700 Dosino

Manual

8.700.1023

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03.2000 dm

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Although all the information given in this documentation has been checked with great care, errors cannot be entirely excluded. Should you notice any mistakes please send us your comments using the address given above.

Documentation in additional languages can be found on *http://products.metrohm.com* under **Literature/Technical documentation**.

1 Overview

1.1 Areas of application

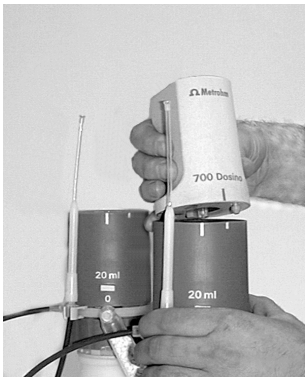
The Metrohm 700 Dosino is a versatile dosing drive which can be used for a wide range of demanding dosing tasks. It can be operated with various control instruments; this predestines it for use in complex automated systems.

Thanks to different 710 Dosing units (buret units) with 2, 5, 10, 20 or 50 mL dosing cylinders the Metrohm 700 Dosino is suitable for flexible use as a buret and can be adapted to a wide range of different applications.

Instead of the standard glass cylinder, dosing cylinders made of plastic (ETFE) are also available for use with aggressive alkalis.

Reagent exchange with the least possible loss of reagent is ensured as the design of the dosing unit has been optimized to provide the smallest possible dead volume.

The 700 Dosino can be placed directly on the reagent bottle. A range of threaded adapters ensures optimal fitting on the various types of bottle and threads. The size of the container is no longer important.
This type of assembly not only means that a lot of space is saved but, because the reagent is located below the drive, no escaping liquid can damage the drive.



If reagents are exchanged frequently then the dosing unit can remain attached to the reagent bottle while the dosing drive is simply removed and attached to the next dosing unit.

1.2 Application possibilities

700 Dosino dosing drives are supported by various Metrohm instruments and are suitable for a wide range of different applications.

Titration
The following Metrohm titrators can control 700 Dosinos as titration burets:

- 726/796 Titroprocessor (connection for four Dosinos as standard; can be extended for up to twelve Dosinos [*])
- 736 GP–Titrino (connection for two Dosinos)
- 751 GPD–Titrino (connection for two Dosinos)
- 758 KFD–Titrino (connection for two Dosinos)

Dosing
For complex dosing tasks, such as dosing controlled by time, dosing rate or temperature, the preparation of standard solutions and dilutions as well as pipetting or sample preparation the Dosino can be used with the

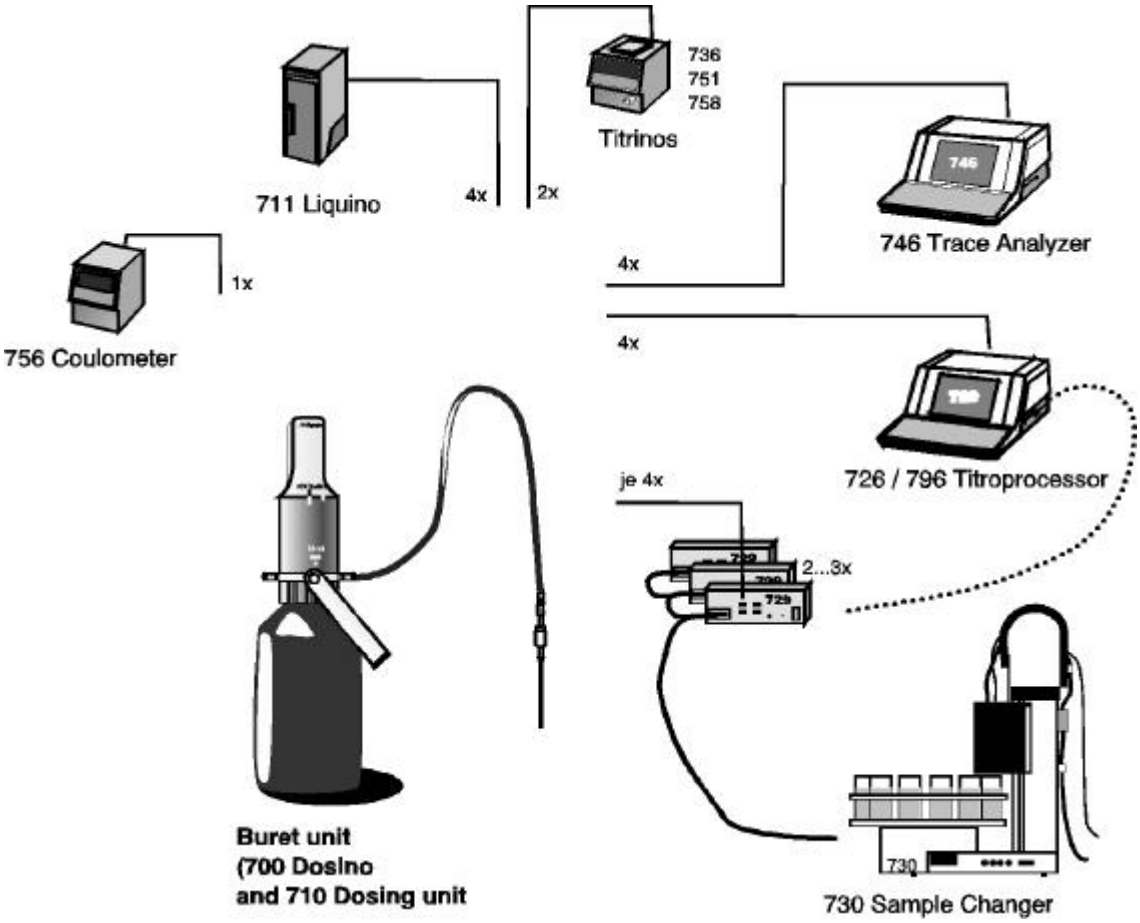
- 711 Liquino

As auxiliary buret the 700 Dosino can be used with e.g. the following Metrohm instruments:

- 730 Sample changer (connection for up to twelve Dosinos [*])
- 756 KF–Coulometer (connection for one Dosino)
- 746 Trace analyzer (connection for four Dosinos)
- 726 Titroprocessor (connection for four Dosinos as standard; can be extended for up to twelve Dosinos [*])
- 736 GP–Titrino (connection for two Dosinos)
- 751 GPD–Titrino (connection for two Dosinos)
- 758 KFD–Titrino (connection for two Dosinos)

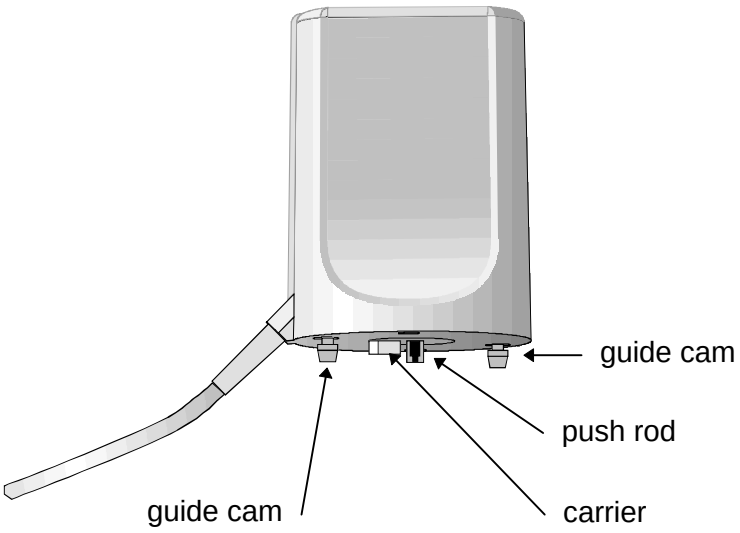
[*] *Four Dosinos can be connected to the external bus of the control instrument via a 729 Dosimat Interface. Up to three 729 Dosimat Interfaces can be operated in cascade form on a single external bus.*

1.2.1 The Dosino as a system component

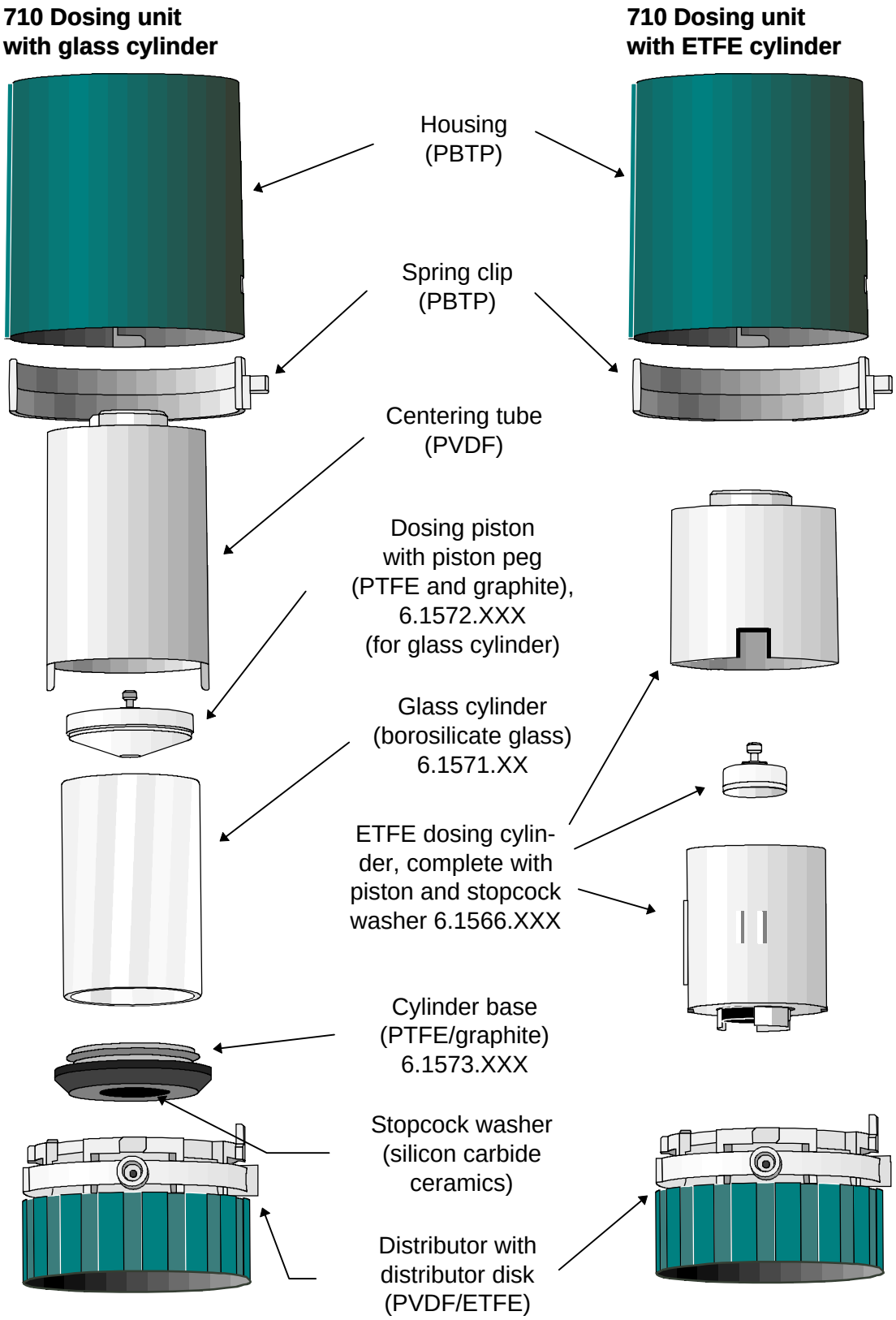


1.3 Construction of the Dosino burets

1.3.1 The 700 Dosino dosing drive



1.3.2 The 710 Dosing unit



2 Setup

2.1 700 Dosino dosing drive

Checks
Please check immediately on receipt whether the shipment is complete and undamaged (compare with delivery note and list of accessories in section 4.4). If transport damage has occurred please refer to section 4.3 'Warranty'.

Location
The 700 Dosino is a robust instrument and can therefore be used under rough conditions in laboratories and factories.
However, care must be taken that it is not exposed to a corrosive atmosphere. Regular care of the instrument is essential if it is used under rough conditions.

If an instrument which has been stored under cold conditions is brought into a warm room then it is possible that the atmospheric humidity could cause water to condense inside the instrument. In order to avoid damage to the instrument it should be allowed to acclimatize itself for at least one hour before it is switched on.

2.1.1 Connecting to a control instrument

The 700 Dosino is supplied with one of two different plugs. Please check that your model is fitted with the correct plug.

- **Model 2.700.0010 with 9-pin plug (DB9)**
  for connection to the following instruments:
  - 726 Titroprocessor
  - 729 Dosimat Interface (for connection to 730 Sample Changer or 726 Titroprocessor)
  - 693 VA Processor
  - 746 Trace Analyzer
  - 695 Autosampler

The **6.2134.010 Adapter cable** can be used for connecting Model 2.700.0020 (mini-DIN plug) to the instruments listed above.

- **Model 2.700.0020 with mini-DIN plug**
  for connection to the following instruments:

  – 711 Liquino
  – 736, 751, 758, 784, 785 Titrinos
  – 756 KF–Coulometer

The **6.2134.020 Adapter cable** can be used for connecting Model 2.700.0010 (DB9-plug) to the instruments listed above.

The location of the correct connection socket for the Dosino can be found in the 'Instructions for Use' of the corresponding control unit.

Only connect the Dosino to a control instrument when this is switched off. The control instrument only recognizes the Dosino during the switching-on process.

Please note the arrangement of the connection sockets. Do not try to plug in the connection cable by using force!

2.1.2 Safety information

General:
This instrument left our factory in perfect condition from a safety point of view (see technical data, safety specification). The following information must be carefully observed in order to maintain this condition and to ensure hazard-free operation.

Connection to a control instrument:
This instrument must only be connected to that connection socket of a Metrohm instrument which is provided for it (see corresponding 'Instructions for Use'). Only those adapter cables listed in the instructions are to be used.

Repairs and maintenance:
If faults or malfunctions occur during the operation of the 700 Dosino it is recommended that the connections with the control instrument are first checked to see if they are correct.

The Dosino (dosing drive) must not be opened. This should only be carried out by authorized service personnel.

2.2 710 Dosing unit

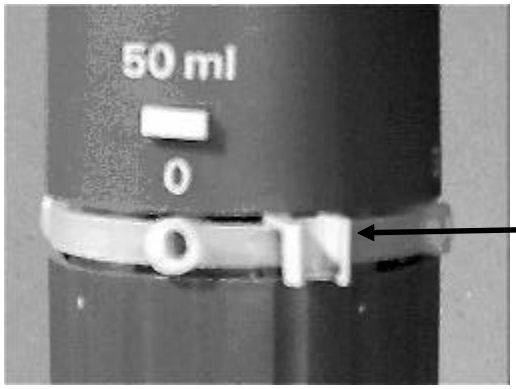
Checks
Please check immediately on receipt whether the shipment is complete and undamaged (compare with delivery note and list of accessories in section 4.5). If transport damage has occurred please refer to section 4.4 'Warranty'.

2.2.1 Mounting the dosing units

Dosing units are available with different cylinder volumes from 2 to 50 mL (see accessory list, p. 45). Dosing units with glass cylinders (ordering no. 6.3031.XXX) are available for standard applications such as dosing and titrating with non-aggressive solutions. For dosing aggressive media such as strong alkalis we recommend the use of dosing units with ETFE cylinders (ordering no. 6.3030.XXX). Dosing units must be ordered separately.

Standard situation
Dosing units can be mounted directly on reagent bottles with a GL45 thread. Suitable threaded adapters are available for bottles from different chemical manufacturers (see accessories list, p. 45).

- First attach the 6.2052.000 Buret tip holder to the white plastic ring of the dosing unit. Insert the double web of the holder into the upper edge of the ring until it reaches the notch and then, using a little pressure, carefully tilt the buret tip holder downwards until the individual webs snap into the lower edge of the ring. A buret tip can now be suspended from the holder with the tip facing upwards.



- Screw the 6.1829.010 Aspiration tubing tightly onto the threaded connection on the lower surface of the dosing unit. This is the filling port (Dosino Port 2). Make care that the tubing is attached tightly so that no air bubbles can penetrate when the reagent solution is aspirated. Tighten the screw nipple firmly by hand.

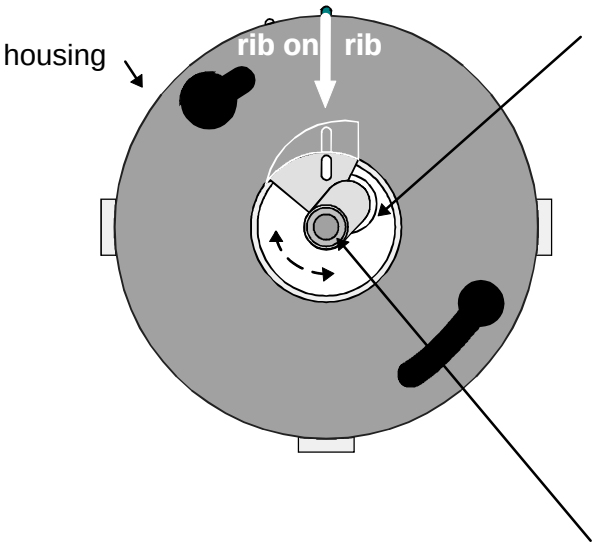
If it is not possible to loosen a connection nipple by hand then you should use the 6.2739.000 Spanner supplied. Using the spanner to tighten up a nipple can damage the tubing connection.

- Place the dosing unit on the reagent bottle and screw it down. Tighten the fixing ring (on the distributor) firmly. It is now possible to rotate the upper part of the housing in any direction you require.
  If the thread does not fit then you must use a threaded adapter, see p. 45.

- Fill the 6.1619.000 Adsorber tube with a suitable adsorption material for the reagent, e.g.
  - Molecular sieve for moisture-sensitive solutions such as KF solutions or others.
  - Soda lime for sodium hydroxide (CO_2 adsorption)
- Screw the adsorber tube onto connection port 0 of the dosing unit. Port 0 vents the reagent bottle. It should never be closed completely. If no adsorber tube is required then Port 0 must remain open.
- Mount the 6.1805.100 Dosing tubing on Port 1 of the dosing unit. Tighten the connection nipple by hand.
- Depending on the application you can now screw the 6.1543.050 Titrating tip with anti-diffusion valve or the 6.1543.060 Dosing tip onto the dosing tubing. The 6.1446.030 Ball stopper supplied can be used to fix the tip in an NS14/15 ground joint opening.

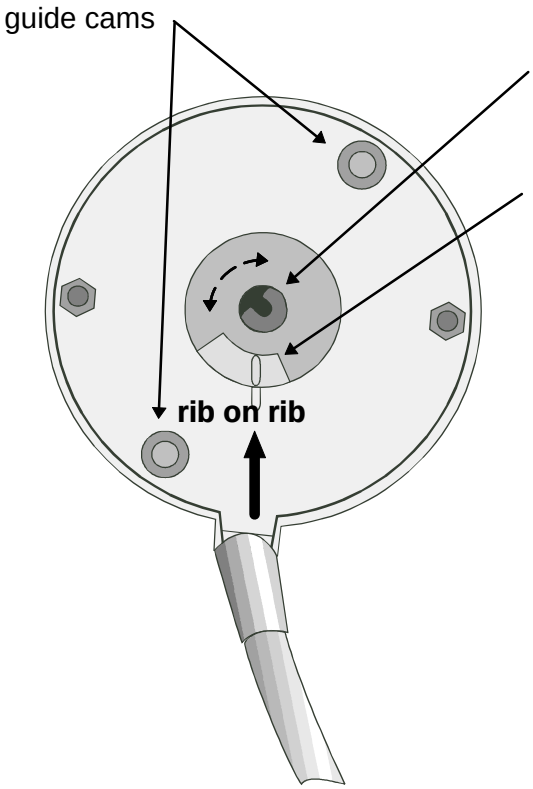
2.2.2 Placing the drive on the 710 Dosing unit

Check the positions of the centering tube and dosing piston of the dosing unit.



- The plastic rib in the recess of the centering tube must be flush with the plastic rib on the dosing unit housing **(rib on rib)**.
- If necessary rotate the centering ring by hand until the rib on rib position is obtained.
- Check the piston peg. It has to be flush with the upper edge of the dosing unit. If this is not the case, see chapter 2.2.3, next page

Check the position of the carrier disk of the drive.

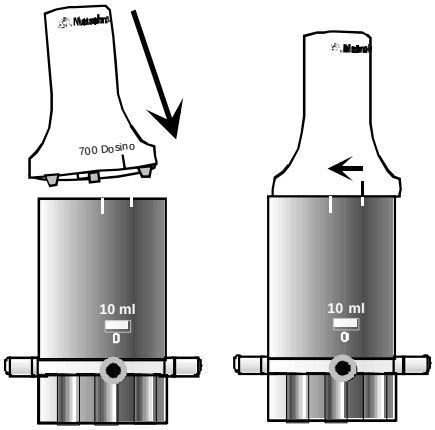


- The plastic rib of the carrier disk must be flush with the plastic rib on the base plate of the drive **(rib on rib)**.
- If necessary rotate the centering ring by hand until the ribon rib position is obtained.

Please note!

The dosing drive carrier can only be adjusted when the control instrument to which it is connected is switched off.

Never use force when attaching the dosing drive!



- Place the dosing drive (700 Dosino) on the 710 Dosing unit.

  *The green line on the Dosino must coincide with the **short** white marking of the dosing unit; see accompanying diagram. The guide cams of the Dosino must be located in the openings provided for them.*

- Lock the drive, i.e. turn to the left (counterclockwise) until the stop is reached.

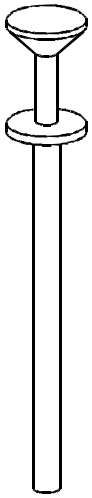
  *The green line on the Dosino must now coincide with the **long** white marking of the dosing unit; see accompanying diagram.*

2.2.3 Problems in attaching the dosing drive?

If the dosing unit cannot be attached then either the stopcock washer of the Dosino or the centering tube of the dosing unit may not be in the exchange position.
The stopcock washer carrier must fit in the dosing unit recess provided for it. Please consult the previous diagrams.

The peg of the piston must be flush with the upper edge of the dosing unit.

How to adjust the dosing piston:



Each Dosino is supplied with piston pliers (6.1546.030); see accompanying diagram.

- Press the white knob of the piston pliers. Two wire loops appear at the piston pliers tip.
- Position the piston pliers so that these wire loops surround the piston peg.
- If you now release the knob carefully the piston pliers will snap shut and you can pull out the piston with the white knob (some force is required).

  Take care with the 2 mL cylinder! *In contrast to the larger dosing cylinders it is possible to pull out the piston completely. You should only pull out this piston so far (and carefully) that*

the gray upper edge of the dosing piston is just visible.

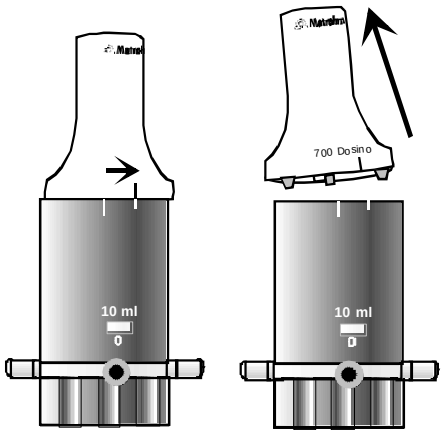
- Release the piston pliers by pressing the white knob.
- Then press the inverted dosing unit against a flat surface. The piston should now be flush with the upper edge of the dosing unit.

2.2.4 Removing the dosing drive from the 710 Dosing unit

A dosing drive can only be removed from a dosing unit when the four-way valve is in Position 2 (filling port, exchange position).

- Press the **<EXCH>**, **<FILL>** or **[Fill]** key on the control instrument. The valve will automatically turn to the 'Exchange' position.

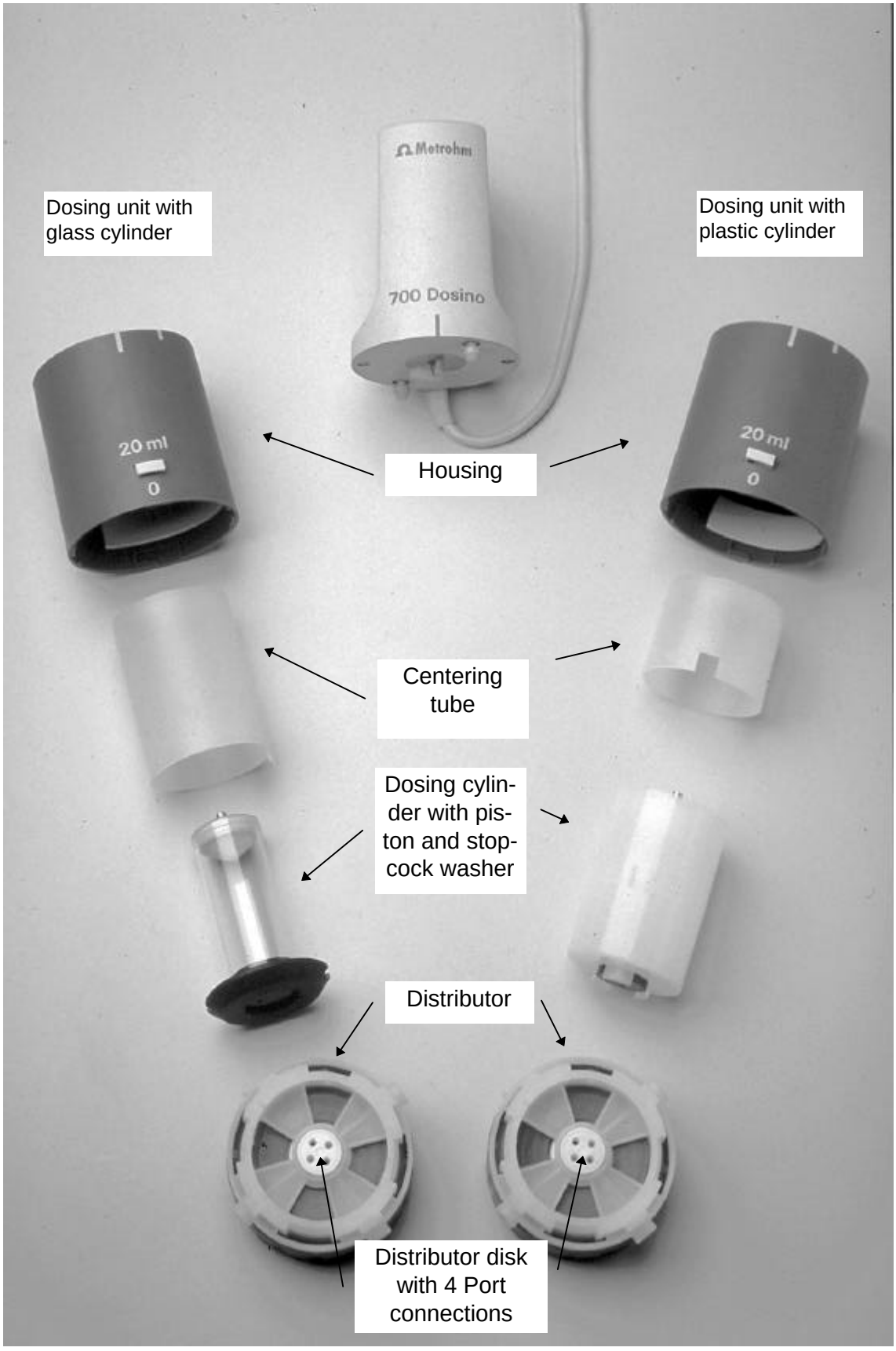
  Detailed information about the manual operation of Dosinos can be found in the 'Instructions for Use' of your instrument.



- The drive mounted on the dosing unit is unlocked by rotating the Dosino to the right (clockwise).

  The green line on the Dosino must now coincide with the shorter white marking of the dosing unit.
- The dosing drive can now be lifted off upwards.
- **Never** adjust the carrier of the Dosino or the centering tube of the dosing unit when these have been separated from each other. This could make attaching the dosing unit more difficult; please refer to the explanations on the previous page.

2.3 Dismantling the dosing units



It is not normally necessary to dismantle the dosing unit when changing the reagent. Owing to the minimal exchange volume of only a few microliters and the **'EMPTY'** and **'PREP'** functions, which each control instrument possesses for the Dosino, the reagent in a dosing unit can be comfortably exchanged without much loss of reagent; please refer to chapter 3.2.

Check the piston and cylinder of a dosing unit regularly (i. e. twice per year), see chapter 3.3. If alkaline, corrosive or concentrated reagents are used then a shorter interval should apply as the glass cylinder could be attacked by aggressive alkalis or crystals may be formed. We also recommend that dosing units with ETFE cylinders are used for alkaline reagents.

- You should empty the cylinder before opening a dosing unit by using the **'EMPTY'** function of the control instrument.

2.3.1 Opening the housing

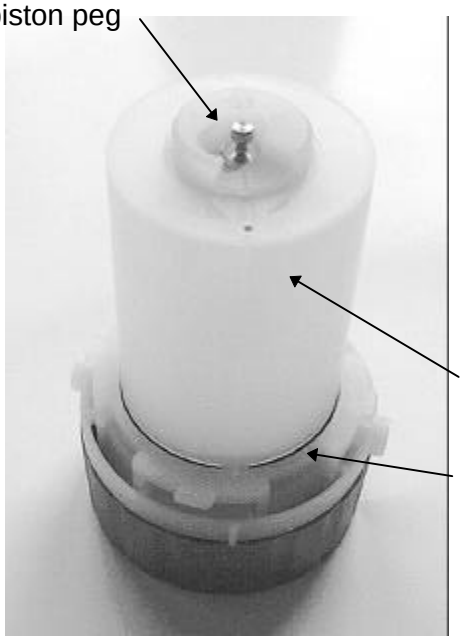
The internal construction of a dosing unit with an ETFE cylinder is different from that of a dosing unit with a glass cylinder. Dismantling a dosing unit with a glass cylinder is described below. Points which have to be taken into account when dismantling a dosing unit with an ETFE cylinder are mentioned on page 16.

- First remove the dosing drive; see chapter 2.2.4.
- Remove all tubing and the drying tube from the dosing unit. In order to remove the drying tube press the rotating axis of the tube firmly and turn it counterclockwise until the screw nipple is loose.
  If the dosing unit is mounted on a reagent bottle screw it off and remove the filling tube.

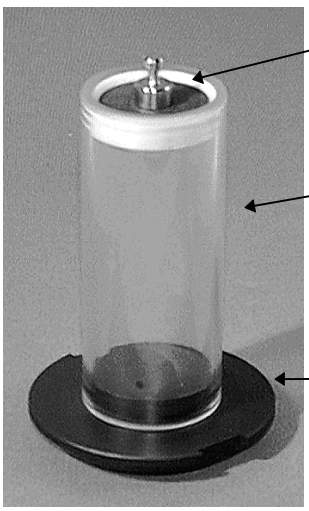
- Place the dosing unit on a flat surface so that the marking showing the volume is facing towards you.

- Keep the white knob pressed down and rotate the dosing unit housing by approx. 1 cm to the right (counterclockwise).
- Release the white knob and carefully lift the housing upwards.
- *Take care that the white spring clip inside the housing does not slip out of place.*

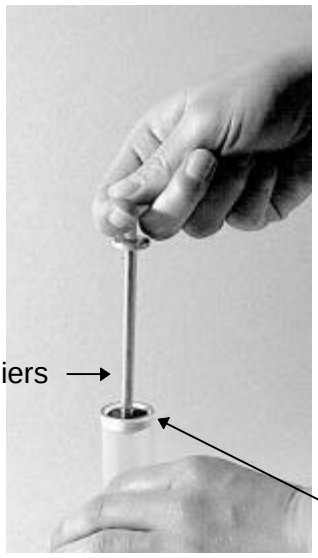
2.3.2 Centering tube and glass cylinder



- You can now see the centering tube, which rotates together with the internal cylinder on the distributor.
- Remove the centering tube.
- *Take care that the black cylinder base is also lifted up.*



- The centering tube is plugged onto the black cylinder base. Loosen it carefully from the cylinder base.



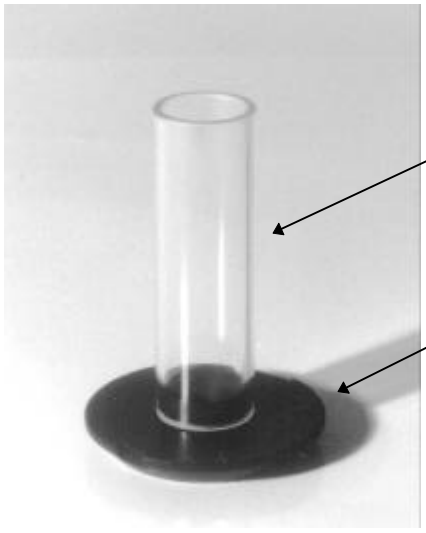
Use the piston pliers (6.1546.030) to pull the dosing piston out of the cylinder:

- Press the white knob of the piston pliers.

  Two wire loops appear at the piston pliers tip.

- Position the piston pliers so that these wire loops surround the piston peg.

If you now release the knob carefully the piston pliers will snap shut and you can pull out the piston with the white knob (some force is required).



- The glass cylinder can now be removed from the cylinder base by twisting it firmly.

Leave the black stopcock washer in the cylinder base.

You can now clean or replace the individual components, such as the cylinder or the piston.

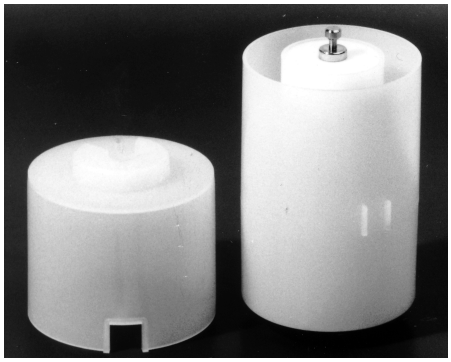
See chapter 3.3 for cleaning instructions.

Please note! It makes no sense to replace the cylinder or the piston separately. Always replace both, if necessary.

2.3.3 Centering tube and ETFE cylinder

In a dosing unit with an ETFE cylinder the centering tube consists of two plastic parts. The dosing cylinder is integrated in the lower plastic part.

- Open the housing as described in section 2.3.1.
- Lift off the centering tube in one piece (i.e. both plastic parts) from the distributor.



- The upper plastic part can simply be pulled off upwards.

  You can now see the plastic cylinder with the dosing piston.

- The dosing piston can be removed with the piston pliers in the same way as for a glass cylinder, see section 2.3.2.

Leave the black stopcock washer in the cylinder base.

2.4 Assembling the dosing units

Several important points must be observed when assembling the dosing units.

The dosing cylinder and piston, in particular its sealing lips, must not be damaged in the assembly process.

- Place the black cylinder base with the stopcock washer facing downwards on a flat surface. Place the glass cylinder on it as **nearly vertical as possible** and press it **gently** and as uniformly as possible onto the cylinder base while moving it backwards and forwards slightly. **Do not tilt!**
- Check whether the glass cylinder is seated properly on the cylinder base.

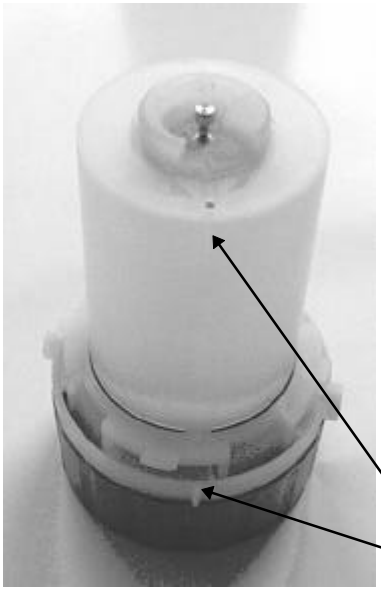
- Place the dosing piston on the cylinder as nearly horizontal as possible.
- Insert the dosing piston as uniformly as possible into the cylinder. Hold the outer edge of the piston between the left and right index fingers (for larger diameter cylinders use the middle fingers as well) and carefully press the piston into the glass cylinder with uniform pressure.
- The upper edge of the sealing lip must be flush with the cylinder rim, see photo.

- You can now attach the centering tube.

  The narrow and the wider web on the lower surface of the centering tube must fit into the corresponding recesses of the black cylinder base.

  The head of the piston push rod must fit into the opening on the top of the centering tube.

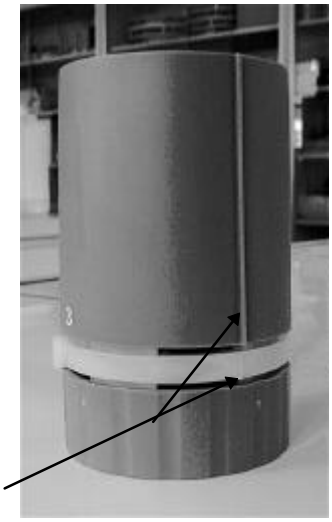
- Press the centering tube firmly onto the cylinder base.



- The centering tube with cylinder and cylinder base is now attached to the distributor.

  The centering tube must be correctly positioned in order to assemble the housing.

- Rotate the centering tube on the distributor so that the marking rib on the centering tube coincides with the marking rib on the distributor rim (see photo alongside), i.e. **rib on rib.**



- Before attaching the green housing check whether the internal gray spring clip is positioned properly in its guide groove and can be easily moved by applying pressure to its projecting knob.
- Now place the dosing unit housing over the centering tube. The alignment is again **rib on rib**, see photo alongside.

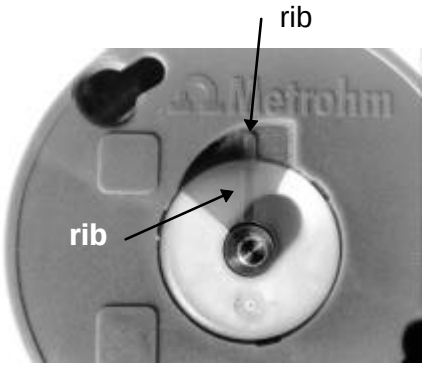
  Make sure that the centering tube fits into the opening on the top of the housing.

- Lock the housing by turning it to the left (clockwise).
  Hold the distributor tightly. Do not use force!

  If all the parts fit together properly the housing will snap into place.

- Now check that the piston and the centering tube are positioned correctly.

  The head of the piston must be flush with the upper edge of the housing.
- Use the piston pliers to pull out the piston until the stop is reached and press the complete inverted dosing unit onto a flat surface.



- Check the valve setting.

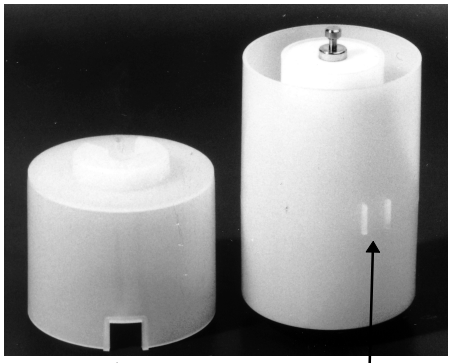
  You can recognize the recess for the carrier of the Dosino on the top of the dosing unit, see photo.

  In this recess you will again see two marking ribs.
- Rotate the centering tube until these ribs coincide.

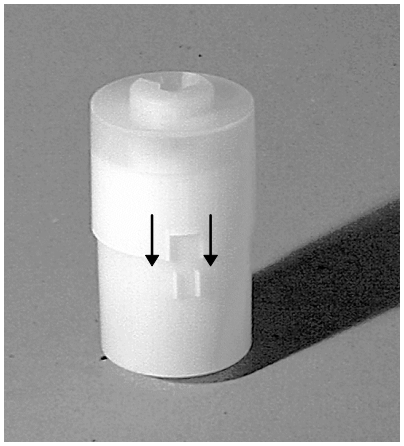
- Refit all tubing and the adsorber tube.

2.4.1 ETFE cylinder

- Insert the dosing piston into the cylinder as described in the previous section.



- The centering tube for the plastic cylinder has a recess on its lower surface.



- Place the centering tube on the lower part of the cylinder so that the recess encloses the double rib on the outside of the lower part.
- Just as for the dosing unit with glass cylinder, care must be taken that the marking ribs on the distributor coincide with those on the outside of the cylinder when placing the complete plastic part on the distributor.

- The housing can now be attached in the same way as described for the dosing unit with glass cylinder.

⇐ Exception:

The 50 mL ETFE cylinder is similar in construction to the glass cylinders and is assembled similarly.

2.5 Dosino and dosing unit setup

Various stands and holding devices are available for Dosino burets:

2.5.1 Support mounting (6.2047.010)

- Attach the support mounting to a support rod (10 mm dia.)
- Place the dosing unit (without bottle) in the mounting from above. Screw the reagent bottle onto the dosing unit from below.

- Version:
  free stand assembly

2.5.2 Double bottle holder (6.2055.100)

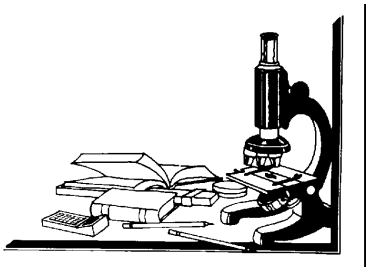
- The double bottle holder can be adjusted in height. Bottles up to 1 liter can be used.
- 2 inserts for sleeves can be used as buret tip or electrode holders.

2.5.3 727 Ti Stand (2.727.0XXX)

- For titrations in particular we recommend the use of our 727 Ti Stand (with or without built-in magnetic stirrer).

2.5.4 Direct mounting on canisters

- A Dosino with dosing unit can be directly mounted on a canister with a suitable adapter. Use 6.1618.050 Thread adapter.

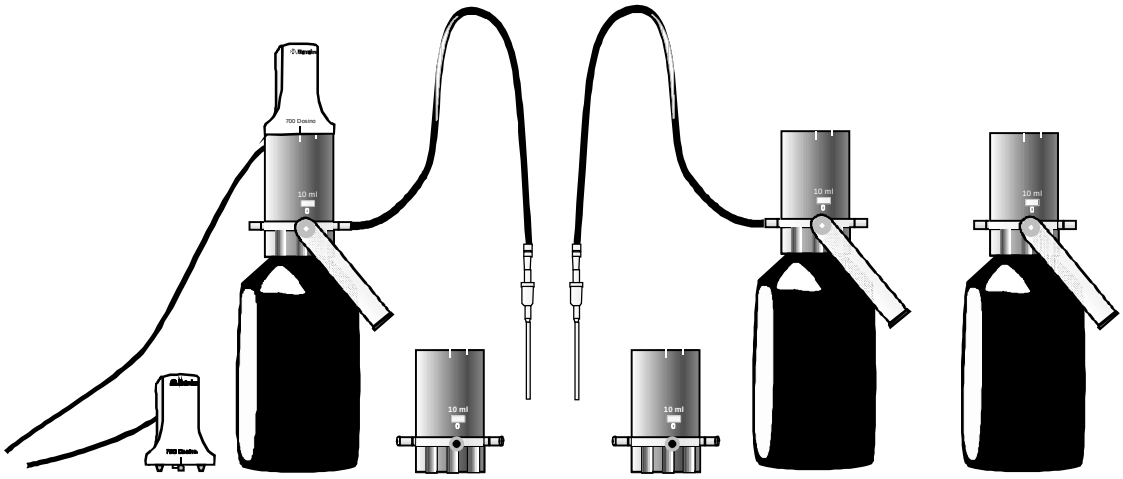


3 The Dosino in practice

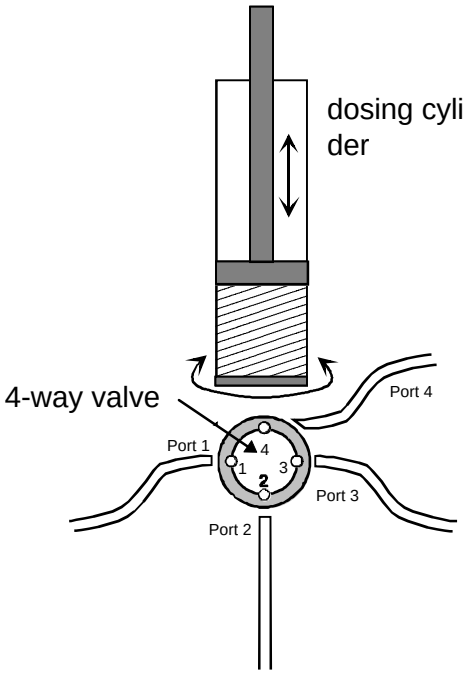
700 Dosinos can be connected to various control instruments. They are used as dosing drives which can be operated with different 710 Dosing units. The dosing unit forms the buret and is mounted directly on a reagent bottle or a canister.

Changing a dosing unit (and therefore a reagent) is very easy. The drive is removed from one dosing unit with a single movement and attached to the next one. The Dosino remains plugged into the control instrument.

Before a Dosino buret is used we recommend that the dosing cylinder and the tubing are rinsed through once with reagent solution in order to ensure that the whole system is bubble-free.
Metrohm instruments possess the comfortable **'PREP'** function for this important preparation step: a complete rinsing cycle is triggered by pressing a key.



If a dosing unit is to be filled with a different reagent then the dosing cylinder and connected tubing are first emptied with the **'EMPTY'** function. The dosing unit is then filled by using the **'PREP'** function .

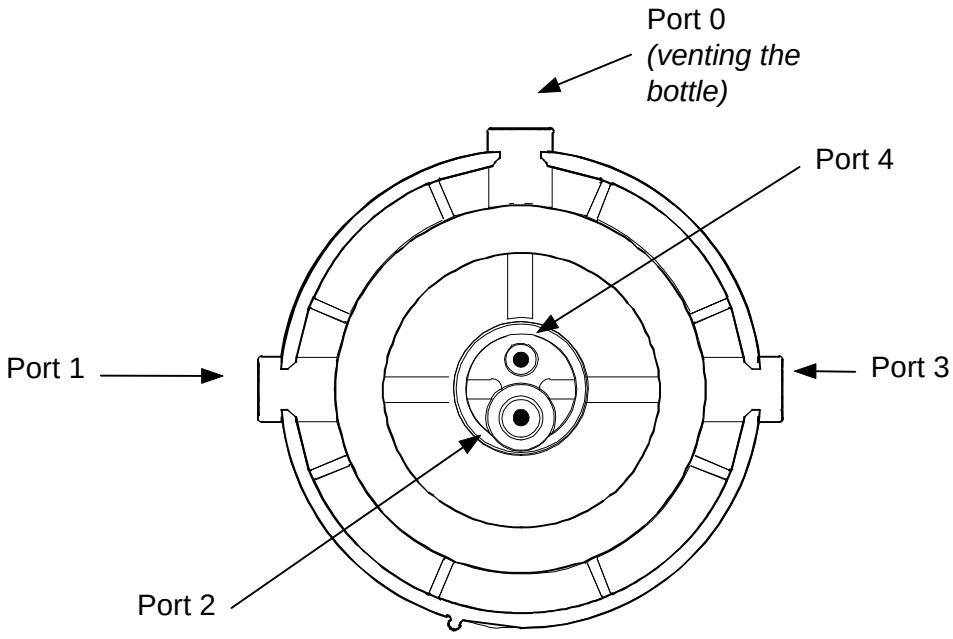


Simplified functional diagram

- The dosing cylinder with the stopcock washer in the cylinder base is coupled to the centering tube.
- The centering tube is loosely seated on a distributor fitted with four different channels. These channels lead to the different ports.
- The dosing drive with its carrier rotates the centering tube and therefore the stopcock washer. This results in movement to a particular valve setting.
- The dosing motor of the drive moves the dosing piston by means of a push rod and in this way ejects or aspires liquid from or into the cylinder via the selected port.

Port assignment

The distributor of a dosing unit has freely addressable inputs/outputs (ports) and an additional connection (Port 0) which leads directly to the lower surface of the distributor. This Port 0, which cannot be addressed by the 4-way valve, is used for venting the storage container and can be fitted with an adsorber tube.



Dosing unit distributor seen from below

The standard assignment listed below applies to the following Metrohm instruments; it cannot be altered:

- 726 / 796 Titroprocessor
- 736, 751 and 758 Titrino models
- 746 VA Trace Analyzer
- 756 KF-Coulometer

The standard occupancy of the Dosino ports:

Port 1 Dosing outlet; M6 threaded connection on the left-hand side of the housing.
The liquid is ejected via dosing or titrating tip.

Port 2 Filling inlet; M6 threaded connection on the bottom of the dosing unit.
The liquid is aspired from a storage container.

Port 3 Not assigned; M6 threaded connection on the right-hand housing side.

Port 4 Special functions; slender connection nipple on the bottom of the dosing unit.
This can be used with the **'PREP'** function for ejecting the liquid. When emptying the dosing unit port 4 is used as the air inlet.

Port 0 Venting the storage bottle; M6 threaded connection at the front. A drying tube can be connected here; this can be filled with e.g. molecular sieve or soda lime.

Variable port assignments are possible with the following instruments:

- 730 Sample changer (and successors)
- 711 Liquino
- 774 Oven Sample Processor

Ports 1 to 4 can be used bi-directionally here and are therefore suitable for filling the dosing cylinder or dosing a liquid as required. This means that complex liquid handling applications are possible.

If one of ports 1 to 3 is not in use then it should be closed with a thread stopper (6.1446.040).

Never close Port 0 with a thread stopper when the dosing unit is attached to a storage container. This could create a vacuum in the storage container – risk of implosion!

3.1 Air bubbles are (almost) inevitable

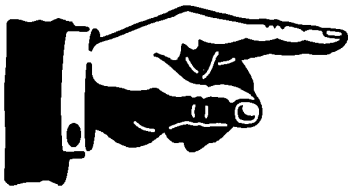
As a result of leaky tubing connections or the release of dissolved air from the liquid to be dosed it is possible that air bubbles could collect in the dosing cylinder.
Always check the tubing ends for damage before you attach the tubings. Please ensure that tubing connections are always tight. Always tighten up the screw nipples firmly by hand and take care that you do not damage the tubing ends when doing this.

All Metrohm instruments which support Dosinos as dosing drives possess a **'PREP'** function. This function is a preparation step in which the cylinder and tubing are automatically filled with liquid. In order for the control instrument to be able to calculate the correct amount of rinsing solution required it is necessary to enter the lengths and diameters of all the connected filling and dosing tubing. This is carried out in the dosing unit configuration of the particular instrument.

Always use the 'PREP' function before you use a dosing unit for the first time, i.e. before you start a sample series carry out the 'PREP' function first (at least once per day).

Further details are given in the ‘Instructions for Use’ of your Metrohm instrument.

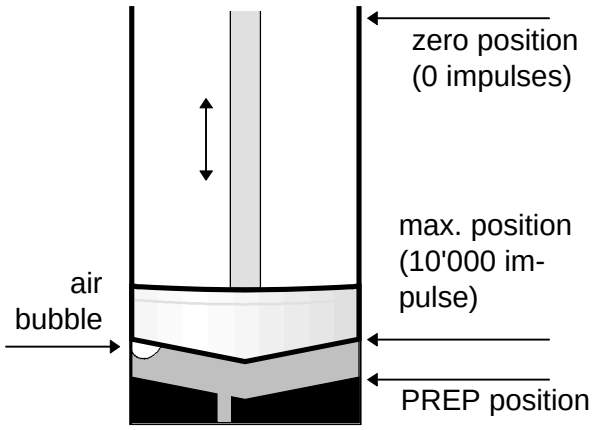
Please note:
With the **'PREP'** function the existing cylinder contents are completely ejected. The piston moves beyond the normal maximum position (10'000 impulses) and presses against the cylinder base. The piston can never completely fill the whole of the cylinder base so that a small air bubble may remain in position.



Even after a **'PREP'** preparation step there will **always be a small air bubble** at the piston. It will not escape the cylinder.

However, such a small air bubble **does not affect the precision of a dosing process!**

For details please refer to the drawing on the following page.



The maximum position of the piston is never exceeded in dosing processes. The remaining dead volume is therefore always larger than any air bubble which may remain after the 'PREP' function has been carried out. This means that it cannot escape into the tubing system and affect the precision of the dosing process. The air bubble remains in the dosing cylinder.

3.2 Reagent exchange

Dismantling and cleaning the dosing unit when a regent is changed is not normally necessary. The dosing unit is constructed so that only a small exchange volume is present.

- Empty the dosing unit with the **'EMPTY'** function of the control instrument.

When the dosing unit has been emptied (with the **'EMPTY'** function of the control instrument) it can be rinsed directly with the new reagent.

- Fill the dosing unit with the **'PREP'** function of the control instrument.

If precipitation or chemical reactions could occur when the new reagent is mixed with the old one then an intermediate rinsing stage should be carried out with an inert solvent.

If a reagent is not to be used for longer than one week then the dosing unit should be emptied by means of the **'EMPTY'** function and the dosing drive removed.

3.3 Cleaning and maintenance

Unlike the dosing units the dosing drive requires no special maintenance. You should ensure that it is not exposed to excessive dirt or corrosive influences. If aggressive reagents are dosed with Dosino burets then, when the dosing unit is not in use, it should be rinsed with an inert solvent (**'PREP'** function) and then emptied (**'EMPTY'** function). The dosing drive should be removed during longer periods (more than one week) of non-use .

Dosing units require to be checked regularly and be cleaned frequently.

If alkaline, corrosive or concentrated reagents are used then a check has to be done once a month or even once a week. Other reagents may allow the inspection period to be extended to six or twelve months.

The way in which a dosing unit is dismantled is shown on page 13ff.

3.3.1 Cleaning the cylinder and piston

- Check the tightness of the dosing piston and cylinder. If there is liquid above the piston this means that the dosing cylinder is either not lubricated at all or is not adequately lubricated. Check whether the sealing lips are deformed or damaged; if they are then the piston and the cylinder must be replaced.

- Clean the dosing cylinder and piston with a liquid detergent. Do not use abrasive powders as these could scratch the cylinder. Then thoroughly rinse the individual components with deionized or distilled water.

- Degreasing the piston and the glass cylinder is part of the cleaning process. Use an appropriate cleaning agent or solvent and possibly an ultrasonic bath. Follow the manufacturer's recommendations.

- Before reassembling the dosing unit check the piston and cylinder again for changes. If the dosing cylinder is scratched or has rough surfaces it must be replaced.

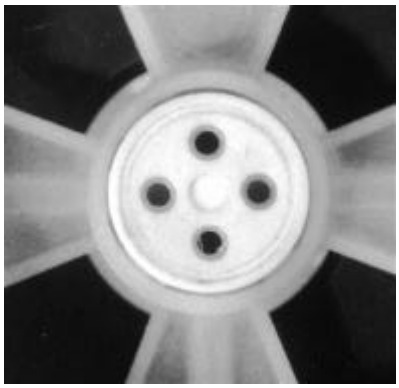
- In order to ensure that the Dosino buret does not leak it must be slightly lubricated. Carefully apply a little 6.2803.000 Grease (silicone-free) with your finger to the outside of the piston and wipe off any excess grease with a soft lint-free cloth.

3.3.2 Cleaning the stopcock washer and distributor disk

The stopcock washer and distributor disk must be checked regularly. Blockages of the disk opening or the outlet ports must be avoided at all costs.

Dismantle the dosing unit completely. The black stopcock washer sits on the cylinder base and can be removed with a pair of forceps or a bent paper clip.

Stopcock washer
(in cylinder base)



Distributor disk with 4 ports
(in distributor)

Leave the white distributor disk in the distributor.

If the cock and distributor disks are stuck together they can be separated in the following manner:

- Try to loosen the two disks by rotation.
- If this does not work place the two parts in water or an organic solvent (i. e. ethanol) for a few minutes. It should now be possible to separate the disks by rotation.

Cleaning the stopcock washer and the distributor disk

- Use a liquid detergent. Abrasive powders are unsuitable and could scratch the stopcock washer.
- Dry the disks with a lint-free soft cloth.

Assembling the stopcock washer and distributor disk

- Insert the **stopcock washer** and press it down. The central hole of the disk must point towards the cylinder base.
- Use a plastic pipet tip to extend the opening of the cylinder outlet on the bottom of the cylinder base.

If the distributor disk was removed it can be reassembled as follows:

- Use a plastic pipetting tip to extend the opening of the distributor.
- Lightly grease the inner surfaces of the distributor disk with 6.2803.000 Grease (silicone-free).
- Mount the distributor disk on the distributor and press it down tight. There is a central hollow on the disk. It has to be facing upwards.
- Extend the opening with a plastic pipetting tip again.

3.4 Troubleshooting / Problems

3.4.1 Dosino buret

Dosing drive cannot be mounted on the dosing unit.

Possible causes:

- **The carrier of the drive is in the wrong position.**

  Þ *Switch the control instrument off and then on again. If the carrier does not automatically rotate to the starting position switch it off again and rotate the carrier manually to the correct position. Pay attention to the marking ribs: rib on rib. See page 9.*

- **The centering tube is wrongly positioned.**

  ⇒ *Rotate the centering tube of the dosing unit into the correct position by hand. Pay attention to the marking ribs: rib on rib. See page 9.*

- **The dosing piston is in the wrong position. The piston peg must be flush with the housing.**

  ⇒ *Use the piston pliers to pull out the piston to the stop (take care with the 2mL buret) and press the inverted dosing unit against a flat surface. See page 10.*

- **The push rod of the drive is wrongly positioned.**

  ⇒ *Place the drive on the empty housing of a dosing unit and press <FILL> or <EXCH>.*

Dosing drive cannot be removed from the dosing unit.

Possible causes:

- **Piston and/or 4-way valve are not in the 'Exchange' position.**

  Þ *Carry out 'EXCH' or 'FILL' function on the control instrument. Check cable connections to control instrument.*

  Þ *Switch control instrument off and then on again.*

  ⇒ *Lock the drive on the dosing unit, i.e. turn it to the left until it reaches the stop.*

- **If the dosing unit still cannot be removed after the 'EXCH' or 'FILL' function has been carried out then either the piston or the 4-way valve is blocked or even damaged. Procedure:**

  1. *Switch off control instrument.*
  2. *Press the white knob of the dosing unit and remove the distributor. Place Dosino buret in an inverted position.*
  3. *Switch on the control instrument and trigger EXCH or FILL. If you can clearly hear the valve rotating the Dosino buret can be replaced on the distributor.*

Þ *Place the dosing unit with attached drive vertically on the distributor, marking rib on marking rib, and turn the dosing unit to the left until you can clearly hear the spring clip snap into position. You should now be able to remove the drive from the dosing unit.*

⇒ *You can also directly dismantle the dosing unit by placing the dosing buret without the distributor vertically on a flat surface and removing the drive. If you now remove the dosing unit housing the interior of the dosing unit with centering tube and cylinder, etc. is freely accessible. Then reassemble the dosing unit properly according to the instructions given on page 17ff.*

If the valve cannot be rotated or if the piston does not move properly to the zero position then the dosing unit must be dismantled by a technician from your local Metrohm service center.
If a dosing cylinder filled with a chemical is opened improperly this can damage the dosing unit and/or the dosing drive.
The dosing drive housing must not be opened as the control electronics of the drive are very susceptible to mechanical damage.

Dosino buret cannot be addressed by the control instrument.

Possible cause:

- **Connection between Dosino and control instrument is interrupted or the Dosino is in a faulty condition.**

  Þ *Check cable connections.*

  Þ *Switch control instrument off and on again.*

  ⇒ *Check the dosing and filling rates.*

  If this does not remedy the problem:
  ⇒ *Contact your local Metrohm service center.*

Control instrument does not recognize the Dosino buret.

Possible cause:

- **Connection between Dosino and control instrument is interrupted or the Dosino has not been initialized.**

  Þ *Check cable connections.*

  Þ *Switch control instrument off and on again.*

  ⇒ *If a 729 Dosimat interface is connected check its E-Bus address.*

  If this does not remedy the problem:
  ⇒ *Contact your local Metrohm service center.*

The whole system is blocked.

Possible cause:

- **The Dosino or control instrument is in an exceptional faulty condition.**

  Þ *Check cable connections.*

  Þ *Switch control instrument off and on again.*

  ⇒ *Remove dosing drive from dosing unit. With the instrument switched on check whether the drive carrier can be rotated.*
  – If yes then the dosing drive is faulty.
  – If no then dismantle the dosing unit. Clean the black stopcock washer in the cylinder base, see page 29.

3.4.2 Dosing unit

Air bubbles in cylinder or dosing tubing

Possible causes:

- **Leaking connections.**

  Þ *Check the tubing ends, in particular that of the aspiration tubing.*

  Þ *Tighten all tubing connections manually.*

  ⇒ *Check whether the housing is properly locked. If necessary remove the housing and then put it back on again.*

- **The reagent releases a lot of gas, i.e. dissolved air forms bubbles.**

  Þ *Carry out PREP.*

  Þ *Lower the filling speed.*

  ⇒ *If necessary degas the reagent ultrasonically.*

- **Wear and tear.**

  ⇒ *Replace piston and/or cylinder.*

- **PREP not carried out or incorrect parameters.**

  Þ *Carry out PREP.*

  ⇒ *Correct tubing lengths and diameters.*

Stopcock washer and distributor disk stick together

Possible cause:

- **Precipitation of crystals from the reagent.**

  ⇒ *Clean the stopcock washer and distributor disk, see page 29.*

Dosing unit leaks from distributor

Possible cause:

- **Leaky distributor disk.**

  ⇒ *Clean the stopcock washer and distributor disk, see page 29.*

Liquid above the piston

Possible cause:

- **Worn or faulty piston and/or cylinder.**

⇒ *Replace dosing piston and cylinder, see page 13.*

Liquid drips into the bottle

Possible cause:

- **Air in the cylinder.**

  Þ *Check the tubing ends, in particular that of the aspiration tubing.*

  Þ *Tighten all tubing connections manually.*

  ⇒ *Check whether the housing is properly locked. If necessary remove the housing and then put it back on again.*

- **The reagent releases a lot of gas, i.e. dissolved air forms bubbles.**

  Þ *Carry out PREP.*

  Þ *Lower the filling speed.*

  ⇒ *If necessary degas the reagent, i. e. with helium, vacuum or an ultrasonic bath.*

- **Wear and tear.**

  ⇒ *Replace piston and/or cylinder.*

- **PREP not carried out or incorrect parameters.**

  Þ *Carry out PREP.*

  ⇒ *Correct tubing lengths and diameters.*

Dosing unit is not recognized or incorrectly recognized

Possible cause:

- **Dosing drive not attached correctly.**

  Þ *Check whether the nominal volume on the dosing unit housing is correct.*

  Þ *Remove Dosino and put it back on again.*

  Þ *Check whether the drive is correctly seated.*

  Þ *Switch control instrument off and on again.*

  ⇒ *If necessary contact your local Metrohm service center.*

Housing cannot be closed

Possible cause:

- **Spring clip inserted wrongly.**

⇒ *Remove housing and position spring clip correctly.*

Dosing cylinder does not fit in centering tube.

Possible cause:

- **Dosing cylinder jammed or tilted on cylinder base.**

⇒ *Dismantle cylinder and use tool to reassemble correctly.*

Drying tube jammed.

⇒ *Use your thumb or ball of thumb to press strongly on the rotary axis of the drying tube and simultaneously turn the tube counterclockwise carefully until the screw nipple becomes loose.*

3.4.3 Dosing drive

Drive carrier rotates continuously.

Possible cause:

- **Dosino electronics damaged.**

⇒ *Send the dosing drive to your local Metrohm service center for repair.*

Dosino becomes hot.

Possible cause:

- **Dosing drive is overloaded: 4-way valve or dosing piston is blocked.**

Þ *Switch off instrument immediately.*

⇒ *Dismantle dosing drive (please observe the information given on page 31) and clean all the components. Replace any faulty parts. See page 13ff.*

3.4.4 Dosing

Reagent dosed from incorrect port

Possible cause:

- **Control instrument configuration is wrong or incorrect parameters have been defined for the dosing unit.**

Þ *Correct the settings; please refer to the 'Instructions for Use' of the control instrument.*

Tubing not completely filled during PREP.

Possible cause:

- **Incorrect parameters have been defined for the dosing unit.**

  ⇒ *Correct the tubing lengths and diameters; please refer to the 'Instructions for Use' of the control instrument.*

Tubing not completely emptied during EMPTY.

Possible cause:

- **Incorrect parameters have been defined for the dosing unit.**

  ⇒ *Correct the tubing lengths and diameters; please refer to the 'Instructions for Use' of the control instrument.*

Wrong volume is dosed.

Possible cause:

- **Dosing unit mounted incorrectly or wrongly assembled.**

  Þ *Remove dosing unit and put it back on again.*

  ⇒ *Check whether the nominal volume on the housing coincides with the effective cylinder volume.*

Dosing does not take place.

Possible cause:

- **Blocked tubing connections or dosing unit wrongly assembled.**

  Þ *Check whether the dosing tip is blocked.*

  Þ *Check whether the dosing port has been closed with a thread stopper.*

  Þ *Check whether Port 0 has been closed with a thread stopper (vacuum in storage bottle!). Port 0 must be open to compensate the pressure.*

  ⇒ *Remove dosing drive and check whether the drive push rod engages the dosing piston. The piston peg must be flush with the upper side of the housing, see page 19.*

4 Appendix

4.1 Validation / GLP

Among other things, **GLP** (**G**ood **L**aboratory **P**ractice) requires the regular checking of the precision and correctness of analytical instruments by means of **SOP**s (**S**tandard **O**perating **P**rocedure).

Recommended literature

- Metrohm brochure "Quality management with Metrohm", detailed information about the principles and procedures of Good Laboratory Practice
- Metrohm Application Bulletin 238/1 "Dosimat test according to GLP/ISO"
- Metrohm Application Bulletin 252/1 "Validation of Metrohm titrators according to GLP/ISO9001"

Dosino burets can be validated in several different ways.

- **Metrodata «Dosing Test» software (6.6025.000) for Windows® 3.11/95/NT**
  PC program for computer-controlled validation of Metrohm dosing units and exchange units. Apart from a normal personal computer this requires the use of a Metrohm Titrino and either a Sartorius or Mettler analytical balance.

- **Metrohm 711 Liquino**
  The 711 Liquino has a GLP mode which can be used for the automatic validation of dosing units. The balances of the following distributos are supported: Mettler-Toledo, Sartorius, AND, Precisa.

- **Manual validation**
  Manual validation can be carried out with any Metrohm instrument which supports the 700 Dosino. Metrohm Application Bulletin 238/1 describes the procedure in detail.

4.2 Dosing accuracy according to ISO 8655-3

Metrohm Ltd. guarantees the following limits (according to ISO 8655-3, draft) for Dosino burets with glass cylinders:

Max. permissible systematic error e_s

Nominal cylinder volume in mL	Maximum permissible systematic errors e_s [a]	
	rel.	abs.
2	± 0,3 %	± 6 µL
5	± 0,3 %	± 15 µL
10	± 0,2 %	± 20 µL
20	± 0,2 %	± 40 µL
50	± 0,2 %	± 100 µL

[a] Expressed as deviation of the mean of a tenfold measurement from any given volume in the range of 10 to 100 % of the nominal volume.

$$e_s = \overline{V} - V_s \quad \text{or in \%} \qquad e_s = \frac{100\left(\overline{V} - Vs\right)}{V_0}$$

$\overline{V}$: mean V_s : selected volume V_0 : nominal volume

Maximum permissible random error s

Nominal cylinder volume in mL	Maximum permissible random errors repeatybility s	
	CV [b]	s [c]
2	± 0,1 %	± 2 µL
5	± 0,1 %	± 5 µL
10	± 0,07 %	± 7 µL
20	± 0,07 %	± 14 µL
50	± 0,05 %	± 25 µL

[b] Expressed as coefficient of variation of a tenfold measurement from any given volume in the range of 10 to 100 % of the nominal volume.

$$CV = \frac{100s}{\overline{V}}$$

[c] Expressed as repeatability standard deviation of a tenfold measurement from any given volume in the range of 10 to 100 % of the nominal volume.

$$s = \sqrt{\frac{\sum \left(V_i - \overline{V}\right)^2}{n-1}}$$

s : repeatability standard deviation
V_i: distributed volume
n : number of distribution

Please note

- The above-mentioned limits are related to water at 20 °C and are valid for dosing units with glass cylinders only.
- The nominal volume of the dosing cylinders are printed on the housing of the dosing units.
- The above-mentioned limits are valid for the useful volume range of 10 % to 100 % of the nominal volume.
- The error limits relate to the ISO 8655-3 Draft International Standard (Piston-operated volumetric apparatus - part 3: Piston burettes), which is to come to effect in the year 2000.
- Metrohm burets with glass cylinders in general have a better quality performance (systematic and random error) than the maximum error limits implied. Check your dosing system according to the ISO test specification.

Possible sources of dosing errors

Influencing parameters are:

- Air bubbles in the dosing cylinder or tubings.
- Leaky piston/cylinder system.
- Leaky tubing connections.
- Differences in hydrostatic pressure of the liquid level in the supply flask versus the dosing tip.
- Viscosity and/or flow characteristics of the liquid to be dosed.

4.3 Technical data

Dimensions *(Dosino with dosing unit)*	*Height:*	200 mm
	greatest diameter:	approx. 95 mm
Weight	approx. 700 g (with dosing unit)	
Material	*Dosino housing:*	PBTP (polybutyleneterephthalate)
	Dosing unit housing:	PVDF (polyvinylidenefluoride)
	Dosing piston:	PTFE (polytetrafluoroethylene)
	Stopcock washer:	silicon carbide ceramics
	Distributor disk:	Al_2O_3 ceramics
Cylinder volume	exchangeable dosing units with cylinders of 2, 5, 10, 20, 50 mL volume	
Resolution	10'000 increments per cylinder volume	
Dosing accuracy	Metrohm Dosino burets with glass cylinders fulfill the performance requirements of the ISO 8655-3 draft international standard:	

Cylinder volume	Resolution	Max. systematic error	Repeatability (random error)
2 mL	0,2 µL	± 6 µL	± 2 µL
5 mL	0,5 µL	± 15 µL	± 5 µL
10 mL	1 µL	± 20 µL	± 7 µL
20 mL	2 µL	± 40 µL	± 14 µL
50 mL	5 µL	± 100 µL	± 25 µL

Dosing/Filling time	18 seconds each per cylinder volume	
Power supply	±12 VDC, 5 VDC (from control instrument), 6 W	
Ambient temperature	*Nominal working range*	+5…+40°C (at 20…80% relative humidity)
	Storage, transport	-40…+70°C
Dosing connection	Mini-DIN 8-pin or D-Sub 9-pin	

Safety specification

Constructed and tested according to IEC 1010, class 3

The 'Instructions for Use' contains information and warnings which must be observed by the operator in order to ensure safe operation of the instrument.

Electromagnetic compatibility (EMC)

Emission: This instrument meets the requirements of the standards EN 50081-1 01.92, EN 55011 (class B), EN 55022 (class B).

Immunity: The following standards are complied with: EN 50082-2/94, IEC801-2 to IEC801-4, EN 50082-1, IEC1000-4-4/95 level 3, IEC 1000-4-5, IEC 1000-4-6.

4.4 Warranty and Conformity

4.4.1 Warranty

The warranty on our products is limited to defects that are traceable to material, construction or manufacturing error which occur within 12 months from the day of delivery. In this case, the defects will be rectified in our workshops free of charge. Transport costs are to be paid by the customer.

For day and night operation, the warranty is limited to 6 months.

Glass breakage in the case of electrodes or other parts is not covered by the warranty. Checks which are not a result of material or manufacturing faults are also charged during the warranty period. For parts of outside manufacture insofar as these constitute an appreciable part of our instrument, the warranty stipulations of the manufacturer in question apply.

With the regard to the guarantee of accuracy, the technical specifications in the instruction manual are authoritative.

Concerning defects in material, construction or design as well as the absence of guaranteed features, the orderer has no rights or claims except those mentioned above.

If damage of the packaging is evident on receipt of a consignment or if the goods show signs of transport damage after unpacking, the carrier must be informed immediately and a written damage report demanded. lack of an official damage report releases Metrohm from any liability to pay compensation.

If any instruments and parts have to be returned, the original packaging should be used if at all possible. This applies above all to instruments, electrodes, burette cylinders and PTFE pistons. Before embedding in wood shavings or similar material, the parts must be packed in a dustproof package (for instruments, use of a plastic bag is imperative). If open assemblies are enclosed in the scope of delivery that are sensitive to electromagnetic voltages (e.g. data interfaces etc.) these must be returned in the associated original protective packaging (e.g. conductive protective bag). (Exception: assemblies with built-in voltage source belong in a non-conductive protective packaging). For damage which arises as a result of non-compliance with these instructions, no warranty responsibility whatsoever will be accepted by Metrohm.

CE

4.4.2 EU Declaration of Conformity

The Metrohm Ltd. company, Herisau, Switzerland hereby certifies, that the instrument:

700 Dosino

meets the requirements of EU Directives 89/336/EEC and 73/23/EEC.

Source of specifications:

EN 50081-1	Electromagnetic compatibility, basic specification Emitted Interference
EN 50082-1	Electromagnetic compatibility, basic specification Interference Immunity
EN 61010	Safety requirements for electrical laboratory measurement and control equipment

Description of the instrument:

Dosing drive with low dead volume for liquid handling such as dosing, liquid transfer, dilution etc.

Herisau, December 6, 1995

Dr. J. Frank	Ch. Buchmann
Development Manager	Production and Quality Assurance Manager

4.4.3 Declaration of Conformity

The 700 Dosino was developed and manufactured in accordance with the requirements demanded by the ISO 9001 quality system regarding the design, manufacture and servicing of Metrohm instruments.

Name of commodity:	700 Dosino	
Manufacturer:	Metrohm Ltd., Herisau, Switzerland	
Technical specifications :	source voltage:	±12 VDC, 5 VDC, 6 W (control device)

The instrument was manufactured and tested according to the following standards:

Electromagnetic compatibility:

Emission
EN55011 (class B) EN55022 (class B) / EN50081/92

Immunity
EN50082-2 / IEC801-2, IEC1000-4-2 (class 3) / IEC801-3, IEC1000-4-3, ENV50140+ENV50204 (class 3) / IEC801-4, IEC1000-4-4 (class 4) / IEC801-5, IEC1000-4-5, IEC801-6, IEC1000-4-6, ENV50141 (class 3) / IEC1000-4-11

Security specifications
IEC1010, EN61010, UL 3101-1

The technical specifications are documented in the instruction manual.

Metrohm Ltd. is holder of the SQS-certificate of the quality system ISO 9001 for quality assurance in design/development, production, installation and servicing.

Herisau, December 6, 1995

Dr. J. Frank
Development Manager

Ch. Buchmann
Production and
Quality Assurance Manager

4.5 Accessories

700 Dosino	**2.700.0010**
Dosing drive with cable (DB9, 1 m), includes the following accessories:	
Piston pliers	6.1546.030
Instructions for use	8.700.1023

700 Dosino	**2.700.0020**
Dosing drive with cable (8 pin Mini-Din plug, 1 m), includes the following accessories:	
Piston pliers	6.1546.030
Instructions for use	8.700.1023

Options

Accessories to separate order and on payment of extra charge:

Adapters/Interfaces

Adapter cable for 2.700.0010 Dosino DB9 (socket) – Mini-Din (plug)	6.2134.020
Adapter cable for 2.700.0020 Dosino Mini-Din (socket) – DB9 (plug)	6.2134.010
729 Dosimat Interface	2.729.0010

for the connection of 4 Dosinos to the 730 Sample Changer, etc.

710 Dosing units with glass cylinder for 700 Dosino, incl. accessories

2 mL Dosing unit with dosing tips, M6	6.3031.120
5 mL Dosing unit with dosing tips, M6	6.3031.150
10 mL Dosing unit with dosing tips, M6	6.3031.210
20 mL Dosing unit with dosing tips, M6	6.3031.220
50 mL Dosing unit with dosing tips, M6	6.3031.250

710 Dosing units with ETFE cylinder cylinder for 700 Dosino, incl. accessories

2 mL Dosing unit with dosing tips, M6	6.3030.120
5 mL Dosing unit with dosing tips, M6	6.3030.150
10 mL Dosing unit with dosing tips, M6	6.3030.210
20 mL Dosing unit with dosing tips, M6	6.3030.220
50 mL Dosing unit with titration and dosing tip	6.3030.250

Accessories for 710 Dosing unit, see above

Dosing unit with **glass cylinder**, piston and stopcock washer (no further accessories)	
2 mL volume	6.1570.120
5 mL volume	6.1570.150
10 mL volume	6.1570.210
20 mL volume	6.1570.220
50 mL volume	6.1570.250
Dosing unit with **ETFE cylinder**, piston and stopcock washer (no further accessories)	
2 mL volume	6.1567.120
5 mL volume	6.1567.150
10 mL volume	6.1567.210
20 mL volume	6.1567.220
50 mL volume	6.1567.250
Ball stopper for buret tips	6.1446.030
Thread stopper	6.1446.040
Antidiffusion tip	6.1543.200
Buret tip	6.1543.060
Adsorber tube	6.1619.000
Tubing connection with buckling protection, 40 cm/2 mm, 2x M6 thread	6.1805.100
Aspiration tubing, 25 cm/2 mm, 1x M6 thread	6.1829.010
Buret tip holder (clip)	6.2052.000
Spanner for screwing down plastic nipples	6.2739.000
Grease (without silicon) for dosing cylinder, 2 g	6.2803.010

Bottles and accessories

Thread adapter 32 mm/GL45 (Riedel-de Haën, Fluka ...)	6.1618.000
Thread adapter 28 mm/GL45 (Fisher ...)	6.1618.010
Thread adapter S40/GL45 (Merck ...)	6.1618.020
Thread adapter 40 mm/GL45 (for 10 L PE canister, 6.1621.000)	6.1618.050
FEP tubing M6, length 50 cm, for PE canister	6.1829.020
1 L Amber glass flask, GL45 thread	6.1608.023
1 L Glass flask, GL45 thread	6.1608.030
1 L PE flask, GL45 thread	6.1608.040
100 mL Glass flask, GL45 thread	6.1608.050
PE flask100 mL	6.1608.060

Tubings and accessories

FEP tubing with screw nipples, 2x M6 thread	
length 80 cm, Ø 2 mm, with buckling protection	6.1805.110
length 150 cm, Ø 2 mm, with buckling protection	6.1805.030
more tubings, see catalog	
Coupling bush for tubings, 2x M6 thread	6.1808.000
T connector , 3x M6 thread	6.1808.060
Olive connector, 1x M6 thread, for tubings (inner diameters appr. 3 mm)	6.1808.020
Thread stopper, outer diameter M6	6.1446.040

Buret tips	
Antidiffusion tip, M6 thread	6.1543.050
Buret tip, M6 thread	6.1543.060
Earthing for buret tip, M6 thread	6.1808.030
Storage tupe for buret tips	6.1228.000

Mountings	
Support mounting, for stand rod Ø 10 mm	6.2047.010
Base plate with stand rod Ø 10 mm	6.2026.010
Double bottle holder for 2x 1 L bottles	6.2055.100
Ti-Stand 727 with built-in magnetic stirrer	
without mains adapter	2.727.0100
with mains adapter 115 V/9 V DC, USA ..	2.727.0101
with mains adapter 230 V/9 V DC, Europe ..	2.727.0104
Ti-Stand 727 without stirrer	
without mains adapter	2.727.0010
with mains adapter 115 V/9 V DC, USA ..	2.727.0111
with mains adapter 230 V/9 V DC, Europe ..	2.727.0114

Spare parts	
Glass cylinders	
2 mL volume *(for dosing unit 6.1570.120)*	6.1571.120
5 mL volume *(for dosing unit 6.1570.150)*	6.1571.150
10 mL volume (*for dosing unit 6.1570.210)*	6.1571.210
20 mL volume *(for dosing unit 6.1570.220)*	6.1571.220
50 mL volume *(for dosing unit 6.1570.250)*	6.1571.250
Piston for glass cylinders	
2 mL volume *(for dosing unit 6.1570.120)*	6.1572.120
5 mL volume *(for dosing unit 6.1570.150)*	6.1572.150
10 mL volume *(for dosing unit 6.1570.210)*	6.1572.210
20 mL volume *(for dosing unit 6.1570.220)*	6.1572.220
50 mL volume *(for dosing unit 6.1570.250)*	6.1572.250
Cylinder base for glass cylinders	
2 mL volume *(for dosing unit 6.1570.120)*	6.1573.120
5 mL volume *(for dosing unit 6.1570.150)*	6.1573.150
10 mL volume *(for dosing unit 6.1570.210)*	6.1573.210
20 mL volume *(for dosing unit 6.1570.220)*	6.1573.220
50 mL volume *(for dosing unit 6.1570.250)*	6.1573.250
ETFE cylinder complete	
(incl. piston, cylinder and stopcock washer)	
2 mL volume *(for dosing unit 6.1567.120)*	6.1566.120
5 mL volume *(for dosing unit 6.1567.150)*	6.1566.150
10 mL volume *(for dosing unit 6.1567.210)*	6.1566.210
20 mL volume *(for dosing unit 6.1567.220)*	6.1566.220
50 mL volume *(for dosing unit 6.1567.250)*	6.1566.250

More accessories, see Metrohm accessories catalog.

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