Portable Density and Concentration Meter

Anton Paar

DMA 35

Instruction Manual

Instruction Manual and Safety Information

DMA 35

Portable Density Meter

(Original Instructions)

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Further information

Published by Anton Paar GmbH. Printed in Austria.
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Date: 12 August 2020

Document number: E28IB002EN-M

Valid for the following instrument software versions:

for standard type DMA 35: from 1.011
for type DMA 35 Ampere: from 1.011
for types DMA 35 Ex and DMA 35 Ex Petrol: from 1.003

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1 Safety Instructions

- Read this document before using the instrument.
- Follow all hints and instructions in this document to ensure the correct use and safe functioning of the instrument.
- The manual is a part of the product. Keep it for the complete working life of the product and make it easily accessible for all persons involved with the product. If you receive any additions to or revisions of the manual from Anton Paar, these must be treated as part of the manual.

1.1 Liability

- This document does not claim to address all safety issues associated with the use of the instrument and samples. It is your responsibility to establish health and safety practices and to determine the applicability of regulatory limitations.
- Anton Paar GmbH only warrants the proper functioning of the instrument if no modifications are made to mechanics, electronics, or software.
- Use the instrument only for the purpose described in the document. Anton Paar GmbH is not liable for damages caused by incorrect use of the instrument.
- The results delivered by the instrument depend not only on the correct functioning of the instrument, but also on various other factors. We therefore recommend that you have the results checked (e.g. plausibility tested) by skilled persons before consequential actions are taken based on the results.

1.2 Installation and Use

- The installation procedure shall be carried out only by authorized persons who are familiar with the installation instructions.
- Use only accessories, consumables or spare parts supplied or approved by Anton Paar GmbH.
- Ensure that all operators have been trained beforehand to use the instrument safely and correctly.
- Ensure that the instrument is sufficiently supervised during operation.

- In case of damage or malfunction, do not continue operating the instrument. Do not operate the instrument under conditions which could result in damage to goods or injuries or loss of life.
- Do not expose the instrument to temperatures below 0 °C (32 °F) when the measuring cell contains water. Freezing water will cause rupture of the measuring cell.
- The instrument is not insulated against high voltages. Measuring samples under high voltage (e.g. in energized battery banks) bears the risk of an electric shock. Define appropriate testing procedures and safety measures to protect yourself from any electric shock.

Operation in areas with risk of explosion

- Standard type DMA 35 and DMA 35 Ampere are **not** explosion-proof and therefore must not be operated in areas with risk of explosion.
- In areas with risk of explosion, only operate instruments marked with an Ex sign () according to ATEX.
- By attaching the Ex sign according to ATEX, Anton Paar GmbH confirms that the intrinsically safe DMA 35 (types DMA 35 Ex and DMA 35 Ex Petrol) meets the requirements of the EU type-examination certificate according to ATEX (directive 2014/34/EU), see appendix F.

  Do not alter the intrinsically safe DMA 35 in any way.
- For setup and operation of the intrinsically safe DMA 35, refer to corresponding norms and regulations in the EU type-examination certificate, see appendix F. It is your responsibility to ensure that the planned use of the instrument conforms to its specification as stated on the Ex sign and the EU type-examination certificate.
- The intrinsically safe DMA 35 (types DMA 35 Ex and DMA 35 Ex Petrol) must not be insulated from earth potential when operated or placed in a hazardous area. The instrument is grounded via the hand of the user or an earthed conductible board. Ensure proper alternative grounding when you wear insulating gloves.
- Should any mechanical damage be visible on the DMA 35 Ex or DMA 35 Ex Petrol (e.g., after the instrument has been accidentally dropped), remove the instrument immediately from areas with risk of explosion and contact your local Anton Paar representative for a repair service.

  Outside the area with risk of explosion, also check underneath the rubber housing for possible damage.

  To prevent damage from falls, use the carrying straps supplied by Anton Paar.

- In areas with risk of explosion, the instrument must be used only with the correct rubber housing for the measuring cell properly mounted.
- In areas with risk of explosion, use only accessories (filling tube, adapter, syringes) supplied by Anton Paar.
- In areas with risk of explosion, use only the carrying straps including snap hooks supplied by Anton Paar.
- In areas with risk of explosion, use only passive RFID tags.
- RFID tags that you use in areas with risk of explosion must not be damaged.
- Never open the battery compartment in areas with risk of explosion. Exchange the batteries only outside hazardous areas.
- The dismounted battery compartment is not a safe part. Do not carry a spare battery compartment with you in areas with risk of explosion.

Batteries

- With the intrinsically safe DMA 35 (types DMA 35 Ex and DMA 35 Ex Petrol), use only alkaline batteries type Varta Industrial 4006.

General precautions

- Observe and adhere to your national safety regulations regarding the handling of all substances associated with your measurements (e.g. use safety goggles, gloves, respiratory protection, etc.).
- Before a measurement, check the wetted parts of the instrument for chemical resistance to the samples and cleaning agents used.

Precautions for flammable samples and cleaning agents

- Keep potential sources of ignition, like sparks or open flames, at a safe distance from the instrument.
- Store only the minimum required amount of sample, cleaning agents, and other flammable materials near the instrument.
- Do not spill sample/cleaning agents or leave their containers uncovered. Immediately remove spilled sample/cleaning agents.
- Ensure that the setup location is sufficiently ventilated. The environment of the instrument must be kept free of flammable gases and vapors.
- Provide fire-extinguishing equipment.

1.3 Service and Repairs

- Service and repair procedures may be carried out only by authorized personnel or by Anton Paar GmbH.
- Disassembly of the measuring cell by unauthorized persons will void any warranty.

1.4 Disposal

- Concerning the disposal of the instrument, observe the legal requirements in your country.

1.5 Conventions for Safety Messages

The following conventions for safety messages are used in this document:

WARNING

Description of risk
Warning indicates a hazardous situation which, if not avoided, **could** result in death or serious injury.

CAUTION

Description of risk
Caution indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Description of risk
Notice indicates a situation which, if not avoided, could result in damage to property.

2 DMA 35 – An Overview

The portable density meter DMA 35 measures the density of liquids in g/cm^3 or kg/m^3 by the oscillating U-tube method. Apart from density you can select various further measuring units (relative density, density at reference temperature, concentrations). A temperature sensor measures the sample temperature directly at the measuring cell. The temperature is displayed and can be used internally for automatic temperature compensation of the density reading if required.

Owing to the compact design, it is easy to perform measurements of samples that are difficult to access. A TFT display ensures clear visibility of results, even in dark surroundings. At the same time the backlight of the oscillator enables you to observe the filling process in detail.

Samples are filled into the measuring cell using the built-in pipette-style pump or a syringe. You can allocate sample IDs to your samples for easier identification.

DMA 35 is operated via keys on the front. Up to 1024 measured data can be stored in the memory of the DMA 35 density meter and can be recalled, exported to a PC, or printed later. The transfer of the stored measured data to a printer or PC is done wirelessly using the integrated Bluetooth interface.

DMA 35 is additionally equipped with an RFID interface. Via this interface, sample IDs and methods can be uniquely linked to an RFID tag. Later on, by reading the RFID tag, you can switch quickly and easily between different sample IDs and methods, which further increases the efficiency of your measuring process.

Four different versions of DMA 35 are available:

- DMA 35
- DMA 35 Ex
- DMA 35 Ex Petrol
- DMA 35 Ampere

DMA 35 Ex and DMA 35 Ex Petrol are both intrinsically safe and specifically designed for the measurement of flammable chemicals (DMA 35 Ex) or petroleum samples (DMA 35 Ex Petrol) in hazardous environments.

DMA 35 Ampere is designed for the density measurement of battery acid, i.e. sulfuric acid.

2.1 Measuring Principle

Definition of density

The density (ρ) of a sample is defined as its mass (m) divided by its volume (V):

$$\rho = \frac{m}{V}$$

As the volume changes with temperature, density is a temperature-dependent measuring unit.

The oscillating U-tube method

The sample is introduced into a U-shaped borosilicate glass tube that is being excited to vibrate at its characteristic frequency. The characteristic frequency changes depending on the density of the sample. With the determination of the characteristic frequency, the density of the sample can be calculated. Due to the temperature dependency of the density value, the temperature of the sample has to be determined precisely.

Concentration measurement

In binary mixtures, the density of the mixture is a function of its composition. Thus, with the aid of density/concentration tables, the density value of a binary mixture can be used to calculate its composition.

This procedure is also applicable for so-called quasi-binary mixtures. These mixtures contain two major components and some additional ones in very small concentrations compared to the two main components.

Many decarbonated soft drinks, for example, can be considered to be quasi-binary mixtures of sugar and water because the concentrations of flavors and acids are very small compared to those of sugar and water. Hence, the sugar concentration can be determined with a density meter.

The same holds for the determination of the alcohol concentration in distilled spirits that can be considered to be quasi-binary mixtures of ethanol and water.

2.2 Functional Components

Front

Rear

Fig. 1: Views of the instrument

Front

1 LC display
2 Power ON/OFF key
3 Function keys
4 Delete key
5 Data storage key
6 Arrow keys
7 Filling pump
8 Screw plug
9 Eyelet for carrying strap
10 Filling tube
11 Measuring cell

Rear

12 RFID interface and type plate with serial number
13 Screw of battery compartment

Table 1: Keys on the front

	Power ON/OFF key	to switch the instrument on and off
	Data storage key	to start a measurement When the measurement is finished, the result is stored automatically in the internal memory.
	Delete key	to delete the data of the last measurement
	Arrow keys	to navigate in the quick access area, in menus, or in selection/character lists
	Function keys	to activate a key function displayed directly above

3 Checking the Supplied Parts

DMA 35 has been tested and packed carefully before shipment. However, damage may occur during transportation.

1. Keep the packaging material (box, foam pieces, transport protection) for possible returns or for questions from the transportation or the insurance company.
2. To check the delivery for completeness, compare the supplied parts to those listed in table 2.
3. If a part is missing, contact your local Anton Paar representative.
4. If a part is damaged, contact the transportation company and your Anton Paar representative.

Table 2: Supplied parts

	Qty.	Article description	Mat. no.
	1	DMA 35 Portable Density Meter *or* DMA 35 Ampere Portable Density Meter *or* DMA 35 Ex *or* DMA 35 Ex Petrol Portable Density Meter *(incl. Rubber housing measuring cell Ex, mat. no. 194159, already mounted)*	172244 187111[a] 226130 187110[a] 223326[a] 183056 183057
			

Table 2: Supplied parts (cont.)

	Qty.	Article description	Mat. no.
	1	Carrying case DMA 35/Snap 41 *(must not be used with DMA 35 Ex or DMA 35 Ex Petrol)* *or* Carrying case DMA 35 Ex/Ex Petrol *(only for use with DMA 35 Ex or DMA 35 Ex Petrol)*	177345 210247
	1	Pump lever with lock function	165216
	1	Rubber housing measuring cell *(not with DMA 35 Ex and DMA 35 Ex Petrol)*	165214
	1	Instruction manual	181207
	1	Standard operating procedure booklet	186436
	1	Filling tube 180 mm	172214
	1	Adapter Luer ¼" UNF	172211
	1	Syringes 2 mL Luer (10 pcs)	58802

Table 2: Supplied parts (cont.)

	Qty.	Article description	Mat. no.
	1	Allen key 3 mm DIN 911	58264

a OEM versions

Table 3: Optional accessories and consumables

Article description	Mat. no.
Screw plug ¼" UNF	172246
Filling tube 600 mm	178843
Bent filling tube 70 mm / 180 mm	227592
Rubber housing operating panel	177115
Rubber housing measuring cell Ex	194159
Alkaline battery 1.5 V LR6 AA Varta	191889
Spare wristband for portable instruments	92477
Set carrying strap DMA 35/Snap	177301
Bluetooth USB adapter	99180
ABS disc tag 30 mm, 5 mm hole R/W	88443
White PVC sticker disc tag 30 mm R/W	88445
Black laundry tag 30 mm R/W	88444
Printer CMP-20BT Bluetooth/RS232C	97154
ISO 17025 calibration density G1	157098
ISO 17025 extra calibration point	157102
ISO 17025 re-calibration density G1	157099
ISO 17025 extra calibration point for re-calibration	166443
Custom parameter	181868
Installation custom parameter	181797

4 Putting DMA 35 into Operation

4.1 Connecting the Filling Tube

Screw in the filling tube by hand until some resistance against further turning can be felt. Tighten with your fingers only, do not use any tools.

Fig. 2: Connecting the filling tube

4.2 Mounting the Syringe Adapter

For some applications, e.g. filling samples of higher viscosity, filling with a syringe may be more convenient. To do so, mount the syringe adapter.

1. Remove the screw plug (see fig. 1).
2. Screw in the adapter Luer ¼" UNF by hand until some resistance against further turning can be felt. Tighten with your fingers only, do not use any tools.

4.3 Switching the Instrument On/Off

- To switch DMA 35 on, tap and hold the ⏻ key until the display lights up.
- To switch DMA 35 off, tap and hold the ⏻ key until the instrument is switched off.

TIP: *For proper operation, cover the entire key area with your finger.*

5 Operating DMA 35

5.1 Main Screen

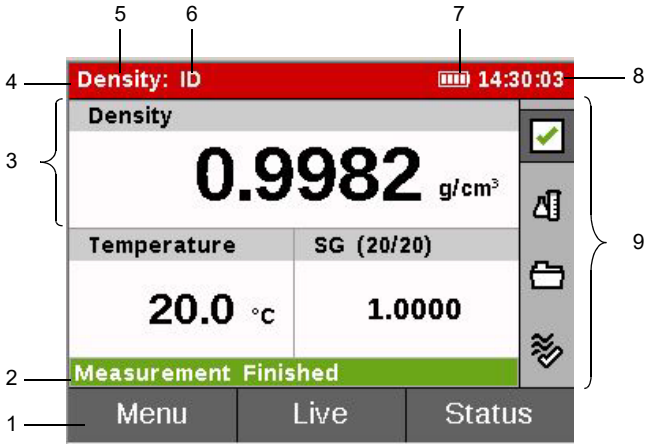

Fig. 3: Example main screen

1 *Key functions*
2 *Status bar*
3 *Output field*
4 *Header*
5 *Method*
6 *Sample ID*
7 *Battery charge status symbol*
8 *Current time*
9 *Quick access area*

Header

On the left of the header, you find information on the currently used method, the sample ID, the number of stored data sets, or the index of the currently shown data set, depending on the active mode and function.

On the right of the header, the battery charge status and the current time are displayed. When activated, the symbol for Bluetooth may also show at the left of the battery symbol.

Table 4: Symbols in the header

	The battery charge status symbol informs you about the battery charge status. See section 13.6 for details.
	The RFID symbol shows in the header of the main screen when an RFID tag is read.
	The Bluetooth symbol shows in the header of the main screen when data are sent via Bluetooth.

Output fields

You can select 2 or 3 sample parameters to be simultaneously displayed on the main screen. Each parameter is shown in a separate output field.

Status bar

The status bar shows the status of the instrument or a measurement. If applicable, a progress bar will show the progress of activities.

5.2 Key Functions

The key functions correspond to the function keys below/above the display (the assignment of keys adapts to the active selection). The following key functions are available:

Function	Description
Back	Leaves the menu and goes to the next higher menu level.
Cancel	Aborts an operation.
Delete	Initiates deleting a value, or deletes the next character to the left.
Done	Finishes an entry.
Edit	Switches into editing mode allowing you to enter values or change the current selection.
Enter	Enters a character.
Live	“Unfreezes” the last measuring result and returns to showing continuous live readings.
Menu	Opens the main menu.
New	Initiates entering a new value.
Next	Continues with a procedure, or selects the next item to the right.
No	Rejects a proposition.
OK	Confirms a selection, or finishes a procedure.
Prev	Selects the next item to the left.
Print	Prints the selected data.
RFID	Reads an RFID tag.
Save	Saves adjustment data.
Start	Starts a procedure.
Yes	Accepts a proposition.

On the main screen, the right function key can assume the following functions according to the icon selected in the quick access area:

Function	Description
Check	Quick access to the checks.
Data	Quick access to the measurement data.
Sample	Quick access to the method list and sample ID list for making a selection.
Status	Quick access to the measurement status and any associated warning or error message.

5.3 Quick Access Area

Use the arrow keys to select a quick access function. Activate the function with the right function key.

The following quick access functions are available:

Icon	Function
  	“Status” function Use it to check the measurement status. The status indicator can assume 3 states: • green check mark: status OK • yellow symbol with exclamation mark: there is a warning message • red symbol with lightning: there is an error message
	“Sample” / “Sample ID” function Use it to select a measuring method and a sample ID for the next measurement.
	“Data” function Use it to view measurement and check data stored in the data memory.
	“Check” function Use it to initiate a check.

5.4 Menu Navigation

- Use the **function keys** to switch menus and to trigger selection-specific activities.
- Use the **arrow keys** to navigate within menus and to select an item.

  With longer screen content, a black scroll bar will show on the right of the scrollable area. Use the arrow keys to scroll through the content.

5.5 Entering Text or Numbers

After you have switched into editing mode, you see a selection bar on the right of the screen:

1. Use the arrow keys to select the next character/digit to enter.

TIP: *Keep the arrow keys pressed to scroll through the selection bar quickly.*

   Select the red left arrow ◂, if available, to edit the previous position (one character to the left).

   Select the red left arrow with shaft ←, if available, to delete the last character.

2. Tap <Enter> to enter the selected character at the current position.

   Tap <Prev>, if available, to move the current position one character to the left.

   Tap <Delete>, if available, to delete the character left of the current position.

   The editing line will show the whole current text/number.

3. Tap <Done> to finish character entry and to confirm the entered text/number.

   Tap <Cancel> at any time to abort character entry and to discard the entered text/number.

5.6 Selecting from a List

After you have switched into editing mode, you see a selection list folded out:

1. Use the arrow keys to select your choice.
2. Tap <OK> to confirm the selected value.

   Tap <Cancel> to abort selection.

5.7 Operation by Gestures

You can start or abort a measurement and also assign method and sample ID to a measurement via RFID by gestures instead of key operation. To be able to do so, enable gesture control in the setup menu (see section 6.7).

To start a measurement

- Turn the instrument to the right as shown in fig. 4, and hold the position until the measurement starts.

Fig. 4: Instrument turned to the right

To abort a measurement

1. Turn the instrument to the left as shown in fig. 5, and hold the position until a confirmation message appears.

Fig. 5: Instrument turned to the left

2. Confirm:
   - To confirm canceling, turn the instrument to the left again as shown in fig. 5, and hold the position until the measurement has stopped.
   - To continue with the measurement, turn the instrument to the right as shown in fig. 4.

To assign method and sample ID to a measurement via RFID

- Tilt the instrument towards you, and hold the position until “Reading Tag” appears on the screen.

  Continue as described in section 7.6.

6 Instrument Settings

6.1 Setting the Language

1. Tap <Menu> and select *Setup* > *Language*.
2. Tap <Edit>.
3. Select the preferred language.
4. Tap <Back> repeatedly to return to the main screen.

6.2 Setting Date and Time

Date and time are automatically saved with measurement and check data. During operation, the current time is displayed on the right of the header.

To set the date or time

1. Tap <Menu> and select *Setup* > *Date and Time* > *Set Date and Time*.
2. Select “Set Date” or “Set Time” and tap <Edit>.
   With the 12 hour clock selected, also select the appropriate time of day from the selection list “AM / PM”.
3. Enter the current date or time/time of day, respectively.
4. Tap <Back> repeatedly to return to the main screen.

To set the date or time format

1. Tap <Menu> and select *Setup* > *Date and Time* > *Set Date and Time Format*.
2. Select “Set Date Format” or “Set Time Format” and tap <Edit>.
3. Select one of three date formats (DD = day, MM = month, YYYY = year):
   DD.MM.YYYY | YYYY-MM-DD | MM/DD/YYYY
   Select one of two time formats (24 hour clock or 12 hour clock):
   24h | AM/PM
4. Tap <Back> repeatedly to return to the main screen.

6.3 PIN Protection

You can protect access to the menu by a PIN (personal identification number). After you have set PIN protection, you can still use all functions of the quick access area (perform measurements and checks, select methods and sample IDs, etc.) without the need for entering a PIN.

To activate PIN protection

1. Tap <Menu> and select *Setup* > *PIN Settings*.
2. Select “Set PIN protection” and tap <Edit>.
3. Select “On” from the selection list.
4. Select “New PIN” and tap <Edit>.
5. Enter your 4-digit PIN.
6. Select “Confirm new PIN” and tap <Edit>.
7. Repeat the PIN that you have entered before.
8. Tap <Back> repeatedly to return to the main screen.

Every time you tap <Menu> while PIN protection is activated, you will have to enter the active PIN and confirm it with “OK” to be able to continue.

NOTICE
Be sure to remember the set PIN as you will not be able to deactivate PIN protection without it.

To deactivate PIN protection

1. Tap <Menu> and enter the active PIN.
2. Select *Setup* > *PIN Settings*.
3. “Active PIN” is preselected.
   Tap <Edit> and enter the active PIN.
4. Select “Set PIN protection” and tap <Edit>.
5. Select “Off” from the selection list.
6. Tap <Back> repeatedly to return to the main screen.

To change the active PIN

1. Tap <Menu> and enter the currently active PIN.
2. Select *Setup* > *PIN Settings*.
3. “Active PIN” is preselected.
   Tap <Edit> and enter the currently active PIN.
4. Select “New PIN” and tap <Edit>.
5. Enter the new PIN.
6. Select “Confirm new PIN” and tap <Edit>.
7. Repeat the PIN that you have entered before.
8. Tap <Back> repeatedly to return to the main screen.

6.4 Display Settings

In this menu you can activate/deactivate the automatic display rotation. Furthermore, you can set the display brightness as well as the time, after which the illumination of the display and the measuring cell will be automatically dimmed.

To activate/deactivate the automatic display rotation

1. Tap <Menu> and select *Setup* > *Display Settings*.
2. Select “Display Rotation” and tap <Edit>.
3. Select “On” or “Off” from the selection list.
4. Tap <Back> repeatedly to return to the main screen.

To set the display brightness

1. Tap <Menu> and select *Setup* > *Display Settings*.
2. Select “Display Brightness” and tap <Edit>.
3. Select a brightness option.
4. Tap <Back> repeatedly to return to the main screen.

To set the display dimming

1. Tap <Menu> and select *Setup* > *Display Settings*.
2. Select “Display Dimming” and tap <Edit>.
3. Select a dimming option (“Off” = no dimming).
4. Tap <Back> repeatedly to return to the main screen.

6.5 Sound Settings

Enables beeps when a key is tapped or when a measurement is finished.

1. Tap <Menu> and select *Setup* > *Sound*.
2. Tap <Edit>.
3. Select “On” or “Off” from the selection list.
4. Tap <Back> repeatedly to return to the main screen.

6.6 Display Units for Density and Temperature

1. Tap <Menu> and select *Setup* > *Units*.
2. Select “Density Unit” or “Temperature Unit” and tap <Edit>.
3. Select a density unit or a temperature unit.
4. Tap <Back> repeatedly to return to the main screen.

6.7 Enabling / Disabling Gesture Control

When gesture control is enabled, you can control certain operating steps by specific movements of the instrument in your hand.

1. Tap <Menu> and select *Setup* > *Gesture Control*.
2. Tap <Edit>.
3. Select “On” or “Off” from the selection list.
4. Tap <Back> repeatedly to return to the main screen.

6.8 Reset to Factory Settings

1. Tap <Menu> and select *Setup* > *Reset to Factory Settings*.
   The following settings will be reset:

Setting	**Factory setting**
Language	English
Methods	Predefined standard methods
Active method	Density
Sample IDs	ID
Date format	DD.MM.YYYY
Time format	24h
Measurement mode	Precise
Display rotation	On
Printer	None
Export data format	CSV
Export data delimiter	Semicolon
Export data decimal point	Comma
Temperature unit	°C
Density unit	g/cm^3
PIN protection	Off
Custom	Factory preset custom parameters

TIP: *Export or print the content of the data memory, the list of sample IDs, and the list of custom parameters before you reset to factory settings, as this function will erase the data memory (and therefore all measured data).*

2. Tap <Yes> to reset to factory settings.
   Tap <No> to cancel the reset operation.
3. Tap <Back> repeatedly to return to the main screen.

7 Measurement Settings

To set up a measurement, you need to specify a “method” and a “sample ID”.

- A “method” is a set of measurement settings, with the exception of the separately defined measurement mode.
- “Sample IDs” identify your sample varieties.

To alter a measurement setting, edit the current method.

7.1 Setting the Measurement Mode

DMA 35 features three measurement modes – “Precise”, “Fast” and “Manual”.

For each measurement mode, different stability criteria have to be fulfilled before the measuring result is stored. The stability criterion is always related to the temperature:

- *Measurement mode “Precise”:*
  The result is stored as soon as the measured temperature value stays within 0.2 K for 10 seconds.

  This measurement mode delivers the most accurate results, but may take a longer time in case the sample temperature differs greatly from the ambient temperature.
- *Measurement mode “Fast”:*
  The result is stored as soon as the measured temperature value stays within 0.4 K for 10 seconds.

  This measurement mode delivers quicker results than the “Precise” mode, but as the density is highly temperature-dependent, the measured result is not as accurate.
- *Measurement mode “Manual”:*
  You decide yourself when your measurement result will be stored:
  Tap the key to store the result immediately.

To set the measurement mode

1. Tap <Menu> and select *Setup* > *Measurement Mode*.
2. Tap <Edit>.
3. Select a measurement mode.
4. Tap <Back> repeatedly to return to the main screen.

7.2 Methods

Methods are preset measurement settings, which you can simply assign to a measurement by the method name.

A method of DMA 35 comprises the following method settings:

- Method Name
  Choose as required.
  - Method names can be up to 10 characters long.
  - You may use the letters “A”–”Z”, digits “0”–”9”, special characters “.”, “-”, “#”, and spaces for the composition of a method name.
- Parameter 1–2
  Select the parameters to be displayed on the measuring screen.
  See the parameter overview in appendix C for possible choices.
  - Parameter lists are filtered by parameter type.
  - If you select “None”, the parameter will not be displayed.
- Offset
  This value will be automatically added to parameter 1.

  You can define a different offset for each method.

TIP: *If the instrument’s measuring results show a constant deviation from your reference value, define an offset for parameter 1.*

- Limits
  Define the upper and lower limit for the measurement results.
  See section 7.2.3 for details.

IMPORTANT: *The limits apply only to parameter 1.*

- Temperature coefficient Alpha *(if applicable for the selected parameter)*
  See section 7.2.4 for details on the temperature coefficient.

DMA 35 comes with 8 predefined methods covering the most common applications.

All calculated parameters of the methods derive from the sample density at the measured temperature.

Table 5: Predefined methods

Method	Parameter 1	Parameter 2
Density	Density	SG (20/20)
Sugar	Brix	Density
Extract	Extract	Density
Ethanol	Alcohol@20°C	Density
Crude Oil	API A@15°C	API SG A@15°C
Fuel Oil	API B@15°C	API SG B@15°C
Lubricants	API D@15°C	API SG D@15°C
H2SO4	H2SO4 %w/w	Density

7.2.1 Managing Methods

You can edit the predefined methods or define new ones (in addition to the predefined methods) to meet your requirements.

Defining your own methods

1. Tap <Menu> and select *Methods* > *New Method*.
2. Edit the method settings as described below.
3. Tap <Back> repeatedly to return to the main screen.

Editing methods

1. Tap <Menu> and select *Methods* > *Edit Method*.
2. Select a method that you want to edit, and tap <Edit>.
3. Select a method setting that you want to edit, and tap <Edit>.
4. Enter a value or select it from a list as appropriate.
5. Repeat steps 3–4 for all method settings that you want to edit.
6. Tap <Back> repeatedly to return to the main screen.

Importing/exporting methods

To import methods from a methods file (see appendix D for an example file) or to export all methods, proceed as described in section 11.2.

- Select “Import Methods” as the import function, or
- select “Export Methods” as the export function.

Deleting methods

1. Tap <Menu> and select *Methods* > *Edit Method*.
2. Select a method that you want to delete, and tap <Delete>.

   You cannot delete the last remaining method.
3. Tap <Yes> to confirm deletion.

   Tap <No> to abort deletion.
4. Tap <Back> repeatedly to return to the main screen.

7.2.2 Assigning a Method to a Measurement

1. In the quick access area, activate  (“Sample” function).
2. Select “Method” and tap <Edit>.
3. Select the appropriate method from the list.
4. Tap <Back> to return to the main screen.

All subsequent measurements will use the selected method until you assign a new one.

The assigned method is shown in the header.

7.2.3 Defining Limits

The function will give a warning when measurement results of parameter 1 lie outside the margins of your internal quality specification.

Define limits in the method settings. Measurement results outside the thereby defined margins will be highlighted by a yellow background color and marked in the data memory accordingly.

1. Tap <Menu> and select *Methods* > *Edit Method*.
2. Select a method from the list and tap <Edit>.
3. Select “Limit” and tap <Yes> to activate the limit function.

   Two more input fields for entering the limit values come up in the parameter list.
4. Enter the values for “Upper Limit” and “Lower Limit”.

IMPORTANT: *The limits apply only to parameter 1.*

5. Tap <Back> repeatedly to return to the main screen.

7.2.4 Calculating the Temperature Coefficient Alpha

The temperature coefficient Alpha [g/cm^3/K] is needed for the calculation of the following measuring units:

- Density@
- Specific Gravity SG
- Baumé

The temperature coefficient Alpha can be calculated as follows:

$$\text{temperature coefficient Alpha} = \left| \frac{\rho_1 - \rho_2}{T_1 - T_2} \right|$$

ρ_1 density at temperature T_1
ρ_2 density at temperature T_2

	Alpha
Numerous aqueous solutions from 0 % to approx. 20 %	0.0003
Numerous aqueous solutions from 10 % to approx. 50 %	0.0005
Numerous organic solutions	0.001

7.3 Custom Parameters

In addition to the standard parameters, your DMA 35 offers 10 predefined custom parameters.

Parameter	**Concentration range**	**Temperature range**
CaCl2 (calcium chloride)	0 to 45 % w/w	0 to 50 °C
HCl (hydrochloric acid)	0 to 40 % w/w	0 to 50 °C
H2O2 (hydrogen peroxide)	0 to 100 % w/w	0 to 30 °C
C3H7OH (isopropanol)	0 to 30 % w/w	0 to 40 °C
C3H7OH (isopropanol)	30 to 100 % w/w	0 to 40 °C
CH3OH (methanol)	0 to 100 % w/w	10 to 40 °C
HNO3 (nitric acid)	0 to 70 % w/w	0 to 40 °C
NaOH (sodium hydroxide)	0 to 53 % w/w	0 to 40 °C
Öchsle	–100 to 600 °Öchsle	5 to 40 °C
KMW (Klosterneuburger Grade)	0 to 30 °KMW	0 to 50 °C

If you need additional measuring parameters, contact your local Anton Paar representative. You will receive a file from Anton Paar containing the custom parameter(s) in the correct format. Parameters from this file can be imported into your instrument.

Importing/exporting custom parameters

To import custom parameters from a custom parameters file or to export all custom parameters, proceed as described in section 11.2.

- Select “Import Custom Parameters” as the import function, or
- select “Export Custom Parameters” as the export function.

Using custom parameters

- Edit a method definition (see section 7.2.1):
  a. Select parameter type “Custom”.
  b. Select the custom parameter.

7.4 Output Fields on the Main Screen

The arrangement of output fields on the main screen depends on your choice of parameters to be displayed (which you have made with the method settings, see section 7.2.1).

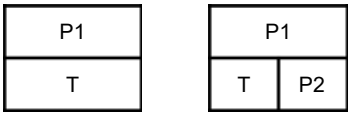

Fig. 6: Possible arrangements of output fields

P1/P2freely configurable parameters
T measuring temperature

7.5 Sample IDs

Sample IDs serve to tag your measurement results, e.g. with a designation from your product varieties, thus facilitating full traceability of your measurement results.

Up to 250 different sample IDs can be manually defined or imported.

- Sample IDs can be up to 10 characters long.
- You may use the letters “A”–”Z”, digits “0”–”9”, special characters “.”, “-”, “#”, and spaces for the composition of a sample ID.

Custom counters

Sample IDs can include counters identifying single measurements performed with that sample ID:

- Include a sequence of hash characters “#” in the sample ID (at any position).
- The first hash character sequence in the sample ID is interpreted as a counter.
- The number of consecutive hash characters in that sequence defines the length of the counter.
- Custom counters will be reset to 1 when you select a new sample ID.

Example:

- Name your sample ID “Tank## PV1” for your product variety 1.
- Measurements with that sample ID will be identified as “Tank01 PV1”, “Tank02 PV1”, “Tank03 PV1”, and so on until you select a new sample ID (thus resetting the counter).

Default counter “ID”

A sample ID named “ID” is treated as a 4-digit measurement counter that keeps counting all measurements (regardless of sample ID changes in between) until it starts over after having reached its maximum value.

7.5.1 Managing Sample IDs

Defining a sample ID

1. Tap <Menu> and select *Sample IDs*.
2. Tap <New>.
3. Tap <Edit> and enter a sample ID.
4. Tap <Back> repeatedly to return to the main screen.

Importing/exporting sample IDs

To import sample IDs from a sample IDs file (see appendix D for an example file) or to export all sample IDs, proceed as described in section 11.2.

- Select “Import Sample IDs” as the import function, or
- select “Export Sample IDs” as the export function.

Deleting a sample ID

1. Tap <Menu> and select *Sample IDs*.
2. Select a sample ID that you want to delete and tap <Delete>.
3. Tap <Yes> to confirm deletion.
   Tap <No> to abort deletion.
4. Tap <Back> repeatedly to return to the main screen.

TIP: *You cannot delete the currently used sample ID.*

7.5.2 Assigning a Sample ID to a Measurement

1. In the quick access area, activate (“Sample ID” function).
2. Select “Sample ID” and tap <Edit>.
3. Select the appropriate sample ID from the list.
4. Tap <Back> to return to the main screen.

All subsequent measurements will use the selected sample ID until you assign a new one.

The assigned sample ID is shown in the header.

7.6 Using the RFID Function

The RFID function enables you to write sample IDs and methods to RFID tags, and to use the programmed RFID tags for a quicker assignment of sample ID and method. Read-only RFID tags can be allocated to a sample ID and method on the instrument.

Qualifications for using RFID

The reading distance of the RFID receiver integrated in the instrument is about 2 cm (0.8 in). The RFID tag must be within this distance for the instrument to be able to successfully read it.

TIP: *The larger the diameter of a tag, the larger is the reading distance.*

For an optimum reading, position the RFID tag about 0.5 cm (0.2 in) below the RFID interface (near the instrument’s RFID antenna) on the top of the instrument (12, fig. 1).

TIP: *When you use the instrument with the rubber housing for the operating panel mounted, hold the area of the RFID mark on the rubber housing close to the RFID tag to ensure proper reading.*

The instrument supports passive read/write or read-only RFID tags.

The following types of RFID tags have been tested by Anton Paar for use:

- Read/write passive RFID disc tag 30 mm, Chip Hitag S2048, 125 kHz
- Read-only passive RFID disc tag 30 mm, Chip EM4102, 125 kHz

Other LF tags (low frequency tags, 125 kHz) may be compatible in the “Read-only” mode.

Reading RFID tags

The RFID tag information comprises:

- UID (unique identification number) of the RFID tag,
- information if the tag is writable (“Yes” or “No”),
- the method stored on the tag or to which the tag has been allocated (default = “None”),
- the sample ID stored on the tag or to which the tag has been allocated (default = UID of the tag).

1. Tap <Menu> and select *Setup* > *RFID* > *Read Tag*.
2. Hold the RFID interface of the instrument to the RFID tag until the RFID tag information is displayed.
3. To read another RFID tag, tap <Back>, then select “Read Tag”, and continue with step 2.
4. Tap <Back> repeatedly to return to the main screen.

Programming RFID tags

Read-only RFID tags evidently cannot be written to. Instead their UID is allocated to the specified method and/or sample ID on the instrument.

- *With read/write tags*, the same method and sample ID can be written to any number of tags.
- *With read-only tags*, you can only allocate one tag to each method and sample ID. If you try to allocate another tag to a method or sample ID, to which a tag has already been allocated, you will see the message “Already in use! Replace?” If you tap <Yes>, the new tag will replace the former allocated tag (which will then be deallocated).

1. Tap <Menu> and select *Setup* > *RFID* > *Write Tag*.
2. Select “Method” and tap <Edit>.
3. Select the method to be written to the RFID tag from the list.
4. Select “Sample ID” and tap <Edit>.
5. Select the sample ID to be written to the RFID tag from the list.

6. Hold the RFID interface of the instrument to the RFID tag.
7. Select “Write Tag”, then select “Write Method/Sample ID” or “Write Method” or “Write Sample ID” and tap <OK>.

   The RFID tag will be programmed with the selected method / sample ID.
8. Repeat this procedure to program further RFID tags with methods and sample IDs.
9. Tap <Back> repeatedly to return to the main screen.

Erasing RFID tags

Read-only RFID tags will be deallocated by erasing. After erasing, all RFID tags hold the default information.

1. Tap <Menu> and select *Setup* > *RFID* > *Erase Tag*.
2. Hold the RFID interface of the instrument to the RFID tag.
3. Tap <OK>.
4. To erase another RFID tag, select “Erase Tag” and repeat steps 2 to 3.
5. Tap <Back> repeatedly to return to the main screen.

Assigning method and sample ID to a measurement via RFID

TIP: *If an RFID tag holds a custom parameter not included in the predefined custom parameters (see section 7.3), this parameter can only be read by the instrument that has programmed the tag.*

The method and sample ID read from the RFID tag are stored temporarily on the instrument until they are changed.

1. Activate RFID tag identification:
   - On the main screen, tap <RFID>,
   - or use the corresponding gesture (see section 5.7) if gesture control is enabled.
2. Hold the RFID interface of the instrument to the programmed RFID tag.

   After reading the RFID tag information, the instrument returns to the main screen. The method name and sample ID from the RFID tag (or to which the RFID tag has been allocated) are shown in the header.

   All subsequent measurements will use the assigned method / sample ID until you assign new ones.

TIP: *If the RFID tag has not been programmed before (and holds only its UID), the currently assigned method will not change and the UID will be used as the sample ID.*

8 Checks and Adjustments

Perform a water check every day before you start the measurements to verify that the instrument is measuring with adequate accuracy.

Perform a water adjustment if the water check advises you to do so.

8.1 Performing a Water Check

- Use freshly degassed ultra-pure (bi-distilled or deionized) water.

1. Clean the measuring cell as described in section 13.1.
2. Rinse the measuring cell until no residues of cleaning agent are present anymore.
3. In the quick access area, activate (“Check” function).
4. Select “Water Check” and tap <OK>.
5. Fill in ultra-pure water with 10 °C to 40 °C (50 °F to 104 °F).
6. Tap <Start>.
7. After the procedure has finished, the check result is displayed.
   If the deviation from the target value exceeds defined limits, you will see a recommendation to perform a water adjustment.
   Tap <OK>.
8. Tap <Back> repeatedly to return to the main screen.

8.2 Performing a Water Adjustment

- Use freshly degassed ultra-pure (bi-distilled or deionized) water.
- The water temperature has to be in the range 15–30 °C (59–86 °F).

1. Clean the measuring cell as described in section 13.1.
2. Rinse the measuring cell until no residues of cleaning agent are present anymore.
3. Tap <Menu> and select *Adjustments* > *Water Adjustment*.
4. Fill in ultra-pure water with 15 °C to 30 °C (59 °F to 86 °F).
5. Tap <Start>.
6. After the procedure has finished, the density deviation from the previous adjustment is displayed.
7. To save the new adjustment, tap <Save>.
   To reject the adjustment, tap <Cancel>.

8.3 Performing a Custom Adjustment

You can use any reference liquid with a known density at 20 °C (68 °F) and a known temperature coefficient Alpha to perform a custom adjustment.

We recommend to perform a custom adjustment if, for example, you measure only liquids in a specific density range (e.g. high density) and want to achieve more accurate results in this range.

1. Clean the measuring cell as described in section 13.1.
2. Rinse the measuring cell until no residues of cleaning agent are present anymore.
3. Tap <Menu> and select *Adjustments* > *Custom Adjustment*.
4. Fill in your reference liquid with 15 °C to 30 °C (59 °F to 86 °F).
5. Tap <Start>.
6. Tap <Edit> and enter the density of the reference liquid at 20 °C (68 °F).

   The density value must be in the range 0.5–1.5 g/cm^3.
7. Tap <Next>.
8. Tap <Edit> and enter the temperature coefficient Alpha of the reference liquid.

   The value for the temperature coefficient must be in the range 0–0.00999.
9. Tap <Next>.
10. After the procedure has finished, the density deviation from the previous adjustment is displayed.
11. To save the new adjustment, tap <Save>.

    To reject the adjustment, tap <Cancel>.

8.4 Reset to Factory Adjustment

If you want to undo all your adjustments, reset the instrument to factory adjustment.

1. Tap <Menu> and select *Adjustments* > *Factory Adjustment*.
2. Tap <Yes> to reset the instrument to factory adjustment.

   The factory adjustment will be restored.
3. Tap <Back> repeatedly to return to the main screen.

9 Measuring

WARNING

Handling samples with temperatures of more than 70 °C bears the risk of heavy burns.

- Wear protective clothes or ensure alternative protection from burns when you handle high temperature samples.

WARNING

DMA 35 is not insulated against high voltages. Measuring samples under high voltage (e.g. in energized battery banks) bears the risk of an electric shock.

- Define appropriate testing procedures and safety measures to protect yourself from any electric shock.

NOTICE

Before you perform a measurement, make sure that the wetted parts are resistant to the sample (see appendix A.3).

IMPORTANT: *Samples containing dissolved CO_2 create bubbles in the measuring cell rendering the measurement results invalid. Degas the sample properly before measurement by:*

- *boiling it for several minutes,*
- *stirring it vigorously for 5 to 15 minutes until bubbling ceases, or*
- *putting it into an ultrasonic bath for approximately 5 to 10 minutes until bubbling ceases.*

9.1 Checks Before the Measurement

Before you start a measurement, check that

- you have selected the proper measurement mode (see section 7.1),
- you have assigned the proper method (see section 7.2.2),
- you have assigned the proper sample ID, if needed (see section 7.5.2),
- the sample's temperature is between 0 °C and 100 °C (32–212 °F),
- suitable solvents for cleaning are at hand.

9.2 Filling the Sample

Depending on the viscosity of the sample, you can fill the measuring cell using the filling tube or a syringe. When filling highly viscous samples, we recommend using the syringe.

TIP: *The pump lever with lock function (supplied with the instrument) is suited for any filling method. However, when you fill with the filling tube, the pump lever without lock function is more convenient. This is why DMA 35 comes with this pump lever already mounted.*

Take care that you fill without bubbles and that the measuring cell is entirely filled.

Possible reasons for bubbles in the measuring cell are:

- gas bubbles in the sample,
- a leaky connection of the filling tube, the pump, or the screw plug / syringe adapter.

9.2.1 Filling with the Filling Tube

1. Press down the pump lever as far as it will go (see fig. 7).
2. Sink the filling tube into the sample.
3. Slowly release the pump lever.

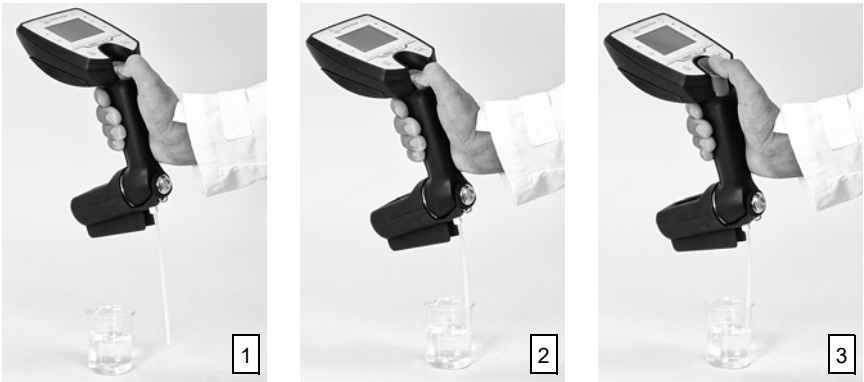

Fig. 7: Filling sample with the filling tube

TIP: *If the movement of the pump lever feels stiff, start by filling deionized water in order to reduce the friction. Then empty the filling tube and fill your sample.*

9.2.2 Filling with a Syringe

WARNING

If you remove the pump while filling with a syringe, or if you remove the syringe directly after filling, the system will become leaky. Harmful liquids leaking from the instrument may cause injuries.

- Do not remove the pump during routine operation.
- Do not remove the syringe during measurement.

IMPORTANT: *The instrument comes with the pump lever without lock function already mounted. For filling with a syringe, replace this pump lever with the pump lever with lock function (supplied with the instrument) as described in section 13.7.*

1. Mount the syringe adapter (see section 4.2).
2. Lock the pump lever.

   Push the pump lever down and forward simultaneously to minimize the dead space within the pump.
3. Lead the filling tube into a suitable waste vessel.
4. Fill the syringe with the sample.
5. Attach the syringe to the syringe adapter and fill the measuring cell (see fig. 8).

Fig. 8: Filling sample with a syringe

9.3 Performing a Measurement

1. Perform all checks in section 9.1.
2. Fill the sample, see section 9.2.1 for filling with the filling tube or section 9.2.2 for filling with a syringe).

   The instrument shows continuous live readings of measuring values.
3. Start the measurement:
   - Tap the key,
   - or use the corresponding gesture (see section 5.7) if gesture control is enabled.

   You may abort a measurement by tapping <Cancel> or with the corresponding gesture if gesture control is enabled.
4. When the measurement is finished (indicated in the status bar), the measuring result will “freeze” on the display, and the result is stored in the internal data memory.

   Tap <Live> to “unfreeze” the measuring result and return to showing continuous live readings.

10 Measurement/Check Data in the Data Memory

Measurement data as well as check data are stored automatically in the data memory.

The data memory can hold a total of 1024 data sets. Further measurements will overwrite the oldest stored data sets.

All stored data sets include the date and time of the measurement or check.

10.1 Viewing Data

1. In the quick access area, activate (“Data” function).

   The last data set will be displayed
2. Use the arrow keys to browse through the data sets in the data memory.

   The index of the currently displayed data set is shown in the header beside the total number of data sets stored.

   Measurement data are shown with gray background, check data with blue background.
3. Tap <Back> to return to the main screen.

10.2 Printing Data

Before you can print data in the data memory on a Bluetooth printer, you need to set up the Bluetooth connection as described in section 11.1.2.

Be sure to switch on your printer.

Printing a single data set

1. In the quick access area, activate (“Data” function).
2. Use the arrow keys to select the data set to be printed.
3. Tap <Print>.
4. Tap <Back> to return to the main screen.

Printing all data sets

1. Tap <Menu> and select *Measurement Data* > *Print All*.
2. Tap <Yes> to confirm printing.

   Tap <No> to abort printing.
3. Tap <Back> repeatedly to return to the main screen.

10.3 Exporting Data to a PC

Before you can export data in the data memory to a PC, you need to set up the Bluetooth connection as described in section 11.1.1.

Setting the export file format for measurement/check data

You can export the measurement/check data as a common text file (TXT) or in CSV format.

1. Tap <Menu> and select *Setup* > *Data Transfer* > *Configure Data Format*.
2. Select “File Format” and tap <Edit>.
3. Select an export file format: CSV | TXT
4. If you have selected CSV:
   a. Select “Table Delimiter” and tap <Edit>.
   b. Select a table delimiter: “;” (semicolon) | “/” (slash) | “,” (comma) | TAB
   c. Select “Decimal Separator” and tap <Edit>.
   d. Select a decimal separator: “.” (point) | “,” (comma)
5. Tap <Back> repeatedly to return to the main screen.

To export measurement/check data

1. Prepare the PC to receive data as described in section 11.2.2 (1).
2. On DMA 35, send the data to the PC:
   a. Tap <Menu> and select *Measurement Data* > *Export Measurement Data*.
   b. Tap <Yes> to confirm the transfer.
   c. Tap <OK> to finish the file transfer.
3. On the PC, specify a location where the file with the exported data shall be saved, then click <Finish> to save the file.

To export methods, sample IDs, custom parameters

To export all methods, all sample IDs, or all custom parameters, proceed as described in section 11.2.

- Select “Export Methods” as the export function, or
- select “Export Sample IDs” as the export function, or
- select “Export Custom Parameters” as the export function.

10.4 Deleting Data

Deleting the last data set in data memory

Method 1

- Tap the key.

  The last (most recent) data set is deleted.
  You will not be asked for confirmation.

Method 2

1. Tap <Menu> and select *Measurement Data* > *Delete Last*.
2. Tap <Yes> to confirm deletion.

   Tap <No> to abort deletion.
3. Tap <Back> repeatedly to return to the main screen.

Deleting all data

1. Tap <Menu> and select *Measurement Data* > *Delete All*.
2. Tap <Yes> to confirm deletion.

   Tap <No> to abort deletion.
3. Tap <Back> repeatedly to return to the main screen.

11 Bluetooth Connections / File Transfer / Data Transfer

IMPORTANT: *Before DMA 35 can communicate with a Bluetooth device, you have to set up the connection once on DMA 35.*

11.1 Setting up Bluetooth Connections

IMPORTANT: *If you experience transfer problems after you have changed a Bluetooth connection, remove DMA 35 from the "Devices and Printers" control panel on the PC (access also via "Show Bluetooth Devices" from the Bluetooth icon in the notification area of the task bar). Then set up the Bluetooth connection anew.*

11.1.1 Setting up the Connection to a PC

1. Switch on the PC, which has to be Bluetooth enabled (if necessary, install an external Bluetooth adapter).
2. Make the PC discoverable/visible over Bluetooth (see Windows help).
3. On DMA 35, tap <Menu> and select *Setup* > *Data Transfer* > *Configure Export Target*.

TIP: *The connection will be valid for export as well as import.*

4. Tap <Start> to search for available Bluetooth devices.
5. Tap <Edit> and select the PC.
6. Tap <Next> and then <OK> to save the connection.
7. Tap <Back> repeatedly to return to the main screen.

IMPORTANT: *You can only save one PC connection. If you set up a new PC connection, the previous one will be overwritten.*

11.1.2 Setting up the Connection to a Printer

1. Switch on the Bluetooth printer.
2. On DMA 35, tap <Menu> and select *Setup* > *Data Transfer* > *Configure Printer*.
3. Tap <Edit> and select "Bluetooth Printer".
4. Tap <Back>.

5. Select “Configure Printer Target”.
6. Tap <Start> to search for available Bluetooth devices.
7. Tap <Edit> and select the Bluetooth printer.
8. Tap <Next> and then <OK> to save the connection.
9. Tap <Back> repeatedly to return to the main screen.

IMPORTANT: *You can only save one printer connection. If you set up a new printer connection, the previous one will be overwritten.*

11.2 File Transfer via Bluetooth

11.2.1 Importing Files from a PC

1. Save the import file on the PC for which a Bluetooth connection has been set up (see section 11.1.1).
2. Prepare DMA 35 to receive data:
   a. Tap <Menu> and select *Setup* > *Data Transfer* > *File Transfer*.
   b. Then select the appropriate import function.
   c. Tap <Start> to start the automatic import procedure.
      The instrument’s identification will be shown.
3. On the PC, send the file to DMA 35:
   a. Right-click the import file and select *Send to* > *Bluetooth device*.
   b. Select DMA 35 from the device list and click <Next>.
   c. On a first time connection / if necessary:
      - Click on the popup notification to accept the connection.
      - Accept the connection PIN (“yes”) and click <Next>.
      - Close the notification window that the device has been added.
   d. Click <Finish> to finish the file transfer.

11.2.2 Exporting Files to a PC

1. Prepare the PC, for which a Bluetooth connection has been set up (see section 11.1.1), to receive data:

   (See Windows help for detailed information.)

   a. Turn the Bluetooth wireless service on.
   b. In the notification area of the task bar, click the Bluetooth icon.
   c. Select “Receive a File”.

2. On DMA 35, send the file to the PC:
   a. Tap <Menu> and select *Setup* > *Data Transfer* > *File Transfer*.
   b. Then select the appropriate export function.
   c. Tap <Yes> to confirm the transfer.
   d. Tap <OK> to finish the file transfer.
3. On the PC, specify a location where the export file shall be saved, then click <Finish> to save the file.

11.3 Sending Data to a Terminal Program on a PC

In the Bluetooth settings on your PC, an incoming COM port has to be assigned for the connection to work (see Windows help).

1. Set up a Bluetooth connection with the PC as printer (see section 11.1.2).
2. On the PC, start a terminal program and set it up as follows:
   - Baud rate: 115200
   - Data bits: 8
   - Parity: none
   - Stop bits: 1
   - Handshake: none
3. On DMA 35, send data by printing as described in section 10.2.

12 Troubleshooting

Table 6: Error messages

Error message	Cause
Out of Specification	The measured sample temperature is outside the specifications.
Out of Range	The measured value is outside the specified range. *Possible reasons:* • The temperature is too high or too low. • The density is too high or too low. • The measured value is invalid.
Temperature Range	The temperature of the reference liquid for readjustment is outside the temperature specifications (+15 °C to +25 °C).
Density Range	The density of deionized water at 20 °C measured during readjustment is outside the allowed limits (tolerance 0.01 g/cm^3).
Criterion	The density of deionized water at 20 °C measured during readjustment deviates from factory adjustment by more than 0.01 g/cm^3.
No Oscillation	The measuring cell is not oscillating. *Possible reasons:* • The measuring cell is not filled correctly. Fill the sample again. The warning disappears when the measuring cell oscillates normally again. • The measuring cell is defective.
Sensor Error	The sensor in the measuring cell is defective.

Table 7: Data transfer

Problem	Cause and correction
Transfer of data via Bluetooth fails.	*Possible reasons:* • The DMA 35 is not paired with the device: Make sure that you have chosen the correct export target for the file transfer (see section 11.1.1). • The battery charge is too low: Bluetooth transfer requires a high charge level. Replace batteries and try again. • If transfer problems persist: Remove DMA 35 from the “Devices and Printers” control panel on the PC. Then set up the Bluetooth connection anew (see section 11.1.1). • Hardware issue: The Bluetooth module is defective.
My Android device is not showing up for pairing.	Leave the Bluetooth menu open on your Android device during the pairing process.

Table 8: Hardware

Problem	Cause and correction
The movement of the pump lever feels stiff.	Start by filling the instrument with deionized water in order to reduce the friction. Then empty the filling tube and fill your sample.

13 Upkeep and Cleaning

NOTICE
- Make sure the solvent that you use for cleaning is suitable. For details on recommended cleaning agents, see section 13.2.3.
- Do not use any mechanical action for cleaning the measuring cell.

13.1 Cleaning the Measuring Cell

1. Empty the measuring cell:
   a. Lead the filling tube into a suitable waste vessel.
   b. *If you have filled with the filling tube:*
      Press the pump lever to empty the measuring cell.
      If you have filled with a syringe:
      Unplug the syringe to let the sample drain off through the filling tube.
2. Fill the measuring cell with a suitable solvent.
3. Pump the solvent through the whole measuring system several times.
4. Empty the measuring cell.

TIP: *If the cleaning is done with a syringe, move the plunger of the syringe back and forth vigorously several times so that air bubbles add to the cleaning action.*

13.2 Cleaning Interval

The cleaning interval strongly depends on the application. For some samples, a displacement of the previous sample by the next one will suffice. For other applications, a cleaning after each measurement may be necessary.

Displacing the sample	For samples that are very similar to each other (e.g. one type of fermenting wine after the other). • To displace the sample, empty the measuring cell after the measurement and rinse it with the next sample before measuring that one. • Clean the instrument thoroughly at the end of your measurement series.
Cleaning after each measurement	For samples with different chemical properties that are immiscible and/or difficult to remove from the measuring cell.

13.2.1 Cleaning at the End of a Measurement Series

At the end of your measurement series, clean your DMA 35 thoroughly before you store it. You need not dry the measuring cell (provided that the cleaning liquid will not freeze in the measuring cell). You can leave deionized water in the measuring cell when you store the instrument for a day.

NOTICE
If you want to dry the measuring cell with compressed air, do not apply an overpressure of more than 1 bar (14.5 psi).

13.2.2 Cleaning Visible Residues in the Measuring Cell

Some samples like wort or grape juice may cause residues in the measuring cell after longer measurement periods. In this case, use an enzymatic lab cleaner to remove the residues from the cell (see recommendations below).

13.2.3 Cleaning Agents – Recommendations

WARNING

The mixture of concentrated sulfuric acid with water will cause a very strong exothermic reaction which may destroy the measuring cell and/or cause serious injuries.

- Never flush out concentrated sulfuric acid with water.
- Ensure that samples of very different concentrations do not come into contact with each other. Therefore remove 98 % H_2SO_4 only with 70 % H_2SO_4, and remove 70 % H_2SO_4 with 40 % H_2SO_4. Then water may be used to rinse the measuring cell.
- Always use separate waste containers for sulfuric acid waste and ethanol (or other solvent) waste. Label the waste containers properly to avoid mix-ups.
- Never flush sulfuric acid waste and ethanol (or other solvent) waste down the sink.
- Always dispose of the waste according to regional laws and regulations.
- Place the waste containers behind a safety shield and in a catch basin.

For cleaning the measuring cell, use two cleaning liquids:

- Cleaning liquid 1 dissolves and removes sample residues in the measuring cell. It has to be a good solvent for all sample components.
- Cleaning liquid 2 removes cleaning liquid 1 (has to be a good solvent for cleaning liquid 1) and evaporates easily so that it accelerates drying of the cell. It must not attack the U-tube or leave any deposits, as drops of cleaning liquid 2 will remain in the U-tube.

TIP: *To prevent limestone deposits, never use tap water as the cleaning liquid 2. Use ultra-pure (bi-distilled or deionized) water instead.*

Table 9: Recommended cleaning agents

Sample	Cleaning liquid 1	Cleaning liquid 2
battery acid	tap water	ultra-pure (bi-distilled or deionized) water
beer & spirits	tap water	ultra-pure (bi-distilled or deionized) water
beer wort, grape juice, syrup	warm tap water	ultra-pure (bi-distilled or deionized) water
liquid soap & detergent, shampoo	tap water	ultra-pure (bi-distilled or deionized) water
milk	tap water, enzymatic lab cleaner	ultra-pure (bi-distilled or deionized) water
petroleum products	petroleum naphtha, petroleum ether, toluene, n-nonane, cyclohexane, …	ethanol
salad dressing, mayonnaise	petroleum naphtha, dish washing agent in water	ethanol
soft drinks	tap water	ultra-pure (bi-distilled or deionized) water
sun tan lotion	petroleum naphtha	ethanol
98 % H_2SO_4	70 % H_2SO_4	• first 40 % H_2SO_4 • then ultra-pure (bi-distilled or deionized) water

Before you fill samples with unknown cleaning properties into the measuring cell, always perform provisional cleaning experiments on a glass plate (e.g. a microscopic slide). A sample should only be introduced into the density measuring cell if it can be removed completely by rinsing (not wiping!) with a suitable solvent.

Aqueous (polar) samples are best rinsed with polar liquids like water, alcohol or acetone.

Organic samples (oils, fuels, lubricants, etc.) are best rinsed with organic liquids (e.g. petroleum naphtha, petroleum ether, toluene, n-nonane).

Samples containing organic and aqueous components (like mayonnaise, which contains oil and water) may have to be rinsed alternately with organic and aqueous rinsing agents several times.

Samples containing protein (e.g. beer, milk) should never be brought into contact with alcohol, because this can cause denaturation of the protein and precipitation on the glass wall. Protein residues can build up when samples like beer wort or grape juice are measured over a long time. Enzymatic lab cleaners are usually best suited for removing these contaminants. We recommend “Winepress Cleaner PM Membrane Presses”, cat. no. 409004, by Wigol® or “TM Desana” by Thonhauser. Refer to the instructions of the manufacturer concerning the concentration of the cleaning agent.

Strong alkaline lab cleaners (pH > 10.5) should only be applied briefly and at temperatures below 25 °C because strong alkalis attack the glass surface upon prolonged exposure and at high temperatures.

13.3 Cleaning the Filling Pump

Clean the filling pump regularly. Intervals depend on your application. If you measure aggressive samples, e.g. battery acid, clean the filling pump more often.

Dismounting the pump

1. Push the pump lever upwards with both thumbs (see fig. 9).
2. Release the pump by a quarter turn counterclockwise.
3. Pull out the pump.

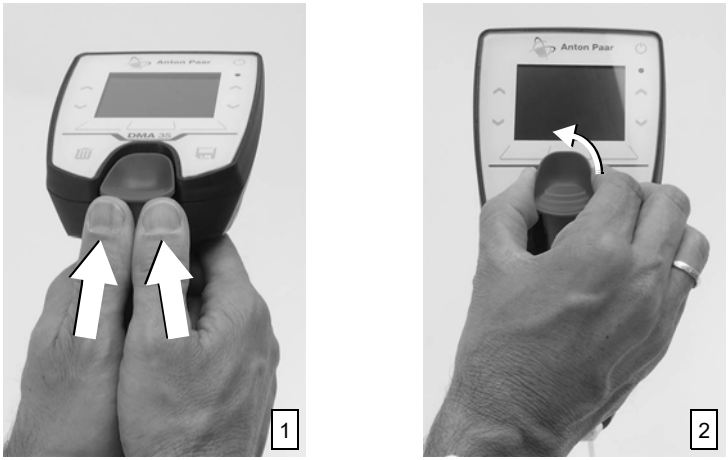

Fig. 9: Dismounting the pump

Cleaning the pump

1. Rinse the pump with running tap water.
2. Dry the pump with a lint-free cloth.

Remounting the pump

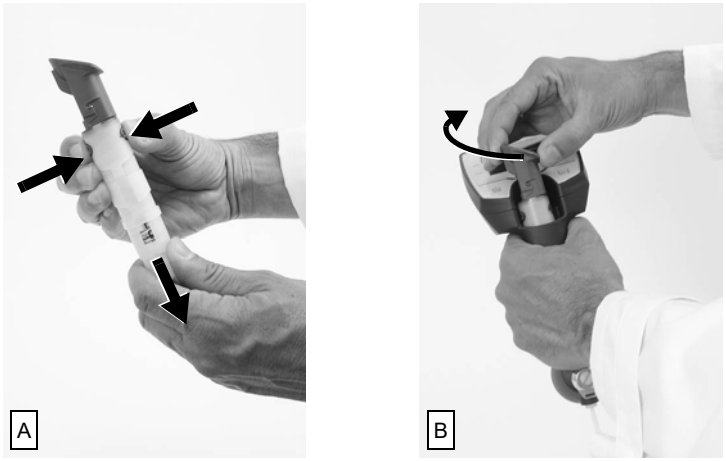

Fig. 10: ***A:*** *Releasing a locked pump |* ***B:*** *Remounting the pump*

1. If the pump shaft has been locked, release the lock (see fig. 10, A):
   a. Press on the marks on the front and rear of the pump shaft.
   b. Pull at the end of the pump shaft.
2. Insert the pump with the pump lever's top pointing to the left (see fig. 10, B).
3. Turn the pump clockwise until it engages.

   The pump lever's top should point towards the instrument's display.
4. Push the pump lever down to fix the pump.

13.4 Cleaning the Housing and the Display

To clean the housing and the display, use a soft cloth dipped in ethanol or warm water. If necessary, you can use a mild solvent (pH < 10).

Remove the rubber housing of the measuring cell regularly to ensure that there is no liquid between the measuring cell and the rubber housing.

Cleaning the rubber housing of the measuring cell

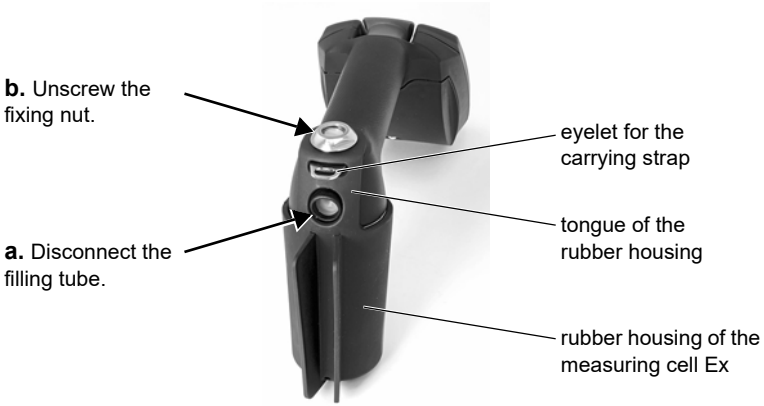

Fig. 11: Unmounting the rubber housing of the measuring cell Ex

1. *Only for DMA 35 Ex and DMA 35 Ex Petrol (see fig. 11):*
   a. Screw off the filling tube.
   b. Use a 17 mm wrench to unscrew the nut fixing the rubber housing.
2. Remove the rubber housing by pulling it off the cell cartridge.

3. Clean and dry the outside of the measuring cell and the entire rubber housing.

   Ensure that all parts are completely dry.

4. Push the rubber housing back onto the measuring cell.
5. *Only for DMA 35 Ex and DMA 35 Ex Petrol:*
   a. Pull the tongue of the rubber housing over the eyelet for the carrying strap and the screw plug.
   b. Screw in and tighten the fixing nut of the rubber housing.
   c. Reconnect the filling tube, see also section 4.1.

13.5 Storing the Instrument

Before you store the instrument for a longer period, clean the measuring cell as described in section 13.1.

For storage lasting less than one day, fill the measuring cell with ultra-pure (bi-distilled or deionized) water or solvent. If you have filled the liquid with the plastic syringe, leave the syringe in the adapter to keep the liquid from running out.

13.6 Exchanging the Batteries

Battery charge status

A symbol in the header of the screen indicates the battery charge status (see fig. 3). When the batteries are almost empty, the icon starts to flash, and after a short time the instrument switches itself off.

To exchange the batteries

WARNING

When you open the battery compartment or exchange batteries, sparks may be generated, which can cause an explosion or fire in hazardous areas. Serious injuries are possible.

- Never open the battery compartment in hazardous areas.
- Exchange the batteries only outside hazardous areas.

1. With the supplied Allen key, unscrew the screw fixing the battery compartment on the rear of the instrument's display (see fig. 12).

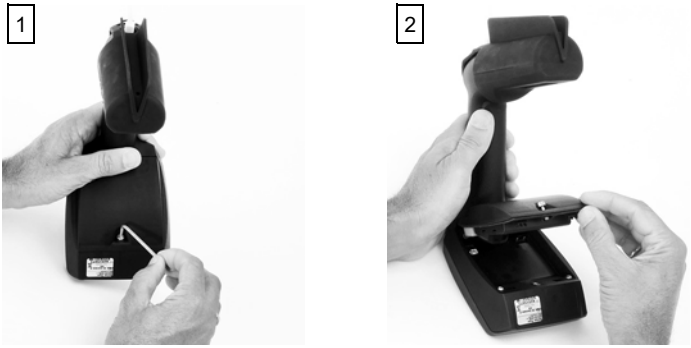

Fig. 12: Removing the battery compartment

2. Lift off the battery compartment.

   The screw stays loosely attached to the battery compartment so that it cannot get lost.
3. Remove the cover of the battery compartment by pressing on it and sliding it forward simultaneously (see fig. 13).

Fig. 13: Removing the cover of the battery compartment

4. Exchange the batteries for new ones.

NOTICE

- Observe the correct polarity when you insert the batteries, see the engraving in the battery compartment.
- Use only batteries of the same type and with the same charge level.
- Ensure that the interior of the instrument is perfectly dry. Any kind of liquid will cause damage to the electronic parts of the instrument.

5. Reassemble all parts in reverse order.

WARNING

The cover of the battery compartment must always be closed when you use the instrument.

13.7 Exchanging the Pump Lever

1. Dismount the pump as described in section 13.3.
2. The pump lever sits on the two pivot pins. Pull it off carefully by hand.

   Do not use any tools.
3. Mount the new pump lever by shifting it in place.
4. Remount the pump as described in section 13.3.

13.8 Software Update

Your Anton Paar representative will inform you when a new software update for your DMA 35 is available. After you have received the update file, you can import it into the instrument via Bluetooth.

NOTICE

All data and settings will be deleted or reset to factory settings during the update.

- Export and save all important data (methods, sample IDs, custom parameters, measured data, etc.) before you perform a software update.

IMPORTANT: *Ensure that the batteries of the instrument are fully charged before you start a software update.*

1. Save the update file (file extension ".afp") on the PC for which a Bluetooth connection has been set up (see section 11.1.1).
2. Prepare DMA 35 to receive the update:
   a. Tap <Menu> and select *Setup* > *Data Transfer* > *Software Update*.
   b. Tap <Start> to start the automatic update procedure.
      The instrument's identification will be shown.
3. On the PC, send the update file to DMA 35 as described in section 11.2.1 (3).

IMPORTANT: *After the software update remove DMA 35 from the "Devices and Printers" control panel on the PC. Then set up the Bluetooth connection anew (see section 11.1.1).*

13.9 System Information

To access system information including serial numbers, software and hardware versions, etc.:

1. Tap <Menu> and select *Service* > *System Information*.
2. Tap <Back> repeatedly to return to the main screen.

14 Maintenance and Repair

14.1 Maintenance Performed by an Authorized Anton Paar Service Engineer

The instrument requires no periodical maintenance. However, optional services are available from your local Anton Paar representative upon request.

Following parts are generally excluded from the warranty (wear and tear parts)

- syringes
- hoses
- adapters, connectors, fittings
- pump diaphragms
- filters
- O-rings, seals, gaskets
- cables
- fuses
- batteries
- desiccants
- protection foils and covers
- filling tube

All parts damaged in consequence of a fall of the instrument are generally excluded from the warranty as well.

14.2 Repair Performed by an Authorized Anton Paar Representative

In case your instrument needs repair, contact your local Anton Paar representative, who will take care of the necessary steps. If your instrument needs to be returned, request an RMA (Return Material Authorization Number). It must not be sent without the RMA and the filled “Safety Declaration for Instrument Repairs”. Please make sure it is cleaned before return.

TIP: *Contact your local Anton Paar representative from the Anton Paar website under “Contact” (https://www.anton-paar.com).*

IMPORTANT: *You must not return instruments that are contaminated by radioactive materials, infectious agents, or other harmful substances that cause health hazards.*

Appendix A: Technical Data

A.1: Specifications

Measuring range	
Density[a]	0–3 g/cm^3
Temperature[b]	0–40 °C (32–104 °F)
Viscosity[a]	0–1000 mPa·s
Accuracy[c]	
Density	0.001 g/cm^3
Temperature	0.2 °C (0.4 °F)
Repeatability s.d.	
Density	0.0005 g/cm^3
Temperature	0.1 °C (0.2 °F)
Resolution	
Density	0.0001 g/cm^3
Temperature	0.1 °C (0.1 °F)
Sample volume	2 mL
Sample temperature	max. 100 °C (212 °F)

a DMA 35 Ampere (verified ranges): density 0.98–1.85 g/cm^3 | viscosity 0–40 mPa·s
b Filling at higher temperatures possible
c Viscosity < 300 mPa·s, density < 2 g/cm^3

A.2: Instrument Data and Operating Conditions

Dimensions (L x W x H)	245 mm x 103 mm x 126 mm (9.6 in x 4.1 in x 5 in)
Weight	660 g (23.3 oz)
Power supply	
Battery type	3x Alkaline battery 1.5 V AA (LR6) type Varta Industrial 4006 **mandatory** for intrinsically safe DMA 35 (types DMA 35 Ex and DMA 35 Ex Petrol)
Battery life	> 100 hours
Ambient temperature[a]	• *Standard type DMA 35 and DMA 35 Ampere:* –10 °C to +50 °C (+14 °F to +122 °F) • *Types DMA 35 Ex and DMA 35 Ex Petrol:* –10 °C to +40 °C (+14 °F to +104 °F)
Storage temperature	• max. 55 °C (131 °F) with batteries • max. 70 °C (158 °F) without batteries
Air humidity	5–90 % relative humidity, non-condensing
Protection class	IP54
Intrinsic safety of DMA 35 Ex and DMA 35 Ex Petrol	II 2 G Ex ib IIB T4
Interfaces	Bluetooth®, RFID
Data memory	1024 measured data sets / 250 sample IDs / 30 measuring methods

a The sample must not freeze in the measuring cell.

A.3: Wetted Parts

The following materials are in contact with the samples and cleaning agents:

Material	**Part**
Borosilicate glass	measuring cell, filling pump
Kalrez	flat seal between connection block and measuring cell
Polypropylene	housing (*types DMA 35, DMA 35 Ampere, DMA 35 Ex)*
POM	housing (*type DMA 35 Ex Petrol)*
PTFE	filling tube
PVDF	connection block, screw plug, adapter Luer, pump lever
Viton Extreme	sealing of the filling pump

Appendix B: Density of Water

Table 10: Density of Water [g/cm^3] (0.0 °C to 40.9 °C) [a]

T °C	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
0	.99984	.99985	.99985	.99986	.99987	.99987	.99988	.99988	.99989	.99989
1	.99990	.99990	.99991	.99991	.99992	.99992	.99993	.99993	.99993	.99994
2	.99994	.99994	.99995	.99995	.99995	.99995	.99996	.99996	.99996	.99996
3	.99996	.99997	.99997	.99997	.99997	.99997	.99997	.99997	.99997	.99997
4	.99997	.99997	.99997	.99997	.99997	.99997	.99997	.99997	.99997	.99997
5	.99996	.99996	.99996	.99996	.99996	.99995	.99995	.99995	.99995	.99994
6	.99994	.99994	.99993	.99993	.99993	.99992	.99992	.99991	.99991	.99991
7	.99990	.99990	.99989	.99989	.99988	.99988	.99987	.99987	.99986	.99985
8	.99985	.99984	.99984	.99983	.99982	.99982	.99981	.99980	.99980	.99979
9	.99978	.99977	.99977	.99976	.99975	.99974	.99973	.99973	.99972	.99971
10	.99970	.99969	.99968	.99967	.99966	.99965	.99964	.99963	.99962	.99961
11	.99960	.99959	.99958	.99957	.99956	.99955	.99954	.99953	.99952	.99951
12	.99950	.99949	.99947	.99946	.99945	.99944	.99943	.99941	.99940	.99939
13	.99938	.99936	.99935	.99934	.99933	.99931	.99930	.99929	.99927	.99926
14	.99924	.99923	.99922	.99920	.99919	.99917	.99916	.99914	.99913	.99911
15	.99910	.99908	.99907	.99905	.99904	.99902	.99901	.99899	.99897	.99896
16	.99894	.99893	.99891	.99889	.99888	.99886	.99884	.99883	.99881	.99879
17	.99877	.99876	.99874	.99872	.99870	.99869	.99867	.99865	.99863	.99861
18	.99859	.99858	.99856	.99854	.99852	.99850	.99848	.99846	.99844	.99842
19	.99840	.99838	.99836	.99835	.99833	.99831	.99828	.99826	.99824	.99822
20	.99820	.99818	.99816	.99814	.99812	.99810	.99808	.99806	.99803	.99801
21	.99799	.99797	.99795	.99793	.99790	.99788	.99786	.99784	.99781	.99779
22	.99777	.99775	.99772	.99770	.99768	.99765	.99763	.99761	.99758	.99756
23	.99754	.99751	.99749	.99747	.99744	.99742	.99739	.99737	.99734	.99732
24	.99730	.99727	.99725	.99722	.99720	.99717	.99715	.99712	.99709	.99707
25	.99704	.99702	.99699	.99697	.99694	.99691	.99689	.99686	.99683	.99681
26	.99678	.99676	.99673	.99670	.99667	.99665	.99662	.99659	.99657	.99654
27	.99651	.99648	.99646	.99643	.99640	.99637	.99634	.99632	.99629	.99626
28	.99623	.99620	.99617	.99615	.99612	.99609	.99606	.99603	.99600	.99597
29	.99594	.99591	.99588	.99585	.99582	.99579	.99577	.99574	.99571	.99568
30	.99564	.99561	.99558	.99555	.99552	.99549	.99546	.99543	.99540	.99537
31	.99534	.99531	.99528	.99524	.99521	.99518	.99515	.99512	.99509	.99506
32	.99502	.99499	.99496	.99493	.99490	.99486	.99483	.99480	.99477	.99473
33	.99470	.99467	.99463	.99460	.99457	.99454	.99450	.99447	.99444	.99440
34	.99437	.99433	.99430	.99427	.99423	.99420	.99417	.99413	.99410	.99406
35	.99403	.99399	.99396	.99393	.99389	.99386	.99382	.99379	.99375	.99372
36	.99368	.99365	.99361	.99358	.99354	.99350	.99347	.99343	.99340	.99336
37	.99333	.99329	.99325	.99322	.99318	.99314	.99311	.99307	.99304	.99300
38	.99296	.99292	.99289	.99285	.99281	.99278	.99274	.99270	.99267	.99263
39	.99259	.99255	.99252	.99248	.99244	.99240	.99236	.99233	.99229	.99225
40	.99221	.99217	.99214	.99210	.99206	.99202	.99198	.99194	.99190	.99186

a Excerpt from F. Spieweck, H. Bettin: Review: Solid and liquid density determination. tm – Technisches Messen 59 (1992) 7–8, pp. 285–292.

Appendix C: Measuring Parameters

C.1: Parameter Overview

Parameters marked with * require additional settings, see appendix C.2 for an overview of the additional settings and appendix C.3 for more details.

The parameter number (“no.”) is used in method files (for method import).

Table 11: Parameter overview

Param. type	Parameter	no.	Description
Density	Density	1	Density at the displayed measuring temperature in g/cm^3, kg/m^3 or lb/gal
	*Density@	2	Density at the selected reference temperature in g/cm^3, kg/m^3 or lb/gal The temperature influence is compensated by the temperature coefficient Alpha [g/cm^3/K].
	*Specific Gravity SG	3	Specific gravity is the density of the sample at the selected reference temperature divided by the density of water at the selected reference temperature. The temperature influence is compensated by the temperature coefficient Alpha [g/cm^3/K].
Alcohol	Alcohol % v/v @ 20°C	4	Concentration of an ethanol/water mixture in % by volume at 20 °C
	Alcohol % w/w	5	Concentration of an ethanol/water mixture in % by weight
	Alcohol US @ 60°F	6	(Degrees) Proof at 60 °F

Table 11: Parameter overview (cont.)

Param. type	Parameter	no.	Description
API	API Gravity A 15°C 20°C 29.5°C 60°F	 7 10 13 16	API number for the product group A (crude oil), referred to the respective reference temperature
	API Gravity B 15°C 20°C 29.5°C 60°F	 8 11 14 17	API number for the product group B (fuels), referred to the respective reference temperature
	API Gravity D 15°C 20°C 29.5°C 60°F	 9 12 15 18	API number for the product group D (lubricants), referred to the respective reference temperature
	API SG A 15°C 20°C 29.5°C 60°F	 20 22 25 28	Specific gravity for the product group A (crude oil), referred to the respective reference temperature
	API SG B 15°C 20°C 29.5°C 60°F	 19 23 26 29	Specific gravity for the product group B (fuels), referred to the respective reference temperature
	API SG D 15°C 20°C 29.5°C 60°F	 21 24 27 30	Specific gravity for the product group D (lubricants), referred to the respective reference temperature
	API Density A 15°C 20°C 29.5°C 60°F	 31 34 37 40	Density of the product group A (crude oil), referred to the respective reference temperature

Table 11: Parameter overview (cont.)

Param. type	Parameter	no.	Description
API	API Density B 15°C 20°C 29.5°C 60°F	 32 35 38 41	Density of the product group B (fuels), referred to the respective reference temperature
	API Density D 15°C 20°C 29.5°C 60°F	 33 36 39 42	Density of the product group D (lubricants), referred to the respective reference temperature
Baumé	*Baumé	43	Degrees Baumé at 60 °F The temperature influence is compensated by the temperature coefficient Alpha [g/cm^3/K]. Degrees Baumé are calculated differently for densities above or below the density of water. The instrument applies the correct calculation method automatically.
H2SO4	H2SO4 % v/v @ 20°C	45	Concentration of sulfuric acid or battery acid in % v/v at 20 °C
	H2SO4 % w/w	44	Concentration of sulfuric acid or battery acid in % w/w
Sugar	Brix	46	Concentration of sugar in °Brix
	Extract	47	Concentration of sugar in °Plato

Table 11: Parameter overview (cont.)

Param. type	Parameter	no.	Description
Custom	KMW	–	Klosterneuburger Mostwaage unit for the sugar content in must, specific to Austria
	Öchsle	–	Measuring unit calculated from the density of grape must
	NaOH	–	Concentration of sodium hydroxide in % w/w
	HNO3	–	Concentration of nitric acid in % w/w
	Methanol	–	Concentration of methanol in % w/w
	Isopr30-100	–	Concentration of isopropanol in % w/w
	Isopr0-30	–	Concentration of isopropanol in % w/w
	H2O2	–	Concentration of hydrogen peroxide in % w/w
	HCl	–	Concentration of hydrochloric acid in % w/w
	CaCl2	–	Concentration of calcium chloride in % w/w
Raw Data	Period	48	Period value in µs of the oscillator at the measuring temperature
	Resistance	–	Resistance in Ω of the temperature sensor (only for service purposes)

C.2: Additional Settings

Table 12: Additional settings

Parameter	Additional settings	Description
Density@	Temperature 1	Reference temperature for which the density is displayed
	Alpha (g/cm^3/K)	Temperature coefficient (see section 7.2.4)
Specific Gravity SG	Temperature 1	Reference temperature for the density of the sample
	Temperature 2	Reference temperature for the density of water
	Alpha (g/cm^3/K)	Temperature coefficient (see section 7.2.4)
Baumé	Alpha (g/cm^3/K)	Temperature coefficient (see section 7.2.4)

C.3: Parameter Details

Table 13: Parameter Details

Parameter	Min.	Max.	Unit	Format	Offset format
Density	0.0000	3.0000	g/cm^3	n.nnnn	0.0nnn
	0000.0	3000.0	kg/m^3	nnnn.n	00nn.n
	00.000	25.000	lb/gal	nn.nnn	0.nnn
Density @ xx°C	0.0000	3.0000	g/cm^3	n.nnnn	0.0nnn
	0000.0	3000.0	kg/m^3	nnnn.n	00nn.n
	00.000	25.000	lb/gal	nn.nnn	0.nnn
Specific Gravity SG	0.0000	3.0000	–	n.nnnn	0.0nnn
Alcohol % v/v @ 20°C	000.0	100.0	% v/v	nnn.n	00n.n
Alcohol % w/w	000.0	100.0	% w/w	nnn.n	00n.n
Alcohol US @ 60°F	000.0	200.0	Proof	nnn.n	00n.n
API Gravity A	–50.0	100.0	°API	nnn.n	00n.n
API Gravity B	–50.0	100.0	°API	nnn.n	00n.n

Table 13: Parameter Details (cont.)

Parameter	Min.	Max.	Unit	Format	Offset format
API Gravity D	–50.0	100.0	°API	nnn.n	00n.n
API SG A	0.5000	1.5000	–	n.nnnn	0.0nnn
API SG B	0.5000	1.5000	–	n.nnnn	0.0nnn
API SG D	0.5000	1.5000	–	n.nnnn	0.0nnn
API Density A	0.5000	1.5000	g/cm^3	n.nnnn	0.0nnn
	0500.0	1500.0	kg/m^3	nnnn.n	00nn.n
API Density B	0.5000	1.5000	g/cm^3	n.nnnn	0.0nnn
	0500.0	1500.0	kg/m^3	nnnn.n	00nn.n
API Density D	0.5000	1.5000	g/cm^3	n.nnnn	0.0nnn
	0500.0	1500.0	kg/m^3	nnnn.n	00nn.n
Baumé	000.0	100.0	°Baumé	nnn.n	00n.n
H2SO4 % v/v @ 20°C	0.8000	2.0000	g/cm^3	n.nnnn	0.0nnn
	0800.0	2000.0	kg/m^3	nnnn.n	00nn.n
H2SO4 % w/w	000.0	070.0	% w/w	nnn.n	00n.n
Brix	–10.0	85.0	°Brix	nnn.n	00n.n
Extract	–10.0	85.0	°Plato	nnn.n	00n.n
CaCl2	000.0	045.0	% w/w	nnn.n	00n.n
HCl	000.0	040.0	% w/w	nnn.n	00n.n
KMW	002.5	030.0	°KMW	nnn.n	00n.n
Öchsle	–100	600	°Oe	nnn	0nn
NaOH	000.0	050.0	% w/w	nnn.n	00n.n
HNO3	000.0	070.0	% w/w	nnn.n	00n.n
Methanol	005.0	100.0	% w/w	nnn.n	00n.n
Isopropanol 30–100	030.0	100.0	% w/w	nnn.n	00n.n
Isopropanol 0–30	000.0	030.0	% w/w	nnn.n	00n.n
H2O2	000.0	100.0	% w/w	nnn.n	00n.n
Period	0000.00	9999.99	µs	nnnn.nn	–
Resistance	–	–	Ohm	nnnn	–

Appendix D: Example Files

methods.txt

```
Method:
Name=H2SO4
Rfid=010BA72305
Parameter1=44
Offset=0.000000
Parameter2=1
Method:
Name=Density
Parameter1=1
Offset=0.000000
Parameter2=3
Temp1=20.0
Temp2=20.0
Alpha=0.000300
```

Remarks:

- An RFID tag with UID “010BA72305” is allocated to the method with the name “H2SO4”.
- For the numbers of the parameters “Parameter1” and “Parameter2”, see table 11.

sampleID.txt

```
ID 1
ID 2
ID 3=0F02BE485E
```

Remarks:

- An RFID tag with UID “0F02BE485E” is allocated to “ID 3”.

Appendix E: EU Declaration of Conformity

EU Declaration of Conformity

(original)

Anton Paar

The Manufacturer **Anton Paar GmbH,** Anton-Paar-Str. 20, A-8054 Graz, Austria -- Europe hereby declares that the product listed below

Product designation:	**DMA™ 35 PORTABLE DENSITY METER**
Model:	**DMA 35 Version 4**
Material number:	172244

is in conformity with the relevant European Union harmonisation legislation. This declaration of conformity is issued under the sole responsibility of the manufacturer.

Electromagnetic Compatibility (2014/30/EU, OJ L 96/79 of 29.3.2014)

Applied standards:

- EN 61326-1:2013

  The product is classified as a class B equipment and is intended for the use in industrial area.

Low Voltage Directive (2014/35/EU, OJ L96/357 of 29.3.2014)

Additional applied standard:

- EN 61010-1:2010 — Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1:General requirements

Radio Equipment Directive (2014/53/EU, ABl. L153/62 vom 22.5.2014)

Applied standards:

- ETSI EN 300328 V2.1.1:2016-11
- ETSI EN 300330-2 V1.6.1:2014-12
- ETSI EN 301489-3 V1.6.1:2013-06
- ETSI EN 301489-17 V2.2.1 2012-09

RoHS Directive (2011/65/EU, OJ L 174/88 of 1.7.2011)

Place and date of issue: Graz, 2018-08-30

ppa

DI Günter Hofer
Executive Director
Business Unit Measurement

Dr. Markus Wuchse
Head of Lab Density & Concentration
Business Unit Measurement

EU Declaration of Conformity

(original)

Anton Paar

The Manufacturer **Anton Paar GmbH,** Anton-Paar-Str. 20, A-8054 Graz, Austria – Europe hereby declares that the product listed below

Product designation:	**DMA 35 PORTABLE DENSITY METER AMPERE**
Model:	**DMA 35 V4 Ampere**
Material number:	226130

is in conformity with the relevant European Union harmonisation legislation. This declaration of conformity is issued under the sole responsibility of the manufacturer.

Electromagnetic Compatibility (2014/30/EU, OJ L 96/79 of 29.3.2014)

Applied standards:

- EN 61326-1:2013

  The product is classified as a class B equipment and is intended for the use in industrial area.

Low Voltage Directive (2014/35/EU, OJ L96/357 of 29.3.2014)

Additional applied standard:

- EN 61010-1:2010 — Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1:General requirements

Radio Equipment Directive (2014/53/EU, ABl. L153/62 vom 22.5.2014)

Applied standards:

- ETSI EN 300328 V2.1.1:2016-11
- ETSI EN 300330-2 V1.6.1:2014-12
- ETSI EN 301489-3 V1.6.1:2013-06
- ETSI EN 301489-17 V2.2.1 2012-09

RoHS Directive (2011/65/EU, OJ L 174/88 of 1.7.2011)

Place and date of issue: Graz, 2019-07-05

DI, MBA Steffen Riemer
Executive Director
Business Unit Measurement

Dr. Markus Wuchse
Head of Lab Density & Concentration
Business Unit Measurement

EU Declaration of Conformity

(original)

Anton Paar

The Manufacturer **Anton Paar GmbH,** Anton-Paar-Str. 20, A-8054 Graz, Austria – Europe hereby declares that the product listed below

Product designation:	**DMA 35 EX PORTABLE DENSITY METER** **DMA 35 EX PETROL PORTABLE DENSITY METER**
Model:	**DMA 35 Version 4 Ex** **DMA 35 Version 4 Ex Petrol**
Material number:	183056, 183057

is in conformity with the relevant European Union harmonisation legislation. This declaration of conformity is issued under the sole responsibility of the manufacturer.

Electromagnetic Compatibility (2014/30/EU, OJ L 96/79 of 29.3.2014)

Applied standards:

- EN 61326-1:2013

  The product is classified as a class B equipment and is intended for the use in industrial area.

Equipment in potentially explosive atmospheres (2014/34/EU, OJ L96/309 of 29.3.2014)

Applied standards:

- EN 60079-0:2012 +A11:2013, EN 60079-11:2012, EN 60529:2014

Notified Body: PTB Germany / D-38116 Braunschweig, Bundesallee 100 / Identification Nr. 0102
EC-type-examination certificate: PTB 18 ATEX 2004 Issue:1

Additional applied standard:

- EN 61010-1:2010

Radio Equipment Directive (2014/53/EU, ABl. L153/62 vom 22.5.2014)

Applied standards:

- ETSI EN 300328 V2.1.1:2016-11, ETSI EN 300330-2 V1.6.1:2014-12, ETSI EN 301489-3 V1.6.1:2013-06, ETSI EN 301489-17 V2.2.1 2012-09

RoHS Directive (2011/65/EU, OJ L 174/88 of 1.7.2011)

Place and date of issue: Graz, 2020-08-11

Dr. Jakob Santner, MBA
CTO
General Management Technology

Dr. Markus Wuchse
Head of Lab Density & Concentration
Business Unit Measurement

Appendix F: EU-Type-Examination Certificate

Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

(1) **EU-TYPE-EXAMINATION CERTIFICATE**
(Translation)

(2) Equipment or Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 2014/34/EU**

(3) EU-Type Examination Certificate Number:

PTB 18 ATEX 2004 **Issue: 1**

(4) Product: Portable Density Meter, type DMA35v4 EX and DMA35v4 EX Petrol

(5) Manufacturer: Anton Paar GmbH

(6) Address: Anton-Paar-Straße 20, 8054 Graz, Austria

(7) This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 17 of the Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential Test Report PTB Ex 20-20101.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0:2012 + A11:2013 EN 60079-11:2012

(10) If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

(11) This EU-Type Examination Certificate relates only to the design and construction of the specified product in accordance to the Directive 2014/34/EU. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

(12) The marking of the product shall include the following:

II 2 G Ex ib IIB T4

Konformitätsbewertungsstelle, Sektor Explosionsschutz Braunschweig, August 7, 2020
On behalf of PTB:

Dr.-Ing. M. Beyer
Direktor und Professor

ZSEx001e c

sheet 1/3

EU-Type Examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.
In case of dispute, the German text shall prevail.

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(13) # SCHEDULE

(14) **EU-Type Examination Certificate Number PTB 18 ATEX 2004, Issue: 1**

(15) Description of Product

The portable density meter, type DMA35v4 EX or type DMA35v4 EX Petrol is a battery-operated measuring instrument for measuring the density of liquid media. The type DMA35v4 EX and the type DMA35v4 EX Petrol differ in their case material.

The density meter is designed for use in laboratory and process environments and provides a hand-operated piston pump. Only the associated accessories (carrying strap, injector, sampling tube) shall be used for the density meter.

The density meter can communicate with external systems via the RFID and Bluetooth modules in the device.

The permissible ambient temperature range is: -10°C up to +40°C

Changes with respect to previous editions

- Change of the permitted gas group from IIC to IIB with the same test specification and no technical changes
- Adaptation of the marking, the instruction manual and the Ex-sticker with regard to the modified gas group
- Introduction of a safety-related description regarding the used TVS-diode

Electrical data

Internal supply	4,5V (DC); battery type approved for power supply: VARTA Industrial type 4006 Changing of the battery and the charging cradle is only permitted outside the hazardous area.
RFID-interface	max. 265mW, 125kHz
Bluetooth-interface	max. 10dBm TX power
Medium temperature	max. 100°C

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Physikalisch-Technische Bundesanstalt
Braunschweig und Berlin
Nationales Metrologieinstitut

SCHEDULE TO EU-TYPE EXAMINATION CERTIFICATE PTB 18 ATEX 2004, Issue: 1

(16) Test Report PTB Ex 20-20101

(17) Specific conditions of use

none

(18) Essential health and safety requirements

Met by compliance with the aforementioned standards.

Konformitätsbewertungsstelle, Sektor Explosionsschutz
On behalf of PTB

Braunschweig, August 7, 2020

Dr.-Ing. M. Beyer
Direktor und Professor

EU-Type Examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt.
In case of dispute, the German text shall prevail.

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