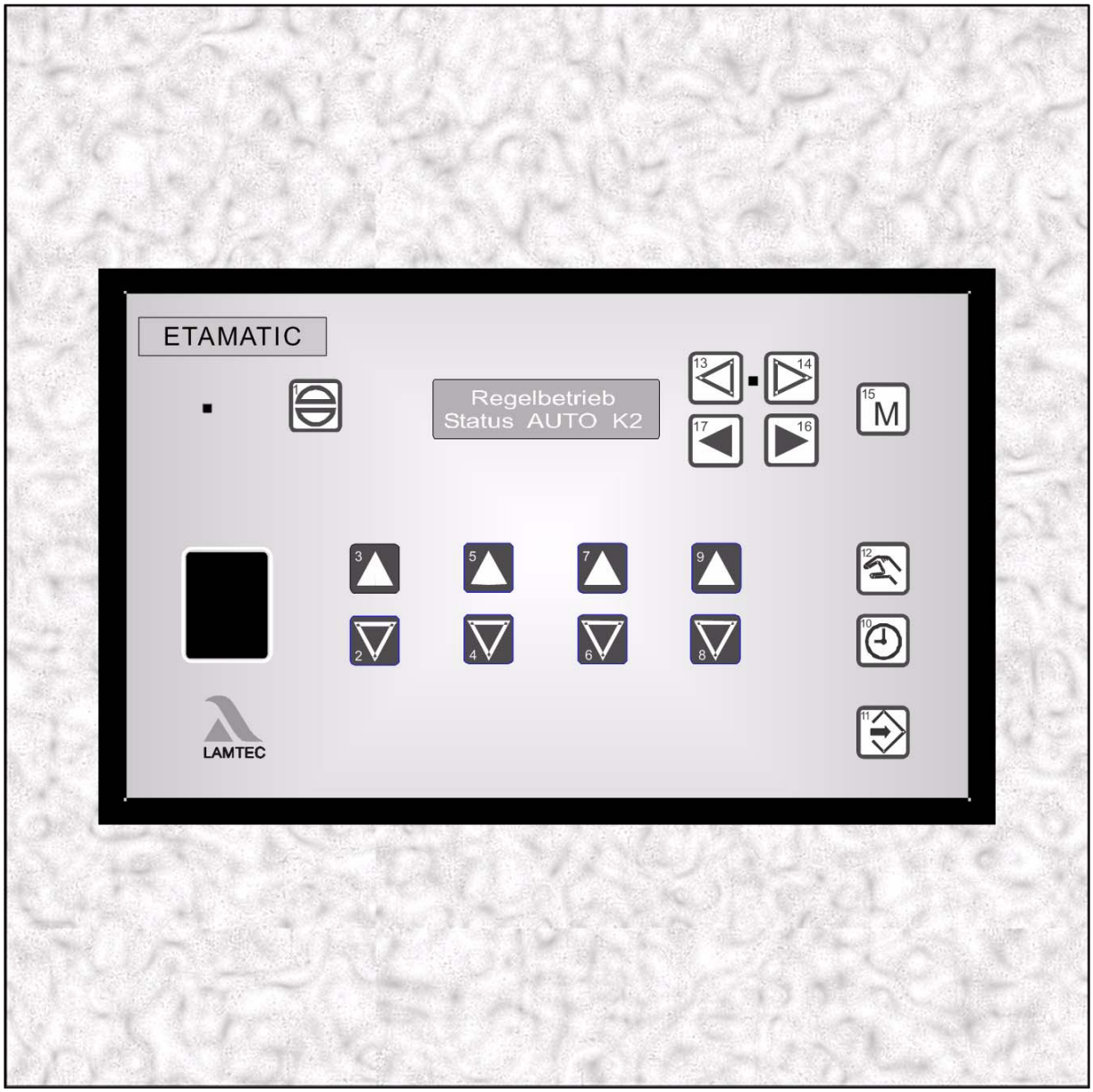
Manual

ETAMATIC / ETAMATIC S
CE-0085 AU 0207



Sensors and Systems
for Combustion Engineering

LAMTEC

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1 General Information

1.1 Validity of these instructions

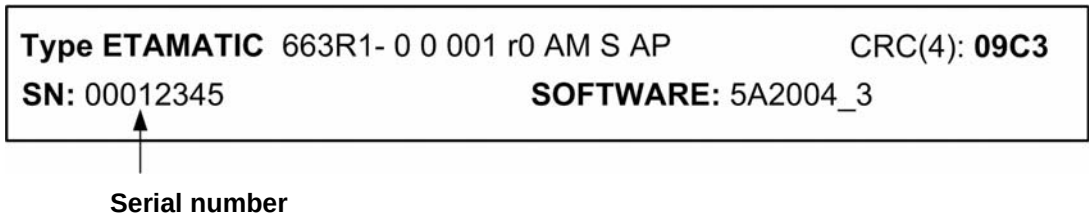
These instructions apply to the ETAMATIC and ETAMATIC S in any configuration.
This devices conform to the following standards and regulations:
EN 230
EN 267 (where applicable)
EN 298
EN 676 (where applicable)
EN 746-2 (where applicable)
EN 12952 -8 u.11 (where applicable)
EN 12953 7 u. 9 (where applicable)
TRD411
TRD412
TRD604
EMC - Directive, Low-Voltage Directive
Pressure equipment directive
Gas Appliance Directive

Test symbols: CE-0085 AU 0207

The ETAMATIC is a control unit for combustion systems.

1.2 Variants - Device Configuration

The variant number describes the device's variant. You will find the variant number on the side of the housing. The variant number is based on the following key:



Example: ETAMATIC in variante no.: 0 0 001 r0 AM S AP

ETAMATIC	0	0	001	r0	AM	S	AP
	a	b	c	d	e	f	g

a: Flame monitoring

1 → Flame monitoring 50Hz
2 → Flame monitoring 60Hz

b: Control by atmospheric condition for PCU / standby operation

1 → cont.by atmospheric condition PCU current 4...20 mA passive
2 → cont.by atmospheric condition PCU PT100 up to 320°C
3 → cont.by atmospheric condition PCU poti 5 kOHM
4 → Current correction
5 → STANDBY-operation if load controller integrated
6 → STANDBY-operation, activation via fieldbus
7 → STANDBY-operation, activation via LSB

c: Analogue in-/output

0 → 4x three-point-step output
1 → 3x DPS and 1x continues output 4...20 mA, FB 4...20 mA
4 → 2x DPS and 2x continues output 4...20 mA, FB 4...20 mA
5 → 4x DPS and output of the internal load
10 → 4x DPS with type switchover channel 1
11 → 3x DPS & 2x continuous.and with type switchover channel1
21 → 3x DPS and 1x continuous output 4...20mA, FB RPM-2L, 300-3600 l/min
22 → 3x DPS and 1x continuous output 4...20mA, FB RPM-2L, 600-7200 l/min
23 → 3x DPS and 1x continuous output 4...20mA, FB RPM-2L, 30-300 l/min
24 → 3x DPS and 1x continuous output 4...20mA, FB RPM-2L, 60-600 l/min
21D → 3x DPS and 1x continuous output 4...20mA, FB RPM-3L, 300-3600 l/min
22D → 3x DPS and 1x continuous output 4...20mA, FB RPM-3L, 600-7200 l/min
23D → 3x DPS and 1x continuous output 4...20mA, FB RPM-3L, 30-300 l/min
24D → 3x DPS and 1x continuous output 4...20mA, FB RPM-3L, 60-600 l/min

21D → 2x DPS and 2x continuous output 4...20mA, FB C1 RPM-3L, 300-3600 l/min
31D → 2x DPS and 2x continuous output 4...20mA, FB C1 RPM-3L, 300-3600 l/min

d: O2/ CO control

r0 → O_2 controller via LAMTEC SYSTEM BUS
r2 → O_2 controller via external system
r3 → O_2/CO controller
r4 → O_2 controller and correction forwarding master
r5 → O_2 controller and correction forwarding slave
r6 → O_2/CO controller and correction forwarding master
r7 → O_2/CO controller and correction forwarding slave

e: Customer

f: Connector set

FED → Connector set spring tension
INV → Connector set invers
S → Connector set standard

g: Output relais fault

AP → Output relais fault normally open
RP → Output relais fault normally closed

2 Safety

2.1 German Law on Device Safety

The legislation on safety of appliances states:

Follow the instructions!
Proceed only in accordance with this ETAMATIC commissioning supplement (print no DLT2001-11-aEN-184)
Use the equipment for the purpose described!

Operating by trained personnel only.
The appliance may only be operated and serviced by personnel with the required knowledge and education to do so on the conditions and safety rules.

Follow the safety instructions of the burner manufacturer.

To be used in grounded power line network only!

If a flame monitor, which is not approved for continuous operation, is connected up, the approval for continuous operation of the system will be rendered invalid.

The unit is approved for use only with an external automatic flame guard. The automatic flame guard type F 250 made by LAMTEC is used for testing purposes.

The following flame monitoring systems / flame sensors are applicable for use
(see the print no. of the associated documents in brackets behind the devices):
Compact flame detector F200 K1 and F200 K2(DLT 7620)
Flame monitoring system F150 (DLT 7521) and F250 (DLT 7540) in conjunction with the flame sensors FFS05 / FFS05 Ex / FFS05 ExII (DLT 7501 and DLT 7503) and FFS06 (DLT 7502)

Any other automatic flame guard tested in accordance with DIN EN 298 and/or DIN EN 230 and approved for continuous operation may be used instead of this.

Before using a flame sensor / flame monitoring system you have to study the associated manual. Pay attention to the specifications and observe the instructions.

Electric connection to devices, which are not mentioned in these instructions only after consultation with the manufacturer or a qualified expert. If an automatic flame guard which is not approved for continuous operation is connected, the system will loose the approval for continuous operation. Liability for proper functioning of the appliance passes to the owner or operator. Liability for correct functioning of the appliances in every case passes to the owner or operator, should the appliance be incorrectly operated, serviced or repaired by persons without the requisite knowledge, or if operation is inconsistent with the specified intended purpose.

In the event of modifications to the unit the type approval lapses. The unit's inputs and outputs and associated modules must only be wired according to the specifications in these instructions.
LAMTEC GmbH & Co KG will not be liable for damage or injury arising out of a failure to observe the instructions above. The warranty and liability provisions of the terms and conditions of sale and supply of LAMTEC GmbH & Co KG shall not be extended by virtue of the instructions above.

LAMTEC GmbH & Co KG will not be liable for damage or injury arising out of a failure to observe the instructions above. The warranty and liability provisions of the terms and conditions of sale and supply of LAMTEC GmbH & Co KG shall not be extended by virtue of the instructions above.

Where reference is made to legislation, government regulations and standards, these are based on the legal system of the Republic of Germany

2 Safety

2.2 For Your Safety

In this operating instructions, the following symbols are used as important safety instructions to the user. These symbols appear wherever there is a need for this information in a particular section.
It is essential to note and comply with the safety instructions, particularly the warnings.

DANGER!

Indicates possible danger to personnel, particularly with regard to electrical equipment

WARNING!

Indicates possible danger to personnel if the system components are not handled correctly.

CAUTION!

Indicates danger to system components or possible impairment of functionality.

NOTICE!

Contains important additional information for the user concerning the system or system components and provides helpful tips

Contained in texts that provide information on how to perform tasks.
In performing all tasks, the operator is requested to observe all statutory safety regulations and to do everything possible, according to the circumstances, to prevent injury to persons or damage to equipment

2.3 Associated Automatic Flame Guard

The unit is available with and without an integral flame guard. Sensor types FFS 06, FFS 05 and FFS 05UV can be connected to the integral flame guard. When used without integral flame guard, any tested flame guard in accordance with DIN EN 298 and/or DIN EN 230 and approval for continuous operation may be connected to terminal 53 like the following (document no. in brackets):

Compact flame detector F200 K1 and K2 (DLT7620) or the flame guards F150 (DLT7521) and F250 (DLT7540) with the flame sensors FFS05 / FFS05 EX / FFS05 ExI (DLT7501 and DLT7503) and FFS06 (DLT7502)

WARNING!

If the ETAMATIC is used with an integral flame guard, terminal 53 must not be connected to any other components.

WARNING!

Electrical connection to appliances not listed in these instructions: only after consultation with the manufacturers or a qualified expert.

If a flame guard, which is not approved for continuous operation, is connected, the approval of the system for continuous operation expires.

Liability for proper functioning of the unit passes to the owner or operator.

If the unit is incorrectly operated, serviced or repaired by unqualified personnel, or if operation is inconsistent with the specified intended purpose, liability for the unit’s correct functioning in each case passes to the owner or operator.)

WARNING!

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

LAMTEC GmbH & Co KG will not be liable for damage or injury arising out of a failure to observe the instructions above. The warranty and liability provisions contained in LAMTEC GmbH & Co KG’s terms and conditions for and Supply, shall not be extended by virtue of the instructions above.

Where reference is made to legislation, government regulations and standards, these are based on the legal system of the Federal Republic of Germany.

3 Brief Description

The ETAMATIC regulates up to 4 control elements as a function of a control variable, in accordance with freely programmable curves. The ETAMATIC has 4 three-point step control outputs. The ETAMATIC S has 3 three-point step control outputs and one 4-20 mA output.

Examples of possible control elements:

- combustion air damper
- combustion air fan (ETAMATIC S only)
- fuel valve
- recirculation damper

Up to 20 points (usual 11) can be programmed per channel. The Display is relative between 0 and 999.

The ETAMATIC has a 25-pole Sub-D connector with serial interface for remote operation / remote display via a PC (Windows software available separately). Connections for Interbus-S, PROFIBUS-DP, CANopen, TCP/IP (Modbus TCP) and Modbus are available as optional equipment. Other BUS-systems available on enquiry. The connection of other plant components, e.g. fault signal systems and O_2 trim, is via the LAMTEC SYSTEM BUS interface to a 9-pole Sub-D connector.

Operation is via a front panel laminated keyboard. The parameters are displayed on a 2-row LCD screen.

The ETAMATIC is also available as a special version without a front panel. In this case, operation is via optional PC software or programming unit. As display for end-user, a customers interface is connectable via LAMTEC SYSTEM BUS.

The ETAMATIC continuously monitors its own functions and those of the connected control elements.

230-V outputs:

- Actuation of the gas valves
- Actuation of the oil valves
- Actuation of the oil pump
- Actuation of the ignition valve and the ignition transformer
- Fan release
- Fault message
- Open/Close control signals for the valve/damper motors

External signals to the ETAMATIC are transmitted via floating contacts or chains of contacts.

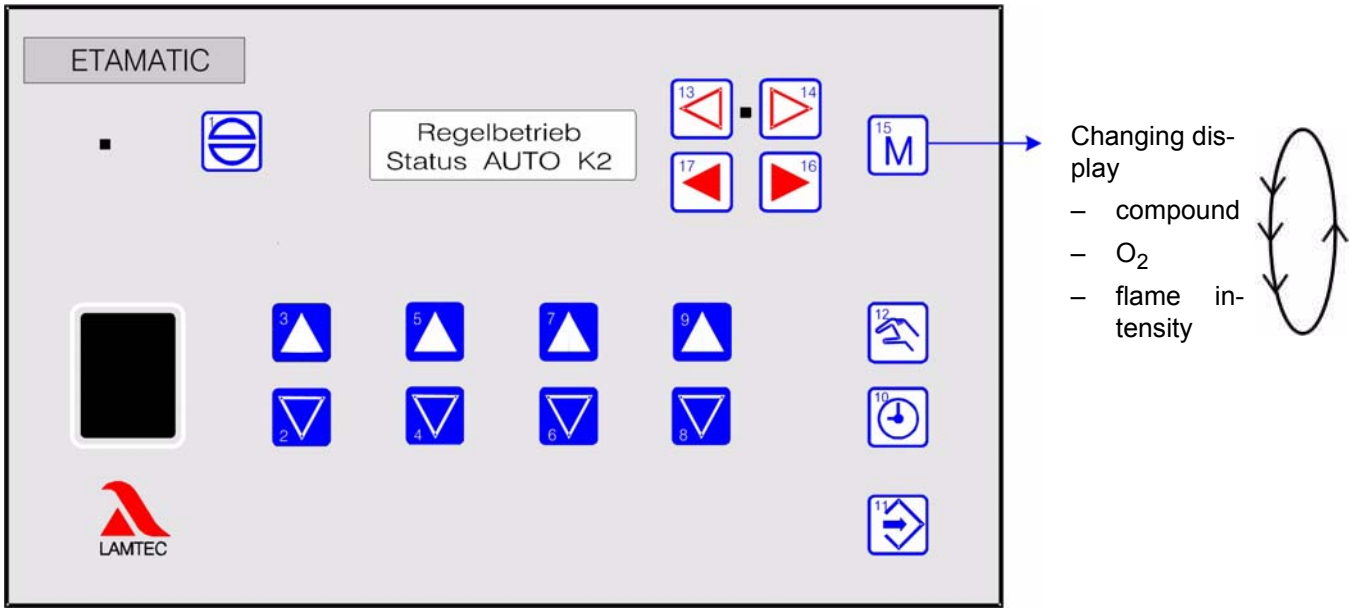
The following signals can be pre-set:

- 3 separate safety interlock circuits
- fault release
- air pressure monitor
- control release
- min. gas pressure monitor (for leakage test)
- flame signal
- ignition position acknowledgement
- re-circulation on
- burner on
- select fuel
- set-point switching (for load regulator)

3 Brief Description

3.1 Display and operational controls

Select operating modes:	UEAN ⇔ PARA ⇔ O_2 [1)] ⇔ AUTO ⇔ SPLO *
Select operating parameters	Status ⇔ Firing-rate rating ⇔ Setpoint ⇔ Actual value feedback ⇔ Setpoint feedback [2)] ⇔ digital inputs



* UEAN = Display of monitoring processor
PARA = Parameterisation
AUTO = Automatic
EINS = Set
SPLO = Clear memory

1) only if activated in the parameter section

2) only in ETAMATIC S

4 Operating Description

(for specimen diagrams, see Appendix 9.8 Process Sequence Charts)

A signal is first fed to terminal 58 (Burner On) indicating when the burner is to start.
The ETAMATIC then interrogates the boiler safety interlock circuit or the common safety interlock chain (ETAMATIC) and the contact of the air pressure monitor. If it does not detect an "OK" condition, the text of a corresponding message appears and the operating control stops.

If all signals are OK, the fan output is activated and the ducts run to their bottom stop as a check.

Once all channels have reached their bottom stop, they open for aeration. The leakage test runs in parallel (gas operation only).

In the case of control elements the aeration is used to enter and/or test the range limits. After reaching its top position, the fuel control element runs back into the ignition position. All other channels remain in open position. The ETAMATIC then interrogates the air pressure monitor. If this signal is OK, the parameterised aeration time runs. If a channel is configured for re-circulation, it opens with a time-delay. On reaching the parameterised re-circulation delay time, the aeration time stops. As soon as the re-circulation channel has reached the aeration position, the aeration time is resumed. When this time has expired all the channels run to the programmed ignition position (re-circulation fully closed). After the lapse of the aeration time, all channels run to the programmed ignition position (recirculation closed)

4.1 Starting without pilot burner

The main valves open and together with the ignition transformer remain activated for the duration of the safety time. During this time the flame signal appears.

4.2 Starting with pilot burner

The ignition valve and main gas 1 (in gas operation) or the ignition valve alone (in oil operation) run open. The pilot flame forms and the flame detection detects the flame. The flame detection sends the signal to the burner control device.

On expiry of the 1st safety time, the ignition transformer switches off. For 3 sec. (stabilisation time) the pilot burner burns alone. Then main gas 2 or the oil valve opens and remains activated in parallel with the ignition valve for the duration of the 2nd safety time. The ignition valve closes again at the end of this period.

3 seconds after ignition, all channels run to the programmed base load point. The ETAMATIC remains in base load position until control release is given.

After control release the ETAMATIC follows the power control unit’s default setting.

A shut off follows the cancelling of the signal of the terminal 58. The main valves close. In gas operation, first main gas 1 and second main gas 2 closes with a delay of approx. 5 sec., in order to allow the test line between the solenoid valves to burn out. In the event of a fault shutdown, both close immediately.

If configured for post-ventilation, the air channels open again for this period.

Thereafter the ETAMATIC is in the "OFF" mode.

5 Commissioning

5.1 Before Commissioning

5.1.1 Basic Settings

First you must configure the device (ETAMATIC) for the requirements of the system.

Therefore, you have to set some parameters.

The factory standard settings are indicated by *.
We recommend to use the LAMTEC PC software for Windows (available separately).

5.1.2 Password Entry


Press key 1


Press keys 5 and 7 and 8 simultaneously.


Press keys 2 to 9 to enter the password (condition on delivery 0000)


Press key 11 (ENTER)


LED between the keys 13 and 14 is on (i.e. keys are working).


Press keys 13 or 14 to set the display to "Parameters".


Press keys 6 or 7 to select the required parameter.


Press keys 8 or 9 to change the content.

5.1.3 Select Language

Select parameter 833

Value	Language	Value	Language	Value	Language
0	German*	8	Danish	16	Coal-Gas-English
1	English	9	Portuguese	17	Slovene
2	French	10	Polish	18	Czech
3	Italian	11	Turk	19	Coal-Oil-French
4	Swedish	12	Croatian	20	Coal-Gas-French
5	Spanish	13	Cole-Oil-German	21	Hungarian
6	Dutch	14	Coal-Oil-English	22	Romanian
7	Slovak	15	Coal-Gas-German		

There are only 5 languages available in a single EPROM. The availability of languages depends on the version of the EPROM. For more information refer to the parameter list (DLT1045).

5.1.4 Character of the Output Channels

Select parameter 356 - 359 (channel 1 to channel 4).
Enter the type of control element which is connected.

No	FMS	ETA	Short Text	Description	Min	Max	Default
356	2	2	Fkt. K	Function definition channel1	0	6	∅
				Category = channel configuration and broken wire detection In this parameter you define the type of actuator the respective output channel controls. This indirectly determines the channel's behaviour at pre-ventilation, at band shifting, at changes of the burner-firing rate and at drift compensation. This possibly may, affect special functions (e.g. if the channel is configured to recirculation or flue gas). 0 = Channel OFF (broken wire monitoring and indication in the display are active further on / channel switch off with P 366 - P 373) 1 = recirculation 2 = fuel 3 = combustion air 4 = flue gas 5 = mechanic compound 6 = atomizer steam (like fuel, but without pre-ventilation of the channel: switch off determination of range limits) Behaviour of the actuators with FMS: steam = Remains CLOSE until the pre-ventilation time has expired. After that the actuator runs to ignition position. REZI = Runs OPEN after the configured pre-ventilation time, even if terminal 6 has a signal. In regular operation terminal 6 must have a signal. flue gas = Runs completely open in BE and remains open until ignition. Then the actuator runs to compound. At start without VO, ignition starts not until flue gas is completely open. mech. compound = Acts like air in VO. Behaviour of the actuators with VMS: steam = Remains CLOSE until the pre-ventilation time has expired. After that the actuator runs to ignition position. REZI = runs open to the configured number of points in VO = position, which the allocated air actuator must have reached (terminal 6 has signal). flue gas = Runs completely open in BE and remains open until ignition. Then the actuator runs to compound. At start without VO, ignition starts not until flue gas is completely open. mech. compound = Acts like air in VO.			
				Default settings at delivery: channel 1 = air channel 2 = fuel (oil) channel 3 = fuel (gas) channel 4 = air			

Selection, which channel is active

Select parameter 366 and 367 (curve set 1 and 2).
Controller release with bit pattern.

No	FMS	ETA	Short Text	Description	Min	Max	Default
366	2	2	K Enb. 1	Channel enable for curve set 1	0	31	15/31
				This parameter defines, which channel is active with which curve set. All channels are active by default (content 31, for ETAMATIC 15). The following function may be realised. Example: changing channel activities with fuel oil/gas emergency operation with or without frequency converter Selection per binary pattern:			
				Bitpattern 7 6 5 4 3 2 1 0 / HEX / DEC / Channel X / 0001 / 1 / 1 X / 0002 / 2 / 2 X / 0004 / 4 / 3 X / 0008 / 8 / 4 X / 0010 / 16 / 5 decimal 15, all 4 channels are released for operation decimal 31, all 5 channels are released for operation			
				Example: Bitpattern 7 6 5 4 3 2 1 0 / HEX / DEC / Channel X X X / 0013 / 19 / 1;2 and 5 Channel 1, 2 and 5 are released			
				Default settings at delivery: curve set 1 (oil) = 1001 curve set 2 (gas) = 1101			

5.1.5 Start with or without pilot burner

Select parameter no. 774 and 775 (oil operation, gas operation).

No	FMS	ETA	Short Text	Description	Min	Max	Default
774	1	1	ZüBr. ÖL	Start with (1) or without (0) pilot burner for oil, (2)=oil with continuous ignition flame	0	4	1
				0 = start without pilot burner - oil operation 1 = start with pilot burner - oil operation 2 = pilot burner also active in burner operation with continuous monitoring of the ignition flame. Therefore P 788 has to be set to 1 3 = start with pilot burner - oil operation, only the ignition flame may be present during ignition (until the 2nd safety time) 4 = pilot burner also active in operation with continuous operation monitoring of the ignition flame, only the ignition flame may be present during ignition (until the 2nd safety time) (from v. 5.4/510 on) 9 = start with pilot burner - oil operation You may start the pilot burner with terminal 70 during operation. 11 = start with pilot burner - oil operation only the ignition flame may be present during ignition (until the 2nd safety time). You may start the pilot burner with terminal 70 during operation. 17 = start with pilot burner - oil operation Before curve set change from solo operation (gas/fuelA) to mixed mode (+oil), the pilot burner starts to ignite oil. 19 = start with pilot burner - oil operation, only the ignition flame may be present during ignition (until the 2nd safety time). Before curve set change from solo operation (gas/fuelA) to mixed mode (+oil), the pilot burner starts to ignite oil. 25 = start with pilot burner - oil operation, You may start the pilot burner with terminal 70 during operation. Before curve set change from solo operation (gas/fuelA) to mixed mode (+oil), the pilot burner starts to ignite oil. 27 = start with pilot burner - oil operation, only the ignition flame may be present during ignition (until the 2nd safety time). You may start the pilot burner with terminal 70 during operation. Before curve set change from solo operation (gas/fuelA) to mixed mode (+oil), the pilot burner starts to ignite oil			

NOTICE!

2 to 4, 9, 11, 17, 19, 25, 27 → The ignition flame input must monitor the ignition flame separately and P 788 must be set to 1.
9, 11 → FMS only
17, 19, 25, 27 → FMS with mixed fuel firing only

No	FMS	ETA	Short Text	Description	Min	Max	Default
775	1	1	ZüBr.Gas	Start with (1) or without (0) pilot burner for gas, (2)=gas with continuous ignition flame	0	4	1
				0 = start without pilot burner - gas operation 1 = start with pilot burner - gas operation 2 = pilot burner also active in burner operation with continuous monitoring of the ignition flame. Therefore set P 788 to 1 3 = start with pilot burner - gas operation, during the ignition (until the 2. safety time) only the ignition flame may be present 4 = pilot burner also active in operation with continuous operation monitoring of the ignition flame. During ignition (until the 2. safety time), only the ignition flame may be present.For this purpose P 788 has to be 1 (since v. 5.4/5o210) 9 = start with pilot burner - gas operation You may start the pilot burner with terminal 70 during operation. 11 = start with pilot burner - gas operation only the ignition flame may be present during ignition (until the 2nd safety time). You may start the pilot burner with terminal 70 during operation. 17 = start with pilot burner - gas operation Before curve set change from solo operation (gas/fuelA) to mixed mode (+gas), the pilot burner starts to ignite gas. 19 = start with pilot burner - gas operation, only the ignition flame may be present during ignition (until the 2nd safety time). Before curve set change from solo operation (oil/fuelA) to mixed mode (+gas), the pilot burner starts to ignite gas. 25 = start with pilot burner - gas operation, You may start the pilot burner with terminal 70 during operation. Before curve set change from solo operation (gas/fuelA) to mixed mode (+gas), the pilot burner starts to ignite gas. 27 = start with pilot burner - gas operation, only the ignition flame may be present during ignition (until the 2nd safety time). You may start the pilot burner with terminal 70 during operation. Before curve set change from solo operation (oil/fuelA) to mixed mode (+gas), the pilot burner starts to ignite gas.			

NOTICE!

2 to 4, 9, 11, 17, 19, 25, 27 → The ignition flame input must monitor the ignition flame separately and P 788 must be set to 1.
9, 11 → FMS only
17, 19, 25, 27 → FMS with mixed fuel firing only

5.1.6 Pre-ventilation period

Select parameter no. 785

If an output channel is set to flue gas re-circulation, attention must still be given to P 427.

No	FMS	ETA	Short Text	Description	Min	Max	Default
785	1	1	ZEIT VO	Pre-ventilating time in seconds	0	999	30
				Set the duration of pre-ventilation in this parameter. The commissioning engineer sets this value. P784 sets the lower limit of the pre-ventilation.			

5.1.7 Recirculation Delay

Select parameter no. 427

No	FMS	ETA	Short Text	Description	Min	Max	Default
427	1	1	VO Del R	Number of points of air channel of recirc. (VMS)/delay time (FMS)	0	999	750/10
				Number of points of an air channel for recirculation (VMS) / delay time (FMS) in seconds. With VMS it is necessary to couple the recirculation flap delay with an air channel during pre-ventilation. Therefore an air channel is assigned to the recirculation flap (see P 428). The opening of this air channel now determines the moment, when the recirculation flap shall open. Set in this parameter the number of digits the air channel has to reach, before recirculation becomes active. If the device is an ETAMATIC or a FMS, set the delay time in seconds before the recirculation flap opens, i. e. during this period only the boiler is ventilated. The total pre-ventilation duration (P 785) has to be greater than the value in this parameter. - VMS opening of the air channel for delay of the recirculation channel (in digit) - FMS delay time (in seconds) 0 = recirculation channel remains closed during pre-ventilation 1... = Delay/delay time of the recirculation channel			

5.1.8 Deactivate load control unit

Select parameter no.790 (type of burner-firing-rate controller)

No	FMS	ETA	Short Text	Description	Min	Max	Default
790	1	1	Lasttyp	Type of output regulator. 0-OFF / 1-constant regulator / 2-weather-controlled regulator	0	3	0/1
				Switch on or set the type of internal firing rate controller 0 = OFF 1 = constant burner sequencer 2 = control by atmospheric condition 1 3 = control by atmospheric condition 2 For ETAMATIC, P 809 selects from which input the actual value signal should be taken. If the parameter is set to 1, the integrated PT100 input is used, otherwise the firing rate input. If the ETAMATIC uses the PT100 input as the actual value signal for the internal firing rate controller, you may deactivate the firing rate controller with a bridge between terminals 19 and 20. The firing rate input occurs via terminals 3-6.			

NOTICE!

These parameters (P 356 - P 359, P 366, P 367, P 427, P 774, P 775 P 785, P 790, P 833) must be adjusted to the system before commissioning. Further parameters which, although you can alter them, only need to deviate from the standard setting in exceptional cases, are given below.

5.1.9 Running Time of the Regular Firing Rate Input with TPS-Input

Select parameter no. 718.

If the load default is not provided via analogue signal, the parameter must be set to „0“

No	FMS	ETA	Short Text	Description	Min	Max	Default
718	1	1	Laufz L	Running time in points/mins. for DPS load input (in digit/min)	0	1200	0/500
				Set how fast the signal of the external firing-rate should change if the firing-rate input is provided via the TPS signal. A counter generates the external firing rate with a TPS signal. It counts up or down, depending on the contact. This parameter sets the speed of the counter. Set the parameter to 0, if the firing-rate input is not TPS. With manual mode the load default via redundant feed-back channel 2 is treated as TPS load, if TPS load is configured (P 718 ≠ 0). 0 = load default current or potentiometer 500 = load default TPS			

5.1.10 Minimum Running Time of the Compound

Select parameter no. 729

No	FMS	ETA	Short Text	Description	Min	Max	Default
729	1	2	stopVERB	Minimum running time of compound	10	999	10
				Minimum running time of the compound (in seconds) Set the minimum running time of the compound in seconds. This parameter slows down the ramp-up time or ramp-down time of the burner from base firing-rate to high firing-rate.			

5.1.11 Post-ventilation time

Select parameter 758

No	FMS	ETA	Short Text	Description	Min	Max	Default
758	1	1	ZEIT NA	Post-ventilating time	0	1000	0
				Post-ventilation time (in seconds) 0 = no post-ventilation 1000 = continuous ventilation (from 5.0 on) Set the duration, how long the VMS/FMS/ETAMATIC ventilates after a switch OFF. The air flaps were open for this purpose. A fan output runs to 20mA. The FMS/ETAMATIC holds the release signal of the fan. No post ventilation occurs if the parameter content is 0 and in the case of a fault shutdown. The actuators are not monitored in post ventilation mode! The actuators only open when the flame is extinguished. The time begins to run immediately with closing of the magnetic valves. It may be necessary to add this post burn time to the required post ventilation time			

5.1.12 Delaytime of the Air Dampers During Pre-ventilation

Select parameter no. 768.

No	FMS	ETA	Short Text	Description	Min	Max	Default
768	1	2	KverznLE	Damper delay after fan ON in seconds	0	15	5
				Delay time for flaps after switching ON the fan in seconds (only for FAT) Enter a delay time for opening of the flaps with respect to the ventilator release. This prevents from increasing the power consumption of the ventilator motor in the star/delta starting phase (only effective for FMS and ETAMATIC). (from 5.4 / 52201 on) This parameter affects even with continuous ventilation.			

5.1.13 Parameters of the Interface

NOTICE!

These parameters have to be equal to the settings of the remote control software. Otherwise no communication is possible.

No	FMS	ETA	Short Text	Description	Min	Max	Default
822	2	2	Baud S1	Baud rate of serial interface 1	0	5	4
				This parameter sets the baud rate for the serial interface. The standard value is parameter content "4" (19,200 baud). If the display shows problems with the serial transmission (especially with long serial connections), it may be helpful to drop the baud rate. This must be carried out on the VMS/FMS/ETAMATIC as well as on the operating device e.g. laptop. 0 = 1200 Baud 3 = 9600 Baud 1 = 2400 Baud 4 = 19 K 2 Baud 2 = 4800 Baud 5 = 38 K 4 Baud*			
824	2	2	Par. S1	Parity check for serial transfer (ser.1)1	0	2	1
				This parameter sets the parity bit for interface transmission. Standard is even (parameter content: EVEN=0, NONE=1, ODD=2). 0 = even 1 = none 2 = odd			
826	2	2	Adr. S1	Network address VMS/FMS (ser.1)1	0	31	1
				Network address VMS / FMS (serial Interface 1) Enter the network address for the serial interface. Factory status for the network address is "1". Only if several devices are connected via an RS422/RS485 bus, this network address has to be changed.			

5.1.14 Deactivate leakage test

Select parameter no. 772

No	FMS	ETA	Short Text	Description	Min	Max	Default
722	1	4	Laufz K	Running time in points/mins. for continuous output channel 4 see P 719	0	65535	9999

5.1.15 Set pilot burner (maintenance mode)

Select parameter no. 787

No	FMS	ETA	Short Text	Description	Min	Max	Default
787	1	1	Wartung	Maintenance mode (control unit only until stabilization time)	0	2	0
				0 = maintenance mode on (main valves are opened) 1 = maintenance mode active 2 = curve set switch allowed in set mode Set the maintenance mode with this parameter. The maintenance mode sets the pilot burner or the ignition flame monitor. It enables to do 5 consecutive ignition attempts without restarting with pre-ventilation and the leakage test. The burner sequencer only steps up to the flame stabilisation time. You may not open the main valves before the reset of this parameter. After the 5th attempt pre-ventilation and leakage start automatically. **Note:** A "Total Reset" resets the counter for maintenance mode automatically i.e. the next cycle is treated as the first and pre-ventilation and the leakage test are running. Therefore, reset faults with a "Partial Reset" wherever possible (selection switch on "Status", first channel key 2 upwards, then in addition channel key 1 downwards). **Attention:** You may not use a partial reset for some faults.			

5.1.16 Automatic Restart after Failure

Respect the directives for combustion plants, if you set this parameter.

No	FMS	ETA	Short Text	Description	Min	Max	Default
836	2	2	AutStart	Automatic restart after fault	0	30	0
				Delay in seconds Automatic restart of the burner on fault condition. In the case of a fault for which the standards permit an automatic restart for FMS/ETAMATIC, this parameter initiates the restart. Set to 0 for VMS. 0 = no restart of the burner 1 = automatic restart of the burner for faults, which are marked in the list of faults Selection of the standard with P 425: 0 = TDR 1 = no restart of the burner 2 = EN676			

5.1.17 Burner Firing Rate Controller

Enter Set Point Values

Select parameter 796 and 798 (setpoint value 1 and setpoint value 2).
With control by atmospheric condition select additionally parameter 797 and 799.

No	FMS	ETA	Short Text	Description	Min	Max	Default
796	0	0	Soll1min	Controller setpoint 1 minimum	0	999	90
				Firing-rate controller setpoint 1 minimum (setpoint 1) in ° C or bar (xx.x) Set the minimum value for the first controller setpoint (active if input "set point switching" = 0) (weather guided controller) in this parameter. If the firing rate controller is configured as a constant controller, the set point is set here. "Set point input via front panel" 1.Selection switch: firing-rate value 2.Display: controller setpoint, controller actual value, firing-rate setpoint, internal firing-rate 3.Channel key 3 down and channel key 4 up at the same time 4.Controller setpoint starts to flash and the setpoint can be changed with channel key 2 5.Do not save value: channel 3 up and channel 4 down at the same time or switch off burner 6.Save value: save the setpoint to the minimum value parameter with the Enter key (in P 796 / P 798 depending on the setpoint switching input) Saving is only possible with constant controller. With control by atmospheric conditions you may set the firing-rate controller setpoint value default manually Activation of the controller setpoint modification is disabled when operating mode is OFF. You may not trigger the burner start by shifting the switching point. refer to figure "Control by Atmospheric Conditions / Setpoint Switching of the Firing-rate Controller"			

No	FMS	ETA	Short Text	Description	Min	Max	Default
798	0	0	Soll2min	Controller set-point 2 minimum	0	999	70
				Firing-rate controller set point 2 minimum (set point 2) in ° C or bar (xx.x) Enter the minimum value for the second controller set point (active if input "set point switching" = 1) (control by atmospheric condition). Enter the setpoint in this parameter, if the firing-rate controller is configured to constant controller, see P 796 refer to figure "Control by Atmospheric Conditions / Setpoint Switching of the Firing-rate Controller"			

Control Range

Select parameter no. 802 and 803

No	FMS	ETA	Short Text	Description	Min	Max	Default
802	0	0	EinschPt	Burner start point	999	999	1
				Enter the switching point of the firing-rate controller as the difference to the set point. [Switching point] = [setpoint] - [parameter content] e. g. : burner should switch on at 110. setpoint = 120, parameter content = 10, 110 = 120 - 10 If the burner shall start above the setpoint, you may enter negative values as well. Therefore the following values correspond: -1 = 65535 and -999 = 94537 Parameter content = 65536 - difference i. e.: burner shall switch on at 125. set point = 120, parameter content = 65536 - 5 = 65531 switching point value= 120 - (-5) = 125			
803	0	0	Regelb.O	upper Control range	0	999	10
				(difference to the set point 1/2) in ° C or bar (xx.x) Enter the upper control range limit. The entered value corresponds to the difference between the actual setpoint and the upper limit of the control range. Depending on the content of Parameter 809, the content of this parameter is interpreted as ° C (directly without decimal point) as bar (resolution 0.1 bar, i.e. range from 0.1 to 99.9 bar) or in digit. see figure "Control range of the Firing-rate Controller"			

Setting the Control Thermostat

Select parameter no. 804

No	FMS	ETA	Short Text	Description	Min	Max	Default
804	0	0	Bren.AUS	Burner off	0	999	15
				Burner switch OFF point (difference to the set point) in ° C or bar (xx.x) Enter the firing-rate controller switch off point. The entered value corresponds to the difference between the current set point and the value, which shuts down the burner. The value has to be greater than the adjusted upper control range.(P 803) Depending on the content of Parameter 809, the content of this parameter is interpreted as ° C (directly without decimal point) as bar (resolution 0.1 bar, i.e. range from 0.1 to 99.9 bar) or in digit see figure "Control range of the Firing-rate controller			

Controller Parameters

Select parameter no. 805 - 808.

No	FMS	ETA	Short Text	Description	Min	Max	Default
806	0	0	I-Faktor	I - term of the controller	0	999	5/100
805	0	0	P-Faktor	P - term of the controller	0	999	10/25
807	0	0	D-Faktor	D - term of the controller	0	999	250/0
808	0	0	Nachst.z	Reset time	0	60	20
				Cyclic control adjustment time Set the adjustment time in seconds. This time is set between the individual control steps. The time relates to the reaction time of the system.			

Outside Temperature Limits

Select parameter no. 800 and 801.

No	FMS	ETA	Short Text	Description	Min	Max	Default
800	0	0	Obergren	Load regulator: upper limit	0	999	999
				Firing-rate controller: Upper Limit (for control by atmospheric condition) in ° C or digit This is the upper limit of the outside temperature for control by atmospheric condition.			

No	FMS	ETA	Short Text	Description	Min	Max	Default
801	0	0	Untergre	Load regulator: lower limit	0	999	0
				Firing-rate controller: Lower Limit (for control by atmospheric condition) in ° C or digit This is the lower limit of the outside temperature for control by atmospheric condition.			

Display of the Units of the Burner Firing Rate Controller Values

Select parameter no. 809

No	FMS	ETA	Short Text	Description	Min	Max	Default
809	1	1	Leinheit	Representation of actual value and set-point for load regulator	0	3	0
				Burner-firing-rate controller actual input and set point interpretation Set how the actual value input of the firing-rate controller is interpreted in the display and in the parameters (definition of the physical parameters). 0 = display in digit 1 = display in °C (0... 320 °C) 2 = display in bar (P 810 and P 811) Select also for ETAMATIC, from which input the actual value signal should be taken. If the parameter is set to 1, the integrated PT100 input is used, otherwise the firing-rate input is used.			

Display Range in bar

Select parameter no. 810 and 811.

No	FMS	ETA	Short Text	Description	Min	Max	Default
810	1	1	min.Einh	4 mA corresponds to x units	0	999	0
				The lower limit/pressure 4mA at the actual value input corresponds with x bar. Enter the lower limit of the display range, which corresponds with 4mA at the input, if the input is configured as a pressure input (only active when Parameter 809 = 2).			
811	1	1	max.Einh	20 mA corresponds to x units	0	999	160
				Upper limit pressure equivalent to 20mA actual input corresponds with x bar. Enter the upper limit of the display range, which corresponds with 20mA at the input, if the input is configured as a pressure input (only active when Parameter 809 = 2).			

5.2 Setting

5.2.1 Setting the Limit Switches of the Motors

As soon as the ETAMATIC is supplied with voltage, it attempts to drive the actuator motors to the lower limit of the factory set curve. If the end-bearing's limit switches are not properly adjusted for this, the motor may hit the actuator's mechanical stop

WARNING!

This may damage the motor or the valve.

Therefore:
Check the position of the end-bearing limit switches in the motors, taking into account the motor output shaft's travel.

If in doubt, set a shorter travel. It may be readjusted later.

5.2.2 Adjusting control elements

Enter password (see chapter 5.1.2 Password Entry)

Press keys 13 and 14 to select "Set"

Press keys 16 and 17 to set "setpoint"

With the keys 2; 4; 6 and 8 set all control elements “000“

Press key 16 to actual value feedback.

Display approx. 80-100 digit on three-point step outputs. If the display shows other values, set the limit switches in the motors and/or potentiometers accordingly.

Display approx. 200 digit on ETAMATIC / S channel 1 with 4 to 20 mA feedback.

With integral speed evaluation the number of digits depends on the setting of the frequency converter (if necessary release fan manually)

WARNING!

Never change the settings of frequency converter or revolution measurement feedback after programming the set-point values at ETAMATIC. Otherwise you have to program the curve again.

Enter the Curve

Select fuel (signal to terminal 49)

Enter password (see chapter 5.1.2 Password Entry)

Clear Memory

Press key 16 twice ("Set-point" display)

Press key 14 twice → the display shows SL in its centre.

Press Enter key 11 "ENTER" → the display shows "cleared", the old curve is cleared. Start burner (signal at terminal 58) and wait until pre-ventilation has ended.

5.2.3 Programming the Ignition Point

Press key 13 → the display shows "EI" in its center

Use keys 16 and 17 to switch to "setpoint"

Use keys 2 to 9 to run the control elements to ignition position

Press key „ENTER" → the display shows "Really ignite"

If not, press key 3 and redefine ignition position.

Press key "ENTER" again to confirm. → Burner ignites.

5.2.4 Programming the Base Load

Use keys 16 and 17 to switch to "load value"

Use keys 2 and 3 to set "200"

Use keys 16 and 17 to switch to "setpoint"

Use keys 2 to 9 to run control elements to base load position.

Press key ENTER .

Program 3rd to 10th point

Proceed as described in "Program base load point", but run to each of the load ratings "250", "300", "400", "500", "600", "700", "800", "900", and "999" one after the other.

Press key ENTER to store the curve.

Press key 13 (switch unit from "Set" to "Automatic").
→ the display shows "memory"

5.2.5 Programming the 3rd up the 10th Point

Proceed as described in "Program base load point", but set each of the load ratings “250", "300", "400", "500", "600", "700", "800", "900", and "999" one after the other.

press key to switch the unit from "Set" to "Automatic"
→ the display shows "Memory"

5.2.6 Saving Curve


Press key 13 (switch unit from “Set” to “Automatic”)
→ the display shows “Menory“

5.2.7 Changing Points

Points can be changed at any time by selecting the load rating for the required point and re-entering the associated position of the control element.

Enter password (see chapter 5.1.2 Password Entry)


Press key 14 → the display shows "EI" in its center


With the keys 16 and 17 set to "load value"


With the keys 2 and 3 select the required load value (point number flashing)


Press key 16 2x twice → the display shows "setpoint".


With the keys 2 to 9 run bring control elements to the required position


Press key ENTER

Change any other points.

5.2.8 Saving Changes


Press key 13 (switch unit from “Set” to “Automatic”)
→ the display shows “Menory“

5.3 Fault

5.3.1 Reading Faults

Red fault LED is on
Press key 17 until "Status" appears. → The display shows a plain text message (incl. running time counter)

Press key „ENTER“ drücken → Plain text message appears on the display (incl. output of the running time counter)

NOTICE!

If you want to read the other display values up to the time of the fault press key 16. All display values are frozen.

5.3.2 Resetting Faults

Press key RESET
Alternatively:
Use an external switch to send a short signal (min. 2 sec.) to terminal 5.
the error is cleared!

5.3.3 Recall Fault History

The ETAMATIC stores the last 10 faults with the associated data of the running time counter.

Requirement: ETAMATIC must not be in fault condition.

Press key 17 until the display shows "Status".

Press key 3 → the display shows the last fault code

Press key 11 (Enter) → the display shows the associated plain text and the running time hours.

Press key 3 again → The display shows the last but one fault code.

Press keys 3 and 2 to browse through the fault history.

CAUTION!

If it is certain that the ETAMATIC has carried a voltage at all times since the last fault, it is possible, that from the present output of the running time counter and the current time, to determine at which time the fault occurred.

6 O_2-Control

6.1 What happens if a fault occurs in the O_2 regulation

In the event of malfunction, the display shows a warning and the O_2 control is deactivated. The specified base value "without control" or the one for "air deficiency" is set. The display shows the running text "O_2 regulation perturbed".

The burner doesn't shut down.

Set the selector switch to "Status" to call up the corresponding error code.

Press key 11 ENTER → The display shows a plain text message about the cause of the error.

6.1.1 How to switch the Display

Press key 15 to change the display from status of the compound to O_2 value (if active) and to flame intensity (if active). If neither O_2 trim, nor integrated flame scanner is active, key 15 has no function.

WARNING!

You can set the O_2 trim only, if you have completed the programming of the compound.

6.2 Air Deficiency Pertubation

If the O_2 actual value is significantly smaller than the O_2 setpoint value (below the second monitoring band) and corrective actions by the ETAMATIC cannot clear this error, the regulation will be deactivated and the base value for air deficiency errors will be output. If desired, the ETAMATIC triggers an air deficiency burner shut-down. Therefor set parameter 897 to 1.

The error code is H360, "Error shut-down by O_2 regulator".

6.3 Resetting O_2-errors

Each new burner start-up resets O_2 errors automatically. This is permissible, because a 100% O_2 measurement test is performed at each start-up.

Manual resetting of O_2 errors is possible at any time, as follows:

Press key RESET
ETAMATIC in O_2 trim mode?

If not, switch over to O_2 trim mode
Press key 15 M once

Press key ENTER and call up the cause of error (mandatory!)

Press key 7

6 O2-Control

6.4 Calling Fault History O_2-Controller

Switch over to compound mode, if necessary press M.

Use key 4 and 5 to browse the fault history.

Display:

1	147	1	000 487
↑	↑	↑	↑
current fault	internal load	curve set	operating hours

The display hides the O_2 history automatically after 5 sec. O_2 trim faults, which last for more than 30 sec are stored. They are only stored in the EEPROM once the fault is cleared up or the ETAMATIC leaves the operating mode or regulation or base load.

6.5 How to Change the Password

First enter the current password, see page capter 5.1.2 Password Entry.

Press key 17 until the display shows "Status"

Press keys 5 , 7and 8 simultaneously..

The display shows an entry field.
Use the keys 2 to 9 to set the new password.

Press key 16 until the display shows “digital inputs”

Press key 11 ENTER.

6.6 How to switch the Display

Press key 15 to change the display from status of the compound to O_2 value (if active) and to flame intensity (if active). If neither O_2 trim, nor integrated flame scanner is active, key 15 has no function.

WARNING!

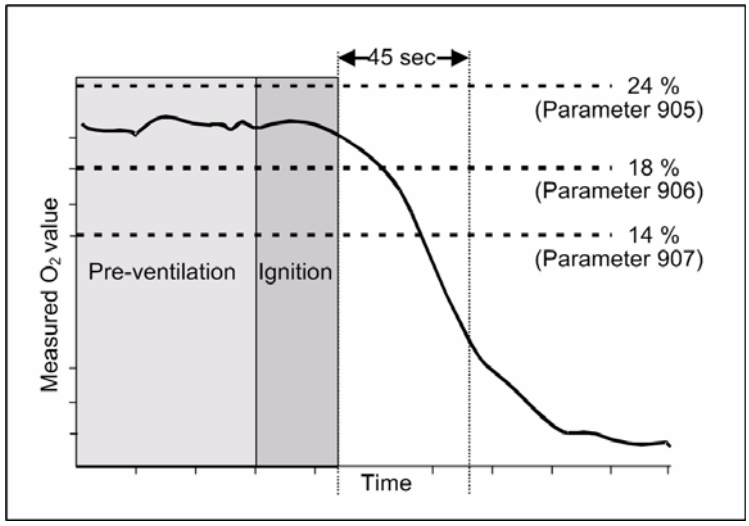
You can set the O_2 trim only, if you have completed the programming of the compound.

6.7 Automatic Function Monitoring During Operation

6.7.1 Test During Burner Start

The actual O_2 value is checked to ensure that during pre-ventilation it corresponds to the air value (equal to or greater than 18 vol.% O_2 and less than 24 vol.% O_2).

After ignition, the actual O_2 value must reach a value equal to or below 14% within 45 seconds. Reaching the threshold value is monitored. If one of the two parameters is not met, O_2 trim is deactivated. The control unit outputs the value “Base value without control”.

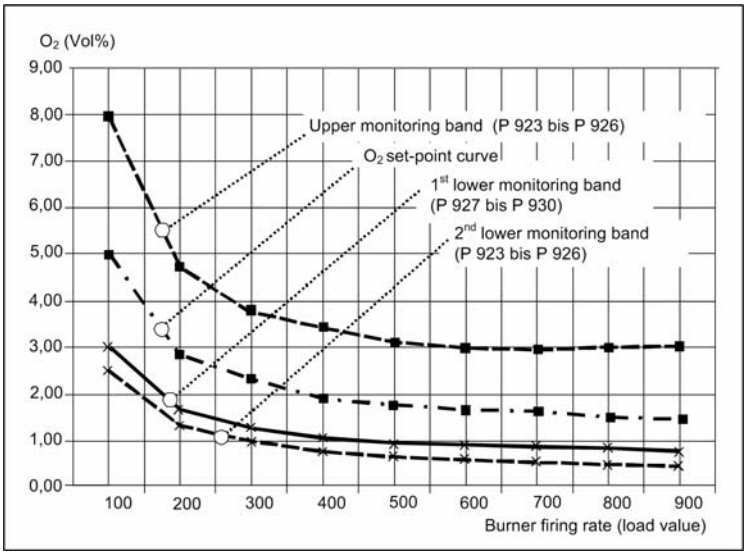


6.7.2 O_2 Monitoring Band

During burner operation, the actual O_2 value is continuously monitored for one maximum and two minimum permissible values. These ranges are located around the O_2 set-point as a function of load. If the actual values stay outside these bands for a defined period, the control system is deactivated and a “Fault” warning is output.

Thereafter, the control unit’s output (correction input) corresponds to “Base value without control” or “Base value with air deficiency”.

6.7.3 O_2 Boundary Curve



You can set the monitoring bands' parameters for 2 fuels, oil/gas, as a function of fuel. The permitted deviation is calculated as a percentage of the setpoint. You can specify two separate percentage values for base load and full load. The section between is interpolated linearly.

Monitoring / shutdown times:

1st monitoring band: 120 seconds; active after "Control on".

2nd monitoring band: 30 seconds; active after "Burner on".

Factory setting:

1st monitoring band, upward direction

– Base load (parameters 923 / 925) 60%

– Full load (parameters 924 / 926) 100%

1st monitoring band, downward direction

– Base load (parameters 927 / 929) 40%

– Full load (parameters 928 / 930) 50%

2nd monitoring band, downward direction (may be modified during commissioning)

– Base load (parameters 931 / 933) 50%

– Full load (parameters 932 / 934) 70%

6.7.4 Dynamic Probe Test

The ETAMATIC monitors the measured O_2 value for changes during operation. If no higher fluctuation than 0,2 O_2 vol.% is detected over a period of 10 minutes, a state of excess air is enforced by changing the fuel/air mixture. If there is still no change in the actual O_2 value after 1 minute, the test is repeated with more excess air. If this does not lead to a change in the actual value, the test is performed a third time with an even excess air. If no change has occurred in the actual O_2 value at this point, the control unit deactivates itself and displays a warning on the screen. Thereafter the control unit's output (correction input) corresponds to "Base value without control".

NOTICE!

The O_2 optimisation fault messages do not affect burner or combustion functions.

6.8 Control Strategy

These trim strategies have been developed and optimised especially for the conditions obtaining in combustion installations:

– Frequent changes in the burner-firing rate

– Long lag times.

During burner start-up, O_2 trim remains in standby, until it is ensured that plausible measured O_2 values are displayed.

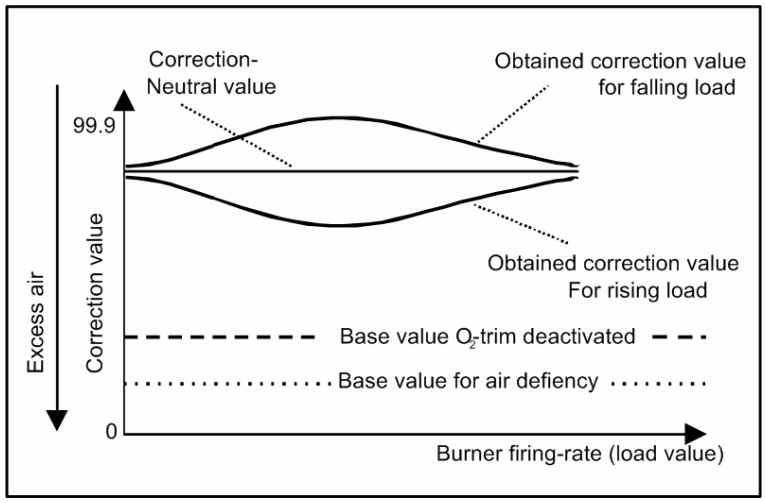
Factory setting: 90 seconds after ignition - parameter 904 (adjustable).

The "neutral value" is output during standby.

The neutral value depends on the selected correction mode;
e.g. in the case of -50% to +50%, the correction value (neutral value) output is 500; in the case of -30% to +70%, the output value is 300.

NOTICE!

The neutral value corresponds to the base settings of the ETAMATIC without control.



6.9 Connecting the O_2 Measurement Device

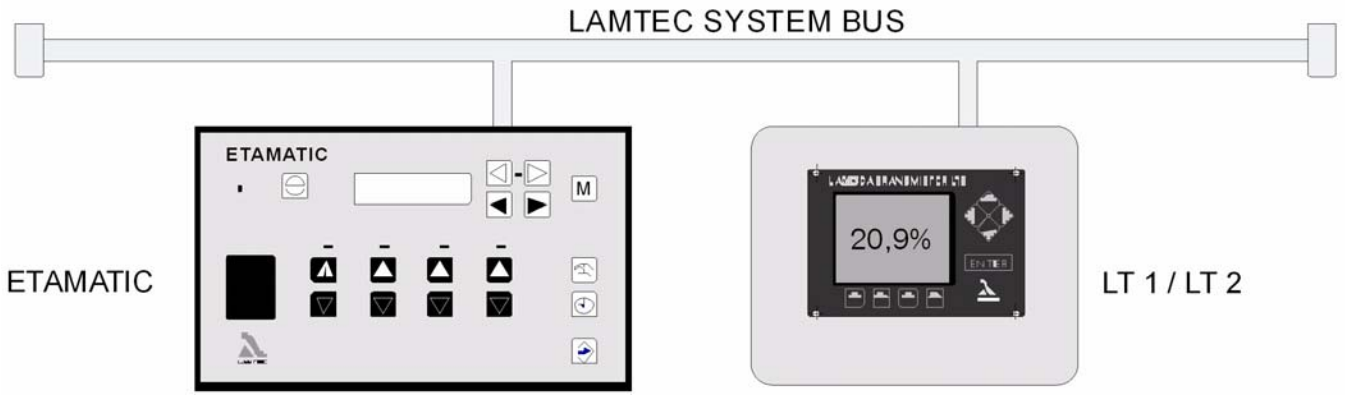


Fig. 6-1 Connection to the O_2 measuring device via LAMTEC SYSTEM BUS

Connecting diagram see appendix.

The LAMTEC SYSTEM BUS transmits the foolowing signals to the ETAMATIC:

- probe current
- probe current during calibration
- probe voltage
- cell inner resistance
- heating output
- low pressure
- measured O_2 value
- operational status and fault status

The LT1 /LT2 recieves from the ETAMATIC the following signal:

- position of internal firing-rate
- status data
- operational modes

6.10 Operation and Display of the O_2-Controller

Press key 15 once, to switch the display to O_2-trim.

When you have switched to "Status", the display shows the O_2 actual value and setpoint value. The display shows the values in brackets, if O_2 trim is deactivated.

NOTICE!

O_2 actual value and setpoint are only displayed, if O_2 trim or O_2 display are activated in parameter 896.

In automatic operation, the display switches during regular operation automatically to O_2 trim mode. However, it is always possible to switch the display over with key "M". The manually preselected setting only remains in force until the next switch to "Regular operation" or "Base load operation", and then returns automatically to the base setting.

You can call up the information texts (running texts) in O_2 trim mode after pressing the Enter key, when the display is in status position.

6.10.1 Display and Interpretation of the Operating Modes

op	O_2 trim in standby (during burner start-up), or O_2 trim temporarily switched off as a function load via parameters 914 and 915.
or	O_2 trim active.
ot	O_2 trim temporarily deactivated (air deficiency, probe dynamics etc).
od	O_2 trim deactivated (fault), e.g. test routine failed during burner start-up, dynamic test negative, O_2 trim temporarily deactivated for over 1 hour etc. Resetting od:

Resetting od:

Press key F1 (reset)

press key 7 twice
Every burner start causes the reset of the faults automatically.

6.10.2 Calling up O_2 Controller Text Messages

Switch display to O_2 trim

press key 1 "RESET"

press key 15

press key 11 "ENTER" to call up the text messages

press key 11 "ENTER" again → back

6.11 Commissioning

6.11.1 Setting the Correction Range and the Correction Mode

The correction value (control signal) transmitted to the electronic compound is 0…100% with a resolution of 0.1%.
0% corresponds to maximum excess air, 100% to minimum excess air. Factory setting is a neutral value of +60% to -40%. This means that the control range in the direction of excess air is 60% and in the direction of air deficiency it is 40%. The main focus of this base setting is that contamination of the burner and the boiler during the operational period would result in an increase in the installation's flow resistance. Thus a larger control range in direction excess air could be an advantage.

If another correction mode is selected via parameter 437, the base setting also changes at the same time:

In Correction Mode	Base Settings
+ 50% .... - 50%	50,0 %
- 50 % .... + 50 %	50,0 %
+ 60 % .... - 40 %	60,0%
- 60 % .... + 40 %	60,0%
0 % ....- 100 %	0,0%
- 100 % ..... 0 %	100,0%

Calling up the base setting (only when burner stationary):

6.11.2 Available Correction Modes

Correction type 1 is used when correction is applied to a linear control element, e.g. to the frequency converter's setpoint for adjusting the combustion air blower's speed. The correction is directly added to or subtracted from the setpoint.
Correction mode: Effect to the setpoint axis

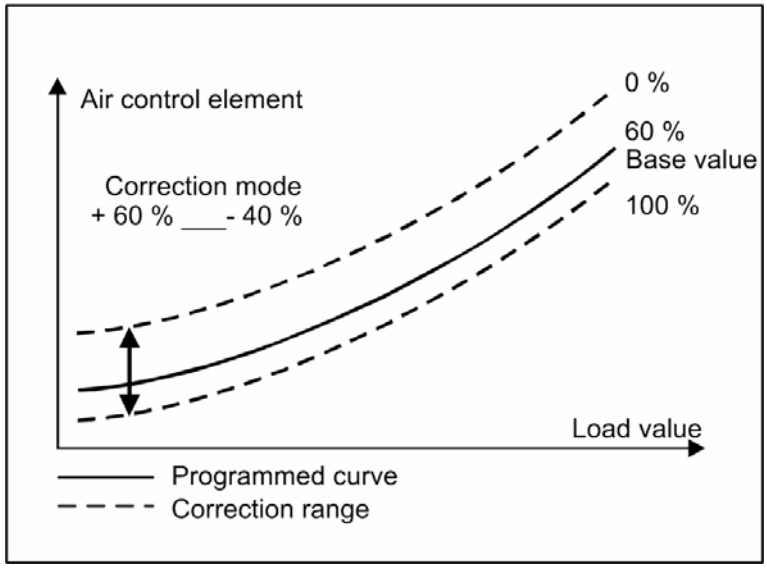


Fig. 6-2 Correction to the setpoint

NOTICE!

When switching on any O_2 correction you must ensure, that the combustion boundary values are maintained even with the maximum possible correction (100%). For details see chapter 6.11.6 Checking the Combustion Boundary Values.

Correction type 2 is used where the correction is applied to a non-linear control element, e.g. air damper. The curve's slope is taken into account before calculating the correction. A flatter curve results in a smaller correction range, whilst a steeper curve results in wider range.

6.11.3 Correction Type 2

Correction mode: Effect to load axis +60% to -40%

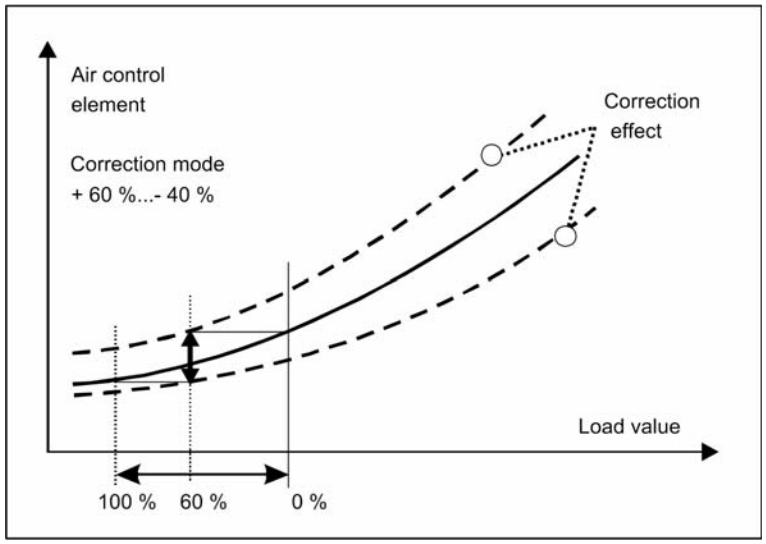


Fig. 6-3 correction type 2

6.11.4 Setting the Correction Range

Use parameter 517 to adjust the correction range from 0 to 999.

Example:	20 - 100 is a typical correction range for O_2 trim. This means: With a correction mode from +60% to -40% (factory setting), the control range, which is adjustable via the correction during correcting to setpoint +120; -80...+60; -40; (in digit)
Recommendation:	You should chose the correction mode and the correction range in that way, that the correction effect on the O_2 value is -2 to 3 vol.% O_2 in direction excess air, and 1 to 1.5 vol.% O_2 in direction air deficiency.

6.11.5 Calling up the Set Correction Mode

Press key 1 "RESET"

Press key 11 "ENTER“ to confirm.

Take the correction into account during later programming.

The correction actuator must be able to operate without the ETAMATIC reaching the end-stop (0 or 999 or limit stop values).

If the correction actuator cannot be driven all the way as required because a channel has reached the range limit determined during pre-ventilation, the burner's output is increased or decreased until the actuator can be driven all the way.

6.11.6 Checking the Combustion Boundary Values

It is necessary to guarantee the combustion facility's safe burning even with the maximum correction applied. The correction value can be modified as follows in order to set the correction range and monitor the combustion boundary values.

Press key 1 RESET

Enter password (see chapter 5.1.2 Password Entry)

Select "Set O_2” via keys 13 and 14

Confirm query with key 8

Set load value with keys 16 and 17

Press key 11 ENTER.

Press key 5 → The display shows "TK".

Use keys 2 and 3 to modify the correction value within the burner running.

Adjustment of the correction range is possible in parameter 517. If you adjust parameter 517 while the burner is running, adjust in small steps and pause between two steps. Otherwise the fault 106 may occur.

NOTICE!

The burner must be ON and the control release must be set.

6.11.7 O_2 curve input

Enter password (see chapter 5.1.2 Password Entry).

Press keys 13 and 14 to select "Set O_2"

Delete the entire O_2-curve with Key 9

If only points should be modified, press key 8

Set to load value with keys 16 and 17.

Use keys 2 and 3 to start the programmed load points of the common compound curve.

Press key 16

NOTICE!

O_2 set-points can only be saved to the programmed load points. If load points are skipped, a linear interpolation is applied in between.

Press keys 8 and 9 to set the required O_2 setpoint.

Press key 11 ENTER to save the setpoint

Press key 17.

Press keys 2 and 3 to address the next load point.
etc.

As soon as you have entered all required O_2 set-points, press key 14
The O_2 set-points curve is now stored.

Changing O_2 set-points

Proceed as described under O_2 set-point input, but press key 8 instead of key 9.

Manual Calculating and Setting of the Control Parameters

Set firing-rate controller to "Manual" and run to low firing-rate.
Enter password (see chapter 5.1.2 Password Entry)

press keys 13 and 14 to select "Set O_2"

press key 8 to confirm the query

press key 16 until the display shows "setpoint"

press key 5 up, to activate the O_2 trim during adjustment. → the display shows "T"

use the keys 6 and 7 to change the O_2 set-point from the preset value with the range +3 to -1 vol.% O_2. Observe the change in the actual O_2 value simultaneously on the display.

Key 7 → more O_2
Key 6 → less O_2

You should choose the setting of parameters 898 and 899 in that way, that the next setpoint value / actual value comparison (control pulse) only takes place if the actual O_2 value has changed visibly (~ 60% of end value). A mark at the centre of the set-point display indicates that a set-point / actual value comparison has just been performed.

No change, or change too small → Increase P factor, parameter 899.

Guidelines

Enter the calculated value in parameter 898.

Factory setting: 15 seconds.
The dead time is weighted as a function of load.
The dead time reduces at full load due to the higher gas velocities. The factory setting is A reduction of 3 seconds in dead time.

Procedure for calculating the dead time at full load, as described above.

Set the P-term in that way, that a deviation of 1…2 vol.% O_2 between target and actual value is corrected within 4…6 steps without overshooting.

Control pulses too short	→	increase P-term, parameter 899
Overshooting	→	reduce P-term

Repeat until the setpoint is reached within ca. 4…6 steps. Check control unit setting at intermediate and full load.

NOTICE!

You may use the P-term (parameter 899) and the dead time (parameters 898 and 900) to achieve optimisation which inter alia depends on the installation's properties; e.g. a shorter dead time can be set if the P-term is reduced at the same time.

Recommendation:

Set control unit speed a bit slower and P-term smaller → safer!!!

– Set base value for "Deactivated control" and "Air deficiency"

If a fault occurs in the O_2 trim will be deactivated, and depending on the cause the preset correction value for "Deactivated O_2 control" or "Air deficiency" would be shown as output. The burner does not shut down.

In the event of an "Air deficiency fault" you can enforce a burner shutdown with parameter 897.

you can select the base values for deactivated O_2 trim and air deficiency in the parameter 896.

8	→	correction input	→	base value for deactivated O_2 trim P 901 / P 902
9	→	correction input	→	base value for air deficiency P 917 / P 918

Recommended settings:

for P 901 / P 902 and P 917 / P 918
Base value for deactivated O_2 trim = neutral value
Base value for air deficiency < base value for deactivated O_2 trim

6 O2-Control

NOTICE!

The neutral value is obtained from the selected correction mode:
+50%/-50% → neutral value 500 = 50% correction mode
+60%/-40% → neutral value 600 = 60%

Parameter	Factory Settings
901/902	Base value for “Deactivated O_2 trim” = 300
917/918	Base value for "Air deficiency” = 150

The following approximate overall picture results for burner output:

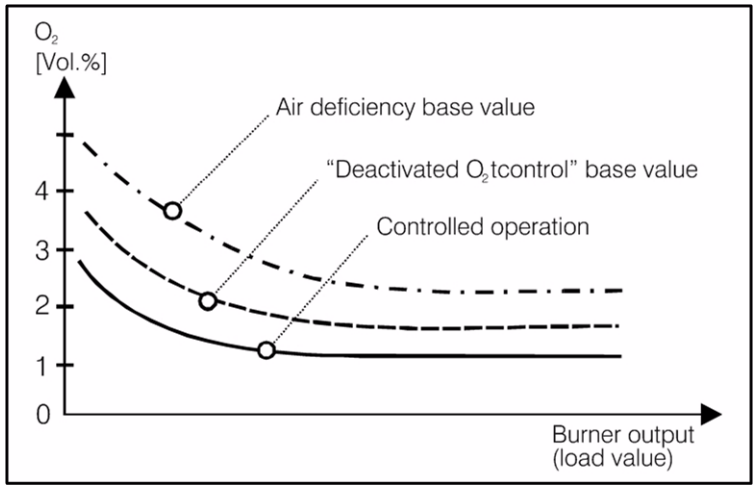
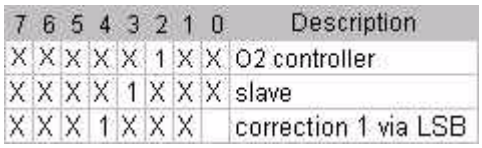
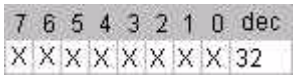


Fig. 6-4 factory settings

No	FMS	ETA	Short Text	Description	Min	Max	Default
897	1	1	O2Stoer	Safety shut-down by O_2 controller / CO controller allowed? (0-never, 1-when insufficient air)	0	1	0
				In case of a fault of the O_2 trim, the O_2 trim will be deactivated. Depending on the cause, the defined correction value for "deactivated O_2 trim" or "air deficiency" will be output. The burner does not shut down (content 0). You can pre-selected, if the burner should shut down in case of the fault "air deficiency" (content 1).			
898	0	0	O2-TotZ	Dead time of O_2 controlled system	3	40	15
				Dead time of the O_2 controled system in seconds Expected values for 2 / 3 -passboiler: 12 seconds			
899	0	0	O2-P-Fak	O_2 P-Term	1	50	5
				Set the P-term in that way, that the set point value / actual value deviation of 1...2 vol.% is regulated in 4...6 steps without overshoot. Setting pulses too short - increase the P-term. Overshoot - reduce P-term			

6 O2-Control

No	FMS	ETA	Short Text	Description	Min	Max	Default
900	0	0	O2 TZ -	Dead time reduction for O_2 controlled system at full load	0	5	3
				Reduces dead time at the burner's high firing-rate. With this parameter, you can adjust the dead time depending on the firing-rate. Because of the higher gas speeds, the dead time is reduced at the high firing-rate. The factory setting is the reduction in the dead time of 3 seconds.			
901	1	1	O2NeutrA	Correction value output when O_2 trim is deactivated	0	1000	400
				Correction value is displayed at deactivated O_2 trim. Fuel 1 (from 5.0 on):  and P 847 = 2,3 or 4:  0 = the last received value is permanently valid 1..65535 = Time-out in seconds after P 901 / P 902 is active.			
902	1	1	O2NeutrB	Correction value output when O_2 trim is deactivated.	0	1000	400
				Correction value is displayed at deactivated O_2 trim. Fuel 1 (from 5.0 on):  at P 7 = 2 (dec) and P 847 = 2, 3 or 4: O_2 trim / CO controller slave / correction 1 via LSB 0 = the last received value is permanent valid 1..65535 = Time-out in seconds after P 901 / P 902 is active.			
917	1	1	LftmKorA	Air deficiency correction value fuel A	0	999	300
				Air deficiency correction value for fuel 1			
918	1	1	LftmKorB	Air deficiency correction for fuel B see P 917	0	999	300

6.12 Calling up Running Time Meter

press key 10 → the display shows the running text of the following data successively:

Total running time
Running time on curve set 1
Starts on curve set 1
Running time on curve set 2
Starts on curve set 2

The total of running times for curve set 1and curve set 2 do not necessarily add up to the displayed total running time.

NOTICE!

The total counter refers to the ETAMATIC 's running time. It starts timing as soon as the unit is connected to a voltage source (this also provides the basis for the fault history).
The individual running time counters refer to the burner's running time. They start timing as soon as the burner is in operation with the relevant curve set (flame signal is present).

6.13 Calling up the Checksum

Press keys 16 and 17 to select "Set-point feedback".

Press key 11 ENTER.
The following values are displayed one by one:

CRC 16 of the levels 0, 1 and 2: adjustable at commissioning time
4: adjustable by LAMTEC only

1st safety time oil in seconds
2nd safety time oil in seconds
1st safety time gas in seconds
2nd safety time gas in seconds
Pre-ventilation time in seconds

Press key 11 ENTER again.

In the ETAMATIC without pilot burner, the 2nd safety time includes the safety time. The 1st safety time figure is then irrelevant.

If you have changed parameters, reset the ETAMATIC. Only a reset refreshes a checksum.

6.14 Re-enter Range Limits

If you change the limit switches after the programming, you must determine the range limits again.

Enter password (see chapter 5.1.2 Password Entry).

 Press key 14 → the display shows "SL" in its center

 Press key 11 ENTER → the display shows "cleared".
The curves and the range limits are deleted.

 Press key 13 twice → the display shows "restore previous curve ?"

 Press key 7

Since no point has been entered, the old curve is re-activated, but the range limits remain cleared.

Now allow the system to pre-ventilate.
Range limits are re-entered.

NOTICE!

You can see this in the "Set-point" display. Without limits the set-point is 0 or 999. Once the limit is determined, the set-point skips to the actual value.

7 Internal Burner Firing-rate Controller

7.1 Purpose

The internal power control unit allows the inserted burner firing-rate position to be continually determined for a specified set-point value (e.g. as a function of temperature or pressure) by comparison with the actual value. This position will be transferred to the electronic compound as a default value.

7.2 Brief Description

The integral power control unit is a PID controller with special combustion engineering functions. You can use it as a fixed value control or as a control by atmospheric condition. The following signals can be pre-set:

- Actual value (temperature or steam pressure)
- Outside temperature or other analog signal for setpoint shift (only on control by atmospheric condition). The ETAMATIC must be equipped with the optional hardware for control by atmospheric condition.
- Setpoint switching (via floating contact). The burner-firing-rate controller releases the combustion internally.

Combustion is triggered internally by the power control unit.

7.3 Limit Ranges

You must set limit values in the parameters, which switch the burner on and off. If the burner shuts down and the actual temperature has not yet reached the switch-on threshold again, a display informs the operator that the power control unit refuses a start-up.

7.4 Light Writing "Actual Temperature is too high"

Press key 12 HAND to override this and start the ETAMATIC, if the maximum temperature has not exceeded.

Press key 12 HAND again to switch back to automatic mode.

NOTICE!

The limit values should always be entered in the form of a difference from the set-point value.

7.5 Enter setpoint of power control

Up to software version A3i1023 you can change the setpoint with parameterisation only.

From software version A3i1023 on you can change the setpoint of the firing-rate controller.

This function works only if the burner is in operation

Press key 9 and 6 simultaneously → the setpoint in the display is blinking.

Use keys 4 and 5 to change the value.

Press key 11 ENTER to confirm the new value

Press keys 7 and 8 simultaneously to leave this mode without changes.

WARNING!

If you change the setpoint, regard that also the on and off switchpoints are shifted, because they are defined as a difference value to the setpoint

7.6 Input Signals

The analogue inputs can be preset in various forms.

Actual value:

- as 0/4-20 mA current signal, terminals 4 and 5 (+), 3 (-)
- as non active current signal 4...20 mA (two-wire connection), terminal 23, + 24V supply, terminals 4 and 5 input
- as 0...10 V voltage signal
- as 0...5 kΩ resistance signal, terminal 4, 5 and 6
- directly as PT 100 terminal 21, 20, 19 as three-wire connection

Outside temperature (setpoint-shifting) - only available if ETAMATIC has the option "control by atmospheric condition"

- as PT100 as three-wire connection, terminals 39, 40, 41 (default)
- as 4...20mA current signal, terminals 39 (-) and 40 (+),
  special option, please order separately
- as non active current signal 4...20 mA, term. 23 + 24V supply, terminal 40 input

7.7 Operating Description

The start of the burner is described as above. Only the burner start release must be forthcoming from the power control unit, i.e. the actual value must be correspondingly below the set-point value.

The burner starts only when the "Burner On" detects the release are forthcoming from the load control unit. Only when the burner is ON and the "Control release" signal has been given does the power control unit function. The load default for the compound is then set via the integral power control unit. It is dependent on the difference between the actual and the set-point value and the adjusted control parameters. Should the actual value exceed the adjusted maximum value, the power control unit switches off the combustion.

The power control unit is only active in the "automatic" mode.

7.8 Steam Pressure

If you get a steam-pressure signal from a pressure transmitter on terminal 3, 4 and 5, you must short-circuit the PT100 input at terminal 19 and 21.

7.9 Control by Atmospheric Condition

If the burner firing-rate controller is configured as "controlled by atmospheric conditions" the setpoint value can be shifted between the parameterised setpoint minimum and setpoint maximum by connecting another PT 100 temperature sensor to the terminals 39, 40 and 41. In the realize by atmospheric conditions, the outside temperature is a component of setpoint calculation. This allows the operator to enter a minimum and a maximum setpoint, between which the outside temperature can determine the final setpoint value.

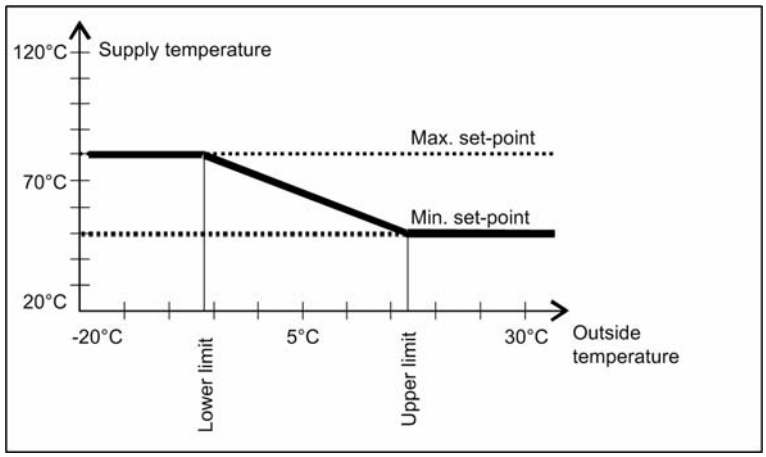


Fig. 7-1 Control by atmospheric conditions

With the option "Control by atmospheric condition" you may realise an external setpoint presetting.

7.10 Set Point Changeover

You can switch the setpoint with the input "setpoint switchover". If you use a version with fixed setpoint value it is possible to select one of the two values, which are entered in the parameters 796 and 798 with this contact.

If you have activated the control by atmospheric conditions additionally, you can select between two pairs of limit values (see control by atmospheric conditions and limit ranges). The parameters for setpoint 1 (for setpoint switching) and setpoint min. 1 (for control by atmospheric conditions) are equal. Likewise the parameters setpoint 2 and setpoint min. 2. The corresponding content is assigned according to the configuration.

When activating the "control by atmospheric conditions" option and setting the adjustable parameters, you may realise an external setpoint default. In other words, the setpoint can be adjusted manually or automatically via a potentiometer (or switched through resistors). By connecting a change-over switch, you can implement a night-time reduction instead of control by atmospheric conditions. A control by atmospheric conditions and a night-time reduction can be realised simultaneously, if you combine the control by atmospheric conditions with the setpoint switching.

No	FMS	ETA	Short Text	Description	Min	Max	Default
796	0	0	Soll1min	Controller setpoint 1 minimum	0	999	90
				Firing-rate controller setpoint 1 minimum (setpoint 1) in ° C or bar (xx.x) Set the minimum value for the first controller setpoint (active if input "set point switching" = 0) (weather guided controller) in this parameter. If the firing rate controller is configured as a constant controller, the set point is set here. "Set point input via front panel" 1.Selection switch: firing-rate value 2.Display: controller setpoint, controller actual value, firing-rate setpoint, internal firing-rate 3.Channel key 3 down and channel key 4 up at the same time 4.Controller setpoint starts to flash and the setpoint can be changed with channel key 2 5.Do not save value: channel 3 up and channel 4 down at the same time or switch off burner 6.Save value: save the setpoint to the minimum value parameter with the Enter key (in P 796 / P 798 depending on the setpoint switching input) Saving is only possible with constant controller. With control by atmospheric conditions you may set the firing-rate controller setpoint value default manually Activation of the controller setpoint modification is disabled when operating mode is OFF. You may not trigger the burner start by shifting the switching point. refer to figure "Control by Atmospheric Conditions / Setpoint Switching of the Firing-rate Controller"			

7.11 Start-up Sequence

The firing-rate controller has a startup circuit, in order to slow down the burner's start firing-rate. The startup circuit is run during each new burner start. The internal firing-rate is held at a value (P 792 adjustable by the user, for as long as the boiler is cold (actual value is below a user-adjustable limit, P 791). If the controller’s actual value is equal to or larger than the parameterised startup maximum temperature, this startup circuit is canceled.

In order to prevent a situation where an excessively large demand on system output, the boiler temperature necessary to cancel the startup circuit is not reached, a startup timer is also triggered in parallel (this timer can also be adjusted by the operator, P 793). Once the internal firing-rate reaches the parameterised startup firing-rate, the output is increased linearly stepwise up to the maximum firing-rate. The slope of this linear increase is calculated from the parameterised startup time.

7 Internal Burner Firing-rate Controller

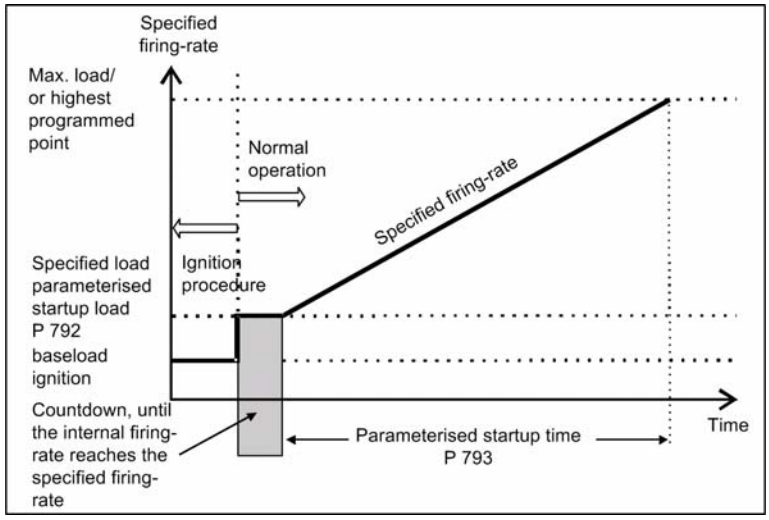


Fig. 7-2 Startup sequence

No	FMS	ETA	Short Text	Description	Min	Max	Default
791	0	0	Anf.Temp	Max. start-up temperature	0	999	0
				Maximum start-up temperature or pressure in relation to the actual value Start - up circuit parameter: Enter the actual temperature, up to which the start - up circuit is active.			
792	0	0	Anf.Leis	Start-up output	0	999	0
				Burner start-up firing-rate, corresponding to the internal firing-rate (in digit) Set the firing-rate value at which the burner should start. see figure start - up circuit			
793	0	0	Anf.Zeit	Start-up time	0	32767	0
				Burner-start-up-time in seconds The maximum time the start - up circuit is active is set here. see figure start - up circuit			

7.12 Thermostat and Control Range

The thermostat function switches the burner on and off on the basis of the temperature and/ or pressure value, but only when burner is released by the start signal. The control range is formed by entering the controller set-point value and the parameters P 802 (switch-on point), P803 (upper control range) and P 804 (burner OFF). The cut-off hysteresis is divided into 2 ranges. The first part lies above the set-point and forms the upper control range. The second part lies below the setpoint and forms the lower control range.

The control range may lie asymmetrically around the setpoint.

The power control unit functions within the upper and lower control range according to its settings in the parameters and the default values.

If the actual value of the control unit reaches the shut-down range, the base load request is emitted. If the control unit’s setpoint exceed the shut-down range a control shut-off occurs. This is done by internal processing. If the actual value drops below the lower control range, a re-start can occur.

7 Internal Burner Firing-rate Controller

NOTICE!

This function can replace the control thermostat, which is required on the plant.

It does not replace a safety thermostat.

No	FMS	ETA	Short Text	Description	Min	Max	Default
802	0	0	EinschPt	Burner start point	999	999	1
				Enter the switching point of the firing-rate controller as the difference to the set point. [Switching point] = [setpoint] - [parameter content] e. g. : burner should switch on at 110. setpoint = 120, parameter content = 10, 110 = 120 - 10 If the burner shall start above the setpoint, you may enter negative values as well. Therefore the following values correspond: -1 = 65535 and -999 = 94537 Parameter content = 65536 - difference i. e.: burner shall switch on at 125. set point = 120, parameter content = 65536 - 5 = 65531 switching point value= 120 - (-5) = 125			
803	0	0	Regelb.O	upper Control range	0	999	10
				(difference to the set point 1/2) in ° C or bar (xx.x) Enter the upper control range limit. The entered value corresponds to the difference between the actual setpoint and the upper limit of the control range. Depending on the content of Parameter 809, the content of this parameter is interpreted as ° C (directly without decimal point) as bar (resolution 0.1 bar, i.e. range from 0.1 to 99.9 bar) or in digit. see figure "Control range of the Firing-rate Controller"			
804	0	0	Bren.AUS	Burner off	0	999	15
				Burner switch OFF point (difference to the set point) in ° C or bar (xx.x) Enter the firing-rate controller switch off point. The entered value corresponds to the difference between the current set point and the value, which shuts down the burner. The value has to be greater than the adjusted upper control range.(P 803) Depending on the content of Parameter 809, the content of this parameter is interpreted as ° C (directly without decimal point) as bar (resolution 0.1 bar, i.e. range from 0.1 to 99.9 bar) or in digit see figure "Control range of the Firing-rate controller			

7.13 Manual Control

press key to overwrite the load default of the power control unit.

press the keys 2 and 3 to variegate the burner-firing-rate.

If you want to cancel this control, press key "Manual" again.

alternatively:

If the display shows „load value“, press keys 2 or 3 to switch to the load pre-setting directly. To adjust the burner firing-rate use the procedure as described above.

To leave the manual load pre-setting press one of the keys 4 to 9.

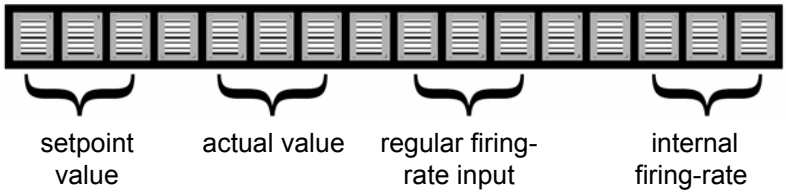
You also may switch the ETAMATIC to "Manual Control" with the terminals. By short-circuiting the PT 100 signal (e.g. switch on terminal 19 and 20) the load control unit is switched off. The compound then directly follows the default of the signal on the load default input. The display shows LE instead of HA.

NOTICE!

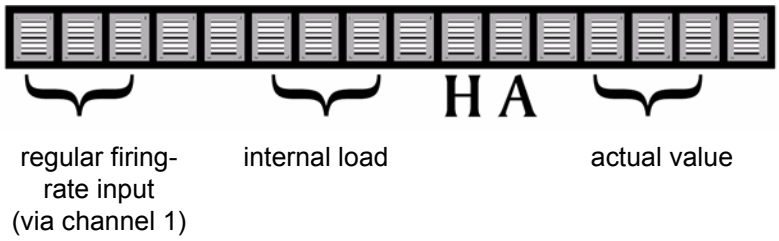
Only use manual control whilst monitoring the system.

7.14 Meaning of the Display

Display in the "Load rating" switch position.



Display in "Hand Mode"



7.15 How to Adjust the Burner-firing-rate Controller

Only adjust the burner firing-rate controller with the parameters.

7 Internal Burner Firing-rate Controller

7.16 Control Range

The control range lies around the setpoint. The content of the "Burner on" parameter is subtracted from the setpoint value to form the switch-on value. The value of the "Upper control range" parameter (P 803) is added to the setpoint value to form the upper limit of the control range. The control range may therefore lie asymmetrically around the setpoint.The shut-off range is upwardly limited by the "Burner off" parameter (P 804). The parameter is added to the setpoint value, too. If this value is exceeded, the burner is shut off.

The range between "Upper control range" and "Burner off" forms the shut-off range. If the actual value reaches this range, the compound runs at base load.
It also follows from this that the value in "Burner Off", is generally greater than that in "Upper control range". Otherwise there is no shut-off range and the burner is immediately shut off on reaching the limit.
The burner 'ON' switching point also can be located above the setpoint. In this case the parameter 802 has to be set negative (<0).

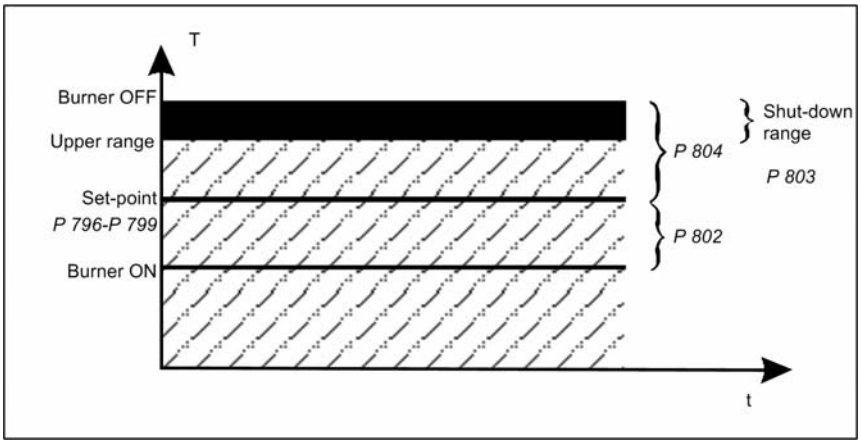


Fig. 7-3 Control range

7.17 Checking of the Safety Limiter

To check and to test the Safety Limiter, the setpoint must be changed. In this case the shut-'OFF' range is offset, too and the Safety Limiter can be overrun in manual mode.

8 Control Mode

The firing-rate controller endeavours to bring the actual value into line with the setpoint value. In so doing, a direct correlation is assumed between the internal firing-rate and the boiler temperature, i.e. the greater the internal firing-rate, the faster the boiler temperature rises. Should the curves be programmed differently, the firing-rate controller will not function.
Four parameters determine the control action.

- **Adjustment time**
  The adjustment time determines at what intervals the deviation is checked and the new adjustment is determined.
- **P term**
  The proportional term acts directly on the deviation, that is the difference between setpoint value and actual value.
  P > → higher step response
- **I term**
  The integral term is calculated from the instantaneous deviation and the previous deviation from the setpoint value.
  I > → faster approximation to the setpoint
  danger of overshooting!
- **D term**
  The difference term is calculated from the variation of the actual values. It has acceleration and respectively slowing effects.

In practice the adjustment of the PID-controller orients itself on the given controlled system. With the characteristics of the controlled system you try to deduce acceptable data, i.e. the values are defined experimentally

- P term, I term, D term are added together and act as adjustment on the load default for the compound control unit. The value is added up, starting from the instantaneous internal load.
- As long as the actual value is below the setpoint, P term and I term are positive, that is to say both these term will increase the load default.
- Only the D term is negative in such a case (assuming that the boiler temperature is rising). Use the D factor sparingly because it leads to a higher burden of the actuators.
- In order to avoid excessive overshoot during burner start-up, the parameters should be adjusted to achieve a suitably large D-term.
- If, despite a large setpoint deviation, the burner is not run at full load or base load, the P term should be increased.
- The longer the adjustment time, the quieter the group. However, this also increases the actual value's deviation from the set-point value and leads to slower adjustment.

	Hot Water Installations		Steam Boiler Installations
P term	120	280	600
I term	60	360	300
D term	20	50	25
Adjustment time	15	2	20

8 Control Mode

8.1 Aides for Setting

Characteristic	Control Process	Control Mode	Start-up Procedure
P term higher	decrease of attenuation	stronger reaction with overshoot	faster start-up with overshoot
P term smaller	increase of attenuation	less reaction, less tendency to oscillate	slower startup

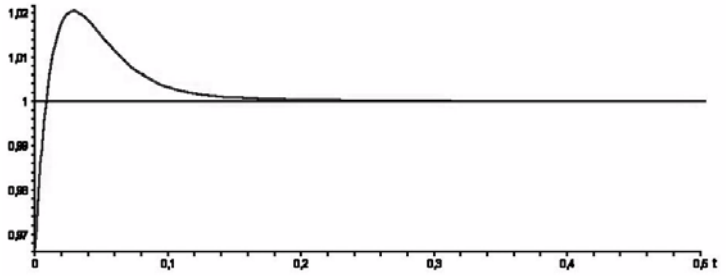


Fig. 8-1 controller operation with P-term too high

Characteristic	Control Process	Control Mode	Start-up Procedure
I term higher	decrease of attenuation	stronger reaction with tendency to oscillate	faster start-up with tendency to oscillate
I term smaller	increase of attenuation	less reaction, less tendency to oscillate	slower start-up

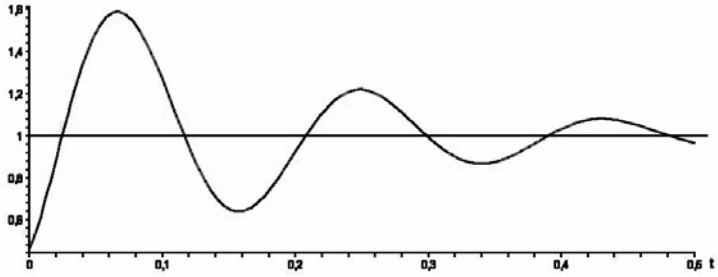


Fig. 8-2 controller operation with I-term too high

Characteristic	Control Process	Control Mode	Start-up Procedure
D term higher	decrease of attenuation	stronger reaction	slower start-up, earlier decrease of power
D term smaller	increase of attenuation	less reaction	faster start-up, decrease of power later

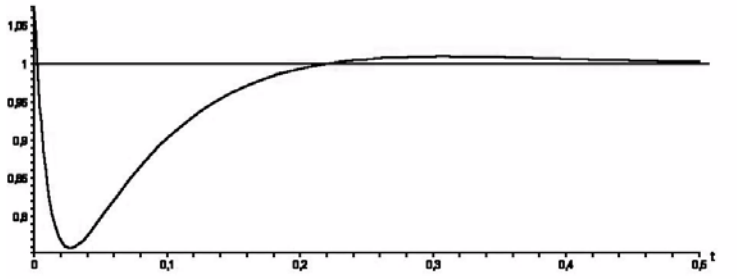


Fig. 8-3 controller operation with D-term too high

8.2 Leakage test

The leakage test checks whether the main gas valves are leak-tight. The supply gas pressure is used for this purpose. Since the leakage test line (space between the two main valves) burns empty in the event of a shut-off, this part is normally without pressure when starting (gas pressure > min. = 0). The ETAMATIC checks this. Main gas 1 is then opened shortly and gas flows into the test line (gas pressure > min. changes from 0 to 1). This pressure must then subsist for 30 seconds. The leakage test is then deemed to be completed.

If the leakage test line is not empty at the start (e.g. as a result of a previous fault shut-down), main gas valve 2 opens first. The leakage test line is vented (into the combustion chamber or over the roof, depending on the system; for suggested circuit, see Appendix). It is checked, whether the line remains pressureless for 30 seconds. Otherwise the procedure is, as described previously.

The leakage test is performed before ignition.

The pressure monitor for the leakage test line must be connected to "Gas pressure >min" input (terminal 47). It also monitors the minimum pressure during operation. If another minimum pressure should to be monitored during operation, the pressure monitor is, to be looped into the gas safety interlock circuit, for this purpose.

However, the test line must be designed to ensure that the test time of 30 seconds per valve is sufficient for reliable detection of a 0.1% leak of the fuel gas consumed at maximum combustion heat output, but at least 50 dm^3/h.

8.2.1 Leakage test flow chart

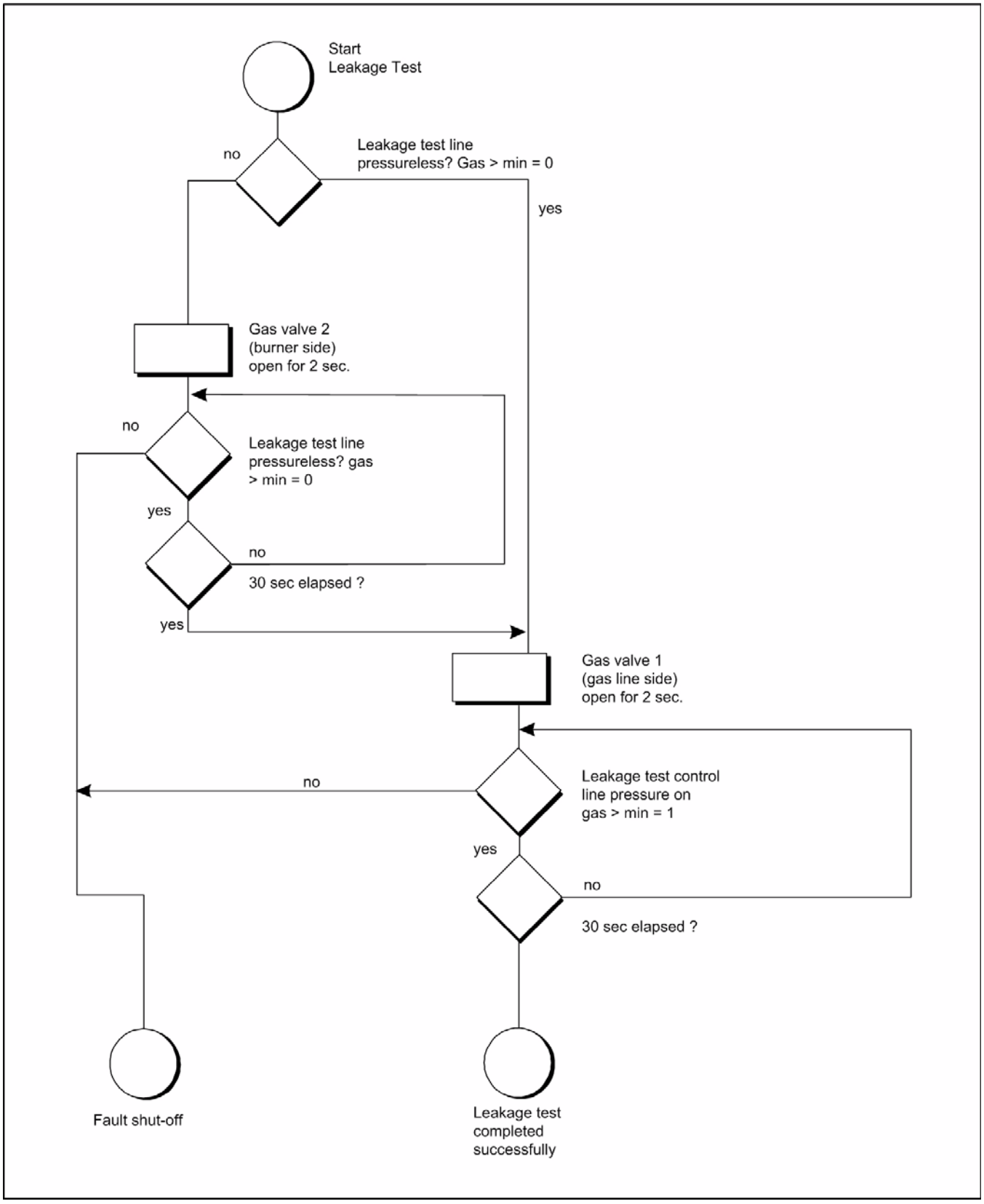


Fig. 8-4 Flow chart leakage test

8.2.2 Calculation example

An (approximate) formula for calculating the leakage test monitoring facility is summarised below:

Definitions:	GDW:	gas pressure monitor
	V1:	gas-side safety shut-off device
	V2:	burner-side safety shut-off device
	P_B	barometric air pressure <1000 mbar
	P_{SU}	lower GDW switching point (falling)
	P_{SO}	upper GDW switching point (rising)
	$DP = P_{SO} - P_B$	GDW switching difference
	PG	gas flow pressure (supply pressure before V1)
	V_P	volume of gas line tested
	V_L	leakage quantity
	V_{Lmax}	maximum admissible leakage quantity (limit value)
	t_P	testing time (30 seconds, fixed)

That is, for a maximum gas flow rate of 50 m3/h the formula is:

$$\frac{V_P}{t_P} \cdot \frac{\Delta p}{P_B} \leq 50\,[dm^3/h] \Rightarrow \frac{V_P}{30\,[s]} \cdot \frac{\Delta p}{1000\,[mbar]} \leq 30[dm^3/h];$$

$$V_P \Rightarrow \leq \frac{416}{\Delta p}[dm^3]$$

Insert the numerical value in mbar for Δ P.

The formula for a gas rate of flow Q of >50 m3/h is:

$$V_P \leq \frac{Q}{0{,}125\Delta p}[dm^3]$$

The numerical value is to be inserted in m^3/h or Q and in mbar for.

A. Assuming: Δp = 20 mbar, gas flow rate < 50 m^3/h

$$V_P \Rightarrow \leq \frac{416}{\Delta p}[dm^3] \Rightarrow V_P \leq 20{,}8\,[dm^3]$$

i.e. the gas line you want to test should not exceed 20,8 dm^3, for being able to detect the required leakage quantity.

B. Assuming: Δp = 20 mbar, gas flow rate < 200 m^3/h;

$$V_P \Rightarrow \leq \frac{200}{0{,}12 \cdot 20}[dm^3] \Rightarrow V_P \leq 83{,}3\,[dm^3]$$

i.e. the gas line you want to test should not exceed 83,3 dm, for binge able to detect the required leakage quantity of 200 dm^3/h.

8.2.3 Standby

Standby mode

In this mode the ETAMATIC enables a switchback to ignition burner mode. The burner re-starts without pre-ventilation.

You can activate „standby mode“, if the internal firing-rate controller is active or if an external input or output command can be connected to LSB module or fieldbus (see parameter 812, level 4).

As soon as the burner firing-rate controller detects that a shutdown of the burner would be necessary, it closes the contact at the LSB or the appropriate bit will be set to high via field bus. This doesn’t lead to a shut down as it was up to now. Stand-by mode will be activated instead.

The stand-by mode drives the load value to ignition point and waits for ignition acknowledgement. Ignition valve and ignition transformer are switched on first. The recirculation channels run to CLOSE position. Ignition position has to be active. After an idle time (stabilisation time) the valve gas 1 (if fuel = gas) is closed for purging the gas system.

Afterwards all fuel valves but the ignition valve stay closed. If you have set the performing of a leakage test after operation at fuel gas, it will be started now.

Afterwards the ignition transformer will be shut off. Only the ignition valve will remain open.

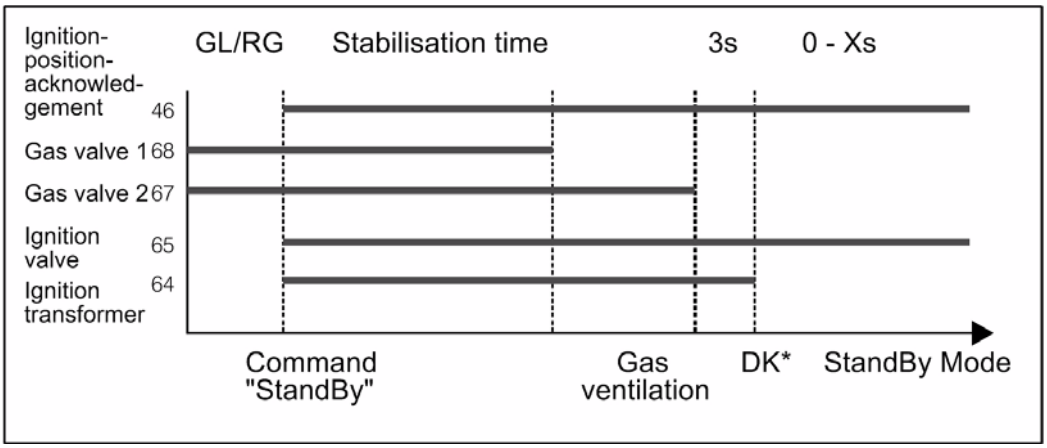


Fig. 8-5 Sequence at gas operation

*DK = Leakage test after operation. During that time the ignition transformer is active.

Specification of the burner sequencer function "Standby Mode"

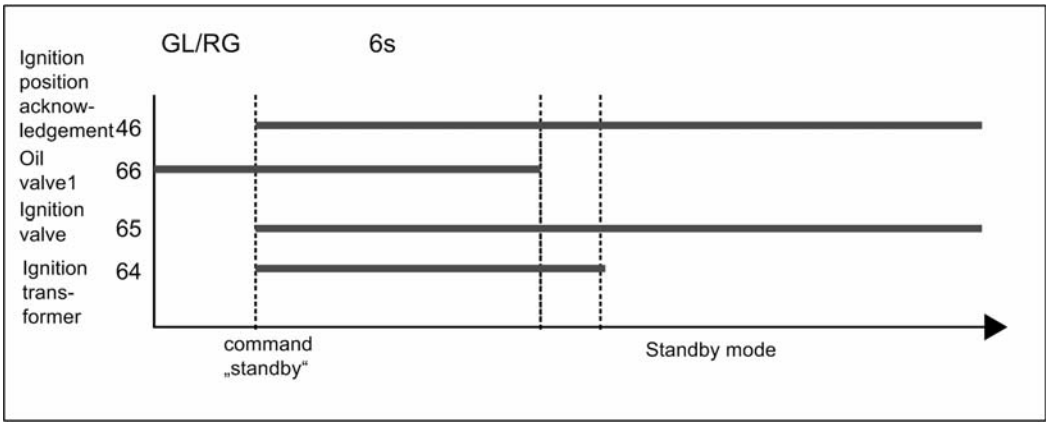


Fig. 8-6 Sequence at oil operation

The sequencer is now in stand-by mode with active ignition flame. Ignition position acknowledgement must apply all the time.

As soon as one of the following incidences happen, the parameterised ignition sequence of the fuel is executed without switching on the ignition transformer:

– boiler pressure or boiler temperature have lapsed to that point, where the burner would start again (with internal firing-rate controller)
– as soon as the LSB contact (terminal 1) opens again
– as soon as the command is transferred via fieldbus

This may occur after leakage test, before operation, with fuel gas and without the transformer leading time (analogue changing via pilot burner → ignite the new fuel)

WARNING!

At combustion plants with just one flame detector, you have to ensure, that the main flame is always ignited by the pilot flame. Otherwise You have to use one flame detector for the main flame and one for the pilot flame.

If the "Burner on" signal will be removed during stand-by mode, the ETAMATIC switches off. This shut-off proceeds like a shut-off out of the mode base load/control mode with all it’s parameterised procedures.

In oil operation the output for the oil pump stays active.

LSB module address 31 input 1

WARNING!

Since it's not sure how long the standby mode applies, a separate ignition flame monitoring must be approved for continuous operation, or main flame and ignition flame will be monitored together with one flame scanner, approved for continuous operation.

Switching in standby via LSB module

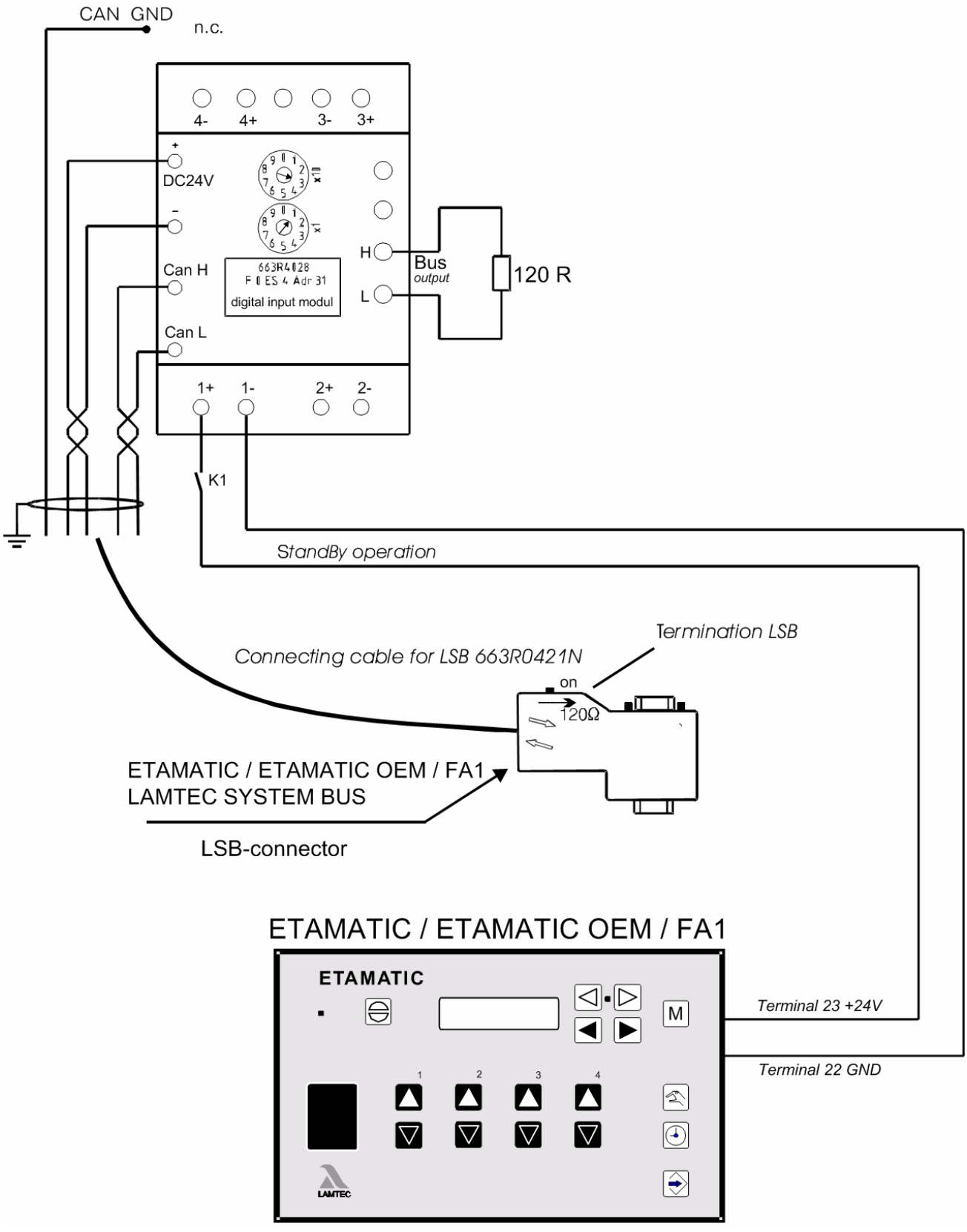


Fig. 8-7 Switching in Standby mode via LSB module

9 Appendix

9.1 Mode Abbreviations Used

Display is set to actual value / status

Short text		Description
BE	→	"Ready" (signal on terminal 58)
ZÜ	→	"Ignition position" or ignition
EZ	→	"Setting/Ignition position" (as "Ignition", but ETAMATIC on "Set")
GL	→	"Base load"
EG	→	"Setting/Base load" (as "Base Load", but ETAMATIC on "Set")
NA	→	"Post-ventilation"
AU	→	"Burner Off" (no signal present)
EL	→	"Setting"
SL	→	"Clear memory"
EV	→	"Setting/Pre-ventilation" (as "Pre- ventilation", but ETAMATIC on "Set")
ES	→	"Setting/Control"(as "Automatic", but ETAMATIC on "Set")
ST	→	"Fault"
VO	→	"Pre-ventilation"
HA or Hand	→	"Manual mode" (burner output may be adjusted manually)
no display	→	Burner set to automatic in operation
LE	→	external firing-rate (firing-rate controller is disabled by digital input)

9 Appendix

9.2 Flame Monitoring

9.2.1 Integral flame monitoring (option)

Purpose

The integral flame monitoring system is primarily used for standard applications (e.g. oil or gas flames at a burner in a combustion chamber) because of it's limited adjustment possibilities.

NOTICE!

We recommend the LAMTEC flame monitoring systems (like F 200 K 2 or f 250 with FFS 05 or FFS 06), if you have other requirements for the flame monitoring (e.g. combustion of coal dust). You will find information on this devices in the corresponding manuals (DLT7600, and DLT7502 / DLT 7503).

The task of the flame monitoring device is to scan the burner's flame in combustion plants unaffected from any condition in the combustion chamber (e.g. glowing nogging) and to release the closing of the fuel valves at a flame blow out with an internal control command of the burner control system.

The flame monitoring device has the following tasks:

– Scanning the burner flame unaffected of the conditions in the combustion chamber (e.g. glowing nogging)
– internal release of the control command to close the fuel valves at a flame blow out with the burner control system

You may connect the following LAMTEC flame sensors:

FFS 06, FFS 05 UV, FFS 06, FFS 06 UV (with the following sub-types FFS 05, FFS 05 UV in version for Ex zone 1 or Ex zone 2).

Characteristics flame sensor

Input variables - optical flame sensor

Required input values from the flame's emitted radiation indication "Flame present"

– Spectral radiation region = 260.....400nm (FFS 05 UV-1/ FFS 06 UV-1)
– Spectral radiation region = 210.....380 nm (FFS 05 UV-2 FFS 06 UV-2)
– Spectral radiation region = 850....1200 nm (FFS 05-1)
– Spectral radiation region = 1200....2800 nm (FFS 05, FFS06, FFS 05-T, FFS 06-T)
– Pulse frequency ca. 10...200 Hz
– Pulse amplitude $\geq$ 10mV

Self Monitoring

– Signal processing with two separately constructed and alternately activated transmission channels.
– Continuous comparison of the output levels for anticoincidence.

The transmission range of the digital frequency analysis covers signal transmittance between 10Hz or 25Hz (factory configuration) and 200 Hz.

Mains frequency signals and their harmonics are filtered, with a filter bandwidth of 3 Hz.

9 Appendix

Setting of the sensitivity of the flame scanner FFS 06 and FFS 05 (IR,UV)

Adjust sensitivity with switch S1 and S2. You will find the switches after opening the scanner's housing.

WARNING!

Do not open FFS 06 UV!

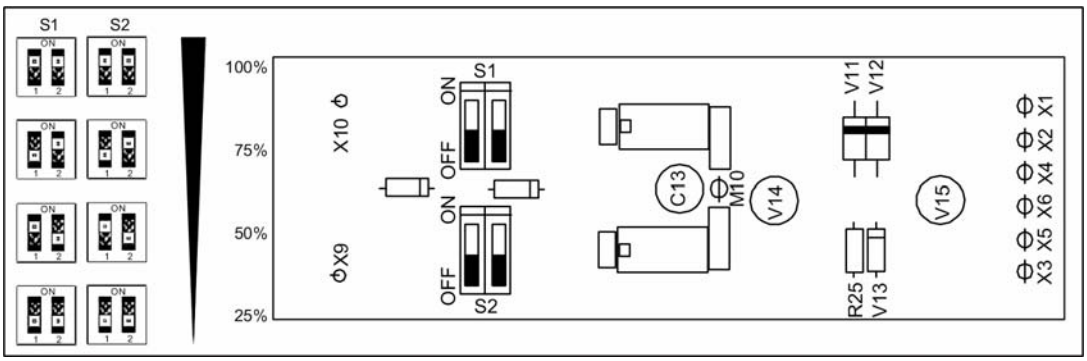


Fig. 9-1 FFS 05 Adjusting the flame sensitivity - factory settings IR 50% UV 100%

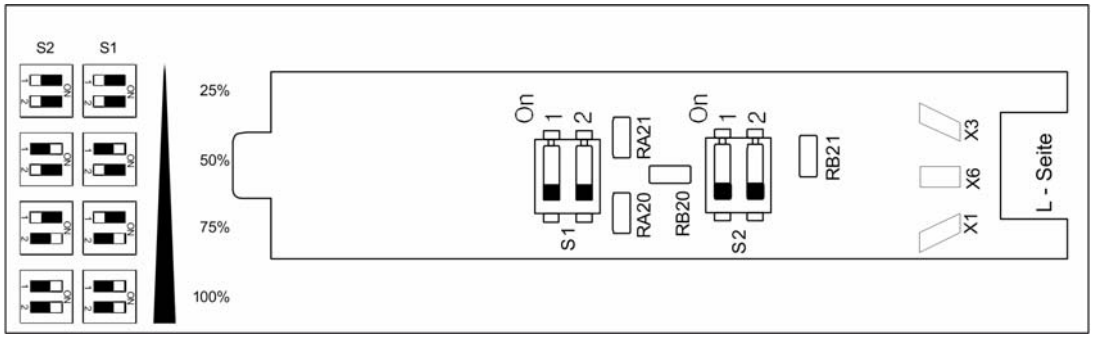


Fig. 9-2 FFS06 There is no sensitivity switch for flame scanner type FFS 06-UV

9.2.2 General Information of the Optical Flame Monitoring

Notes on assembly and installation

The processes that occur during combustion give rise, inter alia, to a pulsing component of the flame's radiation (flame flickering), whose oscillations (flame frequency) are relatively rapid at the flame's root (i.e. near the burner's mouth) and become slower toward is tip.

For individual monitoring, the flame sensor should be aligned in that way, that the first third of the flame is observed.

The flame sensor's correct alignment is essential for achieving a high degree of availability and/or selectivity.

WARNING!

We recommend to lay the supply cable, including their extension, on separate cable trays to keep mains and control lines as well as high-energy power lines and equipment separated from each other (e.g. ignition lines, ignition transformer, electrical motors, contactors). Moreover, avoid any parallel cable routing together with mains cables in trays

9.2.3 Optical flame sensors

Switching to Display the Flame Intensity

FFS 05, FFS 05 UV, FFS 06, FFS 06 UV (with following sub-types; FFS05, FFS05 UV designed for ex-zone 1 or ex-zone 2 as well)

The sensor's circuit components are located on PCBs in a cylindrical housing with a spray-proof, axial optical aperture.

The sensor meets the requirements of protection class IP 65.

Optical flame sensor FFS 06/FFS06-UV (standard for ETAMATIC)

The sensor's circuit components are located on PCBs in a cylindrical housing with a spray-proof, lateral optical aperture. The sensor meets the requirements of protection class IP 65.

The computing circuit for all sensor types is located in the ETAMATIC.

Cabling from the sensor to the ETAMATIC is 5-pole, static-screened with the sensor housing's potential (operating earth connection), a sixth cable is for measuring the flame signal during commisioning.

WARNING!

If the ETAMATIC is used with an integral flame monitor, terminal 53 may not be connected to any other components

Optical flame sensor FFS 05 … ; FFS 06

The optical flame sensors are supplied together with a connecting cable of ca. 2 m length. The line between the sensor and the flame monitoring unit may be extended up to a distance of 500 m. For implementing an on-site extension we recommend a separate screened, five-wire extension cable that can be connected to the sensor cable via an FG 24 (with ex-applications) or FG 21 connector box, e.g.

cable type: LiYCY (blue, red, green, yellow, white) 5 x 1 x 0.5 mm^2 (AWG 20)

WARNING!

If the option "integral flame monitoring" is deactivated subsequently in the ETAMATIC (e.g. an external flame monitoring should be used), up to base version 4.0 the automatic flame guard plug-in card has to be removed from the ETAMATIC, from base version 5.0 on the bridge 450 (beside the 96-pole plug) has to be switched.

The cable's screening may not be used as a low-frequency carrying operational link. The sensors should be so mounted at the inspection aperture, that the burner's flame is properly visible across the entire combustion facility's "operating range”. For selective monitoring, the inspection aperture should be so placed that the sensor covers the monitored flame's root (near the burner's mouth). Attention should be paid to the fact that with extended tube collars the part of the flame, which is covered by the sensor, becomes restricted. If necessary, the inspection aperture should be sealed with a suitable protective glass sheet.

9.3 Avoiding EMC Effects

The proper installation normally prevents from the EMC-adverse effects. In exceptional cases it may be necessary by not traceable and /or not removable sources of interference to find an adequate grounding point for the shielding.

1 In exceptional cases it is possible, that through the protected earth an interference level is injected into the shielding. Unmotivated fault shut-downs (especially with low wanted sig-

nal) or temporary extraneous light may occur. In this cases the following may help beside the fault clearance of the protected earth.

- a disconnection of the flame sensor shielding from the protective earth terminal at the ETAMATIC and the connection with the GND of the flame sensor (terminals 22 or 44)
- In rarely cases the shielding may be disconnected like described in section a) and the sensor housing may be grounded at the burner plate.

2 Adverse effects through coupling into the laid cable may be eliminated normally only with the correct laying and in some cases with an adequate grounding point.

3 Adverse effects straight to the flame sensor may be suppressed with the reduction of the sensitivity when there is a sufficient flame signal.

9 Appendix

9.4 Error Codes

A * means, that a reset is valid in this error. A blinking error LED signalises, that the system will be restarted within a short time.
A ** means, the system tries to restart without a limit.

Fault Code:	TRD P425=0 P836>1	EN676 P425=2 P836>1	Description 21.1.11
S000	0	0	No fault code available for this fault
S001	0	3	No pilot flame appearing
S002	0	0	light/dark check failure
S003	0	3	Flame fault during ignition
S004	1	1	Flame fault during operation
S005	0	3	Flame signal does not appear during 1sr safety time
S006	0	3	Flame signal goes out during stabilising time
S007	0	3	Flame signal goes out during 1st safety time
S008	0	0	Flame signal goes out during 2nd safety time
S009	0	0	Flame signal does not appear during safety time
S010	0	0	Flame signal goes out immediately after ignition
S011	0	0	Internal fault: 5 sec. outside light monitoring period not kept
S012	0	0	relay module not connected or missing 24V supply for relay
S013	1	3	main flame signals appears during ignition
S102	0	0	Internal fault: Internal communication fifo has overflowed
S103	0	0	Internal fault: Error in misc. data
S104	0	0	Internal Fault: D/A-Converter faulty
S105	>88	3	Curve data faulty! Curve set no.:
S106	0	0	parameters not equal for parameter no.:
S107	0	0	Invalid configuration
S108	0	0	Different input signals on main processor and monitoring processor terminal-
S110	0	0	CRC-16 test had found an error
S111	0	0	RAM-Test detected error
S112	0	0	Etamatic selftest exceeds timeout limit
S120	1	1	Different operating modes for mon. and main processor
S121	0	0	Correction is outside permissible range. Channel : 1
S122	0	0	Correction is outside permissible range. Channel : 2
S123	0	0	Correction is outside permissible range. Channel : 3
S124	0	0	Correction is outside permissible range. Channel : 4
S125	0	0	Correction is outside permissible range. Channel : 5
S139	0	0	Integr. Flame Detector: selftest fault
S140	0	0	EEProm is faulty.
S141	0	0	Potentiometer faulty, feedback changing too quickly: channel 1
S142	0	0	Potentiometer faulty, feedback changing too quickly: channel 2

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Fault Code:	TRD P425=0 P836>1	EN676 P425=2 P836>1	Description 21.1.11
S143	0	0	Potentiometer faulty, feedback changing too quickly: channel 3
S144	0	0	Potentiometer faulty, feedback changing too quickly: channel 4
S145	0	0	Potentiometer faulty, feedback changing too quickly: channel 5
S151	>88	3	Reci damper deactivated, out of time in reaching CLOSED position, channel:1
S152	>88	3	the same as P 151, but channel: 2
S153	>88	3	the same as P 151, but channel: 3
S154	>88	3	the same as P 151, but channel: 4
S155	>88	3	the same as P 151, but channel: 5
S161	>88	3	Monitoring direction of ratation: channel 1
S162	>88	3	Monitoring direction of ratation: channel 2
S163	>88	3	Monitoring direction of ratation: channel 3
S165	>88	3	Monitoring direction of ratation: channel 5
S171	>88	3	Dead band over range too long: channel 1
S172	>88	3	Dead band over range too long: channel 2
S173	>88	3	Dead band over range too long: channel 3
S174	>88	3	Dead band over range too long: channel 4
S175	>88	3	Dead band over range too long: channel 5
S181	>88	3	Dead band under range too long: channel1
S182	>88	3	Dead band under range too long: channel 2
S183	>88	3	Dead band under range too long: channel 3
S184	>88	3	Dead band under range too long: channel 4
S185	>88	3	Dead band under range too long: channel 5
S191	1	1	Dead band under range too long: channel
S192	1	1	1st monitoring band over range too long. Channel: 2
S193	1	1	1st monitoring band over range too long. Channel: 3
S194	1	1	1st monitoring band over range too long. Channel: 4
S195	1	1	1st monitoring band over range too long. Channel: 5
S201	1	1	1st monitoring band under range too long. Channel: 1
S202	1	1	1st monitoring band under range too long. Channel: 2
S203	1	1	1st monitoring band under range too long. Channel: 3
S204	1	1	1st monitoring band under range too long. Channel: 4
S205	1	1	1st monitoring band under range too long. Channel: 5
S211	0	0	2nd monitoring band over range too long. Channel: 1
S212	0	0	2nd monitoring band over range too long. Channel: 2
S213	0	0	2nd monitoring band over range too long. Channel: 3
S214	0	0	2nd monitoring band over range too long. Channel: 4
S215	0	0	2nd monitoring band over range too long. Channel: 5
S221	0	0	2nd monitoring band under range too long. Channel: 1
S222	0	0	2nd monitoring band under range too long. Channel: 2
S223	0	0	2nd monitoring band under range too long. Channel: 3
S224	0	0	2nd monitoring band under range too long. Channel: 4
S225	0	0	2nd monitoring band under range too long. Channel: 5
S231	>88	3	Compound blocked: channel 1

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Fault Code:	TRD P425=0 P836>1	EN676 P425=2 P836>1	Description 21.1.11
S232	>88	3	Compound blocked: channel 2
S233	>88	3	Compound blocked: channel 3
S234	>88	3	Compound blocked: channel 4
S235	>88	3	Compound blocked: channel 5
S301	1	1	Broken wire at load input -1
S302	1	1	Broken wire at load input-2
S320	1	1	Broken wire at correction input
S321	1	1	Broken wire at feedback channel 1
S322	1	1	Broken wire at feedback channel 2
S323	1	1	Broken wire at feedback channel 3
S324	1	1	Broken wire at feedback channel 4
S325	1	1	Broken wire at feedback channel 5
S351	1	1	Different status of ignition position relay
S352	>88	3	Invalid curve selection (no signals)
S353	>88	3	Invalid curve selection (several signals)
S360	0	0	Shut down from O_2controller(1) or CO controller(2) :
S361	1	1	Different status of ignition position relay
S362	0	0	carry out burner servicing
S363	1	1	permissible O_2 value was fallen below
S370	0	0	Internal communication between the processors faulty
S371	0	0	Output for internal load faulty
S372	0	0	Deviation between main processor and monitoring processor load values too great.
S381	0	0	Deviation between main processor and monitoring processor too great: correction channel 1
S382	0	0	Deviation between main processor and monitoring processor too great: correction channel 2
S391	0	0	Curves sentence does not fit to the chosen fuel.
S392	0	0	Remote not responding (time-out)
S393	0	0	Remote shut down triggered.
S394	0	0	BURNER-ON/OFF Remote signal missing.
S400	0	0	Different point number at programming
S451	1	1	Ignition position was left in ignition mode. Channel: 1
S452	1	1	Ignition position was left in ignition mode. Channel: 2
S453	1	1	Ignition position was left in ignition mode. Channel: 3
S454	1	1	Ignition position was left in ignition mode. Channel: 4
S455	1	1	Ignition position was left in ignition mode. Channel: 5
S500	0	0	Internal comparison: relay out terminal 67 not picking up.
S501	0	0	Internal comparison: relay out terminal 43 or 68 (Etamatic) not picking up.
S502	0	0	Internal comparison: relay out terminal 16 or 65 (Etamatic) not picking up.
S503	0	0	Internal comparison: relay out terminal 11 or 66 (Etamatic) not picking up.
S504	0	0	Internal comparison: relay out terminal 45 not picking up.
S505	0	0	Internal comparison: relay out terminal 68 or 61 (Etamatic) not picking up.

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Fault Code:	TRD P425=0 P836>1	EN676 P425=2 P836>1	Description 21.1.11
S506	0	0	Internal comparison: relay out terminal 36 (ETAMATIC K202) not picking up.
S507	0	0	Internal comparison: relay out terminal 41 not picking up.
S508	0	0	Internal comparison: relay out terminal 76 not picking up.
S509	0	0	Internal comparison: Output K203 not picking up.
S510	0	0	Internal comparison: Output K201 not picking up.
S520	0	0	Internal comparison: relay output terminal 67 not dropping out.
S521	0	0	Internal comparison: relay output terminal 43 or 68 (Etamatic) not dropping out.
S522	0	0	Internal comparison: relay output terminal 16 or 65 (Etamatic) not dropping out.
S523	0	0	Internal comparison: relay output terminal 11 or 66 (Etamatic) not dropping out.
S524	0	0	Internal comparison: relay output terminal 45 not dropping out.
S525	0	0	Internal comparison: relay output terminal 68 or 61 (Etamatic) not dropping out.
S526	0	0	Internal comparison: relay output terminal 36 not dropping out.
S527	0	0	Internal comparison: relay output terminal 41 not dropping out.
S528	0	0	Internal comparison: relay output terminal 76 not dropping out.
S529	0	0	Internal comparison: Output K203 not dropping out.
S530	0	0	Internal comparison: Output K201 not dropping out.
S540	0	0	TRIAC selftest : optical couplers are not OFF
S541	0	0	TRIAC selftest : all TRIACS are not supplied with voltage!
S542	0	0	TRIAC selftest : main gas 1 is currentless
S543	0	0	TRIAC selftest: main gas 2 is currentless
S544	0	0	TRIAC selftest : oil pump is currentless
S545	0	0	TRIAC selftest : oil valve is currentless
S546	0	0	TRIAC selftest : Ignition transformer is currentless
S547	0	0	TRIAC selftest : ignition valve is currentless
S550	0	0	Oil fuel blocked because a required solenoid valve is not connected
S551	0	0	Gas fuel blocked because a required solenoid valve is not connected
S552	0	0	No valve connected? Check fuse F3 and F4
S600	0	0	Program check time of sequencer expired.
S601	0	0	Leak check fault: gas pressure still applied.
S602	0	0	Leak check fault: gas pressure missing.
S603	0	0	Vent gas line manually.
S604	0	0	Flame signal not arriving in time.
S605	>88	3	Oil pressure < min !!!
S606	1	1	Gas > min appears in oil operation.
S607	1	1	Ignition position acknowledgement dropping.
S608	0	0	Boiler safety chain dropping.
S609	1	1	Gas safety chain dropping.
S610	>88	3	Oil safety chain dropping.

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Fault Code:	TRD P425=0 P836>1	EN676 P425=2 P836>1	Description 21.1.11
S611	>88	3	Gas pressure too low
S612	1	0	Gas pressure too high.
S613	0	0	Air pressure signal missing.
S614	1	1	F.A. safety interl. chain gets OFF
S615	0	0	Flame is blown away during blow out of oil lance
S616	1	1	Ignition flame goes out in standby operation
S617	1	1	Continuous ignition flame goes out under operation
S618	0	0	Oil circulation: Temperature does not rise up within 45 sec.
S620	0	0	Oil lance blow out: Delay for opening not kept
S621	0	0	Oil lance blow out: Oil valve actuator not in ignition position
S622	0	0	Oil lance blow out: blow out period too long
S623	0	0	Atomizer switch-ON-pre-period not kept
S624	>88	3	Oil pressure too low
S625	>88	3	Oil pressure too high
S626	>88	3	Atomizer air pressure too low
S627	>88	3	General safety chain missing
S700	0	0	Pre-ventilating signal present, without signal on terminal 2.
S701	0	0	Flame signal present, without signal on terminal 2.
S702	0	0	Flame signal appears during pre-ventilating.
S703	0	0	Flame signal goes out even though signal on terminal 2 still present.
S711	0	0	Illegal operating mode change
S712	0	0	""
S713	0	0	Incorrect signal combination in operating mode AU
S714	0	0	Incorrect signal combination in operating mode BE
S715	0	0	Incorrect signal combination in operating mode VO
S716	0	0	Incorrect signal combination in operating mode ZP
S717	0	0	Incorrect signal combination in operating mode ZU
S718	0	0	""
S719	0	0	Fuel valves open too long without flame
S720	0	0	Ignition transformer switched on too long
S721	0	0	Ignition valve open too long
S722	0	0	Fuel valves open in maintenance mode
S723	0	0	Ignition process taking too long
S724	0	0	Gas valves open when burning oil
S725	0	0	Oil valves open when burning gas
S726	0	0	Main gas 2 open without main gas 1
S727	0	0	Main gas 1 illegally open
S728	0	0	Main gas valves and ignition valve open too long
S729	0	0	Ignition process taking too long (without pilot burner)
S730	0	0	Maintenance mode without pilot burner
S731	0	0	Ignition valve open without pilot burner
S732	0	0	Incorrect signal combination during operation
S733	0	0	Incorrect signal combination after operation

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Fault Code:	TRD P425=0 P836>1	EN676 P425=2 P836>1	Description 21.1.11
S734	0	0	Pre-ventilating time not complied with
S735	0	0	Fuel safety chain missing
S736	0	0	Leak check: both gas valves open
S737	0	0	Leak check: main gas 2 delayed too long when switching off.
S738	0	0	Leak check: main gas 2 missing
S739	0	0	Leak check: main gas 2 open too long.
S740	0	0	Leak check: main gas 1 leaking
S741	0	0	Leak check: main gas 1 open too long
S742	0	0	Leak check: main gas 2 leaking
S743	0	0	Flame monitoring: flame after-burn too long
S744	0	0	Flame monitoring: flame on again
S745	0	0	Program check time exceeded.
S747	0	0	Leak check: ventilating into boiler not allowed
S750	0	0	Shut-down on faults via bus.
S751	>88	3	No data transfer via the bus (time-out).
S759	0	0	Operating mode adjustment did exceed the time limit of 24 hrs
S760	0	0	Change of curve selection during setting not allowed
S761	0	0	Change of curve lasts too long
S763	0	0	different curve selection between the processors
S764	1	1	CO-Controller, internal fault no. -
S765	0	0	Parameter setting error: The channel for solo-fuel is not to determine.
S766	0	0	The limited load (maximum load without additional-fuel) does not exists in the priority curves
S767	0	0	One parameter of the interpolation type for non-fuels is invalid
S769	0	0	Ignition while mixed fuel operation or burner-start with solo fuel-A
S770	0	0	Fill-Time for fuel-A too long
S791	>88	3	Bus master is in a stop.
S792	>88	3	Bus data length incorrectly configured.
S793	>88	3	Bus master is decoupled.
S800	0	0	Error in parameters, for parameter no.:
S888	0	0	Fault block activated !
S889	0	0	Remote-fault-reset happens within a too short distance
S900	0	0	Error in self-test sequencer.
S901	0	0	Terminal 10 + 24 Volt switch-off faulty.
S902	0	0	Error in over-voltage self-test.
S903	0	0	Error in optical coupler self-test terminal -
S904	1	1	Error in reference of load
S905	1	1	Error in reference element of main processor
S906	1	1	Error in reference element of monitoring processor
S907	1	1	Curve set adjustment via LAMTEC SYSTEM BUS, selftest recognizes fault
S911	1	1	Error in reference, channel: 1

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Fault Code:	TRD P425=0 P836>1	EN676 P425=2 P836>1	Description 21.1.11
S912	1	1	Error in reference, channel: 2
S913	1	1	Error in reference, channel: 3
S914	1	1	Error in reference, channel: 4
S915	1	1	Error in reference, channel: 5
S921	0	0	Relay driver self-test : output terminal 11 or 66 (Etamatic) faulty.
S922	0	0	Relay driver self-test : output terminal 16 or 65 (Etamatic) faulty.
S923	0	0	Relay driver self-test : output terminal 43 or 68 (Etamatic) faulty.
S924	0	0	Relay driver self-test : output terminal 67 faulty
S925	0	0	Relay driver self-test : output terminal 45 faulty.
S926	0	0	Relay driver self-test : output terminal 68 or 61 (Etamatic) faulty.
S927	0	0	Relay driver self-test : output terminal 36 (ETAMATIC K202) faulty.
S929	0	0	Relay driver self-test : output terminal 76 faulty
S930	0	0	Relay driver self-test : Output K203 defect.
S931	0	0	Relay driver self-test : Output K201 defect.
S997	>88	3	Default language missing or LANGUAGE-FLASH defect
S998	0	0	Internal fault: main loop is too slow.
S999	0	0	Internal fault Number -

9 Appendix

9.5 Aides

A13
Fault 105

During the check of the redundant curves an error was identified.

If data were provided via PC interface:
Enter curve data again for the corresponding curve set

if this is not possible:
select appropriate curve set
Clear memory
Re-enter curve

A 14
Fault 106

In checking the redundant parameters an error was identified

If data were provided via computer interface:
Read in parameter again

if this is not possible:
select the parameter
check displayed value and if necessary modify it

In order to restore the parameter, a change must be made. If the correct value is displayed, change it for one digit and change it back again.

If several parameters are defective, repeat as necessary.

If the parameter is not included in your release level, you must request an EEPROM from LAMTEC

A20
Fault 370

The internal communication is not functioning.

Voltage off and back on

After changing EPROM:

Check whether the monitoring program EPROM is correctly inserted

otherwise:
Change processor card.

A21
Fault 901, 904, 905, 906, 911, 912, 913, 914, 915

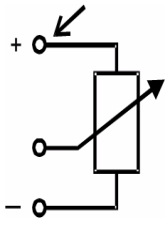
After changing a potentiometer, the reference must be entered again.

Voltage levels are checked in the device. These can give rise to false errors as a result of incorrect external wiring.

Check wiring

In the case of analog inputs the reference element serves for voltage supply to the potentiometers.

reference voltage



external contact at connector loop is possibly inverted,

in the case of fault 904, 911 915, in particular, check the corresponding reference, In the unloaded condition (terminal open) it is 2.4 V. With potentiometer connected somewhat lower, depending on the resistance of the potentiometer. Though the reference voltage has to apply stably, if you adjust the potentiometer across the whole range.
Enter the reference value with a new connected potentiometer.

Enter password and press 14

Press 13 → new reference value is stored

A23
Fault 116, 400

The monitoring processor and the main processor may not have precisely the same load rating, so that one has the old point overwritten, whilst the other has a new point added.

This is possible particularly where the load ratings of the individual points lie close together.

Re-enter curve

A24
Storing 120

Different operating modes on main and monitoring processors. The digital input signals are detected at slightly different times on main processor and monitoring processor.

A signal change occurs only for such a short instant that the main processor detects it but the monitoring processor does not.

Check signal sequence

A 25

At oil flames: decrease flame scanner intensity (see chapter 9.2.1 Integral flame monitoring (option))

A26

The ETAMATIC uses a test-current for testing the fail safe outputs. This current must flow through connected loads (valves etc).

Check, that the current can flow. If not use a RC combination from the output terminal to neutral.

Check fuses.

B4
Fault 171...175, 181...185

Although the control element is in the monitoring band it does not reach the dead band.

Increase pulse length for the channel (P 730 to P 734)
or
limit switch is too close to the programmed top or bottom point.

Adjust limit switch

NOTICE!

After adjusting the limit switch the ETAMATIC must read in the range limits again

B5
Fault 211...215, 221...225

2nd monitoring band fault appears sporadically during operation.

Cause:
Motor is possibly running in wrong direction.
This may happen on capacitor motors if:
- the capacitor is defective
- there is a broken wire in the motor or in the lead

E13
Fault 141...145

Only with three-point step control output.

The feedback values vary more rapidly than the maximum specified in the parameter section

Check potentiometers for short-circuits

otherwise

Change potentiometers

E14

Text message Channel X does not reach aeration position in time and/or fault 600.

The range monitoring during pre-ventilation results in a too low limit stop value of the feedback potentiometer. The upper and lower limit value are not reached during pre-ventilation.

Check potentiometer
Check continuous feedback value

Compare range limits with feedback's stop values

If necessary, re-enter range limits

NOTICE!

If limit switches are adjusted after a curve has been programmed, the range limits must be re-entered.

Maybe the control of the motor is defective

check relay module

check wiring

E18
Fault 451...456

A control element has left the ignition range after the ETAMATIC had detected the ignition position.

Possible causes:

– control element oscillating
– wiring fault
– holding torque of motor too low

---

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H1
Fault 600

The control unit has locked up

Call-up running text and follow it's instructions

Check wiring and extend signal transmitters e.g.

– safety interlock chain boiler
– safety interlock chain gas
– air pressure monitor
– safety interlock chain oil (special function)
– fuel selection (special function)
– external high firing-rate acknowledgement
– external ignition position acknowledgement

Check motor limit stops

otherwise

Extend program monitoring time
see P 777 (only with level 1 access), see also E14

H4
Fault 607

The ignition position acknowledgement signal drops during the ignition sequence (terminal 74)

NOTICE!

The ignition position acknowledgement signal must be present up to the end of the ignition sequence (to the end of the 2nd safety period).

H7

If fault appears directly before ignition:

Maybe the oil pump has not enough time to build up pressure
Parameter 782

H8
Fault 734

For one of the processors the pre-ventilation is still running while the other one already terminated the pre-ventilation.

Check high load indication
Re-enter range limits

I2
Fault 602

The pressure in the leakage test line doesn't build up or the pressure is not maintained for long enough.

Main gas valve 2 (burner side) leaking

– check valve

Main gas valve 1 (gas line side) does not open (or vent valve)

– check valve
– check wiring
– check fuse

Pressure switch in leakage test line defective

– check pressure switch
– set pressure switch

I3
Fault 603

At the start of the leak test the gas pressure monitor indicates, that there is still gas present in the leakage test line.

Automatic venting is deactivated in P 770.

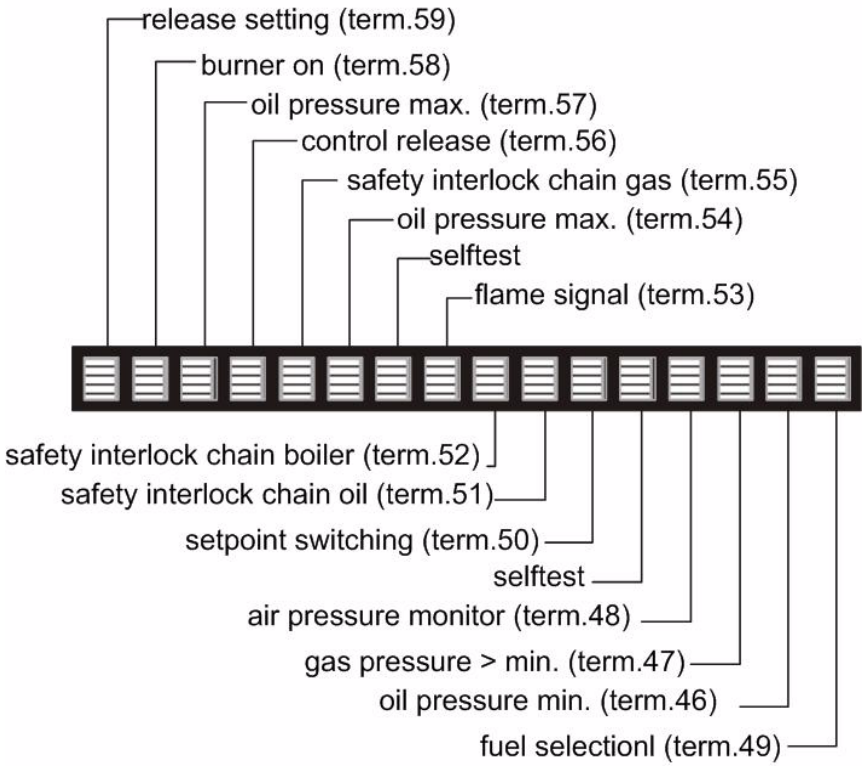
Vent the leakage test line manually.

9 Appendix

9.6 Calling Up the Condition of the Digital Inputs

press keys 16 and 17 to switch to the digital inputs

Significance of ETAMATIC digital input display



↑ = signal is active

¾ = signal is inactive

* = only with ETAMATIC without front panel

9 Appendix

9.7 Tips and Tricks

Oil pressure does not build up in time.
Extending the transformer pre-energise time (P 782) starts the pump sooner.

9.7.1 Set pilot burner

Setting the "Service mode" parameter (P 787) causes the ETAMATIC operating program to run only up to the stabilisation time. But up to 5 successive starts can be attempted without pre-ventilation and without leakage test. After setting the pilot burner, set parameter back to 0

NOTICE!

Resetting a fault with a total reset clears the internal counter for the service mode. The next start-up, pre-ventilation again.

9.7.2 Post-measurement of safety times

If it is required to measure the installation's safety times at a later time (e.g. as part of an installation's acceptance tests), it is not sufficient to disconnect the magnetic valves before start-up. This is recognised by the ETAMATIC's self-testing circuit, and results in emergency shut-down.

Disconnect the ignition position's acknowledgement function (term. 46). Start-up and wait until the ignition position is reached. On the self-test's completion (ca. 5 sec), the magnetic valve can be disconnected. Reconnect the ignition position acknowledgement function.

The installation starts up.

9 Appendix

9.8 Process Sequence Charts

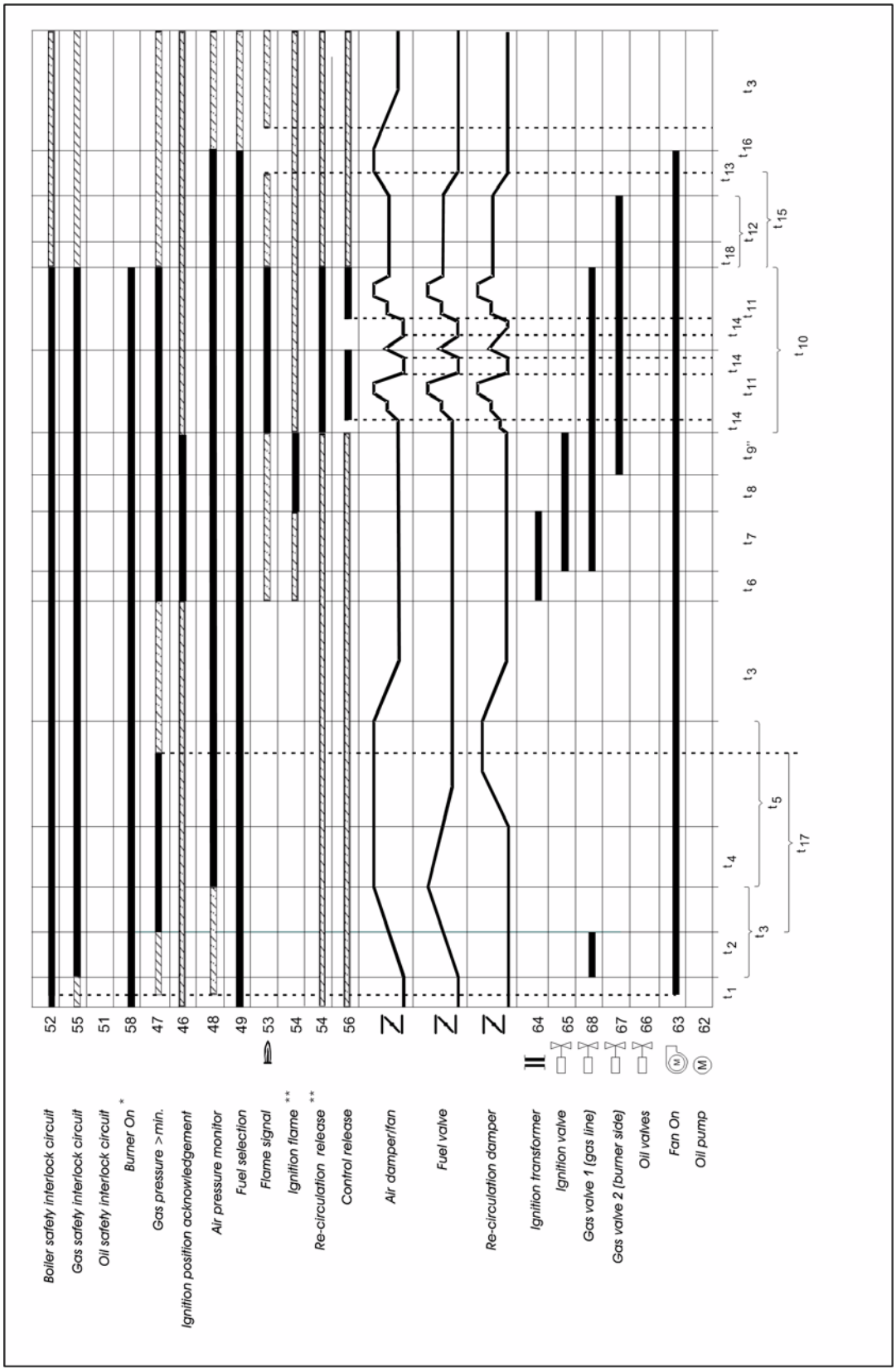


Fig. 9-3 Process sequence chart: gas with pilot burner

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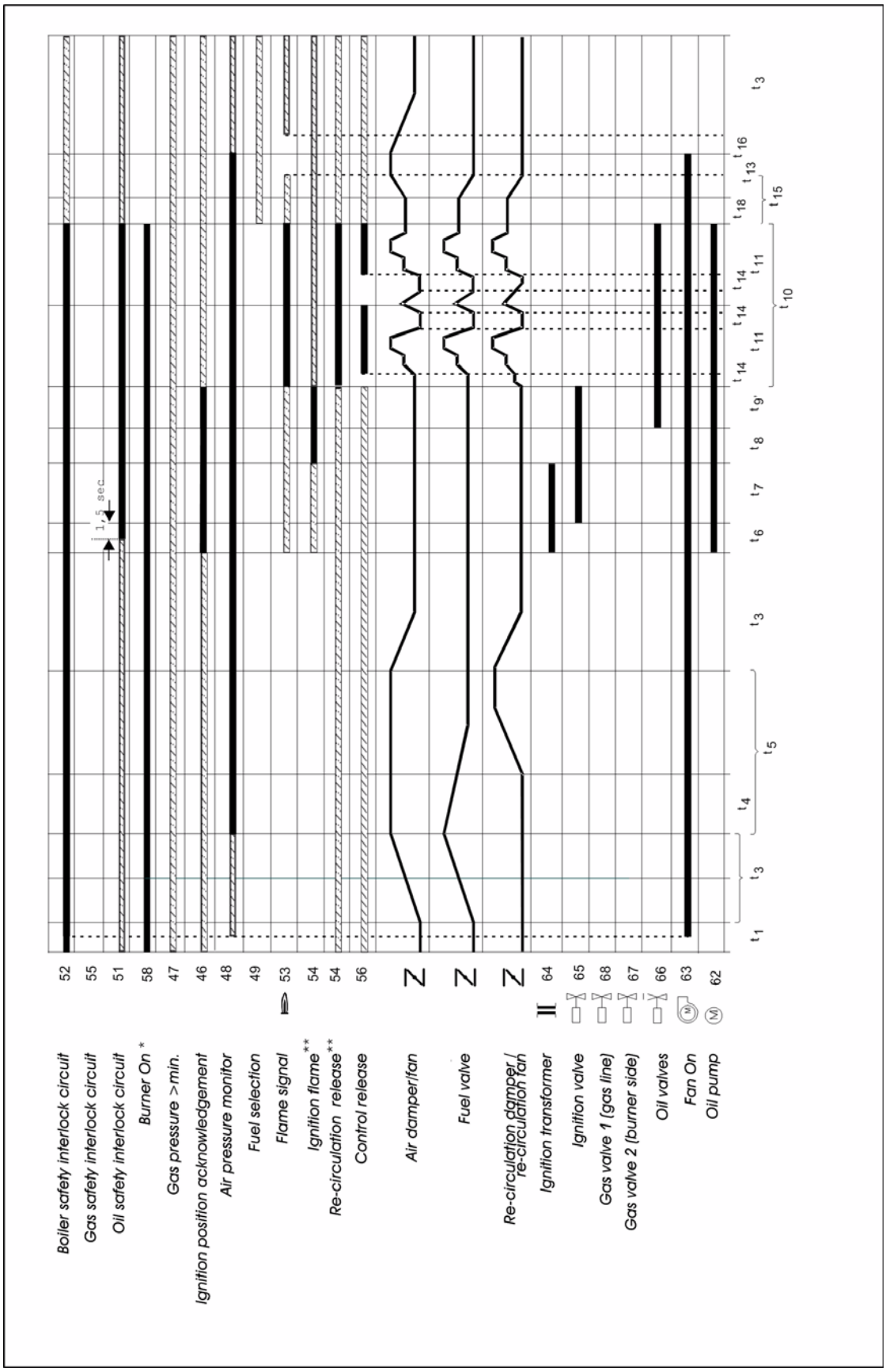

Fig. 9-4 Process sequence chart oil with pilot burner

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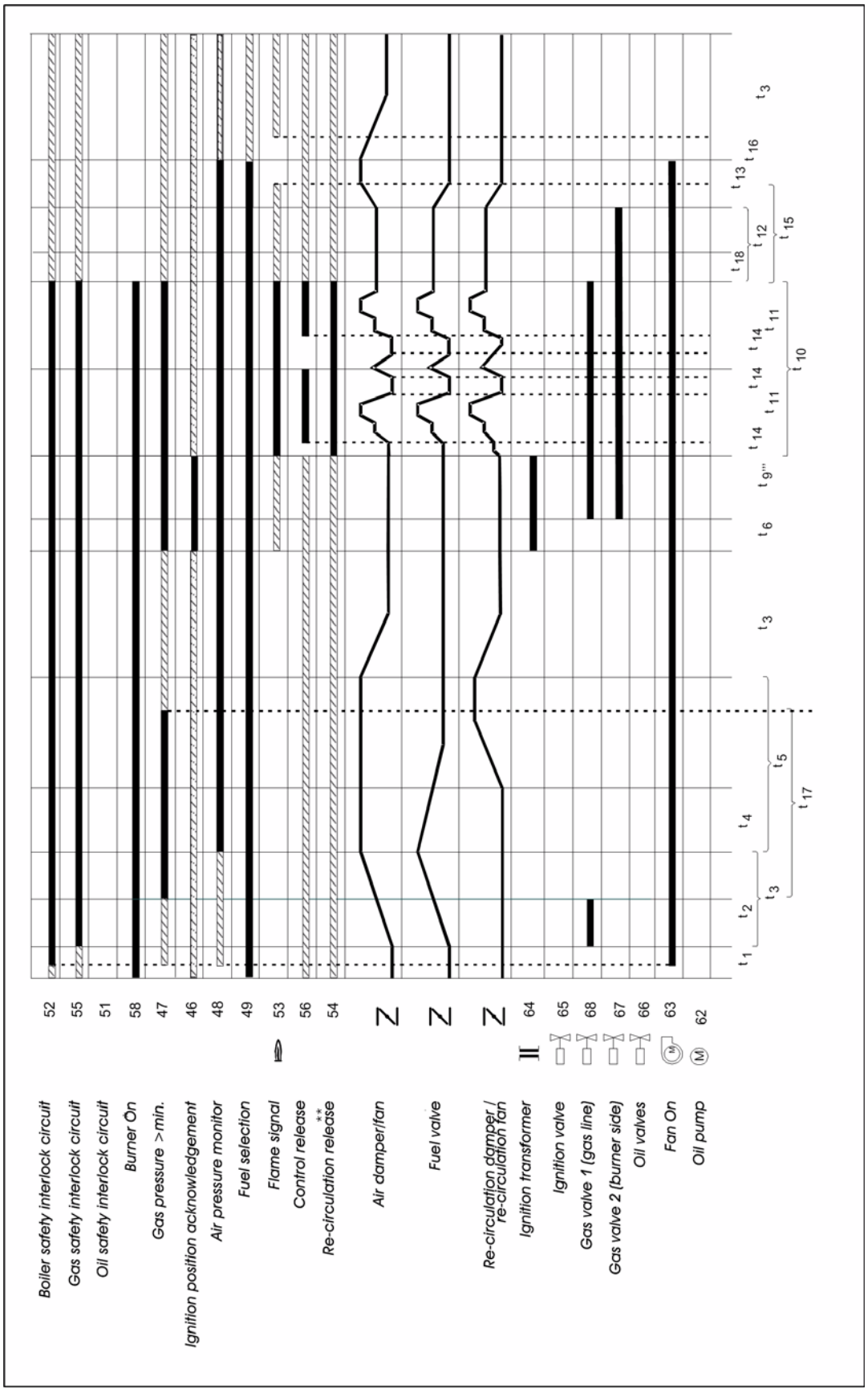

Fig. 9-5 Process sequence chart: gas without pilot burner

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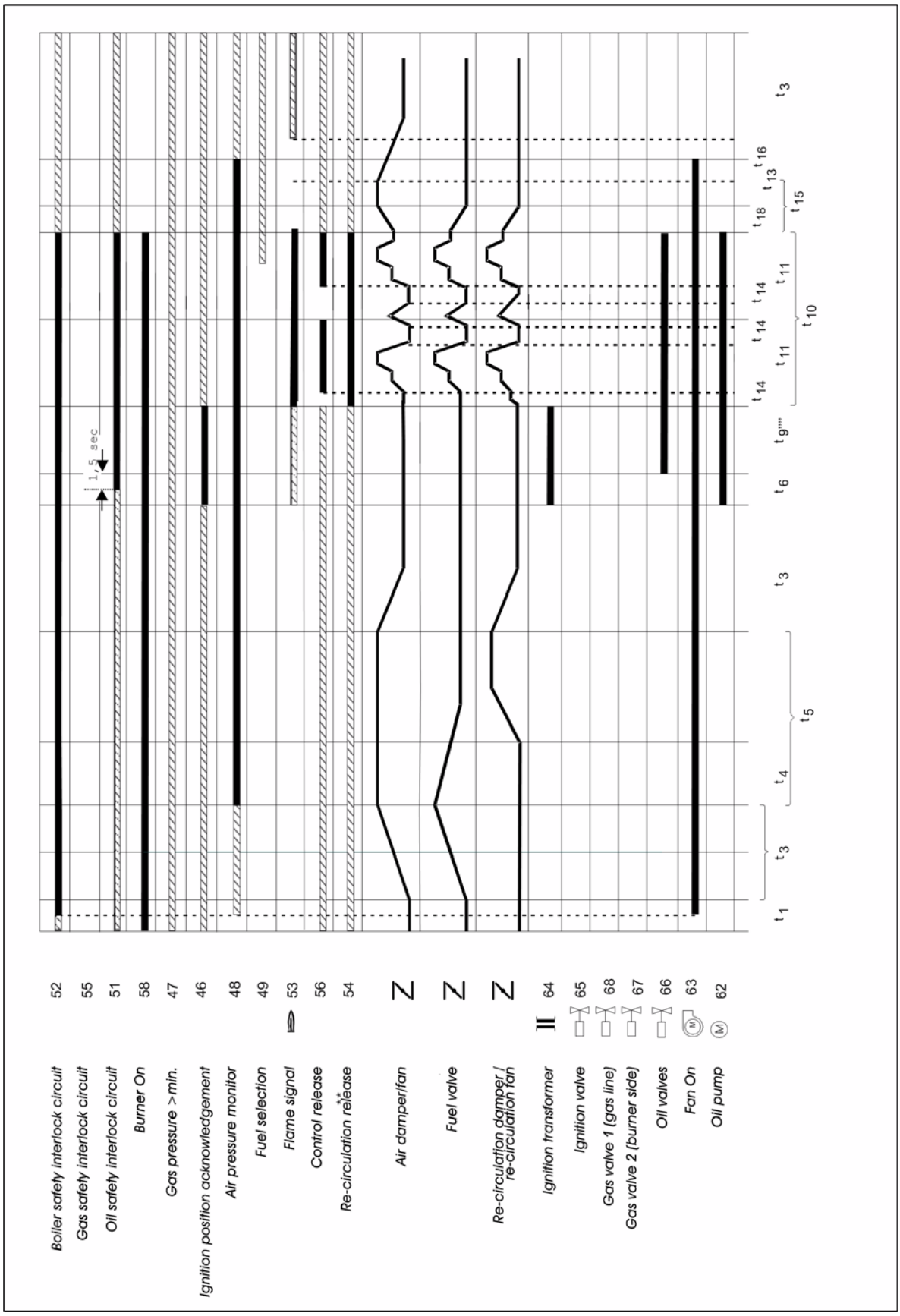

Fig. 9-6 Process sequence chart: oil without pilot burner

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Key to process sequence charts

	**Any condition**	
t1	Wait for gas safety interlock circuit air pressure monitor min. scan	any
t2	Time for pressure build-up in the gas test line (only with leakage test activated)	2 sec.
t3	Servo drive running time	30-60 sec.
t4	Re-circulation damper delay	0-t5
t5	Aeration time	30-999 sec. adjustable
t6	Transformer pre-energise time	3 sec.
t7	1st safety period	4 sec.
t8	Stabilisation period	3 sec.
t9’	2nd safety period	5 sec.
t9’’	2nd safety period	3 sec.
t9’’’	Safety period	3 sec.
t9’’’’	Safety period	4 sec.
t10	Operating phase	any
t11	Control mode	any
t12	Time for pressure relief in the gas test line	3 sec.
t13	Post-ventilation time	0-999 sec. adjustable
t14	Control elements at base load	
t15	After-burning time	0-20 sec.*** adjustable
t16	Flame extinguishing check	5 sec.
t17	Leakage test, gas valve 2	30 sec.
t18	Triac selftest	

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Footnote to the process sequence chart ETAMATIC	
(1)	Flame intensity to adjust the flame sensor (not connected during operation)
(2)	Sensor cable shielded separately
(3)	Alternatively you may connect the ground to terminal 44 instead of terminal 22.
(4)	With steam pressure: actual value on terminals 3, 4, 5 and terminals 20 and 21 bridged. Shut off of the internal firing controller: terminals 19 and 21bridged
(5)	For connection of other LAMTEC devices, e.g. O_2 measurement
(6)	For connection of an external control system - for visualisation or laptop
(7) **	If the recirculation signal is missing during operation, the recirculation channel remains closed or runs close (only valid for ETAMATIC, the internal recirculation signal is always in state 1 at ETAMATIC OEM). If parameter 427 (VODelR) contains "0" , the recirculation channel remains closed at the pre-ventilation period. You may use terminal 54 alternatively as ignition flame input. Therefor you must set P 788 to value 1.
(8) ***	If the flame still burns when the burner is off, the actuators remain in the last compound position until the flame is off - you must increase the post ventilating period if necessary (cf. P17).
(9)	cf. P 18 and P762
(10)	The irrelevance time oil (P 765) affects the safety interlock chain and the oil pressure min. while opening the oil valve or the ignition valve.

Parameters for the footnote:

No	FMS	ETA	Short Text	Description	Min	Max	Default
17	4	4	Etam.OEM	ETAMATIC OEM (0=ETAMATIC, 1=ETAMATIC OEM, 2=BurnerControl, 3=Special	0	3	0
				0 = ETAMATIC 1 = ETAMATIC OEM 2 = BurnerControl FA1 3 = Special (from 5.4 on) **Terminal connections:**			

No.	ETAMATIC	ETAMATIC OEM	Burner Control FA1	Burner Control FA1 Special
59		release setting	release setting	release setting
58	burner on	burner on	burner on	burner on
57	*fault release*	fault release	oil pressure < max	oil pressure < max
56	control release	control release	*pre-ventilation acknowledgement*	*pre-ventilation acknowledgement*
55	SIC gas	SIC gas	SIC gas	SIC gas
54	P788 *0=recirculation on* 1=ignition flame signal	P788 0=gas pressure<max 1=ignition flame signal	P788 0=gas pressure<max 1=ignition flame signal	P788 0=gas pressure<max 1=ignition flame signal
53	flame signal	flame signal	flame signal	flame signal
52	*SIC boiler*	SIC common	SIC common	SIC common
51	SIC oil	SIC oil	SIC oil	SIC oil
50	setpoint switching	setpoint switching	setpoint switching	*high load acknowl-edgement*
49	fuel selection	fuel selection	fuel selection	fuel selection
48	air pressure monitor	air pressure monitor	air pressure monitor	air pressure monitor

	47	gas pressure>min (leakage test)	gas pressure>min (leakage test)	gas pressure>min (leakage test)	gas pressure>min (leakage test))
	46	*ignition position acknowledgement*	P 762 0 = no function 1 = oil pressure>min / atomiser air pressure P 18 0 = oil pressure>min (atomiser) 1 = atomiser air pressure (rotation atomiser)	P 762 0 = no function 1 =oil pressure>min / atomiser air pressure P 18 0 = oil pressure>min (atomiser) 1 = atomiser air pressure (rotation atomiser)	*ignition position acknowledgement*

No	FMS	ETA	Short Text	Description	Min	Max	Default
18	2	2	ÖlpumpON	oil pump ON, 0=standard, 1=together with the fan	0	1	∅
				From version 4.2 on 0 = pressure atomiser, ignition transformer switches output “oil pump” on and terminal 46 is set to “oil pressure > min” (ETAMATIC OEM and FA1 only) 1 = rotation atomiser fan switches on the output “oil pump” and terminal 46 is set to “atomizer air pressure” (ETAMATIC OEM and FA1 only)			
762	2	4	Fkt.Kl.6	Function terminal 6: 0-recirc. ON signal / 1-oil pressure > min signal	0	1	0
				ETAMATIC: 0 = no function 1 = no function / if P788 = 1, then "recirculation ON" via PROFIBUS FMS - terminal 6: 0 = "recirculation ON" If the recirculation signal is missing during operation, the recirculation channel remains closed or runs close. If P 427 (VODelR) = 0 the recirculation channel remains close at the pre-ventilation period. 1 = "oil pressure > min" The internal recirculation signal has always the state 1. ETAMATIC OEM / Burner Control FA1 - terminal 46: 0 = no function 1 = "oil pressure>min" with pressure atomiser (P 18 = 0) or "atomiser air pressure" with by rotation atomiser (P 18 = 1)			

WARNING!

P 762 = 0 → terminal 46 has no function (ETAMATIC OEM and Burner Control FA1!

P 17 = 3 (FA1 special) → terminal 46 is set to "ignition position acknowledgement!

"Oil pressure > min" / "atomiser air pressure" is not monitored via terminal 46!

You must monitor these signals with the safety interlock chain oil via terminal 51!

No	FMS	ETA	Short Text	Description	Min	Max	Default
765	3	4	Irr. Öl	Irrelevance time of safety interlock chain oil when igniting on fuel oil in seconds	0	10	0
				Irrelevance time while igniting (longer tolerance) for safety interlock chain oil Extend the tolerance time for the safety interlock chain oil during the ignition process in this parameter. This avoids fault shut -downs due to pressure impulses by opening the main valves. Set the values in seconds. Standard value is 0. From software version 3i030 on active. After finished ignition process, this parameter is without function. The irrelevance time starts with the opening of the oil valve (2 nd safety time) and ends after the duration, set in this parameter has passed. ETAMATIC OEM → This parameter effects the safety interlock chain oil as well as the oil pressure min.			
788	2	2	Fkt <max	Function mode of gas pressure < max. switch	0	1	1
				FMS input terminal 7 0 = gas pressure < max. 1 = ignition flame monitor ETAMATIC input terminal 54 0 = recirculation "ON" If the recirculation signal is missing during operation, the recirculation channel remains closed or runs close (this is valid for ETAMATIC; ETAMATIC OEM has a static recirculation signal = 1). If P 427 (VODelR) = 0, the recirculation channel remains close during the pre-ventilation period. 1 = ignition flame monitor the internal recirculation signal is always 1 ETAMATIC OEM terminal 54 0 = gas pressure < max. 1 = ignition flame signal Burner Control FA1 0 = gas pressure < max. 1 = ignition flame monitor at input ignition flame signal (see P 728, P 774 and P 775)			

9 Appendix

9.9 Connection Diagrams

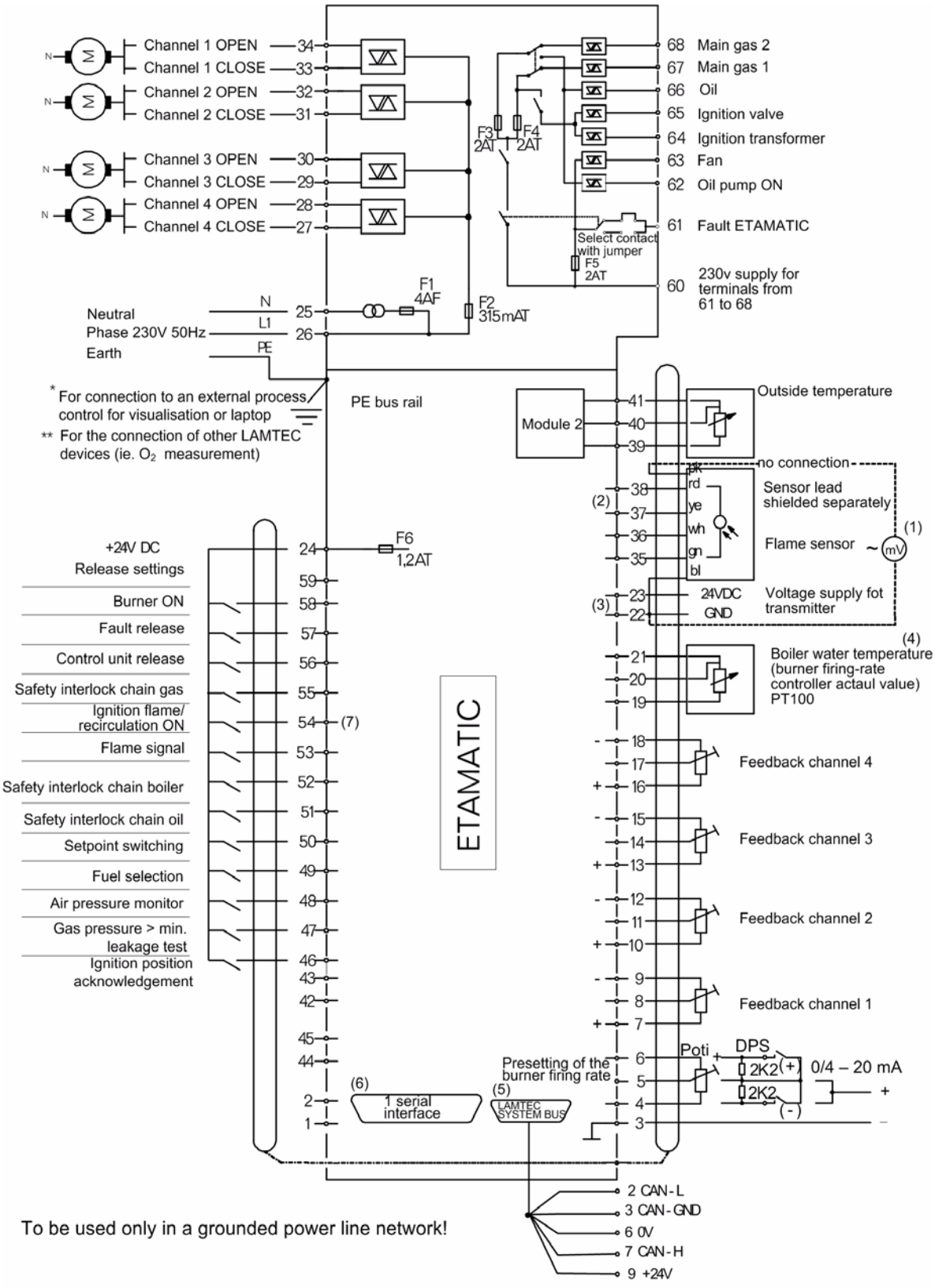

Fig. 9-7 ETAMATIC wiring diagram with ignition flame monitoring

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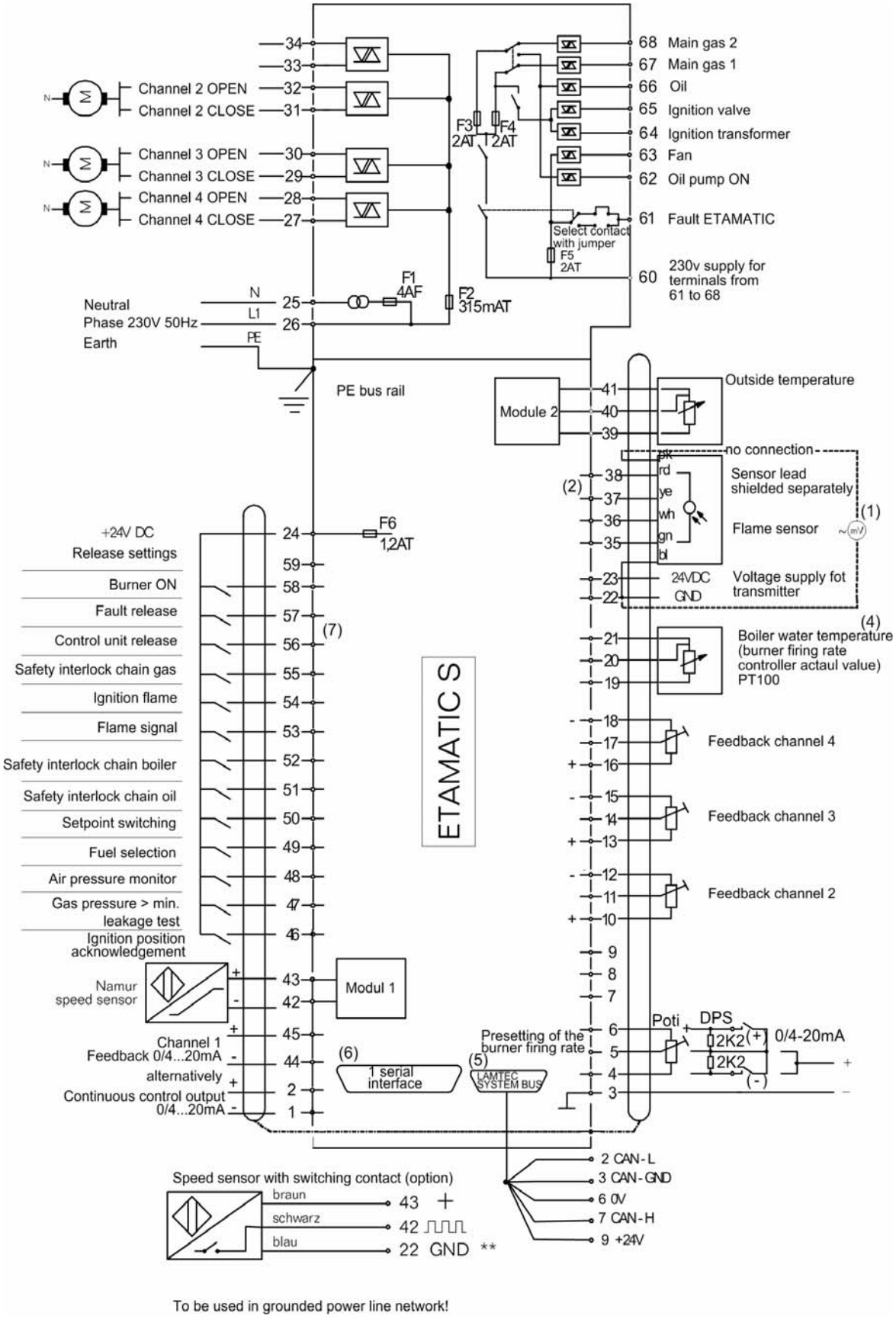


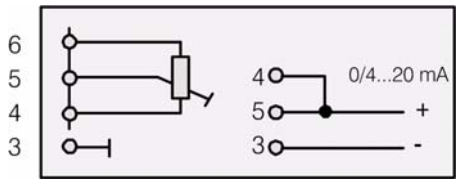
Fig. 9-8 ETAMATIC S wiring diagram with ignition flame monitoring

9 Appendix

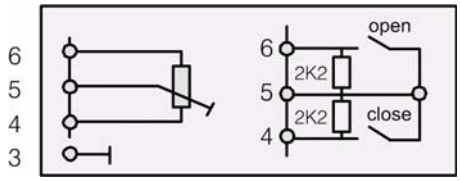
9.10 Connection Examples Regular Firing Rate Input

Connection examples load default

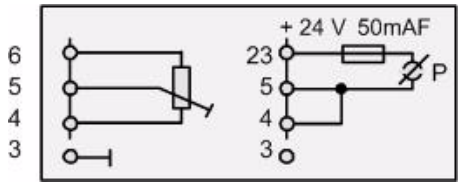
Where current is used as firing-rate default signal instead of a potentiometer:
f.ex. active steam pressure regulator *



Where a three-point step signal from the firing-rate controller is used as firing-rate input, you must connect the contacts instead of the potentiometer of the firing-rate:



Where a 4-20mA unit shall be supplied with 24V (e.g. a passive steam pressure controller).



* At steam pressure: actual value to terminal 3, 4 and 5 and terminal 20 and 21 short circuited. To switch off the internal firing-rate controller, terminal 19 and 21 short circuited.

9.11 Connection flame monitor and external firing rate controller

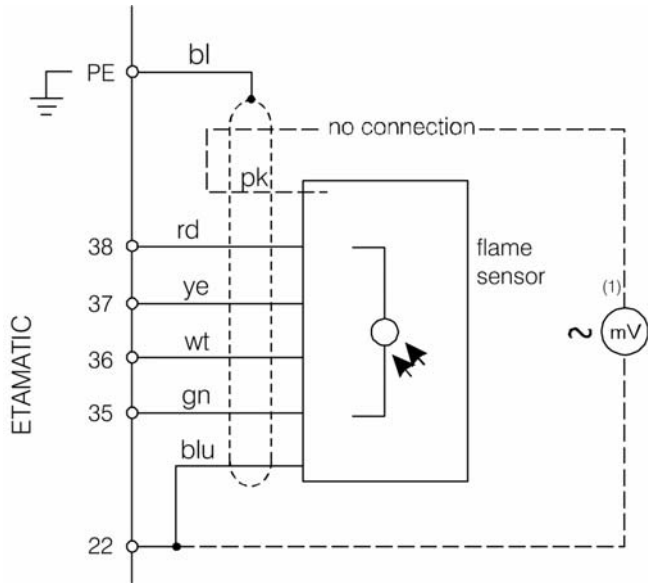


Fig. 9-9 Connection flame monitor

Flame intensity to align the flame sensor (not connected during operation) with delivery of 01.01.2003 on.

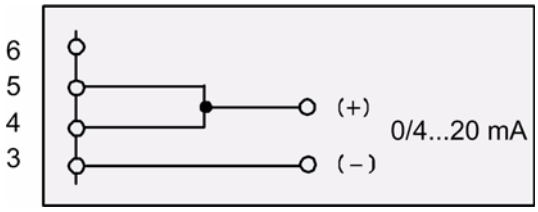


Fig. 9-10 Connection external firing-rate controller

9 Appendix

9.12 LAMTEC SYSTEM BUS (LSB)

9.12.1 Configuration of the Processor Board

NOTICE!

The LAMTEC SYSTEM BUS may not be connected with a branch cable and has to be terminated at both sides with 120 Ω.

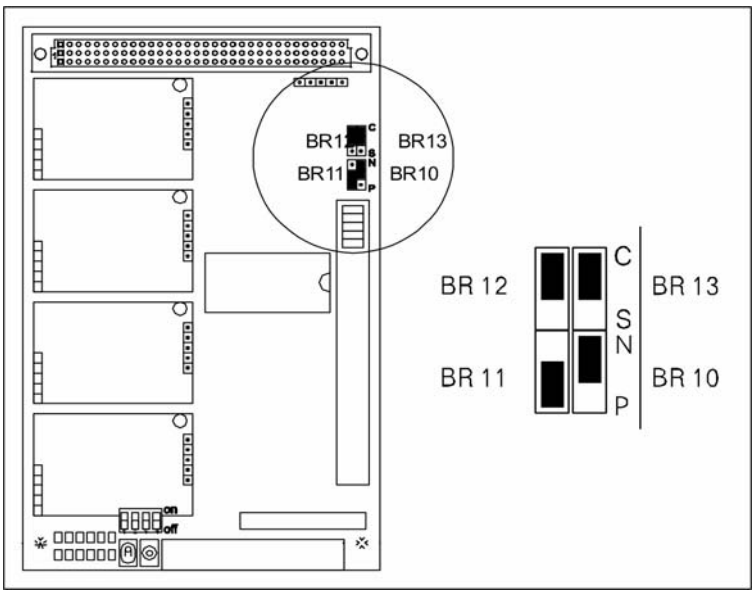


Fig. 9-11 Configuration of the processor board LT1 / LT2 to LAMTEC SYSTEM BUS (LSB)

9.12.2 LSB Connection

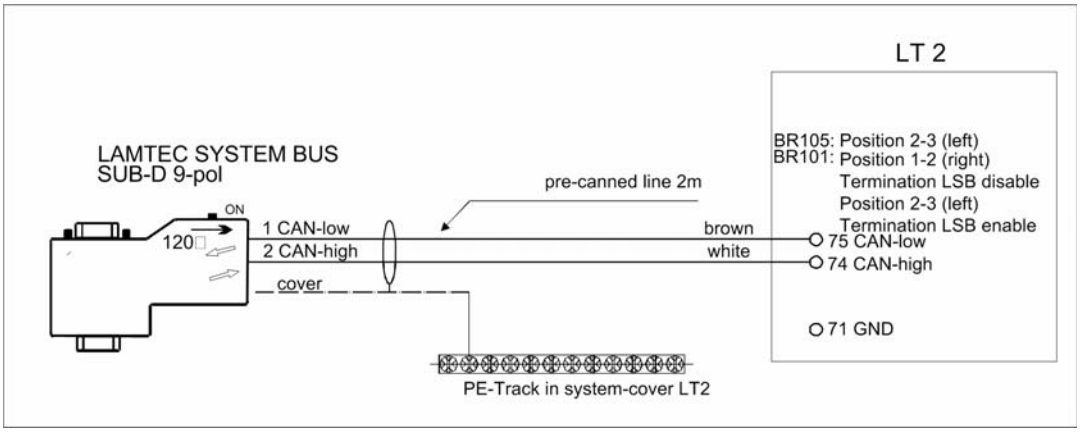


Fig. 9-12 LSB connection ETAMATIC to LT2

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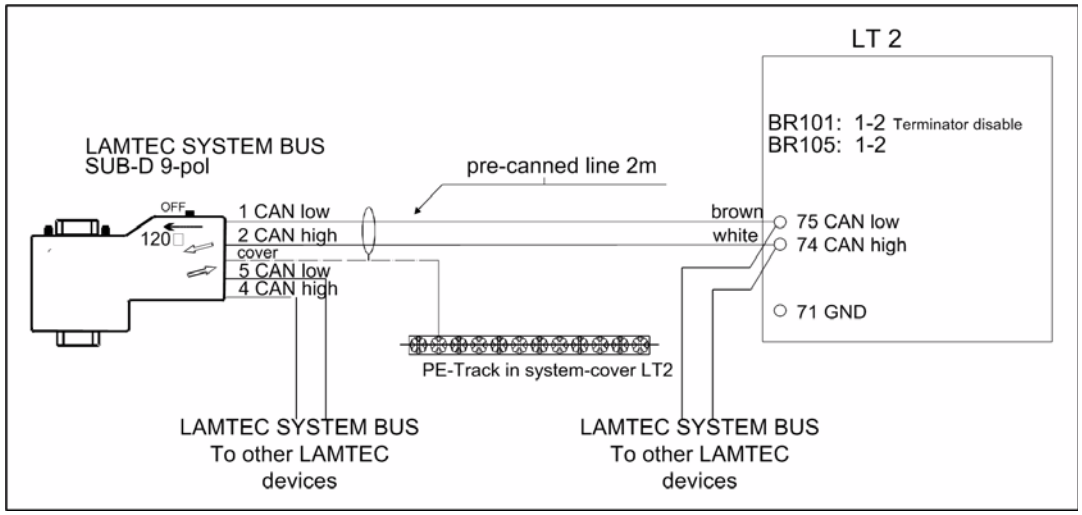

Fig. 9-13 LSB connection ETAMATIC - LT2 - other LAMTEC devices

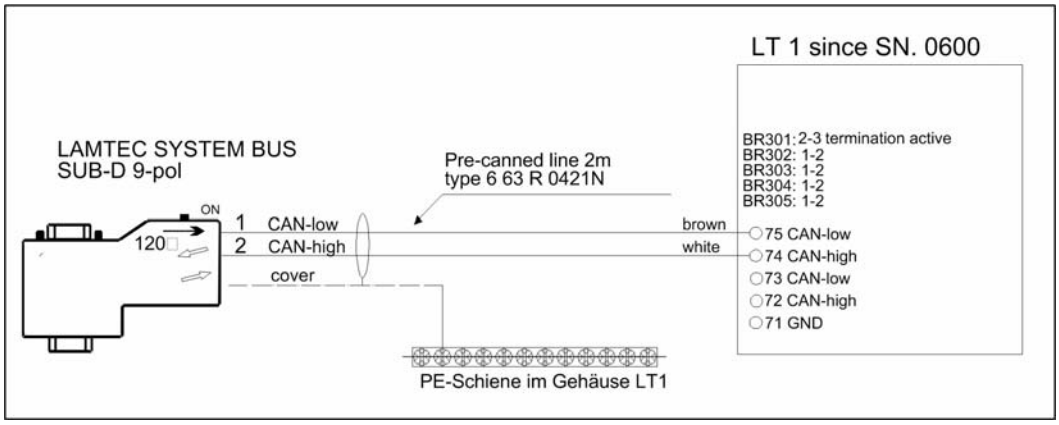

Fig. 9-14 LSB connection ETAMATIC to LT1 from SN 600 on

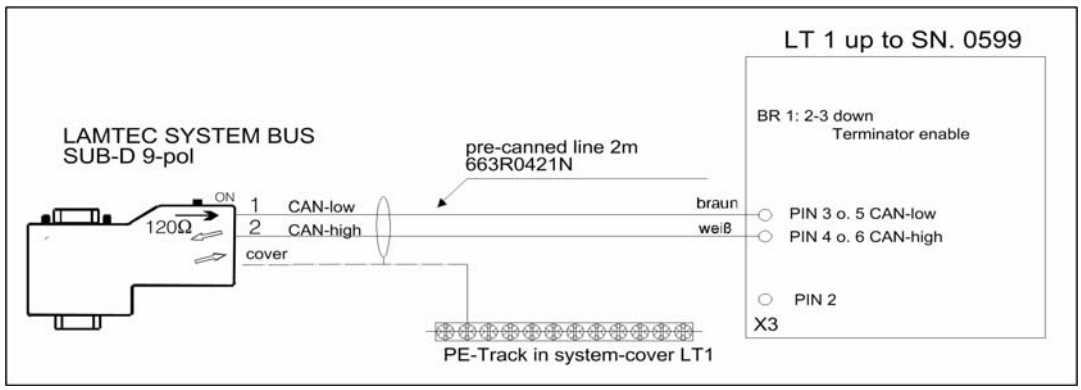

Fig. 9-15 LSB connection ETAMATIC to LT1 up to SN.: 0599

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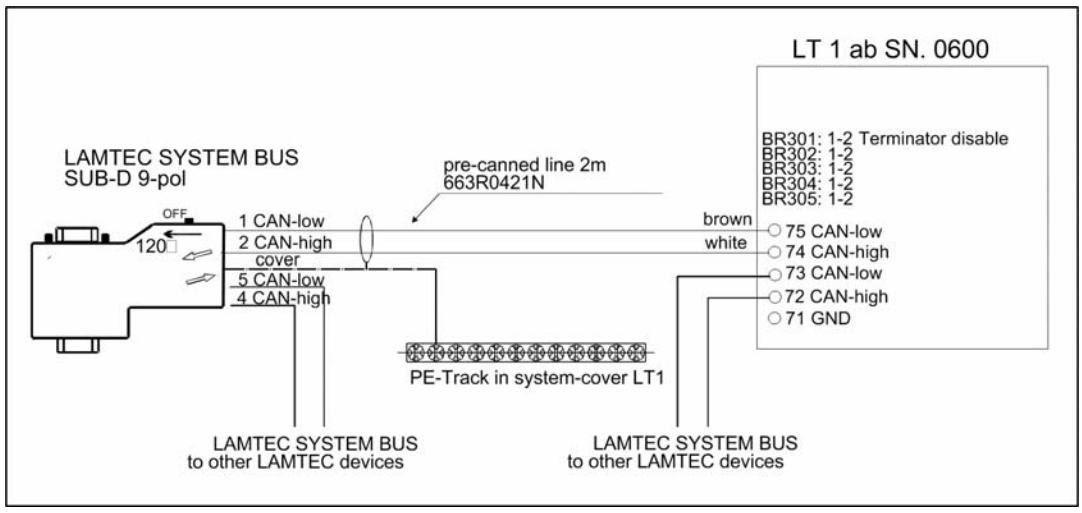

Fig. 9-16 LSB connection ETAMATIC - LT1 - other LAMTEC devices

9.12.3 LAMTEC SYSTEM BUS Plug

Use the LSB plug with service-interface to connect a LAMTEC device to the LAMTEC SYSTEM BUS. The plug is equipped with circuit board clamps. The clamping points can be held open with an integrated slide. With this you can position and insert the conductor ends of the multi conductor bus cable simultaneously.
The clamps are suitable for all wire kinds of 0.08 mm ² to 0.5 mm ².

The plug has 2 horizontal cable inlets for in- and output, of the LAMTEC SYSTEM BUS. The plugged cable is connected to the terminals 4, 5 and 6. If You want to connect the LSB to more LAMTEC devices, use terminals 1, 2 and 3 (terminator OFF). Never use the service and diagnose interface.

If You place the device at the beginning or the end of the LAMTEC SYSTEM BUS, you must set the slide of the plug to ON (terminator active).If you place the device at another position of the LAMTEC SYSTEM BUS, set the slide to OFF (terminator inactive).

Technical data	
double cable inlet	min. Ø 4,5 mm/ max. Ø 9,5 mm
baud rate	10kB....1MB
protection class	IP40
permitted environment temperature	0^{o}C.....+60^{o}C
connection technology	"CAGE CLAMP“terminal strip with activity slide
tool for clamp	screwdriver blade 2,5x0,4 mm
tool for connector	screwdriver blade 3,5x0,5 mm
tool for strain relief	PHO screwdriver

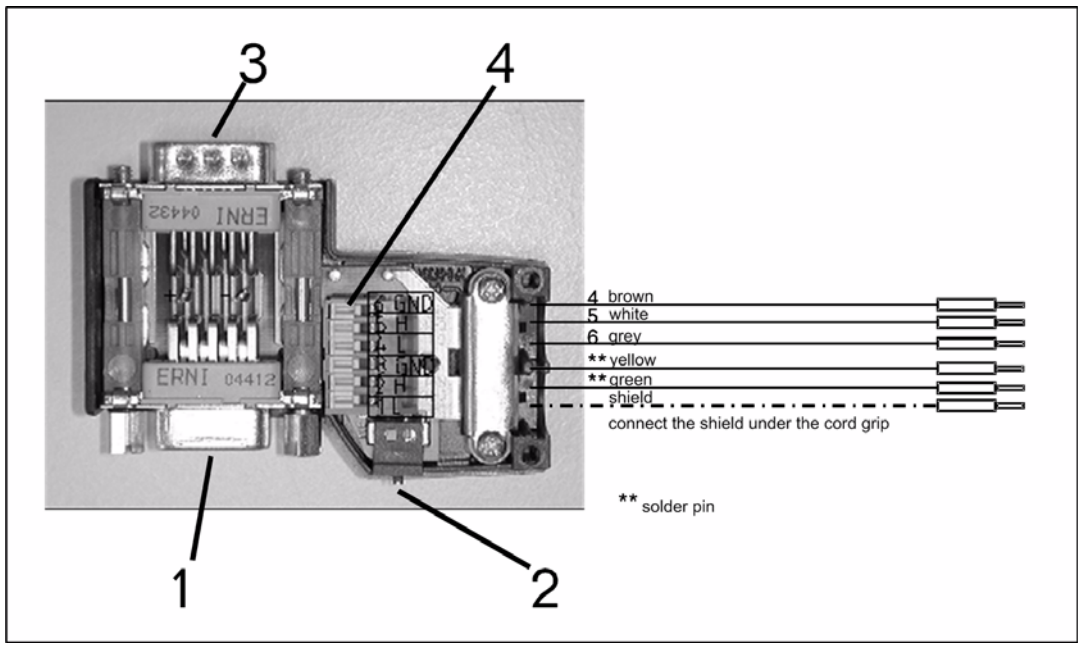

Fig. 9-17 pin assignment LSB plug

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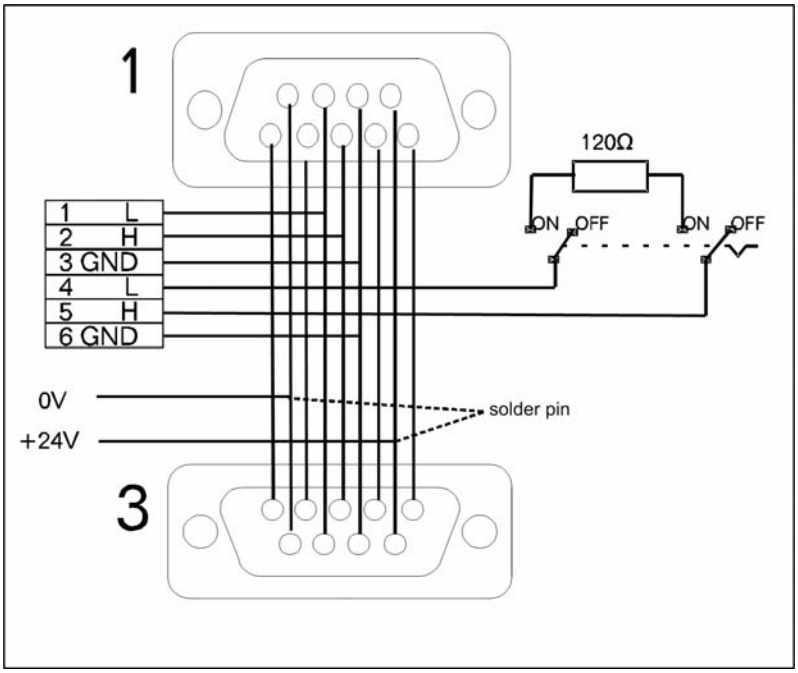

Fig. 9-18 pin assignment LSB plug

No.	Description
1	9 pole Sub-D jack service- and programming interface for the operating unit
2	switch for activating/deactivating the LSB-termination ON.-.OFF
3	9 pole Sub-D pikes LSB for connection with the ETAMATIC / ETAMATIC S
4	clamp-connection

9.13 Modem for Remote Control

Fig. 9-19 Modem for remote control

A connection with ETAMATIC via modem is also possible. The industrial modem (optional) for mounting on top hat rail allows the access to 31 devices at the same time with a LAMTEC tool for Windows. This tool realizes the remote control of the operating mode of the devices

The wiring between modem and RS422 module (interface adapter) is provided by the customer. Use a 4-wire, twisted and shielded cable.

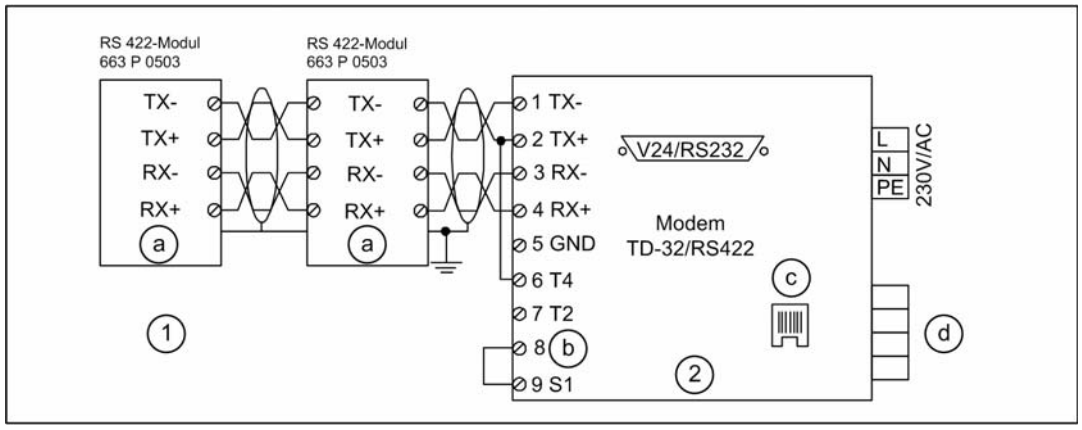

Fig. 9-20 connection diagram modem for remote control

No.	Description	
1	with termination resistors, setting via DIP switch	
2	adjustment of the modem's DIP switch:	
	SW1	dial-up connection 0000
	SW2	all without function 0000 0000
	SW3	tel. connection, 2-wire cable 1000 0000
	SW4	19200 baud, 8N 1110 1100
	SW5	automatic speed adaptation 1111 0000
a	shield	
b	2/4 wire	
c	telephone line	
d	leased line	

9 Appendix

9.14 Inernal Connecting Diagram of the Control Output Device

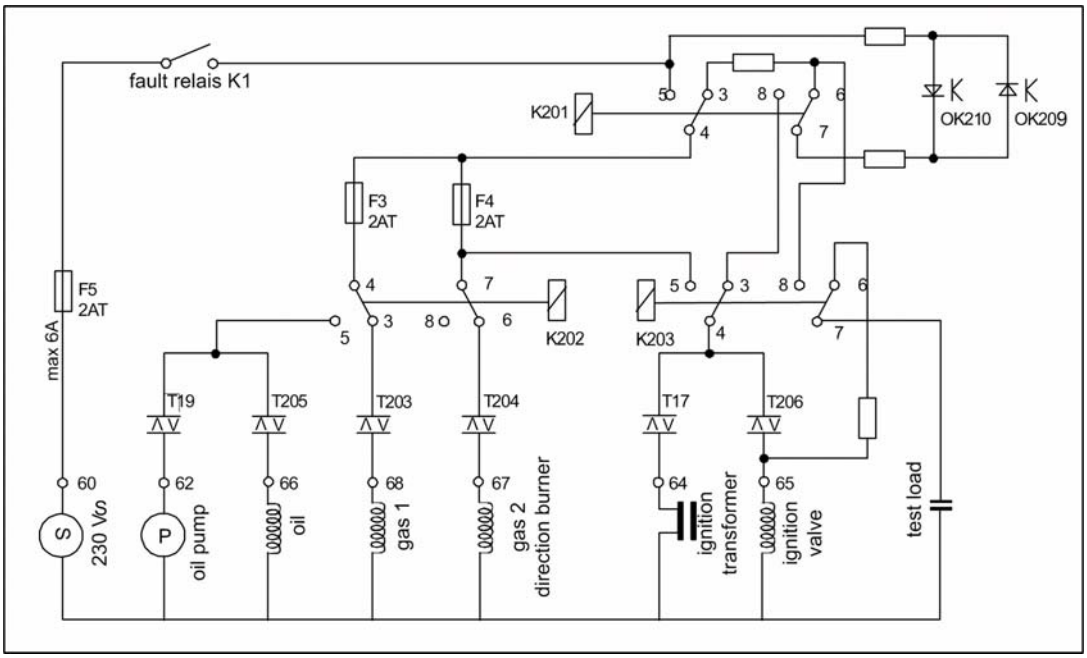

Fig. 9-21 Internal connecting diagram of the control outputs

Always connect the attached loads (valves etc.) to the ETAMATIC (even when the burner is off). If You could not ensure this, use an RC combination (ca. 0,15µF, ca. 220 Ω) between the output terminal and neutral to let the testing current flow.

WARNING!

Connect the valves directly to the terminal. The activating current of the load must be much higher than 9mA

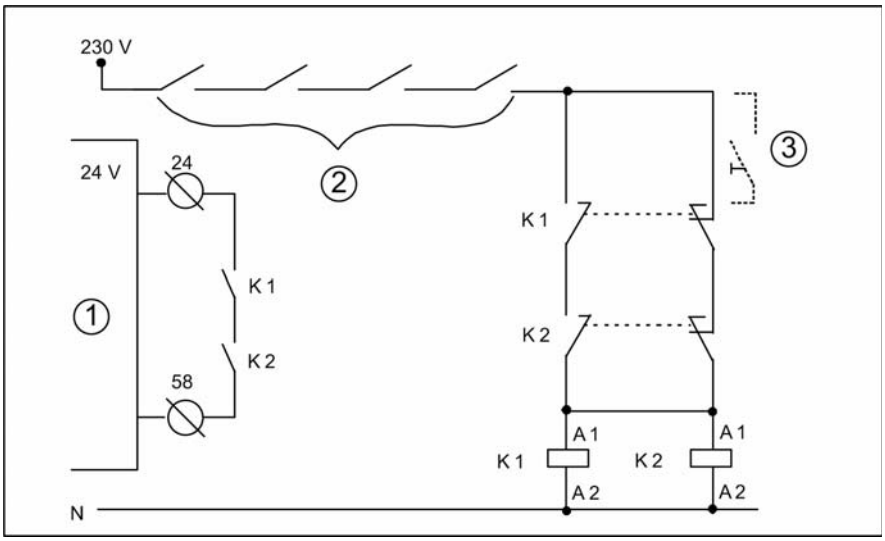

Fig. 9-22 Example: safety interlock chain wiring via 230 V

No.	Description
1	ETAMATIC
2	230 V contacts safety interlock chain
3	optional unlocking switch

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9.15 Exhaust of test line over the roof

NOTICE!

Check the diameter of the gaspipe when gas will be released above the roof.
Enable terminal no. 67 for 2 sec. to release the gas.
Ensure that this time is long enough, even for mostly used gaspipes with a smaller diameter to release the gas.

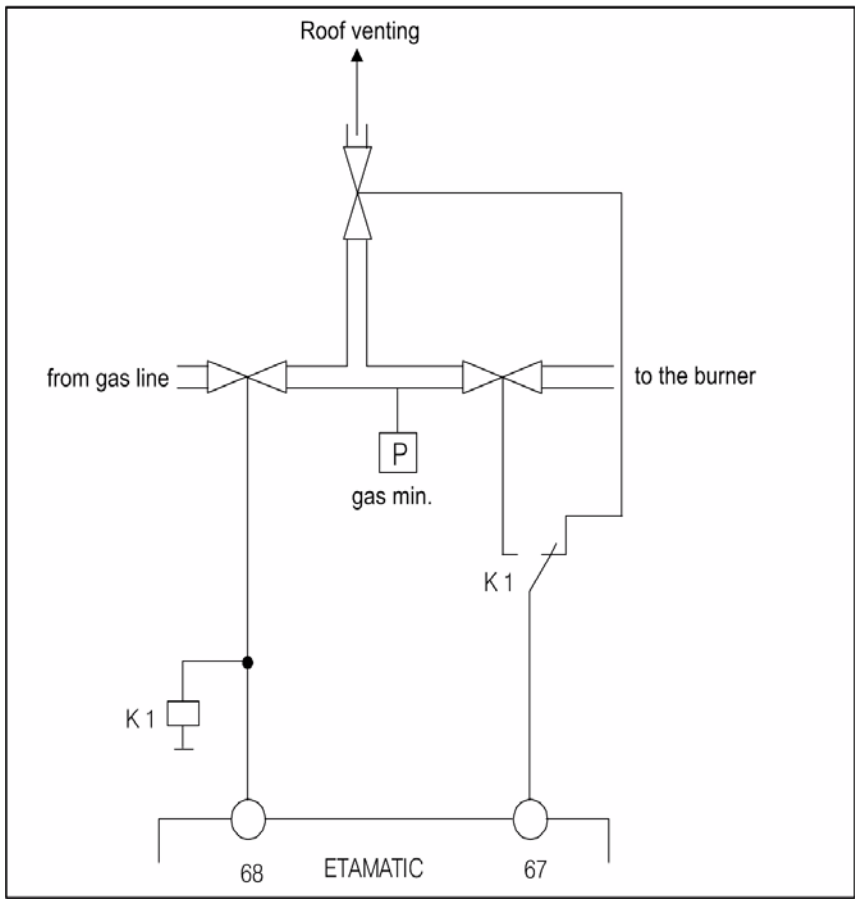
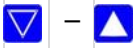
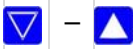


Fig. 9-23 Suggested wiring for venting the gas line over the roof in conjunction with the ETAMATIC

9 Appendix

9.16 Switch- and Key Combinations

Action	Display	Mode	Buttons / Other
Recall correction range	Status	Monitoring display Automatic Setting	 press key 11 (Enter)
Reset			 press key 1 / F1 (Reset)
Code entry for parameterisation	Status	Automatic	 press keys 5, 7 and 8 simultaneously
Recall fault history	Status	Monitoring display Automatic Setting	 press keys 2 or 3 (not in fault mode)
Recall correction input value	Firing rate		 press key 11 (Enter)
firing rate adjustable via switch 1 (manual operation)		Automatic	 press key 12 / F3 (Hand)
Quit manual mode		Automatic	 press key 12 / F3 (Hand) again
firing rate adjustable via switch 1 (internal load presetting)	Firing rate	Setting	 press key 2 or 3
EG/ES mode is activated	Firing rate	Setting Clear memory	 press key 6 GL mode or RG (display shows EL) compound engaged (no "ES barried" message)
EG/ES mode is terminated		Setting Clear memory	 press key 2.....9 in EG or ES mode
Display of running time meter / Starts counter		Automatic	 press key 10 / F2 (clock)
Store point	Setpoint Actual value feedback	Setting	 press key 11 (Enter)
Delete present curve	Setpoint	Clear memory	 press key 11 (Enter)
Display of acceptance data, CRCs for all levels, oil/gas safety times, preventilation time	Setpoint feedback		 press key 11 (Enter)
Traverse channel	Setpoint	Setting	 press key 2.....9
Scanning of serial no and key no	Actual value feedback		 press key 11 (Enter)
Call up flame intensity			 press key 15 / F4 (M) twice Without integral flame monitoring, the display shows "---%"
Modeswitching with O_2 trim ETAMATIC		Automatic	 press key 15 / F4 (M) twice

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Action	Display	Mode	Buttons / Other
O_2 error reset	Status	O_2-control	 Mode O_2 trim, press key 11, (Enter) press key 7 and query cause of error
Calling up text messages	Status	O_2-control	 press key 11 (Enter)
Adjusting correction value	Firing rate	TK O_2-control	 key 2 = Excess air key 3 = Air deficiency
Changing O_2 setpoint value	Setpoint	T O_2-control	 key 7 = more O_2 key 8 = less O_2
Calling up O_2 trim fault history	Status	Automatic	 key 5 = browse fault history key 11 = display description
Changing firing-rate controller setpoint	Firing-rate	Operation	 press keys 9 and 6 simultaneously,
			 when the display is blinking adjust the setpoint with keys 4 and 5, press key 11(Enter) to store the setpoint

9.17 R. P. M. Sensor

9.17.1 Direct connection of the R. P. M. Sensor

(old version until delivery date Sept. 03)

This option allows you to connect an inductive sensor of the company Turck as a speed feedback. On this configuration card 3 speed/ pulse ranges can be set at the factory.
The sensor is directly connected to terminal 42 and 43.

Speed nominal range (164...819 digit):

- I 300 ... 3000 pulses / min. (standard)
- II 800 ... 4000 pulses / min.
- III 1000 ... 8000 pulses / min.

Lower limit (140 digit) / upper limit (941 digit)

- I 200 ... 3500 pulses / min. (standard)
- II 680 ... 4600 pulses / min.
- III 740 ... 9310 pulses / min.

If the set pulse range is exceeded the value remains at the upper end of the range (higher pulse numbers are ignored).
Below the measuring range the signal goes to 0 (approx. 0 - 7 digit).
The standard setting is range I (i.e. on motors with 3000 rpm at 50 Hz, 1 pulse per revolution)

CAUTION!

Make sure that the selected measuring range is not exceeded, otherwise speed changes in excess of this will no longer be detected.

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Technical data of the Namur input: U_O = 8,2V; Ik = 8,2mA, +/- 5%

– make threshold: max 2.1 mA (typical 1.8 mA)
– break threshold: max. 1.2 mA (type 1.4 mA)
– linearity error: < 0,1% v. E.
– temperature drift: < 75 ppm/K (type. 60ppm/K)

Direct connection of Speed sensor (actual version)

This option allows you to connect a inductive sensor for revolution pickup directly. It could be a NAMUR type or a three wired type. The selection of the type and the range is only factory setting. Sensor NAMUR type is connected to terminal 42 and 43, three wired type to terminal 42,43 and 44 or 22.

Speed nominal range (164...819 digit):

- I 30 ... 300 pulses / min.
- II 600 ... 7200 pulses / min.
- III 300 ... 3600 pulses / min. (standard)
- IV 60... 600 pulses / min

lower limit (152 digit) / upper limit (991 digit)

- I 20 ... 350 pulses / min.
- II 355 ... 8430 pulses / min.
- III 175 ... 4220 pulses / min. (standard)
- IV 40... 700 pulses / min

If the set pulse range is exceeded the value remains at the upper end of the range (higher pulse numbers are ignored). Below the measuring range the signal goes to approx. 0 - 7 digit. The standard setting is range III (i.e. on motors with 3000 rpm at 50 Hz, 1 pulse per revolution)

WARNING!

Make sure that the selected measuring range is not exceeded, otherwise speed changes in excess of this will no longer be detected.

Technical Data	
linearity error	< 0,1% v. E.
temperature drift	< 75 ppm/K (typical 60 ppm/K)
Namur input	U_O = 8,2 V; Ik = 8,2 mA, +/- 5%
make threshold:	max. 1,98 mA (typical 1,8 mA), +/- 5%
break threshold:	max. 1,62 mA (typical 1,4 mA), +/- 5%
Switch input	
make threshold:	6,2V
break threshold:	4,5V
Measuring method	period duration measurement over 5 periods
Input pulse width:	>200 µs
Temperature range:	0…60 °C / 32°F...140°F
Usable Namur transmitters	all Turck sensors, which contain Y0 or Y1 in their type designation.

Owing to the large number of usable transducers LAMTEC has only one two wire element and one three wire element in it's product range. It is selected in that way, that it covers a number of measuring tasks. Other transducers only on enquiry or direct from the company Turck.

Type No.	Description
660 R 8101	r.p.m. sensor as a two wire system d= 12mm, switch gab 2mm
663 R 8103	inductive sensor with switch terminals in three wire system d=12mm, switch gab 4mm

9.17.2 Selection of the Suitable R. P. M. Sensor

The correct sensor should always be selected, taking into account the structural features of the element to be measured.
Since this element is not always known, the following is an approximation procedure for dimensioning the attenuating elements and selecting a suitable sensor

In most cases, a shaft is sensed directly. One or several attenuating elements (screw-heads or metal plates) are attached directly to the shaft. A symmetrical arrangement should be ensured, since many instruments work on the principle of measuring the period, and in the case of more than one attenuating element require 100% equal intervals between them.

If this cannot be guaranteed, the signal can exhibit jumps (asymmetry can become particularly noticeable in analogue signals). This problem can be solved by installing only one attenuating element (this is the standard setting for rev. speed capture in the ETAMATIC).

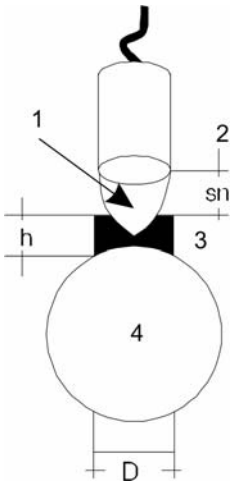

Fig. 9-24 typical arrangement of attenuating element, sensor and shaft.

1 = field
2 = sensor
3 = attentuating element
4 = shaft

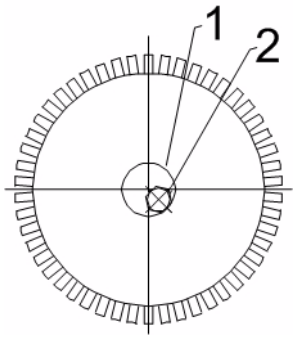

Fig. 9-25 face

1 = motor shaft ∅ 30
2 = M8 screw head glued or bolted

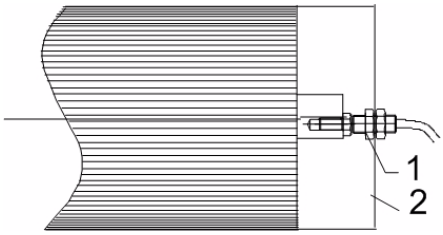

Fig. 9-26 side

1 = 2xM12 bolted
2 = original cowling for the cooling vane of separate locking frame.

The illustration (left) shows a typical arrangement of attenuating element, sensor and shaft.

How the system works:
Every inductive sensor forms an electric field at its active surface, from which the contact gap (nominal contact gap "Sn") can be derived as a function of sensor size. The table lists several typical sensors with their characteristics. The effective contact gap is 0.8 x nominal contact gap in the case of structural steel. An additional correction factor that depends on the material must be included for other materials. These factors are specified in the sensor manufacturer's data-sheets.
The installation distance between the sensor and the attenuating element's upper edge should be Sn/2 (half the nominal contact gap). The sensor's diameter depends on the required nom-

inal contact gap and can be derived from the table. The attenuating element's diameter should be equal to or greater than the sensor's diameter (for frequencies < 20% of the sensor's maximum switching frequency).

Type	sn [mm]	sn x 0,8 [mm]	D [mm]	f [Hz]	Installation
Bi1-EG05-Y1	1	0,8	5	5.000	flush
Bi1,5-EG08K-Y1	1,5	1,2	8	5.000	flush
Ni3-EG08K-Y1	3	2,4	8	5.000	non-flush
Bi2-G12-Y1	2	1,6	12	5.000	flush
Ni5-G12-Y1	5	4	12	2.000	non-flush
Bi5-G18-Y1	5	4	18	1.000	flush
Ni10-G18-Y1	10	8	18	500	non-flush
Bi10-G30-Y1	10	8	30	500	flush
Ni15-G30-Y11	15	12	30	200	non-flush

Tab. 9-1 Selective list of Turck NAMUR sensors

9 Appendix

9.18 External Switching of the fuel motors/ valves

If there are not enough output channels, it is possible to switch externally between actuators, which are not needed in every curve set (oil motors and gas motors).

WARNING!

If you use an external switching you must recognise this for safety reasons:
You must ensure that the feedback of the selected motor is also selected, e.g. by using relays with connected switches.

WARNING!

For switching the feedback signals, you may only use relays with gold contact material.

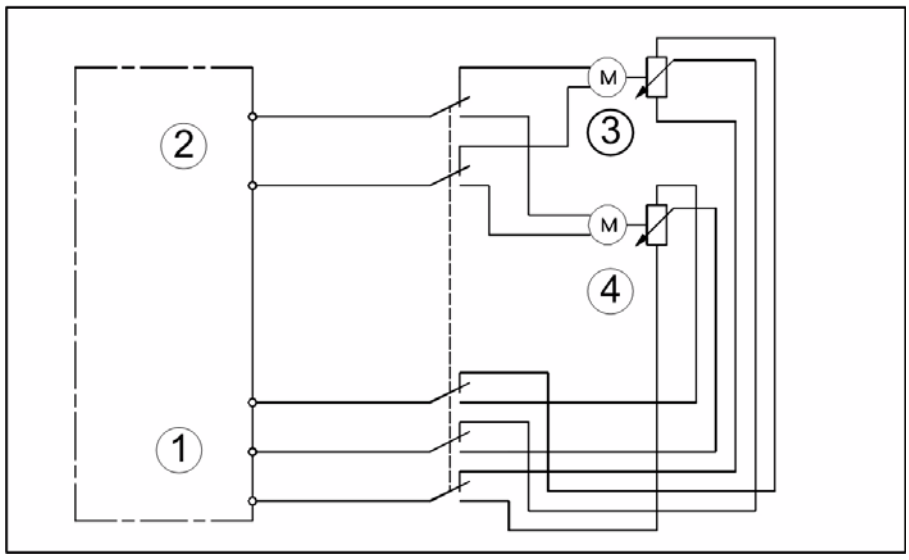

Fig. 9-27 switching from oil motor to gas motor

No.	Description
1	feedback
2	ETAMATIC output
3	gas
4	oil

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9.19 Feedback at Three-point-step Outputs

9.19.1 Joining with positive locking

Since the ETAMATIC, in the case of three-point step channels, adjusts the damper until the actual value is equal to the set-point value. The feedback potentiometer must always reliably correspond to the damper position.
The damper motor potentiometer connections must be positive interlock connections, i.e. not able to rotate.

In addition you must use potentiometers with high quality standards (see next page). If one of these two points is not given, you must use two independent potentiometers (not dual-operated potentiometers) per channel for the feedback.

The motor damper connection must always be a positive interlock.

WARNING!

The connection has to be designed in that way that the maximum torque of the motor could not break the connection under any condition.

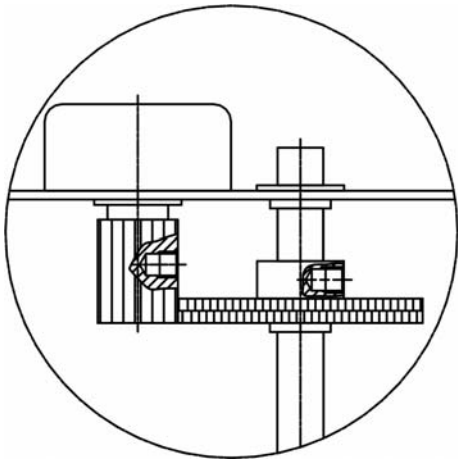

Fig. 9-28 example of positive potentiometer connection

9.19.2 Fail-safe Feedback

In the case of single-channel feedback of TPS outputs, only authorised potentiometers may be used. These must be switched directly.

9.19.3 Examples of potentiometers

Example of potentiometers:

The following potentiometers are authorised for use as solo feedback in the case of ETAMATIC, on condition that they are positively connected to the damper:

Manufacturer	Type	Rating
Novotechnik	SP-Serie	Rating: 5 kΩ*
Contelec	PL 240	Rating: 1 kΩ - 5 kΩ*
Contelec	PL 310	Rating: 5 kΩ*

Manufacturer	Type	Rating
Contelec	PL 295	Rating: 5 kΩ*
Bourns	6639S-095-..	Rating: 5 kΩ*

Other potentiometers are permitted only after consulting LAMTEC or the TÜV.

Examples of servomotors with approved potentiometer, fitted with a positive interlock connection:

Manufacturer	Description
Schimpf	All motors with feedback type R 1* and type R 2*
Landis & Staefa	SQM series with potentiometer PL 240
Haselhofer	HD 60 D 2 with Novotechnik-potentiometer
Haselhofer	HD 60 D 10 with Novotechnik-potentiometer
Aris	WAN 1 - WAN 6
Regeltechnik Kornwestheim	ST 5102 and ST 5113
Keller	CA03 and CA12
Auma	Type enquiries to the manufacturer
KFM Regelungstechnik	4d124B

* also available at LAMTEC

Other motors are admissible only if the potentiometer connection forms a positive interlock or two independent potentiometers are used for feedback.

9.20 Changing Control Drives / Potentiometers

9.20.1 How to replace a servo motor

If you replace a motor without pre-calibration it is necessary to check the burner adjustment after the change, because the potentiometer value and the position of the switches may differ a little bit. This may lead to an other position of the damper.

WARNING!

Therefore you must prove the burner adjustment again in all load positions and all operation modes. If necessary adapt the curves in the ETAMATIC.

9.20.2 How to replace a potentiometer

WARNING!

Keep switches in the same position.

1 Note actual feedback value at lowest position before changing the potentiometer.
2 Remove old potentiometer.
3 Insert new potentiometer and adjust it so that actual value feedback at lowest position is the same like noted before.
4 Fix potentiometer in according to the instruction of the motor manufacturer.
5 Verify burner adjustments and change if necessary

WARNING!

Since the normally used potentiometers can have different values, it is possible that the damper has another position than before. Therefore you must prove the burner adjustment n again after a potentiometer change, at all load points and in all operation modes.

9.21 Changing EPROMs

Tools:

– Crosstip screwdriver size 0
– Crosstip screwdriver size 1
– Socket wrench size 5,5
– Extraction tool for EPROMS

Preparation:

You must generate a protected dataset from the device before you insert the memory extension.

Remove:

Switch OFF supply voltage (zero-potential), take off plugs and if necessary take out ETAMATIC from the control cabinet.

Open the housing:

Remove the 8 countersunk screws from the left side panel.

Remove the circuit boards:

Pull out the circuit boards a bit, remove the PE-connection and take out the circuit boards of the housing.

Remove the base board:

The base board is joined with the rear wall to one unit. You can be take it off simply from the CPU board. Disconnect the PE-wire. The EPROMs / EEPROM /memory extension are plugged on the CPU board.

Remove EPROM/EEPROM:

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The software update set consists of:

– EPROM for main processor “H”
– EPROM for watchdog processor “U”
– EPROM for communication “B”
– EEPROM for watchdog processor
– memory extension

In principle you should always pay attention to the direction of the notches before exchanging. The notches show towards the PE connection.

Remove old EPROMS carefully out of their sockets and insert new EPROMS in the correct position. Make sure that all pins are correctly seated in the sockets.

Insert the memory extension:

Exchange the memory extension against the EEPROM of the main processor. The plug direction of the memory extension is clear.

Assembly:

Connect the PE-wire.

Insert the base board.

Replace the electronic boards in the housing.

Connect the PE-wire from the cover.

Attach and screw on the side cover

Replace ETAMATIC in the control cabinet and connect it again.

Restore dataset!

Before continuing, restore the protected dataset.

Commissioning:

After you have replaced the old EPROMs and switched on the controller, the fault message “U106" may occur at first. This fault is related to the parameters 937 to 976. Set these parameters to their default settings to clear this fault according to the instructions of the manual. Furthermore check and change the following parameters.

Parameter No.	Value
007	11
845	1
846	2
847	1
935	10

You need a password for release level 4 to set these parameters. Ask LAMTEC for the required password. To get this password, send the device’s serial number by phone or fax. Due to the EPROM replacement the CRC 4-check sum changes. Correct the CRC 4 check sum, the existing software version and the writing on the configuration able beside your device! Finally tell LAMTEC the new calculated CRC 4 check sum, that LAMTEC can update the CV of the device. Note that the internal firing-rate controller of software version A4a300 has a new design, therefor it is required, to adjust Parameter 805 and 808 (depending on the software version of your device).

Some experienced data:

Parameter	Description	Hot Water	Steam	
805	P term	120	280	600
806	I term	60	360	300

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Parameter	Description	Hot Water	Steam	
807	D term	20	50	35
808	adjustment time	15	2	20

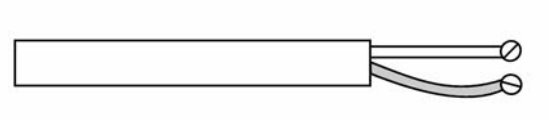
Individual optimisation provided by customer

9.22 Wiring Notes

9.22.1 Connection of the Shields

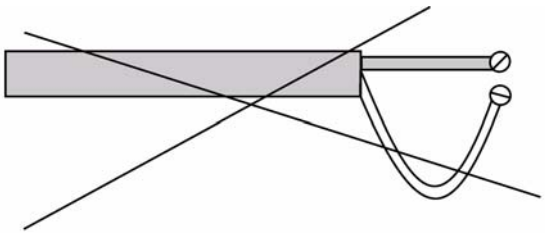
All cables from and to the ETAMATIC must be shielded (with the exception of the 230 V cable). Connect the shielding to PE by the shortest possible route.

Right:



shielding terminal
connection terminal

Wrong:



connection terminal
shielding terminal

9.22.2 PE Bus Rail

Two rails are fitted to the left and right side of the terminal strips and parallel to them on the unit's rear side. Connect all shieldings to these rails. Also connect the PE to this point from the outside.

9.22.3 Control Cabinet Wiring

Don’t let the low-voltage cables from and to the ETAMATIC run in parallel to the power electronics' in and out conductors in one cable duct. Frequency converter cables and switches/ contacts carrying high inductive or capacitive loads are particularly critical. Therefore, avoid routing parallel to the drive cables of solenoid valves, ignition transformers, servo motors and similar devices.

Although this device exceeds all relevant EMC standards in some respects, suitable wiring is essential to ensure that the entire system operates smoothly in all conditions.

Shielding of supply lines out of the field:

The best method of connecting supply lines out of the field (e.g. potentiometer line) is to connect them directly (without additional terminals).

If you need additional terminals, you must connect the shielding beside this terminals

Avoid long distances in the cable duct.

9 Appendix

9.23 Run to Shut-off Limits

Like every control system, the ETAMATIC has tolerances, which affect the accuracy of the settings. You have influence of these tolerances of the ETAMATIC with the parameter settings.

When you adjust the combustion system, ensured that there is a safe and stable flame. To verify this, it is necessary that you test the combination of settings not only by regarding the required values that you have set, but also the so-called shut-down limits. This are actuator settings which the ETAMATIC just takes without switching off.

Perform this test for the whole load range and for all operating modes.

This test may only be dispensed with if:

– the installation is fitted with fail-safe O_2 or CO monitoring which can trigger a burner shut-down if there is incomplete combustion

or

– the installation is fitted with fail-safe O_2 trim/ CO control, which compensates the combustion tolerances

or

– You ensure that the requested mode, has as much excess air over the whole range, that the tolerances of the ETAMATIC are of no consequence

or

– the parameters in the ETAMATIC are set in that way, that the air defficiency tolerances have 0 digit, i.e. there is only tolerance on the excess air side.

WARNING!

If you waive to check the shut-down limits because of one of these measures, you should check the effectiveness of that measure instead, e.g., if there is O_2 / CO monitoring or control, the stability of ignition should be tested at the shut-down value set

WARNING!

Due to verification in respect of authorities, test houses, quality management systems, liability issues, etc., we strongly recommend that you document any running to shut-down limits

press key 12

press keys 2 and 3 to run to the load point for checking it

wait until the system has run to that point

enter password

press key 14 one time (setting)

Adjust setpoint value of the continuous channel in the air deficiency direction until the actual value feedback has changed by the set number of points (monitoring band)

Check combustion
Reset setpoint value to the next continuous channel in air deficiency direction.
Check combustion
Repeat, until all continuous channels are checked at their limits.


press key 12


press keys 2 and 3 to run to the load point for checking it

wait until the system has run to that point

enter password


press key 14 one time (setting)

Adjust set-point value of the three-point step channel in the air deficiency direction (for dead band setting, see parameters)
Reset set-point value to original value
Run all channels this way in succession to the limit at the various load points
- normally at low, medium and full load

Repeat this for all relevant operating modes (curve sets).

WARNING!

If applicable, perform the test which is described above in the air deficiency direction rather than in excess air direction unless it is ensured that the flame is stable and there would be no excess CO at the limits, which are set in the excess air direction.

9.24 Tolerance Limit in Direction Air Deficiency

To be able to perform the test, you must know the parameter values in the air deficiency direction. The default setting for the relevant parameters is shown on the configuration label.

WARNING!

If the default setting for dead bands and monitoring bands have changed during commissioning you must document this clearly. Update the entries on the configuration label in a manner that is durable and cannot be wiped off. (e.g. with a waterproof indelible felt-tipped pen.

There is no tolerance in the air deficiency direction if the following parameter setting is retained:

– For fuel channels and recirculation channels - dead band in positive direction
  parameters 42 to 46 = 0 digits
– For air channels - dead band in negative direction
  parameters 32 to 36 = 0 digits

Furthermore, the "band shift in the event of output change" (P 709 to P 712) must have the same value as the monitoring band for the corresponding channel in the air deficiency direction (P 62 to P 76) so that there is no tolerance on the air shortage side even when there are load changes. For deliveries made after 01.01.05, this will be the default setting and will be marked on the device label.

If you have made changes to this setting, you must perform a documented test of the combustion limit values, as described previously.

WARNING!

If applicable, you must clearly verify the correctness of these parameter settings. You may do so by checking the parameters on the device or by checking the values via remote software or another suitable analysis tool. We recommend that you note this in a protocol. the protocols of the burner settings may contain such a protocol.

Note for the example of a protocol on the next side:

9 Appendix

With the aid of this protocol you can document, that a check on the switch off limits are not necessary. Insert the setting values in the tables. The numbers are describing the parameter numbers or numbers, on which the settings are based of. You must verify the declarations 1 to 6 with your signature.

Cross out everything not applicable.

For excess air: Fill in the reasons, why you do not note excess air. If you don’t do that, you have to do a check with excess air.

9 Appendix

9.24.1 Example of a Protocol of the Parameter Settings of the Monitoring Bands

Date: **Serial No.:** **Installation:**

Operating mode:

Tolerance on air shortage side:

	Channel Functions	Dead band	Monitoring Band	Band shift
Channel 1	356	32 /34	62 / 67	708
Channel 2	357	33 / 43	63 / 73	709
Channel 3	358	34 / 35	64 / 74	710
Channel 4	359	35 / 45	65 / 75	711
Channel 5	360	36 / 46	66 / 76	712

Adjustment in air deficiency direction	**Adjustment in excess air direction**	**Correction range**	**Correction value with O_2** control deactivated	**correction value with air deficiency**

Default setting 40: 60

(cross out, if not applicable)

1. The dead band on the air shortage side is always 0 digit
2. The band shift is at least as large as the monitoring band in the air deficiency direction.
3. If the combustion air fan has speed control, the monitoring band on the air deficiency side is 0 digits.
4. The following applies if 1. and 2. and, if applicable, 3. are satisfied: there is no tolerance on the air shortage side, therefore the shut-off limits in the air shortage direction do not have to be tested.
5. A test has not been performed with regard to excess air because

   .....*
6. It should be ensured that, if the O_2 regulator is deactivated, the burner is operated with more excess air than when operating onthe required value curves (corresponding to the burner setting protocol)

I have checked the facts above.:.....

company name date signature

* If this phrase has been deleted a test protocol on the shut-off limits for excess air should be submitted.

9 Appendix

9.25 Technical Data

Power supply	from 115 V - 15% to 230 V +10% 50/60 Hz **To be used only in a grounded power line network!**
Power Consumption	approx. 50 VA
Ambient Temperature	normal operation:+ 0°C … + 60°C transport and storage:-25°C … + 60°C
Display	alphanumeric display, 2 rows with 16 digit each
Permissible Ambient Humidity	class F, DIN 40 040
Protection Class	IP 54 (with sealing against cabinet door), otherwise IP 20
In- and Outputs	14 digital inputs 24V 16 digital inputs 230V 1 analogue inputs (ETAMATIC S S) 3 analogue inputs - all non-floating
Digital Signal Inputs	The parasitic capacitance of the lead connected to the digital inputs may not exceed 2.2µF as a result of the ETAMATIC self-tests. The lead length should be limited to 100 m. Since the digital inputs are for 24V DC, suitable contacts for that voltage should be used (hard silver or gold-plated)
Regular Firing Rate Input	By actual load power control unit. By means of PT 100 direct connection, manual operation is possible via three-point switch signal.
Feedback Inputs	Potentiometer 5kΩ or current signal 0/4 … 20 mA (ETAMATIC S channel 1) Optional: Direct switching of Namur transmitter
Control Outputs	4
Resolution	999 digit, 10 bit
Three-point-step	running time of the actuating drives: 30s...60s possible servomotors: 6 Nm 60 sec. running time to 90° Type: 6 62 R 2127 19 Nm 60 sec. running time to 90° Type: 6 62 R 2111/N 30 Nm 60 sec. running time to 90° Type: 6 62 R 2112 40 Nm 60 sec. running time to 90° Type: 6 62 R 2121 You may only use other servomotors with the permission of LAMTEC. Current consumption max 50 mA continuous current.

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Continuous control output Apparent ohmic resistance: 4...20mA < 600Ω (ETAMATIC S)

Analogue inputs Apparent ohmic resistance: 100Ω

ETAMATIC with internal flame monitor

Connectable flame sensors:

Type: FFS05
FFS06
FFS 05UV
FFS06UV

NOTICE!

Up to 9 mA test current is discharged through the outputs by a cyclic self-test. This self-test requires the consumers to be connected directly to the outputs. If this cannot be assured, the output must be connected to a test load with the burner stationary; the load can be (e.g.) a 0.15 µF capacitor with 0,15 µF / 220 Ω

Outputs 230V

WARNING!

Only passive or non-reactive equipment may be connected to the 230 V-outputs of the ETAMATIC. Any 230 V supply feed to the unit via these terminals in the event of a fault must be excluded. Connect only equipment which can not be activated by the test current.

230V-Supply All consumers connected to the control unit are supplied via this terminal. The customer must fit a 6A max. slow-acting fuse

Maingas 1 term. 68 Contact for actuation of the main gas valve on the gas line side
max. 1 A**, cos φ = 0,4...1

Maingas 2 term. 67 Contact for actuation of the main gas valve on the burner side
max. 1 A*, cos φ = 0,4...1

Oil term. 66 Contact for actuation of both oil valves
max. 1 A*, cos φ = 0,4...1

Ignition valve term. 65 Contact for actuation of the ignition valves
max. 1 A*, cos φ = 0,4...1

Ignition transformer term. 64 Contact for actuation of the ignition transformer
max. 1 A*, cos φ = 0,2...1

Fan (burner start) term. 63 Contact for actuation of the fan motor and all other components that have to be activated when starting max. 1 A*, cos φ = 0,8...1

Fault term. 61 Contact for signalling a fault condition
max. 0,5 A*, cos φ = 0,8...1

** several contacts are fed through one fuse. The sum of all the currents must not exceed the fuse's rating.

9 Appendix

Times	Pre-ventilation time of 30 - 999 seconds Safety time in operation: 1 sec. 1. safety time: Oil 4 sec. 1. safety time: Gas 3 sec. 2. safety time: Oil 4 sec. (when starting without pilot burner = safety time) 2. safety time: Gas 3 sec. (when starting without pilot burner = safety time)
Storage of the set-point values and variable data:	In EEPROM 11 digits typical (max 20) with linear interpolation
Number of Curve sets	2 (p.ex. for dual-purpose burner)
Regular Operating State Input	by internal control module
Number of program cycles	unlimited
Interfaces	1 serial interface on 25-pole Sub-D-connector, addressable via adapter only (RS 232)

WARNING!

Using the interface without the adapter may damage the device.

You may use devices according to EN60950 / VDE 0805 only.

1 LAMTEC SYSTEM BUS interface on 9-pole plug

max. 500m long

BUS-connection via LSB-interface, BUS card optional for the following systems:

- CAN-BUS (CANopen)
- PROFIBUS DP
- Modbus
- TCP/IP (Modbus TCP)
- Ethernet

9 Appendix

9.26 ETAMATIC without internal flame monitoring

Connectable flame detectors:	Any tested flame sensor with error-proof floating contact for flame signalling

WARNING!

If a flame monitor, which is not approved for continuous operation is connected, the entire system's approval for continuous operation will loose it’s validation.

integral speed sensing

linearity error:	< 0,1% v. E.
- temperature drift:	< 75 ppm/K (60 ppm/K typical)
Namur input:	U_O = 8,2 V; Ik = 8,2 mA, +/- 5%
- make threshold:	max. 1,98 mA (1,8 mA typical) +/- 5%
- break threshold:	max. 1,62 mA (1,4 mA typical)+/- 5%
Switch input:	- make threshold: 6,2V - break threshold: 4,5V
Measuring method:	Cycle duration measurement over 5 cycles
Input impulse width:	> 200 µs
Temperature range:	0 … 60 °C
Usable Namur sensors:	all Turck sensors with Y0 or Y1 in type designation.

Owing to the large number of usable transducers LAMTEC has only one two wire element and on a three wire element in the range. It is selected so as to cover a number of measuring tasks. Other transducers only on enquiry or direct from company Turck.

type 663 R 8101	r.p.m. sensor as a two wire system d = 12 mm, switch gab 2 mm
type 663 R 8103	inductive sensor with switch with terminals in three wire system d = 12 mm, switch gab 4 mm

9 Appendix

9.27 Dimensions and weight

Dimensions

ETAMATIC (l x w x dm)	144 x 240x142
Installation depth	125 mm
Weight	2,3 kg
Protection class to DIN 10 050	IP 40

Installation

ETAMATIC	Panel mounting
Position of use	any

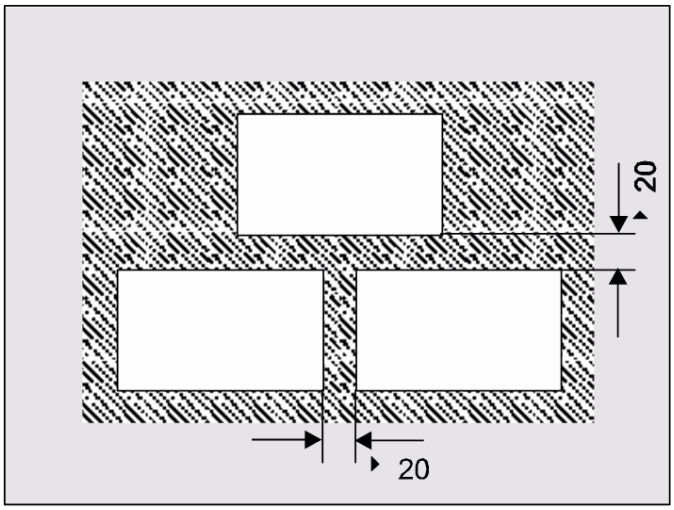

Fig. 9-29 Minimum distances in the case of several cut-outs

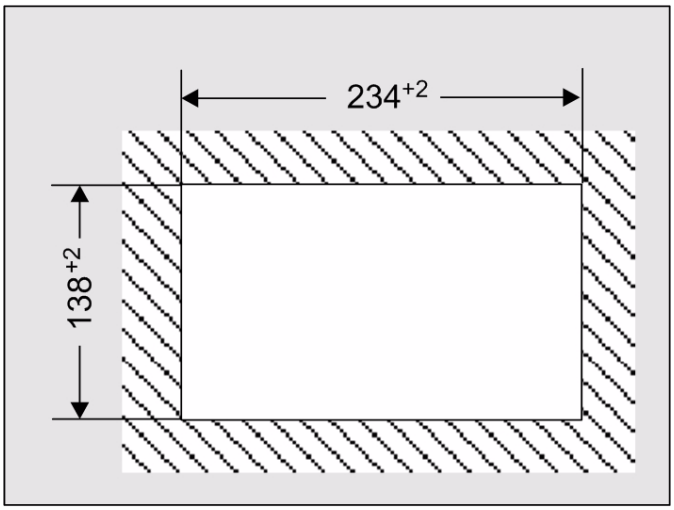

Fig. 9-30 Single cut-out

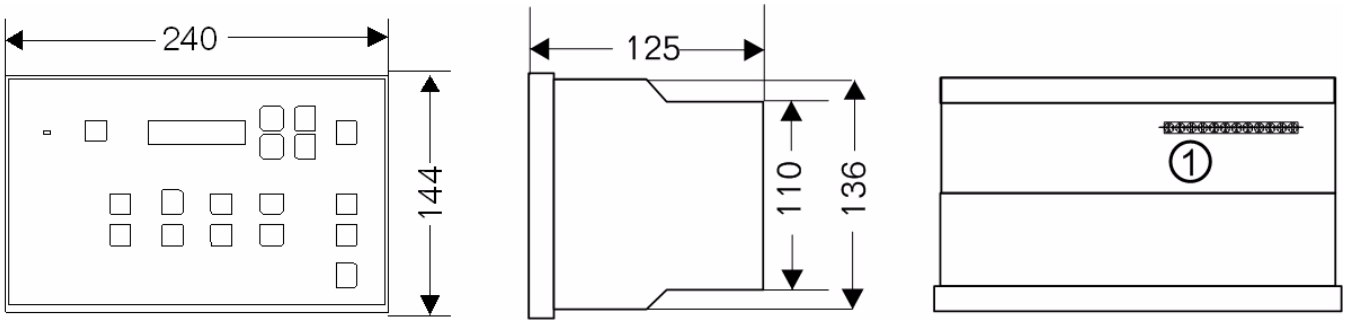

Fig. 9-31 views ETAMATIC

1 PE rail

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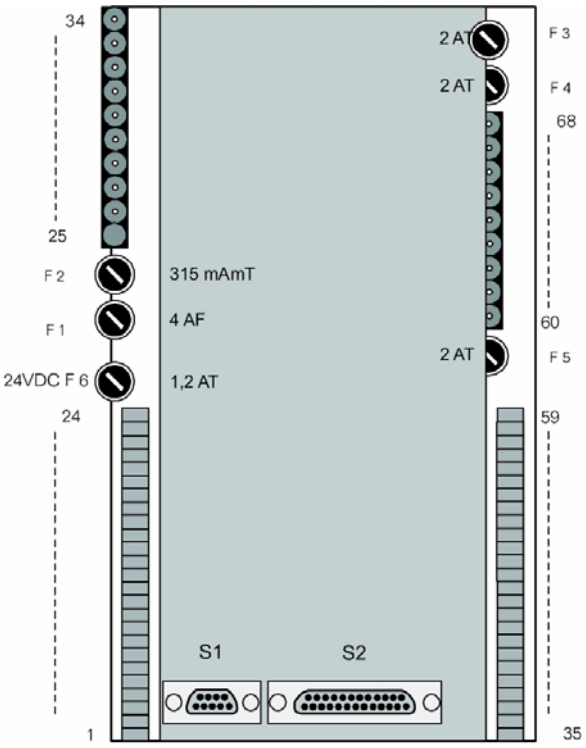

F1 device
F2 control elements
F3 main gas 1
F4 main gas 2
F5 ignition transformer, fan, ignition valves, oil pump, fault

S1 9-pole Sub-D connector for LAMTEC SYSTEM BUS
S2 communications interface

PC connection is possible only with LAMTEC interface adapter!

Fig. 9-32 Rear view

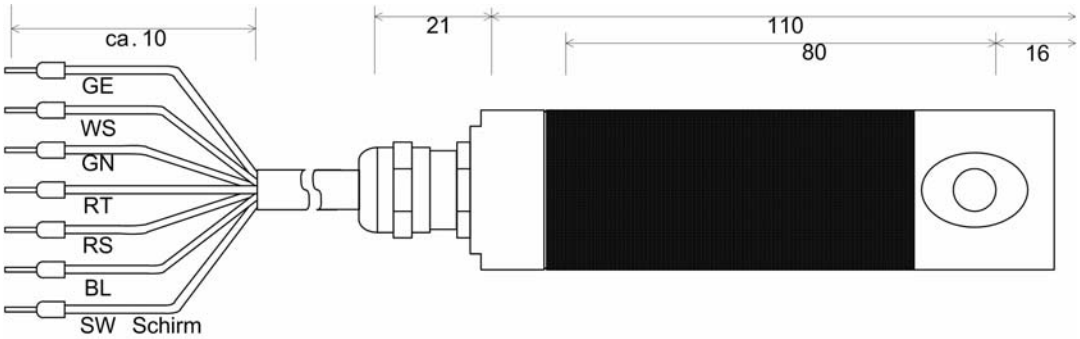

Fig. 9-33 Flame sensor FFS06 IR / VU

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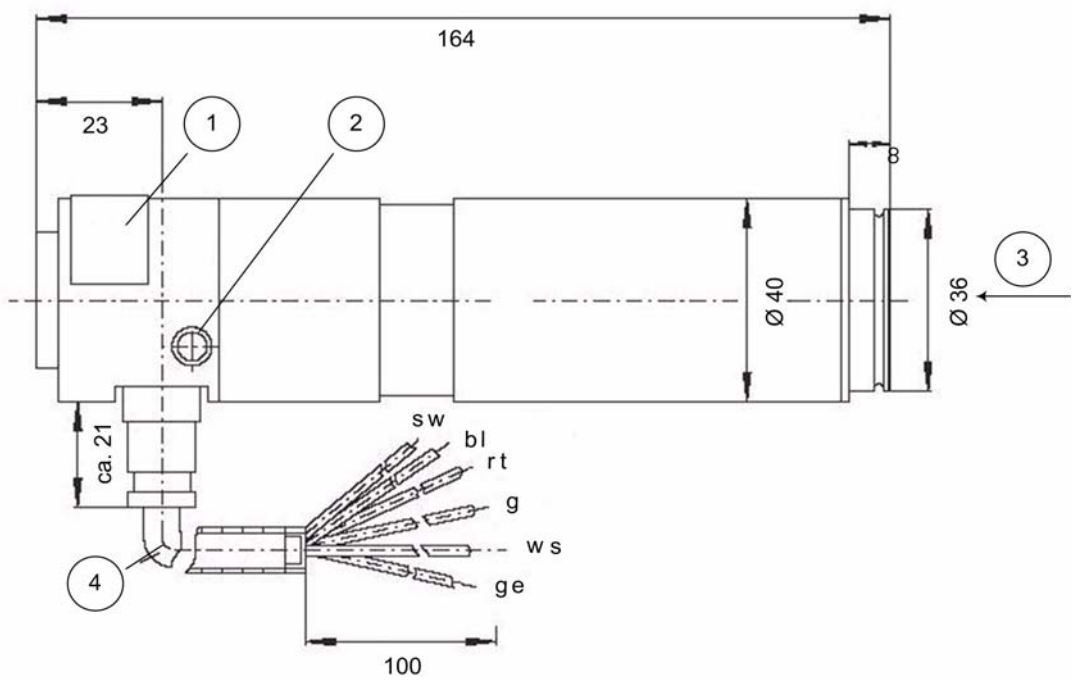

Fig. 9-34 Flame sensor FFS05

No.	Description
1	type plate
2	grounding M4 (Pozidriv 2)
3	incidence of light
4	bend radius of the FM wire min. 25 mm

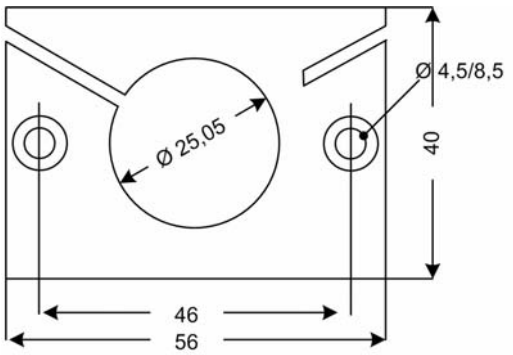

Fig. 9-35 Mounting clip for FFS 06... see also ths documentation of the flame scanner FFS05 (DLT7501 and DLT7503)

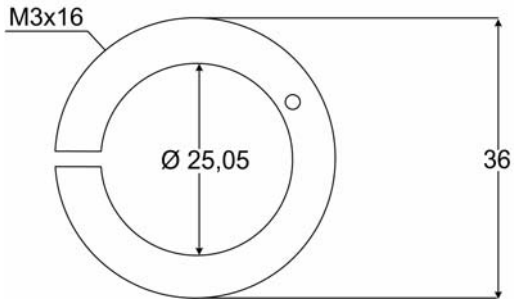

Fig. 9-36 Mounting clip for FFS 05 see the documentation for the desired device

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9.28 Declaration of Conformity

Month/Year: :.....April../...10.....

Manufacturer: **LAMTEC Meß- and Regeltechnik für Feuerungen GmbH & Co KG**
.....

Address: Wiesenstraße 6, D-69160 Walldorf
.....

Product: ETAMATIC / ETAMATIC S

.....

Type approval: CE 0085 AU 0207
.....

The indicated product comply with the regulations of following European Guidelines:

Number	Title
2004/108/EC	Electromagnetic compatibility
2006/95/EC	Low voltage directrive
2009/142/EC	Gas Device Guideline

Further information on observance of these guidelines includes the appendix

Fixing the CE-Label: no, it's a component

Location, day: Walldorf, April 20th, 2010

Legally signature:

The appendix is part of this declaration.
This declaration certifies the observance with the named guidelines, does not include any assurance of characteristics.
Pay attention strictly for the safety instructions of the delivered product documentation.

9 Appendix

EC Declaration of Conformity - Appendix

:

Month/Year: .....April../...2010.....

Product type: ETAMATIC/ETAMATIC S
.....
.....
.....

This compliance is demonstrated by a conformity with the following harmonized standards or other normative documents:

Harmonised European Standards:

Reference-Number:	
EN 298	
EN 230	

National Standards:

Reference-Number:	
VDE 0110	
VDE 0100	
VDE 0116	
VDE 0801	AK 4 complete AK 5 partial
DIN VDE 160	
DIN 4788 Part 3	

Integrated leakage Test: DIN V 3447

Technical Regulations:

Reference-Number:		
TRD 604, as far as applicable	Date of issue:	up to January 1996
TRD 411, as far as applicable	Date of issue:	up to January 1996
TRD 412, as far as applicable	Date of issue:	up to January 1996

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