Control Units

**LEC1...**

Control unit for double- or multiflame supervision of oil, gas or forced draft oil / gas burners of any fuel throughput, suited for continuous or intermittent operation.

The LEC1... and this Data Sheet are intended for use by OEMs which integrate the control units in their products!

**Use**

The LEC1... is designed for the fully automatic startup and supervision of forced draft oil or gas burners where flame supervision should or must be carried out by separate flame safeguards, e.g. with:

- Double supervision of the main flame or pilot and main flame by 2 identical or different detectors
- Supervision of forced draft oil / gas burners with different types of detectors, depending on the selected operating mode
- Multiflame supervision, that is, central and simultaneous control of the startup and supervision sequence of several burners the flames of which must be individually supervised by 1 or 2 flame safeguards each

**Supplementary Data Sheets**

- LAE10 Data Sheet N7781
- LFE10 Data Sheet N7781
- LFE50 Data Sheet N7783

**Note!**

Do not use for new designs.
The following types of flame safeguards are available:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAE10</td>
<td>For the supervision of oil burners with an active photocell detector RAR... in intermittent operation</td>
</tr>
<tr>
<td>LFE10</td>
<td>For the supervision with an ionization probe (gas burners) or with UV detectors QRA... (gas, oil or dual-fuel burners, with or without ignition spark proving) in intermittent operation</td>
</tr>
<tr>
<td>LFE50</td>
<td>For the supervision with UV detectors QRA50... / QRA51...(gas, oil or dual-fuel burners) in intermittent or continuous operation</td>
</tr>
</tbody>
</table>

All units comply with the relevant European standards for oil, gas and forced draft burners of any fuel throughput.

The LEC1... can control the following burner plant components:
Fan motor, flue gas fan, air damper, ignition transformer, 1 to 3 fuel valves, load controller, and an external fault signaling device.

A load controller with 3-position output can be connected.

Design, control sequence and adjustment facilities of the control unit make it suitable for use on combustion plants of any size and type, be it in connection with expanding flame or interrupted pilot burners, continuously operating burners or any other special burners.

Special features:

- Prepurge time adjustable between 8 and 63 seconds
- Operation with or without postpurging
- Fully automatic control of air damper possible, irrespective of the actuator run time
- Possibility of air pressure check in connection with functional control of the air pressure switch prior to startup
- Choice of ignition: Direct ignition with pilot burner, with or without ignition spark proving
- Preignition time can be set to «Long» (during the prepurge time) or «Short» (3 seconds, e.g. for forced draft gas burners)
- 1st and 2nd safety time adjustable between 0 and 9 seconds
- Automatic extraneous light test during burner off periods and during the purging times (with lockout in the event of faulty flame signals)
- Semi-automatic burner startup and operation possible
- Built-in lockout warning lamp
- Electrical remote reset facility
- Cover with 2 additional sealing screws to provide protection against tampering (refer to «Dimensions»)
- Continuous display of the program sequence in the cover’s viewing window
- In the event of a fault, the program indicator shows the operating phase during which the fault occurred
- Motor of the programming mechanism can be switched off to simplify burner adjustments
- Camshaft can be rotated manually
Warning notes

To avoid injury to persons, damage to property or the environment, the following warning notes should be observed!

Only authorized staff may open, interfere with or modify the unit!

- All activities (mounting, installation and service work, etc.) must be performed by qualified staff
- Before performing any wiring changes in the connection area of the LEC1…, completely isolate the unit from the mains supply (all-polar disconnection)
- Ensure protection against electrical shock hazard by providing adequate protection for the unit’s terminals
- Each time work has been carried out (mounting, installation, service work, etc.), check to ensure that wiring is in an orderly state and make the safety checks as described in «Commissioning notes»
- Press lockout reset button only manually (applying a force of no more than 10 N), without using any tools or pointed objects
- Fall or shock can adversely affect the safety functions. Such units must not be put into operation, even if they do not exhibit any damage
- Do not press the lockout reset button on the unit or the remote lockout reset button for more than 10 seconds since this damages the lockout relay in the unit

Mounting notes

- Ensure that the relevant national safety regulations are complied with
- Locate ignition electrode and ionization probe such that the ignition spark cannot arc over to the ionization probe (risk of electrical overloads)

Installation notes

- Always run the high-voltage ignition cables separately while observing the greatest possible distances to the unit and to other cables
- 4 extra terminals for the earth conductor, 4 extra terminals for the neutral conductor, and 4 auxiliary terminals
- In the event of loss of flame during operation, the control unit will initiate lockout
- Do not mix up live and neutral conductors
- Install switches, fuses, earthing, etc., in compliance with local regulations
- Observe the maximum permissible current load of the connecting terminals

Electrical connection of the flame detectors

It is important to achieve practically disturbance- and loss-free signal transmission:

- Never run the detector cable together with other cables
  - Line capacitance reduces the magnitude of the flame signal
  - Use a separate cable
- Observe the maximum permissible lengths of the detector cables (refer to «Technical data» at current flame safeguards
- The ionization probe is not protected against electric shock hazard
- Locate the ignition electrode and ionization probe such that the ignition spark cannot arc over to the ionization probe (risk of electrical overloads) and an override of ionization supervision via ignition spark must be avoided
- Insulation resistance
  - Must be a minimum of 50 MΩ between ionization probe and ground
  - Soiled detector holders reduce the insulation resistance, thus supporting creepage currents
- Earth the burner in compliance with the relevant regulations; earthing the boiler alone does not suffice
### Commissioning notes

- Continuous display of the program sequence in the viewing window:
  It is also possible to program the unit by means of a changeover link (UL3) in a way that the programming mechanism does not stop in case of lockout, but that it runs to the end of the program. The only component that receives power during that period of time is the fan for postpurging (connected to terminal 17)
- The motor of the programming mechanism can be switched off (simplifies burner adjustments)
- The camshaft can be rotated manually
- For setting instructions, refer to «Adjustment facilities on the unit»
- When commissioning the plant or when carrying out maintenance work, make the following checks:

<table>
<thead>
<tr>
<th>Safety check</th>
<th>Anticipated response</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Burner startup with flame detector darkened</td>
<td>Lockout at the end of «TSA»</td>
</tr>
<tr>
<td>b) Burner startup with flame detector exposed to extraneous light</td>
<td>Lockout after no more than 40 seconds</td>
</tr>
<tr>
<td>c) Burner operation with simulated loss of flame</td>
<td>Immediate lockout</td>
</tr>
<tr>
<td>d) Burner startup with open-circuit of air pressure switch (not with atmospheric burners)</td>
<td>Lockout at the end of the specified time «t10»</td>
</tr>
<tr>
<td>e) Burner operation with simulated air pressure failure (not with atmospheric burners)</td>
<td>Immediate lockout</td>
</tr>
</tbody>
</table>
Standards and certificates

### Applied directives:
- Low-voltage directive 2014/35/EU
- Electromagnetic compatibility EMC (immunity) *) 2014/30/EU

*) The compliance with EMC emission requirements must be checked after the burner control is installed in equipment.

### Note!
These devices may only be used as replacements within the EU and EFTA countries.

Compliance with the regulations of the earlier, now withdrawn directives is verified by the adherence to the following standards:
- Automatic burner control systems for oil burners DIN EN 230:2005
- Automatic burner control systems for burners and appliances burning gaseous or liquid fuels DIN EN 298:2004
- Automatic electrical controls for household and similar use Part 2-5: Particular requirements for automatic electrical burner control systems DIN EN 60730-2-5:2005

EAC Conformity mark (Eurasian Conformity mark)

ISO 9001:2015
ISO 14001:2015
OHSAS 18001:2007

China RoHS

### Lifetime

The control unit has a designed lifetime* of 250,000 burner startup cycles which, under normal operating conditions in heating mode, correspond to approx. 10 years of usage (starting from the production date given on the type field). This lifetime is based on the endurance tests specified in standard EN 230 / EN 298. A summary of the conditions has been published by the European Control Manufacturers Association (Afecor) (www.afecor.org).

The designed lifetime is based on use of the control unit according to the manufacturer’s data sheet. After reaching the designed lifetime in terms of the number of burner startup cycles, or the respective period of use, the control unit is to be replaced by authorized personnel.

* The designed lifetime is not the warranty time specified in the terms of delivery.

### Disposal notes

The unit contains electric and electronic components and must not be disposed of as household waste. Local and currently valid legislation must be observed.
**Mechanical design**

The LEC1... as well as the flame safeguards LAE10 and LFE10 are of plug-in design and suitable for mounting in any position on the burner, on control desks or in control panels.

The spacious terminal bases and housings are made of impact-proof and heat-resistant plastic.

The programming mechanism of the unit (driven by a synchronous motor), its auxiliary relays and all other switching, control and adjusting elements are mounted on robust printed circuit boards.

### Type summary

<table>
<thead>
<tr>
<th>Article no.</th>
<th>Type reference and ordering information *</th>
<th>Rated voltage</th>
<th>Factory settings for mains frequency</th>
<th>t1</th>
<th>TSA</th>
<th>t9</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPZ:LEC1/8851</td>
<td>LEC1/8851</td>
<td>AC 220...240 V</td>
<td>50 Hz</td>
<td>60 s</td>
<td>2 s</td>
<td>2 s</td>
</tr>
<tr>
<td>BPZ:LEC1/8853</td>
<td>LEC1/8853</td>
<td>AC 220...240 V</td>
<td>50 Hz</td>
<td>30 s</td>
<td>2 s</td>
<td>2 s</td>
</tr>
<tr>
<td>BPZ:LEC1/8866</td>
<td>LEC1/8866</td>
<td>AC 100...110 V</td>
<td>50 Hz</td>
<td>30 s</td>
<td>2 s</td>
<td>2 s</td>
</tr>
<tr>
<td>BPZ:LEC1/8867</td>
<td>LEC1/8867</td>
<td>AC 100...110 V</td>
<td>60 Hz</td>
<td>30 s</td>
<td>2 s</td>
<td>2 s</td>
</tr>
<tr>
<td>BPZ:LEC1/8868</td>
<td>LEC1/8868</td>
<td>AC 220...240 V</td>
<td>60 Hz</td>
<td>30 s</td>
<td>2 s</td>
<td>2 s</td>
</tr>
<tr>
<td>BPZ:LEC1/8892</td>
<td>LEC1/8892</td>
<td>AC 220...240 V</td>
<td>50 Hz</td>
<td>60 s</td>
<td>5 s</td>
<td>5 s</td>
</tr>
<tr>
<td>BPZ:LEC1.1/8854</td>
<td>LEC1.1/8854</td>
<td>AC 220...240 V</td>
<td>50 Hz</td>
<td>17 s</td>
<td>2 s</td>
<td>2 s</td>
</tr>
<tr>
<td>BPZ:LEC1/9500</td>
<td>LEC1/9500</td>
<td>AC 230 V</td>
<td>60 Hz</td>
<td>60 s</td>
<td>4.5 s</td>
<td>4.5 s</td>
</tr>
<tr>
<td>BPZ:LEC1/9501</td>
<td>LEC1/9501</td>
<td>AC 100...110 V</td>
<td>50 Hz</td>
<td>60 s</td>
<td>4.5 s</td>
<td>4.5 s</td>
</tr>
<tr>
<td>BPZ:LEC1/9502</td>
<td>LEC1/9502</td>
<td>AC 100...110 V</td>
<td>60 Hz</td>
<td>60 s</td>
<td>4.5 s</td>
<td>4.5 s</td>
</tr>
<tr>
<td>BPZ:LEC1/9503</td>
<td>LEC1/9503</td>
<td>AC 230 V</td>
<td>50 Hz</td>
<td>60 s</td>
<td>4.5 s</td>
<td>4.5 s</td>
</tr>
</tbody>
</table>

* The type reference is given near the terminals inside the housing.

The control unit is delivered without terminal base.

The latter must be ordered as a separate item using the following part number:

AGG41041713 (EC) or AGG12.1
## Accessories (to be ordered separately)

<table>
<thead>
<tr>
<th>Article no.</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Terminal base</strong></td>
<td></td>
</tr>
<tr>
<td>· To be ordered as a separate item</td>
<td>BPZ:AGG41041713 (EC) AGG41041713 (EC)</td>
</tr>
<tr>
<td>· For Pg11</td>
<td></td>
</tr>
<tr>
<td><strong>Terminal base</strong></td>
<td></td>
</tr>
<tr>
<td>· To be ordered as a separate item</td>
<td>BPZ:AGG12.1 AGG12.1</td>
</tr>
<tr>
<td>· For M16 x 1.5</td>
<td></td>
</tr>
<tr>
<td><strong>Flame detector</strong></td>
<td></td>
</tr>
<tr>
<td>· For mounting on a viewing tube directed toward the combustion chamber</td>
<td>BPZ:QRA50M QRA50M</td>
</tr>
<tr>
<td>· Complete with flange (for all voltage versions)</td>
<td></td>
</tr>
<tr>
<td>· See data sheet N7783 and mounting instructions 4 319 0876 0 (M7783)</td>
<td></td>
</tr>
<tr>
<td><strong>Flame detector</strong></td>
<td></td>
</tr>
<tr>
<td>· For mounting on the burner (side incidence of radiation)</td>
<td>BPZ:QRA51M QRA51M</td>
</tr>
<tr>
<td>· Complete with clamping flange (for all voltage versions)</td>
<td></td>
</tr>
<tr>
<td>· See data sheet N7783 and mounting instructions 4 319 0876 0 (M7783)</td>
<td></td>
</tr>
</tbody>
</table>
## Technical data

### General unit data

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains voltage</td>
<td>AC 220 V -15 %...AC 240 V +10 %</td>
</tr>
<tr>
<td></td>
<td>AC 100 V -15 %...AC 110 V +10 %</td>
</tr>
<tr>
<td>Mains frequency</td>
<td>50...60 Hz ±6 %</td>
</tr>
<tr>
<td>Unit fuse, built-in</td>
<td>T6.3H250V to DIN EN 60 127</td>
</tr>
<tr>
<td>External fuse</td>
<td>Max. 10 A (slow)</td>
</tr>
<tr>
<td>Power consumption</td>
<td></td>
</tr>
<tr>
<td>· During startup</td>
<td>8 VA</td>
</tr>
<tr>
<td>· During operation</td>
<td>5 VA</td>
</tr>
<tr>
<td>Permissible load on the control outputs</td>
<td></td>
</tr>
<tr>
<td>· Per terminal</td>
<td>Max. 4 A to VDE 0660 AC3</td>
</tr>
<tr>
<td>· Total</td>
<td>Max. 5 A to VDE 0660 AC3</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP 40 (to be ensured through mounting)</td>
</tr>
<tr>
<td>Mounting position</td>
<td>Optional</td>
</tr>
<tr>
<td>Cable glands</td>
<td></td>
</tr>
<tr>
<td></td>
<td>· Pg11 or</td>
</tr>
<tr>
<td></td>
<td>· BSP ¾” or</td>
</tr>
<tr>
<td></td>
<td>· metric M16 x 1.5</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 2 kg</td>
</tr>
</tbody>
</table>

### Environmental conditions

**Storage**
- DIN EN 60721-3-1
- Climatic conditions: Class 1K3
- Mechanical conditions: Class 1M2
- Temperature range: -20...+60 °C
- Humidity: < 95 % r.h.

**Transport**
- DIN EN 60 721-3-2
- Climatic conditions: Class 2K2
- Mechanical conditions: Class 2M2
- Temperature: -50...+60 °C
- Humidity: < 95 % r.h.

**Operation**
- DIN EN 60 721-3-3
- Climatic conditions: Class 3K5
- Mechanical conditions: Class 3M2
- Temperature: -20...+60 °C
- Humidity: < 95 % r.h.
- Installation altitude: Max. 2,000 m above sea level

### Warning!

Condensation, formation of ice and ingress of water are not permitted! If this is not observed, there is a risk of loss of safety functions and a risk of electric shock.

### Flame supervision

- With LAE10
- With LFE10
- With LFE50
Function

The following description of the unit’s function refers to the startup and supervision of a single burner. With multiframe supervision, all burners connected to the control unit are put into operation and supervised simultaneously in the same manner. A fault causing lockout of one of the burners therefore results in the shutdown of all burners.

Prerequisite for the immediate restart of the non-faulty burners is the bridging of the flame safeguard of the faulty burner by means of an operating switch. This switch must simultaneously cut all control lines to the ignition transformer and the fuel valves. For connection examples, refer to the Data Sheet on the LAE10 / LFE10.

Prerequisites for burner startup

The burner starts only if:
- The unit’s switching sequence is in the start position
- The control unit is not in the lockout position, e.g. due to a faulty UV tube
- The contacts of all the control and safety devices in the control loop between terminal 8 and 9 are closed
- The air pressure switch does not indicate any air pressure – if connected in the test circuit

Faults in the flame safeguard or in the control unit prevent startup or lead to a lockout during startup.

Note!
If the air damper is not controlled by the control unit, terminals 20, 21 and 22 must be interconnected.

Startup sequence...

... on startup

First, the fan motor is switched on via terminal 3 and the actuator is controlled via terminal 22. When the air damper reaches its fully open position, the programming mechanism of the unit starts to run – the prepurge time commences. The minimum air pressure set on the air pressure switch must then be reached within 10 seconds (or within 7 seconds in operation with postpurging) and must be maintained until controlled shutdown occurs. Otherwise, lockout will take place. A flame signal during the prepurge time also leads to lockout. On completion of the set prepurge time, the air damper is given the control command to return to the minimum air position. During the air damper’s closing time, the programming mechanism does not move.

As soon as the signal contact for the minimum throttling position is operated by the actuator, the programming mechanism starts again and now controls the program sequence which can no longer be influenced from outside.
- Preignition (provided the ignition equipment was not already switched on during the prepurge time)
- Release of the 1st fuel valve connected to terminal 5 (the fuel valve of a pilot burner which must be closed on completion of the 2nd safety time must, however, be connected to terminal 10)
- The set safety time elapses. If no flame is established during that period of time, lockout will be initiated (control unit always locks itself)
- On completion of an interval of 11 seconds after the release of the 1st valve, the 2nd fuel valve will be released
- The pilot burner – if present – is switched off (connected to terminal 10)
- The load controller is switched on after a further interval of 12 seconds. Now the burner has reached its operating position. From now on, the load controller controls the burner’s output by either increasing or decreasing the fuel throughput and the air volume depending on heat demand (fuel / air ratio control). This can be accomplished in stages, i.e. by means of thermostats or continuously (modulating) by a modulating controller

Loss of flame during operation always leads to lockout of the burner.
Burner startup with ignition spark proving

In principle, the program sequence is the same as with burner startup without ignition spark proving.

Exceptions:
- If the UV flame detector does not receive any input signal during the short preignition time (UL2 on «Short preignition»), lockout occurs before any gas is released, i.e. safety time TSA = 0 seconds
- With ignition spark proving, the safety time for the pilot burner can only be adjusted between 0...6 seconds (in the time diagram of the programming mechanism: TSA’)

Control sequence...

... after a controlled shutdown
Controlled shutdown occurs as soon as one of the control or supervision devices in the control loop between terminal 8 and 9 opens its contact. In that case, the fuel valves will immediately be shut. The programming mechanism starts again and now programs postpurging, if required. On completion of the postpurge time, the programming mechanism has again reached its start position where it remains until the next switch on command is received. The flame supervision restarts again during the postpurge time. Therefore, any flame signal during that period of time will lead to lockout.

... after resetting the LEC1...
After pressing the built-in or the external lockout reset button, the programming mechanism will return to its start position. The only burner plant component that is operated during that period time is a fan motor connected to terminal 17. As the control thermostat or pressurestat normally continues to call for heat, the programming mechanism will initiate a restart after reaching the start position.

Program indicator

The program indicator continuously shows the respective phase of the burner startup sequence. The letters correspond to those of the programming mechanism diagram next to the viewing window. The figures indicate the remaining prepurge time. If lockout occurs, the programming mechanism and the program indicator stop, thus indicating the operating phase during which lockout occurred.

Examples:

- Prepurge time will last another 35 seconds
- Valve 2 at terminal 7 is opened
Adjustment facilities on the unit

- Before making any adjustments, disconnect the unit from the mains supply
- Loosen all 6 retaining screws and only remove the unit cover
- The numbering of the switching cams always starts from the motor
- The camshaft can be manually turned into any position (clockwise direction of rotation as seen from the motor)

**Setting elements:**

<table>
<thead>
<tr>
<th>Cam</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1</td>
<td>Cam 1, fixed</td>
</tr>
<tr>
<td>N2</td>
<td>Cam 2, adjustable (1st safety time)</td>
</tr>
<tr>
<td>N3</td>
<td>Cam 3 adjustable (1st safety time)</td>
</tr>
<tr>
<td>N4</td>
<td>Cam 4, fixed</td>
</tr>
<tr>
<td>N5</td>
<td>Cam 5, adjustable (2nd safety time)</td>
</tr>
<tr>
<td>N7</td>
<td>Cam 7, fixed</td>
</tr>
<tr>
<td>N8</td>
<td>Cam 8, adjustable (prepurge time)</td>
</tr>
<tr>
<td>PA</td>
<td>Program indicator</td>
</tr>
<tr>
<td>UL1</td>
<td>ON / OFF switch for the motor of the switching mechanism</td>
</tr>
</tbody>
</table>

On the rear side of the base:

UL2  Changeover link for «Short / long preignition», in position «Short preignition» locked with varnish
UL3  Changeover link for «STOP» of the control sequence following lockout or «restart». Only the fan for postpurging connected to terminal 17 remains energized

C  «Long preignition time» (during prepurging)
D  «Short preignition time» (3 s, factory setting)

Loosen the screw before making the adjustment and then tighten it carefully.

Adjusting the preignition time

- Loosen the fixing screw of the red cam N8
- Turn camshaft manually until the required prepurge time is indicated next to the index notch on the carrier of the programming mechanism
- Hold camshaft firmly and rotate cam N8 until the contact tappet operated by it just jumps out or the cam strikes this tappet
- Carefully tighten the fixing screw of the cam and check the adjusted time for accuracy. The set time is also visible in the viewing window, if the unit is in its start position

Adjustment of the mark of the red cam N8 to the graduation marks of the black cam N7 results in the prepurge times given in the opposite table.

<table>
<thead>
<tr>
<th>Graduation mark</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>8 s</td>
</tr>
<tr>
<td>II</td>
<td>18 s</td>
</tr>
<tr>
<td>III</td>
<td>28 s</td>
</tr>
<tr>
<td>Adjustment at stop</td>
<td>63 s</td>
</tr>
<tr>
<td>Factory setting</td>
<td>approx. 30 s or 60 s</td>
</tr>
</tbody>
</table>

Adjusting the prepurge time t1

- Loosen the fixing screw of the red cam N8
- Turn camshaft manually until the required prepurge time is indicated next to the index notch on the carrier of the programming mechanism
- Hold camshaft firmly and rotate cam N8 until the contact tappet operated by it just jumps out or the cam strikes this tappet
- Carefully tighten the fixing screw of the cam and check the adjusted time for accuracy. The set time is also visible in the viewing window, if the unit is in its start position

Adjustment of the mark of the red cam N8 to the graduation marks of the black cam N7 results in the prepurge times given in the opposite table.
Adjustment facilities on the unit (cont’d)

Adjusting the safety times «TSA»
The safety times are adjusted by setting the red cams of the programming mechanism. Their time marks serve as a setting aid. After the adjustment, the fixing screws of the cams must be tightened very carefully to make any unintentional readjustment impossible.

Ignition safety time «TSA»
(Operation without ignition spark proving)

- Loosen the fixing screws of cams N2 and N3
- Hold cam N1 firmly and align the setting mark of cam N2 with the corresponding time mark I of cam N1 (see illustration and table, intermediate positions possible). Lock cam N2
- Rotate cam N3 in such a way that its setting mark is set against the lower stop of cam N2. Lock cam N3
- Check the adjusted safety time and set the new value on the rating plate of the unit cover (adjustment slot at the rear of the cover)

1st safety time «TSA´»
(Operation with ignition spark proving)

- Loosen the fixing screws of cams N2 and N3
- Hold cam N1 firmly, set the setting mark of cam N2 to the time mark I of cam N1 (see illustration and table). Lock cam N2
- Hold cam N2 firmly, set the setting mark of cam N3 to the required time and lock cam N3 (see illustration and table)
- Check adjusted safety time and set the new value on the cover’s type field (setting slot underneath the cover)

2nd safety time «t9»
Loosen the fixing screw of cam N5 and align its setting mark to the corresponding time marks of cam N4 (see illustration and table, intermediate positions possible).
Basic diagram

* Do not press EK… for more than 10 seconds!

Warning!
When using UV detector QRA..., terminal 10 must be connected to earth!
Sequence diagram of programming mechanism

Maximum permissible afterburn time is 7 seconds - from the beginning of postpurge time \(t_6\).

Legend:

- **AS** Unit fuse
- **AR** Load relay with contacts \(ar...\)
- **BR** Lockout relay with contacts \(br...\)
- **BV...** Fuel valve
- **(BV...)** Fuel valve for a pilot burner that is switched off on completion of the 2nd safety time
- **c...** Fan contactor with contacts \(c...\)
- **d...** Auxiliary relay with contacts \(d...\)
- **e...** Thermal cutout
- **EK1** Lockout reset button on LEC1...
- **EK2** Remote lockout reset button
- **ION** Ionization probe
- **FR** Flame relay with contacts
- **FW** Contacts of flame safeguards LAE10..., LFE10...
or LFE50...
- **GP** Gas pressure switch
- **GV...** Gas valve
- **H** Main switch
- **HR1** Auxiliary relay with contacts \(hr1\) / \(hr12\)
- **HR2** Auxiliary relay with contact \(hr21\)
- **HR3** Auxiliary relay for flame detector or flame simulation
- **Test**
- **L1** Lockout warning lamp, built-in
- **L2** Lockout warning lamp, external
- **L3** Signal lamp for flame indication
- **LK** Actuator with limit or auxiliary switches
- **(refer so «Connection examples»)**
- **a** = actuator travels to the OPEN position
- **(maximum air volume)**
- **2** = actuator travels to the CLOSED position
- **(minimum air volume)**
- **LP** Air pressure switch
- **M...** Fan motor, fan
- **N** Temperature or pressure sensor
- **Q** Resistive with negative temperature coefficient
- **OV...** Oil valve
- **QRA...** UV detector
- **R...** Control thermostat or pressurestat
- **RAR...** Selenium photocell detector
- **RV** Control valve
- **SB** Safety limiter
- **SM** Synchronous motor of programming mechanism
- **SQ...** Type reference of air damper actuator
- **UL1** Operating switch for motor of programming mechanism
- **UL2** Changeover link for «Short / long preignition time»
- **UL3** Changeover link for «STOP» or «Run» of the programming mechanism after lockout
- **Z** Ignition transformer

Switching times:

- **T** 120 s Run time of programming mechanism
- **TSA** 0...9 s Ignition safety time (setting = 0 s in the case Ignition safety time of ignition spark proving)
- **TSA'** 0...6 s First safety time for the pilot burner in the case of startup with ignition spark proving
- **t1** 6...63 s Adjustable prepurge time
- **t3** \(t11 + t1 + t12 + 7\) s Long preignition time (during the entire prepurge)
- **t3'** 3 s Short preignition time
- **t4** 11 s Interval between release of the 1\(^{st}\) and 2\(^{nd}\) fuel valve
- **t5** 12 s Interval between release of the 2\(^{nd}\) and 3\(^{rd}\) fuel valve or the load controller
- **t6** \(T – (30 + t1)\) Postpurge time
- **t7** 3 s Delay time
- **t8** \(t1 + 30 + t11 + t12\) Total startup time startup sequence
- **t9** 0...9 s 2nd safety time with interrupted pilot burner
- **t10** 10 s Transition time - preset time for air pressure signal
- **t11** optional Programmed opening time for actuator «SA»
- **t12** optional Programmed closing time for actuator «SA»

For the factory setting of the different types, please refer to «Type summary». 
Connection examples and sequence diagrams

For connection examples and switching program for flame supervision with DETACTOGYR® LFE50..., refer to Data Sheet 7783.

Double- or multiflame supervision of oil burners

Startup with long preignition «t3» and checked actuator control.
Air pressure supervision from the start to controlled shutdown.
No load control.
Required type of flame safeguards: LAE10... with selenium photocell detector RAR...

* When using an air pressure switch «LP», the connections between terminals 3 and 4 and 8 and 18 are not required

Air damper control, detailed
In the case of burners without air damper or with an air damper not controlled by the control unit, terminals 20, 21 and 22 must be interconnected.
Link 18-c1-21 is not permitted however!
Connection examples and sequence diagrams (cont’d)

Double- or multiflame supervision of gas burners (expanding flame burners)

Startup with short preignition (3 seconds) and checked actuator control.

Required type of flame safeguards: LFE10... with UV detectors QRA... or ionization probe.

Air damper control, detailed

In the case of burners without air damper or with an air damper not controlled by the control unit, terminals 20, 21 and 22 must be interconnected.

Link 18-c1-21 is not permitted however!
Connection examples and sequence diagrams (cont’d)

Double- or multiflame supervision of burners for selectable operation with oil or gas (expanding flame burner)

Startup with short preignition (3 seconds) and checked actuator control.
Control of the 2nd output stage via on / off controller «R2».
Required type of flame safeguards: LFE10... with UV detectors QRA...

Operating switch BS1
I Nominal load
II Stop
III Partial load
IV Automatic control

Operating mode selector BS2
I Gas
II Off
III Oil
Connection examples and sequence diagrams (cont’d)

Double- or multiflame supervision of modulating burners

Including checked actuator control.

Required type of flame safeguards:
For oil LAE10 with active selenium photocell detectors RAR...
For gas LFE10 with UV detectors QRA... or ionization probe
For oil / gas LFE10 with UV detectors QRA...

Burners designed for continuous adjustment of the burner’s output (modulating burners) require the devices of the temperature or pressure control circuit, in addition to the standard burner equipment, e.g.

- Modulating controller RWF5...
- Temperature or pressure sensor QA... / QB...
- Remote setting unit, if required FZA...
- Actuator for the control of the air damper and the fuel throughput SQ...
- Auxiliary relay d1
- Operating switch BS
- Control valve or similar for adjustment of the fuel throughput RV

This circuit is used if, for certain reasons, fully automatic operation is not required (e.g. with industrial burners). The burner is started up by actuating impulse contact I; the burner is shut down by either pressing circuit-breaking contact 0 or when the limit thermostat cuts out.
To remove the control unit from the plug-in base, loosen only the 4 screws A. To remove the unit cover, also loosen the 2 screws B.

Legend

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>Elongated holes for fixing the base</td>
</tr>
<tr>
<td>EK</td>
<td>Lockout reset button</td>
</tr>
<tr>
<td>SG</td>
<td>Viewing window</td>
</tr>
</tbody>
</table>

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Subject to change!