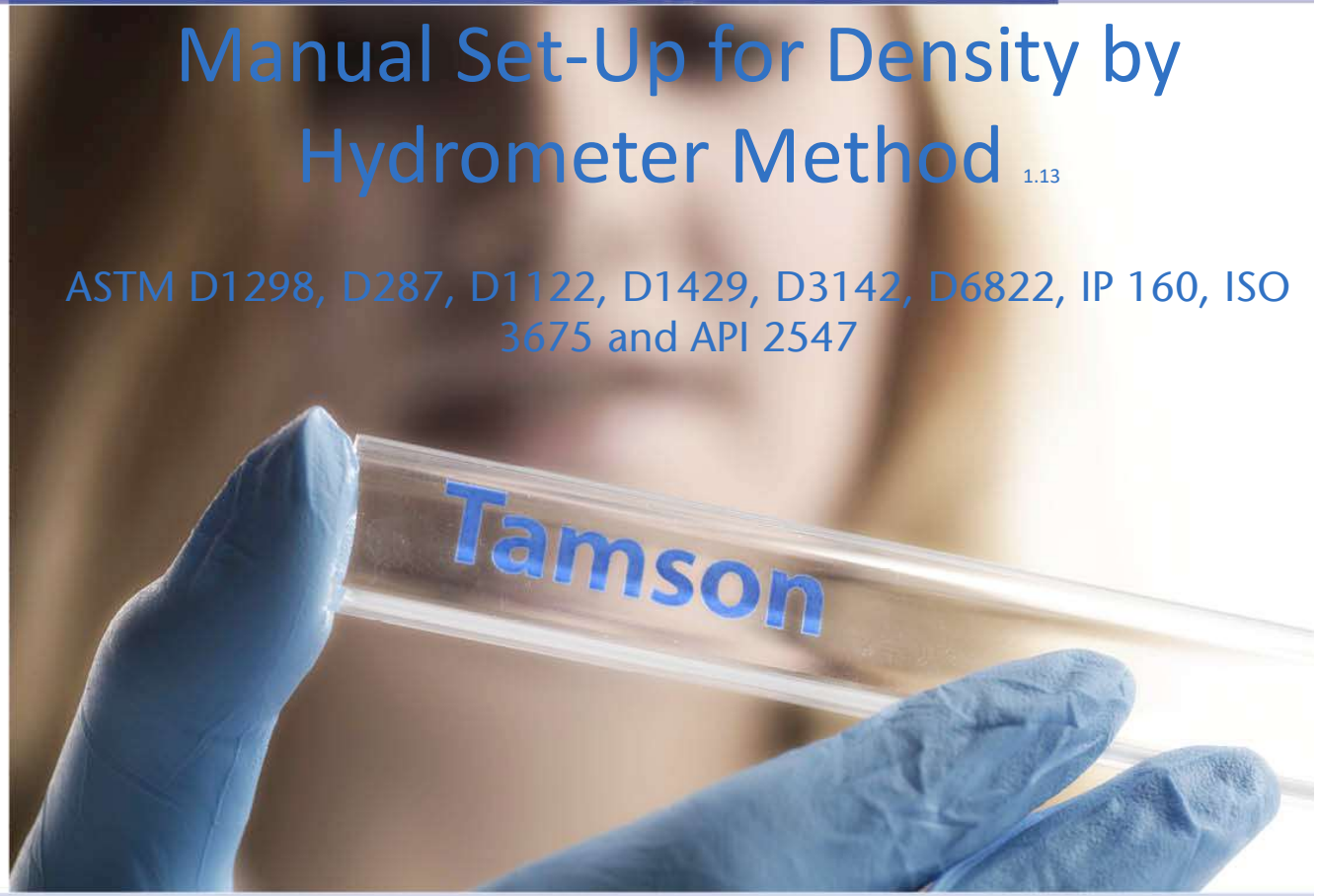
Manual Set-Up for Density by Hydrometer Method 1.13

ASTM D1298, D287, D1122, D1429, D3142, D6822, IP 160, ISO 3675 and API 2547



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MANUAL DENSITY BUSINESS TODAY

- ✓ The reference method for National Metrological Institutes and calibration labs.
- ✓ Density of crude oil is difficult to measure automatically and manual measurement is often necessary as the crude oil is heavy (bitumen). Common practice is to heat sample between 40-60°C and extrapolate back to API.
- ✓ Density by hydrometer method is the referee method in case of dispute with automatic density meter.
- ✓ Done by labs which run a lot of different sample types at different temperatures.

CONTENT OF PRESENTATION

- ✓ The Method
- ✓ ASTM standard D1298*
- ✓ ASTM D1298 Set-up
- ✓ Alternative Devices
- ✓ Unit Installation and Preparing

- *We describe the ASTM D1298 method in this presentation, but our set-up can also be used for ASTM D287, D1122, D1429, D3142 and ASTM D6822.

THE METHOD

- Covers the laboratory determination using a glass hydrometer, of the density, relative density (specific gravity), or API gravity of crude petroleum, petroleum products, or mixtures of petroleum and nonpetroleum products normally handled as liquids, and having a Reid Vapour pressure of 101.325 kPa (14.696 psi) or less.

- Values are measured on a hydrometer at either the reference temperature or at another convenient temperature.

THE METHOD – STANDARD

- Standards ASTM D287, D1122, D1298, D1429, D3142, D6822, IP 160, API 2547, ISO 3675
- The standard describes the manual measurement of density by hydrometer method. (ASTM D6822 describes the thermo hydrometer method).
- The sample is brought to a specified temperature and a test portion is transferred to a hydrometer cylinder that has been brought to approximately the same temperature. The appropriate hydrometer, also at a similar temperature, is lowered into the test portion and allowed to settle. The hydrometer cylinder and its contents are placed in a constant temperature bath to avoid excessive temperature variation during the test. After temperature equilibrium has been reached, the hydrometer scale is read, and the temperature of the sample is taken. The observed hydrometer reading is reduced to the reference temperature by means of the petroleum measurement tables.

The Method – Bath Temperature

- ✓ Use a bath with a constant temperature.
- ✓ Temperature should stay within ± 0.25°C of the test temperature.
- ✓ The temperature measuring device is a glass thermometer. Tamson recommends ASTM S12C thermometer (blue filling, non-hazardous to ship) with a range from -20°C up to +102°C (P/N 25T0911BW). A special thermometer holder is available (P/N 25T2153) which fits in the glass cylinder.

THE METHOD – HYDROMETER

- Glass hydrometers, graduated in units of density, relative density, or API gravity as required, conforming to specification ASTM E100, or ISO 649.

- Hydrometer cylinder, clear glass, plastic (see paragraph 6.3.1), or metal. The inside diameter of the cylinder shall be at least 25 mm greater than the outside diameter of the hydrometer and the height shall be such that the appropriate hydrometer floats in the test portion with at least 25 mm clearance between the bottom of the hydrometer and the bottom of the cylinder.

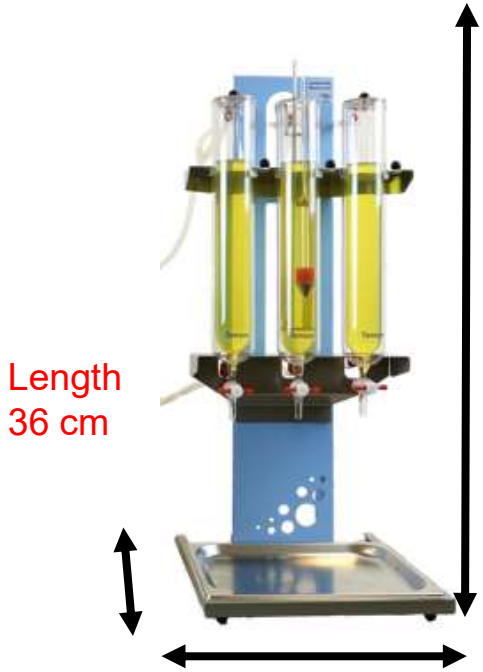
D1298

TAMSON SET-UP

- ✓Small footprint.
- ✓Temperature range.
- ✓Extremely stable.
- ✓Heating & cooling.
- ✓Three positions (six optional).
- ✓Excellent view of hydrometer.
- ✓Easy drainage and cleaning.
- ✓Lids for cylinders.

D1298

SMALL FOOTPRINT



Important:

- TLC15-5 can be placed to the left side, right side or behind the D1298 set-up. It can even be placed under the workbench.
- TLC15-5 has to be placed in a well ventilated area. Air circulation has to be enabled by 30 cm of free space at all sides.

D1298

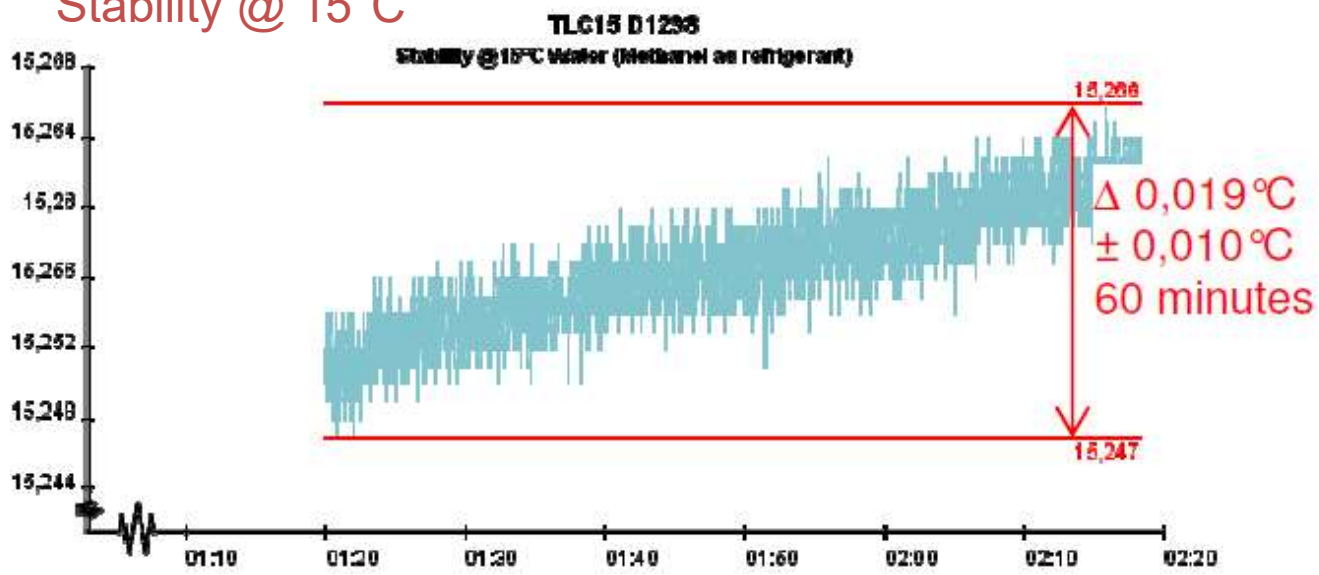
TEMPERATURE RANGE

- ✓ The TLC15-5 circulator pumps a fluid through the double walls of the glass cylinders.
- ✓ Temperature range of TLC15-5 is from -15°C up to +60°C, optional range is from -15°C up to +120°C. This range is much wider than with automatic density devices.
- ✓ Minimum temperature of D1298 set-up approx. +5°C.
- ✓ Maximum temperature depends on the temperature range of TLC15-5, maximum is +120ºC.
- ✓ You can test the density of your sample precisely at the exact temperature. No need for petroleum measurement tables and thus the risk for wrong calculations.

D1298

EXTREMELY STABLE

Stability @ 15°C

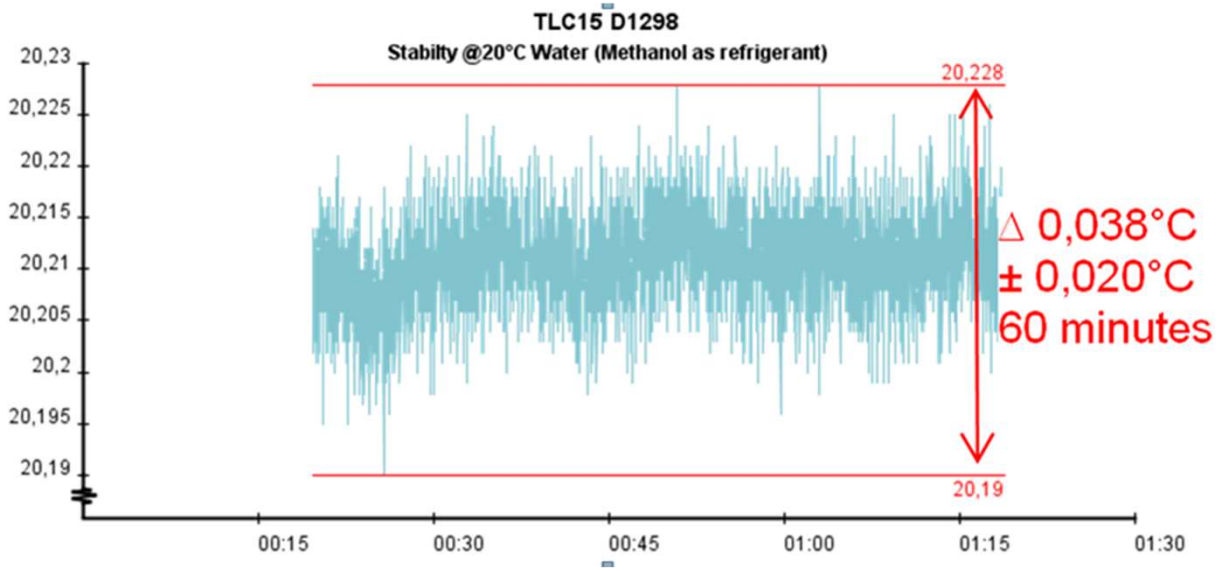


ASTM D1298 states that temperature should stay within ±0.25°C of the test temperature. Our set-up easily meets this requirement.

D1298

EXTREMELY STABLE

Stability @ 20°C

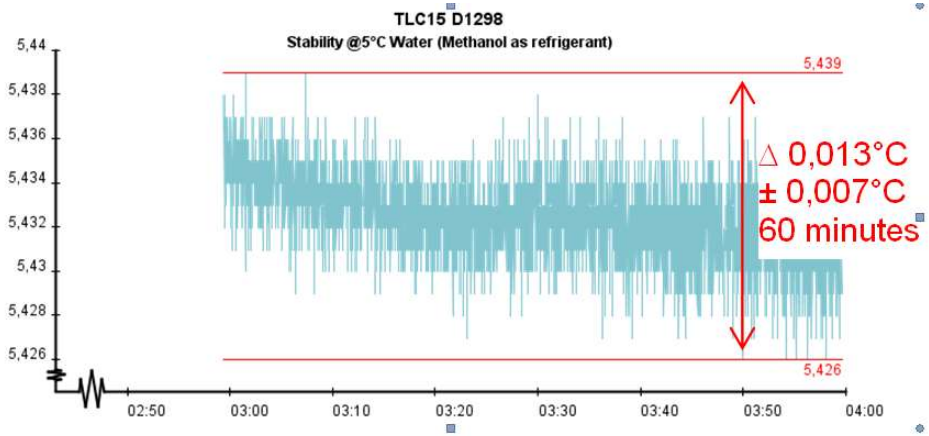


ASTM D1298 states that temperature should stay within ±0.25°C of the test temperature. Our set-up easily meets this requirement.

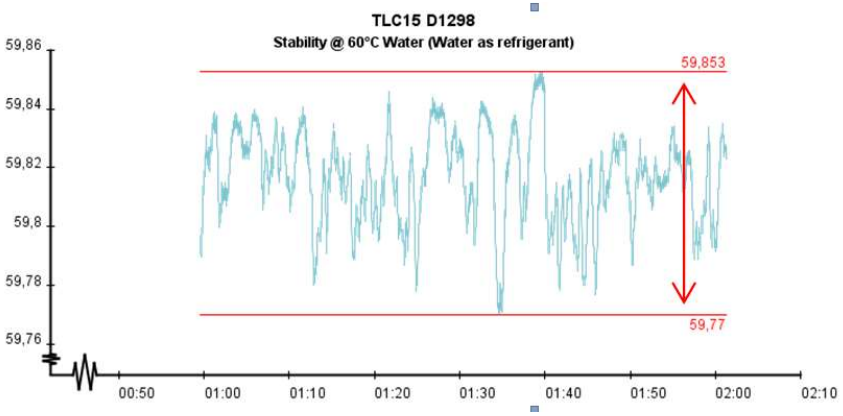
D1298

EXTREMELY STABLE

Stability @ 5°C



Stability @ 60ºC



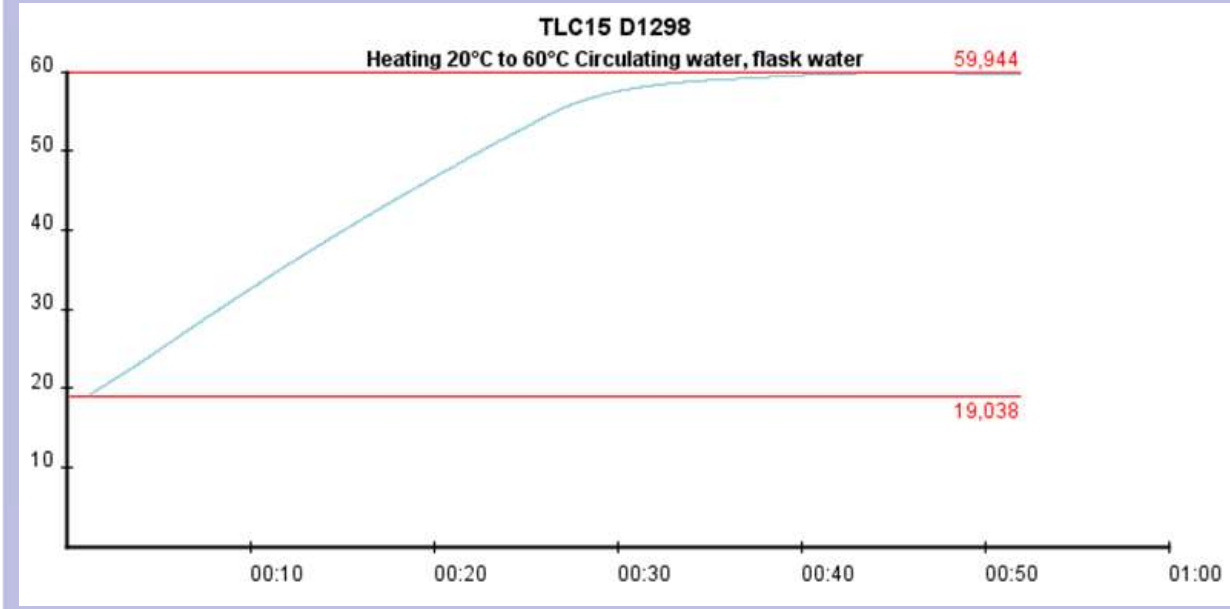
△ 0,083°C
± 0,040°C
60 minutes

ASTM D1298 states that temperature should stay within ±0.25°C of the test temperature. Our set-up easily meets this requirement.

D1298

HEATING & COOLING

- One of the main advantages of our set-up is that you can use it at different temperatures for different type of samples.
- When testing at different temperatures quick cooling and heating is important.
- From ambient to 60ºC it only takes 40 minutes.



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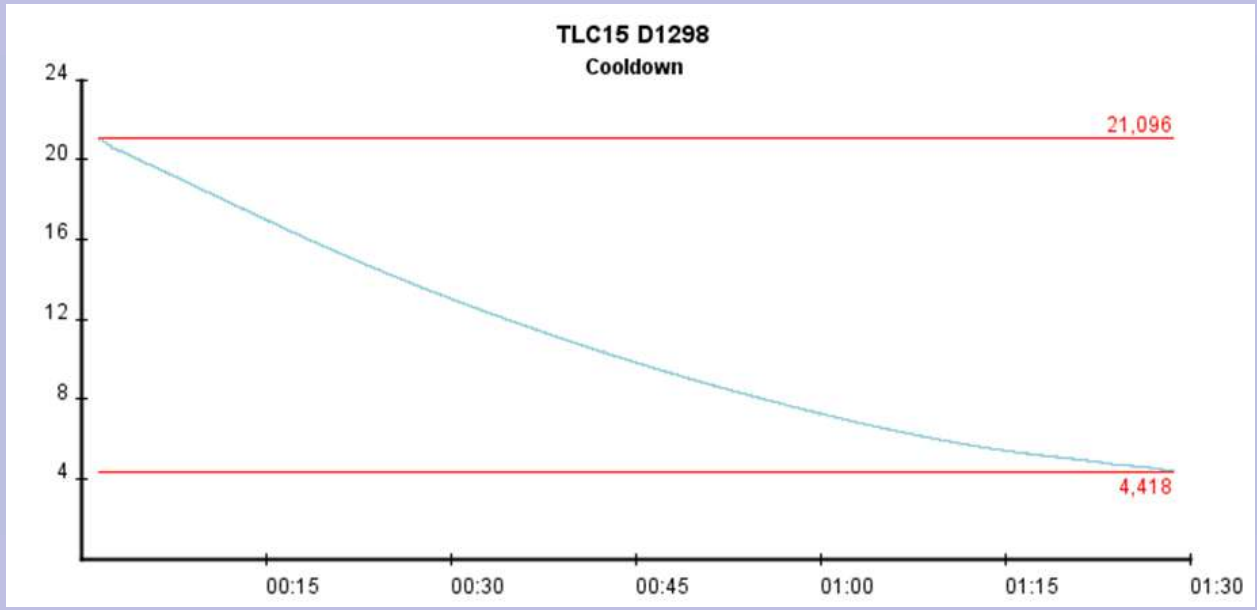
D1298

HEATING & COOLING

- From 20ºC to 5ºC it only takes 70 minutes.



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THREE POSITIONS (SIX OPTIONAL)

- ✓ Set-up can be used with three hydrometers at the same time.
- ✓ Optional an additional mounting rack with cylinders can be added to have six positions in total (P/N 00T1260).
- ✓ Six position set-up shows similar result in stability and heating & cooling capacity.

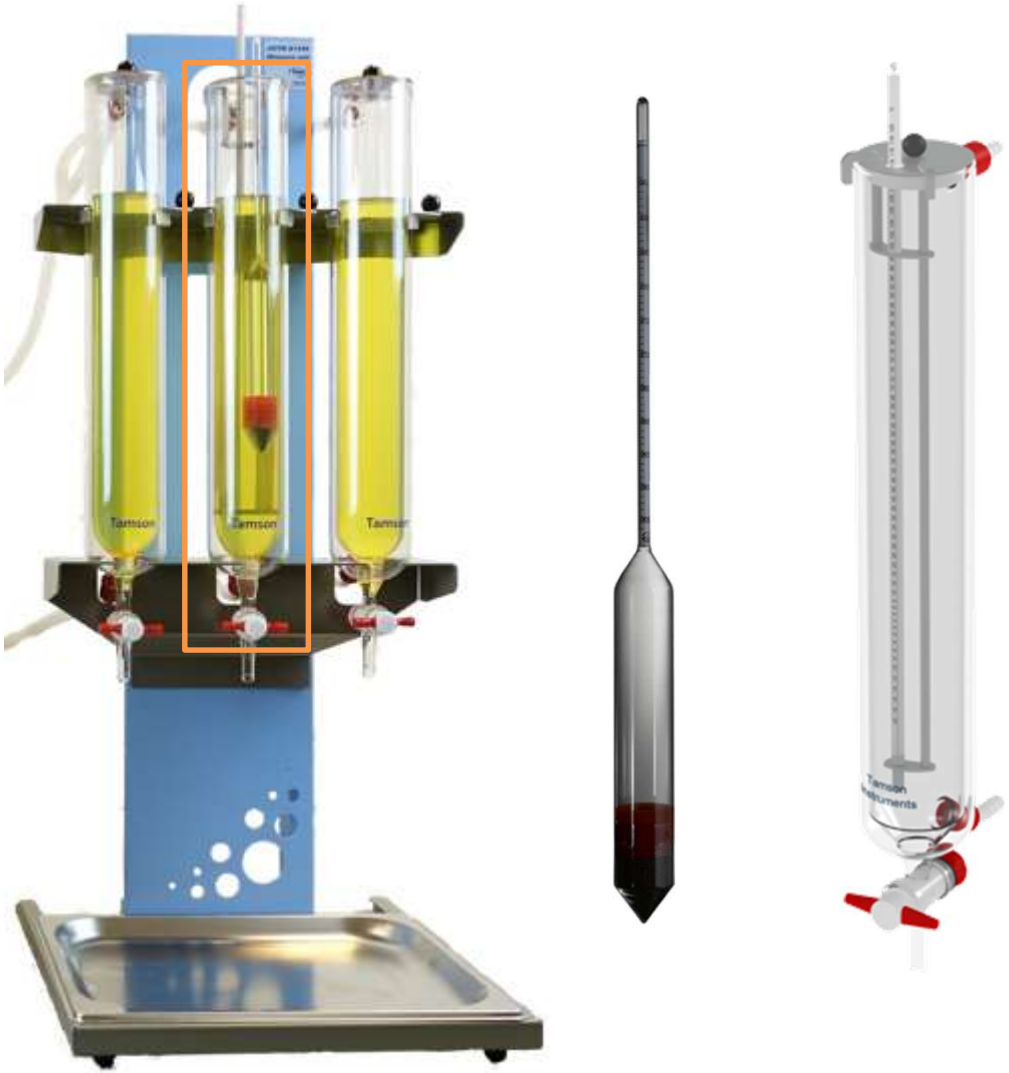
D1298

EXCELLENT VIEW OF HYDROMETER

- ✓ Conventional systems are using some kind of a thermostatic bath with hydrometers cylinders.
- ✓ Part of the hydrometer cylinders are blocked by the lid of the bath.
- ✓ So, part of the hydrometer can not be read.

D1298

EXCELLENT VIEW OF HYDROMETER



- ✓ Our set-up is using a rack in which the jacketed hydrometer cylinders are mounted.
- ✓ Due to the design, you will have a clear view of the hydrometer cylinder.
- ✓ So, you can easily read the complete hydrometer.

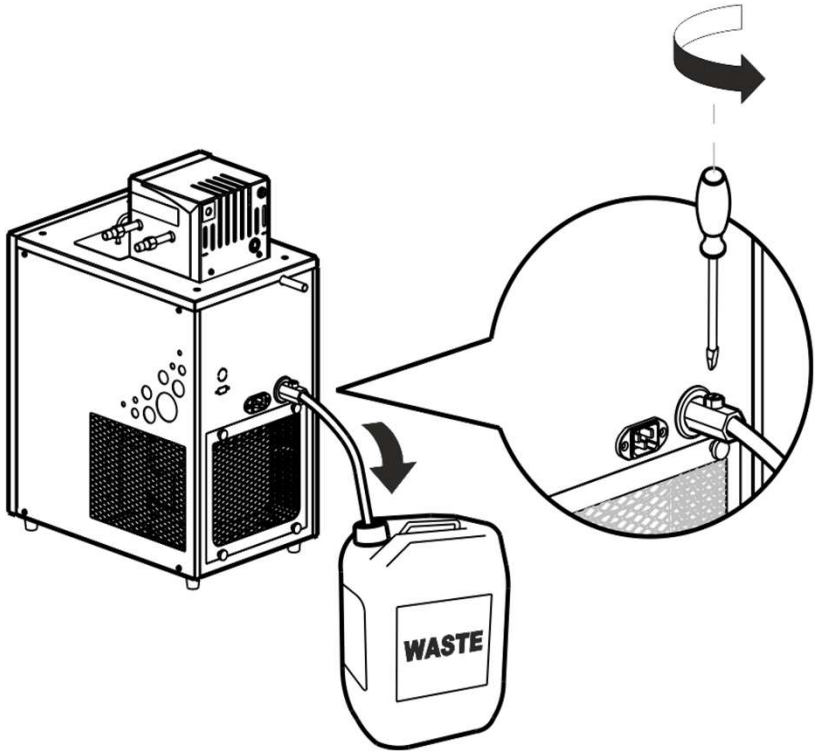
D1298

EASY DRAINAGE AND CLEANING

- ✓ After the sample has been tested, the sample can be easily removed by using the drain.
- ✓ Cylinder can be cleaned with a solvent.
- ✓ In case a portion of the sample is spilled, the tray can be removed and cleaned.
- ✓ Work bench will not get dirty.

D1298

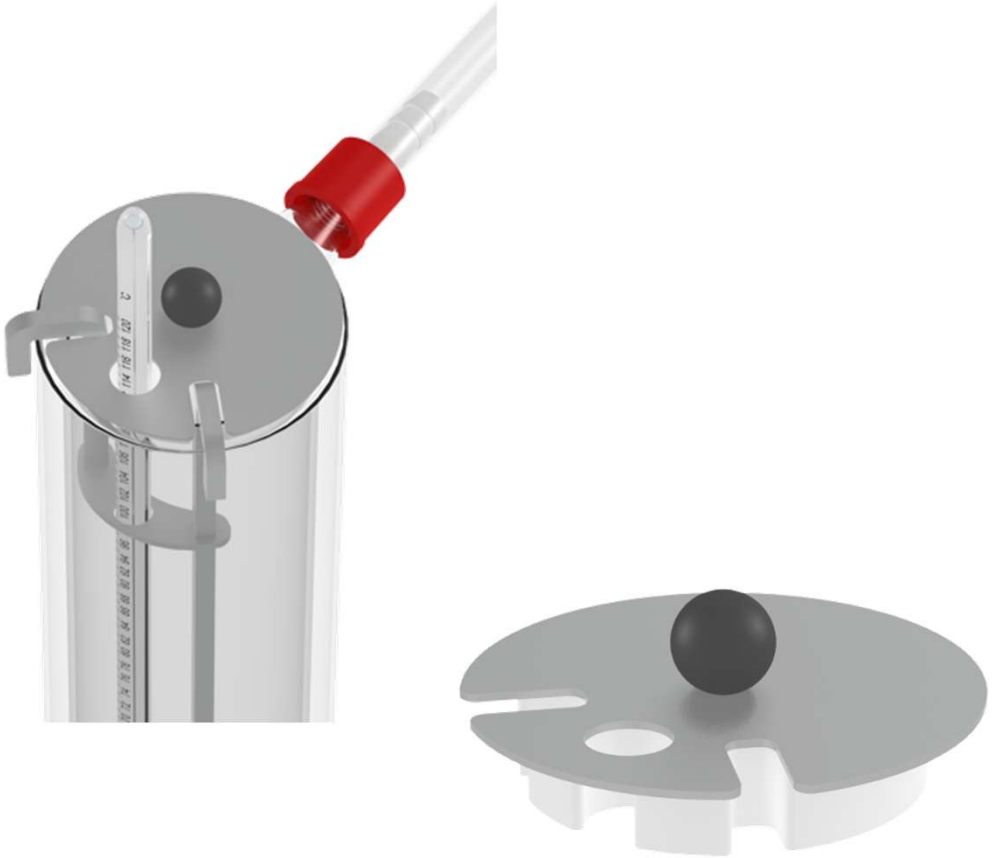
EASY DRAINAGE AND CLEANING



- ✓ TLC15 can be drained by using the drain at the backside of the apparatus.
- ✓ Overflow outlet standard installed.

D1298

LIDS FOR CYLINDER



- ✓ Hydrometer lids can be used to close the cylinders preventing that condensate will go into cylinder or will contaminate the sample.
- ✓ Three lids are standard supplied with delivery.

Alternative devices

TC16 + D1298 SET-UP

- When customer is always testing above ambient temperature, e.g. @ 50ºC, and @100ºC.
- Temperature range of TC16 is up to +250ºC.

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Alternative devices

TV2500

- When customer is always testing above ambient temperature, e.g. @ 40ºC or 100ºC.
- Range from ambient up to 120ºC.
- Can be used with three hydrometer cylinders. Partnumber hydrometer cylinder is 09T0400. Part number for cover with three holes Ø 61 mm is 03T2119.
- Advantage of this TV2500 is that the bath can also be used for kinematic viscosity measurements conforming to ASTM D445.

Alternative devices

TV2500 + TLC10-3

- Same set-up as in previous sheet.
- Additional TLC10-3 cooling circulator which can be connected to the cooiling coil of the TV2500.
- Due to TLC10-3 the range for density measurements will be from +5°C up to 120°C.
- Set-up can be used for kinematic viscosity & density measurements.

Alternative devices

TV3500

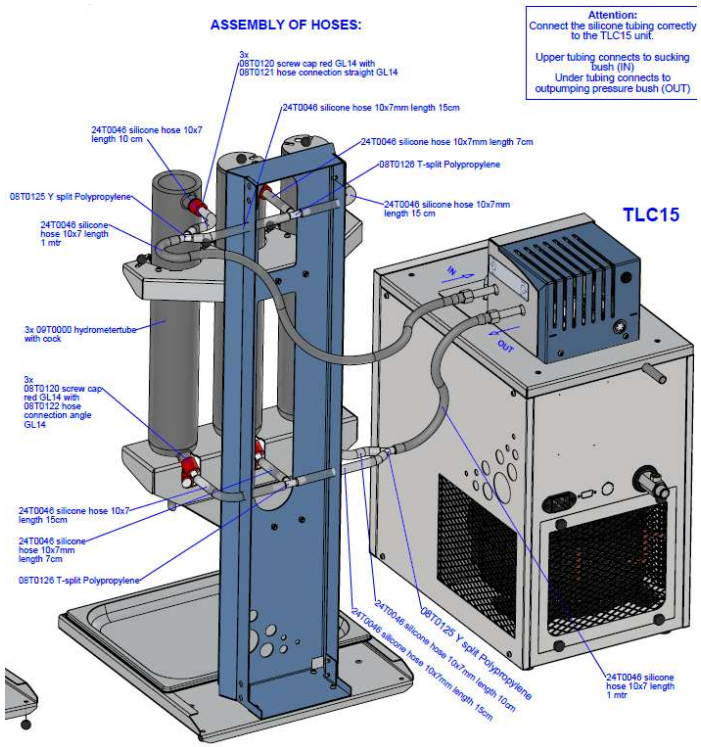
- When customer is always testing above ambient temperature, e.g. @ 40ºC or 100ºC.
- Range from ambient up to 120ºC.
- Can be used with five hydrometer cylinders. Part number hydrometer cylinder is 09T0400. Part number for cover with five openings Ø 61 mm is 03T2128.
- Advantage of this TV3500 is that the bath can also be used for kinematic viscosity measurements conforming to ASTM D445.

Alternative devices

TV3500 + TLC15-5

- Same set-up as in previous sheet.
- Additional TLC15-5 cooling circulator which can be connected to the cooiling coil of the TV3500.
- Due to TLC15-5 the range for density measurements will be from +5°C up to 120°C.
- Set-up can be used for kinematic viscosity & density measurements.

INSTALLATION



- ✓ Unpack the set-up from the box and remove packing materials.
- ✓ Put the cylinders in the rack.
- ✓ Connect the silicon tubing which has already been pre cut.
- ✓ Wall outlets should be properly grounded and provide power with minimum electrical noise.
- ✓ 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.
- ✓ Make sure to use the proper bath medium for each operating temperature.
- ✓ Takes approx. 20 minutes to install the set-up.

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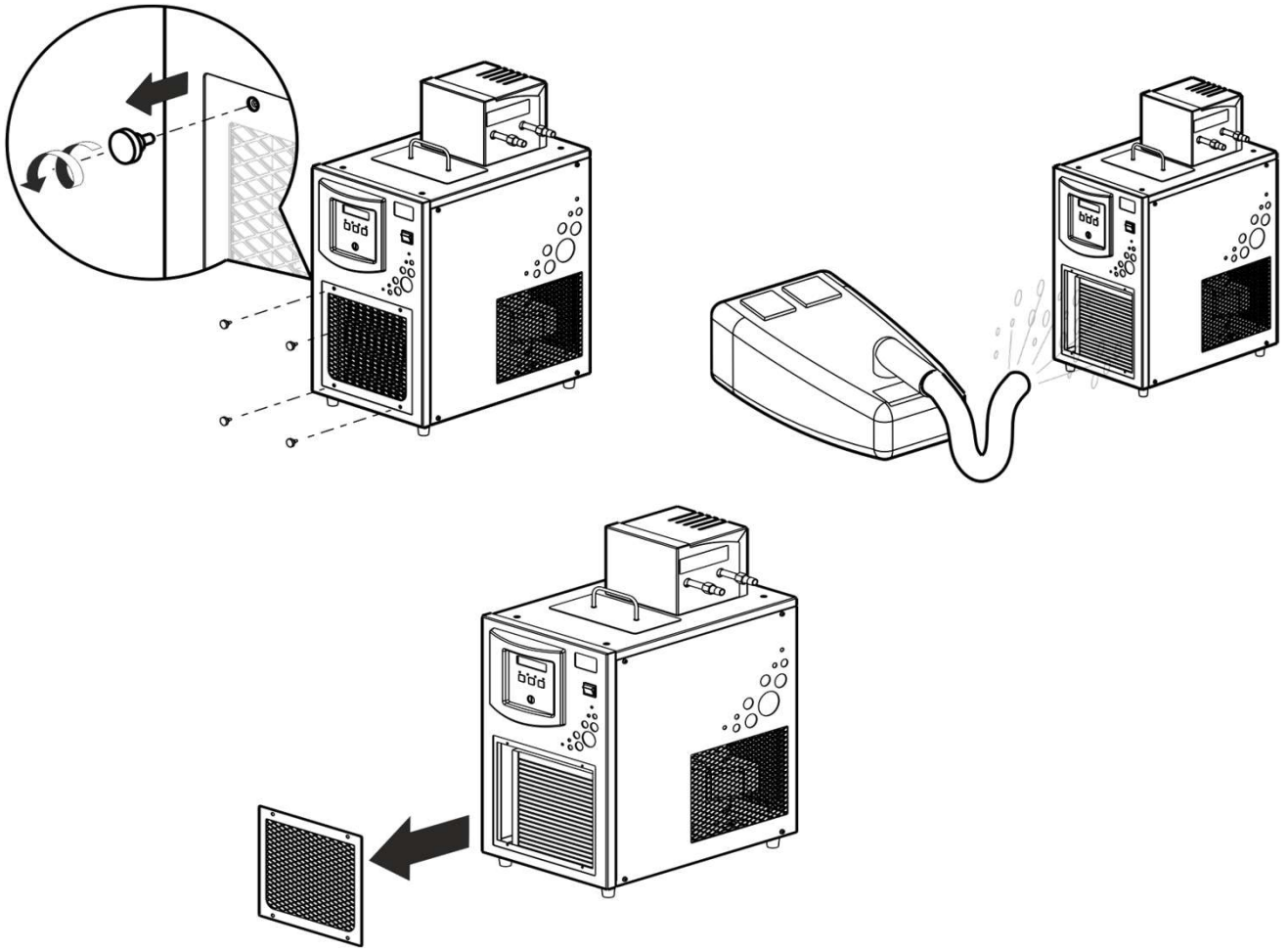
MAINTENANCE



- ✓ Regularly check the apparatus and condenser unit for dust.
- ✓ Remove dust with a vacuum cleaner.
- ✓ Replace bath fluid regularly in order to keep the cylinders clean.

The end

TAMSON D1298 APPARATUS IS THE BEST SOLUTION IN THE MARKET!

Please see our D1298 video on our Tamson YouTube channel.