Original Operating Instructions
Flame signal converter

Type: **3007**

Document: **BA 3007 EN Rev5**

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Content

1 General aspects

1.1 Introduction

These operating instructions are a helpful guide for ensuring the successful and safe operation of the flame signal converter. They contain important information on how to operate the system safely, correctly and efficiently. Observing the operating instructions will help to prevent hazards, reduce costs of repair and downtimes and increase the reliability and life of the device.

All illustrations and drawings in these operating instructions are shown for illustration purposes and are not authoritative detailed designs.

The operating instructions always have to be accessible at the device. They have to be read and applied by each person who is required to work with/on the device.

This work may involve, for example:

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

This should be confirmed by the operating company 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 an 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 an 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

These operating instructions have to be treated as confidential. They may only be used by authorised staff. Access by third parties may only be granted upon written agreement of BFI Automation.

All documents are protected in keeping 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 signal converter 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 instructions carefully before operating the flame signal converter !

The manufacturer is not liable for damage or operating malfunctions that result from the operating instructions not being observed.

The operating company has to supplement the operating instructions with operating instructions on the basis of national regulations on accident prevention and environmental protection, including information on supervision and notification requirements with respect to special operating circumstances, e.g. regarding organisation of work, working processes and staff deployed.

The recognised technical rules for safe and professional working also have to be observed in addition to the operating instructions 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 harmonised with 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 periods.

1.6 Obligation of the operating company

The flame signal converter may cause hazards if it is operated inappropriately or in an improper condition.

The operating company is under the obligation to operate the machine in proper state only. The operating company has to secure hazardous areas that exist between BFI devices and the customer's own equipment.

The operating company has to 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 and aware of hazards and are observing the operating instructions.
- before starting work, staff who are assigned to work with/on the device have to have read and understood the operating instructions, in particular the chapter on "Safety", as well as the relevant regulations.
- the operating instructions and relevant regulations have to be stored in such a way that they are accessible to operating and maintenance staff.
- set out 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 have to 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 these operating instructions 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 amplifier outlined in these operating instructions. No claims can be made based on the specifications, illustrations and descriptions of these operating instructions.

We shall not be liable for damage or operating malfunctions that result from operating errors, inappropriate repairs or the non-observance of the operating instructions. We expressly state that only original spare parts and accessories approved by us may 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 carried out in good faith. We cannot accept any liability for translation errors; this also applies where the translation has been carried out 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 Declaration of conformity

BFI Automation Mindermann GmbH
Rügenstr. 7
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Germany

Tel.: +49 2056 98946 0
Web: www.bfi-automation.de

EU Konformitätserklärung
EC Declaration of Conformity

Produkt	**Flammenbewerter 3007**
Product	*Flame evaluator 3007*
Typ	**3007**
Type	*3007*

Hiermit erklären wir, dass der bezeichnete Flammenwächter, in seiner Konzipierung und Bauart sowie in der von uns in Verkehr gebrachten Ausführung, den grundlegenden Sicherheitsanforderungen folgender EU-Verordnungen und -Richtlinien entspricht:

We hereby declare that the designated flame detector, in their design and construction as well as in the version that we place on the market, comply with the essential safety requirements of the following EU regulations and directives:

Richtlinien *Directives*	2014/30/EU	EMV Richtlinie *EMC directive*
Normen *Standards*	EN 61000-6-2:2005; EN 55032:2012	

Ausgestellt durch
Issued by: BFI Automation Mindermann GmbH

Rechtsverbindliche Unterschrift
Legally binding signature

Name	Funktion *Function*	Ort, Datum *Place, Date*
Michael Thomas	Prokurist *Authorized Officer*	Heiligenhaus, den 27.02.2019

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1.9 Address of the manufacturer

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2 Safety

2.1 Intended use

The flame signal converter 3007 shall be used exclusively to supply components of the series 3000/4000. The flame scanner and flame amplifier together constitute a complete flame monitoring system for burners with a random capacity and random fuels in single and multiple burner systems.

The flame signal converter dissolves up to four flame signals from their flame scanners and makes for each channel a 0/4..20 mA signal linear to the flame intensity aviable.

⚠WARNING

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 instructions have to 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 have to have been commissioned by the operating company.

Do not allow any persons who are being apprenticed, educated, instructed or on a general training programme 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 carried out 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

The following instructions on accident prevention have to be observed when operating the flame signal converter.

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 authorised specialist staff to carry out set-up and/or maintenance work.
- operating staff have to be informed before maintenance or other special work is carried out.
- 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 instructions 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 instructions always have to be kept close to the device and be readily at hand.
- any non-compliance with the safety instructions outlined in these operating instructions may lead to damage to property, personal injury or even death.

2.4 Safety devices

2.4.1 Fundamental aspects

Check the 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 signal converter 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 have to be observed. Damaged or illegible signs have to be replaced immediately.

2.4.2 Safety devices on the power supply

The flame signal converter 3007 has been fitted with the following safety devices:

- two each of channels are protected by one fuse
- housing (optional)
- flame-proof housing (optional)
- explosion protection barriers (optional)

2.5 Safety instructions in case of maintenance and troubleshooting

2.5.1 Fundamental aspects

- Deadlines set or indicated in the operating instructions for repetitive checks / inspections shall have to be observed !
- Appropriate workshop equipment is essential for performing maintenance work.
- In conformity with the electrical regulations, work on the electrical equipment of the system may only be carried out 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, have to be observed! These tasks may only be carried out by authorised specialist staff.
- Operating staff have to be informed before maintenance or other special work is carried out. A supervisor has to be appointed.
- Screw connections which have been loosened during maintenance and servicing work, have to 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.
- Operating and auxiliary materials as well as exchanged parts have to be disposed of in a safe and eco-friendly way.
- 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 monitoring system from the power supply network !

NOTICE

In keeping with the electrical regulations, work on electrical / electronic parts / components may only be carried out 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. Also isolate neighbouring 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 Testing in keeping with the German Workplace Safety Ordinance (BetrSichV)

In case of the coupling or installation of devices from various manufacturers or suppliers, the operating company has to carry out a precise test, prior to start-up, in keeping with the German Workplace Safety Ordinance (BetrSichV) in force and the applicable electrical regulations.

In case of queries, please get in touch with BFI Automation.

2.5.4 Safety test

⚠WARNING

In order to ensure a correct operation, the flame signal converter has to be tested several times in case of all applications by switching on and off the system. The flame relay has to be switch off reliable in all cases.According to the resulting flame signal the flame signal converter gives a corresponding current to its outputs.The test should be performed during several neighbour burner are getting started and stopped and with different boiler outputs. This is an indispensable pre-requisite for a safe and correct operation of the device !

3 Technical data

3.1 General characteristic features

- Transforms flame signals into linear direct current
- 4-channel
- each channels final value is adjustable
- fully electronic

3.2 Electrical system, mechanical system, function

Feature	Value
Input voltage	24V DC, ±20%
Power consumption	approx. 340mA
Recommended fuse	max. 1.0A
Channels	4
Adjustable final values for each channel (choiced by rotary switches)	0…800 0…400 0…200 0…100 0…50 OFF
Output signal for each channel	0/4…20mA (changeable by jumper) max. load 500Ω
Measurement error	< 1% of the final value
Operating temperature	-20…+70 °C

3.3 Weight

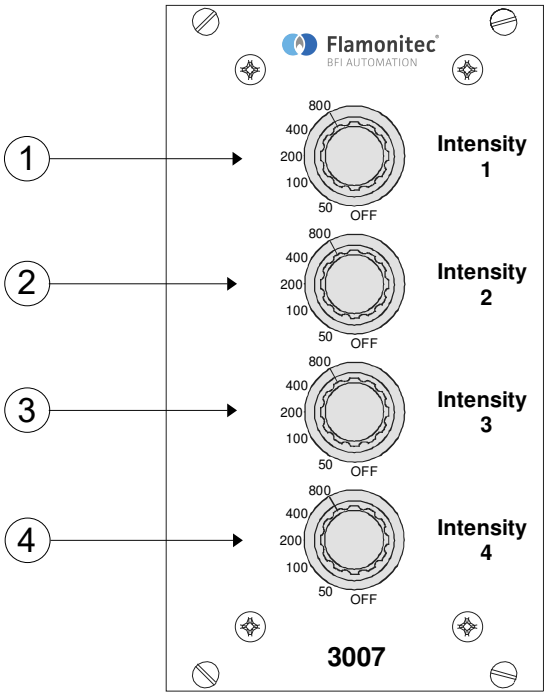
Weight	approx. 0.356	kg

3.4 Dimensions

All slide-in modules of series 3000 completely pluggable for use in card magazines in keeping with German standard DIN 41494 (19" standard).

Width	70.78	mm = 14 HP
Height	128.70	mm = 3 U
Depth:	188.00	mm

3.5 Setting elements



1 Rotary switch flame intensity channel 1

2 Rotary switch flame intensity channel 2

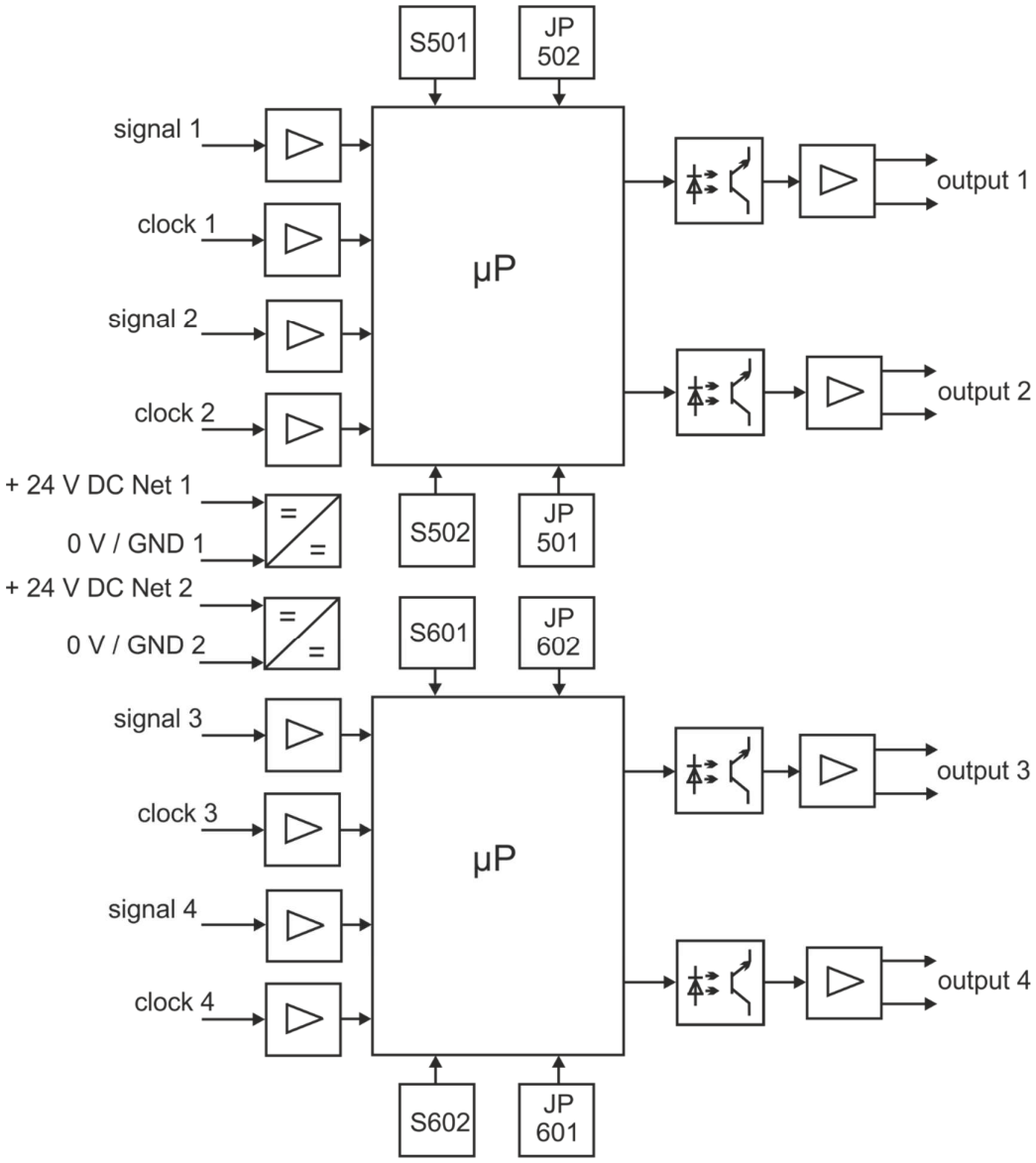
3 Rotary switch flame intensity channel 3

4 Rotary switch flame intensity channel 4

3.6 Unit design

The system plug-in of the flame signal converter is based upon a signal processor circuit, which generates from the flame signal and the clock signal for each channel a linear direct current signal. The final value of the flame signal is preset by the rotary switch for each channel. In case of a higher flame signal then preset, the channel will be limited to 102 % of the preset final value and so the channel is safe.

3.7 Block diagram



µP	Processor
S501	Rotary switch channel1
JP502	0/4...20 mA jumper channel 1
S502	Rotary switch channel 2
JP501	0/4...20 mA jumper channel 2
S601	Rotary switch channel 3
Jp602	0/4...20 mA jumper channel 3
S602	Rotary switch channel 4
JP601	0/4...20 mA jumper channel 4

4 Transport, installation and connection

NOTICE

All installation and connection work may be carried out by qualified and approved specialist staff only !

Observe the legal stipulations and adjustment instructions of the plant operator !

4.1 Scope of delivery

- flame signal converter 3007
- operating instructions
- backpanel with screw terminal (optional)
- pin connector (optional)
- connection cable (optional)
- 19" rack (optional)
- wall-mounted housing (optional)
- flame-proof housing (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 agent, the insurance company and BFI Automation immediately in case of any damage caused by transport or inadequate packaging.

Take steps to minimise and prevent further damage.

Report the insurance case to the insurance company without delay and transmit the full claim documents at once in order to expedite the claims settlement (at the latest in sufficient time before the expiry of any periods of preclusion and/or limitation relating to the compensation claims against third parties).

4.2 Packaging

The flame signal converter is shipped in different packagings.

The most frequently used packaging materials are cardboard and plastics (foils, foamed material). The packaging material also includes materials added to the packed goods as protection against moisture (e.g. bags with silicagel).

NOTICE

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

4.3 Forwarding instructions

NOTICE

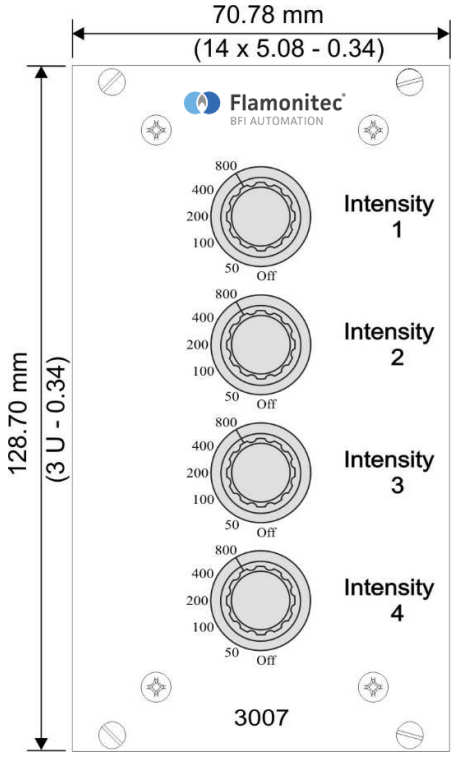
Do not drop the device during transport and do not subject to heavy impacts.

4.4 Weight - flame signal converter

approx. 0.356 kg

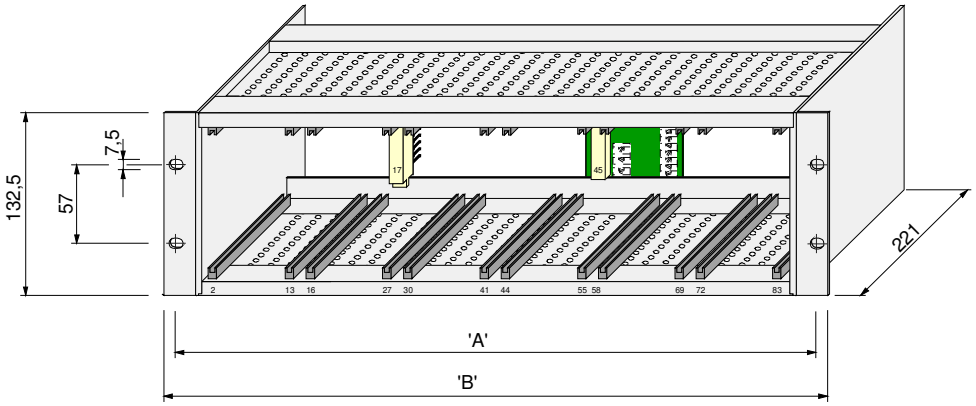
4.5 Space requirement

See following illustration, depth 188 mm.

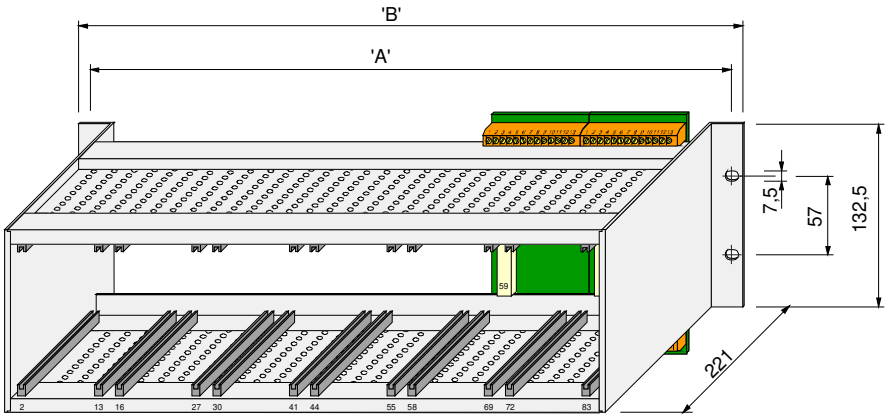


4.6 Installation

4.6.1 19”-built-in housing (rack mount installation)



4.6.2 19”-built-on housing (wall mount installation)



4.6.3 Dimensions for 19”-built in/on housing

All dimensions ± 0.4 mm	**14 HP** for 1 slide-in module System 3000	**28 HP** for 2 slide-in modules System 3000	**42 HP** for 3 slide-in modules System 3000	**56 HP** for 4 slide-in modules System 3000	**84 HP** for 6 slide-in modules System 3000
Dimension "A"	110.3	181.4	252.6	323.7	465.9
Dimension "B"	127.1	198.2	269.4	340.5	482.7

4.7 Connection

4.7.1 Electrical connection

⚠DANGER

Danger to life caused by electrical current !

The safety instructions and local safety regulations have to be observed during connection !

For connection data, please refer to the chapter titled "Technical data" as well as to the following terminal diagram.

Ensure that the available supply voltage complies with the voltage indicated on the type plate (24V DC).

Prior to connection, check the device and the connecting cables for visible damage.

Push the flame signal converter into the 19" rack and connect the connecting cable up to the rack.

Various connection possibilities are available:

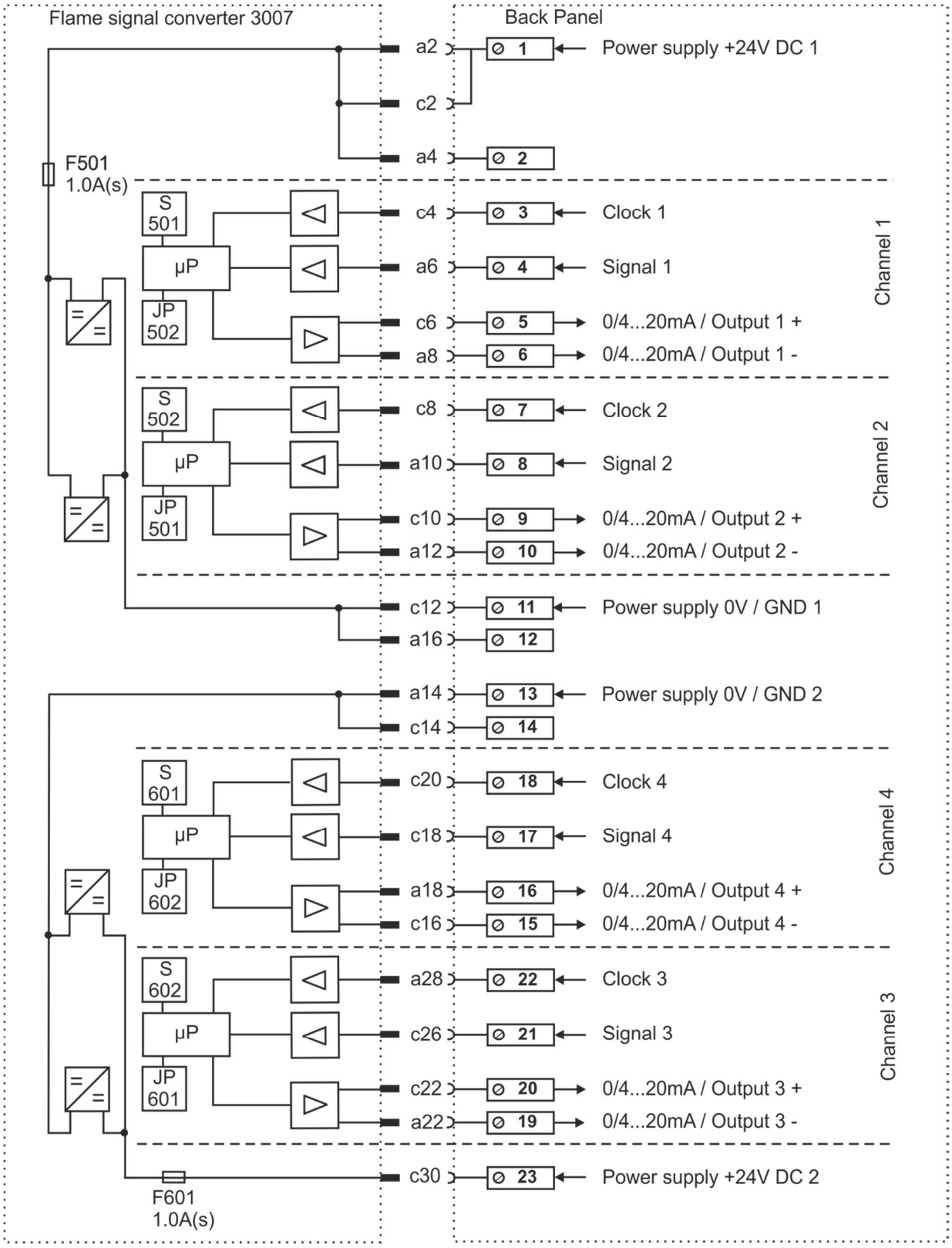
- Backpanel R (screw terminal on the rear)
- Backpanel F (screw terminal on the front)
- Pin connector

  - Flat-Pin 2.8 mm
  - Wire wrap

NOTICE

Prior to the connection of the flame sensor to the flame signal converter, observe the separate operating instructions of the flame scanner !

4.7.2 Terminal diagram



4.8 Storage

Do not unpack the packed flame signal converter and accessories.

The following conditions apply to storage:

- Store in a dry place. Maximum relative humidity 60 %. Make sure that packages are not stored in the open. In addition, It has to be assured that the floor in the storage area will remain dry throughout the storage period.
- Protect from direct sunlight. Storage temperature: 15 degrees to 25 degrees C (59 degrees to 77 degrees F).
- Store in a dustfree location.
- Avoid mechanical vibrations and damage.

5 Description

5.1 Functional description

The flame signal converter gets for each channel an information telegram (800ms/s)from the flame scanner. This signal is converted in a linear analogue signal. Therefore the flame signal converter needs in addition to the flame scanner signal the clock signal from the flame amplifier. On completion of each measurement cycle the sampled flame signal is directed to a digital analogue converter and will be buffered. The analogue output of the converter controls a precision output current driver and stays constant during a measurement cycle. No averaging over multiple measurement cycles will be proceed. Hereby the flame signal converter allows to display quick changes in the flame signal and enables fast reaction to this changes.

The final value of each channel can be changed by a rotary switch on the front plate. If widely fluctuating intensities of the firing ocurr the final value of the measurement channel will stay by 102% of the full scale value, without being damaged.

5.1.1 Current outputs

The current outputs are galvanically isolated to each other and the power supply. Therefore they can be processesd fully uncomplicated .

6 Operation of the flame signal converter

NOTICE

All installation and connection work may be carried out by qualified and approved specialist staff only !

Prior to initial operation, all regulations and adjustment parameters set up by the operating company of the burner have to be observed !

For the operation of the flame signal converter, please observe the separate operating instructions of the flame scanner and flame amplifier!

6.1 Connection of the flame signal converter

NOTICE

Prior to the connection of the flame scanner, flame amplifier and power supply to the flame signal converter, observe the separate operating instructions of the flame scanner, of the flame amplifier and of the power supply!

6.2 Testing the flame signal converter

In order to ensure a correct operation, the flame signal converter has to be tested several times in case of all applications by switching on and off the system. After every switching on the the connected output has to drive a current signal and all connected devices should operate perfect. The tests should be made during different neightbour burner switched on and off and with different boiler outputs.This is an indispensable prerequisite for a safe and correct operation of the device !

6.3 Commisioning of the flame signal converter

The flame signal converter needs in addition to the flame signal of the flame scanner, the system clock of the flame amplifier and a power supply of 24V DC. All security-related functions are internal self monitored by the flame amplifier. The system is promptly ready for use after regulately mounting and connection. By use of the rotary switches in the front the flame converter can be adjusted to the flame signal.

NOTICE

The displayed flame intensity should move in the range of 50% to 100%!

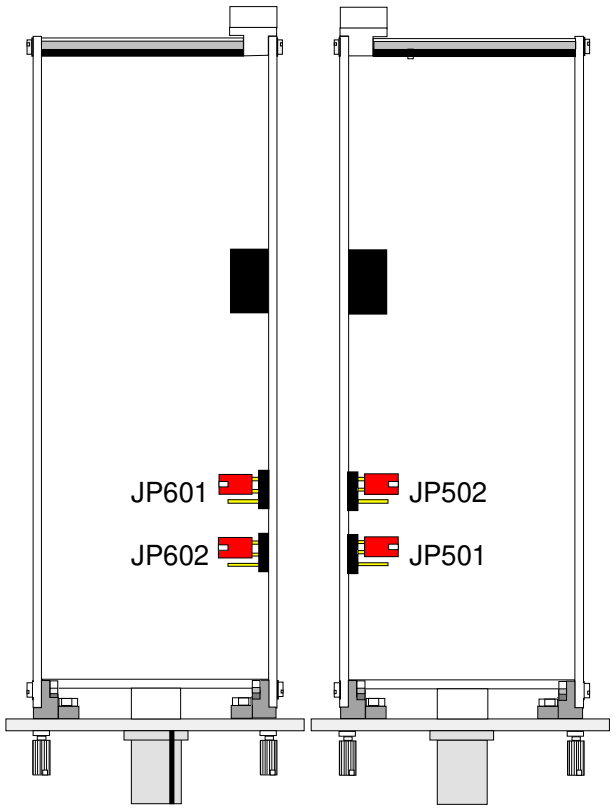
6.4 Factory settings of the flame signal converter

The rotary switches are adjusted to the “OFF”-position.

The current outputs are adjusted to 4…20mA.

6.5 Operational settings of the flame signal converter

Before the first commisioning the adjustment of the current outputs should be proofed and corrected. Therefore pull the flame signal converter from the rack and plug the jumper to the right position as described below:



JP502	-	Switching 0/4-20mA intensity 1
JP501	-	Switching 0/4-20mA Intensity 2
JP602	-	Switching 0/4-20mA Intensity 3
JP601	-	Switching 0/4-20mA Intensity 4

The jumper are shown in the state of delivery (4…20mA).

7 Maintenance and servicing

The flame signal converter requires no maintenance.

For cleaning, use a moist cloth to wipe the front panel from the outside only.

8 Failures

Problem:	Cause:	Correction:
No output signal on each channel	Flame signal converter doesn't work	Check power supply Check fuse F501/F601 (0,2 A) Check flame amplifier Check flame scanner Check connections
No output signal on channel 1 and 2 or 3 and 4	Channel malfunction	Check fuse F501 resp. F601 , if one of them is defective change flame signal converter
Output signal too small	Final value rotary switch is adjusted too high	Reduce final value with the rotary switch
Output signal level too high	Final value rotary switch is adjusted too low	Increase final value with the rotary switch
Output signal corresponds not to the output signal of the flame amplifier	Final value rotary switch is adjusted wrong	Correct final value with the rotary switch
	Channel error	Change flame signal converter

9 Order data

The flame signal converter 3007 is available from BFI Automation Mindermann GmbH under the following order data:

Typ	Order-No.:
Flame signal converter 3007	6020-3007-00

10 Accessories

BFI Automation offers the following accessories:

Type	Bestell-Nr.:
19“-built-on housing, one-part, 14HP, IP 20 with back panel 3000F	6830-0701-00
19“-built-in housing one-part, 14HP, IP 20 with back panel 3000R	6830-0701-01
19“-built-in housing, one-part, 14HP, 32-pole female connector style „D“	6830-0701-02
19“-built-on housing, two-parts, 28HP, IP 20 with back panel 3000F	6830-0702-00
19“-built-in housing, two-parts, 28HP, IP 20 with back panel 3000R	6830-0702-01
19“-built-in housing, two-parts, 28HP, 32-pole female connector style „D“	6830-0702-02
19“-built-on housing, three-parts, 42HP, IP 20 with back panel 3000F	6830-0703-00
19“-built-in housing, three-parts, 42HP, IP 20 with back panel 3000R	6830-0703-01
19“-built-in housing, three-parts, 42HP, 32-pole female connector style „D“	6830-0703-02
19“-built-on housing, four-parts, 56HP, IP 20 with back panel 3000F	6830-0704-00
19“-built-in housing, four-parts, 56HP, IP 20 with back panel 3000R	6830-0704-01
19“-built-in housing, four-parts, 56HP, 32-pole female connector style „D“	6830-0704-02

19“-built-on housing, six-parts, 84HP, IP 20 with back panel 3000F	6830-0706-00
19“-built-in housing, six-parts, 84HP, IP 20 with back panel 3000R	6830-0706-01
19“-built-in housing, six-parts, 84HP, 32-pole female connector style „D“	6830-0706-02
19“-built-on housing, six-parts, 84HP, IP 20 with back panel 3000F	6830-0706-07
Housing with terminal compartment, 20HP, IP66, shock-resistant ABS	6830-0601-00
Housing with terminal compartment, 30HP, IP66, shock-resistant ABS	6830-0602-00
Housing with terminal compartment, 49HP, IP66 shock-resistant ABS	6830-0603-00
Ex-proofed built-on housing, 42HP with terminal compartment and viewing window	1830-5313-01
Rack 84HP, 3U, with 6 x 32-pole female connector	6830-0706-12
Rack 84HP, 3U, with 6 x back panel 3000R	6830-0706-11
Rack 84HP, 3U, with 6 x back panel 3000F	6830-0706-10
back panel 3001F	5020-3001-91
back panel 3001R	5020-3001-92