

Transferpette®-8/-12

Testing Instructions (SOP)

May 2009

1. Introduction

The standard DIN EN ISO 8655 describes both the design and the testing of the piston operated pipette Transferpette®-8/-12. The following Testing Instructions describe how to apply the ISO standard in practice.

We recommend a testing of the piston operated pipette every 3-12 months. This interval may be adjusted to individual requirements. For example, when working very frequently or when using aggressive media, the instrument should be tested more frequently.

These Instructions may be used as a basis for the supervision of testing devices DIN EN ISO 9001, DIN EN ISO 10012 and DIN EN ISO/IEC 17025.

Owing to its 8 respectively 12 channels, the Transferpette®-8/-12 can carry out 8 resp. 12 pipettings in one action. However, this advantage results in an increased effort required in testing. In order to test 8 resp. 12 channels, it is necessary to carry out according to ISO 8655 even 240 resp. 360 weighings, to obtain meaningful results. Therefore, it may take quite a long time to test the multichannel pipettes.

For this reason, the BRAND Calibration Service is particularly attractive, offering an optimized and conforming to standards testing and evaluation of the Transferpette®-8/-12 according to ISO 8655 (see chapter 7). We recommend to use this service to save you time and expense in testing the Transferpette®-8/-12.

Please contact your supplier for details.



2. Preparation for testing and visual examination

2.1 Type and serial number

- ☞ Read instrument type and nominal capacity. ⇒ Enter in Test Record (1).
- ☞ Read Serial Number (embossed at the handle). ⇒ Enter number in Test Record (1).
- ☞ Read customer's identification, if present. ⇒ Enter identification in Test Record (1).

2.2 Minimal configuration of the Transferpette®-8/-12

- Transferpette®-8/-12 ⇒ Use only manufacturer's original parts.
- Pipette tips ⇒ Use only appropriate tips. For best results, use original PLASTIBRAND® pipette tips.

2.3 Cleaning

Recommendation: adjust instrument bevor cleaning (found).

- Clean the pipette shafts. ⇒ No media residues!
⇒ Wipe off with soft cloth.
- V-rings resp. O-rings damaged? ⇒ No media residues!
⇒ V-rings resp. O-rings can be replaced (see Operating Manual)
- Clean the exterior sufficiently. ⇒ Wipe with a moist cloth (water or diluted soapy solution). Slight soiling is permissible.
- Has remaining liquid penetrated into the instrument? ⇒ Disassemble and clean the instrument
⇒ see Operating Manual

2.4 Visual examination

(damage, leaking)

- Housing ⇒ General damages?
- V-rings resp. O-rings ⇒ Scratches on the surface? Deformations? Damages?
- Tip ejector
- Piston ⇒ Scratches or soiling on the surface?
- Seal ⇒ Scratches or soiling on the surface?
⇒ Enter result in Test Record (2).

Possible faults and resulting measures:

Fault	Possible causes	Measures
Scratches on the pipette shaft tip resp. O-rings; pipette tip no longer tight	<ul style="list-style-type: none"> ■ Mechanical damage ■ Wear 	⇒ Replace V-rings resp. O-rings see Operating Manual
Instrument is difficult to move and/ or leaks	<ul style="list-style-type: none"> ■ Seal/ piston soiled or damaged 	⇒ Obtain spare parts; see Operating Manual.

2.5 Functional test

- Mount new pipette tip.

- Set the nominal volume.

- Take up testing liquid. ⇒ Aspiration of the liquid not possible or very slow. See notes in the table below.

- Hold the filled pipette vertically for approx. 10 seconds and observe if a drop forms at the pipette tip. ⇒ If a drop forms: See notes in the table below.

- Release testing liquid. ⇒ Hold pipette tips against wall of vessel and wipe off against the wall.

- ⇒ The pipetting lever must move smoothly and jerk-free.
- ⇒ Enter findings in Test Record (3).

- Eject the tip.

Possible faults and resulting measures: (for measures to rectify other faults please see Instruction Manuals)

Fault	Possible causes	Measures
Aspiration not possible or very slow	<ul style="list-style-type: none"> ■ Pipette shaft or pipette shaft tip are blocked 	⇒ Clean the instrument; see Operating Manual.
Drop forming at the pipette tip	<ul style="list-style-type: none"> ■ Pipette tip not properly mounted ■ Seal or piston are damaged ■ Pipette shaft tip no longer tightly mounted. 	⇒ Use new pipette tips. Mount tip tightly. ⇒ Clean or replace the seal and/or piston; see Operating Manual. ⇒ Re-tighten the pipette shaft tip; see Operating Manual.

3. Equipment required for testing

3.1 For Transferpette®-8/-12 with nominal volume > 50 µl

- **Recipient vessel** filled with deionised or distilled water (e.g., Erlenmeyer flask) (according ISO 3696, at least quality 3). ⇒ Match temperature of room, water and instrument
- **Weighing vessel** filled with some water. (e.g., Erlenmeyer flask). ⇒ Bottom must be covered at least. In case of testing volumes < 100 µl, protect against evaporation. (see 2.6.2)
- Required **accuracy of the balance:** ⇒ Approx. 10 times the accuracy of the instrument.

Testing volume	Balance display	Reproducibility and linearity
> 10 up to 100 µl	5-digit	± 0.02 mg
> 100 up to 1000 µl	4-digit	± 0.2 mg
> 1 up to 10 ml	4-digit	± 0.2 mg
> 10 up to 50 ml	3-digit	± 2 mg

- **Thermometer** with accuracy: 0.2 °C
- **Hygrometer:** Considering the measuring tolerance of the hygrometer a relative atmospheric humidity of at least 35 % should be reached.
- Place the Transferpette®-8/-12 including accessories into the testing room for at least 2 hours (unpacked). ⇒ Allow instrument to adjust to room temperature.

3.2 For Transferpette®-8/-12 with nominal volume < 50 µl

- **Recipient vessel** filled with deionised or distilled water (e.g., Erlenmeyer flask, glass beaker) (according ISO 3696, at least quality 3). ⇒ Match temperature of room, water and instrument.
- **Disposable micro pipettes** intraEND 100 µl; Pipette holder. ⇒ Supplier: BRAND GMBH + CO KG
Postfach 11 55
97861 Wertheim
⇒ Ordering information: IntraEND 100 µl Cat. No. 7091 44
Pipette holder Cat. No. 7086 05
Micro-weighing container ≤ 20 µl Cat. No. 708470
- Required **accuracy of the balance:** ⇒ Approx. 10 times the accuracy of the instrument.

Testing volume	Balance display	Reproducibility and linearity
10 up to 100 µl	5-digit	± 0.02 mg

- **Thermometer** with accuracy: 0.2 °C
- **Hygrometer:** Considering the measuring tolerance of the hygrometer a relative atmospheric humidity of at least 35 % should be reached.
- Place the Transferpette®-8/-12 including accessories into the testing room for at least 2 hours (unpacked). ⇒ Allow instrument to adjust to room temperature.

Traceability of test results to national standards

Through the use of calibrated testing devices (balance and thermometer), the requirement of DIN EN ISO 9001, DIN EN ISO 1001 and DIN EN ISO/IEC 17025 to refer the test to the national standard is fulfilled. The calibration of the balance e.g. can be carried out either by DKD calibration or official certification of the balance, or by calibrating the balance with appropriate weights that are traced to the national standard. The calibration of the thermometer can also be carried out by DKD calibration or official certification, or by a comparison with thermometers that are traced to the national standard (under defined conditions).

4. Gravimetric test

4.1 For mechanical and electronic Transferpette®-8/-12 with nominal volume > 50 µl

1. Set the nominal volume.
2. Determine temperature of the deionized water for testing. ⇒ Enter temperature into Test Record (4).
3. Mount a new pipette tip to one channel. ⇒ Conditioning increases accuracy of the test.
Condition the instrument: Take up and release deionized water five times. Eject the pipette tip.
4. Mount a new pipette tip to the same channel.
5. Pre-rinse the pipette tip once. ⇒ Take in testing liquid once, and release again.
6. Place the weighing vessel (filled with some deionized water) on the balance and tare the balance.
7. Take up deionized water from the recipient. ⇒ Press pipetting lever to first stop (not necessary with Transferpette® electronic).
⇒ Immerse pipette tip approx. 2 - 3 mm into the liquid.
⇒ Release pipetting lever of mechanical Transferpette®-8/-12 steadily. In case of Transferpette®-8/-12 electronic press pipetting key to aspirate liquid.
⇒ Leave tip immersed in the deionized water for approx. 1 second.
8. Remove weighing vessel from the balance.
9. Release testing liquid into weighing vessel. ⇒ Lean pipette tip against wall of vessel at an angle about 30° - 45°.
⇒ Press pipetting lever of mechanical pipette at steady speed to its first stop and keep it there. In case of electronic Transferpette®-8/-12 press and hold the pipetting key.
⇒ Press to second stop to empty pipette tip completely. (with Transferpette® electronic this function is performed automatically).
⇒ Wipe off pipette tip against wall of vessel (approx. 8 -10 mm).
⇒ Release pipetting lever of mechanical Transferpette® steadily. Release pipetting lever of electronic Transferpette®.
10. Place weighing vessel on the balance. Read value. ⇒ Enter weighing value into Test Record (5).
11. Re-tare the balance. Eject the pipette tip.
12. Repeat steps 4 to 11 times each separate channel (recommendation: at least three times). ⇒ Enter weighing values into Test Record (5). This will result in a minimum of 24 weighing values (8-channel) resp. 36 values (12-channel).
13. Along the same lines, carry out the above procedure by pipetting 50 % and 10 % resp. 20 % of the nominal volume. ⇒ Only for variable type and electronic instruments!
⇒ Enter weighing values into Test Record (5), resulting in a minimum total of 72 weighing values (8-channel) resp. 108 weighing values (12-channel).

4.2 For mechanical and electronic Transferpette®-8/-12 with nominal volume < 50 µl

Note:

With pipettes of a nominal volume < 50 µl, the error limits are usually smaller than 0.5 µl. Due to this small error limit, the evaporation of water during the test procedure has a relatively large influence on the result. Therefore, the testing of pipettes of this size requires a test procedure which largely prevents evaporation. For this purpose, BRAND has specially developed the following test procedure. The weighing vessels used are a disposable micropipette or a micro-weighing container which virtually eliminate evaporation.

1. Set the nominal volume.
2. Determine temperature of the deionized water for testing. ⇒ Enter temperature into Test Record (4).
3. Mount a new pipette tip to one channel. Condition the instrument:
Take up and release deionized water five times.
Eject the pipette tip. ⇒ Conditioning increases accuracy of the test.
4. Mount a new pipette tip to the same channel. ⇒ Turn pipette tip while mounting it.
5. Pre-rinse the pipette tip once. ⇒ Take in testing liquid once, and release again.
6. Mount a disposable micropipette on the pipette holder. Place it resp. micro-weighing container upon the balance and tare.
7. Take up deionized water from the recipient. ⇒ Press pipetting lever to first stop.
(not necessary with Transferpette®-8/-12 electronic).
⇒ Immerse pipette tip approx. 2 - 3 mm into the liquid.
⇒ Release pipetting lever of mechanical Transferpette®-8/-12 steadily. In case of Transferpette®-8/-12 electronic press pipetting key to aspirate liquid.
⇒ Leave tip immersed in the deionized water for approx. 1 second.
⇒ Wipe off pipette tip against wall of vessel.
8. Remove disposable micropipette resp. micro-weighing container from the balance. ⇒ The pipette holder facilitates handling!
9. Release deionized water into the disposable micropipette resp. micro-weighing container. ⇒ Push the disposable micropipette upon the pipette tip as far as it will go resp. insert pipette tip into the cone of micro-weighing container.
⇒ Press pipetting lever of mechanical pipette at steady speed to its first stop and keep it there. In case of electronic Transferpette® press and hold the pipetting key.
⇒ Press to second stop to empty pipette tip completely (with Transferpette® electronic this function is performed automatically). An air bubble will form inside the disposable micropipette.
⇒ Keep pipetting lever at second stop **while pulling** the disposable micropipette resp. micro-weighing container off the pipette tip.
⇒ Release pipetting lever of mechanical Transferpette®-8/-12 steadily. Release pipetting lever of Transferpette®-8/-12 electronic.
10. Place the disposable micropipette resp. micro-weighing container on the balance. Read value. ⇒ Enter weighing value into Test Record (5).
11. Re-tare the balance with a new disposable micropipette resp. micro-weighing container. Eject the pipette tip.
12. Repeat steps 4 to 11 ten times for each separate channel. (recommendation: at least three times). ⇒ Enter weighing values into Test Record (5). This will result in a minimum of 24 weighing values (8-channel) resp. 36 values (12-channel).
13. Along the same lines, carry out the above procedure by pipetting 50 % and 10 % resp. 20 % of the nominal volume. ⇒ Only for variable type and electronic instruments!
⇒ Enter weighing values into Test Record (5), resulting in a minimum total of 72 weighing values (8-channel) resp. 108 weighing values (12-channel).

5. Evaluation of gravimetric test results

The values obtained by weighing during the gravimetric test are only the mass values of the dispensed volume without correction of air buoyancy. In order to obtain the actual volume, an adjustment calculation to account for water density and air buoyancy must

be carried out. To facilitate your calculations and evaluations, we recommend the use of the Windows-compatible calibration software EASYCAL™ from BRAND.

The following calculations must be carried out:

1. Mean weighing values of a channel:

(Example for ten weighing values)

$$\bar{x} = \frac{x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 + x_8 + x_9 + x_{10}}{10}$$

2. Mean volume of a channel:

$$\bar{V} = \bar{x} \cdot Z$$

⇒ For factor Z, see Table 1.

⇒ Enter value into Test Record (5.)

3. Standard deviation volume of a channel:

$$s = Z \cdot \sqrt{\frac{(x_1 - \bar{x})^2 + (x_2 - \bar{x})^2 + (x_3 - \bar{x})^2 + (x_4 - \bar{x})^2 + \dots + (x_{10} - \bar{x})^2}{9}}$$

⇒ For factor Z, see Table 1.

⇒ Enter value into Test Record

4. Accuracy of a channel:

$$A [\%] = \frac{\bar{V} - V_{\text{nominal value}}}{V_{\text{nominal value}}} \cdot 100$$

⇒ Enter value into Test Record (5.)

5. Coefficient of variation of a channel:

$$CV [\%] = \frac{s \cdot 100}{\bar{V}}$$

⇒ Enter value into Test Record (5.)

Comparison actual/nominal values per channel::

- Use the error limits of Table 2 and 3, or define your individual error limits.

⇒ Enter value into Test Record (5.)

Result:

If calculated values A [%] and CV [%] are smaller than or equal to the error limits of 0.3 %, the instrument is in good working order.

If the calculated values are **larger** than the error limits:

- Verify if the above instructions have been carefully followed step by step.
- Observe the suggestions under "Troubleshooting" in the Operating Manual.
- Calibrate the Transferpette®-8/-12, Transferpette®-8/-12 electronic, Transferpette® S -8/-12 as described in the Operating Manual (recalibration is only possible with recent models).

If these measures are not successful, we offer you the possibility to have your instruments calibrated by the BRAND Calibration Service (see page 13).

Possible volumetric faults and resulting measures:

Fault	Possible causes	Measures
Volume too small	<ul style="list-style-type: none"> ■ Pipette tips not mounted properly. ■ Faulty seals or pistons ■ V-rings resp. O-rings damaged ■ Pipette shaft tips no longer tightly mounted 	<ul style="list-style-type: none"> ⇒ Use a new pipette tips and mount it tightly. ⇒ Clean or replace the seals and/or pistons; see Operating Manual. ⇒ Replace V-rings resp. O-rings ⇒ Re-tighten the pipette shaft tips.
Volume too large	<ul style="list-style-type: none"> ■ Pipetting lever pressed too far. 	<ul style="list-style-type: none"> ⇒ Do not press beyond the first stop!
Other causes	<ul style="list-style-type: none"> ■ Instrument calibrated wrongly ■ Temperature adjustment between instrument, room and water temperature not completed 	<ul style="list-style-type: none"> ⇒ Revert to original calibration. ⇒ Carry out temperature adjustment.

Table 1:

Excerpt from DIN EN ISO 8655, Part 6.
Table refers to 1013 hPa
Validity range from 950 hPa to 1040 hPa.

Temperature °C	Factor Z ml/g	Temperature °C	Factor Z ml/g
15	1.0020	23	1.0035
15.5	1.0020	23.5	1.0036
16	1.0021	24	1.0038
16.5	1.0022	24.5	1.0039
17	1.0023	25	1.0040
17.5	1.0024	25.5	1.0041
18	1.0025	26	1.0043
18.5	1.0026	26.5	1.0044
19	1.0027	27	1.0045
19.5	1.0028	27.5	1.0047
20	1.0029	28	1.0048
20.5	1.0030	28.5	1.0050
21	1.0031	29	1.0051
21.5	1.0032	29.5	1.0052
22	1.0033	30	1.0054
22.5	1.0034		

Table 2:

Excerpt from DIN EN ISO 8655, Part 2.

Nominal volume	µl	1	2	5	10	20	50	100	200	500
A ≤ ±	%	10	8	5	2.4	2.0	2.0	1.6	1.6	1.6
CV ≤	%	10	4	3	1.6	1.0	0.8	0.6	0.6	0.6

Table 3:

Volume error limits for piston operated pipettes:

The stated volume error limits are final test values relative to the nominal capacity. These error limits refer to new instruments under optimized testing conditions (qualified operators and standardized ambience conditions). **Typically these error limits are two times better under ideal testing conditions (experience of the manufacturer).** For partial volumes, the absolute value (µl) corresponding to the nominal volume is applied.

**Values from Operating Manual
Transferpette®-8/-12 (mechanical):**

Nominal volume µl	Accuracy Value 6e ≤ ± %	Coefficient of variation Value 6f ≤ %
10/5/1	1.6/3.2/16	1/2/10
20/10/2	1/2/10	0.6/1.2/6
25/12.5/2.5	1/2/10	0.6/1.2/6
50/25/5	0.8/1.6/8	0.4/0.8/4
100/50/10	0.8/1.6/8	0.3/0.6/3
200/100/20	0.8/1.6/8	0.3/0.6/3
300/150/30	0.6/1.2/6	0.3/0.6/3

**Values from Operating Manual
Transferpette®-8/-12 electronic:**

Nominal volume µl	Accuracy Value 6e ≤ ± %	Coefficient of variation Value 6f ≤ %
10/5/1	1.2/2.0/8.0	0.8/1.5/4.0
20/10/2	1.0/2.0/8.0	0.5/1.0/3.0
100/50/10	0.8/1.6/4.0	0.25/0.4/1.5
200/100/20	0.8/1.4/4.0	0.25/0.4/1.3
300/150/30	0.6/1.2/3.0	0.25/0.4/1.2

**Values from Operating Manual
Transferpette® S-8/-12 (mechanical):**

Nominal volume µl	Accuracy Value 6e ≤ ± %	Coefficient of variation Value 6f ≤ %
10/5/1	1.6/2/8	1.0/2/6
50/25/5	0.8/1.4/6	0.4/0.8/3
100/50/10	0.8/1.4/4	0.3/0.6/2
200/100/20	0.8/1.4/4	0.3/0.6/1.5
300/150/30	0.6/1.2/3	0.3/0.6/1.5

For calibration, the error limits to be observed by the operator must be individually defined by the user. For this purpose, the following methods can be applied:

- If required by the application and if the optimized conditions for measuring are present, the stated error limits can also be expected in the case of used volumetric instruments in good working order.
- In analogy to the German regulations for official testing, it is also admissible to apply the limits which are typical for practice. These practice limits correspond to double the limits for official testing. In this case, the values found in Table 3 should be **doubled**.
- The user may also define his own individual error limits corresponding to his particular application, and apply these error limits for the calibration of his instrument.

The above procedures fulfil the requirements of DIN EN ISO 9001, DIN EN ISO 10012 and DIN EN ISO/IEC 17025

Test Record for Volumetric Instruments (EX)

1. Instrument:

- Transferpette®-8/-12
- Transferpette®-8/-12 electronic
- Transferpette® S-8/-12
- _____

Type:

- 8-channel
- 12-channel
- Other type

Nominal capacity: _____

Serial number: _____

Customers identification: _____

2. Damage:

- None
- Type of damage:
.....
.....
.....
- Damage repaired

3. Functional defects:

- None
- Type of functional defect:
.....
.....
.....
- Functional defect repaired

4. Water temperature:°C

Balance:

Thermometer:

Air pressure:

Relative atmospheric humidity (at least 35%):

Corrective factor Z:

5. Evaluation and results of gravimetric test

Testing volume: Nominal volume:µl

Nominal volume: (mg) A(%) (nominal) CV(%) nominal

Channel No. Weighing No.	1	2	3	4	5	6	7	8	9	10	11	12
X ₁ (mg)												
X ₂ (mg)												
X ₃ (mg)												
X ₄ (mg)												
X ₅ (mg)												
X ₆ (mg)												
X ₇ (mg)												
X ₈ (mg)												
X ₉ (mg)												
X ₁₀ (mg)												
X mean (mg)												
V mean (µl)												
A(%) found												
CV(%) found												
C(%) nom.												
CV(%) nom.												
Result A												
Result CV												

Testing volume: 50 %:µl

Nominal volume: (mg) A(%) (nominal) CV(%) nominal

Channel No. Weighing No.	1	2	3	4	5	6	7	8	9	10	11	12
X ₁ (mg)												
X ₂ (mg)												
X ₃ (mg)												
X ₄ (mg)												
X ₅ (mg)												
X ₆ (mg)												
X ₇ (mg)												
X ₈ (mg)												
X ₉ (mg)												
X ₁₀ (mg)												
X mean (mg)												
V mean (µl)												
A(%) Ist												
CV(%) Ist												
A(%) Soll												
CV(%) Soll												
Result A												
Result CV												

Testing volume: 10 %:µl

Nominal volume:	(mg)	A(%)				(nominal)				CV(%)		nominal	
Channel No. Weighing No.	1	2	3	4	5	6	7	8	9	10	11	12	
X ₁ (mg)													
X ₂ (mg)													
X ₃ (mg)													
X ₄ (mg)													
X ₅ (mg)													
X ₆ (mg)													
X ₇ (mg)													
X ₈ (mg)													
X ₉ (mg)													
X ₁₀ (mg)													
X mean (mg)													
V mean (µl)													
A(%) Ist													
CV(%) Ist													
A(%) Soll													
CV(%) Soll													
Result A													
Result CV													

The testing was carried out according to DIN EN ISO 8655.

_____ **Date**

_____ **Signature**

