WE ARE KELVION – THE NEW HEAT EXCHANGER BRAND

In the future, GEA Heat Exchangers products will be sold under a new brand name: Kelvion. However, the familiar performance and quality will remain constants. The name of Kelvion is indeed new, but we are continuing a successful business as global experts for plate heat exchangers. We wish to enjoy your full confidence in all we do.

You will still be able to recognize us. We will continue to develop our products, manufacture them with the utmost precision and sell them across the globe. We remain the suppliers of one of the world's largest heat exchanger product portfolios: Plate heat exchangers, shell-and-tube heat exchangers, finned tube heat exchangers, cooling tower systems in modular form, and refrigeration plate heat exchangers for multiple fields of application.

These operating instructions are your personal guide explaining design, function, installation, operation, maintenance, troubleshooting, transport and repairs of our Plate heat exchangers in an easy-to-understand and clear manner. They, in particular, aim to avoid possible hazards or damage right from the beginning. This is why all employees working with the Plate heat exchangers (PHE) should have access to these operating instructions at any time.

If any questions remain unanswered, your Kelvion Sales Office or the Central Service Dept. will be glad to help you.

Additional technical information is available for specific applications.

Visit our website:
www.kelvion.com
Here you find your competent Sales Office.

Responsible for the content:
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Karl-Schiller-Str. 1-3
D-31157 Sarstedt
Germany
5 SETTING UP AND CONNECTING THE K°BLOC ........................................ 28
  5.1 INSPECTING THE EQUIPMENT UPON DELIVERY ...................... 28
     5.1.1 TRANSPORT VARIANTS ........................................... 28
     5.1.2 TRANSPORT PARTICULARITIES ................................... 29
  5.2 SPACE REQUIREMENT AT THE PLACE OF INSTALLATION ............. 29
  5.3 REMOVING AND DISPOSING OF TRANSPORT PACKAGING ............. 30
  5.4 TRANSPORTING THE K°BLOC TO THE PLACE OF INSTALLATION AND SETTING IT UP ......................................................... 31
     5.4.1 TRANSPORTING AND SETTING UP A K°BLOC DELIVERED IN UPRIGHT POSITION ........................................... 31
     5.4.2 TRANSPORTING AND SETTING UP A K°BLOC DELIVERED IN HORIZONTAL POSITION ........................................... 36
  5.5 CONNECTING THE K°BLOC ...................................................... 51
     5.5.1 OPTIONAL SAFETY ACCESSORIES .................................. 51
     5.5.2 INSTALLING PIPING .................................................. 52
6 COMMISSIONING AND DECOMMISSIONING, OPERATION ................. 55
  6.1 COMMISSIONING ...................................................................... 55
     6.1.1 PRE-CONDITIONS .................................................... 56
     6.1.2 COMMISSIONING ...................................................... 56
  6.2 OPERATION .............................................................................. 60
  6.3 DECOMMISSIONING ................................................................. 61
     6.3.1 SHORT-TERM PUTTING OUT OF OPERATION .................... 61
     6.3.2 DECOMMISSIONING - MAINTENANCE ............................. 63
     6.3.3 LONG-TERM PUTTING OUT OF OPERATION ................. 64
  6.4 STORAGE .................................................................................. 65
  6.5 DISPOSAL ................................................................................ 65
7 MAINTENANCE ................................................................................. 66
  7.1 OPENING THE K°BLOC ............................................................. 67
     7.1.1 PREPARATIONS ......................................................... 67
     7.1.2 Dismounting the panel .................................................. 69
  7.2 REPLACING THE GASKETS ...................................................... 76
  7.3 REMOVING THE BAFFLE PLATE BRACKET ............................... 77
  7.4 CLOSING THE K°BLOC ............................................................. 78
     7.4.1 INSTALLING A SINGLE PANEL ..................................... 79
     7.4.2 TIGHTENING THE PANEL ............................................ 82
  7.5 LEAKAGE TEST ....................................................................... 93
  7.6 OUTSIDE CLEANING ............................................................... 94
  7.7 CIP CLEANING .......................................................................... 95
7.8 CLEANING BY REVERSE FLUSHING ........................................... 96
7.9 CLEANING THE PLATE PACK WITH THE K°BLOC OPENED ................................................................. 96
  7.9.1 CLEANING PLATES WITH A CHEVRON PATTERN ......................................................................... 96
  7.9.2 CLEANING PLATES WITH "DOUBLE DIMPLE" PATTERN ................................................................. 98

8 TROUBLESHOOTING ........................................................................................................ 99
  8.1 INSUFFICIENT PERFORMANCE .................................................................................. 99
  8.2 LEAKS ......................................................................................................................... 100

9 TECHNICAL TERMS .................................................................................................... 102
1 PRODUCT INFORMATION

This chapter gives you information about the K°Bloc:

- Technical data (page 6)
- Name plate (page 6)
- Technical documentation (page 7)

1.1 TECHNICAL DATA

The technical data of your K°Bloc can be taken from the technical documentation that is included in the delivery.

1.2 NAME PLATE

Every K°Bloc manufactured by Kelvion has a rating plate. The K°Bloc name plate is fitted on one of the panels.

The K°Bloc name plate gives you the following information:

- Manufacturer
- K°Bloc Type
- Serial no.
- Allowable pressures
- Allowable temperatures
- Test pressures
- Volume
- Net weight
- Year of construction
1.3 TECHNICAL DOCUMENTATION

An assembly drawing is delivered with every K°Bloc unit.

This assembly drawing includes among other information:

- the outer dimensions,
- tensioning parameters of threaded bolts to be respected,
- weight and
- type, size and position of piping connections
2 USER INFORMATION

This chapter gives you information on the use of the Operating instructions:

• About these Operating instructions (page 8)
• Validity (page 9)
• Drawings and figures (page 9)
• Emphasized text sections (page 9)

2.1 ABOUT THESE OPERATING INSTRUCTIONS

These Operating instructions contain important information on how to

• install your K°Bloc safely and properly,
• transport it,
• put it into operation,
• operate it,
• maintain it,
• dismount it and
• remove faults.

These original Operating instructions contain information and rules of conduct aiming for safe heat exchanger operation. Read these original Operating instructions carefully before starting work on the K°Bloc. Keep these original Operating instructions so that everyone has access to them.

If you pass the K°Bloc on to third parties, please include these operating instructions and all other documents included in the scope of supply.
2.2 VALIDITY

These Operating instructions apply to:
• the operating company,
• all instructed persons working on or with the K°Bloc,
• all K°Bloc types manufactured and delivered by Kelvion.

2.3 DRAWINGS AND FIGURES

The drawings used in these Operating instructions serve as examples. Many details are simplified. The actual conditions of an individually manufactured K°Bloc cannot be reflected here.

You find binding views and dimensions of the K°Bloc delivered to you in the technical documentation supplied.

2.4 EMPHASIZED TEXT SECTIONS

Important information contained in these Operating instructions are emphasized by symbols or a special font. The following examples illustrate the most important types of highlighting:
• Safety note (page 10)
• Safety instruction (page 10)
• Warnings (page 11)
• Procedure instruction (page 12)
• Sequence of actions (page 12)
• Tip (page 13)
2.4.1 SAFETY NOTE

Safety instructions: Special note for an informative section.

Explanation of note.

• The dot marks measures that consider this note.

2.4.2 SAFETY INSTRUCTION

SAFETY INSTRUCTION

To carry out the work safely, follow precisely the steps described below:

1. Step one of a safety instruction.
   ! Important note regarding this step.

2. Step two of a safety instruction.
   → Result of this step

✓ The safety instruction is finished, the goal of the safety instruction has been reached.
2.4.3 WARNINGS

**DANGER**

**Warning of injuries resulting in death**
Failure to observe the safety note causes very serious damage to your health including death.

-> The arrow marks a precautionary measure you have to take in order to avoid the hazard.

**WARNING**

**Warning of serious injuries**
Failure to observe the warning may cause serious damage to your health including death.

-> The arrow marks a precautionary measure you have to take in order to avoid the hazard.

**CAUTION**

**Warning of injuries**
Failure to observe the warning may cause damage to your health.

-> The arrow marks a precautionary measure you have to take in order to avoid the hazard.

**IMPORTANT NOTE**

**Warning of material damage**
Failure to observe the warning note can cause serious damage to the K°Bloc or in its vicinity.

-> The arrow marks a precautionary measure you have to take in order to avoid the hazard.
2.4.4 PROCEDURE INSTRUCTION

Carry out the following steps: = Start of a procedure instruction.

1. Step one in a sequence of steps.  
   Required settings ........................................ Setting values

2. Second step in a sequence of actions.  
   ➔ Result of this step

   ✔ The action is finished, the goal has been reached.

2.4.5 SEQUENCE OF ACTIONS

Partial goal of the first sequence of actions

↘

Carry out the following steps: = Start of first procedure instruction.

1. Step one of the first sequence of action.  
   ➔ First alternative instruction to the step.  
   ➔ Second alternative instruction to the step.  
   ➔ …  
   ➔ Last alternative instruction to the step.

2. Second step in a sequence of actions.  
   !( Important note regarding this step.

   Partial goal of the first sequence of actions has been reached.
Partial goal of the second sequence of actions

Carry out the following steps: = Start of second procedure instruction.

➤ The only step of the first sequence of action.

❓ Problem. A fault that was to be expected has occurred.
Origin of fault.
➤ Measure for fault removal.

Partial goal of the second sequence of actions has been reached.

✔ The sequence of actions is finished, the goal of the sequence of actions has been reached.

2.4.6 TIP

TIP
Further useful information.
3 OVERVIEW AND DESCRIPTION

This chapter gives you information on the use of the K°Bloc:

- Intended use (page 14)
- Functional description (page 15)
- Basic design (page 16)
- Panel gaskets (page 17)

3.1 INTENDED USE

The K°Bloc is a component intended for permanent installation in a plant or a machine. It serves for heat transmission from the heat-releasing flow medium to a heat-accepting flow medium.

It is basically designed for mostly stationary use.

The K°Bloc was designed and built specifically for the operating conditions you have specified. The operating conditions are documented in the technical documentation:

- min./max. allowed pressure
- min./max. allowed temperature
- flow rates
- type and composition of flow media
- loads if allowed

Deviating from these allowable operating conditions will void the warranty and the operating permit. The same applies to unauthorized modifications on the K°Bloc.

Please contact your Kelvion Sales Office for verifying such requirements and the possibly required modifications.
The intended use also includes:

• compliance with the present operating instructions and the technical documentation included in the delivery;

• that the K°Bloc is in technically flawless condition, i.e. it shows no apparent defects, e.g. loose or missing threaded bolts and/or nuts or defective connections.

### 3.2 FUNCTIONAL DESCRIPTION

Fully welded K°Bloc plate heat exchangers offer a large heat transfer surface with very compact design. They have been dimensioned to suit your application. The basic structure of a K°Bloc is shown below. The specific execution depends on the application. K°Bloc are made from fully welded heat exchanger plates. The individual plates are welded together on two longitudinal sides and at the corners. This creates two pressure-resistant and separate chambers inside the unit. The resulting plate pack is bolted between four columns, four panels and top and bottom head. The result is a compact plate heat exchanger with two circuits. The K°Bloc is connected to the piping by the connections provided in the panels.
3.3 BASIC DESIGN

The basic structure of a K°Bloc is shown below. The specific execution depends on the application.

**Legend**

<table>
<thead>
<tr>
<th>No.</th>
<th>Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Threaded holes for lifting equipment</td>
</tr>
<tr>
<td>2</td>
<td>Top head with lifting lug</td>
</tr>
<tr>
<td>3</td>
<td>Threaded bolt</td>
</tr>
<tr>
<td>4</td>
<td>Column</td>
</tr>
<tr>
<td>5</td>
<td>Baffle plate bracket</td>
</tr>
<tr>
<td>6</td>
<td>Threaded holes for push-off bolts</td>
</tr>
<tr>
<td>7</td>
<td>Nuts and washers</td>
</tr>
</tbody>
</table>

Components of the K°Bloc
3.4 PANEL GASKETS

The panel gaskets are wear parts and sensitive to chemical, thermal and mechanical damage. The gasket material and its properties are selected on the basis of the customer’s specifications (pressure, temperature, media).
4 IMPORTANT SAFETY INFORMATION

This chapter gives you information on how to operate the K°Bloc safely:
• Operational safety (page 18)
• Residual hazards on the K°Bloc (page 24)
• Personnel qualification (page 23)
• Obligations of unit operating company (page 22)
• Personal protective equipment (page 23)
• Additional protective equipment (page 24)
• Notes / decals on the K°Bloc (page 26)

4.1 OPERATIONAL SAFETY

The K°Bloc has been manufactured in accordance with the state of the art and the recognized safety rules. The K°Bloc can still be the origin of hazards to persons and material assets if you
• fail to observe this chapter,
• fail to observe the warnings in these Operating instructions,
• fail to use the K°Bloc in accordance with the intended use.

For these reasons, read this chapter attentively. It contains important information and obligations. It concerns your health and the troublefree operation of the K°Bloc.
4.2 SAFETY INFORMATION

4.2.1 INFORMATION ON TRANSPORTATION AND SETTING UP

A safety-conscious approach by personnel and acting with foresight avoids dangerous situations while setting up and connecting the K°Bloc.

The fundamental rules below apply to transportation:

- Transportation may be carried out only by personnel that is qualified to perform this task.
- Access for unauthorized persons must be blocked. If necessary, signs focusing the attention to the transport must be put up.
- Moving parts must be properly safeguarded.
- Suitable and flawless lifting equipment (crane, ...) and load holding devices (shackles and round slings, ...) must be used for all transportations.
- The transportation has to consider the weight of the K°Bloc and the position of the point of gravity.

Prepare the K°Bloc for transportation as follows:

- Secure the K°Bloc against slipping off and tipping over, observe the position of the point of gravity.
- Secure any moving parts.

Observe the following information during transportation:

- Accident prevention regulations and local regulations.
- No persons are allowed underneath suspended loads.
- Use lifting equipment only in the specified way.
- Lifting equipment must be designed and approved for the weight of the K°Bloc.
- Use only lifting equipment if in flawless condition.
- Fasten the load holding devices only at the described points.
- Transport the K°Bloc carefully. Do not lift, push or support the unit on any sensitive parts.
- Protect the K°Bloc and the lifting equipment against damage.
4.2.2 OPERATIONAL INFORMATION

The fundamental rules below apply to the operation of the K°Bloc:

- Ensure that all protective measures relevant for the flow medium in question have been installed and are respected.
- When operating the unit with hazardous flow media, it must be ensured that these are reliably collected in case of a leak on the K°Bloc.
- Ensure that the K°Bloc installed is suitable for the flow media and their properties.
- Bring the K°Bloc to the operating temperatures of the two circuits by means of the flow media at low pressure.
- Avoid quick temperature changes (maximum temperature change: 5 K/min.).
- Respect the maximum temperature difference of the flow media of 200 K max. between the hot and the cold side.
- Ensure that under all setting-up and operating conditions, the temperature never falls below the freezing temperature of the flow media used.

4.2.3 MAINTENANCE INFORMATION

When performing maintenance work:

- Prepare a time schedule for regular maintenance work in order to enable reliable unit operation.
- Prior to K°Bloc maintenance, we recommend that you contact your Kelvion Sales Office (see rear cover).
4.2.4 DISMOUNTING INFORMATION

When performing maintenance work on the K°Bloc, never remove the corner bolts. Removing the corner bolts will void the warranty.

Corner bolts (variant 1 and variant 2)
4.3 OBLIGATIONS OF UNIT OPERATING COMPANY

The operating company is responsible for the safe operation of the K°Bloc.

4.3.1 ENSURING SAFE OPERATION

As the operating company, you must ensure that:

• the K°Bloc is operated in line with its intended use exclusively;
• suitable safety precautions are taken so that the permitted K°Bloc pressure is not exceeded by more than 10%.
• the K°Bloc is vented in the installed plant;
• there will be no wear of certain K°Bloc components due to unfavourable ambient conditions.
• all maintenance/inspection work is carried out at regular intervals. You must fix the intervals as a function of field of use, flow media, hazard potentials and regulations in force for the operations;
• that the personnel regularly inspects the K°Bloc for leaks.
• Leaks must be repaired without delay if required.

4.3.2 TRAINING OF PERSONNEL

As the operating company, you must train your personnel regularly in the aspects below:

• compliance with and use of the Operating instructions and of legal provisions;
• use of the K°Bloc in line with the intended use;
• compliance with the Operating companies' instructions in force;
• behaviour in case of emergency.
4.4 PERSONNEL QUALIFICATION

Persons entrusted with setting-up, transportation, installation, commissioning, operation, dismounting or maintenance of the K°Bloc must have the following knowledge:

• basic mechanical knowledge,
• knowledge of the plant into which the K°Bloc is integrated,
• knowledge of the associated technical terms.

To ensure operational safety, these activities may be carried out only by a properly qualified specialist or an instructed person being supervised by a specialist.

Specialists are persons who, on account of their technical training, knowledge and experience as well as due to their knowledge of relevant provisions, are able to

• assess the work entrusted to them,
• identify possible dangers and
• take suitable safety measures.

A specialist must comply with the relevant technical rules, e.g. the accident prevention regulations.

4.5 PERSONAL PROTECTIVE EQUIPMENT

The personal protective equipment for work with and on the K°Bloc includes:

• sturdy gloves,
• protective clothing,
• safety footwear,
• safety helmet,
• eye or face protection.
4.6 ADDITIONAL PROTECTIVE EQUIPMENT

Depending on the type of flow media used, you have to fit additional protective equipment.

Hazardous flow media:
- Fit a tray with a sufficient volume beneath the K°Bloc for collecting its entire content. This tray must be made of a material that resists the flow media permanently.
- When using explosive and flammable media, provide earthing.

When using cold flow media (below 0 °C):
- fit an insulation in order to prevent freezing up of the K°Bloc,
- provide a protection against accidental contact in order to avoid frost-bites of persons,
- set up warning signs alerting persons of the low temperatures.

When using hot flow media (above 50 °C):
- provide a protection against accidental contact to keep persons from suffering burns;
- set up warning signs alerting persons of the high temperatures.

4.7 RESIDUAL HAZARDS ON THE K°BLOC

Wearing personal protection equipment and safety-conscious and foresighted behaviour by personnel avoids dangerous situations.
## Residual hazards on the K°Bloc and measures

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Cause</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Danger of injury</strong></td>
<td>The K°Bloc is heavy. If it falls over or falls down during transport, persons may be killed or seriously injured.</td>
<td>Transport the K°Bloc to its intended position with the transport packaging if possible. Use sufficiently dimensioned lifting equipment exclusively for handling the K°Bloc at the place of installation. Never stand underneath suspended loads and keep other persons away. For opening the K°Bloc, the panels on the longitudinal sides of the K°Bloc must be removed. This involves danger of injury due to the high weight of the panels. Secure the heavy panels so they will not fall over or fall down when opening the K°Bloc.</td>
</tr>
<tr>
<td><strong>Damage to the K°Bloc</strong></td>
<td>Vertical K°Bloc units may tip over easily.</td>
<td>Put up a K°Bloc delivered in a horizontal position only directly before it is installed. Secure the upright PHE against tipping over by bolting it to the ground. Remove the lifting devices used only after the K°Bloc has been fastened to the ground.</td>
</tr>
<tr>
<td><strong>Hazardous flow media</strong></td>
<td>The use of dangerous flow media (explosive, flammable, caustic, toxic) involves danger of chemical burns, fire burns or intoxication.</td>
<td>Wear suitable protective clothing when working on the K°Bloc. Ensure that the K°Bloc is depressurized and empty prior to opening.</td>
</tr>
<tr>
<td><strong>Danger of frostbites or burns.</strong></td>
<td>The flow media may be colder than 0 °C and hotter than +50 °C.</td>
<td>Protect persons by providing a protection against accidental contact. Provide warning signs warning of frostbite and burns.</td>
</tr>
</tbody>
</table>
### 4.8 NOTES / DECALS ON THE K°BLOC

#### Overview of notes / decals on the K°Bloc

<table>
<thead>
<tr>
<th>Notes / decals</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only marked lifting / fixation lugs to be used for transport!</td>
<td>Indication of marked slinging points for lifting: Large-size K°Bloc units with lifting eyes that cannot be clearly identified have this decal pointing to further markings.</td>
</tr>
</tbody>
</table>

![Attention](image) ATTENTION

<table>
<thead>
<tr>
<th>Attach lifting device here only!</th>
<th>Slinging point for lifting: Only a lifting eye (or several lifting eyes) marked with this decal is approved for lifting and for suspended transportation of the entire K°Bloc unit:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• on vertical K°Bloc units, on the lifting eye(s) on the top cover plate;</td>
</tr>
<tr>
<td></td>
<td>• on horizontal K°Bloc units, on the lateral lifting eyes.</td>
</tr>
</tbody>
</table>
Transport safeguard:
An eye marked with this decal can be used as transport safeguard for securing the loaded K°Bloc unit against slipping.

<table>
<thead>
<tr>
<th>Notes / decals</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use this lug for fastening during transport only</td>
<td>Transport safeguard: An eye marked with this decal can be used as transport safeguard for securing the loaded K°Bloc unit against slipping.</td>
</tr>
</tbody>
</table>
5 SETTING UP AND CONNECTING THE K°BLOC

This chapter gives you information on how to set up and connect the K°Bloc:

• Inspecting the equipment upon delivery (page 28)
• Space requirement at the place of installation (page 29)
• Removing and disposing of transport packaging (page 30)
• Transporting the K°Bloc to the place of installation and setting it up (page 31)
• Connecting the K°Bloc (page 51)

5.1 INSPECTING THE EQUIPMENT UPON DELIVERY

Should you discover that the unit is damaged upon delivery despite careful packaging, absolutely note the scope and type of damage in the freight documents and have these documents signed by the deliverer.

5.1.1 TRANSPORT VARIANTS

The completely assembled K°Bloc is packed either horizontally or vertically, depending on the version. The piping connections are plugged.

5.1.1.1 K°BLOC DELIVERED IN UPRIGHT POSITION

Some K°Bloc units delivered in an upright position are fixed on wooden boards or pallets.

5.1.1.2 K°BLOC DELIVERED IN HORIZONTAL POSITION

Vertical-type K°Bloc delivered in horizontal position are fastened on pallets to ensure safe transportation. All horizontal-type K°Bloc are transported in horizontal position.
5.1.2 TRANSPORT PARTICULARITIES

Particular transport conditions apply to some K°Bloc units:

- The K°Bloc may be filled with inert gas at an excess pressure of 1 bar max. CAUTION! Relieve the pressure at the associated drain valve before dismounting the transport flanges.

5.2 SPACE REQUIREMENT AT THE PLACE OF INSTALLATION

Ensure sufficient free space around the K°Bloc. The required free space of at least 1 m on all sides is a guideline value and recommended by Kelvion.

This free space enables sufficient access to the K°Bloc and makes maintenance work easier.

Recommended lateral clearance for vertical- and horizontal-type K°Bloc units
**TIP**

If necessary, dismount inlet/outlet lines to provide enough space for manoeuvring at the place of installation.

---

### 5.3 REMOVING AND DISPOSING OF TRANSPORT PACKAGING

Transport the packaged K°Bloc in its transport packaging as long as possible. This is to prevent damage to the K°Bloc on its way to the place of installation. Remove the transport packaging only at the place of installation if possible.

Carry out the following steps:

1. Remove the transport packaging.
   - Leave the transport plugs on the piping connections if you do not fit the piping immediately. Leave the K°Bloc bolted down to the transport support until it has been transported to its final place of installation.

2. In case of seaworthy packaged K°Bloc units, remove the desiccant packs including those in the connections without damaging them.

3. Dispose of the transport packaging in accordance with applicable regulations.

✔ Done.
5.4 TRANSPORTING THE K°BLOC TO THE PLACE OF INSTALLATION AND SETTING IT UP

This chapter gives you information on how to transport the K°Bloc to its place of installation:

- Transporting and setting up a K°Bloc delivered in upright position (page 31)
- Transporting and setting up a K°Bloc delivered in horizontal position (page 36)

5.4.1 TRANSPORTING AND SETTING UP A K°BLOC DELIVERED IN UPRIGHT POSITION

Requirement:

- The K°Bloc is still packaged.

Tools required:

- Lifting equipment with sufficient load-carrying capacity
- Load holding devices (round slings with shackles) with sufficient load-carrying capacity
**WARNING**

**Danger of injury by heavy weight of K°Bloc!**

The K°Bloc may slip off and fall down during transport when incorrectly fastened. You may suffer serious injuries and bruises in such an accident.

- Never stand underneath suspended loads!
- Always use approved load holding devices with sufficient load-carrying capacity!
- Always use approved lifting equipment with sufficient load-carrying capacity!
- Wear safety shoes at all times!
- Lift and lower the K°Bloc evenly and slowly. Transport the unit vertically at all times!
- Never transport the K°Bloc at the threaded bolts!
- Fasten the load holding devices only at the marked fastening points for transporting the K°Bloc!
- Never attach the lifting slings to the connections!
- Avoid any pendulum movements of the K°Bloc!

Carry out the following steps:

1. Fit the following shackles:
   - one shackle at the transport lifting eye for the vertical K°Bloc of the "single eye" version;
   - two shackles at two transport lifting eyes for the vertical K°Bloc of the "double eye" version;
   - two shackles at two opposite transport lifting eyes for the vertical K°Bloc of the "crosswise double eye" version.
2. Guide a suitable round sling through each of the installed shackles.

3. Hang the round slings into the hook of the lifting equipment.

   The vertical-type K°Bloc delivered in upright position has now been properly fastened to the lifting equipment.
Kevion

Transporting a vertical-type K°Bloc delivered in upright position to the place of instal-
lation

Carry out the following steps:

1. Carefully lift the K°Bloc.
   ! Make sure that you lift the K°Bloc only as high as necessary.

2. Transport the K°Bloc carefully to its intended place of installation.
   ! Make sure that you lift the K°Bloc only as high as necessary.

3. Put down the K°Bloc carefully at its intended place of installation.
   
   The vertical-type K°Bloc delivered in upright position has now arrived at its place of installation.
Setting up a vertical-type K°Bloc delivered in upright position at the place of installation.

Carry out the following steps:

1. Remove the transport packaging, see section „5.3 Removing and disposing of transport packaging“ (page 30).

2. Carefully lift the K°Bloc.
   
   ! Make sure that you lift the K°Bloc only as high as necessary.

3. Put down the K°Bloc carefully at its intended position.

4. Anchor the K°Bloc to the foundation, using suitably dimensioned bolts and nuts.
5. Remove the shackles and round slings from the lifting eyes.

   The vertical-type K°Bloc delivered in upright position has now been set up at its place of installation.

   ✓ Done.

5.4.2 TRANSPORTING AND SETTING UP A K°BLOC DELIVERED IN HORIZONTAL POSITION

All horizontal-type K°Bloc are transported in horizontal position. Some vertical-type K°Bloc units are also transported in horizontal position due to their weight and height. Depending on the type, K°Bloc units must be fastened to the lifting equipment and lifted in different ways:

- Horizontal-type K°Bloc | standard K°Bloc (page 37)
- Horizontal-type K°Bloc | special-design K°Bloc (page 41)
- Vertical-type K°Bloc - delivered in horizontal position (page 45)
5.4.2.1 HORIZONTAL-TYPE K°BLOC | STANDARD K°BLOC

The horizontal-type K°Bloc can be fastened and transported either with a cross-beam or with round slings and shackles. The section below describes how to properly fasten and transport the unit using round slings and shackles.

Requirement:

- The K°Bloc is still packaged.

Tools required:

- Lifting equipment with sufficient load-carrying capacity
- Load holding devices (round slings with shackles or suitable cross-beam) with sufficient load-carrying capacity

Fastening a horizontal-type K°Bloc delivered in horizontal position | standard K°Bloc properly

⚠️ WARNING

Danger of injury by heavy weight of K°Bloc!

The K°Bloc may slip off and fall down during transport when incorrectly fastened. You may suffer serious injuries and bruises in such an accident.

- Never stand underneath suspended loads!
- Always use approved load holding devices with sufficient load-carrying capacity!
- Always use approved lifting equipment with sufficient load-carrying capacity!
- Wear safety shoes at all times!
- Lift and lower the K°Bloc evenly and slowly. Transport the unit horizontally at all times!
- Never transport the K°Bloc at the threaded bolts!
- Fasten the load holding devices only at the marked fastening points for transporting the K°Bloc!
- Never attach the lifting slings to the connections!
- Avoid any pendulum movements of the K°Bloc!

Carry out the following steps:
1. Fit one shackle each to the lifting eyes above the support angles of the horizontal-type K°Bloc | standard K°Bloc.

2. Guide one suitable round sling each through one of the two installed shackles.
3. Hang the two round slings into the hook of the lifting equipment.

The horizontal-type K°Bloc delivered in horizontal position | standard K°Bloc has now been properly fastened to the lifting equipment.

Transporting a horizontal-type K°Bloc delivered in horizontal position | standard K°Bloc to the place of installation

Carry out the following steps:

1. Carefully lift the K°Bloc.
   ! Make sure that you lift the K°Bloc only as high as necessary.

2. Transport the K°Bloc carefully to its intended place of installation.
   ! Make sure that you lift the K°Bloc only as high as necessary.

3. Put down the K°Bloc carefully at its intended place of installation.

   The horizontal-type K°Bloc delivered in horizontal position | standard K°Bloc has now been transported to the place of installation.
Setting up a horizontal-type K°Bloc delivered in horizontal position | standard K°Bloc at the place of installation

Carry out the following steps:

1. Remove the transport packaging, see section „5.3 Removing and disposing of transport packaging“ (page 30).

2. Carefully lift the K°Bloc.
   ! Make sure that you lift the K°Bloc only as high as necessary.

3. Put down the K°Bloc carefully at its intended position.

4. Anchor the K°Bloc to the foundation, using suitably dimensioned bolts and nuts.

5. Remove the two shackles and round slings from the lifting eyes above the support angles.

The horizontal-type K°Bloc delivered in horizontal position | standard K°Bloc has now been set up at the place of installation.

✔ Done.
5.4.2.2 HORIZONTAL-TYPE K°BLOC | SPECIAL-DESIGN K°BLOC

The horizontal-type K°Bloc can be fastened and transported either with a cross-beam or with round slings and shackles. The section below describes how to properly fasten and transport the unit using round slings and shackles.

Requirement:
• The K°Bloc is still packaged.

Tools required:
• Lifting equipment with sufficient load-carrying capacity
• Load holding devices (round slings with shackles or suitable cross-beam) with sufficient load-carrying capacity

Fastening a horizontal-type K°Bloc delivered in horizontal position | special-design K°Bloc properly

WARNING

Danger of injury by heavy weight of K°Bloc!
The K°Bloc may slip off and fall down during transport when incorrectly fastened. You may suffer serious injuries and bruises in such an accident.
➢ Never stand underneath suspended loads!
➢ Always use approved load holding devices with sufficient load-carrying capacity!
➢ Always use approved lifting equipment with sufficient load-carrying capacity!
➢ Wear safety shoes at all times!
➢ Lift and lower the K°Bloc evenly and slowly. Transport the unit horizontally at all times!
➢ Never transport the K°Bloc at the threaded bolts!
➢ Fasten the load holding devices only at the marked fastening points for transporting the K°Bloc!
➢ Never attach the lifting slings to the connections!
➢ Avoid any pendulum movements of the K°Bloc!

Carry out the following steps:
1. Fit two shackles each to the support angles of the horizontal-type K°Bloc | special-design K°Bloc.

2. Guide one suitable round sling each through one of the four installed shackles.
3. Hang the two round slings on each side into the respective hook of the lifting equipment.

The horizontal-type K°Bloc delivered in horizontal position | special-design K°Bloc has now been properly fastened to the lifting equipment.

Transporting a horizontal-type K°Bloc delivered in horizontal position | special-design K°Bloc to the place of installation

Carry out the following steps:

1. Carefully lift the K°Bloc.
   ! Make sure that you lift the K°Bloc only as high as necessary.

2. Transport the K°Bloc carefully to its intended place of installation.
   ! Make sure that you lift the K°Bloc only as high as necessary.

3. Put down the K°Bloc carefully at its intended place of installation.

The horizontal-type K°Bloc delivered in horizontal position | special-design K°Bloc has now been transported to the place of installation.
Setting up a horizontal-type K°Bloc delivered in horizontal position | special-design K°Bloc at the place of installation

Carry out the following steps:

1. Remove the transport packaging, see section „5.3 Removing and disposing of transport packaging“ (page 30).
2. Carefully lift the K°Bloc.
   ! Make sure that you lift the K°Bloc only as high as necessary.
3. Put down the K°Bloc carefully at its intended position.
4. Anchor the K°Bloc to the foundation, using suitably dimensioned bolts and nuts.
5. Remove the four shackles and round slings from the support angles.

The horizontal-type K°Bloc delivered in horizontal position | special-design K°Bloc has now been set up at the place of installation.

✔️ Done.
5.4.2.3 VERTICAL-TYPE K°BLOC - DELIVERED IN HORIZONTAL POSITION

The vertical-type K°Bloc can be either transported with a fork lift truck when fastened to the transport pallet or fastened and transported with round slings and shackles. The section below describes how to properly fasten and transport the unit using round slings and shackles as an example.

Requirement:
- The K°Bloc is still packaged.

Tools required:
- Lifting equipment with sufficient load-carrying capacity
- Load holding devices (round slings with shackles or suitable cross-beam) with sufficient load-carrying capacity

Fastening a vertical-type K°Bloc delivered in horizontal position properly

⚠️ WARNING

Danger of injury by heavy weight of K°Bloc!

The K°Bloc may slip off and fall down during transport when incorrectly fastened. You may suffer serious injuries and bruises in such an accident.

➤ Never stand underneath suspended loads!
➤ Always use approved load holding devices with sufficient load-carrying capacity!
➤ Always use approved lifting equipment with sufficient load-carrying capacity!
➤ Wear safety shoes at all times!
➤ Lift and lower the K°Bloc evenly and slowly.
➤ Never lift or lower the K°Bloc diagonally to the direction of the transportation lifting lug.
➤ Never transport the K°Bloc at the threaded bolts!
➤ Fasten the load holding devices only at the marked fastening points for transporting the K°Bloc!
➤ Never attach the lifting slings to the connections!
➤ Avoid any pendulum movements of the K°Bloc!
Carry out the following steps:

1. Ensure that the transportation lifting lug on the K°Bloc is in a vertical position.

2. Fit the following:
   - one shackle at the transport lifting eye for the vertical K°Bloc of the "single eye" version;
   - one shackle at the upper transport lifting eye for the vertical K°Bloc of the "double eye" version.

   ! Take care that when the K°Bloc is lifted at a later stage the tensile forces act on the transportation lifting lugs as shown in the following illustration.

   If transportation lifting lug are used in the horizontal position, there is a danger of the transportation lifting lug buckling. Therefore, always ensure before lifting that the transportation lifting lug is in the vertical position.

3. Fit two shackles to the two upper openings at the foot.
4. Guide a suitable round sling through each of the installed shackles.

5. Hang the round slings on each side into the respective hook of the lifting equipment.

The vertical-type K°Bloc delivered in horizontal position has now been properly fastened to the lifting equipment.
Straightening up a vertical-type K*Bloc delivered in horizontal position at the place of installation

Carry out the following steps:

1. Carefully lift the K*Bloc on both sides.
   ! Make sure that you lift the K*Bloc only as high as necessary.

2. Move the K*Bloc to a vertical position by suitably lifting (at the Transport lifting eye) and lowering (at the foot) the lifting equipment.
3. Lower the lifting equipment at the foot so that you can remove the two shackles from the foot.

4. Remove the corresponding shackles and round slings.

5. Put down the K°Bloc carefully with the lifting equipment fastened to the lifting eye.

The vertical-type K°Bloc delivered in horizontal position has now arrived at its place of installation and has been set up.

Setting up a vertical-type K°Bloc delivered in horizontal position at the place of installation

Carry out the following steps:

1. Remove the transport packaging, see section „5.3 Removing and disposing of transport packaging“ (page 30).

2. For the vertical K°Bloc "double eye" and "crosswise double eye" type, fit the second shackle at the opposite opening of the transport lifting eye.

3. Guide one suitable round sling through the additionally fitted shackle.

4. Hang the round slings onto the hook of the lifting equipment.

5. Carefully lift the K°Bloc.
   
   ! Make sure that you lift the K°Bloc only as high as necessary.

6. Put down the K°Bloc carefully at its intended position.
7. Anchor the K°Bloc to the foundation, using suitably dimensioned bolts and nuts.

8. Remove the shackle and round sling from the lifting eye.

The vertical-type K°Bloc delivered in horizontal position has now been set up at its place of installation.

✅ Done.
5.5 CONNECTING THE K°BLOC

This chapter gives you information on how to connect the K°Bloc:
- Optional safety accessories (page 51)
- Installing piping (page 52)

5.5.1 OPTIONAL SAFETY ACCESSORIES

If you wish to use the K°Bloc with hazardous flow media (e.g. explosive, flammable, caustic, toxic, under high pressure, very hot or very cold), ensure that the safety accessories below are provided or fitted:

<table>
<thead>
<tr>
<th>Required safety accessories</th>
<th>Properties of flow media</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>highly explosive</td>
</tr>
<tr>
<td>Collecting tray</td>
<td>x</td>
</tr>
<tr>
<td>Splash protection</td>
<td>x</td>
</tr>
<tr>
<td>Earthing lug</td>
<td>x</td>
</tr>
<tr>
<td>Insulation</td>
<td></td>
</tr>
<tr>
<td>Warning sign</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Required safety accessories</th>
<th>Properties of flow media</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>very cold</td>
</tr>
<tr>
<td>Collecting tray</td>
<td></td>
</tr>
<tr>
<td>Splash protection</td>
<td></td>
</tr>
<tr>
<td>Earthing lug</td>
<td></td>
</tr>
<tr>
<td>Insulation</td>
<td>x</td>
</tr>
<tr>
<td>Warning sign</td>
<td>x¹</td>
</tr>
</tbody>
</table>
5.5.2 INSTALLING PIPING

Requirement:
- All inlet and outlet lines to/from the K°Bloc are closed and secured against unintended opening.

Tools required:
- Standard tool set
**WARNING**

Danger of injury due to hazardous flow media!
When using hazardous flow media (explosive, flammable, corrosive, toxic, high pressure, very hot or very cold) in the K°Bloc, you may suffer serious injuries.

- Check the safety accessories fitted on the K°Bloc, see chapter „5.5.1 Optional safety accessories“ (page 51)!
- Wear the prescribed safety equipment relevant for the flow medium in question!
- Wear your personal protective equipment during all work!

**WARNING**

Hazard due to deactivated safety equipment!
When deactivating safety equipment for installation, maintenance or commissioning work, you or other persons may be seriously injured and you have to ensure that this produces no hazard to persons and material assets.

- Make sure at all times that no persons can be injured due to safety equipment that has been put out of operation!
- Always inform all persons involved when you put safety equipment out of operation!
- When using environmentally hazardous media, ensure that these can be reliably collected in case of a K°Bloc leak and cannot pollute the environment!
- Observe the locally applicable instruction manual of the plant where the K°Bloc is integrated.
IMPORTANT NOTE

Damage to piping connections and to K°Bloc due to excessive forces and torques!

When excessive forces and torques are transmitted on the K°Bloc connections through the piping, the piping connections and/or the K°Bloc may be damaged.

- You can take the forces and torques permitted for your K°Bloc from the technical documentation.
- Ensure that the forces and torques transmitted from the piping to the K°Bloc connections are not too high.

Carry out the following steps:

1. Check on the K°Bloc if all safety accessories required for the flow medium used are fitted, see chapter „5.5.1 Optional safety accessories“ (page 51).
2. Open the valve on K°Bloc units filled with compressed air or inert gases.
3. Lay all necessary pipes.
4. Connect the inlet and outlet pipes to the connections of the K°Bloc.
5. Check if all pipes and connections are tight.

✓ Done.
6 COMMISSIONING AND DECOMMISSIONING, OPERATION

This chapter gives you information on how to put the K°Bloc into and out of operation and how to operate it:
- Commissioning (page 55)
- Operation (page 60)
- Decommissioning (page 61)
- Storage (page 65)
- Disposal (page 65)

6.1 COMMISSIONING

This chapter gives you information on how to put the K°Bloc into operation:
- Pre-conditions (page 56)
- Commissioning (page 56)
6.1.1 PRE-CONDITIONS

Before commissioning the K°Bloc, you must ensure that you are able to answer the questions below with "Yes":

- Have all necessary safety equipment items been installed and do they work flawlessly? (See chapter „Setting up and connecting the K°Bloc“ > „Optional safety accessories“ (page 51))
- Are only authorized persons present near the K°Bloc?
- Are there no persons in hazard area of the K°Bloc?
- Can nobody be injured during the commissioning of the K°Bloc?
- Have all nuts been tightened to the torques or tightening dimensions specified in the technical documentation?
- Is the K°Bloc free of residues from previous processes (cleaning media)?
- Do you know what to do in case of malfunction?
- Are all persons working in the hazard area wearing their protective clothing?

6.1.2 COMMISSIONING

Before commissioning the K°Bloc, read the chapter „Important safety information“ > „Important safety information“ (page 18).

Requirement:

- All inlet and outlet lines to/from the K°Bloc are closed and secured against unintended opening.
**WARNING**

**Danger of injury due to hazardous flow media!**
When using hazardous flow media (explosive, flammable, corrosive, toxic, high pressure, very hot or very cold) in the K°Bloc, you may suffer serious injuries.

- Check the safety accessories fitted on the K°Bloc, see chapter „5.5.1 Optional safety accessories“ (page 51)!
- Wear the prescribed safety equipment relevant for the flow medium in question!
- Wear your personal protective equipment during all work!

**WARNING**

**Hazard due to deactivated safety equipment!**
When deactivating safety equipment for installation, maintenance or commissioning work, you or other persons may be seriously injured and you have to ensure that this produces no hazard to persons and material assets.

- Make sure at all times that no persons can be injured due to safety equipment that has been put out of operation!
- Always inform all persons involved when you put safety equipment out of operation!
- When using environmentally hazardous media, ensure that these can be reliably collected in case of a K°Bloc leak and cannot pollute the environment!
- Observe the locally applicable instruction manual of the plant where the K°Bloc is integrated.
IMPORTANT NOTE

Damage to the K°Bloc due to sudden temperature changes and temperature differences!

Sudden temperature changes and major temperature differences of the flow media may damage the inside of the K°Bloc.

- Bring the K°Bloc to the operating temperatures of the two circuits by means of the flow media at low pressure.
- Avoid quick temperature changes (maximum temperature change: 5 K/min.).
- Respect the maximum temperature difference of the flow media of 200 K max. between the hot and the cold side.
- Ensure that under all setting-up and operating conditions, the temperature never falls below the freezing temperature of the flow media used.

IMPORTANT NOTE

Damage to piping connections and to K°Bloc due to excessive pressure variations, forces and torques!

When excessive forces and torques are transmitted on the K°Bloc connections through the piping, the piping connections and/or the K°Bloc may be damaged.

- You can take the forces and torques permitted for your K°Bloc from the technical documentation.
- Ensure that the forces and torques transmitted from the piping to the K°Bloc connections are not too high.
- Always open or close the valves of the piping connected to the K°Bloc slowly.
- Prevent damage to the K°Bloc due to sudden pressure rise (liquid hammer) or sudden pressure drop (cavitation hammer)
- Avoid sudden evaporation and condensation of gases by suitable process control.
- Respect pressure variations of max. 2 bar/min. (1.4404/316L) and 0.5 bar/min. for other materials.
Chapter 6
Commissioning and decommissioning, operation

Carry out the following steps:

1. Check on the K°Bloc if all safety accessories required for the flow medium used are fitted, see chapter „5.5.1 Optional safety accessories“ (page 51).

2. Check if all nuts have been tightened to the torques or tightening dimensions specified in the technical documentation and correct if necessary.

3. Vent the K°Bloc completely.

4. Always open or close the valves of the piping connected to the K°Bloc slowly.

5. Avoid sudden condensation of gases by suitable process control.

6. Check if all pipes and connections are tight.

✓ Done.
6.2 OPERATION

Safety instructions: Functional failure of gaskets!

Operation at unpermitted pressure and temperature levels and with unpermitted media may cause direct functional failure of the gaskets. Hazardous media may escape under high pressure and high or low temperatures and injure persons.

- Always comply with the allowed values and specifications according to the name plate.

Safety instructions: Compliance with operating pressure and differential pressure!

The operating pressure values must be kept as stable as possible. Repeated pressure variations resulting in the pressure conditions being reversed (e.g. by opening/closing a throttle valve) may damage the plate pack and cause leaks between the circuits.

- Unless otherwise specified in the technical documentation, the recommended differential pressure between the two circuits is more than 1 bar.

The operator must check if the K°Bloc works correctly at regular intervals.

Keep an eye in particular on the following possible malfunctions:

- Is a medium escaping from the K°Bloc?
- Is there any unusual noise?

If you notice a malfunction, stop operation of the K°Bloc immediately, see chapter „6.3.1 Short-term putting out of operation“ (page 61). Remove the cause of the malfunction as far as you are authorized to do so. In doing so, observe chapters „7 Maintenance“ (page 66) and „8 Troubleshooting“ (page 99).
6.3 DECOMMISSIONING

Before putting the K°Bloc out of operation, read the chapter „Important safety information“ > „Important safety information“ (page 18).

6.3.1 SHORT-TERM PUTTING OUT OF OPERATION

**WARNING**

Danger of injury due to hazardous flow media!
If hazardous media (explosion-hazardous, flammable, caustic, toxic, high pressure, very hot or very cold) flow through the K°Bloc, you may get seriously injured.

- Check the safety accessories fitted on the K°Bloc, see chapter „5.5.1 Optional safety accessories“ (page 51)!
- Wear the prescribed safety equipment relevant for the flow medium in question!
- Wear your personal protective equipment during all work!

**WARNING**

Hazard due to deactivated safety equipment!
When deactivating safety equipment for installation, maintenance or commissioning work, you or other persons may be seriously injured and you have to ensure that this produces no hazard to persons and material assets.

- Make sure at all times that no persons can be injured due to safety equipment that has been put out of operation!
- Always inform all persons involved when you put safety equipment out of operation!
- When using environmentally hazardous media, ensure that these can be reliably collected in case of a K°Bloc leak and cannot pollute the environment!
- Observe the locally applicable instruction manual of the plant where the K°Bloc is integrated.
**IMPORTANT NOTE**

Damage to the K°Bloc due to sudden temperature changes and temperature differences!

Sudden temperature changes and major temperature differences of the flow media may damage the inside of the K°Bloc.

- Bring the K°Bloc to the operating temperatures of the two circuits by means of the flow media at low pressure.
- Avoid quick temperature changes (maximum temperature change: 5 K/min.).
- Respect the maximum temperature difference of the flow media of 200 K max. between the hot and the cold side.
- Ensure that under all setting-up and operating conditions, the temperature never falls below the freezing temperature of the flow media used.

**IMPORTANT NOTE**

Damage to piping connections and to K°Bloc due to excessive pressure variations, forces and torques!

When excessive forces and torques are transmitted on the K°Bloc connections through the piping, the piping connections and/or the K°Bloc may be damaged.

- You can take the forces and torques permitted for your K°Bloc from the technical documentation.
- Ensure that the forces and torques transmitted from the piping to the K°Bloc connections are not too high.
- Always open or close the valves of the piping connected to the K°Bloc slowly.
- Avoid sudden evaporation and condensation of gases by suitable process control.
- Respect pressure variations of max. 2 bar/min. (1.4404/316L) and 0.5 bar/min. for other materials.
Carry out the following steps:

 közgyûl

 1. Stop the media feed into the K°Bloc slowly and evenly.
     ! Ensure that no media can escape during the standstill phase of the K°Bloc.

√ Done.

6.3.2 DECOMMISSIONING - MAINTENANCE

Carry out the following steps:

1. Put the unit out of operation by the short-term procedure, see chapter „6.3.1 Short-term putting out of operation“ (page 61).

2. Ensure that the K°Bloc is at the ambient pressure level.

3. Wait for the K°Bloc to reach the ambient temperature level.

4. Drain the K°Bloc completely.
   ! While draining, ensure that the media contained in the K°Bloc are safely evacuated or collected.

5. Dismount the piping from the K°Bloc connections.

√ Done.
6.3.3 LONG-TERM PUTTING OUT OF OPERATION

**IMPORTANT NOTE**

Damage on the K°Bloc due to corrosion of heat exchanger plates!
Flow media remaining inside the K°Bloc during extended standstill periods may cause corrosion of the heat exchanger plates.

⇒ Drain the flow media completely!
⇒ Clean and flush the K°Bloc and let it dry completely!
⇒ Plug the piping connections with blind plugs in order to avoid ingress of moisture or dirt into the K°Bloc during standstill!
⇒ Take care of protected storage until the unit is put back into operation!

Carry out the following steps:

1. Put the unit out of operation for maintenance, see chapter „6.3.2 Decommissioning - maintenance“ (page 63).
2. Clean and flush the K°Bloc.
3. Let the K°Bloc dry completely.
4. Plug the piping connections.
5. Take care of protected storage of the K°Bloc, see section „6.4 Storage“ (page 65).

✔ Done.
6.4 STORAGE
When storage precedes the commissioning of the delivered K°Bloc, the K°Bloc must be stored as follows:
• Leave the K°Bloc in the delivered packaging.
• Store the unit in a closed and ventilated room.
• The ambient air must be free of aggressive media and dust.
• Ambient temperature range from 0 °C to + 55°C.
• Avoid major temperature variations.
• The environment must have low air humidity, causing no corrosion.

6.5 DISPOSAL
This chapter gives you information on how to dispose of the K°Bloc:

The fundamental rules below apply to disposal:
• Dispose of all parts in accordance with the local and legal disposal regulations.
• In case of parts contaminated with dangerous substances, observe the particular local and legal regulations.

Upon request, Kelvion will take care of disposing of your K°Bloc. The K°Bloc will be dismounted, transported away and disposed of properly by our employees against payment of the expenses incurred. If part of the K°Bloc are contaminated, Kelvion cannot take care of disposal. In this case, disposal of the K°Bloc is the responsibility of the operating company.
7 MAINTENANCE

This chapter gives you information on how to maintain the K°Bloc:

• Opening the K°Bloc (page 67)
• Replacing the gaskets (page 76)
• Removing the baffle plate bracket (page 77)
• Closing the K°Bloc (page 78)
• Leakage test (page 93)
• Outside cleaning (page 94)
• CIP cleaning (page 95)
• Cleaning by reverse flushing (page 96)
• Cleaning the plate pack with the K°Bloc opened (page 96)
7.1 OPENING THE K°BLOC

7.1.1 PREPARATIONS

Carry out the following steps:

1. Put the K°Bloc out of operation, see chapter „Commissioning and decommissioning, operation“ > „Decommissioning - maintenance“ (page 63).

2. Clean the threaded bolt threads.

3. Apply a little grease to the visible threads of the threaded bolts.
   - The nuts can be slackened off easier.
   - The risk of damage of threaded bolts during dismounting is reduced.
4. Mark the panel to be dismounted.

! This ensures that the panels are fitted at their initial positions during assembly at a later date.

✔ Done.
7.1.2 DISMOUNTING THE PANEL

Single or several panels can be dismounted for maintenance and cleaning work. Only two opposite panels may be dismounted at the same time. This section describes the dismounting procedure of a single panel. Removal of the second opposite panel is in the same way.

Requirement:

- The K°Bloc was put out of operation, see chapter „Commissioning and decommissioning, operation“ > „Decommissioning - maintenance“ (page 63).
- The preparations for dismounting were carried out, see chapter „7.1.1 Preparations“ (page 67).
- Before opening the K°Bloc, it must be ensured that a new original gasket is available for each panel to be dismounted.
- Before opening the K°Bloc it must be ensured that the lifting equipment available for removing the panel is sufficiently dimensioned.
- You must wear suitable protective clothing.

**WARNING**

Danger of injury due to hazardous flow media!

When using hazardous flow media (explosive, flammable, corrosive, toxic, high pressure, very hot or very cold) in the K°Bloc, you may suffer serious injuries.

- Check the safety accessories fitted on the K°Bloc, see chapter „5.5.1 Optional safety accessories“ (page 51)!
- Wear the prescribed safety equipment relevant for the flow medium in question!
- Wear your personal protective equipment during all work!
**WARNING**

**Danger of injury from the movable loose plates!**
You may suffer serious injuries when shifting or moving the panels.

⇒ Secure the K°Bloc panels against tipping over unexpectedly.

**IMPORTANT NOTE**

**Faulty function of K°Bloc due to damaged nuts, washers and threaded bolts!**
During maintenance work, many nuts and washers need to be dismounted. If parts are damaged, flawless function of the K°Bloc can no longer be guaranteed.

⇒ When opening, check if the nuts, washers and threaded bolts are damaged and replace them by original spare parts if necessary!
⇒ Save the dismounted nuts and washers carefully!
⇒ Clean the threaded bolts before opening!

**IMPORTANT NOTE**

**Damage of K°Bloc by simultaneous removal of more than two opposite panels!**
Simultaneous removal of all panels may cause malfunctions or damage to the K°Bloc.

⇒ Dismount no more than two opposite panels at the same time!
**IMPORTANT NOTE**

Damage of K°Bloc by slackening off/removing the corner bolts!

Simultaneous removal of one or more corner bolts may cause malfunctions or damage to the K°Bloc.

➔ Never remove or slacken off the corner bolts.

Carry out the following steps:

1. Slacken off the marked nuts at the adjoining panels so that no play will result.

   ! Slacken off the nuts alternately, moving from the outside towards the centre.
2. Slacken off the marked nuts at the panel to be dismounted so that no play will result.

! Slacken off the nuts alternatingly, moving from the outside towards the centre.

3. Slacken off the marked nuts so that play results, but do not remove the nuts.
4. Slacken off and remove the marked nuts along with the associated washers and store them carefully.

5. Slacken off and turn the marked nuts up to the end of the respective threaded bolt.

6. Secure the panel so it will not fall down.

   ! Attach sufficiently dimensioned and undamaged lifting slings to the lifting points / screw-in lifting eyes.

   ➔ The panel was secured against falling down.
7. Move the panel away carefully.

! Removing the panel is easier on larger K°Bloc units because of the threaded holes provided for push-off bolts.

8. Slacken off and remove the marked nuts along with the associated washers.
9. Remove the panel attached to the lifting sling carefully.
   ! When removing, ensure that the threaded bolts are not damaged.
   ! Put down the panel so that the connections are not exposed to a load.
   ➜ The remaining nuts were slackened off and the panel was removed and put down as well.

✓ Done.
7.2 REPLACING THE GASKETS

The gasket of the K°Bloc is a wear part. It must be replaced every time after dismounting a panel.

Requirement:

- The K°Bloc was opened, see chapter „7.1 Opening the K°Bloc“ (page 67).

Tools required:

- A new original gasket for each panel to be dismounted and the "K°Bloc gasket replacement" technical maintenance manual. Contact your Kelvion Sales Office.

**IMPORTANT NOTE**

Danger of leaks due to wrong gasket material!

Deviating from the "K°Bloc gasket replacement" technical maintenance manual, from the gasket material and its original dimensions may cause leaks and/or irreversible damage to the K°Bloc.

⇒ When replacing gaskets, use only original gaskets by Kelvion.

Carry out the following steps:

⇒ Replace the gasket according to the "K°Bloc gasket replacement" technical maintenance manual.

? You do not have a technical maintenance manual?

⇒ Contact your Kelvion Sales Office.

✓ Done.
7.3 REMOVING THE BAFFLE PLATE BRACKET

Safety instructions: Danger of damage to the plate pack and/or the baffle plate bracket with baffle plates!

Mechanical forces resulting from removing the baffle plate bracket may damage the plate pack, the baffle plate bracket and/or the baffle plates.

- For removing, never use conventional tools made of carbon steel!
- Always use tools made of austenitic materials or plastic!
- The plate pack is sensitive to mechanical forces of any kind. Improper handling will cause damage and impaired function.

Cleaning the plate pack generally does not require removing the baffle plate bracket. Inspecting the plate pack weld seams hidden by the baffle plate brackets may require removing the baffle plate bracket.

![Baffle plate bracket of K°Bloc](image)
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Observe the following note on removing the baffle plate bracket:

- Bear in mind that the plate pack and the baffle plate bracket are sensitive to the action of lever forces.
- Document the installation position and alignment clearly before removing a baffle plate bracket so you can refit it properly afterwards.
- The baffle plate bracket should always be removed as a complete component.

### 7.4 CLOSING THE K°BLOC

Before you can close the K°Bloc again, the following pre-conditions must be met:

- The K°Bloc gasket was replaced, see chapter „7.2 Replacing the gaskets“ (page 76).
- Obtain information in advance if the panel must be tightened to the gap dimension or to a specified torque.
- If the baffle plate brackets were removed, they must be fitted back in the correct position.
7.4.1 INSTALLING A SINGLE PANEL

**WARNING**

Danger of injury from removable panels!
You may suffer serious injuries when shifting or moving the panels.
➔ Secure the K°Bloc panels against tipping over unexpectedly.

**IMPORTANT NOTE**

Damage and malfunction of K°Bloc by incorrect installation of baffle plate bracket!
When the baffle plate bracket is incorrectly installed, the K°Bloc may be damaged when installing the panels or during operation. In addition, the function of the K°Bloc may be impaired.
➔ Be sure to install the baffle plate bracket in the correct position and alignment.

**IMPORTANT NOTE**

Damage to panels by improper handling!
Improper handling of panels may damage the connections, the sealing faces and the gaskets.
➔ Do not tip the panels over the connections, sealing faces and gaskets!

Carry out the following steps:

1. Attach the panel to be installed safely to sufficiently dimensioned and undamaged lifting equipment.
2. Lift the panel carefully.
3. Approach the panel carefully to the K°Bloc over the threaded bolts.

! Ensure that the threads of threaded bolts and the gasket will not be damaged when positioning the panel.

! Ensure that all end plate collars and columns engage in the panel recesses and that the gasket has not slipped.

4. Fit all nuts with the associated washers.

! Tighten the nuts only hand-tight.

5. Remove the lifting equipment attached to the panel.
6. Tighten all nuts to suit the respective gasket type.
   - Tighten to the specified torque, see "7.4.2.1 Tightening the panel – to the specified torque on panels with corner bolt hole" (page 82).
   - Tighten to the specified torque, see "7.4.2.2 Tightening the panel – to the specified torque on panels without corner bolt hole" (page 86).
   - Tighten to the specified gap size, see "7.4.2.3 Tightening the panel - to a gap dimension" (page 90).

![Diagram](image1)

Panel with corner bolt hole

Panel without corner bolt hole

✓ Done.
7.4.2 TIGHTENING THE PANEL

Depending on the gasket used, the panels are either tightened to the specified torque or to a gap dimension. Please consult the technical documentation or the name plate to learn in which way the panels of this K°Bloc must be tightened.

7.4.2.1 TIGHTENING THE PANEL – TO THE SPECIFIED TORQUE ON PANELS WITH CORNER BOLT HOLE

Requirement:
• You must know the permitted tightening torques. You can find these in the technical documentation or the K°Bloc name plate.

Carry out the following steps:

1. Tighten all nuts of panel "I" to 20 % of the maximum torque crosswise from 1 to 22 according to the exemplary figure below.

   ! The coloured corner bolts of the panel "I" (here: 21 and 22) may be tightened only to 25 % of the allowed torque.

Figure 7.4.2.1.a
2. Tighten the nuts framed in figures Figure 7.4.2.1.b and Figure 7.4.2.1.c on the two adjoining panels "II" and "III" to 20 % of the maximum torque.

! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "II" towards the outside.

! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "III" towards the outside.

! The corner bolts marked in colour here may be tightened only to 25 % of the permitted torque.
3. Tighten all nuts of panel "I" (see Figure 7.4.2.1.a) crosswise to 40 % of the maximum torque (here: 1 to 20).
   ! The coloured corner bolts of panel "I" (here: 21 and 22) may be tightened only to 25 % of the allowed torque.

4. Tighten the nuts framed in figures Figure 7.4.2.1.b and Figure 7.4.2.1.c on the two adjoining panels "II" and "III" to 40 % of the maximum torque.
   ! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "II" towards the outside.
   ! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "III" towards the outside.
   ! The corner bolts marked in Figure 7.4.2.1.b red may be tightened only to 25 % of the permitted torque.

5. Tighten all nuts of panel "I" (see Figure 7.4.2.1.a) crosswise to 60 % of the maximum torque (here: 1 to 20).
   ! The coloured corner bolts of panel "I" (here: 21 and 22) may be tightened only to 25 % of the allowed torque.

6. Tighten the nuts framed in figures Figure 7.4.2.1.b and Figure 7.4.2.1.c on the two adjoining panels "II" and "III" to 60 % of the maximum torque.
   ! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "II" towards the outside.
   ! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "III" towards the outside.
   ! The corner bolts marked in Figure 7.4.2.1.b red may be tightened only to 25 % of the permitted torque.

7. Tighten all nuts of panel "I" (see Figure 7.4.2.1.a) crosswise to 80 % of the maximum torque (here: 1 to 20).
   ! The coloured corner bolts of panel "I" (here: 21 and 22) may be tightened only to 25 % of the allowed torque.

8. Tighten the nuts framed in figures Figure 7.4.2.1.b and Figure 7.4.2.1.c on the two adjoining panels "II" and "III" to 80 % of the maximum torque.
   ! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "II" towards the outside.
When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "III" towards the outside.

The corner bolts marked in Figure 7.4.2.1.b red may be tightened only to 25 % of the permitted torque.

9. Tighten all nuts of panel "I" (see Figure 7.4.2.1.a) crosswise to 100 % of the maximum torque (here: 1 to 20).

The coloured corner bolts of panel "I" (here: 21 and 22) may be tightened only to 25 % of the allowed torque.

10. Tighten the nuts framed in figures Figure 7.4.2.1.b and Figure 7.4.2.1.c on the two adjoining panels "II" and "III" to 100 % of the maximum torque.

When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "II" towards the outside.

When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "III" towards the outside.

The corner bolts marked in Figure 7.4.2.1.b red may be tightened only to 25 % of the permitted torque.

Done.
7.4.2.2 TIGHTENING THE PANEL – TO THE SPECIFIED TORQUE ON PANELS WITHOUT CORNER BOLT HOLE

Requirement:
- You must know the permitted tightening torques. You can find these in the technical documentation or on the name plate of the K°Bloc.

Carry out the following steps:

1. Tighten all nuts of panel "I" to 20 % of the maximum torque crosswise from 1 to 22 according to the exemplary figure below.

![Figure 7.4.2.2.a](image-url)
2. Tighten the nuts framed in figures Figure 7.4.2.2.b and Figure 7.4.2.2.c on the two adjoining panels "II" and "III" to 20 % of the maximum torque.

! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "II" towards the outside.

! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "III" towards the outside.

3. Tighten all nuts of panel "I" (see Figure 7.4.2.2.a) crosswise to 40 % of the maximum torque (here: 1 to 22).
4. Tighten the nuts framed in figures Figure 7.4.2.2.b and Figure 7.4.2.2.c on the two adjoining panels "II" and "III" to 40 % of the maximum torque.
   ! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "II" towards the outside.
   ! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "III" towards the outside.

5. Tighten all nuts of panel "I" (see Figure 7.4.2.2.a) crosswise to 60 % of the maximum torque (here: 1 to 22).

6. Tighten the nuts framed in figures Figure 7.4.2.2.b and Figure 7.4.2.2.c on the two adjoining panels "II" and "III" to 60 % of the maximum torque.
   ! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "II" towards the outside.
   ! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "III" towards the outside.

7. Tighten all nuts of panel "I" (see Figure 7.4.2.2.a) crosswise to 80 % of the maximum torque (here: 1 to 22).

8. Tighten the nuts framed in figures Figure 7.4.2.2.b and Figure 7.4.2.2.c on the two adjoining panels "II" and "III" to 80 % of the maximum torque.
   ! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "II" towards the outside.
   ! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "III" towards the outside.

9. Tighten all nuts of panel "I" (see Figure 7.4.2.2.a) crosswise to 100 % of the maximum torque (here: 1 to 22).
10. Tighten the nuts framed in figures Figure 7.4.2.2.b and Figure 7.4.2.2.c on the two adjoining panels "II" and "III" to 100% of the maximum torque.

! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "II" towards the outside.

! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "III" towards the outside.

✔ Done.
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**7.4.2.3 TIGHTENING THE PANEL - TO A GAP DIMENSION**

The gap is measured between the panels and the columns and end bottom/top heads.

Requirement:

- Take the permitted gap size from the technical documentation or the name plate.

Carry out the following steps:

1. Tighten all nuts of panel "I" crosswise to a 5 mm gap according to the figure below (here: 1 to 22).

![Figure 7.4.2.3.a](image)

Panel with corner bolt hole

Panel without corner bolt hole
2. Tighten the nuts framed in Figure 7.4.2.3.b and Figure 7.4.2.3.c on the two adjoining panels "II" and "III" to a gap size of 5 mm.

! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "II" towards the outside.

! When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "III" towards the outside.

3. Tighten all nuts of panel "I" (see Figure 7.4.2.3.a) crosswise to a 5 mm gap according to the figure below (here: 1 to 22).
4. Tighten the nuts framed in Figure 7.4.2.3.b and Figure 7.4.2.3.c on the two adjoining panels "II" and "III" to a gap size of 4 mm.
   - When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "II" towards the outside.
   - When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "III" towards the outside.

5. Tighten all nuts of panel "I" (see Figure 7.4.2.3.a) crosswise to a 5 mm gap according to the figure below (here: 1 to 22).

6. Tighten the nuts framed in Figure 7.4.2.3.b and Figure 7.4.2.3.c on the two adjoining panels "II" and "III" to a gap size of 3 mm.
   - When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "II" towards the outside.
   - When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "III" towards the outside.

7. Tighten all nuts of panel "I" (see Figure 7.4.2.3.a) crosswise to a 5 mm gap according to the figure below (here: 1 to 22) according to the technical documentation or the name plate.

8. Tighten the nuts framed in Figure 7.4.2.3.b and Figure 7.4.2.3.c on the two adjoining panels "II" and "III" to the permitted gap size according to the technical documentation or the name plate.
   - When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "II" towards the outside.
   - When tightening, proceed alternately from the centre of the line of bolts framed in red of the adjoining panel "III" towards the outside.

✔ Done.
7.5 LEAKAGE TEST

After having opened the K°Bloc, a leakage test must be carried out. Here the tightness test pressure is equal to the max. permitted pressure specified on the rating plate and must be applied to the K°Bloc on both sides evenly at the same time.

**WARNING**

Danger of injury from functional failure of K°Bloc components!
The use of pressure and temperature levels and media may cause functional disorder of K°Bloc components and endanger persons and the environment.

- Never exceed permitted pressure and temperature levels.
- Do not use any unapproved media in the K°Bloc.

**IMPORTANT NOTE**

Damage to the K°Bloc due to extreme pressure variations!
In the leakage test, the K°Bloc is tested at defined pressure levels. The K°Bloc may be damaged if the pressure test is not performed properly.

- Respect pressure variations of max. 2 bar/min. (1.4404/316L) and 0.5 bar/min. for other materials.
- Avoid a sudden pressure rise (liquid hammer) and sudden pressure drop on the K°Bloc.
- Avoid any pressure direction changes on the K°Bloc!
- Should the maximum allowed pressure levels on both sides deviate, the high-pressure side should always have a higher pressure than the low-pressure side when increasing and reducing the pressure!
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Carry out the following steps:

- Carry out the leakage test at the maximum permitted pressure specified on the name plate.

  *Does the pressure drop?*
  
  The pressure on the K°Bloc side to be tested may drop due to compression of the gas inside the unit or due to a slight maladjustment of the plates. This does not mean that the K°Bloc is leaking.
  
  ➔ Readjust the leakage test pressure and check if the pressure is stable after half an hour.

  *Are there any leaks?*
  
  ➔ Attempt to remedy the leaks, using the troubleshooting table, see chapter „Troubleshooting“ > „Troubleshooting“ (page 99).

✔ Done.

### 7.6 OUTSIDE CLEANING

Carry out the following steps:

1. Clean the outside of the K°Bloc at regular intervals.

2. Retouch scratches and impact damage on the painted surfaces of the K°Bloc immediately.

   ➔ The K°Bloc is protected against corrosion and weather.

✔ Done.
7.7 CIP CLEANING

Safety instructions: Aggressive cleaning media!

The use of aggressive cleaning media involves a poisoning hazard and danger of chemical burns.

The chemical cleaning process may attack the plate pack and gasket materials and cause leaks.

In addition, aggressive cleaning media may escape into the environment and cause environmental damage.

Ensure the following:

• that you have been instructed in how to handle CIP cleaning before starting and that you have safe control of all work steps;
• that you always wear suitable protective equipment when working with aggressive cleaning media;
• that the cleaning medium you use is completely removed from the K°Bloc after the cleaning process is complete;
• that the cleaning media will not attack the plate pack and gasket material;
• that you reach a suitable temperature and do not let the cleaning agents take effect for an unnecessarily long time;
• that the safety regulations and recommendations of the cleaning media manufacturers are observed;
• that you collect the cleaning medium you have used completely so that it cannot escape into the environment;
• that you dispose of the cleaning medium you have used according to environmental regulations.

Safety instructions: Respect the permitted values!

The rating plate of your K°Bloc specifies the permitted values, e.g. for pressure and temperature. When these values are exceeded during K°Bloc cleaning, the K°Bloc may be damaged.

• Ensure that even during cleaning all permitted values specified on the name plate are respected.
The CIP cleaning process ("Cleaning in Place") removes soiling by the solving capacity of the cleaning medium and by the mechanical effect of turbulent flow.

7.8 CLEANING BY REVERSE FLUSHING
Reverse flushing is employed when the flow media contain coarse dirt particles plugging the manifold spaces. The dirt particles are removed from the K°Bloc by briefly reversing the flow direction.

7.9 CLEANING THE PLATE PACK WITH THE K°BLOC OPENED
Depending on the plate pattern, the cleaning process must be carried out in different ways.

7.9.1 CLEANING PLATES WITH A CHEVRON PATTERN
Requirement:
· The K°Bloc was opened, see chapter „7.1 Opening the K°Bloc“ (page 67).

**IMPORTANT NOTE**
Danger of material damage on the K°Bloc from hard cleaning tools!
Hard cleaning tools (e.g. metal brushes) damage the metal surfaces. This may cause corrosion.
➢ Never use hard cleaning tools.
➢ Work carefully and thoroughly when cleaning.
WARNING

Danger of injury due to aggressive cleaning media!
When using aggressive cleaning media, you may suffer from intoxication, chemical burns and burns.

➤ Wear your personal protective equipment.
➤ Make yourself familiar with the handling of aggressive cleaning agents.
➤ Ensure that the cleaning medium you use is completely removed from the plate pack after the cleaning process is complete.

Carry out the following steps:

➤ Clean the plate pack with a high-pressure jet cleaner.

  ! Hold the cleaning jet at an angle of 45° relative to the corrugation of the plates.

✔ Done.
7.9.2 CLEANING PLATES WITH "DOUBLE DIMPLE" PATTERN

Requirement:

- The K°Bloc was opened, see chapter „7.1 Opening the K°Bloc“ (page 67).

**IMPORTANT NOTE**

Danger of material damage on the K°Bloc from hard cleaning tools!

Hard cleaning tools (e.g. metal brushes) damage the metal surfaces. This may cause corrosion.

- Never use hard cleaning tools.
- Work carefully and thoroughly when cleaning.

**WARNING**

Danger of injury due to aggressive cleaning media!

When using aggressive cleaning media, you may suffer from intoxication, chemical burns and burns.

- Wear your personal protective equipment.
- Make yourself familiar with the handling of aggressive cleaning agents.
- Ensure that the cleaning medium you use is completely removed from the plate pack after the cleaning process is complete.

Carry out the following steps:

- Clean the plate pack with a high-pressure jet cleaner.

✓ Done.
8 TROUBLESHOOTING

Safety instructions: Before rectifying faults

You should contact your Kelvion Sales Office before removing faults in order to avoid improper work on the K°Bloc and its consequences.

8.1 INSUFFICIENT PERFORMANCE

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced heat transfer and/ or excessive pressure loss</td>
<td>Deposits on the plate pack plates</td>
<td>Open the K°Bloc and clean the plate pack – see „Maintenance“ &gt; „Opening the K°Bloc“ (page 67) chapter.</td>
</tr>
<tr>
<td></td>
<td>Operation, flow media etc. differing from the design case</td>
<td>Have the K°Bloc design with new operating data checked by Kelvion.</td>
</tr>
<tr>
<td></td>
<td>Damaged baffle plates</td>
<td>Open the K°Bloc and straighten slight mechanical damage of baffle plates in built-in condition. In case of serious baffle plate damage, please contact your Sales Office.</td>
</tr>
<tr>
<td></td>
<td>Clogging of distributing space</td>
<td>Open the K°Bloc and clean the distributing space.</td>
</tr>
</tbody>
</table>
## 8.2 LEAKS

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaks visible from the outside</td>
<td>Incorrect tensioning of threaded bolts</td>
<td>Check the correct tensioning values against the data in the technical documentation and the tensioning procedure and correct if necessary.</td>
</tr>
<tr>
<td></td>
<td>Excessive operating pressure</td>
<td>Check operating pressure levels according to rating plate data.</td>
</tr>
<tr>
<td></td>
<td>Operating temperatures too high / too low</td>
<td>Check operating temperatures according to rating plate data.</td>
</tr>
<tr>
<td>Incorrectly positioned gaskets</td>
<td>Open the K°Bloc according to the opening procedure, see „Maintenance” &gt; „Opening the K°Bloc” (page 67). Check the seat of gaskets and replace gaskets if necessary.</td>
<td></td>
</tr>
<tr>
<td>Dirty gaskets</td>
<td>Open the K°Bloc according to the opening procedure, see „Maintenance” &gt; „Opening the K°Bloc” (page 67). Clean the gaskets and sealing faces, replace gaskets if required.</td>
<td></td>
</tr>
<tr>
<td>Defective gaskets</td>
<td>Open the K°Bloc according to the opening procedure, see „Maintenance” &gt; „Opening the K°Bloc” (page 67). Clean the gaskets and sealing faces. Replace the gaskets.</td>
<td></td>
</tr>
</tbody>
</table>
### Faults and Remedies

<table>
<thead>
<tr>
<th>Fault</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaks visible from the outside</td>
<td>Excessive load from pipework</td>
<td>Reduce connecting loads to permitted values. Check if metal components are damaged and contact your Sales Office if required.</td>
</tr>
<tr>
<td></td>
<td>Defective metal components</td>
<td>If a defective gasket can be excluded, contact your Sales Office.</td>
</tr>
<tr>
<td>Internal leak</td>
<td>Defective metal components</td>
<td>If a defective gasket can be excluded, contact your Sales Office.</td>
</tr>
<tr>
<td>Leaks between K°Bloc connection and pipework</td>
<td>Excessive load of K°Bloc connection from pipework</td>
<td>Reduce connecting loads to permitted values.</td>
</tr>
<tr>
<td></td>
<td>Incorrect position of connection gasket</td>
<td>Slacken off connections and correct gasket seat.</td>
</tr>
<tr>
<td></td>
<td>Dirty gasket</td>
<td>Slacken off K°Bloc connection and clean the gasket.</td>
</tr>
<tr>
<td></td>
<td>Defective gasket</td>
<td>Slacken off K°Bloc connection and replace the gasket.</td>
</tr>
<tr>
<td></td>
<td>Flange connection is not sufficiently tightened</td>
<td>Check gasket and retighten connection evenly if required.</td>
</tr>
</tbody>
</table>
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**9 TECHNICAL TERMS**

<table>
<thead>
<tr>
<th>Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chevron plates</td>
<td>The plates of the plate pack have a diagonal pattern.</td>
</tr>
<tr>
<td>Gasket</td>
<td>Seal between panel and sealing faces of the K°Bloc heart</td>
</tr>
<tr>
<td>Double Dimple plates</td>
<td>The plates of the plate pack have round embossings in both directions of the plate surface.</td>
</tr>
<tr>
<td>Thrust plate</td>
<td>Pressure bearing plate at the at the K°Bloc sides.</td>
</tr>
<tr>
<td>Corner bolt</td>
<td>Joining element between the bottom/top heads and the columns.</td>
</tr>
<tr>
<td>Foot</td>
<td>Joint between the K°Bloc and the foundation.</td>
</tr>
<tr>
<td>K°Bloc heart</td>
<td>Inner section of the K°Bloc, comprising the plate pack, top and bottom panel, lifting eye, foot and the four columns.</td>
</tr>
<tr>
<td>Threaded bolts, washers, nuts</td>
<td>The threaded bolts are fitted in the bottom/top heads and in the columns. The panels are fastened by means of washers and nuts.</td>
</tr>
<tr>
<td>Assembly lifting lug / Assembly lifting fixture</td>
<td>Component intended for lifting the K°Bloc panels. Lifting fixtures include e.g. load rings and lifting eyes.</td>
</tr>
<tr>
<td>Top head</td>
<td>Upper pressure bearing plate of the K°Bloc.</td>
</tr>
<tr>
<td>Plate pack</td>
<td>Fully welded combination of K°Bloc plates and covering / lining.</td>
</tr>
<tr>
<td>PHE</td>
<td>Short for the term “Plate Heat Exchanger”.</td>
</tr>
<tr>
<td>Column</td>
<td>Join the top/bottom heads of the K°Bloc at the four corners. The panels are fastened on the two sides pointing to the outside.</td>
</tr>
<tr>
<td>Transportation lifting lug</td>
<td>Component intended for lifting the K°Bloc.</td>
</tr>
<tr>
<td>Baffle plate</td>
<td>Component enabling multi-pass design of the K°Bloc.</td>
</tr>
<tr>
<td>Baffle plate bracket</td>
<td>Frame holding the baffle plates.</td>
</tr>
<tr>
<td>Bottom head</td>
<td>Bottom pressure bearing plate of the the K°Bloc.</td>
</tr>
</tbody>
</table>