

**SYSTEM 3000 / 4000**

**FLAME SCANNER  
7.0**

**TECHNICAL DESCRIPTION**

**EDITION: TB 7.0-SZ1**

# Flame Scanner 7.0

- Monitoring of residue combustion
- TÜV tested, DIN-DVGW approved
- Fail-safe, self-checking
- Fully electronic design
- Temperature difference method
- Type of protection IP 65
- DIN-DVGW and DIN-CERTCO approved

## Application

In combination with a flame amplifier module of the **3000** or **4000** line the flame scanner **7.0** forms a complete flame monitoring system for meeting the safety requirements for steam generators in accordance with TRD.

The flame monitoring system **3000/4000** is tested and approved in accordance with EN 230 and EN 298.

The main field of application for this fully electronic flame scanner is flame detection at residue combustion processes of any kind, like plants for thermal treatment and energy recovery, for inst. with clarification sludge, pesticides, contaminated waste gas, tail gas, sour gas, furnace gas, tar oil, and pitch. The flame scanner **7.0** can be used anywhere where combustion processes must be monitored in which flame radiation does not occur as continuous radiation bands or where reliable detection in the IR range is not possible due to reflection from the combustion chamber (hot brick lining, red-hot melt). Therefore, main places of application are combustion chambers, rotary kilns, melting furnaces, and grate firing installations.

The method developed by and patented to BFI Automation, i.e. to detect a flame by sensing the temperature re-circulation of its combustion gases, opens up completely new applications for safeguarding a firing plant. Monitoring for controlling fuels previously possible only by employing expensive parallel operation of UV and IR flame

scanners, can now be replaced simply and offering a substantial increase of availability by flame scanner **7.0**.

Faulty opening due to absorption of flame radiation, caused by fuel composition or charging of additional media does no longer occur. Faulty light signals due to combustion chamber radiation are ruled out. The choice of the spectral range permits in addition the setting of a lowest flame temperature from which detection takes place.

For the first time, for inst., in plants for sulphur reclamation (Claus process) only H<sub>2</sub>S combustion is monitored, also when the combustion chamber is quenched with steam. Addition of backup gas, required by the other optical flame monitoring systems can be dispensed with. Measurements with thermocouples subject to heavy wear and expensive can no longer limit the availability of the process.

The flame scanner is fully electronic, i.e. it has no mechanically moving parts. The photoelement is not subject to any ageing, so that the sensitivity of the monitoring device remains unchanged even after many years of service. Maintenance work is not required. This results for the operator in a significant increase of safety and availability of the firing plant as a whole.

## Function

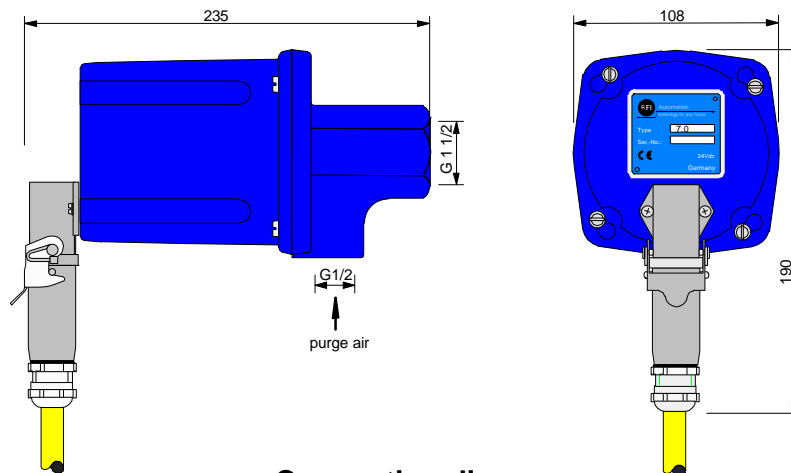
The new solution for monitoring combustion processes of any kind is based on sensing and evaluating the difference of flame temperature and variation of the same at two predetermined points. The patented method is making use of the fact that combustion is maintained only when there is always sufficient energy fed back into the ignition zone in order to maintain combustion. Because of this, the recirculation of the combustion gases in the flame mantle is monitored by flame scanner **7.0**. The result is a detection method which works reliably fully independent of fuel with any flame colour. The world-wide application, mainly in the petrochemical industry demonstrates that this principle permits flame monitoring systems far superior to conventional optical systems used so far.

As radiation sensors two thermoelement chains are used, vapour-deposited on a substrate, because these have linear sensitivity across the complete radiation emitted by the flames and therefore can be made selective for defined wave length ranges by filters. An optical system defines the two cones of view and preallocates temporarily the wave length range. Additional filters can further reduce the flame spectrum to be evaluated in order to pick up only the spectral lines of

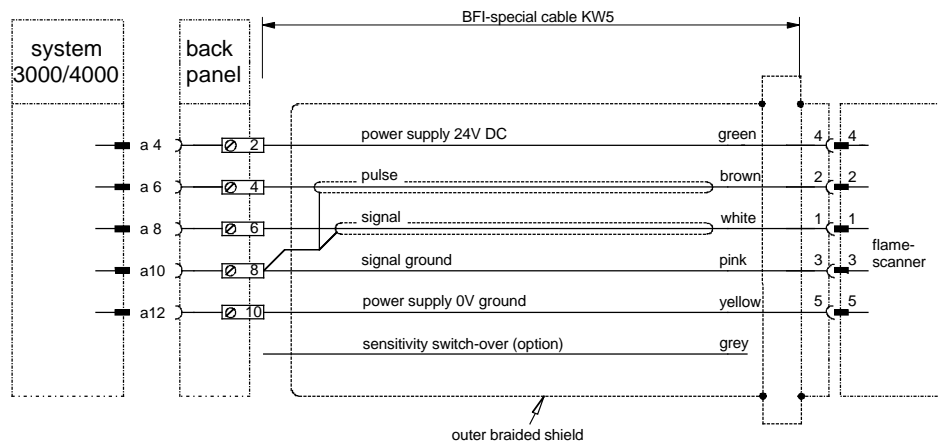
typical combustion products like, for inst., CO, CO<sub>2</sub>, H<sub>2</sub>S or H<sub>2</sub>O. In this way application-oriented flame evaluation can be effected.

The flame scanner is directed towards the combustion so that the two thermoelement chains recognise along the flame points offset to each other. The scanners are inter-connected anti-parallel and, therefore, produce at the output the difference of the radiation power picked up. As the two measuring points in the flame are positioned close to each other the same emissivity applies to both allowing to determine the temperature difference. The downstream amplifier cuts off variations with low frequency and processes flame signals only between 25Hz and 1000Hz, in order to concentrate on temperature movement. Faulty signal emission from the glowing brick lining is excluded because their absolute radiation is being shielded due to the anti-parallel connection of the thermoelement chains. Possible low-frequency modulation by stack gases is picked up by both elements and does not produce a difference signal of higher frequency which could be evaluated.

## Dimensions



## Connection diagram



## Technical data

Self-monitoring for the fail-safe function control accordance to EN 230, EN 298. Conforms to the requirement of DIN VDE 0116 and TRD 411 to 414, approved accordance to DIN-DVGW and DIN CERTCO.

UV-VIS-IR semi-conductor, adjustable sensitivity, selective modulation filter.

Spectral sensitivity	250 to 7000 nm, standard 1000 to 2700nm
Viewing angle	3°
Self-monitoring	fully electronic, 1* per second
Operating voltage	24 V DC, inner electrical isolation
Current consumption	max. 100mA
Operating temperature range	-20 to +70 °C
Electric connection	dust-proof plug connector
Protection	IP 65
Length of cable	max. 1000m (KW 5)
Sight tube connection	1" internal thread. ISO 228
Purging air connection	1/2" internal thread ISO 228
Purging air quantity	10 Nm <sup>3</sup> /h
or	
Purging air pressure	0,02 bar over combustion chamber inner pressure
Weight	approximate 1kg
Part no.	S 510.0

This flame scanner is also available in an Ex-casing.

**Edition: 07/98, Right of technical modifications reserved.**