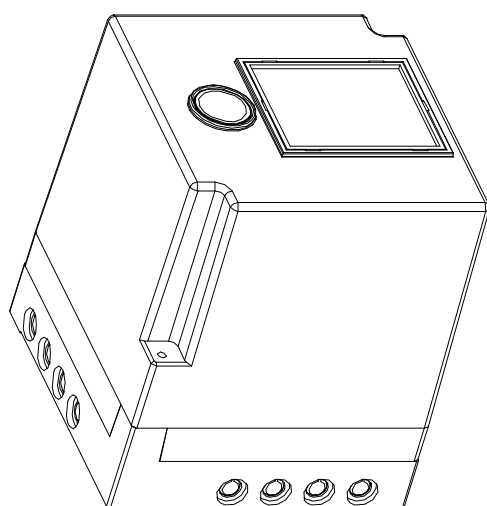


EUROGAS SERIES

TYPE MPI

(Mixed for Medium to High Capacity)

AUTOMATIC CONTROL SYSTEM FOR FORCED DRAUGHT BURNERS FOR MIXED OIL AND GAS FUELS



DESCRIPTION

The designation MPI refers to a series of microcontroller-based devices also suitable to control forced draught burners for mixed oil and gas fuels for non-permanent operation. The MPI is a new product, as each unit, in addition to carrying out all typical burner functions, also incorporates a valve tightness checking programme which can be activated by a simple operation upon request. Wiring one control unit only instead of two is certainly a technical and economical advantage.

These controls perform non-volatile lockout, i.e. the restart of the system from the safety shutdown condition is only possible by means of the control manual reset.

Another peculiar feature is the possibility to control different types of air damper; in fact, thanks to the versatility of the control unit, the operating cycle requested by the standard in force is always respected.

This range of controls is suitable to equip multistage or modulating burners for domestic and industrial heating.

PATENT/CERTIFICATION

- EC-Type certification (PIN **0694BQ0913**) in accordance with Gas Appliance Directive 90/396;
- in accordance with the followings standards:
 - **EN 298:03** (European standard for automatic gas burner ignition and flame monitoring systems),
 - **EN 676:03** (European standard for automatic forced draught gas burners),
 - **EN 1643:00** (European standard for valve proving systems),
 - **EN 267:99** (Forced draught oil burners);
 - **EN 746-1:97** (Industrial thermoprocessing equipment);
 - **EN 746-2:97** (Industrial thermoprocessing equipment);
 - **EN 230:05** (European standard for automatic oil burner flame monitoring systems).

GENERAL FEATURES

The main features of this range are the following:

- flame monitoring through the rectification property of the flame (ionization) or through UV phototubes type UV1 (for technical characteristics see relevant data sheets);
- two independent safety contacts for gas valve control;
- electrical service life at max. declared load >250.000 operations;
- inbuilt and/or remote manual reset with LCD indication of the causes leading to safety shutdown;
- possibility to manage the valve tightness check during the pre-purge or post-purge phase;
- easy installation and wiring;
- possibility to have multiple ignition attempts depending on the final application;
- operating cycles compatible with controller type LFL1 (Siemens);
- when replacing the control, the socket should also be changed.

TECHNICAL DATA

Power supply:	230V (+10%/-15%) - 50/60Hz
upon request:	110/120V (+10%/-15%) - 50/60Hz
Operating temperature range:	-20°C + 60°C
Ambient humidity:	95% max
Protection degree:	IP40
Classification codes:	
according to EN 298:03	FBLLXN
according to prEN 230:03	FTLLXN "WLE"
With option "V" according to EN 230:03	FTCLXN "WLE"
With option "V" according to EN 298:03	FBCLXN

Times:

– delay for M2 starting (t7):	0...60 s
– delay for air damper max. opening (t16)	0...60 s
– pre-purge time (t1):	0...120 s
– delay for APS check (t10):	10...120 s
– safety time (t2):	0...3 s
– safety time (t2'):	0...5 s
– pre-ignition time (t3):	0...30 s
– pre-ignition time (t3'):	0...12 s
– second safety time (t9):	0...10 s
– delay for second valve activation (t4):	0...120 s
– delay for second valve activation (t4'):	0...120 s
– delay for LR modulation (t5):	0...120 s
– post-purge time (with M2) (t6):	0...1800 s
– emptying time (tsv)	≤ 3 s
– checking time (test1)	22 s
– filling time (trp)	≤ 3 s
– checking time (test2)	27 s
– inter-purge time	0...300 s
– multiple ignition attempts	1...4
– drop-out time on running flame failure:	< 1 s

Power consumption, at start-up

7,5 VA

Power consumption, running:

9 VA

Contact rating:

lmax

Power supply:

max 5A cosφ > 0,4

Motor 1:

3A cosφ > 0,4

Motor 2:

3A cosφ > 0,4

EVP:

0,5A cosφ > 0,4

First valve:

0,5A cosφ > 0,4

Second valve:

0,5A cosφ > 0,4

Alarm:

max 4A cosφ = 1

Ignition transformer:

3A cosφ > 0,4

Internal fuse rating:

6,3A delayed

External fuse rating:

≤ 6,3A fast blow

REMARK: During the whole operation the total load rating shall never exceed the power supply.

– min. valve operation voltage: 130 ÷ 175 Vac

Flame monitoring:

The flame detection device can either exploit the rectification property of the flame (ionization) or be fitted with a UV1 phototube (see relevant data sheets for details); both devices are not safe to touch (no provision with any protection impedance).

Ionization by electrode

- Max. ionization current: 8,5μA*
- Min. ionization current: 0,5 μA*
- upon request: 1,2 μA
- Recommended ionization current:
≥ 3 times the min. ionization current
- Min. insulation resistance of detection
electrode and cable to earth: ≥ 50 MΩ
- Max. stray capacitance of detection electrode: ≤ 1nF
- Max. short-circuit current: < 200 μA AC

* Measure obtained by a DC microammeter with internal resistance ≤ 5 kΩ.

Ionization by UV phototube:

BRAHMA sensor type UV1 or UV2 (see relevant data sheets).

- Min. ionization current: 0,5 μA*
- upon request: 1,2 μA*
- UV test current during t1 (max): 14 μA
- Current in running condition (max): 11 μA
- Voltage on UV1 during testing: 330Vac (+10%/-15%)
- Voltage on UV1 during operation: 230Vac (+10%/-15%)
- Max. distance from UV source: 1 m
- Temperature range of UV sensor: -20 ÷ +60°C

* Measure obtained by a DC microammeter with internal resistance ≤ 5 kΩ.

Remote emergency shutdown

In case the remote reset push-button is wired between pins 12 and 1, on pressing the push-button the control unit performs an emergency shutdown and goes to lockout.

Weight including socket: 950g

CONSTRUCTION

The use of a particular construction technique and the adoption of SMT technology have enabled to obtain an extremely flexible device which can control an air damper.

The enclosure made of plastic material protects the control from any damage resulting from crashes, incautious handling dust and dirt from the conditions of installation.

A varistor protects the control from voltage transients in the mains supply. An inbuilt fuse protects the internal relays of the control box in case of short circuit on the outputs (gas valves, motor, transformer and lockout signal). Since this is not an accessible fuse, the control should be protected with an external fuse of fast blow type suitable to the loads connected and never exceeding 6,3A.

OVERALL DIMENSIONS

Fig. 1 shows the overall dimensions of the control box.

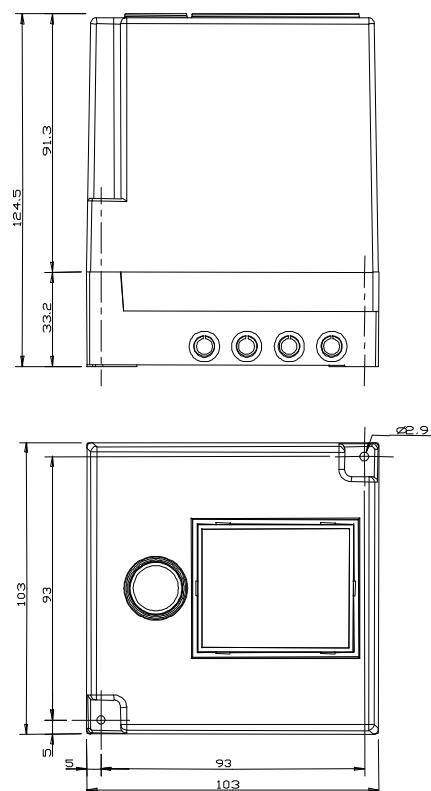


Fig. 1

The devices are fitted with inbuilt reset push-button and, upon request, with remote reset push-button (Fig.2).



The length of the cables of external components should not exceed 1m.



- A regulation shutdown should occur every 24 hours to enable the device to check its own efficiency (systems for non-permanent operation).
- Ignition devices are safety systems and shall not be unduly opened; the manufacturer's responsibility and guarantee are invalidated in case of incautious handling.
- Connect and disconnect the control unit only after switching off the mains supply.
- The control can be mounted in any position.
- Avoid exposing the device to dripping water.
- Ventilation and a suitably low temperature ensure the longest life of the control box.
- Make sure that the type (part number and times) you are using is correct before installing or replacing the control.
- With reference to the standard EN 1643 (European standard for valve proving systems), please be informed that this control unit manages the valve tightness check (VPS function) but is not a VPS, as it does not incorporate any gas valves or gas pressure switch. The manufacture should therefore complete the VPS by the installation of valves and pressure switches complying with

- if a starting attempt occurs without fuel supply, the device should proceed to lockout at the end of the first safety time t_2 ;
- if the ignition attempt occurs with insufficient air flow, the control should go to lockout at the end of the t_{10} time;
- when stopping the gas flow while the control is running, power supply to the gas valves should be interrupted within 1s and the device should go to lockout;
- operating times and sequence should correspond to the behaviour declared for each type of control unit;
- the level of the flame signal should be high enough (see Fig.4 for the measuring test);
- any limiters or protection devices switching on should cause the safety shutdown of the device according to the final appliance.



OPERATION MODE

On closing of thermostats R, W and GP, the device gives the starting command to the first burner motor (M1) and, at the end of the delay time (**t7**), also to the second burner motor (M2). At the end of the **t16** delay, the air damper is given the command for opening to max. air flow; as soon as the air damper is completely open, the control checks the APS air pressure switch commutation, and if the APS does not switch within the **t10** time, the control will perform lockout. Otherwise, the cycle will proceed with the pre-purge time (**t1**).

At the end of the pre-purge stage, the air damper is given the command for closing to min. air flow, and the pre-ignition phase **t3** (**t3'**) starts, in which the ignition transformer is activated. If in this stage the control box detects a flame signal in the burner (due, for example, to leakage from the fuel valves), it will perform lockout within 1s. If the pre-ignition stage is successfully accomplished, the safety time **t2** (**t2'**) will start, in which the control box energizes the gas valve and keeps the ignition transformer working. At the end of the safety time, the control checks the flame signal; if no flame signal is detected, the control unit will go to lockout. The second valve is energized with a **t4** delay in comparison to the first valve, provided that a sufficient flame signal is detected. The starting sequence ends on elapsing of the **t5** delay, when the air damper starts modulating between min. and max. air flow through the **LR** external control.

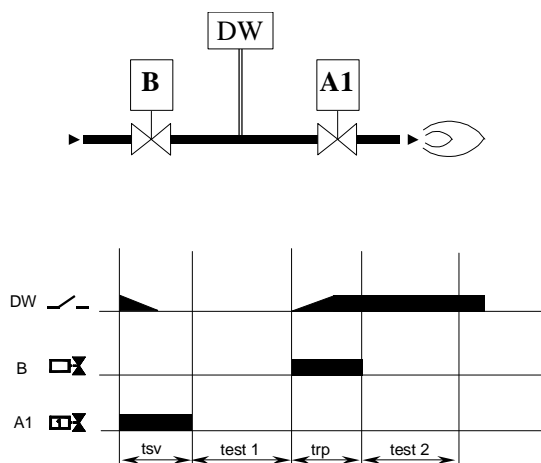
At start-up, the air damper is checked to prove its closed position (**z**); as soon as the M1 motor is energized, the control ensures that the air damper is in totally open position (**a**) to enable the best cleaning of the combustion chamber; before the beginning of the pre-ignition time, the control provides the closing command to min. air flow (**m**); this condition persists until the end of the ignition sequence, then the control unit gives the modulation command to the **LR** external device.

The attached operation diagrams are useful to better understand the working cycle of the devices.

VALVE TIGHTNESS CHECK

If the control unit is prearranged with inbuilt valve tightness check, on any restoration of power supply and on any reset from lockout condition, the control unit performs the sequence enabling to check any valve leakage. This check is then carried out on any burner shutdown.

The test is based on the two-stage pressure proving principle: first, the valve on the mains supply side (**B**) is tested by evacuating the test space (*tsv*) and measuring the atmospheric pressure inside it (*test1*). Then, the valve on the burned side (**A1**) is tested by pressurizing the test space (*trp*) and ensuring that leakage is not too high (*test2*). If one of these tests is not successful, the control unit will go to lockout and signal which of the two valves has got a leakage.



Valve tightness checking test setting procedure

Depending on the application in which the control unit shall be installed, you can choose to set the valve tightness checking test or not. Programming occurs through the reset push-button by following the procedure described hereunder. The procedure should only be carried out if the control unit is not in lockout status and the heat demand thermostat (R) is open:

1. Press the reset push-button on the device, and keep it pressed until the symbol Pr and the currently stored programme (Pr00 without tightness check; Pr01 with tightness check) appear on the display in the hour counter position (display 2). The indication of the programme stored is displayed until the reset push-button is pressed; as soon as the reset push-button is released, the starting programme is displayed (Pr00);
2. Press the reset push-button for at least one second and release to modify the programme according to the required use;
3. Wait until the symbol Stby (heat demand waiting on display 1) flashes. In addition to the Stby symbol, the display 2 also flashes, in which the wording Set and the programme just selected are displayed alternatively. Press the reset push-button again until the wordings stop flashing to confirm and store the required programme.

It is important to remember that if the programme is not confirmed by pressing the reset push-button, the previous programme will remain stored.

NOTES:

- If the above-mentioned programming procedure is not observed, the system may lose their "alignment" (simultaneous and independent operation). Should this happen, it is important to remember that the system will behave safely as well, without activating the fuel valves and displaying error "Err 0". In this case, the correct operation can be restored by repeating the programming procedure previously described.
- If the system is factory-set in order not to manage the valve tightness check (VPS function), on the LCD appears a padlock symbol (🔒).

ANOMALIES

– Valve tightness check:

During the test sequence, any leakage from the gas valves leads to lockout, with signalling of the faulty valve.

– Air flow failure (standard behaviour):

Any commutation failure of the air pressure switch (**APS**) within **t10** causes lockout for air flow failure. This condition also occurs if the air pressure switch goes back to no-air-flow position during the running stage.

– Air pressure switch is stuck in running condition at start-up:

If the air pressure switch is stuck in running condition at start-up, the control box will wait for the restoration of the APS contact.

– Flame simulation or extraneous light (standard behaviour):

Flame simulation or extraneous light during the pre-purge or pre-ignition time leads the control to lockout. In case of failure in the flame signal amplifier simulating the presence of flame, at start-up the device waits for the restoration of normal operation conditions.

– Flame/light signal failure in running condition (standard behaviour):

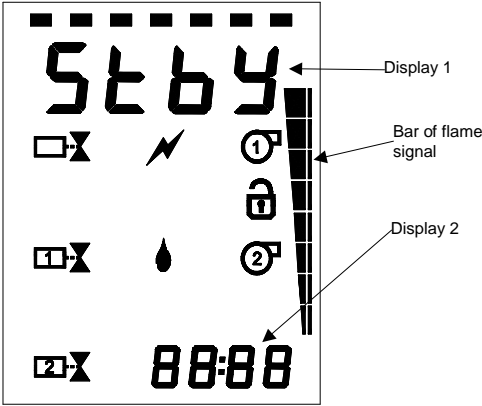
The control performs lockout and de-energizes the fuel valves within 1 second.

RESETTING THE CONTROL UNIT

When the control unit performs lockout, press the inbuilt or remote reset push-button at keep it pressed until the lockout signal disappears (one second approx.).

DISPLAY INDICATIONS

An LCD provides indications about the operation status of the control box and any anomalies which may occur. Please find here below a short key to display symbols and message meanings:



Symbol	Description
	Safety valve / pilot valve
	Valve 1
	Valve 2
	Ignitor
	Motor 1
	Motor 2
	The system is prearranged in order not to manage the VPS function
	Flame signal detection
Display1	System status
Display2	Second counter / type of anomaly

Meaning of error messages (display 2).

Anomaly	Description
Err0	Lockout for internal fault
Err1	Lockout for air flow failure at start-up
Err2	Lockout for air flow failure in running condition
Err3	Lockout for flame detection failure at the end of the first safety time
Err4	Lockout for flame simulation / extraneous light during the pre-purge time
Err5	Lockout for flame signal loss in running condition
Err6	Emergency shutdown of the control box
Err7	Loss of the filling valve
Err8	Loss of the emptying valve
Err9	Not used

Meaning of messages during the tightness check programming phase (display 2).

Anomaly	Description
Pr00	Working cycle without tightness check
Pr01	Working cycle with tightness check

Here below you will find the messages appearing during normal operation with their meaning (display 1).

STATUS	Description
stby	Control box waiting for thermostat closing
Mot1	Motor 1 activated
Mot2	Motor 2 activated
Ai rm	Air damper opened to max.
ai rn	Air damper opened to min.
Ac0n	Ignitor activated
E1on	Valve 1 activated
E2on	Valve 2 activated
modu	Air damper in modulation position
bl oc	Safety shutdown
test	Valve tightness test

The above messages are indicative and can be modified upon request according to the application.

PART REFERENCES AND AVAILABLE OPTIONS

Type Options

MPI (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

Type description

(1) Type of burner:

- 1: direct ignition;
- 2: intermittent first stage (standard version);

(2) Pilot valve:

- 1: No pilot valve;
- 2: Intermittent pilot valve (standard version);
- 3: The pilot valve is switched off with the control unit in running condition (without valve tightness check only);

Options description

(3) Ignition mode:

- no letter:** the ignition device operates for the whole safety time. Standard mode;
- B:** the ignition device is switched off as soon as the control unit detects a flame signal;

(4) 2nd valve (A2) opening with flame signal:

- no letter:** delay t4=12s. Standard mode;
- X:** the second valve is operated at the end of the safety time t2 (t2=t4);
- Wnn:** with delay t4 (nn time in seconds set upon request. See paragraph TECHNICAL DATA);

(5) Lockout due to extraneous light:

- no letter:** lockout without delay. Standard mode;
- K:** the system remains in continuous prepurge;

(6) No or insufficient air flow at start-up:

- no letter:** lockout with delay t10. Standard mode;
- Q:** the system remains in continuous prepurge;
- Qnn:** the system performs a lockout with delay t10 (nn time in seconds set upon request. See paragraph TECHNICAL DATA);

(7) Flame failure in running condition:

- no letter:** lockout without delay. Standard mode;
- V:** the control unit repeats the ignition sequence;

(8) Post-purge¹:

- no letter:** no post-purge setting. Standard mode;
- Pnn:** the post-purge time can be set upon request (nn time in seconds. See paragraph TECHNICAL DATA);
- PTnn** The post-purge time can be set upon request (nn time in seconds set upon request. See paragraph TECHNICAL DATA). The post-purge time ends on the next heat demand.

(9) Ignition attempts:

- no letter:** one ignition attempt with lockout at the end of the time t2 (safety time). Standard mode;
- Yn:** n= number of repetitions of the ignition sequence allowed (2...4).

(10) Inter-purge time:

- no letter:** no inter-purge time. Standard mode;
- Inn:** nn= the inter-purge time can be set upon request (nn time in seconds set upon request. See paragraph TECHNICAL DATA)

(11) Pre-ignition:

- No letter:** With pre-ignition of 6 seconds. This is the standard mode
- J:** With pre-ignition. The pre-ignition time is set on request (see TECHNICAL DATA paragraph)

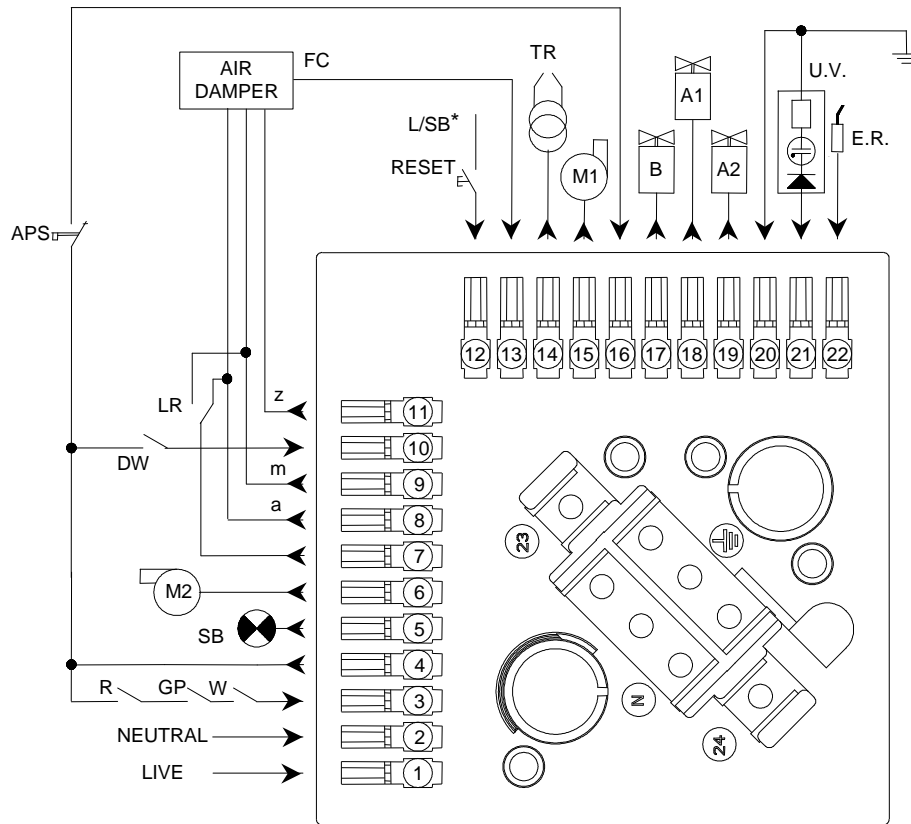
(12) Air pressure switch failure in running status:

- No letter:** Lockout without delay. This is the standard mode.
- R:** Repetition of the start-up sequence.

NOTES

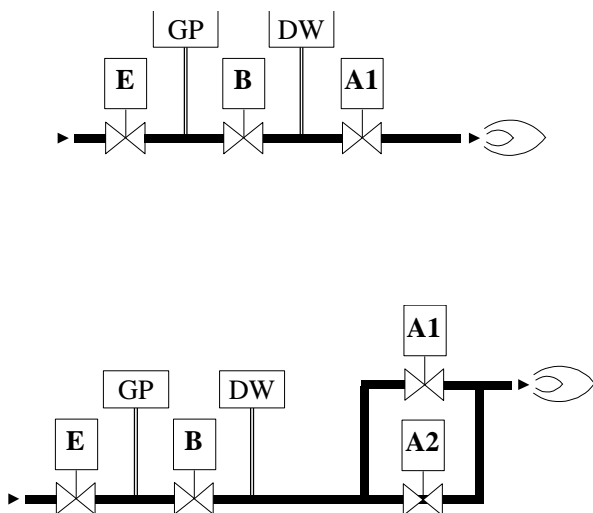
1 The post-purge time, when set, starts at the end of the valve tightness checking test (VPS function). If the valve tightness check is not set, the post-purge time starts at the end of the heat demand.

WIRING DIAGRAM WITH VALVE TIGHTNESS CHECK



* If the RESET is wired between pins 12 and 1 (LIVE), both the remote reset function with device in lockout and the remote emergency shutdown function with device in running condition are available. If the RESET is wired between pins 12 and 5 (SB), only the remote manual reset function with device in lockout is available.

HYDRAULIC DIAGRAMS WITHOUT CONNECTION PIPES IN ATMOSPHERE

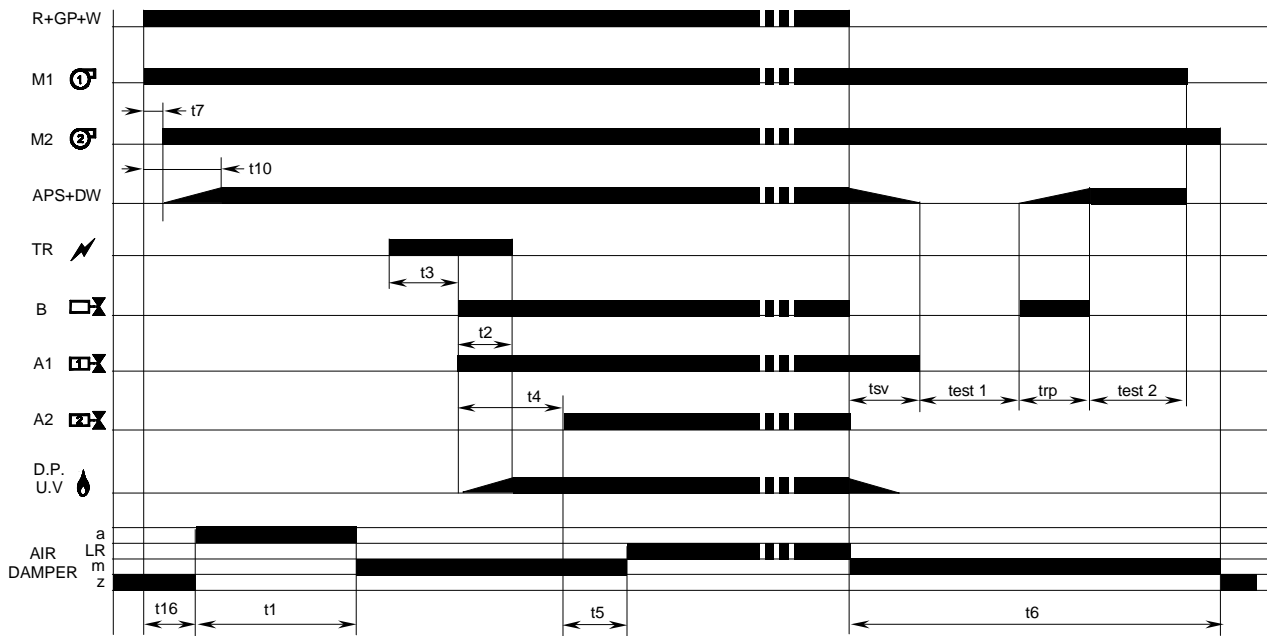


Key to symbols:

A1, A2	first and second gas valve
B	test circuit filling valve
E	safety shut-off valve (optional)
R	adjustment thermostat
W	safety or limit thermostat
GP	safety gas pressure switch
APS	safety air pressure switch
DW	safety tightness check pressure switch
bv	gas valve position checking contact
M1, M2	motor 1 and motor 2
SB	lockout signal
RESET	remote reset from lockout
TR	Ignition transformer
U.V.	UV phototube
E.R.	detection electrode
z	air damper closed
m	air damper at min. air flow
a	air damper at max. air flow
LR	air damper in modulation status
FC	limit switch

OPERATING CYCLE

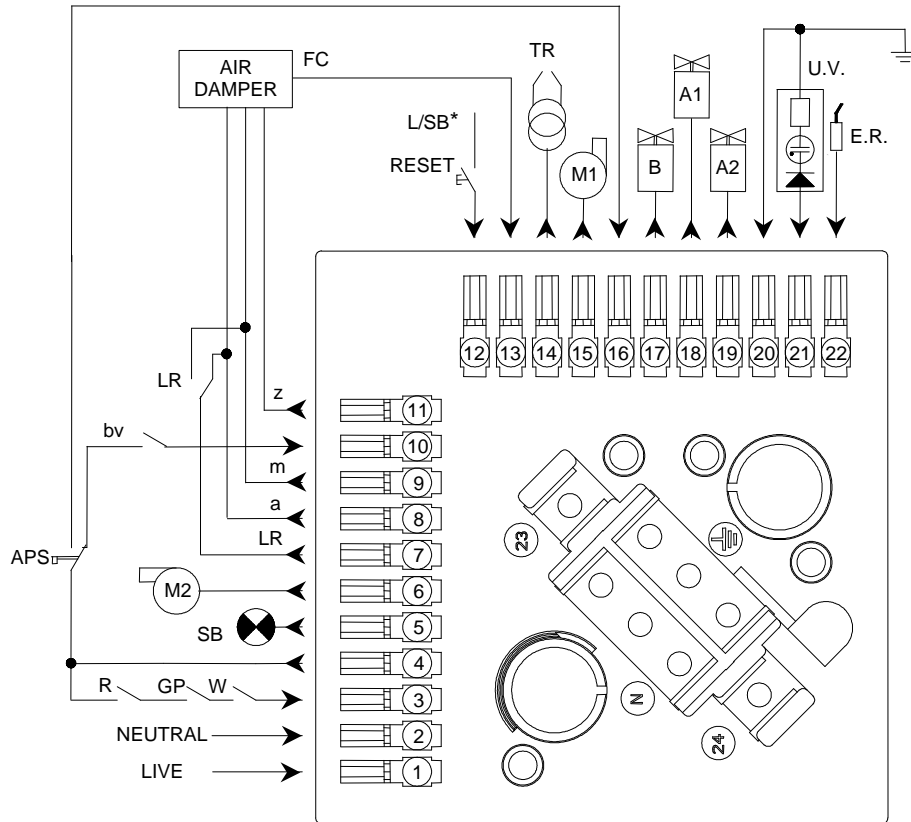
VERSION WITH VALVE TIGHTNESS CHECK DURING POST-PURGE



Key to time symbols:

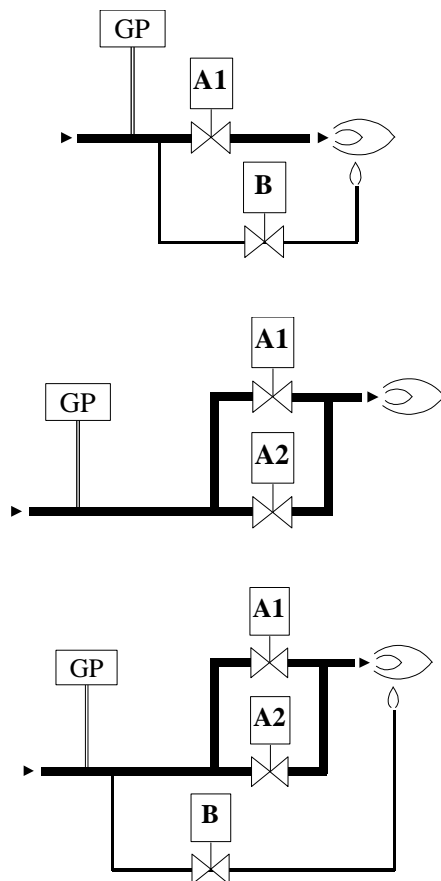
t7	motor 2 delay
t16	air damper max. opening delay
t1	pre-purge time with air damper open
t10	air pressure switch check initial delay
t2	safety time
t3	pre-ignition time
t4	second valve activation delay
t5	air damper modulation delay
t6	post-purge time
tsv	control circuit in atmosphere
test 1	check with atmospheric pressure
trp	control circuit under pressure
test 2	check with gas pressure

WIRING DIAGRAM WITHOUT VALVE TIGHTNESS CHECK



* If the RESET is wired between pins 12 and 1 (LIVE), both the remote reset function with device in lockout and the remote emergency shutdown function with device in running condition are available. If the RESET is wired between pins 12 and 5 (SB), only the remote manual reset function with device in lockout is available.

HYDRAULIC DIAGRAMS

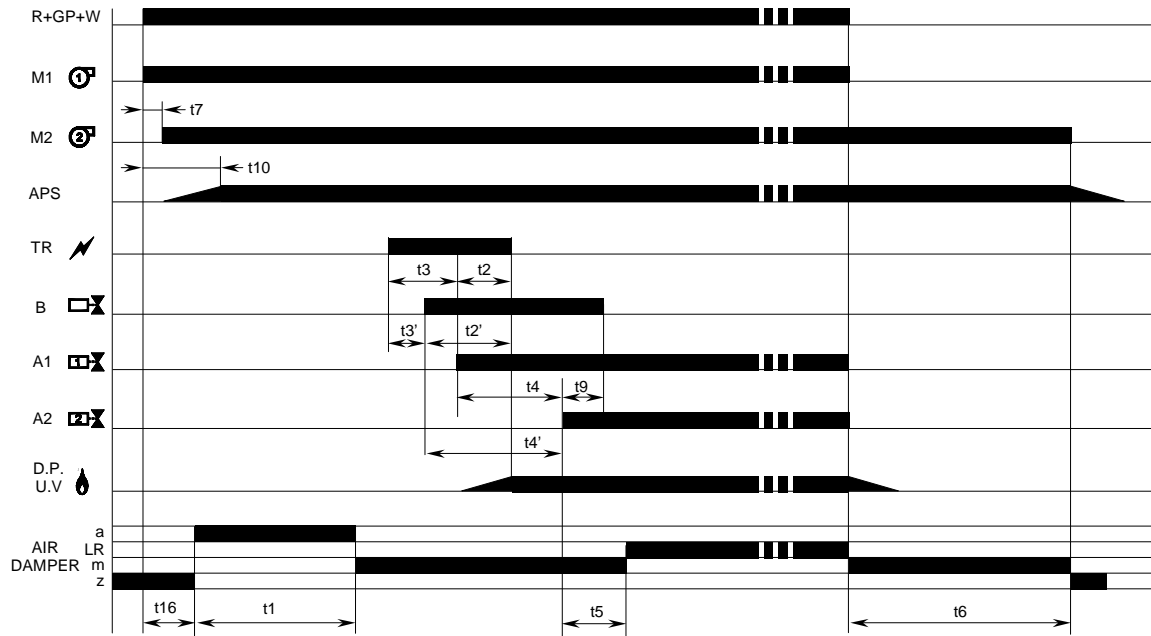


Key to symbols:

A1, A2	first and second gas valve
B	pilot valve
R	adjustment thermostat
W	safety or limit thermostat
GP	safety gas pressure switch
APS	safety air pressure switch
bv	gas valve position checking contact
M1, M2	motor 1 and motor 2
SB	lockout signal
RESET	remote reset from lockout
TR	ignition transformer
U.V.	UV phototube
E.R.	detection electrode
z	air damper closed
m	air damper at min. air flow
a	air damper at max. air flow
LR	air damper in modulation status
FC	limit switch

OPERATING CYCLE

VERSION WITHOUT VALVE TIGHTNESS CHECK



Key to time symbols:

t7	motor 2 delay
t16	air damper max. opening delay
t1	pre-purge time with air damper open
t10	air pressure switch check initial delay
t2 (t2')	safety time
t3 (t3')	pre-ignition time
t4 (t4')	second valve activation delay
- (t9)	second safety time
t5	air damper modulation delay
t6	post-purge time

ATTENTION -> Company Brahma S.p.A. declines any responsibility for any damage resulting from the Customer's interfering with the device

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