Safety Manual

# BurnerTronic BT300
# BT320 ... BT341


Sensors and Systems for Combustion Engineering

LAMTEC
www.lamtec.de

# Table of Contents

# 1 General Information

## 1.1 Purpose

The Safety Manual contains information for a device (E/E/PE-System) from the manufacture Lamtec in the scope of functional safety. It provides the necessary information and data for all stages of the safety lifecycle according to IEC 61508:2010 (or DIN EN 61508:2011) and related standards. It helps the user to plan, operate, maintain and dismount the device in safety related appliances.

All given information is addressed to skilled and educated personnel, responsible for the planning, assembly, commissioning, operation, maintenance and dismount of the device. The plant operator is responsible for the correct execution of these operations.

***NOTICE***

The Safety Manual does not replace the operating and installation manuals of this device. It contains necessary information focussed on the usage of the device in safety functions. For additional manuals check the according product website at www.lamtec.de.

The Safety Manual applies to the following burner control systems, including valve proving system, fuel/air ratio control and optional CO/$O_2$ control.

- BT320
- BT330 / BT331
- BT340 / BT341

The Safety Manual is valid from device version **SW-V3.0.0.0**.

## 1.2 Standards and Directives

The basis of test for this device are the following standards and directives:

- DIN EN 298: 2012-11
- DIN EN 13611: 2011-12
- DIN EN 1643: 2014-09
- DIN EN 12067-2: 2004-06
- ISO 23552-1:2007-10
- DIN EN 50156-1:2016-03, clause 10.5
- DIN EN 50156-2:2016-03
- DIN EN 61508:2011 parts 1-7
- DIN EN 60730-2-5: 2011-03
- DIN EN 60730-1: 2012-10
- DIN EN 60335-1:2012-10, clause 30
- DIN EN 60730-2-5:2015-10 and draft DIN EN 60730-1:2014-07 (only for LCM100)

- 2014/35/EU Low Voltage Directive (LVD)
- 2014/30/EU Electromagnetic Compatibility (EMC) Directive
- 2014/68/EU Pressure Equipment Directive Cat.4 Mod. B+D
- 2009/142/EG Gas Appliance Directive

## 1.3 Classification of the Safety Instructions and Warnings

The following symbols are used in this document to draw the user's attention to important safety information. They are located at points where the information is required. It is essential that the safety information is observed and followed, and that applies particularly to the warnings.

**DANGER!**

This draws the user's attention to imminent danger. If it is not avoided, it will result in death or very serious injury. The plant including its surroundings could be damaged.

**WARNING!**

This draws the user's attention to the possibility of imminent danger. If it is not avoided, it may result in death or very serious injury. The plant including its surroundings could be damaged.

**CAUTION!**

This draws the user's attention to the possibility of imminent danger. If it is not avoided, it may result in minor injuries. The plant including its surroundings could be damaged.

***NOTICE***

This draws the user's attention to important additional information about the system or system components and offers further tips.

The safety information described above is incorporated into the instructions.

Thus, the operator is requested to:

1 Comply with the accident prevention regulations whenever work is being carried out.

2 Do everything possible within his control to prevent personal injury and damage to property.

# 1 General Information

## 1.4 Terms and Definitions

For further explanations of terms and definitions see IEC 61508-4 (or DIN EN 61508-4).

| | |
|---|---|
| **DC** | Diagnostic coverage |
| **$DC_{AVG}$** | Average diagnostic coverage |
| **E/E/PE-System** | Electrical/electronic/programmable electronic system |
| **EUC** | Equipment under control |
| **FIT** | Failure In Time in $10^{-9}$ 1/h |
| **FMEDA** | Failure Mode, Effects, and Diagnostics Analysis |
| **$\lambda_s$** | Probability of safe failure (detected and undetected) |
| **$\lambda_d$** | Probability of dangerous failure |
| **$\lambda_{dd}$** | Probability of dangerous detected failure |
| **$\lambda_{du}$** | Probability of dangerous undetected failure |
| **$\lambda_{no\ effect}$** | Probability of failures with no effect (not used in SFF calculation) |
| **HFT** | Hardware fault tolerance |
| **MooN** | M out of N channel architecture |
| **MTBF** | Mean time between failures |
| **MTTR** | Mean time to repair |
| **MTTF** | Mean time to failure |
| **PFD** | Probability of dangerous failure on demand (Low Demand mode) |
| **$PFD_{AVG}$** | Average probability of dangerous failure on demand |
| **PFH** | Average frequency of a dangerous failure per hour (Continuous mode) |
| **SFF** | Safe failure fraction |
| **SIF** | Safety instrumented function |
| **SIS** | Safety instrumented system |
| **SIL** | Safety integrity level |
| **SIL AC** | Safety integrity level architectural constraint |
| **SC** | Systematic Capability |
| **$T_1$** | Proof test interval |
| **$T_2$** | Diagnostic test interval |

# 2 General Safety Instructions

## 2.1 Intended Use

The device is developed and approved for appropriate and intended use. If the device is used improperly, the protection of personnel and plant is not ensured.

The corresponding manuals or chapters for each particular stage of the product life cycle must be regarded in addition to this Safety Manual see chapter *1.1 Purpose*. Ignoring these instructions will void any warranty and absolve the manufacturer from any liability.

## 2.2 Safety Functions

The burner control system Burnertronic BT300 is suitable for flame detection and control of burners and combustion systems for gaseous, liquid or solid fuels with permanent operation.

The burner control system is designed with integrated valve proving system and with integrated fuel/air ratio control, optionally with CO and $O_2$ control loop.

The unit is available with an integrated flame guard. Sensor types LDR/UV and ION-probes can be connected to the integrated flame guard. When used without integrated flame guard, any tested flame guard in accordance with DIN EN 298 and approval for continuous operation may be connected to terminal X21 such as the following (Lamtec document no. in brackets):

- Compact flame detector F200K1 and F200K2 (DLT7620)
- Compact flame detector F300K (DLT7650)
- Flame scanner F152 (DLT7665), with flame sensors FFS07/FFS07 Ex (DLT7665) and FFS08 (DLT7665)

***NOTICE***

We recommend the latest Lamtec flame monitoring systems (like F300K, F200K2), if there are other requirements for the flame monitoring (e.g. combustion of coal dust). Informations are available in the corresponding manuals (DLT7650, DLT7600 and DLT7502/ DLT7503).

**⚠ WARNING!**

The type approval lapses in the event of modifications to the unit. The unit's inputs and outputs must be wired according to the specifications in the instruction manual only.

**⚠ DANGER!**

The appendix Hints and requirements for installation, commissioning, operation and verification" must be considered properly.

## 2.3 Safe State

The safe state is achieved when all fuel valves are closed and in a de-energized condition.

# 2 General Safety Instructions

## 2.4 Scope of Application

The Burnertronic BT300 burner control system and the integrated fuel/air control fulfil:

- the technical requirements of **DIN EN 61508:2011**, parts 1-7 for **SIL 3**.
- the requirements to be used as single device for SIF according to **DIN EN 61511-1:2005-05** up to **SIL 3**.
- the requirements to be used as single device for safety related control functions (SRCF) according to **EN ISO 13849-1:2006** up to performance level **PL** e and can be used for safety shut-down of the entire fuel supply of burners or combustion systems according to **DIN EN 50156-1:2005-03** (clause 10.5.5.) up to **SIL 3** according to **DIN EN 50156-2:2016-03.**

## 2.5 Additional Components

The safety parameters do not include external components (except VSM100, DFM300) such as flame scanners (except FFS07 or FFS08, connected directly to the Burnertronic BT300), valves or any other sensors and actors.

For usable external components like actuators see chapter *7.3 C: System components*".

Safety shut off valves, air pressure switches and gas valve leakage test pressure switches must be certified for the required usage. E.g. for applications within the European Union see DIN EN 13611.

## 2.6 Safety Values

The safety values have been determined by the use of a FMEDA with the following basic conditions:

- Component failure rates based on Siemens standard SN 29500, DIN EN 13611: 2011-12 and B10d values of manufactures where no other values are available.
- Specific load parameters, quality factors and an ambient temperature of 40°C have been used for the calculation.
- Failure models from IEC62061 and additionally failure model drift have been used. Under special circumstances short circuits have not to be assumed.
- Estimation of common cause factors $\beta = 2\%$ $\beta_D = 1\%$.
- The "Proof test interval" $T_1$ is equivalent to the product mission or life time.
- The calculation of the safety probability values has been done with a lifetime of 10 years[1].
- For redundant structures a diagnostic test interval of T2 = 24h has been defined.
- For redundant subsystems (HFT>=1) the SFF is > 90%, for subsystems without redundancy (HFT=0) the SFF is > 99%
- The Burnertronic BT300 is designed as one safety unit (PES). There is no separation within the Burnertronic BT300 electronic between safety and non safety related components by architectural design.
- There is no difference between $\lambda_s$ detected and undetected. All safe failures can be assumed as safe undetected ($\lambda_{su}$).

[1] See chapter *2.7 Life time*for more information.

| | burner control system<br>without DFM300 / with DFM300 | fuel/air ratio control system<br>without VSM100 / with VSM100 |
|---|---|---|
| Device type | Type B (complex component) | Type B (complex component) |
| Mode of operation | High demand or continuous mode | High demand or continuous mode |
| Safety state | De-energized outputs / safety valves | De-energized outputs / safety valves |
| HFT[2] | 0 | 0 |
| SIL (SC) | 3 | 3 |
| $\lambda_s$ ($\lambda_{su}$) | 7,45E+02 FIT / 7,57E+02 FIT | 1,11E+02 FIT / 1,12E+02 FIT |
| $\lambda_{dd}$ | 6,46E+02 FIT / 8,23E+02 FIT | 1,29E+02 FIT / 3,50E+02 FIT |
| $\lambda_{du}$ | 1,95E+01 FIT / 2,13E+01 FIT | 5,53E+00 FIT / 7,95E+00 FIT |
| $\lambda_{no\ effect}$ | 6,93E+02 FIT / 9,46E+02 FIT | 2,03E+02 FIT / 4,44E+02 FIT |
| SFF[3] | 98,6% / 98,6% | 97,4% / 98,0% |
| $DC_{AVG}$ | 97,0% / 97,3% | 96,0% / 97,4% |
| PFH | 1,7E-08 1/h / 1,9E-08 1/h | 2,9E-09 1/h / 5,3E-09 1/h |
| $PFD_{AVG}$ | 7,0E-04 / 7,8E-04 | 8,3E-05 / 1,9E-04 |
| T1 | 10 years | 10 years |
| T2 | 24 hours | 24 hours |
| MTTF | 46 years / 39 years | 184 years / 105years |
| MTTR[4] | 8 hours | 8 hours |
| MTBF | 46 years / 39 years | 184 years / 105years |

[2] According to DIN EN 61508:2011 HFT > 0 requires complete redundancy, including sensors, actors and power supplies. Nevertheless, a HFT=0 device may reach the safety integrity for the usage in SIL3 safety functions according to DIN EN 61508 or DIN EN 61511 (see 2.4 Scope of Application).

[3] SFF is relevant for elements, subsystems or systems in a complete safety loop. This device is always part of a complete safety loop. A SIL calculation of a safety loop must be evaluated finally with the safe failure fraction of elements, subsystems and the complete system. Nevertheless, the SFF of the device is given in this document for reference.

[4] The MTTR is assumed with 8h for the calculation of PFD/PFH (exchange of the device). In practise, the devices will be locked in the safe state until it is replaced.

| | electronic control and feedback circuit of the actuators (662R50…-X) | electronic control and feedback circuit of the actuators (662R5500-X) |
|---|---|---|
| Device type | Type B (complex component) | Type B (complex component) |
| Mode of operation | High demand or continuous mode | High demand or continuous mode |
| Safety state | - | - |
| HFT[5] | 0 | 0 |
| SIL (SC) | 3 | 3 |
| $\lambda_s$ ($\lambda_{su}$) | 0,49E+00 FIT | 0,36E+00 FIT |
| $\lambda_{dd}$ | 1,09E+02 FIT | 1,13E+02 FIT |
| $\lambda_{du}$ | 1,23E+00 FIT | 1,27E+00 FIT |
| $\lambda_{no\ effect}$ | 4,03E+01 FIT | 4,66E+01 FIT |
| SFF[6] | 98,9% | 98,9% |
| $DC_{AVG}$ | 98,9% | 98,9% |
| PFH | 1,1E-09 1/h | 1,3E-09 1/h |
| $PFD_{AVG}$ | 5,5E-05 | 5,7E-05 |
| T1 | 10 years | 10 years |
| T2 | 24 hours | 24 hours |
| MTTF | 754,4 years | 706,6 years |
| MTTR[7] | 8 hours | 8 hours |
| MTBF | 754,4 years | 706,6 years |

[5]According to DIN EN 61508:2011 HFT > 0 requires complete redundancy, including sensors, actors and power supplies. Nevertheless, a HFT=0 device may reach the safety integrity for the usage in SIL3 safety functions according to DIN EN 61508 or DIN EN 61511 (see chapter *2.4 Scope of Application* ).

[6]A SFF is relevant for elements, subsystems or systems in a complete safety loop. This device is always part of a complete safety loop. A SIL calculation of a safety loop must be evaluated finally with the safe failure fraction of elements, subsystems and the complete system. Nevertheless, the SFF of the device is given in this document for reference.

[7]The MTTR is assumed with 8h for the calculation of PFD/PFH (exchange of the device). In practise, the devices will be locked in the safe state until it is replaced.

## 2.7 Life time

The mission time or life time of the device is 10 years.

In accordance with the DIN EN 61508 the life time is 8 to 12 years under normal operating conditions, because electronic components are assumed to have a constant failure rate λ through this period. After that period the failure rates of the components will increase significantly with time (see "bathtub curve" for electronic components).

The life time of 10 years does not mean, that the device will become unsafe after this time immediately. The extensive diagnosis of safety related components remains still active. DIN EN 61508-2:2011 Note N3 gives the hint, that appropriate measures taken by the manufacturer and plant operator can extend the useful lifetime.

The burner control is designed for 250.000 switching cycles with nominal switch loads. For normal operation this is equal to 10 years of operation[5]. For industrial use with reduced loads and a lower ambient temperature more switching cycles are possible.

Nevertheless, when the device stays in operation after the end of the life time, Lamtec does not guarantees the proper function and all calculated safety values become invalid.

[5] Base on the switching cycles and the corresponding lifetime are EN 13611, DIN EN 298 and an overview from the European Control Manufacturers Association (Afecor, www.afecor.org)

# 3 Installation and Commissioning

For installing the device, check the instruction and installation manuals as well as valid norms, standards and directives for the application (see also chapter *1.2 Standards and Directives*).

**WARNING!**

Connect the device only to other components or devices which are suitable for this safety application.

## 3.1 Verification

Check the safety functions to ensure the expected operation of the device before using it in a safety related environment.

**WARNING!**

The appendix "Hints and requirements for installation, commissioning, operation and verification" shall be considered properly.

# 4 Operation

During operation the device must not be deactivated or bypassed. The operator must be familiar with the displayed information of the device and the measures to be executed in the moment of any signalized disturbance. The information in the instruction manual must be regarded.

Only suitable elements and devices must be connected, also for the commission of the device (see chapter *2.5 Additional Components*).

**WARNING!**

Safe failures should be corrected and must be reported to Lamtec as soon as possible.

**DANGER!**

Danger to life and material: Do not put the safety loop out of service

## 4.1 Proof Test

The "Proof test interval" $T_1$ is equivalent to the product`s mission or life time. There are no components or elements used that can be set into an "as new condition" by a proof test of the device. For electronic components, the "as new condition" would mean to set the electronic components back to the beginning of the constant period of the "bathtub curve", which is not possible.

Nevertheless, it is recommended to validate the safety functions once a year to ensure the proper operation of the device.

# 5 Repair and Maintenance

**WARNING!**

The device must not be repaired, modified or manipulated. Otherwise the safety integrity can be lost and LAMTEC will not guarantee for the proper operation any more.

***NOTICE***

Defects and failures must be reported to LAMTEC as soon as possible, including type, version and serial number of the device.

In case of a repair or maintenance, comply with instructions from the installation manual. Defective devices must be sent to LAMTEC for a repair. The safe operation of the application must be ensured while the device is being repaired or a maintenance is ongoing. After a repair or a maintenance, follow chapter 3 for installation and commissioning again.

**WARNING!**

Replace the device only by one of the same type and version and check the corresponding data and parameter set.

**DANGER!**

The burner control  is a safety device. Any repair work or other changes to the device shall only be carried out by the manufacturer's specialist staff or by other persons appointed by the manufacturer. Any other persons are not allowed to operate on parts inside the device. Any unauthorizied replacement, repair or modification of the device can lead to a loss of the safety integrity.

# 6 Decommission and Dismount

To put the device out of service, comply with instructions from the installation manual and ensure the safe operation of the application after that. The device should be replaced after the product`s mission or life time (see chapter *2.7 Life time*).

The device must be disposed properly. This device is designed for industrial usage and must be disposed accordingly.

# 7 Appendix

## 7.1 A: TÜV Confirmation

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### CONFIRMATION

**on the type examination of a burner control system with integrated valve proving system and integrated fuel/air ratio control system**

Date: 2016-11-30

Our reference:
IS-TAF-MUC/ku

Order no. 2534708

Document:
CF14570716_BST.docx

Page 1

| | | |
|---|---|---|
| **Test Laboratory** | TÜV SÜD Industrie Service GmbH<br>Abteilung Feuerungs- und Wärmetechnik | |
| **Subject of Test** | Type | **Burnertronic BT300** |
| | Models | **BT320, BT330, BT331, BT340, BT341** with safety related extension modules type **DFM300, VSM100** |
| **Ordering Company** | LAMTEC Meß- und Regeltechnik<br>für Feuerungen GmbH & Co KG<br>D-69190 Walldorf (Baden) | |
| **Product description** | Burner control system with integrated valve proving system and integrated fuel/air ratio control system (including $CO/O_2$ control functions) | |
| **Basis of Test** | DIN EN 298:2012-11, DIN EN 61508:2011, parts 1–7;<br>DIN EN 13611:2011-12, DIN EN 1643:2014-09,<br>DIN EN 12067-2:2004-06, ISO 23552-1:2007-10,<br>DIN EN 50156-1:2016-03, clause 10.5,<br>DIN EN 50156-2:2016-03 | |
| **Test Report** | no. C-F 1457-05/13 dated 2013-02-20<br>no. C-F 1457-06/14 dated 2014-12-19<br>no. C-F 1457-07/16 dated 2016-11-30 | |

The document consists of 2 pages



The test results refer exclusively to the units under test.

The results in detail, the evaluation of the results and the conclusions out of the results are described in the above mentioned test reports.
Excerpts from these test reports are printed on the reverse.

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# 7 Appendix



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| | | |
|---|---|---|
| Type designation | **Burnertronic BT300** | |
| Models | **BT320, BT330, BT331, BT340, BT341** | |
| Software version | **V.3.4.0.0** | |
| Extension modules type | **DFM300, VSM100** | (safety related) |
| | **UI300, LCM100, LSA100, LEM100, PBM100, EBM100** | (feedback free) |

Model **BT320** is suitable for flame detection and control of burners for gaseous or liquid fuels – also in hot air generators – with non-permanent operation.

Models **BT330**, **BT331**, **BT340** and **BT341** are suitable for flame detection and control of burners for gaseous or liquid fuels – also in hot air generators – with permanent operation (only in combination with an ionisation flame probe or with an external flame detector device approved for permanent operation),
or with non-permanent operation (in combination with all other flame sensors / flame detectors mentioned in **annex X** of test report no. C-F 1457-07/16).

In combination with adequate parametrization the system is suitable to fulfil the functional requirements of DIN EN 267:2011-11, DIN EN 676:2008-11, TRD 411:1997-02, TRD 412:1998-06, DIN EN 12952-8:2002-08 and DIN EN 12953-7:2002-08.

Models **BT330**, **BT331**, **BT340** and **BT341** also fulfil the requirements of DIN EN 50156-1, clause 10.5, and of DIN EN 50156-2 for burners and combustion systems with permanent operation up to **SIL 3**.

Except for the $CO/O_2$ control functions, models **BT331** and **BT341** also conform to the applicable requirements of DIN EN 61508:2011-02, parts 1-7, for safety integrity level **SIL 3**.
The probabilistic parameters for the system and its external components are mentioned in **annex Y** of test report no. C-F 1457-07/16.

Except for the $CO/O_2$ control functions, models **BT331** and **BT341** are capable to be used as single device for safety related control functions (SRCF) up to performance level **PL e** according to DIN EN ISO 13849-1:2016-06, table 3.

The "Hints and requirements for integration, installation, commissioning and verification" (**annex Z** of test report no. C-F 1457-07/16) shall be considered.

# 7 Appendix

## 7.2 B: Hints and requirements for installation, commissioning, operation and verification



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**Hints and requirements for integration, installation, commissioning and verification of the burner control system, type BT300 (software version 3.4.0.0)**

1. **General**
   a. Only the components listed in annex X of test report no. C-F 1457-07/16 shall be used.
   b. After installation in the burner or appliance the class of protection for the burner control system, its flame sensors resp. flame detectors, and all additional components shall be a minimum of IP 40 – or IP 54 for use in the open air – according to EN 60529.
   c. To ensure IP 54 protection during the entire life time of type 662R50…-X actuators, the bearing of the drive shaft must be located such that it will not be directly exposed to water or dust.
   d. The use of flame detector type IRD 1010.1 is restricted to oil burners.
   e. The use of flame sensors type QRB 1…, QRB 3… or MZ770S is restricted to oil burners. If the illumination intensity of the oil burner flame is less than 3 Lux then the safety against extraneous light signals shall be checked together with the oil burner.
   f. External flame detector devices which are not listed in annex X shall conform to EN 298. They shall be suitable for permanent operation if required by the application. Their flame failure detection time shall not exceed 1 second.
   g. During standby or during continuous post-purge after shut-down the external safety devices are not monitored. Thus, if safety devices wired in the safety chain of the burner or appliance are actuated, the system will not proceed to non-volatile lock-out and the combustion air fan will not stop. Additional measures may be necessary in the application to provide an appropriate emergency stop function of the burner or appliance, and to provide a lock-out function for external limiters.
   h. Any information technology equipment of other manufacturers which is connected to the external communication interfaces of the system must conform to the requirements for safe insulation from mains supply.
2. **Parameters, Software**
   a. Safety-related parameters shall be configured in accordance with all requirements applicable to the controlled burner or appliance. Among others this includes safety times, pre-purge time, recycling following flame failure, combustion air flow monitoring, the fuel/air ratio control system and the valve proving functions. In particular the following rule shall be considered:

      If flame detectors type KLC…, or type IRD 10…, or other external flame detector devices are used then their flame failure detection time shall be considered in addition to the flame failure response time of the programming unit in order to meet the specific requirements for the burner or appliance.
   b. The actual parameter configuration (in particular safety-related parameters with access levels 1, 2 and 4) shall be recorded and validated by functional evaluation (e.g. during type examination of the burner or appliance).
   c. The manufacturer of the burner or appliance shall provide adequate procedures to verify the correct parameter configuration (e.g. by providing the E²PROM check sums).
   d. Access level 1 parameters shall be protected against unintended modification by programming a password different from „0000".
   e. The manufacturer of the burner or appliance shall provide adequate procedures to verify and validate the parameter configuration after parameter modifications during commissioning or maintenance.
   f. After restoration of a parameter set which has been saved in the user interface type UI300 the complete commissioning procedure of the burner or appliance shall be repeated.

# 7 Appendix



3. **Fuel/air ratio control systems**
   a. All actuators shall be mounted durably and shall be secured against distortion.
   b. A form-fit (positive) mechanical connection shall be provided between the output drive of the actuators and the control devices of the burner or appliance. This connection shall be adequately designed for the maximum controlling torque of the actuators.
   c. For modulating burners or appliances a sufficient number of set points for the control of the fuel quantity and of the air volume flow must be saved over the complete heat input range of the burner or appliance.
   d. Under consideration of fuel pressure and pressure within the combustion chamber as well as of temperature and pressure of the combustion air, the set points of the actuators for the control devices for air and fuel shall be adjusted in a way that a safe and stable combustion is ensured over the complete heat input range of the burner or appliance.
   e. Conformity with 3.d. shall be proven by evaluation of the relevant combustion parameters of the burner or appliance while it is operated normally, and operated at the limits of the fuel/air ratio control and monitoring system (difference between the set position and the actual position of the actuators; tolerance limits specified by parameters **606**…**615**). During evaluation only one actuator position is shifted to the tolerance limit at the same time.
   f. If the combustion system is equipped with a "fail safe" CO or $O_2$ control system then the evaluation procedure according to clause 3.e. will not apply. Instead of that the combustion system shall be proven at the shut-off limits of the CO or $O_2$ control system according to the applicable installation and commissioning instructions.
   g. The manufacturer of the burner or appliance shall provide adequate procedures to ensure a safe and stable combustion of the burner or appliance after installation.
   h. It shall be ensured that the measurement range of the variable speed module type VSM100 is neither exceeded nor underrun when used to control and monitor a frequency controlled fan.
   During parameterization of the module the maximum corrective influence shall also be considered.
   i. If an external flue gas recirculation fan is used then it shall be activated simultaneously with the combustion air fan of the burner. The flue gas recirculation fan shall be monitored by a separate safety device (e.g. a pressure monitoring device) which must by wired externally with the monitoring device of the combustion air fan according to the installation instructions.
4. **Valve proving system (VPS)**
   a. Auxiliary valves integrated into the functional sequence of the VPS shall conform to EN 161, class A.
   b. Gas pressure sensing devices integrated into the functional sequence of the VPS shall conform to DIN EN 1854.
   c. The gas shut-off valves, the gas pressure sensing device and, if applicable, the external discharge valves for the VPS shall be wired according to the indications of the control manufacturer.
   d. Depending on the volume between the gas shut-off valves, on the gas pressure and on the set point of the gas pressure sensing device, the leakage testing times of the VPS must be adjusted in a way that a leakage rate of 0,1 % of the heat input, at least 50 $dm^3/h$, will be safely detected.
   An appropriate calculation method for the parameters of the VPS shall be provided with the instructions for the burner.
   e. If discharge of gas into the combustion chamber during the programme sequence is not permissible (e.g. if the VPS is used as an alternative for pre-purge or post purge) then additional equipment may be required to vent gas into the atmosphere at a safe location.
5. **Miscellaneous**
   a. Possible risks caused by external fire or by traffic, wind and earthquake loading shall be examined separately depending from the installation situation of the pressure equipment
   b. Adequate information about proper location, mounting, installation, putting into service, operation and maintenance of the burner control system shall be included into the installation and operating instructions of the burner or appliance in an official language of the country in which it is to be used.

# 7 Appendix

## 7.3 C: System components

Annex X, page 1
Test report no. C-F 1457-07/16
Date: 2016-11-30

Document: CF14570716_Anl.X1.docx

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**Lamtec, Burnertronic BT 300**

**List of tested system components**

| *Component* | *Type / models* | *latest Version* | *latest test report no.* | *Remark* |
|---|---|---|---|---|
| Programming unit, Electronic control module | **BT300**<br>BT320<br>BT330<br>BT331<br>BT340<br>BT341 | HW V 1.009<br>SW V 3.4.0.0 | C-F 1457-07/16 | |
| User Interface | **UI300** | HW V 1.2.0.0 | C-F 1457-05/13 | not safety related [1)] |
| Load Controller Module | **LCM100** | – | C-F 1457-07/16 | not safety related [1)] |
| Dual Fuel Module | **DFM300** | HW V 1.0.0.0 | C-F 1457-06/14 | |
| Varable Speed Drive Module | **VSM100** | HW V 1.5.0.0<br>SW V 1.1.0.0 | C-F 1457-07/16 | |
| Actuators | **662R5500-X**<br>**662R5001-X**<br>**662R5003-X**<br>**662R5009-X**<br>**662R5010-X** | – | C-F 1457-00/11<br>C-F 1457-04/12<br>C-F 1457-05/13 | refer to page 3 |
| LSB Extension Module | **LEM100** | – | C-F 1457-06/14 | not safety related [1)] |
| LSB Service Adapter | **LSA100** | – | C-F 1457-07/16 | not safety related [1)] |
| Profibus-Modul | **PBM100** | – | C-F 1457-06/14 | not safety related [1)] |
| Ethernet-Busmodul | **EBM100** | – | C-F 1457-06/14 | not safety related [1)] |

[1)] Only tested concerning electrical safety and no impact on safety functions
The actual version of not safety related modules and their compatibility with different SW versions of the programming unit / electronic control module is documented by the manufacturer.

# 7 Appendix




**List of suitable flame sensors / flame detector devices**

| *Component* | *Type* | *Manufacturer* | *Suitable for permanent operation* | *Spectral range Further remarks* |
|---|---|---|---|---|
| Ionisation flame sensor | – | usual in trade | YES | – |
| Photo-resistive flame sensor | **QRB 1 A / B / C QRB 3 / 3S** | Siemens AG | NO | 450 … 800 nm Only for oil burners |
| Photo-resistive flame sensor | **MZ 770S** | Honeywell | NO | 400 … 800 nm Only for oil burners |
| IR flame detector | **IRD 1010.1** | Honeywell | NO | 800 … 1100 nm (flicker) Only for oil burners |
| IR flame detector | **IRD 1020.1** | Honeywell | NO | 800 … 1100 nm (flicker) With mounting flange type M93 |
| IR flame detector | **KLC 2002** | BST Solutions GmbH | NO | 380 … 1150 nm (flicker) PIN CE-0085BP0001 |
| UV flame detector | **KLC 1000** | BST Solutions GmbH | NO | 185 … 260 nm PIN CE-0085BS0448 |
| UV flame sensor | **QRA 2 / 2M, QRA 4.U QRA 10 / 10M** | Siemens AG | NO | 190 … 270 nm |

Annex X, page 3
Test report no. C-F 1457-07/16
Date: 2016-11-30

Document: CF14570716_Anl.X3.docx

Industrie Service

**Lamtec, Burnertronic BT 300**

**List of actuators**

| Lamtec part no | Schneider type / part no. | IP | Rated torque | Max. Power consum. | Running time | Working range | Operating range | Resolution motor / monitor. | Repeat-ability | Monitoring accuracy |
|---|---|---|---|---|---|---|---|---|---|---|
| 662R5500-X | STE4,5 B0.37/6... 0044601377XXX | IP 40 | 0,8 Nm | 7,5 W | 5 s / 90° | 108,5° | 90° | 0,1° / 0,7° | ±0,1° | ±2° |
| 662R5001-X | STE4,5 Q3.51/6 1,2Nm ... 0044551517XXX | IP 54 | 1,2 Nm | 7,5 W | 5 s / 90° | 108,5° | 90° | 0,1° / 0,7° | ±0,1° | ±2° |
| 662R5003-X | STE4,5 Q3.51/6 3Nm ... 0044551517XXX | IP 54 | 3 Nm | 10 W | 5 s / 90° | 108,5° | 90° | 0,1° / 0,7° | ±0,1° | ±2° |
| 662R5009-X | STE15 Q3.51/6 10Nm ... 0044551517XXX | IP 54 | 9 Nm | 10 W | 15 s / 90° | 108,5° | 90° | 0,03° / 0,7° | ±0,1° | ±2° |
| 662R5010-X | STE15 Q3.51/6 10Nm ... 0044551517XXX | IP 54 | 10 Nm | 10 W | 15 s / 90° | 108,5° | 90° | 0,03° / 0,7° | ±0,1° | ±2° |

**Common data:**

Operating temperature range: -20 ... 60 °C

Remark: Actuators type 662R5009-X and type 662R5010-X use the same Schneider actuator.
However, actuator type 662R5009-X has a spring operated pre-tension mechanism assembled to the output shaft which decreases the rated torque by 1 Nm. The pre-tension mechanism has no influence on the safe operation of the fuel/air ratio control functions.

# 8 EC Declaration of Conformity

Sensoren und Systeme für die Feuerungstechnik

LAMTEC

## EG-Konformitätserklärung

EC Declaration of Conformity
Déclaration CE de Conformité

| | |
|---|---|
| Wir (We / Nous) | **LAMTEC Meß- und Regeltechnik für Feuerungen GmbH & Co. KG**<br>**Wiesenstraße 6**<br>**D-69190 Walldorf (Baden)** |
| erklären, dass die<br>(declare that)<br>(déclarons que) | **BT300 230 VAC/115 VAC – Burner Control System** |
| inklusive<br>(inclusive)<br>(y compris) | **Varianten 320/330/331/340/341**<br>(variants, variants)<br>**User Interface UI300**<br>**Erweiterungsmodulen:**<br>(additional modules, modules complémentaires) |

| | |
|---|---|
| **DFM300** | **Dual Fuel Module** |
| **VSM100** | **Variable Speed Drive Module** |
| **LCM100** | **Load Controler Module** |
| **PBM100** | **PROFIBUS Module** |
| **EBM100** | **Ethernet Module** |
| **RAST5** | **Adapter Module for DFM** |
| **LSA100** | **LAMTEC SYSTEM BUS Adapter** |
| **LEM100** | **LSB Extension Module** |

Produkt-ID-Nummer:
(Product Id Number)
(Numéro d'identification du produit)

| | |
|---|---|
| **BT300 inkl. Varianten** | **667R13XX-X** |
| (incl. variants, y compris les variants) | |
| **UI300** | **667R0100-X** |
| **DFM300** | **667R0600-1 / -2** |
| **VSM100** | **667R0200-1** |
| **LCM100** | **667R0500-1** |
| **PBM100** | **667R0700-1** |
| **EBM100** | **667R0720-1** |
| **RAST5** | **667R0620-1** |
| **LSA100** | **667R0300-1** |
| **LEM100** | **667R0400-1** |

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# 8 EC Declaration of Conformity

Sensoren und Systeme für die Feuerungstechnik

LAMTEC

auf welche sich diese Erklärung bezieht, mit den folgenden Norm(en) übereinstimmt
(to which this declaration relates conforms to the following standard(s))
(sur laquelle cette déclaration se réfère, et conformément aux dispositions de la norme(s))

DIN EN 298: 2012-11
DIN EN 1643: 2001-02
DIN EN 12067-2: 2004-06
ISO 23552-1: 2007-10
DIN EN 13611: 2011-12
DIN EN 60730-2-5: 2011-03
DIN EN 60730-1: 2012-10

gemäß den Bestimmungen der folgenden Richtlinie(n).
(according to the provisions of the following directive(s))
(conformément aux dispositions de la directive(s))

| Nummer (Number / Numéro) | Text (Text / Texte) |
|---|---|
| **2014/35/EU** | Niederspannungsrichtlinie |
| **2014/35/EU** | Low Voltage Directive |
| **2014/35/UE** | Directive basse tension |
| **2014/30/EU** | EMV-Richtlinie |
| **2014/30/EU** | EMC Directive |
| **2014/30/UE** | Directive CEM |
| **2014/68/EU** | Druckgeräterichtlinie Kat.4 Mod. B+D |
| **2014/68/EU** | Pressure Equipment Directive |
| **2014/68/UE** | Directive équipements sous pression |
| **2009/142/EG** | Gasverbrauchseinrichtungen |
| **2009/142/EC** | Gas Appliance Directive |
| **2009/142/CE** | Directive appareils à gas |
| **2011/65/EU** | RoHS |
| **2011/65/EU** | RoHS |
| **2011/65/UE** | RoHS |

Das Datenblatt und gegebenenfalls die Basisdokumentation sind zu beachten.
(The data sheet and basic documentation, if any, have to be considered.)
(La consultation de la fiche technique, et éventuellement de la documentation technique de base, est requise.)

Hinweise zur Anwendung der Richtlinie 2014/35/EU und 2014/30/EU:
Die Konformität mit 2009/142/EG setzt die Übereinstimmung mit 2014/35/EU voraus und beinhaltet diese.
Die Konformität mit 2014/30/EU ist nach Einbau des Bauteils in das Endgerät nachzuweisen und zu erklären.

Remarks regarding the application of directive 2014/35/EU and 2014/30/EU:
Conformity with 2009/142/EC presupposes that requirements of 2014/35/EC are fulfilled and includes these.
Conformity with 2014/30/EC has to be proved and declared after installation of the component.

Remarques sur l'application des directives 2014/35/UE et 2014/30/UE:
La conformité avec la 2009/142/UE intègre la conformité avec la 2014/35/UE.
La conformité avec la 2014/30/UE après l'installation de l'appareil est à prouver et à declarer.

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# 8 EC Declaration of Conformity

Sensoren und Systeme für die Feuerungstechnik

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Anbringung der CE-Kennzeichnung: ja
(Placing of the CE marking)
(L'apposition du marquage CE)

| Produkt (product / produit) | Text (Text / Texte) |
|---|---|
| **BT300** | $CE_{0036}$<br>CE-0085 CM0337 |
| **UI300** | CE |
| **DFM300** | $CE_{0036}$<br>CE-0085 CM0337 |
| **VSM100** | $CE_{0036}$<br>CE-0085 CM0337 |
| **LCM100** | CE |
| **PBM100** | CE |
| **EBM100** | CE |
| **RAST5** | CE |
| **LSA100** | CE |
| **LEM100** | CE |

Walldorf, 19.07.2016
H.J. Altendorf, Geschäftsführung

Rechtsverbindliche Unterschrift
(Authorised signature) (Signature autorisée)

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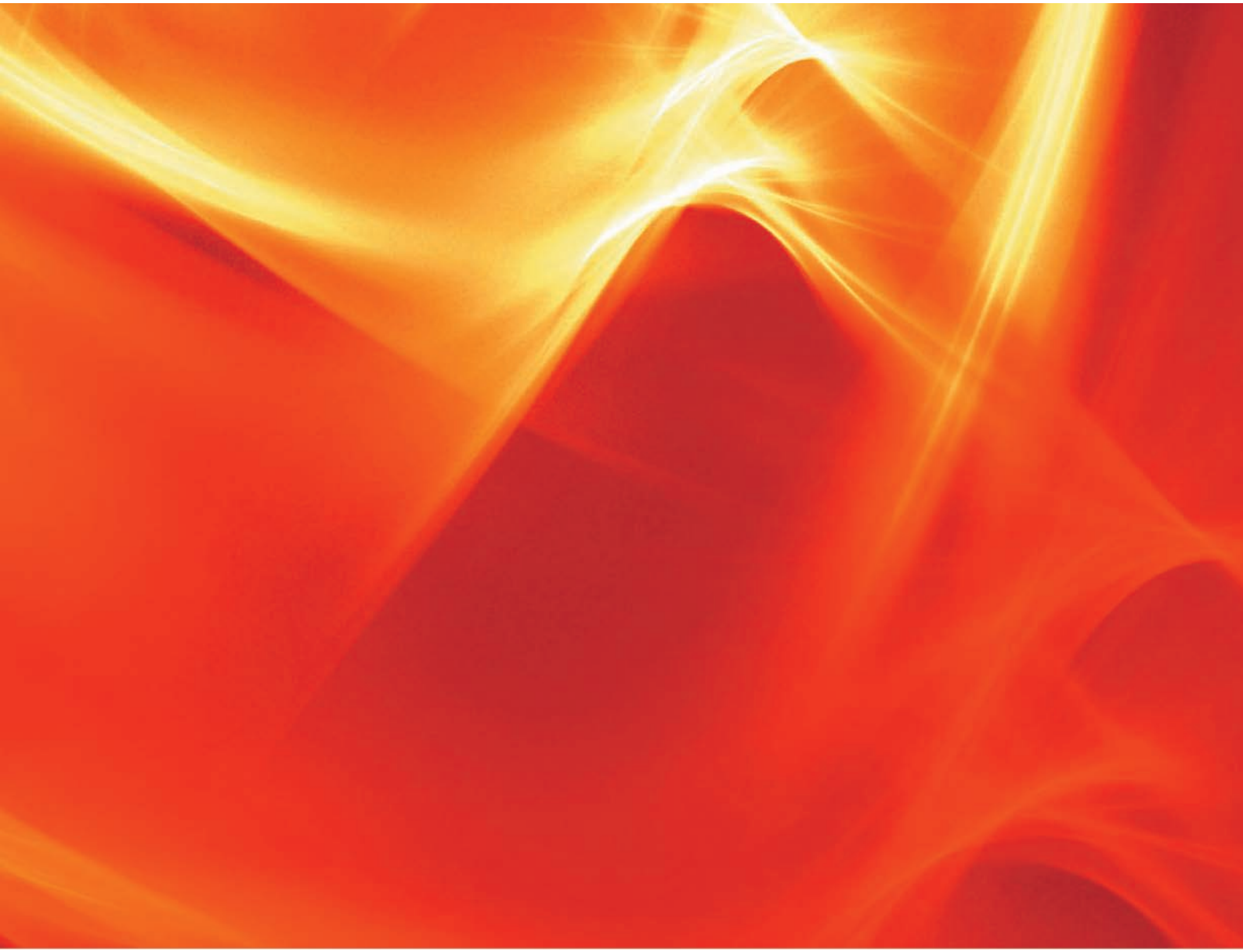

The information in this publication is subject to technical changes.

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