Liquid Handling

User Manual



Please read the manual before installation and operation.

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READ CAREFULLY BEFORE USE!



READ CAREFULLY BEFORE USE!Please read the Chemical

Compatibility table carefully before use!

Safety Instructions

This instrument may be used with approved hazardous materials, operations, and equipment.

This manual does not purport to address all of the safety problems associated with its use. It is the responsibility of whomever uses this instrument to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

- a. Follow the general instructions for hazard prevention and safety regulations,
 e.g., wear protective clothing, eye protection and gloves.
- b. Observe the reagent manufacturer's information.
- c. Every user must be acquainted with this Operating Manual before operation.
- Use the instrument only for dispensing liquids, with strict regard to the defined Operating Exclusions and Limitations. If in doubt, contact the manufacturer or supplier.



- e. When dispensing, the discharge tube must always point away from the user or any other person. Avoid splashes. Only dispense into suitable vessels.
- f. Never carry the mounted instrument by the cylinder sleeve or the valve block.
 Breakage or loosening of the cylinder may lead to personal injury from chemicals.
- g. Never press down the piston when the closure cap is pushed on.
- h. Never remove the discharge tube while the cylinder is filled.
- Use smooth gentle movements to operate the piston upwards and downwards.
- J. Use only original manufacturer's accessories and spare parts. Don't carry out technical modifications.
- k. Before use check the instrument for visual damages. In case of trouble (e.g., piston difficult to move, sticking valves or leakage), immediately stop dispensing. Clean the instrument according to the cleaning instructions before any further use of the instrument or contact the manufacturer.



Components

- 1. Piston seat
- 2. Volume adjustment knob
- 3. Scale pointer
- 4. Cylinder sleeve
- 5. Piston
 - Glass cylinder
- 7. Seal

6.

- 8. Discharge valve
- 9. Discharge tube sleeve
- 10. Discharge tube
- 11. Closure cap
- 12. Filling seal
- 13. Filling valve
- 14. Filling tube
- 15. Air vent cap
- 16. Valve block







Application and Design

This instrument is designed for dispensing liquids,

observing the following limits:

- 15 to 40 °C of instrument and reagent
- vapor pressure up to 500 mbar
- density up to 2.2 g/cm³

Materials

When the instrument is correctly used, the dispensed liquid comes into contact

with only the following chemically resistant materials: Borosilicate glass, PFA, FEP,

PTFE, Hastelloy; PP (closure cap).

Operating Exclusions

Never use this instrument for

- liquids attacking FEP, PFA, PTFE or Hastelloy.
- liquids attacking borosilicate glass (e.g., hydrofluoric acid)
- liquids which are decomposed catalytically by Hastelloy (e.g., H2O2)
- explosive liquids .
- suspensions as solid particles may clog or damage the instrument.







Operating Limitations

Concentrated hydrochloric acid and concentrated nitric acid, chlorinated and fluorinated hydrocarbons, or liquids which form deposits may make the piston difficult to move or may cause jamming.

When dispensing flammable media, make provisions to avoid static charging, e. g., do not dispense into plastic vessels; do not wipe instruments with a dry cloth.

Warning!

If there is a sign of a potential malfunction (e.g., piston difficult to move) never use force. Immediately stop dispensing and follow cleaning instructions or contact the manufacturer.

Note:

Compatibility of the instrument for this special application(e.g.,trace material analysis) must be checked by the user or contact the manufacturer.





Preparing instrument for use

Attention!

The adapters supplied with the instrument are made of polypropylene (PP), and

can only be used for media which does not attack PP.

Warning!

Wear protective clothing, eye protection and gloves. Follow all Safety Instructions

and observe the Operating Exclusions and Limitations.





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Warning!

Always wear protective gloves when touching the instrument and the bottle, especially when using dangerous liquids. Carry the mounted instrument only as shown in figure.

Connecting the discharge tube

Warning!

Do not use any other type of discharge tube.

Never use damaged or deformed discharge tubes.



Figure 2

- 1. Firmly tighten the discharge valve with tools.
- 2. Push the discharge tube as far as possible into the discharge valve.

Connecting the filling tube



- 1. Cut off the bottom of the filling tube diagonally.
- 2. Push the filling tube into the valve block as far as possible with the diagonal end down.

Mounting instrument on bottle

The instrument can be screwed directly onto a GL 45 screwthread. For other bottles, use the accompanying adapters.

Attention!

The adapters supplied with the instrument are made of polypropylene (PP), and

can only be applied for media which do not attack PP.





Priming the instrument

Attention!

For small bottles use a bottle stand to prevent tipping over.

Warning!

Reagent may drop off the discharge tube and closure cap.



- Figure 4
- Hold the discharge tube and carefully remove the closure cap.
- Slide the closure cap backwards on the tube support, away from the discharge tube opening.







Figure 5

- 1. Hold an appropriate collecting vessel under the discharge tube opening.
- 2. Gently pull the piston up, then press it down rapidly.
- 3. Repeat this procedure until most of the air bubbles in the glass cylinder and

discharge tube have been removed.

Note:

Before using the instrument for the first time, ensure it is rinsed carefully or discard

first few samples dispensed.

Priming/Dispensing







Figure 6

Warning!

Follow all Safety Instructions and observe the Operating Exclusions and

Limitations. The discharge tube must always point away from the user or any other

person. Never press down the piston when the closure cap is pushed on. Reagent

may drop off the discharge tube and closure cap.

Setting the volume











- Hold an appropriate collecting vessel under the discharge tube opening.
- Pull the piston up slowly and evenly to the upper stop to draw reagent into the glass cylinder.
- Push the piston down gently and evenly to dispense the reagent into the vessel.

Attention!

After use, always leave the piston in the down position.

Cleaning

The instrument must be cleaned in the following situations to assure correct operation:

- if the piston becomes difficult to move
- after dispensing liquids which form deposits
- before changing the reagent
- prior to long term storage
- should liquid have accumulated in the closure cap
- prior to sterilization



- before replacing the valves

Warning!

Follow all Safety Instructions. The glass cylinder, valves, filling and discharge tubes contain reagent. Wear protective clothing, eye protection and appropriate

hand protection.

Note:

Never change the pistons of the instruments!

- 1. Push on the closure cap.
- 2. Empty and unscrew the instrument from the bottle and lift the instrument so that

the filling tube is out of the liquid but still in the bottle.

3. Carefully tap the filling tube against the bottle from the inside so that the reagent

runs back into the bottle. Figure 9



- 4. Remove the closure cap, and dispense the remaining reagent into the bottle by repeated piston operation.
- 5. Mount the instrument onto another bottle filled with an appropriate cleaning solution.
- 6. Flush the instrument.
- 7. Empty the bottle, flush it and fill it with water. Repeat step 6 and 7.
- 8. Empty the instrument.



Figure 10



9. Unscrew the piston seat (1).

10. Carefully pull the piston (5) out of the glass cylinder (6) by pulling on the piston seat only.





11. Carefully remove deposits at the edge of the glass cylinder with a screw driver.

Clean piston and cylinder with a bottle-brush.

12. Carefully reassemble the instrument

Note:

Insert the piston straight into the cylinder, not at an angle.

Cleaning/replacing the filling valve

- 1. Follow all cleaning instructions.
- 2. Remove the filling tube.
- 3. Unscrew the filling valve using the mounting tool. Remove the valve with its

sealing washer. Make sure the sealing washer does not remain in the valve block.



Figure 12

4. Rinse the filling value in the cleaning solution, and clean with soft brush. Should value ball stick, push into filling opening of value with pointed instrument, and



release valve ball.

5. Screw the cleaned/new filling valve together with its sealing washer into the valve block and tighten it firmly using the mounting tool.

Cleaning/replacing the discharge valve



- 1. Follow all cleaning instructions.
- 2. Unscrew the discharge tube.
- 3. Remove valve locking ring.
- 4. Unscrew the discharge valve using the mounting tool.

Remove the valve with its sealing washer. Make sure the sealing washer does not remain in the valve block.

- 5. Rinse the discharge valve in the cleaning solution, and clean with soft brush. Should valve ball stick, push into filling opening of valve with pointed instrument (e.g., disposable pipette tip), and release valve ball.
- 6. Screw the cleaned/new discharge valve together with its sealing washer into the valve block and tighten it firmly using the mounting tool.

Figure 13



 Slide on the valve locking ring making sure the two prongs properly align with the notches.

Autoclaving

This instrument is not capable of tolerating high temperature and pressure. Do not use this method to disinfect it.

Checking the Volume

The accuracy and coefficient of variation of the instrument are determined gravimetrically as follows:

- Set to the nominal volume.
- Dispense distilled H2O.
- Weigh the dispensed quantity on an analytical balance.
- Calculate the dispensed volume taking the temperature into account.
- Perform at least 10 dispensing and weighing operations.
- Calculate the accuracy (A%) and the coefficient of variation (CV%) by means of the formular used in statistical quality control. The proceeding is described e.g., in DIN EN ISO 8655-6. Observe the operating manual of the balance



manufacturer and the corresponding standards.

Calculations (for the nominal volume)

Mean value $\overline{x} = \frac{\sum n}{n}$

xi = results of weighings n = number of weighings

Mean value $\overline{V} = \overline{x} \cdot z$

Z = correction factor (e. g. 1.0029 μ l/mg at 20 °C, 1013 hPa)

Accuracy

Standard deviation

$$A\% = \frac{\overline{V} - V_0}{V_0} \cdot 100 \qquad \qquad S = \mathbf{z} \cdot \sqrt{\frac{\sum (X_1 - \overline{X})^2}{n - 1}}$$

V₀ = nominal volume

Coefficient of variation

$$CV\% = \frac{100_2}{\overline{\overline{V}}}$$

Trouble Shooting





Problem	Possible cause	Corrective action
	- Formation of	- Stop dispensing immediately.
Piston difficult to	crystals, dirty	Loose piston by circular motion,
move		but do not disassemble. Follow
		all cleaning instructions.
	- Volume adjusted to	- Set to required volume.
Filling not possible	minimum setting	- Clean the filling valve. If
Filling not possible	- Sticking filling valve	necessary replace the valve
		with sealing washer.
	- Discharge tube	- Remove closure cap.
	closure cap	- Push on the closure cap. Hold
Instrument does not dispense liquid	pushed on	the piston in place, and push the
	- Discharge tube not	original manufacturer's discharge
	firmly connected or	tube on firmly. Replace a
	damaged	deformed or damaged discharge
		tube.



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	-	Reagent with high	_	Slowly draw in reagent.
		vapor pressure has	-	Double check that seal (12) is in
		been drawn in too		place, and that the knurled
		quickly		locking nuts at the discharge
	-	Seal not inserted,		tube are firmly seated and finger
		knurled locking nuts		tight.
Air bubbles in		not firmly connected	-	Priming the instrument.
the instrument	-	Air not expelled	-	Push the filling tube on firmly. If
		from the instrument		necessary cut off approx. 1 cm
	-	Filling tube not		of tube at the upper end and
		firmly connected or		reconnect it or replace filling
		damaged		tube.
	-	Valves dirty, not	-	Cleaning procedure. Tighten the
		firmly installed or		valves using the mounting tool.

		Liquid H	lan	dling <<<<<
	-	Discharge tube not	-	Push the original manufacturer's
		firmly connected or		tube on firmly.
		damaged	-	Cleaning procedure. Push the
	-	Filling tube not		filling tube on firmly. If this does
Dispensed volume is too low -		firmly connected or		not suffice, cut off approx. 1 cm
		damaged		of tube at the upper end and
	-	Valves not firmly		re-connect it or replace filling
		installed or		tube.
		damaged	-	Clean the instrument. Tighten
	-	Sticking filling		the valves using the mounting
		valve		tool, if necessary replace the



Technical Data



Volume	Graduation	A* ≤±		CV*≤		Cat Na	
ml	ml	%	μl	%	μl	Cal. No.	
0.5- 5	0.1	0.5	25	0.1	5	731100010000	
1 - 10	0.2	0.5	50	0.1	10	731100020000	
2.5 - 25	0.5	0.5	125	0.1	25	731100030000	
5 - 50	1.0	0.5	250	0.1	50	731100040000	

* Error limits (A = Accuracy, CV = Coefficient of variation) relative to the nominal capacity (maximum volume) indicated on the instrument, obtained at equal temperature ($20 \,^{\circ}$ C) of instrument, ambience and dist. water, and with smooth operation.

Items supplied:

Operating manual, 1 discharge tube, 1 mounting tool, 1 filling tube and adapters of PP of the following sizes:

Nominal vol. tube	Adapter, PP	Filling
		22

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0.5 – 5		
1 10	GL 25, GL 28, GL	300mm
1 - 10	32,GL 38, S40	
2.5 – 25		

Warranty

As provided by law, any and all warranties are null and void if the product has been misused, modified or repaired by unauthorized personnel, if the defects are caused by negligence (instruction manual, maintenance) or by normal wear and tear. Use only original manufacturer's accessory/spare parts.



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