DOC222.53.90639

DR300

Service Manual

02/2019, Edition 2

Table of Contents

Section 1 Specifications

Specifications are subject to change without notice.

Specification	Details
Dimensions (W x H x D)	6.9 x 15.7 x 3.4 cm (2.7 x 6.2 x 1.3 in.)
Enclosure	IP67, waterproof at 1 m (3.3 ft) for 30 minutes when battery compartment is closed and locked.
Light source	Light emitting diode (LED)
Detector	Silicon photodiode
Display	LCD with backlight
Weight	0.25 kg (0.55 lb)
Power requirements	4 AAA batteries; approximate life of 5000 tests (use of backlight decreases this number) Rechargeable batteries are not recommended.
Operating environment	0 to 50 °C (32 to 122 °F), 0 to 90% relative humidity non-condensing
Storage temperature	–20 to 55 °C (–4 to 131 °F), 0 to 80% relative humidity non-condensing
Wavelength	Fixed wavelength ±2 nm, different for each model
Filter bandwidth	15 nm
Absorbance range	0 to 2.5 Abs
Sample cell	25 mm (10 mL) and 1 cm (10 mL)
Data storage	Last 50 measurements
Bluetooth® [1]	Bluetooth® is on when the optional Hach Communication Dongle is installed.
Certifications	CE
Warranty	1 year (EU: 2 years)

[1] The Bluetooth® word mark and logos are registered trademarks owned by the Bluetooth SIG, Inc. and any use of such marks by HACH is under license.

In no event will the manufacturer be liable for direct, indirect, special, incidental or consequential damages resulting from any defect or omission in this manual. The manufacturer reserves the right to make changes in this manual and the products it describes at any time, without notice or obligation. Revised editions are found on the manufacturer's website.

2.1 Safety information

NOTICE

The manufacturer is not responsible for any damages due to misapplication or misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect processes during a possible equipment malfunction.

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. Do not use or install this equipment in any manner other than that specified in this manual.

2.1.1 Use of hazard information

⚠DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠WARNING

Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

⚠CAUTION

Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE

Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.

2.1.2 Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol on the instrument is referenced in the manual with a precautionary statement.

	This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information.
	Electrical equipment marked with this symbol may not be disposed of in European domestic or public disposal systems. Return old or end-of-life equipment to the manufacturer for disposal at no charge to the user.

2.1.3 Certification

Canadian Radio Interference-Causing Equipment Regulation, IECS-003, Class B:

Supporting test records reside with the manufacturer.

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de classe B répond à toutes les exigences de la réglementation canadienne sur les équipements provoquant des interférences.

FCC Part 15, Class "B" Limits

Supporting test records reside with the manufacturer. The device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

1. The equipment may not cause harmful interference.
2. The equipment must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this equipment not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at their expense. The following techniques can be used to reduce interference problems:

1. Move the equipment away from the device receiving the interference.
2. Reposition the receiving antenna for the device receiving the interference.
3. Try combinations of the above.

2.2 Product overview

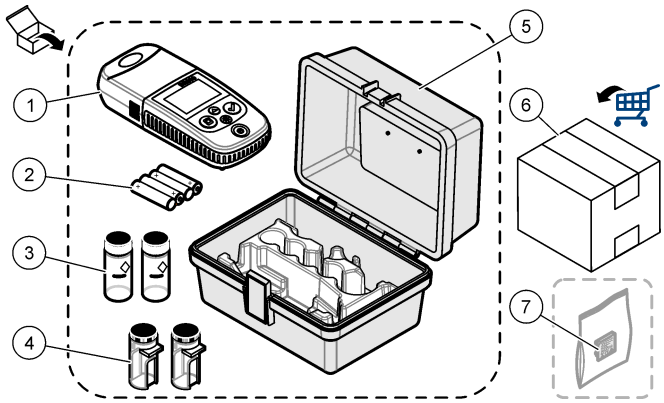
This instrument is a portable filter photometer used for testing water.

Note: *This instrument has not been evaluated to measure chlorine and chloramines in medical applications in the United States.*

2.3 Product components

Make sure that all components have been received. Refer to Figure 1. If any items are missing or damaged, contact the manufacturer or a sales representative immediately. Figure 1 is an example and shows the parts supplied with LPV445.99.00110. Other instruments come with different components.

Figure 1 Product components

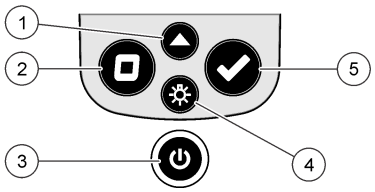


1 DR300	**5** Storage case
2 AAA alkaline batteries	**6** Reagents
3 Sample cells, 25 mm (10 mL), glass	**7** Hach Communication Dongle (optional, supplied separately)
4 Sample cells, 1 cm (10 mL), plastic	

2.4 Keypad description

Figure 2 shows the keypad and gives the key functions.

Figure 2 Keypad

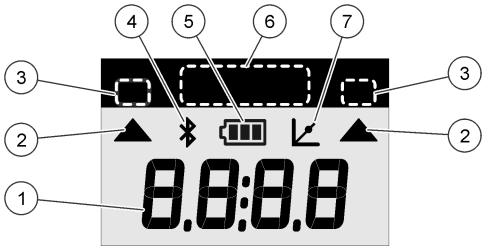


1 Range key: Selects the measurement range (e.g., LR or HR). Push and hold for 3 seconds to enter or exit menu mode. In menu mode, scrolls up or increases the value of the selected digit.	**4 Backlight key:** Sets the backlight to on and off. In menu mode, scrolls down or decreases the value of the selected digit.
2 Zero key: Sets the zero value before a measurement. In menu mode, goes back one menu level or moves the cursor to the previous digit.	**5 Read key:** Starts a sample measurement. In menu mode, selects the menu option shown or moves the cursor to the next digit.
3 Power key: Sets the power to on and off. Push and hold for 5 seconds to reset the instrument. The calibration is not deleted.	

2.5 Display description

Figure 3 shows the values and icons shown on the display.

Figure 3 Display



1 Numeric display: Measured value or menu options	**5 Battery icon:** Battery power level. Flashes when the battery power level is low.
2 Range icon: Points to the selected measurement range	**6** Parameter and measurement ranges
3 Measurement ranges or parameters	**7 Calibration adjusted icon:** The factory default calibration was adjusted or a user-entered calibration curve was entered.
4 Bluetooth® icon: Bluetooth® is on[2].	

[2] Shows when the Hach Communication Dongle is installed.

Section 3 Startup

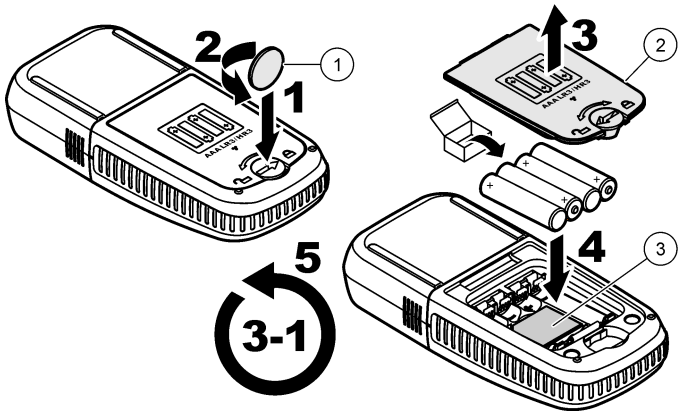
3.1 Install the batteries

⚠WARNING

Explosion hazard. Incorrect battery installation can cause the release of explosive gases. Be sure that the batteries are of the same approved chemical type and are inserted in the correct orientation. Do not mix new and used batteries.

Refer to Figure 4 to install the batteries. Then, push ⏻ to set the instrument to on.

Figure 4 Install the batteries



1 Coin	**3** Plastic insert for dongle[3]
2 Battery cover	

3.2 Set the time

Set the time (24-hour format).

1. Push and hold ▲ for 3 seconds to enter menu mode.
   The time shows (or 00:00).
2. Push ✔ to set the time.
3. Push the ▲ or ☼ to change the number that flashes. Push ✔ to go to the next digit. Push ◘ to go to the previous digit.

3.3 Do a test

⚠DANGER

Chemical or biological hazards. If this instrument is used to monitor a treatment process and/or chemical feed system for which there are regulatory limits and monitoring requirements related to public health, public safety, food or beverage manufacture or processing, it is the responsibility of the user of this instrument to know and abide by any applicable regulation and to have sufficient and appropriate mechanisms in place for compliance with applicable regulations in the event of malfunction of the instrument.

[3] Only remove the plastic insert to install the Hach Communication Dongle. Refer to the installation instructions supplied with the dongle.

⚠ DANGER

Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

⚠ CAUTION

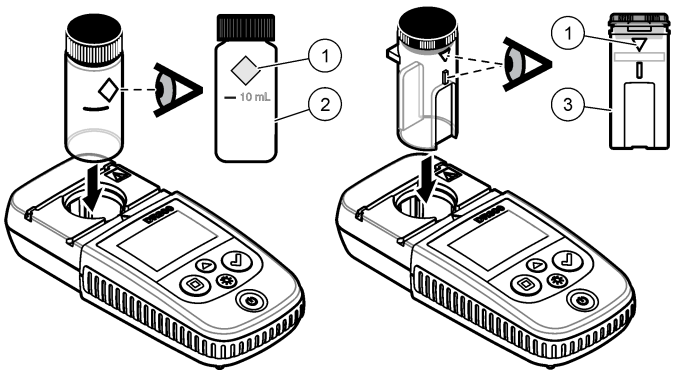
Chemical exposure hazard. Dispose of chemicals and wastes in accordance with local, regional and national regulations.

The generic steps to do a test follow.

To do a test for a specific parameter (e.g., chlorine), download the test procedure from the manufacturer's website. Refer to Download a test procedure on page 11.

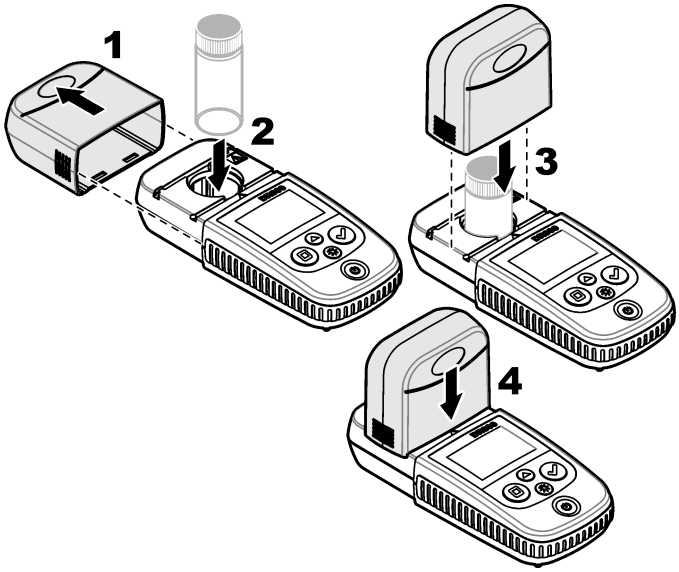
1. Push ▲ to select the applicable measurement range (e.g., LR or HR).
2. Prepare the blank. Refer to the test procedure.
3. Clean the sample cell with a no-lint cloth.
4. Insert the blank sample cell into the cell holder. Make sure to install the blank sample cell in the correct and consistent orientation so that the results are more repeatable and precise. Refer to Figure 5.
5. Install the instrument cap over the cell holder. Refer to Figure 6.
6. Push ▯ to set the instrument zero.
7. Remove the blank sample cell.
8. Prepare the sample. Refer to the test procedure.
9. Clean the sample cell with a no-lint cloth.
10. Insert the sample cell into the cell holder. Make sure to install the sample cell in the correct and consistent orientation so that the results are more repeatable and precise. Refer to Figure 5.
11. Install the instrument cap over the cell holder. Refer to Figure 6.
12. Push ✔. The display shows the results in concentration units or absorbance.
    Note: *The result flashes if the result is less or more than the instrument range.*
13. Remove the sample cell from the cell holder.
14. Immediately empty and rinse the sample cell. Rinse the sample cell and cap three times with deionized water (or distilled water).
    Note: *As an alternative, use tap water to rinse the sample cell if the samples measured have a higher concentration than the tap water.*

Figure 5 Sample cell orientation



1 Orientation mark[4]	**2** Sample cell, 25-mm (10 mL), glass[5]	**3** Sample cell, 1-cm (10 mL), plastic[6]

Figure 6 Install the instrument cap over the cell holder



3.3.1 Download a test procedure

1. Go to http://www.hach.com.
2. Enter "DR300" in the Search box.
3. Select the applicable instrument from the list.
4. Click the Downloads tab.
5. Scroll down to "Methods/Procedures".
6. Click the link for the applicable test procedure to download it.

3.4 Show measurements

Note: *The instrument saves a maximum of 50 measurements. After 50 measurements are done, new measurements replace the oldest measurements.*

1. Push and hold ▲ for 3 seconds.
2. Push ▲ until "rCL" (recall) shows, then push ✔.

[4] Some variants of the instrument have sample cells without an orientation mark.
[5] Use the glass sample cell for low-range chlorine tests.
[6] Use the plastic sample cell for high-range chlorine tests.

"– 01 –" shows. Measurement 01 is the last measurement done.

3. Push ✔ to scroll forward.

   The measurement number is followed by the measurement value and then the time.

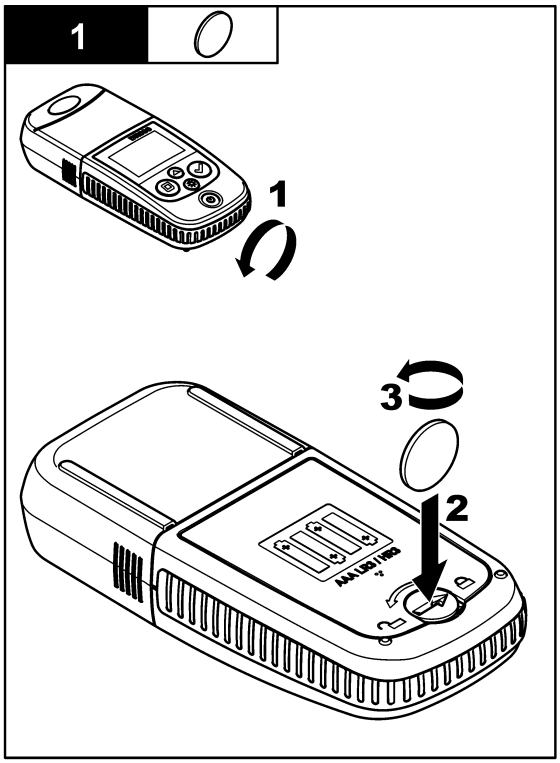
4. To go to a measurement number, push ✔ until a measurement number shows, then push ▲ or ☼.

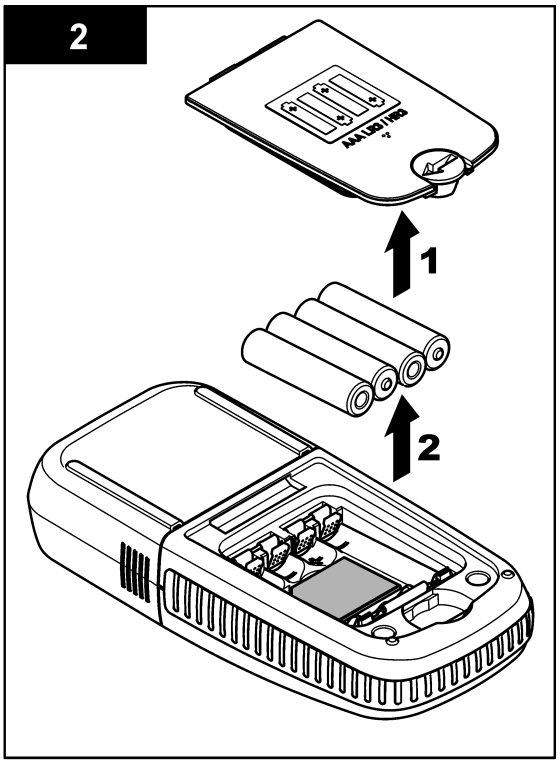
   Note: *Measurements cannot be deleted.*

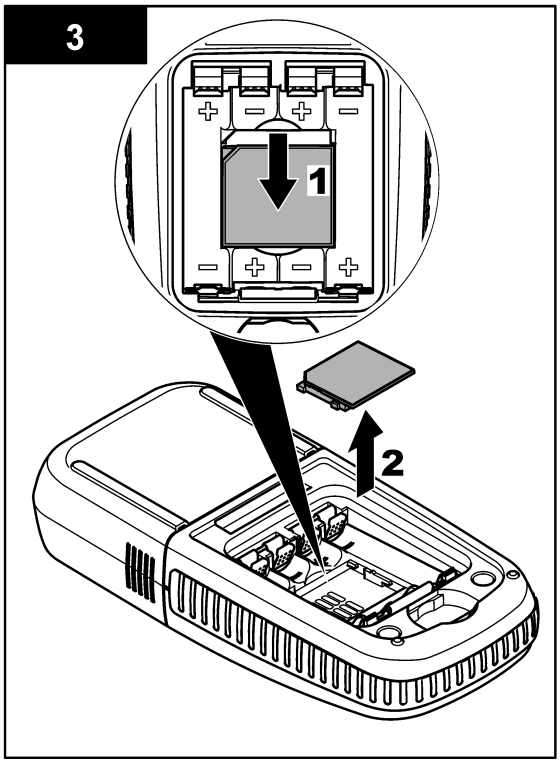
5. Push and hold ▲ for 3 seconds to go back to measurement mode.

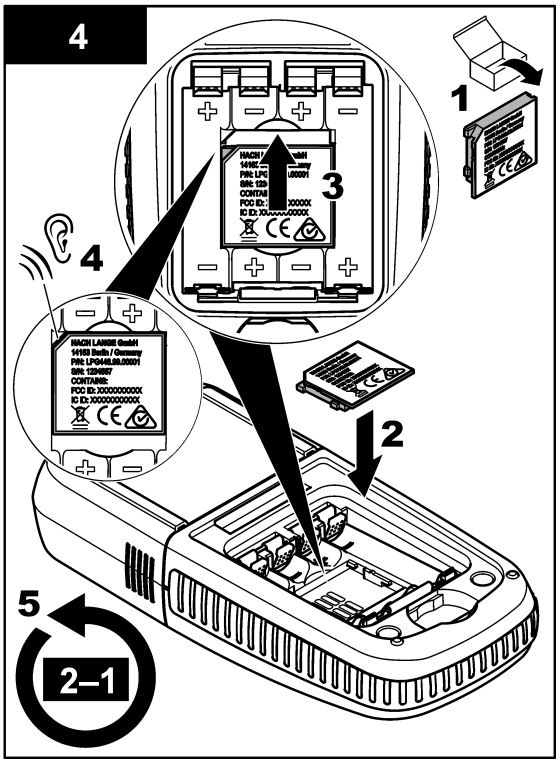
3.5 Install the Bluetooth® Dongle

To install the Hach Communication Dongle do the illustrated steps that follows. After correct installation the display shows the Bluetooth® icon. Refer to Figure 3 on page 8.


1
1
3
2


2
1
2


3
1
2


4
1
3
4
2
5
2–1

Section 4 Inspection

4.1 Visual check

Examine the parts that follow for damage or scratches:

- Housing upper and lower part
- Seal
- Battery cover
- Display window
- Keypad
- Cell compartment
- Springs into the cell compartment

Replace scratched or damaged parts if necessary.

This inspection task is also available as a service video on HSO. HSO full access requires login credentials. First log into HSO and afterwards click on https://support.hach.com/app/answers/answer_view/a_id/1024331. Select the desired service video.

Note: *Following hyperlink without being logged will end in a* ***permission denied*** *information screen.*

4.2 Clean the instrument

Clean the exterior of the instrument with a moist cloth and a mild soap solution and then wipe the instrument dry as necessary.

4.3 Clean the cell compartment

⚠CAUTION

Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

Items to collect:

- Distilled water
- Lint-free cloth
- Compressed air (oil free)

Based on the degree of contamination, clean the cell compartment:

- Use air to blow out dust.
- Use a lint-free cloth with a soft surface to wipe out dust and deposits.
- Moisten a lint-free soft cloth with distilled water. Use this damp cloth to wipe out deposits.

This inspection task is also available as a service video on HSO. HSO full access requires login credentials. First log into HSO and afterwards click on https://support.hach.com/app/answers/answer_view/a_id/1024331. Select the desired service video.

Note: *Following hyperlink without being logged will end in a* ***permission denied*** *information screen.*

4.4 Replace the batteries

Replace the batteries when the battery power level is low. Refer to Install the batteries on page 9.
Note: *Make sure that the batteries and battery contact points show no leakage damage. If so replace the battery contacts or the housing. Refer to* Replace the battery contacts *on page 49* and Replace the housing *on page 47*.

4.5 Inspection with test filter set, service cable, PC and VAP235 software

If the device is in a service center or the service technician has a PC and a service cable (VAA10036.99.G00), the inspection is done with the software VAP235.

- To install the software VAP235, refer to Install VAP235 software on page 16.
- To install the service cable VAA10036.99.G00, refer to Insert the service cable on page 19.
- To do an inspection, refer to Do an inspection with the test filter set, service cable, PC and VAP235 software on page 21.

The software VAP235 and the service cable (VAA10036.99.G00) provide additional functions:

- A software update, refer to Update the software on page 33
- Get the instrument logger, refer to Get the instrument logger on page 56
- Get the data logger, refer to Get the data logger on page 61
- After replacement of the mainboard, set the part number and serial number, refer to Set the part number on page 43 and Set the serial number on page 44
- Set back to delivery state, refer to Set back the instrument to factory settings on page 62

If the service technician does not have a PC and service cable in the field, a field service inspection will be performed. Refer to Do a service inspection with the test filter set and service mode on page 28. A field service inspection includes the following items:

- Check the key functions
- Check the backlight function
- Measure the absorbance of the test filter set VAA10038.99.V00
- Fill out and sign the certification of service inspection

4.5.1 Install VAP235 software

NOTICE

Open the file "installation_VAP235.pdf" and follow the detailed installation instructions.

The software tool VAP235 is a .NET client program for factory or service inspection of a DR300 instrument. The software uses the RS232 serial port to communicate with an instrument. The software will guide the user step by step through the inspection process. If the test passes, a certificate will be saved as a PDF file on the selected path.
Requirements

- Minimum OS: Windows 7 SP1, .NET 4.7.2 (or higher)
- Minimum monitor resolution: 1280 × 1024
- Minimum Microsoft Excel 2010
- VAA10036.99.G00 Service cable

Installation

1. If .NET 4.7.2 is required, unzip VAP235_NET_and_driver.zip and run NDP472-KB405430-x86-x64-AllOS-ENU.exe.
2. If Excel 2010 or newer is not installed, install Excel 2010 or newer.
3. Run VAP235_Vx.x-BLx.xx-UIx.xx-Pxx-Pxx.exe and follow instructions.

Files and templates

After Installation Finalinspection.csv and NominalValues.csv have been installed in the following directory: C:\ProgramData\VAP235\Files (hidden folder). This directory also contains templates for labels and certificates. The newest NominalValue.csv file is stored at https://danaher.sharepoint.com/:f:/r/sites/hch/team/rd/Shared%20Documents/Released%20Software/Service%20Tools/DR300?csf=1.

Note: *Update NominalValues.csv when you received a new or recalibrated test kit.*

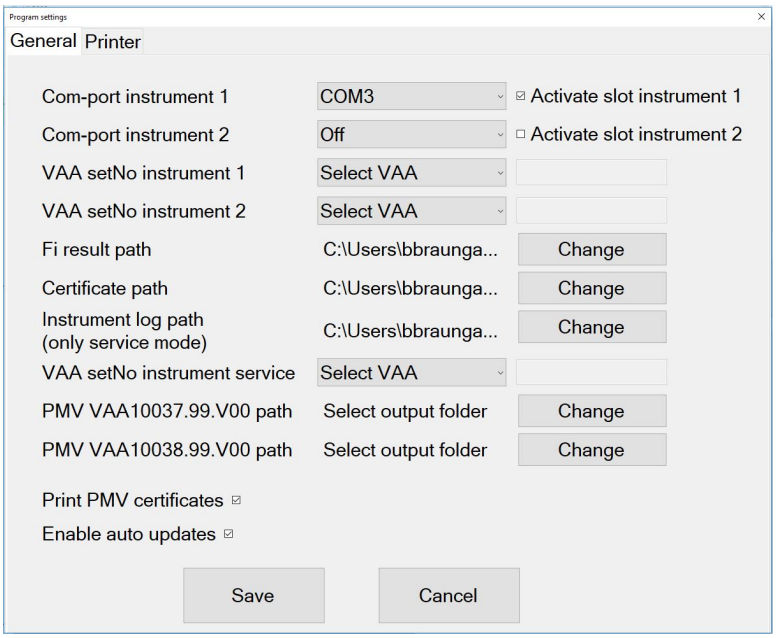
Firmware

After Installation DR300_BLx.xx_CRCxxxx.bin and DR300_UIx.xx_CRCxxxx.bin have been installed in the application directory in the folder Update (for example: C:\Program Files (x86)\VAP235\Update). If you get an updated file, close the program if it is opened and replace the file right here (remove the old one).

Settings

1. Start VAP235.
2. Select the folder **Settings**.
3. Select **Language** and select English, Chinese or German.
4. Select **Program settings**.
5. Select the folder **General**. Refer to Figure 7.
6. Enter the "fi result path" and the "Certificate path" where the certificate is stored. If the paths are not defined during installation, an error message is shown at the first start.
7. Make sure that **Enable updates** is activated. If enabled, VAP235 checks for new application and boot updates that are available and necessary.
8. Push **Save** to save the settings.
9. Select the folder **Mode** and select **Service**.
10. At the next start, the software tool VAP235 will start with the selected settings and the correct mode.

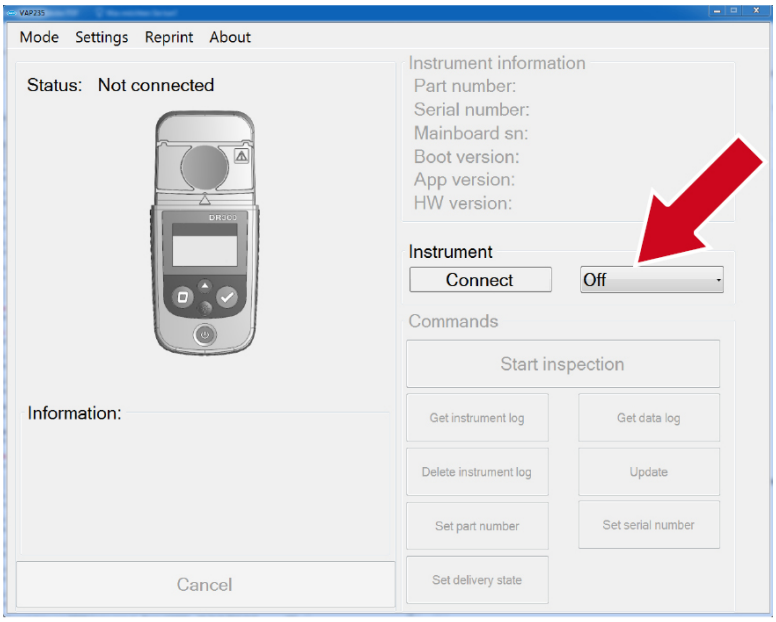
Figure 7 General settings



Preparation for inspection

1. Install the service cable VAA10036.99.G00 in the DR300. Refer to Insert the service cable on page 19.
2. Connect the VAA10036.99.G00 to an USB port.
3. Select the correct com port in the drop-down menu near by the Connect button. Refer to Figure 8. Go to windows device manager and look for USB Serial Port (COMX). Plug in and out the USB to see which com port the USB has.
4. Push ⏻ on the DR300.
5. Push **Connect**.
6. Push **Start inspection**.
7. Enter the set number of the **VAA10038.99.V00**. The set number is shown and automatically used for further inspections.
8. Follow the instructions to complete the first inspection. Refer to Do an inspection with the test filter set, service cable, PC and VAP235 software on page 21.

Figure 8 Set the com port



This task is also available as a service video on HSO. HSO full access requires login credentials. First log into HSO and afterwards click on https://support.hach.com/app/answers/answer_view/a_id/1024331. Select the desired service video.

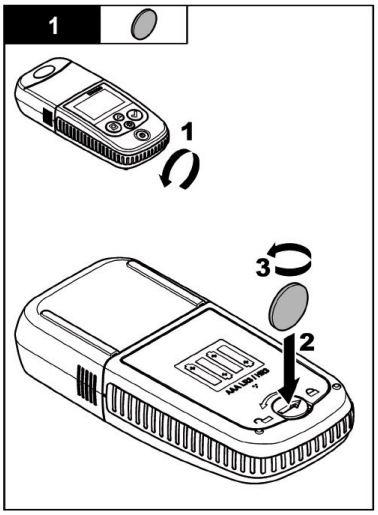
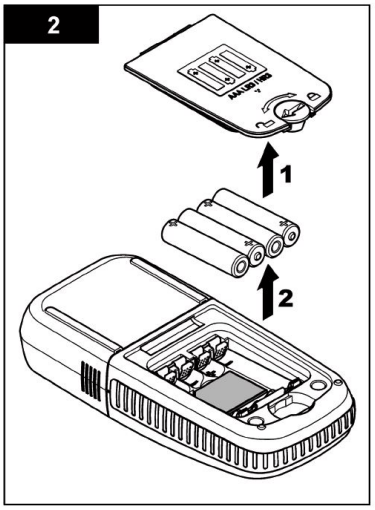
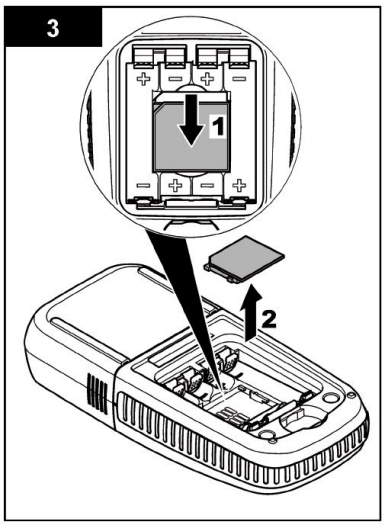
Note: *Following hyperlink without being logged will end in a* ***permission denied*** *information screen.*

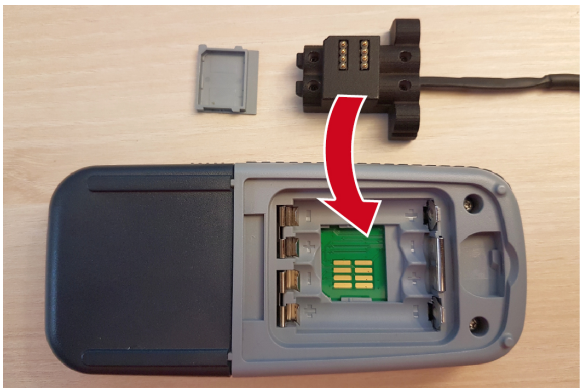
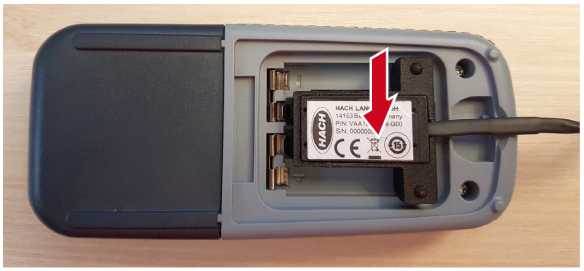
4.5.2 Insert the service cable

Item to collect:

- VAA10036.99.G00: Service cable

- VAP235: Service tool software

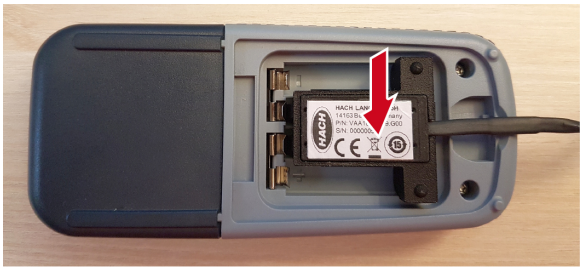
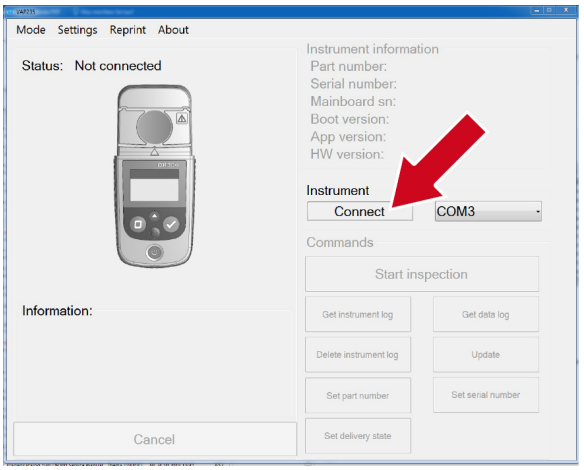
Step	Description	Picture
1	Open the battery cover.	
2	Remove the batteries.	
3	Remove the plastic insert for dongle or the Hach Communication Dongle.	

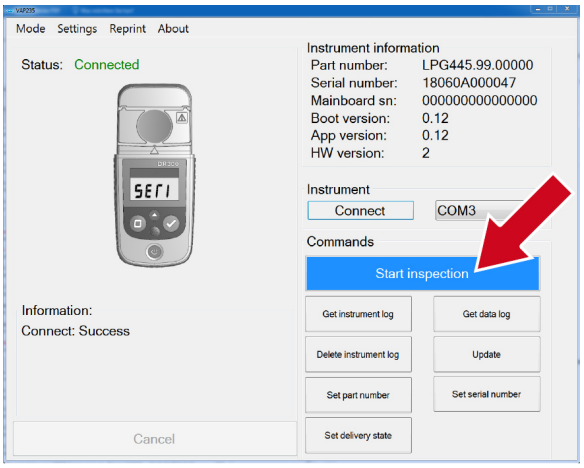
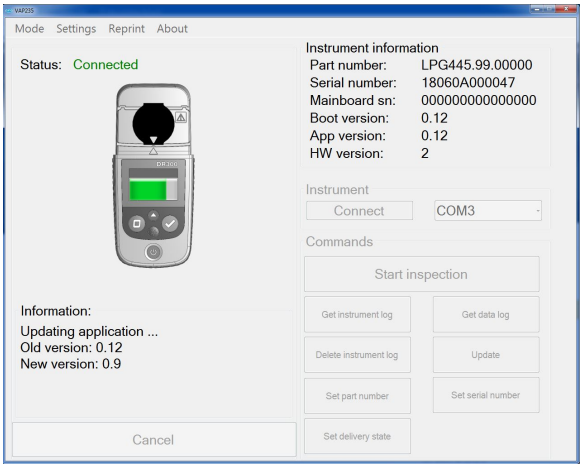
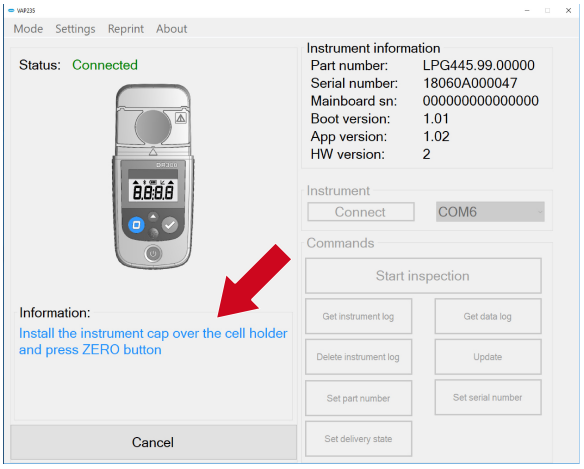
Step	Description	Picture
4	Insert the UART connector of the cable.	
5	Push the connector down.	
6	Connect the USB connector of the cable to a USB-A port of the PC.	
7	Start the service tool software VAP235.	

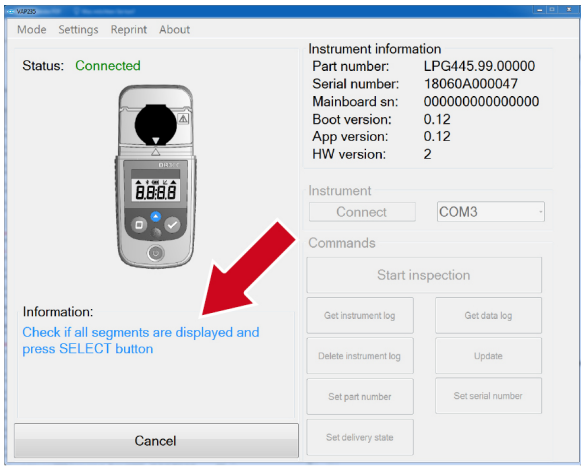
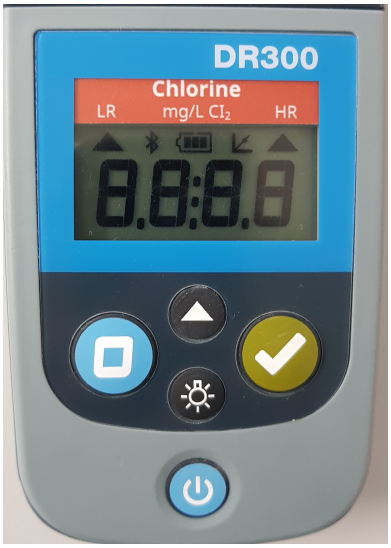
4.5.3 Do an inspection with the test filter set, service cable, PC and VAP235 software

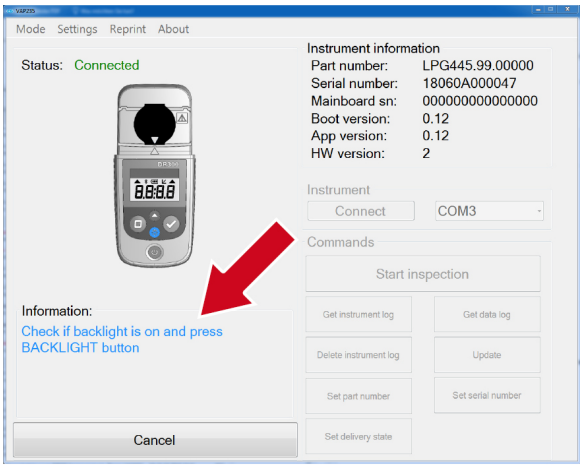
Items to collect:

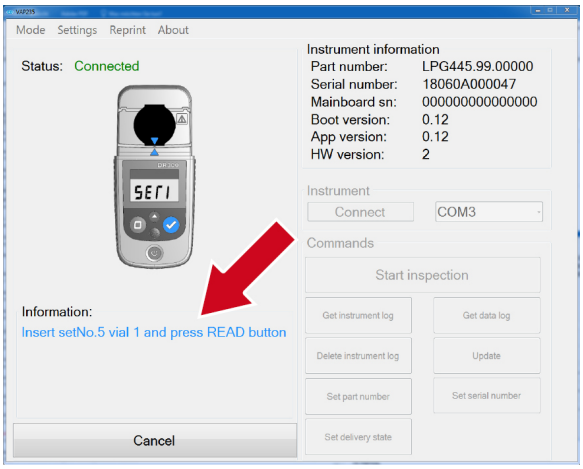
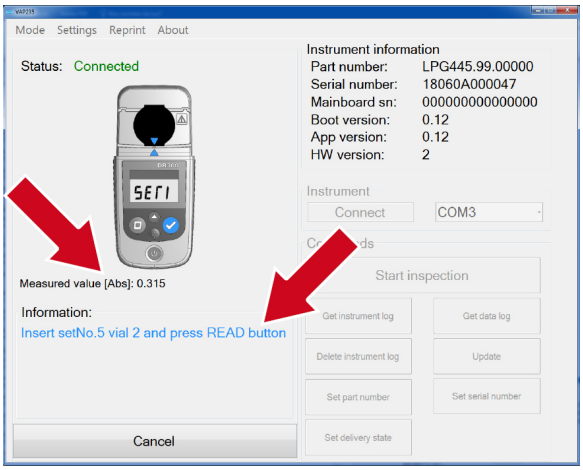
- PC and Software VAP235
- Service cable VAA10036.99.G00
- Test filter set service DR300 VAA10038.99.V00
- Printer (if a printout of the Certificate of Service Inspection is necessary)

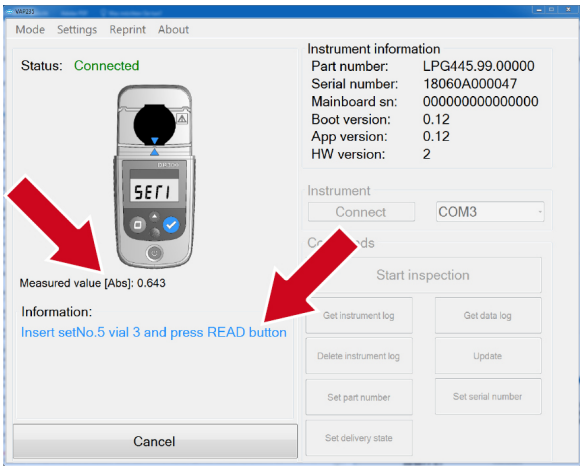
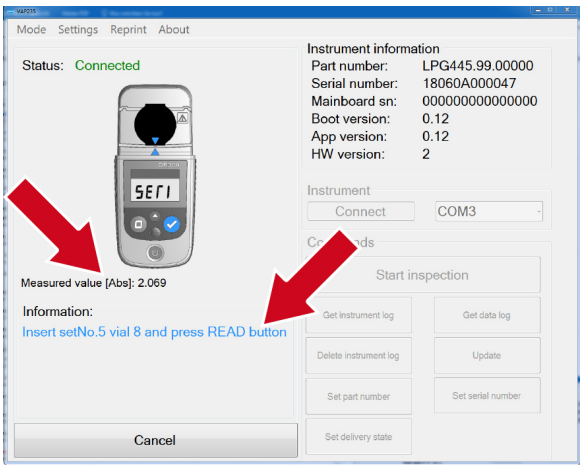
Step	Description	Picture
1	First install the software VAP235. Refer to Install VAP235 software on page 16.	
2	Install the service cable VAA10036.99.G00 in the DR300. Refer to Insert the service cable on page 19.	
3	Connect the service cable VAA10036.99.G00 to an USB port.	
4	Push ⏻ on the DR300.	
5	Push **Connect**.	
6	The display of the DR300 shows 'seri' (serial).	

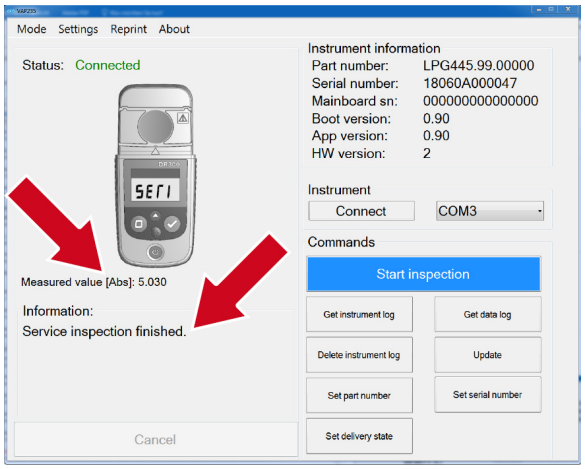
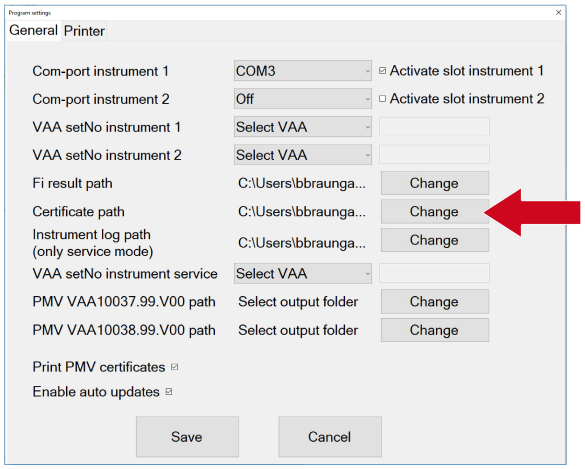
Step	Description	Picture
7	Push **Start inspection**.	
8	The application version and boot version are automatically checked. If VAP235 is configured to perform the update automatically (Enable updates, refer to Install VAP235) the update starts.	
9	Follow the commands. Install the instrument cap over the cell holder and press ZERO button.	

Step	Description	Picture
10	Check if all segments are displayed and press SELECT button.	 

Step	Description	Picture
11	Check if backlight is on and press BACKLIGHT button.	 
12	For the following commands use the test filter set service DR300 VAA10038.99.V00. The used set No.# is shown.	

Step	Description	Picture
13	Insert set No.# vial 1 and press READ button. ***Note:*** *Make sure to install the filter in the correct orientation.* ***Note:*** *The filter is light-tight. Therefore, it is not necessary to install the instrument cap.*	 
14	The measured value of vial 1 (in absorbance) is shown. Insert set No.# vial 2 and press READ button. ***Note:*** *The filter is light-tight. Therefore, it is not necessary to install the instrument cap.*	

Step	Description	Picture
15	The measured value of vial 2 (in absorbance) is shown. Insert set No.# vial 3 and press READ button. ***Note:*** *The filter is light-tight. Therefore, it is not necessary to install the instrument cap.*	
16	The measured value of vial 3 (in absorbance) is shown. Insert set No.# vial 8 and press READ button. ***Note:*** *The filter is light-tight. Therefore, it is not necessary to install the instrument cap.*	

Step	Description	Picture
17	The measured value of vial 8 (in absorbance) is shown. Service inspection finished.	
18	If the inspection completes without error, a Certificate of Service Inspection HDQ303 is automatically stored. Find the pdf file in the path which is defined in Settings > Program Settings > General > Certificate path. Print it out and sign. Refer to Certificate of Service Inspection on page 79. Subsequently, an instrument log is automatically read out. Refer to Figure 11 on page 57. Find the txt file in the path which is defined in Settings > Program Settings > General > Instrument log path. E.g. Logger_LPG445_18060A000047.txt.	

This inspection task is also available as a service video on HSO. HSO full access requires login credentials. First log into HSO and afterwards click on https://support.hach.com/app/answers/answer_view/a_id/1024331. Select the desired service video.

Note: *Following hyperlink without being logged will end in a* ***permission denied*** *information screen.*

4.6 Do a service inspection with the test filter set and service mode

Items to collect:

- VAA10038.99.V00 Test filter set Service DR300
- Certificate of Service Inspection, refer to Certificate of Service Inspection (manually) on page 81

Step	Description	Picture
1	Note the part number and serial number from the DR300 on the Certificate of Service Inspection.	
2	Note the set number and expiration date from VAA10038.99.V00 on the Certificate of Service Inspection.	

Step	Description	Picture
3	Note from the VAA10038.99.V00 Filter set on the Certificate of Service Inspection for each filter: • Wavelength • Nominal value • Minimum value • Maximum value Make sure to note the correct wavelength of the DR300 type. Refer to Set the part number on page 43.	
4	To start the service mode push and hold ▲, then push ⏻ at the same time.	
5	Keep pushing ▲ and release ⏻. Examine the display, all segments must be shown. Release the key.	
6	For a short time the firmware version is shown. Note the firmware on the Certificate of Service Inspection.	
7	The instrument starts the absorbance modus, the display shows AbS.	

Step	Description	Picture
8	Push ☼ and do a backlight test.	
9	• Install the instrument cap on the cell holder. • Push ◘ to set the instrument zero. 0.000 is shown.	

Step	Description	Picture
10	• Insert the NG11 filter into the cell holder. Make sure to install the filter in the correct orientation. • Install the instrument cup. ***Note:*** *The filter is light-tight. Therefore, it is not necessary to install the instrument cap.* • Push ✔ to measure the absorbance. • Make a note of the measured value of the NG11 filter and enter the actual value in the Certificate of Service Inspection.	
11	• Insert the NG5 filter into the cell holder. Make sure to install the filter in the correct orientation. • Install the instrument cup. ***Note:*** *The filter is light-tight. Therefore, it is not necessary to install the instrument cap.* • Push ✔ to measure the absorbance. • Make a note of the measured value of the NG5 filter and enter the actual value in the Certificate of Service Inspection.	

Step	Description	Picture
12	• Insert the NG3 filter into the cell holder. Make sure to install the filter in the correct orientation. • Install the instrument cup. ***Note:*** *The filter is light-tight. Therefore, it is not necessary to install the instrument cap.* • Push ✔ to measure the absorbance. • Make a note of the measured value of the NG3 filter and enter the actual value in the Certificate of Service Inspection.	
13	• Insert the BG3 filter into the cell holder. Make sure to install the filter in the correct orientation. • Install the instrument cup. ***Note:*** *The filter is light-tight. Therefore, it is not necessary to install the instrument cap.* • Push ✔ to measure the absorbance. • Make a note of the measured value of the BG3 filter and enter the actual value in the Certificate of Service Inspection.	
14	• Remove the filter. • Install the instrument cup. • Push ✔ to measure the absorbance of the air. • Make a note of the measured air value and enter the actual value in the Certificate of Service Inspection.	
15	If the measurements are within limits and the display and function keys are OK, fill out the Certificate of Service Inspection and sign. Refer to Certificate of Service Inspection (manually) on page 81.	

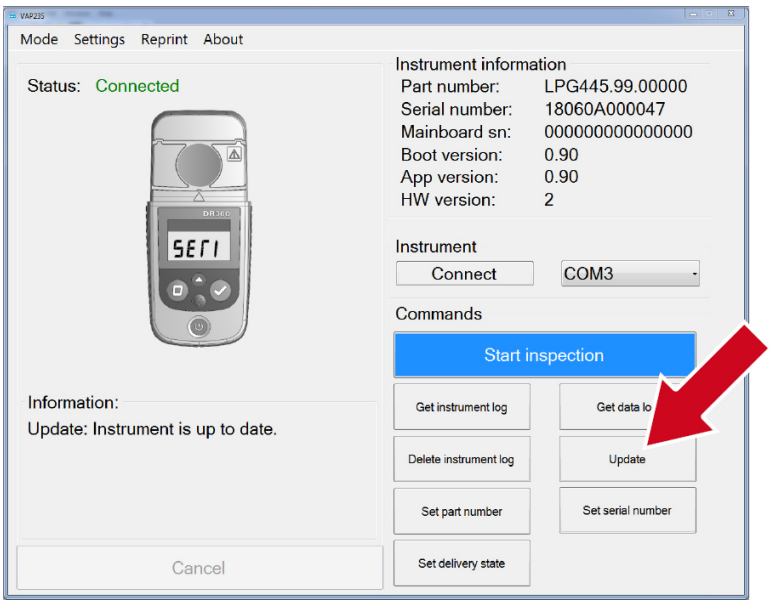
This inspection task is also available as a service video on HSO. HSO full access requires login credentials. First log into HSO and afterwards click on https://support.hach.com/app/answers/answer_view/a_id/1024331. Select the desired service video.

Note: *Following hyperlink without being logged will end in a* ***permission denied*** *information screen.*

4.7 Update the software

1. Install the service cable VAA10036.99.G00 in the DR300. Refer to Insert the service cable on page 19.
2. Start the VAP235 software.
3. Connect the service cable VAA10036.99.G00 to an USB port.
4. Push ⏻ on the DR300.
5. Push **Connect**. The display of the DR300 shows serial.
6. Push **Update**. Refer to Figure 9.
7. If no update is necessary the information "Instrument is up to date" is shown.
   Note: *If VAP235 is configured to perform the update automatically (Enable updates, refer to Figure 7 on page 18) an manually update of the software is not necessary.*

Figure 9 Update the software



⚠ DANGER

Electrocution hazard. Remove power from the instrument before this procedure is started.

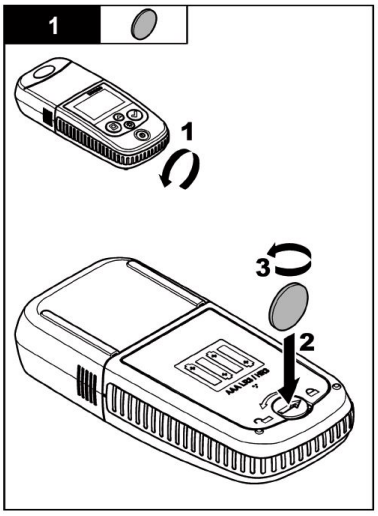
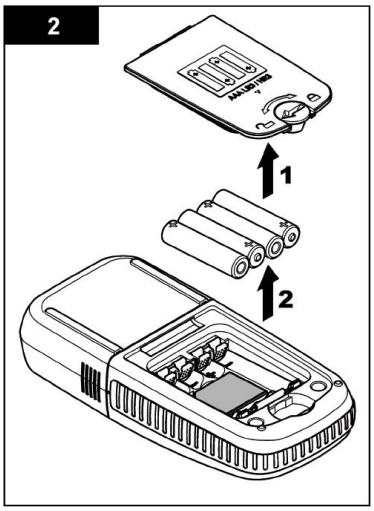
⚠ WARNING

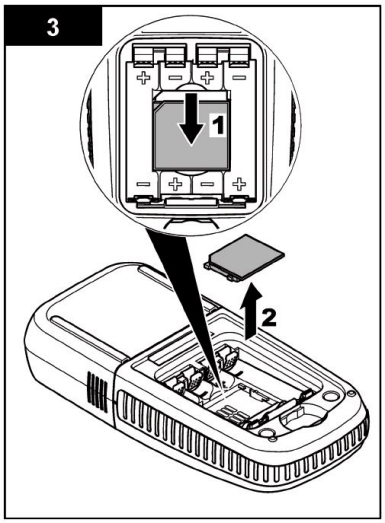
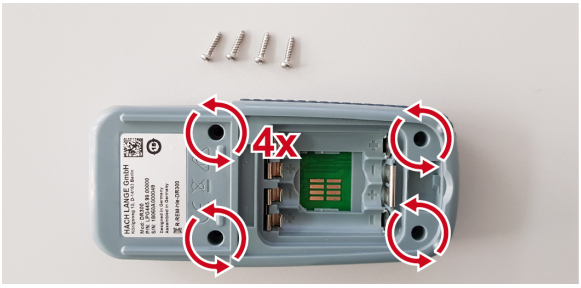
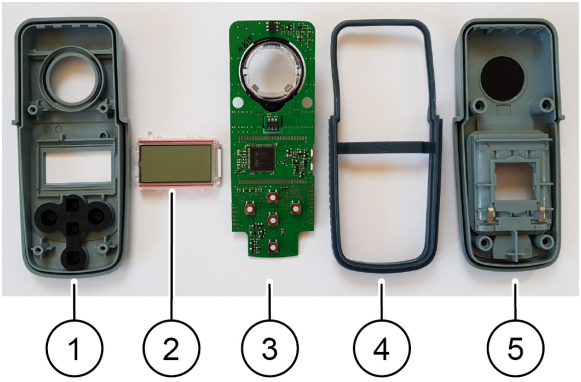
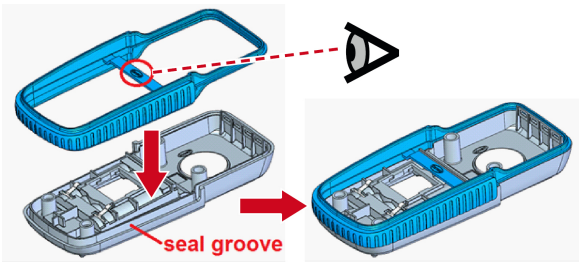
Chemical exposure hazard. Obey laboratory safety procedures and wear all of the personal protective equipment appropriate to the chemicals that are handled. Refer to the current safety data sheets (MSDS/SDS) for safety protocols.

5.1 Open the instrument

Items to collect:

- Coin
- TORX 10 torque screw driver
- Krytox oil (item no. 16004801)

Step	Description	Picture
1	To open the battery compartment, use a coin.	
2	Remove the batteries.	

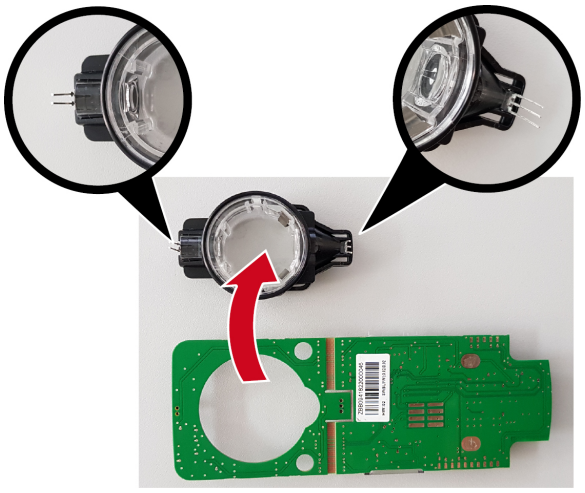
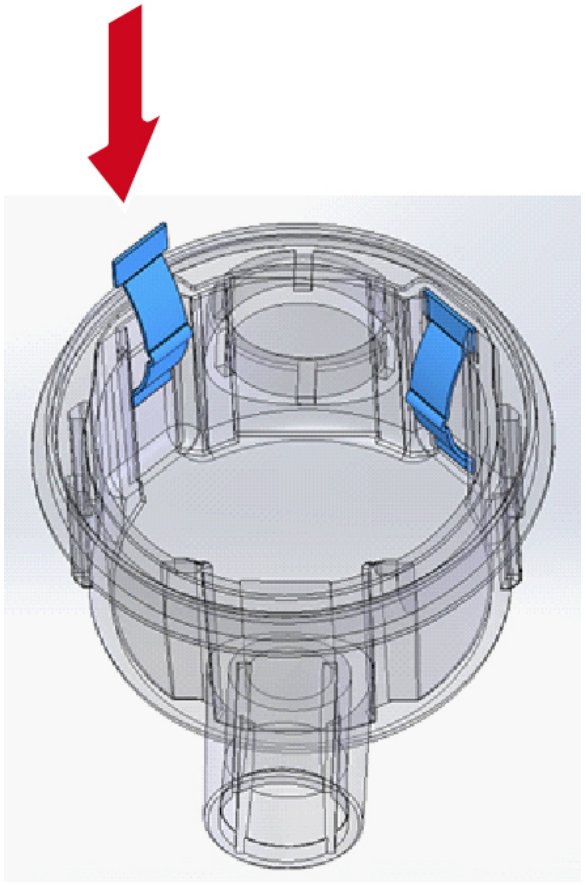
Step	Description	Picture
3	Remove the plastic insert for dongle or the Hach Communication Dongle.	
4	To remove the screws (4x), use a TORX T10 torque screw driver.	
5	Open the instrument. **1.** Top housing including keypad **2.** Display **3.** Mainboard including optical unit **4.** Seal **5.** Bottom housing	
6	To reassemble the instrument, follow the previous steps in reverse order. ***Note:*** *Coat the seal groove with Krytox oil.* ***Note:*** *Make sure that the seal is in the correct orientation.* ***Note:*** *Make sure that the screws are tightened to 0.8 Nm.*	

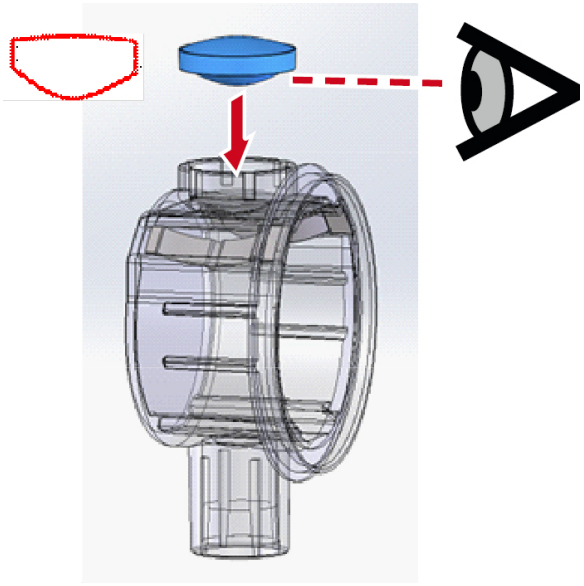
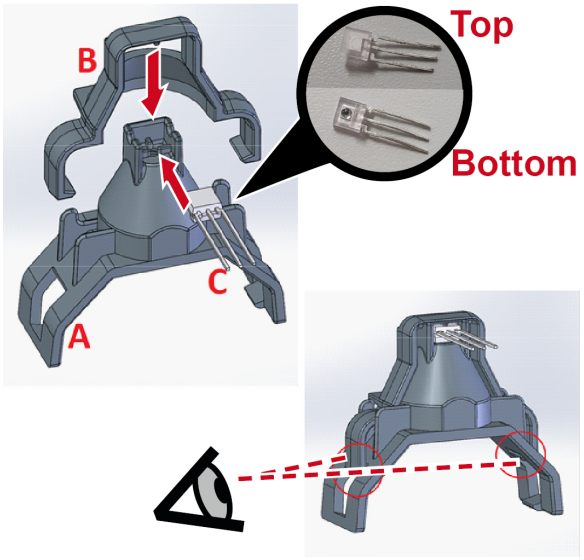
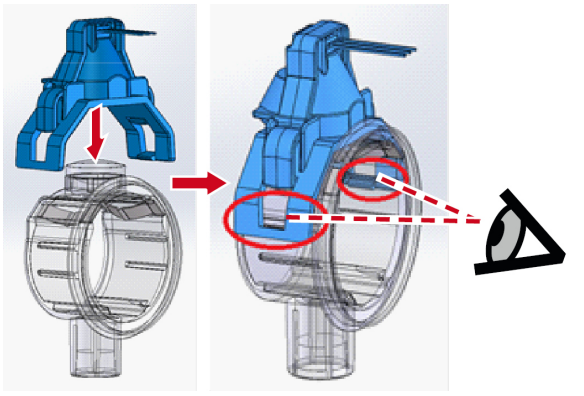
5.2 Replace the optical unit

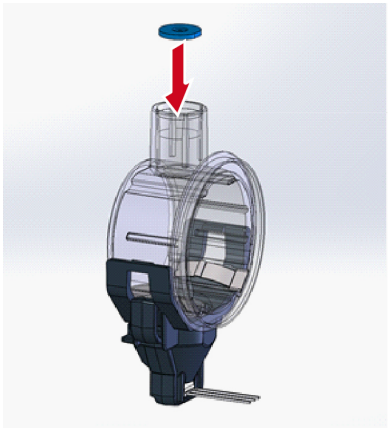
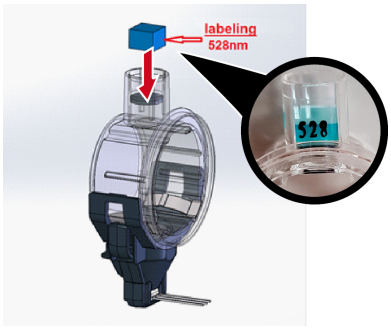
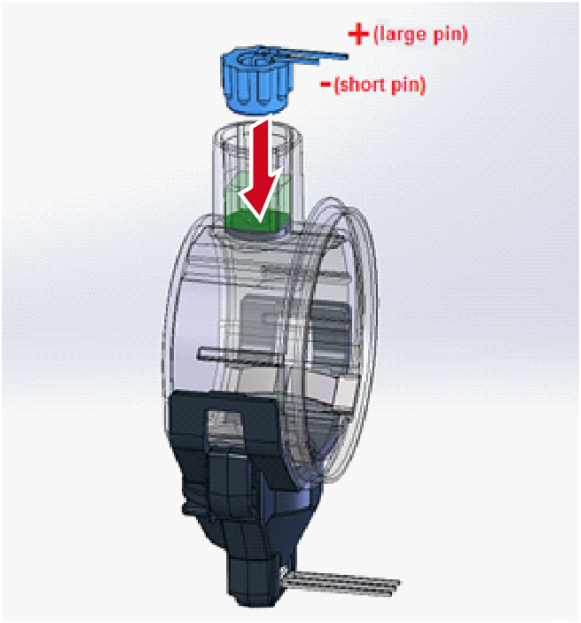
Items to collect:

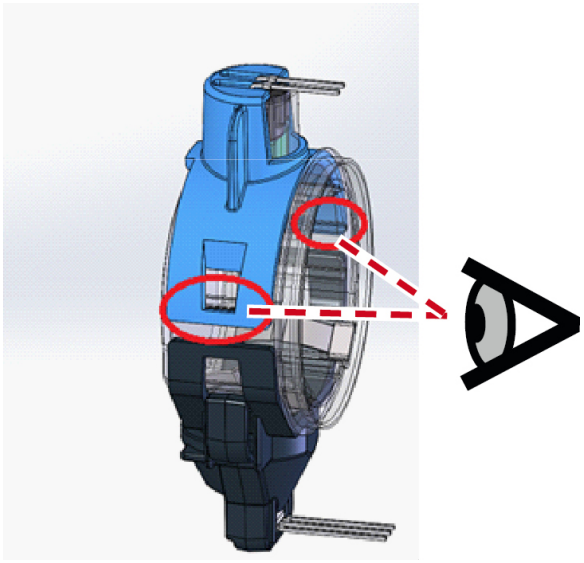
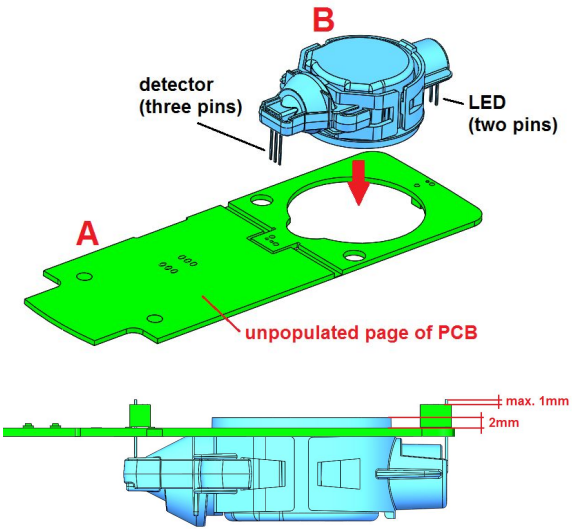
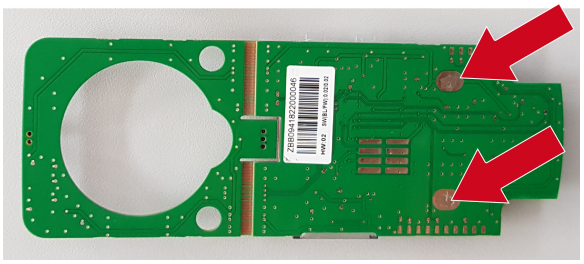
- Optical cup
- Retaining springs (2x)
- Lens
- Retainer detector
- Detector clip
- Detector (IC converter light to frequency)
- Aperture
- Interference filter
- Housing for LED
- LED white
- O-ring
- Wire cutter

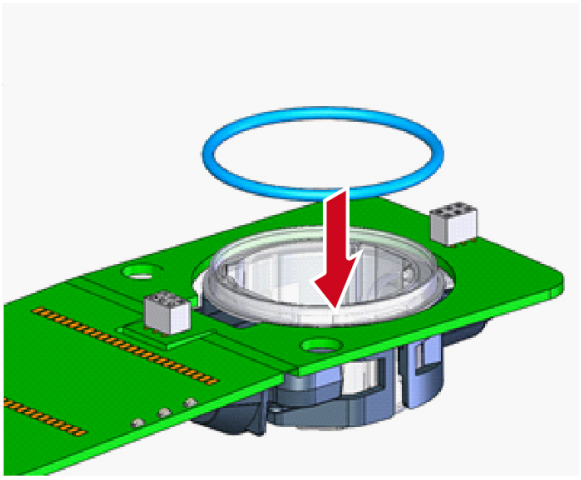
- Krytox oil (item no. 16004801)

Step	Description	Picture
1	Open the instrument, refer to Open the instrument on page 35. Remove the optical unit from the mainboard.	
2	Insert retainer springs (2x) in the optical cup. Push the springs in the correct position.	

Step	Description	Picture
3	Insert the lens. ***Note:*** *Make sure that the larger curvature of the lens points downwards.*	
4	To mount the detector assembly, slide the retainer (A) in the detector clip (B). Do not lock it yet. Insert the detector (C), the lens points downwards. Snap the retainer on the detector clip.	
5	Snap the detector assembly over the optical unit.	

Step	Description	Picture
6	Turn the optical unit and insert an aperture.	
7	Insert the interference filter. ***Note:*** *Make sure that the wavelength is correct.* ***Note:*** *Make sure that the wavelength label is readable.*	
8	Push the LED head in the housing. Bend the pins 90°. Note the polarity and direction. Push the housing in the optical unit.	

Step	Description	Picture
9	Snap the LED retainer in the optical unit.	
10	Assemble the optical unit with the mainboard. Carefully insert the pins of LED and detector into the plugs and press the optical unit against the mainboard. Make sure that the optical unit overlaps the mainboard for 2 mm. Use protective glasses and cut the pins of LED and detector on the compartment side of the mainboard to a length of 1 mm over the plugs.	
11	***Note:*** *Make sure that the contact surfaces on the mainboard are not touched.*	

Step	Description	Picture
12	Install the O-ring seal to the optical unit. ***Note:*** *Make sure that the contact surfaces on the mainboard are not touched. Touch the mainboard only at the side.*	
13	Reassemble the instrument. ***Note:*** *Coat the seal groove with Krytox oil.*	
14	After replacing the optical unit an inspection is necessary. Refer to Do a service inspection with the test filter set and service mode on page 28 or to Do an inspection with the test filter set, service cable, PC and VAP235 software on page 21. If the setpoints of the VAA10038.99.V00 Test filter set are not met, refer to Troubleshooting on page 53.	

This repair task is also available as a service video on HSO. HSO full access requires login credentials. First log into HSO and afterwards click on https://support.hach.com/app/answers/answer_view/a_id/1024331. Select the desired service video.

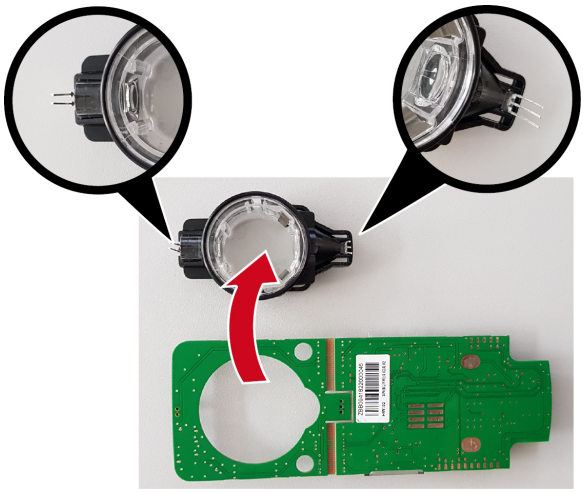
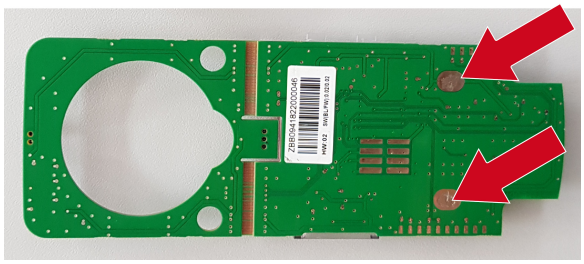
Note: *Following hyperlink without being logged will end in a* ***permission denied*** *information screen.*

5.3 Replace the mainboard

Items to collect:

- Mainboard
- Krytox oil (item no. 16004801)
- VAA10036.99.G00: Service cable

- VAP235: Service tool software

Step	Description	Picture
1	Open the instrument, refer to Open the instrument on page 35.	
2	Remove the optical unit carefully. ***Note:*** *Make sure that the contact pins are not damaged.*	
3	To reassemble the mainboard, follow the previous steps in reverse order. ***Note:*** *Coat the battery contact surfaces on the mainboard with Krytox oil.* ***Note:*** *Coat the seal groove with Krytox oil.*	
4	After replacing the mainboard it is necessary • to set the part number. Refer to Set the part number on page 43. • to set the serial number. Refer to Set the serial number on page 44. • to do an inspection. Refer to Do an inspection with the test filter set, service cable, PC and VAP235 software on page 21.	

This repair task is also available as a service video on HSO. HSO full access requires login credentials. First log into HSO and afterwards click on https://support.hach.com/app/answers/answer_view/a_id/1024331. Select the desired service video.

Note: *Following hyperlink without being logged will end in a* ***permission denied*** *information screen.*

5.3.1 Set the part number

Note: *It's not allowed to reconfigure an instrument to another parameter!*

1. Install the service cable VAA10036.99.G00 in the DR300. Refer to Insert the service cable on page 19.
2. Start the VAP235.
3. Connect the VAA10036.99.G00 to an USB port.
4. Push ⏻ on the DR300.
5. Push **Connect**. The display of the DR300 shows Service.

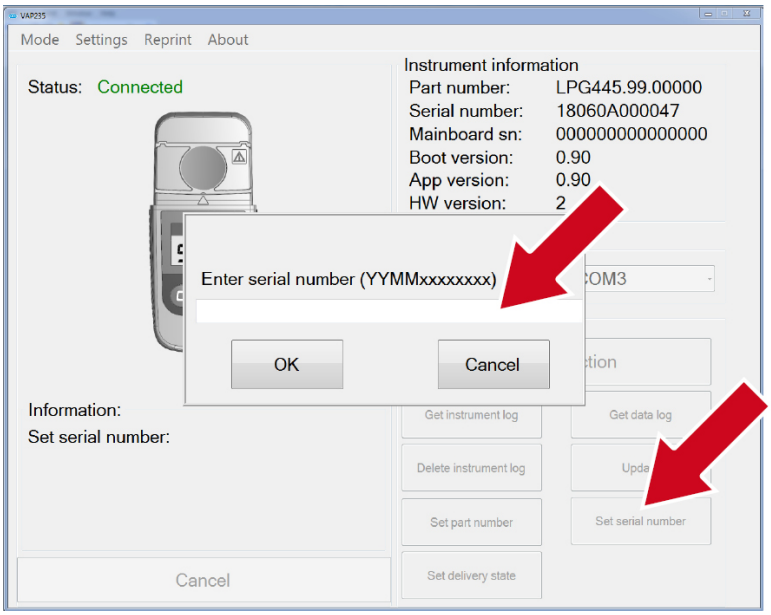
6. Push **Set part number**.
7. Select the part number of the device. Confirm with OK or cancel.

Part number	Parameter	Range left	Range right	Label number	Wavelength [nm]
LPG445.99.00000	Chlorine	LR	HR	HDB212	528
LPG445.99.01000	Bromine	LR	HR	HDB230	528
LPG445.99.02000	Nitrate	1	2	HDB229	528
LPG445.99.03000	Dissolved Oxygen	mg/L O_2	abs	HDB231	528
LPG445.99.04000	Ozone	LR	MR	HDB228	600
LPG445.99.06000	Phosphate	1	2	HDB227	600
LPG445.99.09000	Zinc	mg/L Zn	abs	HDB223	600
LPG445.99.10000	Molybdenum	LR	HR	HDB219	600
LPG445.99.12000	Chlorine/pH	mg/L Cl_2	pH	HDB216	528
LPG445.99.15000	Manganese-HR	mg/L Mn	abs	HDB233	528
LPG445.99.16000	Iron-TPTZ	mg/L Fe	abs	HDB225	600
LPG445.99.22000	Iron-Ferro Ver®	mg/L Fe	abs	HDB224	500
LPG445.99.25000	Aluminium	mg/L Al	abs	HDB232	528
LPG445.99.26000	Mono/Free NH_3	Cl_2	NH_3-N	HDB221	655
LPG445.99.40000	Ammonia	mg/L NH_3-N	abs	HDB222	655
LPG445.99.50000	500 nm	1	2	HDB234	500
LPG445.99.51000	Chlorine Dioxide	1	2	HDB217	528
LPG445.99.52000	528 nm	1	2	HDB235	528
LPG445.99.60000	600 nm	1	2	HDB236	600
LPG445.99.62000	Chlorine	MR	HR	HDB215	528
LPG445.99.65000	655 nm	1	2	HDB237	655

5.3.2 Set the serial number

1. Install the service cable VAA10036.99.G00 in the DR300. Refer to Insert the service cable on page 19.
2. Start the VAP235.
3. Connect the VAA10036.99.G00 to an USB port.
4. Push ⏻ on the DR300.
5. Push **Connect**. The display of the DR300 shows serial.
6. Push **Set serial number**.
7. Enter the serial number of the device. Confirm with OK or cancel. Refer to Figure 10.

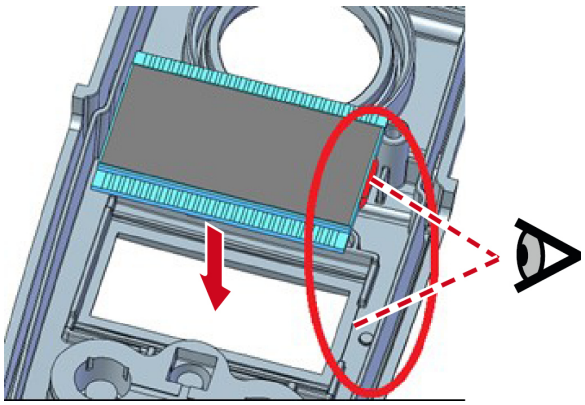
Figure 10 Set serial number

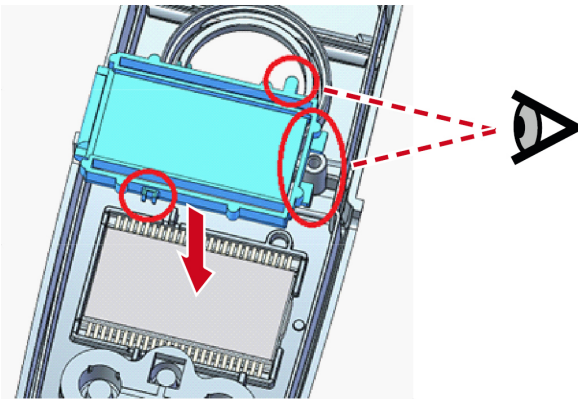
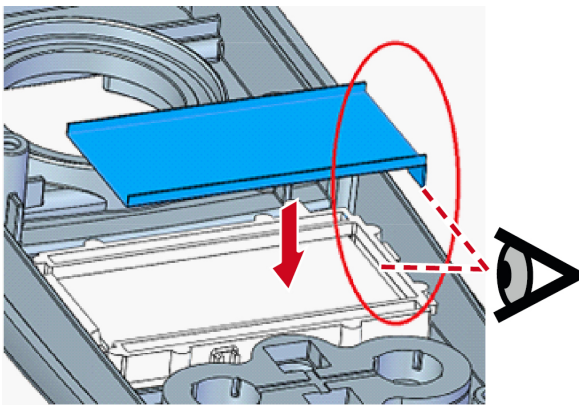
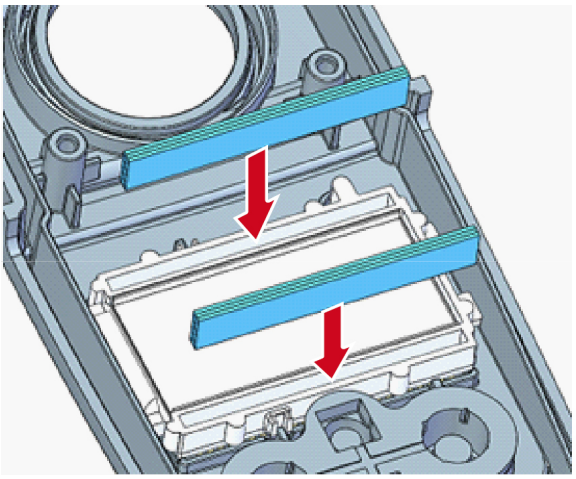


5.4 Replace the display

Items to collect:

- Display
- Display frame
- Backlight reflector label
- Connector, LCD zebra (2x)
- Krytox oil (item no. 16004801)

Step	Description	Picture
1	Open the instrument, refer to Open the instrument on page 35. Remove the display.	
2	To install a new display, remove the protective foil from the front and back side of the display. Insert the display in the housing top. ***Note:*** *Make sure that the bright grey surface faces the inside of the housing.* ***Note:*** *Make sure that the orientation of the nut is in the lead.*	

Step	Description	Picture
3	Insert the display frame. ***Note:*** *Make sure that the orientation of the nut is in the lead.*	
4	Insert the backlight reflector label. ***Note:*** *Make sure that the orientation of the nut is in the lead.*	
5	Insert the connectors (2x) in the slots of the display frame.	
6	To reassemble the instrument. ***Note:*** *Coat the seal groove with Krytox oil.*	

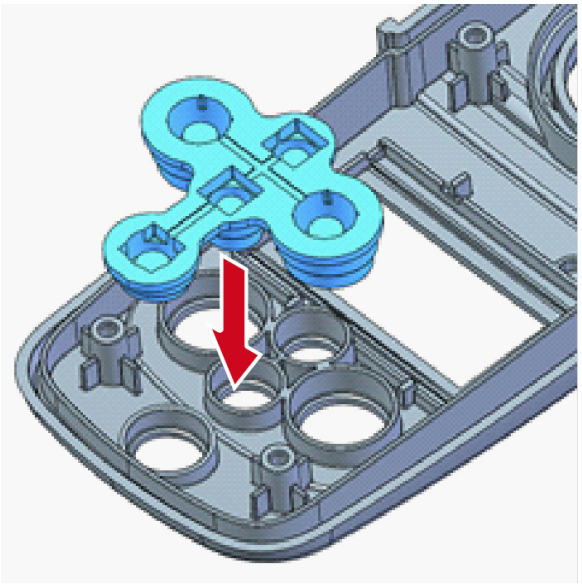
This repair task is also available as a service video on HSO. HSO full access requires login credentials. First log into HSO and afterwards click on https://support.hach.com/app/answers/answer_view/a_id/1024331. Select the desired service video.

Note: *Following hyperlink without being logged will end in a* ***permission denied*** *information screen.*

5.5 Replace the keypad

Items to collect:

- Keypad
- Krytox oil (item no. 16004801)

Step	Description	Picture
1	Open the instrument, refer to Open the instrument on page 35. Remove the keypad.	
2	Install a new keypad in the top housing. ***Note:*** *Coat the opening for the keypad with Krytox oil.*	
3	To reassemble the instrument. ***Note:*** *Coat the seal groove with Krytox oil.*	

This repair task is also available as a service video on HSO. HSO full access requires login credentials. First log into HSO and afterwards click on https://support.hach.com/app/answers/answer_view/a_id/1024331. Select the desired service video.

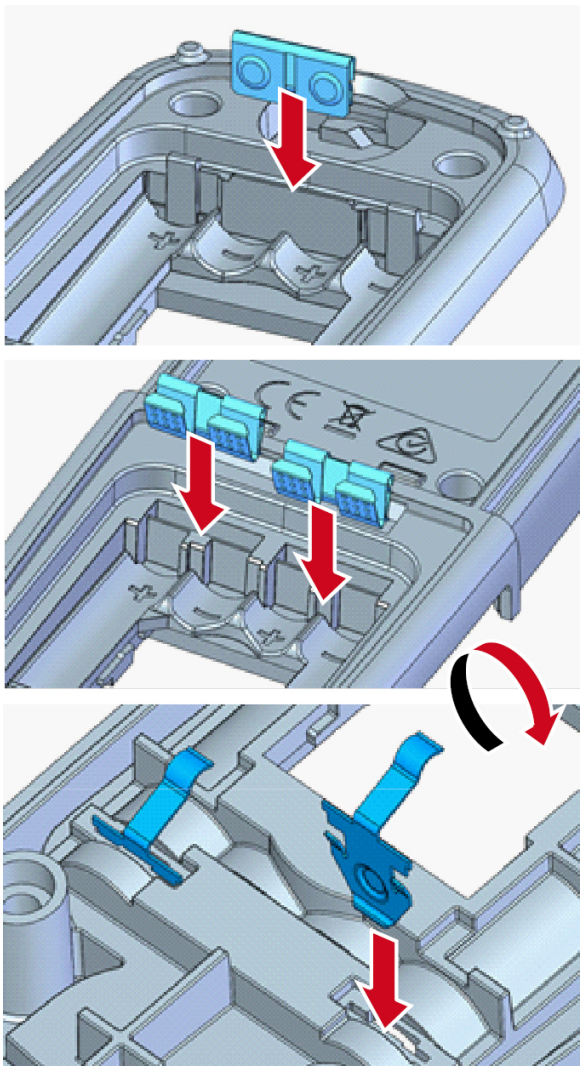
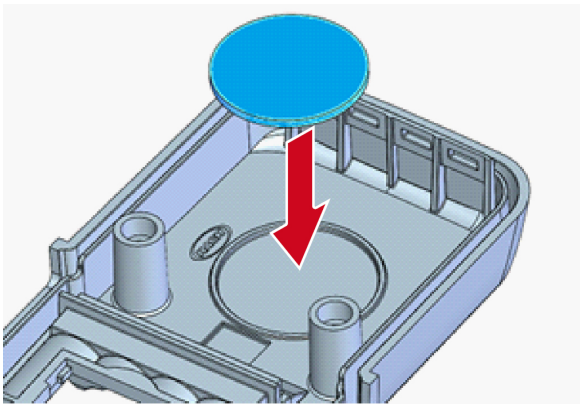
Note: *Following hyperlink without being logged will end in a* ***permission denied*** *information screen.*

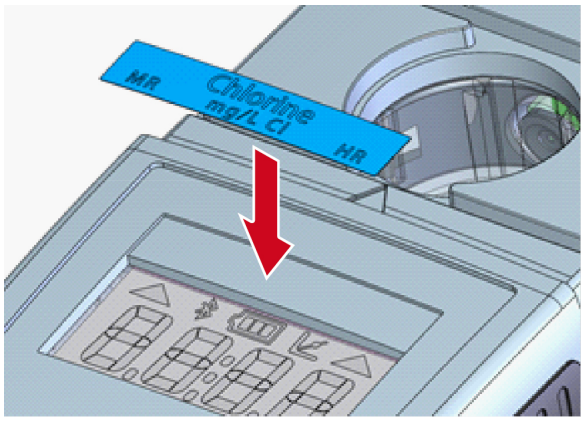
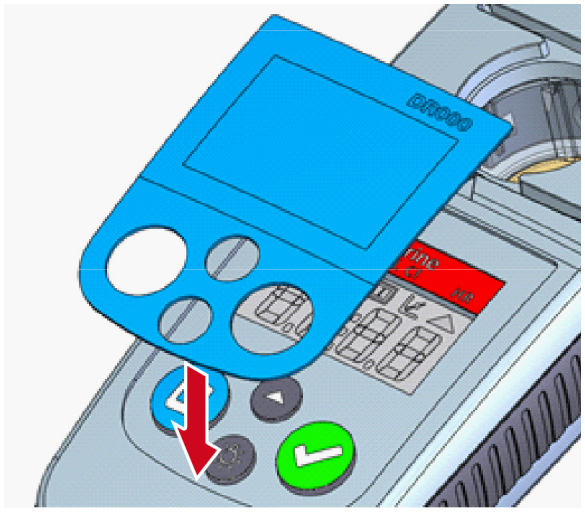
5.6 Replace the housing

Items to collect:

- Top housing
- Bottom housing
- Battery contacts
- Load disk, foam
- Parameter label, refer to Set the part number on page 43
- Window

- Krytox oil (item no. 16004801)

Step	Description	Picture
1	Open the instrument, refer to Open the instrument on page 35.	
2	Install in a new bottom housing new battery contacts. ***Note:*** *Push down the battery contact springs with blade of a screw driver.* ***Note:*** *First stick the contacts to the slot in the plastic part. Make sure that the contacts are placed in correct direction. Push in the battery contacts. The battery contacts click in the correct position.*	
3	• Stick the foam load disk (self-adhesive) on the marked area in the bottom housing. • Stick the type label of the instrument, including part numer and serial number to the outside of the bottom housing.	

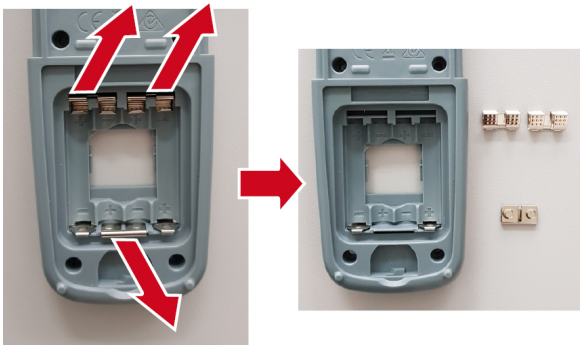
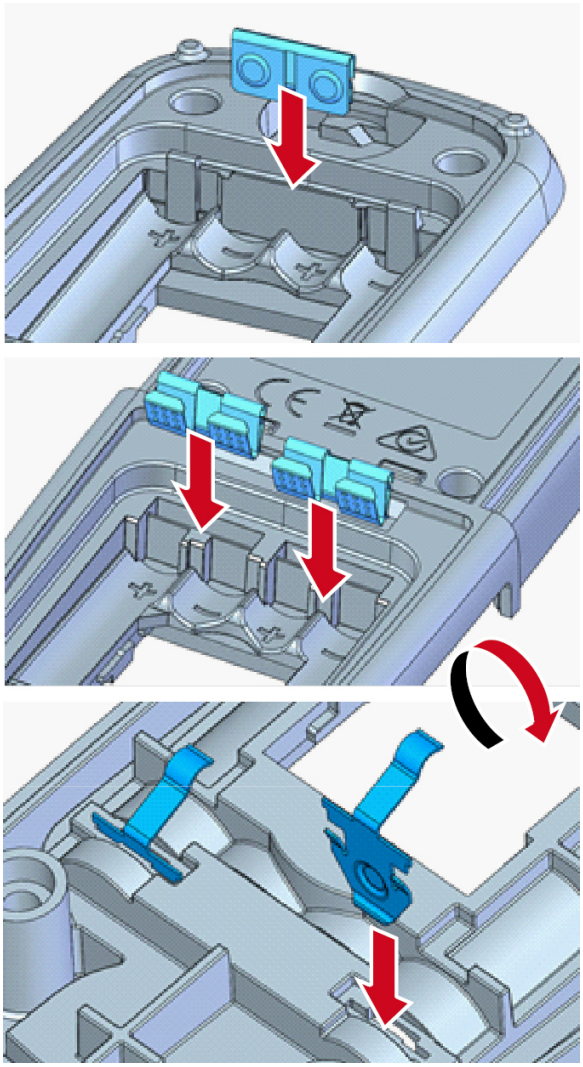
Step	Description	Picture
4	Stick at a new top housing the correct parameter label (self-adhesive).	
5	Stick the window (self-adhesive) bubble-free on the housing. ***Note:*** *Proper bonding is important for IP67 waterproof.*	
6	To reassemble the instrument, install display, keypad, optical unit and mainboard. Close the instrument. ***Note:*** *Coat the seal groove with Krytox oil.* ***Note:*** *Make sure that the screws are tightened to 0.8 Nm.*	

5.7 Replace the battery contacts

Items to collect:

- Battery contacts

- Krytox oil (item no. 16004801)

Step	Description	Picture
1	Open the instrument, refer to Open the instrument on page 35.	
2	Remove the defective battery contacts from the bottom housing. If the battery contact LPZ445.99.00011 is defective, replace the bottom housing. Refer to Replace the housing on page 47.	
3	Install in the bottom housing new battery contacts. ***Note:*** *Push down the battery contact springs with blade of a screw driver.* ***Note:*** *First stick the contacts to the slot in the plastic part. Make sure that the contacts are placed in correct direction. Push in the battery contacts. The battery contacts click in the correct position.*	
4	To reassemble the instrument, install display, keypad, optical unit and mainboard. Close the instrument. ***Note:*** *Coat the seal groove with Krytox oil.* ***Note:*** *Make sure that the screws are tightened to 0.8 Nm.*	

This repair task is also available as a service video on HSO. HSO full access requires login credentials. First log into HSO and afterwards click on https://support.hach.com/app/answers/answer_view/a_id/1024331. Select the desired service video.

Note: *Following hyperlink without being logged will end in a* ***permission denied*** *information screen.*

Error	Description	User action recommendations	Technical information including troubleshooting action items (only for Service Operator)
			Note: *The following information lists the most likely error causes and actions to be taken.* **1.** "+" means additional information shall be checked **2.** ">" means action to be taken **3.** Most likely action is listed first **4.** If more than one action option is shown, first action is to be taken. If problem persists, second action is to be taken, and so on...
E-00	No zero	In user calibration mode, a standard solution was measured before the instrument zero was set. Measure a blank solution to set the instrument to zero.	Check user settings. > Reset mainboard to factory settings.
E-01 ***Note:*** *E-01*	Ambient light error	There is ambient light in the cell holder. Make sure that the instrument cap is fully installed over the cell holder. Refer to Figure 6 on page 11. When an E-01 error occurs on a measurement, the display shows "_.__". The decimal place depends on the chemistry. If the E-01 error occurs while the instrument is set to zero, set the instrument to zero again.	System detects too much ambient light. Dark frequency is > 1000 Hz at light detector. + Check/read the service log for possible other error messages. Check instrument cell compartment for possible ambient light sources. >Replace the cell compartment. Check the instrument cap for possible defects. > Replace the cap. Check if light detection system is working > Replace detector. > Replace the mainboard on page 42
E-02	LED error	The LED (light source) is out of regulation. Replace the batteries. Make sure that the LED in the cell holder comes on when 'read' or 'zero' is pushed. Do the test again. If the error continues, contact technical support.	The LED light source control on mainboard is out of regulation. + Check/read the service log for possible other error messages. Check if LED (or LED pin) is damaged. > Replace LED Check if pin contact of LED to mainboard is not appropriate or mainboard connector pin is damaged. > Replace the mainboard on page 42
E-03	Standard adjust error	• The measured value of the standard solution is more than the adjustment limits. Prepare a fresh standard. • The standard solution is not within the concentration range that can be used for standard calibration adjust. Prepare a standard with a value at or near the recommended concentrations given in the procedure. • Make sure that the concentration of the standard solution is entered correctly.	Configuration or setting error of user. The measured value of the standard solution is more than the adjustment limits. + Check/read the service log for possible other error messages. Check user settings. > Reset mainboard to factory settings. >Replace the mainboard on page 42

Error	Description	User action recommendations	Technical information including troubleshooting action items (only for Service Operator)
E-04	The reading is more or less than the instrument range	If the reading is less than the instrument range, make sure that the instrument cap is fully installed over the cell holder. Measure a blank. If the blank reading is not zero, set the instrument to zero again.	+ Check/read the service log for possible other error messages. Option A) If the upper range limit value +10% is blinking, the current measurement value is above the upper range limit +10%. Check user calibration settings. > Reset mainboard to factory settings. Check the absorbance reading in 'service mode'. Check absorbance values for service test kit vials. > Replace the mainboard on page 42 > Replace LED > Replace detector Option B) If '0.00' is blinking (or low range limit value –10% is blinking), the current measurement value is below the lower range limit –10 %. Check user calibration settings. > Reset mainboard to factory settings. Check the absorbance reading in 'service mode'. Check with 'clear/blank' water. Absorbance value shall not be negative. Check preformance with service test kit vials. > Replace the mainboard on page 42 > Replace LED > Replace detector
		If the reading is more than the instrument range, identify if there is a light blockage in the cell holder. Dilute the sample. Do the test again.	
Note: *E-04*		The value that flashes will be 10% over the upper test range limit.	
E-06	Abs error	The absorbance value is not correct or the user entered calibration curve has fewer than two points. Enter or measure the absorbance value again.	Configuration or setting error of user. The absorbance value is not correct or the user entered calibration curve has fewer than two points. + Check/read the service log for possible other error messages. Check user settings. > Reset mainboard to factory settings. > Replace the mainboard on page 42
E-07	Standard value error	The standard solution concentration is equal to another standard solution concentration that is already entered in the user-entered calibration curve. Enter the correct standard concentration.	Configuration or setting error of user. The standard solution concentration is equal to another standard solution concentration that is already entered in the user-entered calibration curve. + Check/read the service log for possible other error messages. Check user settings. > Reset mainboard to factory settings. > Replace the mainboard on page 42
E-09	Flash error	The instrument is not able to save data. Push and hold for 5 seconds to reset the instrument. If the error continues, contact technical support.	Data flash error on mainboard. The instrument is not able to save data. + Check/read the service log for possible other error messages. > Reset instrument to hardware reset state. Push and hold power button for 5 seconds . > Replace the mainboard on page 42

Error	Description	User action recommendations	Technical information including troubleshooting action items (only for Service Operator)
E-10	Environment temperature too high or too low	The ambient temperature is out of range. Use the instrument only in the specified operating conditions. Refer to Specifications on page 3.	The ambient temperature was measured out of range. Probably the instrument was used out of spec temperature. (T < -20°C or T > 70 °C) + Check/read the service log for possible other error messages. > Replace the mainboard on page 42
E-12	Low battery power	Battery power is too low. Replace the batteries. Refer to Install the batteries on page 9.	Battery power is too low. Error appears between 0-2% battery capacity. + Check/read the service log for possible other error messages. Check battery power. > Replace batteries Check battery contacts got appropriate contact to mainboard. > Replace the battery contacts on page 49 > Replace the mainboard on page 42
E-13	Parameter load failure	The memory of the instrument is defective. Contact technical support.	The DR300 chemical parameters could not be loaded (neither from filesystem nor from backup). The device is not capable to function without and is therefore locked. + Check/read the service log for possible other error messages. > Update mainboard firmware and parameter setting. > Replace the mainboard on page 42
E-14	Zero measurement invalid	The zero measurement is too low. Use a sample cell filled with water and try again. If the error continues, contact technical support.	Signal of zero measurement is too low. Zero - High Frequency < 1 KHz + Check/read the service log for possible other error messages. > Use water vial and try again. > Replace LED > Replace optical filter > Replace detector > Replace the mainboard on page 42
E-15	Absorbance too high	Identify if there is a light blockage in the cell holder. Clean the cell holder. Dilute the sample. Do the test again. ***Note:*** *This instrument can not read absorbance values higher than 3.5 Abs.*	Absorbance was read > 3.5 Abs. + Check/read the service log for possible other error messages. Check if beam path (cell compartment) is blocked. > Clean cell compartment. Check the absorbance reading in 'service mode'. Check absorbance values for service test kit vials. > Replace detector > Replace the mainboard on page 42 > Replace LED > Replace optical filter
E-20	Signal measurement out of range	There is too much light on the light detector. Make sure that the instrument cap is fully installed on the cell holder. Do the test again. If the error continues, contact technical support.	Too much signal on light detector. Zero or Read signal - High frequency > 500 KHz + Check/read the service log for possible other error messages. Check the absorbance reading in 'service mode'. Check absorbance values for service test kit vials. Check optical aperture in front of LED is still in place. > Replace optical aperture > Replace optical filter > Replace LED > Replace detector > Replace the mainboard on page 42

Error	Description	User action recommendations	Technical information including troubleshooting action items (only for Service Operator)
E-21	Signal measurement unstable	There is an unstable signal on the light detector. There is too much or unstable ambient light. Make sure that the instrument cap is fully installed on the cell holder. Do the test again. If the error continues, contact technical support.	Unstable signal on light detector. Too much or unstable ambient light? Internal frequency measurement 'ratio of Highfrequency/Midfrequency' out of range. + Check/read the service log for possible other error messages. Check the absorbance reading in 'service mode'. Test measurment can be performed with any vial... > Replace the mainboard on page 42 > Replace detector > Replace LED
E-22	Hardware error	The electronic system is defective. Contact technical support.	Mainboard hardware error with ADC system. ADC Timeout Error or ADC Invalid Status Error (Battery Voltage, Hardware ID voltage, Module ID voltage, LED monitor voltage, LED voltage, Temperature) + Check/read the service log for possible other error messages. > Replace the mainboard on page 42
E-30	No application	There was an error during the application update. A valid application was not found on the instrument. Update the instrument again.	No valid application found on the device. + Check/read the service log for possible other error messages. > Update application to device again. > Replace the mainboard on page 42
E-31	Bootloader update failed	There was an error during the transmission of the bootloader update. Update the bootloader again.	Bootloader Update failed during transmission. The device is still intact. Error feedback will also be shown on the updating mobile phone. + Check/read the service log for possible other error messages. > Update bootloader to device again. > Replace the mainboard on page 42
E-32	Application update failed	There was an error during the transmission of the application update. Update the instrument again.	Application update failed during transmission. The bootloader is still intact. Error feedback will also be shown on the updating mobile phone. > Update application to device again. > Replace the mainboard on page 42
E-66	Update failed	The instrument is defective. Contact technical support.	Device is not functional anymore. > Replace the mainboard on page 42

6.1 Get the instrument logger

1. Install the service cable VAA10036.99.G00 in the DR300. Refer to Insert the service cable on page 19.
2. Start the VAP235 software.
3. Connect the service cable VAA10036.99.G00 to an USB port.
4. Push ⏻ on the DR300.
5. Push **Connect**. The display of the DR300 shows serial.
6. Push **Get instrument log**. Refer to Figure 11.
7. Find the txt file in the path which is defined in Settings > Program Settings > General > Instrument log path. E.g. Logger_LPG445_18060A000047.txt. Refer to Figure 12.

Figure 11 Get the instrument log

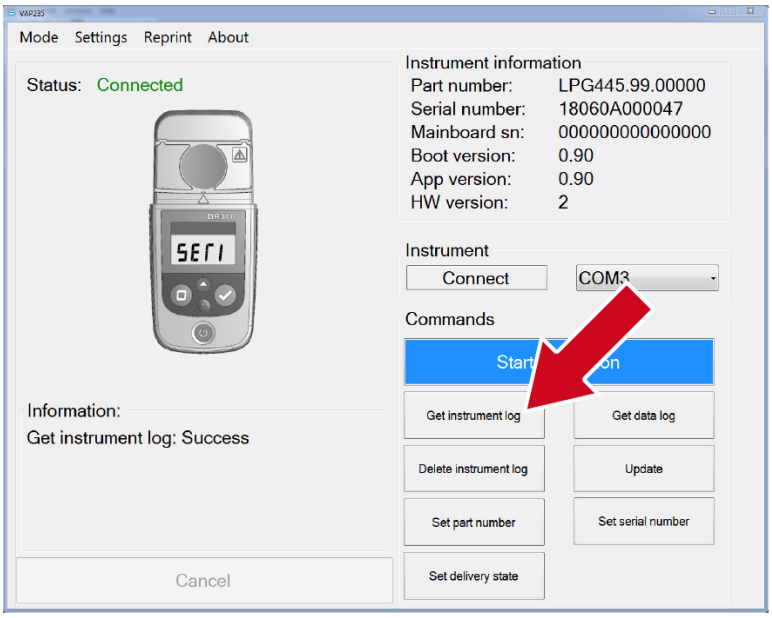


Figure 12 Instrument logger

```
DR300,S/N 18060A000049
Instrument Version:,0.12
2000-01-01T00:00:00,110
2000-01-01T04:16:08,109,27
2000-01-01T04:16:09,111,1,0.252,4.975,18.754,0
2000-01-01T04:16:09,109,27
```

Category	Code	Value	Short description	Detailed description
error	15		Error during software update	[DR300]SUBKEY_UPDATE_FAILED_MISC = 0U SUBKEY_UPDATE_FAILED_SIGN_ERR =1U SUBKEY_UPDATE_FAILED_CRC_ERROR = 2U SUBKEY_UPDATE_FAILED_CANCELED = 3U
		[none]	Error type	
error	17		Warning: battery capacity is low	[DR300]Warning: battery capacity is < 2%
		[V]	Battery Voltage	
		[%]	Battery Capacity	
		[°C]	Temperature	
		[V]	Hardware ID Volt	
		[V]	Module ID Volt	
standard message	23		Status: serial number was changed	[Default]No further information for this event.
		[none]	new serial number	
		[none]	previous serial number	
standard message	26		Status: start SW-Update	[Default]No further information for this event.

Category	Code	Value	Short description	Detailed description
		[none]	FWType (0=BL, 1=APP)	
		[none]	Update Channel(0=factory, 1=BLE)	
		[none]	SW Version (old)	
standard message	27		Status: completed SW-Update	[Default]No further information for this event.
		[none]	SW Version (new)	
standard message	44		Warning: Environmental Limits Exceeded	[Default]No further information for this event.
		@1	Selfcheck	
		[°C]	temperature	
		[V]	battery voltage	
		[%]	battery capacity	
		@2	Zero or Read too high	
		[°C]	temperature	
		[V]	Battery voltage	
		[%]	battery capacity	
		@3	Zero/Read Difference too high	
		[°C]	zero temperature	
		[°C]	read temperature	
		[V]	battery voltage	
		[%]	battery capacity	
error	108		Measurement error	[DR300]Type 1 - Zero Invalid (E-14) 2 - Signal too high (E-21) 3 - Invalid freq quotient (E-22) 4 - LED error (E-2) 5 - LED error slfchk (E-2) 6 - Absorbtion too high (E-15)
		[none]	Type	
		[kHz]	Dark frequency	
		[kHz]	High frequency	
		[kHz]	Mid frequency	
		[V]	Battery voltage	
		[%]	Battery capacity	
		[°C]	Temperature	
		[V]	LED voltage	
		[V]	LED monitor voltage	
		[%]	LED PWM duty cycle	
		[none]	Absorbtion	

Category	Code	Value	Short description	Detailed description
error	109		Filesystem error	[DR300]FS_HACH_ERR_OPEN = 24 FS_HACH_ERR_WRITE = 25 FS_HACH_ERR_READ = ... FS_HACH_ERR_FILESIZ FS_HACH_ERR_ARG FS_HACH_ERR_MALLOC FS_HACH_ERR_CONTENT FS_HACH_ERR_CRC FS_HACH_ERR_FLASH FS_HACH_ERR_VERIFY
		[none]	error index	
standard message	110		Battery replaced	
standard message	111		Module detected	[DR300]Module type 1=factory 2=ble 3=eeprom 10=unknown
		[none]	module type	
		[V]	Module ID Volt	
		[V]	Battery Volt	
		[%]	Battery Capacity	
		[°C]	Temperature	
		[none]	Module Supply Voltage ON	
standard message	112		Monthly statistics	[DR300]Module type 1=factory 2=ble 3=eeprom 10=unknown

Category	Code	Value	Short description	Detailed description
		[none]	Counter power on	
		[none]	Counter zero measurements	
		[none]	Counter readings	
		[h]	Operating time LED	
		[h]	Operating time instrument	
		[none]	Counter ambient light error	
		[kHz]	Zero dark frequency	
		[kHz]	Zero mid frequency	
		[kHz]	Zero high frequency	
		[kHz]	Zero difference frequency	
		[°C]	Zero temperature	
		[kHz]	Read dark frequency	
		[kHz]	Read mid frequency	
		[kHz]	Read high frequency	
		[kHz]	Read difference frequency	
		[°C]	Read temperature	
		[Ext]	Absorbtion	
		[none]	Concentration unadjusted	
		[none]	Concentration adjusted	
		[V]	Battery voltage	
		[%]	Battery capacity	
		[none]	Hardware version	
		[V]	Hardware version voltage	
		[none]	Module ID	
		[V]	Module ID voltage	
standard message	113		HWC LED adjust	[DR300]Maximum LED power for high frequency as percent. Calibrated during HWC.
		[%]	max PWM threshold	
error	114		Error: stack overflow	[Default]One or more stack overflow events occurred.
		[none]	Taskflags	
error	115		Error: module communication	
		[V]	Battery voltage	
		[%]	Battery capacity	
		[°C]	Temperature	
		[V]	Hardware ID voltage	
		[V]	Module ID voltage	

Category	Code	Value	Short description	Detailed description
error	116		Error: ADC	[DR300]ADC_CHANNEL_LED_VOLTAGE=1 ADC_CHANNEL_LED_MON=2 ADC_CHANNEL_BATTERY_VOLTAGE =3 ADC_CHANNEL_HARDWARE_ID=4 ADC_CHANNEL_MODULE_ID_CODE =15 ADC_CHANNEL_STM32_TEMPERA TURE=17
		[none]	Type: ADC=23, Timeout=231, Invalid=232	
		[none]	Channel	
		[none]	Sampling time	
standard message	117		Instrument information	
		[none]	Mainboard serial	
		[none]	Bootloader version	
		[none]	Hardware version	
		[none]	Module ID	
		[none]	BLE module version (if equipped)	
		[%]	HWC LED adjust	
		[none]	HWC LED adjust timestamp	
		[none]	BLE module MAC address (if equipped)	
error	118		Parameter load error	

6.2 Get the data logger

1. Install the service cable VAA10036.99.G00 in the DR300. Refer to Insert the service cable on page 19.
2. Start the VAP235 software.
3. Connect the service cable VAA10036.99.G00 to an USB port.
4. Push ⏻ on the DR300.
5. Push **Connect**. The display of the DR300 shows serial.
6. Push **Get data log**.
7. Define the path to store the data logger. Refer to Figure 13.
8. Find the csv file in the path which is defined. E.g. DL_LPG445.99.00000_SN18060A000047_180926_1544.csv. Refer to Figure 14.

Figure 13 Get data log

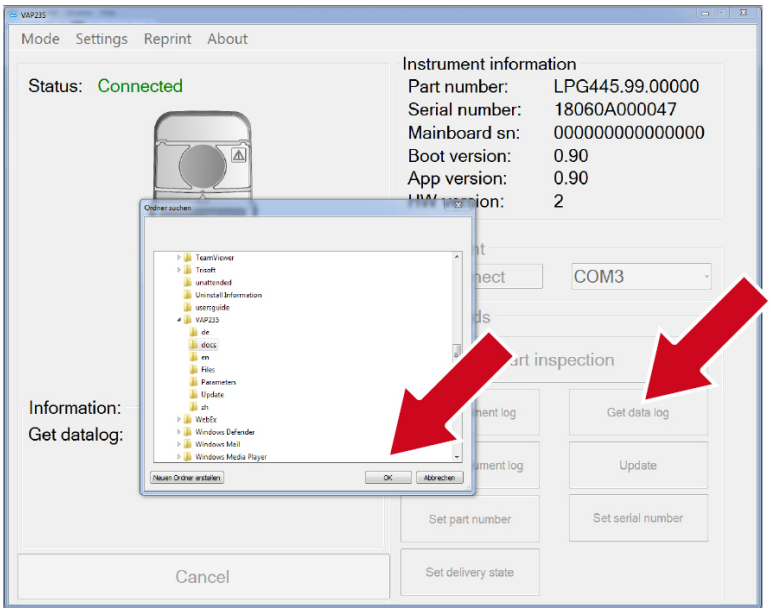


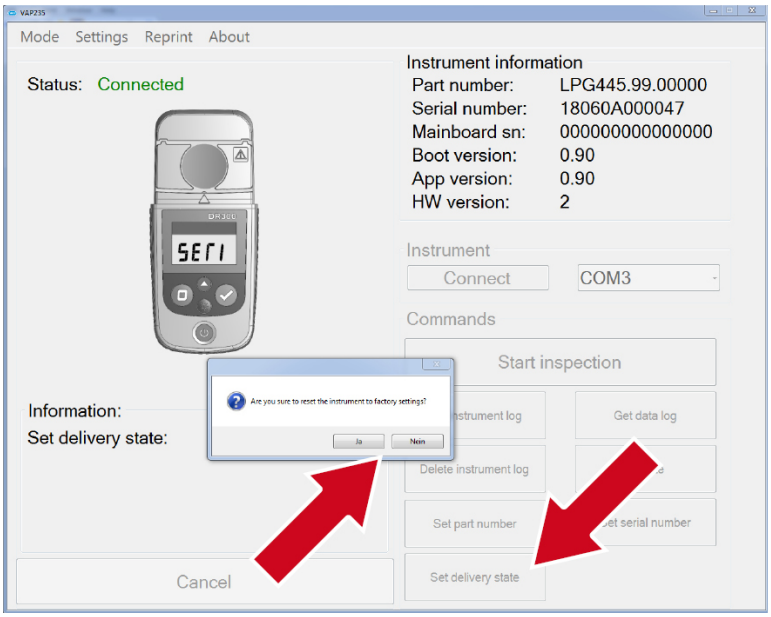
Figure 14 Data logger

[Header]
#Type,actVal
PartNo,LPG445.99.00000
StartDate,2018-09-26T15:44:39
Serialnumber,18060A000047
mb-serialnumber,0000000000000000
Bootversion,0.11
FW_version,0.11
HW_revision,2
SVN_revision,7189
[Log]
#dateTime,measID,val,abs,stdAdjust,usercalibID,paramSelect,zero
2000-01-01T00:11:03,1,0.083,0.435,1.000,0,0
2000-01-01T00:11:09,2,0.108,0.569,1.000,0,0
2000-01-01T00:12:45,3,11.147,257.581,1.000,0,1
2000-01-01T00:13:00,4,58.395,1248.391,1.000,0,1
2000-01-01T00:13:10,5,0.025,0.591,1.000,0,1

6.3 Set back the instrument to factory settings

1. Install the service cable VAA10036.99.G00 in the DR300. Refer to Insert the service cable on page 19.
2. Start the VAP235 software.
3. Connect the service cable VAA10036.99.G00 to an USB port.
4. Push ⏻ on the DR300.
5. Push **Connect**. The display of the DR300 shows serial.
6. First save the customer data and get a data log. Refer to Get the data logger on page 61.
7. Push **Set delivery state**. Refer to Figure 15. The data log, event log and the user calibration will be deleted.

Figure 15 Set delivery state



⚠WARNING

Personal injury hazard. Use of non-approved parts may cause personal injury, damage to the instrument or equipment malfunction. The replacement parts in this section are approved by the manufacturer.

Note: *Product and Article numbers may vary for some selling regions. Contact the appropriate distributor or refer to the company website for contact information.*

Figure 16 Top part and optical unit

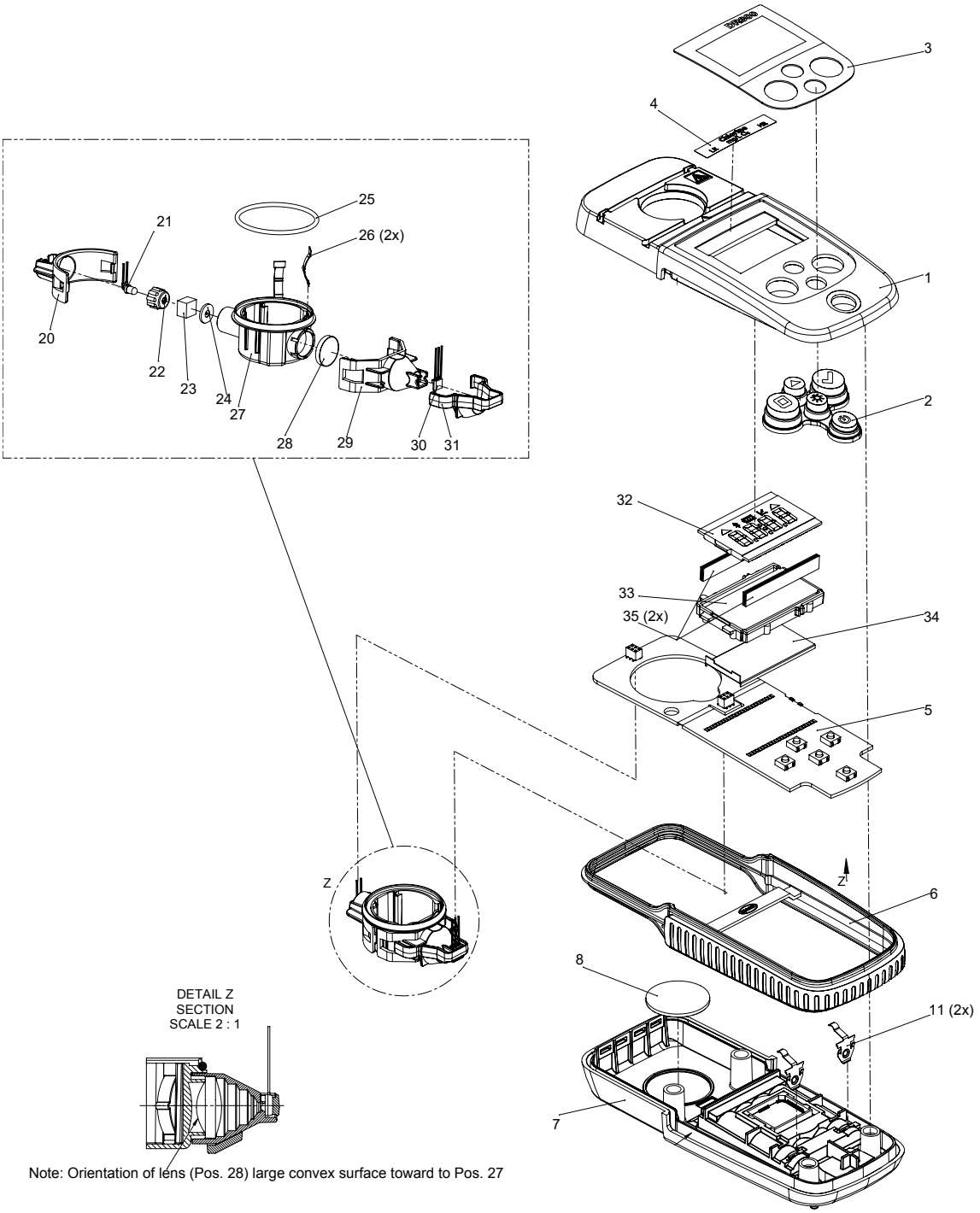
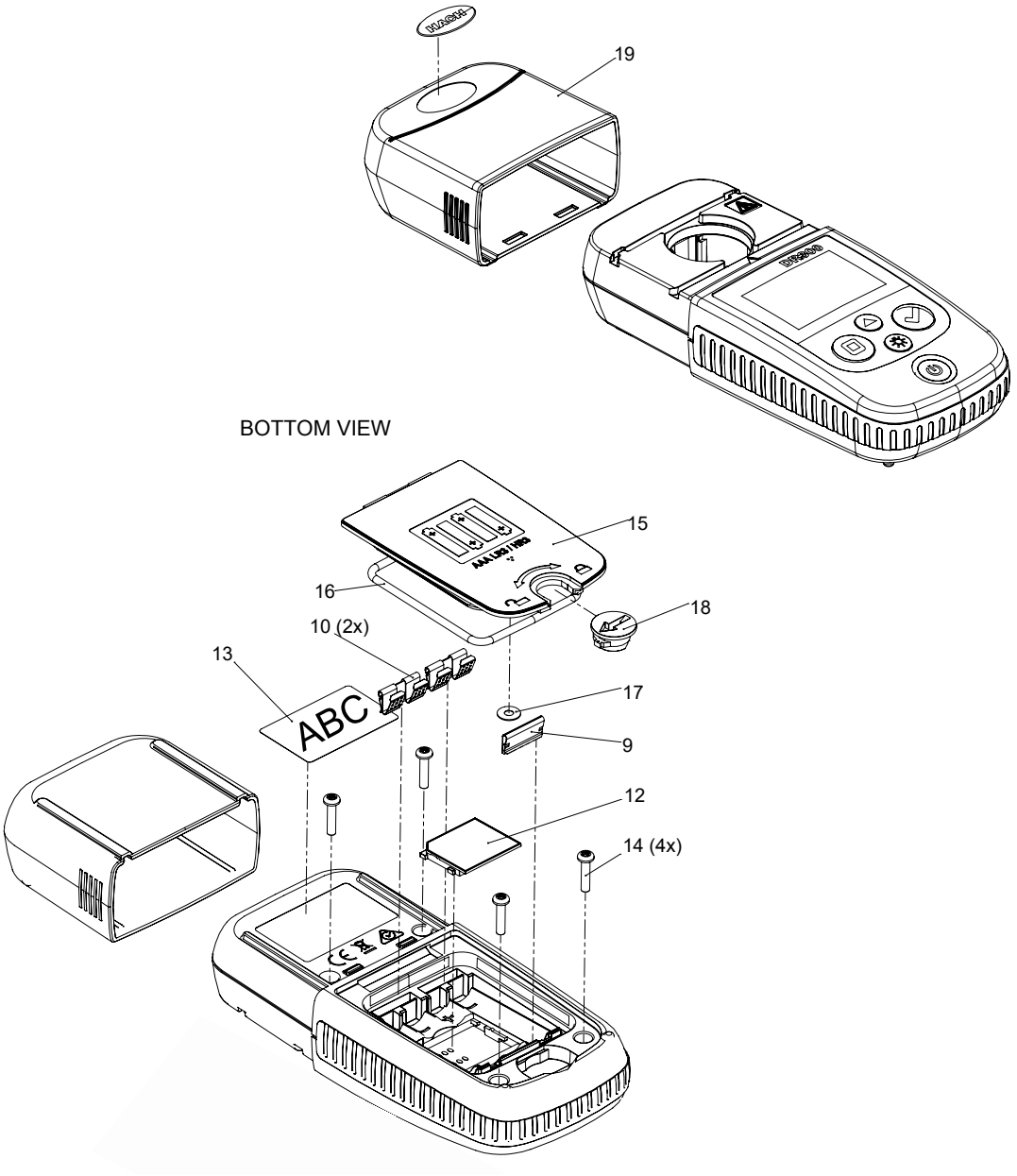
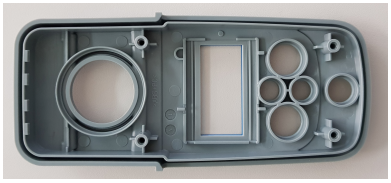


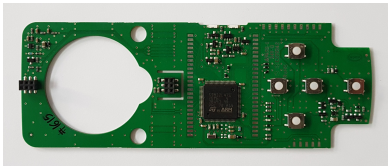
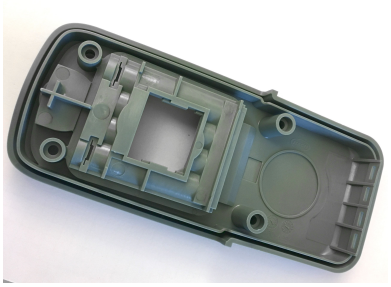
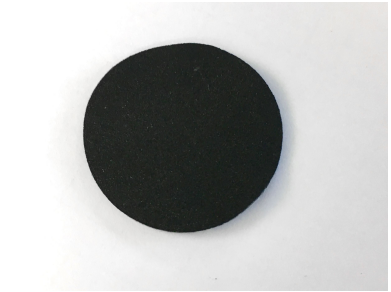
Figure 17 Bottom part and battery contacts

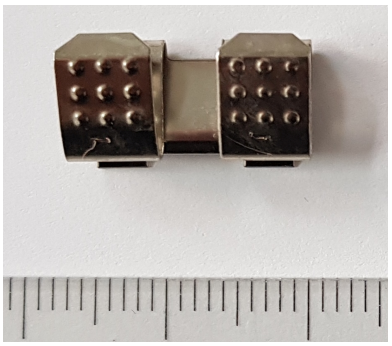
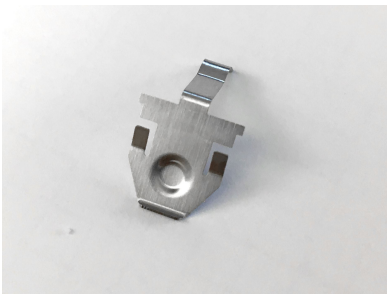
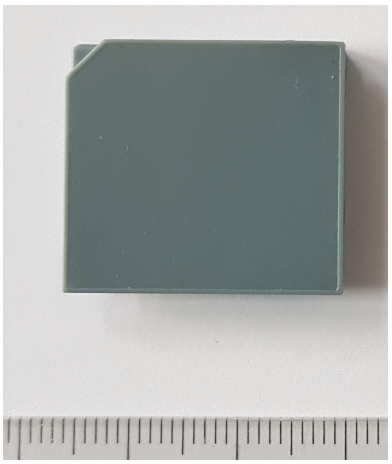


Replacement parts

Position no.	Item no.	Description	Picture
1	LPZ445.99.00010	Housing, top	
2	LPZ445.99.00013	Keypad	
3	LPZ445.99.00014	Window	
4	LPZ445.99.00019	Label, Parameter, Chlorine LR	
4	LPZ445.99.00020	Label, Parameter, Chlorine	
4	LPZ445.99.00021	Label, Parameter, Chlorine/pH	
4	LPZ445.99.00022	Label, Parameter, Chlorine Dioxide	
4	LPZ445.99.00023	Label, Parameter, Molybdenum	
4	LPZ445.99.00024	Label, Parameter, Mono/Free NH_3	

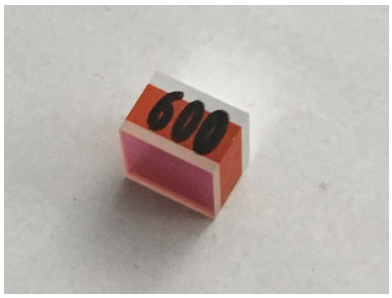
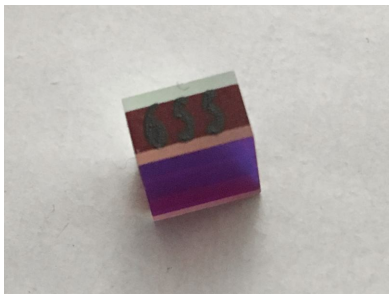
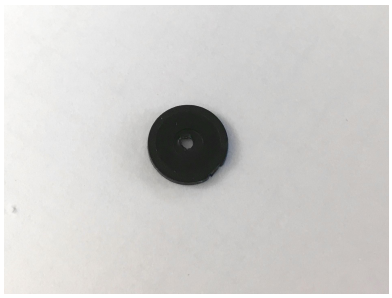
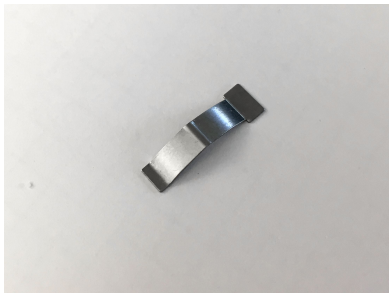
Position no.	Item no.	Description	Picture
4	LPZ445.99.00025	Label, Parameter, Ammonia	
4	LPZ445.99.00026	Label, Parameter, Zinc	
4	LPZ445.99.00027	Label, Parameter, Iron-Ferro Ver®	
4	LPZ445.99.00028	Label, Parameter, Iron-TPTZ	
4	LPZ445.99.00029	Label, Parameter, Phosphate	
4	LPZ445.99.00030	Label, Parameter, Ozone	
4	LPZ445.99.00031	Label, Parameter, Nitrate	
4	LPZ445.99.00032	Label, Parameter, Bromine	
4	LPZ445.99.00033	Label, Parameter, Dissolved Oxygen	
4	LPZ445.99.00034	Label, Parameter, Aluminium	
4	LPZ445.99.00035	Label, Parameter, Manganese-HR	
4	LPZ445.99.00036	Label, Parameter, 500 nm	
4	LPZ445.99.00037	Label, Parameter, 528 nm	
4	LPZ445.99.00038	Label, Parameter, 600 nm	
4	LPZ445.99.00039	Label, Parameter, 655 nm	

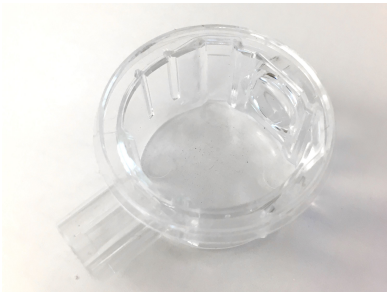
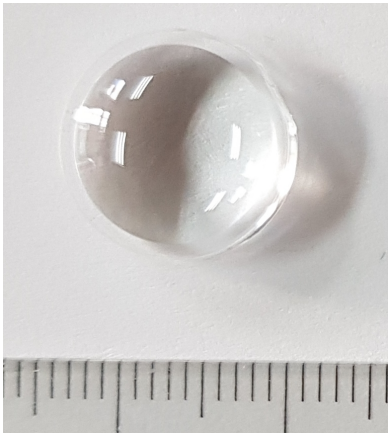
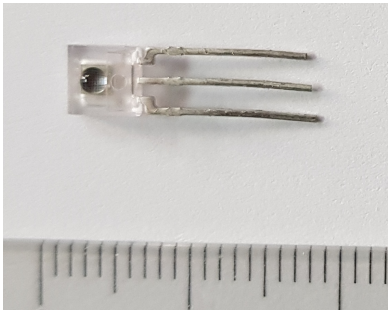
Position no.	Item no.	Description	Picture
5	YAB210	Mainboard DR300 ASSY	
6	LPZ445.99.00015	Seal/Grip	
7	LPZ445.99.00009	Housing, Bottom	
8	LPZ445.99.00053	Load disk, foam	
9	LPZ445.99.00049	Battery contact, fixed, DUAL AAA	

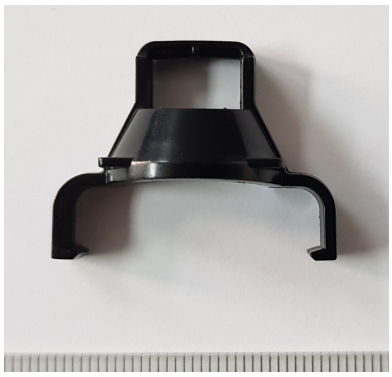
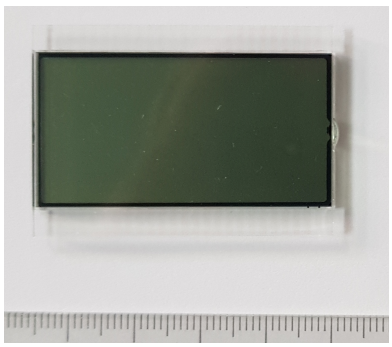
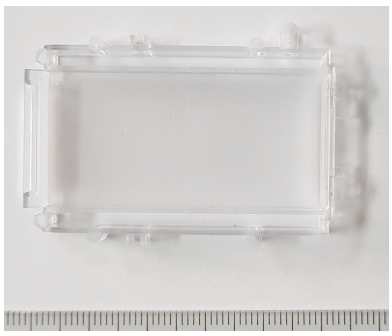
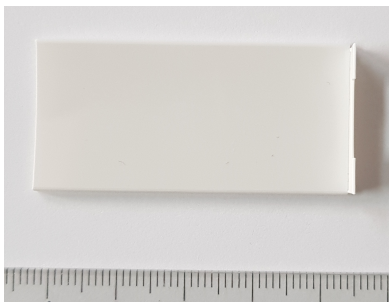
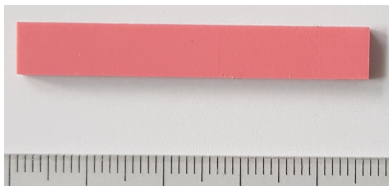
Position no.	Item no.	Description	Picture
10	LPZ445.99.00050	Battery contact, spring, DUAL AAA 6, 2x	
11	LPZ445.99.00011	Battery Contact, spring, 2x	
12	LPZ445.99.00008	Housing, HCD Dongle 14	
13	LPZ445.99.00018	Typelabel - DR300 (HACH LANGE)	

Position no.	Item no.	Description	Picture
14	LPZ445.99.00046	Screw, 4x24 500 PAN SST TORX, 4x	
	LPZ445.99.00007	Battery cover, assembly	
19	LPZ445.99.00006	Instrument cap, assembly	
	Optical unit		
20	LPZ445.99.00044	Retainer, LED, Densichek, PKT II	

Position no.	Item no.	Description	Picture
21	LPZ445.99.00045	LED (3,1 mm, white)	
22	LPZ445.99.00043	Housing, LED, white, PKT II	
23	LPZ445.99.00001	Filter, Interference 500 nm	
23	LPZ445.99.00002	Filter, Interference 528 nm	

Position no.	Item no.	Description	Picture
23	LPZ445.99.00003	Filter, Interference 600 nm	
23	LPZ445.99.00004	Filter, Interference 655 nm	
24	LPZ445.99.00040	Aperture, 063, Densichek, PKT II	
25	LPZ445.99.00051	O-ring for cell compartment, 1.301ID X .070W	
26	LPZ445.99.00048	Spring, cell compartment, 2x	

Position no.	Item no.	Description	Picture
27	LPZ445.99.00005	Cup, optical, Densichek, PKT II	
28	LPZ445.99.00041	Biconvex lens PMMA	
29	LPZ445.99.00042	Retainer, detector, Densichek	
30	LPZ445.99.00047	IC conv light to frequency 235	

Position no.	Item no.	Description	Picture
31	LPZ445.99.00052	Clip, detector, Pocket Colorimeter	
	Display unit		
32	YAB211	Display DR300	
33	LPZ445.99.00012	Frame, display	
34	LPZ445.99.00016	Label, backlight reflector	
35	LPZ445.99.00017	Connector, LCD, ZEBRA, 2x	

Accessories

Item no.	Description	Picture
LPV446.99.00001	Hach Communication Dongle	
5953100	Soft-sided case/holster	
4674300	AAA batteries, alkaline	

Item no.	Description	Picture
2427606	Sample cell, 25 mm (10 mL), glass	
4864302	Sample cell, 1 cm (10 mL), plastic	

Service tools

Item no.	Description	Picture
VAA10038.99.V00	Test filter set Service DR300	
VAA10036.99.G00	Service cable	
VAP235	Software for factory and service inspection ***Note:*** *Not available to order.*	

Replacement parts and accessories

Item no.	Description	Picture
2525400	Dielectric grease	
16004801	Krytox GPL103 oil, colorless	

Appendix A Certificate of Service Inspection

ISO 9001 Certified

Be Right™

DR300

Certificate of Service Inspection

Part No. **Serial No.**	Gerätenummer, n°d'appareil Seriennummer, numéro de série	**LPG440.99.00002** ***1234567***
General Function	Allgemeine Funktion, fonction générale	
Display	Anzeigeelement, écran:	ok
Function Keys	Funktionstasten, touch de cuves:	ok
Photometric Data	Photometrische Werte, data photométrique	
Inspection Filter Set	Prüffiltersatz, set de filtres de contrôle : # . . .	***0000***
NG11	NG11	
Nominal Value Absorbance	Sollwert Extinktion, absorbance valeur prévue:	0
Tolerance	Toleranz, tolérance:	0,000 ... 0,000
Actual Value Absorbance	Istwert Extinktion, absorbance valeur réelle :	***0***
NG5	NG5	
Nominal Value Absorbance	Sollwert Extinktion, absorbance valeur prévue:	0
Tolerance	Toleranz, tolérance:	0,000 ... 0,000
Actual Value Absorbance	Istwert Extinktion, absorbance valeur réelle :	***0***
NG3	NG3	
Nominal Value Absorbance	Sollwert Extinktion, absorbance valeur prévue:	0
Tolerance	Toleranz, tolérance:	0,000 ... 0,000
Actual Value Absorbance	Istwert Extinktion, absorbance valeur réelle :	***0***
BG3	BG3	
Nominal Value Absorbance	Sollwert Extinktion, absorbance valeur prévue:	0
Actual Value Absorbance	Istwert Extinktion, absorbance valeur réelle :	***0***
Date	Datum, date:	**Dec 11, 2018**
Signature	Unterschrift, signature:	

Please add this certificate to your documents.
Bitte verwahren Sie dieses Zertifikat bei Ihren Unterlagen auf.
S'il vous plaît, conservez scrupuleusement ce certificat dans vos archives.

HDQ303 V 1.1

Appendix B Certificate of Service Inspection (manually)

Management System
ISO 9001:2015
ISO 14001:2015
OHSAS 18001:2007
www.tuv.com
ID 0091004412

Hach Lange GmbH

Certificate of Service Inspection

Dear customer,

We have fixed within our quality management system that our test resources can be traced back by national standards, there where it is possible. Therefore your Hach Lange calibration certificate, supported by this protocol, provides the necessary documentation and audit trail for the control of your measuring and testing equipment.

Device name: DR300 Device type: LPG445 Serial-No.: _____

Software Version : _____

General Function

Display ☐ ok Function Keys ☐ ok

Photometric Data

Inspection Filter Set VAA10038.99.V00 No.: Valid until:

Photometric accuracy

Filter	Wavelength [nm]	Nominal value [Abs]	Minimum value [Abs]	Maximum value [Abs]	Actual value [Abs]
NG11					
NG5					
NG3					

Straylight

Filter	Wavelength [nm]	Nominal value [Abs]	Actual value [Abs]
BG3			

Zero measurement (air)

Filter	Nominal value [Abs]	Minimum value [Abs]	Maximum value [Abs]	Actual value [Abs]
Air	0.000	-0.003	0.003	

The DR300 is within specification and has passed calibration.

Suggested next calibration: _____

Date:_____ Service Technician:_____ Signature:_____

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