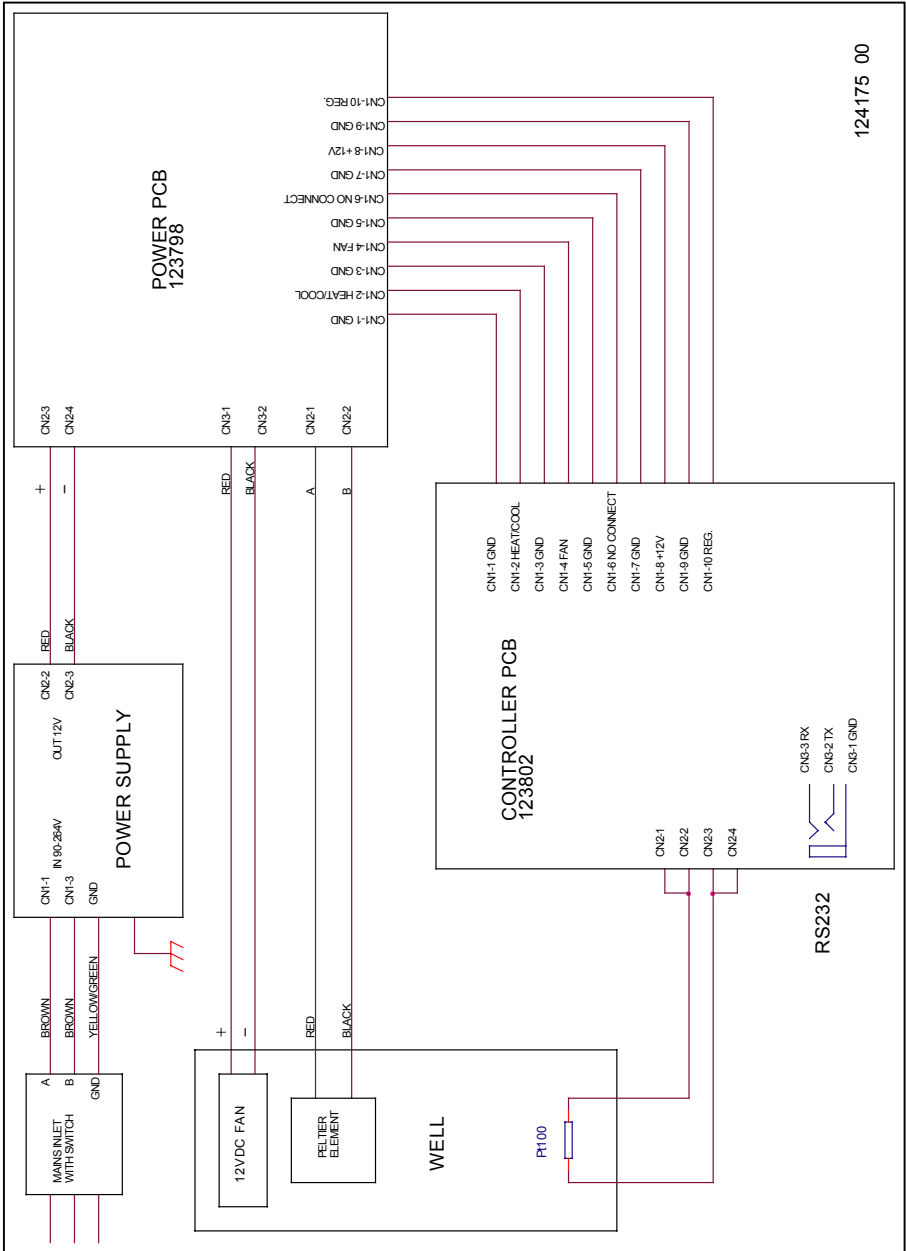
|  |  |   |  |                             |  |                             |  |                             |  |
|--|--|---|--|-----------------------------|--|-----------------------------|--|-----------------------------|--|
| <p>AMETEK<br/>CORPORATION 32-34<br/>3850 MILLER RD<br/>EMERYVILLE OH 44025</p> |  | <p>CONTRACT NUMBER<br/>DS/ISO<br/>2788<br/>MILLEN</p> |  | <p>DATE<br/>23 sep. 02</p>  |  | <p>UNIT PRICE<br/>mm</p>    |  | <p>TEMPERATURE<br/>A3</p>   |  |
| <p>REVISION<br/>1.2</p>  |  | <p>REVISION<br/>1.2</p>                               |  | <p>REVISION<br/>HT</p>      |  | <p>REVISION<br/>mm</p>      |  | <p>REVISION<br/>A3</p>      |  |
| <p>REVISION<br/>124138</p>   |  | <p>REVISION<br/>124138</p>                            |  | <p>REVISION<br/>124138</p>  |  | <p>REVISION<br/>124138</p>  |  | <p>REVISION<br/>124138</p>  |  |
| <p>REVISION<br/>ETC-400</p>  |  | <p>REVISION<br/>ETC-400</p>                           |  | <p>REVISION<br/>ETC-400</p> |  | <p>REVISION<br/>ETC-400</p> |  | <p>REVISION<br/>ETC-400</p> |  |

# 4.4 Exploded view – ETC-400 R



|   |  |   |  |                                 |  |                            |  |                       |  |
|---|--|---|--|---------------------------------|--|----------------------------|--|-----------------------|--|
| Rev /<br>int /<br>date  |  |   |  |                                 |  |                            |  |                       |  |
| <p>Change by cad-system only !!</p> <p>It is not for use, repair or handle on<br/>to any third party, or otherwise disposed<br/>without express permission in<br/>writing. ©</p> <p>This drawing is the property of Ametek.</p> |  |   |  |                                 |  |                            |  |                       |  |
| <p>Material</p>   |  | <p>DS/ISO<br/>2788</p>                                      |  | <p>Material<br/>MELLEME</p>     |  | <p>Scale<br/>1:2</p>       |  | <p>Format<br/>A3</p>  |  |
| <p>Manufacturer</p>   |  | <p>AMETEK<br/>GYSERWANG 22-24<br/>T.E.F. - 445-48180000</p> |  | <p>Emitted in<br/>ETC-400 R</p> |  | <p>Drawn in<br/>124248</p> |  | <p>Revised<br/>00</p> |  |
| <p>Overhaul number 86<br/>Date<br/>Author<br/>Title<br/>Unit<br/>Type<br/>Date<br/>Page Number</p>  |  |   |  |                                 |  |                            |  |                       |  |

# 4.5 Wiring diagram – ETC-125 A



124175 00

RS232



# 4.6 Wiring diagram – ETC-400 A / R

