121,0 E

Meteorological Thermometers

General Information concerning Thermometer Fluids:

We would like to inform you that from 10th October 2017 the regulation (EU) no. 847/2012 of the European Commission of 19th September 2012 came into effect. After this deadline no mercury-filled thermometers may be placed on the market anymore within EU.

Also in future you do not have to do without precision thermometers from the company Dr. Müller Meteorologische Instrumente KG. We have a thermometric replacement liquid available with which most types of thermometers, except maximum thermometers, can be produced without mercury and with the usual high quality and accuracy.

Maximum thermometers with mercury are only within the range of delivery for the use in research, for calibration of instrumentation, or for use as a reference standard. Also a digital alternative is deliverable by our company.

The thermometric fillings pertain to two categories: liquids which wet glass, and liquids which do not wet. The last are to be preferred as the results they give are much more reliable.

filling with Propylene carbonate = Prop (blue)

- preferred for meteorological applications, as replacement of mercury
- non wetting by coating the bore of the capillary with Fluorosilane
- Application of temperature: - 50 °C + 170 °C

filling with Ethyl Alcohol = Alc (only used for minimum thermometers, sometimes coloured red)

- Wetting
- Application of temperature: - 100 °C + 100 °C

filling with Paraffine Oil = red filling (not preferred for meteorological applications)

- Wetting
- Application of temperature: - 10 + 200 °C

Please note: As a result of long influence of temperature the colour of the non metallic liquids will possibly fade.

1. Extreme Thermometers

These thermometers are designed for measuring the highest and lowest temperatures over a particular time, generally a day. They are suitable for government testing, according to DIN 58654 and DIN 58653.

The Maximum Thermometers have a Hg-filling and the Minimum thermometers have an alcohol filling.

Minimum Thermometer (acc. DIN 58653)

The minimum thermometer is filled with alcohol. They are determined for meteorological measurements with subsequent reading of minimum temperatures and have to be operated in a horizontal position. In case of sinking temperature, the index marker below the wetting filling will be pulled downward and remains in this position. In advance of the next measurement the upper part of the thermometer muss be tilted downward to ensure that the index marker returns to the bottom of the filling.

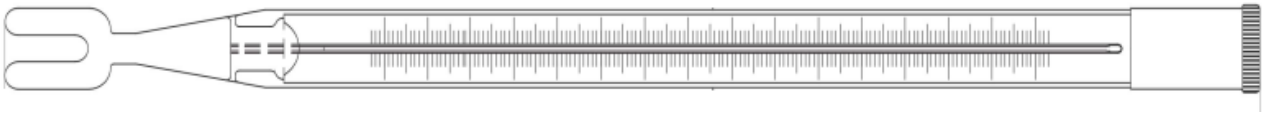
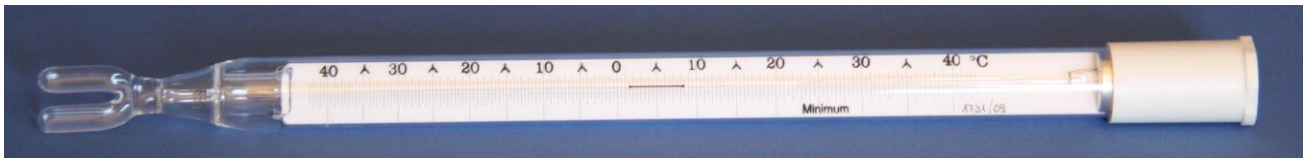


Fig. 1 and 2 Minimum Thermometer

old Art. No.	**Art. Nr.**	**range**	**division**	**diameter in mm**	**lenght in mm**
43d/40	**MIN-40+40/0,2**	-40…+40°C	0.2°C	17 / 18	370 / 360
43d/50	**MIN-30+50/0,2**	-30…+50°C	0.2°C	17 / 18	370 / 360
	special ranges:				
	MIN-30+60/0,2	-30…+60°C	0.2°C	18	360
43/40	**MIN-40+40/0,5**	-40…+40°C	0.5°C	17 / 18	290 / 300
43/50	**MIN-30+50/0,5**	-30…+50°C	0.5°C	17 / 18	290 / 300

filling: Ethyl Alcohol clear or red, depending on thermometer
weight: < 0.08 kg

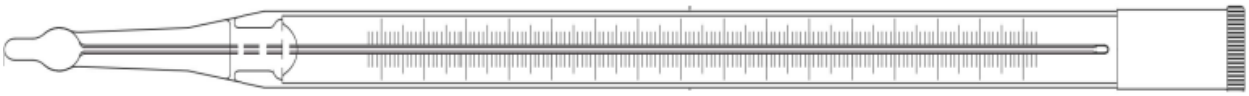
Alternative, some units with different ranges available from stock too.



The interruption of the measuring liquid (mercury for Maximum Thermometers resp. alcohol for Minimum Thermometers) is caused by severe treatment during the transport. This effect is observed in many cases. Therefore, you should follow the given instruction for remove the interruptions at the end of this leaflet.

Maximum Thermometers (acc. DIN 58654) (only available with mercury at special request)

The maximum thermometers are mercury thermometers with cut-off threads. In the bulb a glass rod is fused. Its free end projects into the capiliary leaving a small free space, which allows the mercury to expand through, but with contraction causes a breaking of the thread, which thus remains in the maximum position. The mercury column cannot flow back by itself, even after cooling. After reading and in advance of the next measurement the column has to be shaken back to room temperature (similar to fever mercury thermometers).



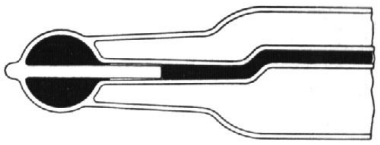


Fig. 3 and 4: Maximum Thermometer and (cut-off arrangement)

Available in division 0.5°C and 0.2°C and in different ranges, depending on stock availability.
These thermometers with mercury are only for the use in research, for calibration of instrumentation, or for use as a reference standard.

Type	**Divisions**	1/2 °C	1/5 °C
	Length	290 / 300 mm	370 / 360 mm
	Diameter	17 / 18 mm	17 / 18mm
	Weight	0.075 kg	0.080 kg
	Range	**No.**	**No.**
Maximum Thermometer	- 30 ... + 50 °C - 20 ... + 60 °C	**MAX-30+50/0,5** **MAX-20+60/0,5**	**MAX-30+50/0,2** **MAX-20+60/0,2**

The interruption of the measuring liquid (mercury for Maximum Thermometers resp. alcohol for Minimum Thermometers) is caused by severe treatment during the transport. This effect is observed in many cases. Therefore, you should follow the given instruction for remove the interruptions at the end of this leaflet.

T23 UG14 Combined holder (support) for Maximum and Minimum Thermometer

Fig 5: Maximum and Minimum Thermometers with Support T23 UG14

T23 UG01 **Tripod with rod**
for carrying Psychro- and Extreme Thermometers
Weight: 1.25 kg

TH48 UG03 **Holder for one maximum- or minimum-thermometer**

T23 UG35 **Thermometer Support consisting of:**
- tripod with rod (T23 UG01)
- Combined holder for Maximum and Minimum Thermometer (T23 UG14)
- Holder for one Thermometer for measuring air temperature (RM34 T118)
(without thermometers)

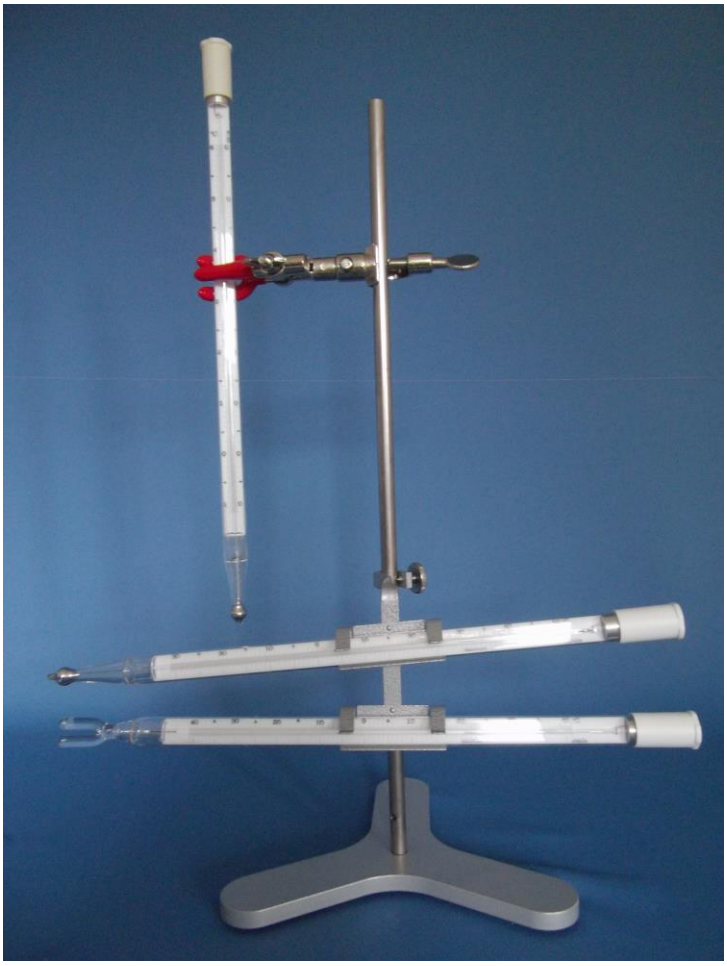


Fig. 6:
Thermometer support
No. T23 UG35

2. Thermometers for Measuring Air Temperature
Thermometer for Psychrometer August Type for calculation of humidity

For measuring air temperature, in addition to the following types for special cases, the **Aspiration Psychrometer** may be preferred, which, on account of its radiation screen and the effective artificial ventilation of the thermometer, gives a representative cross-sectional value with the best accuracy. These instruments are described in Leaflet 131,0 E.

Thermometer (acc. DIN 58660) (for Psychrometer type August)
Filling: free of mercury with propylene carbonate = Prop
ACCU-SAFE technology

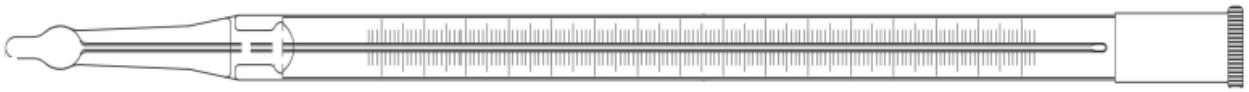


Fig. 7
August Psychrometer Thermometer

AUG-35+40/0,2	range -35 °C to +40 °C, division in 1/5 °C
AUG-20+60/0,2	range -20 °C to +60 °C, division in 1/5 °C
AUG-30+50/0,2	range -30 °C to +50 °C, division in 1/5 °C
	length 370 mm, 15 mm diameter

Alternative, some units with different ranges and alternative division of 0.5°C are available from stock too.
e.g.

29/45	range -35 °C to +45 °C, division in 1/2 °C
29/60	range -10 °C to +60 °C, division in 1/2 °C
	length 340 mm, 15 mm diameter

other ranges possible on request, but total measuring range 80 K

52g **Grass Minimum Thermometer**
Holder for one thermometer for measuring the minimum air temperature close to the earths surface
with support rod, thermometer holder TH48 UG03 and radiation screen
measuring height adjustable from 2 to 12 cm
Weight: 1.0 kg

(please order one minimum thermometer additional to this instrument)

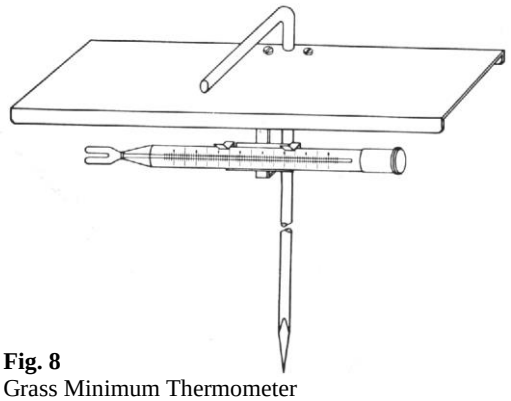


Fig. 8
Grass Minimum Thermometer consisting of Stand No. 52g with one minimum thermometer

52gk **Holder for two thermometers for measuring the maximum and minimum air temperature close to the earths surface**
with support rod, thermometer holder T23 UG14 and radiation screen
measuring height adjustable from 2 to 12 cm
Weight: 1.1 kg

(please order one minimum thermometer and one maximum thermometer additional to this instrument)

3. Soil Thermometer (acc. DIN 58655)

These instruments are intended for shallow depths. To the filling bulb is fused a vertical shaft, of a length corresponding to the measuring depth. For easy reading the tube bearing the scale above the surface of the soil is angled at 60° from the horizontal. This improved form minimises breakage movement of the soil. The insertion depth is calculated from the middle of the bulb.

Soil Thermometer,

Divisions: 0.2°C
Range: -25…+60°C
Weight: 0.1-0.3 kg
total length: 345 mm
diameter 17 resp. 18 mm
Filling: free of mercury with propylene carbonate = Prop
with ACCU-SAFE technology

No.	Depth in cm
ST/0	0
ST/2	2
ST/5	5
ST/10	10
ST/15	15
ST/20	20
ST/30	30

alternative ranges are possible on special request against surcharge

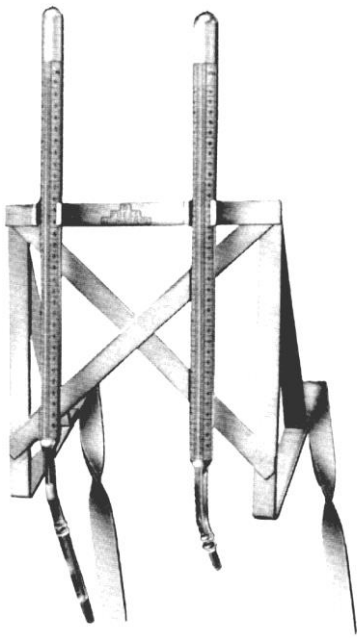
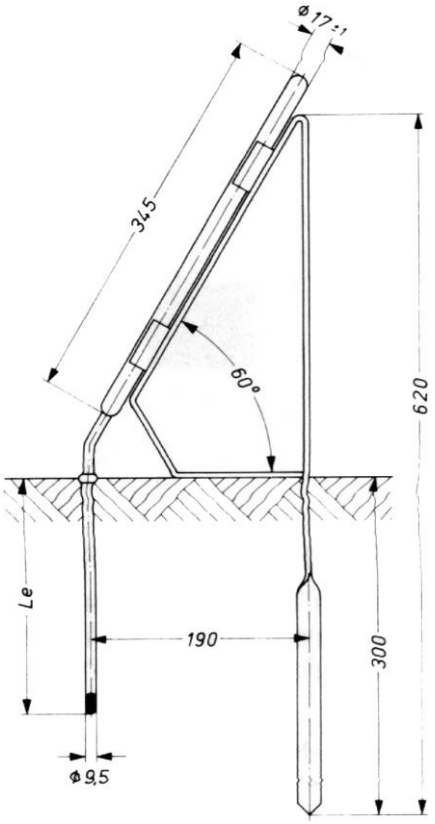


Fig. 9 Stand No.51a with two soil thermometers

Iron Stand for Soil Thermometer

51 for 1 Thermometer
51a for 2 Thermometers Weight: 0.72 kg
51b for 3 Thermometers Weight: 0.76 kg
51c for 5 resp. 6 (on request) Thermometers



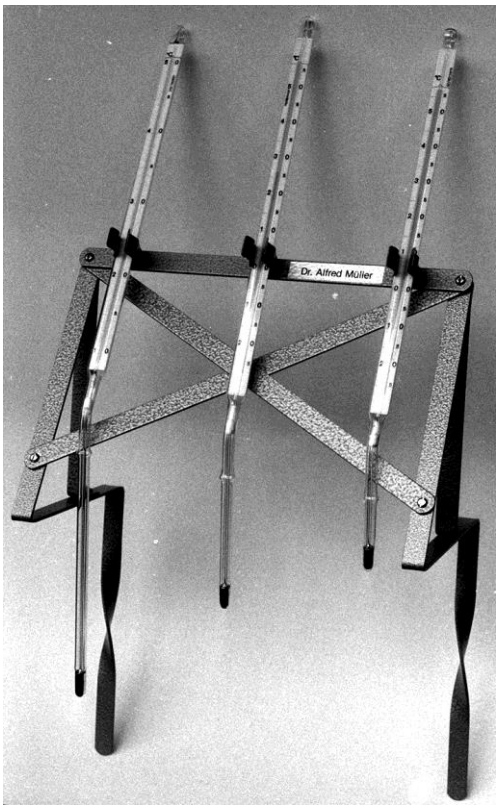


Fig. 10 to 12 Stands for Soil Thermometers

4. Deep-Soil Thermometer (acc. DIN 58664)

For larger depths soil thermometer 61 shown in fig. 10 is suitable. Equipped with a large propylene carbonate filling bulb, the thermometer is fitted in the lower end of a plastic sheath, and the whole unit is withdrawn from the soil for reading. The protruding thermometer bulb is protected by a cap of corrosion-resisting material. For protection and for inserting the thermometer into the soil a plastic tube is used. The upper protective cap with its gasket prevents the ingress of water and foreign bodies, as well as the formation of air currents inside the thermometer. Furthermore, the low thermal conductivity of the plastic parts will prevent a variation of measurement values when withdrawing and reading the thermometer. By the use of corrosion and humidity resisting materials, a long life is guaranteed. To accommodate the natural structure and heat conductivity of the soil, a soil borer of the same size is used for inserting the thermometer tube.

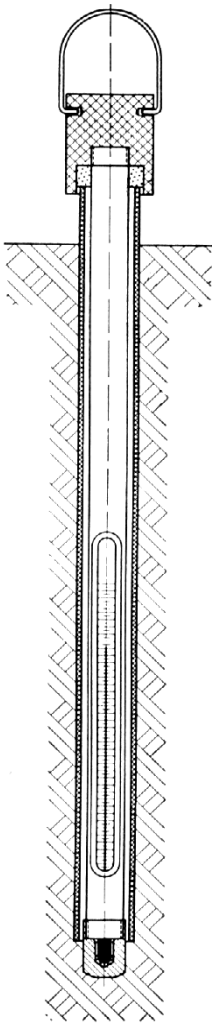


Fig. 13
Deep-Soil Thermometer
No. 61/…K

Deep-Soil Thermometer in Plastic Sheath

with protective cap and insertion tube
filling: Propylene carbonate = Prop
standard range: -10°C ... +30°C, divisions 0.1°C

on special request available with alternative ranges:
e.g. -20 … +60°C / 0.2°C

61/30K	for 10 / 20 / 30 cm depth	Weight: 0.8 kg
61/50K	for 50 cm depth	Weight: 0.9 kg
61/100K	for 100 cm depth	Weight: 1.4 kg
61/200K	for 200 cm depth	
61/300K	for 300 cm depth	

Fig. 14 and 15
Deep-Soil Thermometer
No. 61/30K for 10 / 20 / 30 cm depth

Fig. 16 to 18:
Deep-Soil Thermometersfor
50 cm and 100 cm depth

Spare Thermometer for deep soil thermometer:
length: 330 mm
diameter: 16 mm
filling: Propylene carbonate = Prop

DS-10+30/0,1 range: -10 … +30°C, division: 0.1°C
DS-20+60/0,2 range: -20 … +60°C, division: 0.2°C

5. Six-Thermometers

T23 UG37

range : -30°C ..+ 50°C
division : 1°
accuracy: ± 1°C
aluminium, silver
for wall attachment
with push button
mercury-free
dimensions : 50 x 24 x 220 mm, 104g

Fig. 19
Six Thermometer
No. T23 UG37

6. Thermometer for calculation of humidity for use with Aspiration Psychrometer No. 32E and for use with Sling Psychrometer No. SP10

Spare Thermometers

AS-35+40/0,2	range: -35 °C to +40 °C, division in 1/5°C
AS-10+60/0,2	range: -10 °C to +60 °C, division in 1/5°C

length: 280 mm
diameter: 8 mm
weight: 0.02 kg
acc. DIN 58661
free of mercury with Propylen-Carbonat filling (colour blue)

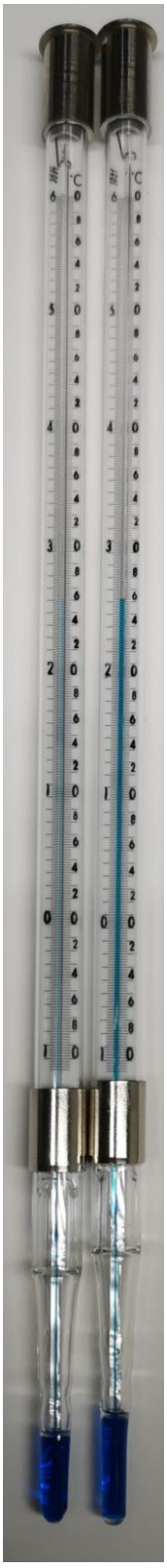
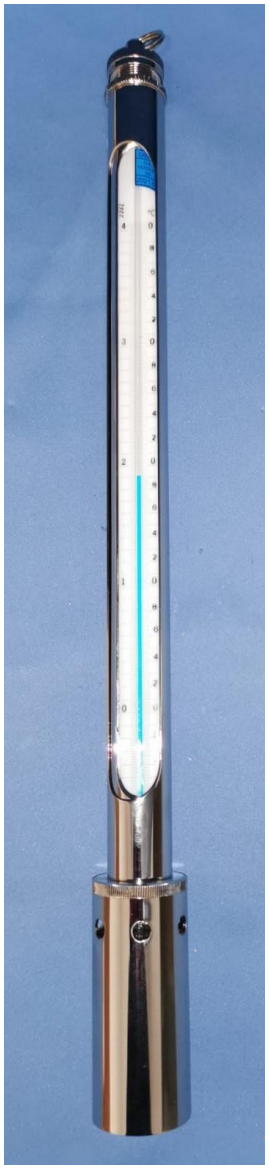


Fig. 20
Spare Thermometer for
Assmann Type Psychrometer

7. Water Thermometer in nickel holder with scoop No. 53c

Tank and Dipping Precision Thermometers with integrated dipper for sampling and simultaneous temperature measurements
consisting of: No. 53f and 53d



Thermometer inserts (No. 53f or equal) (without protection case)

- suitable for official certification
- length of thermometer: 350 mm
- filling free of mercury:
  Propylene carbonate
- ACCU-Safe technology
- available ranges:
  No. 53f: - 5 ... + 40 : 0,2°C (standard)
  No. 53g: -10 ... + 50 : 0,2°C
  No. 53e: 0 ... + 50 : 0,2°C
  (further ranges on special request possible)
- Divisions 0.2°C
- Error Max: ±0,4°C resp. acc. certificate
- Total-length of internal thermometer:
  350 mm ± 5 mm
- column: blue
- immersion: total
- Ø upper part: 17 ± 1 mm
- Ø lower part: 8-9 mm

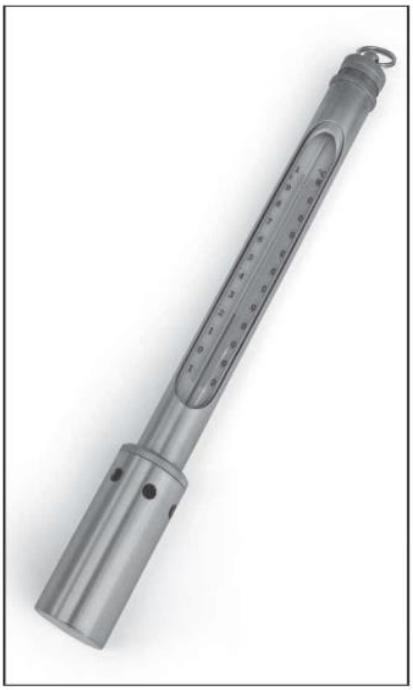


Fig. 21 & 22: Water Thermometer No. 53c

optional available:
with traceable DAkkS-calibration (DIN EN ISO IEC 17025)
@ 2 calibration points (-5°C and +40°C)
(additional points on special request possible)

Protection case with rotary scale cover (No. 53d)

- completely mounted in slotted brass armour with scoop vessel, double protection subject to a second rotatable metal sheath
- dipper: length 75 mm, 32 mm diameter
- total length of thermometer with protection case: 385 mm
  - top part dimensions: height 300 mm,
  Ø 20 mm internal tube and Ø 22 mm external tube
- for insert thermometer length: 350 mm (Art. No. 53f)
- with suspension ring
- standard: nickel plated version
  optional: brushed and lacquered brass version

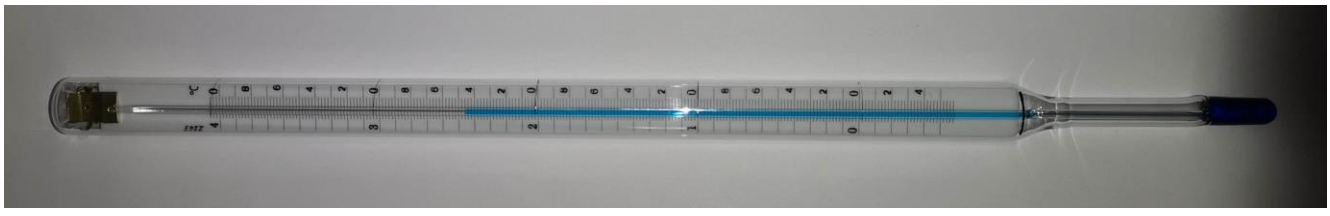


Fig. 23: spare Thermometer No. 53f

For additional information see our leaflet concerning mercury free thermometers with ACCU-Safe technology.

Information concerning Maximum and Minimum Thermometers

The interruption of the measuring liquid (mercury for Maximum Thermometers resp. alcohol for Minimum Thermometers) is caused by severe treatment during the transport. This effect is observed in many cases. Therefore, you should follow the given instruction for remove the interruptions at the end of this leaflet.

Please consider the method of heated water bath which is described in the instructions for Extreme Thermometers below is useful for Minimum and Maximum.
Please use a simple water pot on a hotplate for slow heating the water, in first step up to the maximum value of your thermometer and if necessary, some degree above this value. You can watch the scale up of the interruptions, finally all interruptions disappear in the safety chamber. After that hold the thermometer in vertical position and cool down very gradually up to room temperature. The liquid column will be come down slowly without interruptions.

Notes on the use of Meteorological Minimum Thermometers

Before use, make sure that the liquid column is not interrupted and that no liquid has deposited in the safety chamber of the capillary tube. These phenomena are frequently caused by violent shocks during transport, and also by using the instruments in a horizontal position during a long period.

It is, in most cases, possible to rejoin the interrupted liquid:

1. by a vigorous and brief shaking movement (as in the case of clinical thermometers) see illustr. 1
2. by holding the thermometer vertically and by knocking it against the inside of the hand, (see illustr. 2)
3. by holding the thermometer in sloping position and knocking it careful against the other hand or fingers (see illustr. 3).

The latter method has to be used, if liquid has deposited on the top in the safety chamber of the capillary tube.

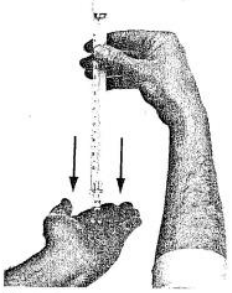
The knocking causes the liquid to enter the lower portion of the safety chamber. When carefully heating the bulb of the thermometer, the liquid column rises to this safety chamber where it joins the other liquid portion. Following this, it is essential to let the thermometer cool down very gradually in the vertical position and leave it alone in this position, for at least 10 minutes.

Before every measurement, turn the thermometer with the protective cap pointing downwards, thus enabling the index (dark glass pin) in the liquid of the capillary tube to move forward to the surface.

For use, the thermometer has to be placed in the horizontal position. As the temperature drops, the index is pulled back by the surface tension of the liquid and remains at the minimum value as the temperature rises.

The storage of spirit filled thermometers has absolutely to be in vertical, or some sloping position!

illustr. 1



illustr. 2

illustr. 3

Notes on the use of Meteorological Maximum Thermometers

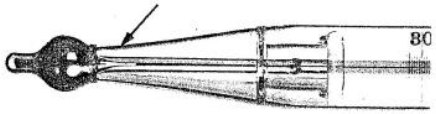
Before use, make sure that the mercury column is not interrupted. If this is the case, the mercury can be joined by shaking the thermometer (as for clinical thermometers, see illustr. 1).

The thermometer also has to be shaken before every measurement, to take the mercury column to the temperature prevailing at that time.

The mercury column indicates the maximum temperature over a given period and remains at this maximum when the temperature drops.

If the mercury column in the capillary tube is interrupted just above the mercury bulb, this does not mean that the thermometer is defective. A small solid glass pin projects here into the capillary tube and causes these interruptions. It constitutes a necessary functional device (see illustr. 4).

For use, the thermometer has to be placed in a horizontal position, but with the mercury bulb slightly sloping downwards (about 15°).



illustr. 4

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