Table of contents

1 About this manual ................................................................. 4

2 Safety ................................................................. 5
   2.1 User qualification ......................................................... 5
   2.2 Proper use ............................................................... 5
   2.3 Improper use ............................................................. 5
   2.4 Safety warnings and safety signs used in this manual .......... 6
   2.5 Product safety .......................................................... 8
      2.5.1 General hazards ..................................................... 8
      2.5.2 Personal protective equipment ................................. 9
      2.5.3 Built-in safety elements and measures ....................... 9
   2.6 General safety rules .................................................. 10

3 Technical data .............................................................. 11
   3.1 Technical data .......................................................... 11
   3.2 Materials used ........................................................ 12

4 Description of function .................................................... 13
   4.1 Functional principle ................................................... 13

5 Putting into operation ...................................................... 15
   5.1 Installation site ......................................................... 15
   5.2 Electrical connections ................................................. 17

6 Operation ............................................................. 18
   6.1 Operating controls and housing ..................................... 18
   6.2 Preparing for use ...................................................... 20
      6.2.1 Installing the hoses .............................................. 20
      6.2.2 Filling the chiller ................................................. 21
   6.3 Start operation ........................................................ 21
   6.4 No BUCHI vacuum controller connected to the system ......... 21
   6.5 Working with BUCHI vacuum controller ......................... 22

7 Maintenance and repairs .................................................. 23
   7.1 Customer service ...................................................... 23
   7.2 General inspection and cleaning instructions ................... 24

8 Troubleshooting ........................................................... 25
   8.1 Error message display (only F-105) ................................. 25
   8.2 Malfunctions and their remedies ..................................... 25

9 Shutdown, storage, transport and disposal ............................. 26
   9.1 Storage and transport ............................................... 26
   9.2 Disposal ............................................................... 27

10 Spare parts ............................................................. 29
   10.1 Enclosed parts ......................................................... 29
   10.2 Instrument configuration .............................................. 30
   10.3 Spare parts, optional accessories .................................... 30
1 About this manual

This manual describes the Chiller and provides all information required for its safe operation and to maintain it in good working order.
It is addressed to laboratory personnel and operators in particular.

Read this manual carefully before installing and running your system and note the safety precautions in section 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. Technical data are subject to change without notice.

NOTE
The symbols pertaining to safety (WARNINGS and ATTENTIONS) are explained in section 2.

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.

The German manual is the original language version and serves as basis for all translations into other languages. If you need another language version of this manual, you can download available versions at www.buchi.com or reorder manuals from a BUCHI representative.
2 Safety

This section introduces the safety concept of the instrument and contains general rules of behavior and warnings from direct and indirect hazards concerning the use of the product. For the users safety, all safety instructions and safety messages in the individual sections shall be strictly observed and followed. Therefore, the manual must always be available to all persons performing any tasks described herein.

2.1 User qualification

The instrument may only be used by laboratory personnel and other persons who on account of training and professional experience know the potential dangers that can develop when operating the instrument. Untrained personnel, or persons who are currently being trained, require careful supervision by a qualified person. This Operation Manual serves as a basis for training.

2.2 Proper use

The Recirculating Chiller is conceived and built as a piece of laboratory equipment. Its regulation use is the cooling of closed cycles (e.g. rotary evaporators, reaction vessels). When the Recirculating Chiller is used in combination with other instruments (e.g. rotary evaporator and extraction unit) all related manuals are to be fully observed. The regulation use of the Recirculating Chiller also includes its care.

2.3 Improper use

Any other use than the one stated above and any application that does not comply with the technical data is considered to be improper use. Improper use can cause hazardous situations for the operator and / or for the instrument and might cause consequential property damage.

The operator bears the sole risk for any damages or hazards caused by improper use!

In particular, the following uses must not be permitted

- Installation or use of the instrument in rooms, which require ex-protected instruments.
- The use of spare parts or accessories other than those mentioned in these operating instructions.
- The equipment may not be operated using combustible substances.
- It is not allowed to put anything on the top of the Recirculating Chiller.
2.4 Safety warnings and safety signs used in this manual

DANGER, WARNING, CAUTION and NOTICE are standardized signal words for identifying levels of hazards and risks related to personal injury and property damage. All signal words, which are related to personal injury are accompanied by the general safety sign.

For your safety it is important to read and fully understand the table below with the different signal words and their definitions!

<table>
<thead>
<tr>
<th>Sign</th>
<th>Signal word</th>
<th>Definition</th>
<th>Risk level</th>
</tr>
</thead>
<tbody>
<tr>
<td>🟠</td>
<td>DANGER</td>
<td>Indicates a hazardous situation which, if not avoided, will result in death or serious injury.</td>
<td>★★★★</td>
</tr>
<tr>
<td>🟠</td>
<td>WARNING</td>
<td>Indicates a hazardous situation which, if not avoided, could result in death or serious injury.</td>
<td>★★★☆</td>
</tr>
<tr>
<td>🟠</td>
<td>CAUTION</td>
<td>Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.</td>
<td>★★☆☆</td>
</tr>
<tr>
<td>no</td>
<td>NOTICE</td>
<td>Indicates possible property damage, but no practices related to personal injury. (property damage only)</td>
<td>★☆☆☆</td>
</tr>
</tbody>
</table>

Supplementary safety information symbols may be placed in a rectangular panel on the left to the signal word and the supplementary text (see example below).

<table>
<thead>
<tr>
<th>Space for supplementary safety information symbols.</th>
<th>SIGNAL WORD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplementary text, describing the kind and level of hazard/risk seriousness.</td>
<td></td>
</tr>
<tr>
<td>• List of measures to avoid the described hazard or hazardous situation.</td>
<td></td>
</tr>
<tr>
<td>• …</td>
<td></td>
</tr>
<tr>
<td>• …</td>
<td></td>
</tr>
</tbody>
</table>

Table of supplementary safety information symbols

The reference list below incorporates all safety information symbols used in this manual and their meaning.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>🟠</td>
<td>General warning</td>
</tr>
<tr>
<td>🟠</td>
<td>Electrical hazard</td>
</tr>
<tr>
<td>🟠</td>
<td>Heavy weight, avoid overexertion</td>
</tr>
<tr>
<td>🟠</td>
<td>Explosive gases, explosive environment</td>
</tr>
</tbody>
</table>
## Safety

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Fire hazard" /></td>
<td>Fire hazard</td>
</tr>
<tr>
<td><img src="image" alt="Harmful to life forms" /></td>
<td>Harmful to life forms</td>
</tr>
<tr>
<td><img src="image" alt="Hot item, hot surface" /></td>
<td>Hot item, hot surface</td>
</tr>
<tr>
<td><img src="image" alt="Device damage" /></td>
<td>Device damage</td>
</tr>
<tr>
<td><img src="image" alt="Inhalation of substances" /></td>
<td>Inhalation of substances</td>
</tr>
<tr>
<td><img src="image" alt="Chemical burns by corrosives" /></td>
<td>Chemical burns by corrosives</td>
</tr>
<tr>
<td><img src="image" alt="Cuts by sharp edges" /></td>
<td>Cuts by sharp edges</td>
</tr>
<tr>
<td><img src="image" alt="Flooding" /></td>
<td>Flooding</td>
</tr>
<tr>
<td><img src="image" alt="Wear laboratory coat" /></td>
<td>Wear laboratory coat</td>
</tr>
<tr>
<td><img src="image" alt="Wear protective goggles" /></td>
<td>Wear protective goggles</td>
</tr>
<tr>
<td><img src="image" alt="Wear protective gloves" /></td>
<td>Wear protective gloves</td>
</tr>
</tbody>
</table>
Additional user information

Paragraphs starting with NOTE transport helpful information for working with the device/software or its supplementaries. NOTEs are not related to any kind of hazard or damage (see following example).

NOTE

*Useful tips for the easy operation of the instrument/software.*

## 2.5 Product safety

The Recirculating Chiller has been designed and built in accordance with current state-of-the-art technology, at the time of development. Safety warnings in this manual (as described in section 2.4) serve to make the user alert to, and avoid hazardous situations emanating from residual dangers by giving appropriate counter measures.

However, risks to users, property and the environment can arise when the instrument is damaged, used carelessly or improperly.

### 2.5.1 General hazards

The following safety messages show hazards of general kind which may occur when handling the instrument. The user shall observe all listed counter measures in order to achieve and maintain the lowest possible level of hazard.

Additional warning messages can be found whenever actions and situations described in this manual are related to situational hazards.

<table>
<thead>
<tr>
<th>🚨 DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death or serious injuries when used in explosive environments.</td>
</tr>
<tr>
<td>• Do not store or operate the instrument in explosive environments</td>
</tr>
<tr>
<td>• Remove all sources of flammable vapors</td>
</tr>
<tr>
<td>• Do not store chemicals in the vicinity of the device</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>🚨 CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of minor or moderate cuts by sharp edges.</td>
</tr>
<tr>
<td>• Do not touch defective or broken glassware with bare hands</td>
</tr>
<tr>
<td>• Do not touch thin metal edges</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>🚨 NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of instrument damage by liquids or mechanical shocks.</td>
</tr>
<tr>
<td>• Do not spill liquids over the instrument or its components</td>
</tr>
<tr>
<td>• Do not drop the instrument or its components</td>
</tr>
<tr>
<td>• Keep external vibrations away from the instrument</td>
</tr>
</tbody>
</table>
Safety messages regarding Refrigerant R134a:

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danger of injury and material damage due to overheating.</td>
</tr>
<tr>
<td>• Keep at a temperature not exceeding 45 °C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danger of corrosion and poisoning through inhalation of the fumes.</td>
</tr>
<tr>
<td>• In case of fire and/or explosion do not breathe fumes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>If R134a escapes in the event of a fault..</td>
</tr>
<tr>
<td>• Avoid contact with skin and eyes</td>
</tr>
<tr>
<td>• Always wear safety goggles</td>
</tr>
<tr>
<td>• Always wear safety gloves</td>
</tr>
</tbody>
</table>

2.5.2  Personal protective equipment

Always wear personal protective equipment such as protective eye goggles and protective clothing. The personal protective equipment must meet all requirements of all data sheets for the chemicals used. These instructions are an important part of the Recirculating Chiller and must be made available at all times to the operating personnel at the place where the equipment is deployed.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious chemical burns by corrosives.</td>
</tr>
<tr>
<td>• Always wear protective goggles</td>
</tr>
<tr>
<td>• Always wear protective gloves</td>
</tr>
<tr>
<td>• Always wear laboratory coat</td>
</tr>
</tbody>
</table>

2.5.3  Built-in safety elements and measures

The instrument is fitted with a thermal overload protection for the compressor.
2.6 General safety rules

Responsibility of the operator
The head of the laboratory is responsible for training his/her personnel.
The operator shall inform the manufacturer without delay of any safety-related incidents which might occur during operation of the instrument or its accessories. Legal regulations, such as local, state and federal laws applying to the instrument or its accessories must be strictly followed.

Duty of maintenance and care
The operator is responsible for the proper condition of instrument. This includes maintenance, service and repair jobs that are performed on schedule by authorized personnel only.

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

Modifications
Modifications to the instrument are only permitted after prior consultation 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.
This section introduces the reader to the Recirculating Chiller and its specifications. It contains the technical data, requirements and performance data.

### 3.1 Technical data

<table>
<thead>
<tr>
<th></th>
<th>F-100</th>
<th>F-105</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions (W x D x H)</td>
<td>280 x 420 x 500 mm</td>
<td>280 x 420 x 500 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>28 kg</td>
<td>30 kg</td>
</tr>
<tr>
<td>Power consumption (max.)</td>
<td>800 W</td>
<td>800 W</td>
</tr>
<tr>
<td>Heating emission</td>
<td>700 W</td>
<td>700 W</td>
</tr>
<tr>
<td>Cooling capacity at 15 °C</td>
<td>-</td>
<td>530 W</td>
</tr>
<tr>
<td>Cooling capacity at 10 °C</td>
<td>300 W</td>
<td>390 W</td>
</tr>
<tr>
<td>Cooling capacity at 0 °C</td>
<td>-</td>
<td>120 W</td>
</tr>
<tr>
<td>Cooling capacity at -10 °C</td>
<td>-</td>
<td>10 W</td>
</tr>
<tr>
<td>Set temperature range</td>
<td>fix at 10 °C</td>
<td>-10 °C to +25 °C</td>
</tr>
<tr>
<td>Connection voltage</td>
<td>230 VAC ± 10 %</td>
<td>230 VAC ± 10 % or 115 VAC ± 10 %</td>
</tr>
<tr>
<td>Frequency</td>
<td>50 / 60 Hz</td>
<td>50 / 60 Hz</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>60 Hz</td>
</tr>
<tr>
<td>Fuse</td>
<td>6.3 AT</td>
<td>6.3 AT</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>8 AT</td>
</tr>
<tr>
<td>Temperature display</td>
<td>no display</td>
<td>digital, resolution 0.1 °C</td>
</tr>
<tr>
<td>Refrigerant</td>
<td>R 134a (280 g)</td>
<td>R 134a (280 g)</td>
</tr>
<tr>
<td>Temperature regulation accuracy</td>
<td>± 2 °C</td>
<td>± 1 °C</td>
</tr>
<tr>
<td>Tank volume</td>
<td>3 L</td>
<td>3 L</td>
</tr>
<tr>
<td>Tubing connection</td>
<td>8 mm (GL14)</td>
<td>8 mm (GL14)</td>
</tr>
<tr>
<td>Pump pressure (max.)</td>
<td>0.6 bar</td>
<td>0.6 bar</td>
</tr>
<tr>
<td>Flow rate</td>
<td>2.5 L/min</td>
<td>2.5 L/min</td>
</tr>
<tr>
<td>Compatibility with interface</td>
<td>-</td>
<td>I-100, V-850, V-855</td>
</tr>
<tr>
<td>Overvoltage category</td>
<td>II</td>
<td>II</td>
</tr>
<tr>
<td>IP Code</td>
<td>IP20</td>
<td>IP20</td>
</tr>
<tr>
<td>Pollution degree</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>
3 Technical data

Max. altitude above sea level 2000 m

Ambient temperature 5 - 35 °C (25 °C)

Maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C

Storage temperature max. 45 °C

For indoor use only.

3.2 Materials used

<table>
<thead>
<tr>
<th>Component</th>
<th>Material designation</th>
<th>Material code</th>
<th>Hazardous substances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stainless steel, powder-coated with polyester-epoxide</td>
<td>Housing</td>
<td>1.4301</td>
<td>–</td>
</tr>
<tr>
<td>Copper</td>
<td>Internal pipes and coolers</td>
<td>CU</td>
<td>–</td>
</tr>
<tr>
<td>Polyester</td>
<td>Foil</td>
<td>PES</td>
<td>–</td>
</tr>
<tr>
<td>Glass-fiber-reinforced epoxy resin</td>
<td>Circuit board</td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>Polyanil chloride</td>
<td>Cable</td>
<td>PVC</td>
<td>–</td>
</tr>
<tr>
<td>R134a</td>
<td>Refrigerant</td>
<td>1,1,1,2-tetrafluoroethane</td>
<td>Check MSDS</td>
</tr>
</tbody>
</table>

Check MSDS
4 Description of function

This section explains the basic working principle of the Recirculating Chiller. It also shows how the instrument is structured and provides a general functional description of its assemblies.

4.1 Functional principle

The BUCHI Recirculating Chillers are a closed-circuit cooler for use with appropriate laboratory instruments. The F-100 has a fixed cooling temperature without display. The model F-105 is equipped with a control unit and built in display to regulate and indicate the actual and set value of the cooling temperature.

Diagram F-100

1 Circulation pump
2 Container with cooling coil
3 Capillary
4 Filter dryer
5 Heat exchanger
6 Compressor
Diagram F-105

1. Circulation pump
2. Container with cooling coil
3. Thermostatic expansion valve
4. Filter dryer
5. Heat exchanger
6. Compressor
7. In-line valve
5 Putting into operation

This section describes how the instrument has to be installed. It also gives instructions for the initial startup.

NOTE
Inspect the instrument for damage during unpacking. If necessary, prepare a status report immediately and inform customer and your local BUCHI representative. Keep the original packaging for future transportation.
Also adhere to all instructions concerning transport as described in section 9.1, Storage and transport.
To move the instrument use the handle (as described in section 6.1, Operating controls and housing), slightly lift the side of the instrument with the fix anti-slip foots and pull the instrument carefully by the rollers.

5.1 Installation site

![DANGER](image)

Death or serious injuries when used in explosive environments.
- Do not store or operate the instrument in explosive environments
- Remove all sources of flammable vapors
- Do not store chemicals in the vicinity of the device

Put the instrument onto a clean, stable and horizontal surface. Consider the maximum product dimensions and weight. Obtain the environmental conditions as described in section 3.1, technical data.

Installation pre-requisites and installation steps:
- Do not place any objects in front of or behind the instrument.
- The instrument must have a clearance of 40 cm between itself and the wall, both in front and behind (sufficient cooling).
- Do not place containers, chemicals or other items behind the instrument.
- Do not place anything on top of the Recirculating Chiller.

NOTE
- After transport, wait at least 2 hours before switching on the chiller! Within this time the refrigerant gathers in the compressor, avoiding damage of the compressor.
- To ensure that the power can be cut by unplugging in case of an emergency, the mains plug must not be blocked by the instruments or any other items!
- Depending on the environmental conditions, condensation water at the cooling tubes and all other cold surfaces of the instruments can collect!
### WARNING

Stumbling or falling due to improper installation of the cables and hoses.
- The length of the cables and hoses should be kept as short as possible
- Absorb condensate water from tubes and all other cold surfaces
- If possible, avoid installing cables and hoses in aisle areas
- If installation of cables and hoses in aisle areas is unavoidable, use an adequate protective pad in order to avoid the danger of stumbling and damage

### WARNING

Fire hazard, damage to the instrument through overheating due to inadequate air circulation.
- Do not cover the instrument
- Minimum distance from other objects must be at least 40 cm

### CAUTION

Risk of minor or moderate injury due to the heavy weight of the instrument.
- Do not drop the instrument or its transport box
- Place the instrument on a stable, even and vibration-free surface
- Keep limbs out of crushing zone

### CAUTION

Danger from falling objects due to inadequate stability.
- Do not place other objects or instruments on the Chiller
5.2 Electrical connections

<table>
<thead>
<tr>
<th>Notice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of instrument damage if mains supply is incorrect.</td>
</tr>
<tr>
<td>• External mains supply must meet the voltage given on the type plate</td>
</tr>
<tr>
<td>• Check for proper grounding</td>
</tr>
<tr>
<td>• Exchange defective cabling immediately</td>
</tr>
</tbody>
</table>

After the installation procedure has been completed successfully, the power plug of the Recirculating Chiller can be connected to mains.

The used mains circuit has to:
• provide the voltage that is given on the type plate of the instrument.
• be able to handle the load of the connected instruments.
• be equipped with adequate fuses and electrical safety measures, in particular proper grounding.

See also technical data of all components regarding the different minimum system requirements!

NOTE
• Additional electrical safety measures such as residual current breakers may be necessary to meet local laws and regulations!
• External power switches (e.g. emergency stop switches) must meet IEC 60947-1 and IEC 60947-3 requirements. Such devices must be clearly labeled and accessible at any time.
• External connections and extension lines must be provided with a grounded conductor lead (3-pole couplings, cord or plug equipment). All electrical cables used must be suitable for the required power rating.

5.3 Factors affecting chilling capacity

The available chilling capacity is dependent on various factors. The most important aspect to be aware of is that the chilling capacity diminishes as the chilling temperature is lowered. In the case of the F-105 it is approx. 600 W at 20 °C and only around 50 W at –5 °C. The ambient temperature has an effect as well. At room temperatures above 35 °C the chiller's air cooling may, depending on chilling capacity, no longer be sufficient and the chiller may switch off for safety reasons to protect itself against overheating. At an ambient temperature of 30 °C the F-105 still has a chilling capacity of around 150–W. We recommended a chilling temperature setting of 10–15 °C and a room temperature that does not exceed 25 °C. Outside of those parameters, the chilling capacity is substantially reduced.
6 Operation

This section gives examples of typical instrument applications and instructions on how to operate the instrument properly and safely. See also section 2.5 “Product safety” for general warnings.

6.1 Operating controls and housing

Front side

1 Opening for cooling medium
2 Handle (to pull the instrument)
3 On-/Off switch (lights green when instrument is switched on)
4 Cooling media level indicator
5 Cooling lamella for air flow in
6 Wheels (not lockable)
7 Fix anti-slip feet
8 Operating panel with various parameter displays (not available on the F-100)

<table>
<thead>
<tr>
<th>Buttons (not for F-100)</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP</td>
<td>Increase the desired set temperature in steps of 0.1 °C.</td>
</tr>
<tr>
<td>DOWN</td>
<td>Decrease the desired set temperature in steps of 0.1 °C.</td>
</tr>
<tr>
<td>START</td>
<td>Button to start or continue the cooling regulation.</td>
</tr>
</tbody>
</table>
STOP
Button to stop the cooling regulation.

Display (not for F-100)

1 Set temperature of Recirculating Chiller in °C
2 Actual temperature of Recirculating Chiller in °C
3 Active cooling is indicated by the snow flake
4 If the Recirculating Chiller is connected to the BUCHI vacuum controller the connection symbol is displayed

Level indicator

1 Lower black line: minimum filling level
2 Upper black line: maximum filling level
3 Ball float: actual fill level of coolant
6.2 Preparing for use

Prerequisites
- All parts must be clean and free of damage.
- Close the drainvalve.

6.2.1 Installing the hoses

**WARNING**
Stumbling or falling due to improper installation of the cables and hoses.
- The length of the cables and hoses should be kept as short as possible
- If possible, avoid installing cables and hoses in aisle areas
- If installation of cables and hoses in aisle areas is unavoidable, use an adequate protective pad in order to avoid the danger of stumbling and damage

- Connect out flow and return flow connections of the Recirculating Chiller with the condenser of the rotary evaporator.

**NOTE**
*Only use hoses which can withstand min. –10 °C and 2 bar pressure and secure them with the usual hose clamps.*

- Connect Chiller outlet (OUT) to the second condenser installed on the pump.
- Connect the outlet of the second condenser to the Rotavapor® Condenser.
- Connect the outlet of the Rotavapor® Condenser to the inlet (IN) of the Recirculating Chiller.
6.2.2 Filling the chiller

**NOTICE**
Risk of instrument damage if wrong cooling medium is used.
- Check to ensure that the cooling medium is suitable for use at the desired cooling temperature and does not freeze at the working temperature

Fill the cooling liquid in the opening to maximum filling level while the chiller is not connected to another device. We recommend a mixture of ethylene glycol/water at least 40/60, which does not freeze until –16 °C.

6.3 Start operation

**NOTE**
See installation instructions (chapter 5.1) for initial startup!

**WARNING**
Danger of injury due to tipping or failure of the instrument due to vibrations.
- After being transported, the recirculating chiller must be allowed to stand for at least 2 hours before it is switched on.

Start the Recirculating Chiller by switching on the Instrument by the main switch. Press start on the Chiller to fill the cooling coils.

6.4 No BUCHI vacuum controller connected to the system

**Preparational steps**
- System must be in good working order. See final installation check, section 5.1.
- Turn on instrument.
- Check level of cooling transfer medium as described in section 6.1 Level indicator.
- Set the desired working temperature by the UP and DOWN buttons (not for F-100).
- Press the START button to start the cooling process (not for F-100).
- Check the actual temperature on the Chiller until it has reached the required temperature and start working.

**Working steps**
- The cooling temperature can be adjusted during the operation process by pressing the UP and DOWN buttons on the Chiller (not for F-100).
- If the Chiller can’t keep the required temperature, do a slower distillation, by means of decreasing the vacuum to a slightly higher level so that less vapour is coming to the cooling coil.

**Steps for end of process**
- Press the STOP button on the Chiller.
  - The cooling stops immediately.
  - After a few seconds ventilation also stops.
6.5 Working with BUCHI vacuum controller

The Chiller model F-105 is equipped with a communication socket. Here, a BUCHI Rotavapor setup or other appropriate laboratory instruments equipped with a BUCHI vacuum controller (model V-850 or higher with firmware version 3.0 or higher) can be attached.

To establish communication switch on all connected devices. After bootup time the UP and DOWN buttons of the Chillers operation panel are blocked – the Chiller can be controlled via the Vacuum Controller buttons.

NOTE
Do not exceed max. recommended cable length (5m). For more information about operation see respective manual of the Vacuum Controller in use.

<table>
<thead>
<tr>
<th>Communication F-105</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vacuum Controller</td>
<td>Interface I-100</td>
</tr>
<tr>
<td>Start or stop chiller via controller or interface</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Display set point and current temperature</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Adjust set point via controller or interface</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
7 Maintenance and repairs

This section gives instructions on maintenance work to be performed in order to keep the instrument in a good and safe working condition. All maintenance and repair work requiring the opening or removal of the instrument housing must be carried out by trained BUCHI service personnel and only with the tools provided for this purpose.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Death or serious burns by electric current.</td>
</tr>
<tr>
<td>- Switch off the instrument, disconnect the power cord and prevent unintentional restart before touching any of the elements inside the Recirculating Chiller</td>
</tr>
<tr>
<td>- Do not spill liquids over the device</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of housing and instrument damage by liquids and detergents.</td>
</tr>
<tr>
<td>- Use only ethanol or soapy water for cleaning</td>
</tr>
</tbody>
</table>

NOTE
Use only genuine consumables and spare parts for any maintenance and repair work in order to assure warranty and continued system performance. Any modifications of the Recirculating Chiller or parts of it require the prior written permission of the manufacturer.

7.1 Customer service

Only authorized service personnel are allowed to open up the housing and/or perform repair work on the instrument which is not described in this manual. Authorization requires a comprehensive technical training and knowledge of possible dangers which might arise when working at the instrument. Such training and knowledge can only be provided by BUCHI.

Addresses of official BUCHI customer service offices are given on the BUCHI website under: 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
7.2 General inspection and cleaning instructions

Check the housing for visible defects (switches, plugs, enclosure etc.) and clean it regularly under safe conditions with a damp cloth. Wipe off any splashes of aggressive chemicals immediately using a damp cloth in order to avoid any damage being caused to the coating on the housing. Ethanol as a cleaning agent is also possible to use.

Cleaning under safe conditions
• Switch off the Recirculating Chiller and unplug the power cord.
  ➡ Let the system reach ambient temperature completely!
• Perform cleaning actions with a damp cloth.
• Regularly clean lamella with a damp cloth to remove dust, at least once a year.

Hoses
• Check the hoses for wear at least every six months.
• Exchange damaged hoses.

Cooling media tank
• Check before prior use the filling level of the Recirculating Chiller
• Exchange the cooling liquid once a year by means of the drainvalve and renew.
8 Troubleshooting

This section helps to resume operation after a problem has occurred with the instrument which does not require special technical training. It lists possible occurrences, their probable causes and suggests how to remedy the problem.

8.1 Error message display (only F-105)

![Image showing error message display]

1. For every error, the triangle lights.
2. The error number is indicated on the display.

8.2 Malfunctions and their remedies

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 “Remedy”.

### Malfunctions and their remedies

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Problem</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>E01</td>
<td>Temperature fault</td>
<td>Switch off the unit, and restart. Call service if the problem persists.</td>
</tr>
<tr>
<td></td>
<td>Temperature sensor circuit break</td>
<td></td>
</tr>
<tr>
<td>E04</td>
<td>Pressure fault of the compressor</td>
<td>Switch off the unit, let it cool down the compressor. Call service to check the system if the problem persists.</td>
</tr>
<tr>
<td>E05</td>
<td>Data fault</td>
<td>Switch off the unit and restart. Call service if the problem persists.</td>
</tr>
<tr>
<td>E06</td>
<td>Temperature fault in the electronics</td>
<td>Switch off the unit, let it cool down, clean air inlet and restart. Call service if the problem persists.</td>
</tr>
</tbody>
</table>

**Problem**  
**F-100 / F-105 does not work**  
Switch off the unit and unplug the power cord. Change the fuse according to technical data and restart. Call service if the problem persists.
9 Shutdown, storage, transport and disposal

WARNING
Poisoning or serious injuries through contact with or incorporation of harmful substances.

- Wear safety goggles
- Wear safety gloves
- Wear a laboratory coat
- Clean the instrument and all accessories thoroughly to remove possibly dangerous substances
- Do not clean dusty parts with compressed air
- Store the instrument and its accessories in a dry place in the original packaging

This section instructs how to shut down and pack the instrument for storage or transport. Specifications for storage and shipping conditions can also be found listed here.

NOTE
See manufacturer safety data sheet (chapter 11) about the refrigerant!

9.1 Storage and transport

NOTICE
Defective instrument due to improper packaging or improper transport.

- Pack the instrument for safe transport with new, suitable packaging material
- In particular, secure the compressor for transport
- Secure the properly packaged instrument on a pallet for transport

Switch off the instrument and remove the power cord. To disassemble the Recirculating Chiller follow the installation instructions in section 5 in reverse order. Clean the instrument thoroughly! The cooling liquid is to be drained before storage or shipping. The instrument is to be stored in the original packaging in a dry location. Shipping is also to be done in the original packaging and in upright position only.

NOTE
- After transport, wait at least 2 hours before switching on the chiller! Within this time the refrigerant gathers in the compressor, avoiding damage of the compressor.
- Completely drain off coolant fluid (tilt appliance slightly if necessary). Then turn off the drain tap.
9.2 Disposal

**CAUTION**

Freeze-burns and eye injuries through direct contact with R134a.

- Avoid contact with skin and eyes
- Always wear safety goggles
- Always wear safety gloves
- Hoses can be additionally insulated (see optional offering for hose insulation)

---

**Disposal of instrument**

For instrument disposal in an environmentally friendly manner, a list of materials is given in section 3.2. This helps to ensure that the components can be separated and recycled correctly by a specialist for disposal.

You have to follow valid regional and local laws concerning disposal. For help, please contact your local authorities!

**NOTE**

*When returning the instrument to the manufacturer for repair work, please copy and complete the health and safety clearance form on the following page and enclose it with the instrument.*

**Disposal of Refrigerant R134a**

The cooling medium R134a must be destroyed in an approved facility, which is equipped to absorb and neutralize acidic gases and other toxic processing products.
Health and Safety Clearance

Declaration concerning safety, potential hazards and safe disposal of waste.
For the safety and health of our staff, laws and regulations regarding the handling of dangerous goods, occupational health and safety regulations, safety at work laws and regulations regarding safe disposal of waste (e.g. chemical waste, chemical residues or solvents) require that this form must be completed, signed and enclosed to every return shipment of equipment or defective parts.

**Instruments or parts will not be accepted if this declaration is not present.**

### Equipment
Model: Part/Instrument no.:

#### 1.A Declaration for non dangerous goods
We assure that the returned equipment:
- ☐ is unused and new.
- ☐ has not been exposed to toxic, corrosive, biologically active, explosive, radioactive or other dangerous matters. No hazard emanates from the device!
- ☐ is free of contamination (e.g. that chemicals, solvents or residues of pumped media have been drained prior to shipment). No hazard emanates from the device!

#### 1.B Declaration for dangerous goods
Exhaustive list of dangerous substances the equipment has been exposed to:

<table>
<thead>
<tr>
<th>Chemical, substance</th>
<th>Danger classification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

We assure that:
- ☐ all hazardous substances (e.g. toxic, corrosive, biologically active, explosive, radioactive etc.) which have been processed or been in contact with the equipment are listed above.
- ☐ the equipment has been cleaned, decontaminated and is free of transmissible agents such as hazardous fungi, bacteria, viruses etc. If sterilization is applicable, all in- and outlets of the equipment have been properly sealed the process.

#### 2. Final Declaration
We hereby declare that:
- we know all about the substances which have been in contact with the equipment and all questions have been answered correctly.
- we have taken all measures to prevent potential risks that might emanate from the delivered equipment.
- this document will be attached clearly visible and securely to the outside of the transport box.

Company name or stamp: ____________________________

Place, date: ____________________________________

Name (print), job title (print): ____________________

Signature: _____________________________________
10  **Spare parts**

This section lists spare parts, accessories and options including their ordering information. Only order spare parts and consumables from BUCHI to maintain the warranty status and to assure best performance and reliability of the system and affected components. Any modifications to the spare parts used are only allowed with the prior written permission of the manufacturer.

Always state the product designation, instrument serial and part numbers for warranty clearance when ordering spare parts!

10.1  **Enclosed parts**

<table>
<thead>
<tr>
<th>Enclosed parts matrix</th>
<th>F-100</th>
<th>F-105</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains cables</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Control cable RJ45,</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>2 m</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Hose D6/9 2 m,</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2×</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Hose nipple 8 mm,</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4×</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Screw cap GL14,</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4×</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Hose clamp 9.9 mm,</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4×</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Operation Manual</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
10.2 Instrument configuration

<table>
<thead>
<tr>
<th>Instrument versions:</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUCHI Recirculating Chiller</td>
<td></td>
</tr>
<tr>
<td><strong>F-1XX 230 V</strong></td>
<td></td>
</tr>
<tr>
<td>F-100 Model 300 Watt fix at 10 °C</td>
<td>11056460</td>
</tr>
<tr>
<td>F-105 Model 500 Watt controlled</td>
<td>11056462</td>
</tr>
<tr>
<td><strong>F-1XX 115 V</strong></td>
<td></td>
</tr>
<tr>
<td>F-105 Model 500 Watt controlled</td>
<td>11056463</td>
</tr>
</tbody>
</table>

10.3 Spare parts, optional accessories

<table>
<thead>
<tr>
<th>Description</th>
<th>Order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power cable 3 pin, type CH</td>
<td>010010</td>
</tr>
<tr>
<td>Power cable 3 pin, type SCHUKO</td>
<td>010016</td>
</tr>
<tr>
<td>Power cable 3 pin, type GB</td>
<td>017835</td>
</tr>
<tr>
<td>Power cable 3 pin, type AU</td>
<td>017836</td>
</tr>
<tr>
<td>Power cable, 3 pin, type US</td>
<td>010020</td>
</tr>
<tr>
<td>Power cable, 3 pin, type IND</td>
<td>11060536</td>
</tr>
<tr>
<td>Ethernet cable, 2 m, RJ45 Cat. 5e, gray</td>
<td>044989</td>
</tr>
<tr>
<td>Cable RJ45, 5 m</td>
<td>11056240</td>
</tr>
<tr>
<td>Tubing, silicone, 6/9 mm, 1 m, transparent (F-100, F-105)</td>
<td>04133</td>
</tr>
</tbody>
</table>
Set of hose barbs, GL14 olive bent (4 pcs), cap nut (4 pcs) 037287

Hose clamp 9.9 mm 027738

Insulation hose for silicone hose, Kaiflex, 11/23 mm, 1m, black 28696

Y piece tubing coupling, 8 mm 011043

Quick-fit coupling, 12 mm set of 2 pieces 042885
BUCHI Service Contacts:

Europe

Switzerland/Austria
BUCHI Labortechnik AG
CH – 9230 Flawil
T +41 71 394 63 63
F +41 71 394 64 64
service.switzerland@buchi.com
www.buchi.com

Benelux
BUCHI Labortechnik GmbH
Branch Office Benelux
NL – 3342 GT Hendrik-Ido-Ambacht
T +31 78 684 94 29
F +31 78 684 94 30
service.deutschland@buchi.com
www.buchi.com/bx-en

France
BUCHI Sarl
FR – 94656 Rungis Cedex
T +33 1 56 70 62 60
F +33 1 46 86 00 31
service.france@buchi.com
www.buchi.com/fr-fr

Germany
BUCHI 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
service.deutschland@buchi.com
www.buchi.com/de-de

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

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

United Kingdom
BUCHI UK Ltd.
GB – Oldham OL9 9QL
T +44 161 633 1007
F +44 161 633 1007
service.uk@buchi.com
www.buchi.com/gb-en

America

Brazil
BUCHI Brasil Ltda.
BR – Varghinho SP 13271-200
T +55 19 3849 1201
F +55 19 3849 2907
service.brasil@buchi.com
www.buchi.com/br-pt

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
service.usa@buchi.com
www.buchi.com/us-en

Asia

China
BUCHI China
CN – 200233 Shanghai
T +86 21 6280 3366
F +86 21 5330 8821
service.china@buchi.com
www.buchi.com/cn-zh

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

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

Japan
Nihon BUCHI K.K.
JP – Tokyo 110-0008
T +81 3 3821 4777
F +81 3 3821 4555
service.japan@buchi.com
www.buchi.com/jp-ja

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

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

Singapore
BUCHI Singapore Pte. Ltd.
SG – Singapore 609919
T +65 6566 1175
F +65 6566 7047
service.singapore@buchi.com
www.buchi.com/sg-en

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

Middle East
BUCHI Labortechnik AG
UAE – Dubai
T +971 4 313 2860
F +971 4 313 2861
service.middleeast@buchi.com
www.buchi.com

Latin America
BUCHI Latinoamérica
S. de R.L. de C.V.
MX – Mexico City
T +52 55 901 5396
latinoamerica@buchi.com
www.buchi.com/es-es

We are represented by more than 100 distribution partners worldwide.
Find your local representative at: www.buchi.com