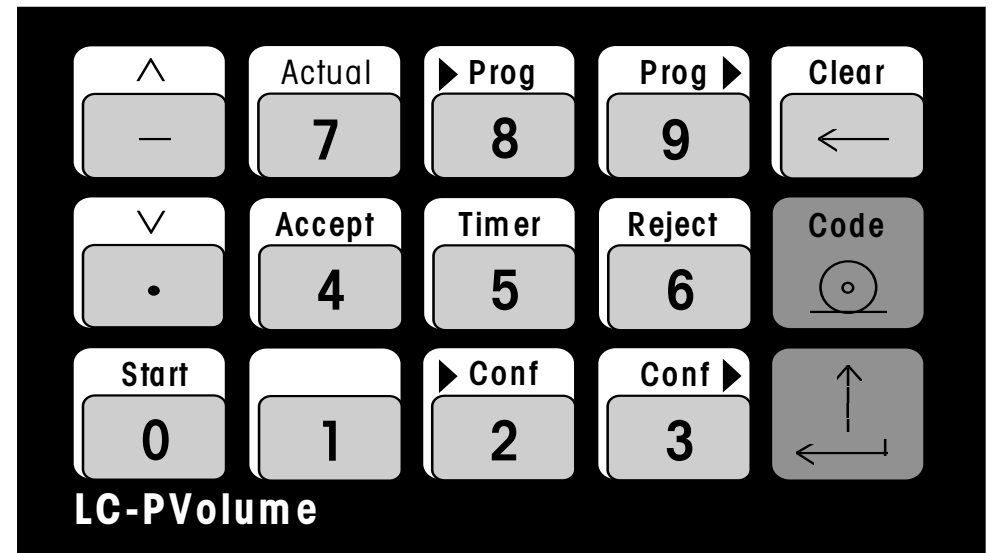


Operating Instructions

LC-PVolume



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1 METTLER TOLEDO LC-PVolume

LC-PVolume is an aid for evaluating performance of volumetric equipment. It fulfills the requirements of

- the primary test method of Guideline I8 ("Determining the Performance of Volumetric Equipment"), proposed by the National Committee for Clinical Laboratory Standards (NCCLS).
- ISO / DIS 8655/1
- DIN 12650/6

The test method, called the Gravimetric Analysis (→ section 6), is a weighing procedure. Aside from its repetitive nature, it requires a number of physical and statistical calculations, making the entire procedure a tedious one. With LC-PVolume, the length of time it takes to finish a complete test cycle would be greatly reduced. This is mainly because the operator is relieved of several tasks, namely: writing down each weighing result, calculation of results, and creating a record of the test procedure. Moreover, LC-PVolume allows for internal storage of definitions for test parameters, which further shortens the test cycle time.

Special features of the system:

Max. number of programs	60; storage positions 0...59 (with -59- as user specified default for defining other empty positions)
Units	Input: g or mg...Output: mg (→ µl)
Sample size	4/10/30
Two level password protection	System configuration and programs
Print mode	Line printer, selectable in the configuration menu or via special keypress (press and hold down [1] for a few seconds while in standby mode to go to printer mode; to return to LC-PVolume mode, press and hold down [Actual] for a few seconds).

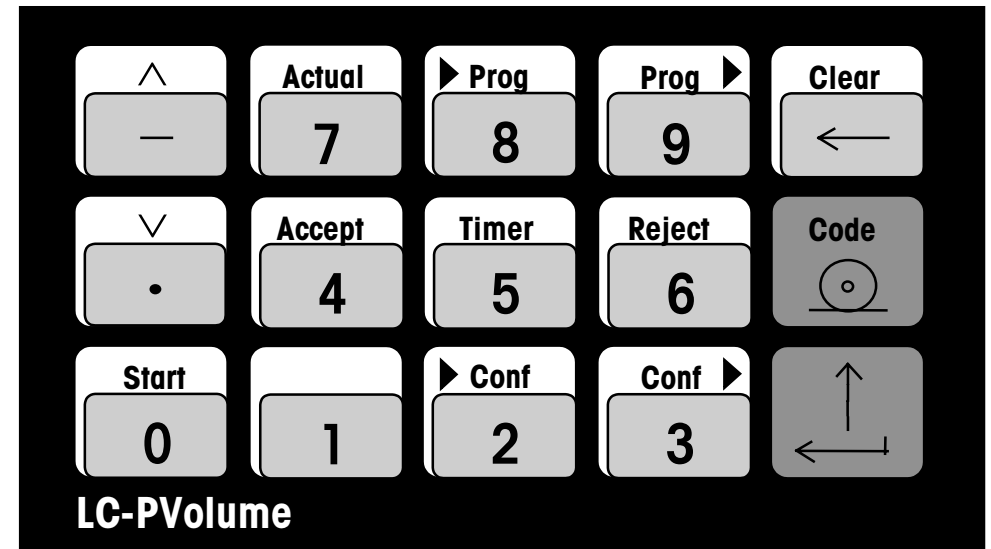
Any one of the following METTLER TOLEDO balances may be attached:

- AM balances with standard software V10.45.XX or higher
- AT, MT, UMT balances with software version 1.09 or higher

Also for balances with restricted display function:
(DeltaTrac for position and test indicator not present)

- AJ balances with data interface Option 018
- AE (Option 012) balances
- B and G series (CAN/SICS balances)
- B-S and G-S series (RS232)

LC-PVolume keypad



2 First steps

Setting up the system

- Unpack and position the LC-PVolume Controller
- Install batteries (→ section 10: System startup and maintenance)
- Insert paper (→ section 10: System startup and maintenance)
- Connect LC-PVolume Controller and balance with the required cable and attach to power supply (→ Appendix B)
- Switch on balance and set to default settings: RESET. For some certified M balances/scales, Au (Auxiliary) must also be set to ON in the I-FACE menu to enable all functions (→ balance operating inst.).
- Switch on LC-PVolume Controller and balance:
 - Status display of the LC-PVolume Controller (LED):

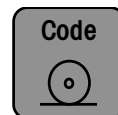
LED flashes rapidly	Initialization after switching on
LED flashes slowly	Balance is switched off, or LC-PVolume is in printer mode, or there is no connection to balance/scale
LED constantly lit up	RS232C interface in order and LC-PVolume system ready for operation
- Configuration (→ section 4: Configuring the system)
 - Important: Enter date and time**
 Finally, check the system using the routine opposite.
- Define default program position -59- first (→ section 5) to have your company's specific data preset on all other positions. This facilitates in particular, the input of header and footer lines.
- Program definition (→ section 5). Program position -59- is the default.
- Examples (→ section 9: Sampling operation)

Checking the system using a test weight

With the built-in control of inspection, measuring and test equipment, the sequence of operations can be planned to comply with the recommendations of ISO9000, GLP (Good Laboratory Practice) and GMP (Good Manufacturing Practice). It is extremely easy to check at any time whether the LC-PVolume is operating flawlessly when connected to a balance. (First set date and time.)



Pressing the [>Conf] key normally leads to entry into the system configuration. The balance display then shows the prompt for password entry "PASS".



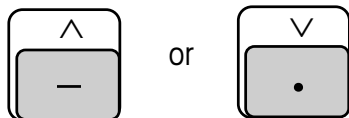
Skip this prompt and press the [Code] key directly. When "tare..." appears on balance display press the tare key or bar of the balance.

After taring, the following record printout starts. Load test weight and remove on completion of the printout.

----- VERIFICATION -----	
Date and time of test -----	13.12.94 16:25
Version of balance software -----	STD 10.1.19
Balance type -----	TYPE : AT 261
Identification number -----	2.00.00
Zero value -----	S 0.00 mg
Value after loading test weight -----	S 50000.00 mg
Nominal weight value, certificate -----	Ref.:
No. or accuracy class of test weight -----	Act./Sign.:
Signature of test person -----	

3 General key functions/entries

Although each key of the LC-PVolume has two functions, it is not necessary to switch to a different assignment level. The system always checks the context of the key that was pressed, to decide for itself whether, e.g. a function is being called up or a number entered.

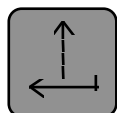


Previous or next position

for selection of the program. The DeltaTrac always shows the current program position like the minute hand of a clock. In menus: Stepping up or down on the menu positions.

Input of alphanumeric data (for free code, → [Code], or for character values in the configurations [like P1 or C17], → sections 4 and 5)

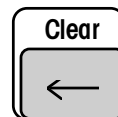
[^], [v] to select A...Z/a...z, . (decimal point), - (dash) and space, [↵], or 0...9 for the next character, and [↵] to conclude the input. If the last character inputted is alphanumeric, press [↵] [↵] to conclude the input.



[↵] key (Enter)

In (Conf) or (Prog), [↵] stores the displayed value. The new entry is recorded on the printer. Otherwise the printer's paper feed advances.

The keypress is also interpreted as confirmation for various functions.



In alphanumeric entries: **Deletion of last inputted character/number**, if [↵] has not yet been pressed. When there is no longer a digit to the left of the cursor, the old value is again shown. Pressing the key again provides an empty input. Pressing again terminates the entry function.

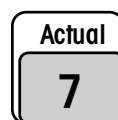
The current parameter can be cleared by pressing [Clear] immediately after the parameter value is displayed. The balance display shows "_". Confirm by pressing [↵].

Program is active:

Pressing and holding down [Clear] for a few seconds will abandon the pipette test that is currently running. Confirm 'abort' by pressing [↵] or refuse by pressing [Clear] again.

No program is active (standby mode):

Pressing and holding down [Clear] for a few seconds will start the procedure to delete the current program (→ section 5).



Displays the current program and its position on the DeltaTrac.

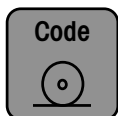
Pressing and holding down this key for a few seconds will switch from print mode to program mode.



Pressing and holding down this key for a few seconds will switch from program mode to print mode.



Starts the volumetric test using the parameters defined for the current program position.



[Code] key

Pressing and holding down [Code] for a few seconds while switching on LC-PVolume: The **character set** is printed out.

Entry and printout of a free **code**: The code entered must always be concluded with [↵].

No program is active (standby mode):

- If [Code] is pressed directly following [>Conf], a **verification** record is printed out (→ section 2).
- Pressing and holding down [Code] for a few seconds: A **program catalog** is printed out as an overview of LC-PVolume (→ section 5).

Printer mode (→section 4):

Printout of the next stable value.

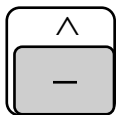
4 Configuring the system



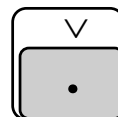
Pressing this key the first time enters the system configuration menu. Subsequent presses on this key after entering the correct password, switches to the next configuration parameter.

PASS

Prompt for password entry. Press [↵] if no password has been defined.



Moves forward to the next configuration parameter.



Moves back to the previous configuration parameter.

Configuration parameters (characters printed in **boldface** are the current default settings):

C1	PASS	Password up to 6 digits (0...9, . and -). (first four characters are required for program definition and deletion; all digits for system configuration only)	.-0...9
C2	Lang	Language: 1=German, 2=French, 3=English	1..3
C3	dAte	Date, e.g. 13.12.93 (European format use .) or 12-13-93 (US format use -).	
C4	HH.MM	Time in hours and minutes, entry in 24-hour format.	
C5	nrPg	Number of possible programs (test parameter definitions). (E.g. if there are only 5 programs used, set C5 to "5"; Default position -59- is accessible only when C5 is set to "60")	1... 60
C6	ABab	0=Upper case , 1=Mixed case letters (If set to "1", the scrolling alphanumeric character loop will also include lower case letters)	0/1
C7	PrtM	Printer mode: 0=Inactive 1=no 'TA' and no leading 'S' (stable values) will be printed out, 2=Print all	0/1/2

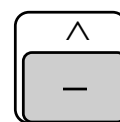
C8	7/8	Printer: 7=7 bit, even parity, no handshake, baud rate=2400 , 8=8 bit, no parity, Xon/Xoff, baud rate=2400 Note: Restart LC-PVolume to activate new settings of C7/C8.	7/8
C9	LCo	Number of line feeds after code input (3).	0...255
C10	LOt	Number of line feeds after miscellaneous printouts (3).	0...255
C11	bUn	Barometer unit: 1=mmHg , 2=mbar, 3=hPa	1/2/3
C12	reJ	Printout of rejected values: 0=no printout, 1=printout of total number of rejected values, 2=printout of total number and of all (max. 30) individual rejected values.	0/1/2
C13	doo	Automatic door mode (AT balance): 0=none, 1=open , 2=open/close, 3=close	0/1/2/3
C14	eva	Working with evaporation (blank) test: 0=no, 1=yes	0/1

To print out configuration press [Code] when the balance display shows the configuration parameter "C1 Pass".

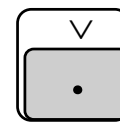


Quits the system configuration when the title of a configuration parameter ("C..") is on the display. Otherwise, press [↵] or [Clear] first.

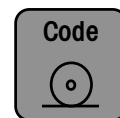
5 Defining the program (test parameter)



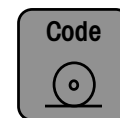
or



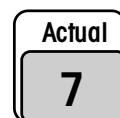
Selection of the desired storage position of a new program (Display: -n- for empty positions, otherwise program name). The positions are shown by the DeltaTrac.



0...59



Goes directly to the position specified.



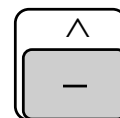
Displays the current program and its position on the DeltaTrac. Pressing and holding down this key for a few seconds will switch from printer mode back to standby mode.



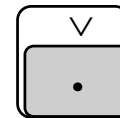
Pressing this key the first time enters the test parameter menu. Subsequent presses on this key, after entering the correct password, switches to the next test parameter.

PASS

Prompt for password entry. Press [↵] if no password has been defined.



or



[^] Moves forward to the next test parameter (same as >Prog)

[v] Moves back to the previous test parameter

After choosing one of the test parameters (e.g. 'P1' for instrument name, [see following test parameters]), press [↵] to check the actual value. Press [↵] or [Clear] to leave it unchanged, or input your new value and press [↵] to confirm.

Test parameters (characters printed in **boldface** are the default settings):

P1	Inst	Name of the volumetric equipment, up to 20 characters [0]...[9] [↵]; [^] [v] for A to Z . - and space, [↵] for the next character, [↵][↵] to conclude the input. Important: There has to be an input for this parameter, otherwise LC-PVolume will cease to continue.
P2	Opr	Name of the operator, up to 15 characters. Valid characters are the same as in P1.
P3	no.	Identification number (additional info), up to 20 characters. Valid characters are the same as in P1.
P4	noM	Nominal volume to test [μl]: 0.0 0.01 ... 10'000'000
P5	-n-	Sample size: 4=Short, 10=Normal , 4/10/30 30=Long
P6	Cy t	Cycle time in seconds. 15 s 1...99
P7	Eco	EconoMode: 0=with instructions , 1=Normal, 0/1/2 2=Compressed (see sample printouts → section 9: Sampling operation)
P8	† 1	Header, line 1 date/time (see opposite), or 24 char.
P9	† 2	Header, line 2 date/time (see opposite), or 24 char.
P10	† 3	Header, line 3 date/time (see opposite), or 24 char.
P11	E 1	Footer, line 1 date/time (see opposite), or 24 char.
P12	E 2	Footer, line 2 date/time (see opposite), or 24 char.
P13	E 3	Footer, line 3 date/time (see opposite), or 24 char.

Special header and footer lines (for P8...P13):

Date/Time:	
Entry: .1.	Printout: -- 13.12.94 16:25:00 --
Entry: .2.	Printout: --- 13.12.94 - 16:25 ---
Entry: .3.	Printout: ----- 13.12.94 -----
Entry: .4.	Printout: ----- 16:25 -----
Entry: .5.	Printout: ----- 16:25:00 -----
Entry: .6.	Printout: -----
Entry: .7.	Printout: =====
.1.	Date and time (long format)
.2.	Date and time (short format)
.3.	Date
.4.	Time (short format)
.5.	Time (long format)
.6.	Single line
.7.	Double line

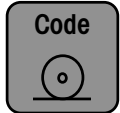
Date/Time/Position No.:	
Entry: .11.	Printout: -13.12.94---16:25:00- 7-
Entry: .12.	Printout: - 13.12.94 - 16:25 -- 7-
Entry: .13.	Printout: ----- 13.12.94 ----- 7-
Entry: .14.	Printout: ----- 16:25 ----- 7-
Entry: .15.	Printout: ----- 16:25:00 ----- 7-
Entry: .16.	Printout: ----- 7-
Entry: .17.	Printout: ===== 7-

Entries .11., ..., .17.: Same as entries .1., ..., .7., but in addition, a position number is indicated on the right hand side of each line.



Quits and saves test parameter definitions.

Printing out program catalog



Pressing and holding down [Code]: A program catalog will be printed out as an overview of all positions.

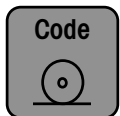
Only the following parameters are printed out for every occupied storage position: Instrument, operator, number, nominal volume and sample size.

Printing out test parameters

For a printout of all test parameters of an instrument, select an instrument using the [^] and [v] keys.

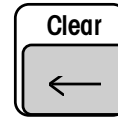


Entry into the database of the selected test. Enter password, then press [↵].



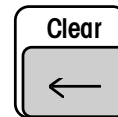
If the [Code] key is pressed while the balance display shows "P1 Inst", all **test parameters** of the selected test are printed out.

Deleting test parameters



The current instrument can be deleted from the memory by pressing and holding [Clear]. The balance display then shows "Clr.Prg". Confirmation with [↵]. If a password has been defined, the balance will then ask for the password. Enter password, then press [↵].

Clearing individual string parameters



The current parameter can be cleared by pressing [Clear] immediately after the parameter value is displayed. The balance display shows "_". Confirmation with [↵].



Default position: -59-

The parameter values of storage position -59-, if defined, will serve as default for all other test positions that are yet to be defined. In this case, the previous default values, as marked in this chapter are overwritten by the values of position -59-.

In the definition of test parameters for the default position, It is not necessary to enter the instrument name before moving on to the other parameters.

6 How does LC-PVolume work?

Following is a step-by-step procedure on how to properly run LC-PVolume.

Step No.	Key	Display	Procedure
1			Select an instrument using the [^] and [v] keys. Prepare the test instrument.
2		RUN	LC-PVolume is setting up for the volumetric evaluation using the test parameters defined for the current storage position.
3		tEMP	Enter the temperature reading (15... 30°C), then press [↵]. If a test has been conducted prior to this one, the temperature entered in that test was kept in memory. To view this value, press [↵]. Key in a new value if the previous temperature is not the one desired then press [↵] again.
4		barP	Enter the barometer reading, then press [↵]. Do the same procedure as in temperature in case a barometer reading has been entered for a prior test. Place a sample beaker containing water on the balance.
5		tIMER	LC-PVolume is ready for the user to press [Timer].
6		WAlt	The countdown display will appear as

7

b1 15...
...b1 0

soon as the balance gets a stable value.

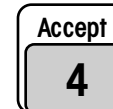
For the blank tests, remove the beaker from the balance, wait for a few seconds, and return the beaker again on the balance.
Note: For the blank tests, no water is added into the beaker.

8

-0.31

The weighing result (mg) is displayed on the balance. It shows the amount of evaporated water during the countdown time.

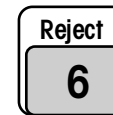
9



tIMER

If the current individual test is acceptable, press [Accept]. The weight result will be printed out on the test record. If an error occurs during the test cycle, press [Reject]. The weight result will be discarded and the sample counter will be reset. As soon as either [Accept] or [Reject] is pressed, LC-PVolume will again prompt the user to press [Timer].

or



10

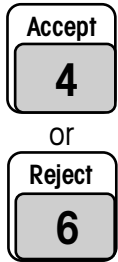


Wait for the countdown display to appear.

11

-1-15...
...-1-0

For the sample tests, remove the beaker from the balance, dispense water from the pipette into the beaker, and put the beaker back on the balance.

Step No.	Key	Display	Procedure
12		78.13	The weighing result (mg) is displayed on the balance.
13			Like the blank tests, each sample test could be accepted or rejected.
14			<p>Repeat Steps 6 to 13, with a blank test being done every 10th sample test, until the last of the sample/blank tests are done.</p> <p>Note: For the short test, evaluation ends after the 4th sample test; for the normal test, after the 2nd blank test; and for the long test, after the 4th blank test.</p>
15		tEMP	The end of the evaluation is signaled by the prompt for the second temperature reading (→ step 3).

After the second temperature is entered, LC-PVolume prints out the calculated mean volume and the results of the statistical computations (imprecision and inaccuracy).

The Gravimetric Analysis

Before performing the test procedure, make sure that the temperatures of the equipment to be evaluated, the room, and the test liquid are identical, and as stable as possible (+/- 0.5°C) for at least 2 hours before and throughout the evaluation period.

Measurement of evaporation (C14=1)

This test method makes use of the weights of a series of weighing samples of a test liquid (distilled water), corrected for evaporation. Before the actual test is done, a weighing vessel (e.g. beaker) containing a small amount of test liquid is placed on the balance. Following this, the temperature and barometer pressure readings should be recorded.

In order to obtain complete and correct test sampling results, perform the following procedures: Start the timer, remove the weighing vessel, wait for a few seconds, and place the vessel back on the balance. The weighing result is the weight of the evaporated test liquid. Repeat the procedure again, but this time, add test liquid to the vessel before putting the vessel back on the balance. The weight result is the weight of the current sample.

Repeat these procedures, doing the blank test every 10 sample tests, until the last of the test has been done. Record the temperature again.

Preventing evaporation (C14=0)

If the test is performed using a humidity trap or is within a saturated environment, then the blank tests are no longer necessary. Setting C14 of the system configuration to 0 will omit the blank tests.

7 Error messages during operation of LC-PVolume

Below are error messages that may appear as a result of an incorrect operation of the program:

noProg	The balance will display this error message if the program for the current storage position is not defined.
Wrong Unit	This message will be printed out if the balance is configured to a weighing unit other than mg or g.
-RANGE-	The balance will display this error message if input for temperature or barometer readings are beyond the range for the gravimetric analysis. For temperature, range is from 15°C to 30°C. For barometer pressure, range is from 600 mmHg to 800 mmHg; 800 mbar to 1067 mbar; 800 hPa to 1067 hPa.
noNom	The balance will display this error message if no nominal volume has been defined for the current program.

8 What if...?

...the printer reports Input not valid?	Entry outside the designated definition range, e.g. blank instrument, wrong date format, etc.
...the printer reports Access denied?	Wrong password or non-modifiable parameter.
...the system automatically quits a function?	No key has been pressed for at least 10 minutes.

...the printer reports Transmission error?	Transmission rate, number of data bits or parity is incorrectly set on the balance.
In program mode:	2400 baud, 7 bits, even parity, no handshake
In printer mode: (selectable in C8)	2400 baud, 7 bits, even parity, no handshake 2400 baud, 8 bits, no parity, handshake Xon/Xoff
...the printer reports Battery discharged?	This message appears every 2 hours when the capacity of the batteries is no longer sufficient to store the data if a power outage occurs.
	Warning: Do not switch off LC-PVolume Controller and do not disconnect from the power supply. Otherwise, the data could be lost. Replace batteries as described in Section 10: Installing the batteries.
...the printer reports Memory reset?	The memory has been cleared due to low battery voltage. All data has been lost.
...the printer reports Printer mode?	The LC-PVolume is in printer mode at start-up (configured in C7) or [1] was pressed and held for a few seconds. Only data from a master weighing system will be printed out by the printer. Press and hold down [Actual] for a few seconds to switch to LC-PVolume mode.

9 Sampling operation (examples)

System configuration: Default settings, date and time must be defined; Printout of rejected values = 0

→ section 4: Configuring the system

Program definition: Nominal volume = 80 µl; Sample size = 4; EconoMode = 0

→ section 5: Defining the program

Keys pressed/weighings	Balance display		Printout
Program selection with keys [^] and [v].	P 80	Position indicator with the DeltaTrac.	- 29.03.95 - 14:28 -- 0-
Start the volumetric evaluation with [Start].	RUN		- THE QUALITY COMPANY --
Enter the temperature reading. [2] [1] [.] [5] [↵]	tEMP ⇨	21.5	Operator Dennis Lauzon
Enter the barometer reading. [7] [5] [5] [↵]	barP ⇨	755	-----
Start countdown with [Timer].	tIMER	DeltaTrac indicates which sample is about to be processed.	Inst P 80
Counting down. Make blank test: Remove beaker from the balance and return it back on the balance before timer reaches 0.	WAIt		No. 569
Do not dispense water into the beaker. The blank test result is displayed (should be a negative value). Print it out on the record with [Accept]. As soon as [Accept] is pressed, the "tIMER" prompt appears again on the display.	b1 15 ↓ b1 1 -0.31		Nominal 80.00 µl
	tIMER		Cycle time 15 s
			T1 = 21.5 °C
			Air press. = 755.0 mmHg
			* Place beaker with
			* water on the balance.
			* Press <Timer> when
			* ready for blank test.
			-- Sample # -- Weight --
			e 1 -0.31 mg

Continued...

Keys pressed/weighings	Balance display	Printout
<p>Repeat the preceding steps but instead of just returning the beaker back on the balance, dispense the contents of one pipette into the beaker for every test cycle.</p> <p>After the 4 test cycles have been done, enter the temperature reading again. [2] [1] [.] [7] [↵]</p> <p>Automatic printout of results.</p>	<p>78.13 Test indicator with the DeltaTrac. 77.94 77.95 77.25</p> <p>tEMP ⇒ 21.7</p>	<p>1 78.13 mg 2 77.94 mg 3 77.95 mg 4 77.25 mg</p> <p>T2 = 21.7 °C</p> <p>Mean T 21.6 °C Mean vol 78.377 µl</p> <p>Inaccuracy (mean error): E -1.623 µl E% -2.03 %</p> <p>Imprecision: s (est.) 0.221 µl CV(est.) 0.28 % Range 0.88 µl</p> <p>-----14:29-----</p>

System configuration: Default settings, date and time must be defined; Printout of rejected values = 1
 Program definition: Nominal volume = 50 µl; Sample size = 10; EconoMode = 1

→ section 4: Configuring the system
 → section 5: Defining the program

Keys pressed/weighings	Balance display	Printout
Program selection with keys [^] and [v].	P 50	- 29.03.95 - 14:26 -- 0-
Start the volumetric evaluation with [Start].	RUN	- THE QUALITY COMPANY -- Operator Dennis Lauzon -----
Enter the temperature reading. [2] [1] [.] [0] [↵]	tEMP ⇨ 21.0	Inst P 50
Enter the barometer reading. [7] [5] [5] [↵]	barP ⇨ 755	Nominal 50.00 µl Cycle time 15 s
Start countdown with [Timer].	tIMER	T1 = 21.0 °C Air press. = 755.0 mmHg
Counting down. Make blank test: Remove beaker from the balance and return it back on the balance before timer reaches 0. Do not dispense water into the beaker.	WAIt b1 15 ↓ b1 1	-- Sample # -- Weight -- e 1 -0.22 mg
The blank test result is displayed. Print it out on the record with [Accept].	-0.22	1 53.07 mg 2 52.61 mg 3 50.98 mg 4 51.88 mg 5 51.16 mg 6 51.97 mg 7 51.61 mg 8 51.95 mg 9 50.58 mg 10 52.06 mg
As soon as [Accept] is pressed, the "tIMER" prompt appears again on the display.	tIMER	

Continued...

Keys pressed/weighings	Balance display		Printout
<p>Repeat the preceding steps but instead of just returning the beaker back on the balance, dispense the contents of one pipette into the beaker for every test cycle.</p> <p>To redo test cycles with undesirable results, press [Reject] rather than [Accept] when the weight result is displayed.</p> <p style="padding-left: 40px;">[Rejected value]</p> <p style="padding-left: 40px;">[Rejected value]</p> <p style="padding-left: 40px;">[Rejected value]</p>	<p>53.07</p> <p>52.61</p> <p>50.98</p> <p>51.88</p> <p>51.16</p> <p>51.97</p> <p>51.61</p> <p>0.00</p> <p>51.95</p> <p>100.23</p> <p>50.58</p> <p>75.23</p> <p>52.06</p>	<p>Test indicator with the DeltaTrac.</p>	<p>e 2 -0.51 mg</p> <p>T2 = 20.8 °C</p> <p>Mean T 20.9 °C</p> <p>Mean vol 52.311 µl</p> <p>Inaccuracy (mean error):</p> <p>E 2.311 µl</p> <p>E% 4.62 %</p> <p>Imprecision:</p> <p>s 0.748 µl</p> <p>CV 1.43 %</p> <p>Range 2.50 µl</p>
<p>After the 10 test cycles have been done, perform another blank test.</p>	<p>-0.51</p>		<p>Rejected values: 3</p> <p>-----14:28-----</p>
<p>After the second blank test, enter the temperature reading again.</p> <p>[2] [0] [.] [8]</p> <p>Automatic printout of results, including total number of rejected values.</p>	<p>tEMP ⇨</p>	<p>20.8</p>	

System configuration: Default settings, date and time must be defined; Printout of rejected values =2
 Program definition: Nominal volume = 100 µl; Sample size = 30; EconoMode = 2

→ section 4: Configuring the system
 → section 5: Defining the program

Keys pressed/weighings	Balance display		Printout
Program selection with keys [^] and [v].	P 100	Position indicator with the DeltaTrac.	- 29.03.95 - 14:20 -- 0-
Start the volumetric evaluation with [Start].	RUN		- THE QUALITY COMPANY -- Operator Dennis Lauzon -----
Enter the temperature reading. [2] [0] [.] [7] [↵]	tEMP ⇨	20.7	Inst P 100 No. C848
Enter the barometer reading. [7] [5] [8] [↵]	barP ⇨	758	Nominal 100.00 µl Cycle time 15 s T1 = 20.7 °C Air press. = 758.0 mmHg
Start countdown with [Timer].	tIMER	DeltaTrac indicates which sample is about to be processed.	e 1 -0.28 mg
Counting down. Make blank test: Remove beaker from the balance and return it back on the balance before timer reaches 0.	WAlt b1 15 ↓ b1 1		1 98.18 mg 2 98.25 mg 3 99.70 mg 4 95.88 mg 5 99.98 mg 6 96.18 mg 7 98.22 mg 8 99.29 mg 9 99.35 mg 10 100.07 mg
Do not dispense water into the beaker.			e 2 -0.53 mg
The blank test result is displayed. Print it out on the record with [Accept].	-0.28		11 99.17 mg 12 99.24 mg 13 99.69 mg

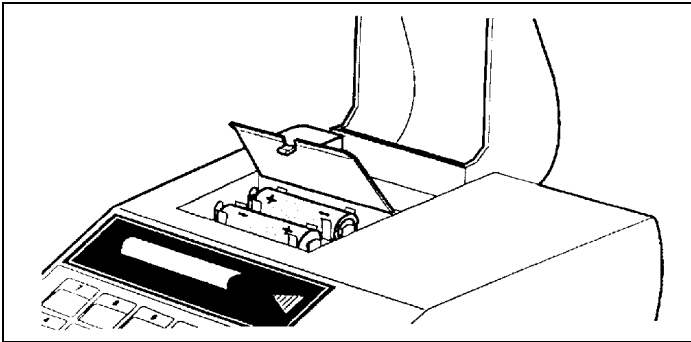
Continued...

Keys pressed/weighings	Balance display	Printout
As soon as [Accept] is pressed, the "TIMER" prompt appears again on the display.	TIMER	14 99.65 mg 15 99.88 mg 16 102.00 mg
Repeat the preceding steps but instead of just returning the beaker back on the balance, dispense the contents of one pipette into the beaker for every test cycle.	98.18 98.25 ↓ 100.07	17 99.95 mg 18 99.63 mg 19 101.58 mg 20 99.21 mg
After the 10 test cycles have been done, perform another blank test.	-0.53	e 3 -0.49 mg 21 100.19 mg 22 98.35 mg 23 100.42 mg 24 99.39 mg
Perform the cycle tests for the next 10 test cycles. Press [Reject] to redo the tests with undesirable results.	99.17 99.24 99.69 [Rejected value] 97.46 99.65 99.88 [Rejected value] 89.75 102.00 99.95 99.63 101.58 99.21	25 100.11 mg 26 100.53 mg 27 100.83 mg 28 100.36 mg 29 100.27 mg 30 99.93 mg
Perform another blank test.	-0.49	e 4 -0.40 mg T2 = 20.9 °C Mean T 20.8 °C Mean vol 100.243 µl Inaccuracy (mean error): E 0.243 µl E% 0.24 %

Continued...

Keys pressed/weighings	Balance display		Printout
<p>Perform the last 10 test cycles. Press [Reject] to redo the tests with undesirable results.</p> <p>[Rejected value]</p>	<p>100.19 98.35 100.42 99.39 -0.22 100.11 100.53 100.83 100.36 100.27 99.93</p>	<p>Test indicator with the DeltaTrac.</p>	<p>Imprecision: s 1.295 µl CV 1.29 % Range 6.14 µl</p> <p>Rejected values: 4 97.46 mg 89.75 mg -0.22 mg 99.64 mg</p> <p>-----11:07-----</p>
<p>After the last 10 test cycles, the last blank test is done.</p>	<p>99.64</p>		
<p>An error was made during the last blank test. Press [Reject] and redo the test.</p>	<p>-0.40</p>		
<p>Enter temperature reading again. [2] [0] [.] [9] [↵]</p>	<p>tEMP ⇨</p>	<p>20.9</p>	
<p>Automatic printout of results, including rejected values.</p>			

10 System startup and maintenance



Installing the batteries

The two enclosed batteries power the clock and the data memories for the settings, register data and statistics when the LC-PVolume Controller is not connected to the power supply.

Please note: If work has already been performed with the system and the existing data have to be retained, the LC-PVolume Controller must be connected to the power supply and switched on when the batteries are changed. Otherwise, the data will be lost within a few minutes.

- Raise paper cover and pull paper backward out of printer
- Open battery compartment and insert batteries

Replacing the ribbon

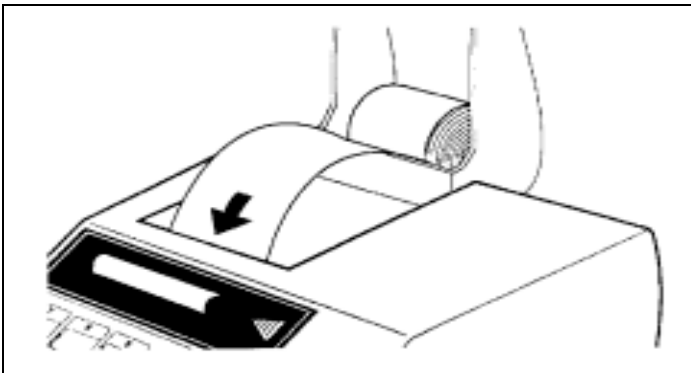
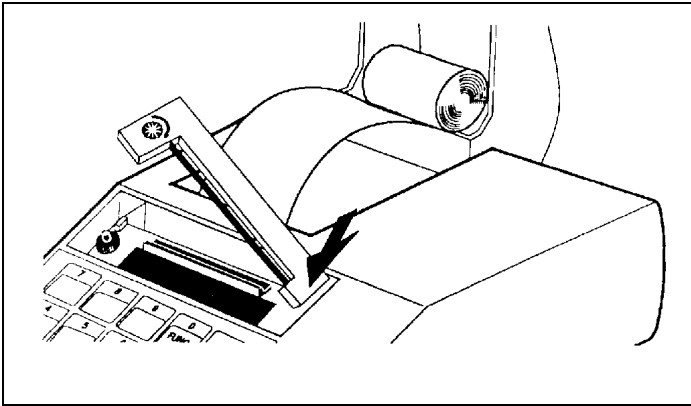
- Remove paper from printer
- Remove ribbon cover
- Remove ribbon cartridge
- Insert new ribbon cartridge (tighten with the tensioning wheel if necessary) and reattach ribbon cover

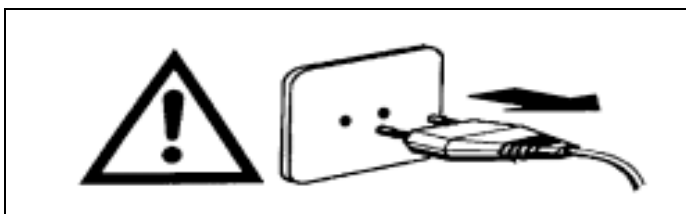
Inserting paper

- Insert paper in the slot of the printer in the direction of the arrow
- Switch on LC-PVolume Controller (toggle switch at rear right)
- Press and hold the [↑] key until sufficient paper has been drawn in

Connecting LC-PVolume to balance

Connect LC-PVolume to the balance using the appropriate cable (→ Appendix B). Use one of the two small, round and green CAN plugs to connect a CAN balance, or the 9-pin RS232 plug for all other balances.

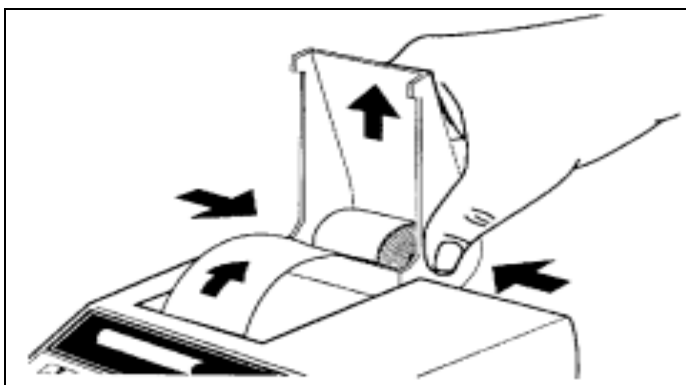




Cautionary note:

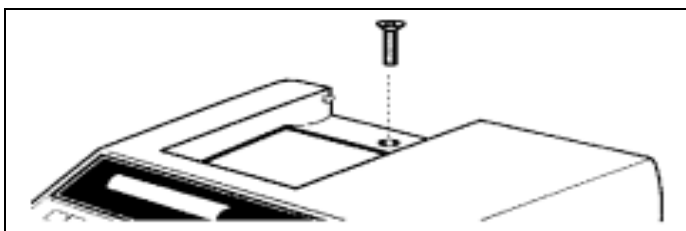
If the printer or the power fuse has to be replaced, the housing must be opened.

Before opening the instrument, make sure that the power cable is unplugged!



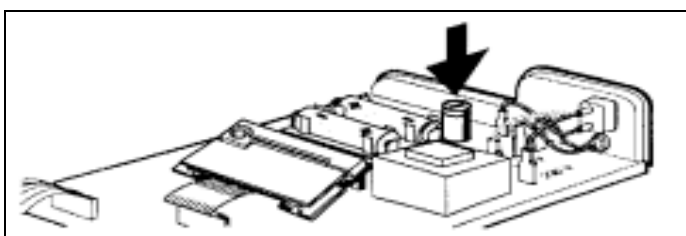
Replacing the printing unit

The printing unit can be replaced. Order number in Appendix C: Standard and optional equipment. The instructions for replacing the printing unit are enclosed with the printer.



Replacing the power fuse

- Pull paper out of printer and remove roll
- Gently press paper cover together until it disengages from the controller housing
- Remove paper cover
- Unscrew housing screw
- Carefully open housing (pay attention to ribbon cable connection to top housing; the screening plate has been omitted from the illustration)
- Replace fuse
230V: slow-blow 100mA, 250V
115V: slow-blow 200mA, 250V
- Close housing and tighten screw



Appendix A: Technical data of LC-PVolume Controller

Printing unit

Type of printing unit	Dot-matrix printer 5x9 dots, 24-character/line Epson/IBM character table No. 4
Printing speed	Faster than 1 line per second
Ribbon cartridge	Exchangeable, black
Paper roll	Normal paper 58 x Ø 51 mm, integrated in housing, commercial size

Clock

Time and date, EURO or US format representation, leap year taken into account

Interface

RS232C bi-directional, 2400 baud fixed
LC-PVolume mode: printer mode selectable:

Number of data bits	7	7	or	8
Parity	even	even		none
Handshake	none	none		Xon/Xoff
Printer buffer	128 characters			

Mechanical port

Temp. range/humidity 0...40°C/15...85% r.h.
Approvals EN60950 (equivalent to UL1950), CSA

Power supply

Line voltage, 100...120V, 160mA or 220...240V,
Consumption, frequency 80mA, 50...60Hz

Dimensions, weight

W x D x H = 157x210x85mm,
net 1.5kg (incl. paper roll)

Appendix B: Standard and optional equipment

Included in the standard equipment of the METTLER TOLEDO LC-PVolume:

Order No.

1 Paper roll	→ below
1 Ribbon cartridge, black	→ below
2 Batteries UM3 (1.5V) accord. to IEC LR 6	commercial
Fuse 230V (Slow-blow 100mA, 250V) or Fuse 115V (Slow-blow 200mA, 250V) according to IEC 127 / III	commercial
Operating Instructions German	21900418
Operating Instructions French	21900419
Operating Instructions English [One of them is included]	21900302

Optional accessories:

Paper rolls, set of 5	72456
Ribbon cartridges, black, set of 2	65975
Connection cable for AE (Option 012)	59759
Connection cable for LC-PVolume - Balance (AT, MT, UMT, AM, AJ Option 018)	229029
Connection cable SQC14 – balance RS232, (PG-S, PB, Spider1)	11101051
For CAN/SICS balances: Connection/extension (max 10 m) cable ...	
... for LocalCAN, 0.3 m	LC-LC03 239270
... for LocalCAN, 1.0 m	LC-LC1 229161

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Subject to technical changes and to the availability
of the accessories supplied with the instruments.