

**Gebrauchsanleitung**

**Kolbenbürette  
TITRONIC® T 110**

**Operating Instructions**

**Piston Burette  
TITRONIC® T 110**

**Mode d'emploi**

**Burette à piston  
TITRONIC® T 110**

**SCHOTT**

## Gebrauchsanleitung ..... Seite 1 .... 26

**Wichtige Hinweise:** Die Gebrauchsanleitung vor der ersten Inbetriebnahme der Kolbenburette TITRONIC® T 110 bitte sorgfältig lesen und beachten. Aus Sicherheitsgründen darf die Kolbenburette TITRONIC® T 110 ausschließlich nur für die in dieser Gebrauchsanleitung beschriebenen Zwecke eingesetzt werden.

Bitte beachten Sie auch die Gebrauchsanleitungen für die anzuschließenden Geräte.

Alle in dieser Gebrauchsanleitung enthaltenen Angaben sind zum Zeitpunkt der Drucklegung gültige Daten. Es können jedoch von **SCHOTT** sowohl aus technischen und kaufmännischen Gründen, als auch aus der Notwendigkeit heraus, gesetzliche Bestimmungen der verschiedenen Länder zu berücksichtigen, Ergänzungen an der Kolbenburette TITRONIC® T 110 vorgenommen werden, ohne dass die beschriebenen Eigenschaften beeinflusst werden.

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**Important notes:** Before initial operation of the Piston Burette TITRONIC® T 110 please read and observe carefully the operating instructions. For safety reasons the Piston Burette TITRONIC® T 110 may only be used for the purposes described in these present operating instructions.

Please also observe the operating instructions for the units to be connected.

All specifications in this instruction manual are guidance values which are valid at the time of printing. However, for technical or commercial reasons or in the necessity to comply with the statutory stipulations of various countries, **SCHOTT** may perform additions to the Piston Burette TITRONIC® T 110 without changing the described properties.

## Mode d'emploi ..... Page 53 ..... 78

**Instructions importantes:** Prière de lire et d'observer attentivement le mode d'emploi avant la première mise en marche de la Burette à piston TITRONIC® T 110. Pour des raisons de sécurité, la Burette à piston TITRONIC® T 110 pourra être utilisée exclusivement pour les usages décrits dans ce présent mode d'emploi.

Nous vous prions de respecter également les modes d'emploi pour les appareils à connecter.

Toutes les indications comprises dans ce mode d'emploi sont données à titre indicatif au moment de l'impression. Pour des raisons techniques et/ou commerciales ainsi qu'en raison des dispositions légales existantes dans les différents pays, **SCHOTT** se réserve le droit d'effectuer des suppléments concernant la Burette à piston TITRONIC® T 110 qui n'influencent pas les caractéristiques décrits.

# SCHOTT

# Operating Instructions

# Piston Burette TITRONIC T 110

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Abb. 1 Kolbenburette TITRONIC® T 110  
Fig. 1 Piston Burette TITRONIC T 110  
Fig. 1 Burette à piston TITRONIC T 110

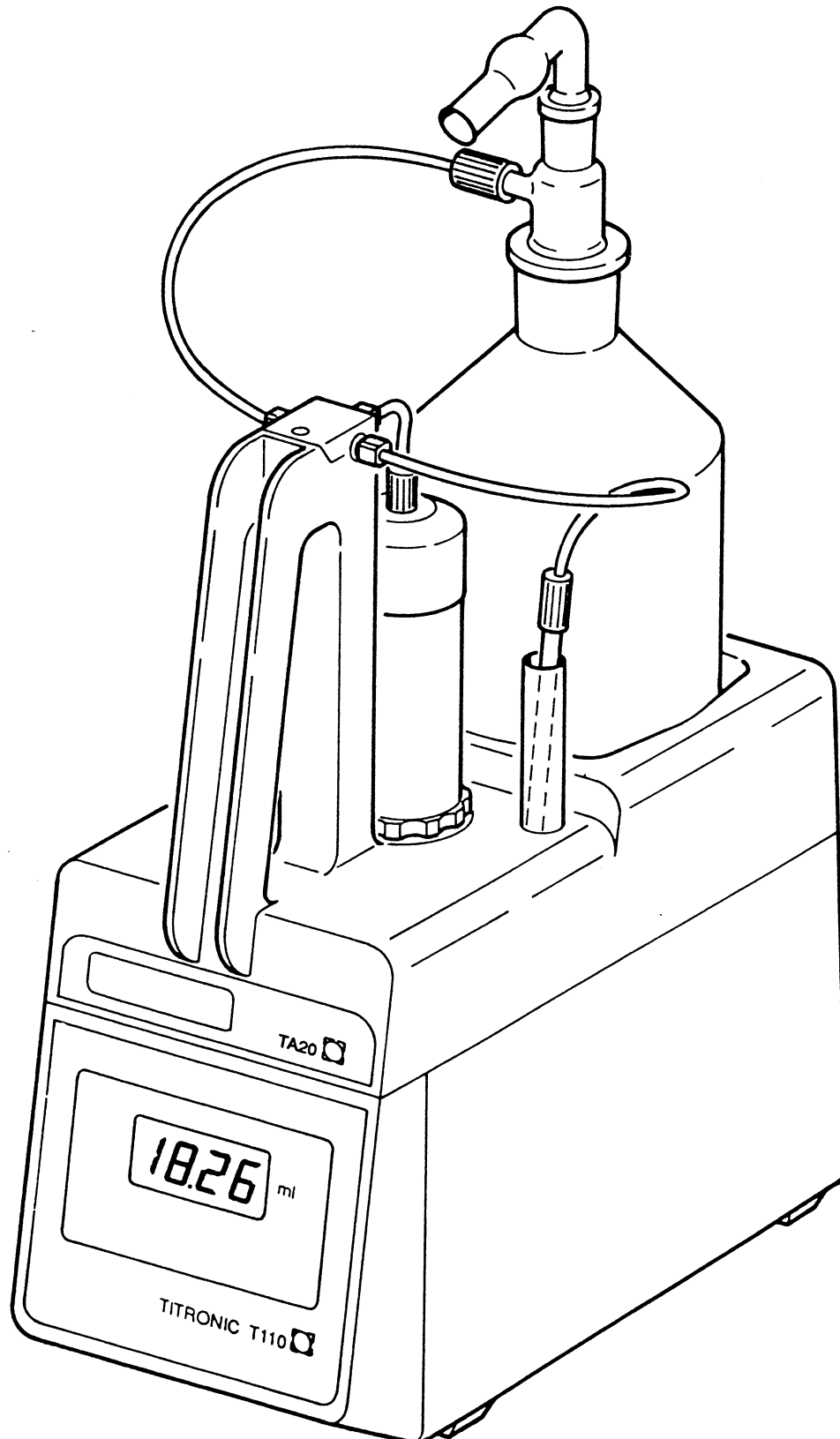
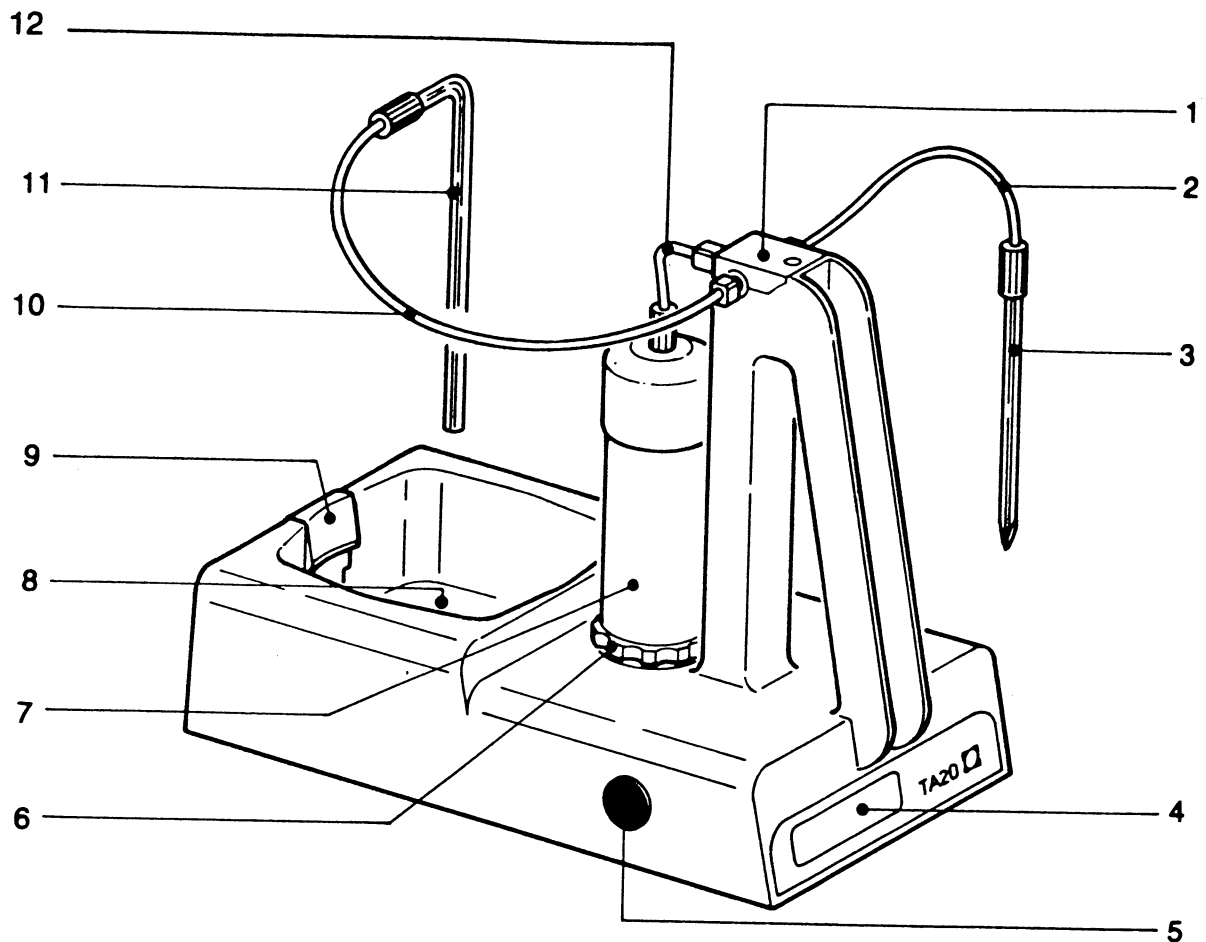


Abb. 2 Wechselaufsatz  
 Fig. 2 Interchangeable Unit  
 Fig. 2 Unité interchangeable



- |   |                                                                                                                                                   |    |                                                                                                                                                                                                                                                                          |
|---|---------------------------------------------------------------------------------------------------------------------------------------------------|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Eingebautes automatisch gesteuertes Ventil<br>Built-in automatically controlled valve<br>Vanne incorporée à commande automatique                  | 8  | Aufnahme für Reagenzien-Flasche nach<br>DIN 12 036 und DIN 12 039 sowie Vierkant-<br>Plastikflasche<br>Receptacle for reagent bottle conforming to<br>DIN 12 036 and DIN 12 039 and for rectangular<br>plastic bottle<br>Logement pour le flacon à réactif rectangulaire |
| 2 | Schlauch zwischen Ventil und Titrierspitze<br>Hose between valve and titration tip<br>Tuyau flexible entre vanne et pointe de burette             | 9  | Justierung für Reagenzien-Flasche<br>Adjustment for reagent bottle<br>Dispositif d'ajustage du flacon                                                                                                                                                                    |
| 3 | Titrierspitze<br>Titration tip<br>Pointe de burette                                                                                               | 10 | Schlauch zwischen Ansaugrohr und Ventil<br>Hose between suction tube and valve<br>Tuyau flexible entre tube d'aspiration et vanne                                                                                                                                        |
| 4 | Beschriftungsfeld<br>Marking label<br>Plaque pour des inscriptions                                                                                | 11 | Ansaugrohr<br>Suction tube<br>Tube d'aspiration                                                                                                                                                                                                                          |
| 5 | Arretierung zum Kolbenbürettenunterteil<br>Locking device for bottom section of piston<br>burette<br>Dispositif d'arrêt pour la partie inférieure | 12 | PTFE-Schlauch mit UV-Schutz für Verbindung:<br>Ventil ↔ Zylinder Typ Nr. TZ 1617<br>PTFE-tube with UV protection for connection:<br>valve ↔ cylinder type no. TZ 1617<br>Tuyau souple en PTFE pour connexion:<br>vanne ↔ cylindre type no. TZ 1617                       |
| 6 | Andruckschraube für Zylinder<br>Press-screw for cylinder<br>Vis d'assemblage du cylindre                                                          |    |                                                                                                                                                                                                                                                                          |
| 7 | UV-Schutz<br>Ultraviolet protection<br>Protection ultra-violet                                                                                    |    |                                                                                                                                                                                                                                                                          |

# 1 Technical properties of the TITRONIC T 110 Piston Burette

## 1.1 Summary, Declaration of Conformity

Using the TITRONIC T 110 Piston Burette practically all titration and dosage tasks in a laboratory can be completed. The dosed substances or mixtures of substances must be fluid.

Examples of possible uses for the Piston Burette include:

- Dosage and titration within the TPC 2000 Computer Titration System
- Titration in conjunction with automatic titration units
- Titration with manual control with the TR 160 Manual Titration Controller

The following may be used:

- All normal titration solutions whereby the solutions specified in the "Küster-Thiel" calculation tables (published by Walter de Gruyter) are to be taken as standard.
- Water and all non-aggressive, inorganic and organic fluids may be used as solvents. When handling inflammable substances the explosion protection directives of the Professional Association of the Chemical Industry are to be observed.
- Liquids with a higher viscosity ( $\geq 5 \text{ mm}^2/\text{s}$ ), a lower boiling point or a tendency to exhalation cannot be dosed, since the pressures building up during filling can cause disturbances.

The two RC-232-C-interfaces allow an interconnection of the TITRONIC T 110 Piston Burettes as well as the connection of other SCHOTT devices suitable for interlinkage, e. g. a TITRONIC T 200 Piston Burette. The flexible I/O connection (see Fig. 8, item 8) allows other units to be triggered and the reception of external controlling impulses.

A stand can be directly connected to the TITRONIC T 110 Piston Burette for the attachment of a mixer or electrode clamps (Fig. 3).

Interchangeable Units can be supplied for volumes of 50 ml, 20 ml, 10 ml, 5 ml and 1 ml (see Fig. 2). The centrepiece of the Interchangeable Units is the precision cylinder made of borosilicate glass (Fig. 5) whose internal diameter is made with a tolerance of  $\pm 0.003 \text{ mm}$ . This diameter tolerance and the low wear precision spindle inside the Piston Burette mean that the maximum fault deviation caused by the Piston Burette is a maximum of  $\pm 0.1 \%$  for the TITRONIC T 110 Piston Burette e. g. with Interchangeable Units TA 10, TA 20 and TA 50.

# **KONFORMITÄTSERKLÄRUNG** **DECLARATION OF CONFORMITY** **DÉCLARATION DE CONFORMITÉ**

Wir erklären in alleiniger Verantwortung, daß das Produkt

We declare under our sole responsibility that the product

Nous déclarons sous notre seule responsabilité que le produit

**KOLBENBÜRETTE**

**PISTON BURETTE**

**BURETTE A PISTON**

**TITRONIC® T 110**

**TITRONIC T 110**

**TITRONIC T 110**

auf das sich diese Erklärung bezieht, mit den folgenden Normen übereinstimmt

to which this declaration relates is in conformity with the following standards

auquel se réfère cette déclaration est conforme aux normes

**DIN 12 650, Teil 5**

und/and/et

**ISO DIS 8655**

**SCHOTT-GERÄTE GmbH**  
 Im Langgewann 5  
 D-6238 Hofheim am Taunus  
 Deutschland, Germany, Allemagne

Hofheim am Taunus,  
 21. April, April 21st, 21. Avril 1992  
 CONF. No. A 017

## 1.2 Technical properties of the TITRONIC T 110 Piston Burette

Display:	LCD display, 4-digit volume display with floating point, 14 mm high
Piston drive:	pulse-controlled step motor, maximum frequency = 330 Hz, also suitable external control
Interchangeable Units:	1 ml, 5 ml, 10 ml, 20 ml and 50 ml, standard UV protection filter, marking label on the front which can be erased, (identical to TITRONIC T 200)
Resolution:	10000 impulses per 100 % volume, smallest step 0.1 $\mu$ l with 1 ml Interchangeable Unit
Dosing accuracy:	0.2 % to 0.1 % relative to 100 % volume, depending on Interchangeable Units, (ref. to chapter 1.4)
Reproduction:	0.1 % to 0.05 %, depending on Interchangeable Unit
Display accuracy:	0.000...9.999 ml, 10.00...99.99 ml, 100.0...999.9 ml, 1000...9999 ml
Filling speed:	100 % volume in 30 seconds
Outfeed speeds:	0.01 ml/h to 100 ml/min, depending on Interchangeable Unit
Valve switching:	automatic
Mains connection:	220 V $\pm$ 10 %, 50...60 Hz or 110 V $\pm$ 10 %, 50...60 Hz, internal conversion
Power consumption:	50 VA
Inputs and outputs:	two serial interfaces (RS-232-C), 25-pole sub-miniature D jack, I/O port (multi-functional input/output), 15-pole sub-miniature D jack, option: analog output, BNC jack, 0...- 1000 mV corresponding to 0...100 % volume
Dimensions:	150 x 360 x 290 (W x H x D) with Interchangeable Unit
Weight:	approx. 5.0 kg (with Interchangeable Unit) approx. 4.1 kg (without Interchangeable Unit)

## 1.3 Technical properties of the Interchangeable Units

Compatibility:	the Interchangeable Units are identical to those of the TITRONIC T 200 Piston Burette and mutually compatible with those of the T 100 Piston Burette
Code for the cylinder size:	automatic, mounting for the glass cylinder bears unmistakable code
Valve:	volume-independent cone valve made of fluorcarbon polymers
Cylinder:	made of borosilicate glass, standard UV protection filter
Hoses:	PTFE hose set with brown UV-protection
Bracket for storage bottle:	to fit glass bottle to DIN 12 036 and DIN 12 039 or rectangular plastic bottle
Fastening for Interchangeable Unit:	with automatic examination
Materials:	borosilicate glass, fluorcarbon polymers, PPS, high-grade steel, polypropylene, acrylic glass
Dimensions:	150 x 210 x 290 mm (W x H x D) without reagent bottle
Weight:	approx. 0.9 kg for Interchangeable Unit TA 20 (without reagent bottle)

### Manufacturer's certificate (ref. to chapter 7)

This is to certify that the TITRONIC T 110 Piston Burette is radio-noise suppressed according to the BMPT gazette decrees 243/1991 and 46/1992. The Federal Agency for Telecommunication Licences was notified of the marketing of the device and entrusted with verifying the series for the observance of the relevant regulations.



#### 1.4 Accuracies in the overall TITRONIC T-110 Piston Burette system with Interchangeable Units

Interchangeable Type no.	Volume [ml]	Tolerances of glass cylinder $\varnothing_i$ [mm]	Max. dosing error rel. to 100 % vol [%]	Reproduction [%]	Step size [ml]
TA 01	1.000	$\pm 0.003$	$\pm 0.2$	0.1	0.0001
TA 05	5.000	$\pm 0.003$	$\pm 0.15$	0.07	0.0005
TA 10	10.00	$\pm 0.003$	$\pm 0.1$	0.05	0.001
TA 20	20.00	$\pm 0.003$	$\pm 0.1$	0.05	0.002
TA 50	50.00	$\pm 0.003$	$\pm 0.1$	0.05	0.005

**Attention:** All specifications in this instruction manual are guidance values which are valid at the time of printing. However, SCHOTT-GERÄTE may make changes at any time for technical or commercial reasons or in the case of necessity to comply with the statutory stipulations of various countries. This does not affect the Declaration of Conformity contained in the present operating instructions.

## 1.5 Warning and safety instructions

For safety and functional reasons, the TITRONIC T 110 Piston Burette must basically be opened by authorized persons only; e. g. work at the electric appliance must only be carried out by trained specialists. With unauthorized operation of the device as well as careless or deliberate damaging, the warranty is no longer valid.

The TITRONIC T 110 Piston Burette has protection class I. It has been built and tested according to protective arrangements for electronic measuring instruments DIN 57 411, part 1/VDE 0411, part 1, and has left our plant in perfect condition concerning safety regulations. To maintain this condition and to guarantee safe operation the user has to observe the instructions and warning marks which are included in these operating instructions.

Before switching on, it has to be guaranteed that the adjusted operating voltage and supply voltage correspond. Operating voltage is indicated on the type plate. The mains plug must only be inserted in a socket outlet with earthing contact. The protective effect must not be invalidated by an extension line without earthed lead. Any interruption of the earthed lead inside or outside the device or detaching the earthed lead connection could make the device dangerous. Deliberate interruption is not permissible.

It has to be guaranteed that fuses and rated current strength indicated are used as substitute. The use of patched fuses or short-circuiting of fuse holder is not permissible.

The built-in safety devices should never be made inoperative.

If there is reason to believe that non-dangerous operation is not possible, the device should be stopped and secured against unintentional operation. Turn off the TITRONIC T 110 Piston Burette, remove the electric cord and call the SCHOTT-GERÄTE service department.

It is reasonable to assume that safe operation of the unit is no longer possible,

- if the TITRONIC T 110 Piston Burette is visibly damaged,
- if the TITRONIC T 110 Piston Burette does not operate properly,
- if a major damage during transportation has happened.

The unit must not be stored or operated in wet rooms.

For safety reasons the unit is only to be used for the purposes described in these operating instructions. The relevant directives for dealing with dosed fluids must be observed. The user must ensure that the persons entrusted with using the Piston Burette are trained in dealing with the substances with the Piston Burette.

When working with fluids which are not conventional titration media, the chemical resistance of the materials of the TITRONIC T 110 Piston Burette must be particularly taken into account (see chapter 1.2 "Technical properties of the TITRONIC T 110 Piston Burette" and 1.3 "Technical properties of the Interchangeable Units").

When using liquids with a high vapour pressure and/or matters or mixed matters not qualified for use under chapter 1.1, "Summary, Declaration of Conformity", the user will be responsible for the safe and proper operation of the Piston Burette.

When the piston rises in the cylinder a microfilm of the dosed fluid remains on the internal wall of the cylinder each time but this has no influence on the dosage accuracy. The minimal residue of fluid may evaporate, however, and thus get into the zone beneath the piston and corrode or dissolve the materials used there (cp. chapter 5, "Maintenance and care of the TITRONIC T 110 Piston Burette").

The TITRONIC T 110 Piston Burette is equipped with integrated circuits (EPROMs). These circuits (ICs) can be deleted by X-rays, radioactive rays or UV rays. Whilst UV rays can be completely reflected by the housing, X-rays or other high energy rays may penetrate the housing and delete the program.

Please also observe the relevant operating instructions for any units to be connected to the TITRONIC T 110 Piston Burette, for example manual titration controllers, sample changers, balances, analog recorders, printers, computers and titration controllers.

## 2 Setting up and commissioning

### 2.1 Unpacking and setting up the TITRONIC T 110 Piston Burette

The Piston Burette, all its accessories and periphery units have been carefully checked at the factory to ensure they function correctly and are the correct size.

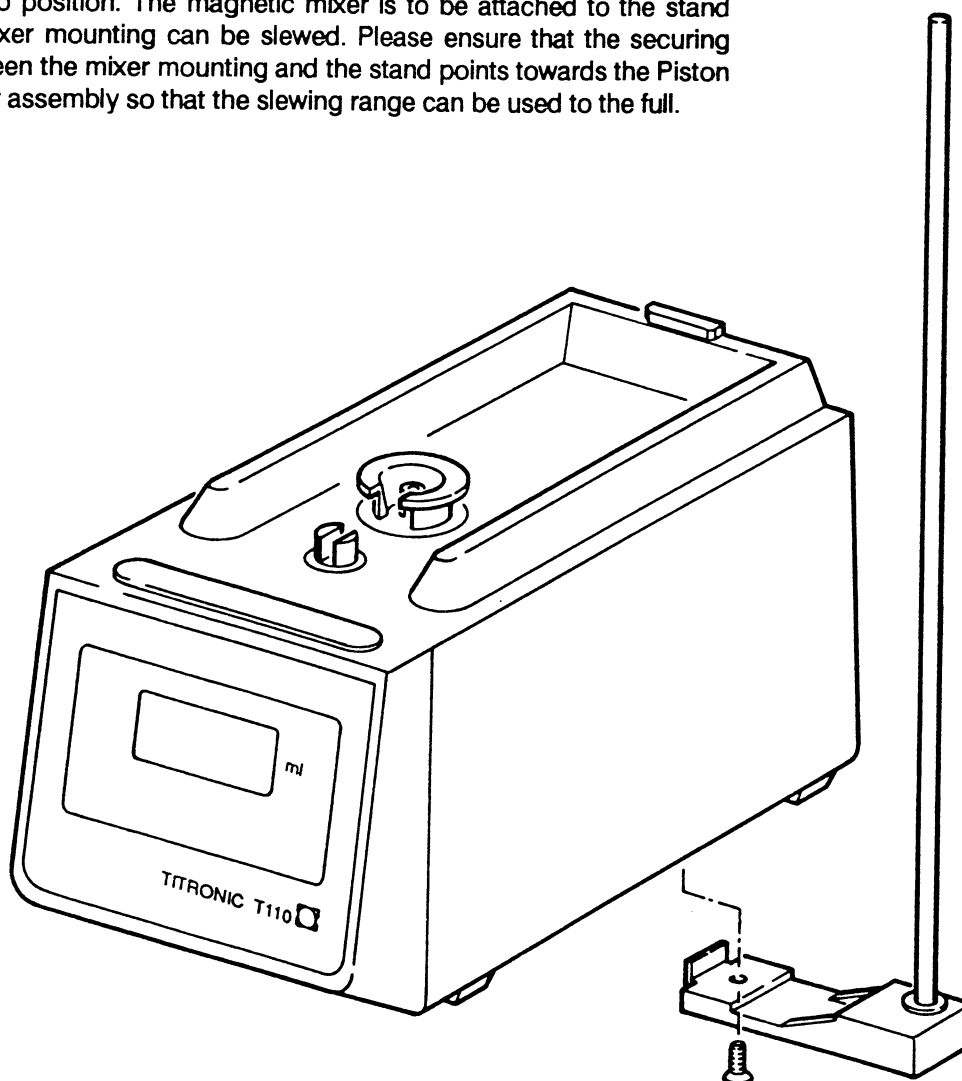
Please ensure that the small accessories must also be removed in full from the packaging. Parts list: 1 TITRONIC T 110 Piston Burette, 1 stand rod support (type no. TZ 1516), 1 stand rod (type no. TZ 1510), 1 electrode double clamp (type no. Z 331), 1 plastic support for titration-tip (type no. TZ 1511), 1 piston drawer (type no. TZ 1513), 1 mains cable, 1 spare fuse.

The bottom section of the Piston Burette can be set up on any flat surface. The mains connection cable is plugged into the mains connection jack at the rear and the mains plug inserted into the socket. Before switching on ensure that the unit operating voltage and the mains voltage are the same. The operating voltage is shown on the type plate (see base plate on the T 110) (also ref. to Fig. 8).

### 2.2 Assembling the stand

The stand (type no. TZ 1516) is contained in the scope of delivery and is to be fitted to the base plate of the Piston Burette. To do so the bottom section of the Piston Burette is to be turned upside down and the stand tongs bracket attached to the base. The stand tongs are then to be screwed into position. The magnetic mixer is to be attached to the stand rod. The mixer mounting can be slewed. Please ensure that the securing screw between the mixer mounting and the stand points towards the Piston Burette after assembly so that the slewing range can be used to the full.

Fig. 3



### 2.3 Fitting and replacing an Interchangeable Unit

An Interchangeable Unit is installed by simply slipping it on over the guide rail from the front to the back. The installation is completed when you clearly hear the mechanical retention device snap in.

If you have problems during installation, the position of the PTFE piston in the glass cylinder has to be adjusted. To adjust the piston it must be drawn downwards using the piston drawer provided until the top edge of the PTFE piston is approx. 8 mm below the top edge of the black pressure screw. The actual adjustment is now made by simply pressing the Interchangeable Unit on to a flat surface, for example a table top.

The titration tip (see Fig. 2, item 3) is to be screwed to the right-hand PTFE hose (see Fig. 2, item 2) on the Interchangeable Unit, the angled glass tube (see Fig. 2, item 11) mounted on the left-hand PTFE hose and suspended in the storage bottle.

As an alternative method, you can screw the left PTFE hose to the bottle adapter. To replace an Interchangeable Unit, the piston in the cylinder has to be set to the lower starting position. To do so, one has to initiate the filling operation (also refer to chapter 3.4, "Filling and rinsing the TITRONIC T 110 Piston Burette"). Hereafter the Interchangeable Unit can be easily removed towards the front by pressing the retention key on the left side of the unit (Fig. 4).

After removing the Interchangeable Unit the signal tone sounds and the display shows <<H-->>. After inserting a different (or the same) Interchangeable Unit the burette size is automatically recognised, and displayed (see fig. 6).

**Caution:** After each replacement an automatic filling plus a float balancing will take place. Therefore, the interchangeable unit **must not** be removed **immediately**, but only after the colon in the display has disappeared (ref. to figure 6).

If a new Interchangeable Unit is installed without reagent, you have to initiate a "Initial filling" or "Rinsing" of the Piston Burette (refer to chapter 2.5).

The front parts of the Interchangeable Units contain a code which communicates the size of the installed cylinder to the bottom section of the burette. This ensures accuracy of the dosed volume at any time.

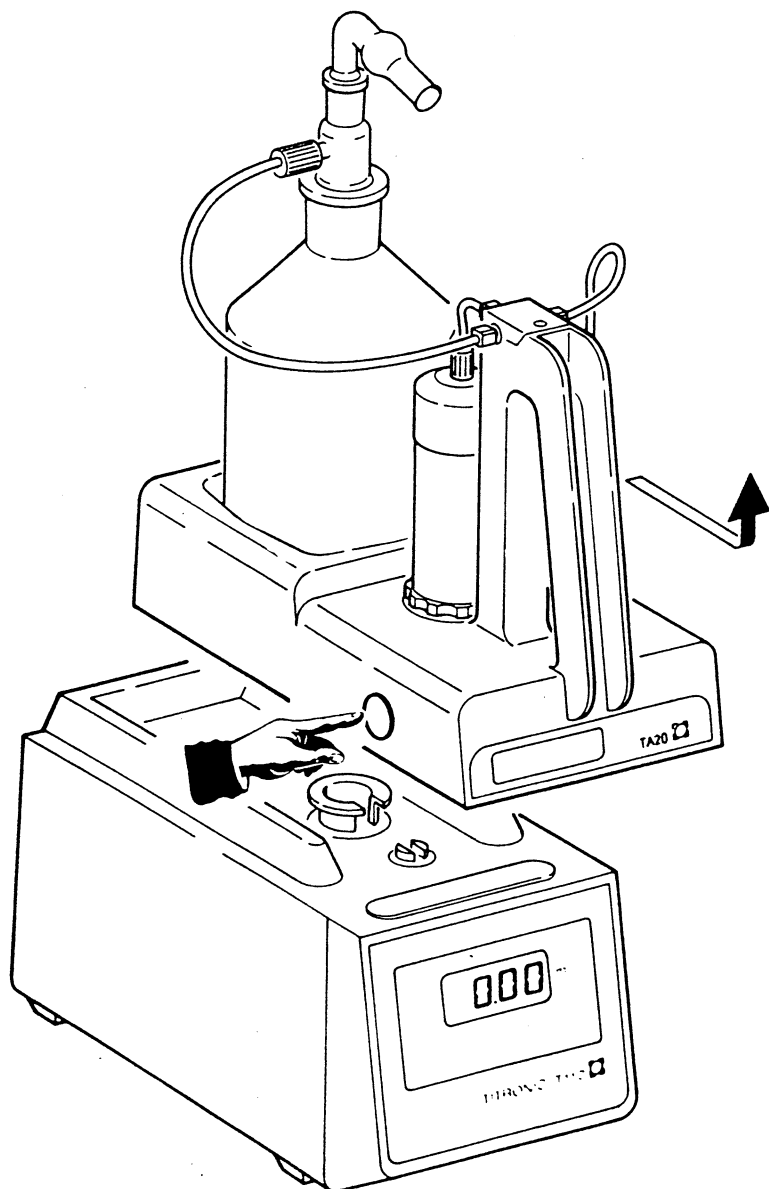


Fig. 4

## 2.4 Replacing a glass cylinder

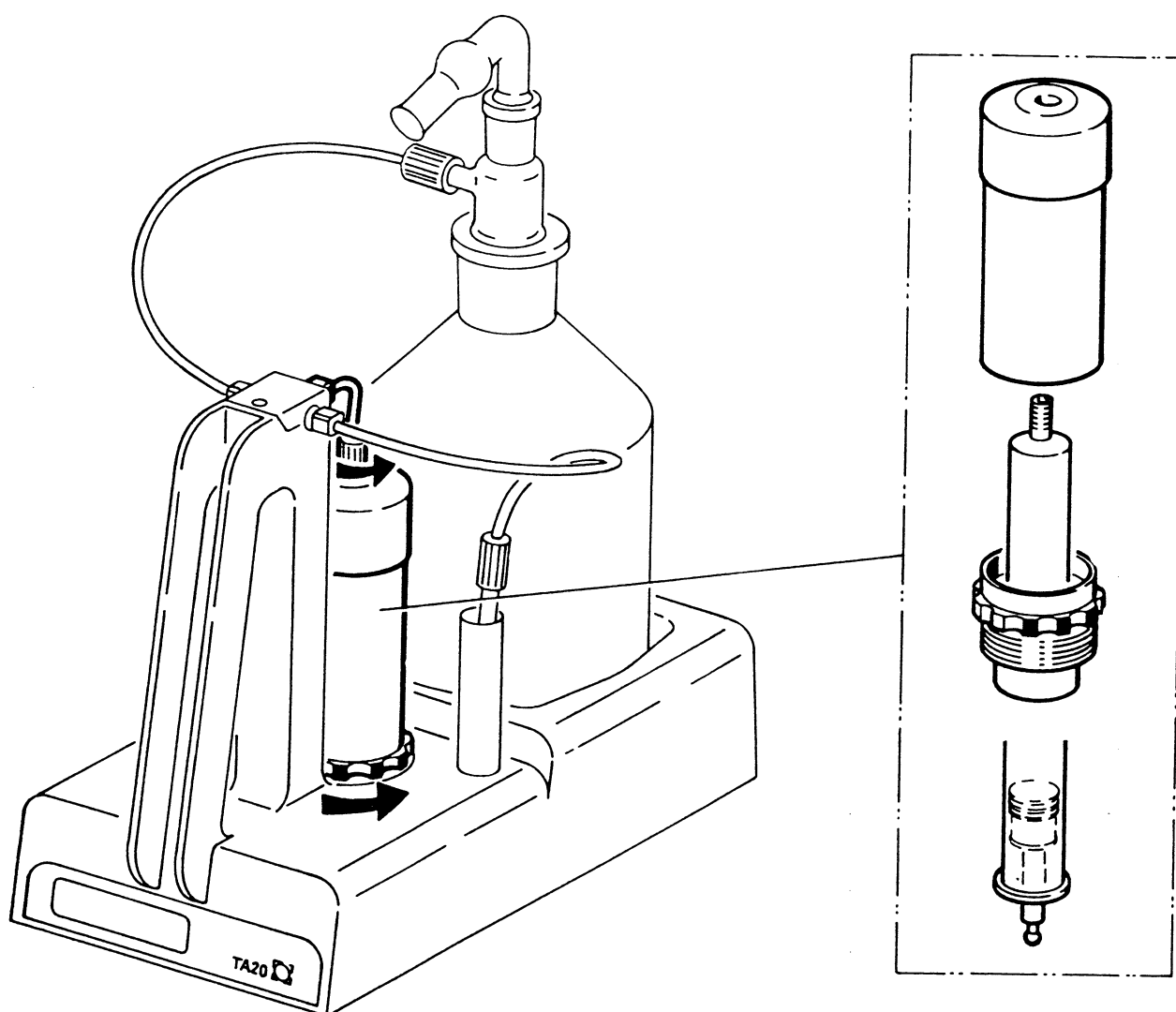
The hose between the cylinder and the valve is to be unscrewed from the cylinder (see Fig. 2, item 12). The ultraviolet protection is to be drawn down and the black press screw (cp. Fig. 2, item 6) for the glass cylinder is to be slackened by turning it anti-clockwise and drawn downwards. The cylinder with the piston inside can be removed. A new cylinder with a piston is to be fitted in reverse order and then adjusted as described under chapter 2.3 "Fitting and replacing an Interchangeable Unit". Basically it is to be ensured that only the intended cylinder size is fitted in an Interchangeable Unit because otherwise the code in the Interchangeable Unit will not conform with the cylinder size. The result would be an incorrect dosage. For reasons of dosage and analysis accuracy it is recommended that the PTFE piston is replaced at the same time when a defect glass cylinder is replaced. This particularly applies if the glass is broken since the sealing rings for the PTFE piston may be damaged by splinters of glass.

**Important:** The hoses and cylinder generally contain chemicals which may escape or be sprayed when the unit is dismantled. The relevant safety precautions for dealing with the chemicals have to be observed.

**Abb. 5 Glaszylinder-Montage (vergl. auch Abb. 2)**

**Fig. 5 Installation of the glass cylinder (comp. also Fig. 2)**

**Fig. 5 Montage du cylindre en verre (voir aussi fig. 2)**



## 2.5 Initial filling and rinsing program of the complete Interchangeable Unit

Initial filling of the burette is carried out by the rinsing program. You initiate rinsing with the <FILL> rinsing key located on the rear side of the TITRONIC T 110 Piston Burette (press for approx. 3 s until the acoustic signal becomes audible).

It is **not possible** to invoke the first-fill or rinsing program via the filling key on a connected Titration Controller or via software.

If a Titration Controller is connected in each case the filling key on the rear side of the TITRONIC T 110 Piston Burette must be used.

During the run of the first-fill or rinsing program you have to place a waste container underneath the titration tip.

Firstly the piston is moved automatically to its bottom position. Now the contents of the cylinder (air or old reagent) are ejected. When the top position is reached the filling procedure is started during which fresh reagent is drawn in. Reaching the lower piston position the complete contents of the cylinder is ejected. Another filling cycle will take place, and after float balancing the message <<0.000 ml>> will appear in the case of Interchangeable Units from 1 to 10 ml, or <<0.00 ml>> with Interchangeable Units of 20 and 50 ml, respectively.

**Attention:** The initial filling resp. rinsing program is not suitable when interchanging titration media, solutions or liquids which widely differ in composition and/or concentration. In such cases the parts coming in contact with the titration media, e. g. suction tube, valve, glass cylinder and titration tip, have to be cleaned thoroughly (for disassembly, please refer to chapter 2.4, "Replacing a glass cylinder"):

After the execution of the program the TITRONIC T 110 Piston Burette is ready for the next titration or dosing process.

Further options are explained in chapter 3.4, "Filling and rinsing the TITRONIC T 110 Piston Burette".

## 2.6 Combining the TITRONIC T 110 Piston Burette with other devices

The following devices can be linked to the TITRONIC T 110 Piston Burette:

- the TR 250 Titration Interface or the TR 240 Extension Box via an RS-232-C plug-in board, type no. TZ 2550
- Titration Controllers featuring an RS-232-C interface, e. g. TC 1200 Titration Controller
- TR 160 Manual Titration Controller
- a TITRONIC T 200 Piston Burette in the TPC 2000 Computer Titration System or for dosing in dual operation
- another TITRONIC T 110 Piston Burette in the TPC 2000 Computer Titration System or in combination with Titration Controllers
- Titration Controllers TR 151, TR 154 + CG 804, TR 156
- TS 165 Titration Recorder
- VISCO SYSTEM AVS 500
- analytical balance (ref. to chapter 3.5, "Working with a connected balance")

The connections and functions are described in chapter 3, "Working with the TITRONIC T 110 Piston Burette" of these operating instructions. Please also observe the operating instructions provided with the units connected to the Piston Burette. When connecting a device to the TITRONIC T 110 Piston Burette, this device has to be switched off under all circumstances. When connecting a peripheral device having its own mains voltage both devices must be switched off.

Connected device	Connection to the T 110 (Fig. 8)	Cables used type no.	Explanations
TR 250	RS-232-C (1)	TZ 1587 / TZ 1594	Device addresses optional from 1 to 15. (Address 00 is preset for the TW 180 Sample Changer).
TC 1200	RS-232-C (1)	TZ 1587 / TZ 1594	Device addresses generally optional, except for "03", since "03" is reserved for TW 280.
T 110, T 200 (Daisy-chain)	RS-232-C (2)	TZ 1587 / TZ 1594	In Daisy-chain operation, the device addresses to all devices interlinked are different.
T 200 (Dosing in dual operation)	RS-232-C (1)	TZ 1587 / TZ 1594	Both interlinked burettes have the same device address, both burettes are connected to the RS-232-C (1) cable.
Balance	RS-232-C (2)	TZ 1595 (Sartorius A 200 S)	In the TPC 2000 system, an additional TZ 1953 coding plug is needed. Different balances require individually adapted cables.
TR 151, TR 154, TR 156	I/O digital port	TZ 1951	End-point titration without automatic evaluation.
TS 165	I/O digital port	TZ 1950	Recording of the titration without automatic evaluation.
AVS 500	I/O digital port	TZ 1952	Used for dilution viscosimetry.
TR 160	I/O digital port	Firmly connected cable	Manually controlled titration without automatic evaluation.

### 3 Working with the TITRONIC T 110 Piston Burette

#### Switching the Piston Burette on

The TITRONIC T 110 Piston Burette must only be switched on after all the devices required for work have been connected and all the address and baud-rate settings have been made on the backpanel of the unit (ref. to chapter 4, "Connections and data transfer", including Fig. 8).

After power-up, the display test for all display segments will appear.

#### Possible applications using the TITRONIC T 110 Piston Burette

- The TITRONIC T 110 Piston Burette is controlled by other devices via the RS-232-C interface. In this case the RS-232-C takes priority over all other functional units (ref. to chapter 3.1, "Titration with the TPC 2000 Computer Titration System" and 3.2 "Titrating with Titration Controllers").
- Titration can be carried out using manual control with the TR 160 Manual Titration Controller (ref. to chapter 3.3, "Titration with the TR 160 Manual Titration Controller").
- Titrations using the SCHOTT-GERÄTE TR 151, TR 154, TR 156 Titration Controllers or the TS 165 Titration Recorder.

Fig. 6

0.0:0.0

Display test following power-up. During the following "blank" test, all display elements are switched off. The following display of the colon indicates that the filling operation has already been initiated.

92:22

Display of the version number of the internal program.

H 20

Display of the size of the interchangeable unit, 20 ml in the example used.

H - -

Interchangeable unit missing.

0.0:0.0

The colon between the two central digits indicates the filling operation. The third point is the decimal point following the first or second digit, depending on the size of the interchangeable unit.

6:35

2.0:47



### 3.1 Titration with the TPC 2000 Computer Titration System

This versatile system opens up titration possibilities which are not possible using classic titration arrangements. It is equally suitable for large batches and for individual research work. The basis for this efficiency is the direct control of the titration processes by the computer software. A data protocol specially developed for this systems allows extremely rapid data flow between the units.

In addition to the TITRONIC T 110 Piston Burette, a TR 250 Titration Interface and an IBM-compatible AT-PC are required for the system. The system may be extended practically arbitrarily and adapted to the complexity of the tasks in hand by further TITRONIC T 110 or TITRONIC T 200 Piston Burettes and by sample changers.

The TITRONIC T 110 Piston Burette is connected to the TR 250 Titration Interface or the TR 240 Extension Box by means of the RS-232-C plug-in board, type no. TZ 2550.

Up to three TITRONIC T 110 or TITRONIC T 200 Piston Burettes can be connected to one plug-in board, type no. TZ 2550, by means of linkage.

If the address is set to "15" on plug-in board, type no. TZ 2550, the system recognises the connected TITRONIC T 110 Piston Burette as one which is driven in mode "T 100". In this case only a TITRONIC T 110 Piston Burette can be connected to this same plug-in board.

The system is described in detail in the operating instructions for the TR 600/TPC 2000 software.

### 3.2 Titrating with Titration Controllers

#### Titration with Titration Controllers featuring an RS-232-C interface

These titrations require a Titration Controller with RS-232-C interface and at least one TITRONIC T 110 Piston Burette.

The connected TitrationController (e. g. the TitrationController 1200) takes over the entire control of the TITRONIC T 110 Piston Burette. The control through a Titration Controller via the RS-232-C interface has priority over all the other connected units, e. g. the TR 160 Manual Titration Controller.

As a rule, the data communication between the TITRONIC T 110 Piston Burette and a Titration Controller with a RS-232-C interface is established using a data cable, type no. TZ 1587 or TZ 1594, and the data input 1 of the TITRONIC T 110 Piston Burette is used unless the operating instructions of the Titration Controller contain contrary provisions.

#### Titration with Titration Controllers TR 151, TR 154, TR 156

The Titration Controllers are connected to the multi-functional input/output (see Fig. 8, item 8) of the TITRONIC T 110 Piston Burette using a cable type no. TZ 1951 (I/O). Ensure at the Titration Controller side that the two plugs are connected as shown in the following table:

- TR 151 to jacks A + B
- TR 154 to jacks A + C
- TR 156 to jacks A + B

#### Titration with the TS 165 Titration Recorder

The TS 165 Titration Recorder is connected using cable type no. TZ 1950.

Subsequently, the TS 165 Titration Recorder is ready to be used according to the corresponding operating instructions.

### 3.3 Titration with the TR 160 Manual Titration Controller

The TR-160 Manual Titration Controller is connected direct to the I/O connection (Fig. 8, item 8) of the TITRONIC T 110 Piston Burette. If the TR 160 Manual Titration Controller is connected, manual titration can begin right away.

#### Function

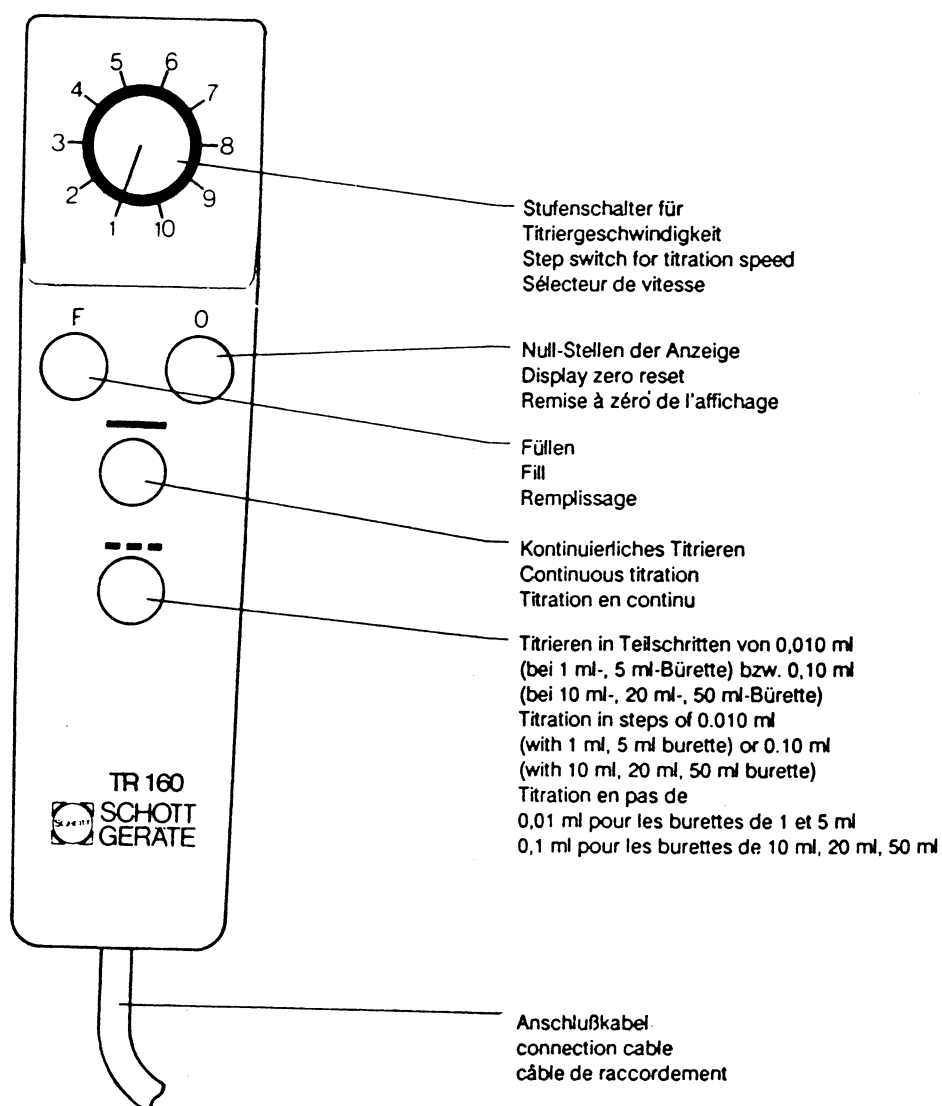
With the TR 160 Manual Titration Controller, titrating can be controlled manually. This involves a 10-level switch and 4 pressbuttons.

All the keys are logically interlocked. If any of the key is depressed, the Piston Burette will not react to any other command until the operation in course is completed.

Abb. 7 Titrier-Handregler TR 160

Fig. 7 Manual Titration Controller TR 160

Fig. 7 Régulateur manuel de titrage TR 160



### Rotary Switch

10 different titration speeds can be selected with this rotary switch. The titration speed may also be changed during a running titration by turning this switch. Setting <1> gives the slowest titration speed (100 % burette volume in 300 seconds). Setting <10> gives the fastest titration speed (100 % burette volume in 30 seconds). A useful feature for manual titration is the possibility of direct switching from highest to lowest titration speed (setting 10 to setting 1) or conversely.

### Pressbutton <F>

Pressbutton <F> (Filling) releases the filling process of the burette from any piston position. Only briefly pressing the pressbutton is necessary for this. The ex-factory setting for the filling time for 100 % of volume is 30 s for all Interchangeable Units.

### Pressbutton <0>

Press the button <0> to reset the display of the Piston Burette to <<0.000>> or <<0.00>>. When the titer is small, several titrations can be carried out in succession by this means without refilling between them.

However, before changing the Interchangeable Unit, initiate the filling cycle (press the button <F>), to bring the piston to the bottom end position.

### Pressbutton < — >

For as long as this button is held depressed, reagent is ejected at the rate selected with the rotary switch. Thereby the ejected volume is shown continuously by the display on the Piston Burette. If the upper limit switch is thus reached, no zero-position of the display will happen after the filling procedure. Briefly pressing the pushbutton (< 0.3 sec.) allows accurate dosing of 0.001 ml with Interchangeable Unit TA 01 and TA 05 or of 0.01 ml with Interchangeable Unit TA 10, TA 20 and TA 50.

### Pressbutton <--->

When this button is pressed, volumes are ejected in steps of 0.010 ml for burette volumes 1 ml or 5 ml, or in steps of 0.10 ml for burette volumes 10 ml, 20 ml or 50 ml. The step size and speed of the titration steps are programmed in fixed manner and can not be changed externally. A brief actuation of the pressbutton suffices; prolonged pressing has no further effect.

### 3.4 Filling and rinsing the TITRONIC T 110 Piston Burette

Depending on the application, the TITRONIC T 110 Piston Burette has to be filled at various times or occasions.

"Filling" of the TITRONIC T 110 Piston Burette is initiated:

- by pressing and then "releasing" the locking device on the Interchangeable Unit (Fig. 2, item 5, and Fig. 4)
- automatically after pushing on a Interchangeable Unit
- by a command from the TPC 2000 Computer Titration System or a Titration Controller
- by starting the "rinse" process with the <FILL> filling key (press for about 3 s, until the acoustic signal occurs) located on the back panel of the TITRONIC T 110 Piston Burette (Fig. 8, item 6) (refer to chapter 2.5, "Initial filling and rinsing program of the complete Interchangeable Unit")

During filling, colons are displayed between the digits of the volume display.

### 3.5 Working with a connected balance

Balances featuring an RS-232-C interface can be connected to the TITRONIC T 110 Piston Burette. As a basic condition, the configuration of the balance interface has to be adapted to the features of the TITRONIC T 110 Piston Burette (refer to chapter 4.1 "RS-232-C interfaces, inputs and outputs"). With recent balance types, this adaptation is usually possible. Up to the time of the impression of the present operating instructions, the following types were well tested: Sartorius A 200 S and Mettler AT 261.

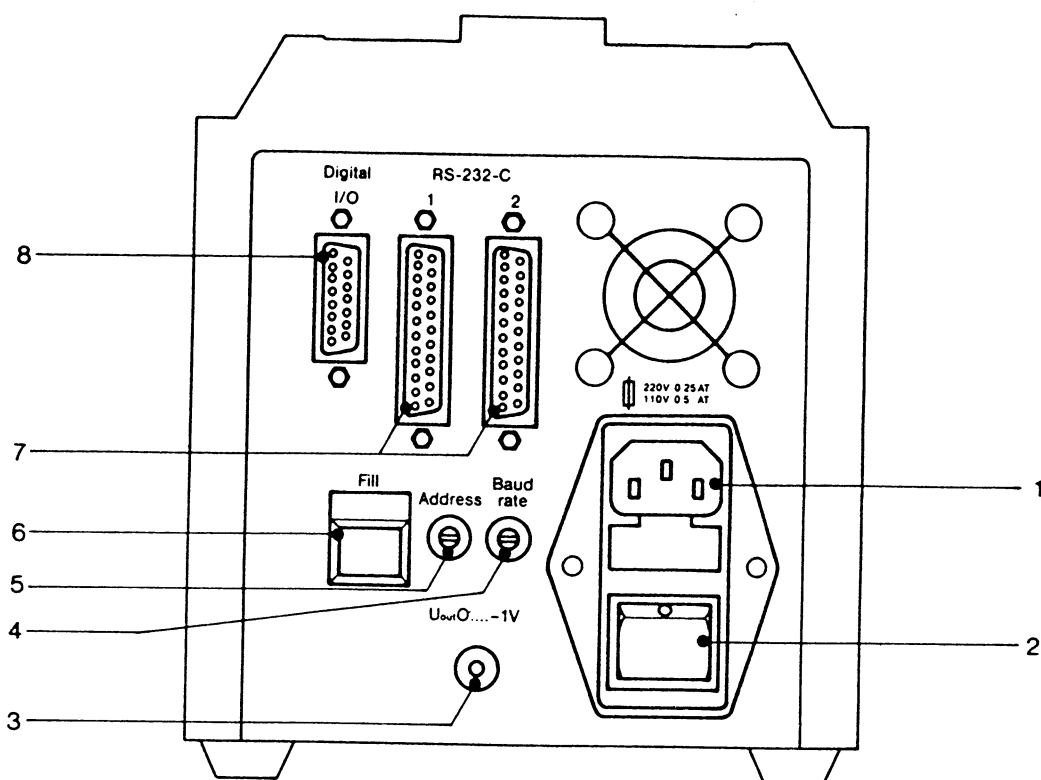
The balance is connected to the RS-232-C (2) interface of the TITRONIC T 110 Piston Burette using a suitable RS-232-C cable. Owing to the different interface configurations on the side of the balance manufacturers, special cables will be required in most cases.

The TITRONIC T 110 Piston Burette features an internal batch memory which can store up to 50 originally weighed-in quantities. These weighing-balance data can be called up using interface commands, e. g. WA, and can then be used in the following titration process as initially weighed-in quantity in the calculation of the results (cp. chapter 4.2, "List of commands for RS communication").

As a rule, according to the "first in first out" principle, always the oldest originally weighed-in volume stored in the memory will be called in, used, and then deleted.

Plugging in a coding plug type no. TZ 1953 (without cable) in the multifunction I/O port ("Digital I/O") activates the integrated balance interface of the TITRONIC T 110 Piston Burette. This possibility must be used basically when working within the titration system from SCHOTT, e. g. the TPC 2000 Computer Titration System.

## 4 Connections and data transfer



**Abb. 8 Rückseite Kolbenburette TITRONIC® T 110**

**Fig. 8 Rear view Piston Burette TITRONIC T 110**

**Fig. 8 Face arrière de la burette à piston TITRONIC T 110**

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1 Netzanschluß mit Netzfilter und Sicherung<br/>Mains connector with mains filter and fuse<br/>Raccord réseau avec filtre réseau et fusible</p> <p>2 Netzschalter<br/>Power switch<br/>Fiche secteur</p> <p>3 Option: Analog-Ausgang<br/>Option: Analog output<br/>Option: Sortie analogique</p> <p>4 Baudraten-Schalter<br/>Baud rate switch<br/>Sélecteur de vitesse de transmission/Baud</p> <p>5 Adreß-Schalter<br/>Address switch<br/>Sélecteur d'adresse</p> <p>6 Fülltaste<br/>Fill button<br/>Remplissage</p> | <p>7 Bidirektionale Datenanschlüsse RS-232-C<br/>1 = Anschluß: Titration Controller 1200,<br/>Titrations-Regler, Titrations-Interface TR 250,<br/>Extension-Box TR 240, Personal Computer,<br/>serieller Drucker (RS-Drucker)<br/>2 = Anschluß: Kolbenburettens TITRONIC® T 110,<br/>TITRONIC® T 200, Probenwechsler TW 280, Waage</p> <p>Bidirectional data connections RS-232-C<br/>1 = connection: Titration Controller 1200,<br/>Titrations Controller, Titration Interface TR 250,<br/>Extension Box TR 240, Personal Computer,<br/>serial printer (RS printer)<br/>2 = connection: Piston Burettes TITRONIC® T 110,<br/>TITRONIC® T 200, Sample Changer TW 280, balance</p> <p>Raccordements bidirectionnels des données RS-232-C<br/>1 = raccordement: Titration Controller 1200,<br/>Régulateur de titration, Interface de titration TR 250,<br/>Unité d'extension TR 240, ordinateur personnel,<br/>imprimante serielle (imprimante RS)<br/>2 = raccordement: Burettes à piston TITRONIC® T 100,<br/>TITRONIC® T 200, Changeur d'échantillons TW 280,<br/>balance</p> <p>8 Multifunktions-Ein-/Ausgänge<br/>Multifunction input/output<br/>Sortie polyvalente I/O (input/output)</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 4.1 RS-232-C interfaces, inputs and outputs

The TITRONIC T 110 Piston Burette has two serial interfaces (RS-232-C) (see Fig. 8, item 7) for data communication with other units. The plug connectors for these interfaces are on the rear of the unit. The socket "1" assumes the linkage with a connected computer or printer with a serial interface. Socket "2" can be used to connect additional devices - also in chain arrangement - within the titration system.

PIN assignment of the RS-232-C interfaces:

PIN No.	Meaning
1	Screen, earth contact
2	T x D data output
3	R x D data input
4	RTS
5	CTS
7	Digital earth

### Setting the data transfer parameters

**Attention:** Data parameters may be changed only when the devices are switched off.

The data transfer parameters are set using the baud rate switch on the rear of the TITRONIC T 110 Piston Burette (see Fig. 8, item 4). All the units which communicate with each other must have the same transfer parameters.

The transfer parameters are set at the factory to 4800 baud, 7 bit, 2 stop bits and no parity (corresponds to switch position 2). This basic setting is for use with the TPC 2000 Computer Titration System.

Possible parameters are as follows:

Switch position	Baud rate	Data bits	Stop	Parity	
0	1200	7	2	no	<b>(standard)</b>
1	2400	7	2	no	
2	<b>4800</b>	<b>7</b>	<b>2</b>	<b>no</b>	
3	9600	7	2	no	
4	1200	8	2	no	
5	2400	8	2	no	
6	4800	8	2	no	
7	9600	8	2	no	
8	1200	7	1	even	
9	2400	7	1	even	
A	4800	7	1	even	
B	9600	7	1	even	
C	1200	8	1	even	
D	2400	8	1	even	
E	4800	8	1	even	
F	9600	8	1	even	

### Setting the unit address

The use of a unit address allows several units to be operated in a chain. To do so an RS-232-C cable, e. g. type no. TZ 1588 is used to make a connection from the computer to the 1st interface connector of the first unit in the chain. Another RS-232-C cable, e. g. type no. TZ 1594 is then used to connect the 2nd interface connector of the first unit to the 1st interface connector of the second unit. Other units can then be connected to the 2nd interface connector of the second unit.

It must be ensured that the units in the chain have different addresses. The unit address for the TITRONIC T 110 Piston Burette is set using the address switch on the rear of the Piston Burette (see Fig. 8, item 5).

The addresses may be set **from 00 to 15**:

Switch position	Address	Switch position	Address
0	00	8	08
1	01	9	09
2	02	A	10
3	03	B	11
4	04	C	12
5	05	D	13
6	06	E	14
7	07	F	15

## 4.2 List of commands for RS communication

The commands have the following form:

Address      two-figure (aa)    e. g.: 01  
 Command                      e. g.: BP  
 Parameter                     e. g.: 14

<CR> <LF>

**Each** command must be concluded with <CR> <LF> and must be entered separately. All replies will be returned to the computer only when the action has been completed.

Command	Description	Reply
aaBF	Filling burette	aaY
aaBH14	Number of steps up 1 to 10000	aaY
aaBI3456	Step increment 1 to 10000	aaY
aaBN	Reset of ml display	aaY
aaBR145	Number of steps down 1 to 10000	aaY
aaBS	Status inquiry of T 100 mode, e. g.	10100101
aaBP	Call up piston position in scale units	aaBP = 1234
aaBV	Burette inquiry	aaV = 12.34
aaDA13.56	Carry out dosing with addition of the volume	aaY
aaDO123.4	Dose the specified quantity in ml	aaY
aaDB123.4	Dose quantity in ml without filling and zero	aaY
aaDM34.56	Carry out dosing (ml) with sensor supervision	aaY
aaGDH11.3	Speed for dosing in ml/h	aaY
aaGDM20.3	Speed for dosing in ml/min	aaY
aaGF30	Filling time in seconds (min 30s)	aaY
aaIP	Read input port 8 bit	aaI = 10101011
aaOA1.2	Switch off specified outputs (1 to 4)	aaY
aaOE1.3	Switch on outputs (1 to 4)	aaY
aaOJ	Switch on all outputs	aaY
aaON	Switch off all outputs	aaY
aaRH	Identification request	aaldent T110
aaRA	Call up unit size	aaAUFSATZ:20
aaRS	Report status	aaStatus:"text"
aaRC	Inquiry "last command"	aa"last command"
aaVD123.4	Dose the specified quantity in ml	aaY
aaVE	Call up software version no.	aaVersion:9049
aaVF	Valve in fill position	aaY
aaVN	Valve in dosing position	aaY
aaVO	Volume call up from display	aaV = 12.345ml
aaSR	Stop current function	aaY
aaWA	Inquire balance data by blocks	(ref. to note)
aaWE	Inquire single balance information	(ref. to note)
aaWO	Don't collect balance data	aaY
aaWS	Collect balance data	aaY
aaWZ	Transfer number of balance data	aanumbers of balance data =

**Note:** The balance data are transmitted in the following form: 12.45678g. If the entire data is inquired at the same time, a list of the balance data will appear, on which each balance information is ended with <CR>, <LF>. At the end of the list, address and Y are transmitted. Once inquired, the balance data will be deleted.

**Example:** Dosing 12.58 ml with the TITRONIC T 110 Piston Burette with the address "03":  
 "03DO12.58 <CR> <LF>". Reply from the Piston Burette after dosing: "03Y <CR> <LF>".



### 4.3 Multi-functional inputs/outputs, input/output jack

There is a 15-pole jack on the rear of the TITRONIC T 110 Piston Burette to act as a multi-functional input/output (Fig. 8, item 8). This I/O connection is controlled by the internal program of the TITRONIC T 110 Piston Burette or direct by computer commands. It is used among other things for connecting the TR 151, TR 154 and TR 156 Titration Controllers, the TR 165 Titration Recorder and the TR 160 Manual Titration Controller.

The multi-functional input/output consists of 8 inputs and 4 outputs:

Input:	PIN No. 1; 2; 3; 4; 5; 6; 7; 8
Output:	PIN No. 9; 10; 11; 12
Non-connected:	PIN No. 13
Earth:	PIN No. 14; 15

The inputs correspond to TTL signals and are triggered by a pull-up resistor (10 kOhm) to + 5 V.

The outputs correspond to the outputs of an open collector module (LS 05). Therefore the relevant PINs of a connected unit must be connected through a resistor from 1...10 kOhm to the supply voltage of the connected unit.

### 4.4 Analog output for the volume (option)

If the TITRONIC T 110 Piston Burette is equipped with a volume-proportional analog output, an ungrounded potentiometric recorder (BNC jack) can be connected.

The output voltage of this analog output is 0...- 1000 mV per 0...100 % of volume.

Tolerance: typical  $\pm 0.2$  %, max.  $\pm 0.3$  %, connector: BNC jack.

## 5 Maintenance and care of the TITRONIC T 110 Piston Burette

To retain the function of the Piston Burette the following maintenance and inspection work is to be carried out.

### Maintenance intervals

Normal operation:

- As a rule, the max. intervals for carrying out all maintenance work is 6 months.

Under particular stress:

- Once per quarter, the glass cylinder has to be inspected visually in order to check for damages, and in addition a test according to DIN 12 650, part 6, or ISO DIS 8655, part 3, has to be carried out. These verifications are particularly necessary if solutions have been used which are likely to attack glass, e. g. alkaline, fluoride, or phosphatic solutions.
- If there is suspicion that a solution is attacking the glass excessively the maintenance intervals are to be reduced accordingly.
- Once per quarter, the electrical contacts have to be checked, if the Piston Burette is used in premises with an occasional occurrence of corrosive matters in their atmosphere.

In case of disturbances:

- The work has to be carried out immediately if a disturbance, an error, or another defect becomes obvious.

### **Maintenance work to be carried out**

- Check the piston and the cylinder for visible signs of mechanical damage, such as cracks, fractures and damage of the surface.
- Check the piston rod for corrosion.
- Check the hoses, screw unions and seals for signs of visible damage, contamination and leaks.
- Check the electrical plug contacts for corrosion and mechanical damage (on Piston Burette and cables).
- Defect parts must be repaired or replaced with new ones. Defect glass parts must always be replaced.
- After each maintenance operation, a test for metrological reliability according to DIN 12 650, part 6, or ISO DIS 8655, part 3, has to be carried out.

### **Periods without operation**

- If the Interchangeable Units for the TITRONIC T 110 Piston Burette are not used over a long period of time, the liquids contained in the system, in particular aggressive solutions, have to be drained. If the liquid is left in the system, one has to reckon with corrosion and a alteration of solutions used over the time. Since the state of the art does not provide plastic hoses which are absolutely free of diffusion occurrences, this precaution measures apply in particular to the hose-line section.

### **Cleaning**

- The Interchangeable Units can be cleaned using a piece of cloth soaked in normal water or a household cleansing agent containing ethanol. In general, short-term immersion in, or rinsing with, water or ethanol is not harmful, but this method should only be applied in extreme cases.
- The casing of the lower section of the Piston Burette can also be cleaned using a piece of cloth and a household cleansing agent. The lower and rear side have to be cleaned dry. In no case must water penetrate into the interior of the lower section.

## **6 Storage and transportation**

- If the TITRONIC T 110 Piston Burette or the Interchangeable Units have to be stored over a period of time, or to be transported, using the original packing will be the best protection of the devices. However, in many cases this packing will not be available any more, so that one will have to compose an equivalent packaging system. Sealing the lower section in a foil is hereby recommended.
- The devices should be stored in a room with a temperature between + 10 and + 40°C, and the (relative) humidity of the air should not exceed 70 %.

## 7 Declaration by the manufacturer

### **Manufacturer's/importer's certificate**

This is to certify that the

Device: **Piston Burette**  
Type: **TITRONIC T 110**

is radio-noise suppressed according to the BMPT gazette decrees 243/1991 and 46/1992.

The Federal Agency for Telecommunication Licences was notified of the marketing of the device and entrusted with verifying the series for the observance of the relevant regulations.

Company

SCHOTT-GERÄTE GmbH  
Im Langgewann 5  
D-65719 Hofheim a. Ts.

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**Typ / Type / Type:**

**Serien Nr. / Serial no. / No. de série:**

## **Bescheinigung des Herstellers**

Wir bestätigen, dass das oben genannte Gerät gemäß DIN EN ISO 9001, Absatz 4.10.4 "Endprüfung" geprüft wurde und dass die festgelegte Qualitätsanforderung an das Produkt erfüllt wird.

## **Supplier's Certificate**

We certify that the equipment EN ISO 9001, part 4.10.4 "Final inspection and testing" and that the specified requirements for the product are met.

## **Certificat du fournisseur**

Nous certifions que le produit a été vérifié selon EN ISO 9001, partie 4.10.4 "Contrôles et essais finals" et que les exigences spécifiées pour le produit sont respectées.

EDV 008 27 087 1 Version 010214 M

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# **SCHOTT**

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