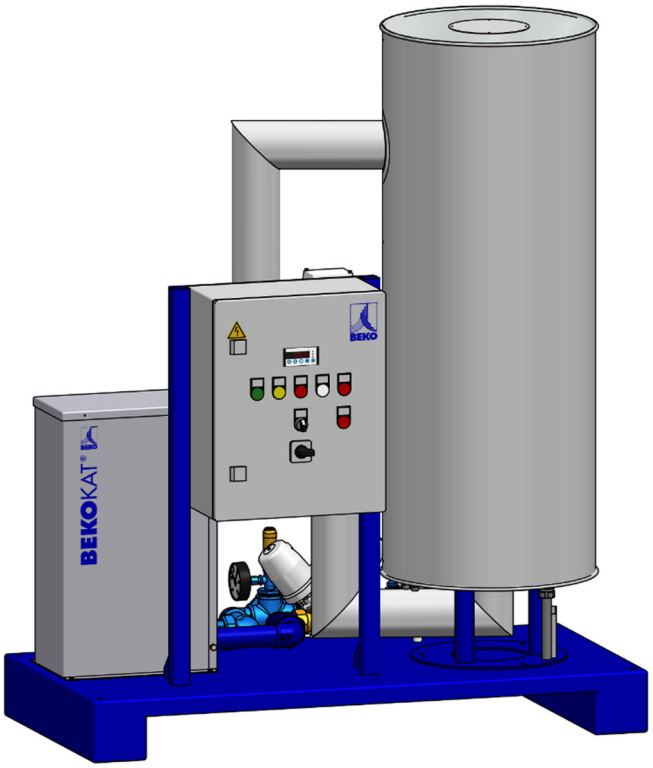
EN – English

Installation and operation manual

BEKOKAT® CC-360

Catalytic converter

For removing oil from compressed air



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Dear customer

Thank you for purchasing the **BEKOKAT®** CC-360 Catalytic Converter. Please follow our instructions and read this installation and operation manual carefully before installing and comissioning the catalytic converter. The proper function of the catalytic converter can only be guaranteed when the described regulations and instructions are strictly observed.

Table of contents

1. General

The **BEKOKAT®** described in this installation and operating manual is used to remove oil from the compressed air and is designed and manufactured according to the latest state-of-the-art technology.

All components are subjected to a continuous quality control throughout the manufacturing process according to the criteria of our quality management system.
BEKO TECHNOLOGIES GMBH is certified according to ISO 9001:2008.

This installation and operation manual of the BEKOKAT® must be carefully read and fully understood by the responsible specialist personnel before the start of all work (installation, commissioning and maintenance).

A prerequisite for safe handling and trouble-free operation of this plant is the compliance with all stated safety instructions and handling instructions.

The operating instructions are an integral part of the system and must be available at all times at the location of use of the **BEKOKAT®**.

The local accident prevention regulations applicable for the product and the general safety regulations must be complied with.

1.1 Pictograms and symbols

The safety instructions in this operating instructions are intended to prevent hazards. They are located in the operating manual before an action / work / activity is described which can create a hazard.

General hazard symbols (danger, warning, caution).

Warning about electric voltage.

Warning about hot surfaces.

General instructions.

The installation and operation manual guidelines must be strictly adhered to.

Wear eye protection

Wear safety shoes.

Wear protective clothing.

Information for fire fighting.

Environmentally friendly material.

The packaging material is recyclable. Dispose of it according to the applicable statutory regulations.

1.2 Signal words according to ISO 3864 and ANSI Z.535

DANGER	**Imminent hazard** Consequences of non-compliance: serious or even fatal injury
WARNING	**Potential danger** Consequences of non-compliance: possibly serious or even fatal injury
CAUTION	**Imminent hazard** Consequences of non-compliance: injury and/or damage to property
NOTE	**Additional notes, information, tips** Consequences of non-compliance: Disadvantages during operation and maintenance.

1.3 General safety instructions

NOTE	**Installation and operation manual**
	• Before reading this manual, make sure that it refers to your plant model. This document contains important information and instructions for the safe operation of the plant. Non-compliance with these installation and operating instructions can cause hazards for people and the plant. • Before executing any work, all specialist technical personnel[1] must therefore have read the installation and operating instructions. • A copy of these operating instructions must be kept near the installation location where it is accessible all times. • In addition to the instructions in this installation and operating manual, always comply with the relevant national and statutory regulations for machine operation, accident prevention and safety for the respective application. This also applies to the use of accessories and spare parts.

DANGER	**Insufficient qualification**
	• Improper use and handling of the **BEKOKAT®** can lead to considerable damage to persons or property. All activities described in these operating instructions such as operation, function tests, installation, adjustment and maintenance work may only be carried out by qualified specialist personnel. • This installation and operation manual of the **BEKOKAT®** must be carefully read and fully understood by the responsible specialist personnel before the start of all (installation, commissioning and maintenance) work.

1) Specialist technical personnel
Specialist technical personnel are people who, due to their professional qualification and knowledge in the field of measuring, control and pneumatic technology, and their knowledge of the applicable statutory regulations, guidelines and standards are in a position to independently foresee potential dangers in relation to the use of the device and who are qualified to perform the tasks described in this manual. Special operating conditions (e.g. aggressive media) require additional knowledge.

DANGER	**Compressed air! Gases under high pressure**
	Any contact with escaping compressed gas or not secured system parts will create danger of serious injuries or death. • Only executeinstallation work and maintenance work in a depressurised status. • Use only pressure-resistant installation materials and suitable tools that are in proper working order. • Only ever use fittings and connecting elements which are approved for this application. Always adhere to the manufacturer's information and instructions. • Always inspect all plant parts before pressurising the system and tighten them. • Open valves slowly to prevent pressure blow outs during operation. • The compressed air lines must be permanently installed. • Always prevent people or objects from being affected by escaping compressed gas. • Prevent vibrations, oscillations and impact from being transferred to the plant. • Perform a leakage test. • Never carry out structural modifications on the plant! • Use only original spare parts and accessories! • The general statutory safety and accident prevention regulations apply.

DANGER	**Electric power**
	Touchable conductive parts can lead to dangerous voltages / mains voltage during installation and maintenance or in case of defects. Hazard resulting in of serious or even fatal injury from electric shock when coming into contact with uninsulated parts or mains voltage. • All work on the electrical components of the **BEKOKAT®** may only be carried out by suitably trained specialists. • The **BEKOKAT®** must not be put into operation if the power supply cables have been damaged or parts of the housing have been damaged or removed. • The valid legal regulations and provisions at the local place of use must be complied with without exception. • Observe the electrical data provided on the rating plate. • Work on the electrical connections may only be executed when the power supply is switched off. The system must be secured against unintentional restart. • Only utilise components for the electrical installation which have a current authorisation and are labelled with a CE-Identification marking. • The wire ends to be connected to the control unit must be equipped with wire-end ferrules. • All electrical connections must be inspected before commissioning and at regular intervals. • The removal of seals and labels on safety equipment is prohibited.

NOTE	**MAINTENANCE**
	• The **BEKOKAT®** may only be used by qualified and authorised specialist personnel in accordance to the technical data. • The removal of seals and labels on safety equipment is strictly prohibited.

WARNING	**Operation of plant outside limit range**
	If the specified limits are undershot and/or exceeded, then function and operating malfunctions could occur and cause danger for people and material. • **BEKOKAT®** may only be used in accordance with its intended use and within the permitted limiting values stated on the rating plate as well as in the technical data. • The maximum compressed air volume flow at the inlet of the **BEKOKAT®** plant must not exceed 360 m³/h (refer to the data on the rating plate as well as in the technical data). • Always adhere to the permitted storage and transport conditions.

WARNING	**Hot surface**
	• Risk of injury to people property damage - risk of fire! • Before carrying out any work on **BEKOKAT®**, the plant must be allowed to cool down! • Secure and mark the accessible places.

DANGER	**Fire safety**
	A fire at the plant might result in serious injury or damage to materials. • If there are potential ignition sources at the place of installation in the plant, the operator must take suitable safety measures to ensure that the permissible operating parameters of the plant are not exceeded.

WARNING	**Fire**
	• Adjust the fire extinguishing measures to the working environment. • Never use water in a full jet for safety reasons. • Wear a respiratory mask independent of ambient air.

DANGER	**Excessive pressure / temperature**
	• Suitable measures must be implemented to ensure that the permissible operating pressure and operating temperature are not exceeded on the plant. • It is the duty of the operating company to ensure that the connected pressure generator is protected against exceeding the maximum operating overpressure of 16 bar (g) and the temperature limits on the **BEKOKAT®**. • It must be ensured that the pressure generating compressor and the compressed gas system are secured and safe. • Suitable measures must be implemented to ensure that the permissible operating temperature is not inadvertently exceeded by ambient conditions at the installation location.

CAUTION	**Use of protective clothing**
	To prevent injuries to the feet and hands during transport of the **BEKOKAT®**, the skilled technical personnel must wear sufficient protective clothing and safety shoes**!**

WARNING	**Equipment to prevent dangerous conditions**
	• The **BEKOKAT®** must not be utilised as the sole means of averting dangerous conditions on machinery and plants. • All machines and plants must be designed in such a way that malfunctions or faulty conditions do not pose a danger to operation personnel.

NOTE	Risk of malfunction and/or impaired safety
 	• Insufficient maintenance can result in malfunctions and impaired safety. • Perform the maintenance work regularly! • In any case observe the safety instructions for maintenance, inspection and assembly work! • If you have any queries regarding the content of this installation and operating manual, please contact **BEKO** TECHNOLOGIES GMBH. • The system must only be operated and serviced according to the information in the operating instructions to ensure safe operation. • In addition to these instructions, always comply with the required statutory regulations for the application cases for system operation and company safety regulations as well as accident prevention regulations. • This also applies to the use of accessories and spare parts. • Non-compliance with these installation and operating instructions can cause hazards for people and the plant.

1.4 Special notes for pressurised equipment according to Pressure Directive 2014/68/EU

Proper utilisation of the **BEKOKAT®** is a fundamental prerequisite for safe operation. The owner and/or operator must therefore always proceed as follows:

- The **BEKOKAT®** must only be operated within the pressure and temperature limits specified by the manufacturer on the rating plate.
- The **BEKOKAT®** may only be used for fluid group 2 medium according to PED 2014/68 / EU, i.e. with a medium free of aggressive, corrosive, toxic, flammable and oxidizing components.
- The housing and frame of the systems must not be welded.
- The **BEKOKAT®** must neither be operated in insufficiently ventilated rooms nor near heat sources or flammable, hazardous materials or substances.
- To prevent breakages caused by material fatigue, the **BEKOKAT®** must be protected against vibration during operation.
- The maximum permissible operating pressure specified on the manufacturer type plate must not be exceeded under any circumstances. It is the responsibility of the operating company to install suitable safety and control devices to prevent excessive pressure.
- The documentation shipped in association with the **BEKOKAT®** (manual, operating instructions, Declaration of Conformity, etc.) must be kept in good condition for future viewing and reference.
- No objects may be attached or placed on the **BEKOKAT®** and connecting cables.
- Never carry out welding work on the pressure vessel or alter it in any way!
- Only install the plant in frost-free rooms.
- The operation of the system is permitted only with completely closed and intact housings and panels. The operation of the system with a damaged housing/casing is prohibited.
- The compressed air system in which the **BEKOKAT®** is integrated must have pressure limiting devices.

WARNING	**Unauthorised interference**
	• Unauthorised interference with the device can cause injury or damage to the pressure equipment. • Do not make any unauthorised modifications to the device and use the pressure equipment only for the intended purpose. • The removal of seals and labels on safety equipment is prohibited.

WARNING	**National regulations**
	• Owners and/or operators of the systems must observe the local and national pressure equipment regulations in the country of installation.

1.5 Special safety instructions

DANGER	**Compressed air parameters**
	• Exceeding the maximum pressure can cause damage to the plant. • Observe the maximum permissible pressure specified on the rating plate!

NOTE	**Endangered functional safety**
	Faulty installation can endanger the functional safety and have a negative effect on maintenance work. • The clear width of the pipe connection must be at least as large as the connection dimension of the **BEKOKAT®**. • It is strongly recommended that a shut-off valve be installed before and after the **BEKOKAT®** for maintenance work. • Furthermore, it is strongly recommended to provide the **BEKOKAT®** with a lockable bypass line. • Overloading of the **BEKOKAT®** can endanger functional safety! Always observe the permissible temperature and pressure range! • Do not exceed the permissible volume flow rate and the permissible operating pressure! • Do not undershoot the working pressure!

NOTE	**Maintenance works**
	• All maintenance work on the **BEKOKAT®** may only be executed when the catalytic converter is switched off, depressurised and voltage-free. • The removal of seals and labels on safety equipment is prohibited.

1.6 Residual risk

The **BEKOKAT®** catalytic converter corresponds to the current specifications of safety technology. Nevertheless, certain residual risks remain:

- Hazards caused by incorrect transport and storage.
- Hazards caused by electrical voltage when using improper electrical connection cables or touching live parts with the control box open.
- Hazards caused by improper commissioning and/or assembly personnel who are not trained.
- Hazards caused by incorrect or irregular maintenance.
- Hazards caused by ignoring the safety instructions.
- Hazards caused by circumventing or disarming the safety equipment or devices.
- Hazards caused by operating outside permissible pressure and temperature limits.
- Hazards caused by operating with a medium other than the approved one.
- The safety labels and/or safety instructions in this operating manual indicate additional residual risks. Always adhere to all safety instructions.

DANGER	**Incorrect installation location**
	**Never install the BEKOKAT® in explosion hazardous areas.**

1.7 Intended use

The **BEKOKAT®** is used to remove oil from the compressed air. The compressed air must be free of aggressive, corrosive, caustic, toxic, flammable or oxidising substances.

Any other utilisation is thereby considered to be non-intended use.

The manufacturer shall not be liable for damage caused by improper use. All responsibility for any other possible resulting damage will be solely borne by the owner and/or operator.

The proper and safe operation of the **BEKOKAT®** includes compliance with the installation instructions in this manual, in particular the instructions regarding:

- Location of installation/operation, installation conditions
- Voltage supply and frequency
- Pressure and temperature of the inlet air
- Ambient temperature
- Media of fluid group 2 according to DGRL 2014/68/EU free of aggressive, corrosive, caustic, toxic, flammable and oxidising components
- Surrounding area free of aggressive, corrosive, caustic, toxic, flammable or combustion supporting materials and substances.
- Connecting the alarm contacts and their signal processing.

The system is delivered as approved at the factory. The operator only has to carry out the connections to the supply networks as described in the following chapters.

WARNING	**Equipment to prevent dangerous conditions**
	• The **BEKOKAT®** must not be utilised as the sole means of averting dangerous conditions on machinery and plants. • All machines and plants must be designed in such a way that malfunctions or faulty conditions do not pose a danger to operation personnel.

WARNING	**Danger caused by incorrect use**
	The **BEKOKAT®** complies with the latest technology and is safe to operate. There are however some residual risks which may result from the system if improperly used and operated by untrained personnel. Improper use includes: • Exceedance of permissible maximum operating pressure • Exceedance of maximum permissible operating temperature • Exceedance of maximum permissible volume flow • Use with a medium that does not comply with fluid group 2 according to PED 2014/68/EU • Bypassing of or interference with safety equipment • Ignoring of alarms • Use of the system for a purpose other than the intended

1.8 Legal warranty and liability for property defects

All warranty claims will be voided if **BEKOKAT®** is not utilised in accordance to its intended use or in excess of the specifications stated in the technical data; this particularly includes the following:

- Technically incorrect installation, incorrect commissioning, incorrect maintenance or incorrect operation
- Operation with defective components
- Non-compliance with the instructions in this manual, in particular the safety instructions
- Implementing constructive interventions or modifications to the plant
- Non-compliance with the prescribed maintenance intervals
- Utilising non-original or unapproved spare parts for repair and maintenance works.

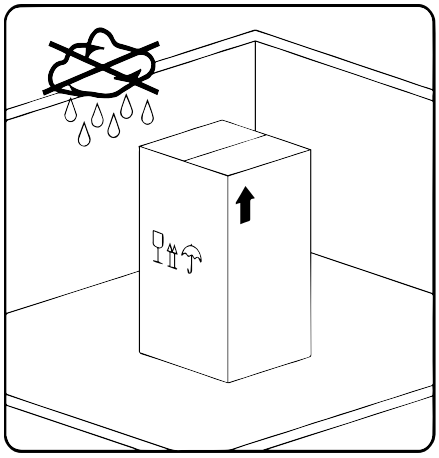
2. Transport and Storage

2.1 Safety instructions

CAUTION	**Danger due to improper transport!**
	Incorrect transport or storage may cause damage to the system. • The **BEKOKAT®** must only be transported and stored by authorised and suitably trained specialist technical personnel. • Always observe the general safety and accident prevention regulations when transporting the **BEKOKAT®**. • Only use suitable and technically faultless lifting and hoisting tools with sufficient lifting capacity for transport. • Handle the system carefully. • After opening the transport packaging, control the **BEKOKAT®** for possible damage. The **BEKOKAT®** must not be exposed to direct sunlight or heat radiation.

CAUTION	**Danger from damaged components!**
	• If you suspect that the **BEKOKAT®** is damaged, then do not put it into operation. • Damaged components can impair the functional safety and cause additional damage.

CAUTION	**Use of protective clothing**
	To prevent injuries to the feet and hands during transport of the **BEKOKAT®**, the skilled technical personnel must wear sufficient protective clothing and safety shoes**!**



- The **BEKOKAT®** must be stored in the original packaging in a closed, dry and frost-free room.
- Ensure that the ambient conditions do not undershoot and/or exceed the details or information on the type plate.
- Always take suitable measures to protect the **BEKOKAT®** against weathering even in a packaged condition.
- Always secure the **BEKOKAT®** against falling over and protect it against impacts and vibrations.

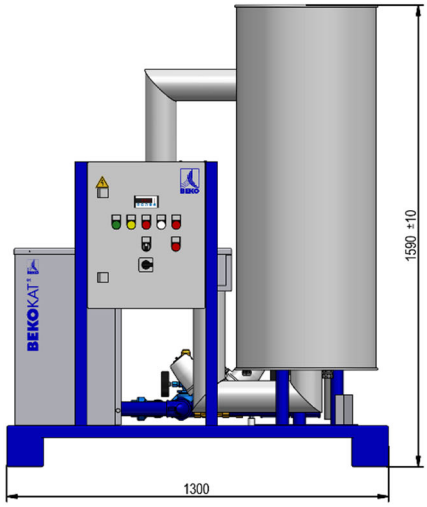
NOTE	Additional information
	Always retain the installation and operation manual together with the product.

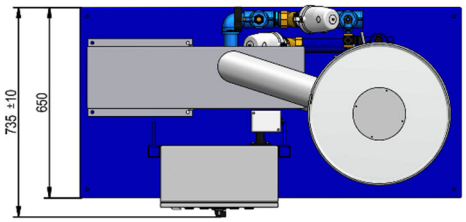
NOTE	Recycling packaging material
 	The packaging material is recyclable. Dispose of the packaging material according to the applicable statutory regulations.

2.2 Transport

The **BEKOKAT®** is generally delivered in a tightly closed wooden crate.

Despite our best efforts, transport damage cannot be excluded. Therefore, always inspect the **BEKOKAT®** for possible transport damage after transport and removal of the packaging material. The freight forwarder and **BEKO** TECHNOLOGIES or the **BEKO** TECHNOLOGIES representative must be notified immediately of any damage.





1. Always provide suitable lifting equipment for transport and installation.
2. Secure the **BEKOKAT®** on the pallet truck or fork-lift vehicle against slipping.
3. Transporting the **BEKOKAT®** to the place of installation.
4. The function and service life of the **BEKOKAT®** depends on the conditions at the installation location.
5. In case of doubt, we recommend that the installation location is inspected by experts.
6. Remove the packaging (open the wooden crate) of the **BEKOKAT®**.
7. Transport the **BEKOKAT®** to the installation location.

2.3 Requirements for the site

The installation location must fulfil the following requirements:

- The installation will be executed within a building.
- The **BEKOKAT®** must be protected from exposure to moisture.
- The ambient temperature must not exceed the specifications on the rating plate.
- Select a level, solid and vibration-free installation surface with a maximum inclination of < 5% to all sides. The weight of the **BEKOKAT®** must be taken into account when selecting the surface.
- Set up the converter so that the system is easily accessible from the sides and from the top.
- Ensure adequate ventilation and heat dissipation.
- Maintain a safe distance to traffic routes when setting up the **BEKOKAT®**.
- The blow-off direction of the safety valve must be away from traffic routes. An appropriate risk assessment must be carried out at the installation site.
- Equip the system with suitable collision protection.
- Ensure that no water or condensate can ingress into the **BEKOKAT®**.
- Install an easily accessible manual shut-off valve before and after the assembly unit.
- The surrounding area must be free of aggressive, corrosive, caustic, toxic, flammable or oxidising substances.
- The intake area of the compressor must be free of aggressive, corrosive, caustic, toxic, flammable or oxidising substances.

3. Product information and system description

3.1 Type plate

German explanation

Baujahr
Product name
Serial No.
Model
Zulassung
Max. Cap. Betriebsüberdruck PS Min. / Max. Druckluft- EINTRITTS-Temperatur
Max. Volume flow am EINTRITT
Power supply
Max. current consumption
Maximum power consumption
Weight approximation.
CE

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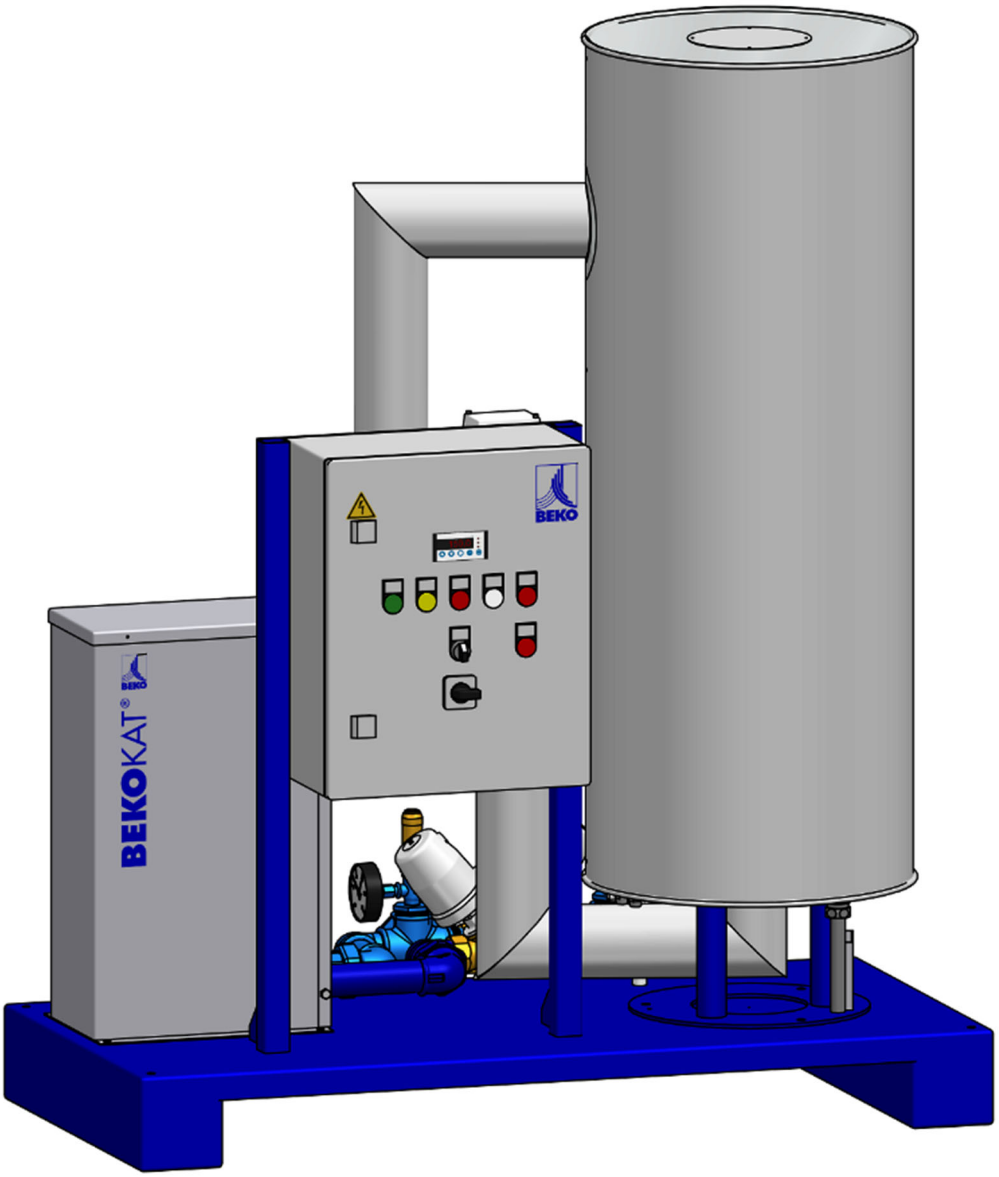
Year of Construction	
Product name	**BEKOKAT® CC-360**
Serial No.	
Model:	4010833
Inspection	TUV 1
Maximum permissible working pressure PS	16 bar(g)
Minimum / Maximum compressed air INLET temperature	+5/ +45 °C
Max. volumetric air flow at INLET	360 m³/h
Supply voltage	400V/3Ph./PE/50Hz
Full load amperage	8.5 A
Power input of total unit	5.35 kW
Weight approx.	315 kg
CE	0035

3.2 Product view



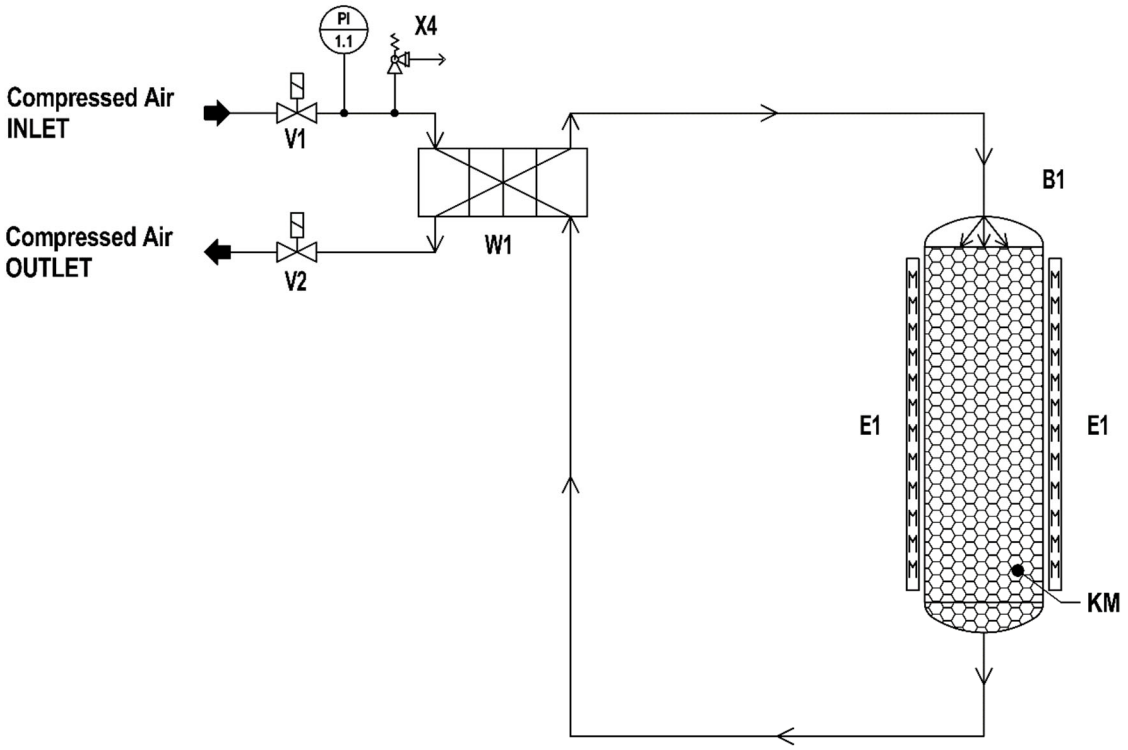
3.3 Function description of the catalytic converter

The **BEKOKAT®** catalytic converter has been developed for the treatment of oily compressed air.

The **BEKOKAT®** catalytic converter can be installed and operated downstream of compressors of any type (reciprocating compressors, screw compressors, etc.) provided the maximum operating conditions specified are observed.

In terms of high energy efficiency, heat exchanger systems are used, which allow a return of the exiting thermal energy into the system.

The proportion of externally supplied energy decreases accordingly after the heating phase.



B1: Catalytic converter reactor (2)

E1: Heating system (4)

KM: Catalyst agent

V1: Valve -Entry (7)

V2: Valve - Condensate drain (oil and grease-free) (8)

W1: Heat exchanger plate (1)

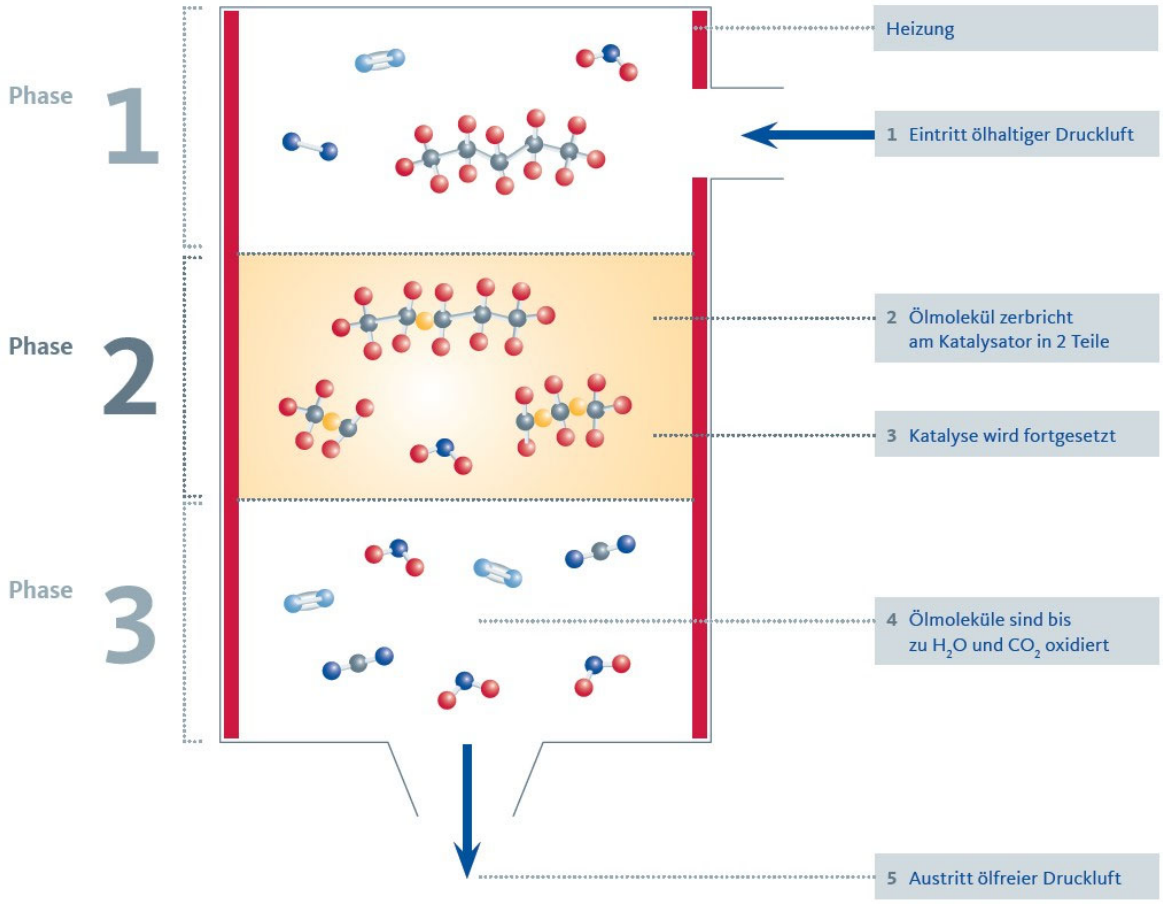
X4: Safety valve (9)

The air constituents can be in gas, vapour and aerosol form and are converted into carbon dioxide (CO_2) and water (H_2O) in the **BEKOKAT®**.

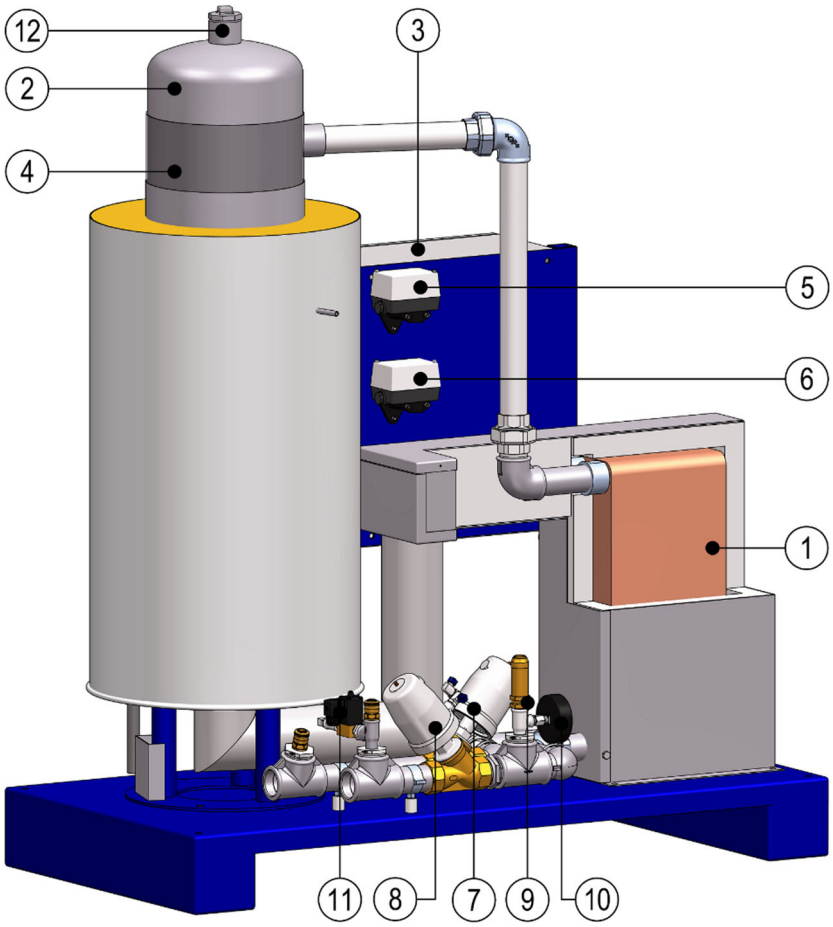
The incoming oil-saturated air from the compressor normally has a temperature of 10 K above the ambient temperature. This is used in the heat exchanger W1 by the hot air from the Reactor B1 at preheated temperatures of about 100°C up to +130°C. Then it flows over the converter located in the catalytic converter, which is heated by means of the electric heating system E1 to the operating temperature of +150 °C set on the operating part.

The system uses a catalytic converter specially developed and optimized for the total oxidation of hydrocarbons (lubricants, oil) in compressed air.

In the converter, the hydrocarbons contained in the air are catalytically oxidised by means of atmospheric oxygen. The resulting heat reaction is negligible in the usual hydrocarbon concentrations in compressed air. The cleaned compressed air is then cooled in the heat exchanger W1 to a temperature of approx. 10 K ... 15 K via inlet.



3.4 Set-up Description



1 Plate heat exchanger for air heating

2 Catalytic converter reactor (converter) with catalyst agent

3 Temperature Control Unit

4 Heating system

5 Safety temperature monitor F01

6 Safety temperature limiter F02

7 Incline seat valve V1 Compressed air INLET

8 Incline seat valves V2 Compressed air CONDENSATE DRAIN, oil and grease-free

9 Safety Valves X4

10 Pressure gauge

11 Control valve Y1

12 Nozzle for filling and emptying catalyst agent

3.5 Description of the components

3.5.1 Heat exchanger plate (1)

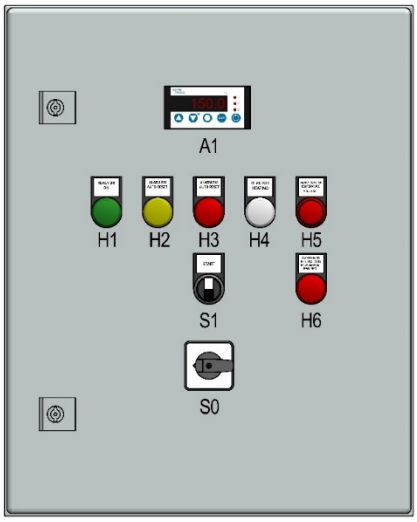
The heat exchanger plate is designed as an air-to-air heat exchanger. The cold compressed air entering into the assembly unit is heated by means of emerging from the reactor compressed air at high temperatures accordingly. In parallel, the cooling of the escaping compressed air takes place in the heat exchanger.

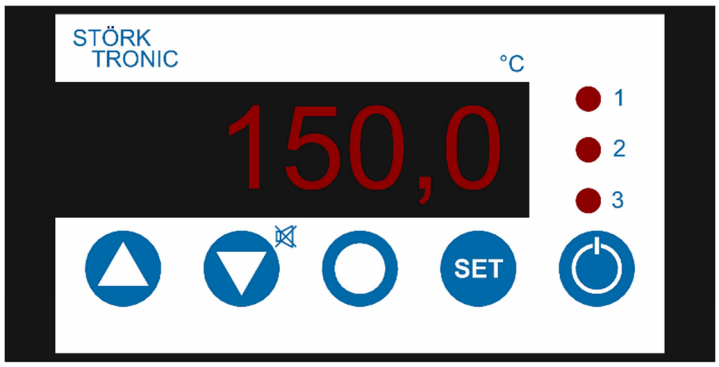
3.5.2 Catalytic converter reactor (2)

NOTE	Technical data
	• The maximum permissible operating pressure is 16 bar. • The maximum permissible operating temperature of the container tank walls is 300 °C. • The catalytic converter reactor is a pressure device according to PED 2014/68/EU. • The reactor is not designed for pressure cycling. • The removal of seals and labels on safety equipment is prohibited.

3.5.3 Temperature Control Unit (3)

The temperature sensor TT1.1 in the middle of the catalytic bed continuously measures the operating temperature and the temperature control unit regulates the catalytic temperature to the Setpoint temperature of + 150 °C set on the control element. The actual temperature in the middle of the tank is shown on the display A1 of the control box.

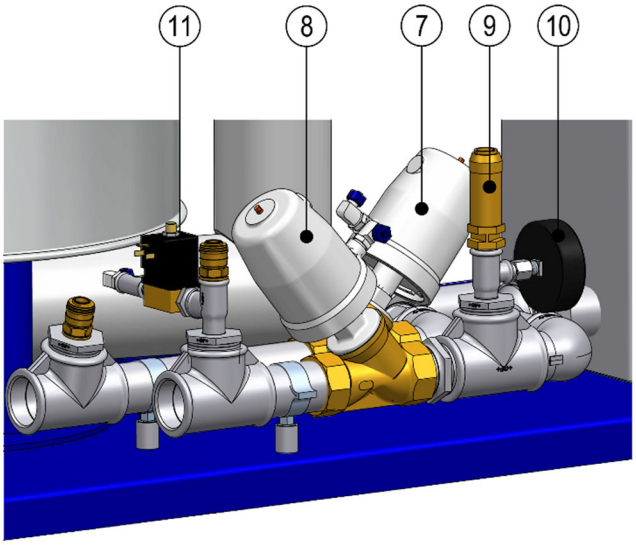




CAUTION	**Exceeding or falling below temperatures**
	If the temperature falls below T <60 °C, T> 200 °C, a warning signal sounds and the display flashes. • If the temperatures exceed or undershoot the set alarm temperatures, valves V1 and V2 will be closed at the inlet and condensate drain of the **BEKOKAT®**. • In the event of the temperature being undershot, this prevents untreated compressed air from leaving the system, since catalysis cannot be reliably carried out at temperatures that are too low. • If the temperature is exceeded, the closing of the inlet and outlet valves prevents the further supply of compressed air, and therefore oxygen, and prevents a possible fire. • In addition to the automatic closing of the valves at the inlet and condensate drain, in this case, the manual shut-off valves must also be closed before and after the assembly unit. • As soon as the valves close, the potential-free alarm contact is activated, signalling the fault by means of an external display (warning signal, light, etc.). This connection option should be used. • If the temperature is exceeded, the system must be shut down and checked in any case. • Commissioning of the **BEKOKAT®** is only permitted after inspection and approval by authorised specialist personnel.

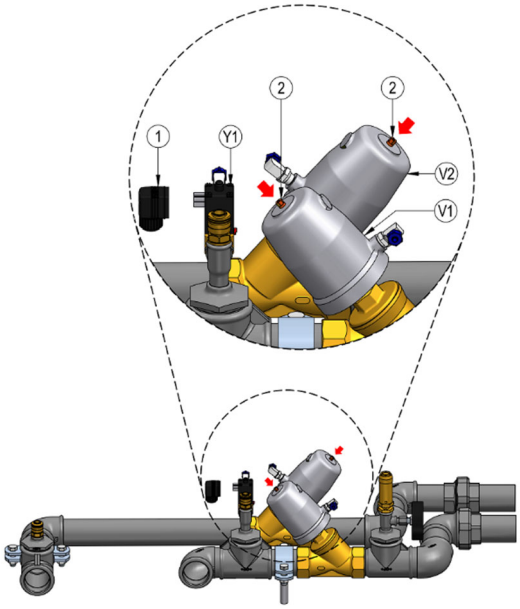
3.5.4 Incline seat valves (7/8)

In order to ensure the safe operation of the assembly unit (even in the unlikely event of an oil breakthrough), the incline seat valves V1 and V2 are installed in the inlet and condensate drain line for automatic shut-off of the compressed air. These are controlled by the measured temperature in the catalyst bed.

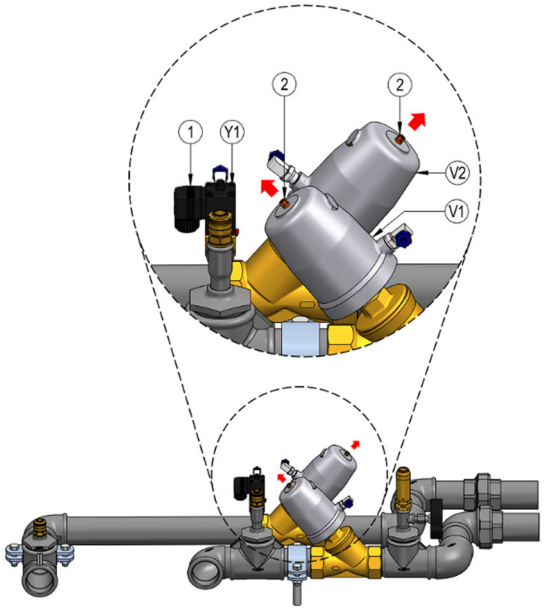


Incline seat valves are engaged via the control valve Y1 (11).

When the incline seat valves V1 and V2 close, then the position indicators of the valves (2) move down into the drive of the valves.



When the incline seat valves V1 and V2 open, then the position indicators of the valves (2) move upwards out of the drive of the valves.

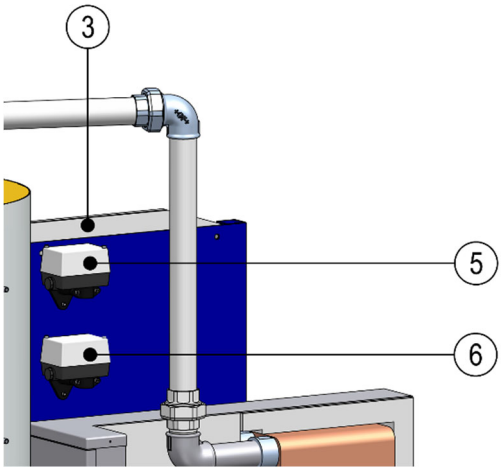


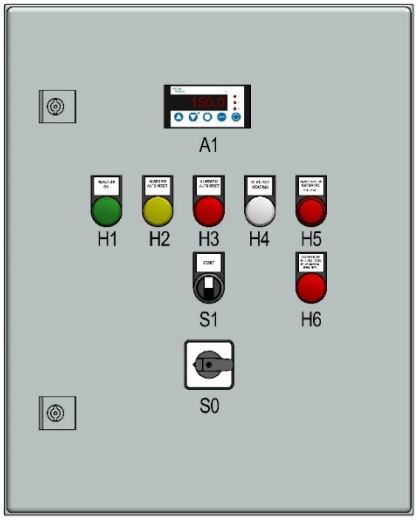
3.5.5 Safety valve (9)

Closing valves V1 and V2 can lead to a pressure increase above the permissible 16 bar in the event of a temperature overrun in the system. Installation of the safety valve X4 reliably prevents this pressure increase.

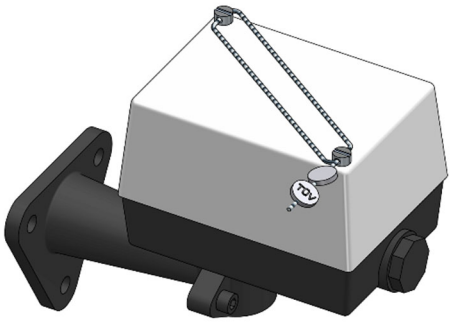
3.5.6 Safety equipment against temperature overruns (5/6)

The reactor tank has been calculated and tested for a maximum operating temperature of + 300 °C. There are 2 safety thermostats installed on the outer wall of the container.





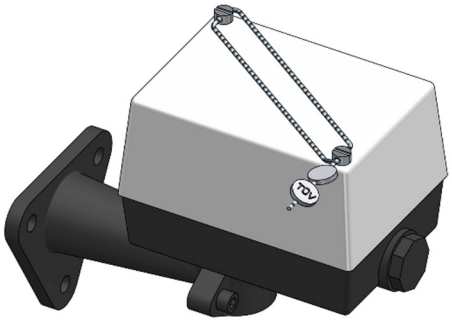
The temperature monitor TW (5) is installed in the upper part of the reactor on the tank wall and opens when a set limit value of + 260 °C is exceeded



In this situation, the indicator light H2 turns yellow and the alarm F01 is displayed.

After falling below the limit value, the reset is carried out by means of automatic RESET TW F01.

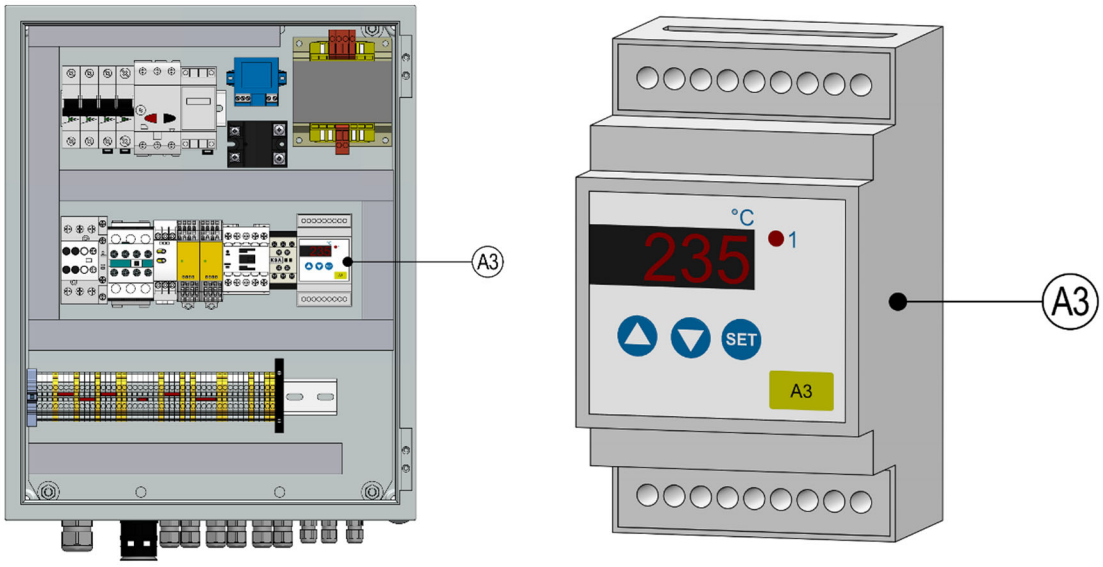
The safety temperature limiter STW (6) is installed at the bottom of the reactor on the tank wall and opens when a set limit of + 300 °C is exceeded.



In this case, the H3 indicator lights red and alarm F02 is displayed.

After falling below the limit value, the reset is carried out by means of automatic RESET STW F02.

Temperature control takes place via the temperature control unit A3.



Both the safety temperature monitor TW and the safety temperature limiter STW are connected to the temperature controller A3. This control unit realises the switching on and off of the heating system according to the height of the temperatures on the container wall.

The outside temperature is displayed in the upper area of the container.

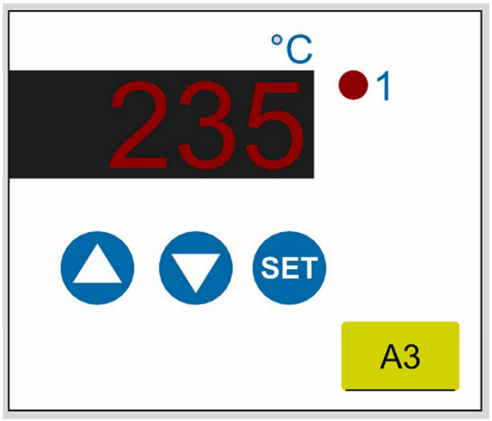
The current supply to the heaters is interrupted as soon as the set limit of 235°C is reached.

It does not matter whether the exceeded temperature was detected in the upper or lower area of the container.

As soon as the temperature drops below +230°C, the current supply for the heaters is released again.

In some cases, the threshold may also be slightly lower, e.g. be set to + 200 °C.

Pressing the SET button displays the set limit.



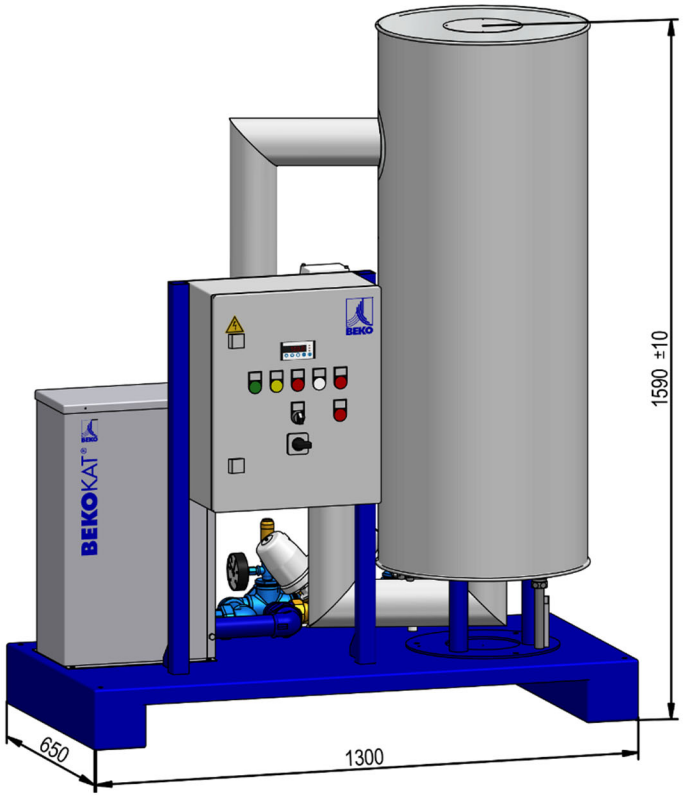
The factory-set parameters ensure trouble-free operation of the **BEKOKAT®** plant. Changing the setting is not required and may only be performed by authorised skilled technical personnel.

3.6 Technical data

Technical data BEKOKAT®	
Name	**BEKOKAT®** CC-360
Model	**BEKOKAT®** catalytic converter
Medium	Compressed air Fluid group 2 according to DGRL 2014/68/EU Up to 100% saturated, free of liquid water or condensate Free of aggressive, corrosive, caustic, toxic, flammable or combustion supporting materials and substances
Connection	Cylindrical internal thread Rp 2 1/2 ", DN 40 In accordance to DIN EN 10226-1
Minimum permissible operating pressure	4 bar (g)
Maximum permissible operating pressure	16 bar (g)
Differential pressure of the assembly unit	<0.6 bar at 100% load
Operating pressure	7 bar (g)
Maximum volume flow rate at inlet (ISO 1217) at operating pressure	360 m³/h Relating to +20°C and 1 bar(a)
Min. volume flow rate at the inlet	20% of the nominal volume flow = 72 m³ / h
Permissible compressed air temperature at inlet	+5°C … +45°C [1)]
Operating temperature for compressed air	+35°C,
Minimum / Maximum Ambient temperature	+5°C / +45°C
Supply Voltage	400 VAC / 3 Ph / PE / 50 Hz
Nominal capacity	5.35 kW
Current consumption	8.5 A
Temperature sensor	Thermocouple type "K" NiCr-Ni
Safety valve	Setting value 16 bar (g)
Weight	315 kg
Width x Height x Depth	1300 mm x 1578 mm x 650 mm

1) At inlet temperatures above + 45 °C, temperatures> + 60 °C may occur at the outlet of the **BEKOKAT®**. Please pay attention to the corresponding design of the following components.

Technical data BEKOKAT®	
Maximum permissible operating pressure PS	16 bar (g)
Permissible minimum/maximum operating temperature TS	-10°C / +300°C
Test pressure (hydraulic) PT	37.86 bar(g)
Pressure vessel volume V	50.0 litres
Pressure equipment category according to PED	II
Load alternation	1,000 arrivals and departures
Design and construction	According to PED 2014/68/EU and AD-2000
Identification marking	Refer to rating plate



3.7 Applied EU Directives and harmonised standards

The system meets the essential requirements of the following directives and harmonised standards:

2014/68/EU	Pressure Equipment Directive
2014/35/EU	Low Voltage Directive
2014/30/EU	Guideline relating to electromagnetic compatibility, EMC directive
AD 2000	Pressure equipment
DIN EN 50156-1	Electrical equipment for furnaces and related equipment - Part 1: Provisions for application planning and construction

The declaration of conformity is enclosed separately with the assembly unit or can be requested from **BEKO** Technologies GmbH.

4. Installation

4.1 Safety instructions

CAUTION	**Quality of compressed air**
	• The compressed air must be free of aggressive, corrosive, caustic, toxic, flammable or oxidising substances. • Compressed air up to max. 100% saturated, free of liquid water or condensate.

DANGER	**Compressed air! Gases under high pressure**
	Any contact with escaping compressed gas or not secured system parts will create danger of serious injuries or death. • Only executeinstallation work and maintenance work in a depressurised status. • Use only pressure-resistant installation materials and suitable tools that are in proper working order. • Only ever use fittings and connecting elements which are approved for this application. Always adhere to the manufacturer's information and instructions. • Always inspect all plant parts before pressurising the system and tighten them. • The compressed air lines must be permanently installed. • Always prevent people or objects from being affected by escaping compressed gas. • Perform a leakage test. • Never carry out structural modifications on the plant! • Use only original spare parts and accessories! • The general statutory safety and accident prevention regulations apply.

NOTE	**Endangered functional safety**
	• Faulty installation can endanger the functional safety and have a negative effect on maintenance work. • The clear width of the pipe connection must be at least as large as the connection dimension of the **BEKOKAT®**. • Ensure that no water or condensate can ingress into the **BEKOKAT®**. • To execute maintenance work, a shut-off valve should be installed upstream of the **BEKOKAT®** inlet and downstream of the **BEKOKAT®** outlet. • If necessary, install a bypass pipe. • Flawless function of the **BEKOKAT®** and the pressure equipment along with the safety fittings must always be ensured. • The removal of seals and labels on safety equipment is prohibited. • Non-compliance with this installation and operating manual can cause hazards for personnel and assembly units.

CAUTION	**Use of protective clothing**
	To prevent injuries to the feet and hands during transport of the **BEKOKAT®**, the skilled technical personnel must wear sufficient protective clothing and safety shoes**!**

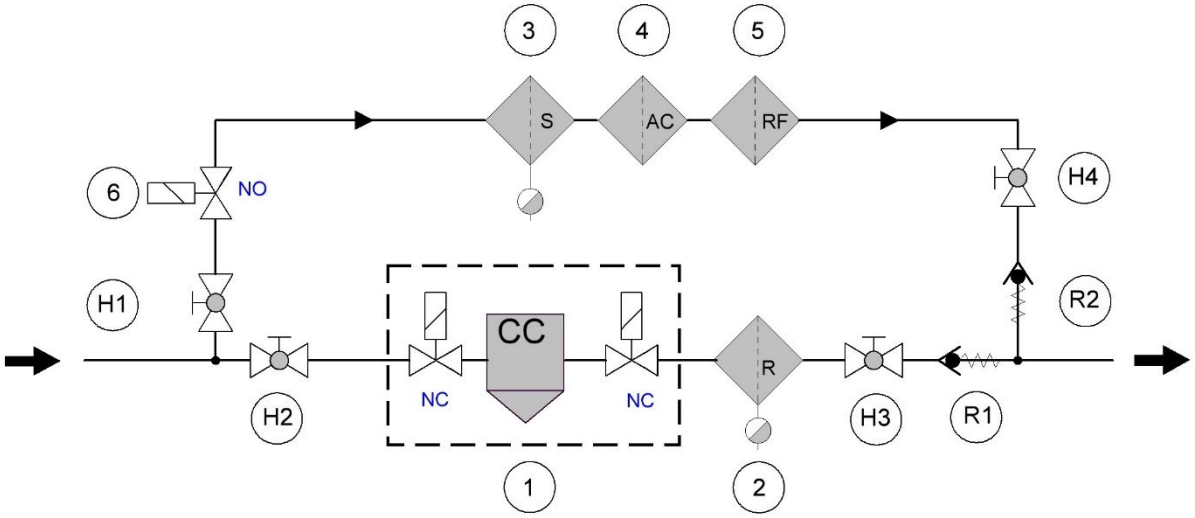
4.2 Fundamental requirements for the installation

1. Set up the converter so that the system is easily accessible from the sides and from the top.
2. Ensure a suitable base (sufficiently stable and level) during the setting up process.
3. The blow-off direction of the safety valve must be away from traffic routes.
4. The **BEKOKAT®** may only be operated in an environment free of aggressive, corrosive, caustic, toxic, flammable and oxidising components.
5. When installing the **BEKOKAT®** downstream of a compressor with aftercooler, make sure that no liquid water or condensate gets into the **BEKOKAT®**.
6. Please note that for longer distances between the compressor / compressed air container and **BEKOKAT®**, post-condensation may occur in the pipes resulting in free condensate.
7. Liquid water can impair the function of the **BEKOKAT®**. In this situation install a suitable system for water and condensate discharge.
8. We recommend the use of our **CLEARPOINT®** water separators and **CLEARPOINT®** filters.
9. Minimum ambient temperature +5 °C.
10. Maximum ambient temperature + 45 °C.
11. Always ensure unimpeded air exchange and sufficient ventilation.
12. According to DIN EN 50156-1, the installation of an EMERGENCY STOP switch / EMERGENCY STOP device is required.

NOTE	**Manual shut-off valves and non-return valve**
	• A manual shut-off valve must be installed before and after the **BEKOKAT®**. • We recommend to install a **BEKOKAT®** check valve to safely prevent reverse flow. • Furthermore, we strongly recommend that the **BEKOKAT®** is equipped with a lockable bypass pipe.

4.3 Bypass System

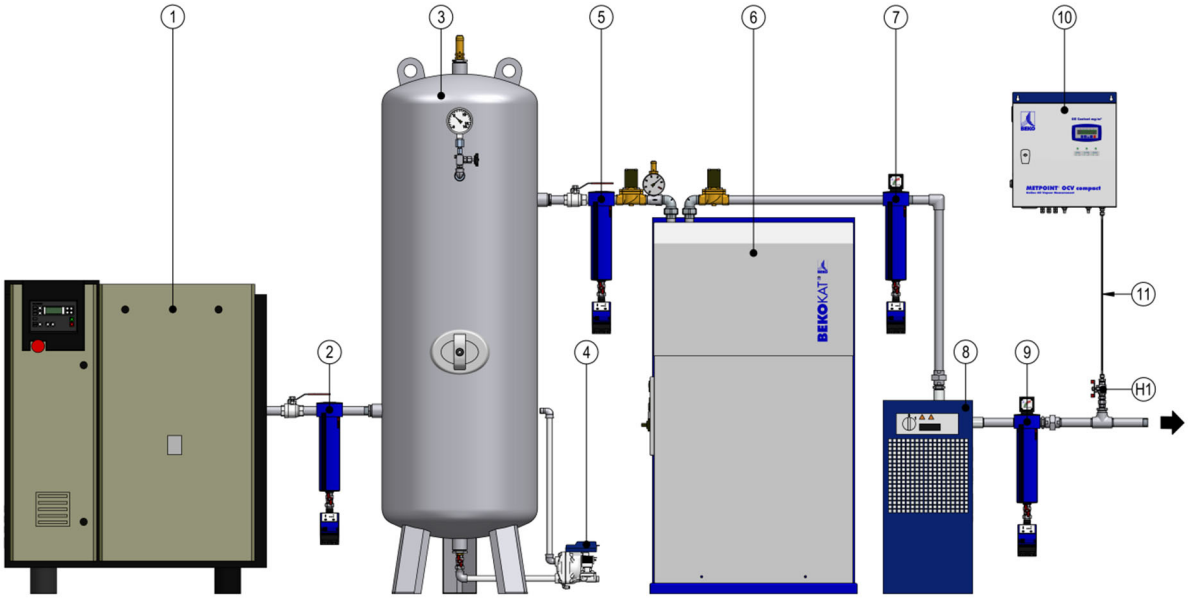
The bypass system should be equipped with an automatic bypass valve and installed as follows:



1	**BEKOKAT®**
2	**CLEARPOINT®** particle filter as afterfilter with **BEKOMAT®**
3	**CLEARPOINT®** ultra-fine filter as bypass filter with **BEKOKAT®**
4	**CLEARPOINT®** Activated-carbon adsorbers
5	**CLEARPOINT®** particle filter as afterfilter
6	Automatic BYPASS VALVE for **BEKOKAT®**
H1, H2	shut-off ball valve
H3, H4	shut-off ball valve, oil and grease-free model
R1, R2	Check valve, oil and grease-free version

4.4 Installation examples

4.4.1 Compressed air treatment with a BEKOKAT® catalytic converter



1	Compressed air compressor (oil lubricated)
2	Water separator with condensate arrester **BEKOMAT®**
3	Compressed air vessel
4	Condensate arrester **BEKOMAT®** for boiler drainage
5	Universal filter (CX) with **BEKOMAT®** (option for heavily soiled or contaminated compressed air)
6	Universal filter (CX) with **BEKOKAT®**
7	Oil-free and grease-free dust filter (FX) with **BEKOMAT®**
8	Oil-free and grease-free **DRYPOINT® RA** refrigeration dryer
9	Oil-free and grease-free super fine filter (SX) with **BEKOMAT®**
10	**METPOINT® OCV compact** measuring device
11	Oil-free and grease-free connection pipework made of stainless steel
H1	Oil-free and grease-free shut-off ball valve

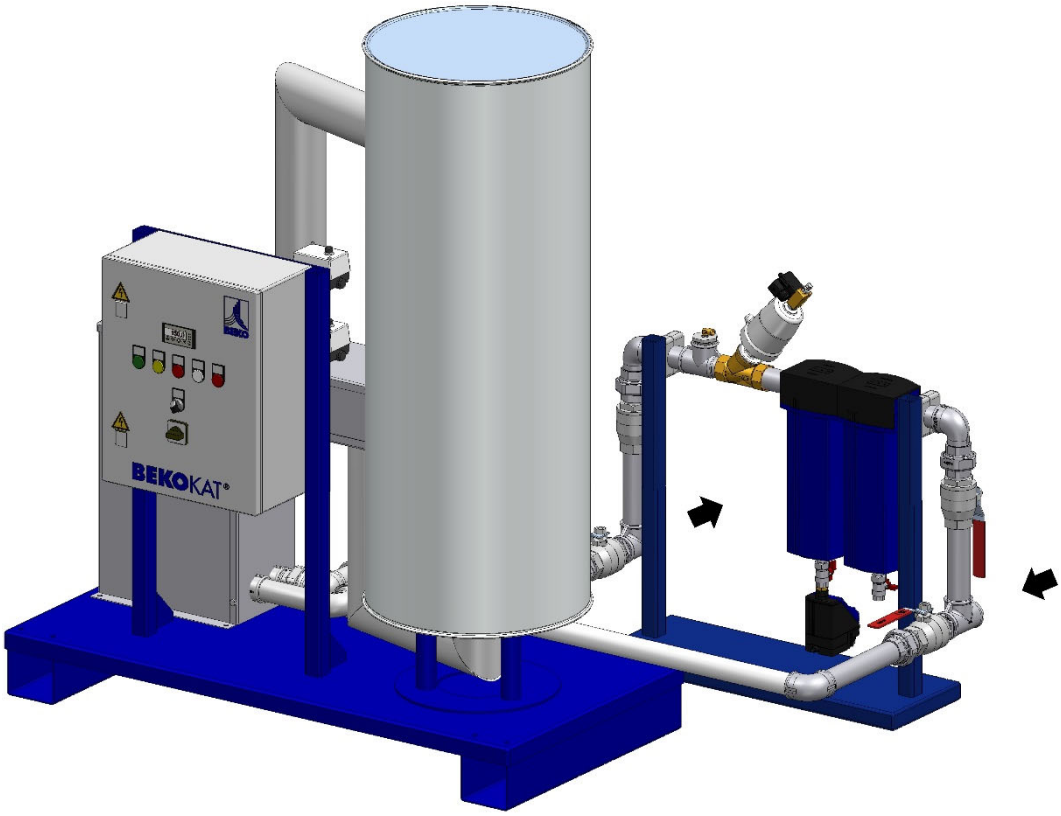
4.4.2 BEKOKAT® with Bypass

BEKOKAT® CC-360

Bypass with automatic valve

Prefilter **CLEARPOINT** M018SWT

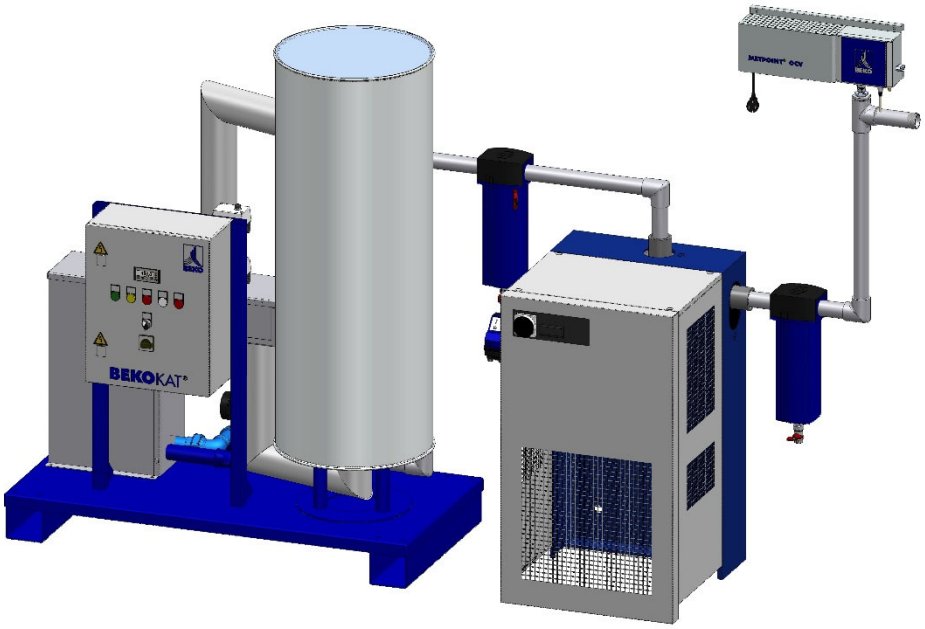
Activated carbon filter **CLEARPOINT** M018AWM



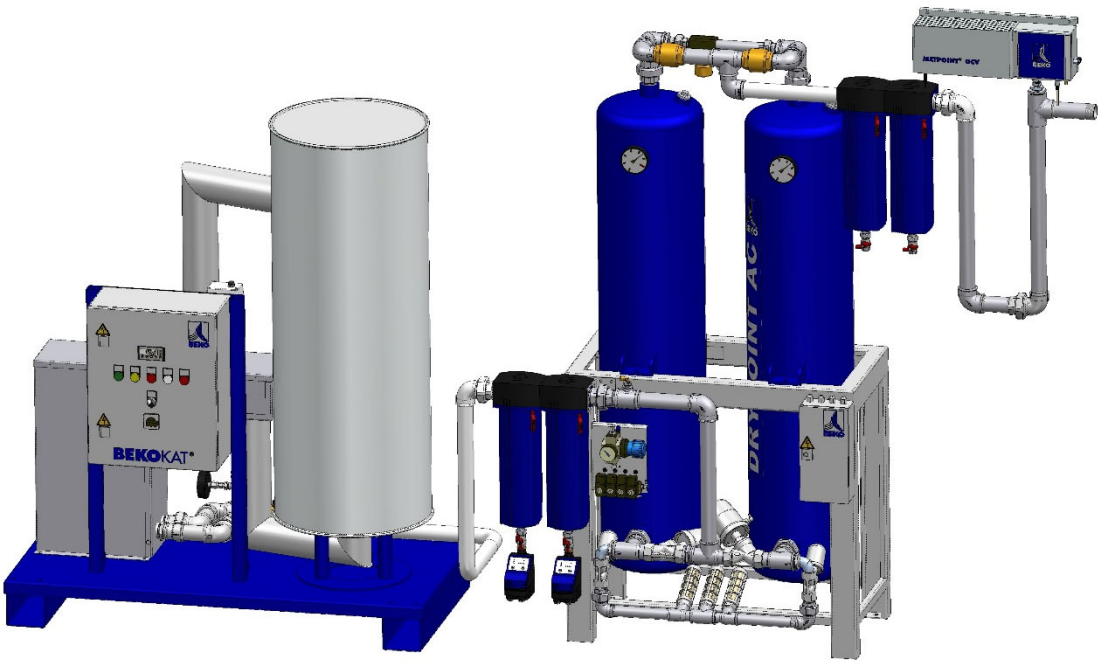
NOTE	Installation
	• Please note that the activated carbon filter in the bypass only has a service life of approx. 100 operating hours. • In the installation after the **BEKOKAT®**, only use components in oil and grease-free models. Otherwise, the system will be contaminated with hydrocarbons again. • The maximum permissible pressure of the converter is 16 bar. • The ambient temperature must be between + 5 °C and + 45 °C.

4.4.3 BEKOKAT® with DRYPOINT® refrigeration dryer and METPOINT® OCV

In general, the integration of the **BEKOKAT®** into your system is recommended as a complete unit with the corresponding drying of the compressed air and the monitoring of the residual oil content using **METPOINT® OCV**.

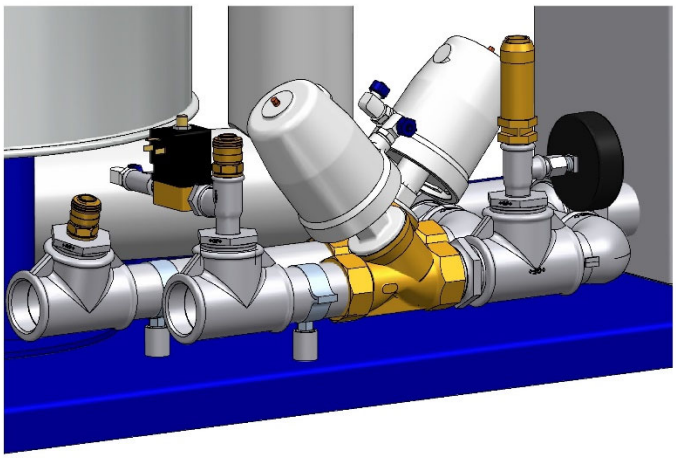


4.4.4 BEKOKAT® with DRYPOINT® adsorption dryer and METPOINT® OCV



4.5 Installation of compressed air connection

The compressed air connection of the **BEKOKAT®** is located on the valves for inlet and condensate drain (see illustration).



The connection is designed as a **cylindrical internal thread Rp 2 1/2 " in accordance to DIN EN 10266-1**.

Proceed as follows to connect the BEKOKAT® to the compressed gas system:

1. Connect **BEKOKAT®** professionally to the compressed air line.

2. Inspect compliance with the safety instructions relating to the **quality of the compressed air.**

   Refer to the "Assembly" chapter.

3. Inspect all bolt fittings for correct seating and tightness.

4. Inspect the correct connection of the inlet and outlet pipes to the assembly unit.

5. Subsequently initiate a leak tightness examination for the whole installation.

4.6 Electrical installation

4.6.1 Safety instructions

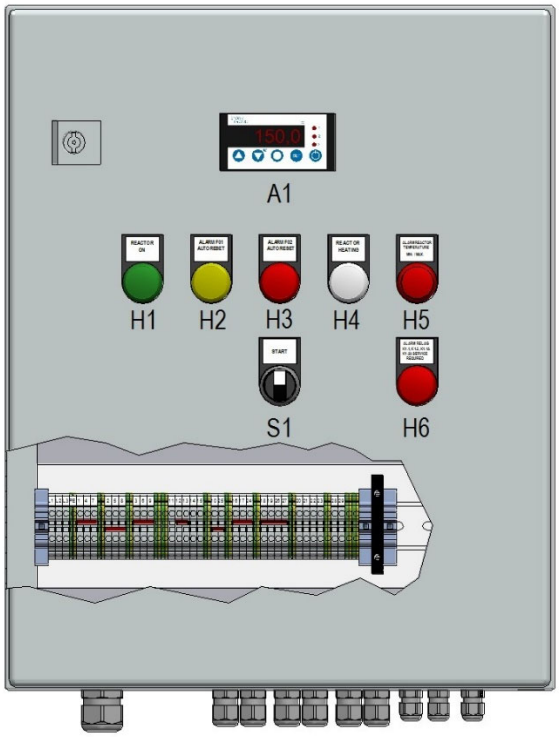
DANGER	Electric power
	Touchable conductive parts can lead to dangerous voltages / mains voltage during installation and maintenance or in case of defects. Hazard resulting in of serious or even fatal injury from electric shock when coming into contact with uninsulated parts or mains voltage. • All work on the electrical part of the assembly unit may only be carried out by suitably trained skilled technical personnel. • The **BEKOKAT®** must not be put into operation when the power supply cables have been damaged or parts of the housing have been damaged or removed. • The valid legal regulations and provisions at the local place of use must be complied with without exception. • Observe the electrical data provided on the rating plate. • Work on the electrical connections may only be executed when the power supply is switched off. The system must be secured against unintentional restart. • Only utilise components for the electrical installation which have a current authorisation and are labelled with a CE-Identification marking. • The wire ends to be connected to the control unit must be equipped with wire-end ferrules. • All electrical connections must be inspected before commissioning and at regular intervals.

DANGER	**Operation without earth connection**
	If there is a missing earth connection (protective earth), there is a danger that mains voltage components might become energised in case of errors. These will pose a risk of serious or even fatal injury. **Earth connection takes place in this assembly unit via the mains supply line.** • The assembly unit must always therefore be earthed and/or connected to a protective conductor. • The assembly unit may only be connected to a grounded power outlet. • Do not use plug adapters at the power plug. If required, have the power plug replaced by a qualified electrician. • Only replace a damaged mains power cable with an equivalent cable.

DANGER	**Operation without circuit breaker**
	All components that are dangerous when touched due to their voltage must be disconnectable by means of dedicated external circuit breakers. • The circuit breaker must be located in the vicinity of the system. • The circuit breaker must conform to IEC 60947-1 and IEC 60947-3. • The circuit breaker must disconnect all electrical conductors from the mains power supply. • The circuit breaker must not be installed in the power supply line. • The circuit breaker must at all times be easily accessible to operating personnel.

DANGER	**Lack of EMERGENCY-STOP Switch**
	According to DIN EN 50156-1, installation of an EMERGENCY STOP switch / EMERGENCY STOP device is required. • It is the responsibility of the operator to install an EMERGENCY STOP button. • Emergency shut-down devices must meet the following requirements: • They must be located in an easily accessible, safe place outside the room in which the **BEKOKAT®** is installed or along the escape route and marked according to the intended use. • The switch to trigger the emergency shutdown must be a red switch on a yellow background.

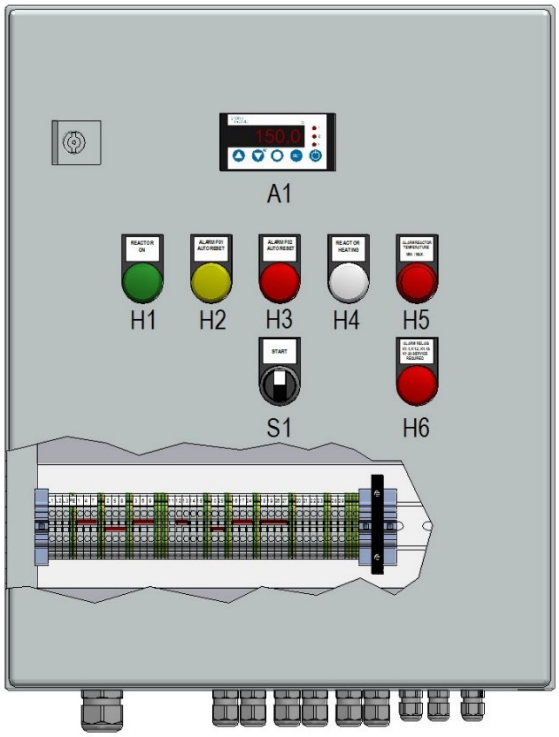
4.6.2 Electrical connections

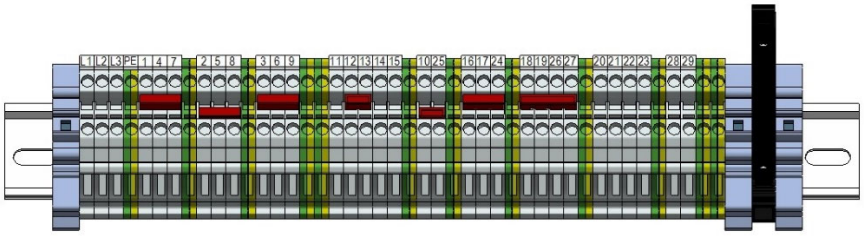


On the lower side of the control box of the **BEKOKAT®** are the cable glands for the electrical and signal connections.

Here, the power supply lines and the **potential-free alarm contact** for the operating message are connected.

4.6.3 Terminals for electrical connections





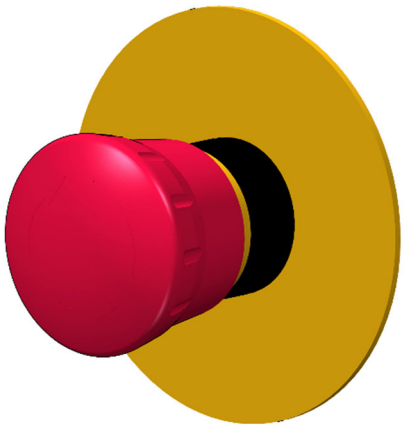
All electrical connections are screw terminals.

Open the control box, feed the cables through the screw connections into the control box and close the wiring according to the circuit diagram.

Then firmly tighten the cable glands.

Close unused feed-throughs with a blind plug. Close the switch box again.

4.6.4 EMERGENCY STOP switch / EMERGENCY STOP device



Install an EMERGENCY STOP switch.

In accordance with DIN EN 50156-1, emergency shut-down devices must meet the following requirements:

- They must be located in an easily accessible, safe place outside the room in which **BEKOKAT®** is installed or along the escape route and marked according to the intended use.
- The switch to trigger the emergency shutdown must be a red switch on a yellow background.

5. Commissioning

5.1 Safety instructions

DANGER	Compressed air! Gases under high pressure
	Any contact with escaping compressed gas or not secured system parts will create danger of serious injuries or death. • Only executeinstallation work and maintenance work in a depressurised status. • Always inspect all system parts before pressure build-up and tighten them. • Open valves slowly to prevent pressure blow outs during operation. • The general statutory safety and accident prevention regulations apply.

DANGER	Risks due to damaged components
	• If you suspect that the **BEKOKAT®** is damaged, then do not put it into operation. Damaged components can impair the functional safety and cause additional damage.

DANGER	Excessive pressure / temperature
	• Suitable measures must be implemented to ensure that the permissible operating pressure and operating temperature are not exceeded on the plant. • It is the duty of the operating company to ensure that the connected pressure generator is protected against exceeding the maximum operating excess pressure of 16 bar (g) and the temperature limits on the **BEKOKAT®**. • It must be ensured that the pressure generating compressor and the compressed gas system are secured and safe. • Suitable measures must be implemented to ensure that the permissible operating temperature is not inadvertently exceeded by ambient conditions at the installation location.

WARNING	**Hot surface**
	• Risk of injury to people property damage - risk of fire! • Before executing any work on **BEKOKAT®**, the plant must be allowed to cool down! • Secure and mark the accessible places.

WARNING	**Smoke Detection**
	• Danger of exposure to personnel - Risk of fire! • Please install a smoke detector in the vicinity of the **BEKOKAT®**.

WARNING	**National regulations**
	• Owners and/or operators of the systems must observe the local and national pressure equipment regulations in the country of installation.

5.2 Inspection before commissioning

The relevant country-specific regulations must be observed with regard to testing prior to commissioning.

Implement a risk assessment in accordance with the applicable national guidelines.

Safety-related technical inspections must be executed in accordance with national regulations.

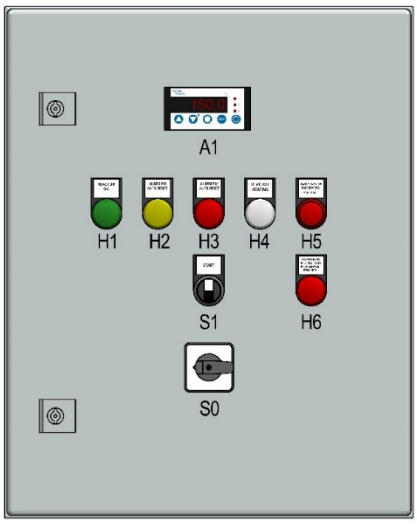
NOTE	**Technical safety inspection**
	After initial connection by a qualified electrician, a measurement of the loop impedance of the fuse must be carried out.

5.3 Operation

NOTE	Safe operation
	• The assembly unit must only be operated and serviced according to the information in the operating instructions to ensure safe operation. • In addition to these instructions, always comply with the required statutory regulations for the application cases for system operation and company safety regulations as well as accident prevention regulations. • This also applies to the use of accessories and spare parts. • Non-compliance with these installation and operating instructions can cause hazards for people and the plant.

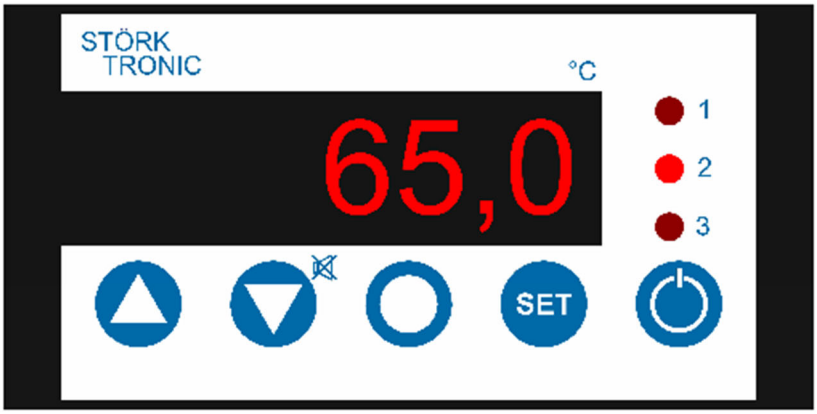
WARNING	Operation of plant outside limit range
	If the specified limits are undershot and/or exceeded, then function and operating malfunctions could occur and cause danger for people and material. • **BEKOKAT®** may only be used in accordance with its intended use and within the permitted limiting values stated on the rating plate as well as in the technical data. • The maximum compressed air volume flow at the inlet of the **BEKOKAT®** plant must not exceed 360 m³/h (refer to the data on the rating plate as well as in the technical data).

5.3.1 Electric control



Designation	Description	Display
S0	Main switch	
S1	Start switch	
A1	Temperature control unit	
H1	Converter in operation	"Green" indicator light
H2	ALARM with AUTO-RESET Temperature monitor TW	"Yellow" indicator light
H3	ALARM with AUTO-RESET Safety Temperature Monitor STW	"RED" indicator light
H4	Reactor heating phase	"White" indicator light
H5	ALARM Reactor min. / Max.	"RED" indicator light
H6	ALARM Malfunction Relay K1.1, K1.2, K1.1A, K1.2A	"RED" indicator light

5.3.2 Settings



Key	Designation	Function
	**FUNCTION KEY 1** **Default setting**	On/off control, Setpoint switching and/or coupling to an output relay. After mains interruption the status remains stored.
	**KEY OPEN**	Pressing this key enlarges the parameter or parameter value or scrolls through the parameter list.
	**KEY DOWN**	By pressing this key, the parameter or parameter value is reduced or the parameter list is scrolled through. In the event of an alarm, the buzzer function is switched off by pressing the key.
	**FUNCTION KEY 2** **Default setting Setpoint changeover**	On/off control, Setpoint switching and/or coupling to an output relay. After mains interruption the status remains stored.
	**SET BUTTON**	While this button is pressed, the setpoint value is displayed. This button is also used for parameter settings.

5.4 Initial commissioning

After installation has been completed, proceed as follows for commissioning of the **BEKOKAT®**:

1st Ensure that the pipework system is free of contamination and impurities.

2nd Inspect the compliance with the safety instructions relating to the quality of the compressed air. Refer to the "Assembly" chapter.

3rd Inspect the compliance with the safety instructions for the electrical connections and the voltage supply. Refer to the "Installation" chapter.

4th Check if an EMERGENCY STOP switch / EMERGENCY STOP device is installed.

5th Connect the alarm contacts for minimum and maximum temperature.

6th Turn on the main switch.

7th Connect the signal line for the bypass valve (option).

8th Turn on the Start switch S0 / S1 "Converter Operation" to "ON".

The heating control light **BEKOKAT®** lights up white (H4), the converter is heated up. As long as the temperature of +150°C has not yet been reached, the valves remain closed.

9th The heating phase lasts about 5 hours.

After this, the valves open.

The heating up time of the **BEKOMAT®** depends on the following factors:

- Voltage
- Ambient temperature
- Air movement at the place of installation
- Duration of shutdown of the assembly unit.

The specified value for the heating time can thus be exceeded or fallen below.

10th After a heating phase of about 5 hours, the target temperature of + 150 °C is set in the catalytic bed. The white indicator goes out and the green "Reactor ON" (H1) indicator comes on.

The compressed air supply is automatically opened via the solenoid valve Y1.

Below a stable operating point is reached where the actual temperature can fluctuate by the set target value of about +/- 5 °C. For this purpose, the changing operating conditions due to load and idle time of the compressor are responsible.

11th No additional adjustments are required to be implemented after successful commissioning.

BEKOKAT® is now ready for use. The operation is fully automatic.

Should unforeseen malfunctions occur during ongoing operation, then please notify your responsible service technician.

5.5 Notes on the reactor temperature during commissioning

During commissioning of the **BEKOKAT®**, the reactor temperature may rise above + 200 °C. This condition usually occurs when the commissioning of the **BEKOKAT®** takes place in stand-by mode, i.e. without compressed air.

- When the set nominal temperature in the reactor is reached, the valves open at the inlet and condensate drain of the **BEKOKAT®**.

- In the further course, the reactor temperature can reach values> + 200 °C, because there is no cooling by the flow of compressed air.

- The heating of the reactor takes place from the container wall to the center of the reactor bed. That is, during commissioning, the outer edge of the bed is first heated. After a relatively short time a temperature of + 260 °C is reached and the heating systrm switches off. At this time, the temperature at the sensor is still significantly lower, e.g. + 90 °C. Although the heateing system has been turned off, the heat migrates to the centre of the container and causes heat distribution throughout the reactor bed.

- The rise in temperatures above +200°C only occurs when heating during the commissioning. This effect is caused by the large temperature difference between reactor wall and reactor centre.

- If the reactor is flowed through with compressed air immediately after opening the valves, then the heating above + 200 °C by the heat discharge by means of the compressed air is avoided.

- In the further course, the heat exchange within the container only leads to fluctuations between + 150 °C and + 175 °C. Values over + 200 °C are not reached.

- Thus, the valves remain permanently open in stand-by mode.

CAUTION	**Reactor temperature> + 200 °C**
	Rise in reactor temperature to> + 200 °C during commissioning • The increase of the reactor temperature to> + 200 °C during commissioning is not a malfunction. • If the reactor temperature does not drop despite flowing through with compressed air, then it is a malfunction incident and the system must be shut down and checked in any case. • Commissioning of the **BEKOKAT®** is only permitted after inspection and approval by authorised skilled technical personnel.

5.6 Notes on the operation of the BEKOKAT®

DANGER	**Blow-off compressed air at the safety valve**
	Contact with rapidly escaping compressed air from the safety valve may result in serious damage to persons. When working on the assembly unit (maintenance / inspection / repair), make sure that the permissible operating pressure is not exceeded. Be careful when blowing off the safety valve. The operating personnel must be instructed by the operator of this possible danger.

NOTE	**For the operation of BEKOKAT® please be aware of the following notes:**
	1. The assembly unit is switched on and off with the main switch S0 and Start switch S1. 2. The display A1 shows the reactor temperature. 3. At nominal conditions, the reactor temperature sets between + 145 °C and + 160 °C. 4. The **BEKOKAT®** works fully automatically during operation. 5. If a heating system fails, please contact the **BEKO** customer service. 6. If faults occur during operation, please inform the responsible service technician.

5.7 Notes on reactor temperature during operation

The following operating states can occur:

Reactor temperature T <+ 110 °C
Please check the following points: • Volume flow too high • Operating pressure too low • heating system failed • Set the setpoint + 150 °C for the reactor temperature (see chapter 5.3.2) • Compliance with the heating time after shutdown.

Reactor temperature T <+ 180 °C
Please check the following points: • Volume flow deviating from the nominal data of the system • Operating pressure too small • Oil entry very high • Set the setpoint + 150 °C for the reactor temperature (see chapter 5.3.2)

In these cases, a change in the reactor set point temperature is possible to minimise the thermal load on the system and energy consumption.

The setpoint can be reduced in increments of 5 K to approx. + 140 °C (see chapter 5.3.2). Please consult the **BEKO** TECHNOLOGIES service.

DANGER	**Reactor temperature> + 200 °C**
	shown on the display reactor temperature> + 200 °C • If the reactor temperature indicated on the display is> + 200 °C, and there is a fault, e.g. it may have been caused by an increased oil input into the **BEKOKAT®**. • Commissioning of the **BEKOKAT®** is only permitted after inspection and approval by authorised skilled technical personnel.

5.8 Re-commissioning after shut down

If the **BEKOKAT®** is only put back into operation after a long downtime, proceed as with initial commissioning.

Check, particularly after maintenance or repair, if the **BEKOKAT®** is fully piped and electrically connected. If not, then initiate a correct installation.

6. Troubleshooting and remedying malfunctions

6.1 Safety instructions

WARNING	**Hot surface**
	• Risk of injury to people property damage - risk of fire! • Before executing any work on **BEKOKAT®**, the plant must be allowed to cool down! • Secure and mark the accessible places.

WARNING	**Fire**
	• Adjust the fire extinguishing measures to the working environment. • Never use water in a full jet for safety reasons. • Wear a respiratory mask independent of ambient air.

6.2 Reactor temperature> + 200 °C

Malfunction image	
The reactor temperature rises during operation above T> + 200 °C. **Close valves V1 / V2. The compressed air supply is interrupted.** As soon as the valves close, the potential-free alarm contact is activated, signalling the fault by means of an external display (warning signal, indicator light, etc.). This connection option must be used.	
Cause	**Measure**
The system must be shut down and checked in all cases if the reactor temperature is exceeded.	
The air flow through the reactor was interrupted for a long time.	Check that the compressor regularly supplies compressed air to the reactor. Establish compressed air supply.
The amount of oil entering the **BEKOKAT®** is too large.	Check oil separator of compressor.

In addition to the automatic closing of the valves at the inlet and outlet, in this case the manual shut - off valves must also be closed before and after the system.

DANGER	**Commissioning**
	**Commissioning of the BEKOKAT® is only permitted after inspection and approval by authorised skilled technical personnel.**

6.3 Reactor temperature> + 60 °C

Malfunction image	
The reactor temperature drops below T <+ 60 °C during operation. **Close valves V1 / V2 as complete catalysis can not be ensured. The compressed air supply is interrupted.** As soon as the valves close, the potential-free alarm contact is activated, signalling the fault by means of an external display (warning signal, indicator light, etc.). This connection option must be used.	
Cause	**Measure**
The heating system has failed.	Check the function of the heating elements.
The supplied air flow is too large (overload) and is not heated.	Check volume flow rate.

6.4 Safety temperature monitor (TW) activated

Malfunction image	
The safety temperature monitor (TW) of the heating system of the reactor responds, the temperature at the container tank wall in the upper range is T> + 260 °C.	
Cause	**Measure**
The setpoint of the reactor temperature (in the display + 150 °C) has been changed.	Temperature control on the display with the Set key, if the setpoint of + 150 °C is set. (see chapter 5.3.2)
Compressed air flow too low.	Increase flow rate.
Inadmissible high oil concentration, e.g. due to breakage of the oil separator cartridge of the compressor.	Replacement of the oil separator cartridge on the compressor. **BEKOKAT®** recommissioning procedure.

NOTE	**AUTO-RESET**
	The alarm is reset via AUTO-RESET (see chapter 3.5.7). The response of the safety temperature monitor (TW) during the heating phase is not a fault. This is a normal control status.

6.5 Safety temperature monitor (STW) activated

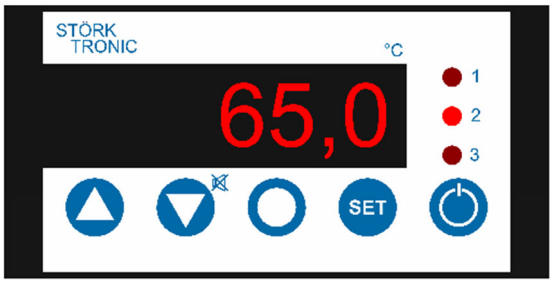
Malfunction image	
The safety temperature monitor (STW) of the heating system of the reactor responds, the temperature at the container tank wall in the lower area is T> + 300 °C.	
Cause	**Measure**
The setpoint of the reactor temperature (in the display + 150 °C) has been changed.	Temperature control on the display with the Set key, if the setpoint of + 150 °C is set. (see chapter 5.3.2)
Compressed air flow too low.	Increase flow rate.
Inadmissible high oil concentration, e.g. due to breakage of the oil separator cartridge of the compressor.	Replacement of the oil separator cartridge on the compressor. **BEKOKAT®** recommissioning procedure.

NOTE	**AUTO-RESET**
	The alarm is reset via AUTO-RESET (see chapter 3.5.7). The response of the safety temperature monitor (STW) during the heating phase is not an incident. This is a normal control status.

6.6 Short-term power failure

Malfunction image	
Close valves V1 / V2. **The current supply is interrupted.** **No alarm is displayed.**	
Cause	**Measure**
Interruption of the voltage supply.	The valves close automatically. When the power is restored, the time of approx. 5 hours via the K1T (see E-plan page 6) expires again. At a reactor temperature between + 130 °C and + 150 °C, the RESET function of K1T can be used (refer to Chapter 6.10).
Exceeding the permissible voltage range. This will trigger the fuses and interrupt the voltage supply.	The valves close automatically. When the power is restored, the time of approx. 5 hours via the K1T (see E-plan page 6) expires again. At a reactor temperature between + 130 °C and + 150 °C, the RESET function of K1T can be used (refer to Chapter 6.10).

6.7 Error display

Malfunction image

The display A1 shows "Err". **Close valves V1 / V2.** **The compressed air supply is interrupted.** As soon as the valves close, the potential-free alarm contact is activated, signalling the fault by means of an external display (warning signal, indicator light, etc.). This connection option must be used.

Cause	Measure
Error in the temperature sensor	Check temperature sensor. Replace temperature sensor if necessary. Please contact the **BEKO** TECHNOLOGIES service.
Capillary break in the thermostat	Check thermostat. Replace temperature sensor if necessary. Please contact the **BEKO** TECHNOLOGIES service.

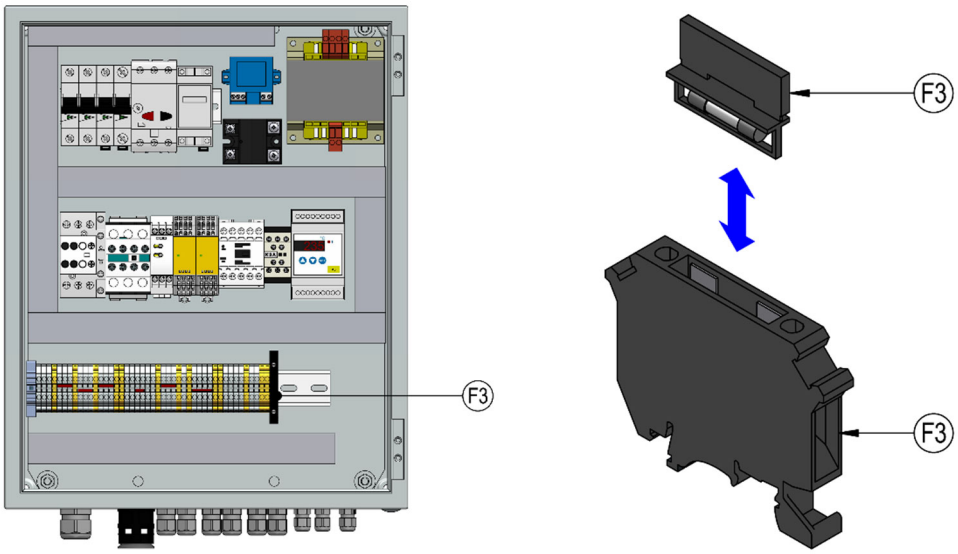
NOTE	**Skilled technical personnel**
	All function tests, operation, installation, configuration and maintenance of the device must be carried out by authorised skilled personnel.

6.8 Defective contactor or defective relay module

Malfunction image	
Indicator "H6" lights up	
Cause	**Measure**
Power contactor K1.1 or K1.2 blocked	Check contactor and replace if necessary. Please contact the **BEKO** TECHNOLOGIES service.
Relay module K1.1A or K1.2A blocked	Check relay module and replace if necessary. Please contact the **BEKO** TECHNOLOGIES service.

NOTE	**Skilled technical personnel**
	All function tests, operation, installation, configuration and maintenance of the device must be carried out by authorised skilled personnel.

6.9 Defective fuse

Malfunction image
The indicator lights "H1-H6" are switched off. **The display A1 is active.** 

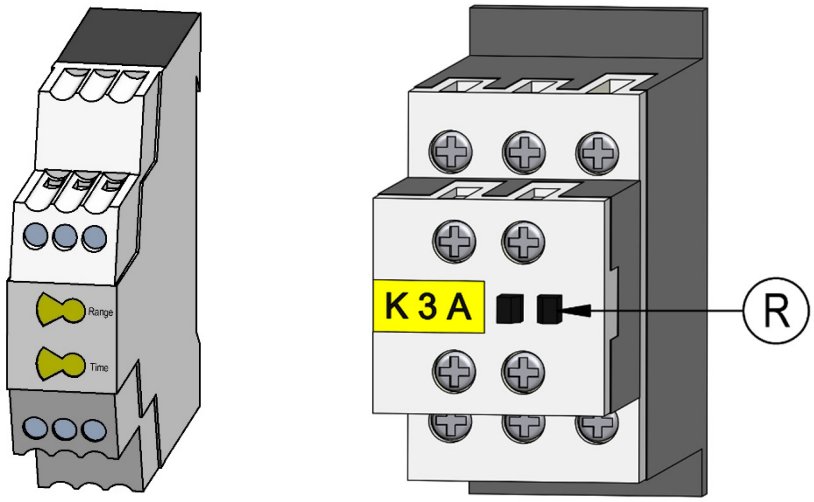
Cause	Measure
Fuse F3 defective	Check fuse and replace if necessary. Please contact the **BEKO** TECHNOLOGIES service.

NOTE	Skilled technical personnel
	All function tests, operation, installation, configuration and maintenance of the device must be carried out by authorised skilled personnel.

6.10 RESET for time relay K1T

There is a contactor K3A in the e-box (see E-plan attached). At a reactor temperature of> + 130 °C ... + 150 °C it is possible, in consultation with the service technician of **BEKO** TECHNOLOGIES, to actuate the RESET key of the K3A and thus to bridge the time relay.

When the RESET button is pressed, the incline seat valves V1 and V2 open. This can be utilised to wait for e.g. shorten a short-term voltage drop.



R RESET button for relay K1T

DANGER	**Observe temperature**
	• At a reactor temperature of <+ 130 °C ... + 150 °C the time of K1T of approx. 5 hours must be kept. • Only after reaching a reactor temperature> + 130 °C ... + 150 °C can the possibility of the RESET key (R) on the relay K3A be used. • A reactor temperature **> + 250 °C** handelt es sich um einen **fault** and the system must be shut down and checked. • The RESET button (R) must **not** be pressed in this case. • Commissioning of the **BEKOKAT®** is only permitted after inspection and approval by authorised skilled technical personnel.

7. Maintenance

7.1 Safety instructions

NOTE	Maintenance works
	• All maintenance work on the **BEKOKAT®** may only be executed when the catalytic converter is switched off, depressurised and voltage-free. • All function tests, operation, installation, configuration and maintenance of the device must be carried out by authorised skilled personnel. • The removal of seals and labels on safety equipment is prohibited. • Only ever use fittings and connecting elements which are approved for this application. • Always adhere to the specific manufacturer's information and instructions. • Pay attention to the correct professional installation of the connections.

WARNING	Hot surface
	• Risk of injury to people property damage - risk of fire! • Before executing any work on **BEKOKAT®**, the plant must be allowed to cool down! • Secure and mark the accessible places.

CAUTION	Use of protective clothing
	To prevent injuries to the feet and hands during transport of the **BEKOKAT®** , the skilled technical personnel must wear sufficient protective clothing and safety shoes**!**

DANGER	**Electric power**
	Touchable conductive parts can lead to dangerous voltages / mains voltage during installation and maintenance or in case of defects. Hazard resulting in of serious or even fatal injury from electric shock when coming into contact with uninsulated parts or mains voltage. • All work on the electrical components of the **BEKOKAT®** may only be carried out by suitably trained specialists. • Before starting work, disconnect the system from the power supply via an external disconnecting device. • The **BEKOKAT®** must not be put into operation if the power supply cables have been damaged or parts of the housing have been damaged or removed. • The valid legal regulations and provisions at the local place of use must be complied with without exception. • Observe the electrical data provided on the rating plate. • Work on the electrical connections may only be executed when the power supply is switched off. The system must be secured against unintentional restart. • Only utilise components for the electrical installation which have a current authorisation and are labelled with a CE-Identification marking. • The wire ends to be connected to the control unit must be equipped with wire-end ferrules. • All electrical connections must be inspected before commissioning and at regular intervals. • The removal of seals and labels on safety equipment is prohibited.

7.2 Decommissioning for service, maintenance or repair

Always proceed as follows to decommission the plant for servicing, maintenance or repairs:

1st Turn off the **BEKOKAT®** master switch.

2nd Open the bypass-line (not included).

3rd Close the shut-off valves in front of and behind the **BEKOKAT®**.

4th Before starting work, the **BEKOKAT®** system must be depressurised.

Use the safety valve X4 installed at the compressed air inlet.

5th De-energize the system via an external disconnecting device.

6th Let the system cool down.

The cooling can take up to 48 hours.

7.3 Maintenance schedule

Carefully perform the maintenance according to the following points.

Position	Activity	Weekly	Monthly	Annually
1	Check display of SET and ACTUAL temperature.	**x**		
2	Inspect operating pressure.	**x**		
3	Inspect the volume flow rate.	**x**		
4	Implement a general visual inspection. Pay attention to unusual occurrences, damage and possible malfunctions in ongoing operation.	**x**		
5	Check the indicator light "H6". The indicator light is inactive during normal operation.	**x**		
6	Check the function of valves V1 and V2.		**x**	
7	Function test of safety valves X4 Turn the release button counter-clockwise until a clear blow out of the operating medium is audible. Then turn the venting release knob clockwise until it stops. It is the duty of the operator to ensure that this work is carried out only by authorised skilled technical personnel.		**x**	
8	Check that the nozzle X5 (see P & I diagramme) on the rear side of the catalyst reactor is firmly and tightly closed. This nozzle is not available in all versions.		**x**	
9	Analyse the compressed air quality at the outlet on the **BEKOKAT®**. We will be pleased to advise you how to do this.		**x**	

Position	Activity	Weekly	Monthly	Annually
10	Perform a leakage test of valves V1 and V2. If necessary, replace the valves.			**x**
11	Maintenance of safety valves X4. Maintenance of the safety valve and its intervals must be determined by the operator according to the conditions of use.			**x**
12	Change the filter element on the afterfilter (option).			**x**
13	Replacement of the set of wearing parts of the **BEKOMAT®** 20 FM at the afterfilter (option).			**x**
14	Exchange of catalyst agent	**Refer to Chapter 7.5**		

NOTE	**Skilled technical personnel**
	The annual maintenance of the **BEKOKAT®** can only be performed by **BEKO** TECHNOLOGIES or by authorised skilled technical personnel allocated by the manufacturer.

7.4 Recurring inspections

The owner and/or operator is obliged to specify deadlines for the recurring inspections and, depending on the classification in the compressed air equipment category in accordance with the Pressure Equipment Directive, have these executed by an approved inspection body.

7.5 Exchange of catalyst agent

It is recommended to replace the catalyst granules in the reactor after about 20,000 hours of continuous operation.

The replacement of the catalyst granulate can only be carried out by **BEKO** TECHNOLOGIES or by authorised skilled technical personnel authorised by the manufacturer.

The utilised catalyst agent is not subject to mandatory labelling in accordance to the Hazardous Substances Regulation. The customary precautionary measures for handling chemicals still apply in this case.

NOTE	Fire prevention
	Adjust the fire extinguishing measures to the working environment. Never use water in a full jet for safety reasons. Wear a respiratory mask independent of ambient air.

7.6 Waste code

In accordance with Directive 2008/98/EC, the following waste code has been established:

Material	Waste code
Used catalysts	Waste code 16 08

The corresponding material safety data sheets are available on request.

8. Disposal

8.1 Decommissioning

Take the system out of operation as described in Chapter 7.2 and dispose of the system according to the legal regulations stipulated in the user country.

8.2 Disposal

The waste must not be disposed of as normal household waste in municipal rubbish bins. The product must be disposed of appropriately at the end of its useful life. Materials such as metal, glass, plastics and some chemical compounds are mostly recoverable, reusable, or recyclable.

If **BEKOKAT®** is not returned to **BEKO** TECHNOLOGIES GmbH for disposal, the components must be disposed of in accordance with the **waste code** (see Chapter 7.6).

WARNING	**Risk to health and the environment!**
	Never dispose of old plants in household waste! Depending on the medium utilised in the system, residues in the system could cause a hazard for the health of the operator and the environment. Therefore always implement suitable protective measures and dispose of the device through the proper channels.

9. Appendix

The electrical plan is attached separately in the E-box.

The declaration of conformity will be sent separately with the system documentation and is not an integral part of this delivery.

10. Service addresses

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