



## System Overview

# Combustion Management System FMS



Sensors and systems for combustion engineering

[www.lamtec.de](http://www.lamtec.de)

# Approvals.

## EC Type Examination Certificate (Module B) according to Directive 2014/68/EU

- DIN EN 298
- DIN EN 1643
- DIN EN 230
- DIN EN 60730-2-5
- DIN EN 12067-2
- DIN EN 50156-1, point 10.5

## SIL3

- DIN EN 61508 Parts 2+3



CE 0085

## EC Type Examination Certificate

- EU/2009/142/EC
- DIN EN 298
- DIN EN 13611
- DIN EN 1643
- DIN EN 12067-2

## EC Declaration of Conformity

- 2014/35/EU (Low Voltage Directive)
- 2014/30/EU (EMC Directive)
- 2014/68/EU (Pressure Equipment Directive Cat. 4 Mod.) B+D
- 2009/142/EC (Gas Appliances Directive)

EAC



# The FMS Combustion Management System.

These days, combustion systems are expected to meet one requirement above all others: efficiency. And this demand no longer just applies to the technology itself, we also expect the installation, configuration and commissioning processes to be effective as well.

It combines all the advantages of an electronic assembly along with up to five actuators and an electronic burner control unit. As the device also contains a power control unit, CO/O<sub>2</sub> controller and valve leakage test tests and can also be connected to a LAMTEC flame monitoring system, this single device has everything you need to control and monitor your burner. The fault-proof design offers a level of flexibility normally only achievable with a PLC. You therefore only need one solution for almost all of your burner needs. Safety interlock chains, sensors and monitors are connected straight to the FMS, significantly reducing the cost of additional relays and wiring. When you use an FMS, you often only require a small on-site control cabinet. An integrated device like the FMS also offers significant advantages when it comes to the commissioning process. Reduced wiring work and the standard operator interface help to reduce the likelihood of error from the start, while intelligent information displays make searching for errors even easier.

For the electronic actuator, every actuator can either be controlled via 0/4 ... 20 A or a three-point-step (apart from channel 5). The FMS can also meet a number of special requirements.

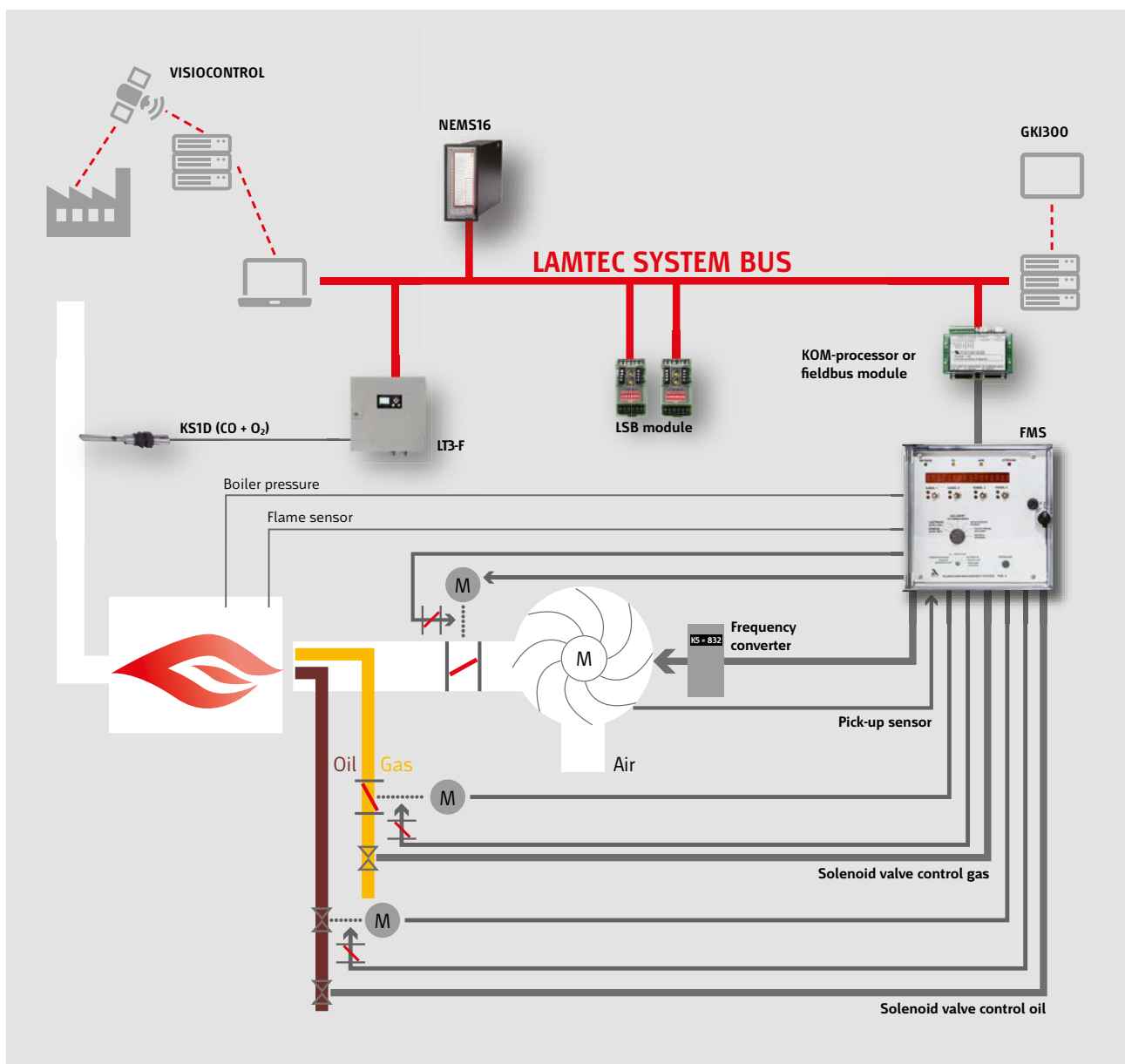


The set fuel/air curves can be shifted using two correction inputs for disturbance variable feedforward during operation. As such, this can help to offset influences on combustion, e.g. changes to the suction air temperature.

Operating notifications and error messages are displayed in clear text in the user's native language. An additional module containing a new value/first value and process indicator system can be connected for displaying operating and fault displays and for resolving safety interlock chains. The device is fitted with its own running time meter that is able to measure the burner running time for each fuel type separately. The number of starts is also measured separately for each operating mode. On request, the FMS can also assume responsibility for regulating power in the burner.

## Advantages:

- Fail-safe burner control unit
- Electronic fuel/air ratio control with up to 5 channels
- Universal field bus interface for connection to control technology
- Integrated power controller (optional)
- Integrated valve leakage test (optional)
- Integrated CO/O<sub>2</sub> control
- Sliding controlled fuel change
- Simultaneous combustion of 2 fuels with variable mix ratio
- Oil gun purge function
- Possibility to resolve safety interlock chain when used in combination with NEMS16



Functions in the FMS.

The FMS' analogue inputs can be configured using plug-in cards at various physical input sizes. A number of software functions, e.g. the pre-ventilation period, can be parameter set by the commissioning engineer on site.

A CO/O<sub>2</sub> controller software module is integrated in the FMS. When used in conjunction with the LT1/LT2/LT3 O<sub>2</sub> and CO/O<sub>2</sub> measuring devices, this means that every combustion system can always run at the ideal level regardless of external influences such as temperature and air pressure.

The FMS is easy to combine with existing control technology. It "speaks" virtually all languages used by conventional fieldbuses. The FMS is TÜV-checked and meets all applicable European standards.

For the commissioning engineer, an additional PC interface makes work on the FMS even easier. Users can operate the device remotely from a laptop that they can then also use to archive configurations and store curve data. If you ever need to replace the device, this solution means that the replacement will be ready to use in just



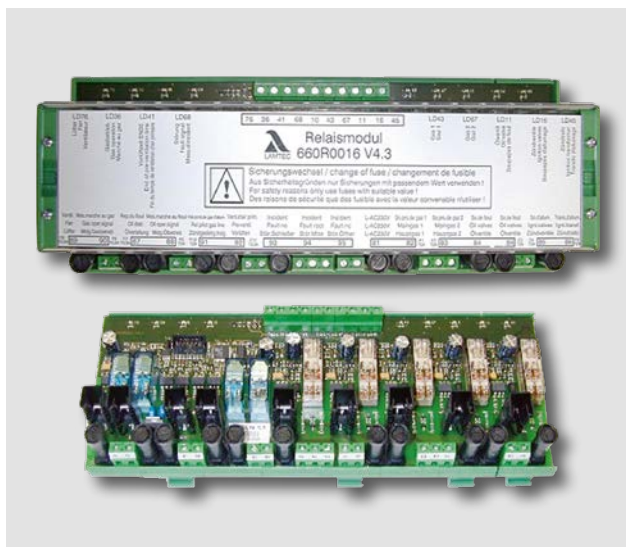
a few minutes as the stored data simply needs to be imported to the new device.

Use of an industrial modem means that you can access data on the FMS from your office as well. This means you don't actually have to be on site to detect the source of any errors.

## Modular options.

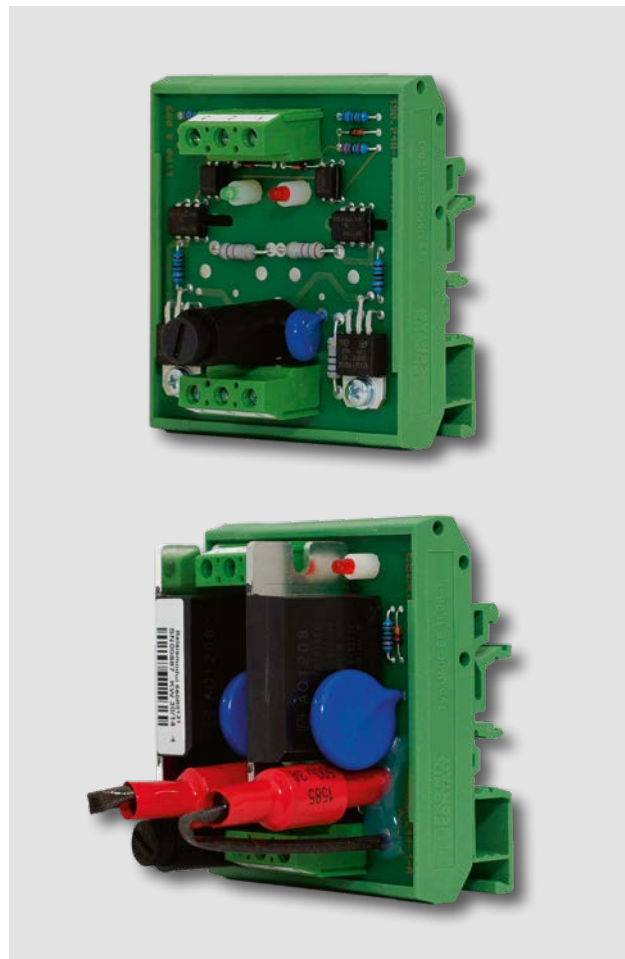
### Relay module for burner management

For use in burner management, the FMS emits nine digital signals that are converted into twelve output signals for 230 VAC using the relay module 660R0016/R0016 V4.3.



### Relay module for motor control

Three point step output relay modules are required to control the actuating motors. Various relay modules are available depending on the motor torque.



# Inputs.

# Outputs.

|                                         |                                |                                                                                                                         |                          |
|-----------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------|--------------------------|
| Pre-ventilation suppression             | <b>Digital inputs<br/>24 V</b> | <b>Burner sequencer/<br/>valve actuation</b><br><br><b>Depending on<br/>power supply</b><br><br><b>Relay module R16</b> | Main gas 1               |
| Burner "ON"                             |                                |                                                                                                                         | Main gas 2               |
| Flame signal                            |                                |                                                                                                                         | Oil                      |
| Safety interlock chain                  |                                |                                                                                                                         | Ignition valves          |
| Control release                         |                                |                                                                                                                         | Ignition transformer     |
| Fault release                           |                                |                                                                                                                         | Oil operation indication |
| Acknowledgement<br>of high firing rate  |                                |                                                                                                                         | Fan                      |
| Pilot flame signal                      |                                |                                                                                                                         | Gas operation indication |
| Recirculation ON                        |                                |                                                                                                                         | Oil distribution         |
| General safety interlock chain          |                                |                                                                                                                         | Pre-ventilate            |
| Oil safety interlock chain              |                                |                                                                                                                         | Fault in FMS             |
| Fuel selection                          |                                |                                                                                                                         |                          |
| Acknowledgement of<br>ignition position |                                |                                                                                                                         |                          |
| Valve leakage test                      |                                |                                                                                                                         |                          |
| Air pressure monitor                    |                                |                                                                                                                         |                          |

|                                                                      |                                                    |                                                                                         |                            |
|----------------------------------------------------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------|
| Channel 1 feedback<br>(potentiometer, speed,<br>current 4 ... 20 mA) | <b>Feedback signals<br/>from the<br/>actuators</b> | <b>Fuel/air ratio control/<br/>activation of the<br/>actuators<br/>(fuel/air ratio)</b> | Channel 1 (DPS or current) |
| Channel 2 feedback<br>(potentiometer, speed,<br>current 4 ... 20 mA) |                                                    |                                                                                         | Channel 2 (DPS or current) |
| Channel 3 feedback<br>(potentiometer, speed,<br>current 4 ... 20 mA) |                                                    |                                                                                         | Channel 3 (DPS or current) |
| Channel 4 feedback<br>(potentiometer, speed,<br>current 4 ... 20 mA) |                                                    |                                                                                         | Channel 4 (DPS or current) |
| Channel 5 feedback<br>(potentiometer, speed, current<br>4 ... 20 mA) |                                                    |                                                                                         | Channel 5 (current)        |

|                                                                              |                                                            |                                      |                                          |
|------------------------------------------------------------------------------|------------------------------------------------------------|--------------------------------------|------------------------------------------|
| External firing rate setting<br>(potentiometer, DPS,<br>current 4 ... 20 mA) | <b>Firing rate/<br/>power controller<br/>specification</b> | <b>firing rate/<br/>power output</b> | Internal firing rate output<br>(current) |
| Boiler temperature (Pt100)                                                   |                                                            |                                      |                                          |
| Pressure/external temperature (current)                                      |                                                            |                                      |                                          |
| Correction 1 (current)                                                       |                                                            |                                      |                                          |
| Correction 2 / mixing signal<br>(current)                                    | <b>Analogue inputs</b>                                     |                                      |                                          |

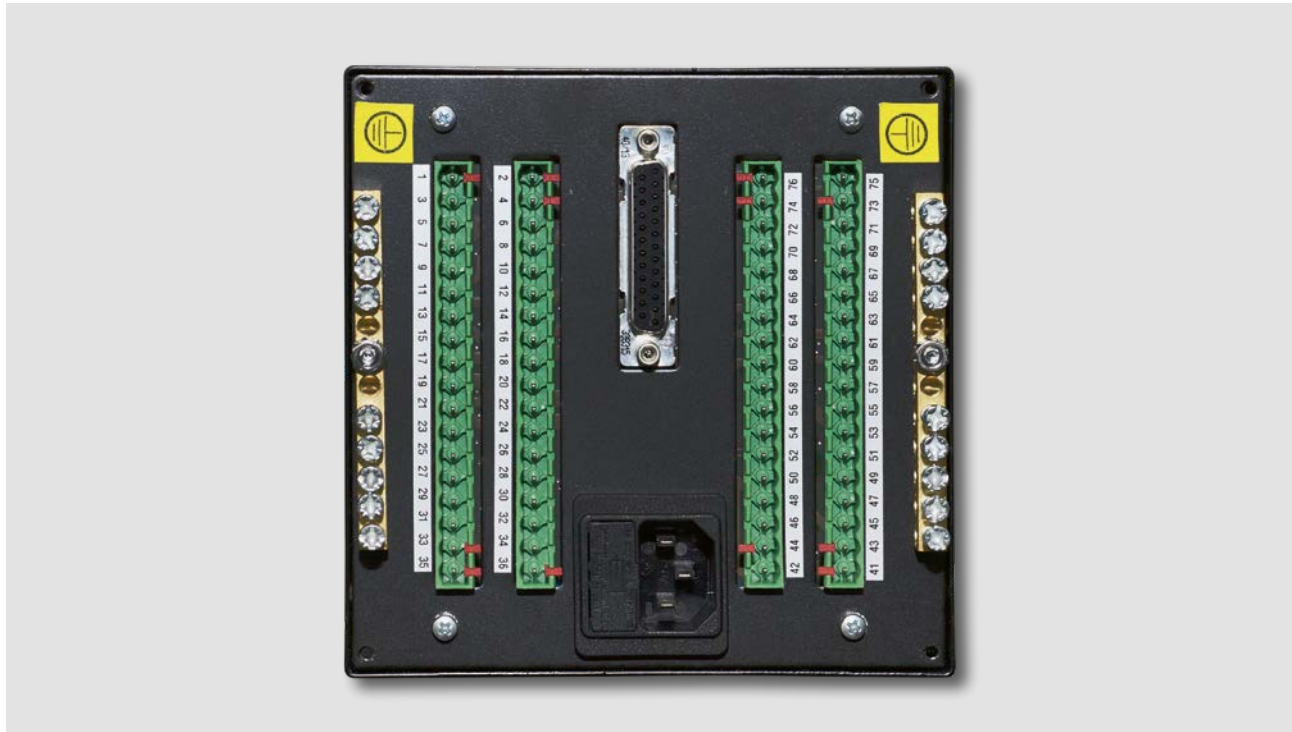
|                                        |                                                                                                                                     |                                                                                                                                      |                                                                                                                 |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Standby mode                           | <b>Selection of<br/>additional BUS signal<br/>inputs LSB module<br/>and fieldbus<br/>(Ethernet, PROFIBUS,<br/>MODBUS, INTERBUS)</b> | <b>Selection of<br/>additional BUS signal<br/>outputs LSB module<br/>and fieldbus<br/>(Ethernet, PROFIBUS,<br/>MODBUS, INTERBUS)</b> | Operating mode<br><i>Pre-purge - Ignition -<br/>Operation - Post-purge</i>                                      |
| Continuous ventilation                 |                                                                                                                                     |                                                                                                                                      | Fuel operation                                                                                                  |
| Acknowledgement<br>of high firing rate |                                                                                                                                     |                                                                                                                                      | Fuel air ratio control output infor-<br>mation: <i>Ignition position reached<br/>- high firing rate reached</i> |
| Curve set selection                    |                                                                                                                                     |                                                                                                                                      |                                                                                                                 |

|                                                         |  |  |                             |
|---------------------------------------------------------|--|--|-----------------------------|
| 12 analogue inputs<br>"Special activations"<br>possible |  |  | O <sub>2</sub> actual value |
|                                                         |  |  | Channel 2 setpoint          |
|                                                         |  |  | Flame intensity             |

# Basic model.



Front of the FMS.



Rear of the FMS.

The LAMTEC FMS Combustion Management System can be operated directly on the device. Password protection prevents data from being entered unintentionally. Thanks to its modular design, the FMS provides a high degree of flexibility for any application. Settings can also

be adjusted via a PC interface, enabling users to work remotely, e.g. using a laptop.

# Optional components.

## Startup Manager

The "Startup Manager" function also supports the commissioning engineer both during the initial installation of the burner and when adjusting the burner settings using the wizard.



Startup Manager.

## LAMTEC SYSTEM BUS module

Each FMS comes with an optional LAMTEC SYSTEM BUS (LSB) interface. The LSB module is compatible across the LAMTEC range and enables users to connect LAMTEC devices to one another using a quick and easy solution that doesn't require a lot of wiring work. It also enables users to control fieldbus modules in a top hat rail mounting via an adjustable address so that the input status and modifications to the fieldbus can be forwarded.



Analogue input/output.



Digital input/output.

## Control technology link-up

The FMS is easy to combine with existing control technology. It "speaks" virtually all languages used by conventional fieldbuses. Connections for PROFIBUS-DP, TCP/IP (MODBUS TCP), MODBUS and INTERBUS-S are available as options (other bus systems on request).



PROFIBUS DP fieldbus.



Ethernet fieldbus



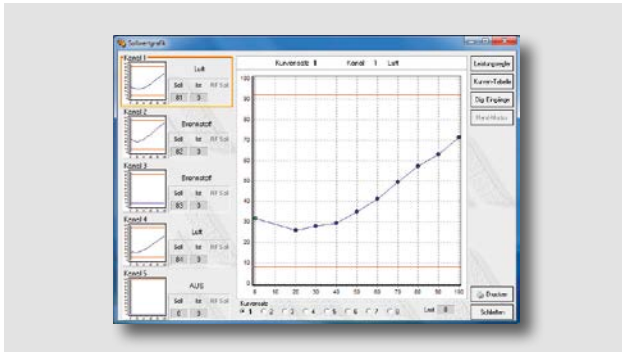
MODBUS fieldbus.



INTERBUS fieldbus.

### PC interface (RS232)

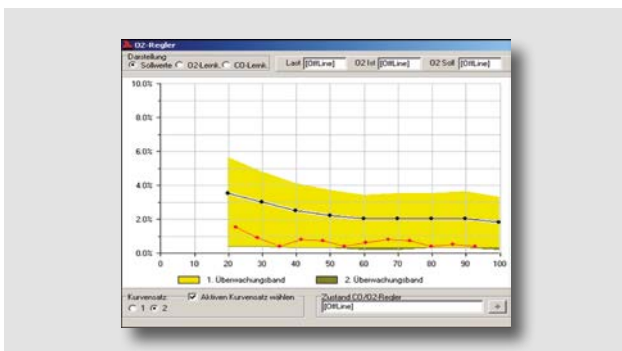
The PC interface makes working with the FMS even easier: The device can be operated remotely using a laptop. Set configurations and curve data can be archived – this backs up data so that it can be re-imported in the event of an emergency, enabling the device to be ready for operation again in just a few minutes. By using an industrial modem, you can check the status of the FMS from your office so that you can detect faults and their causes without having to be on-site.



Screenshot from Remote Software: Setpoint graph.

### CO/O<sub>2</sub> controller

Combustion processes are subject to constant interference from changes in temperature, moisture levels, air pressure and changes to the quality of the fuel used (oil viscosity, gas fuel value). The CO/O<sub>2</sub> control integrated into the FMS helps to compensate for these influences during ongoing operation (shift in the fuel/air ratio curves). It includes a software module that we have developed specifically for combustion control. This module translates the precise values from our CO/O<sub>2</sub> measuring devices to automatically control the air supply as required in real time. For example, it automatically reduces the air supply until CO is produced. It is always able to detect CO/O<sub>2</sub>, no matter how small the quantity. The assembly then increases the air supply by one step and thus generates an individual operating curve in line with the local conditions with which the burner still just burns without CO. The system learns and improves almost automatically in a sustainable and fail-safe manner. This means that almost every combustion system will always run at the ideal combustion point.



Screenshot from Remote Software: O<sub>2</sub> controller.

### Rotational speed sensor

There are two different speed sensors available for the FMS. The 663R8101 speed sensor is equipped with two-line technology and has a switching distance of 2 mm. The 663R8103 speed sensor is an inductive proximity switch with switch contact in three-line technology and has a switching distance of 4 mm. This means that you can always find the right sensor for the design features in question. As the elements to be recorded are not always known, approximate values should be used for sizing the damping elements and selecting the appropriate sensor. Due to the variety of sensors that can be used, LAMTEC only offers a two-line and a three-line element. These have been selected to ensure that most measuring tasks can be covered with just these two elements. Please let us know if neither of these elements is suitable for a specific measuring task, we will be happy to find a solution.



Rotational speed sensor with 2 wires, Namur.



Rotational speed sensor with 3 wires.

## Flame monitoring

Flame monitoring systems are available for the LAMTEC FMS. Continuous and precise flame monitoring helps to ensure safety and efficiency. Of course, the key requirement here is the quick detection of switching between On and Off. The digital evaluation of the spectrum, frequency or intensity also helps to improve the combustion process. With the LAMTEC FMS, users have access to leading, integrated flame monitoring technology for little investment. Users have the choice of three flame monitoring systems: the F300K, F200K and F152. You will find further information under each of the corresponding system overviews.



F300K flame monitoring device.



F200K flame monitoring device.



F152 flame monitoring device, FFS07 above, FFS08 below.

## Actuating motor

With the aim of providing “one-stop source for all your needs”, LAMTEC also offers safety approved motors tried and tested for use with electronic systems to drive the flaps and control valves in your combustion systems.

Of course, these motors also meet all safety requirements related to the use of tested potentiometers with an interlocking, form-fit connection. LAMTEC offers five types of standard motor: 6 Nm, 20 Nm, 30 Nm, 40 Nm and 90 Nm, all at 60 sec. runtime. In addition to these standard motors, we can also supply motors up to 200 Nm available with a range of different limit switches, potentiometers and runtimes. LAMTEC also offers other models for electronic manual adjustment, electronic control and special models.



Actuating motor.

## Notes.



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