DUNGS®
Combustion Controls

Manual
MPA 41xx

Edition: 02.14

GB

Nr. 257 454 - GB

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µP Automatic Burner Control MPA 41xx

Automatic burner control for one-stage and modulating gas burners

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Combustion Controls

- **Automatic gas burner control for one-stage burners with pilot burner or direct ignition**
- **Continuous operation**
- **Configurable program sequence**
- **Version with or without display**
- **Two independent flame detectors:**
  Ionisation input
  Gate input
- **Additional functions by extension modules**
- **Profibus**
- **Accessories**
  Flame detector
  Ignition transformers
  Parameterisation and service box

Description

Microprocessor-controlled automatic gas burner control for intermittent and continuous operation of one-stage atmospheric burners or one-stage or modulating fanned burners.
The program sequence and times can be customised by setting software parameters.

Versions

- MPA 4111 without display
- MPA 4112 with integrated display
- MPA 4122 with metal housing and integrated display

Application

For one-stage or modulating gas burners with or without ignition gas. In particular for industrial thermoprocessing equipment to EN 746-2.

Approvals

EC type-examination certificate according to the EC Gas Appliances Directive:
MPA 41xx CE-0085BU 0487

EC type-examination certificate according to the EC Pressure Equipment Directive:
MPA 41xx CE0036

FM Approved to FM 761
UL Recognized Component per UL 372, UL 1998 and CSA C22.2.
GOST / Rostechnadzor

Suitable for applications up to SIL3. Meets the requirement according to IEC 61508 (2nd Ed. 2011)
Certified by TÜV Süd

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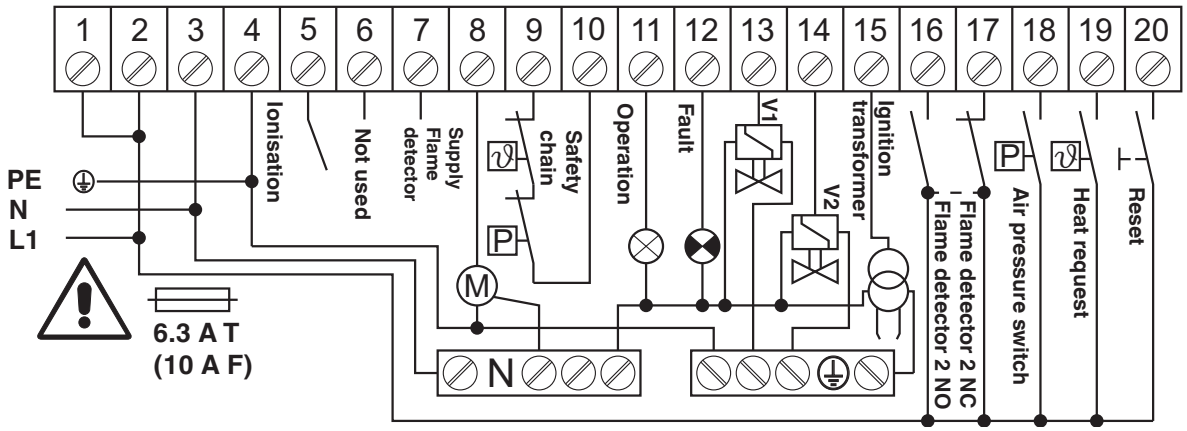
MPA 41xx automatic gas burners are suitable for all types of one-stage or modulating gas burners with and without ignition gas.

The flame is monitored either by means of an ionisation input, gate input or both inputs for burners with two flame detector positions.

- For atmospheric burners and fan burners
- Suitable for continuous operation
- MPA 4112/4122 configuration without laptop/PC via display
- Ionisation and gate inputs as flame detectors
- Extension module for Profibus communication

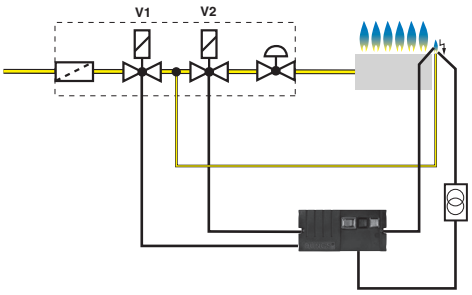
Wiring scheme



The wires which are used for the connection must be approved for ambient temperatures of minimun 75 °C (167 °F).

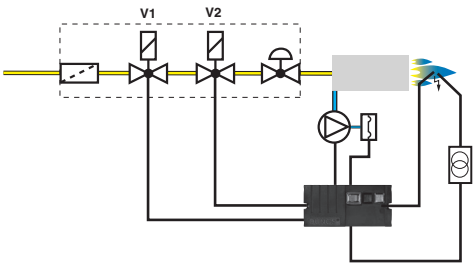
Example for connection

Atmospheric burner with ignition gas output



Atmospheric burner with ignition gas output.
After the heat request and an adjustable delay, the ignition is switched on and V1 and Vz are opened.
After the flame has been detected, the main gas flow V2 is opened.

Fan burner, direct ignition:



Fan burner, direct ignition of the main gas flame.
After the heat request, the fan is switched on, and the air pressure is checked by the pressure switch. After the pre-aeration time has lapsed, the ignition is switched on, and the two valves V1 and V2 are opened together.

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The program sequence and times can be modified on the mounted display (MPA 4112/MPA 4122) to match each application.
A laptop or PC is not required for the modification.
The automatic burners are protected by passwords against unauthorised access.

All settings for the MPA 41xx automatic gas burners can also be made by means of a laptop/PC via MPA Vision Box.

Display modes
Operation display

- Display of the current operating state
- Display of the program state
- Display of bus address

Info display

- Display of flame quality
- Display of resettable counters for start-up, operating hours and operating cycles

Error display
Display of the error memory

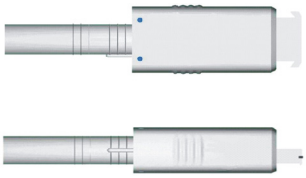
- Automatic activation of error messages
- Additional information about faults
- Query of the last ten faults

Parameter display

- Password-protected functional levels for service and OEM parameter settings
- Setting of important parameters such as:
  Pre-purge time
  Safety time for startup phase
  Post-purge time
  Behaviour after flame lift-off
  Operating modes of V1 and V2
  Continuous or intermittent operation

Accessories

Flame detector
FLW 10 IR
IR flame detector for connection to ionisation input. Suitable for intermittent operation.



FLW 20 UV
UV flame detector for connection to ionisation input. Suitable for intermittent operation.

UV 41 (HE)/UV 42
UV flame detector for high mechanical load; metallic version. Suitable for intermittent operation.

With shutter module suitable for continuous operation

FLW 41 I
Flame safeguard module for ionisation flame monitoring. The FLW 41I is connected to the second flame guard input of the MPA 41xx.
When equipped with an extension module, for example EM 2/4, suitable for continuous operation.

Communication

MPA 41 extension module EM2/4
Additional circuit board and connector set for Profibus DP and Modbus communication.

MPA 41 extension module EM2/6
Additional circuit board for Profibus DP and Modbus communication.
PWM output for open loop control of DC fans, voltage-/current output also program state related relay outputs.

Parameter setting and service
MPA 41 parameterisation and service box
Universal support for checking devices in the field; for producing small and medium series.

MPA Vision Box
In addition to MPA41 parameterisation and service box for setting parameters via a PC/laptop.

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µP Automatic Burner Control
MPA 41xx

Automatic burner control for one-stage or modulating gas burners

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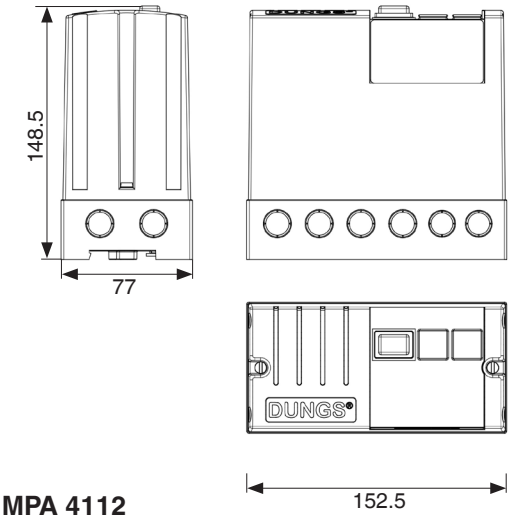
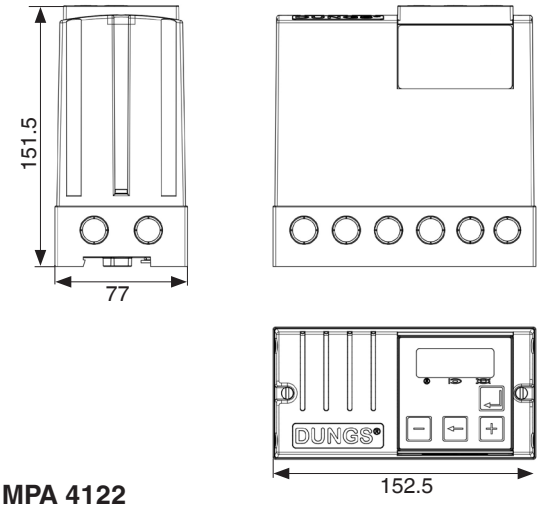
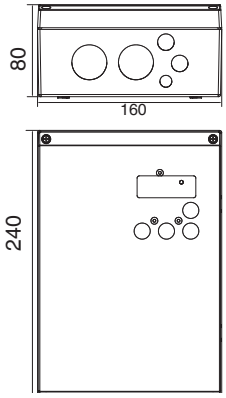
Dimensions [mm]
MPA 4111



MPA 4112



MPA 4122



Technical Data

Rated voltage	115 VAC -15 % ... +10 %
(depending on the model)	230 VAC -15 % ... +10 %
Frequency	50 Hz...60 Hz
Power consumption	max. 10 VA
Fuse	max. 6.3 A slow-blow
	or 10 A fast-blow
Ready signal	max. 1 A
Fault signal	max. 1 A
Gas valves	max. 2 A
Fan	max. 1 A
Ignition	max. 1 A
Flame detector supply	230 VAC / 10 mA
Flame detector	Ionisation
Ionisation current / operation	10-20 µA
Shutdown sensitivity	1,2 µA
Short-circuit current limit	approx. 280 µA
Unlocking due to fault	Pushbuttons and remote unlocking
Type of protection	MPA4111 / IP 42
	MPA4112 / IP 54
	MPA 4122 / IP 65
Ambient temperature	-40 °C - +70 °C
	-20 °C - +60 °C (UL approval)

Ordering data

MPA 4111/230 VAC	Order No. 259 058
MPA 4111/115 VAC	Order No. 259 062
MPA 4112/230 VAC	Order No. 259 066
MPA 4112/115 VAC	Order No. 259 070
MPA 4122/230 VAC	Order No. 260 347
MPA 4122/115 VAC	Order No. 260 355
Extension module	
EM2/4 MPA 411x	Order No. 257 960
EM2/4 MPA 412x	Order No. 257 961
Profibus DP, Modbus, Shutter	
EM2/6 MPA 411x	Order No. 260 751
EM2/6 MPA 412x	Order No. 260 570
Profibus DP, Modbus, Shutter, PWM, analog In/Out	
Flame detector	
FLW 10 IR	Order No. 255 216
FLW 20 UV	Order No. 250 733
FLW 41 I	Order No. 258 396
UV 41	Order No. 256 692
UV 41 HE	Order No. 260 575
UV 42	Order No. 258 385
UV 4x-EM 1/1 (Shutter)	Artikel-Nr. 259 361

Subject to technical modification in the interest of technical progress.

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Approval overview

Approval overview	Order No.	CE	FM	UL recog-nized	UL listed	CSA C22.2	Gost	AGA
MPA 4111 / AC 230 V	259058	x	x			x	x	x
MPA 4111 / AC 115 V	259062	x	x	x		x	x	x
MPA 4112 / AC 230 V	259066	x	x			x	x	x
MPA 4112 / AC 115 V	259070	x	x	x		x	x	x
MPA 4122 / AC 230 V	260347	x	x			x	x	x
MPA 4122 / AC 115 V	260355	x	x	->	x	x	x	x
Extension module								
EM2/2 MPA 41xx	256556	x	x	x		x	x	
EM2/3 MPA 41xx	257387	x					x	
EM2/4 MPA 411x	257960	x	x	x		x	x	(x)*
EM2/4 MPA 412x	257961	x					x	(x)*
EM2/5 MPA 412x	260743	x	x	x		x	x	(x)*
EM2/6 MPA 411x	260751	x	x	x		x	x	(x)*
EM2/6 MPA 412x	260570	x	x	x		x	x	(x)*
Flame detector								
FLW 10 IR	255216	x						
FLW 20 UV	250733	x						
FLW 41 I	258396	x						**x**
UV41	256692	x	x	x		x	x	x
UV41 HE	260575	x	x	x		x	x	(x)*
UV42	258385	x	x	x		x	x	x
UV 4x-EM1/1 (Shutter)	259361	x	x	x		x	x	x
Ignition Transformer								
DEZ 1xx	alle	x		(x)*			x	
DEZ 2xx	alle	x		(x)*			x	

* on request

Safety Integrity Level (SIL)

MPA41xx from V1.1	UV4x	UV4x-EM1/1 (Shutter)	Components	SIL	SFF	PFH
X			Ionisation input	3	99,48 %	1,80E-09
X			Input FLW2 NO, FLW2 NC, LDW and remote unlo-cking	3	99,38 %	1,80E-09
X	**X**		UV41 + ionisa-tion input	2	96,91 %	1,50E-07
X	**X**		UV42 + input FLW2 NO	2	96,87 %	1,51E-07
X	**X**	**X**	UV4x-EM1/1 (shutter) + UV41 + ionisa-tion input	3	99,35 %	3,15E-08
X	**X**	**X**	UV4x-EM1/1 (Shutter) + UV42 + input FLW2 NO	3	99,34 %	3,15E-08

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1 MPA 41xx System description

The automatic gas burner control systems MPA 41xx are suitable for intermittent or continuous operation of gas burners with or without fan. The system parameters may be set on the integrated display (MPA 4112/ MPA 4122) and/or using the DUNGS VisionBox.
The flame is either monitored using an ionisation electrode, a DUNGS FLWXX flame detector or DUNGS UV 41 flame detector connected to the ionisation electrode input or over a second flame detector input for a flame detector with potential-free two-way contact or by means of the DUNGS UV 42 flame detector.
Both flame detector inputs may be used individually or combined.

The MPA 41xx parameterisation and service box is available for the production of small series and for checking the system when service is required.

For operation in burner networks, a Profibus/Modbus communication over the extension module EM-2/4 or EM 2/6 is possible.

System variants

Designation	Article no.	Voltage	Display
MPA 4111	259 058	230 VAC	Minimum indication
MPA 4111	259 062	115 VAC	Minimum indication
MPA 4112	259 066	230 VAC	3-digit 7-segment display
MPA 4112	259 070	115 VAC	3-digit 7-segment display
MPA 4122	260 290	230 VAC	3-digit 7-segment display
MPA 4122	260 355	115 VAC	3-digit 7-segment display

Accessories

Ignition transformers:
- DEZ xxx
- Connection line
- Ignition line

Flame detector:
- IR: FLW 10
- UV: FLW 20, UV 41, UV 42
- Ionisation: FLW 41I

Extension modules EM
- EM 2/4: Shutter, Profibus DP, Modbus

- EM 2/6: Shutter, Profibus DP, Modus, PWM analogue IN/OUT.

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Technical Data

General MPA41XX	
Protection type of the plastic housing MPA 4111 MPA 4112	 IP 42 IP 54
Protection type of metal housing MPA 4122	 IP 65 (Attention: use suitable cable screw connections only)
Ambient temperature MPA 41xx	-20 °C ... +60 °C (UL Approval) -40 °C ... +70 °C
Storage and transport	-40 °C ... +80 °C
Humidity	DIN 60730-1, no dewing admissible
Useful life Switching outputs	Minimum 250,000 switching operations
Mounting position	as desired
Dimensions of MPA 411x in mm	MPA 4111 (L x H x T): ca. 152,5 x 148,5 x 77 mm MPA 4112 (L x H x T): ca. 152,5 x 151,5 x 77 mm
Weight MPA 411x	0,82 kg
Dimensions of MPA 412x in mm	MPA 4122 (L x H x T): ca. 160 x 240 x 80 mm (excluding cable screw connection)
Weight MPA 412x	2,2 kg

Electrical data	
Rated voltage	230 VAC -15 % ... +10 % or 115 VAC -15 % ... +10 %, depending on the version
Frequency	50 Hz ... 60 Hz
Fuse	6.3 A slow-blow fuse or 10 A fast-blow fuse, integrated, exchangeable
Isolation	No galvanic isolation between mains and 24 VDC or 5 VDC
Electrical connection	**Correct phase sequence** (!) connection and protective earth conductor according to the wiring diagram The **contact protection** for the UV sensor must be guaranteed by mounting it in the operating equipment
Power consumption (own consumption)	Maximum 10 W Typically 115 V 230 V Standby 1.5 W ... 1.8 W Operation 3.4 W ... 4.8 W With extension card EM2/4 Standby 3.3 W ... 3.5 W Operation 5.4 W ... 6.3 W With extension card EM2/6 Standby xx W ... 6.3 W Operation xx W ... 9.0 W
Short-circuit current ION against N 115/230 VAC	280 µA

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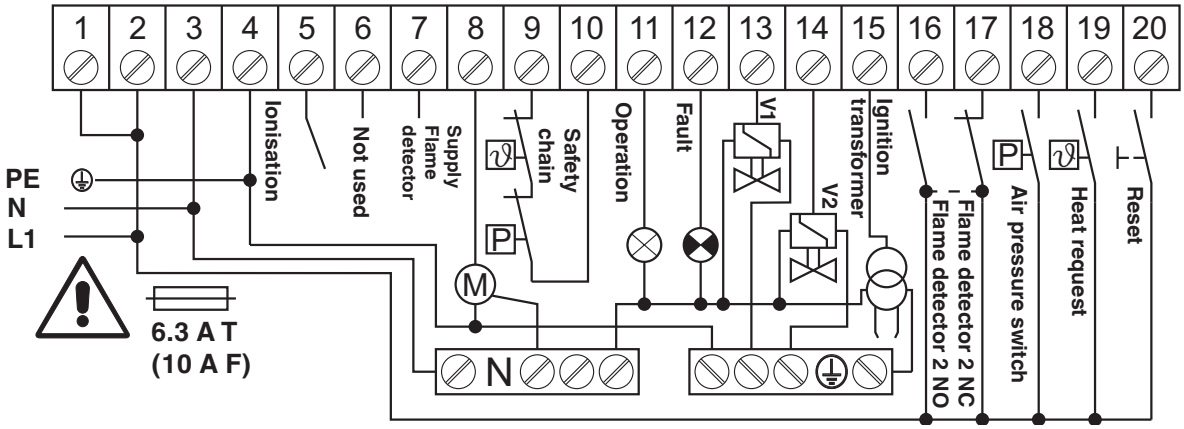
Connection diagram
MPA411x



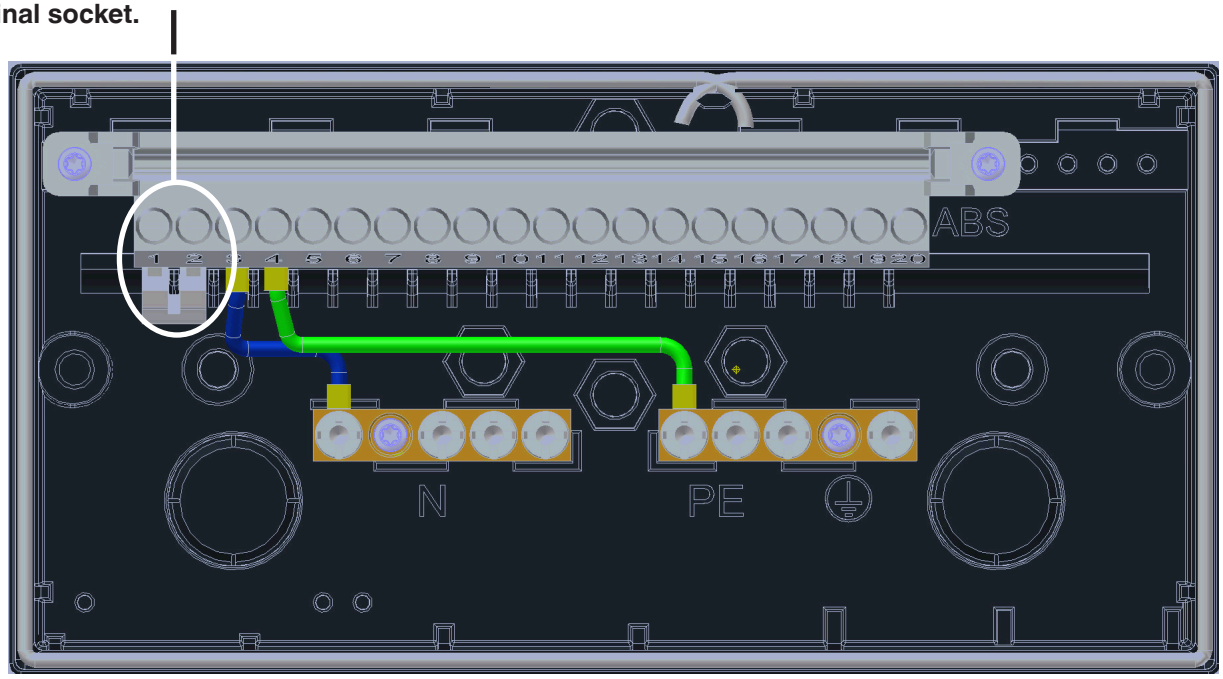
The wires which are used for the connection must be approved for ambient temperatures of minimun 75 °C (167 °F).

Attention:

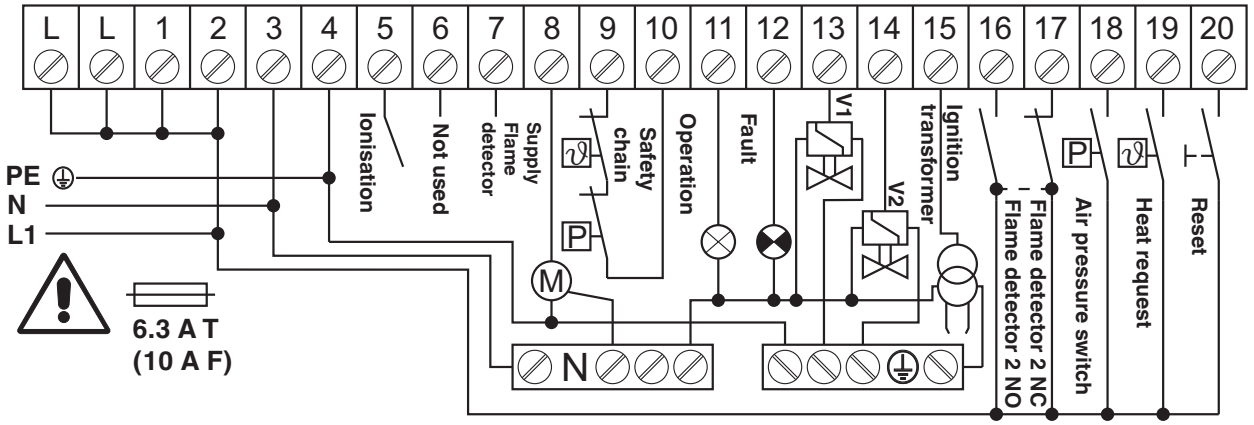
Riks of fatal electric shocks!
You must interrupt the power supply before removing the hood.

After having removed the hood, you might get in contact with the electrical connections in the terminal socket.

Do not remove the jumper between terminals 1 and 2, which was mounted in the factory. It is required for the intended use of the automatic gas burner control system.



Connection diagram
MPA 412x



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Outputs*				
Designation	**Safety-related**	**Type of output**	**Line length**	**Electrical data**
V1 Main gas valve	●	Relay contact	Max. 100 m	115/230 VAC / 2 A cos φ = 1 Minimum load 0.5 W
V2 Safety gas valve	●	Relay contact	Max. 100 m	115/230 VAC / 2 A cos φ = 1 Minimum load 0.5 W
Ignition	●	Relay contact	Max. 100 m	115/230 VAC / 1 A cos φ = 0.4 corresponds to 115/230 VAC / 2.5 A cos φ = 1
Fan		Relay contact	Max. 100 m	115/230 VAC / 1 A cos φ = 0.4 corresponds to 115/230 VAC / 2.5 A cos φ = 1
Operation		Relay contact	Max. 100 m	115/230 VAC / 1 A cos φ = 1
Fault		Relay contact	Max. 100 m	115/230 VAC / 1 A cos φ = 1
Flame detector supply		For UV41 (HE), 42 FLW10, FLW20	Max. 100 m	230 VAC / 10 mA *1

*1: The flame detector is always supplied with 230 VAC, even the 115 VAC version, via the MPA 41xx power supply flame detector, pin 7

The sum of the currents of all safety-related consumers must not exceed 5 A!
The sum of the currents of all consumers must not exceed 6.3 A (10 A), note fuse value

Inputs*			
Designation	**Type of input**	**Line length**	**Electrical data**
Safety chain	Potential-free contact	Max. 100 m	115/230 VAC / max. 10 A
Flame detector 1 (Ionisation)	Ionisation for one or two-probe operation	Max. 10 m **	Threshold value: approx. 1.2 µA
Flame detector 2 NO	Switching contact	Max. 100 m	115/230 VAC “normally open”
Flame detector 2 NC	Switching contact	Max. 100 m	115/230 VAC “normally closed”
Heat request	Switching contact	Max. 100 m	115/230 VAC
Air pressure switch	Switching contact	Max. 100 m	115/230 VAC
Remote unlocking	Switching contact	Max. 100 m	115/230 VAC

* The wires which are used for the connection must be approved for ambient temperatures of minimun 75 °C (167 °F).

** For distances > 10 m flame detector 2 should take place.
For special applications Ionization line length up to 50 m is possible on request.

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General information				
Designation	**Type of input**	**Electrical data**	**MPA 4111**	**MPA 41x2**
L1 connection over exchangeable backup fuse		L1 protected by integrated fuse, 6.3 A slow-blow or 10 A fast-blow	●	●
TWI interface	TWI	Connection only for Vision-Box and parameterisation box **NOT galvanically isolated!**	●	●
Switch for parameter mode	Bistable switch	ON/OFF switch in MPA (may only be switched after having removed MPA from the base)	●	●
Display unit "Multi-function switch"	In housing towards integrated multi-function switch	1 pushbutton with 2 LED's	●	
Display	In housing towards integrated display	3x7 segment + 4 keys		●

Spark generator connection
MPA 41xx does not have a mounted spark generator.
Suitable spark generators, see accessory list.

Attention: A special spark generator is required depending on the electrode arrangement (single-electrode operation).

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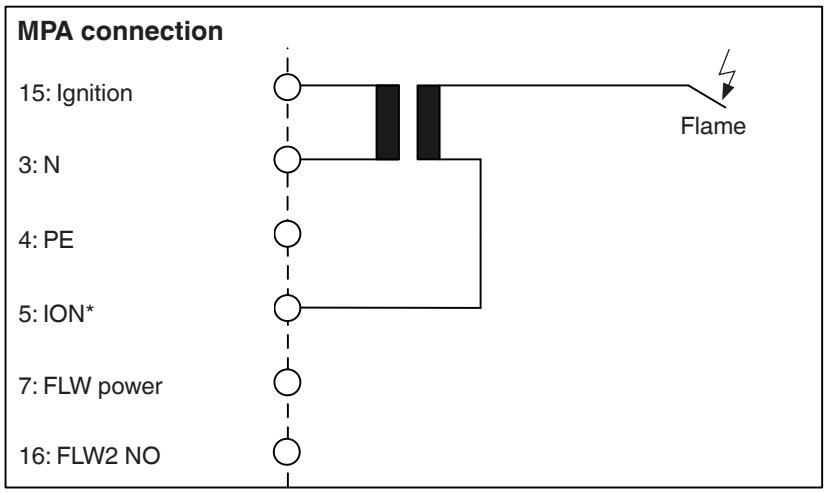
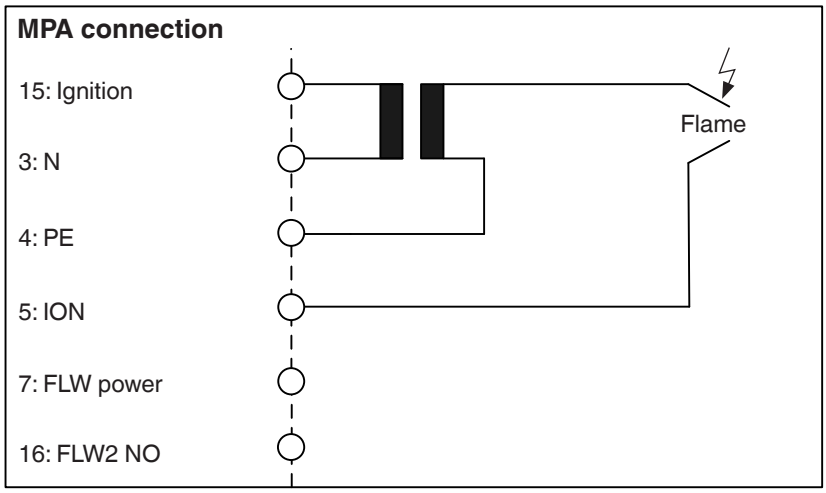
Flame monitoring system and Ignition
Flame detector 1 connection

Single-electrode operation ionisation



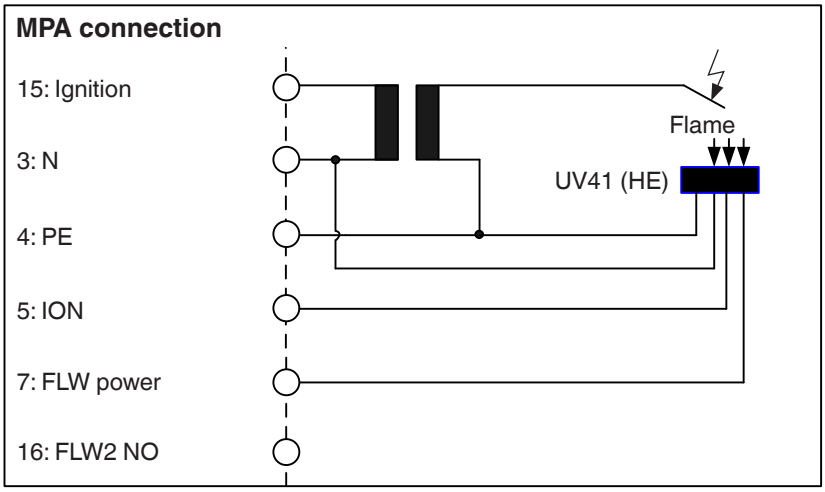
*When using a DUNGS DEZ 1xx SEO ignition transformer for single-electrode operation, the green/yellow cable must be connected to terminal 5.

Two-electrode operation ionisation



Flame detector connection

Flame detector UV41 (HE) / FLW 10 IR / 20 UV



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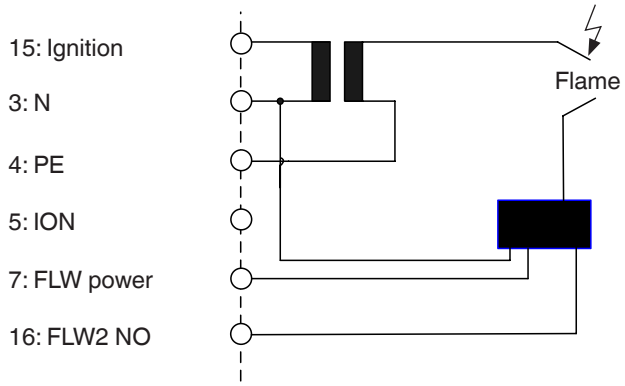
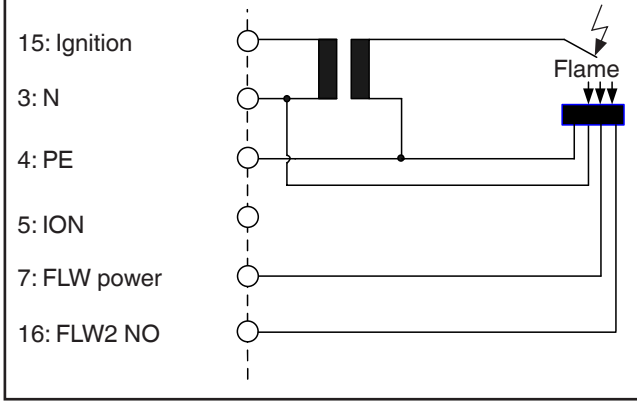
Flame detector connection and ignition

Flame detector 2 connection

Flame detector FLW 41I



Flame detector UV 42



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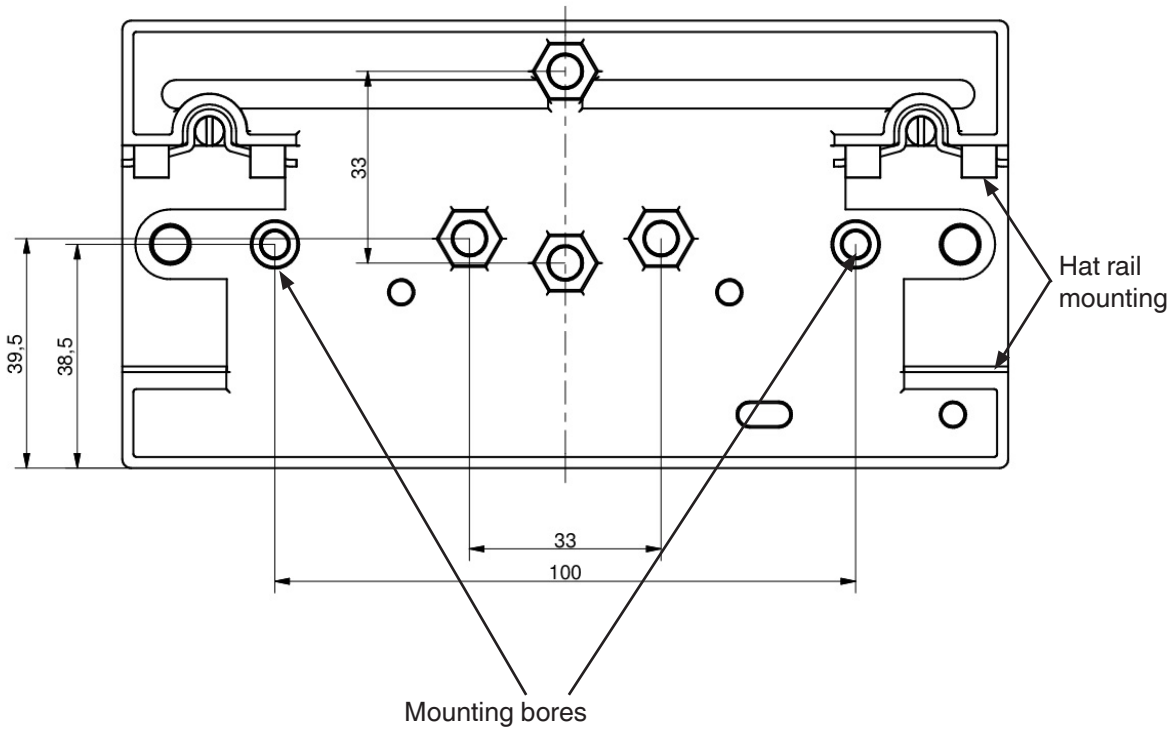
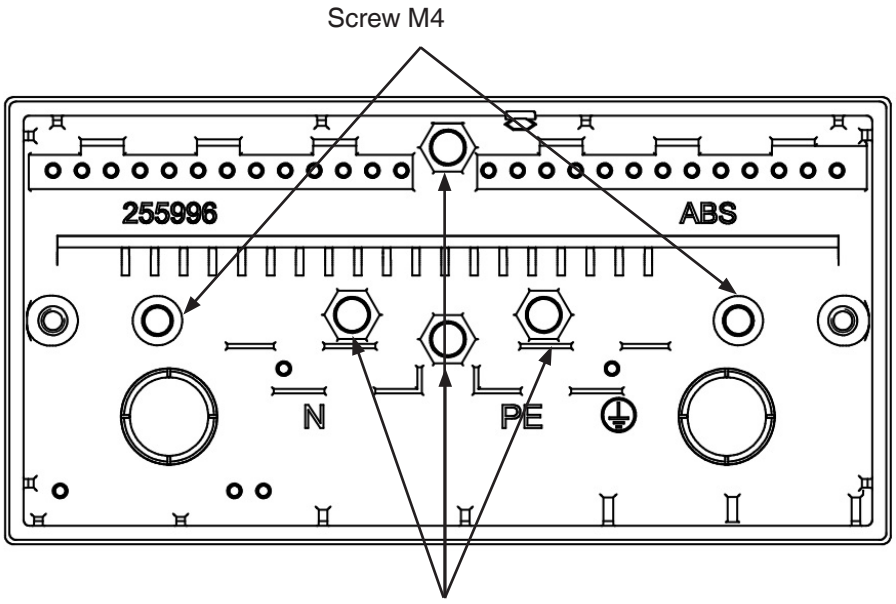
Installation of the MPA 41xx

Installation options for the MPA 41xx:

- direct screw connection
  of the base on the mounting surface Break out mounting holes, e.g., with a suitable screwdriver or drill them with a drill 4.2 mm (M4) or 5.5 mm (M5).

- Hat rail mounting (locking the base into place on a hat rail)





Attention! Use only plastic screws!

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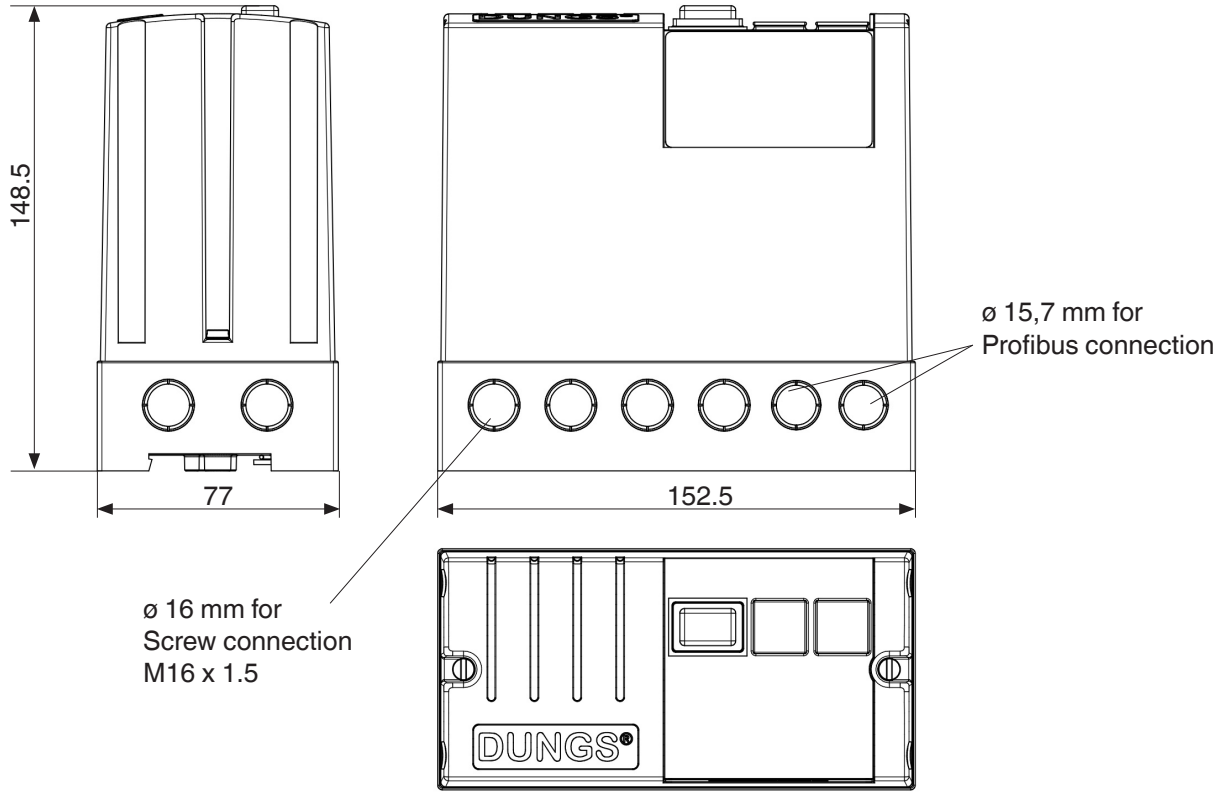
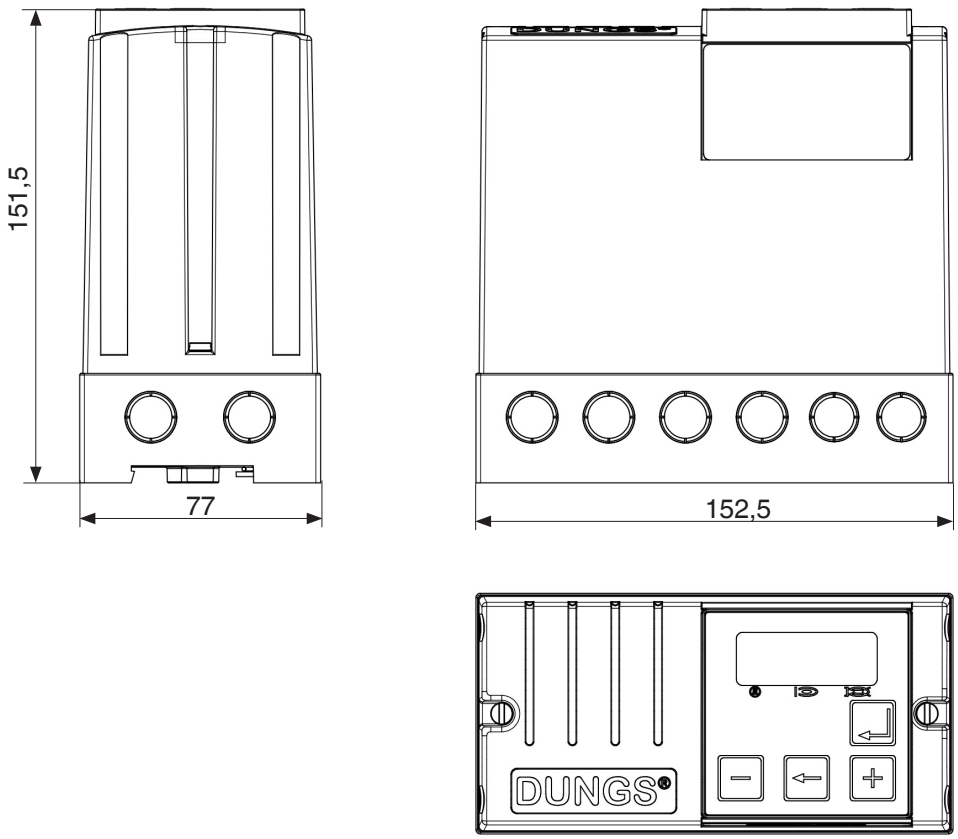
Dimensions of the MPA 4111



Dimensions of the MPA 4112



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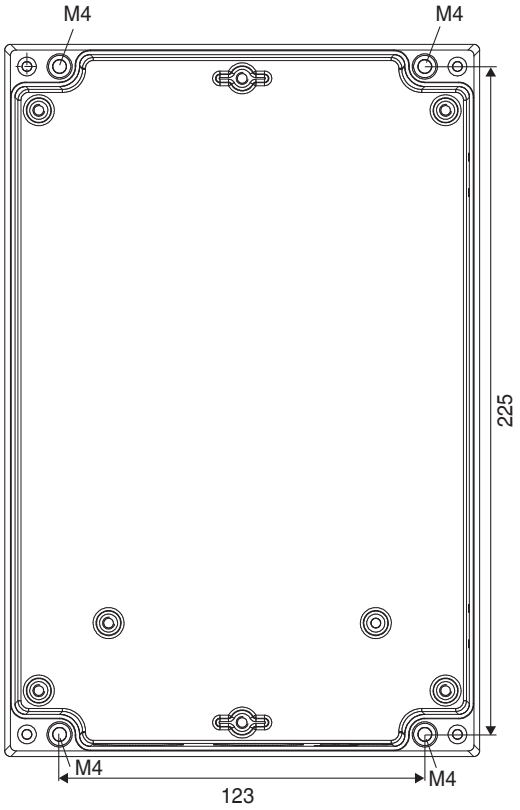
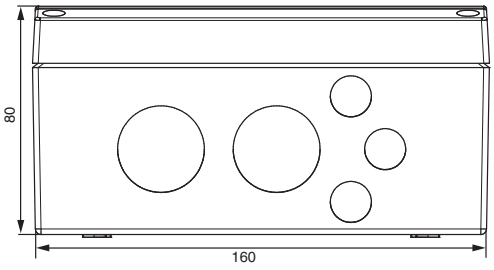
Installation of the MPA 41xx

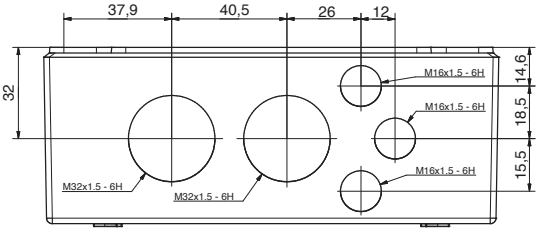
Installation options for the MPA 412x:

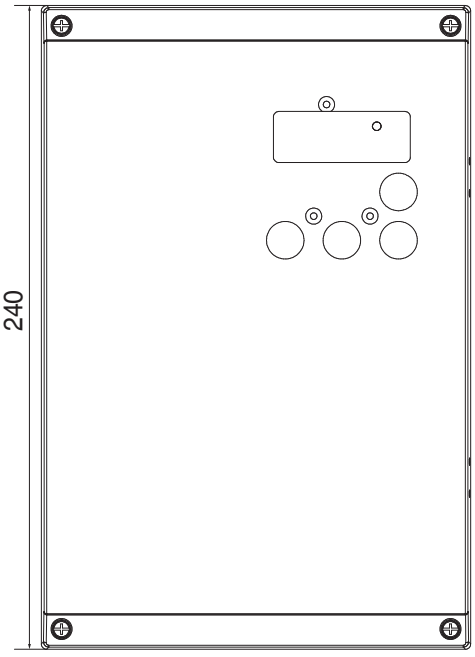
- direct screw connection of the housing on the installation surface using M4 screws, length min. 20 mm



Dimensions of the MPA 412x







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Description of the functions

Unlocking function

If MPA is locked (state 0), it can be unlocked by pressing the unlock key. Keep the key pressed minimum 0.5 s (max. 5 s) to distinguish the function from possible EMC interfering impulses.
The same is true for 230 V unlocking and unlocking via fieldbus modules.

According to DIN EN 14459 (annex J), the number of possible unlocking processes is limited to 5 in 15 minutes, that means the automatic system denies further unlocking if the MPA has been unlocked more than 5 times within a short time period. Only after a waiting time during which the MPA is provided with power is it possible to unlock the MPA again.

The waiting time is 15 minutes or 3 minutes for each unlocking.

Extended unlocking

The described limitation to 5 unlocking operations in 15 minutes can be reset by means of "Extended unlocking". To do this, the unlock key must be pressed for at least 5 s (max.. 10 s) (after 5 s, the display begins to flash).

The "Extended unlocking" is active in all operational states of the MPA, that means that a safety cut-off with restart of the MPA in operation can be carried out via the "Extended unlocking" also in the presence of a flame.

Extended unlocking is not possible via the 230 V unlocking input and via fieldbus modules!

Access level

Write access to MPA is defined on different access levels.
Each parameter is assigned to a certain access level. In order to modify a parameter, MPA must be in the assigned or higher level.
If the access level is not sufficient for modifying a parameter, the VisionBox reports it, or a message is prompted on the MPA display requesting to enter the valid password. In higher levels, the users must press a key to confirm that they are on site. The display is flashing for 30 s until a key is pressed; otherwise, the MPA remains in the previous level.
In order to change the access level, enter the correct password either on the display (MPA 4112/MPA 4122) or in the VisionBox → MPA settings → Access level.

The access level is automatically reset after 5 hours or after power failure. Exception: If the automatic gas burner control system makes a restart during these 5 hours, for example due to an error, these 5 hours for the current access level are counted again from the beginning.

Note: We recommend resetting the access level after having configured the automatic gas burner control system.

Level	Designation	Key confirmation required
1	Dungs	yes
2	OEM Expert	yes
3	OEM	yes
4	Service	yes
5	Operator	no

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Gas valves
The valve connection may be configured, see section "Parameter description" - P38.

Flame detector
See Annex - Flame detector.

For the connection of a second flame detector, see section "Parameter description" - P18.

Air pressure switch
See section "Parameter description" - P16

Gas pressure detector
See section "Parameter description" - P18

Limit switch / POC Proof of Closure
See section "Parameter description" - P18

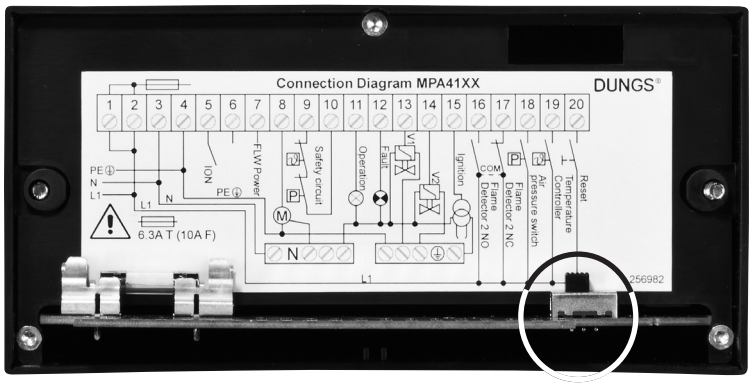
Parameter mode (manual operation)
A switch in the connection chamber is used for switching between parameter and automatic mode.
The MPA registers a switching operation not before a restart.

MPA 4112/MPA 4122
After connecting the mains supply in Parametermode, a messages is prompted on the display requesting you to enter the code. Enter the password for service or OEM level.

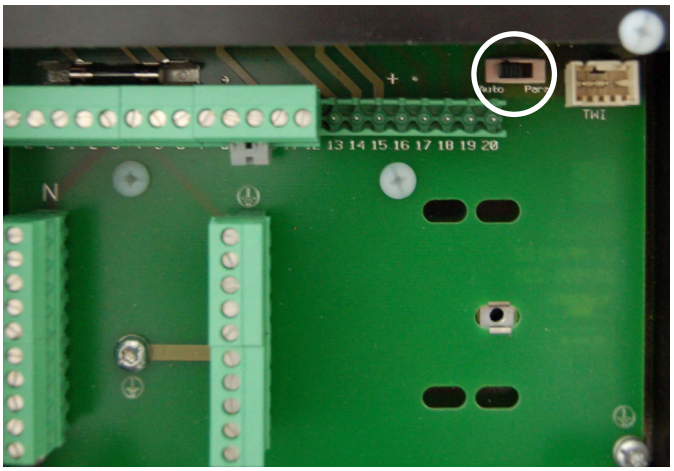
After having changed the level, the selected parameters are activated one after the other.
See chapter MPA 4112/MPA 4122 Parameter display for parameters and sequence.
The parameter values may be modified by pressing the keys + and -. The unlock key is used for saving the displayed value. Press the ← key to return to the previous position or parameter.

As the display has two positions only, some values are represented in an optimised resolution. If the set value cannot be displayed in this resolution, the display shows "– –". The value may be changed in a resolution that can be displayed.
If all parameters are set, there is an automatic start for checking the parameter values. The program stops in pause states; press a key to proceed (Hx is displayed).
The set parameter values will be applied when reaching the H5 state.
If you do not press any key for 30 minutes in parameter mode, the program tries a restart.

Switch on "Auto"
With this switch position, the MPA is working in normal operation. If a monitored parameter was changed and not released the MPA indicates an error with 0x60.



Parameter switch
Left "Auto" position
Right "Para" position



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Flow chart

The program sequence may be customised by changing the parameters.

Attention: All modifications must comply with the requirements of the valid standard.
DUNGS shall not assume any liability for material or personal damage caused by improper use or parameter setting of the automatic gas burner control system.

*1 The monitoring of the LDW depends on the operating mode set in P16.
*2 V1 can be deactivated via parameter P38 after the second safety time (= interrupted start gas)
*3 The two inputs Flame 1 and Flame 2 can be activated or deactivated independently of one another per parameter for phase 1 and phase 2.
*4 Both flame inputs must be off!
*5 With "Flame on", it will run with 15 minutes of follow-up after a regular switch-off. After 24h OFF, the signal will be activated for 1 minute.
*6 The input "Flame 2 NC" can also be configured as GDW. The GDW tolerates faulty signals of up to 1s.
*7 The follow-up time already starts during the "Post-purge" state. If the post-purge is greater than/equal to the follow-up time, the "Follow-up time" state will be skipped.
*8 The MPA can also run in two-stage operation (P38=2). The selection of stage 1 / stage 2 will then be made via a field bus (e.g. Profibus, Modbus,...). V1 is always open (=stage 1). V2 will open after a field bus setpoint input (=stage 2). In the operating modes "interrupted start gas" (P38=0) and "permanent start gas" (P38=1), V2 is always ON.
*9 The input "Flame 2 NC" can also be configured as Proof-Of-Closure (POC) as a function of output V1 or V2. The POC tolerates faulty signals of up to 1s.
*10 In the operating mode P38 = 2 (two-stage operation), the second safety time is skipped, and the MPA goes from "Pause 3" directly to the "Operation" state!

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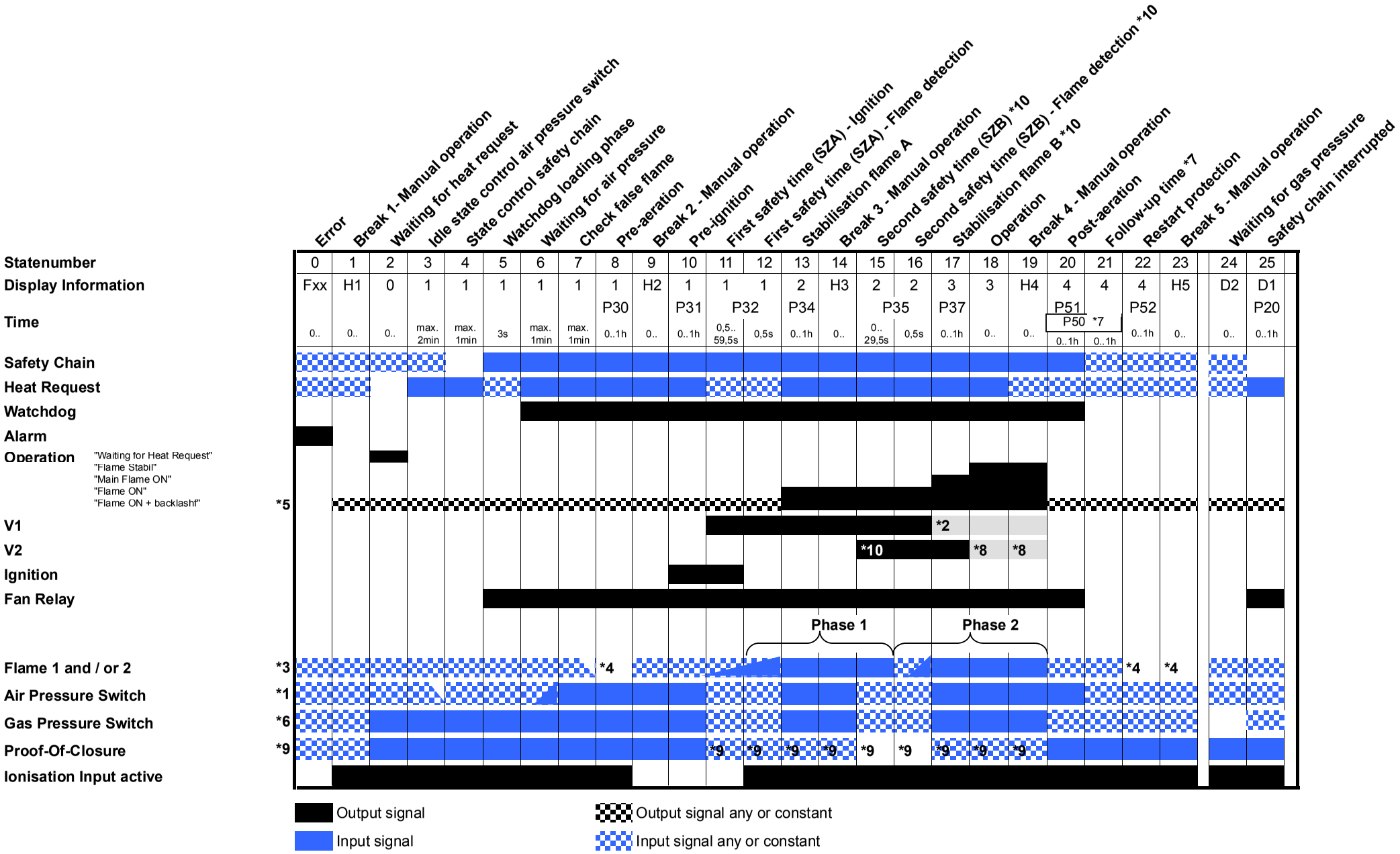

Caption see page 20

State description		
MPA 41xx		
State xx	**Designation**	**Description**
00	**Error**	If the automatic gas burner control system is in this state, there is an error. The display automatically shows an error message and indicates the current error (e.g. "F 11") instead of the state number.
01	**Manual operation - Pause 1**	If the switch is on "Para" for the parameter mode, the MPA stops in this state. Press the "Next" key (unlock key) to continue with the next state. If you do not press any key during 30 minutes, the automatic gas burner control system restarts or indicates an error. The manual mode may only be cancelled after having run completely through all states and after having reset the parameter switch to automatic mode. If you reset the parameter switch before reaching state H5 and you have modified parameters, they are not yet applied, and the automatic gas burner control system indicates an error (see also P10).
02	**Waiting for heat request**	The automatic control system is ready for operation but there is not any heat request.
03	**Idle state control LDW (air pressure switch)**	Depending on the operating mode of LDW (P16), it is checked whether LDW reports "no air pressure". Max. waiting time 2 min. → Restart.
04	**Safety chain monitoring**	In this state, it is checked whether the safety chain is potential-free. The fan relay is still open, and the watchdog relay has not yet picked up. If the safety chain is not potential-free, the system waits maximum one minute before trying to restart.
05	**Watchdog loading phase**	The safety-related watchdog -circuit is activated. If the safety chain is interrupted → State 25.
06	**Waiting for air pressure**	The air pressure must be applied within a state time of max. 1 min., otherwise, the system tries to restart.
07	**External light monitoring**	The flame may not be detected within the state time of max. 1 min. Otherwise, the system tries to restart.
08	**Pre-purge**	This state provides sufficient pre-purge. Both flame inputs must be switched off for the duration defined in parameter "Pre-purge" (P30).
09	**Manual operation - Pause 2**	If the switch is on "Para" for the parameter mode, the MPA stops in this state. Press the "Next" key (unlock key) to continue with the next state. If you do not press any key during 30 minutes, the automatic gas burner control system restarts or indicates an error. The manual mode may only be cancelled after having run completely through all states and after having reset the parameter switch to automatic mode. If you reset the parameter switch before reaching state H5 and you have modified parameters, they are not yet applied, and the automatic gas burner control system indicates an error (see also P10).
10	**Pre-ignition**	The ignition is activated for the duration specified in parameter P31 without opening valve V1.
11	**First safety time - ignition**	The gas valve V1 is opened in this state. The duration of this state is P32 - 0.5 s.

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State description		
MPA 41xx		
State xx	**Designation**	**Description**
12	**First safety time - flame detection**	After deactivating the ignition, the process for flame detection is started. If an ionisation current flows or the 230V input is switched on - depending on the configuration -, the MPA reports a flame. The duration of this state is 0.5 s.
13	**Flame A stabilisation**	The flame can stabilise in this state. The duration of the stabilisation phase (P34) can be configured.
14	**Manual operation - Pause 3**	If the switch is on "Para" for the parameter mode, the MPA stops in this state. Press the "Next" key (unlock key) to continue with the next state. If you do not press any key during 30 minutes, the automatic gas burner control system restarts or indicates an error. The manual mode may only be cancelled after having run completely through all states and after having reset the parameter switch to automatic mode. If you reset the parameter switch before reaching state H5 and you have modified parameters, they are not yet applied, and the automatic gas burner control system indicates an error (see also P10).
15	**Second safety time**	The gas valve V2 is opened in this state. The duration of this state is P35 - 0.5 s.
16	**Second safety time - flame detection**	The process for detecting the second flame is started. If an ionisation current flows or the 230V input is switched on - depending on the configuration -, the MPA reports flame 2. The duration of this state is 0.5 s.
17	**Flame B stabilisation**	The flame 2 can stabilise in this state. The duration of the stabilisation phase (P37) can be configured.
18	**Operation**	The automatic gas burner control system is now operating. A voluntary switch-off after a defined time can be activated (P40). If this time is set to a maximum of 23 hours and 59 minutes, the MPA is in intermittent mode.
19	**Manual mode - Pause 4**	If the switch is on "Para" for the parameter mode, the MPA stops in this state. Press the "Next" key (unlock key) to continue with the next state. If you do not press any key during 30 minutes, the automatic gas burner control system restarts or indicates an error. The manual mode may only be cancelled after having run completely through all states and after having reset the parameter switch to automatic mode. If you reset the parameter switch before reaching state H5 and you have modified parameters, they are not yet applied, and the automatic gas burner control system indicates an error (see also P10).
20	**Post-purge**	In this state, the post-purge of the combustion chamber is carried out (P51). The gas valves remain closed from this state on. The fan continues running in this state; it is switched off in the next state.
	Post-purge (P51) may be interrupted by a repeated heat request if the restart protection (P52) has been set to 0 and the follow-up time (P50) has already lapsed.	

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State description		
MPA 41xx		
State xx	**Designation**	**Description**
21	**Follow-up time**	During this time (P50-P51 > 0), a flame signal may be present from the previous mode caused by e.g. existing residual gas in the combustion chamber. The external light monitoring is only started in the following state. The follow-up time starts in the post-purge state if the post-purge is equal to or greater than the follow-up time; then the follow-up time state is skipped.
22	**Restart protection**	In this state, the system waits until parameter P52 is finished; this prevents an immediate restart of the automatic gas burner control system if a heat request is active. The flame may no longer be detected in this state; otherwise, MPA reports an external light error.
23	**Manual mode - Pause 5**	If the switch is on "Para" for the parameter mode, all parameters are set, and the system has run through the entire process, the automatic gas burner control system stops in this state. The set parameter values are now applied automatically. You may reset the parameter switch to the "Auto" mode. Alternatively, you may press the "Next" key (unlock key) to restart parameter setting from the beginning. If you do not press any key during 30 minutes, the automatic gas burner control system restarts or indicates an error.
24	**Waiting for gas pressure**	If the automatic gas burner control system is configured for use of a Gas pressure switch, it changes to state 24 when detecting missing gas in states 1 to 10. It leaves it in state 1 after sufficient gas pressure has been built up. The MPA runs through the post-purge, follow-up time and restart protection states before changing to state 24.
25	**Safety chain open**	The automatic gas burner control system remains in this state during the time set in parameter P20 if the system does not detect a closed safety chain. After the time has lapsed, it decides based on P15 whether it locks immediately or tries to restart. If the safety chain is closed before the time of P20 has lapsed, MPA changes to state 1 to check the safety chain again. In this state, the fan relay is active, the fan is running.

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Parameters
Parameter change
Parameter types:
1-bit parameter (U1) - setting 0 and 1 (displayed as ON/OFF), no limits
8-bit parameter (U8) - value setting within variable limits
16-bit parameter (U16) - value setting within variable limits.

A parameter may be modified on the display of MPA4112/MPA 4122 or via the VisionBox software on a PC.

In order to change a parameter, you need to set the access level assigned to the parameter.

The value must be within the variable limits; a value outside these limits is not possible.
In access level 2 (OEM expert), it is possible to change the variable upper and lower limits. The variable limits may only be changed by means of VisionBox, not on the MPA display. The variable limits are restricted by means of fixed limits. These fixed limits cannot be changed.

To change a parameter that cannot be changed during normal operation, it is necessary to change to state "Waiting for heat request".
Most of the parameters are monitored in automatic mode (switch on the board on "Auto"). The MPA detects changes of the values and immediately changes to lockout (error 0x60). Any changes must be released in parameter mode incl. a manual program run (see also parameter table).

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Parameters			
Parameter description			
Parameter	**Designation**	**Description**	**Setting / Examples**
P11	**Fieldbus address configuration**	Setting the bus slave address of MPA. If an invalid address for the connected bus module is set and the MPA is in automatic mode, it restarts (error 0x18). If an invalid value for the connected bus module is set and the MPA is in parameter mode, an error message is generated. Furthermore, the setting "o" for the bus address is entered when setting the parameters. During operation and error messages, the current bus address may be seen by pressing the ← key.	Value range: OFF (no Fieldbus) 0 to 254 (e.g. Profibus adjustment range from 1 to 126) Note: A modified value for this parameter is not applied before a restart or extended unlocking.
P12	**Number of restart attempts or anti-oscillation counter**	Number of restart attempts of the MPA. After a failed last start, the MPA locks and changes to lockout (fault state 0). The anti-oscillation counter is reset when returning to operating state or when unlocking the MPA.	Value range: 0-5 attempts
P13	**Number of restart attempts when flame is missing after the start-gas flame proving period**	The number of restart attempts after creating a flame (P12) can be limited for the case that the flame is still missing after the first start-gas flame proving period. The restart counter and the anti-oscillation counter are reset when changing to the operating state or after unlocking.	Value range: 0-5 attempts Example: P12 = 5, P13 = 1 During the first start phase, no flame is generated → 1. Restart attempt → Error idle state control LDW → 2. Restart attempt → Error idle state control LDW 3. Restart attempt After the third restart attempt LDW OK, there is still no flame Automatic gas burner control system is locked although the number of restart attempts (P12) has not yet been reached but the number of restart attempts after missing flame has been reached.
P14	**Number of restart attempts after flame lift-off or missing flame after the second start-gas flame proving period**	The number of restart attempts (P12) can be limited for the case that there is a flame lift-off or that the flame is still missing after the second start-gas flame proving period. The restart counter and the anti-oscillation counter are reset when changing to the operating state or after unlocking.	Value range: 0-5 attempts Example: P12 = 5, P14 = 1 Flame lift-off during operation → 1. Restart attempt → Error Idle state control LDW → 2. Restart attempt → Error Idle state control LDW → 3. Restart attempt → A flame is not created after the third restart attempt LDW OK → Automatic gas burner control system is locked.

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Parameters			
Parameter description			
Parameter	**Designation**	**Description**	**Setting / Examples**
P15	**Locking with open safety chain**	If the safety chain is not closed, the MPA waits in state 25 (safety chain open). If the adjustable time (P20) has lapsed and the safety chain is still open, the system changes to lockout due to an error or restarts (depending on the anti-oscillation counter).	This setting is also valid if the safety chain is opened after state 4. Setting: 0: Restart attempt depending on the anti-oscillation counter 1: Immediate lockout
P16	**Air pressure switch operating mode**	Monitoring of the air pressure may be activated for start-up (states 6 to 10) and/or operation (states 13, 14 and 17 to 20) and/or during post-purge (state 20). Also for idle state control (state 3).	

Air pressure switch operating mode

Setting	Air pressure monitoring during post-purge	Air pressure monitoring during startup	Air pressure monitoring during operation	Idle state control
0	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
3	OFF	OFF	ON	ON
4	OFF	ON	OFF	OFF
5	OFF	ON	OFF	ON
6	OFF	ON	ON	OFF
7	OFF	ON	ON	ON
8	ON	OFF	OFF	OFF
9	ON	OFF	OFF	ON
10	ON	OFF	ON	OFF
11	ON	OFF	ON	ON
12	ON	ON	OFF	OFF
13	ON	ON	OFF	ON
14	ON	ON	ON	OFF
15	ON	ON	ON	ON

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Parameters			
Parameter description			
Parameter	**Designation**	**Description**	**Setting / Examples**
P17	**Temperature controller operating mode** **- Internal parameter Value will be set automatically by the MPA.**	The temperature controller can be operated in the following operating modes:	Setting 0: The heat request is always switched OFF, independently of the hard-ware input Setting 1: The heat request is always switched ON, independently of the hardware input Setting 2: The heat request is OFF, however, this operating mode must be defned again within one minute. Otherwise the automatic gas burner control system switches to the setting 3. This can happen, for example, if the fildbus communication is interrupted. Setting 3: The heat request is determined by hardware input "temperature controller". Setting 4: The heat request is ON, however, this operating mode must be defned again within one minute. Otherwise the automatic gas burner control system switches to the setting 3. This can happen, for example, if the fildbus communication is interrupted.

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Parameters			
Parameter description			
Parameter	**Designation**	**Description**	**Setting / Examples**
P18	**Flame detector 2 or gas pressure detector**	This parameter defines whether a second flame detector, a gas pressure detector or a limit switch for valve monitoring is connected.	Setting 0: The inputs NO and NC are monitored for the flame signal. The signals must be inverse. Setting 1: Only input NO is monitored for the flame signal. Setting 2: Only input NO is monitored for the flame signal. In addition, the Gas pressure switch signal is read out on input NC. Setting 3: Only input NO is monitored for the flame signal. In addition, the limit switch signal for valve 1 is read out on input NC. Setting 4: Only input NO is monitored for the flame signal. In addition, the limit switch signal for valve 2 is read out on input NC.
P19	**Configuration of the output operating mode**	The output may be switched to different states by means of the following parameter settings. ON means 115 VAC or 230 VAC, for all others, OFF, i.e. 0 V.	Setting 0: "Wait": Output is ON in state 2 (waiting for heat request). Setting 1: "Stable": Output is ON in states 18 (operation) and 19 (pause 4). Setting 2: "Main flame ON" output is ON in states 17 (flame B stabilisation) to 19 (pause 4). Setting 3: "Flame ON" Output is ON from states 13 (flame A stabilisation) to 19 (pause 4). Setting 4: "Follow-up": Output is ON from states 13 (flame A stabilisation) to 19 (pause 4). When this states will be left, the output remains for another 15 minutes. This follow-up information remains activated beyond a restart attempt of the automatic gas burner control system, but not if the mains supply is switched off and on again. In addition, the output is switched on for one minute after 24 hours as pump blocking protection. **Note:** After a restart within 24 hours the 24 hour cycle of the pump blocking protection starts new.

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Parameters			
Parameter description			
Parameter	**Designation**	**Description**	**Setting / Examples**
P20	**Duration of safety chain open**	This parameter defines the duration of state 25 (safety chain open). Time until the system restarts or changes to lockout, depending on the anti-oscillation counter and P15 (locking with open safety chain).	Value range: 0 to 65535 (resolution in 1/16 s).
P21	**Shutter test for flame detector**	The shutter test of the flame detector is activated by means of this parameter. Make sure to observe the settings for parameter P33 (active FLW in phase 1) and P36 (active FLW in phase 2).	Example: If P33=1 and P36=1, there is not any shutter flame test for flame detector 2. The test is only active in states with "flame ON" (states 12-19). Setting 0: Shutter flame test inactive. Setting 1: Shutter flame test for flame detector 1. Setting 2: Shutter flame test for flame detector 2. Setting 3: Shutter flame test for flame detectors 1 and 2 (expert setting). With this setting, the test starts only if both flame signals report ON; it ends with success if both flame signals report OFF
P22	**FM mode**		Setting 0: not active Setting 1: Lockout with missing gas and fault of limit switch for main gas.
P30	**Duration of pre-purge**	This parameter defines the duration of state 8 (pre-purge).	Value range: 0 to 65534 (resolution in 1/16 s).
P31	**Duration of pre-ignition time**	This parameter defines the duration of state 10 (pre-ignition). During this time, the ignition is already active, the gas valve is closed.	Value range: 2 to 65534 (resolution in 1/16 s).
P32	**Start-gas flame proving period / first safety time**	Defines the duration of the start-gas flame proving period. Maximum time from opening the gas valves to detecting a flame. Note: This duration is divided into states 11 and 12. State 12 is always 0.5 seconds.	Value range: 16 to 960 (resolution in 1/16 s). **Attention:** For FM applications the following values should not exceeded. Burner with pilot flame: 10 s Burner with direct ignition: < 2,500,000 Btu/hr ≤ 15 s > 2,500,000 Btu/hr ≤ 10 s

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Parameters			
Parameter description			
Parameter	**Designation**	**Description**	**Setting / Examples**
P33	**Active flame detector(s) for start-gas flame proving period**	The parameter controls which flame detector(s) (states 11 to 16) is/are active for detecting a flame. Note: If flame signal 2 is used, please make sure to observe the setting for P18 (flame detector 2 or gas pressure detector).	Setting: 1: Only flame signal 1 relevant 2: Only flame signal 2 relevant 3: Flame 1 AND flame 2 4: Flame 1 OR flame 2
P34	**Stabilisation time A**	Duration of state 13 "Flame A stabilisation"	Value range: 0 to 65534 (resolution in 1/16 s).
P35	**Second start-gas flame proving period**	Duration of the second safety time; the time between detecting the flame signal of the first safety time and the maximum time is set. Maximum time from opening the gas valves to detecting a flame.	Note: This duration is divided into states 15 and 16. State 16 is always 0.5 seconds. Value range: 16 to 480 (resolution in 1/16 s). **Attention:** For FM applications the following values should not exceeded. Burner with pilot flame: 10 s (Setting value max. 160) Burner with direct ignition: < 2,500,000 Btu/hr ≤ 15 s (Setting value max. 240) > 2,500,000 Btu/hr ≤ 10 s (Setting value max. 160)
P36	**Active flame detector(s) for phase 2**	The parameter controls which flame detector(s) (states 17 "Flame B stabilisation" to 19 "Pause 4") is/are active in phase 2 for detecting a flame. Note: If flame signal 2 is used, please make sure to observe the setting for P18 (flame detector 2 or gas pressure detector).	Setting: 1: Only flame signal 1 relevant 2: Only flame signal 2 relevant 3: Flame 1 AND flame 2 4: Flame 1 OR flame 2
P37	**Stabilisation time B**	Duration of state 17 "Flame B stabilisation"	Value range: 0 to 65534 (resolution in 1/16 s).
P38	**Operating mode V1 V2**	Defines the operating modes for gas valves V1 and V2 during operation. Only valid for states 18 (operation) and 19 (pause 4).	0: Interrupted start gas. V1 OFF, V2 ON 1: Permanent start gas. V1 and V2 ON 2: Two-level operation. V1 ON, V2 ON/OFF during operation; determined by bus. V2 does not open during the second start-gas flame proving period! **Note:** If you use setting 2, a bus connection is required. If it is missing, restart is tried because the bus connection is monitored in the operating states.

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Parameters			
Parameter description			
Parameter	**Designation**	**Description**	**Setting / Examples**
P40	**Standard mode duration**	If the MPA is operating, it changes to state 2 after this time has lapsed and restarts. A self-test during start-up is required every 24 hours in intermittent operation. If the heat request is active until these 24 hours have passed, an automatic restart is tried. NOTE (if continuous operation is not set): The stabilisation times A (P34) and B (P37) are added to the operating time; therefore, these times are deducted from the duration of the normal operation if they exceed 1 minute. If the total of stabilisation times is longer than the duration of the normal operation, the duration of the normal operation is set to 0, and MPA switches off immediately when starting operation (state 18).	Value range 1 to 65534: Time until restart (resolution in minutes) 65535: Continuous operation 1439: Intermittent operation
P41	**Operation safety time FLW1**	Defines the duration of the safety time for MPA41xx during operation for flame 1. Time until gas valves close when there is not any flame.	Value range: 12 to 48 (resolution in 1/16 s). **ATTENTION:** The entire reaction time after there is not any flame during operation is combined of P41 and possible reaction times of external flame detectors, see chapter 14 Annex - flame detector.
P42	**Operation safety time FLW2**	Defines the duration of the safety time during operation for flame 2. Maximum time until gas valves close when there is not any flame.	Value range: 3 to 48 (resolution in 1/16 s). **ATTENTION:** The entire reaction time after there is not any flame during operation is combined of P42 and possible reaction times of external flame detectors, see chapter 14 Annex - flame detector.
P50	**Follow-up time**	Defines the duration of the follow-up time (state 21). However, the time measurement is already started during post-purge (state 20), i.e. if the follow-up time is smaller than or equal to the post-purge time, the follow-up state is skipped.	Value range: 9 to 65534 (resolution in 1/16 s).
P51	**Post-purge time**	Defines the duration of the post-purge time (state 20).	Value range: 0 to 65534 (resolution in 1/16 s).
P52	**Restart protection**	Defines the duration of the restart protection (state 22).	Value range: 0 to 65534 (resolution in 1/16 s).
Notes regarding P50, P51 and P52	**Post-purge (P51) may be interrupted by a repeated heat request if the restart protection (P52) has been set to 0 and the follow-up time (P50) has already lapsed.**		
P260 and following	**Internal parameters**	Please do not change!	

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Parameter							
Factory settings							
Parameter	Designation	Factory setting	Unit	Access level	Comfort parameter setting	Min. value	Max. value
P11	Field bus address configuration	255		SERVICE	x	0	255
P12	Number of restart attempts or anti-oscillation counter	5		OEM		0	5
P13	Number of restart attempts when flame is missing after the start-gas flame proving period	0		OEM	x	0	5
P14	Number of restart attempts after a flameout or missing flame after the second start-gas flame proving period	0		OEM	x	0	5
P15	Locking with open safety chain	ON		OEM	x		
P16	Air pressure switch operating mode	15		OEM	x	0	15
P18	Flame detector 2 or gas pressure switch	0		OEM	x	0	4
P19	Configuration of the output operating mode	1		SERVICE	x	0	255
P20	Duration of safety chain open	960	1/16 s	OEM		0	65535
P21	Shutter test for flame detector	0		OEM	x	0	3
P22	FM mode	OFF		OEM			
P30	Duration of prepurge	32	1/16 s	OEM	x	0	65534
P31	Duration of preignition time	16	1/16 s	OEM	x	0	65534
P32	Start-gas flame proving period / first safety time	16	1/16 s	OEM	x	16	960
P33	Active flame detector(s) for start-gas flame proving period	1		OEM	x	1	4
P34	Stabilisation time A	48	1/16 s	OEM		0	65534

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Parameter							
Factory settings							
Parameter	Designation	Factory setting	Unit	Access level	Comfort parameter setting	Min. value	Max. value
P35	Second start-gas flame proving period	16	1/16 s	OEM	x	16	480
P36	Active flame detector(s) for phase 2	1		OEM	x	1	4
P37	Stabilisation time B	48	1/16 s	OEM		0	65534
P38	Operating mode V1 V2	1		OEM	x	0	2
P40	Standard mode duration	1439	min.	OEM	x	0	65535
P41	Operation safety time FLW1	16	1/16 s	OEM	x	12	48
P42	Operation safety time FLW2	16	1/16 s	OEM	x	3	48
P50	Follow-up time	80	1/16 s	OEM		16	65534
P51	Post-purge time	80	1/16 s		x	0	65534
P52	Restart protection	80	1/16 s	SERVICE	x	0	65534

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Status Information			
MPA 41xx			
Designation	**Description**	**Display via Vision-Box**	**Display via display**
General information			
Lockout	System is locked	●	LED
State number	Current state of the system, key combination + and -	●	7-segment
Current access level		●	
Flame	Flame detected	●	LED
Manual mode	System in manual mode	●	7-segment
Flame quality	Value > 49 good flame (for ionisation)	●	Info
Hardware input for temperature controller	Signal for temperature controller input	●	
Bus connection present		●	7-segment
Heat request	Signal combination from bus setpoint input and hardware input	●	LED
Inputs			
LDW		●	
Flame 1	Signal from flame 1 input	●	
Flame 2 NO	Signal from flame2_NO input	●	
Flame 2 NC / GDW / POC	Signal from flame2_NC input or GDW or POC	●	
Outputs			
Gas valve V1		●	
Gas valve V2		●	
Ignition		●	
Fan		●	
Counter			
Time counter/Lifetime counter	Time since switching on the automatic gas burner control system	●	
Runtime meter	Fixed runtime	●	Info
Runtime meter Resettable	Resettable via VisionBox and display	●	
Start counter	Fixed start counter	●	Info
Resettable start counter	Resettable via VisionBox and display	●	
Switching cycles counter V2		●	Info
Internal information			
State timer in minutes	Displayed state timer runs in minutes, otherwise in 1/16 sec.	●	
Initialisation phase	The automatic gas burner control system is being initialised	●	
Multi-function switch	Is "ON" when unlock key is pressed	●	
Access level change	CCC or value flashes on display, ↵ key expected	●	7-segment
Safety switch-off flag	System is locked	●	
Error index	Internal error counter	●	
Remaining state time	is 65535 if unlimited remaining time	●	
Cycl. state counter	Counts in 1/128 s cycle	●	
Processor load		●	
Nominal modulation degree	No function	●	
Actual modulation degree	No function	●	

LED: Indicated by one of the 3 LEDs on the display
7-segment: Indicated by one or several characters of the 7-segment display
Info: Displayed in informative display mode

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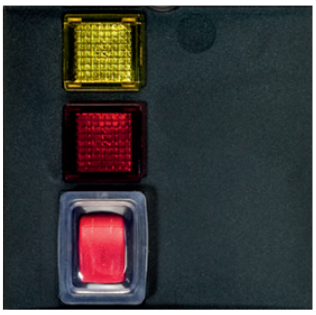
MPA 4111
Version without display
The MPA 4111 version may be used if the dialog via the display is not required or limited information is enough.

The parameters of the system are either set by means of VisionBox or by means of the parameterisation and service box.

The system status is indicated by means of two LEDs.

Display unit



Yellow LED
- Operation

Red LED
- Fault
- Flashing signal for error code
- Pause state during parameter setting

RESET key
- Unlocking
- Extended unlocking
- Confirmation of access level change

Yellow LED information

LED OFF:
Fault (state 0)

LED permanently ON:
Waiting for heat request (state 2) until second safety time for flame detection (state 17) and from states post-purge (20) to pause 5 (23).

Flashing LED (0.5 Hz):
Operation (states 18 and 19).

Fast flashing LED (2 Hz):
Waiting for gas pressure if gas is missing (state 24) and safety chain open (state 25).

Red LED information

Fault
The different flashing frequencies indicate the most important error codes.
The remaining error codes are indicated by a permanently lit LED.

Both LED information:
Password entry expected
Both LED flashing alternating

MPA 4111 in Parameter mode
After entering of the password both LED are flashing simultarious
Parameter could be changed

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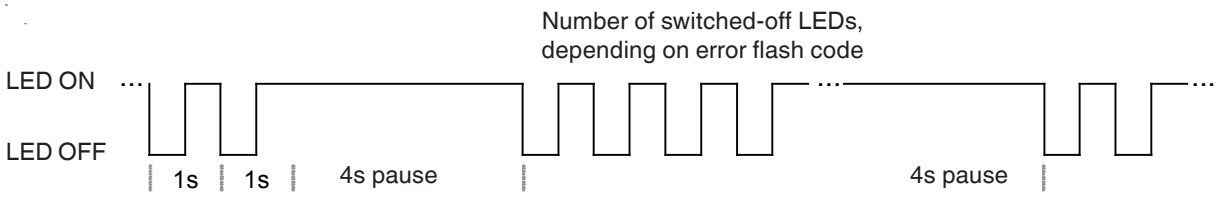
Error code - flashing frequency



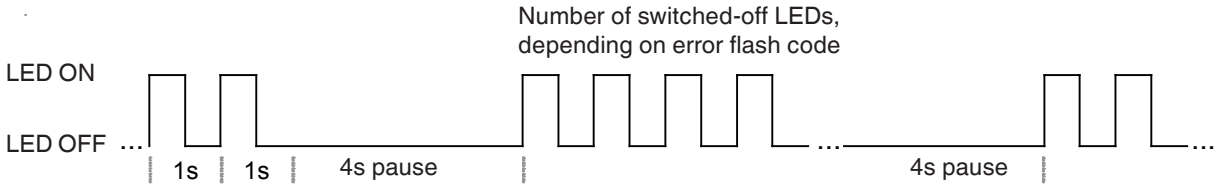
Blink code Minimum indication	Error ID	Error designation Please see the tables above for more information about the individual errors.
1	0xA2	ERROR_SAFETY_CHAIN_OPEN
2	0x60	ERROR_PARAMETER CHANGE_NOT RELEASED
3	0xA7	ERROR_NO FLAME_DURING_FIRST SAFETY TIME
3	0xBC	ERROR_NO FLAME_DURING_SECOND SAFETY TIME
3	0xA9	ERROR_FLAME_GONE_OUT_DURING_STABILISATION
4	0xA8	ERROR_FLAME_GONE_OUT_DURING_OPERATION
5	0xAA	ERROR_IDLE STATE CONTROL_LDW
5	0xAB	ERROR_NO_AIR_PRESSURE
6	0xA6	ERROR_EXTERNAL_LIGHT
7	0x18	ERROR_EXTERNAL_APPLICATION
8	0x16	ERROR_TWI_COMMUNICATION AND LOW VOLTAGE

Parameter setting

To change parameters, set the switch in the connection chamber to "Para" and supply the system with power; both LEDs are flashing alternately. Enter the password and confirm it by pressing the RESET button. Both LEDs are flashing simultaneously. The parameters may now be changed. In parameter mode, the MPA stops in pause states; press the RESET button to continue to the next state (see state description).

Attention: The changed parameters are applied after pause 5 (state 23). The flashing frequency of the LED shows the pause state and that it is required to press the RESET button.

Example: The pause 4 state has been reached: the red LED flashes 4 times and is then switched off during 4 seconds.



Information about both LEDs:

Both LEDs are lighted twice to check their functionality when live voltage is applied.

Both LED flash (1 Hz) if you are requested to press a button to change a level or if the automatic gas burner control system is ready for the extended unlocking (pressing a button after 5 s, until 10 s).

Both LEDs flash alternately if the system is started in parameter mode and the password for changing the parameters has not been entered yet (in VisionBox on PC). The RESET button and the manual mode are locked.

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MPA 4112/MPA 4122
Version with display
The customer may customize the MPA 4112/MPA 4122 version on the integrated display to match the desired burner.
All important parameters may be set by means of the four operating keys.

The parameters of the device are either set by means of VisionBox or by means of the parameterisation and service box.

3x7 segment display

LED:
Blue: Heat request
Yellow: Flame quality (flashes if the flame quality is poor)
Red: Fault

Release button
RESET function and confirmation of the entry

Back

Plus
Increases the displayed value

Minus
Reduces the displayed value

Depending on the operating state of the automatic gas burner control system, different information is displayed:

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Overview of the display modes for MPA 4112/MPA 4122

Mode:	**Active:**
Operation display	in normal operation if no error is active
Error display	if the automatic gas burner control system is in lockout
Info display	From operation display by pressing a shortcut 
Display of the error memory	From operation display by pressing a shortcut 
Parameter display	From operation display by pressing a shortcut 
Reset display	From operation display by pressing a shortcut 
Flashing display	Depending on the display mode: 1. Request to confirm the access level change 2. Keep the unlock key depressed for more than 5 s to restart the MPA ("Extended unlocking") 3. Processor 2 error, see error list 4. New password after password change 5. Restart of the system, all segments and LEDs are flashing

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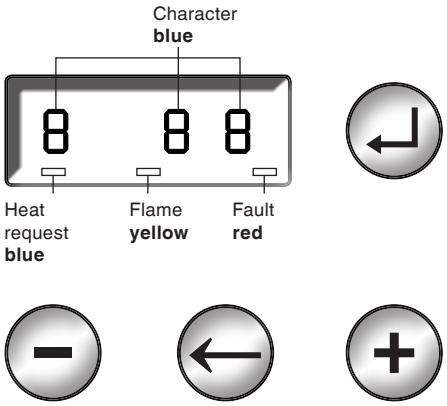
MPA41x2 display	
►	**Displayed operating state for setting parameters and troubleshooting**



Attention
Illustration in 7-Segment display

1. Digits

6 = 6

8 = 8

0 = 0

2. Characters

B or.b = b

D or.d = d

O or o = o

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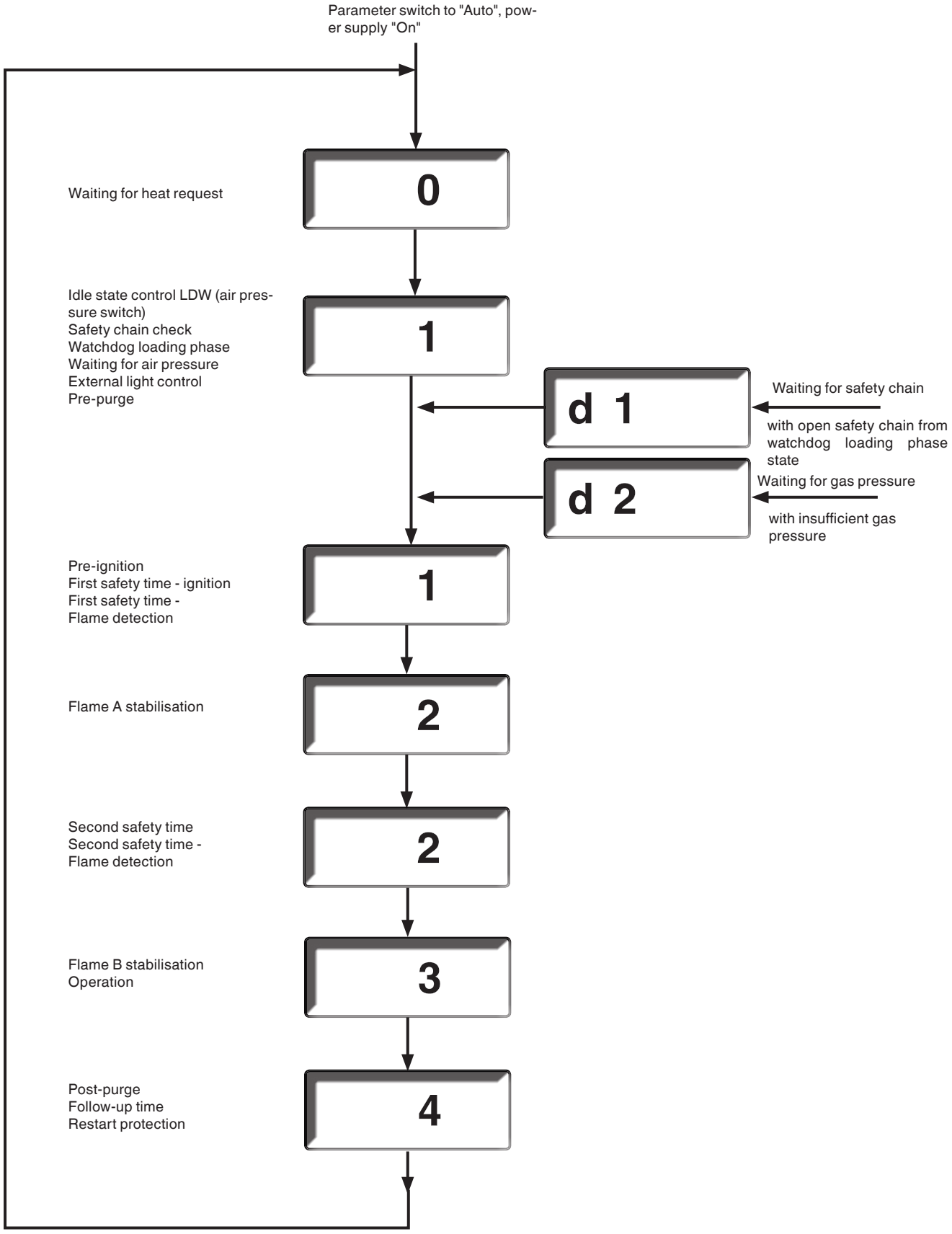
11.7 Operating state

MPA 4112 display
► Shows the operating state of the system



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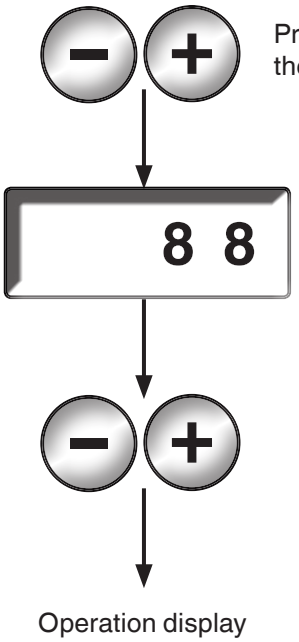
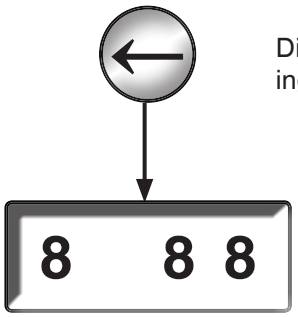
Additional display information	
►	**Display of state number**
►	**Display of bus address**



Press the keys simultaneously to change the state display

Display of state number



Display of bus address while pressing a key

Display of bus address or OFF

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Display / Parameterisation and service box	
►	**Display of the state of the automatic gas burner control system for parameterisation or check in the service box**

Parameters are loaded from the parameterisation and service box into MPA

The MPA is in test mode initialised by the parameterisation and service box.
Note: The parameter and reset display is locked during the test

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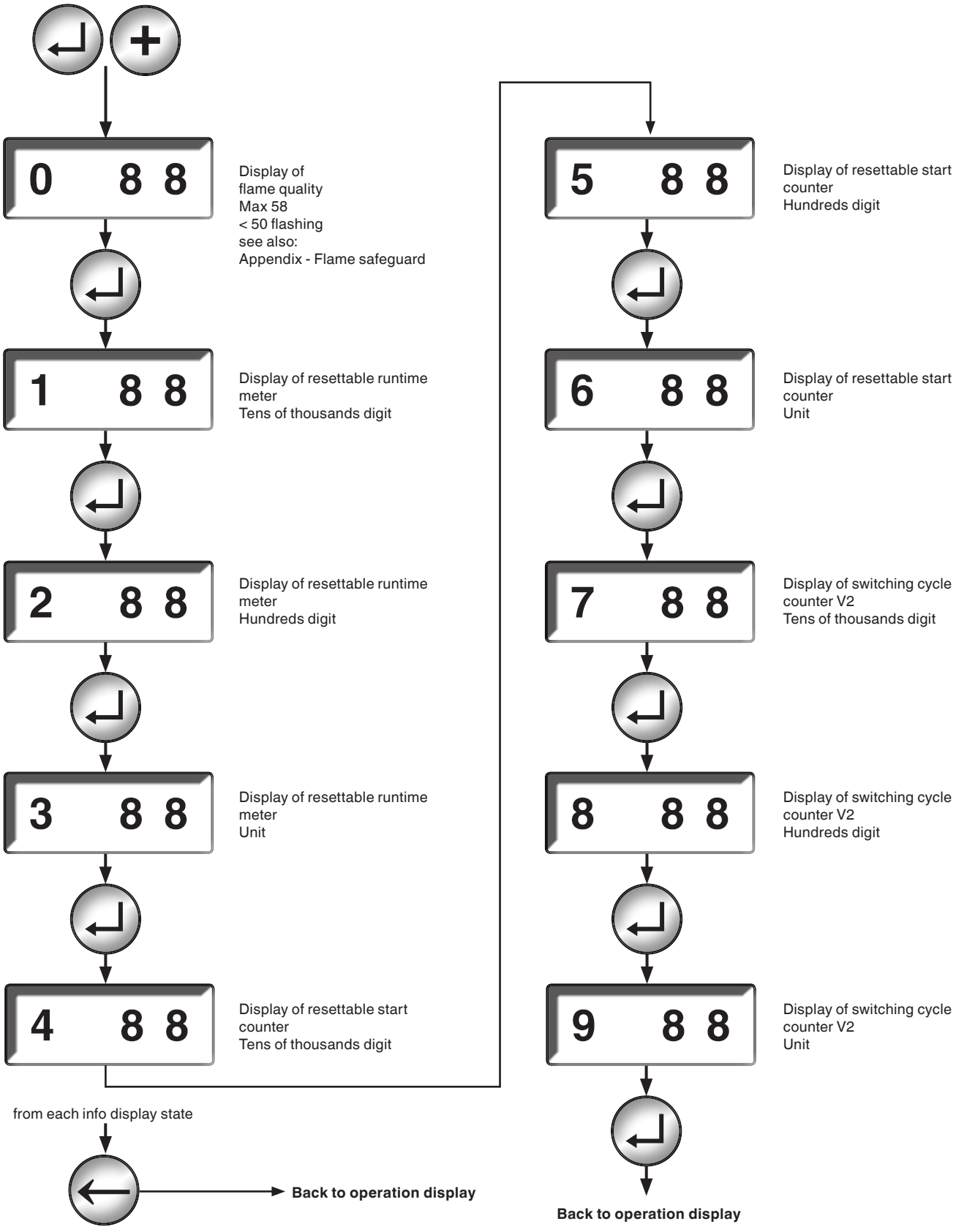
Information display	
►	**The information display is activated from the operation display (not during automatic parameter setting).**
►	**The information display allows to see the flame quality, the resettable runtime meter, the resettable start counter and the switching cycles counter.**
►	**This mode is quit after 60 seconds due to a timeout if you do not press any key within this time period.**



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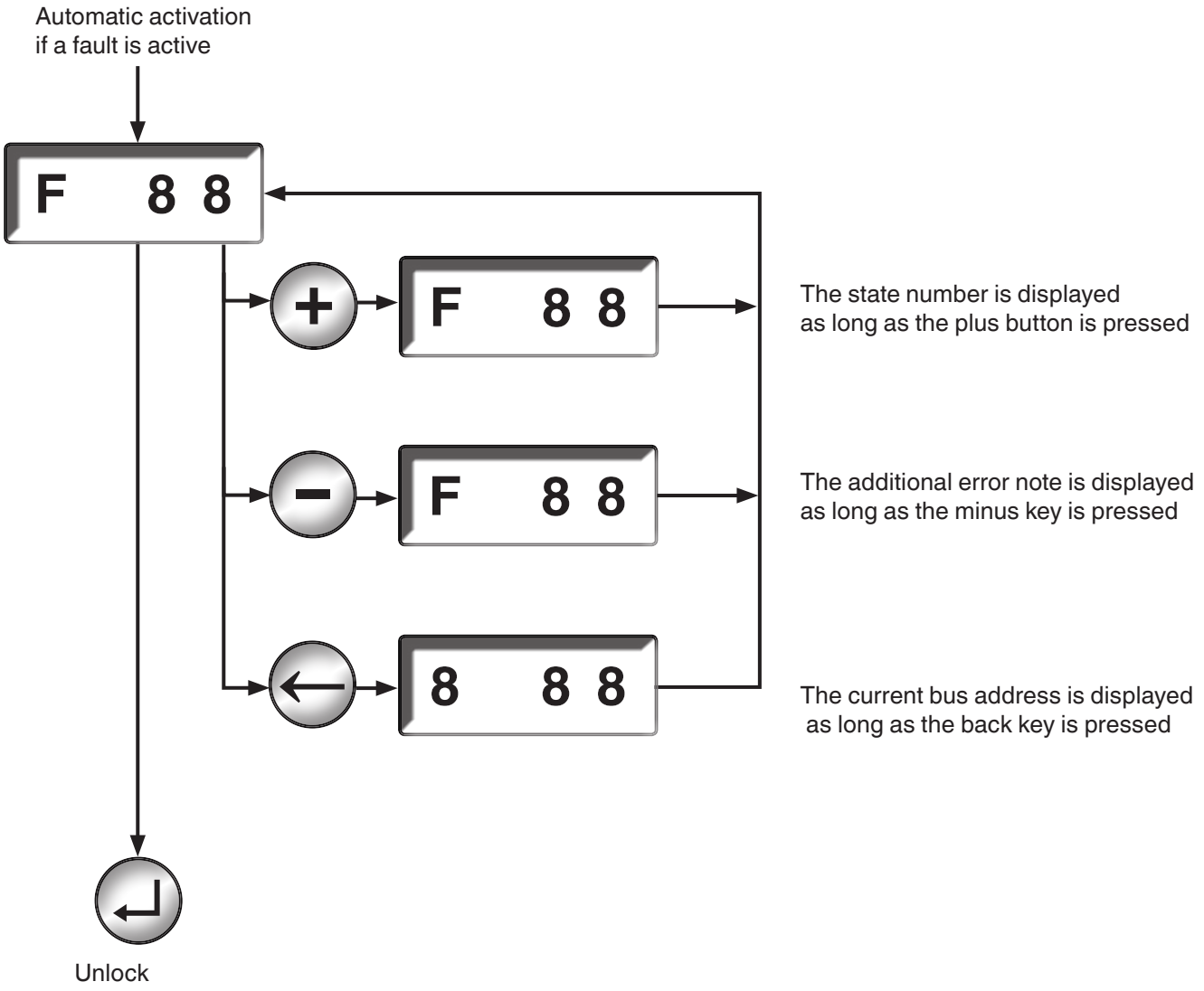
Error display	
►	**The error display is automatically activated if the automatic gas burner control system signalises an error.**
►	**The last occurred error is displayed.**



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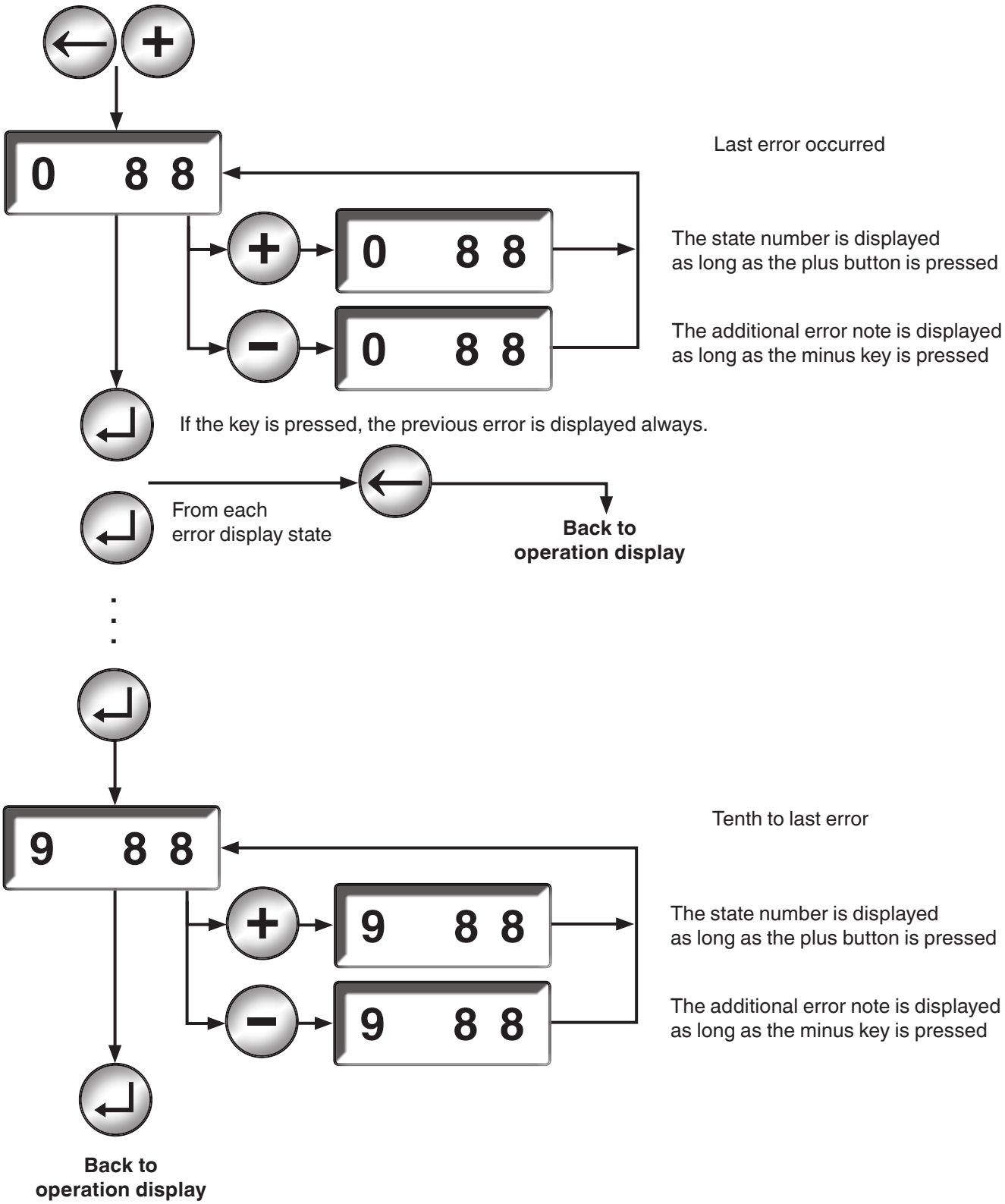
Display of the error memory	
►	The error memory shows the last 10 errors.
►	The error that has occurred last is displayed.
►	The error memory display is activated out of the operation display (not during automatic parameter setting).
►	The error code is displayed on the two-digit seven-segment display.
►	This error memory display is quit after 60 s due to a timeout if you do not press any key within this time period.
►	If there is not any error for the error position, -- is displayed.



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Parameter display	
►	**After activating the automatic parameter setting, 19 parameter values must be defined; see parameter list.**
►	**This parameter setting is not quit by means of a timeout.**
►	**A password is required for changing the parameters.**
►	**Attention: Some parameter values are displayed in another resolution than in the parameter mode using VisionBox. If it is not possible to display the parameter value in this resolution, -- is displayed; nevertheless, the value may be changed in the resolution that can be displayed.**
►	**To change service or OEM parameters, the required password or a higher-level password must be entered (e.g. all service parameters may also be changed using the OEM password).**

Display Number	Parameter	Value range	Unit
0	P30 - pre-purge time	0...99	1 s
1	P31 - duration of pre-ignition	0...99	1 s
2	P32 - First start-gas flame proving period	1...60	1 s
3	P33 - Active flame monitoring phase 1	1...4	
4	P35 - Second start-gas flame proving period	1...30	1 s
5	P36 - Active flame monitoring phase 2	1...4	
6	P41 - Operation safety time for flame detector 1	06...30 (=0.6...3 s)	0.1 s [*1]
7	P42 - Operation safety time for flame detector 2	05...30 (=0.5...3 s)	0.1 s [*1]
8	P51 - post-purge time	0...99	1 s
9	P14 - Number of permitted restarts after flame lift-off during operation	0...5	
A	P13 - Number of permitted restarts after missing flame	0...5	
b	P15 - Locking after opening the safety chain	0 = OFF / 1 = ON	
C	P16 - Operating mode of the air pressure detector	0...15	
d	P38 - Operating mode V1 V2	0...2	
E	P18 - Flame detector 2 NC monitoring / Gas pressure switch / POC	0...4	
F	P40 - Continuous operation (no switch-off after 24 h)	0 = OFF / 1 = ON	
h [*3]	P21 - Shutter test for flame detector	0...3	
L	P19 - Output operating mode "Operation"	0...4	
o	P52 - Duration of restart protection	0...99	1 s
n [*2]	P11 - Fieldbus address	0...99 [*2]	

[*1] Adjustable in steps:

05 = 0.5 s	8/16	(only possible for FLW2 for FLW 41 I with 0,19 s reaction time)
08 = 0.75 s	12/16	(only possible for FLW1, smallest possible adjustment)
09 = 0.875 s	14/16	(for UV41/UV42 with 0.125 s reaction time)
10 = 1 s	16/16	
15 = 1.5 s	24/16	(for FLW 41 I with 0,19 s reaction time)
19 = 1.875 s	30/16	(for UV41/UV42 with 0.125 s reaction time)
20 = 2 s	32/16	
25 = 2.5 s	40/16	(for FLW 41 I with 0,19 s reaction time)
29 = 2.875 s	46/16	(for UV41/UV42 with 0.125 s reaction time)
30 = 3 s	48/16	

[*2] Use the shortcut - and + to switch between OFF (display = oF) and the address. The setting "o" is only displayed if a bus module is connected. Addresses over 99 must be set by means of VisionBox.

[*3] The setting "h" is only displayed if continuous operation is active or has been activated in setting F.

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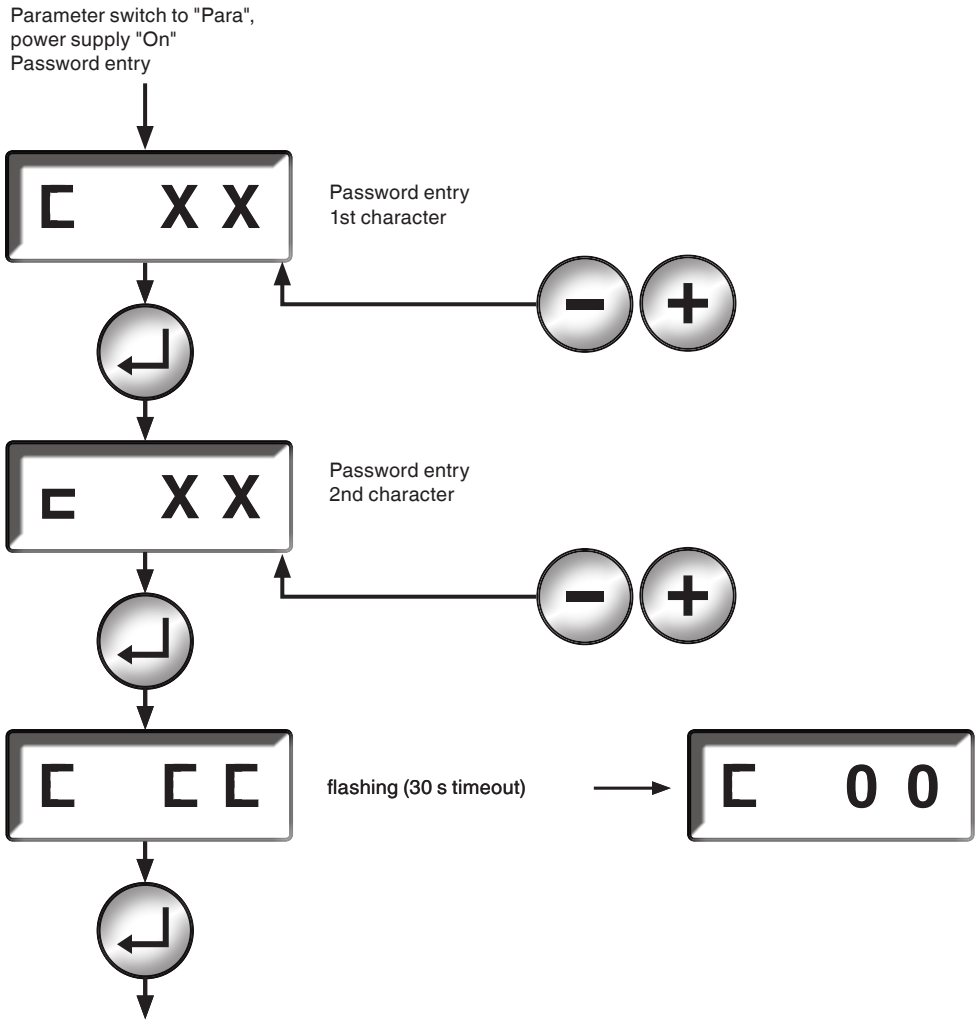
Parameter display	
►	**Attention: Press the "Back" button ⏎ to return to previous steps in parameter mode. If you have reached the first entry field again, press the ⏎ key again to quit the parameter mode.**



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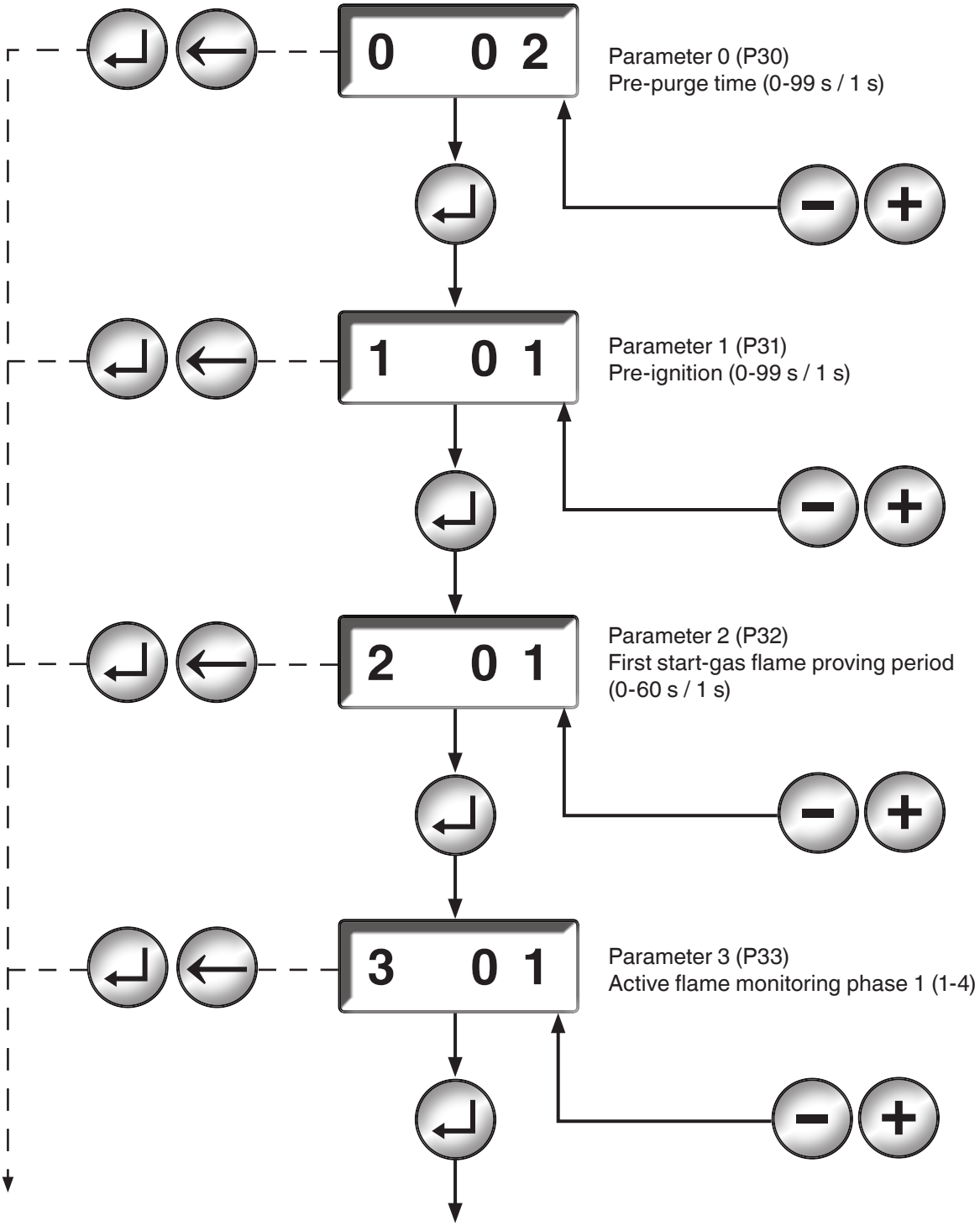

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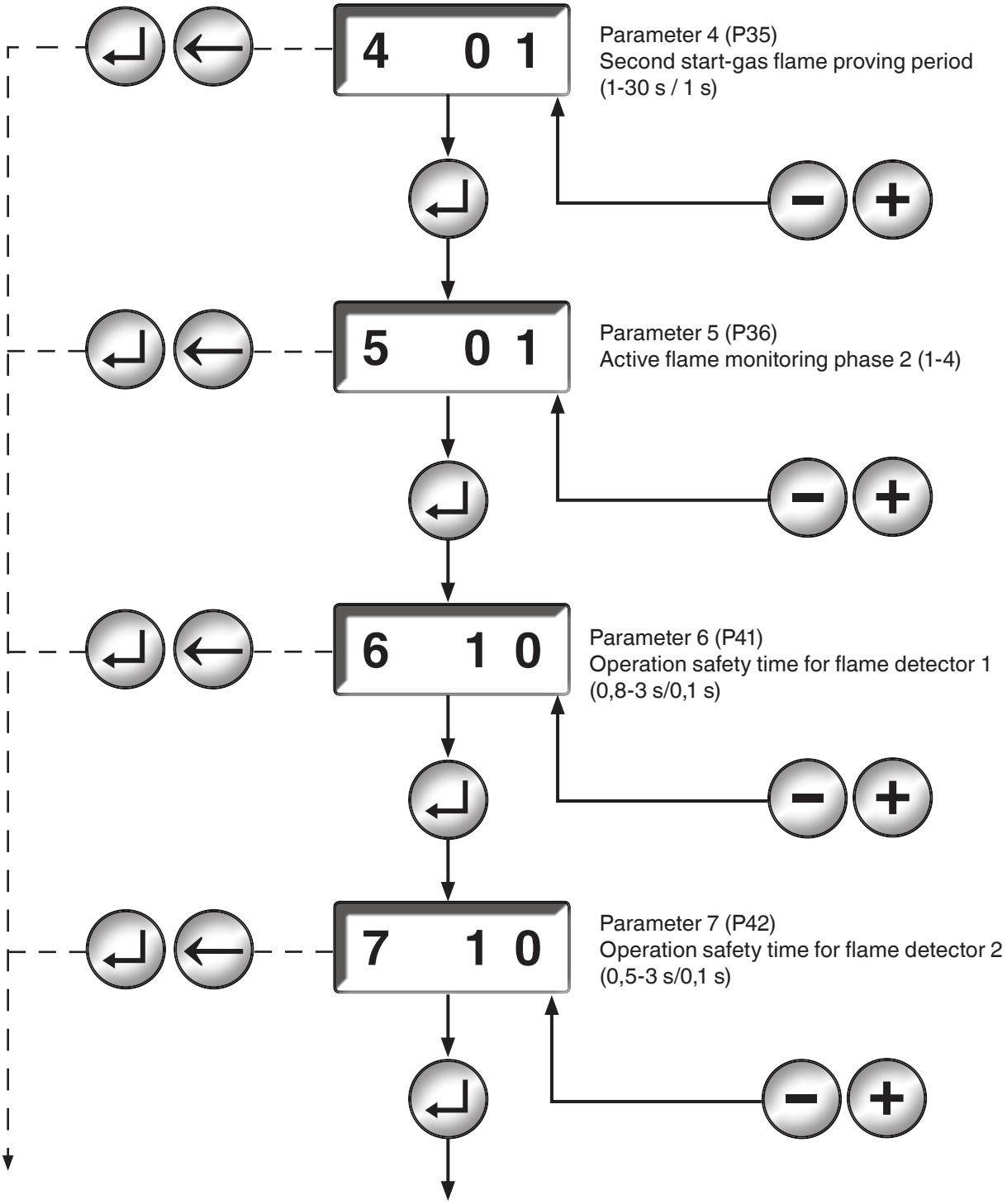

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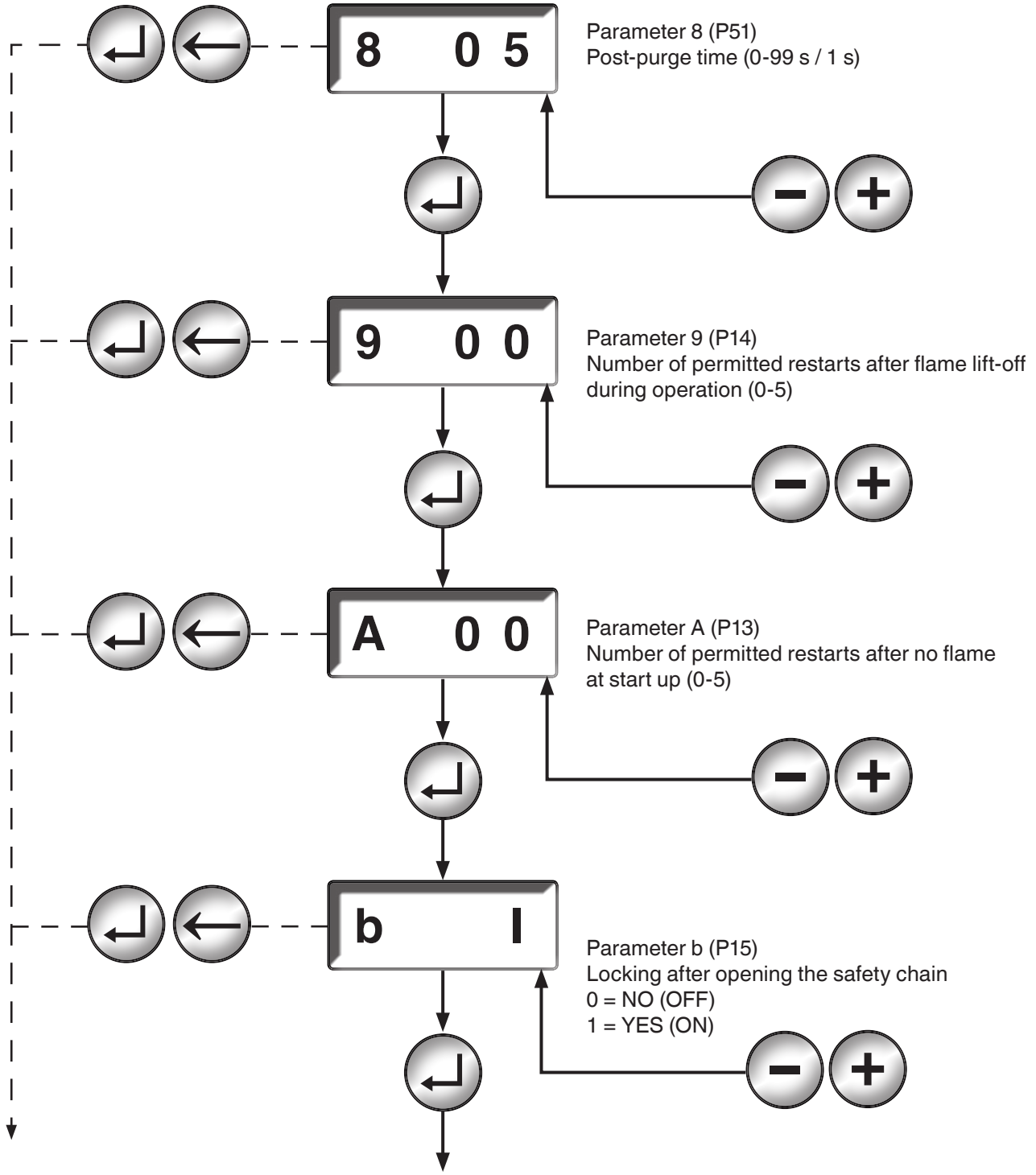

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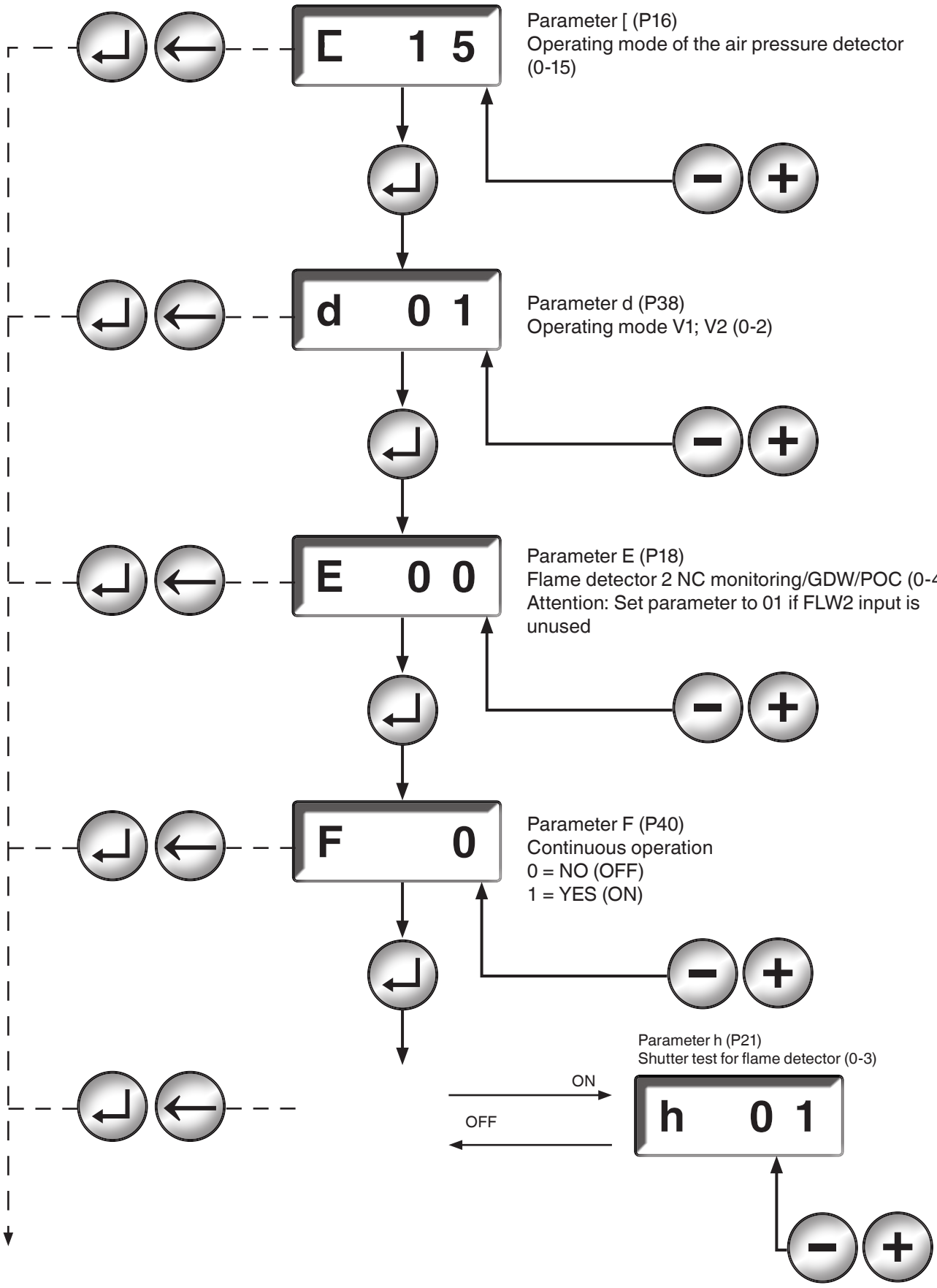

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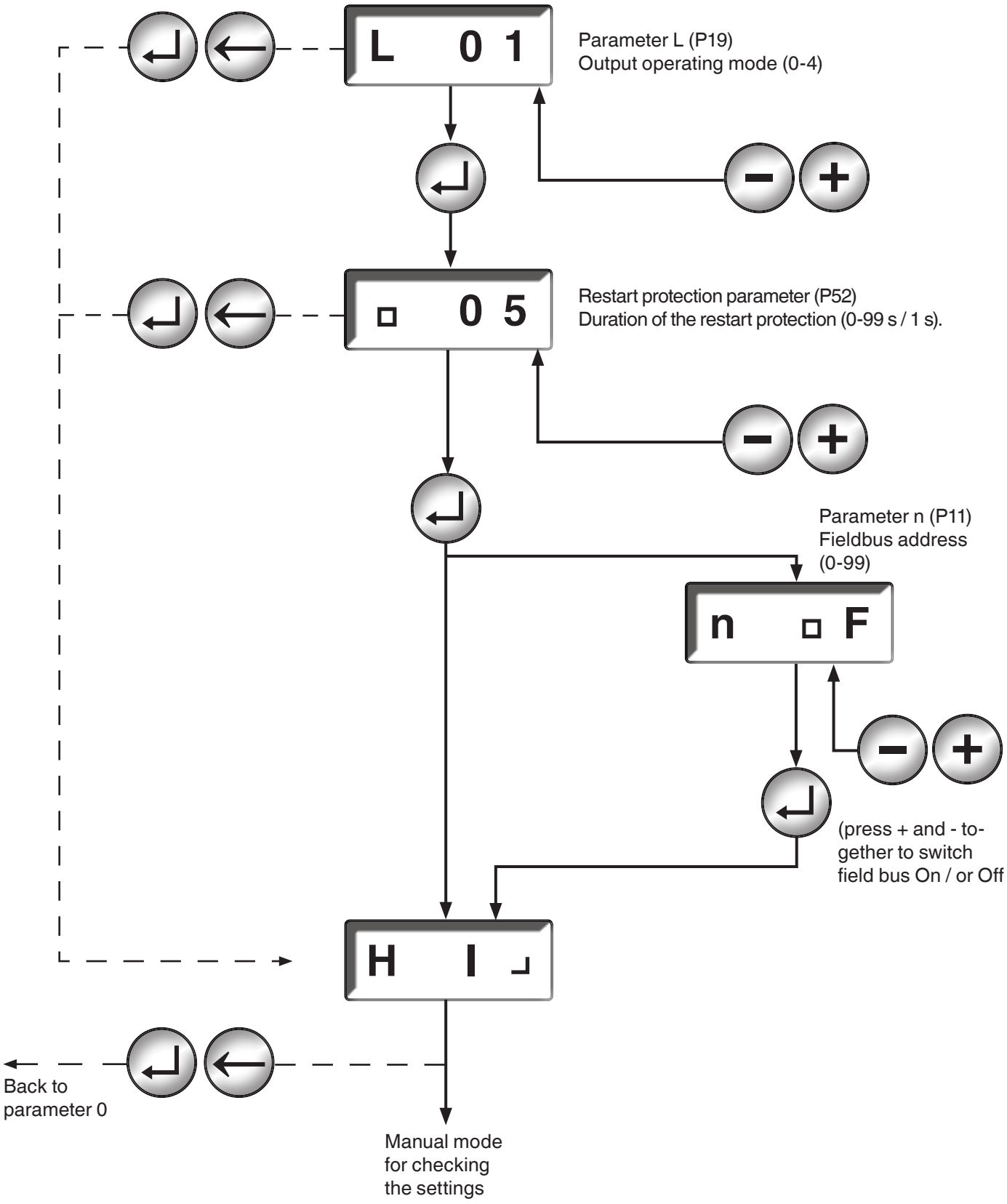

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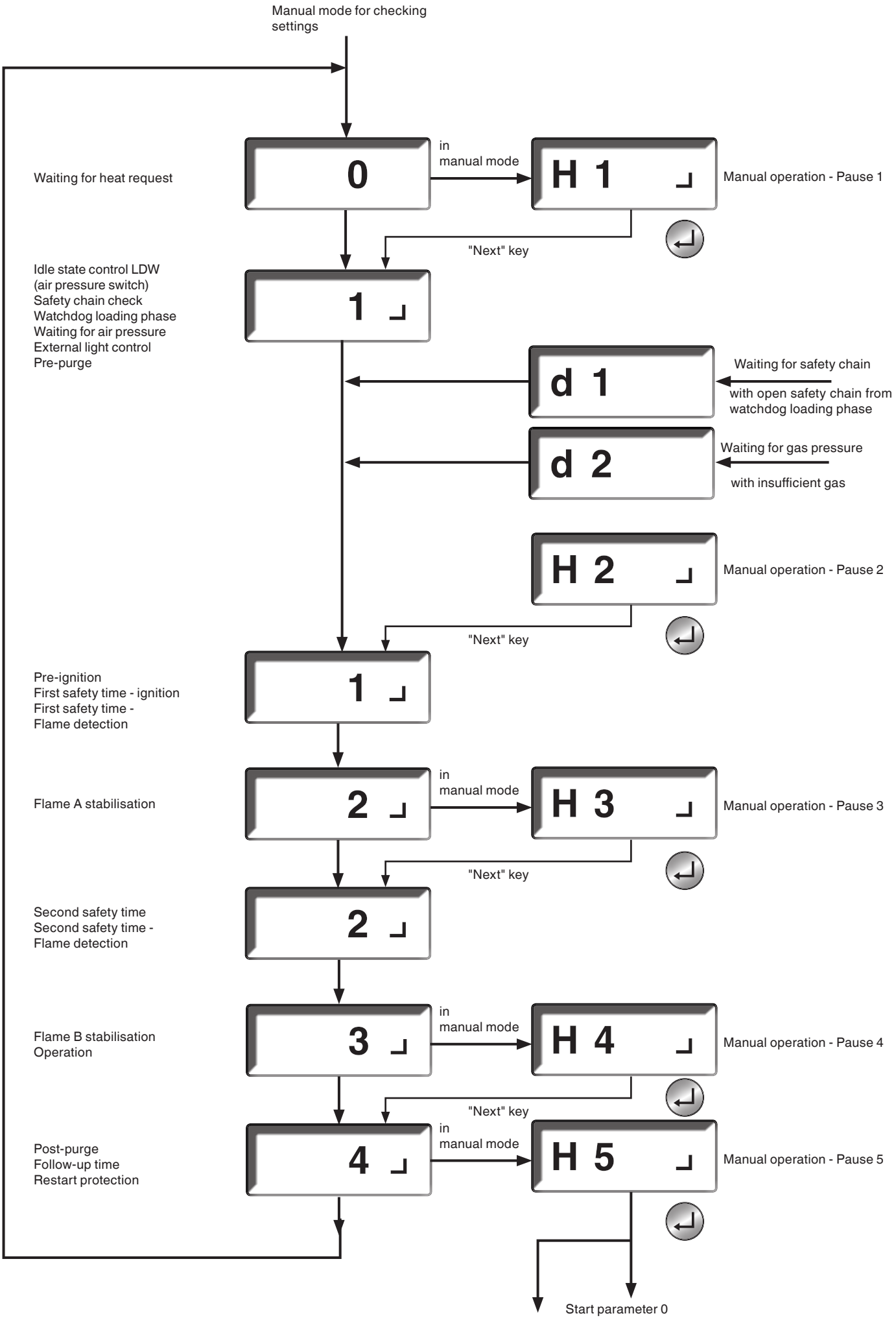

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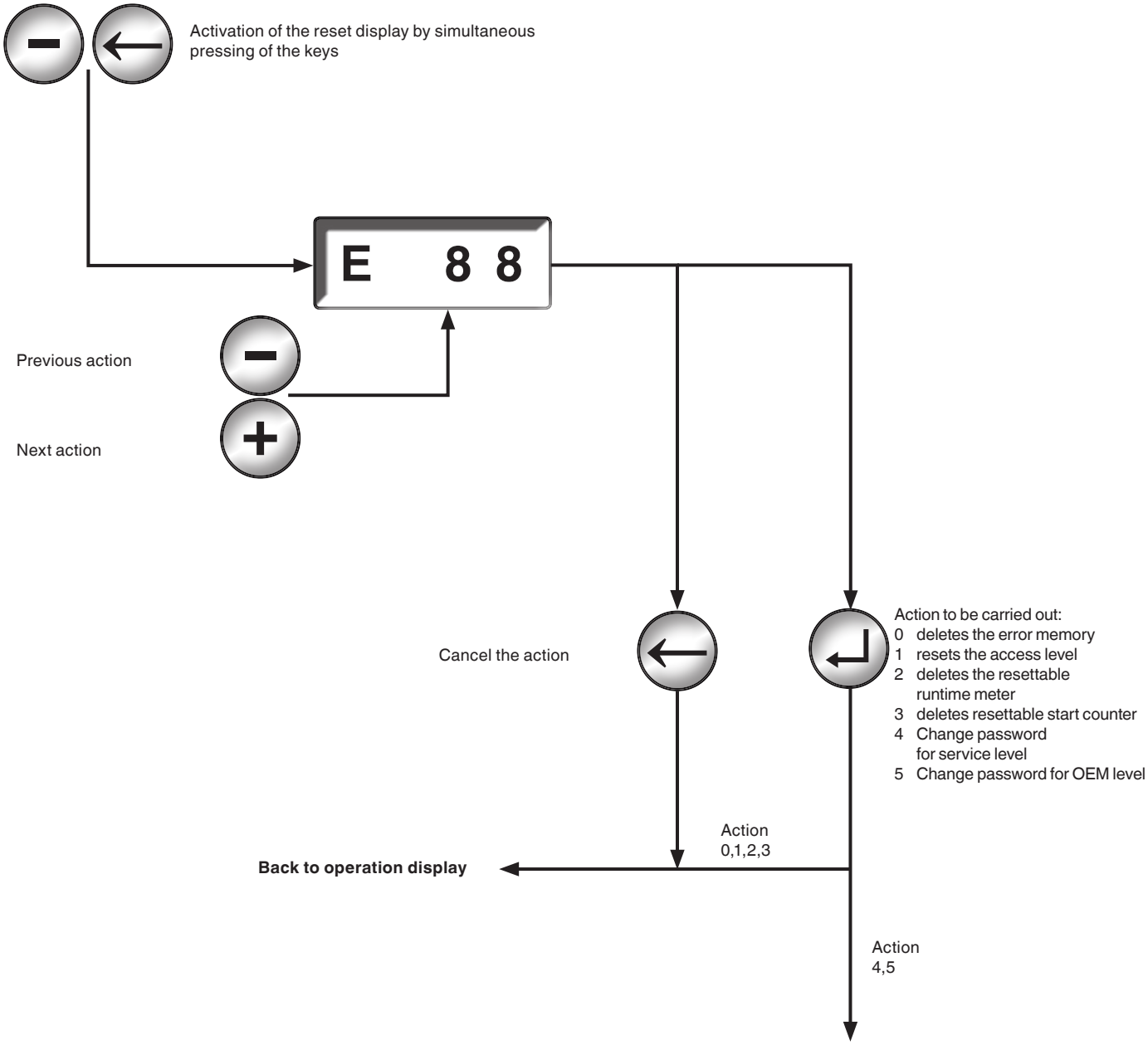
Reset display	
►	**The reset display is activated out of the operation display (not during automatic parameter setting).**
►	**The reset display allows deleting error memory, access level, resettable runtime meter or start counter and changing the passwords for service and OEM level.**
►	**This mode is quit after 60 seconds due to a timeout if you do not press any key within this time period.**
►	**If the test mode of the programm- and service box is active the reset display is locked.**



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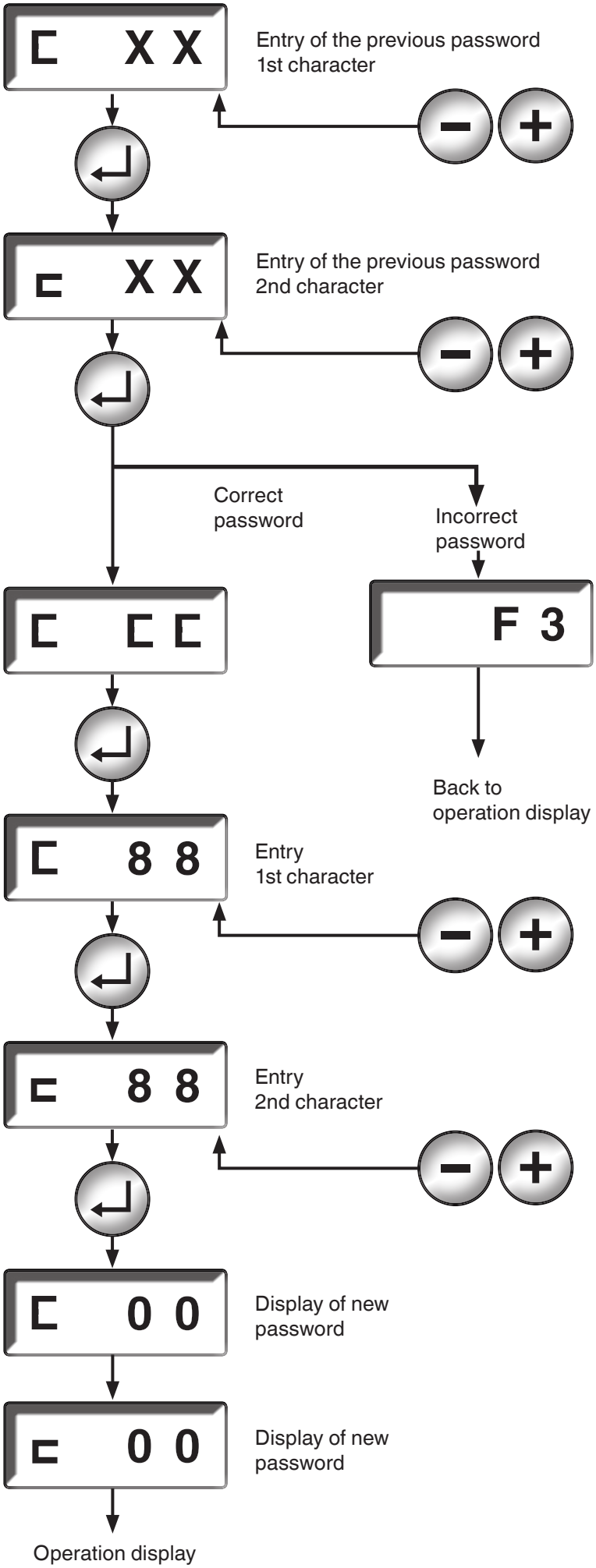

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Error overview		
MPA 41xx error table for minimum indication (MPA4111) ordered by flash code		
Error ID	**Internal error**	**Error description Please see the tables above for more information about the individual errors.**
1	**0xA2**	ERROR_SAFETY_CHAIN_OPEN
2	**0x60**	ERROR_PARAMETER CHANGE_NOT RELEASED
3	**0xA7**	ERROR_NO FLAME_DURING_FIRST SAFETY TIME
3	**0xBC**	ERROR_NO FLAME_DURING_SECOND SAFETY TIME
3	**0xA9**	ERROR_FLAME_GONE_OUT_DURING_STABILISATION
4	**0xA8**	ERROR_FLAME_GONE_OUT_DURING_OPERATION
5	**0xAA**	ERROR_IDLE STATE CONTROL_LDW
5	**0xAB**	ERROR_NO_AIR_PRESSURE
6	**0xA6**	ERROR_EXTERNAL_LIGHT
7	**0x18**	ERROR_EXTERNAL_APPLICATION
8	**0x16**	ERROR_TWI_COMMUNICATION AND LOW VOLTAGE

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Error overview		
MPA 41xx error without error ID		
Error ID	**Internal error**	**Error description**
F1 flashing		Low voltage Bus connection interrupted Internal error
F2 flashing	**x**	The connected display is invalid
F3 flashing		The password has been entered incorrectly when trying to change it or has not been confirmed by means of the unlock key
F4 flashing		The signal of the remote unlocking via bus is active too long
F5 to F8		not used
F9 flashing		Connection to bus missing. The bus module has been connected but there is not any connection to the master.
FA flashing	**x**	Failed to read parameter "Output operating mode", the output for the operating mode is not switched

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Error overview			
MPA 41xx			
Error from the basic system (0x01 to 0x3F)			
Error ID	**Flash code minimum indica-tion**	**Internal error**	**Error description**
0x01	**0**	X	ERROR_INTERRUPT_CYCL_STATE FRAME
0x02	**0**	X	ERROR_WD_TRIGGERING
0x03	**0**		ERROR_WD_HARDWARE Possible cause of the error: Too high ambient temperature Overvoltage
0x04	**0**		ERROR_UNLOCKING_DENIED Possible cause of the error: More than 5 unlocking operations in the last 15 minutes. Remedy: Wait or extended unlocking
0x05	**0**	x	ERROR_ROM_TEST
0x06	**0**	x	ERROR_RAM_TEST
0x07	**0**	x	ERROR_PINSHORTCIRCUIT
0x08	**0**	x	ERROR_STACK_OVERFLOW
0x09	**0**	x	ERROR_PROGRAMMING
0x0A	**0**	x	ERROR_DI_VARIABLE
0x0B	**0**	x	ERROR_IN_TABCONTROLERROR
0x0C	**0**	x	ERROR_CONFIGURATION
0x0D	**0**	x	ERROR_CPU_TEST
0x0E	**0**	x	ERROR_EEPROM_PARAMETER
0x0F	**0**	x	ERROR_ADDRESS_TEST
0x10	**0**	x	ERROR_FUNCTION_ERROR ID
0x11	**0**		ERROR_UNDERVOLTAGE Possible cause of the error: The admissible lower voltage limit was not reached at least for a short time
0x12	**0**		ERROR_POWERFAILURE Possible cause of the error: The supply voltage was interrupted during startup, operation or regular switch-off
0x13	**0**	x	ERROR_WD_STATUS Safety chain not potential-free. Possible cause of the error: The fan continues running too long. Remedy: Increase the time for the restart protection
0x14	**0**	x	ERROR_DI_SEGMENT_TEST
0x15	**0**	x	ERROR_SFRREGISTER_TEST
0x16	**0**		ERROR_TWI_COMMUNICATION Possible cause of the error: A TWI bus user was connected to the bus or separated from the bus while the MPA was not disconnected from the mains. Remedy: Connect or separate a user of the TWI bus only if the MPA is disconnected from the mains. Too many users are connected to the TWI bus or EMC faults occur on the TWI line. Remedy: Use shorter lines or reduce the number of users
0x17	**0**	x	ERROR_STATE FRAME_OVERLOAD

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Error overview			
MPA 41xx			
Error from the basic system (0x01 to 0x3F)			
Error ID	**Flash code minimum indication**	**Internal error**	**Error description**
0x18	**7**		ERROR_EXTERNAL_APPLICATION Possible cause of the error: A switch-off has been activated by an external user, for example by selecting the function "Switch-off" in the PC software of the VisionBox Timeout of parameter mode/manual mode (0.5 h without pressing a key) - detail error 4th byte=0xA0 An invalid fieldbus address has been entered in P11 for the connected bus module. Detail error 4th byte = 0xA1 and 6th byte = set address P11
0x19	**0**		not used
0x1A	**0**	x	ERROR_SWWD_DURING_INITIALISATION
0x1B	**0**	x	ERROR_BUFFEROVERFLOW
0x1C	**0**	x	ERROR_SYNCHRONISATION_DURING_INITIALISATION
0x1D	**0**		ERROR_PROCESSORFAILURE Possible cause of the error: There is strong EMC interference on MPA
0x1E	**0**	x	ERROR_SFRREGISTER_STATEBLOCK

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Error overview			
MPA 41xx			
Error from the extended functions (0x40 to 0x9F)			
Error ID	**Flash code minimum indication**	**Internal error**	**Error description**
0x40 - 0x42			reserved
0x43	0	x	ERROR_TEST_IONISATIONINPUT
0x44 - 0x5F			reserved
0x59			ERROR_MONITORING_INTERFACEP2 Internal failure Fieldbus not connected or interrupted while P38 setting = 2 (external detarmination V2)
0x60	2		ERROR_PARAMETER CHANGE_NOT RELEASED A monitored parameter has been changed
0x61			ERROR_SHUTTERTEST

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Error overview			
MPA 41xx			
Error from the extended functions (0x40 to 0x9F)			
Error ID	**Flash code minimum indica-tion**	**Internal error**	**Error description**
0xA0	0	x	ERROR_STATE_DURATION_TOO_LONG
0xA1			reserved
0xA2	1		ERROR_SAFETY_CHAIN_OPEN Possible cause of the error: The safety chain has been opened or is not closed The wires of the safety chain are interrupted
0xA3			not used
0xA4	0	x	ERROR_FEEDBACK_V1_INCORRECT
0xA5	0	x	ERROR_FEEDBACK_V2_INCORRECT
0xA6	6		ERROR_EXTERNAL_LIGHT Possible cause of the error: Earth connection to an ionisation electrode Gas flows out and is burned for example by neighbouring burners Wrong configuration of P46 and P47 (total must be greater than 0.5 s) Defective UV tube Connected flame detector (UV, ...) detects light or is defective
0xA7	3		ERROR_NO FLAME_DURING_FIRST SAFETY TIME Additional information byte 0: Bit 0 = Flame to FLW1; Bit 1 = Flame to FLW2 Additional information byte 1: Flame quality for FLW1 Possible cause of the error: Ionisation electrode incorrectly set Ignition electrodes incorrectly set Insulated lines of the ignition electrodes or defective ionisation electrode Gas valves do not open the gas flow Connected flame detector (UV, ...) does not detect light or is defective Lines of mains connection on the MPA exchanged ("N" and "L1")
0xA8	4		ERROR_FLAME_GONE_OUT_DURING_OPERATION Additional information byte 0: Bit 0 = Flame to FLW1; Bit 1 = Flame to FLW2 Additional information byte 1: Flame quality for FLW1 Possible cause of the error: Flame body defective Connected flame detector (UV, ...) does not detect light or is defective
0xA9	3		ERROR_FLAME_GONE_OUT_DURING_STABILISATION Additional information byte 0: Bit 0 = Flame to FLW1; Bit 1 = Flame to FLW2 Additional information byte 1: Flame quality for FLW1
0xAA	5		ERROR_IDLE STATE CONTROL_LDW Possible cause of the error: The air pressure detector is defective There is air pressure during the idle state control, for example due to an air flow from the exhaust line,... The threshold value of the air pressure detector is set incorrectly
0xAB	5		ERROR_NO_AIR_PRESSURE
0xAC	0	x	ERROR_FEEDBACK_IGNITION_INCORRECT
0xAD	0		ERROR_LACKOFGAS_GDWMIN
0xAE–0xAF			reserved
0xB0	0	x	ERROR_TESTCIRCUIT_EXTENSION
0xB1-2			reserved
0xB3			ERROR_GASVALVEFEEDBACK_FALSE Additional information byte 0:1 = V1, 2=V2
0xB4-5			reserved
0xB6	0		ERROR_LIMIT SWITCH_MAIN GAS (POC)

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Error overview			
MPA 41xx			
Error from the extended functions (0x40 to 0x9F)			
Error ID	**Flash code minimum indica-tion**	**Internal error**	**Error description**
0xB7–0xBB			reserved
0xBA			ERROR_FALSEFLAME_START False flame > 1 min. after heat request
0xBC	3		ERROR_NO FLAME_DURING_SECOND SAFETY TIME Additional information byte 0: Bit 0 = Flame to FLW1; Bit 1 = Flame to FLW2 Additional information byte 1: Flame quality for FLW1
0xBD	0		ERROR_FLAME DETECTOR_NOT SWITCHED_INVERSE
0xBF	0		ERROR_SAFETY_CHAIN_NOT_POTENTIAL-FREE

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Annex

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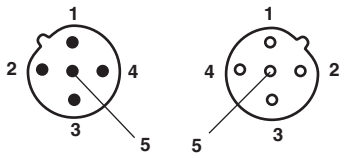
Setting the Profibus address
If you want to connect the automatic gas burner control system to the bus, a valid Profibus address must be entered in parameter P11. The display shows OFF during parameter setting if you have not set any address. Press the keys - and + to switch to the change mode. Now set the desired address in the range from 1 to 126.
If you want to change the address later on, it is possible during operation. Important: Any modifications are applied after a restart or an extended unlocking of the automatic gas burner control system.

Bus termination
A terminator is required on the first and last device on the bus.

The shielding of the bus cable should be placed onto
PE to avoid electromagnetic radiation.

Pin assignment (M12-5 B-coded)

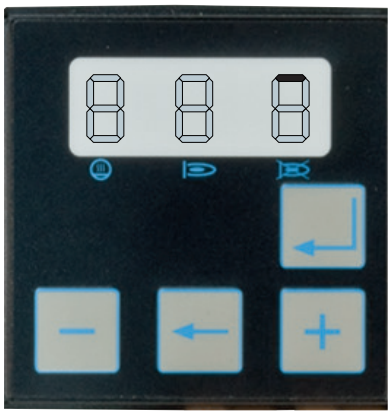


Pin **Socket**

Pin no.	Signal
1	+5 V supply for bus termination
2	Data line minus (A conductor)
3	Earth
4	Data line plus (B conductor)
5	not used
Thread	Shielding (earth connection) recommended

A bus connection is not required for operating the MPA. If a bus is not connected, the MPA can only receive a heat request via the hardware input "Temperature controller".
If there is a bus connection, which can be recognised by a flashing digit on the display, the heat request is given by means of bit 0 and bit 6 in AB0. If the system is again separated from the bus, it automatically changes to reading the hardware input "Temperature controller" after one minute.

During operation and error messages, the current bus address may be seen by pressing the ← key.



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Extension module MPA 41xx EM 2/4 Profibus DP interface, Modbus RTU / ASCII and shutter activation for flame detector device suitable for continuous operation

Universal extension module for integrating the MPA 41xx in fieldbus systems with up to 32 slaves.

Integrated functions:
- Profibus DP interface
- Modbus RTU / ASCII
- Activation for shutter module UV4x / Shutter

The bus protocol can be selected by means of DIP switch.
Via the bus, commands can be transmitted to the MPA and status information can be queried.
In addition, an output for activating the shutter module to continuously operate the UV 4x probes is integrated.

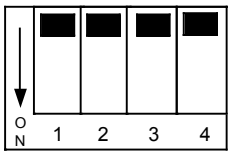
BUS protocol presettings

The 4-pin DIP switch is used to select the bus protocol and to activate the respective line termination.
The bus protocol must be selected only with dead voltage. Modifications are impossible during operation.

Bus protocol selection

DIP switch No. 4:

OFF position = Profibus
ON position = Modbus



Bus termination

If the termination is activated via the DIP switch, external termination resistors must not be plugged into the output connectors.

If a termination is activated, the termination of the alternative bus protocol has to be deactivated in any case.
Modbus termination

DIP switch No. 1:

ON position = Modbus termination resistor 120 Ohm

Profibus termination

DIP switches No. 2 and 3:

ON position = Profibus termination resistor 220 Ohm

Setting the bus address

The bus address is entered in the P11 parameter (display indication "n"). OFF is displayed if no address has been entered.
An address between 1 and 99 (up to 126 via VisionBox) can be entered in the parameter mode. Any modifications will take effect only after a restart or an extended unlocking.

During operation and error messages, the current bus address may be seen by pressing the ← key.

Bus interruption

Modbus
The bus module requires at least one query per minute. If there is no query:

- safety switch-off if V2 is activated via the bus
  or
- after another minute, switchover to the hardware input
  "heat request" is done

Profibus
If the cyclic data stream is interrupted, after a Profibus Watchdog period defined by the master (e.g. 2.5s):
- safety switch-off if V2 is activated via the bus
  or
- after another minute, switchover to the hardware
  input "heat request"

Profibus data

The amount of the input and output data is defined by the modules in the enclosed GSD file for Profibus.

Profibus output data master to MPA

The output data have 8 bits, see table

Bit	Output byte AB0
0	Heat request
1	High power / level 2
2	Remote unlocking
3	Not used
4	Not used
5	Not used
6	Ignore bit 0 (heat request via bus)
7	Reserve (please set 0)

Command contents of assigned bits:

Bit 0 (heat request) set to 1 by master = heat request.

Bit 1 (high power) set to 1 by master = V2 is opened in the states 18 (operation) and 19 (pause4) (parameter 38 is set to value 2).

Bit 2 (remote unlocking) set to 1 by master (at least 0.5 s max. 5 s) = MPA is unlocked.

Bit 6 (deactivate heat request) set to 1 by master = the bit 0 signal "heat request" is ignored, the automatic gas burner control system does not receive a heat request via the bus. The heat request is only possible via the hardware input.

Eight modules are integrated in the enclosed GSD file. Four of them, a module for Basic, Standard and Extended, do not contain any output bytes but only input bytes (information about MPA). Therefore they cannot give any commands to MPA.

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Profibus input data MPA to master

Input data is information about the state of the MPA. The input data contain a different number of bytes, depending on the data transfer module used. The lower bytes are always the same, i.e. Basic transfer is included in Standard transfer, Standard transfer in Extended transfer.

Basic transfer 2 bytes
EB0 and EB1

Standard transfer 4 bytes
EB0 to EB3

Extended transfer 12 bytes
EB0 to EB11

Special Extended-Transfer 20 bytes
EB0 bis EB19

The bytes EB0 and EB1 contain bit information.
If the bit is set to 1, the condition is included in the description of the bits. Some bits are active during the fault (marked with "X"), others are 0.

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Basic transfer area			
MPA 41xx			
Bit	**Input byte EB0**	**Description**	**During fault**
0	Flame 1	There is a signal for flame 1	0
1	Flame 2	There is a signal for flame 2	X
2	Flame 2 NC / GDW	There is a signal for flame 2 NC or GDW	X
3	Flame detection	The resulting flame signal has been detected	X
4	LDW	Sufficient air pressure	X
5	Input for temperature controller	Signal of the hardware input "Temperature controller"	X
6	Valve 1	The gas valve V1 is open	X
7	Valve 2	The gas valve V2 is open	X
Bit	**Input byte EB1**	**Description**	**During fault**
0	Spark generator	Ignition active	X
1	Manual mode	Manual mode active	X
2	Fan	Fan relay on	X
3	not used		0
4	Temperature controller (hardware + bus)	Evaluation between temperature controller hardware input and bus specification	X
5	not used		0
6	not used		0
7	Fault	There is a fault in the automatic gas burner control system	X

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Standard transfer area			
MPA 41xx			
Bit	**Input byte EB2**	**Description**	**During fault**
0-7	State number or error code	Current state number or error code if there is a fault	X
Bit	**Input byte EB3**	**Description**	**During fault**
0-7	Flame quality	Quality of the flame over ionisation input	0

Extended transfer area			
MPA 41xx			
Bit	**Input byte EB4**	**Description**	**During fault**
0-7	Resettable Runtime meter	Low byte (byte 0) of the 32-bit runtime meter (Unit s)	X
Bit	**Input byte EB5**	**Description**	**During fault**
0-7	Resettable Runtime meter	Byte 1 of the 32-bit runtime meter (Unit s)	X
Bit	**Input byte EB6**	**Description**	**During fault**
0-7	Resettable Runtime meter	Byte 2 of the 32-bit runtime meter (Unit s)	X
Bit	**Input byte EB7**	**Description**	**During fault**
0-7	Resettable Runtime meter	High byte (byte 3) of the 32-bit runtime meter (Unit s)	X
Bit	**Input byte EB8**	**Description**	**During fault**
0-7	Resettable Start counter	Low byte (byte 0) of the 32-bit start counter	X
Bit	**Input byte EB9**	**Description**	**During fault**
0-7	Resettable Start counter	Byte 1 of the 32-bit start counter	X
Bit	**Input byte EB10**	**Description**	**During fault**
0-7	Resettable Start counter	Byte 2 of the 32-bit start counter	X
Bit	**Input byte EB11**	**Description**	**During fault**
0-7	Resettable Start counter	High byte (byte 3) of the 32-bit start counter	X

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Special extended transfer area			
MPA 41xx			
Bit	**Input byte EB12**	**Description**	**During fault**
0-7	Resettable Switching cycles counter V2	Low byte (Byte 0) des 32–bit switching cycles counter V2 (Unit: s)	X
Bit	**Input byte EB13**	**Description**	**During fault**
0-7	Resettable Switching cycles counter V2	Byte 1 des 32–bit switching cycles counter V2 (Unit: s)	X
Bit	**Input byte EB14**	**Description**	**During fault**
0-7	Resettable Switching cycles counter V2	Byte 2 des 32–bit switching cycles counter V2 (Unit: s)	X
Bit	**Input byte EB15**	**Description**	**During fault**
0-7	Resettable Switching cycles counter V2	High byte (Byte 3) of the 32–bit switching cycles counter V2 (Unit: s)	X
Bit	**Input byte EB16**	**Description**	**During fault**
0-7	Resettable Runtime meter V2	Low byte (Byte 0) of the 32–bit runtime meter V2 (in s)	X
Bit	**Input byte EB17**	**Description**	**During fault**
0-7	Resettable Runtime meter V2	Byte 1 of the 32–bit runtime meter V2 (in s)	X
Bit	**Input byte EB18**	**Description**	**During fault**
0-7	Resettable Runtime meter V2	Byte 2 of the 32–bit runtime meter V2 (in s)	X
Bit	**Input byte EB19**	**Description**	**During fault**
0-7	Resettable Runtime meter V2	High byte (Byte 3) of the 32–bit runtime meter V2 (in s)	X

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Declaration of the Profibus interface	
MPA 41xx	
Manufacturer identification	ID OXOCF1 (Karl Dungs GmbH & Co. KG)
ASCIC type	VPC3+C
Sync and freeze mode	Is supported (Sync command: Freeze all outputs of the addressed slaves Freeze command: Freeze all inputs of the addressed slaves)
Cycle time	Maximum time until there is a response to a request telegram, depending on the bus transfer rate: 9.6 kBit/s to 500 kBit/s → 15 bit times 1500 kBit/s → 20 bit times 3000 kBit/s → 35 bit times 6000 kBit/s → 50 bit times 12000 kBit/s → 95 bit times
Diagnosis	The Profibus module creates an external diagnosis if it detects an internal error. The diagnosis information of the DP slave consists of standard diagnosis information (6 bytes) and a user-specific diagnosis information error number (2 bytes). Octet 1: Bit 0 = Diagnosis station does not exist (sets master) Bit 1 = Diagnosis station not ready: The slave is not ready for data exchange. Bit 2 = Diag.cfg_Fault: Configuration data do not match Bit 3 = Diag.ext_diag: Slave has external diagnosis data Bit 4 = Diag.not supported: Requested function is not supported in slave Bit 5 = Diag.invalid_slave_response (sets slave fixed to 0) Bit 6 = Diag.prm_fault: Wrong parameters (ID number, etc.) Bit 7 = Diag.master_lock (sets master): Parameters of slave are set by another master Octet 2: Bit 0 = Diag.Prm_req: Slave requires new parameters Bit 1 = Diag.Stat_diag: Statical diagnosis (byte diag-bits) Bit 2 = fixed to 1 Bit 3 = Diag.WD_ON: Reaction monitoring active Bit 4 = Diag.freeze_mode: Freeze command received Bit 5 = Sync_mode: Sync command received Bit 6 = reserved Bit 7 = Diag.deactivated (sets master) Octet 3: Bit 0 - Bit 6 = reserved Bit 7 = Diag.ext_overflow Octet 4: Diag master_add: Master address after setting parameters (FF without parameter setting) Octet 5: High byte ID number Octet 6: Low byte ID number
Parameter	Only cyclical communication supported
Automatic baud rate detection	is supported

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Modbus data
Modbus RTU or ASCII mode

The modbus protocol can be switched over to ASCII mode (see protocol) using the FunctionCode 0x41.
The setting is permanently saved in the slave.
Standard value (upon delivery) is modbus RTU.

Modbus output data master to MPA

The output data have 16 bits, see table

Bit	Registration address 0
0	Heat request
1	High power / level 2
2	Remote unlocking
3	Not used
4	Not used
5	Not used
6	Ignore bit 0 (heat request via bus)
7	Not used
8	Not used
9	Not used
10	Not used
11	Not used
12	Not used
13	Not used
14	Not used
15	Not used

Command contents of assigned bits:

Bit 0 (heat request) set to 1 by master = heat request.

Bit 1 (high power) set to 1 by master = V2 is opened in the states 18 (operation) and 19 (pause4) (parameter 38 is set to value 2).

Bit 2 (remote unlocking) set to 1 by master (at least 0.5 s max. 5 s) = MPA is unlocked.

Bit 6 (deactivate heat request) set to 1 by master = the bit 0 signal "heat request" is ignored, the automatic gas burner control system does not receive a heat request via the bus. The heat request is only possible via the hardware input.
Use the following FunctionCodes to write these specifications.
05 (0x05) Write Single Coil (Coil = bit at bit address x)
06 (0x06) Write Single Register (to register address)
16 (0x10) Write Single Register (from register address)

If it is not written on AB0, the MPA functions via the hardware inputs.

Modbus input data MPA to master

Input data is information about the state of the MPA. The input data contain a different number of bytes, depending on the used data transfer module. The lower bytes are always the same, i.e. Basic transfer is included in Standard transfer, Standard transfer in Extended transfer.
An EBx contains 16 bits.

Basic transfer 4 bytes
EB0 and EB1

Standard transfer 8 bytes
EB0 to EB3

Extended transfer 24 bytes
EB0 to EB11

Special Extended transfer 42 bytes
EB0 to EB20

Special Extended-Transfer kurz 21 Bytes
EB21-EB31
Full use of the 16 Bit register , containing the information of EB0-EB20

Use the following FunctionCodes to read this information.
03 (0x03) Read Holding Registers
01 (0x01) Read Coils.

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Basic transfer area

Bit	Registration address 0	Description	During Fault
0	Flame 1	There is a signal for flame 1	0
1	Flame 2	There is a signal for flame 2	X
2	Flame 2 NC / GDW	There is a signal for flame 2 NC or GDW	X
3	Flame detection	The resulting flame signal has been detected	X
4	LDW	Sufficient air pressure	X
5	Input for temp. controller	Signal of the hardware input "Temperature controller"	X
6	Valve 1	The gas valve V1 is open	X
7	Valve 2	The gas valve V2 is open	X
8...15	Not used	Not used	0

Bit	Registration address 1	Description	During Fault
0	Spark generator	Ignition active	X
1	Manual mode	Manual mode active	X
2	Fan	Fan relay on	X
3	not used		0
4	Temperature controller (hardware + bus)	Evaluation between temperature controller hardware input and bus specification	X
5	not used		0
6	not used		0
7	Fault	There is a fault in the automatic gas burner control system	X
8...15	Not used	Not used	0

Standard transfer area

Bit	Registration address 2	Description	During Fault
0-7	State number or Error code	Current state number, or in case of fault, the error code is included here	X
8...15	Not used	Not used	0

Standard transfer area

Bit	Registration address 3	Description	During Fault
0-7	Flame quality	Quality of Flame Signal	0
8...15	Not used	Not used	0

Extended transfer area

Bit	Registration address 4	Description	During Fault
0-7	resettable runtime meter	Low byte (byte 0) of the 32-bit runtime meter (in s)	X
8...15	Not used	Not used	0

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Bit	Registration address 5	Description	During Fault
0-7	resettable runtime meter	Byte 1 of the 32-bit runtime meter (in s)	X
8...15	Not used	Not used	0

Bit	Registration address 6	Description	During Fault
0-7	resettable runtime meter	Byte 2 of the 32-bit runtime meter (in s)	X
8...15	Not used	Not used	0

Bit	Registration address 7	Description	During Fault
0-7	Resettable Runtime meter	High byte (byte 3) of the 32-bit runtime meter (in s)	X
8...15	Not used	Not used	0

Bit	Registration address 8	Description	During Fault
0-7	Resettable Start counter	Low byte (byte 0) of the 32-bit start counter	X
8...15	Not used	Not used	0

Bit	Registration address 9	Description	During Fault
0-7	Resettable Start counter	Byte 1 of the 32-bit start counter	X
8...15	Not used	Not used	0

Bit	Registration address 10	Description	During Fault
0-7	Resettable Start counter	Byte 2 of the 32-bit start counter	X
8...15	Not used	Not used	0

Bit	Registration address 11	Description	During Fault
0-7	Resettable Start counter	High byte (byte 3) of the 32-bit start counter	X
8...15	Not used	Not used	0

Bit	Registration address 12	Description	During Fault
0-7	Switching cycles counter V2	Low byte (byte 0) of the 32-bit cycle counter V2	X
8...15	Not used	Not used	0

Bit	Registration address 13	Description	During Fault
0-7	Switching cycles counter V2	Byte 1 of the 32-bit cycle counter V2	X
8...15	Not used	Not used	0

Bit	Registration address 14	Description	During Fault
0-7	Switching cycles counter V2	Byte 2 of the 32-bit cycle counter V2	X
8...15	Not used	Not used	0

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Bit	Registration address 15	Description	During Fault
0-7	Switching cycles counter V2	High byte (byte 3) of the 32-bit cycle counter V2	X
8...15	Not used	Not used	0

Bit	Registration address 16	Description	During Fault
0-7	Runtime meter V2	Low byte (byte 0) of the 32-bit cycle counter V2 (in s)	X
8...15	Not used	Not used	0

Bit	Registration address 17	Description	During Fault
0-7	Runtime meter V2	Byte 1 of the 32-bit cycle counter V2 (in s)	X
8...15	Not used	Not used	0

Bit	Registration address 18	Description	During Fault
0-7	Runtime meter V2	Byte 2 of the 32-bit cycle counter V2 (in s)	X
8...15	Not used	Not used	0

Bit	Registration address 19	Description	During Fault
0-7	Runtime meter V2	High byte (byte 3) of the 32-bit cycle counter V2 (in s)	X
8...15	Not used	Not used	0

Bit	Registration address 20	Description	During Fault
0-7	Additional error information	First additional error information byte	X
8...15	Not used	Not used	0

In the following, the information is linked to allow the complete use of the 16 bits register.
Query if the bus load is to be reduced.

Bit	Registration address 21	Description	During Fault
0	Flame 1	There is a signal for flame 1	0
1	Flame 2	There is a signal for flame 2	X
2	Flame 2 NC / GDW	There is a signal for flame 2 NC or GDW	X
3	Flame detection	The resulting flame signal has been detected	X
4	LDW	Sufficient air pressure	X
5	Input for temperature controller	Signal of the hardware input "Temperature controller"	X
6	Valve 1	The gas valve V1 is open	X
7	Valve 2	The gas valve V2 is open	X
8	Spark generator	Ignition active	X
9	Manual mode	Manual mode active	X
10	Fan	Fan relay on	X
11	not used		0
12	Temperature controller (hardware + bus)	Evaluation between temperature controller hardware input and bus specification	X
13	not used		0
14	not used		0
15	Fault	There is a fault in the automatic gas burner control system	X

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Bit	Registration address 22	Description	During Fault
0-7	State number or error code	Current state number OR error code if there is a fault	X
8-15	Flame quality	Quality of the flame over ionisation input	0

Bit	Registration address 23	Description	During Fault
0-7	Resettable Runtime meter	Low byte (byte 0) of the 32-bit runtime meter (in s)	X
8-15	Resettable Runtime meter	Byte 1 of the 32-bit runtime meter (in s)	0

Bit	Registration address 24	Description	During Fault
0-7	Resettable Runtime meter	Byte 2 of the 32-bit runtime meter (in s)	X
8-15	Resettable Runtime meter	Highbyte (Byte 3) of the 32–bit runtime meter (in s)	X

Bit	Registration address 25	Description	During Fault
0-7	Resettable Start up counter	Low byte (byte 0) of the 32-bit start counter	X
8-15	Resettable Start up counter	Byte 1 of the 32-bit start counter	X

Bit	Registration address 26	Description	During Fault
0-7	Resettable Start up counter	Byte 2 of the 32-bit start counter	X
8-15	Resettable Start up counter	Highbyte (Byte 3) of the 32-bit start counter	X

Bit	Registration address 27	Description	During Fault
0-7	Switching cycles counter V2	Low byte (byte 0) of the 32-bit cycle counter V2	X
8-15	Switching cycles counter V2	Byte 1 of the 32-bit cycle counter V2	X

Bit	Registration address 28	Description	During Fault
0-7	Switching cycles counter V2	Byte 2 of the 32-bit cycle counter V2	X
8-15	Switching cycles counter V2	High byte (byte 3) of the 32-bit cycle counter V2	X

Bit	Registration address 29	Description	During Fault
0-7	Runtime meter V2	Low byte (byte 0) of the 32-bit runtime counter V2	X
8-15	Runtime meter V2	Byte 1 of the 32-bit runtime counter V2	X

Bit	Registration address 30	Description	During Fault
0-7	Runtime meter V2	Byte 2 of the 32-bit counter operating hours V2	X
8-15	Runtime meter V2	High byte (byte 3) of the 32-bit counter operating hours V2	X

Bit	Registration address 31	Description	During Fault
0-7	Additional error information	First additional error information byte	X
8-15	Not used	Not used	0

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Line lengths

Designation	Line length	Electrical data
Profibus DP	Max. 1200 m, see BMA MPA41xx	Galvanically isolated 4kV
Modbus	Max. 1000 m	Galvanically isolated 4kV

Supported baud rates

Profibus

The following table is only valid for line type A to EN 50170

Transfer speed kBit/s	9,6	19,2	45,45	93,75	187,5	500	1500	3000	6000	12000
max. line length in m	1200	1200	1200	1200	1000	400	200	100	100	100

Modbus

9600 bauds, 19200 bauds, 19200 bauds and 57600 bauds

The baud rate can be changed during operation by means of the Function-Code 0x41 and is permanently saved in the slave.
The relative parity bit can also be defined. None, Even and Odd are supported.
Default values (upon delivery) are 19200 bauds and Even Parity.

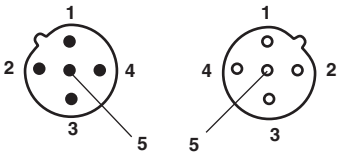
Bus termination

A termination resistor is required on the first and the last device of the bus structure.
Alternatively to internal termination (above), an external bus termination resistor can be connected instead of another bus cable.

The bus cable shielding is to be connected to PE to avoid electromagnetic radiation.

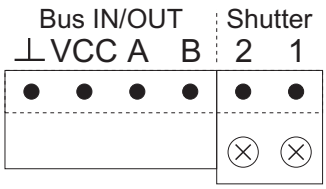
1.1 Pin assignment (M12–5 B-coded)

MPA 411x



Pin **Socket**

MPA 4122



Pin no.	Signal
1	+5V supply for bus termination
2	Data line minus (A conductor)
3	Earth
4	Data line plus (B conductor)
5	not used
Thread	Shielding (earth connection) recommended

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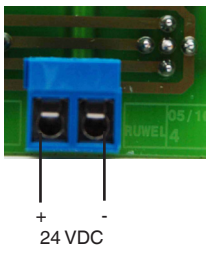
Flame detector device test for UV4x EM shutter

The EM 2/4 module includes an activation for the UV 4x / shutter.
The use of the UV 4X / shutter allows to use an UV flame detector device UV 41 (HE) and UV 42 suitable for continuous operation.
The shutter signal can also be used for continuous operation of one or more FLW 41I flame detector device (s).

The control signal is independent from the use of the bus interface.

Connection:



Supply voltage:

24 VDC

Current:

Max. 200 mA

Shutter frequency:

1 shutter signal / 10 minutes, the frequency is not adjustable.

Parameter setting:

The shutter signal is turned on / off by means of the P 21 parameter (parameter „h“ in the display).

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Extension module MPA 41xx EM 2/6

The multifunctional extension module EM 2/6 includes the following functions:

- Relay outputs as a function of state
- PWM output for speed control of DC fans with power input by a PWM signal
- Voltage output 0..10V
- Current output 4..20mA
- Profibus interface
- Modbus interface
- Output for activation of the EM1/1 shutter module or the continuous operation function of the FLW 41I.

For the EM 2/6 MPA 411x, art. no. 260751 the separately available mounting base MPA 411x WB, art. no. 261374 is required.

The EM 2/6 for MPA 412x, art. no. 260 903 is mounted in the metal housing.

Attention

The mounting of the EM 2/6 modules must only take place by DUNGS or by third parties authorised by Dungs.

Functions

Relay outputs as a function of state:

As a function of the program state, the relay contacts are closed or opened. The externally applied voltage is switched to random consumers.

Application
- Signalling of operational states
- Activation of analogue actuators

By using analogue actuators, two position messages can be reported to the EM 2/6.

PWM signal for activation, for example, of speed-controlled fans.

The PWM signal can be modulated during the "operation" state by applying a mains voltage signal.
The speed is controlled with no speed feedback.

Analogue output for current / voltage

The current signal (4-20 mA) or the voltage signal (0-10 VAC) can be modulated by applying a mains voltage signal.

Fieldbus communication

Profibus DP and modbus interface are integrated into the EM 2/6 extension module.
For the description, see page 70 ff.
EM 2/4 modul

Flame safeguard, shutter activation for continuous operation.

The activation of the EM1/1 shutter module, which is necessary for the continuous operation of DUNGS UV 4x and FLW 41I flame safeguards, is integrated into the EM 2/6 (for the description, see page 82).

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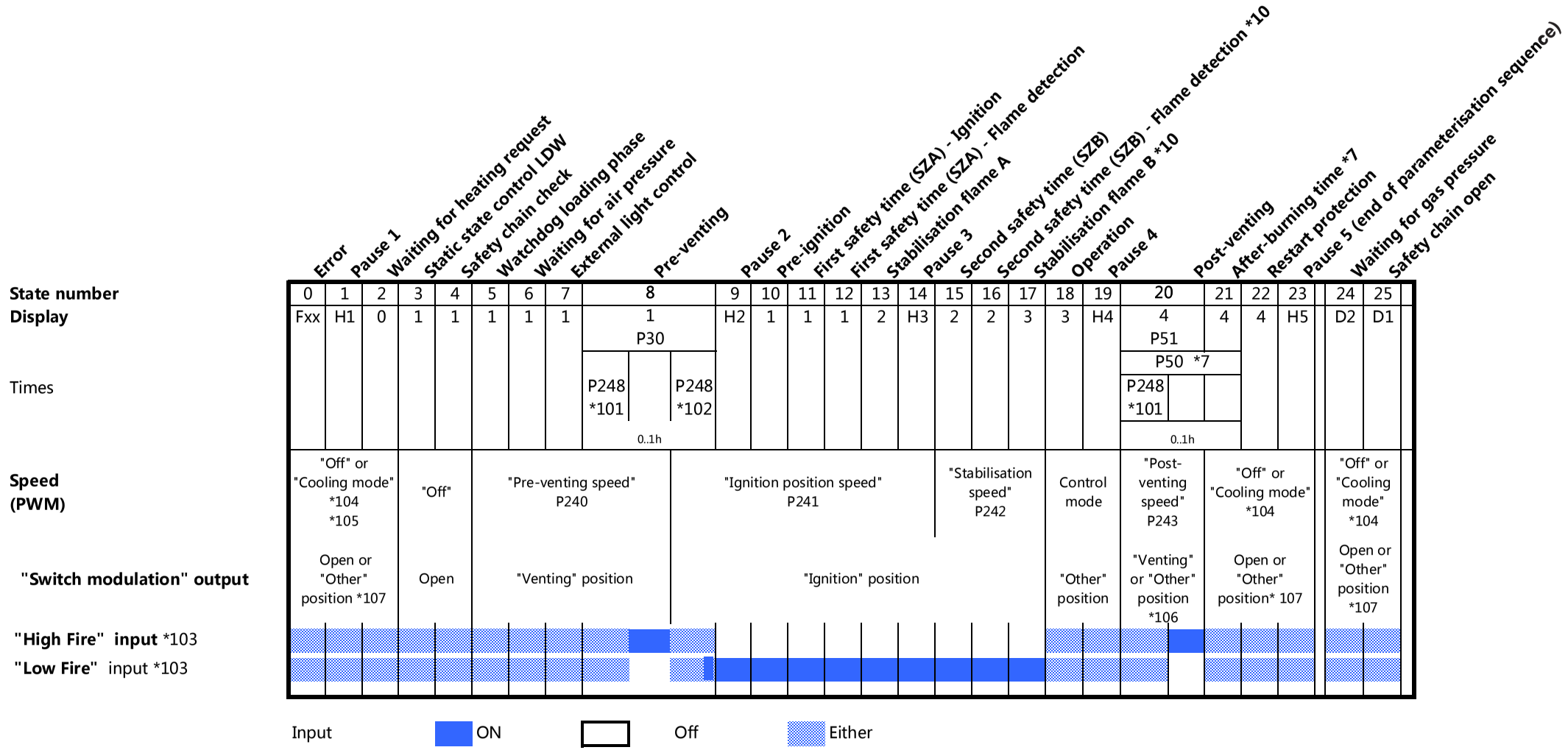
Flow chart "EM 2/6"



*7) The after-burning time starts already in the "Post-venting" state. When the post-venting becomes larger or equal to the after-burning time, the "After-burning time" will be skipped.
*101) Monitoring of the "High Fire" input will not be started until the time defined in P248 has expired..
*102) The ignition speed is already set before the end of the pre-venting time, this time being defined in P248. Starting from this moment, the "High Fire" input will no longer be monitored.
*103) Monitoring of the "High Fire" and "Low Fire" inputs can be activated or deactivated via parameter P249 .
*104) P249, bits 2+3 can be used to define whether the speed is "Offs" or whether the fan is working in cooling mode.
*105) The start value of the speed, following a software restart, is established via P244 if the cooling mode is active.
*106) P249 is used to establish whether the "Venting" position is activated also during post-venting.
*107) P249 is used to establish whether the "Switch modulation" is Open or connected to the "Other" input.

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Technical data

Outputs*				
Designation	**Safety-related**	**Type of output**	**Line length**	**Electrical data**
Fan activation		PWM 4 kHz, without detection of speed feedback	Max. 10 m	24 V DC, safety extra low voltage (3 lines: GND, +24 V DC, PWM control signal
Frequency converter activation		0...10 V 4...20 mA	Max. 10 m	10 V DC, safety extra low voltage
Activation of shutter		Switching contact	Max. 100 m	24 V DC, safety extra low voltage

Inputs*			
Designation	**Type of input**	**Line length**	**Electrical data**
"High Fire" feedback	Switching contact	Max. 100 m	115/230 V AC
"Low Fire" feedback	Switching contact	Max. 100 m	115/230 V AC
Power +	Switching contact	Max. 100 m	115/230 V AC
Power -	Switching contact	Max. 100 m	115/230 V AC

Other functions*			
Designation	**Type of input**	**Line length**	**Electrical data**
Switch for option: 0...10V, 4…20mA or PWM output	Switch		Plastic housing: Can only be switched over with the extension module dismounted. Metal housing: No dismounting required Attention: Switch over only in de-energised state
MODBUS interface	MODBUS based on RS485	Max. 1000 m	RS485 galvanically isolated 4 kV
DIP switch terminating resistors MODBUS	DIP switch		For activation or deactivation of RS485 terminating resistors (MODBUS)
Profibus DP		Max. 1200 m	Galvanically isolated 4 kV

*** The connection cables used must be suitable for an ambient temperature of at least 75 °C (167 °F)**

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Pin assignment

Connector 1 (analogue On/Off 115 VAC / 230 VAC)

1: COM
2: "High Fire" switching position
3: "Low Fire" switching position
4: Automatic switching position

Connector 2 (115 VAC / 230 VAC inputs)

6: N
7: "Low Fire" feedback
8: "High Fire" feedback
9: Power -
10: Power +

Connector 3 (analogue out)

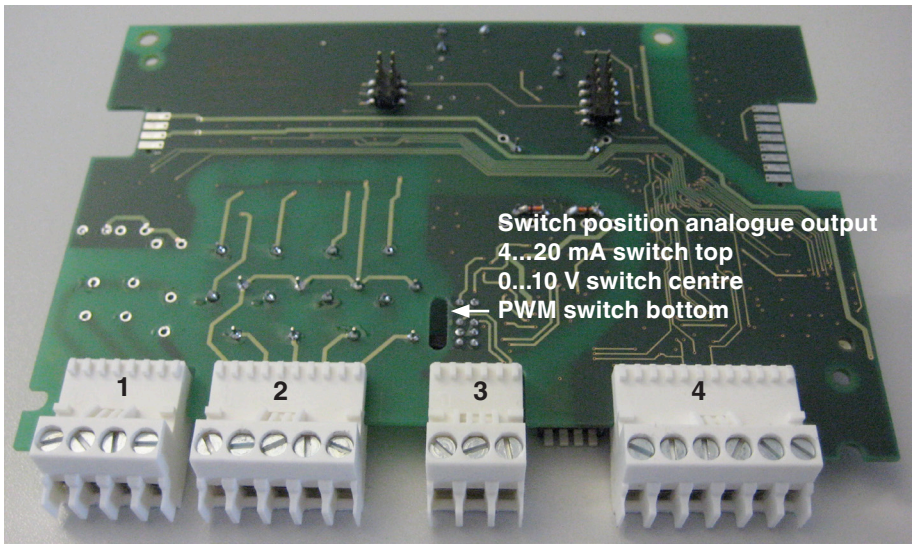
PWM output (connector bottom)
12: DGND
13: PWM
14: VCC out (10.5...24 VDC)

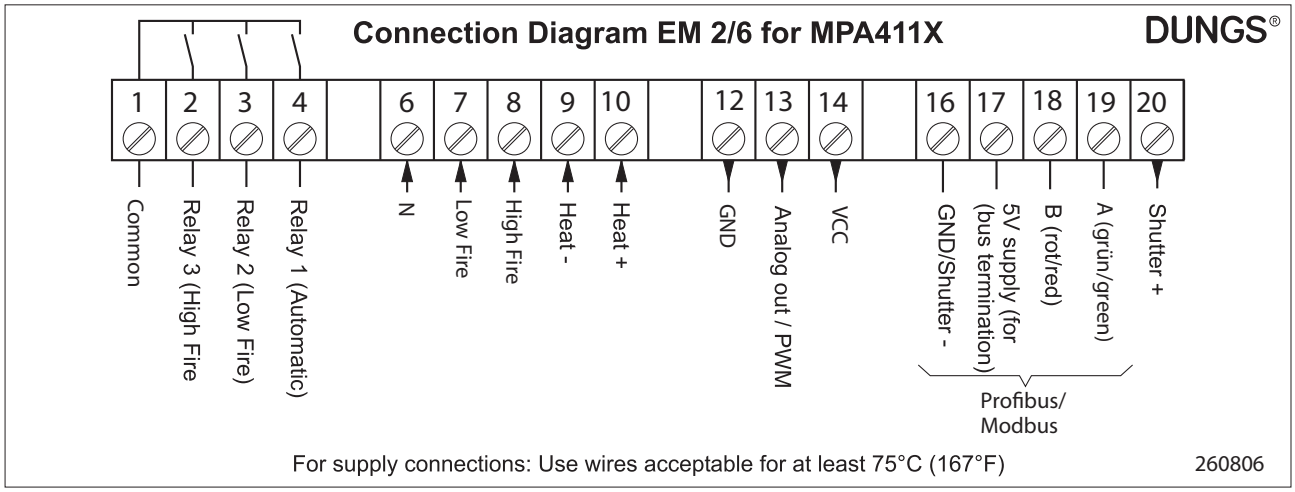
Analogue output 0...10 V (switch centre)
12: DGND
13: Analogue output 0…10 V
14: 10 V out

Analogue output 4...20 mA (switch top)
12: DGND
13: Analogue output 4...20 mA
14: VCC out (10.5...24 VDC)

Connector 4 (bus und shutter):

16: GND / shutter -
17: VCC 5 V (for booster minimisation)
18: B (red)
19: A (green)
20: GND shutter +





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Parameters

All "speed" values or the like refer to the PWM control signal and have no significance for the actual speed of the fan.

The values P240 to P244 can be changed after entry of a password, depending on the access level. Reading access is possible for all parameters, independently of the access level.
Parameters P245 to P249 can be changed without password.

Parameters can be changed via the VisionBox or the display of the MPA 41x2.

Changed parameters are applied to the fan control after no later than 10 s.

Overview of the fan control parameters			
VisionBox No.	**Display No.**	**Name**	**Meaning**
240	P r0	RESERVIERT_OEM_0	Pre-venting
241	P r1	RESERVIERT_OEM_1	Ignition position
242	P r2	RESERVIERT_OEM_2	Stabilisation
243	P r3	RESERVIERT_OEM_3	Post-venting
244	P r4	RESERVIERT_OEM_4	Start value
245	P r5	RESERVIERT_BETREIBER_0	Min. speed
246	P r6	RESERVIERT_BETREIBER_0	Max. speed
247	P r7	RESERVIERT_BETREIBER_2	Increment
248	P r8	RESERVIERT_BETREIBER_3	Transition time (when starting pre- and post-venting and before the end of pre-venting)
249	P r9	RESERVIERT_BETREIBER_4	Bit functions (see description P249)

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Parameter			
Parameter description			
Parameter	**Designation**	**Description**	**Setting / Examples**
P240	**Pre-venting / Activation of the extension module**	The parameter value is used for states 5-8 (start to pre-venting) of the MPA41xx, it being possible for state 8 (pre-venting) to be divided, see P248. Refers directly to the PWM control signal.	Setting from 0.01 % to 100.00 % *1 Resolution: 0.01 % If the parameter has been set to >0, an extension module must have been connected to the main board. This prevents operation without an extension module by generating an error (0x18, see chapter 10 Error overview). Setting 0: If the EM is connected to the MPA, an error will be generated (0x18, Error overview).
P241	**Ignition position**	The parameter value is used for states 8-14 (ignition and flame detection) of the MPA41xx, it being possible for state 8 (pre-venting) to be divided, see P248. Refers directly to the PWM control signal.	Adjustable from 0.00 % to 100.00 % *1 Resolution: 0,01 %
P242	**Stabilisation**	The parameter value is used for states 15-17 (second safety time (SZB) and stabilisation B) of the MPA41xx. Refers directly to the PWM control signal.	Adjustable from 0.00 % to 100.00 % *1 Resolution: 0.01 %
P243	**Post-venting**	The parameter value is used for state 20 (post-venting) of the MPA41xx. Refers directly to the PWM control signal.	Adjustable from 0.00 % to 100.00 % *1 Resolution: 0.01 %
P244	**Start value**	If the MPA is started by Mains On, this value will be used as start value. If the MPA changes to one of states 21 to 25 (after-burn time to safety chain open), and the current speed is 0, it is started again from the start value. If the MPA changes to state 1 or 2 (e.g., due to cancelling the heat request), and the current speed is 0, it is started again from the start value. Refers directly to the PWM control signal.	Adjustable from 0.00 % to 100.00 % *1 Resolution: 0.01 %
P245	**Minimum speed**	Minimum speed, control will not output a smaller value. All parameter values of the fan control must be above or at this limit. Refers directly to the PWM control signal.	Adjustable from 0.00 % to 100.00 % Resolution: 0.01 %
P246	**Maximum speed**	Maximum speed, control will not output a larger value. All parameter values of the fan control must be below or at this limit. Refers directly to the PWM control signal.	Adjustable from 0.00 % to 100.00 % Resolution: 0.01 %

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Parameter			
Parameter description			
Parameter	**Designation**	**Description**	**Setting / Examples**
P247	**Increment of speed change**	Indicates the value by which the desired speed of the fan is incremented or decremented. The calculation is carried out 16 times per second, i.e., the value of the parameter is added to or subtracted from the current value in the 1/16 s cycle. The increment in the tables is used for certain positions of the inputs, see D+ and D-.	Adjustable from 0.01 % to 100.00 % Resolution: 0,01 % Calculation of the time based on the increment Time [in 1/16] = (Max [in %] - Min [in %]) / Increment [in %] Calculation of the increment (contents P247) P247 [in 0.01 %] = ((Max [in %] - Min [in %]) / (Time [in s] * 16)) * 100 Examples: Increment P247=40 (=0.4 % per 1/16 s) requires 12.5 s of min speed = 20 % to max speed 100 %. Longest time from 0 to 100 % at increment P247=1 is 625 s.
P248	**Transition time to ignition speed**	The parameter value is used for state 8 (pre-venting) of the MPA41xx. Indicates at which time the fan is moved to the ignition position. The value corresponds to the time before the end of pre-venting (remaining pre-venting state time). NOTE: Must not be greater than the P30 pre-venting time, otherwise fault configuration with restart will be carried out. State 8 (pre-venting) is divided into 3 parts P248 + x+ P248 = P30 (x must be greater than 1 if monitoring is active). After the first High Fire time (P248): State 20 (post-venting) P248 +x = P51 (x must be greater than 1 if monitoring is active). The control of parameters P248, P30 and P50 takes place during the watchdog loading phase. During changes in operation (parameter not monitored), Low/High Fire monitoring can be disabled if P248 ≤ P50.	Adjustable from 0 to 1h. Resolution: 1/16 s

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P249 bit functions
The parameter includes the PWM/ analogue switchover, the idle state control of both air pressure switches LDW Low / LDW High and a ramp function (desired value delay).

The output of the correct signal depends on the switch position (centre=voltage output signal), (bottom=PWM output signal), which must be identical to the setting of this parameter.

The parameter is divided into 16 bits:
Bit 0
Setting 0: PWM output.
Set slide switch to PWM output (bottom position).

Setting 1: Analogue output.
Set slide switch to voltage (centre position) or current (top position).
All parameter values in % are now converted to the output of the analogue value.

Example:
A post-venting parameter of 6000 gives 6 V at the analogue output, etc.

Bit 1
Setting 0: Voltage output active 0..10 V
Setting 1: Current output active 4..20 mA

Bits 2+3:
Setting 0: During standby and fault PWM = 0
Setting 1: During standby and fault PWM = power +/-
Setting 2: During standby and fault PWM = power +/-
Setting 3: Error configuration

Bit 4
Setting 0: All relay outputs open (WO)
Setting 1: Relay 1 (automatic closed)

Bit 5
Setting 1: High Fire input control during pre-venting time

Bit 6
Setting 1: Low Fire input control during ignition and stabilisation time

Bit 7
High Fire input control during post-venting time

Bit 8
Setting 1: High Fire relay 3 closed

Bit 9
Bit 10
Bit 11
Bit 12
Bit 13
} 5-bit value

The ramp (desired value delay) of the output signal is active during each change in speed. The More Heat / Less Heat inputs have priority if they are active.

Bit 14
Reserved: Setting 0

Bit 15
Reserved: Setting 0

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Calculation as ramp

5-bit value	Duration in s Example: if change is from 0 % to 100 %
0	Jump
1	3,125
2	6,250
3	9,375
4	12,5
5	15,625
6	18,75
7	21,875
8	25
9	28,125
10	31,25
11	34,375
12	37,5
13	40,625
14	43,75
15	46,875
16	50
17	53,125
18	56,25
19	59,375
20	62,5
21	65,625
22	68,75
23	71,875
24	75
25	78,125
26	81,25
27	84,375
28	87,5
29	90,625
30	93,75
31	96,875

Formula for ramp calculation:
Duration = | (old desired value - new desired value) | * 5-bit value * 1 s/16

Example:

Change from 0 to 100 %, 5-bit value 31
100 % / 2 % * 31/16 s = 97 s

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Fieldbus communication
Profibus DP

For Profibus setting, termination, technical data, see page 70 ff. EM 2/4 modul

Profibus input data MPA to master

Input data is information about the state of the MPA. The input data contain a different number of bytes, depending on the data transfer module used. The lower bytes are always the same, i.e. Basic transfer is included in Standard transfer, Standard transfer in Extended transfer.

Basic transfer 2 bytes
EB0 and EB1

Standard transfer 7 bytes
EB0 to EB6

Extended transfer 15 bytes
EB0 to EB14

Special Extended transfer 25 bytes
EB0 to EB24

The bytes EB0 and EB1 contain bit information.
If the bit is set to 1, the condition is included in the description of the bits. Some bits are active during the fault (marked with "X"), others are 0.

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Basic transfer area			
MPA 41xx			
Bit	**Input byte EB0**	**Description**	**During fault**
0	Flame 1	There is a signal for flame 1	0
1	Flame 2	There is a signal for flame 2	X
2	Flame 2 NC / GDW	There is a signal for flame 2 NC or GDW	X
3	Flame detection	The resulting flame signal has been detected	X
4	LDW	Sufficient air pressure available	X
5	Input for temperature controller	Signal of the hardware input "Temperature controller"	X
6	Valve 1	The gas valve V1 is open	X
7	Valve 2	The gas valve V2 is open	X
Bit	**Input byte EB1**	**Description**	**During fault**
0	Spark generator	Ignition active	X
1	Manual mode	Manual mode active	X
2	Fan	Fan relay on	X
3	not used		0
4	Temperature controller (HW+BUS)	Evaluation between temperature controller hardware input and bus specification	X
5	not used		0
6	not used		0
7	Fault	There is a fault in the automatic gas burner control system	X
Standard transfer area			
Bit	**Input byte EB2**	**Description**	**During fault**
0-7	State number or error code	Current state number or error code if there is a fault	X
Bit	**Input byte EB3**	**Description**	**During fault**
0-7	Flame quality	Quality of the flame via ionisation input	0
Bit	**Input byte EB4**	**Description**	**During fault**
0	More Heat	HW input state	X
1	Less Heat	HW input state	X
2	High Fire	HW input state	X
3	Low Fire	HW input state	X
4	Warning message: More and Less Heat simultaneously	The inputs for Heat + and Heat - are simultaneously active	X
5	not used		0
6	not used		0
7	not used		0

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Bit	Input byte EB5	Description	During fault
0	Relay matrix output (2-bit) 00 = Off 01 = Relay 1 10 = Relay 2 11 = Relay 3		X
1			X
2	Warning: Low/High Fire simultaneously on		X
3	not used		0
4	not used		0
5	not used		0
6	not used		0
7	not used		0

Bit	Input byte EB6	Description	During fault
	Degree of modulation in %		

Extended transfer area			
MPA 41xx			
Bit	**Input byte EB7**	**Description**	**During fault**
0-7	Resettable runtime meter	Low byte (byte 0) of the 32-bit runtime meter (Unit: s)	X
Bit	**Input byte EB8**	**Description**	**During fault**
0-7	Resettable runtime meter	Byte 1 of the 32-bit runtime meter (Unit: s)	X
Bit	**Input byte EB9**	**Description**	**During fault**
0-7	Resettable runtime meter	Byte 2 of the 32-bit runtime meter (Unit: s)	X
Bit	**Input byte EB10**	**Description**	**During fault**
0-7	Resettable runtime meter	High byte (byte 3) of the 32-bit runtime meter (Unit: s)	X
Bit	**Input byte EB11**	**Description**	**During fault**
0-7	Resettable start counter	Low byte (byte 0) of the 32-bit start counter	X
Bit	**Input byte EB12**	**Description**	**During fault**
0-7	Resettable start counter	Byte 1 of the 32-bit start counter	X
Bit	**Input byte EB13**	**Description**	**During fault**
0-7	Resettable start counter	Byte 2 of the 32-bit start counter	X
Bit	**Input byte EB14**	**Description**	**During fault**
0-7	Resettable start counter	High byte (byte 3) of the 32-bit start counter	X

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Special Extended transfer area			
MPA 41xx			
Bit	**Input byte EB15**	**Description**	**During fault**
0-7	Switching cycles counter V2	Low byte (byte 0) of the 32-bit switching cycle counter V2	X
Bit	**Input byte EB16**	**Description**	**During fault**
0-7	Switching cycles counter V2	Byte 1 of the 32-bit switching cycles counter V2	X
Bit	**Input byte EB17**	**Description**	**During fault**
0-7	Switching cycles counter V2	Byte 2 of the 32-bit switching cycles counter V2	X
Bit	**Input byte EB18**	**Description**	**During fault**
0-7	Switching cycles counter V2	High byte (byte 3) of the 32-bit switching cycles counter V2	X
Bit	**Input byte EB19**	**Description**	**During fault**
0-7	Runtime meter V2	Low byte (byte 0) of the 32-bit runtime meter V2 (Unit: s)	X
Bit	**Input byte EB20**	**Description**	**During fault**
0-7	Runtime meter V2	Byte 1 of the 32-bit runtime meter V2 (Unit: s)	X
Bit	**Input byte EB21**	**Description**	**During fault**
0-7	Runtime meter V2	Byte 2 of the 32-bit runtime meter V2 (Unit: s)	X
Bit	**Input byte EB22**	**Description**	**During fault**
0-7	Runtime meter V2	High byte (byte 3) of the 32-bit runtime meter V2 (Unit: s)	X
Bit	**Input byte EB23**	**Description**	**During fault**
0-7	Error additional info 1	First additional error info byte	X
Bit	**Input byte EB24**	**Description**	**During fault**
0-7	Error additional info 4	Fourth additional error info byte	X

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Output data of the master to MPA

Byte 0	
Bit	Output byte AB0
0	Heat request
1	High power / level 2
2	Remote unlocking
3	Not used
4	Not used
5	Not used
6	Ignore bit 0 (heat request via bus)
7	Reserve (please set to 0)

Byte 1	
0	Control bit bus inputs Activate More/Less Heat
1	More Heat
2	Less Heat
3	Not used
4	Not used
5	Not used
6	Not used
7	Not used

Byte 2	
0	Not used
1	Not used
2	Not used
3	Not used
4	Not used
5	Not used
6	Not used
7	Not used

Transfer areas:
A: no bytes

B: 1 byte

C: 3 bytes

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Fieldbus
Modbus
For Modbus setting, termination, technical data, see page 70 ff. EM 2/4 modul

Modbus input data
Use the following FunctionCodes to read this information:
03 (0x03) Read Holding Registers
01 (0x01) Read Coils

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Basic transfer area

Bit	Register address 0	Description	During fault
0	Flame 1	There is a signal for flame 1	0
1	Flame 2	There is a signal for flame 2	X
2	Flame 2 NC / GDW	There is a signal for flame 2 NC or GDW	X
3	Flame detection	The resulting flame signal has been detected	X
4	LDW	Sufficient air pressure available	X
5	Input for temperature controller	Signal of the hardware input "Temperature controller"	X
6	Valve 1	The gas valve V1 is open	X
7	Valve 2	The gas valve V2 is open	X
8...15	Not used	Not used	0
Bit	**Register address 1**	**Description**	**During fault**
0	Spark generator	Ignition active	X
1	Manual mode	Manual mode active	X
2	Fan	Fan relay on	X
3	not used		0
4	Temperature controller (hardware + bus)	Evaluation between temperature controller hardware input and bus specification	X
5	not used		0
6	not used		0
7	Fault	There is a fault in the automatic gas burner control system	X
8...15	Not used	Not used	0

Standard transfer area

Bit	Register address 2	Description	During fault
0-7	State number or error code	Current state number OR error code if there is a fault	X
8...15	Not used	Not used	0

Standard transfer area

Bit	Register address 3	Description	During fault
0-7	Flame quality		0
8...15	Not used	Not used	0

Bit	Register address 4	Description	During fault
0	More Heat	HW input state	X
1	Less Heat	HW input state	X
2	High Fire	HW input state	X
3	Low Fire	HW input state	X
4	Warning message: More Heat/ Less Heat simultaneously on		X
5	Not used		0
6	Not used		0
7	Not used		0
8...15	Not used		0

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Bit	Register address 5	Description	During fault
0	0..1 or 8..9 : output state switch modulation (2-bit): 0 = Off, 01 = Relay 1, 10 = Relay 2, 11 = Relay 3		X
1			X
2	Warning message: Low Fire/ High Fire simultaneously on		X
3	Not used		0
4	Not used		0
5	Not used		0
6	Not used		0
7	Not used		0
8...15	Not used		0

Bit	Register address 6	Description	During fault
0-15	Degree of modulation in %		X

Extended transfer area

Bit	Registration address 7	Description	During fault
0-7	Resettable runtime meter	Low byte (byte 0) of the 32-bit runtime meter (in s)	X
8...15	Not used	Not used	0

Bit	Register address 8	Description	During fault
0-7	Resettable runtime meter	Byte 1 of the 32-bit runtime meter (in s)	X
8...15	Not used	Not used	0
Bit	**Register address 9**	**Description**	**During fault**
0-7	Resettable runtime meter	Byte 2 of the 32-bit runtime meter (in s)	X
8...15	Not used	Not used	0
Bit	**Register address 10**	**Description**	**During fault**
0-7	Resettable runtime meter	High byte (byte 3) of the 32-bit runtime meter (in s)	X
8...15	Not used	Not used	0

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Bit	Register address 11	Description	During fault
0-7	Resettable start counter	Low byte (byte 0) of the 32-bit start counter	X
8...15	Not used	Not used	0

Bit	Register address 12	Description	During fault
0-7	Resettable start counter	Byte 1 of the 32-bit start counter	X
8...15	Not used	Not used	0

Bit	Register address 13	Description	During fault
0-7	Resettable start counter	Byte 2 of the 32-bit start counter	X
8...15	Not used	Not used	0

Bit	Register address 14	Description	During fault
0-7	Resettable start counter	High byte (byte 3) of the 32-bit start counter	X
8...15	Not used	Not used	0

Extended transfer area

Bit	Register address 15	Description	During fault
0-7	Switching cycles counter V2	Low byte (byte 0) of the 32-bit switching cycle counter V2	X
8...15	Not used	Not used	0

Bit	Register address 16	Description	During fault
0-7	Switching cycles counter V2	Byte 1 of the 32-bit switching cycles counter V2	X
8...15	Not used	Not used	0

Bit	Register address 17	Description	During fault
0-7	Switching cycles counter V2	Byte 2 of the 32-bit switching cycles counter V2	X
8...15	Not used	Not used	0

Bit	Register address 18	Description	During fault
0-7	Switching cycles counter V2	High byte (byte 3) of the 32-bit switching cycles counter V2	X
8...15	Not used	Not used	0

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Bit	Register address 19	Description	During fault
0-7	Runtime meter V2	Low byte (byte 0) of the 32-bit runtime meter V2 (in s)	X
8...15	Not used	Not used	0

Bit	Register address 20	Description	During fault
0-7	Runtime meter V2	Byte 1 of the 32-bit runtime meter V2 (in s)	X
8...15	Not used	Not used	0

Bit	Register address 21	Description	During fault
0-7	Runtime meter V2	Byte 2 of the 32-bit runtime meter V2 (in s)	X
8...15	Not used	Not used	0

Bit	Register address 22	Description	During fault
0-7	Runtime meter V2	High byte (byte 3) of the 32-bit runtime meter V2 (in s)	X
8...15	Not used	Not used	0

Bit	Register address 23	Description	During fault
0-7	Additional error info 1	First additional error information byte	X
8...15	Not used	Not used	0

Bit	Register address 24	Description	During fault
0-7	Additional error info 4	Fourth additional error info byte	X
8...15	Not used	Not used	0

In the following, the information is linked to allow complete use of the 16-bit register.
Query if the bus load is to be reduced.

Bit	Register address 25	Description	During fault
0	Flame 1	There is a signal for flame 1	0
1	Flame 2	There is a signal for flame 2	X
2	Flame 2 NC / GDW	There is a signal for flame 2 NC or GDW	X
3	Flame detection	The resulting flame signal has been detected	X
4	LDW	Sufficient air pressure available	X
5	Input for temperature controller	Signal of the hardware input "Temperature controller"	X
6	Valve 1	The gas valve V1 is open	X
7	Valve 2	The gas valve V2 is open	X
8	Spark generator	Ignition active	X
9	Manual mode	Manual mode active	X
10	Fan	Fan relay on	X
11	not used		0
12	Temperature controller (hardware + bus)	Evaluation between temperature controller hardware input and bus specification	X
13	not used		0
14	not used		0
15	Fault	There is a fault in the automatic gas burner control system	X

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Bit	Register address 26	Description	During fault
0-7	State number or error code	Current state number OR error code if there is a fault	X
8-15	Flame quality	Quality of the flame via ionisation input	0

Bit	Register address 27	Description	During fault
0	Heat plus	HW input state	X
1	Heat minus	HW input state	X
2	High Fire	HW input state	X
3	Low Fire	HW input state	X
4	Warning message: Power plus and minus simultaneously on		X
5	Not used		X
6	Not used		X
7	Not used		X
8..9	Output state switch modulation (2-bit): 0 = Off, 01 = Relay 1, 10 = Relay 2, 11 = Relay 3		X
10	Warning message: Low and High Fire simultaneously on		X
11	Not used		0
12	Not used		0
13	Not used		0
14	Not used		0
15	Not used		0

Bit	Register address 28	Description	During fault
0-15	Degree of modulation in %		X

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Bit	Register address 29	Description	During fault
0-7	Resettable runtime meter	Low byte (byte 0) of the 32-bit runtime meter (in s)	X
8-15	Resettable runtime meter	Byte 1 of the 32-bit runtime meter (in s)	X

Bit	Register address 30	Description	During fault
0-7	Resettable runtime meter	Byte 2 of the 32-bit runtime meter (in s)	X
8-15	Resettable runtime meter	High byte (byte 3) of the 32-bit runtime meter (in s)	X

Bit	Register address 31	Description	During fault
0-7	Resettable start counter	Low byte (byte 0) of the 32-bit start counter	X
8-15	Resettable start counter	Byte 1 of the 32-bit start counter	X

Bit	Register address 32	Description	During fault
0-7	Resettable start counter	Byte 2 of the 32-bit start counter	X
8-15	Resettable start counter	Byte 3 of the 32-bit start counter	X

Bit	Register address 33	Description	During fault
0-7	Switching cycles counter V2	Low byte (byte 0) of the 32-bit switching cycle counter V2	X
8-15	Switching cycles counter V2	Byte 1 of the 32-bit switching cycles counter V2	X

Bit	Register address 34	Description	During fault
0-7	Switching cycles counter V2	Byte 2 of the 32-bit switching cycles counter V2	X
8-15	Switching cycles counter V2	High byte (byte 3) of the 32-bit switching cycles counter V2	X

Bit	Register address 35	Description	During fault
0-7	Runtime meter V2	Low byte (byte 0) of the 32-bit runtime meter V2 (in s)	X
8-15	Runtime meter V2	Byte 1 of the 32-bit runtime meter V2 (in s)	X

Bit	Register address 36	Description	During fault
0-7	Runtime meter V2	Byte 2 of the 32-bit runtime meter V2 (in s)	X
8-15	Runtime meter V2	High byte (byte 3) of the 32-bit runtime meter V2 (in s)	X

Bit	Register address 37	Description	During fault
0-7	Additional error info 1	First additional error info byte	X
8-15	Additional error info 4	Fourth additional error info byte	X

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Bit	Register address 38	Description	During fault
0-7	Low byte: LSByte of the u24 article number SW P1		X
8-15	High byte: u24 article number SW P1		X

Bit	Register address 39	Description	During fault
0-7	Low byte: MSByte of the u24 article number SW P1		X
8-15	High byte: index article number SW P1		X

Bit	Register address 40	Description	During fault
0-7	Low byte: day production MPA		X
8-15	High byte: month production MPA		X

Bit	Register address 41	Description	During fault
0-7	Low byte: year production MPA		X
8-15	High byte: not used		X

Bit	Register address 42	Description	During fault
0-7	Low byte: LSByte of the u32 device number MPA		X
8-15	High byte: u32 device number MPA		X

Bit	Register address 43	Description	During fault
0-7	Low byte: u32 device number MPA		X
8-15	High byte: MSByte of the u32 device number MPA		X

Bit	Register address 44	Description	During fault
0-7	Low byte: LSByte of the u24 article number HW		X
8-15	High byte: u24 article number HW		X

Bit	Register address 45	Description	During fault
0-7	Low byte: MSByte of the u24 article number HW		X
8-15	High byte: index article number HW		X

Bit	Register address 46	Description	During fault
0-7	Low byte: LSByte of the u24 article number device		X
8-15	High byte: u24 article number device		X

Bit	Register address 47	Description	During fault
0-7	Low byte: MSByte of the u24 article number device		X
8-15	High byte: index article number device		X

Bit	Register address 48	Description	During fault
0-7	Low byte: LSByte of the u24 article number SW EM		X
8-15	High byte: u24 article number SW EM		X

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Bit	Register address 49	Description	During fault
0-7	Low byte: MSByte of the u24 article number SW EM		X
8-15	High byte: index article number SW EM		X

Bit	Register address 50	Description	During fault
0-7	Low byte: day of EM production		X
8-15	High byte: month production EM		X

Bit	Register address 51	Description	During fault
0-7	Low byte: year production EM		X
8-15	High byte: not used not used		X

Bit	Register address 52	Description	During fault
0-7	Low byte: LSByte of the u32 device number EM		X
8-15	High byte: u32 device number EM		X

Bit	Register address 53	Description	During fault
0-7	Low byte: u32 device number EM		X
8-15	High byte: MSByte of the u32 device number EM		0

Bit	Register address 54	Description	During fault
0-7	Low byte: LSByte of the u24 article number HW-EM		X
8-15	High byte: u24 article number HW-EM		X

Bit	Register address 55	Description	During fault
0-7	Low byte: MSByte of the u24 article number HW-EM		X
8-15	High byte: index article number HW-EM		X

Bit	Register address 56	Description	During fault
0-7	Low byte: LSByte of the u24 article number device EM		X
8-15	High byte: u24 article number device EM		X

Bit	Register address 57	Description	During fault
0-7	Low byte: MSByte of the u24 article number device EM		X
8-15	High byte: index article number device EM		X

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Output data
Use the following FunctionCodes to write these specifications.

05 (0x05) Write Single Coil (Coil = bit at bit address x)
06 (0x06) Write Single Register (to register address)
16 (0x10) Write Single Register (from register address)

Bit	Register address 0
0	Heat request
1	High power / level 2
2	Remote unlocking
3	Not used
4	Not used
5	Not used
6	Ignore bit 0 (heat request via bus)
7	Not used
8	Activate Bus Control Heat +/-
9	Heat +
10	Heat -
11	Not used
12	Not used
13	Not used
14	Not used
15	Not used

Bit	Register address 1
0-15	Not used

Digital inputs
Use the following FunctionCodes to read this information.
04 (x04) Read Input Registers
02 (0x02) Read Discrete Inputs
This information is contained in the input data (see above).

Bit	Register address 0
0	HW input state more heat
1	HW input state less heat
2	HW input state High Fire
3	HW input state Low Fire
4	Not used
5	Not used
6	Not used
7	Not used
8	Bits 8..15: not used

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Error display
The error information can be displayed via the MPA display, the DUNGS vision box or via the fieldbus.

Error display on display: see page 44

Error overview		
Error ID	**Internal error**	**Error description**
0x18		Error in external application Causes of the error: • **Additional byte 1: 0xB4 (error in VisionBox)** Switch-off was caused externally, for example by selecting the "switch-off" function in the PC software of the VisionBox • **Additional byte 1: 0x90 (internal MPA error P2)** Additional byte 4: 0xA0 timeout parameterization mode Additional byte 4: 0xA1 invalid bus address Additional byte 4: 0xA2 parameter adjustment error of the service case Additional byte 4: 0xA3 anti-oscillation function shutter error Additional byte 4: 0xA4 extension module test (P240 > 0 and no EM connected) • **Additional byte 1 0xC2 (extension module error)** Additional byte 4: 0xE0 parameter error (parameter outside the limits) Additional byte 4: 0xE1/0xE2 calibration value not set in EEPROM or not OK Additional byte 4: 0xE3 reserved Additional byte 4: 0xE4 High Fire Signal missing during pre-venting Additional byte 4: error 0xE5 configuration: - Parameter P249 one or more bits without function - Pre- or post-venting time too short for P248 Additional byte 4: 0xE6 error configuration: - P248 < 16 (1s) - P30-2*P248 < 16 (1s) - P51-P248 < 16 (1s) Additional byte 4: 0xE7 reserved Additional byte 4: 0xE8 EM2/6 not recognized (P240=0, EM 2/6 connected) Additional byte 4: 0xE9 wrong signal Low Fire during ignition and stabilisation Additional byte 4: 0xEA wrong signal High Fire during post-venting time Additional byte 4: 0xEF additional module not compatible with MPA version
xx		For other errors, see page 56 ff.

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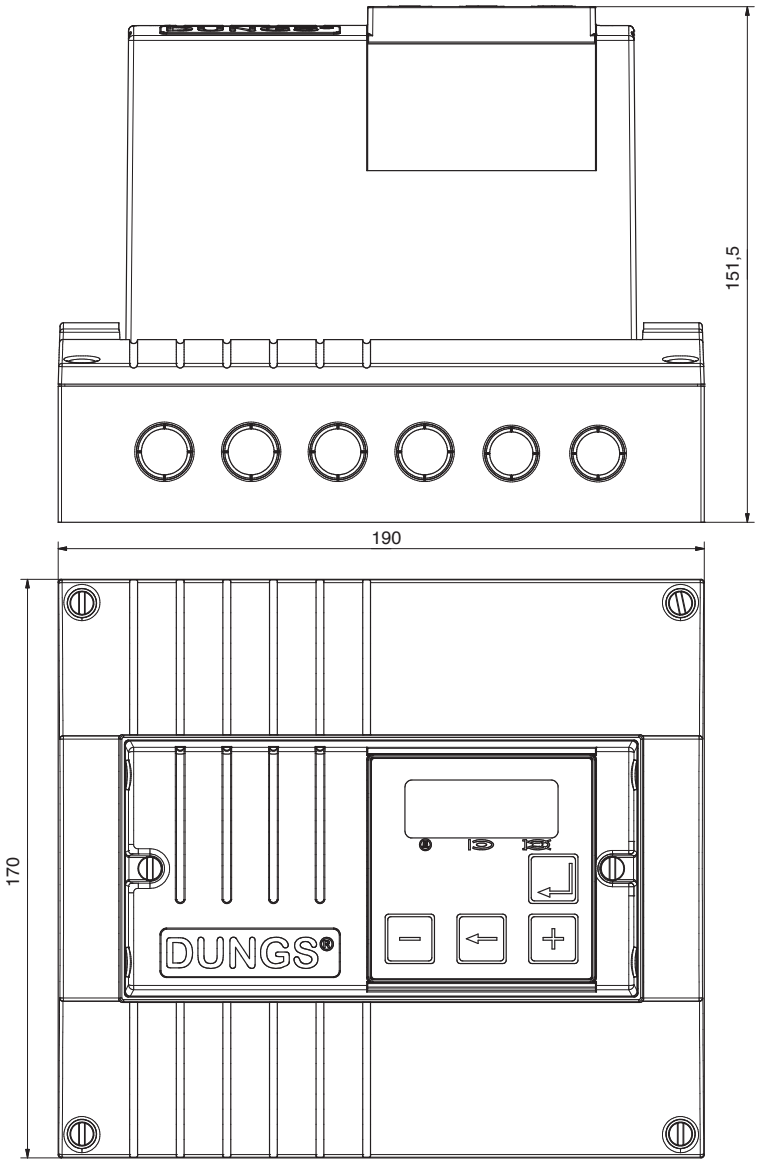
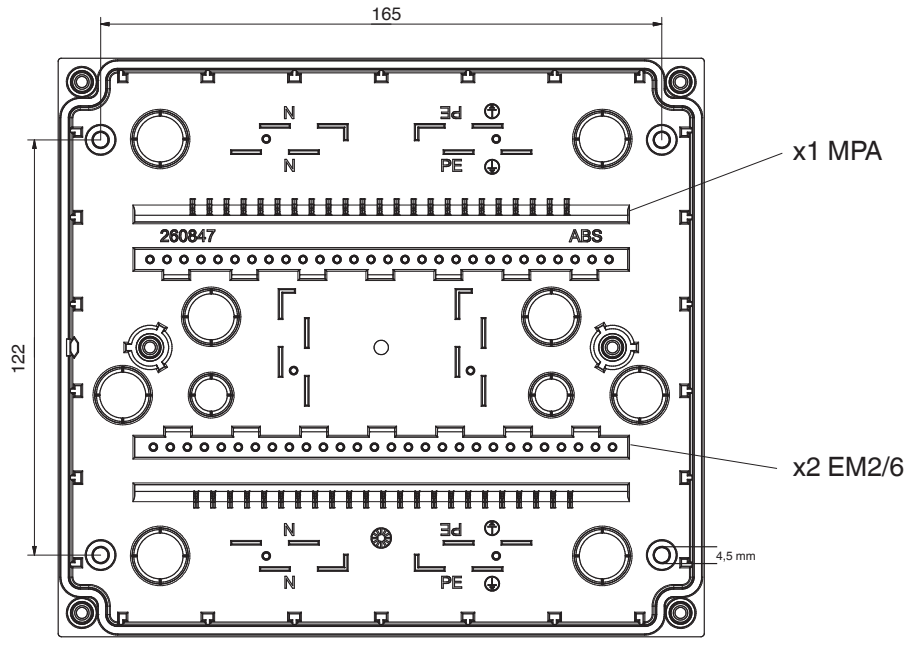
Dimensions of plug-in base





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Flame detector

Requests for operation by separate flame detectors on MPA41xx:

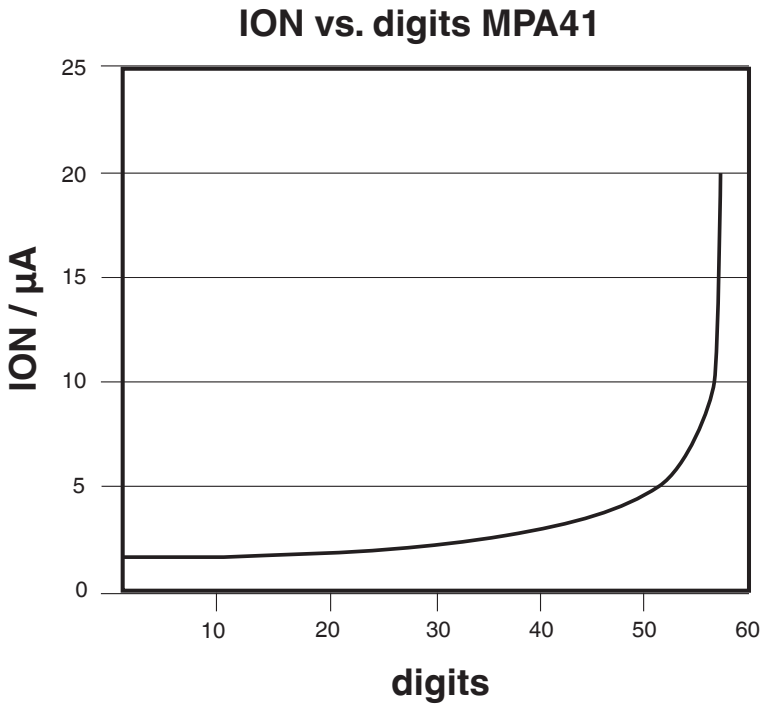
The flame detectors must be tested and approved for monitoring gas burners.

The reaction times must be observed!

Total reaction time = reaction time MPA + reaction time flame detector
A proof about the compliance with the requirements of EN 298 is required.

The reaction time after a flame lift-off of an external flame detector may not be longer than the first or second start-gas flame proving period.
When connected to FLW1, the ionisation behaviour of a flame must be simulated (rectifier effect). The following values are active on the ionisation input and output of the MPA:
230 VAC +10 % -15 %.
The internal resistance of the MPA is approx 1 MΩ. For safety reasons, the flame sensor must work properly also with an internal resistance of 360 kΩ.
Under these conditions, the simulation circuit in the flame detector must reach at least a direct current 3 µA.
If an alternating current with a DC component is simulated, the DC component should reach at least 25%.
The current can be derived to N, PE or returned to N on the MPA.
When connected to FLW2, the switching output of a suitable flame detector must be connected to FLW2 NO (115 VAC or 230 VAC).
For continuous operation, FLW2 NC must also be connected (EXOR signal). The selected flame detector must also be certified for continuous operation. Alternatively, a flame detector for intermittent operation (only FLW2 NO) may be used in combination with a DUNGS shutter in continuous operation.
The EMC regulations must be observed (EN 298). The entire system must not produce inadmissible emissions.
MPA41xx is not galvanically isolated.
MPA 41xx and the flame detector must be connected according to the correct phase.

Attention:
DUNGS cannot be held liable if the flame detector and the automatic burner control do not work orderly together. Especially if the electromagnetic behaviour is not according to the regulations or if the time-dependent behaviour is not correct.



The quality of the flame signal is displayed for flame guard 1 as a number between 0 and 58.
Evaluation of the flame signal is only possible with ionisation flame monitoring, also by monitoring with UV 41 (HE).
When using the UV42, FLW 10 IR or FLW 20 UV, the maximum value is always displayed.

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Flame detectors tested and authorised by DUNGS:

Manufacturer	Designation	Type	Output signal	Safety time Flame detector	Total reaction time after flame lift-off	Intermittent	Continuous operation
–	Ionisation electrode	Ionisation	Ionisation	0 s	P41	Yes	Yes
DUNGS	UV41 (HE)	UV tube	Ionisation	0.125 s (= 2/16 s)	P41 + 0.125 s	Yes	Continuous operation only together with DUNGS shutter function
DUNGS	UV42	UV tube	Switching output 230 VAC	0.125 s (= 2/16 s)	P41 + 0.125 s	Yes	Continuous operation only together with DUNGS shutter function
DUNGS	FLW 20	UV tube	Ionisation	0.5 s	P41 + 0.5 s	Yes	No
DUNGS	FLW 10	Flicker detector with frequency analysis	Ionisation	0.5 s	P41 + 0.5 s	Yes	No
DUNGS	FLW 41I	Ionisation	Switching output 230 VAC	0,19 s (= 3/16 s)	P41 + 0,19 s	Yes	Continuous operation only in connection with DUNGS shutter signal (e.g. EM 2/4)

Flame detectors that are not included in this list must be authorised before use by DUNGS

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UV 41 (HE)

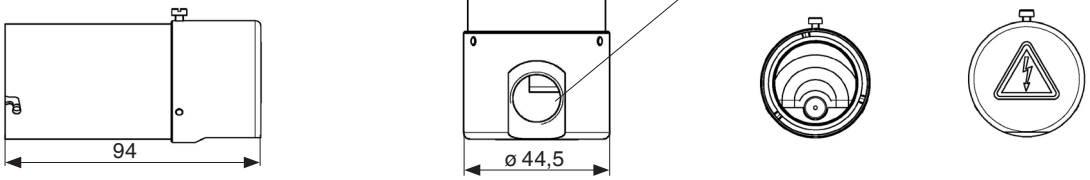
The UV 41 is a flame detector with UV tube in metal design for high mechanical stress.
The flame detector is connected to the ionisation input of the MPA 41xx and is suitable for intermittent operation.
For use in continuous operation applications, the UV 4x shutter is additionally required.
The adapter UV4x-EM1/x must be used for mounting the UV 41.
Other mounting adapters upon request.

Technical Data

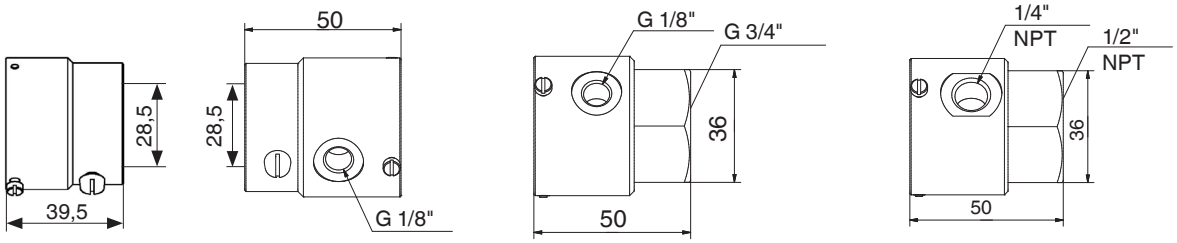
UV 41 General	
Rated voltage	230 VAC -15 %...+10 %
Frequency	50…60 Hz
Power consumption	< 1 W
Type of protection	IP54
Ambient temperature	-40 °C ... +60 °C -40 °C ... +80 °C with reduced lifetime of the UV tube
Storage and transport	-40 °C ... +80 °C maximum storage time without power supply: 3 month
Humidity	DIN 60730-1, no dewing admissible
Lifetime	10,000 operating hours (Ausführung (HE) verminderte Lebensdauer)
Mounting position	as desired
Dimensions in mm	Diameter: 44.5 mm Length: 94 mm Length with UV4x-EM1: approx. 128-143 mm
Max. line length	10 m

Dimensions

UV 41 (HE)



UV 4x EM 1/x adapter



EM 1/3 | EM 1/4 EM 1/6 | EM 1/5 EM 1/7 | EM 1/8 EM 1/9

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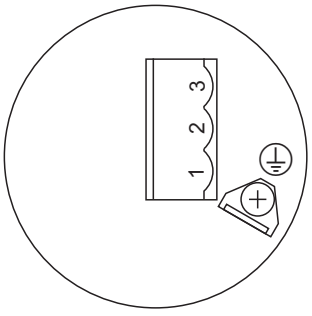
Installation
The UV 41 (HE) must be mounted as closely as possible to the flame to be monitored.
The UV 41 (HE) EM 1/3 adapter fits a 1" inspection tube; when mounting it, make sure that the rubber sealing ring enclosed with the UV 41 (HE) is inserted between the UV 41 (HE) and the mounting adapter.
The UV sensor will also detect external light as a flame, which is why the UV 41 (HE) must be mounted such that, for example, no daylight, ignition sparks or other flames can be detected.
The UV 41 (HE) tube is sensitive to impacts, vibrations, etc., which is why it must be mounted without vibrating it.
After the mounting work is complete, all screws must be checked for tight fit.
If temperatures of more than 60 °C are reached at the UV 41 (HE), an adapter fitted with a quartz cover glass and, if necessary, an additional purging air connection must be used (upon request).

Attention
The maximum allowed line lengths must not be exceeded. Supply and signal lines must be laid separately, as far as possible.

Attention
The flame detector UV 41 (HE) is delivered without cable screw connection.
To guarantee the required traction relief and IP protection class IP 54, a cable screw connection M16x1.5 for cable diameters 5 - 9 mm is required (3 x 0.75 mm^2, which corresponds to an AWG of 20, to 3 x 1.5 mm^2, which corresponds to an AWG of 16).
The protective earth conductor must be connected using an insulated female connector according to DIN 46245.

Electrical connection



Connection	UV 41 (HE)	MPA 41xx
Pin 1	Out	Ionisation (5)
Pin 2	N	N
Pin 3	L	Vers. FLW (7)
PE	⏚	⏚

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UV 42

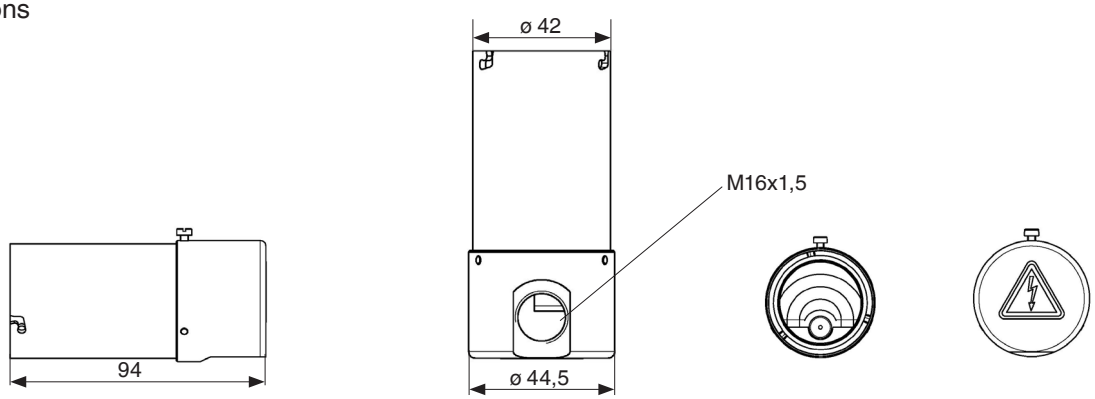
The UV 42 is a flame detector with UV tube in metal design for high mechanical stress.
The flame detector is connected to the ionisation input of the MPA 41xx and is suitable for intermittent operation.
For use in continuous operation applications, the UV 4x shutter is additionally required.
The adapter UV4x-EM1/x must be used for mounting the UV 42.

Technical Data

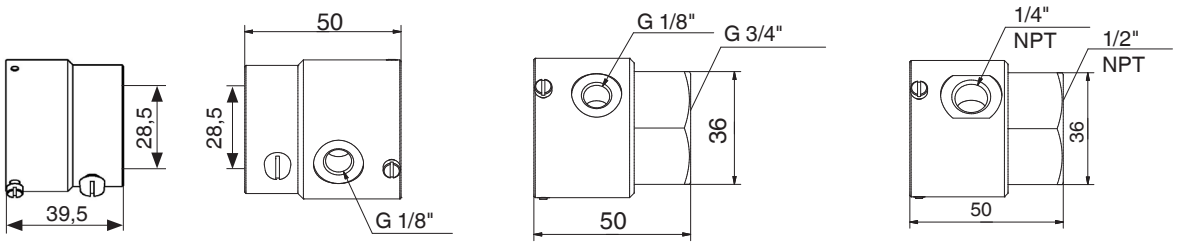
UV 42 General	
Rated voltage	230 VAC -15 %...+10 %
Frequency	50…60 Hz
Power consumption	< 1 W
Type of protection	IP 54
Ambient temperature	-20° C ... +60° C -40° C ... +80° C with reduced lifetime of the UV tube
Storage and transport	-40° C ... +80° C maximum storage time without power supply: 3 month
Humidity	DIN 60730-1, no dewing admissible
Lifetime	10,000 operating hours
Mounting position	as desired
Dimensions in mm	Diameter: 44.5 mm Length: 94 mm Length with UV4x-EM1: approx. 128-143 mm
Max. line length	100 m

Dimensions

UV 42



UV 4x EM 1/3 adapter



EM 1/3 | EM 1/4 EM 1/6 | EM 1/5 EM 1/7 | EM 1/8 EM 1/9

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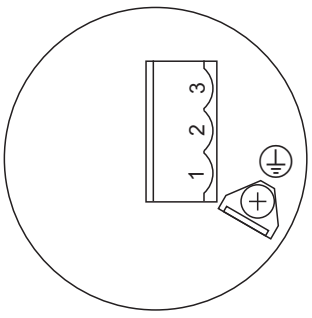
Installation
The UV 42 must be mounted as closely as possible to the flame to be monitored.
The UV 42 EM 1/3 adapter fits a 1" inspection tube; when mounting it, make sure that the rubber sealing ring enclosed with the UV 42 is inserted between the UV 42 and the mounting adapter.
The UV sensor will also detect external light as a flame, which is why the UV 42 must be mounted such that, for example, no daylight, ignition sparks or other flames can be detected.
The UV tube is sensitive to impacts, vibrations, etc., why it must mounted in a vibration free area.
After the mounting work is complete, all screws must be checked for tight fit.
If temperatures of more than 60 °C are reached at the UV 42, an adapter fitted with a quartz cover glass and, if necessary, an additional purging air connection must be used (upon request).

Attention
The maximum allowed line lengths must not be exceeded. Supply and signal lines must be laid separately, as far as possible.

Attention
The flame detector UV 42 is delivered without cable screw connection. To guarantee the required traction relief and IP protection class IP 54, a cable screw connection M16x1.5 for cable diameters 5 - 9 mm is required (3 x 0.75 mm^2, which corresponds to an AWG of 20, to 3 x 1.5 mm^2, which corresponds to an AWG of 16).
The protective earth conductor must be connected using an insulated female connector according to DIN 46245.

Electrical connection



Connection	UV 42	MPA 41xx
Pin 1	Out	FLW2 NO (16)
Pin 2	N	N
Pin 3	L	Vers. FLW (7)
PE	⏚	⏚

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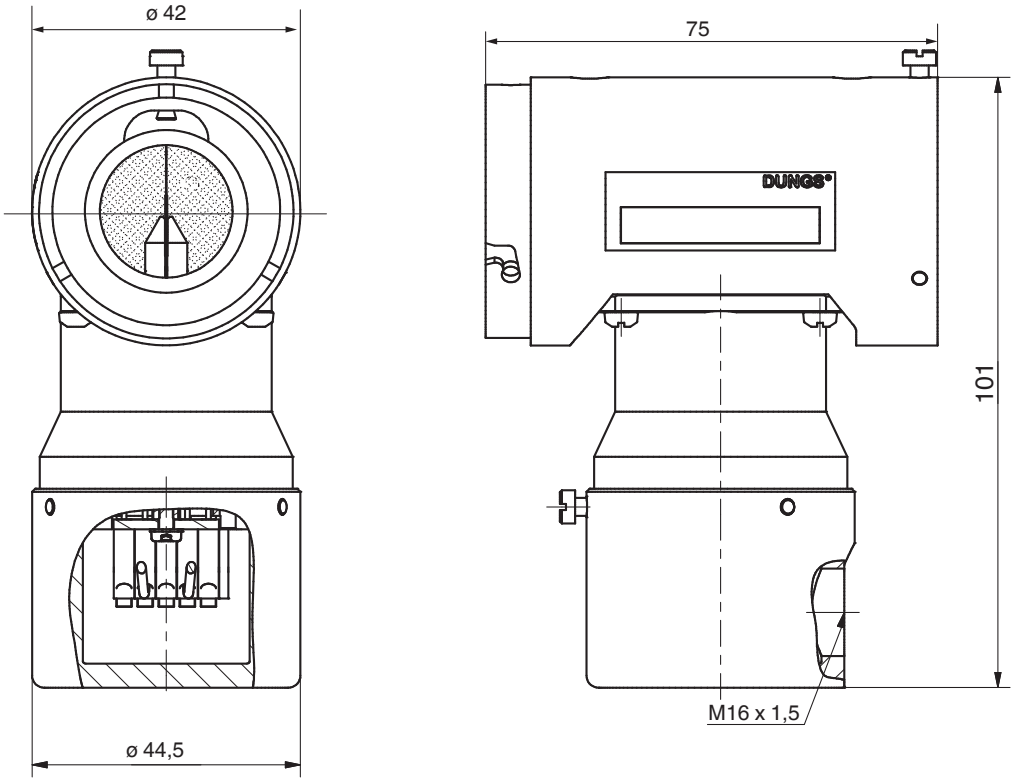
UV 4x EM 1/1 (shutter module)
The UV 4x shutter module allows continuous operation of the UV 41 and UV 42 flame safeguards. The shutter module is inserted between the flame safeguard and the corresponding mounting adapter.
A separate power supply is not necessary, as only the shutter signal provided by the MPA 41xx via an extension module (e.g. EM 2/4) must be connected.

Technical data

UV 4x EM 1/1 general (Shuttermodul)	
Schutzkleinspannung	24 VDC
Type of protection	IP 54
Ambient temperature	-20° C ... +60° C -40° C ... +80° C (with reduced lifetime)
Storage and transport	-40° C ... +80° C
Humidity	DIN 60730-1, no dewing admissible
Lifetime	1 million switchings (at 10 min/switching, 20 a)
Mounting position	as desired
Dimensions in mm	Diameter: 44,5 mm Length: 75 mm Height: ca. 101 mm
Max. line length	100 m

Dimensions
UV 4x EM 1/1



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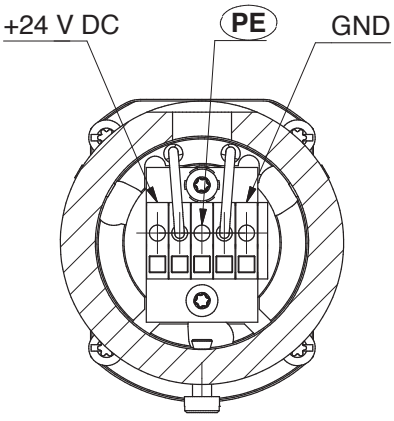
Attention
The maximum allowed line lengths must not be exceeded. Supply and signal lines must be laid separately, as far as possible.

Attention
The flame safeguard UV 41 is delivered without cable screw connection.
To guarantee the required traction relief and IP protection class IP 54, a cable screw connection M16x1.5 for cable diameters 5 - 9 mm is required (3 x 0.75 mm^2, which corresponds to an AWG of 20, to 3 x 1.5 mm^2, which corresponds to an AWG of 1)**.**

Attention
Also if the shutter is closed a rent of light can full on the UV-cell.
Through this safety shut down's can occur even if the UV-cell works correctly.
In such case the mounting position of the UV-cell has to be changend or a mounting adaptor with a reduced diameters has to take place.
Alternatively the diameter can be reduced by additional nipple.

The shutter module is mounted between the UV 41 (HE) or UV 42 flame safeguard and the mounting adapter UV 4x EM 1/x.

Electrical connection



Connection	UV 4x EM 1/1	MPA 41xx EM 2/x
Pin 1	+24 VDC	+24 VDC
Pin 2	⏚	
Pin 3	GND	GND

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FLW 20UV

The FLW 20UV is a flame detector with UV tube in plastic design.
The use of a UV tube guarantees that background radiation, for example from red-hot walls or parts of the mixing device, will not be detected.
The flame signal intensity can be seen directly on the optical LED display of the flame detector.
The FLW 20UV is connected to the ionisation input of the MPA 41xx and is suitable exclusively for intermittent operation.
The FLW flanges are suitable for mounting.

Technical Data	
Rated voltage	230 VAC -15 %...+10 %
Frequency	50…60 Hz
Power consumption	5.5 mA
Output data	Reaction time with flame on typ.: 0.5 sec. Reaction time with flameout < 0.5 sec.
Switching output	max. switching current 15 mA, max. switching power 0.3 W max. switching voltage 280 V AC / 400 V DC
Optic evaluation	Spectral region 185 – 260 nm
Alignment to the flame	Radial, left
Type of protection	IP41
Ambient temperature	-20 °C … 50 °C -20 °C…60 °C with reduced lifetime
Transport and storage	-20 °C … 60 °C
Humidity	max. 95 % of r.h., no dewing admissible
Lifetime	10,000 operating hours
Mounting position	as desired
Max. line length	10 m

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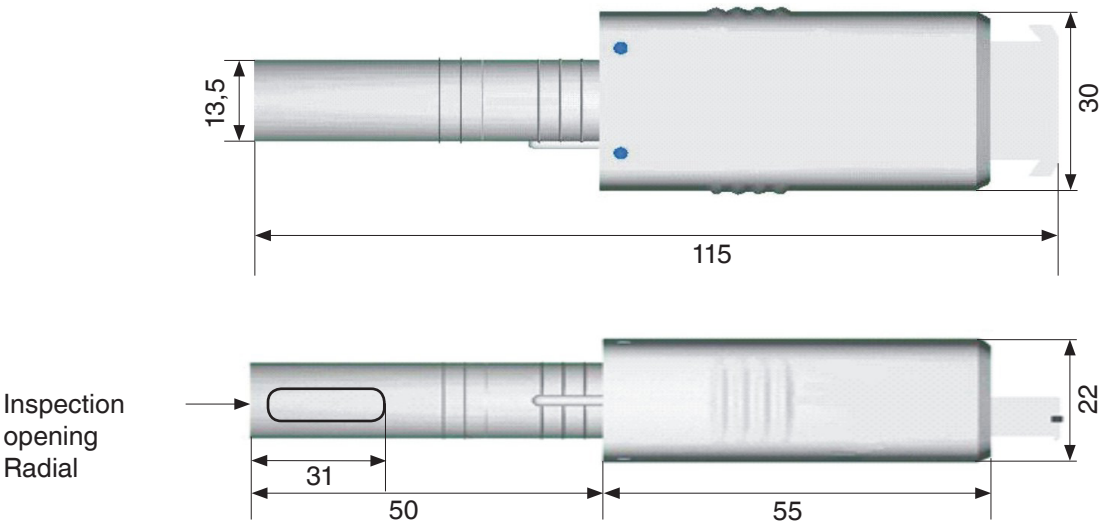
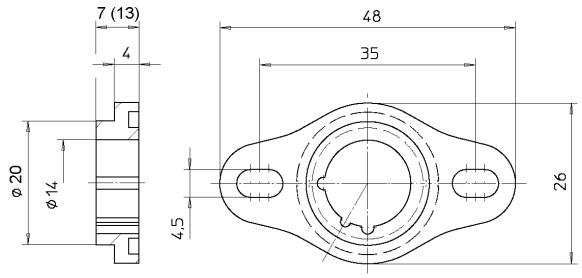
Dimensions [mm]
FLW 20 UV



FLW flange



Installation

The FLW 20UV must be mounted as closely as possible to the flame to be monitored.
It is mounted by means of a FLW flange (height 7 or 13 mm) or of a holder with a 14 mm mounting bore. The flame detector must be firmly inserted into the holder. No external light must be incident on the sensor, and direct view of the ignition spark must be avoided as well.

Attention: The maximum allowed line lengths must not be exceeded. Supply and signal lines must be laid separately, as far as possible.

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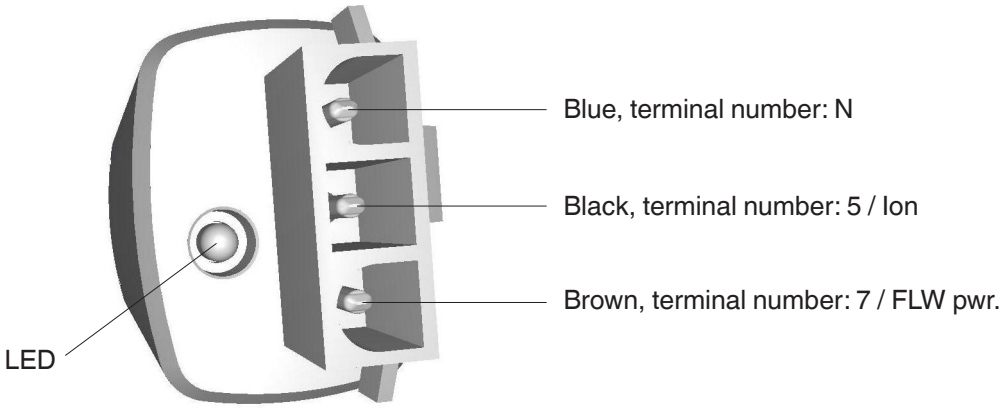
Electrical connection



Operation display LED

The flame signal intensity of the flame detector FLW 20 UV is shown on the built-in LED.

LED off
FLW is dead or no flame is detected.

LED flashing
Flame is detected, the flashing pulses of the LED signalling the flame signal intensity –
Increasing flashing pulses = higher intensity

LED permanently on
Flame is detected at the highest flame intensity

Commissioning and maintenance

Since the UV tube is subject to ageing, a safety check of the flame detector must be carried out during each commissioning and each maintenance.
The following functions must be checked:

Start-up without flame signalling
Darken the flame detector during start-up, the automatic burner control system must either output a fault at the end of the safety time or perform a restart.

Start-up with flame signalling
During the startup attempt of the automatic burner control system, the flame detector is exposed to an external UV radiation, for example from a lighter or a gas flame (available room light is not sufficient). The automatic burner control system reports external light.

Burner operation
Cover the flame detector while the burner is running – depending on the parameter setting of the automatic burner control system, a lock-out or safety shutdown, followed by a restart attempt, will take place.

In case of malfunctions, the flame detector must be replaced.
After a runtime of 10,000 h, the flame detector should be replaced as a preventive measure.
A replacement of the UV tube is not possible.

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FLW 10IR

The FLW 10IR is a flame detector equipped with an IR sensor for monitoring burners with blue-burning flames.
The flame detector detects the flicker frequency of the flame. Light rays that emit a uniform frequency are filtered out. External light like that caused by glowing components or fluorescent tubes is not detected as flame.
The flame signal intensity can be seen directly on the optical LED display of the flame detector.
The FLW 10IR is connected to the ionisation input of the MPA 41xx and is suitable exclusively for intermittent operation.
The FLW flanges are suitable for mounting.

Technical Data	
Rated voltage	230 VAC -15 %...+10 %
Frequency	50…60 Hz
Power consumption	3...4 mA
Output data	Reaction time with flame on typ.: 0.5 sec. Reaction time with flameout < 0.5 sec.
Switching output	max. switching current 15 mA, max. switching power 0.3 W max. switching voltage 280 V AC / 400 V DC
Optic evaluation	Spectral region 380-1150 nm, maximum sensitivity at 920 nm
Alignment to the flame	Radial
Type of protection	IP41
Ambient temperature	-20 °C … 60 °C
Transport and storage	-20 °C … 60 °C
Humidity	max. 95 % of r.h., no dewing admissible
Mounting position	as desired
Max. line length	10 m

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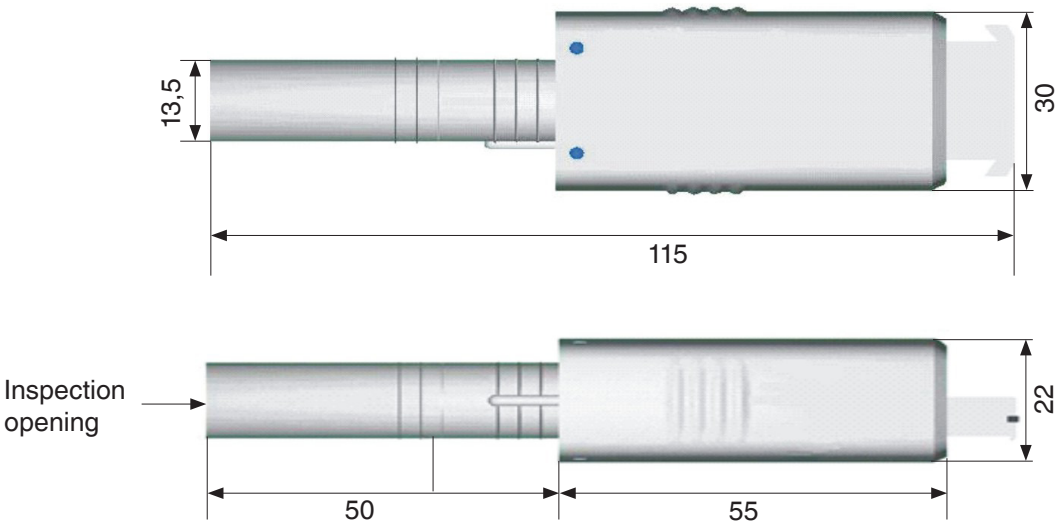
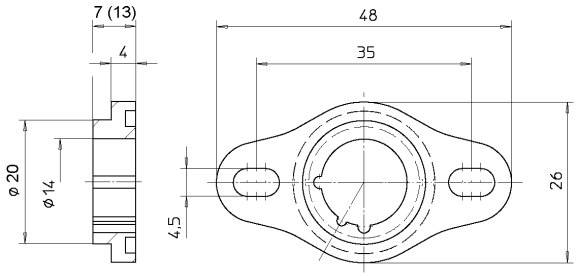
Dimensions [mm]
FLW 10IR



FLW flange



Installation

The FLW 10IR must be mounted as closely as possible to the flame to be monitored.
It is mounted by means of an FLW flange (height 7 or 13 mm) or of a holder with a 14 mm mounting bore. The flame detector must be firmly inserted into the holder. No external light must be incident on the sensor, and direct view of the ignition spark must be avoided as well.

Attention: The maximum allowed line lengths must not be exceeded. Supply and signal lines must be laid separately, as far as possible.

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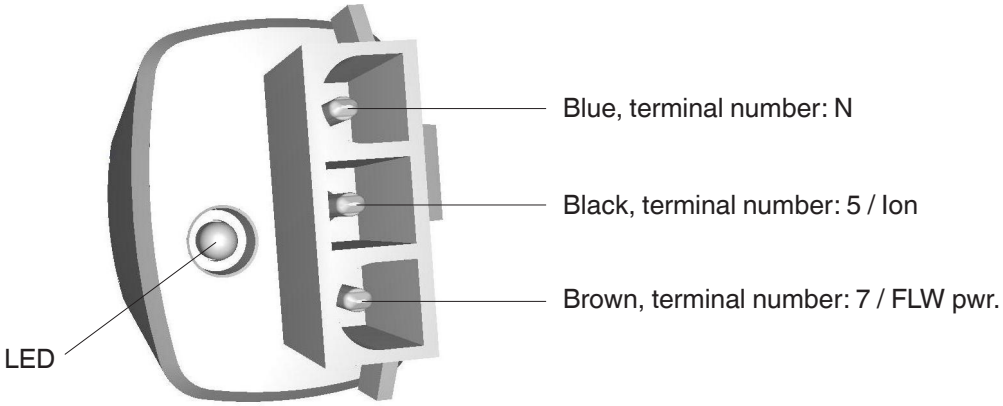
Electrical connection



Operation display LED

The flame signal intensity of the flame detector FLW 10 IR is shown on the built-in LED.

LED off
FLW is dead or no flame is detected.

LED flashing
Flame is detected, the flashing pulses of the LED signalling the flame signal intensity –
Increasing flashing pulses = higher intensity

LED permanently on
Flame is detected at the highest flame intensity

Commissioning and maintenance

The FLW 10IR is maintenance-free.

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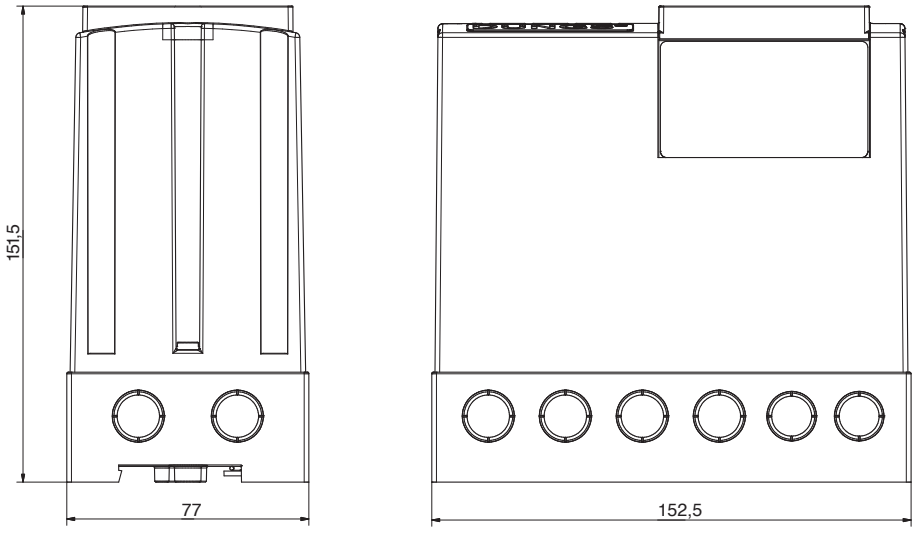
FLW 41I

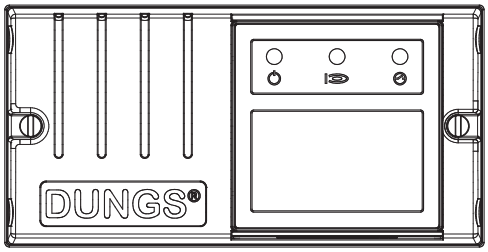
The flame safeguard module FLW 41I is connected to the second flame guard input of the MPA 41xx.
Flame monitoring is done by means of an ionisation electrode.
This allows burners to be monitored via two measuring points.
Suitable for intermittent operation, in connection with an electronic shutter signal (e.g. EM 2/3 or EM 2/4) also suitable for continuous operation.

Technical data

FLW 41I General	
Rated voltage	230 VAC -15 %...+10 %
Frequency	50…60 Hz
Power consumption	< 3 W
Type of protection	IP 54
Ambient temperature	-40° C ... +70° C
Storage and transport	-40° C ... +80° C
Humidity	DIN 60730-1, not dewing admissible
Mounting position	as desired
Dimensions in mm (LxHxT)	approx. 152,5x151,5x77 mm
Weigth	0,6 kg
Max. line length to MPA	100 m
Max. ionization line length	10 m

Dimensions
FLW 41I





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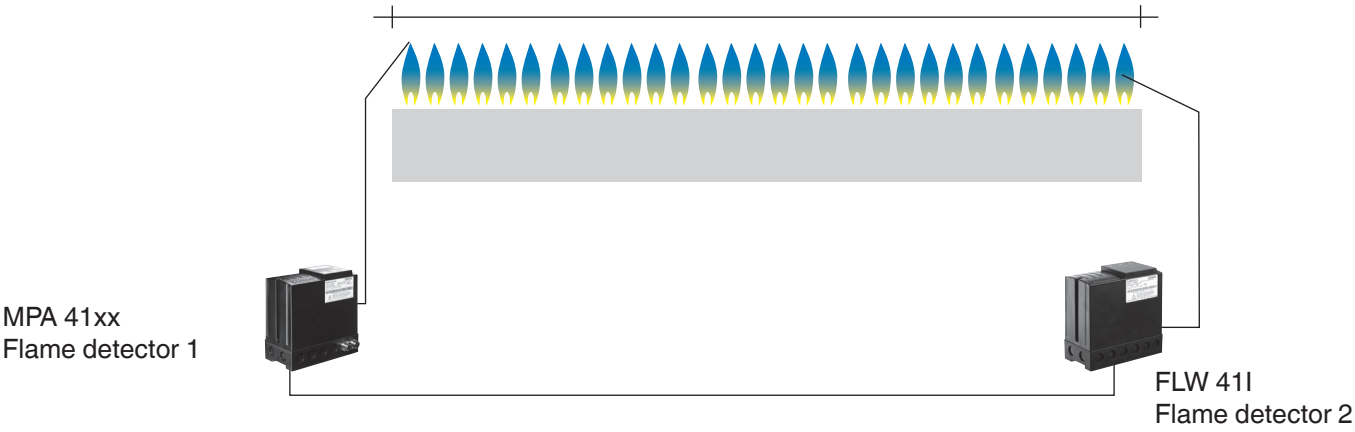
Assembly
The FLW 41 can be mounted either on a hat rail or by means of a direct screw connection (all dimensions as for MPA411)

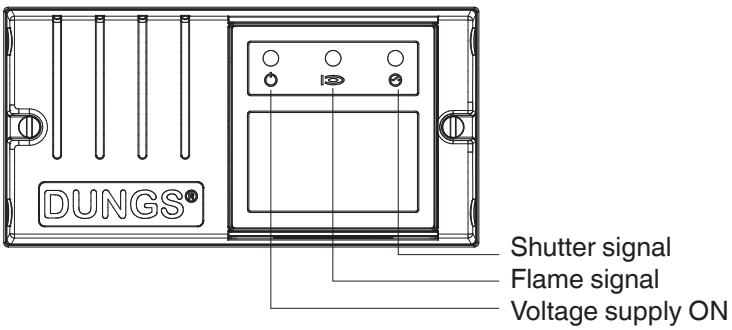
Attention
The maximum allowed line lengths must not be exceeded.
Supply and signal lines must be laid separately.

Function
The FLW 41 I allows a flame to be monitored at two measuring points or two flames to be monitored independently of one another.
If the shutter signal of the MPA 41xx is connected, the FLW 41 I is suitable for continuous operation.

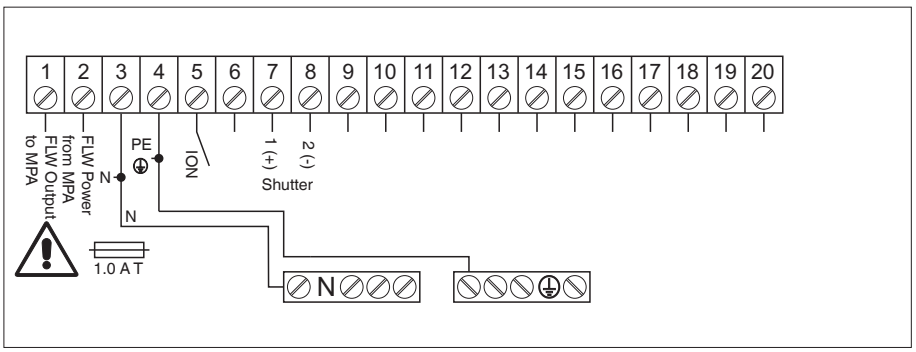
Example



Display:



Electrical connection



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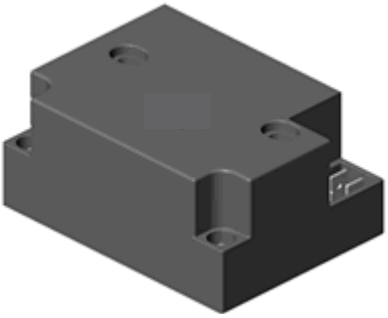
DEZ ignition transformers

Technology



The DUNGS DEZ are electronic high-performance ignition transformers with high-frequency oscillation technology.
Compared with conventional inductive ignition transformers, the DEZ are much smaller and lighter.
Designs for one or two ignition electrodes are available in different voltage versions.

Application

For oil and gas burners, ignition takes place, depending on design, with one ignition electrode against the burner mass or with two ignition electrodes between the electrodes.

Approval

73/23/EEC Low-Voltage Directive
89/336/EEC EMC Directive

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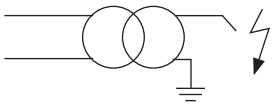
Parameter overview

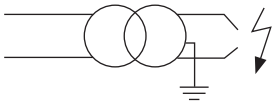
DEZ function

The DEZ ignition transformers are available in two versions.
Either with a high-voltage output (DEZ 1xx) for ignition against the burner mass or with two high-voltage outputs (DEZ 2xx) for ignition between the electrodes.
Both versions are available with different performance data.
For use in burner systems in which ignition and ionisation flame monitoring takes place via a common electrode, the "SEO" versions must be used.

DEZ 1xx



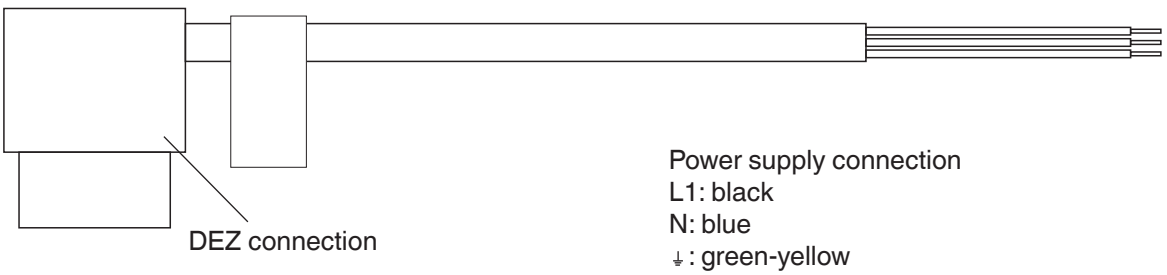
DEZ 2xx



DEZ Versions	DEZ 100	DEZ 101	DEZ 100 SEO	DEZ 101 SEO	DEZ 200
High-voltage outputs	1	1	1	1	2
Mains voltage [VAC]	230/240	120	230	120	230/240
Frequency [Hz]	50/60	50/60	50/60	50/60	50/60
Current consumption [A]	0.3	0.5	0.3	0.5	0.14
Power consumption [VA]	69	55	69	60	32
Secondary voltage [kV] +/- 10 %	1 x 15	1 x 15	1 x 15	1 x 15	2 x 10
Secondary frequency [kHz]	10	13	10	16	10
Short-circuit current [mA]	30	30	30	30	20
Duty cycle 3 min.	33 %	33 %	33 %	33 %	100 %
Type of protection	IP 54	IP 54	IP 54	IP 54	IP 54
Ambient temperature ta [°C]	-20…60 °C	-20…60 °C	-20…60 °C	-20…60 °C	-20…60 °C
Weight [kg]	0.32	0.32	0.32	0.32	0.32
Part-No.	252 113	255 018	257 126	257 127	252 114

Electrical connection

Connection to the mains is made through pre-fabricated connection lines DEZ 1xx/2xx, which are available in different lengths.



The ignition electrodes are connected via pre-fabricated carbon fibre ignition lines. The high line resistance of the ignition line of 10 kOhm/m effectively suppresses EMC faults.

The ignition lines are fitted with an insulated 6.5 mm angle plug on the electrode side.

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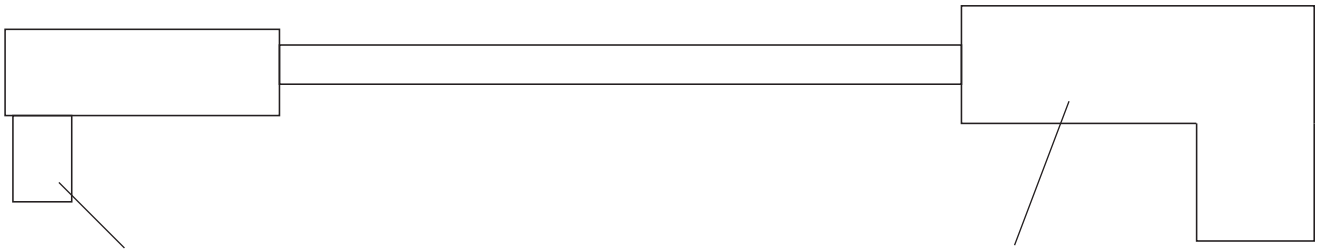
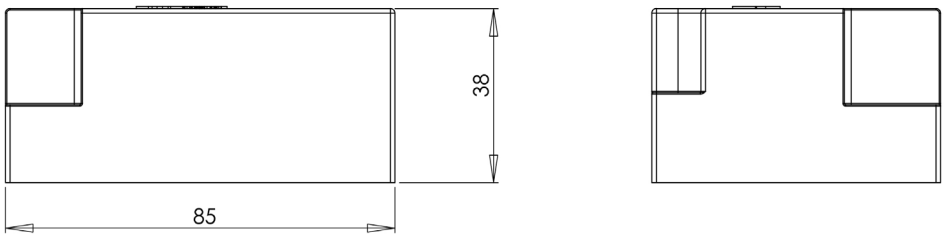
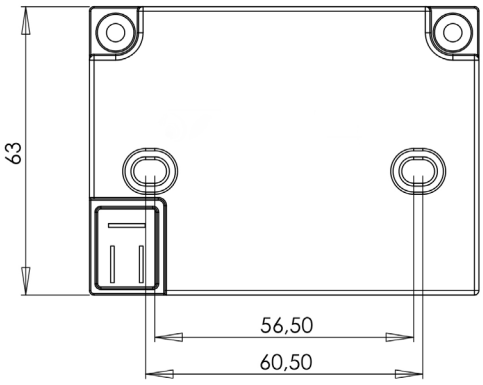


Dimensions





Attention
The operation of the DEZ ignition transformers produces very high voltages. The ignition transformers may only be put into operation if the ignition electrodes were built into the burner / burner chamber touch-proof and all live connections by means of the lines provided for this purpose were made touch-proof.

The length of the ignition line(s) must not exceed 1 m.

Connecting the protective earth is mandatory.

Connecting the protective earth is mandatory.
In the "SEO" version for single-electrode operation, the protective earth is connected to terminal 5 of the MPA 41xx.

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VisionBox
The VisionBox is used for access to the MPA via a PC.
See VisionBox documentation

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Overview of revisions

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