



**Flamონitec**<sup>®</sup>

BFI AUTOMATION

Operating Manual (us)

# Flame Detector KLC 20 / KLC 21



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# 1 | General aspects

## 1.1 Introduction

This operating manual is an essential guide for the successful and safe operation of the flame detector. It contains important information on how to operate the system safely, properly and economically. Observance of these instructions helps to avoid dangers, to reduce repair costs and downtimes and to increase the reliability and service life of the unit. All illustrations and drawings in this operating manual are for general illustration purposes and are not authoritative for the design in detail.

The operating manual must be available on the unit at all times. It must be read and used by every person who is assigned to work with/on the unit,

**for example:**

- operation
- troubleshooting during operation
- servicing
- maintenance (servicing, inspection, repair) and/or
- transport

The operator should have this confirmed in writing.

## 1.2 Warning notes

The following warning notes are used in these operating instructions:

 **DANGER**

This warning level indicates an imminent hazardous situation. If the hazardous situation is not prevented, this will result in death or severe injury. Follow the instructions that accompany this warning to prevent the risk of death and severe personal injury.

 **WARNING**

This warning level indicates a potentially hazardous situation. If the hazardous situation is not prevented, this may result in death or severe injury. Follow the instructions that accompany this warning to prevent the potential risk of death and severe personal injury.

 **CAUTION**

This warning level indicates a potentially hazardous situation. If the hazardous situation is not prevented, this may result in slight or moderate injuries. Follow the instructions that accompany this warning to prevent the injury of persons.

**CAUTION**

This warning level indicates potential damage to property. If this situation is not prevented, it may result in damage to property. Follow the instructions that accompany this warning to prevent damage to property.

**NOTICE**

A notice indicates additional information that will make the handling of the device easier.

### 1.3 Copyright protection

This operating manual has to be treated as confidential. They may only be used by authorized staff. Access by third parties may only be granted upon written agreement of BFI Automation.

All documents are protected in accordance with the German copyright law.

The disclosure and reproduction of documentation, in whole or in part, as well as the exploitation and communication of its content shall not be permitted unless expressly stated otherwise. Offenders are liable for prosecution and the payment of damages. We reserve all rights to exercise industrial property rights.

### 1.4 Disposal information



The flame detector is equipped with electrical and electronic components and must be disposed separate from household waste. Follow the local and actual regulations for waste disposal.

### 1.5 Warranty

**Read these operating manual carefully and in full before operating the flame detector KLC 20!**

The manufacturer is not liable for damage or operating malfunctions that result from the operating manual not being observed. The operating manual must be supplemented by the operator with operating instructions based on existing national regulations for accident prevention and environmental protection, including information on supervisory and reporting obligations to take account of special operational features, e.g. with regard to work organisation, work processes and personnel deployed. The recognized technical rules for safe and professional working also must be observed in addition to the operating manual and the regulations on accident prevention applicable to the country and place of use.

**The warranty shall become void, for example, in the event of:**

- inappropriate use
- use of impermissible equipment
- incorrect connection
- prior works that are not part of the supplied product or service
- non-use of original spares and accessories
- conversion, if this has not been approved by BFI Automation
- non-performance of specified maintenance work

#### NOTICE

It is recommended that the operator of the device concludes a service contract with BFI Automation. This guarantees that the device is regularly checked by our service staff and ensures that any required wearing and spare parts are available without long delivery pe-

#### NOTICE

Warranty of this device does not cover damage in transit, lens glass breakage (photo element) or other damage caused by unqualified handling, incorrect adjustment or inadequate maintenance.

## 1.6 Obligation of the operating company

The flame detector KLC 20 may cause hazards if it is operated inappropriately or in an improper condition.

The operating company is under the obligation to operate the device properly. The operating company must secure hazardous areas that exist between BFI devices and the customer's own equipment.

### **The operating company must appoint and instruct responsible staff:**

- Only deploy trained or instructed staff.
- Clearly set out the responsibilities of the staff with regard to operation, set-up, maintenance and repair.
- Regularly check that staff are safety conscious, aware of hazards, and are observing the operating instructions.
- Before starting work, staff who are assigned to work with/on the device must have read and understood the operating instructions, in particular the chapter on „Safety“, as well as the relevant regulations.
- The operating manual and relevant regulations must be stored in such a way that they are accessible to operating and maintenance staff.
- Appoint who will have responsibility for device operation and ensure that this person has the authority to overrule any unsafe instructions of third parties.

#### **NOTICE**

Generally valid legal and other binding regulations on accident prevention and environmental protection must be observed and instructed, in addition to the operating instructions.

## 1.7 Liability disclaimer

All technical information, data and guidance on device operation that are contained within this operating manual are, to the best of our knowledge, correct at the time of printing, taking into account our present understanding and experience.

We reserve the right to make technical changes with respect to the further development of the flame detector outlined in this operating manual. No claims can be made based on the specifications, illustrations and descriptions of this operating manual.

BFI Automation shall not be liable for damage or operating malfunctions that result from operating errors, inappropriate repairs, or non-observance of the operating manual. We expressly state that only original spare parts and accessories approved by us shall be used. This also applies to the components of other manufacturers that have been used.

The installation or use of non-approved spare and accessory parts and any unauthorized retrofits and modifications are not permitted for safety reasons and exclude any liability by BFI Automation for consequential damages.

BFI Automation is liable for possible errors or omissions with the exclusion of additional claims entered into in the framework of the warranty obligations conceded to in the contract. Claims for damages, on whatever legal basis they may be, shall be excluded.

Translations into foreign languages are done in good faith. We cannot accept any liability for translation errors; this also applies where the translation has been done or has been commissioned by us. The original text alone shall be binding. Descriptions and illustrations do not necessarily depict the delivered product or a possible spare parts order. Drawings and graphics are not to scale.

### **1.8 Address of the manufacturer**

BFI Automation Mindermann GmbH  
Ruegenstr. 7 . 42579 Heiligenhaus . Germany  
T +49 2056 989 46-0 . E-Mail: [info@flamonitec-bfi.com](mailto:info@flamonitec-bfi.com)  
[www.flamonitec.com](http://www.flamonitec.com)

## 2 | Safety

### 2.1 Intended use

The flame detector provides the burner control with the safety-related, switched ionization current simulation.

The KLC 20 is approved for intermittent operation. For safety reasons and technical regulations, a restart controlled by the system of at least once per 24 h operating hours must be guaranteed.

#### DANGER

Danger when improperly used! The device may cause hazards if it is not used as intended and/or for any other purposes. The device has to be used only for the purposes for which it is intended. The procedures described in the operating manual must be observed.

The manufacturer/supplier shall not be liable for damage resulting from use for non-intended purposes. The user/operating company alone shall bear the risk.

### 2.2 Requirements on persons

#### NOTICE

Work on/with the device may only be performed by persons authorized to do so based on their training and qualification. Furthermore, such persons must have been commissioned by the operating company.

Do not allow any persons who are being apprenticed, educated, instructed or on a general training program to work on the device without the constant supervision of an experienced person.

Persons who are under the influence of drugs, alcohol or medication that affects reactivity shall not be permitted to carry out work on the device.

Connection, set-up, maintenance and repair work may only be done by qualified specialist staff.

This device may cause hazards if it is operated inappropriately by untrained staff or if it is not used for its intended purpose.

Generally valid legal and other binding regulations on accident prevention and environmental protection in addition to basic health and safety requirements have to be observed. The operating company has to instruct its staff accordingly.

## 2.3 Safety instructions

Before working at the flame detector switch off the power supply. Before first commissioning or replacement of the device check external wiring!

The following instructions on accident prevention must be observed when operating the flame detector:

### NOTICE

#### **Only operate the device if it is in a proper state.**

- Do not remove or disable safety devices.
- Check for externally noticeable damage and defects prior to using the device. Immediately notify the appropriate authority/person of any changes that occur (including changes in operating performance). If necessary, stop and secure the device immediately.
- Allow only authorized specialist staff to carry out set-up and/or maintenance work.
- Replace worn or defective parts.
- Use suitable maintenance tools only.
- After repair work, refit all safety devices and carry out electrical and mechanical checks.
- Check the operating manual for details of displays as well as switch-on and switch-off procedures.
- Prior to switching on the device, make sure that no-one can be endangered by the device.
- The operating manual always have to be kept close to the device and be readily at hand.
- Any non-compliance with the safety instructions outlined in this operating manual may lead to damage to property, personal injury or even death.

## 2.4 Safety devices

### 2.4.1 Fundamental aspects

Check safety equipment and locking devices on the device for safe operational condition. Only operate the device if all safety devices are present and enabled. The operating company or operator of the flame detector is responsible for the proper operation of the device.

### NOTICE

The device has been fitted with warning and danger signs for the protection of operating staff. These signs must be observed. Damaged or illegible signs must be replaced immediately.

### 2.4.2 Safety devices on the flame detector

The flame detector has been fitted with the following safety devices:

- Housing (protection against accidental contact)
- Selftest function at power up

#### NOTICE

Due to the safety function of the disturbance frequency cut off a simulation of the flame by means of a simple artificial light source is not possible. If a flame simulation is required, such as for final testing of the burner without a real flame, a light source with a constantly changing frequency between 60 Hz and 150 Hz or the flame simulation unit TG10 must be used.

## 2.5 Safety instructions in case of maintenance and troubleshooting

### 2.5.1 Fundamental aspects

- Deadlines set or indicated in the operating manual for repetitive checks / inspections shall must be observed!
- Appropriate workshop equipment is essential for performing maintenance work.
- In conformance with electrical regulations, work on electrical equipment of the system may only be done by an electrical specialist or by trained staff under the direction and supervision of an electrical specialist.
- The adjustment, maintenance and inspection activities, and deadlines stipulated by BFI Automation, including information on the replacement of parts / assemblies, must be observed! These tasks may only be done by authorized specialist staff.
- Operating staff must be informed before maintenance or other special work is done. A supervisor must be appointed.
- Screw connections which have been loosened during maintenance and servicing work, must be tightened.
- If maintenance and repairs require safety devices to be dismantled, these devices have to be remounted and checked as soon as the maintenance and repair work has been completed.
- Ensure safe and environmentally friendly disposal of replacement parts!
- Spare parts supplied by BFI Automation or approved of by BFI Automation only may be used.

## 2.5.2 Electrical / electronic devices

### DANGER

Danger to life caused by electrical current!  
Contact with live wires or components presents a danger to life!  
Prior to any work on the electrical equipment, disconnect the flame detector from the power supply network!

### NOTICE

In keeping with the electrical regulations, work on electrical, electronic parts, components may only be done by electrical specialists.

### Important rules of conduct

- Check the device in regular intervals. Any defects or faults ascertained have to be corrected immediately. Switch off the device until the defects have been corrected.
- Equipment parts undergoing inspection, maintenance or repair work have to be made de-energised, if required. First check that the disconnected parts are no longer live, then short to earth (ground). Also isolate neighboring live parts!
- If work is required on live parts, a second person has to be assigned who can disconnect the power supply in case of an emergency. Only use insulated tools!
- Fuses must not be repaired or bridged. Only use original fuses with the specified current!

## 2.5.3 Inspection in accordance with the Ordinance on Industrial Safety and Health

In the event of the combination or installation of units from different manufacturers or suppliers, a precise test must be done by the operator before commissioning in accordance with the applicable industrial safety regulations and the applicable electrical engineering rules.

In case of queries, please contact BFI Automation.

## 2.5.4 Safety test

### WARNING

To ensure proper operation, the flame detector must be tested several times in all applications by starting and stopping the burner several times. The flame relay must switch off reliably in all cases when there is no flame. This test should be done in different operating situations (see technical data sheet). This is an indispensable prerequisite for safe and proper operation of the unit!

## 3 | Technical data

### 3.1 General characteristic features

- Selftest function after power up
- Intermittent operation
- UV/VIS/IR-Sensor
- Fully electronic construction
- Spectral analyzing process
- MH47747

### 3.2 Electrical system, optical system, mechanical system

Optical features VIS/IR	350 to 1100 nm, max. sensitivity at 920 nm
Selftest function	Fully electronic at power up Selftest time < 2 s
Switch-on time	Typically 0.5 s
Switch-off time	< 0.6 s
Flicker range	15 to 400 Hz
Switch-on frequency	25/52 Hz, other frequencies on request
Switch-off frequency	15 Hz, other frequencies on request
Accepted flame signal loss duration	ca. 280 ms
Output max. switching current max. switching power max. switching voltage	15 mA 0.3 W 280 V AC / 400 V DC
Input	120 V AC 50/60 Hz 24 V AC/DC
Consumption	max. 6 mA
Operating temperature KLC 20	0 °F to 140 °F
Humidity	max. 95% r.H., non-condensing
Connection	Plug connector
Kind of protection	IP 21
Operating position	any position
Protection class	II
Cable length	24.5 in oder 1.18 in

### 3.3 Weight

Weight approx. 1.02 oz

### 3.4 Dimensions

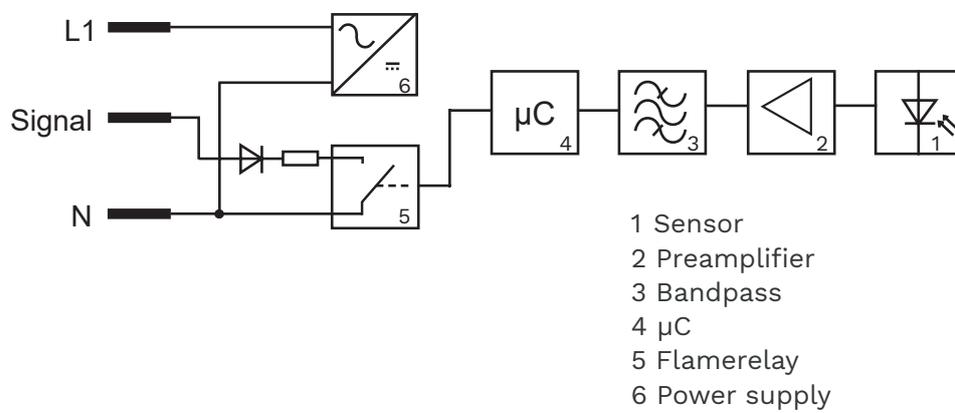
Length 4.53 in

Width 1.18 in

Height 0.87 in

Dimensional drawing see under point 4.4

### 3.5 Block diagram KLC 20



## 4 | Transport, installation and connection

### NOTICE

All installation and connection work must only be done by qualified and approved specialist staff! Observe the legal stipulations and adjustment instructions of the plant operator!

### 4.1 Scope of delivery

- Flame detector KLC 20
- Operating manual (optional, customer-dependent)
- Connection cable (optional)
- Mounting flange (optional)
- Angle adapter KLC (optional)
- Adapter ADP (optional)
- Diagnostic tool KLC-com (optional)
- Flame simulation device TG 10 (optional)

Refer to the order papers for the exact scope of delivery and compare with the delivery note.

### Checking for completeness

Check the entire delivery for completeness against the accompanying delivery note. Please refer to our terms of sale and delivery otherwise.

### Report any damage

After arrival of the device and accessories, notify the shipping or carrier, and BFI Automation immediately in case of any damage caused by transport or inadequate packaging.

### Take steps to minimize and prevent further damage.

Take measures to minimize and prevent further damage. Report the case of damage to the distributor immediately.

## 4.2 Packaging

The flame detector is shipped in different packaging materials. The most frequently used packaging materials are cardboard and plastics (foils, foamed material).

### NOTICE

Packaging has to be disposed of in an environmentally friendly way and in accordance with the relevant provisions on disposal.

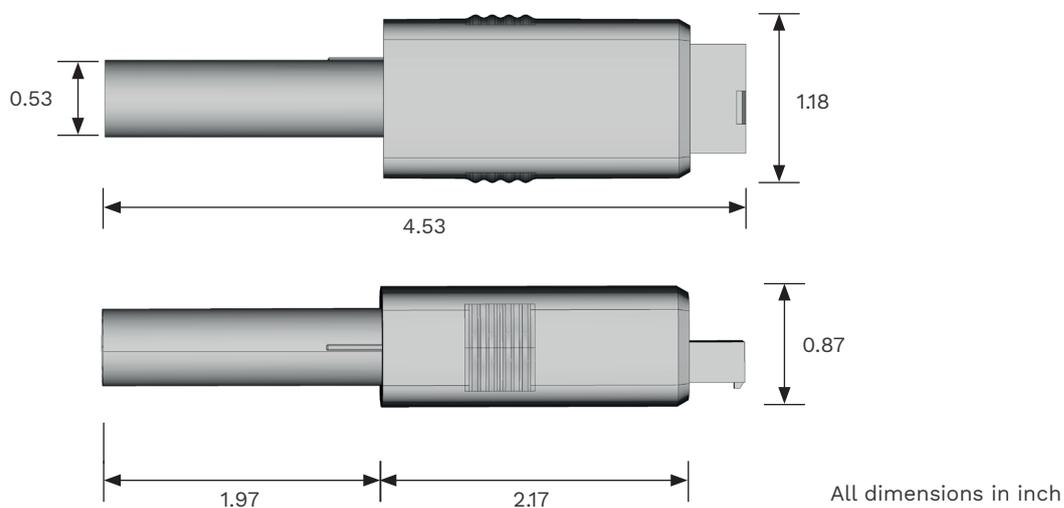
## 4.3 Shipping instructions

### NOTICE

Do not subject the appliance to heavy impacts during transport. Do not subject the appliance to any humidity!

## 4.4 Dimensions

see the following illustration:



## 4.5 Installation

### NOTICE

All installation and connection work must only be done by qualified and approved specialist staff! The legal regulations as well as adjustment instructions of the plant operator have to be observed!

The KLC 20 should be mounted close to the flame with straight alignment. The compact flame detector should be mounted with the mounting flange KLC or another suitable holder with  $\varnothing$  0.55 inch opening. The radial adjustment to the flame is realized with the viewing angle adapter KLC and replaces the mounting flange KLC. Mount the detector with the holder. The best flame signal will be achieved from strong flickering parts of the flame radiation. The angle of view, especially with sight tubes, must be of appropriate dimensions to avoid any reduction of flame radiation. Protect the sensor against other light sources.

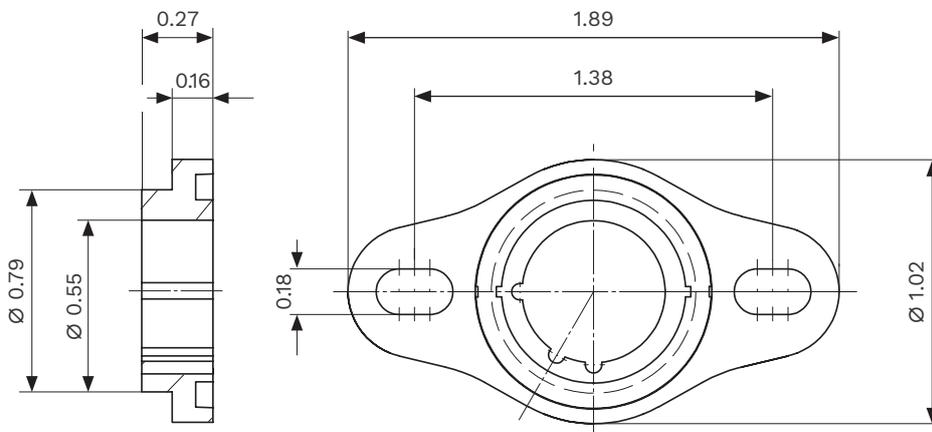
To prevent faults, the direct view of an ignition spark must be avoided. Faults in the prepurge phase can be caused by this. The maximum cable length of the connection cable must be observed. The connection cable must be kept separate from high-energy ignition and mains cables and must not be laid parallel to them over long distances.

**Attention:** For safety reasons and technical regulations a controlled burner shut down of at least once per 24 hours must be guaranteed.

For the mounting BFI Automation offers different accessories:

### 4.5.1 Mounting flange KLC

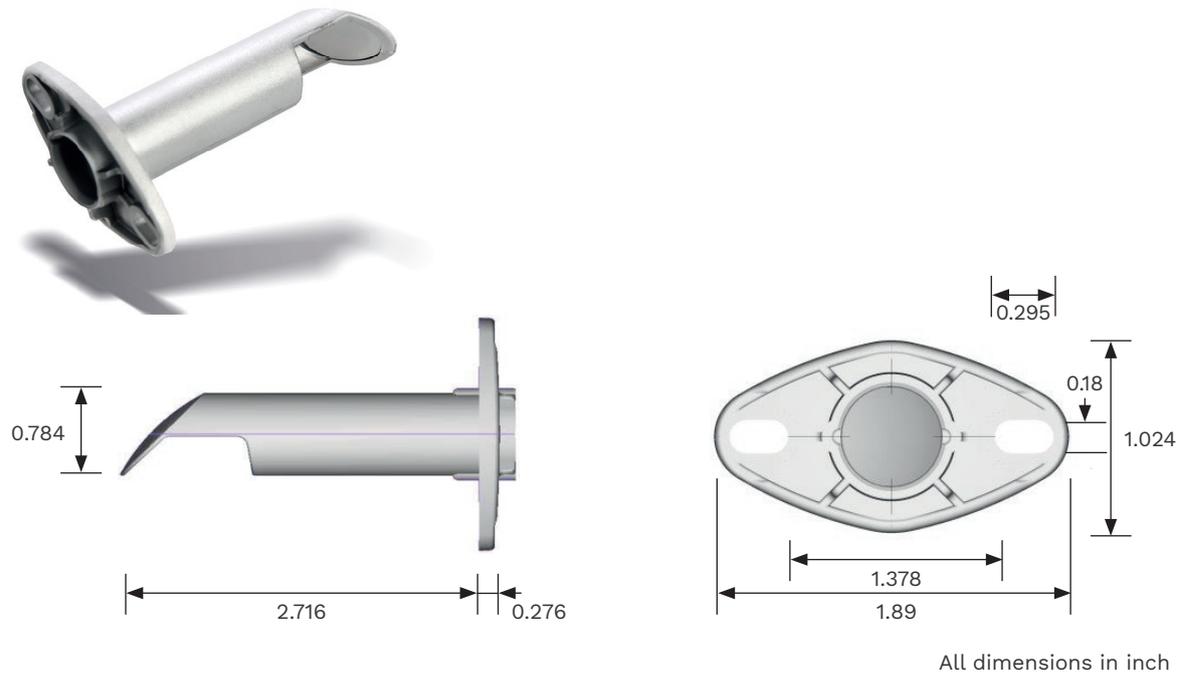
The mounting flange holds the detector in a suitable position to view the flame. Two overall heights of 0.28 in and 0.52 in are available. An O-ring seal is available which will give the mounting flange an air tight seal to the burner housing if required.



All dimensions in inch

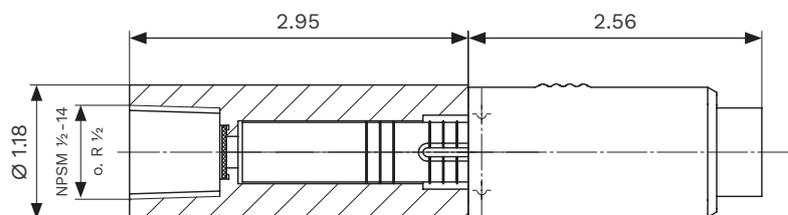
**4.5.2 Viewing angle adapter KLC for radial adjustment**

With the optionally available angle adapter, the radial alignment of the KLC 20 to the flame axis is done by means of an optimally shaped mirror surface. The angle adapter simultaneously replaces the KLC holder. A separate flame detector type is therefore not required. With maintenance work the reflector surface should be protected from possible contamination and if necessary it is to clean with a clean, soft and lint free cloth.



**4.5.3 Adapter ADP**

Adapter ADP makes it possible to mount the flame detectors KLC 20 with additional axial alignment directly on a combustion chamber opening. A quartz glass serves as a pressure barrier and prevents the escape of heating gases from the combustion chamber. For the application of the flame detector KLC at high surface temperatures, the version made of heat-insulating material should be used.



All dimensions in inch

## 4.6 Connection

### 4.6.1 Electrical connection

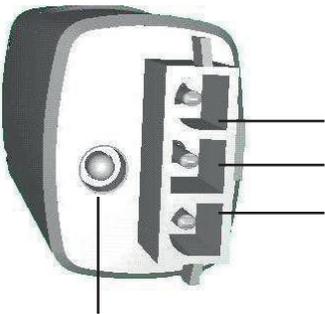
**⚠ DANGER**

Danger to life caused by electrical current!  
When connecting, observe the safety instructions and the locally applicable safety regulations!

Refer to the Technical Data chapter and the following wiring diagram for connection data. Check that the mains voltage corresponds to the voltage indicated on the type plate. Before connecting, check the device and the connecting cables for visible damage.

### 4.6.2 Connector diagram

Control boxes from Dungs / Satronic / Lamtec  
Ask for connector details of other burner control boxes.



Type of control box Wire colour	MPA22	BT300	DKO 9.. DKW 9.. DMO 9..	TMO 720-4
Blue terminal no.:	12 – 5 N	LDR-	2	2
Black terminal no.:	12 – 3 Ion	LDR+	1	1
Brown terminal no.:	6 – 17 L1	L	9	9

LED

## 4.7 Storage

**Do not unpack packed flame detector and accessories.**

**The following conditions apply to storage:**

- Store in a dry place. Maximum relative humidity: 95 % r. h., non-condensing.
- Ensure that the packages are not stored outdoors.
- In addition, ensure that the floor of the storage room is dry during storage.
- Protect from direct sunlight. Storage temperature: 35 °F to 120 °F
- Store dust-free.
- Avoid mechanical shocks and damage.

## 5 | Description

### 5.1 Functional description

The flame detector KLC 20 is a compact flame detector specially developed for blue-burning combustion systems in forced draft burner applications in the household sector and ovens. The patented evaluation of the signal is done via the flicker frequency of the radiation of the upcoming flame. A processor enables the evaluation and conversion of the flame signal to a digital signal in the value required for the flame signal amplifier of the corresponding firing system. No adjustments are necessary during commissioning or maintenance.

The KLC 20 only evaluates the flickering of the flame to be monitored. A device version with interference frequency suppression is available as an option.

In this case, uniform light radiation and any constant frequencies do not lead to permanent flame detection. Interfering sources of extraneous light, such as from fluorescent tubes or low-frequency background radiation from glowing refractories, are blanked out. Unintentional influences on the flame detection can thus be avoided.

Via the LED display as an optical interface, it is possible to read out various relevant operating parameters (such as monitoring of the flame signal, serial number). The flame detector provides the burner control unit with the safety-related binary signals for 'flame ON/OFF'.

The KLC 20 activates its self-test function during power up. Therefore the flame detector is approved for intermittent operation. For safety reasons and technical regulations, a restart controlled by the system of at least once per 24 h operating hours must be guaranteed.

### 5.2 Disturbing frequency cut off (optional)

The KLC 20 is equipped with the 'disturbing frequency cut off-function'. Through this the KLC 20 detects only real flames, which are characterized by unsteady changing frequencies. DC lights and any kind of constant frequencies, such as from fluorescent tubes or other electrical lamps, will be blanked out and will not lead to a constant flame detection. After the sensor is admitted with constant frequencies of a light source, this function will enable at first the switching output, but after approximately 5 seconds the output will be disconnected again. Therefore it is to paid attention during an inspection of the flame detector KLC 20, that this performance is intended and describes not a malfunction.

#### NOTICE

This option is **mandatory** for use in gas applications!

### 5.3 Optional function modules for KLC

#### 5.3.1 Relay module for flame detectors RMF 1

The flame detector KLC 20 is a low power signal output equipped to simulate ionization or LDR signal. If a relay switch contact is required, the use of RMF 1 is recommended. The RMF 1 has an electrically isolated changeover contact with a maximum switching voltage of 250 V AC, a maximum switching current of 1 A and a maximum rating of 250 VA. More information can be found in the operating manual of the RMF1 in its current version.

## 6 | Operation of the flame detector

### 6.1 Test of the flame detector

To ensure proper operation, the flame detector has to be tested several times by starting and stopping the burner. As long as there is no flame in all cases the flame relays has to be switched off solid. The test should be repeated for differnt operation situations (see data sheet). This is an essential condition for safe and proper operation.

### 6.2 Operating indicator LED

Flame detector KLC 20 uses a built-in LED to indicate the following operating conditions:

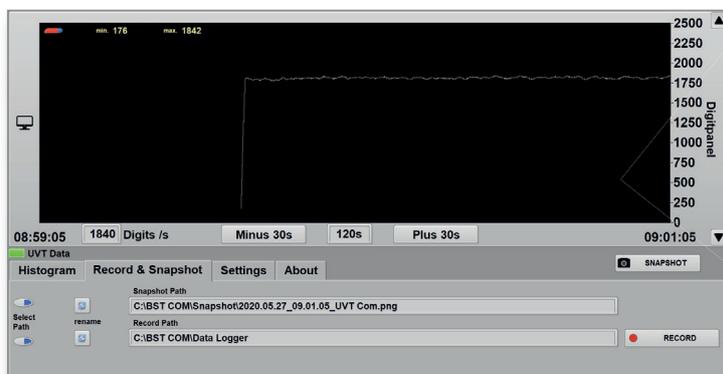
LED	Meaning
off	KLC is not active or without potential.
blinking	Selftest finished, KLC is active, no flame detected.
on	Selftest finished, KLC is active, flame detected.

### 6.3 Diagnostic with KLC-Com

The UVT-Com readout unit, consists of an optical adapter with cable, USB interface and software BFI-Com. The following information can be read out from the KLC 20:

- Impulses
- Serial Number
- Version / Edition
- present flicker frequency

For this purpose, the USB-optoadapter KLC-Com must be inserted into the recess of the LED. Via the connection cable and the interface, the data can be read into a laptop or PC using the corresponding BFI-Com software. Further information can be found in the BFI-Com operating instructions.



## 7 | Maintenance and servicing

The flame detector KLC 20 requires no maintenance.

### 7.1 Cleaning

For cleaning, use a moist cloth to wipe the housing from the outside only. For maintenance of the sight glass, please use a clean and lint free cloth. Do not use any kind of cleaning sprays or liquids.

#### NOTICE

Do not scratch the glass!

### 7.2 Maintenance interval

The flame detector should be checked as part of general system maintenance.

### 7.3 Safety-related check

A safety check of the flame monitoring must be done during commissioning and every maintenance of the combustion system.

#### The following steps should be checked:

- During start-up of the BMS the flame detector should be darkened. After the safety time the BMS should indicate a fault!
- During the start-up procedure of the BMS, the flame detector should light up with an external, frequency-varying light source (e.g. TG 10) -> the burner control box must go to fault during the prepurge phase!
- After the burner flame has started, the flame detector should be darkened. Depending on the BMS, a fault must be indicated after the safety time has elapsed during a restart or directly after the flame detector has been darkened.

## 8 | Troubleshooting

Error description	Cause	Remedy
Flamerelay does not switch	I) connecting error or no active power	Please check the plugs an the connetions of the burner controller box
	II) Glass dirty	Power off the KLC and take it out of the flange. Now clean the glass carefully with a clean and fuzz-free cloth
	III) KLC malfunction	Exchange the KLC
No communication with laptop or pc	I) LED dirty	Clean the LED
	II) Optical adapter defect	replace the optical adapter
	III) Interface circuit defect	replace the KLC
	IV) wrong com port number chosen at the pc	Choose the right com port number in KLC-com

## 9 | Order data

The flame detector KLC 20 is available under the following order data:

Article	Version	Part-No.
Flame detector KLC 20 / 120, 25/15Hz, DFC	Axial, with disturbing frequency cut off, for gas, 120 V AC	6011-1423-03
Flame detector KLC 20 / 120, 52/15Hz, DFC	Axial, with disturbing frequency cut off, for oil, 120 V AC	6011-1426-00
Flame detector KLC 20 / 24, 25/15Hz, DFC	Axial, with disturbing frequency cut off, for gas, 24 V AC/DC	6011-1413-00
Flame detector KLC 20 / 24, 52/15Hz, DFC	Axial, with disturbing frequency cut off, for oil, 24 V AC/DC	6011-1416-00

## 10 | Accessories

Article	Version	Part-No.
Mounting flange KLC	overall height 0.28 in	1550-4220-07
Mounting flange KLC	overall height 0.52 in	1550-4220-13
Angle adapter KLC, standard mirror	Accessories for radial mounting applications	1550-4225-10
Angle adapter KLC, stainless steel mirror	Accessories for radial mounting applications	1550-4225-20
ADP 20 – UV, heat insulated, NPSM ½"-14	Adapter for direct mounting applications, heat-insulated up to 360 °F	6580-2031-00
Connecting cable KLC	length 24.5 in	6060-2225-02
Connecting cable KLC	length 72.0 in	6060-2225-07
Connecting cable KLC	other length on request	-
Read out unit KLC-Com	optical adapter, USB-interface	6040-4832-00
Software BST Com for KLC and IFx	via download	9030-2000-05
RMF 1 / 120	Relais modul for 120 V AC	6040-0001-00
RMF 1 / 24	Relais modul for 24 V DC	6040-0001-20



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All data are without guarantee and refer to the product group.  
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