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Additional description

KERN TACS-A, TACJ-A

Version 1.0

2026-06

en

Density determination

TACS-A_TACJ-A-ZB-e-2610

1 Density determination of solids

When determining the density of solids, the solid is first weighed in air and then in a reference liquid of known density. The difference in weight gives the buoyancy, from which the software calculates the density.

Distilled water or ethanol are usually used as the reference liquid.

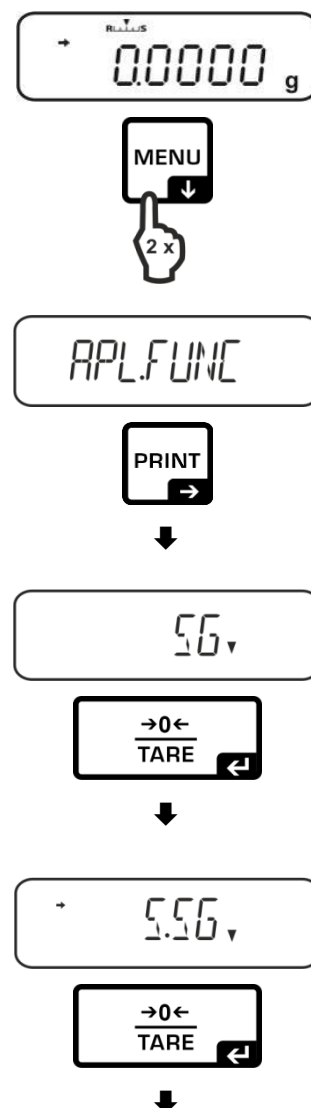
Preparation:

- ⇒ Install the density determination kit in accordance with the YDB-03 installation instructions

1.1 Set parameters

1. Select application

- ⇒ Access the menu:
In weighing mode, press the MENU key twice.
- ⇒ Press the navigation keys (↓ ↑) repeatedly until “APL.FUNC” is displayed.
- ⇒ Confirm by pressing the PRINT key
- ⇒ Press the navigation keys (↓ ↑) repeatedly until “SG” is displayed.
- ⇒ Confirm with **TARE**; “SET” followed by the current setting will be displayed.
- ⇒ Each time you press the TARE key, you can switch between the “SG” and “S.SG” settings (Solid Density Determination mode). The stability display shows the current setting.



2. Enter the parameters for the auxiliary liquid

- ⇒ Confirm with **TARE**. "SET" followed by the currently selected auxiliary liquid (e.g. water) is displayed.
- ⇒ Press the navigation keys (↓ ↑) repeatedly until the desired auxiliary liquid is displayed.
- ⇒ Use the navigation keys ↑, ↓
Select auxiliary fluid
 1. If you select <WATER>, <ETHL> or <METHL>, enter the temperature of the auxiliary fluid in the next step

or

2. If you select <OTHER>, enter the known density of the auxiliary fluid in the next step.

SET,

* WATER,

* WATER,

Distilled water



* ETHL,

Ethanol



* METHL,

Methanol



* OTHER,

Carrier fluid of your choice

Select <WATER>, <ETHL> or <METHL>

- ⇒ Confirm your selection with TARE, then press "SET", followed by the prompt to enter "Auxiliary fluid temperature" appears.

→0←
TARE



SET,

LTEMP,

→0←
TARE



- ⇒ Press **TARE**; the display switches to numeric input.

Numeric entry

The indicator # indicates that the balance is in numeric input mode. The first digit flashes and can be changed.

- ↑ Increase the flashing digit
- ↓ Decrease the flashing digit
- Select the next digit to the right
- ← Confirm entry

- ⇒ Read the temperature on the thermometer and enter it using the navigation keys. Confirm with the TARE key.

The balance automatically determines the corresponding density from the built-in density table and displays it for approx. 3 seconds.

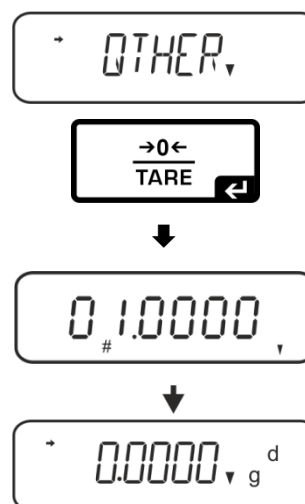
- ⇒ The balance switches to the mode "Density Determination for Solids"



To switch between density mode (↔) and weighing mode, press **MENU** for 3 seconds.

Select <OTHER>

- ⇒ Press **TARE**; the display switches to numerical input.
- ⇒ Enter the known density of the auxiliary liquid of your choice using the navigation keys. Confirm with the TARE key.

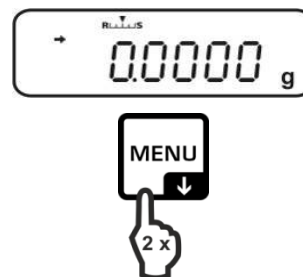


3. Hold function <SG.HOLD>

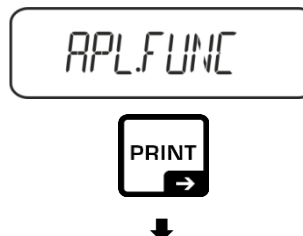
The Data Hold function can be activated when determining the density of solids as well as when determining the density of liquids.

The displayed density value fluctuates very frequently, making it difficult to read. When this function is activated, the first value displayed for the result remains on the screen until it is cleared using the **UNIT** key.

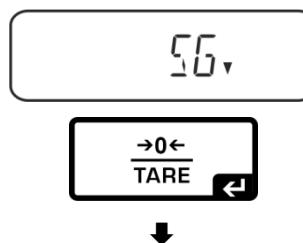
- ⇒ To access the menu:
In weighing mode, press the MENU key twice.



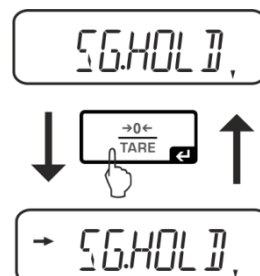
- ⇒ Press the navigation keys (↓ ↑) repeatedly until 'APL.FUNC' is displayed.
- ⇒ Confirm with the PRINT key



- ⇒ Press the navigation keys (↓ ↑) repeatedly until "SG" is displayed.
- ⇒ Confirm with **TARE**; "SET" followed by the current setting will be displayed.

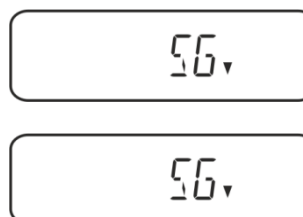


- ⇒ Press the navigation keys (↓ ↑) repeatedly until "SG.HOLD" is displayed.
- ⇒ Confirm with the TARE button.
- ⇒ Each press of the TARE button cycles between the 'OFF' and 'ON' settings. The stability indicator shows the current setting.



Stability indicator 	'SG.HOLD' setting
OFF	OFF
ON	ON

- ⇒ Press the ON/OFF button to return to the menu and make further settings
- ⇒ Press the ON/OFF button to return to the menu and make further settings



or

- ⇒ Press the ON/OFF button repeatedly to return to density measurement mode.



4. Taking air buoyancy into account <AIR.COR>

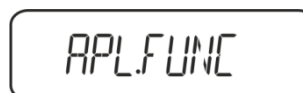
The balance allows you to calculate density with or without taking air buoyancy into account.

	"AIR.COR" setting	
	OFF Calculation without taking air buoyancy into account *Factory setting	ON Calculation taking air buoyancy into account
Density determination of solids	$\rho = \frac{A}{A-B} \rho_o$ ρ Density of the sample A Weight of the sample in air B Weight of the sample in the auxiliary liquid ρ_o Density of the auxiliary liquid	$\rho = \frac{A}{A-B} (\rho_o - \rho_a) + \rho_a$ ρ Density of the sample A Weight of the sample in air B Weight of the sample in the auxiliary liquid ρ_o Density of the auxiliary liquid ρ_a Density of air (0.0012 g/cm³)

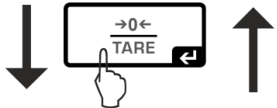
- ⇒ To access the menu:
In weighing mode, press the MENU key twice.



- ⇒ Press the navigation keys (↓ ↑) repeatedly until "APL.FUNC" is displayed.
⇒ Confirm with the PRINT key



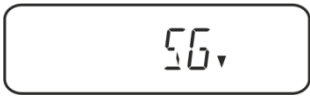
- ⇒ Press the navigation keys (↓ ↑) repeatedly until “SG” is displayed.
- ⇒ Confirm with **TARE**; “SET” followed by the current setting will be displayed.



- ⇒ Press the navigation keys (↓ ↑) repeatedly until “AIR.COR” is displayed.
- ⇒ Confirm with the TARE button.
- ⇒ Each press of the TARE button cycles between the “OFF” and “ON” settings. The stability indicator shows the current setting.

Stability indicator 	“AIR.COR” setting
OFF	OFF
ON	ON

- ⇒ Use the ON/OFF button to return to the menu and make further settings



or

- ⇒ Press the ON/OFF button repeatedly to return to density measurement mode.



1.2 Determining the density of sinking solids ($d > 1 \text{ g/cm}^3$)

1. Remove the immersion basket and place the beaker, filled with the auxiliary liquid, in the centre of the platform. The liquid level should be approximately $\frac{3}{4}$ of the beaker's capacity. Ensure that it does not come into contact with the stand. Reattach the immersion basket. Ensure that it does not touch the beaker. Zero the balance.
2. Ensure that the balance is set to 'Solid Density' mode.

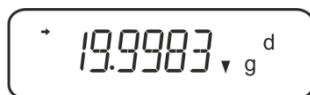


3. Place the solid sample in the upper sample pan.



Fig. 1: Weighing in air

The weight of the sample in air is displayed.



4. Wait for the stability indicator (➡) to appear, then press **UNIT**. 'SINK' is displayed.

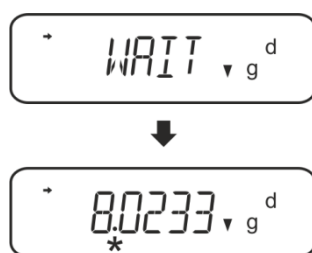


5. Place the solid sample into the lower sieve pan.
To do this, remove the immersion basket from the stand. Take great care to ensure that no additional air bubbles adhere to the sample when it is re-immersed in the liquid; it is better to place the sample directly onto the sieve pan using tweezers or similar. Ensure that the sample is immersed to a depth of at least 1 cm.



Fig. 2: Weighing in auxiliary liquid

6. Press the UNIT key. "WAIT" is displayed. The balance determines the density of the solid and displays it.



7. If an optional printer is connected, the result can be printed.
8. Remove the sample. For further measurements, press **UNIT** and start again at step 2



To prevent corrosion damage, do not leave the weighing basket submerged in liquid for prolonged periods.

Printout example KERN YKB-01N:

KERN & Sohn GmbH	Company
TYPE ACS 200-4	Model
SN WB19AG0002	Serial No.
ID 1234	Scale identification no.
1.2188DS	Result
-SIGNATURE- -----	Processed by

1.3 Determining the density of floating solids ($d < 1 \text{ g/cm}^3$)

For solids with a density of less than 1 g/cm^3 , density can be determined using two different methods.

Method 1:

For the procedure, see Section 1.2.

A liquid with a lower density than that of the solid is used as the reference liquid, e.g. ethanol (approx. 0.8 g/cm^3).

This method should be used if the density of the solid differs only slightly from that of distilled water.

Ethanol should not be used if it reacts with the solid.



When working with ethanol, it is essential to observe the applicable safety regulations.

Method 2:

- ⇒ Remove the immersion basket and place the beaker filled with the auxiliary liquid in the centre of the platform. The liquid level should be approximately $\frac{3}{4}$ of the beaker's capacity. Ensure that it does not come into contact with the stand. Reattach the immersion basket. Ensure that it does not touch the beaker. Zero the balance.
- ⇒ Ensure that the balance is set to 'Solid Density' mode.

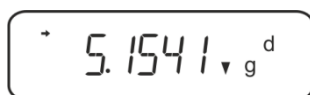


- ⇒ Place the solid sample in the upper sample pan.



Fig. 3: Weighing in air

The weight of the sample in air is displayed.



- ⇒ Wait for the stability indicator (➔) to appear, then press **UNIT**. "SINK" is displayed.

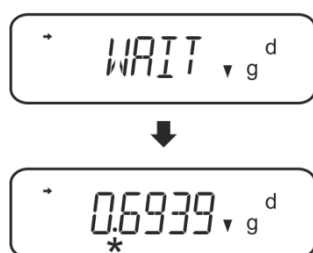


- ⇒ Place the solid completely **beneath** the lower sieve pan.
To do this, remove the immersion basket and, when re-immersing it, place the sample beneath the sieve pan with as few air bubbles as possible.
Alternatively, if possible, use tweezers or similar to place the sample directly beneath the sieve pan.



Fig. 4: Weighing in auxiliary liquid

- ⇒ Press the UNIT key. “WAIT” is displayed. The balance determines the density of the solid and displays it.



- ⇒ If an optional printer is connected, the result can be printed out.
⇒ Take a sample. For further measurements, press **UNIT** and start at step 2.



To prevent corrosion damage, do not leave the immersion basket submerged in the liquid for a prolonged period.

2 Density determination of liquids

When determining the density of liquids, a sinker of known density is used. The sinker is first weighed in air and then in the liquid whose density is to be determined. The difference in weight gives the buoyancy, from which the software calculates the density.

Either

Determine the volume of the supplied steel sinker as described below.

Or

have it determined quickly and cost-effectively in our DKD calibration laboratory. Information is available on the KERN website (www.kern-sohn.com).

2.1 Determining the volume of the sinker

- ⇒ Set up the density measurement kit in accordance with the YDB-03 installation instructions
- ⇒ Fill the container with distilled water. The water level should be approximately $\frac{3}{4}$ of the container's capacity. Maintain the temperature until it remains constant.
- ⇒ Prepare the sinker
- ⇒ Read the temperature on the thermometer

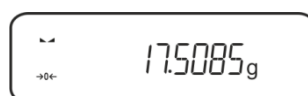
1. Select weighing mode and, if necessary, zero the balance



2. Place the sinker in the upper sample pan. Wait for the stability indicator to appear, and note down the weight displayed.



3. Place the sinker in the lower sample pan. Wait for the stability indicator to appear, and note down the weight displayed.



Calculate the volume of the sinker using the following formula.

$$V = \frac{A - B}{\rho_w}$$

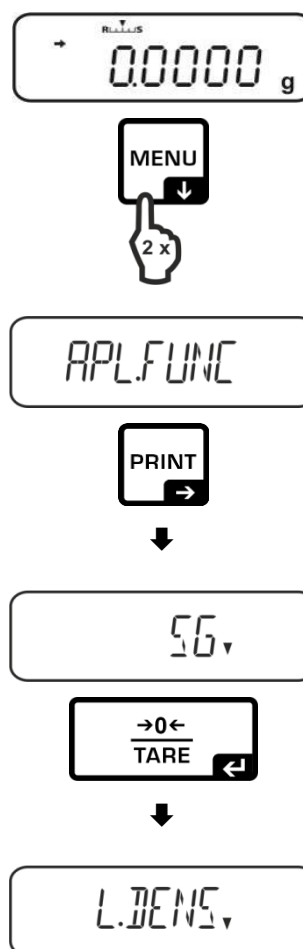
V = volume of the sinker
 A = Weight of the sinker in air = 20.0000 g
 B = Weight of the sinker in water = 17.50850 g
 ρ_w = Density of water (see Chapter Fehler! Verweisquelle konnte nicht gefunden werden.) at 20°C = 0.9982 g/cm³

$$V = \frac{20.0000 \text{ g} - 17.5085 \text{ g}}{0.9982 \text{ g/cm}^3} = 2.4960 \text{ cm}^3$$

2.2 Set parameters

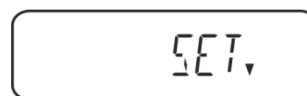
1. Select application

- ⇒ Open the menu:
In weighing mode, press the MENU key twice.
- ⇒ Press the navigation keys (↓ ↑) repeatedly until “APL.FUNC” is displayed.
- ⇒ Confirm by pressing the PRINT key
- ⇒ Press the navigation keys (↓ ↑) repeatedly until “SG” is displayed.
- ⇒ Confirm with **TARE**; “SET” followed by the current setting will be displayed.
- ⇒ Press the navigation keys (↓ ↑) repeatedly until “L.DENS” (Liquid Density Determination mode) is displayed.

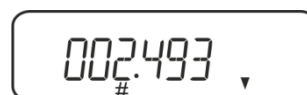




- ⇒ Press the TARE button to confirm. “SET” is displayed, followed by the prompt to enter the sinker’s volume.



- ⇒ Press the TARE key; the display switches to numeric input mode. The ‘#’ indicator shows that the balance is in numeric input mode. The first digit flashes and can be changed. Enter the volume of the sinker (see section 2.1, ‘2.1 ’) using the navigation keys.

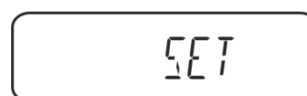


Numeric input

The ‘#’ indicator shows that the balance is in numerical input mode. The first digit flashes and can be changed.

- ↑ Increase the flashing digit
- ↓ Decrease the flashing digit
- Select the next digit to the right
- ← Confirm entry

- ⇒ The balance switches to the mode for determining the density of liquids.



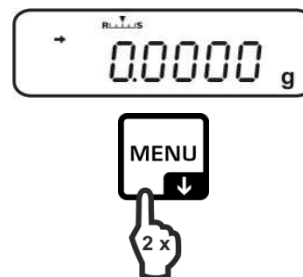
To switch between density mode (↔) and weighing mode, press **MENU** for 3 seconds.

2. Hold function <SG.HOLD>

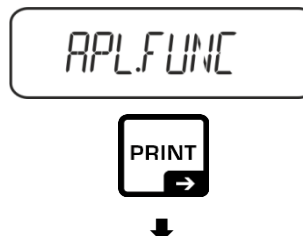
The Data Hold function can be activated when determining the density of solids as well as when determining the density of liquids.

The displayed density value fluctuates very frequently, making it difficult to read. When this function is activated, the first value displayed for the result remains on the screen until it is cleared using the **UNIT** key.

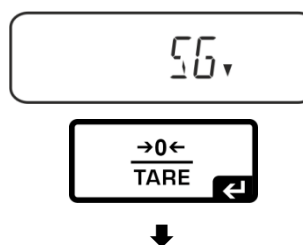
- ⇒ To access the menu:
In weighing mode, press the MENU key twice.



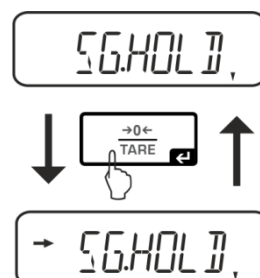
- ⇒ Press the navigation keys (↓ ↑) repeatedly until 'APL.FUNC' is displayed.
- ⇒ Confirm with the PRINT key



- ⇒ Press the navigation keys (↓ ↑) repeatedly until "SG" is displayed.
- ⇒ Confirm with **TARE**; "SET" followed by the current setting will be displayed.

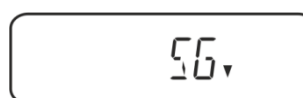


- ⇒ Press the navigation keys (↓ ↑) repeatedly until "SG.HOLD" is displayed.
- ⇒ Confirm with the TARE button.
- ⇒ Each press of the TARE button cycles between the 'OFF' and 'ON' settings. The stability indicator shows the current setting.



Stability indicator 	'SG.HOLD' setting
OFF	OFF
ON	ON

- ⇒ Use the ON/OFF button to return to the menu and make further settings



or

- ⇒ Press the ON/OFF button repeatedly to return to density measurement mode.



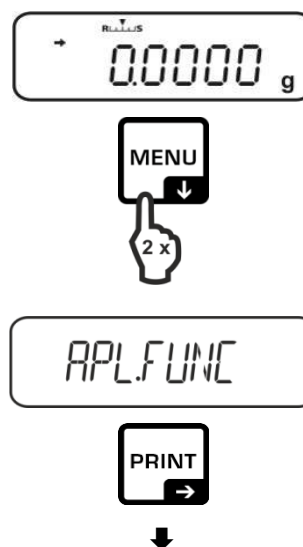
3. Taking air buoyancy into account <AIR.COR>

The balance allows you to calculate density with or without taking air buoyancy into account.

	“AIR.COR” setting	
	OFF	ON
	Calculation without taking air buoyancy into account *Factory setting	Calculation taking air buoyancy into account
Density determination of liquids	$\rho = \frac{A-B}{V}$	$\rho = \frac{A-B}{V} + \rho_{\alpha}$
	ρ Density of the test liquid A Weight of the sinker in air B Weight of the sinker in test fluid V Density of the sinker	ρ Density of the test liquid A Weight of the sinker in air B Weight of the sinker in test fluid V Density of the sinker ρ_{α} Density of air (0.0012 g/cm³)

- ⇒ To access the menu:
In weighing mode, press the MENU key twice.

- ⇒ Press the navigation keys (↓ ↑) repeatedly until “APL.FUNC” is displayed.
- ⇒ Confirm with the PRINT key



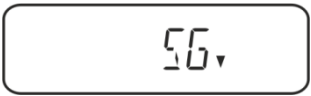
- ⇒ Press the navigation keys (↓ ↑) repeatedly until “SG” is displayed.
- ⇒ Confirm with **TARE**; “SET” followed by the current setting will be displayed.



- ⇒ Press the navigation keys (↓ ↑) repeatedly until “AIR.COR” is displayed.
- ⇒ Confirm with the TARE button.
- ⇒ Each press of the TARE button cycles between the “OFF” and “ON” settings. The stability indicator shows the current setting.

Stability indicator 	“AIR.COR” setting
OFF	OFF
ON	ON

- ⇒ Use the ON/OFF button to return to the menu and make further settings



or

- ⇒ Press the ON/OFF button repeatedly to return to the density measurement mode.



2.3 Determine the density of the test liquid

1. Pour the test liquid into the beaker.
Ensure that the balance is in the mode for determining the density of liquids (see section 2.2).



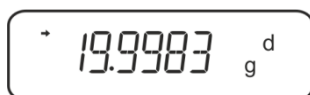
If the balance does not display zero, press the TARE button.

2. Place the sinker in the upper sample pan.

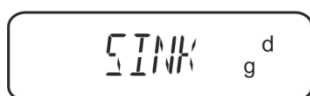


Fig. 5: Weighing in air

The weight of the sinker in air is displayed.



3. Wait for the stability indicator (➡) to appear, then press **UNIT**. "SINK" is displayed.



4. Place the sinker into the lower sieve pan.



Fig. 6: Weighing in test liquid

5. Press the UNIT key. "WAIT" is displayed. The balance determines the density of the liquid and displays it.



6. If an optional printer is connected, the result can be printed.

Printout example KERN YKB-01N:

KERN & Sohn GmbH	Company
TYPE ACS 200-4	Model
SN WB19AG0002	Serial No.
ID 1234	Scale identification no.
0.1109DL	Result
-SIGNATURE-	Processed by

For further measurements

- ⇒ Carefully clean and dry the container and the sinker.
- ⇒ Reattach the probe
- ⇒ Press the UNIT button
- ⇒ Start at step 2



To prevent corrosion damage, do not leave the immersion basket submerged in liquid for a prolonged period.