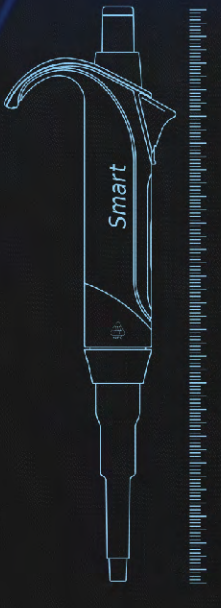
Smart

GEN-NEXT PIPETTE

USER GUIDE



INTRODUCTION

Congratulation on making a SMART choice. You are now the proud owner of a KERN SMART pipette.

This user guide lists details on how you can take care of your SMART pipette and benefit the most from its advance features as follows:

- SMART is one of the most lightweight pipette with durable working.
- Designed to dispense accurate volume of liquid with long term precision.
- Ergonomically designed for ease in operation and user safety.
- Color coded for easy identification.

CHECK LIST

Your KERN SMART pack would carry…..

- SMART Pipette
- Sample pack of tips
- Recalibration / Ellen Key
- Silicone Grease
- Shelf Mounting Stand
- User Guide
- Warranty Card
- Certificate of Conformity including Calibration Certificate

PRODUCT DESCRIPTION

SMART pipettes operate on air displacement principle and uses disposable tips.

Variable Volume pipette

CAT No.	Volume Range [µl]	Increments [µl]
SVA-125	0.1-2.5	0.002
SVA-100	0.5-10	0.02
SVA-200	5-50	0.1
SVA-500	10-100	0.1
SVA-600	100-1000	1
SVA-700	2-20	0.02
SVA-800	20-200	0.2
SVA-905	500-5000	10
SVA-1000	1000-10000	20

Fix Volume pipette

CAT No.	Volume [µl]
SFA-205	2.5
SFA-5	5
SFA-10	10
SFA-20	20
SFA-25	25
SFA-50	50
SFA-100	100
SFA-200	200
SFA-250	250
SFA-500	500
SFA-1000	1000
SFA-2000	2000
SFA-5000	5000
SFA-10000	10000

Multichannel pipette

8-channels

CAT No.	Volume Range [µl]	Increments [µl]
SMA8-010	0.5 - 10 µl	0.02
SMA8-020	2- 20 µl	0.02
SMA8-050	5- 50 µl	0.1
SMA8-100	10 - 100 µl	0.1
SMA8-200	20 - 200 µl	0.2
SMA8-300	30 - 300 µl	0.2

12 channels

CAT No.	Volume Range [µl]	Increments [µl]
SMA12-010	0.5 - 10 µl	0.02
SMA8-020	2- 20 µl	0.02
SMA12-050	5 - 50 µl	0.1
SMA12-100	10 - 100 µl	0.1
SMA12-200	20 - 200 µl	0.2
SMA12-300	30 - 300 µl	0.2

Digital Display

In SMART pipette, delivery volume is evidently indicated in the large digital display on the handle.

In variable volume pipette, the last wheel of the counter has a scale that assists to set precise delivery volume.

In some of the variable volume pipettes the last one or two counter wheels will be in grey color which indicates the value after decimal.

A pointer is used to set exact or intermediate volumes with the help of scale on last wheel.

Raw Material

The SMART pipette is made of mechanically robust and chemically resistant materials, making it a durable and stable pipette giving consisting performance for long time.

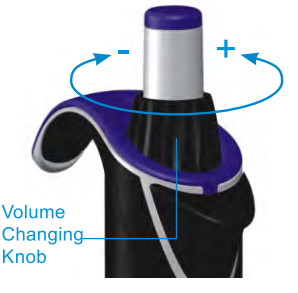
Parts Description

PIPETTE OPERATION

Setting the Volume

With the SMART pipette, the delivery volume of liquid is set using the digital counter. A pointer is used to set exact or intermediate volume using the scale on the last wheel of digital counter. In some of the variable volume pipettes, counter wheels are in black & grey color. Grey wheel indicates value after the decimal.

You can set the delivery volume using the volume changing knob on the upper side of pipette after unlocking the counter by pushing up the counter lock. To decrease the delivery volume, turn it clockwise and to increase, turn it anti-clockwise. Do make sure that the desired delivery volume is set in-line with pointer. Pull down the lock to ensure that volume doesn't accidently change during pipetting.



1) Counter lock mechanism is to ensure volume changing knob remains in its position while aspirating or dispensing liquids. Any forced efforts to rotate the volume changing knob while counter lock mechanism is in lock position will either make it in unlock position or may damage the locking mechanism.

2) Setting the volume beyond the specified volume range is not advisable. Using excessive force to turn the volume-changing knob outside the specified range, may jam the mechanism and eventually damage the pipette.

Loading and Ejection of Tips

Each SMART pipette is fitted with a tip ejector which helps eliminate safety hazards associated with contamination.

It is necessary to check that the tip cone is clean before fitting a tips. Press the tip on the cone of the pipette firmly to ensure an airtight seal. The seal is set tight when a visible seating ring forms between the tip and the tip cone.

The tip ejector needs to be pressed downwards firmly with the thumb to ensure proper tip ejection. Once the process is complete, make sure that the tips are disposed of into a suitable waste container.

PIPETTING GUIDELINES

- While using the pipette make sure that operating knob has been handled slowly and smoothly.
- Ensure that the tips is firmly attached on the tip cone. Please check for foreign particles and remove if any, around the tip cones.
- Make sure that the temperature of tip, pipette and liquid are at equilibrium.
- While holding the pipette, its main handle should be resting on your index finger.
- While aspirating, hold the pipette in upright position and keep the tips at a constant depth below the surface of the liquid.
- You should pre-rinse the tips before aspirating the liquid by filling and emptying the tip 5 times. This is important especially when dispensing liquids, which have a viscosity and density different from water.
- For the volatile solvents you should saturate the air-cushion of your pipette by aspirating and dispensing the solvent repeatedly before aspirating the sample.
- When pipetting liquids with temperature different to the ambient temperature, pre-rinse tips tip several times before use.
- After pipetting acids or other corrosive liquids that emit vapors, remove the tip-cone and rinse the piston, O-ring and seal with distilled water.
- Do not pipette liquids having temperatures above 70^0 C or below 4^0 C.

Make sure that liquids never enter the tip-cone. To prevent this:

- Never lay the pipette on its side when there is liquid in the tip.
- Press and release the push knob slowly and smoothly.
- Never turn the pipette upside down

PIPETTING TECHNIQUES

Forward Pipetting

1. Press the operating knob to the first stop.

2. Dip the tip under the surface of the liquid in the reservoir to a depth of about 1cm and slowly release the operating knob. Withdraw the tip from the liquid touching it against the edge of the reservoir to remove excess liquid.

3. Dispense the liquid by gently pressing the operating knob to the first stop. After a delay of about one second, continue to press the operating knob all the way to the second stop. This action will empty the tip.

4. Release the operating button to the ready position. Change the tip and continue pipetting.

Reverse Pipetting

The reverse technique is suitable for dispensing liquids that have a high viscosity or a tendency to foam easily. The technique is also recommended for dispensing very small volumes.

1. Press the operating knob all the way to the second stop.

2. Dip the tip under the surface of the liquid in the reservoir to a depth of about 1cm and slowly release the operating knob. This action will fill the tip. Withdraw the tip from the liquid touching it against the edge of the reservoir to remove excess liquid.

3. Deliver the preset volume by gently pressing the operating knob to the first stop. Hold the operating knob at the first stop. Some liquid will remain in the tip and it should not be dispensed.

4. The remaining liquid should either be discarded with the tip or should be dispensed back into the reagent reservoir.

CALIBRATION AND ADJUSTMENT

ALL SMART pipette are been quality tested according to ISO8655/DIN 12650. The quality control according to ISO8655/DIN 12650 involves gravimetric testing of each pipette with distilled water (quality 3, DIN ISO3696) at 25° C+-1 ° C.

ALL SMART pipettes are been calibrated I ISO/IEC 17025 accredited laboratory. Each Pipette is calibrated, inspected and validated by qualified technicians according to defined quality system.

SMART pipettes are constructed to permit re-adjustment for other pipetting techniques or liquids of different temperature and viscosity.

Devise requirements and test conditions

An analytical balance must be used. The balance selection depends upon selected model of the pipette and sensitivity of balance reading.

Test liquid: Water, distilled or deionized, grade 3 water conforming ISO3696

Calibration should be carried out in a draft-free room at a constant (+/-0.5°C) temperature of water, pipette and air between 15°C to 30°C. The relative humidity must be above 50% especially with volumes under 50 µl, the air humidly should be as high as possible to reduce the effect of evaporation loss.

Special accessories for analytical balance, such as the evaporation trap are recommended for the calibration of volumes under 50 µl.

Procedure to check calibration

The pipette is checked at maximum volume, at 50 % of maximum volume and at minimum or 10% of maximum volume, whichever is higher.

- A new tip is first pre-wetted 3-5 times and a series of ten pipetting is done at each volume.
- Use of forward pipetting technique is recommended. Calculate the inaccuracy and imprecision for all three volumes as per EN ISO 8655 /DIN 12650 standards on the basis of the following calculation

Conversion of weight readings to volume

Mean Value $\bar{V} = \bar{X} \cdot Z$

Mean Value $\bar{X} = \frac{\sum Xi}{n}$

Xi = Balance Reading
n = number of reading
Z = Conversion factor
[example Z=1.0040 µl/mg at 25°c and 1013 hPa]

Calculation for in-accuracy (Systematic Error)

$$A\% = \frac{\bar{V} - Vo}{Vo} \cdot 100$$

$\bar{V}$ = Mean Value
Vo = Particular volume at which readings are taken

Calculation for Impression (Random Error)

$$S = \sqrt{\frac{\sum_{i=1}^{n} (Vi - \bar{V})^2}{n - 1}}$$

S = Standard Deviation
$\bar{V}$ = Mean Value
n = number of readings

$$CV\% = \frac{100 \cdot S}{\bar{V}}$$

• Compare the results to the limits in the subsequent tables

Variable Volume Pipette

CAT No.	Color code	Volume Range [µl]	Incre-ments [µl]	Test Volume [µl]	Inac-curacy (±) %	Impreci-sion (±) %
SVA-125		0.1-2.5 µl	0.002	0.25	12	6
				1.25	3	3
				2.5	2.5	1.6
SAV-100		0.5-10 µl	0.02	1	2.5	1.8
				5	2	1
				10	1	0.6
SAV-200		5-50 µl	0.1	5	2	2
				25	0.8	0.4
				50	0.6	0.3
SAV-500		10-100 µl	0.1	10	3	1
				50	1	0.5
				100	0.8	0.2
SAV-600		100-1000 µl	0.1	100	3	0.6
				500	1	0.4
				1000	0.6	0.2
SAV-700		2-20 µl	0.02	2	3	2
				10	1.5	1
				20	0.9	0.4
SAV-800		20-200 µl	0.2	20	2.5	0.7
				100	0.7	0.3
				200	0.6	0.2
SAV-905		500-5000 µl	10	500	2.4	0.6
				2500	1.2	0.25
				5000	0.6	0.2
SAV-1000		1000-10000 µl	20	1000	3	0.6
				5000	0.8	0.3
				10000	0.6	0.2

Fix Volume Pipette

CAT No.	Color code	Volume Range [µl]	Test Volume [µl]	Inaccuracy (±) %	Imprecision (±) %
SFA-2.5		2.5 µl	2.5	2	1.6
SFA-0005		5 µl	5	1.3	1.2
SFA-0010		10 µl	10	1.2	0.8
SFA-0020		20 µl	20	1	0.5
SFA-0025		25 µl	25	1	0.3
SFA-0050		50 µl	50	0.7	0.3
SFA-0100		100 µl	100	0.6	0.2
SFA-0200		200 µl	200	0.6	0.2
SFA-0250		250 µl	250	0.6	0.2
SFA-0500		500 µl	500	0.6	0.2
SFA-1000		1000 µl	1000	0.6	0.2
SFA-2000		2000 µl	2000	0.3	0.15
SFA-5000		5000 µl	5000	0.3	0.15
SFA-10000		10000 µl	10000	0.6	0.2

Multi Channel Pipette

8 Channels & 12 Channels

CAT No.	Color code	Volume Range [µl]	Increments [µl]	Test Volume [µl]	Inaccuracy (±) %	Imprecision (±) %
SMA8-010 SMA12-010		0.5-10 µl	0.02	1	8	5
				5	4	2
				10	2	1
SMA8-020 SMA12-020		2-20 µl	0.02	2	7	3
				10	3	2
				20	2	1.6
SMA8-050 SMA12-050		5-50 µl	0.1	5	3	2
				25	1.5	1
				50	1	0.7
SMA8-100 SMA12-100		10 – 100 µl	0.1	10	3	2
				50	1	0.8
				100	0.8	0.3

SMA8-200 SMA12-200		20-200µl	0.2	20	5	1.4
				100	1	0.4
				200	0.7	0.25
SMA8-300 SMA12-300		30-300 µl	0.2	30	3	1
				150	1	0.5
				300	0.6	0.3

Calibration Adjustment

1. Calibration adjustment is done with the Recalibration (Ellen) key.

2. Remove the calibration guard and place the Recalibration (Ellen) key into the opening of the calibration screw on the side of the handle.

3. Turn the key clockwise to increase or counterclockwise to decrease the volume.

4. After adjustment, check the calibration according to the instructions above.

5. Once within permissible error range, place calibration guard in its position to avoid accidental changes in calibration.

⚠ *Depending upon use, we recommend checking of calibration every six months. However this can be adjusted to individual requirements.*

MAINTENANCE

When the SMART pipette is not in use, please make sure that it is stored in an upright position. KERN recommends the SMART stand for this purpose.

You should check the pipette at the beginning of each day for accumulation of dust and dirt on the outside surfaces. Attention should be paid to the tip cone. No other solevent except Iso-propanol should be used to clean the pipette. If the pipette isi used daily, It should be inspected every three months.

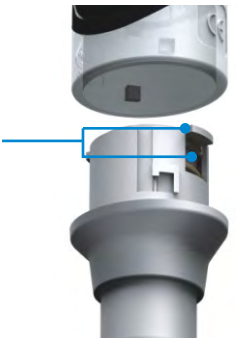
The servicing procedure starts with the disassembly of the pipette. Please refer to the spare parts lists for better understanding of the components. Shown here is an example of dis-assembly and assembly procedure of 100-1000 µl pipette, the basic procedure is to be followed for all other volume pipettes.

1. For opening press the tip ejector closer upwards
2. Rotate the tip ejector closer in the direction indicated until the snap
3. Turn out the tip ejector, slowly

- Pull out the piston and other parts by unscrewing the tip cone. Push out with piston the rest of the piston assembly including the Seal and O-Ring. Remember to keep all parts in order for reassembly.
- Clean the piston, the piston spring, Seal and the O-ring with a isopropanol and line free tissue. Allow them to dry.
- Check the tip cone for foreign particles and remove, if any. Grease the cleaned parts with the approved lubricant provided with each pipette.

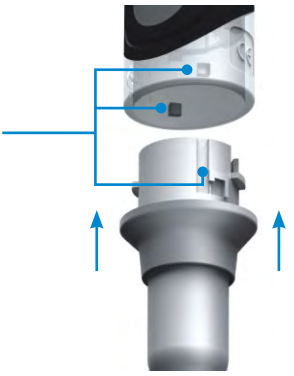
1

Align the notch on the tip ejector with the slots on tip ejector closure as indicated



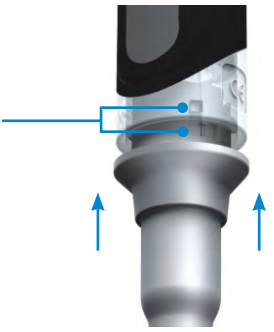
2

Ensure the notch on the main handle matches the slots on the tip ejector closure. Push the tip ejector closure upwards as indicated.



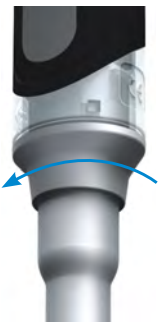
3

Insert both parts in the aligned manner as indicated.



4

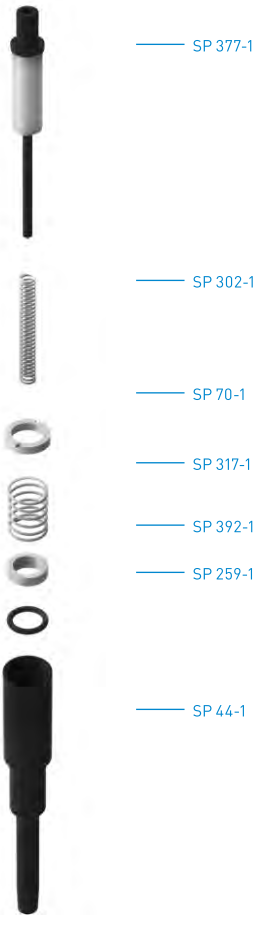
Once completely closed, twist the tip ejector closure in the indicated direction to close.



For correct re-assembly, it is crucial that the slots on the tip ejector closer match the notches on the inside of the main handle. Please follow the above procedure.

List of Spare Parts

Variable Volume	100-100µl
Fix Volume	250µl 500µl 1000µl



Variable Volume 0.1-2.5µl

Fix Volume 0.5µl
2.5µl

Variable Volume 0.5-10µl

Fix Volume 10µl

Variable Volume 2-20µl

Fix Volume 20µl

Variable Volume 5-50µl

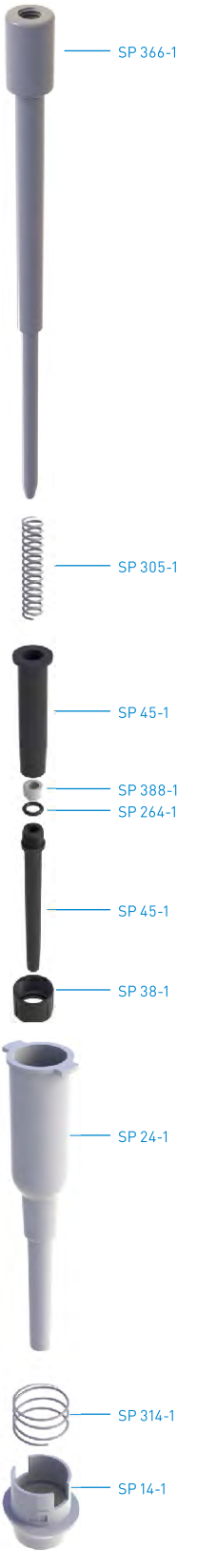
Fix Volume 25µl
50µl

Variable Volume 10-100µl

Fix Volume 100µl

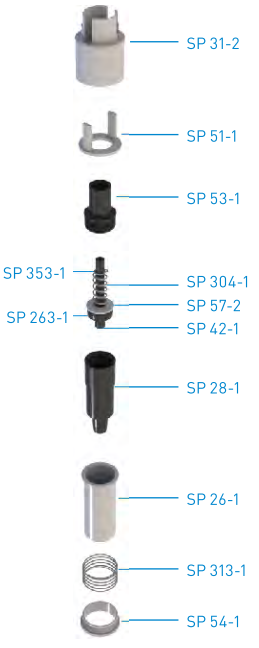
Variable Volume 20-200µl

Fix Volume 200µl



Variable Volume 1-5ml

Fix Volume 2ml
5ml



Variable Volume 1-10ml

Fix Volume 10ml

AUTOCLAVING

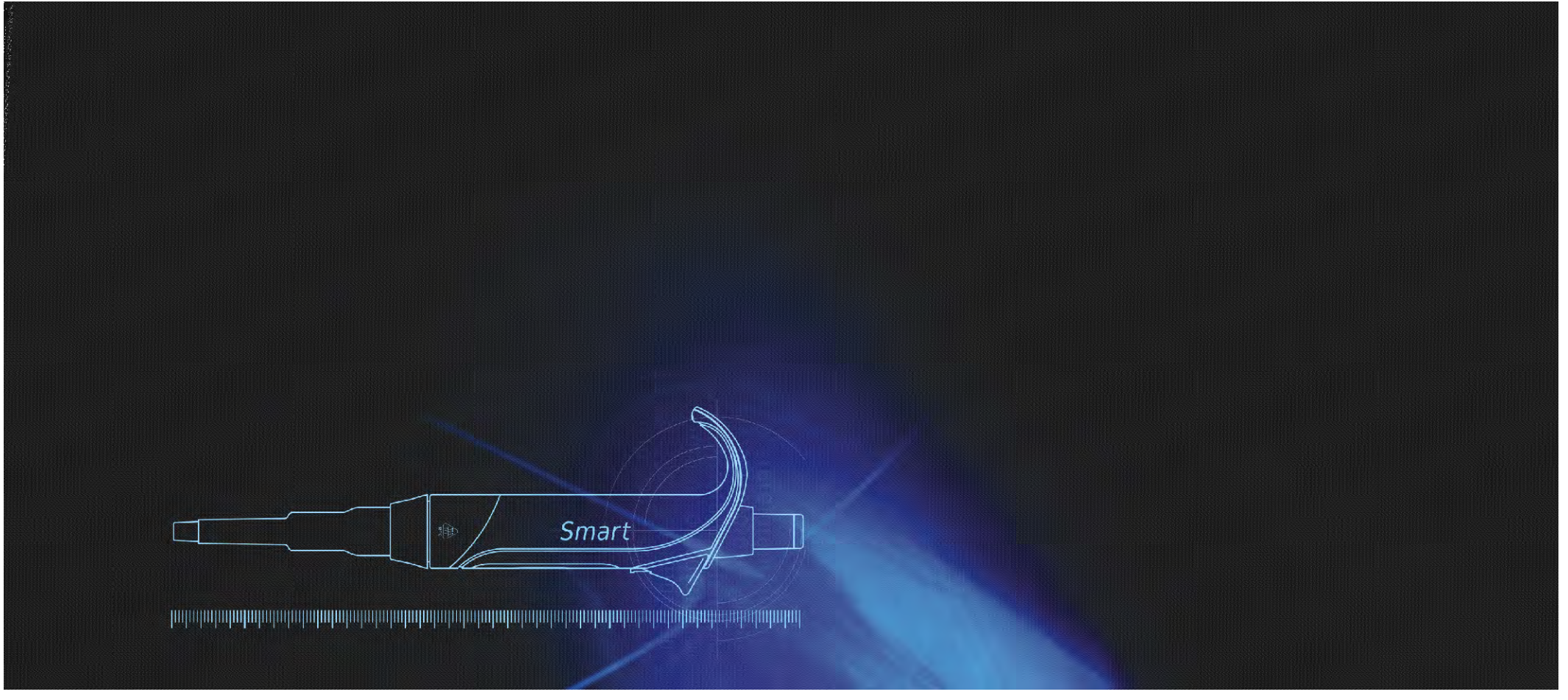
KERN SMART pipette is completely autoclavable at 2 bar pressure 121^{0}c temperature for 20 minutes exposure time according to DIN

- Keep digital counter in unlock position.
- Autoclave the complete pipette without any disassembling.
- After autoclaving, allow pipette to completely cool and dry.

If the pipette is autoclaved frequently, the piston and springs should be greased with the lubricant supplied with each pipette to maintain smooth movement.

TROUBLE SHOOTING GUIDE

Problem area	Possible Cause	Solution
Pipette is leaking	Worn O-ring or seal	Replace worn parts
	Foreign particles between tip and tip cone	Clean tip cone, attach new tip
	Foreign particles between piston and seal	Clean seal and piston
Pipette is won't aspirate	Worn O-ring or seal	Replace worn parts
	Tip cone is loose	Tighten tip cone
	Piston is damaged (Chemically or Mechanically)	Return pipette to Authorised Distributor
	Damaged tip cone	Replace the tip cone
Pipette is inaccurate	Improper assembly	See "Maintenance" section
	Tip cone is loose	Tighten tip cone
	Tip incorrectly attached	Attach firmly
	Calibration altered	Recalibrate according to instructions
Inaccurate dispensing with certain liquids	Calibration not suitable for particular liquid	Recalibrate with the liquid in question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