Anton Paar

Portable Density/ Specific Gravity/ Concentration Meter

DMA 35 Basic

Instruction Manual

Instruction Manual and Safety Information

DMA 35 Basic

Portable Density Meter

instrument software version: from 1.90
(Original Instructions)

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Further information

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Contents

1 Safety instructions

- Read the documentation before using the instrument.
- Follow all hints and instructions in the documentation to ensure the correct use and safe functioning of the instrument.
- The documentation 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 or revisions to the documentation from Anton Paar GmbH, these must be treated as part of the documentation.

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 documentation. 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.

- 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.
- If the batteries leak fluid (electrolyte), do not use the instrument any longer. Contact your local Anton Paar representative to clarify further steps.
- Do not expose the instrument to temperatures below 0 °C (32 °F) when the measuring cell or the pump 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

- The instrument is **not** explosion-proof and therefore must not be operated in areas with risk of explosion.
- Never remove the pump lock or the battery cover in hazardous areas. Only exchange the batteries outside of hazardous areas.

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 persons or by Anton Paar GmbH.

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, kg/m^3, or lb/gal according to the oscillating U-tube method. Apart from density, you can select various further measuring units (density at reference temperature, specific gravity, concentrations). A temperature sensor measures the sample temperature right 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 lightweight and compact design, you can easily perform measurements of samples that are usually difficult to access. The backlight of the display ensures clear visibility of results, even in dark surroundings. The backlight of the oscillator at the same time enables 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. You can also define and store different measuring methods allowing acceleration of repeatedly performed standard measurements.

DMA 35 is operated via seven keys. 1024 measured data including date, time, and sample ID can be stored in the memory of the instrument 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 an infrared interface (IrDA).

2.1 Measuring principle

Definition of density

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

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

Density is a temperature-dependent measuring unit.

The oscillating U-tube method

The sample is introduced into a U-shaped tube made of borosilicate glass that is being excited to oscillate at its characteristic frequency, which changes with temperature and density of the filled sample. Through determination of the characteristic frequency, the density of the sample can be calculated. Due to the temperature-dependency of density, the temperature of the sample has to be determined precisely.

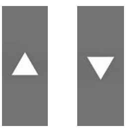
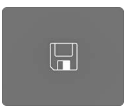
Concentration measurement

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

This is also possible with so-called quasi binary mixtures. These are mixtures containing two major components and some additional ones that are present 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 in water because the concentrations of flavors and acids are very small compared to sugar and water. Therefore, the sugar concentration can be measured with a density meter.

2.2 Functional components

Table 1: Keys of DMA 35

At the front *(see fig. 1)*	
	Power key: to switch the instrument on and off.
	Delete key: to remove measured data, entries, and characters during an entry.
	Softkeys for selecting menu items and for navigation. The function of the right softkey can be configured.
	Arrow keys: to navigate within the menu and for the entry of characters. **TIP:** *For faster up and down navigation, keep the arrow keys pressed.* **TIP:** *Press the arrow keys to switch between the <Info> softkey shown together with the warning sign and the original softkey configuration.*
At the back *(see fig. 3)*	
	Data storage key: for starting a measurement and for storing results in the memory.

Front

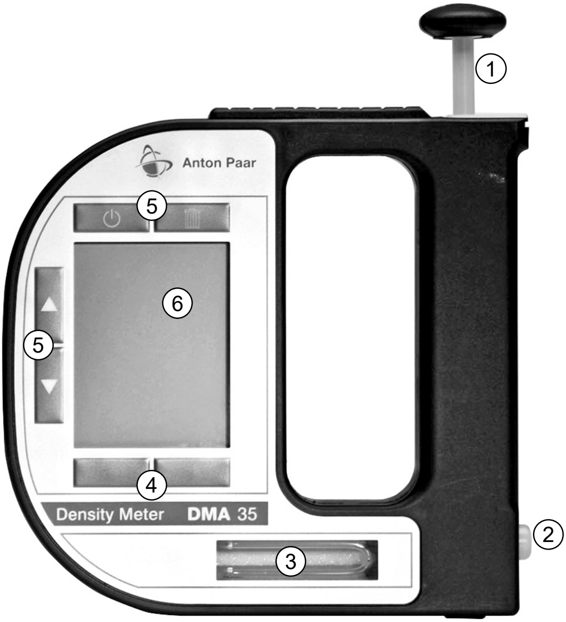


Fig. 1: Front of the instrument

- *1 Pump lever of built-in pump*
- *2 Screw plug*
- *3 Measuring cell*
- *4 Softkeys (see table 1)*
- *5 Operating keys (see table 1)*
- *6 Graphical monochrome LC display*

Top

Fig. 2: Top of the instrument

- *1 Pump lever of built-in pump*
- *2 Fixing screw of the pump lock*
- *3 Pump lock*
- *4 Infrared interface (IrDA)*

Back

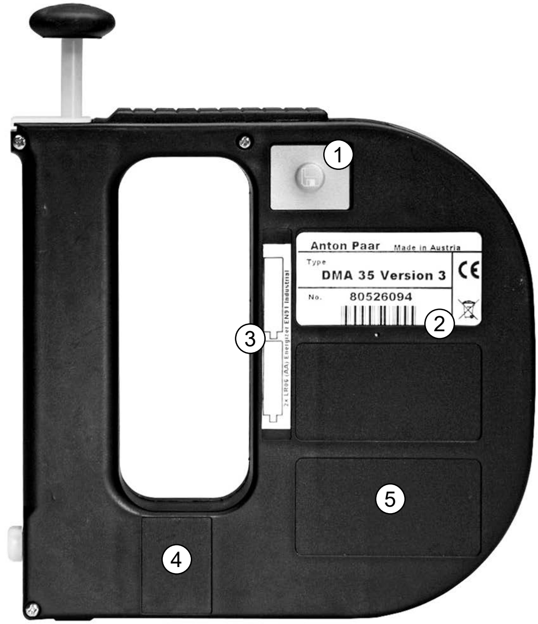


Fig. 3: Back of the instrument

1 *Data storage key (see table 1)*
2 *Type plate with serial number*
3 *Depiction of how to correctly insert batteries*
4 *Calibration number (optional)*
5 *Custom functions (optional)*

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 piece) 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.

Fig. 4: Supplied parts

1 DMA 35 density meter
2 Filling tube PTFE, length: 180 mm
3 Adapter Luer 1/4" UNF (for syringe filling)
4 Plastic syringes 2 mL
5 IrDA USB adapter (optional)

Table 2: Supplied parts

	Qty.	Article description	Mat. no.
	1	DMA 35 Basic portable density meter	84138
	1	Instruction manual English	88155
	1	Filling tube PTFE, length: 180 mm	68527
	1	Adapter Luer 1/4” UNF *(for syringe filling)*	64792
	1	Syringes 2 mL (10 pcs.)	58802
	1	Allen wrench 2.5 mm DIN 911	58263

Table 3: Optional accessories and consumables

Article description	Mat. no.
Rubber housing DMA 35	105540
New custom function for DMA 35	88974
ISO 17025 calibration density G1	157098
Filling tube PTFE, length: 600 mm	78503
IrDA USB adapter	88085
Set wristband for portable instruments	92416

4 Putting DMA 35 into operation

NOTICE
Protect the instrument against any collision or strong shock as this may lead to a malfunction of the instrument and breakage of the measuring cell.

IMPORTANT: *Standard tolerances in dimensions of AA batteries may result in some rattling noise coming from the battery compartment when moving the instrument. This has no negative influence on the operation of the instrument.*

4.1 Connecting the filling tube

Screw in the filling tube by hand until you feel some resistance against turning. Do not use any tools for screwing in the filling tube.

Fig. 5: Connecting the filling tube

4.2 Mounting the syringe adapter

1. Remove the screw plug (2, fig. 1) at the side of the instrument.
2. Screw in the supplied adapter Luer 1/4” UNF by hand until you feel some resistance against turning. Do not use any tools.

5 Operating the instrument

5.1 Switching the instrument on/off

- To **switch on** the instrument, press the key for approximately two seconds until the instrument beeps and shows the welcome screen.

  After the welcome screen DMA 35 switches immediately to the main screen (measuring mode). Now you can start measuring.

- To **switch off** the instrument, press the key until “Power Off” is displayed.

  If the instrument is in **energy saving mode** (see section 6.4), DMA 35 switches off automatically after the set time of inactivity.

5.2 The display

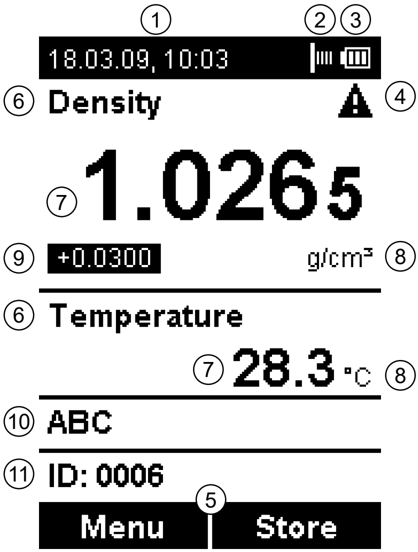


Fig. 6: Example main screen

Header information
1 *Date and time*
2 *Infrared data transfer (see table 4)*
3 *Battery charge level (see table 4)*
4 *Warning sign*

Footer keys
5 *Softkey configuration*

Measurement information
6 *Measuring quantity*
7 *Measuring value*
8 *Measuring unit*
9 *Custom offset*
10 *Method*
11 *Sample ID*

Table 4: Symbols on the display

	The symbol for infrared data transfer is shown when data is imported or exported via the IrDA interface.
	The symbol indicates the battery charge level of your instrument (see details in section 12.7).
	The warning sign indicates that a measured value is outside range specifications. The warning sign is always shown together with an information (press the right softkey) stating the warning type (see details in appendix E).

5.3 Assigning the softkey function

When the instrument shows the main screen, the left softkey (4, fig. 1) always takes you to the main menu, whereas the right softkey can be assigned one of the predefined functions (only available on the main screen):

Table 5: Predefined functions for the right softkey on the main screen

ID	opens the sample ID list to select an ID for the next measurement
Method	opens the method list to select a method for the next measurement
Store	provides the same functionality as the data storage key  (see table 1) at the back of the instrument: starts and stores a measurement
Print	enables immediate print-out of the measured value via the IrDA interface

1. Press <Menu> and select *Setup* > *Softkey*.
2. Select the preferred setting and press <Save>.

5.4 Password protection

You can protect your instrument with a password. If password protection is enabled, you have to enter the password before changing the settings, before performing an adjustment, and before selecting a measuring unit.

For performing measurements as well as entering, changing, or deleting measuring methods or sample IDs, no password entry is required.

You can change the password or disable password protection entirely at any time. Keep your password information safe.

To set, change, or delete a password

1. Press <Menu> and select *Setup* > *Set Password*.
2. When your instrument is already password protected, enter your current password.
3. Enter your new password using the arrow keys and press <Continue>.
4. If you want to disable the password protection entirely, enter <0000> as the new password and press <Continue>.
5. Enter the password again and press <Save>.

6 Instrument settings

6.1 Menu language

1. Press <Menu> and select *Setup* > *Language*.
2. Select the preferred language (English, German, French, or Spanish) and press <OK>.

6.2 Standard density and temperature units

1. Press <Menu> and select *Setup* > *Units*.
2. Select the preferred density unit (g/cm^3, kg/m^3, or lb/gal) and press <OK>.
3. Select the preferred temperature unit (°C or °F) and press <Save>.

6.3 Sound settings

When sound is enabled, DMA 35 beeps when it is switched on and off and when a key is pressed.

When sound is disabled, the instrument only beeps when it is switched on and off.

1. Press <Menu> and select *Setup* > *Beep*.
2. Select the preferred setting (Beep on/off) and press <Save>.

6.4 Energy saving mode

Enabling the energy saving mode reduces the power consumption of the instrument and extends battery life. When energy saving mode is enabled, the instrument will automatically switch itself off after the set time of inactivity.

When energy saving mode is disabled, the instrument stays switched on until it is turned off using the key.

1. Press <Menu> and select *Setup* > *Energy Saving*.
2. Select the preferred setting (Off, 3, 5 or 10 minutes) and press <Save>.

6.5 Backlight

The LC display and the oscillator are equipped with a backlight. The backlight ensures that even under bad lighting conditions the measuring results and menu options are easily readable. The backlight of the oscillator enables you to observe the filling process.

Table 6: Available backlight settings

Auto	The backlight automatically turns on when a key is pressed or when a new sample is filled into the measuring cell. To activate the backlight without accessing the menu, press an arrow key. The backlight is switched off automatically after 30 seconds.
Off	The backlight is permanently off.
On	The backlight is permanently on.

TIP: *Having the backlight turned on permanently will shorten battery life.*

1. Press <Menu> and select *Setup* > *Backlight*.
2. Select the preferred setting and press <Save>.

6.6 Display contrast

Adjust the display contrast to suit your preference:

1. Press <Menu> and select *Setup* > *Display Contrast*.
2. Select the preferred setting (–8 to +8) and press <Save>.

6.7 Setting date and time

During operation, the header information always shows the current date and time (1, fig. 6).

Setting date and time

1. Press <Menu> and select *Setup* > *Date and Time* > *Set Date and Time*.
2. Enter the current day, month, and year using the arrow keys and confirm each of your selections by pressing <OK>.

   The cursor moves to the next value to be set.
3. Press <Save>.

   The time settings are shown.
4. Repeat the procedure to enter the current time and press <Save>.

Setting the date format

1. Press <Menu> and select *Setup* > *Date and Time* > *Date Format*.
2. Select the preferred date format and press <OK>.

Setting the time format

1. Press <Menu> and select *Setup* > *Date and Time* > *Time Format*.
2. Select the preferred time format and press <OK>.

7 Measurement settings

7.1 Measuring units

For measuring your samples, you can choose between numerous predefined measuring units, or you can import custom functions into the instrument and select one of them as the measuring unit. Contact your Anton Paar representative to obtain a custom function from Anton Paar.

All measuring units are derived from the density of the sample at the measured temperature.

Selecting the measuring unit

1. Press <Menu> and select *Measuring Units*.

   The list of the predefined measuring units is shown.
2. Select the preferred measuring unit and press <OK>.

   Some measuring units contain sub-items with options to be selected:
   - Select the preferred option and press <OK>.

7.1.1 Predefined measuring units

For further details see appendix C.

Table 7: Predefined measuring units

Meas. unit	**Option**	**Description**
Density	Density	Density at the displayed measuring temperature [g/cm^3, kg/m^3, or lb/gal]
	Density @xx °C: α (g/cm^3/K)	Density at the chosen reference temperature [g/cm^3, kg/m^3, or lb/gal] The temperature influence is compensated by the set temperature coefficient α (g/cm^3/K).
	Specific Gravity SG: SG Temp. (°C or °F) α (g/cm^3/K)	Specific gravity is the density of the sample (at the chosen reference temperature) divided by the density of water (at the chosen reference temperature) The temperature influence is compensated by the set temperature coefficient α (g/cm^3/K).
Alcohol	Alcohol % v/v @20 °C	Concentration of an ethanol/water mixture [% by volume at 20 °C]
	Alcohol % w/w	Concentration of an ethanol/water mixture [% by weight]
	Alcohol US @60 °F (°Proof)	Degrees Proof at 60 °F

Table 7: Predefined measuring units (cont.)

Meas. unit	Option	Description
API	API Gravity A API Gravity B API Gravity D	API number for the product group referred to the reference temperature of 15 °C, 20 °C, 29.5 °C, or 60 °F *Product group A:* crude oil *Product group B:* fuels *Product group D:* lubricants
	API SG A API SG B API SG D	Specific gravity for the product group referred to the reference temperature of 15 °C, 20 °C, 29.5 °C, or 60 °F
	API Density A API Density B API Density D	Density for the product group [g/cm^3] referred to the reference temperature of 15 °C, 20 °C, 29.5 °C, or 60 °F
Baumé	α ($g/cm^3/K$)	Degrees Baumé at 60 °F The temperature influence is compensated by the set temperature coefficient α ($g/cm^3/K$). There are two different calculation methods for degrees Baumé, depending on whether the density is above or below the density of water. DMA 35 chooses automatically the correct calculation method according to the density of the measured liquid.
H2SO4	H2SO4 % w/w	Concentration of sulfuric acid or battery acid [% by weight]
	H2SO4 @20 °C	Density of sulfuric acid or battery acid at 20 °C
Sugar	Brix	Degrees Brix (sucrose concentration [% by weight])
	Extract (°Plato)	Degrees Plato
Custom functions	–	Optional custom functions Contact your Anton Paar representative to obtain a custom function.
Period	–	Period value of the oscillator at the measuring temperature

Table 7: Predefined measuring units (cont.)

Meas. unit	**Option**	**Description**
Raw data	–	Period value and resistance of the temperature sensor *(only for service purposes)*

7.1.2 Calculating the temperature coefficient α

The temperature coefficient α ($g/cm^3/K$) is required for the calculation of some measuring units at a certain reference temperature. It 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

Typical temperature coefficients:	**α**
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

7.1.3 Custom functions

In addition to the predefined measuring units, you can import up to ten custom functions into the instrument and select one of them as the measuring unit.

The coefficients for the calculation of your measuring unit have to be transferred to the instrument in the correct format. Contact your Anton Paar representative if you want to import additional measuring units. You will receive a file from Anton Paar containing the custom functions in the correct format.

The import procedure is described in section 10.

7.2 Measuring methods

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

You can define and store up to 20 different measuring methods, which may comprise the following method settings:

- measuring unit
- offset value
- temperature coefficient α

If you own several DMA 35 instruments, you can import the same method list into all your instruments.

Selecting a method for the measurements

1. Press <Menu> and select *Methods > Select Method*.

   All stored methods are shown.

2. Select the preferred method and press <OK>.

7.2.1 Defining a new method

1. Select the preferred measuring unit (see section 7.1) and, if required, the custom offset (see section 11.4).
2. Press <Menu> and select *Methods > Enter new Method*.
3. Enter the name of the measuring method using the arrow keys.
4. Browse to the tick symbol using the arrow keys and press <Save>.

TIP: *If you keep an arrow key pressed, the cursor automatically stops at the tick symbol.*

7.2.2 Defining a method list

If you plan to define or edit a large method list, you can do so conveniently on a PC and then import the list into DMA 35. If you own several DMA 35 instruments, you can import the same method list into all of them to get identical instruments.

To gain insight into the format to be used, first define one or two methods on the instrument (see section 7.2.1), then transfer these to a PC. After doing that, you can conveniently define further methods in the same format and import the list into the instrument.

The import procedure is described in section 10.

IMPORTANT: *Importing a new method list, automatically overwrites the existing method list.*

Defining a method list on a PC, also allows for using additional characters. The instrument supports the space character and the following characters:

!	"	#	$	%	&	'	(	)	*	+	,	-	.	/	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^
_	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	{	|	}
~	°	²	³	µ	Ä	Ö	Ü	ß	ä	é	è	ö	ü	û																

Method list template

The following template explains the lines of a method list:

<DMA35>	
<METHODLIST>	
<METHOD>	
<NAME>ALCOHOL</NAME>	name of the first method: ALCOHOL
<UNIT>11</UNIT>	measuring unit: Alcohol % v/v
</METHOD>	
<METHOD>	
<NAME>SG</NAME>	name of the second method: SG
<UNIT>3</UNIT>	measuring unit: Specific Gravity SG
<ALPHA>0.00124</ALPHA>	temperature coefficient α: 0.00124
<TEMP1>20</TEMP1>	temperature 1 (for α): 20[a]
<TEMP2>4</TEMP2>	temperature 2 (for α): 4[a]
</METHOD>	
</METHODLIST>	
</DMA35>	

a *The measuring unit is defined by the measuring unit set on the instrument when the method list is imported.*

7.2.3 Editing a method

1. Press <Menu> and select *Methods > Edit Method*.
2. Select the method that you want to edit and press <OK>.

TIP: *For changing a method name, see section 7.2.1.*

7.2.4 Deleting methods

1. Press <Menu> and select *Methods > Edit Method*.
2. Select the method to be deleted and press .
3. Select
   - <Delete Selected> to delete only the selected method or
   - <Delete all> to delete all methods.
4. Press <Delete> to confirm deletion.

7.3 Sample IDs

Sample IDs serve to tag your measurement results and provide full traceability. They help to uniquely assign measured data to

- samples (sample identification)
- users who performed the measurement (user identification)
- the measuring point where the sample was taken etc.

You can define and store up to 100 different sample IDs.

Selecting a sample ID for the measurements

1. Press <Menu> and select *Sample-ID > Select ID*.
   All stored sample IDs are shown.
2. Select the required sample ID and press <OK>.

7.3.1 Defining a new sample ID

1. Press <Menu> and select *Sample-ID > Enter new ID*.
2. Enter the sample ID using the arrow keys.
3. Browse to the tick symbol using the arrow keys and press <Save>.

TIP: *If you keep an arrow key pressed, the cursor automatically stops at the tick symbol.*

Default counter <empty>

If you define a new sample ID and select only the tick symbol without entering characters for the ID, the sample ID is automatically given the name <empty>. It is treated as a 4-digit measurement counter that keeps counting until it starts over after having reached its maximum value.

Custom counters

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

- Include a sequence of one to four hash characters "#" in the sample ID (at any position).
- 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 "Tank1-##" for your measuring point "Tank1".
- Measurements with that sample ID will be identified as "Tank1-01", "Tank1-02", "Tank1-03", and so on until you select a new sample ID (thus resetting the counter).

TIP: *If you have reset the custom counter by mistake (by selecting the same sample ID anew), switch the instrument off and on again to proceed with the next higher count of the custom counter.*

7.3.2 Defining a sample ID list

If you plan to define or edit a large sample ID list, you can do so conveniently on a PC and then import the list into DMA 35. If you own several DMA 35 instruments, you can import the same sample ID list into all of them to get identical instruments.

To gain insight into the format to be used, first define one or two sample IDs on the instrument (see section 7.3.1), then transfer these to a PC. After doing that, you can conveniently define further sample IDs in the same format and import the list into the instrument.

The import procedure is described in section 10.

Sample ID list template

The following template explains the lines of a sample ID list:

<DMA35>	
<IDLIST>	
<ID>	
<NAME>ETHANOL</NAME>	first sample ID: ETHANOL
</ID>	
<ID>	
<NAME>WATER</NAME>	second sample ID: WATER
</ID>	
</IDLIST>	
</DMA35>	

7.3.3 Editing a sample ID

1. Press <Menu> and select *Sample-ID* > *Edit ID*.
2. Select the sample ID that you want to change and press <OK>.
3. Proceed as described in section 7.3.1.

7.3.4 Deleting sample IDs

1. Press <Menu> and select *Sample-ID* > *Edit ID*.
2. Select the sample ID to be deleted and press .
3. Select
   - <Delete Selected ID> to delete only the selected sample ID or
   - <Delete all IDs> to delete all sample IDs.
4. Press <Delete> to confirm deletion.

7.4 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 saved. The stability criterion is always related to the temperature:

- *Measurement mode “Precise”:*
  The result is saved 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 saved 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 saved: Press the data storage key (see table 1) at the back of the instrument to save the result immediately.

To set the measurement mode

1. Press <Menu> and select *Setup* > *Measurement Mode*.
2. Select the required setting and press <Save>.

8 Measuring

General instructions for 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

Risk of an electric shock

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.*

- Fill the measuring cell free of gas bubbles. Possible reasons for gas bubbles in the measuring cell:
  - gas bubbles in the sample
  - leaky connection of the filling tube, the pump, or the screw plug
- Fill the measuring cell completely.

- Ensure that the sample temperature does not deviate too much from the ambient temperature.

  If the sample temperature is outside temperature specifications (0 °C to 40 °C / 32 °F to 104 °F), the warning sign (4, fig. 6) is shown until the sample has reached a measurable temperature. If the measured value is nevertheless saved, it is shown with an exclamation mark.
- Carefully clean the instrument after each measurement series to avoid deposits in the measuring cell.
- Ensure that suitable solvents for cleaning are at hand.

TIP: *The filled sample is continuously measured, and the measuring result is displayed. By saving the measuring result, you can print it or export it to a PC later.*

8.1 Filling the sample

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

8.1.1 Filling using 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.

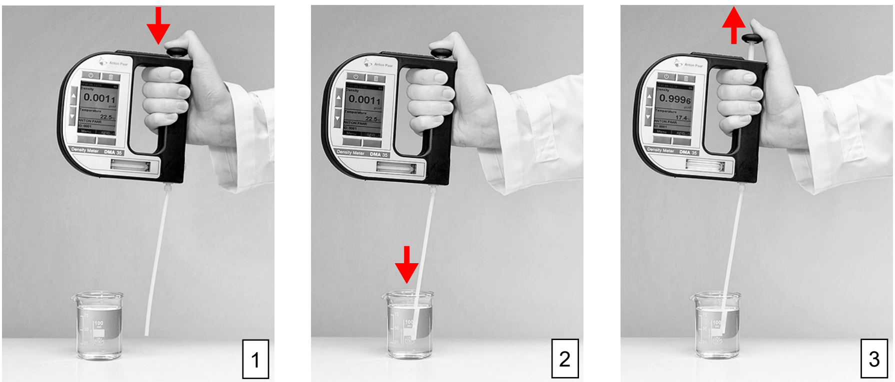


Fig. 7: Filling sample using the filling tube

8.1.2 Filling with the plastic syringe

IMPORTANT: *Do not remove the pump when filling with the plastic syringe. Otherwise liquids will leak.*

1. Fill the plastic syringe with the sample.
2. Fill the measuring cell through the adapter Luer 1/4” UNF using the plastic syringe (see fig. 8).

Fig. 8: Filling sample using the plastic syringe

8.2 Actual measurement procedure

1. Select the measuring unit (see section 7.1) or an appropriate measuring method (see section 7.2).
2. Select a sample ID (see section 7.3).
3. Fill the measuring cell with the sample (see section 8.1).
4. Press the data storage key (see table 1) at the back of the instrument.

   The measured value is displayed when the result is stable. It is then saved in the results list (with all corresponding data).
5. Return to the measuring mode:
   - Press <OK>.

   To **delete** the measured value:
   - Press instead of <OK> when the measured value is shown. The measured value is deleted, and the instrument returns to the measuring mode.

To immediately print the measured value

You can transfer the measured value to a printer via the IrDA interface. Your Anton Paar representative will inform you about compatible printers.

1. Assign the Print function to the right softkey (see section 5.3).
2. Switch on the printer with the IrDA interface.
3. Press the <Print> key when the measured value is shown.
4. Hold the IrDA interface of DMA 35 to the IrDA interface of the printer to establish communication.

   The measured value is printed.

TIP: *You can also print out all or single saved data sets, see section 9.3.*

8.3 Emptying the measuring cell

1. Lead the filling tube into a suitable waste vessel.
2. Press the pump lever (1, fig. 1) to empty the measuring cell.

9 Measurement data in the data memory

You can save up to 1024 sets of measurement data directly in the data memory of DMA 35. If the data memory contains 1024 saved data sets, further data sets will overwrite the oldest ones.

- Saved data sets are numbered consecutively by a 4-digit counter (see fig. 9). If you see numbers greater than 1024, this indicates that older data sets have been overwritten.
- If you delete all measured data, the counter is reset to 0001.

9.1 Viewing measurement data

- Press <Menu> and select *Measured Data*.

  The saved sets of measurement data are shown, see fig. 9.

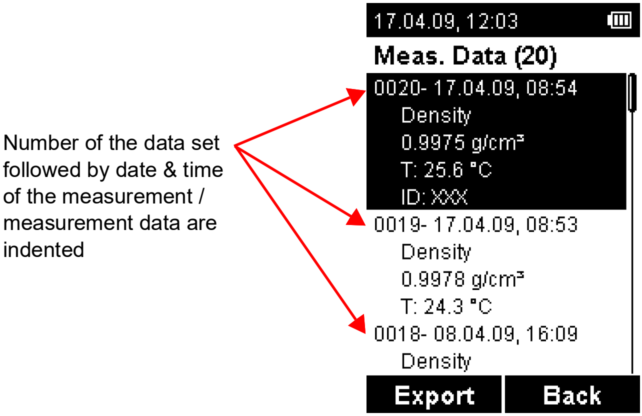


Fig. 9: List of measured data

9.2 Exporting measurement data to a PC

The export procedure is described in section 10.

To set the export file format

1. Press <Menu> and select *Setup > Import / Export > Data Format*.
2. Select the export file format:
   - <CSV> or
   - <TXT>

   and press <OK>.
3. Select a delimiter *(only applied with CSV data export)*:
   - <,> [comma],
   - <;> [semicolon], or
   - </> [slash]

   and press <OK>.
4. Select the decimal point *(only applied with CSV data export)*:
   - <.> [point] or
   - <,> [comma]

   and press <OK>.

Exporting a single data set

1. Establish a connection between DMA 35 and the PC as described in section 10.1.
2. Press <Menu> and select *Measured Data*.
3. Select the data set to be exported (using the arrow keys).
4. Press <Export>.
5. Select <Export Selected> to export the selected data set to the PC.

   A window on the PC asks for confirmation to accept the file.
6. Click <Yes>.

   The data set is transferred and filed on the desktop.

Exporting all measured data

1. Establish a connection between DMA 35 and the PC as described in section 10.1.
2. Press <Menu> and select *Measured Data*.
3. Press <Export>.
4. Select <Export All> to export all measured data to the PC.

   A window on the PC asks for confirmation to accept the file.
5. Click <Yes>.

   The measured data are transferred and filed on the desktop.

9.3 Printing saved measurement data

You can transfer saved measurement data to a printer via the IrDA interface. Your Anton Paar representative will inform you about compatible printers.

1. Switch on the printer with the IrDA interface.
2. Press <Menu> and select *Measured Data*.
3. Select the data set to be printed (using the arrow keys) if you want to print a single data set.
4. Press <Export>.
5. Select
   - <Print Selected> to print the selected data set or
   - <Print All> to print all measured data.
6. Hold the IrDA interface of DMA 35 to the IrDA interface of the printer to establish communication.

9.4 Deleting saved measurement data

To delete the last measured data set

1. Press <Menu> and select *Measured Data*.
2. Select a data set and press .
3. Select <Delete Last> and press <OK>.
4. Press <Delete> to confirm deletion.

To delete all measured data

1. Press <Menu> and select *Measured Data*.
2. Select a data set and press .
3. Select <Delete All> and press <OK>.
4. Press <Delete> to confirm deletion.

10 Exchanging data with a PC

Your DMA 35 features wireless data transfer from and to a PC via the integrated IrDA interface. You need a PC with an infrared interface or a PC with an IrDA USB adapter installed and connected. Contact your Anton Paar representative if you need an IrDA USB adapter for your PC.

10.1 Establishing a connection to a PC

1. If your PC has no IrDA interface, install the IrDA USB adapter on your PC.
2. Hold the IrDA interface of DMA 35 to the IrDA interface of the PC to establish communication.
3. Continue with section 10.2 or section 10.3.

10.2 Exporting data to a PC

The following data can be exported from DMA 35 to a PC:

- measurement data (see section 9.2)
- custom functions (customized measuring units)
- adjustment data (currently valid adjustment)
- device information
- sample ID list
- method list
- system settings (backup copy of instrument)

1. Establish a connection between DMA 35 and the PC, see section 10.1.
2. Press <Menu> and select *Setup* > *Import / Export* > *Send to PC*.
3. Select the type of data that you want to export.

   A window on the PC asks for confirmation to accept the file.
4. Click <Yes>.

   The selected data are transferred and filed on the desktop.

10.3 Importing data from a PC

The following data can be imported from a PC to DMA 35:

- custom functions (customized measuring units)
- sample ID list
- method list
- firmware updates

1. Establish a connection between DMA 35 and the PC, see section 10.1.
2. Press <Menu> and select *Setup* > *Import / Export* > *Receive from PC*.
3. On the PC, click with the right mouse button on the file that you want to send and select *Send to > A nearby computer*.

   The selected file is transferred to DMA 35.

11 Checks and adjustments

If the measuring cell is not sufficiently cleaned, residues can form in the measuring cell. To address the risk, perform check measurements with ultra-pure water regularly.

11.1 Performing a check measurement

1. Clean the measuring cell as described in section 12.1, and rinse it until no more solvent residues are present.
2. Select the measuring unit “Density” (see section 7.1).
3. Fill the measuring cell with ultra-pure water and perform a measurement (see section 8).
4. Compare the measured density value with the table value at the given temperature (appendix D).

   If the measured density value deviates from the table value by more than ±0.001 g/cm^3, perform an adjustment.

TIP: *An adjustment is only possible if the difference between the measured and the theoretical value is less than 0.01 g/cm^3 and the temperature of the water is between 15 °C (59 °F) and 25 °C (77 °F).*

11.2 Performing a water adjustment

Reference liquid: ultra-pure water

1. Clean the measuring cell as described in section 12.1, and rinse it until no more solvent residues are present.
2. Press <Menu> and select *Adjustment* > *Water Adjustment*.
3. Fill the measuring cell with ultra-pure water of approx. 20 °C (68 °F).

   Ensure that the temperature of the water is between 15 °C (59 °F) and 25 °C (77 °F), and that you fill without bubbles.
4. Confirm with <OK>.

   The density of the filled ultra-pure water is measured and compared with the reference data, then the calculated deviation (Delta) is shown.
5. Press <OK> to activate the new adjustment.

11.3 Performing a custom adjustment

Instead of ultra-pure water, you can also use any other reference liquid with a known density at 20 °C (68 °F) and a known temperature coefficient for the 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 12.1, and rinse it until no more solvent residues are present.
2. Press <Menu> and select *Adjustment* > *Custom Adjustment*.
3. Fill the measuring cell with reference liquid of approx. 20 °C (68 °F).

   Ensure that the temperature of the reference liquid is between 15 °C (59 °F) and 25 °C (77 °F), and that you fill without bubbles.
4. Confirm with <OK>.
5. Enter the density of your reference liquid at the stated reference temperature (using the arrow keys), then press <Save>.

   The density of the filled reference liquid is measured and compared with the entered density for the reference liquid at 20 °C (68 °F), then the calculated deviation (Delta) is shown.
6. Press <OK> to activate the new adjustment.

11.4 Defining an offset

You can define an offset for your measurements, which is automatically added to each measured value. The offset value always refers to the selected measuring unit and is voided when you change to another measuring unit. If you have selected a method, the offset is saved with the method.

1. Press <Menu> and select *Adjustment* > *Custom Offset*.
2. Enter an offset value and press <Save>.

TIP: *The offset value saved with a method can be changed later on.*

11.5 Reset to factory adjustment

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

1. Press <Menu> and select *Adjustments* > *Factory Adjustment*.

   You are asked for confirmation.
2. Press <OK> to reset the instrument to factory adjustment.

   The factory adjustment will be restored.

12 Upkeep and cleaning

NOTICE

- Make sure the solvent that you use for cleaning is suitable. For details on recommended cleaning agents, see section 12.1.4.
- Do not use any mechanical action for cleaning the measuring cell.

12.1 Cleaning the measuring cell

Clean the measuring cell with a suitable solvent regularly before and after each measurement series to ensure the long-term accuracy of your results. If the measuring cell is not sufficiently cleaned, residues may form in the measuring cell and lead to inaccurate measurement results. Depending on the application, also cleaning between measurements may be required.

1. Empty the measuring cell (see section 8.3).
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 you clean with a syringe, move the plunger back and forth vigorously several times so that air bubbles add to the cleaning action.*

12.1.1 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. a series of fermenting wines). • 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 or difficult to remove from the measuring cell.

12.1.2 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 ultra-pure water in the measuring cell when you store the instrument for a day.

12.1.3 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 (see recommendations below).

12.1.4 Cleaning agent – recommendations

WARNING

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

- Never flush out concentrated sulfuric acid with water.
- Ensure that samples of strongly differing concentrations do not come into contact with each other:
  - 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.

NOTICE
The pump cylinder of DMA 35 is not resistant to aggressive cleaning liquids, such as acetone or methyl ethyl ketone (MEK).

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 water instead.*

Table 8: Typical samples and recommended cleaning agents

Sample	Cleaning liquid 1	Cleaning liquid 2
petroleum products	toluene, petroleum naphtha, petroleum ether, n-nonane, cyclohexane, ...	ethanol
battery acid	tap water	ultra-pure water
liquid soap & detergent, shampoo	tap water	ultra-pure water
salad dressing, mayonnaise	petroleum naphtha, dishwashing agent in water	ethanol
sun tan lotion	petroleum naphtha	ethanol
soft drinks	tap water	ultra-pure water
beer, spirits	tap water	ultra-pure water
beer wort, grape juice, syrup	warm tap water	ultra-pure water
milk	tap water, enzymatic lab cleaner	ethanol, ultra-pure water
98 % H_2SO_4	70 % H_2SO_4	40 % H_2SO_4, followed by ultra-pure water

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

- **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 for a long time.

  Enzymatic lab cleaners are usually best suited for removing these contaminants. Recommended cleaning agents:

  - "Winepress Cleaner PM Membrane Presses", cat. no. 409004, by Wigol®
  - "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 (77 °F) because strong alkalis attack the glass surface upon prolonged exposure and at high temperatures.

12.2 Removing the filling pump

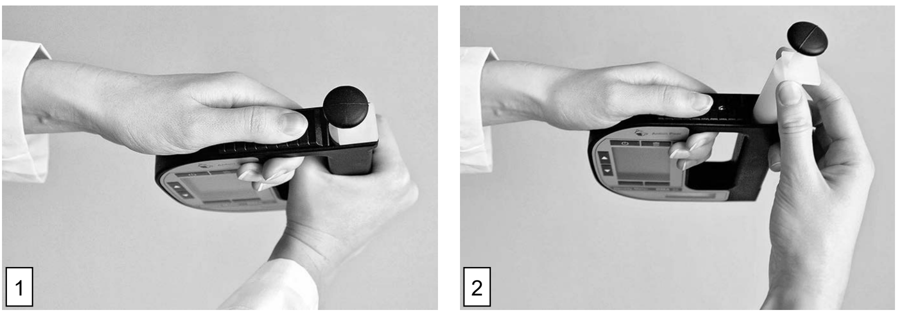


Fig. 10: Removing the pump

- Open the pump lock (1, fig. 10) and remove the pump (2, fig. 10).

12.3 Cleaning the filling pump

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

1. Open the pump lock and remove the pump (see section 12.2).
2. Rinse the pump under running tap water while moving the pump piston up and down.
3. Dry the pump with a lint-free cloth.
4. Reinsert the pump and close the pump lock.
5. Empty the measuring cell (see section 8.3).

12.4 Cleaning the pump housing

The instrument is completely sealed against the outside and the pump. Therefore, you can rinse the pump housing with running tap water if the housing is dirty.

1. Open the pump lock and remove the pump (see section 12.2).
2. Hold the pump housing under running water and rinse it thoroughly.
3. Reinsert the pump and close the pump lock.
4. Empty the measuring cell (see section 8.3).

12.5 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).

12.6 Storing the instrument

Before you store the instrument for a longer period, clean the measuring cell as described in section 12.1.

For storage lasting less than one day, fill the measuring cell with ultra-pure water or with solvent. If you have filled the liquid with the plastic syringe, leave the syringe in the adapter to prevent leakage of the liquid.

12.7 Exchanging the batteries

Battery charge level

A symbol in the header information (3, fig. 6) indicates the battery charge level:

 batteries fully charged

 high

 low

 batteries depleted

When the batteries are almost depleted, the warning “Low Battery” is shown. After the second warning, “Battery Empty”, 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. Empty the measuring cell (see section 8.3).
2. Open the pump lock and remove the pump (see section 12.2).

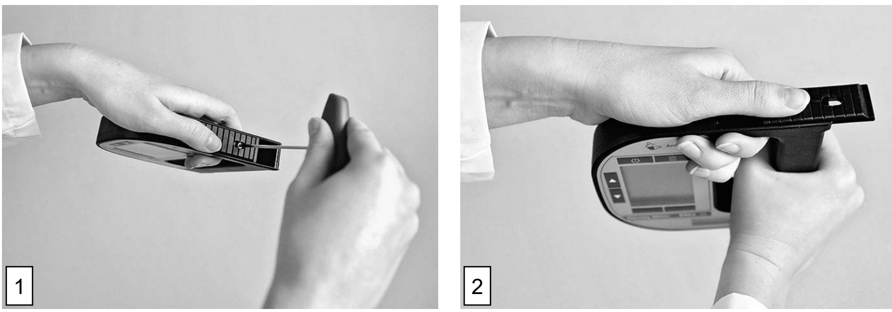


Fig. 11: Removing the pump lock screw (1) and the pump lock (2)

3. Unscrew the pump lock screw with the supplied Allen wrench 2.5 and remove it (1, fig. 11).
4. Remove the pump lock by sliding it outwards (2, fig. 11).
5. Use the supplied Allen wrench 2.5 to open the battery cover.
6. Remove the depleted batteries by turning the instrument upside down.
7. Insert the new batteries.

NOTICE

- Observe the correct polarity when you insert the batteries, see the depiction on the back of the instrument (3, fig. 3).
- Use only batteries of the same type and with the same charge level.

8. Close the battery cover using the supplied Allen wrench 2.5.
9. Reinsert the pump lock and slide it back to the original position.

   Make sure that you slide the pump lock in the correct direction.
10. Fix the pump lock with the Allen screw.
11. Reinsert the pump and close the pump lock.
12. Check that the instrument is working properly by switching it on and checking the display.

12.8 Firmware update

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

1. Establish a connection between DMA 35 and the PC, see section 10.1.
2. Import the firmware file as described in section 10.3.

   After the successful file import, DMA 35 checks the validity of the update file.
3. When “Import valid” is shown, press <OK> to start the installation.

   After successful installation the instrument switches itself back on.

12.9 Device information

The instrument holds system information comprising:

- Manufacturer
- Instrument name
- Serial number of the instrument
- Instrument status:
  - Measured data: *xxxx*/1024
  - IDs: *xxx*/100
  - Methods: *xx*/20
- Firmware version
- Date of the firmware version
- Bootloader version
- Date of the bootloader version
- Hardware status

Accessing device information

• Press <Menu> and select *Setup* > *Device Information*.

The device information can be exported to a PC, see section 10.2.

13 Maintenance and repair

13.1 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.

13.2 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

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

a *Viscosity < 100 mPa·s, density range 0 g/cm^3 to 2 g/cm^3*

A.2: Instrument data and operating conditions

Ambient temperature	–10 °C to +50 °C (+14 °F to +122 °F) The sample must not freeze in the oscillator.
Storage temperature	–20 °C to +70 °C (–4 °F to +158 °F) Empty the measuring cell before storing the instrument.
Air humidity	5 % to 90 % relative humidity, non-condensing
Protection class	IP54 (use in light rain or snow possible)
Display	LCD monochrome, graphical, 160x240 px, 41x55 mm
Data memory	1024 measured data
Interfaces	IrOBEX/IrLPT
Power supply	
Battery type	alkaline battery 1.5 V, type EN91 (LR06, AA) by Energizer Industrial
Battery life	> 100 hours
Dimensions	140 mm x 138 mm x 27 mm (5.5 in x 5.4 in x 1.1 in) (without pump and filling tube)
Weight	345 g (12.2 oz) including batteries

A.3: Wetted parts

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

Material	**Part**
Borosilicate glass	measuring cell, pump cylinder
PP (polypropylene) Faradex MS002	housing
PTFE (polytetrafluoroethylene)	filling tube, piston for hand pump
PVDF (polyvinylidene fluoride)	connection block, bolt
Viton	O-ring

Appendix B: Declarations of conformity

DocuSign Envelope ID: 892384E6-B2E7-4CA7-BB03-B0F1217D010E

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 Version 3**
Model:	**DMA 35 Version 3**
Material number:	84138, 90201

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 — Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

Low Voltage Directive (2014/35/EU, OJ L 96/357 of 29.3.2014)

Applied standards:

- EN 61010-1:2010 +A1:2019 +A1:2019/AC:2019 — Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements

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

Place and date of issue: Graz, 2022-11-21

DocuSigned by:
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DI Steffen Riemer, MBA
Executive Director
Business Unit Measurement

DocuSigned by:
66833374CFAF464...
DI Dr. Wolfgang Baumgartner
Head of Lab Density & Concentration
Business Unit Measurement

www.anton-paar.com | 2022-11-21 | C96 DMA35 V3 EU-Declaration C.docx page 1 von 1

UK Declaration of Conformity

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 Version 3**
Model:	**DMA 35 Version 3**
Material number:	84138, 90201

is in conformity with all the relevant UK legislation

Electrical Equipment (Safety) Regulations 2016, 2016 No. 1101

Electromagnetic Compatibility Regulations 2016, 2016 No. 1091

Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012, 2012 No. 3032

complies with the designated standards:

- EN 61010-1:2010 + A1:2019 + A1:2019/AC:2019
- EN 61326-1:2013

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Importer: Anton Paar Ltd, Unit F, The Courtyard, Hatfield Rd, St Albans AL4 OLA, United Kingdom;

Place and date of issue: Graz, 2022-11-21

DocuSigned by:
17130DDD5260426...
DI Steffen Riemer, MBA
Executive Director
Business Unit Measurement

DocuSigned by:
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DI Dr. Wolfgang Baumgartner
Head of Lab Density & Concentration
Business Unit Measurement

Appendix C: Measuring unit details

ID	Measuring unit	Minimum	Maximum	Unit	Format	Offset format
1	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
2	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
3	Specific Gravity SG	0.0000	3.0000	–	n.nnnn	0.0nnn
4	Period	0000.00	9999.99	µs	nnnn.nn	no offset
5	Raw Data: Period	0000.00	9999.99	µs	nnnn.nn	no offset
	Raw Data: Resistance	1000	200000	Ohm	nnnnn	no offset
6	Baumé	000.0	100.0	°Baumé	nnn.n	00n.n
7	Brix	–10.0	85.0	°Brix	nnn.n	00n.n
8	Extract	–10.0	85.0	°Plato	nnn.n	00n.n
9	H2SO4 % w/w	000.0	070.0	% w/w	nnn.n	00n.n
10	H2SO4 @20 °C	0.8000	2.0000	g/cm^3	n.nnnn	0.0nnn
		0800.0	2000.0	kg/m^3	nnnn.n	00nn.n
11	Alcohol % v/v @20 °C	000.0	100.0	% v/v	nnn.n	00n.n
12	Alcohol % w/w	000.0	100.0	% w/w	nnn.n	00n.n
13	Alcohol US @60 °F	000.0	200.0	Proof	nnn.n	00n.n
14	API Gravity A	–50.0	100.0	°API	nnn.n	00n.n
15	API Gravity B					
16	API Gravity D					
17	API SG A	0.5000	1.5000	–	n.nnnn	0.0nnn
18	API SG B					
19	API SG D					
20	API Density A	0.5000	1.5000	g/cm^3	nnnn.n	0.0nnn
		0500.0	1500.0	kg/m^3	n.nnnn	00nn.n
21	API Density B	0.5000	1.5000	g/cm^3	nnnn.n	0.0nnn
		0500.0	1500.0	kg/m^3	n.nnnn	00nn.n
22	API Density D	0.5000	1.5000	g/cm^3	nnnn.n	0.0nnn
		0500.0	1500.0	kg/m^3	n.nnnn	00nn.n

ID	Measuring unit	Minimum	Maximum	Unit	Format	Offset format
23 30 ... 38	Custom Functions	–	–	–	–	–

ID	Measuring unit	ρ_{min} [g/cm^3]	ρ_{max} [g/cm^3]	T_{min} [°C]	T_{max} [°C]	$T_{min\ valid}$ [°C]	$T_{max\ valid}$ [°C]
1	Density	0	3	–20	80	0	40
2	Density @xx °C	0	3	–20	80	0	40
3	Specific Gravity SG	0	3	–20	80	0	40
4	Period	–	–	–	–	–	–
5	Raw Data: Period	–	–	–	–	–	–
	Raw Data: Resistance	–	–	–	–	–	–
6	Baumé	0.5	2	–20	80	0	40
7	Brix	0.8	2	–20	80	0	40
8	Extract	0.8	2	–20	80	0	40
9	H2SO4 % w/w	0.8	2	0	75	10	40
10	H2SO4 @20 °C	0.8	2	0	75	10	40
11	Alcohol % v/v @20 °C	0.5	1.0	–10	40	0	40
12	Alcohol % w/w						
13	Alcohol US @60 °F						
14	API Gravity A	0.5	1.5	–20	80	0	40
15	API Gravity B						
16	API Gravity D						
17	API SG A	0.5	1.5	–20	80	0	40
18	API SG B						
19	API SG D						
20	API Density A	0.5	1.5	–20	80	0	40
21	API Density B						
22	API Density D						
23 30 ... 38	Custom Functions	–	–	–	–	–	–

Appendix D: Density of water

Table 9: 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 E: Error messages and warnings

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 the adjustment is outside the temperature specifications (15 °C to 25 °C / 59 °F to 77 °F).
Density Range	The density of ultra-pure water at 20 °C (68 °F) measured during adjustment is outside the allowed limits (tolerance 0.01 g/cm^3).
Criterion	The density of ultra-pure water at 20 °C (68 °F) measured during adjustment deviates from factory adjustment by more than 0.01 g/cm^3.
Low Battery	The battery is almost empty.
Battery Empty	The battery is empty.
Error 01	The temperature is invalid.
Error 02	The period is invalid.
Error 03	The instrument has no adjustment data.
Error 04	Calculation error

IMPORTANT: *If any of the error messages “Error xx” occurs, send in your instrument for service by Anton Paar.*

Appendix F: Menu tree

Measured Data	Export	Export All
		Export Selected
		Print All
		Print Selected
Sample-ID	Select ID	
	Enter new ID	
	Edit ID	
Methods	Select Method	
	Enter new Method	
	Edit Method	
Measuring Units	Density	Density
		Density @xx °C
		Specific Gravity SG
	Alcohol	Alcohol % v/v @20 °C
		Alcohol % w/w
		Alcohol US @60 °F
	API	API Gravity A
		API Gravity B
		API Gravity D
		API SG A
		API SG B
		API SG D
		API Density A
		API Density B
		API Density D
	Baumé	
	H2SO4	H2SO4 % w/w
		H2SO4 @20 °C
	Sugar	Brix
		Extract
	Custom Functions	
	Period	
	Raw Data	
Adjustment	Water Adjustment	
	Custom Adjustment	
	Custom Offset	
	Factory Adjustment	

Setup	Measurement Mode	Precise; Fast; Manual	
	Import / Export	Send to PC	Custom Functions
			Adjustment
			Device Information
			Sample-ID List
			Methods
			System Settings
			Measured Data
		Receive from PC	
		Data Format	Format: CSV; TXT
			Delimiter: . ; /
			Decimalpoint: . ,
	Set Password		
	Date and Time	Set Date and Time	
		Date Format	dd.mm.yy
			dd.mm.yyyy
			yy-mm-dd
			yyyy-mm-dd
			mm/dd/yy
			mm/dd/yyyy
		Time Format	24 hours
			am/pm
	Softkey	ID; Method; Store; Print	
	Display Contrast	–8, ..., +8	
	Backlight	On; Auto; Off	
	Energy Saving	Off; 3 min; 5 min; 10 min	
	Beep	On; Off	
	Units	Density: g/cm^3; kg/m^3; lb/gal	
		Temperature: °C; °F	
	Language	English	
		German	
		French	
		Spanish	
	Device Information		