Manual Kinematic Viscosity Bath

Tamson TV12LT

Rev. 1.14

PMT est. 1878

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VISCOSITY BUSINESS TODAY

- ✓ Testing kerosene
- ✓ Testing diesel
- ✓ Testing lubricants
- ✓ Testing fuel oils
- ✓ Testing residues
- ✓ Testing bituminous or asphalt samples
- ✓ Testing used oils
- ✓ Testing bio fuel

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CONTENT OF PRESENTATION

- ✓The Method
- ✓Standards
- ✓Manual Kinematic Viscosity baths
- ✓TV12LT (Main Characteristics)
- ✓Unit Installation and Preparing

THE METHOD

- A manual bath is used for the measurement of transparent liquids and opaque liquids.
- Viscometer constant is independent to the temperature with a suspended-level viscometer.
- Therefore, we recommend to use suspended-level viscometers (e.g. Ubbelohde) for testing in combination with the TV12LT, as the tests are usually done at sub-zero temperatures.

STANDARDS

- Standards: ASTM D445, ASTM D446, ASTM D1655, ASTM D2270, IP71, EN ISO 3104, ISO 3105, DIN 51562, IP PM EJ, IEC 61868, D7566 (-40°C requirement).
- The standard describes the manual procedure to determine the kinematic viscosity.
- Measure the time for a volume of liquid, transparent or opaque, to flow under gravity through a calibrated glass capillary viscometer (please see ASTM D445 & D446).

Manual Baths

BATH TEMPERATURE

- Use a bath with a constant temperature.
- Temperature tolerance max. ± 0.02°C between +15°C to +100°C. Outside this range ± 0.05°C.
- The temperature measuring device is a calibrated glass thermometer, accuracy ± 0.02°C or better. Or a Digital Contact Thermometer (DCT) is allowed. We recommend our TT3B DCT thermometer with temp. range from -40°C to +140°C (P/N 10T6094).
- Since October 2017, mercury in LIG thermometers are forbidden in the European Union and the market has to change to DCTs.

Manual baths

BATH TEMPERATURE

Tamson TT3B Thermometer

Complies to ASTM D445 / D8278

- Sensor element PT100 (Thermistor or PT100)
- Display resolution 0.01 or 0.001°C (0.01°C)
- Accuracy better than ±0.02°C (±0.02°C)
- Linearity ±0.01°C (±0.01°C)
- Fast response time 6 sec (<8 sec)
- Annual drift <± 0.001°C (<± 0.02°C)

Requirements ASTM D445 / D8278

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Tamson TT3B DCT

Now available!

Manual baths

CAPILLARIES

- The viscometer is a calibrated capillary, the size depends on the sample being tested.
- Flow times between 200 and 1000 seconds are recommended.
- The viscometer has to be suspended in a vertical position. This is possible with Tamson stainless steel viscometer holders. These are available for most of the ASTM D446 viscometers, see www.tamson.com for more information.

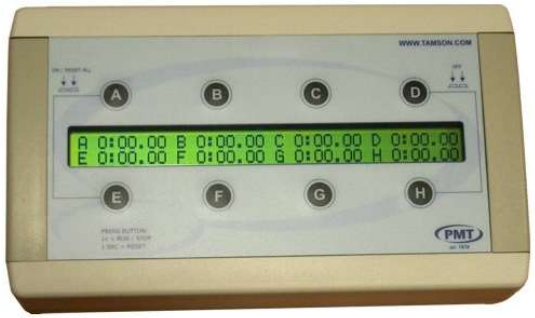
Manual Baths

Timing Device

- The manual timing device must allow readings with a tolerance of 0.1 second or better. Accuracy ± 0.07%.
- Electrical timing devices can be used if an accuracy of ± 0.05 % or better is reached.

Manual Baths

Timing Device



- Tamson timer (P/N 10T6090) uses a crystal which has a maximum deviation of 20 ppm (parts per million).
- On one second that is (1 / 1000.000) * 20 = 0.00002 sec.
- One hour has 60*60*0.00002 = 0.072 seconds.
- Human reaction time is 0.2 second (200 mS).
- So, fault of Tamson timer when measuring one hour is three times less than human error (viscosity flow time is between 200 and 900 seconds).

TV12LT

FEATURES

- ✓Small Footprint
- ✓Built-in Cooling
- ✓Range -42°C up to +80°C
- ✓Ultra High Stability
- ✓Four places, Small Bath Volume
- ✓Internal LED Lights
- ✓Detachable Front Window
- ✓Bath Drain
- ✓RS232 Communication

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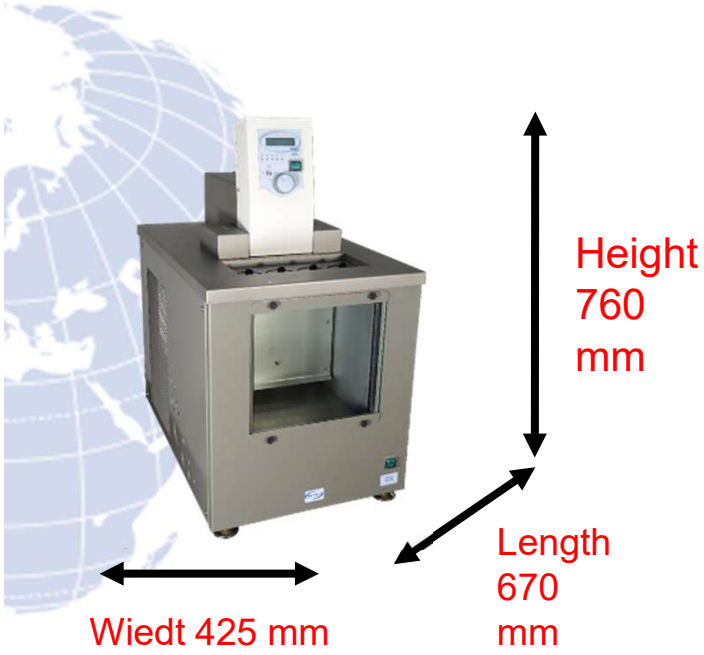
TV12LT

SMALL FOOTPRINT



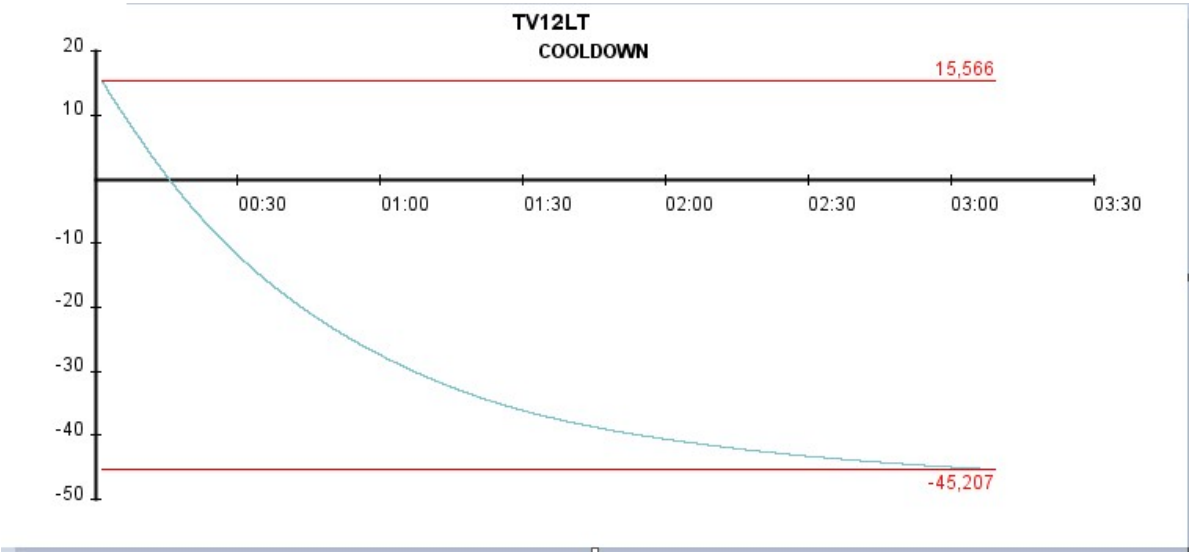
Ventilation:

•The bath has to be placed in a well ventilated area.

•Air circulation has to be enabled by 30 cm of free space at all sides.

TV12LT

BUILT-IN COOLING



Integrated compressor enabling to cool down to -20°C in just 60 minutes and to -40°C in 120 minutes.

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BUILT-IN COOLING

- The bath is provided with integral cooling system. The cooling is split in two functions.
- When cooling down to the set point temperature maximum cooling capacity is used.
- When the set point temperature is reached, the bath will start to tune for stable temperature control. It also switches the cooling in a low power mode.
- The surplus of cooling is heated away. In this way a very accurate set point temperature is maintained.
- By using this two stage system only limited cooling capacity is heated away. This saves an enormous amount of energy when comparing energy consumption of competing products. It also offers much more precise temperature control.

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RANGE -50°C UP TO +80 °C

	TV12LT	
Range	-42..+20°C -43.6..+68°F	-42..+80°C -43.6..+176°F
230V/50Hz	00T0410	00T0425
115V/60Hz	00T0415	00T0430
230V/60Hz	00T0420	00T0435

Three different ranges for the TV12LT!

TV12LT

Ultra High Stability

ASTM D445 requirement:

Temperature tolerance max. ± 0.02°C between 15°C to 100°C. Outside this range ± 0.05°C.

Table: Stability TV12LT measured @ -20°C

Stability	[°C]	stdev 0.004 min/max ± 0.014
Uniformity	[°C]	stdev 0.004 min/max ± 0.013

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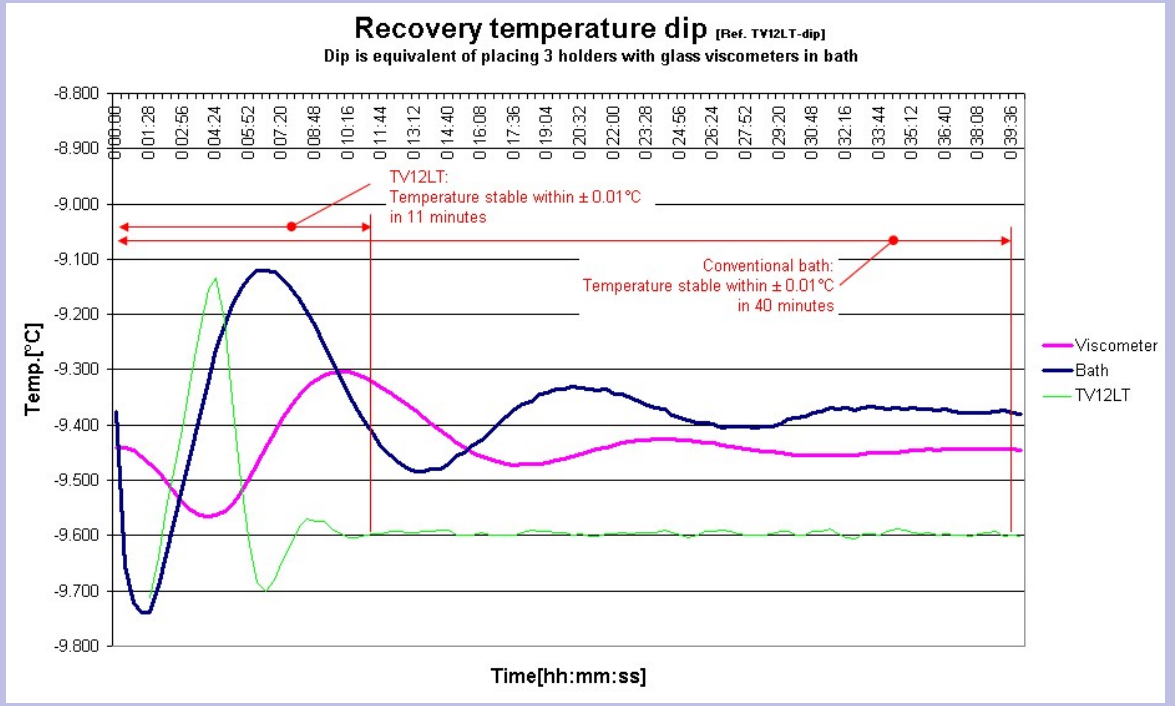
ULTRA HIGH STABILITY

When the bath temperature is disturbed i.e. when viscometers in viscometer holders are placed, the electronic regulation will establish new control over 3 times faster than conventional systems.

The graph shows the temperature of a conventional bath (blue) and the temperature measured inside the glass capilary of a viscometer (pink).

The green curve shows the TV12LT behaviour. This is strictly conform the method ASTM D445 as it states that you should wait for 30 minutes before starting the measurement.



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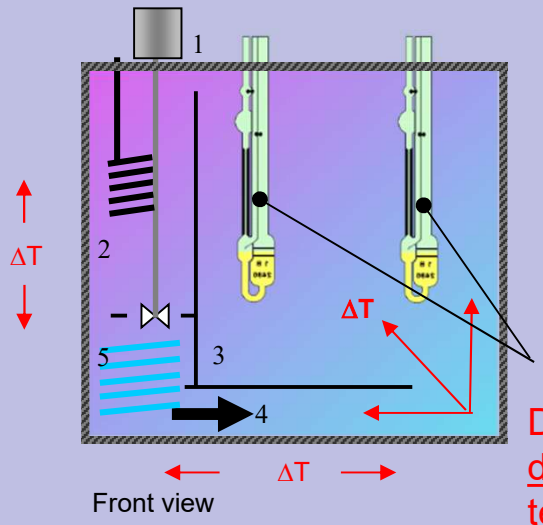
Ultra High Stability

All thermostatic baths contain heating. Simple bath constructions have a single heater and stirrer for circulation. This causes random energy distribution and poor homogeneity. The heating energy is distributed randomly.

More sophisticated systems have controlled flow by using a baffle plate. The heat distribution however is still diagonal in the bath as shown in the diagram.



1: Stirrer
2: Heater
3: Baffle plate
4: Circulation
5: Cooling

Devices have different temperature

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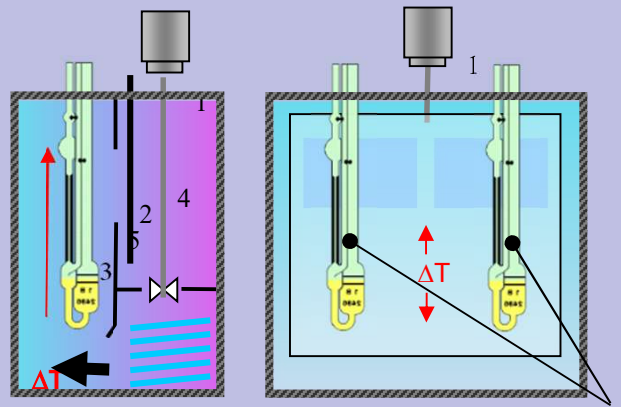
ULTRA HIGH STABILITY

The TV12LT construction is such that it only knows vertical offset. When outlining viscometers or other measuring devices for measuring or calibration, they will all have the same temperature.



Side view

Front view

Devices have same temperature

Temperature gradient TV12LT versus conventional system

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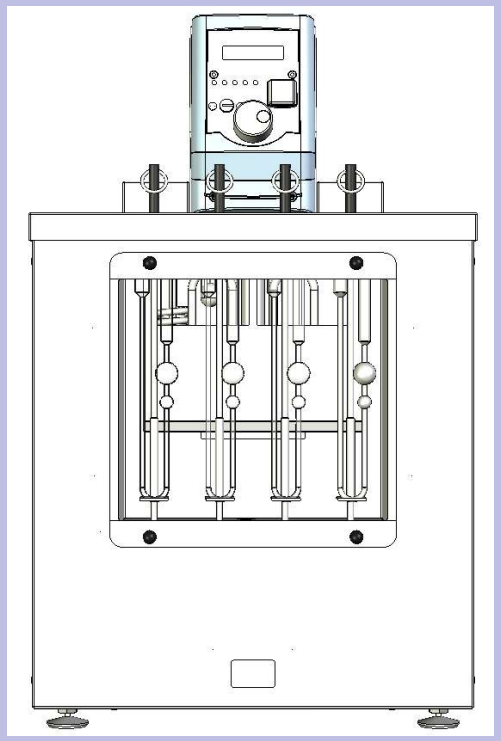
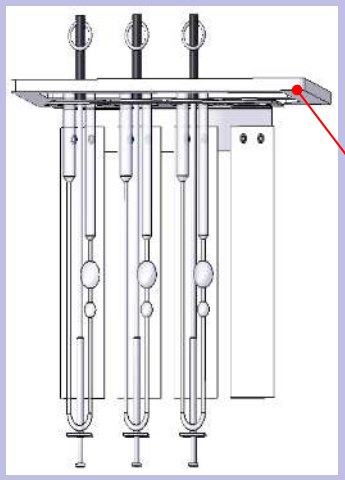
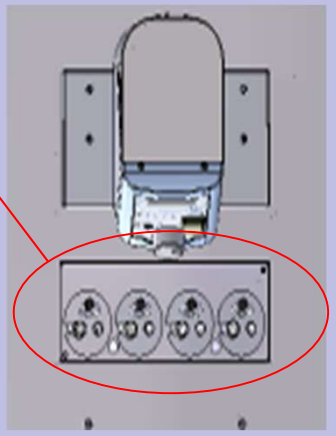
FOUR PLACES, SMALL BATH VOLUME

The cover of the bath has four round 51 mm openings with lids, for suspending glass capillary viscometers in holders.







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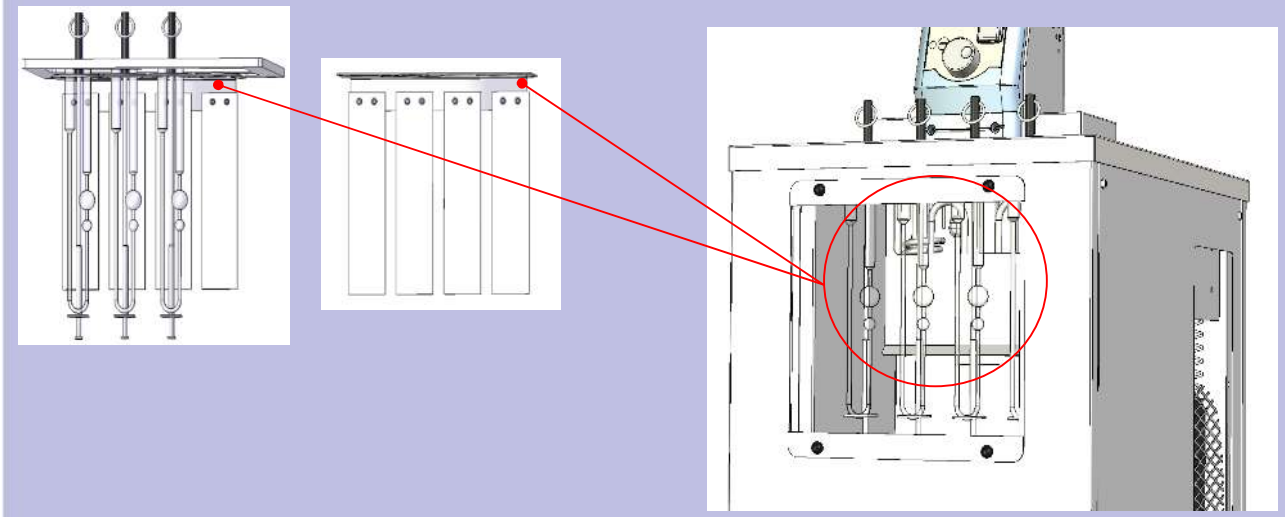
INTERNAL LED LIGHTS

A permanent LED light is located below the top plate to supply clear light and to guarantee optimal visibility inside the bath.

Levelling platform (13T6220) with background contrast (optional).
White background is mounted on the bafle plate The white background realises uniform background and optimizes contrast and readout of the viscometer, especially when analysing transparent samples.



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DETACHABLE FRONT WINDOW

•The bath is fitted with a double window of which the front panel is detachable for cleaning purposes.

•The window is heated preventing built up of condensate.

•Even when TV12LT is turned-off over the night/weekend, the window heating can be seperately switched-on to prevent the built up of condensate.

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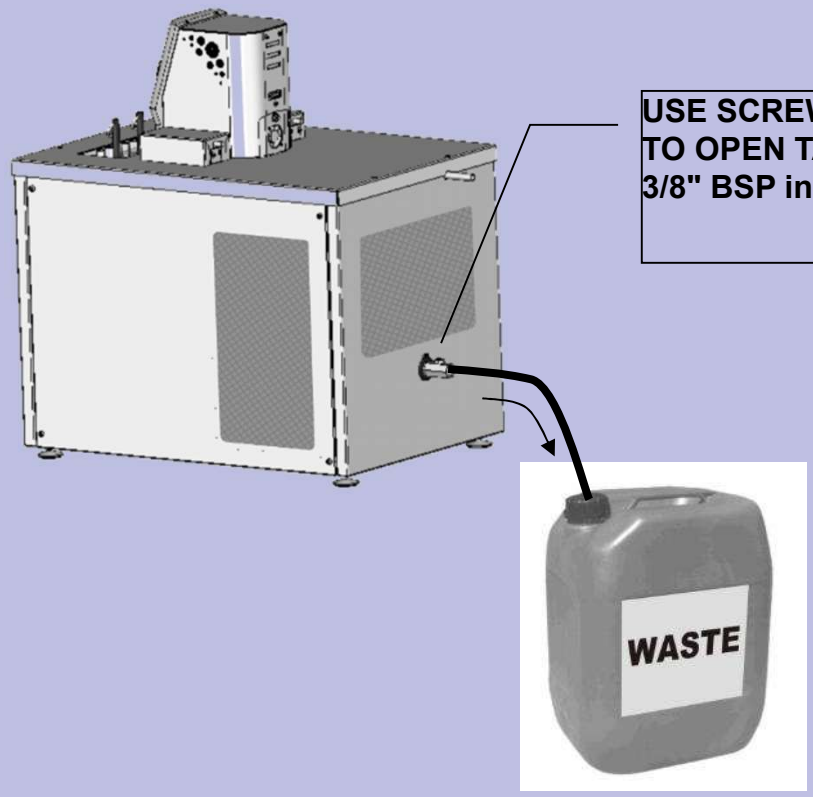
BATH DRAIN & OVERFLOW OUTLET

- The TV12LT can be emptied via the drain tap located at the backside of the apparatus.

- For safety reasons the tap can only be opened by using a screwdriver.

- The thread inside the tap is 3/8“ BSP.



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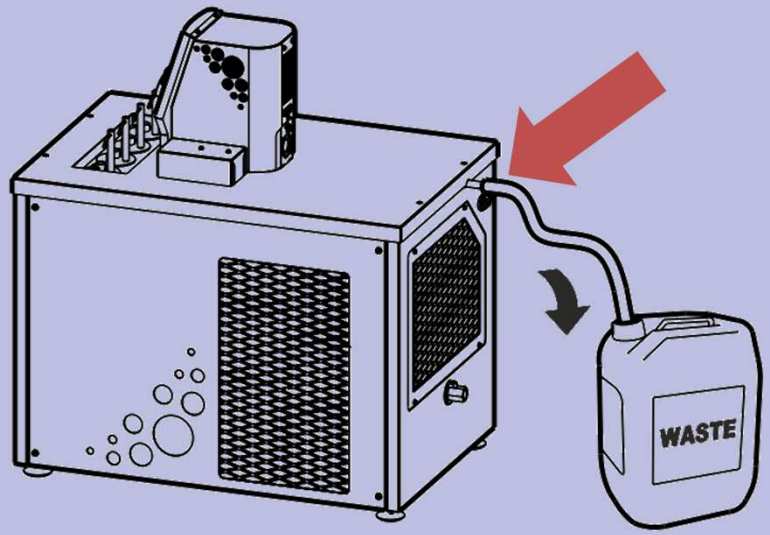
Bath Drain & Overflow Outlet

- If the fluid level is too high, it will leave the bath via the overflow outlet (10 mm outer diameter pipe).
- Prevent fluid from the overflow outlet entering the backside of the TV12LT.
- For this reason the overflow outlet must be connected to a waste container.



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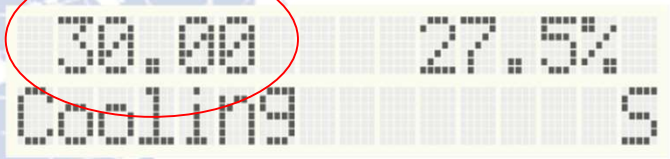
DIGITAL CONTROLLER

- One of the reasons for the unique bath stability is that we use our own Tamson Microprocessor Controller (TMC70) board. This circuit board offers several nice features:

✓ Two decimal readout
✓ Offset
✓ Percentage heating is shown in display, maximum percentage can be programmed
✓ PID settings (automatic and manually)
✓ RS232 communication

TV12LT

DIGITAL CONTROLLER- TWO DECIMAL READOUT



- Temperature stability is very important for ASTM D445. Therefore, we show a two decimal readout in the display. Optional is a three decimal readout.

- It is doubtful to use a viscosity bath with an analog controller or a digital controller offering one decimal readout for ASTM D445 tests.

DIGITAL CONTROLLER - OFFSET

- The temperature displayed can be increased or decreased with an offset ranging from +5.00°C down to -5.00°C in steps of 0.01°C. This way the temperature reading on the display can be synchronised with an independent separate thermometer.

- N.B. an offset is essential for your viscosity bath.

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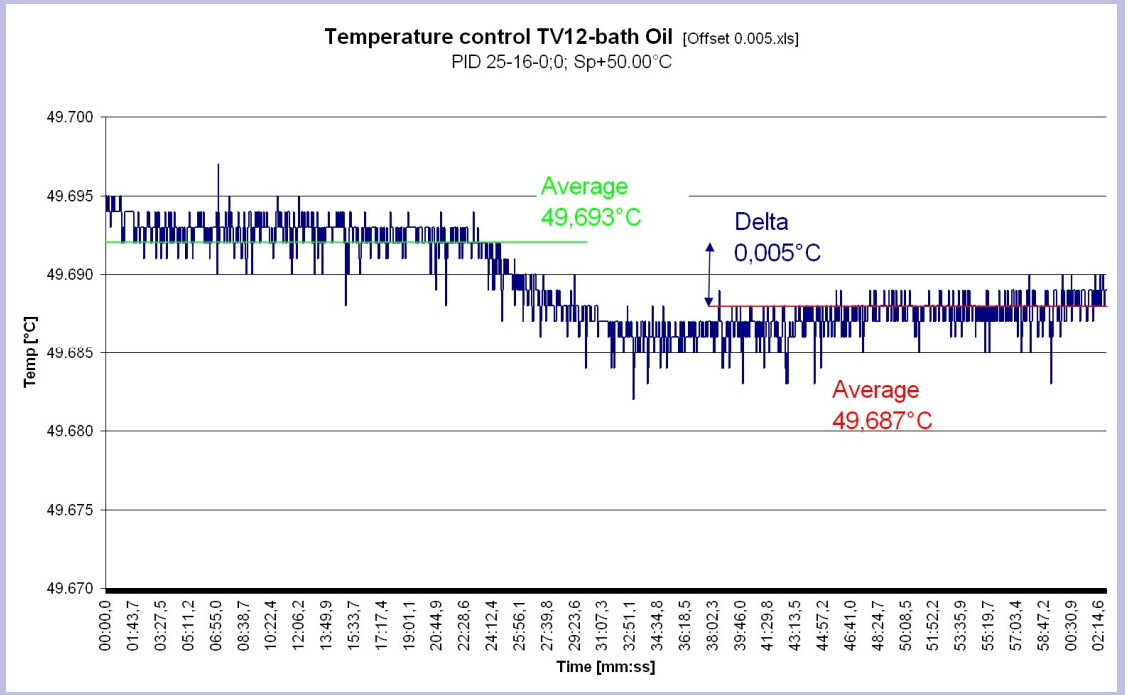
DIGITAL CONTROLLER- OFFSET

Also, we offer standard an additional 0.005°C offset.

This is very important e.g. when temp is 39.995°C you can only go to 40.005°C, with a 0.01°C offset

With the 0.005°C offset you can go to 40.000°C.



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DIGITAL CONTROLLER- PERCENTAGE HEATING

- Maximum percentage of heating can be selected in the menu. This maximum power can be selected to prevent overshoot or burning of bath media. Four stages are available: 25%, 50%, 75% and 100%
- The controller continually calculates the amount of power which should be applied for stable control. The value is displayed with a resolution of 0.1% and ranges from 0% to 99.9%.
- If this percentage is lower than 10%, additional cooling is needed to get good stability. This is a good explanation as to why the bath temperature is not stable. Other brands don't give you this information.

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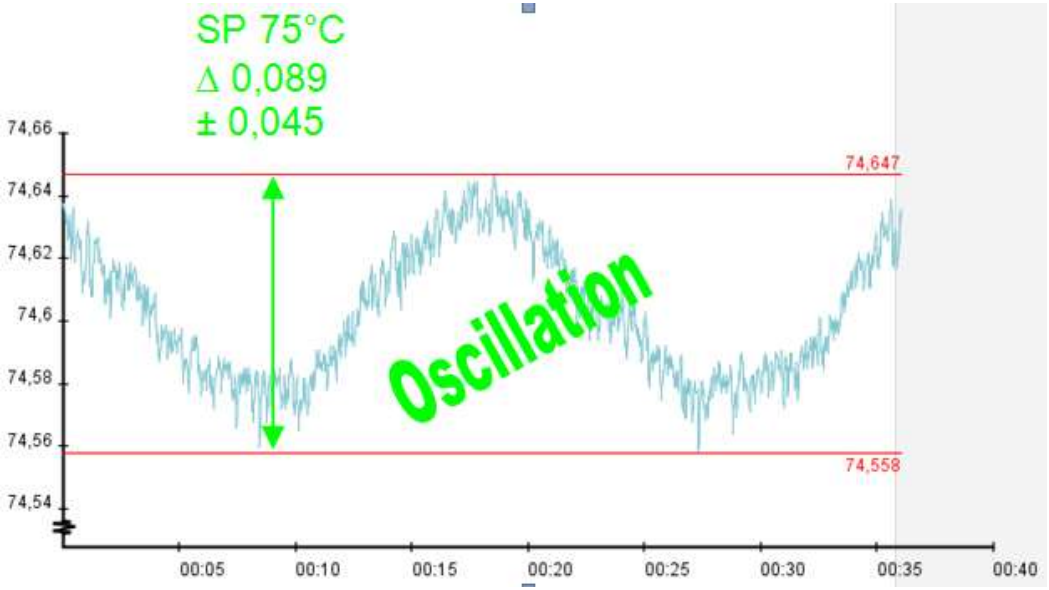
DIGITAL CONTROLLER – PID SETTINGS



Temperature:	75°C
Proportional band (Pb):	100
Integrator:	16
Differentiator:	0
Min/max:	± 0.045

Controller is equipped with PID settings

If necessary, the PID settings can be manually adjusted to get the best optimum.

For example, on this slide a graph off an unstable bath.

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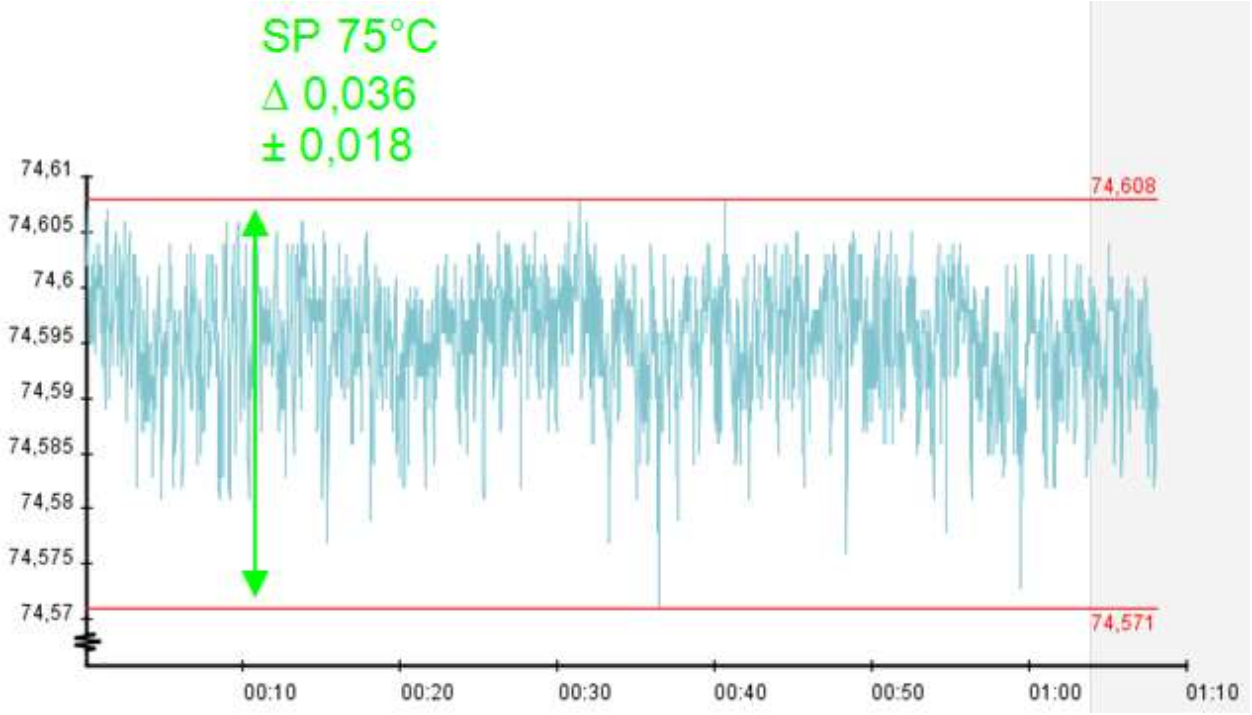
DIGITAL CONTROLLER – PID SETTINGS



Temperature:	75°C
Proportional band (Pb):	50
Integrator:	16
Differentiator:	0
Min/max:	± 0.018

By changing the P from '100' to '50', stability is becoming better. All other variables are the same.

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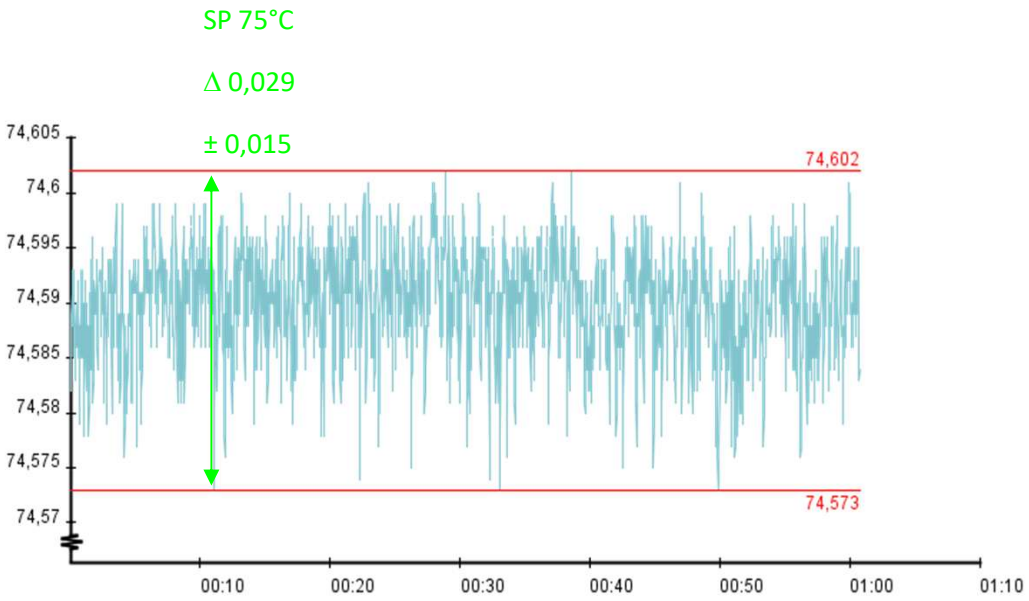
DIGITAL CONTROLLER – PID SETTINGS



Temperature:	75°C
Proportional band (Pb):	25
Integrator:	16
Differentiator:	0
Min/max:	± 0.015

By changing the P from ’50’ to ’25’ the temperature stability even improves further.

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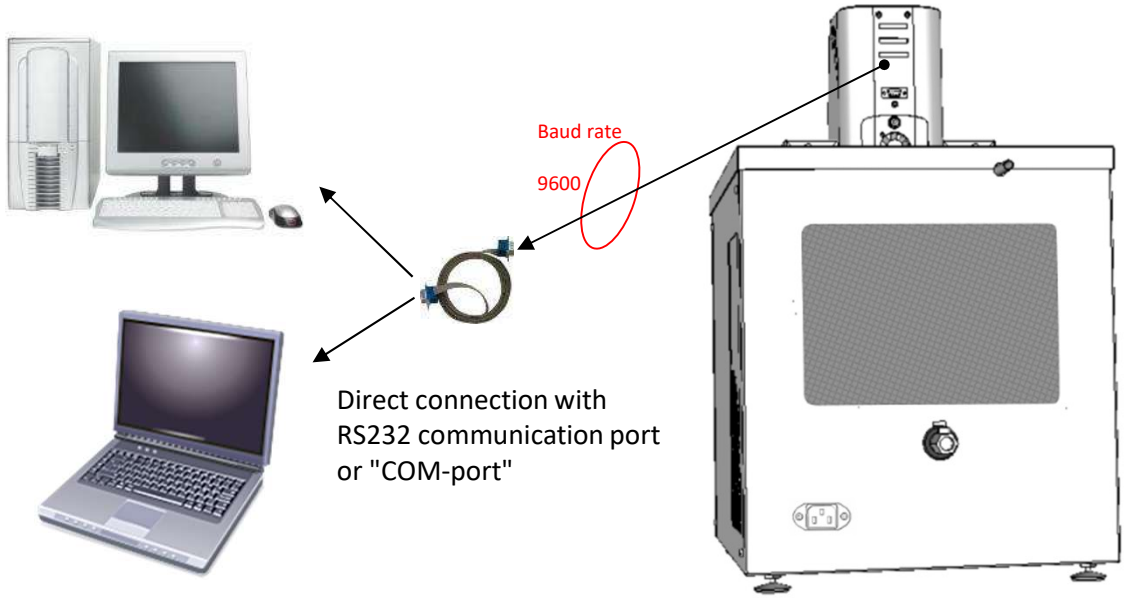
DIGITAL CONTROLLER – RS232 COMMUNICATION



- ✓ Equipment is standard equipped with RS232 communication.
- ✓ By using the RS232 communication port, the controller can be controlled remotely using the Tamson software, or a serial terminal, or your own software.

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DIGITAL CONTROLLER – RS232 COMMUNICATION

The Tamcom software can do following:

- ✓ Logging data into a file (CSV)
- ✓ Programming a Set Point curve via simple data in a file
- ✓ Display process value and set point temperature in a graph
- ✓ Actual values
- ✓ Change set point temperature
- ✓ Show Process value
- ✓ Set Offset
- ✓ Set PID values.

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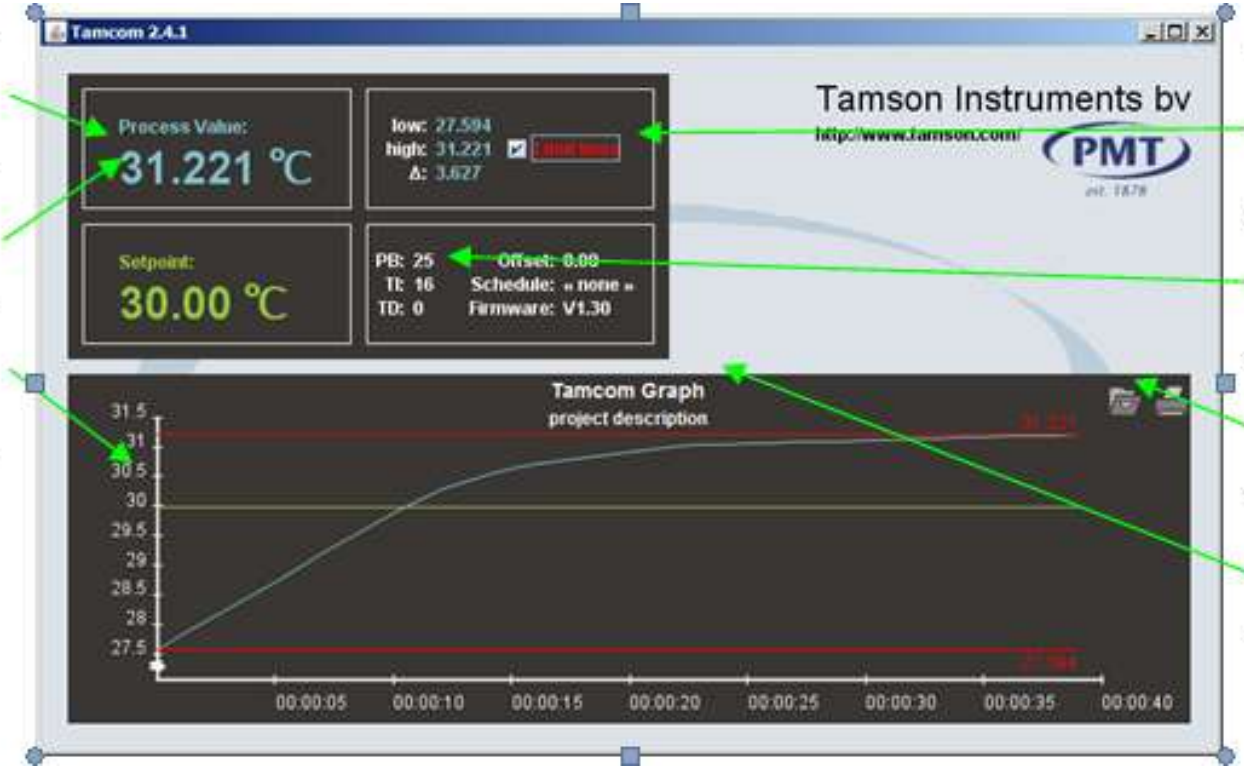
DIGITAL CONTROLLER – RS232 COMMUNICATION

Easy setting of important parameters, click and alter

Actual process value (PV) and set point (SP)

Curve displayes PV and SP. Time stamp is hh:mm:ss



Min and max values during run. Toggle red marker lines on or off

Alter PID values, offset or import setpoint curve file

Print or export graph as PNG(word) or CSV(Excel)

Reminder text or project description for header log file

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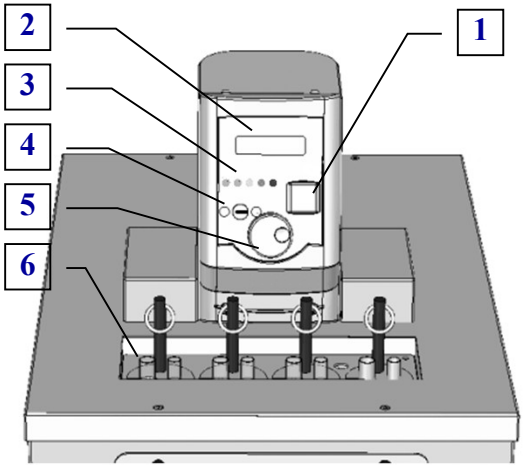
INSTALLATION

- ✓ Bath is completely assembled and tested at factory.
- ✓ Remove bath from packaging material.
- ✓ Clean inner bath thoroughly of any loose packing materials, etc.
- ✓ Place the bath spirit level. The four supporting feet can be turned in and outwards for exact adjustment.
- ✓ Use a mains supply that is well earthed and clean of interference and can carry the load of the bath. Be sure to check the power requirements (230V/50Hz, 230V/60Hz, 115V/60Hz) marked on the tag plate at the back side of the bath.
- ✓ Check operating voltage (230V/50Hz, 230V/60Hz, 115V/60Hz) and connect the bath to appropriate mains supply. The bath has to be filled with a liquid suitable for operating temperature.

Preparing

PREPARING – TOP SIDE



1: On/off switch
2: Display (two decimals)
3: Indicator lights
4: Over-temperature cut-out
5: Encoder switch
6: Viscometer holders

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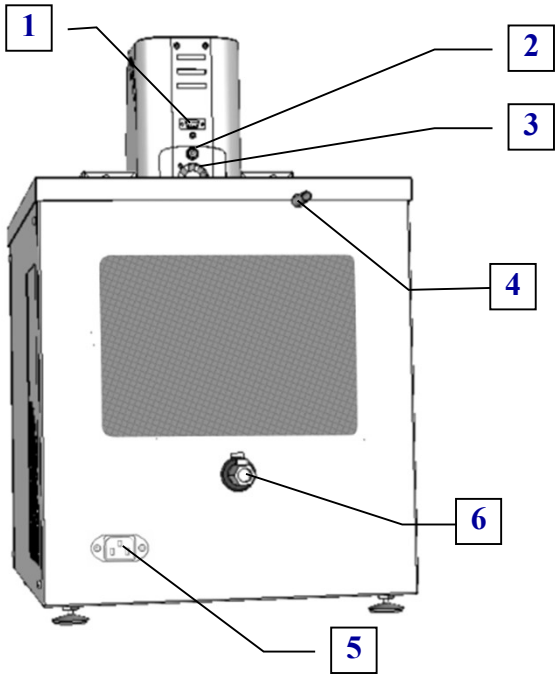
Preparing

PREPARING – BACK SIDE



1: RS232 connector (Sub D - female)

2: Motor fuse

3: Fan

4: Overflow outlet (10mm outer diameter)

5: Mains connector (IEC60320) (use well protected earth!)

6: Bath drain (3/8" inner thread)

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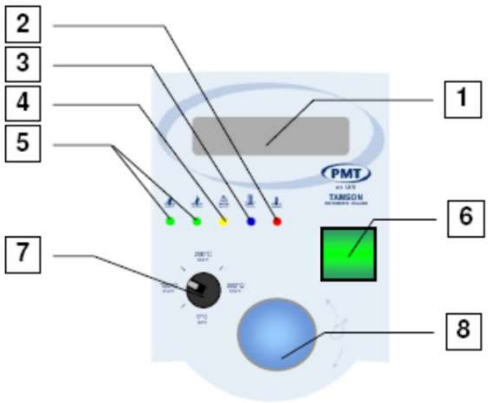
Preparing

PREPARING – BACK SIDE



1: LC Display
2: Over-temperature indicator (Red)
3: Level indicator, optional (Blue)
4: Error (Yellow)
5: Heater indicators (Green)
6: Mains switch
7: Safety thermostat
8: Turn-push button

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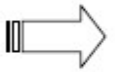
PREPARING

Overview menu items

- ✓Set point
- ✓Offset (press: <-5.00 .. +5.00°C resolution 0.01°C)
- ✓Max Power (press: low 25, med, hi, max)
- ✓Boost heater (press on / off)
- ✓Time const (press: fast, medium slow, precise)
- ✓Stirrer
- ✓Low alarm
- ✓High alarm
- ✓PID parameter
- ✓Backlight
- ✓Temp units
- ✓Baudrate
- ✓SP Offset
- ✓Restart

The front panel layout shows the turn-push button:

Next / increase:	Turn right	
Previous / decrease:	Turn left	
Select:	Press	

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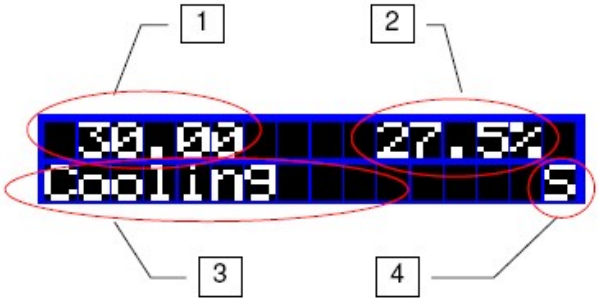
PREPARING



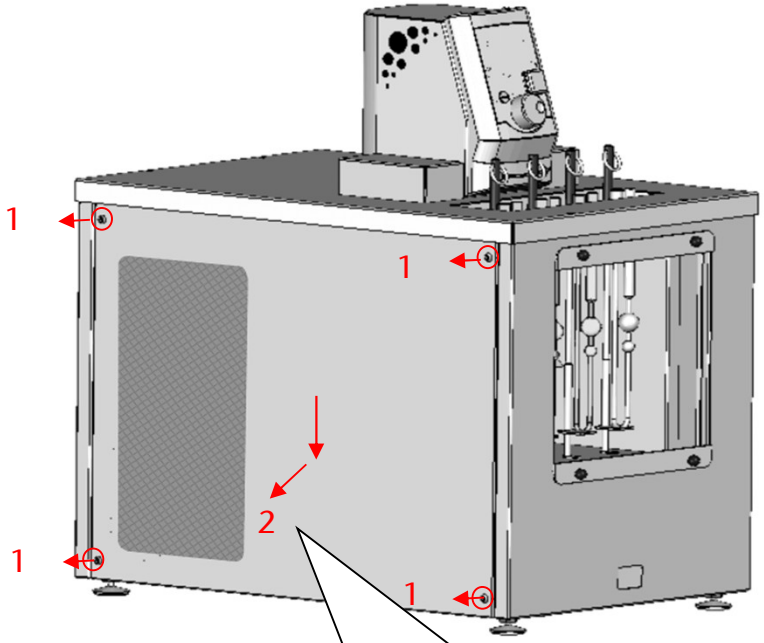
- 1 **Temperature readout**
  When the controller starts or is restarted, the displayed value increases to a stable readout appears after a few seconds.

- 2 **Applied percentage of power**
  The controller calculates every second the amount of power which should be applied for stable control. The value is displayed with a resolution of 0.1% and ranges from 0% to 99.9%.
  To have a stable bath heating percentage should be higher than 10% at working temperature.

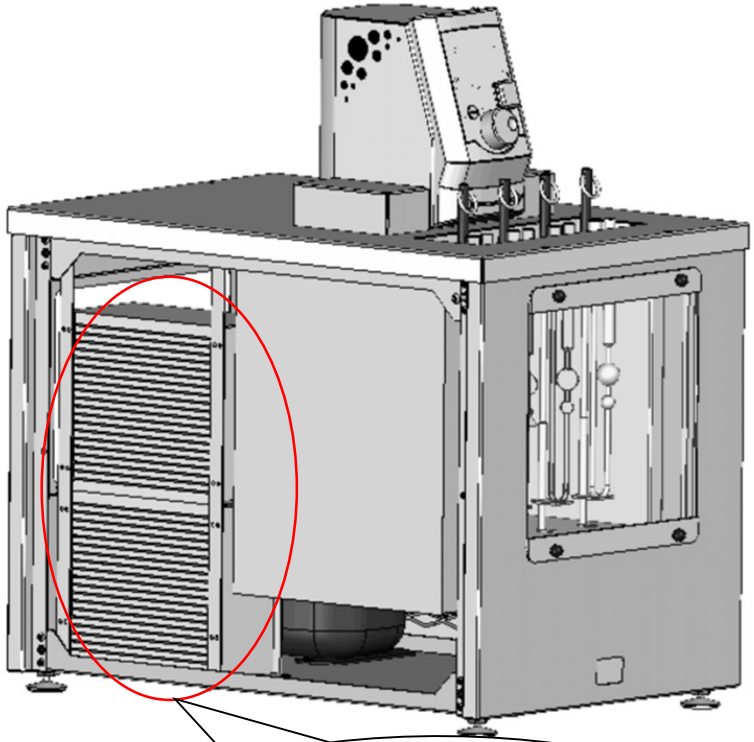
- 3 **Operating mode**

Boost	Bath is heating to set point using boost heater
Heating	Bath is heating to set point, boost heater is off
Cooling	Bath is cooling down to set point
Tuning Ratio	Bath is tuning for power needed at set point, first step
Tuning SA	Bath is tuning, second step
PID SP=25.00	Bath is controlling, set point is 25.00°C

- 4 **Indicator, alarm high, alarm low, control stable**
  Bath control is stable



1) Remove four screws, (hexagonal head socket)
2) Lower panel and remove panel



Clean area with vacuum cleaner

The end

TAMSON TV12LT IS THE BEST SOLUTION IN THE MARKET

Please see our TV12LT video on the Tamson YouTube channel.