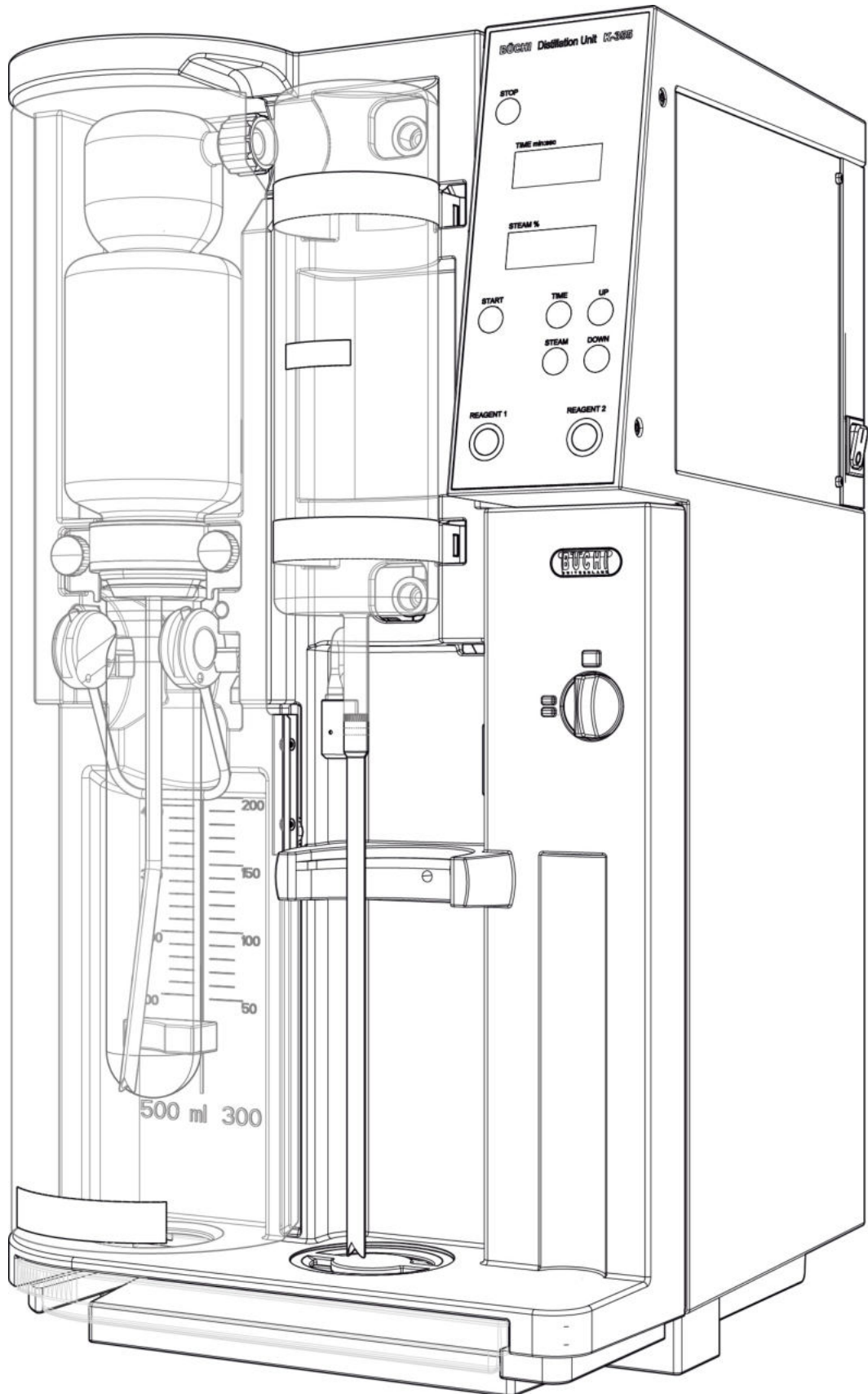




# Distillation Unit K-355

## Operation Manual



## **Imprint**

Product Identification:  
Operation Manual (Original), Distillation Unit K-355

093036H en

Publication date: 04.2016

BÜCHI Labortechnik AG  
Meierseggstrasse 40  
Postfach  
CH-9230 Flawil 1

E-Mail: [quality@buchi.com](mailto:quality@buchi.com)

BUCHI reserves the right to make changes to the manual as deemed necessary in the light of experience; especially in respect to structure, illustrations and technical detail.

This manual is copyright. Information from it may not be reproduced, distributed, or used for competitive purposes, nor made available to third parties. The manufacture of any component with the aid of this manual without prior written agreement is also prohibited.



# ***LAB Online Exhibition***



**Operation Manual**



**knowledge**



**Action movie**

## Table of contents

<b>1</b>	<b>About this manual . . . . .</b>	<b>5</b>
1.1	Abbreviations . . . . .	5
<b>2</b>	<b>Safety. . . . .</b>	<b>6</b>
2.1	User qualification . . . . .	6
2.2	Proper use . . . . .	6
2.3	Improper use . . . . .	6
2.4	Warning notices used in this manual . . . . .	7
2.5	Product safety. . . . .	7
2.5.1	Instrument-related hazards . . . . .	7
2.5.2	Other hazards . . . . .	8
2.5.3	Safety measures . . . . .	8
2.5.4	Safety elements . . . . .	8
2.6	General safety rules . . . . .	9
<b>3</b>	<b>Technical data . . . . .</b>	<b>10</b>
3.1	Scope of delivery . . . . .	10
3.1.1	Standard instrument. . . . .	10
3.1.2	Standard accessories . . . . .	11
3.1.3	Optional accessories . . . . .	12
3.2	Technical data. . . . .	15
3.3	Materials used. . . . .	15
<b>4</b>	<b>Description of function . . . . .</b>	<b>16</b>
4.1	Instrument overview . . . . .	16
4.2	Function principle . . . . .	17
4.3	Controls of the instrument . . . . .	18
<b>5</b>	<b>Putting into operation. . . . .</b>	<b>19</b>
5.1	Installation site. . . . .	19
5.2	Electrical connections . . . . .	19
5.3	Reagent and water connections. . . . .	20
5.3.1	Cooling water connection . . . . .	20
5.3.2	Drainage of cooling water . . . . .	20
5.3.3	Storage tank connection . . . . .	21

Read this manual carefully before installing and running your system and note the safety precautions in chapter 2 in particular. Store the manual in the immediate vicinity of the instrument, so that it can be consulted at any time.

No technical modifications may be made to the instrument without the prior written agreement of Buchi. Unauthorized modifications may affect the system safety or result in accidents.

This manual is copyright. Information from it may not be reproduced, distributed, or used for competitive purposes, nor made available to third parties. The manufacture of any component with the aid of this manual without prior written agreement is also prohibited.

**If you need another language version of this manual, you can download it at [www.buchi.com](http://www.buchi.com).**

<b>6</b>	<b>Operation</b>	<b>22</b>
6.1	Addition of chemicals	22
6.1.1	Manual dosage	22
6.1.2	Automatic dosage	22
6.1.3	General information	22
6.2	Setting the distillation time	23
6.3	Setting the steam power	23
6.4	Program storage	23
6.4.1	Storing a program	23
6.4.2	Selecting a stored program	23
6.5	Steam generator status	24
6.5.1	Heating	24
6.5.2	Standby mode (after 30 minutes)	24
6.6	Switching ON/OFF checklist	24
6.7	Carrying out a distillation	24
<b>7</b>	<b>Maintenance</b>	<b>26</b>
7.1	Daily maintenance	26
7.1.1	Cleaning the instrument from inside	26
7.1.2	Cleaning the housing	26
7.1.3	Cleaning the glass parts	26
7.1.4	Preparing the instrument for a standstill overnight	27
7.2	Weekly maintenance	27
7.2.1	Cleaning the splash protector and the rubber bung seal	27
7.3	Monthly maintenance	27
7.3.1	Checking the distillate amount	27
7.4	Half-yearly maintenance	28
7.4.1	Replacing the NaOH tube	28
7.5	Yearly maintenance	28
7.5.1	Replacing the rubber bung seal	28
7.5.2	Replacing the NaOH pump	28
7.6	Customer service	28
<b>8</b>	<b>Troubleshooting</b>	<b>29</b>
8.1	Malfunctions and their remedy	29
<b>9</b>	<b>Shutdown, storage, transport and disposal</b>	<b>30</b>
9.1	Preparing the instrument for transport	30
9.2	Storage and transport	30
9.3	Disposal	30
<b>10</b>	<b>Spare parts</b>	<b>31</b>
10.1	Spare parts K-355	31
10.2	Hosing connection scheme	32
<b>11</b>	<b>Declarations and requirements</b>	<b>34</b>
11.1	FCC requirements (for USA and Canada)	34

# 1 About this manual

This manual describes the Distillation Unit K-355 and provides all information required for its safe operation and to maintain it in good working order. It is addressed to laboratory personnel in particular.

**NOTE**

*The symbols pertaining to safety (WARNINGS and ATTENTIONS) are explained in chapter 2.*

## 1.1 Abbreviations

*EPDM*: Ethylene Propylene Dimonomer

*FEP*: Fluorinated Ethylene Propylene

*FPM*: Fluoroelastomer

*PP*: Polypropylene

*PTFE*: Polytetrafluoroethylene

*RSD*: Relative Standard Deviation

## 2 Safety

This chapter points out the safety concept of the instrument and contains general rules of behavior and warnings from hazards concerning the use of the product.

The safety of users and personnel can only be ensured if these safety instructions and the safety-related warnings in the individual chapters are strictly observed and followed. Therefore, the manual must always be available to all persons performing the tasks described herein.

### 2.1 User qualification

The instrument may only be used by laboratory personnel and other persons who on account of training or professional experience have an overview of the dangers which can develop when operating the instrument.

Personnel without this training or persons who are currently being trained require careful instruction. The present Operation Manual serves as the basis for this.

### 2.2 Proper use

The instrument has been designed and built for laboratories. It serves for the distillation of steam-volatile substances.

### 2.3 Improper use

Applications not mentioned above are improper. Also, applications which do not comply with the technical data are considered improper.

The operator bears the sole risk for any damages caused by such improper use.

The following uses are expressly forbidden:

- Use of the instrument in rooms which require ex-protected instruments.
- Use on samples, which can explode or inflame (e.g. explosives, etc.) due to shock, friction, heat or spark formation.

## 2.4 Warning notices used in this manual



### **WARNING**

Generally, the triangular warning symbol indicates the possibility of personal injury or even loss of life if the instructions are not followed.



### **WARNING**

Hot surface.



### **WARNING**

Electrical hazard.



### **WARNING**

Caustic substances.



### **ATTENTION**

With the general „Read this” symbol, ATTENTIONs indicate the possibility of equipment damage, malfunctions or incorrect process results, if instructions are not followed.

### **NOTE**

Useful tips for the easy operation of the instrument.

## 2.5 Product safety

The instrument is designed and built in accordance with state-of-the-art technology. Nevertheless, risks to users, property, and the environment can arise when the instrument is used carelessly or improperly.

The manufacturer has determined residual dangers emanating from the instrument

- if the instrument is operated by insufficiently trained personnel.
- if the instrument is not operated according to its proper use.

Appropriate warnings in this manual serve to make the user alert to these residual dangers.

### 2.5.1 Instrument-related hazards

Pay attention to the following safety notices:



### **WARNING**

Potential implosion risk if used with damaged glassware.

- Beware of damaged or cracked glass parts.



### **WARNING**

Potentially hot surfaces during operation (surface temperatures at times exceed 60 °C) and hot steam passing off the waste outlet.

- Always be aware of the risk of being burned.



### **WARNING**

Potentially lethal voltage inside the instrument.

- Do not remove covers and other parts protecting from electricity.
- Always keep the areas of electric parts, such as power supply plug, mains switch, etc. dry.

### 2.5.2 Other hazards



#### **WARNING**

*Certain solvents in or in the vicinity of the instrument can form peroxides and/or are highly inflammable.*

- *Always be aware of the explosion risk when working with hazardous substances or with substances of unknown composition.*
- *Always provide a good ventilation within or in the vicinity of the system.*

### 2.5.3 Safety measures



#### **WARNING**

*Sodium hydroxide, acids and lye are used for applications according to Kjeldahl. For this reason, protective goggles must be worn at all times when using the instrument or working in its immediate proximity.*



### 2.5.4 Safety elements

The instrument is provided with the following safety elements:

- Protective door: Safety appliance to protect users from burns at the splash protector (distillation area), which is hot during distillation.
- Protective door sensor: Prevents the start of a distillation with the protective door open and stops a running distillation and the dosing of reagents immediately when the protective door is opened during the process.
- Sample tube sensor: Prevents the start of a distillation without a sample tube inserted.
- Protective shield (cover) at condenser: Protection of glass parts.
- Service door sensor/switch: Electrical power is disconnected immediately when the service door is opened, thus preventing electrical shock during maintenance.

## 2.6 General safety rules

### Responsibility of the operator

The head of laboratory is responsible for training his personnel.

The operator shall inform the manufacturer without delay of any safety-related incidents which might occur during operation of the instrument. Legal regulations, such as local, state and federal laws applying to the instrument must be strictly followed.

### Duty of maintenance and care

The operator is responsible for ensuring that the instrument is operated in proper condition only, and that maintenance, service, and repair jobs are performed with care and on schedule, and by authorized personnel only.

### Spare parts to be used

Use only genuine consumables and genuine spare parts for maintenance to assure good system performance and reliability. Any modifications to the spare parts used are only allowed with the prior written permission of the manufacturer.

### Modifications

Modifications to the instrument are only permitted after prior consultation with and with the written approval of the manufacturer. Modifications and upgrades shall only be carried out by an authorized Buchi technical engineer. The manufacturer will decline any claim resulting from unauthorized modifications.

## 3 Technical data

This chapter introduces the reader to the instrument specifications. It contains the scope of delivery, technical data, requirements and performance data.

### 3.1 Scope of delivery

Check the scope of delivery according to the order number.

**NOTE**

For detailed information on the listed products see [www.buchi.com](http://www.buchi.com) or contact your local dealer.

#### 3.1.1 Standard instrument



**Table 3-1: Standard instrument**

Product	Order number
Distillation Unit K-355 Standard with glass splash protector, 230 V, 50/60 Hz	43505
Distillation Unit K-355 with splash protector made of fiber glass reinforced polypropylene, 230 V, 50/60 Hz	43419
Distillation Unit K-355 Standard with glass splash protector and SO <sub>2</sub> determination kit	43070

## 3.1.2 Standard accessories

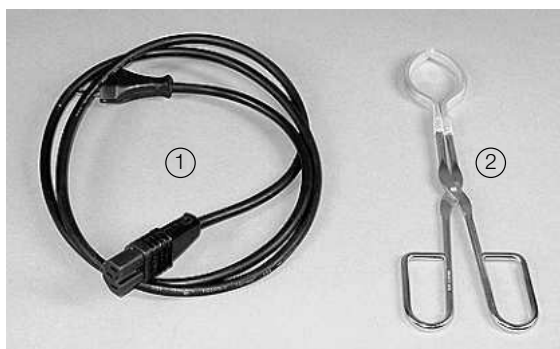
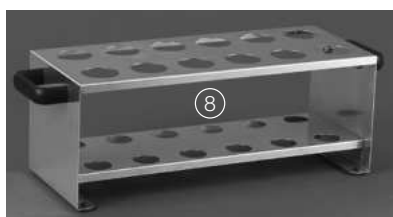
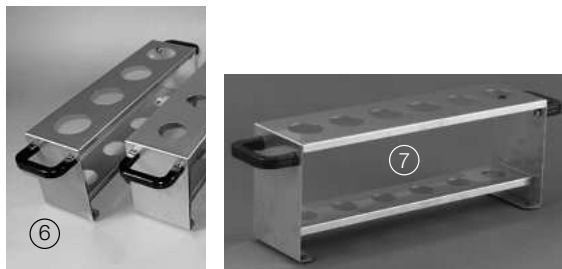
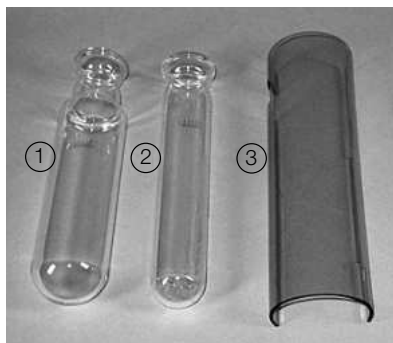


Table 3-2: Standard accessories

Product	Order number
① 1 mains cable of the following types	
Type CH	10010
Type Schuko	10016
Type GB	17835
Type AUS	17836
Type USA	33763
Type Japan	10016
② 1 pair of glass tongs	02004
③ 1 hose cooling water drain, silicone, L = 1.8 m, Ø 10/14 mm	43439
④ 1 hose chemical supply, solaflex, L = 3.5, Ø 10/5 mm	43555
⑤ 1 hose tygon, L = 530 mm	43029
⑥ 3 suction tubes to tanks, FEP, L = 580 mm	43407
⑦ 1 hose connector PP	43565
⑧ 1 Y hose coupling	11043
⑨ 2 clamps Ø 7.6	43571
⑨ 6 clamps Ø 11.9	43841
⑩ 1 hose viton (acid resistant) L = 2 m	20344
⑪ 1 cooling water hose complete: G ¾", ½", L = 1.5 m	37780
⑫ 3 tanks 10 l, without caps	43410
⑬ 1 cap for 10 l tanks, large	25869
⑭ 3 tank labels	43434
⑮ 1 cap for 10 l and 20 l tanks, small	43477

### 3.1.3 Optional accessories


**Table 3-3: Optional accessories K-355**

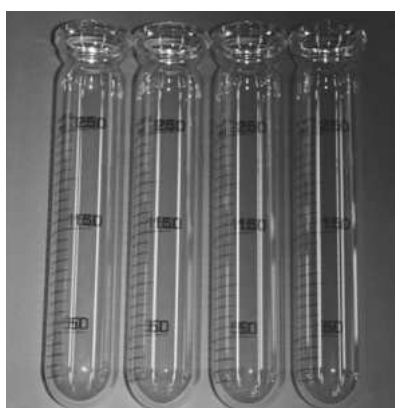
Product	Order number
① 1 sample tube 500 ml	26128
4 sample tubes 500 ml	43982
② 4 sample tubes 300 ml	37377
③ Condenser cover, complete	43484
④ 20 l tank for chemicals	43469
⑤ 10 l tank for chemicals	43468
⑥ Holder for 4 sample tubes, 500 ml	16951
⑦ Holder for 6 sample tubes, 300 ml	43039
⑧ Holder for 12 sample tubes, 300 ml	43041

**Table 3-3: Optional accessories K-355 (cont.)**

Product	Order number
Splash protector for Devarda method K-350/K-355/K-360/K-370	43335



Constricted distillate outlet tube $\varnothing$ 5 mm	43096
---	-------



Sample tubes graduated, 300 ml, set of 4	43049
--	-------

**Table 3-3: Optional accessories K-355 (cont.)**

Product	Order number
Universal adapter for K-350, K-355, K-360, K-370	43115

SO <sub>2</sub> accessory	48680
---------------------------	-------

## 3.2 Technical data

**Table 3-4: Technical data K-355**

Table 3-4: Technical data K-355	
	Distillation Unit K-355
Power consumption	max. 2.2 kW
Connection voltage	230 V $\pm$ 10% / 200 V $\pm$ 10%
Frequency	50/60 Hz
Current consumption (230 V)	8.5 A
Mains connection	3-pole (P, N, E) via power cord
Recovery rate	$\geq$ 99.5%
Reproducibility (RSD)	$\leq$ 1%
Detection limit	$\geq$ 0.1 mg Nitrogen
Environmental conditions	for indoor use only
Temperature	5 - 35 °C
Altitude	up to 2000 m
Humidity	maximum relative humidity 80% for temperatures up to 31 °C decreasing linearly to 67% relative humidity at 35 °C
Installation category	II
Pollution degree	2
Dimensions (W x H x D)	400 x 660 x 360 mm
Weight	17 kg

## 3.3 Materials used

**Table 3-5: Materials used for the K-355**

Component	Material designation	Material code
Housing	Polyurethane	PUR / UL V0
Glass parts	Borosilicate glass 3.3	DIN/ISO 3585
Steam generator isolation	Ceramic fiber	Multitherm 550
Steam generator housing	Stainless steel	1.4301
Protective door	Polymethyl methacrylate	PMMA
Condenser cover	Polymethyl methacrylate	PMMA
Connecting stopper	Hypalon	CSM
NaOH tube	Ethylene Propylene Dimonomer	EPDM

## 4 Description of function

This chapter explains the basic principle of the instrument, shows how it is structured and gives a functional description of the assemblies.

### 4.1 Instrument overview



- ① Splash protector
- ② Sample tube
- ③ Protective door

- ④ Condenser
- ⑤ Operating panel
- ⑥ Service door

Fig. 4.1: Instrument overview

## 4.2 Function principle

The Distillation Unit K-355 is suitable for determining nitrogen using the Kjeldahl (TKN; Total Kjeldahl Nitrogen) and Devarda methods as well as for other distillations of steam-volatile substances (e.g. of alcohol, SO<sub>2</sub>, volatile acids).

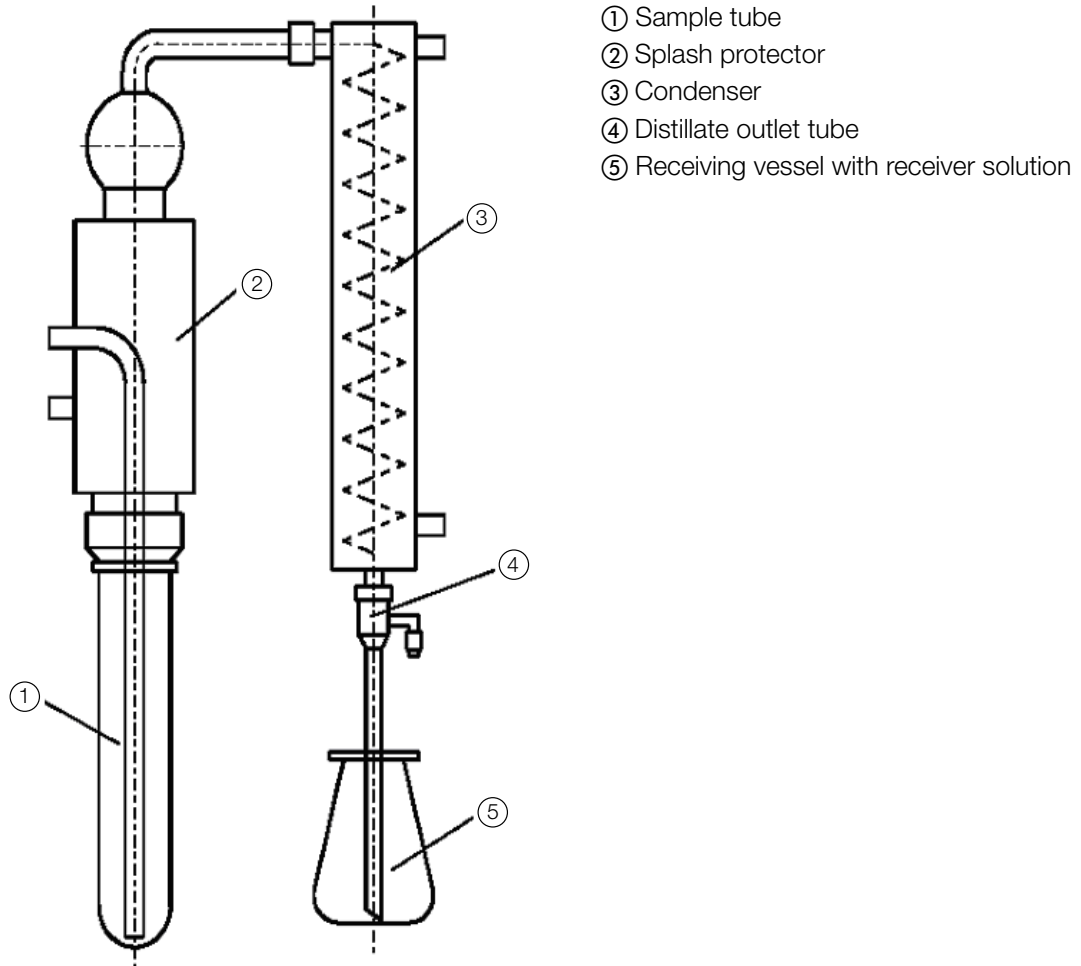


Fig. 4.2: Function principle

Steam is introduced into the sample solution (in sample tube ①) to drive out volatile components (such as ammonia, alcohol, etc.). After condensation (in condenser ③) the condensate is collected in a receiver solution (in receiving vessel ⑤).

### 4.3 Controls of the instrument



- ① STOP: Stops a distillation or the addition of reagent
- ② TIME display
- ③ STEAM power display
- ④ START: Starts a distillation
- ⑤ TIME: Sets time in min:sec
- ⑥ UP: Increases time and steam up
- ⑦ STEAM: Sets steam power
- ⑧ DOWN: Decreases time and steam down
- ⑨ REAGENT: Button that adds reagent (e.g. water, sodium hydroxide solution)

Fig. 4.3: Controls of the instrument

## 5 Putting into operation

This chapter describes how the instrument is installed and gives instructions on initial startup.

### NOTE

*Inspect the instrument for damages during unpacking. If necessary, prepare a status report immediately to inform the postal company, railway company or transportation company.*

Keep the original packaging for future transportation.

### 5.1 Installation site

Install the instrument on a clean, flat and stable base and place the tank for Reagent 1 (acid) below instrument level (not more than 1 m). Place the other tanks on the same level as the instrument (not higher and not more than 1 m lower).



#### ATTENTION

*To ensure the instrument safety do not place any object on top of it.*



#### ATTENTION

*For safety reasons, make sure that the distance between the instrument and another object or a wall is at least 30 cm.*



#### ATTENTION

*For safety reasons do not place any containers, chemicals or other instruments behind the instrument.*

### 5.2 Electrical connections



Fig. 5.1: Electrical connections



#### ATTENTION

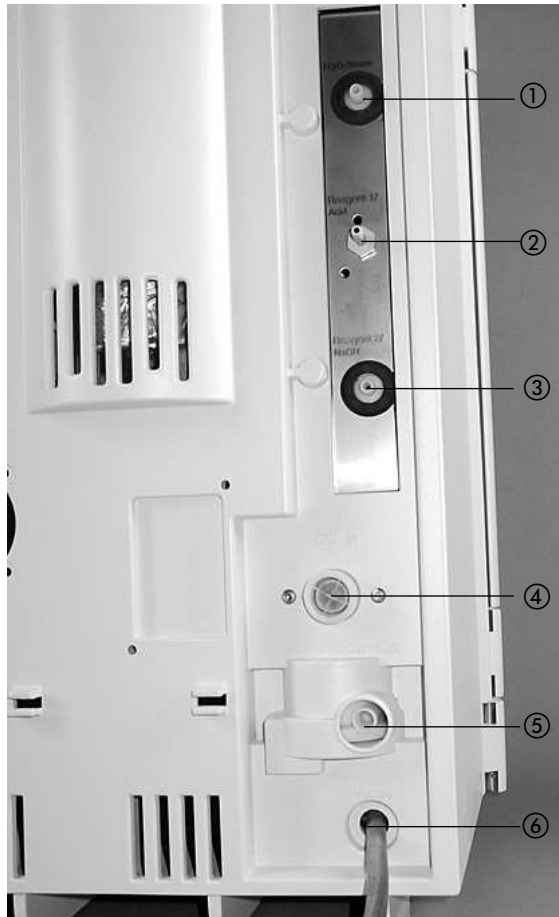
*Make sure that the voltage on the socket corresponds to the voltage given on the type plate of the instrument.*

*Always connect the instrument to an earthed socket. External connections and extension cables must be provided with an earthed conductor lead (3-pole couplings, cable or plug equipment) as the mains lead has a molded plug, thus avoiding risks due to inadvertent defective wiring.*

*The instrument cable must be well attainable at all times.*

*Make sure that no electric sparks form in the instrument or its surroundings as they might damage the instrument.*

### 5.3 Reagent and water connections



- ① H<sub>2</sub>O inlet (for steam generator) from tank
- ② Reagent 1 inlet (water or acid)
- ③ Reagent 2 inlet (NaOH)
- ④ Cooling water inlet
- ⑤ Cooling water outlet
- ⑥ Drain to waste

Fig. 5.2: Reagent and water connections

All pumps are self-priming, no overpressure is necessary at the tanks.

#### 5.3.1 Cooling water connection

Secure the cooling water hose with a hose clamp on both the instrument and the water connection side. The water pressure should be at a maximum of 4 bar. The built in valve reduces the water flow to 1.2 liters per minute.

The flanged screw coupling for the water connection has a standard screw thread of G 3/4".

#### 5.3.2 Drainage of cooling water

Place the drain hose for the cooling water directly into the drain. For this purpose, shorten the silicone hose to the optimal length. The drain hose should not show any kinks, sharp bends and/or siphoning effect. Prevent flooding inside and outside the instrument by securing the drain hose.

### 5.3.3 Storage tank connection

To connect the storage tanks, proceed as follows:

- Cut the solaflex tube into pieces of the appropriate length (use an acid resistant tube, if acid is dosed).
- Insert a PTFE suction tube into the solaflex tube.
- Push an EPDM sealing ring over the solaflex tube.
- Now fasten the tubes to the tank with the red screw cover.
- Connect the tubes at the appropriate connections at the instrument side and secure them with the clamps.

The "H<sub>2</sub>O" storage tank may be used to feed both the steam generator pump as well as the sample tube pump. For this purpose the Y hose coupling can be used.

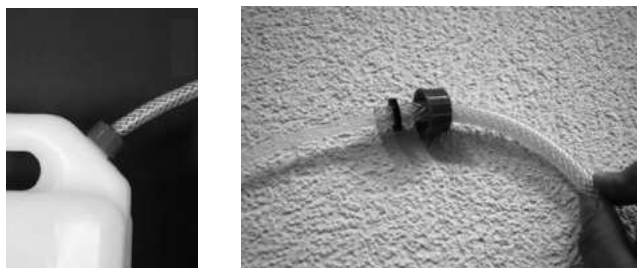


Fig. 5.3: Tank connection

All pumps are self-priming, no overpressure is necessary at the tanks.



#### **ATTENTION**

*To ensure proper system functioning, consider the following:*

- Use only distilled water for the H<sub>2</sub>O storage tank to keep the steam generator maintenance-free.
- Make sure that the tanks are connected correctly. If the wrong tank (e. g. reagent tank containing NaOH) is connected to the pump labelled „H<sub>2</sub>O steam“, the steam generator will be damaged.

## 6 Operation

This chapter gives examples of typical instrument applications and instructions on how to operate the instrument properly and safely.



### **WARNING**

*Risk of injury.*

- Never operate the instrument when glassware is damaged.



### **WARNING**

*Sodium hydroxide, acid and lye are used for applications according to Kjeldahl. For this reason, protective goggles must be worn at all times when using this instrument or working in its immediate proximity.*



### **NOTE**

*Close unused connections with plug caps.*

*If the connection for reagent 1 (pump) is used for the addition of strong acids (e.g. HCl), rinse the pump with distilled water at the end of the day.*

## 6.1 Addition of chemicals

### 6.1.1 Manual dosage

When pressing “REAGENT 1” or “REAGENT 2” the connected reagent is dosed as long as the switch is pressed.

### 6.1.2 Automatic dosage

The reagent volume dosed before the distillation is started is stored (e.g. in one of the nine different programs or as default value). This volume can be recalled after distillation (or a program containing the required volume can be recalled).

The stored volume is dosed by pressing “REAGENT” shortly. After releasing the switch, the volume is dosed automatically.

### 6.1.3 General information

The reagent switch is also active when the instrument is “Ready” or “Busy” (during distillation), so that additional dosage of reagent is possible during distillation.

During preheating, reagent addition is not possible.

The reagent volume stored before the start of the distillation is defined as the pump operating time.

The stored pump operating time (reagent volume) can be recalled after the distillation or after pressing “STOP”.

If “STOP” is pressed during the automatic addition of reagent, the default volume is set to 0 ml.

The pumps for addition of Reagent 1 and Reagent 2 are different. Therefore different settings for the two pumps may be necessary.

## 6.2 Setting the distillation time

To set the distillation time, proceed as follows:

- Press "TIME", the digit for minutes starts to flash.
- Press "TIME" again, the digit for seconds starts to flash.
- Set the distillation time by pressing "UP" and "DOWN".
- Start the distillation by pressing "START".

Digits stop flashing after a certain time or after starting the distillation.

When pressing "UP" and "DOWN", the time is first counted slowly, then faster.

The distillation time can be set in a range of 1 second to 99 minutes 59 seconds.

## 6.3 Setting the steam power

To set the steam power, proceed as follows:

- Press "STEAM", the digit starts to flash.
- Set the steam power by pressing "UP" and "DOWN".

Digits stop flashing after a certain time or after starting the distillation.

When pressing "UP" and "DOWN", the steam power is first counted slowly, then faster.

The steam power can be set in a range of 30 to 100%.

## 6.4 Program storage

The program storage function can be used optionally. Up to 9 programs can be stored. In addition the last used program is stored.

### 6.4.1 Storing a program

To store a program, proceed as follows:

- Select a program with "UP" and "DOWN". The steam-display shows P and the program number. The program settings are shown after releasing the "UP"/"DOWN" button.
- Press "STEAM" and set the steam power by pressing "UP" and "DOWN".
- Press "TIME", the digit for minutes starts to flash.
- Press "TIME" again, the digit for seconds starts to flash.
- Set the distillation time by pressing "UP" and "DOWN".
- Press "REAGENT 1" until you reach the required acid or water dosing volume for storage.
- Press "REAGENT 2" until you reach the required sodium hydroxide dosing volume for storage.
- Press "START" to store the program.

### 6.4.2 Selecting a stored program

Select a stored program by pressing "UP" and "DOWN". The steam-display shows "P" and the program number. The program settings are shown after releasing the "UP"/"DOWN" button.

#### **NOTE**

*The program settings are changed before a new distillation is started. The old program settings will be overwritten with the new settings.*

## 6.5 Steam generator status

### 6.5.1 Heating

A constant colon (:) and an "H" in the STEAM-display indicates, that the steam generator is heating.  
A flashing colon (:) and a signal sound for 1 second indicates that the steam generator is ready.

### 6.5.2 Standby mode (after 30 minutes)

The TIME display and STEAM display show (----).  
Press "START" to cancel the standby mode.

## 6.6 Switching ON/OFF checklist

To switch on and preheat the instrument, proceed as follows:

- Check the filling level of the supply tanks.
- Open the main water tap.
- Switch on the instrument and wait until the steam generator is ready.
- Insert an empty sample tube and an empty receiving vessel.
- Close the protective door.
- Set the distillation time to 2 minutes (see section "Setting the distillation time") and the steam to 100% (see section "Setting the steam power").
- Start the distillation by pressing "START".

To switch off the instrument, proceed as follows:

- Switch off the instrument.
- Close the main water tap.
- Rinse the reagent 1 pump with distilled water when it is used for the addition of strong acids.

## 6.7 Carrying out a distillation

To carry out a distillation, proceed as follows:

- Switch on the instrument and wait until the steam generator is ready.
- Insert the sample tube containing the sample.
- Prepare a conical flask or a similar receptacle with a volume of about 250 ml as receiving vessel.
- If required, select suitable chemicals in accordance with the method and the substance you determine.
- Add reagents as required.
- Set the required distillation time or select a program.
- Start the distillation by pressing "START".

For Kjeldahl distillation note the following:

- Fill boric acid solution of 4% and 2-3 drops of Sher indicator into the receiving vessel. Alternative: Select suitable chemicals for the back titration.
- Add water to dilute the sample by pressing "REAGENT 1". The dilution with water prevents a too violent reaction when the sodium hydroxide solution is subsequently added. The sample must be diluted in a ratio of approximately 1 part of acid to 2 parts of water.

- Add sodium hydroxide solution by pressing "REAGENT 2": Recommended alkali concentration: 32%. Add alkali to the sample in a ratio of about 1 part of acid to 3 parts of sodium hydroxide solution. The volume of the added sodium hydroxide solution is measured on the scale behind the sample tube. The added volume selected must produce a clear shift in color to brown or blue.

**NOTE**

*After distillation or after "STOP", the last distillation time can be recalled by pressing "START" or will automatically be recalled when exchanging the sample tube.*

## 7 Maintenance

This chapter gives instructions on all maintenance work to be performed in order to keep the instrument in good working condition.



### **WARNING**

*Electrical hazard:*

- *Prior to all maintenance work on the instrument switch off the power supply and remove all sources of flammable vapor.*



### **WARNING**

*All maintenance and repair work requiring the opening or removal of instrument covers may only be carried out by trained personnel and with the tools provided for this purpose.*

*The service door may only be opened for maintenance or service purposes.*



### **WARNING**

*Potentially hot service door or interior behind the service door during operation (surface temperatures at times exceed 60 °C). Danger of burns.*

- *Always let the instrument cool down before opening the service door.*



### **ATTENTION**

*Always wear personal protective equipment such as protective eye goggles, protective clothing and gloves when maintaining the instrument.*



*Check the instrument for proper operation after any repair work.*

## 7.1 Daily maintenance

### 7.1.1 Cleaning the instrument from inside

To ensure proper instrument functioning regular cleaning is vital. Thus the generation of caustic substances within the instrument and the degradation of glassware is avoided. To clean the inside of the instrument, distill 100 ml of distilled water for a period of 2 minutes.

Rinse the reagent 1 pump with distilled water.

### 7.1.2 Cleaning the housing

Check the housing for defects (switches, plugs) and clean it with a damp cloth.

#### **ATTENTION**

*Never use solvents as cleaning agents as these might damage the instrument.*

- *As the housing is made of polyurethane and covered with an acid-resistant coating, any acid drops must be wiped away immediately with a damp cloth.*

### 7.1.3 Cleaning the glass parts

The glass parts can be taken out and cleaned with commercially available cleaning agents or in an ultrasonic bath. After the glass parts have been cleaned and fully dried, check each part visually for cracks, scratches and for any parts or sections that might have splintered off. Take out and replace any damaged glass parts.

### 7.1.4 Preparing the instrument for a standstill overnight

To prepare the instrument for a longer standstill (e.g. overnight), fill 50 ml distilled water into the receiving vessel and 30 ml of distilled water into the sample tube.

## 7.2 Weekly maintenance

### 7.2.1 Cleaning the splash protector and the rubber bung seal

Unmount the splash protector and remove the rubber bung seal.

Rinse the splash protector with water to remove sample residues.

We recommend to replace the splash protector after approximately 5000 determinations, depending on the kind of application and frequency of maintenance.

To prolong the lifetime of the seal, rinse it with water, especially if working with crystalline products. Afterwards, dry it with a soft cloth, remount it and put the splash protector back in place.



#### **ATTENTION**

*When removing and reinstalling the seal, make sure not to damage it. Always move it perpendicularly to the axis of the glass parts and ensure no damage occurs to the sealing lip.*

*Never apply grease to the seal and never touch it with sharp objects, otherwise it will get damaged.*

## 7.3 Monthly maintenance

### 7.3.1 Checking the distillate amount

To check the distillate amount, wait until the steam generator is ready, i.e. the instrument is warmed up. Then run a single sample with an empty tube and an empty receiving vessel with the following parameters:

**Table 7-1: Checking the distillate amount**

Parameter	Setting
Check distillate amount:	Distillation and titration
Sample tube:	empty
Water:	0 ml
NaOH:	0 ml
Distillation time:	5:00

After the check is finished, measure the distillate amount by means of a measuring flask. With the above parameters it should be **about** 150 ml.

## 7.4 Half-yearly maintenance

### 7.4.1 Replacing the NaOH tube

We recommend to replace the NaOH tube every six months. The other tubes need to be replaced as and when required.

## 7.5 Yearly maintenance

### 7.5.1 Replacing the rubber bung seal

The seal is subject to wear and tear, thus you should check it regularly. We recommend to replace it once a year.

### 7.5.2 Replacing the NaOH pump

We recommend to replace the NaOH pump once a year. The other pumps need to be replaced as and when required.

## 7.6 Customer service

Only authorised service personnel are allowed to perform repair work on the instrument. These persons have a comprehensive technical training and knowledge of possible dangers which might arise from the instrument.

Addresses of official Buchi customer service offices are given on the Buchi website under: [www.buchi.com](http://www.buchi.com). If malfunctions occur on your instrument or you have technical questions or application problems, contact one of these offices.

The customer service offers the following:

- Spare part delivery
- Repairs
- Technical advice

## 8 Troubleshooting

This chapter helps to resume operation after a minor problem has occurred with the instrument. It lists possible occurrences, their probable cause and suggests how to remedy the problem.

The troubleshooting table below lists possible malfunctions and errors of the instrument. The operator is enabled to correct some of those problems or errors by him/herself. For this, appropriate corrective measures are listed in the column "Corrective measure".

The elimination of more complicated malfunctions or errors is usually performed by a Buchi technical engineer who has access to the official service manuals. In this case, please refer to your local Buchi customer service agent.

### 8.1 Malfunctions and their remedy

<b>Table 8-1: General malfunctions and their remedy</b>		
Error number / Error indication	Possible cause	Corrective measure
E 30	Service door open.	Close service door.
E 31	Protective door open.	Close protective door.
E 32	Sample tube missing.	Insert a sample tube.
E 40	Steam generator overheat.	Switch off the instrument immediately and contact the Buchi customer service.
E 40 - E 47	Electronic problem.	Contact the Buchi customer service.
E 50 - E 56	Steam generator problem.	Water feeding problem. Control the water volume in the tank. Control the tube connections.
E 61	Cooling water flow too low (< 0.5 l/min for > 30 seconds).	Increase the cooling water flow. Check the tightness of the cooling water circulation.
E 70 - E 76 Signal sound in a 10 seconds interval	Keyboard problem.	Switch off the instrument. Contact the Buchi customer service.
"H" in the STEAM display	Steam generator is heating, not ready for distillation.	Heating takes approx. 3 minutes. A flashing colon (:) and no "H" in the STEAM display indicates that the steam generator is ready.
Decimal point flashing in the TIME display during distillation	Cooling water flow too high (> 2.5 l/min).	Reduce the cooling water flow.
Decimal point stable in the TIME display during distillation	Cooling water flow too low (< 0.5 l/min).	Increase the cooling water flow until the decimal point disappears (reaction time approx. 5 seconds). Check the tightness of the cooling water circulation system.

## 9 Shutdown, storage, transport and disposal

This chapter instructs how to shut down the instrument, how to pack it for storage or transport, and specifies the storage and shipping conditions.

### 9.1 Preparing the instrument for transport

Take out the power cord and remove all water/reagent tubing. Rinse the sodium hydroxide solution tube with distilled water. Clean the instrument thoroughly, so that all chemical residues are removed completely.

To empty the steam generator, proceed as follows:

- Turn off the instrument and disconnect the power cord.



#### **WARNING**

*The steam generator gets very hot during operation. Danger of being burned.*

- *Always let the steam generator cool down for at least 30 minutes after having switched it off before handling it.*
- Open the service door.
- Attach an appropriate silicone tube to the drain cock.
- Place a receiving vessel with a volume of 500 ml below the end of the tube.
- Slowly open the stop-cock with a screw driver and empty the steam generator completely.

### 9.2 Storage and transport

Store and transport the instrument in its original packaging.

### 9.3 Disposal

To dispose of the instrument in an environmentally friendly manner, a list of materials is given in chapter 3. This helps to ensure that the components are separated and recycled correctly. Please follow valid regional and local laws concerning disposal.

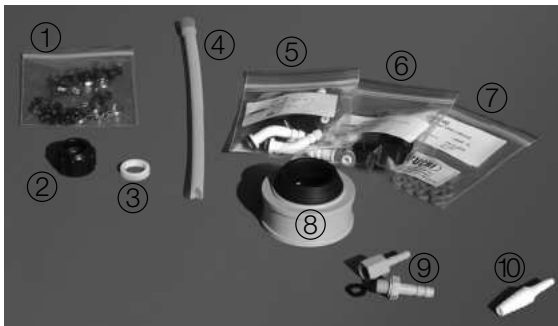
## 10 Spare parts

This chapter lists spare parts, accessories, and options including their ordering information.

Order the spare parts from Buchi. Always state the product designation and the part number when ordering spare parts.

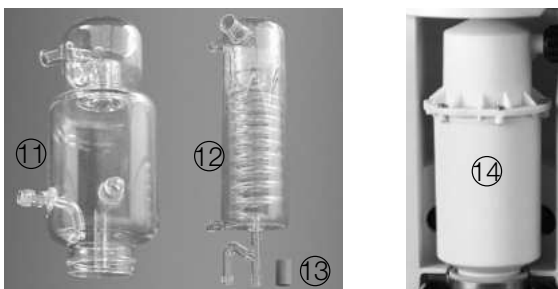
Use only genuine Buchi consumables and genuine spare parts for maintenance and repair to assure good system performance and reliability. Any modifications to the spare parts used are only allowed with the prior written permission of the manufacturer.

### 10.1 Spare parts K-355



**Table 10-1: Spare parts K-355**

Product	Order number
① Set of clamps $\varnothing$ 7.6 / $\varnothing$ 11.9 / $\varnothing$ 9.6 / $\varnothing$ 10.7 / $\varnothing$ 12.8 (5 pieces each)	43586
② SVL 22 screw cap	03577
③ SVL 22 sealing	02073
④ Outlet tube for distillate, PTFE	43569
⑤ Set of hose connectors, bent EPDM sealing (4 pieces)	43129
⑥ Set of hose connectors, straight, FPM sealing (4 pieces)	40296
⑦ Set of sealings, FPM (10 pieces)	40040
⑧ Gasket, complete (splash protector)	43068
Gasket with ring and without screw nut (splash protector)	
⑨ Set of connectors cooling water outlet (1 piece of each)	43538
⑩ Hose connector, PP	43565
⑪ Splash protector, glass	43332
⑫ Condenser	43320
⑬ Check valve, complete	43356
⑭ Splash protector, polypropylene	43590
⑮ Set of accessories for splash protector K-350 and K-355	43585





**Table 10-1: Spare parts K-355 (cont.)**

Product	Order number
16 Drip tray	43302
4 sample tubes 300 ml	37377
Cap for 20 l tanks, large (1 piece)	43478

## 10.2 Hosing connection scheme

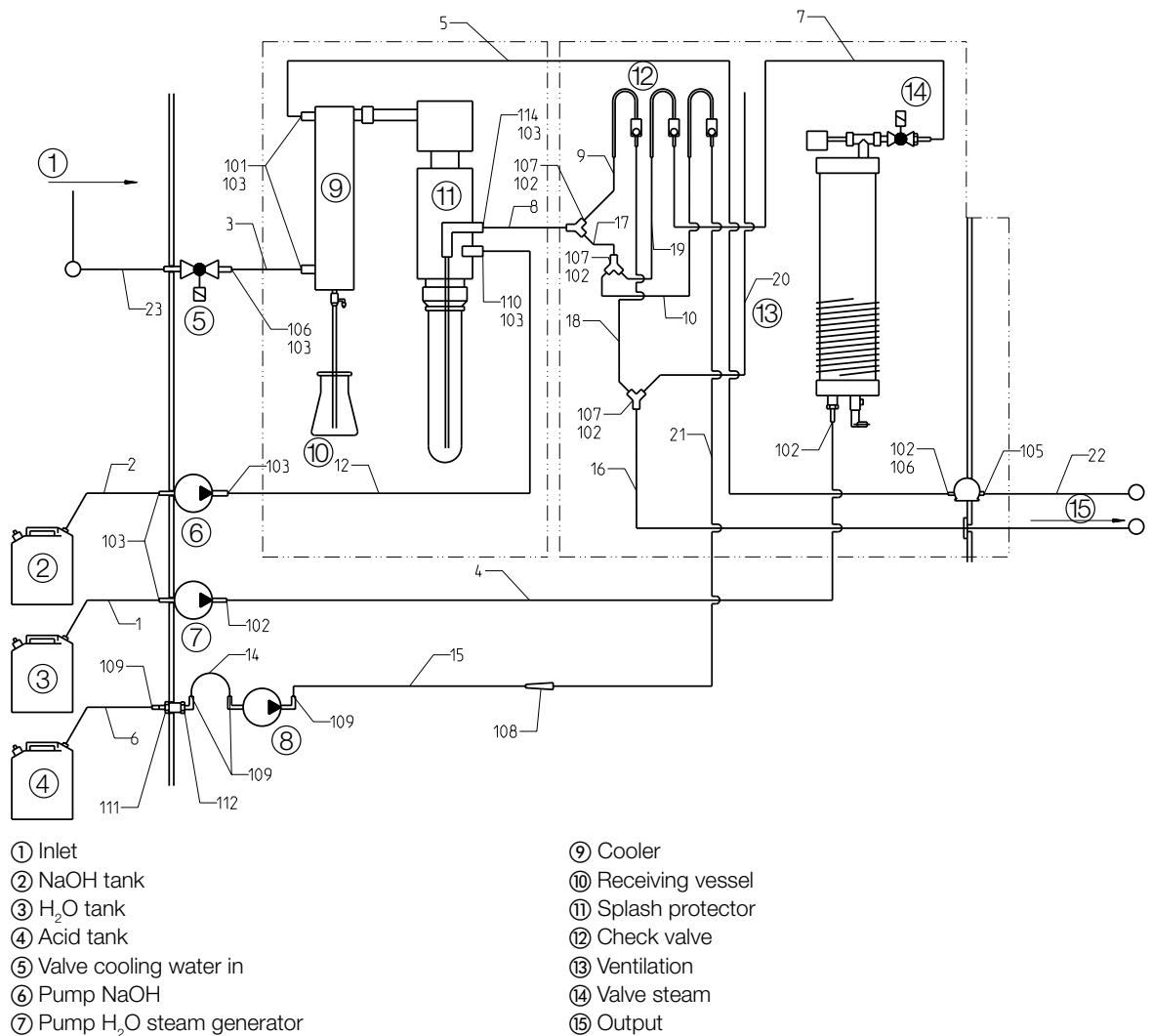


Fig. 10.1: Hosing connection scheme

**Table 10-2: Tubes and components Distillation Unit K-355**

Position	Order number	Pcs	Description
1 - 2	43555	1	Solaflex tube Ø 10/5, L = 3500
3	43153	1	Unisil Ø 6 x 2, L = 640
4	43151	1	Unisil Ø 6 x 2, L = 370
5	43154	1	Unisil Ø 6 x 2, L = 920
6	43572	1	Viton tube Ø 9/6, L = 1200
7	43578	1	Viton tube Ø 10/7, L = 380
8	43574	1	Viton tube Ø 10/7, L = 190
9	43575	1	Viton tube Ø 10/7, L = 230
10	43574	1	Viton tube Ø 10/7, L = 190
12	43029	1	EPDM 6.35/1.58, L = 530
14	43573	1	Viton tube Ø 7/4, L = 120
15	43573	1	Viton tube Ø 7/4, L = 120
16	43572	1	Viton tube Ø 7/4, L = 1200
17	43574	1	Viton tube Ø 10/7, L = 190
18	43578	1	Viton tube Ø 10/7, L = 380
19	43574	1	Viton tube Ø 10/7, L = 190
20	43574	1	Viton tube Ø 10/7 L = 190
21	43574	1	Viton tube Ø 10/7, L = 190
22	43439	1	Silicone tube Ø 14/10, L = 1800
23	37780	1	Cooling water tube, complete, L = 1500
101	43139	3	Connectors GL-14, bent, EPDM
102	27738	11	Hose clamps Ø 9.6, black
103	43202	7	Hose clamps Ø 10.7, green
105	29646	1	CW flow sensor
106	43207	1	Tube spout
107	11043	3	Y-pieces PP
108	43565	1	Reduction piece PP
109	03562	7	Binders 2.5 x 98 mm
110	43139	1	Connector, bent, black
111	43542	1	Screw spout D4, G1/8"
112	43533	1	Screw spout, bent D4, G1/8"
113	43534	1	Screw spout D6, G1/8"
114	40297	1	Connector, bent, green

## 11 Declarations and requirements

### 11.1 FCC requirements (for USA and Canada)

English:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to both Part 15 of the FCC Rules and the radio interference regulations of the Canadian Department of Communications. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Français:

Cet appareil a été testé et s'est avéré conforme aux limites prévues pour les appareils numériques de classe A et à la partie 15 des réglementations FCC ainsi qu'à la réglementation des interférences radio du Canadian Department of Communications. Ces limites sont destinées à fournir une protection adéquate contre les interférences néfastes lorsque l'appareil est utilisé dans un environnement commercial.

Cet appareil génère, utilise et peut irradier une énergie à fréquence radioélectrique, il est en outre susceptible d'engendrer des interférences avec les communications radio, s'il n'est pas installé et utilisé conformément aux instructions du mode d'emploi. L'utilisation de cet appareil dans les zones résidentielles peut causer des interférences néfastes, auquel cas l'exploitant sera amené à prendre les dispositions utiles pour palier aux interférences à ses propres frais.



BUCHI Affiliates:

Europe

Switzerland/Austria

**BÜCHI Labortechnik AG**  
 CH – 9230 Flawil  
 T +41 71 394 63 63  
 F +41 71 394 65 65  
 buchi@buchi.com  
 www.buchi.com

Italy

**BUCHI Italia s.r.l.**  
 IT – 20010 Cornaredo (MI)  
 T +39 02 824 50 11  
 F +39 02 575 12 855  
 italia@buchi.com  
 www.buchi.it

Benelux

**BÜCHI Labortechnik GmbH**  
 Branch Office Benelux  
 NL – 3342 GT Hendrik-Ido-Ambacht  
 T +31 78 684 94 29  
 F +31 78 684 94 30  
 benelux@buchi.com  
 www.buchi.be

Russia

**BUCHI Russia/CIS**  
 Russia 127287 Moscow  
 T +7 495 36 36 495  
 F +7 495 98 10 520  
 russia@buchi.com  
 www.buchi.ru

France

**BUCHI Sarl**  
 FR – 94656 Rungis Cedex  
 T +33 1 56 70 62 50  
 F +33 1 46 86 00 31  
 france@buchi.com  
 www.buchi.fr

United Kingdom

**BUCHI UK Ltd.**  
 GB – Oldham OL9 9QL  
 T +44 161 633 1000  
 F +44 161 633 1007  
 uk@buchi.com  
 www.buchi.co.uk

Germany

**BÜCHI Labortechnik GmbH**  
 DE – 45127 Essen  
 T +800 414 0 414 0 (Toll Free)  
 T +49 201 747 49 0  
 F +49 201 747 49 20  
 deutschland@buchi.com  
 www.buechigmbh.de

Germany

**BÜCHI NIR-Online**  
 DE – 69190 Walldorf  
 T +49 6227 73 26 60  
 F +49 6227 73 26 70  
 nir-online@buchi.com  
 www.nir-online.de

America

Brazil

**BUCHI Brasil Ltda.**  
 BR – Valinhos SP 13271-200  
 T +55 19 3849 1201  
 F +55 19 3849 2907  
 brasil@buchi.com  
 www.buchi.com

USA/Canada

**BUCHI Corporation**  
 US – New Castle, DE 19720  
 T +1 877 692 8244 (Toll Free)  
 T +1 302 652 3000  
 F +1 302 652 8777  
 us-sales@buchi.com  
 www.mybuchi.com

Asia

China

**BUCHI China**  
 CN – 200052 Shanghai  
 T +86 21 6280 3366  
 F +86 21 5230 8821  
 china@buchi.com  
 www.buchi.com.cn

India

**BUCHI India Private Ltd.**  
 IN – Mumbai 400 055  
 T +91 22 667 75400  
 F +91 22 667 18986  
 india@buchi.com  
 www.buchi.in

Indonesia

**PT. BUCHI Indonesia**  
 ID – Tangerang 15321  
 T +62 21 537 62 16  
 F +62 21 537 62 17  
 indonesia@buchi.com  
 www.buchi.co.id

Japan

**Nihon BUCHI K.K.**  
 JP – Tokyo 110-0008  
 T +81 3 3821 4777  
 F +81 3 3821 4555  
 nihon@buchi.com  
 www.nihon-buchi.jp

Korea

**BUCHI Korea Inc.**  
 KR – Seoul 153-782  
 T +82 2 6718 7500  
 F +82 2 6718 7599  
 korea@buchi.com  
 www.buchi.kr

Malaysia

**BUCHI Malaysia Sdn. Bhd.**  
 MY – 47301 Petaling Jaya,  
 Selangor  
 T +60 3 7832 0310  
 F +60 3 7832 0309  
 malaysia@buchi.com  
 www.buchi.com

Singapore

**BUCHI Singapore Pte. Ltd.**  
 SG – Singapore 609919  
 T +65 6565 1175  
 F +65 6566 7047  
 singapore@buchi.com  
 www.buchi.com

Thailand

**BUCHI (Thailand) Ltd.**  
 TH – Bangkok 10600  
 T +66 2 862 08 51  
 F +66 2 862 08 54  
 thailand@buchi.com  
 www.buchi.co.th

BUCHI Support Centers:

South East Asia

**BUCHI (Thailand) Ltd.**  
 TH-Bangkok 10600  
 T +66 2 862 08 51  
 F +66 2 862 08 54  
 bacc@buchi.com  
 www.buchi.com

Middle East

**BÜCHI Labortechnik AG**  
 UAE – Dubai  
 T +971 4 313 2860  
 F +971 4 313 2861  
 middleeast@buchi.com  
 www.buchi.com

Latin America

**BUCHI Latinoamérica Ltda.**  
 BR – Valinhos SP 13271-200  
 T +55 19 3849 1201  
 F +55 19 3849 2907  
 latinoamerica@buchi.com  
 www.buchi.com

We are represented by more than 100 distribution partners worldwide.  
 Find your local representative at: [www.buchi.com](http://www.buchi.com)