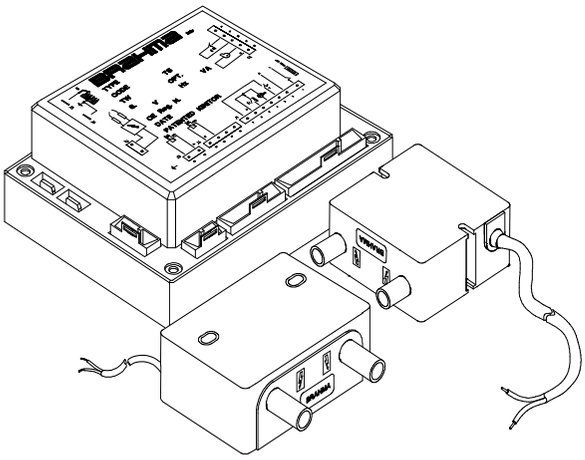
DIGITAL MICROFLAT SERIES TYPES DM/E..PR DTM/E..PR

MICROPROCESSOR BASED AUTOMATIC CONTROL SYSTEMS FOR GAS BURNERS WITH EXTERNAL IGNITION DEVICE



Application

The microprocessor based burner control systems belonging to DIGITAL MICROFLAT Series types …PR has been specifically designed for atmospheric pre-mixed gas burners for intermittent operation (systems for non-permanent operation), with or without fan in the combustion circuit.

These systems are available with non-volatile lock-out, i.e. a restart from the safety shutdown condition can only be accomplished by a manual reset of the system, or with volatile lock-out, i.e. a restart from safety shutdown condition can be accomplished by the interruption and subsequent restoration of mains supply (not by heat demand device switching).

The automatic burner control units of this series are also suitable for:

- combi boilers;
- heating boilers;
- condensing boiler;
- air heaters;
- water heaters.

The DIGITAL MICROFLAT Series types …PR maintains the main features and reliability of previous MICROFLAT Series, but thanks to flexibility of microprocessor technology adds several facilities regarding times and operational modes. For instance, the systems of this series are suitable to be used in gas-fired air heaters according to EN 525, EN 1020 and EN 1319 standards.

These automatic control systems are provided with connector for external ignition device (selected by the appliance manufacturer). As a result these controls can be advantageously used in appliances where ignition is particularly difficult.

To reduce the electromagnetic interference produced by ignition device, these control units can be fitted with our electronic ignition transformers type TC..AF/TD..AF with E.M.C. filter (see technical sheets about “Electronic ignition transformers”).

Features

Table 1 shows the main features of this series. Other important features are:

- EC-type certification (CE PIN 0694BP0610) in accordance with Gas Appliance Directive 90/396/EEC and following amendment 93/68/EEC;
- in accordance with EN 298 (European standard for automatic gas burner control systems and flame detectors for gas burners);
- prearranged for external ignition device connection;
- possibility of mounting a resistor (0 ÷ 470 kΩ) in series to the lockout signal output, to avoid possible damages to the control in case the connections of the reset button and the connections of the lockout signalling are reversed (manual reset versions only);
- accurate and repeatable timings;
- flame monitoring by the rectification property of the flame (ionization);
- direct ignition of main burner or by means intermittent pilot;
- multiple re-ignition attempts;
- possibility of connection to balanced mains supply (phase-phase network).

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TABLE 1

The following table lists the main features of the controls. For more details about operation modes and options see the controls denomination paragraph.

Type	Reset	Fan	VG2 (3)	Safety thermostat (2)	EN 298 code (1)
DM11PR	Manual	No	No	No	AMCLXN
DM12PR	Manual	No	Yes	No	ATCLXN
DM31PR	Manual	Yes	No	No	FMCLXN
DM32PR	Manual	Yes	Yes	No	FTCLXN
DE11PR	Electrical	No	No	No	AMCVXN
DE12PR	Electrical	No	Yes	No	ATCVXN
DE31PR	Electrical	Yes	No	No	FMCVXN
DE32PR	Electrical	Yes	Yes	No	FTCVXN
DTM11PR	Manual	No	No	Yes	AMCLXN
DTM12PR	Manual	No	Yes	Yes	ATCLXN
DTM31PR	Manual	Yes	No	Yes	FMCLXN
DTM32PR	Manual	Yes	Yes	Yes	FTCLXN
DTE11PR	Electrical	No	No	Yes	AMCVXN
DTE12PR	Electrical	No	Yes	Yes	ATCVXN
DTE31PR	Electrical	Yes	No	Yes	FMCVXN
DTE32PR	Electrical	Yes	Yes	Yes	FTCVXN

(1) Flame failure during TS causes spark restoration.
(2) Safety thermostat opening causes recycling followed by lock-out.
(3) VG2 output may be used to signal the flame presence to a remote device (mains voltage output).

TECHNICAL DATA

Rated Supply Voltage: 220-240V~ 50-60Hz
Operating temperature range: -20℃ +70℃
Ambient humidity: 95% max at 40℃
Protection degree: IP 00
Times:
- Waiting time **(TW):** 0...60 s
- Pre-purge time **(TP):** 0...60 s
- Safety time **(TS):** 3...120 s
- Ignition time of spark **(TSP):** (TS-1) s
- Response time in case of flame failure: < 1 s
- Post-purge time: 0…30 min
- Inter-waiting or inter-purge time: 1…240 s
- Delay time on VG2 opening: 0…60 s
- Lock-out for no air flow at starting: 3…120 s
- Pre-ignition time: 0…60 s

Re-cycling attempts: 1…10
Power consumption: 30 VA
Contact rating:
- Room thermostat: 4 A cos φ ≥ 0.4
- VG1: 240V RMS 0.5 A cos φ ≥ 0.4
- VG2: 0.3 A at 20 ℃ (A)
  0.2 A at 60 ℃ (A)
  0.15 A at 70 ℃ (A)
- Fan: 1.3 A (B)
- External ignition device: 0.5 A
- Lock-out signalling:
  with high voltage output: max. 50mA RMS with 0 Ω resistor
  0.5mA RMS with 470 kΩ resistor
  LED indicator output: max. 8mA (C)

(A) VG2 is driven by an optotriac
(B) the fan is driven by a triac
(C) this output is not safe to touch

Max. length of cables of external components (except room thermostat): 1m
Internal fuse rating: 3.15 A Fast
External fuse rating(suggested): 2 A Fast (*)
The external fuse rating must be selected according to applied maximum load; in any case its value must never exceed internal fuse rating.

Flame control:
The ionization flame detection device makes use of the rectification property of the flame.
The ionization flame rod is a safe to touch output (provided with protective impedances).
As important safety aspect, note that the control system is more flame sensitive at starting or during waiting/pre-purge time (negative switching differential).
- Minimum ionization current: 0.5 μA
  on request: 1.2 μA/2.5 μA
- Recommended ionization current: 3 ÷ 5 times the minimum ionization current
- Max. length of the cable: 1 m
- Minimum insulation resistance of the cable and the flame detector device to earth: ≥ 50 MΩ
- Max. parasitic capacitance of the detection probe: ≤ 1 nF
- Max. short circuit current: < 200 μA AC

Optotriac:
- Repetitive peak off-state voltage: 400 V
- RMS on-state current (20 ℃): 300 mA
- RMS on-state current (60 ℃): 200 mA
- RMS on-state current (70 ℃): 150 mA
- Off-state current (100 ℃): 100 μA

Triac:
- Repetitive peak off-state voltage: 600 V
- RMS on-state current: 500 mA

Weight about: 150 g
Varnishing: on request

Construction
The enclosure made of plastic material (and the varnishing of the circuit board on request) protects the control from mechanical damages, dust and dirt from the conditions of installation.
Through the use of an electronic board assembled with surface mounted components, which houses the “logic core” of the system, it has been possible to reduce the printed circuit board dimensions and to realize even the most complex control with extremely compact dimensions.
A varistor protects the control from voltage transient on the mains supply, caused for example by discharges such as lightning. An internal accessible fuse protects the relays of the control in case of short circuit on the outputs (valves, fan and lockout signalling).

Overall dimensions
The automatic control systems of the DIGITAL MICROFLAT Series types …PR can be supplied in different executions but with the same enclosure. The following figures show the overall dimensions of the controls (Fig.1).

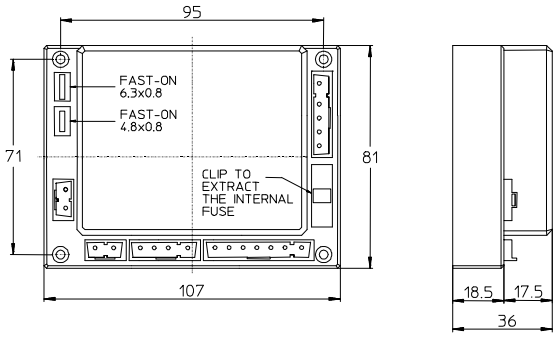


Fig.1

Possible fixing systems

top: self-tapping screw UNI6951AB 2.9x22
M3x22 screw UNI6107

bottom: screwplast self-forming screw ISO0003 F 3.5x13
screwplast self-forming screw ISO0003 F 3.9x13

Accessories

The control system are usually supplied with a kit of female connectors and/or a reset button (see Fig. 2).

Do not fit terminals and female connectors of different types.

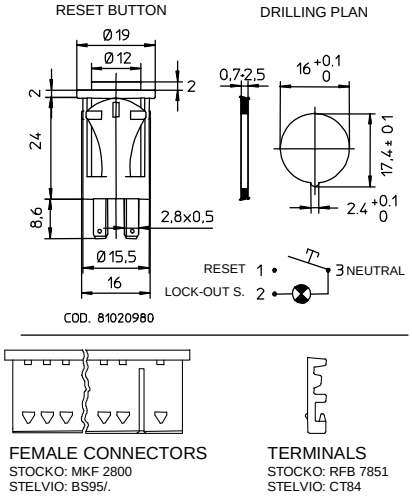


Fig. 2

Connection

The use of non-reversible connectors with a different number of poles makes the connection easy and reliable. One-way fast-on connectors of different size for flame detection probe and earth connection enable an easy installation and replacement.

The one-output ignition device allows spark generation on one point (3a), whereas the dual-output ignition device enables spark generation on two points (3b) or two electrodes isolated from the metal frame of the burner (3c), see Fig. 3. The configuration (3c) ensures a more reduced emission of electromagnetic interference.

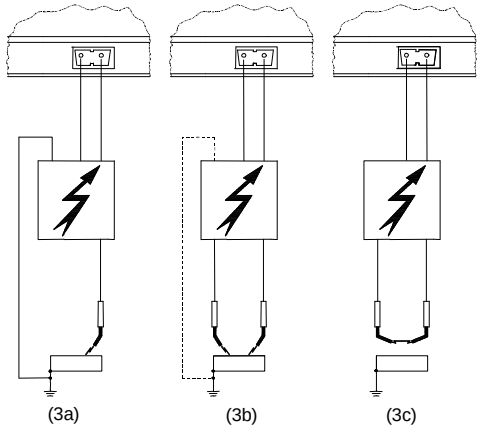


Fig. 3

Provisions such as strain relieves, sufficient earth terminals and neutral terminals have to be available in the appliance or in external connection boxes.

The control systems type DTM…PR/DTE…PR are prearranged for the connection of a safety thermostat ST (as shown in Fig. 4) which stops the supply to the gas valve VG1 and causes a safety shutdown after a delay which is the sum of waiting (pre-purge) and safety times. If a self-resetting safety thermostat is applied, the recovery time of this thermostat in the appliance must be longer than the total time needed for the maximum allowed number of re-ignition attempts in order to reach lock-out.

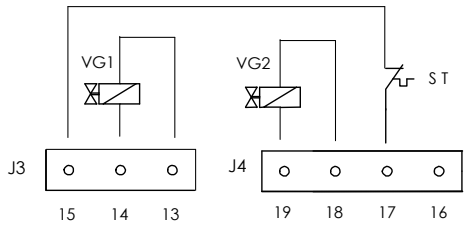


Fig. 4

Directions for use

- For technical and safety reasons a regulation shutdown must occur every 24 hours (systems for non-permanent operation).
- Automatic control systems are safety devices and must not be opened. The manufacturer's responsibility and guarantee are invalidated if the control is opened.
- The control system must be connected and disconnected only after switching off the mains supply.
- The control system can be mounted in any position.
- Avoid exposing the control system to dripping water.
- Ventilation and the lowest temperature ensures the longest life of the control system.
- Make sure that the type (code and times) you are using is correct before installing or replacing the control system.
- The gas appliance on which the control system is installed must provide adequate protection against the risk of electrical shock (at least IP20).

Electrical installation

- The applicable national regulation and the European standards (e.g. EN 60335-1/EN 50165) regarding electrical safety must be respected.
- Phase and Neutral should be connected correctly, a mistake could cause a dangerous situation, i.e. the valves would still be live with the thermostats and limits switched off. If Phase-Neutral polarity is not respected the control performs a non-volatile lockout at the end of the safety time at starting up. This is not valid for not polarized versions (identified by N option).
- Before starting the system check the cables carefully. Wrong connections can damage the control system and compromise the safety.
- The earth terminal of the control system, the metal frame of the gas burner and the earth on the mains supply must be well connected.
- Avoid putting the detection cable close to power or ignition cables.
- Use a heat resistant cable for the flame detection probe, well insulated to the ground and protected from possible moisture (or water in general).
- Use ignition cable(s) as short and straight as possible and keep it(them) far from other conductors to reduce

the emission of interference (max.length <2 m and insulation voltage >25 kV).

In case of Phase-Neutral network with unearthed Neutral or Phase-Phase network (with centre of the star not earthed) the control can operate correctly by means of a built-in resistor.

In case of "partial" short circuit or bad insulation between Phase and earth the voltage on the flame detection probe can be reduced until it causes the lockout of the control, because of the impossibility of detecting the flame signal.

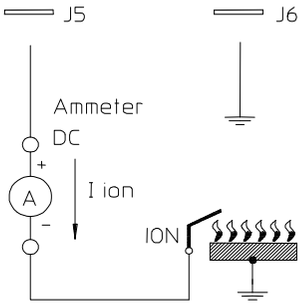


Fig. 5

Checking at start

Always check the control system before the first start and also after any substitution or a long period of non-operation of the system. Before any ignition attempt make sure that the combustion chamber is free from gas.

Then make sure that:

– if the starting attempt occurs without gas supply the control system performs a lockout after TS;
– when stopping the gas flow while the control is in running state the supply to the gas valve is interrupted within 1 second, and after a recycling (or more up to 10 depending on setting up) the control system proceeds to a lockout;
– operating times and sequence are suitable;
– the level of the flame signal is sufficient, see Fig. 5 for the measuring test;
– the ignition probe(s) is (are) adjusted in the most stable way for the recommended spark gap;
– the intervention of limiters or safety devices causes a safety shutdown according to the application.

Operation

This description relates to the control system having standard operating cycle:

at every start the control system proceeds to a self-checking of its own components. During the waiting (TW) or pre-purge time (TP) the operation of the flame signal amplifier is checked; the internal circuit makes a test of the flame signal amplifier circuit. A flame simulation or a fault in the amplifier leading to the same condition prevent the control system from starting.

In the types with fan control, before the elapsing of the pre-purge time (TP), the air pressure switch is checked to prove its "no air flow" state.

Only if the test is positive the fan is started and with the air pressure switch in "air flow" state the pre-purge time (TP) begins. The air pressure switch test is repeated at every operating cycle start.

At the end of waiting (TW) or pre-purge time (TP) the VG1 gas valve is energized and the external ignition device is operated. In this way safety time (TS) begins. If the presence of flame is detected during safety time, the external ignition device is inhibited and, in the suitable models, the main valve (VG2) is supplied (in type DXX32 at the end of safety time).

Flame failure during safety time causes the external ignition device to be re-activated within one second.

On the contrary, if no flame signal is detected during safety time the control proceeds to lockout, the VG1 gas valve and the external ignition device are switched off while the lockout signalling is supplied.

The attached operating cycle diagrams are useful to understand how each control operates.

Variations on operating cycle

Followings are the available variations on the operating cycle of control systems:

– Option 11: Lock-out for flame simulation

If the control system detects a flame simulation at starting or during waiting/pre-purge time then it performs a lock-out.

– Option 12: No or insufficient air flow

If the control system detects no or insufficient air flow at starting or during waiting/pre-purge time then it performs a lock-out within 3÷120 seconds (the time is set on request).

– Option 13: Air flow failure at running

If an air flow failure occurs during running the control system performs a lock-out without delay.

– Option 14: Flame failure at running

If a flame failure occurs during running the control system performs a lock-out.

– Option 16: Post-purge time

The interval between any shut-down and the moment the fan is switched off (the time is set on request).

– Option 17: Recycling attempts

The control system carries out multiple recycling attempts after a shutdown (the number of attempts is set on request).

– Option 18: Inter-waiting or inter-purge time

The control system carries out a waiting or purge time after unsuccessful ignition attempt and prior to the next recycle attempt.

– Option 21: Pre-ignition time

The control system energises the external ignition device at the end of waiting or pre-purge time and before the beginning of safety time (pre-ignition time is set on request)

Reset of the control

Non-volatile lock-out (manual reset)

When a control system has reached the non-volatile lockout condition, to reset the control system it is necessary to act on the reset push-button.

Volatile lock-out (electrical reset)

The reset of the control system from volatile lock-out is achieved by means of the interruption of the mains supply and its subsequent restoration. It is not possible to reset the control system by switching off the heat demand device.

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CONTROLS DENOMINATION

Type **Options**

D (1) (2) (3) (4) **PR** (5) (6) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20)

Type description
(1) T: prearranged for safety thermostat (ST) connection
(2) M or E: non-volatile lock-out (M) or volatile lock-out (E)
(3) 1 or 3: without fan (1) or with fan (3)
(4) 1 or 2: direct ignition (1) or intermittent first stage (2)

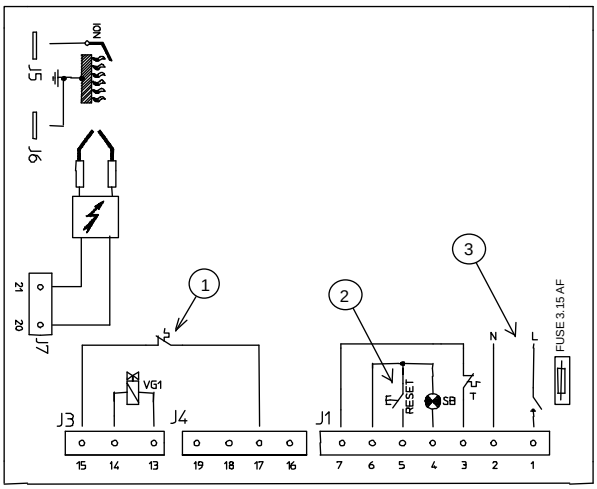
Options description
(5) *: EN 298-2003 compliant
(6) Ignition mode
no letter: ignition spark operates for TSP time (TS-1). This is the standard mode
A: ignition spark operates for TS
B: ignition spark is switch off when flame presence is detected
(7) R: resistor in series to lock-out signalling as protection against reset push-button reversed connection
(10) VG2 opening with flame presence
no letter: no delay (This is the standard mode)
X: at the end of safety time TS
W: delayed (see TECHNICAL DATA paragraph)
(11) Lock-out for flame simulation
no letter: not available (the control remains in continuous waiting/pre-purge state). This is the standard mode
K: lock-out condition
(12) No or insufficient air flow at starting
no letter: the control remains in stand-by condition. This is the standard mode
Q: the operation mode is set on request (see TECHNICAL DATA paragraph)
(13) Air flow failure at running
no letter: safety shutdown followed by stand-by condition. This is the standard mode
S: lock-out condition without delay
(14) Flame failure at running
no letter: recycling (see TECHNICAL DATA paragraph). This is the standard mode
V: lock-out condition without delay
(15) Connection to the mains supply
no letter: Phase-Neutral polarized (Phase sensitive control). This is the standard mode
N: 2 relays for gas valve (1 for Phase, 1 for Neutral). Not polarized;
N1: Phase-Neutral polarized (phase sensitive control) with 2 relays for the gas valve (1 for Phase, 1 for Neutral)
N2: as N1 but the control is Neutral sensitive (L-N connections are reversed)
(16) Post-purge
no letter: no post-purge. This is the standard mode
P: the post-purge time is set on request (see TECHNICAL DATA paragraph)
(17) Recycling attempts
no letter: one recycling after a safety shut-down. This is the standard mode
Y: multiple re-ignition attempts on request (see TECHNICAL DATA paragraph)
(18) Inter-waiting or inter-purge
No letter: no inter-waiting or inter-purge time. This is the standard mode
I: the inter-waiting/inter-purge time is set on request (see TECHNICAL DATA paragraph)
(19) Lock-out signalling output
No letter: high voltage output with max. current rate 50 mA RMS
F: LED indicator output with max. current rate 8 mA (this output is not safe to touch)
(20) Air pressure switch control
No letter: air pressure switch control
G: without air pressure switch control
G1: Recycling for flame failure without control of the air pressure switch status.
G2: Recycling without control of the air pressure switch status in case heat demand still occurs at the end of the post-purge stage.
Note: Controls with option “G” are intended for special applications in which a check of the air flow is not required by the appliance standard.
(21) Pre-ignition:
No letter: without pre-ignition. This is the standard mode
J: with pre-ignition. The pre-ignition time is set on request (see TECHNICAL DATA paragraph)

Example: **DTM11PR KVN ⇒** The features of this control type are:

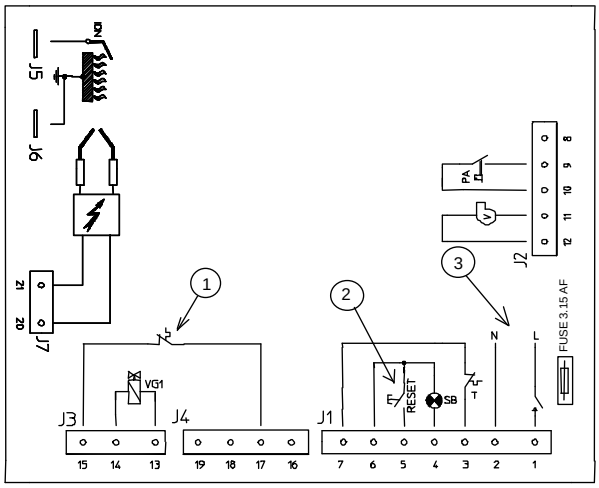
T: prearranged for safety thermostat (ST) connection
M: non-volatile lock-out
1: without fan
1: direct burner ignition

K: lock-out condition for flame simulation
V: lock-out condition without delay due to flame failure during running
N: not polarized

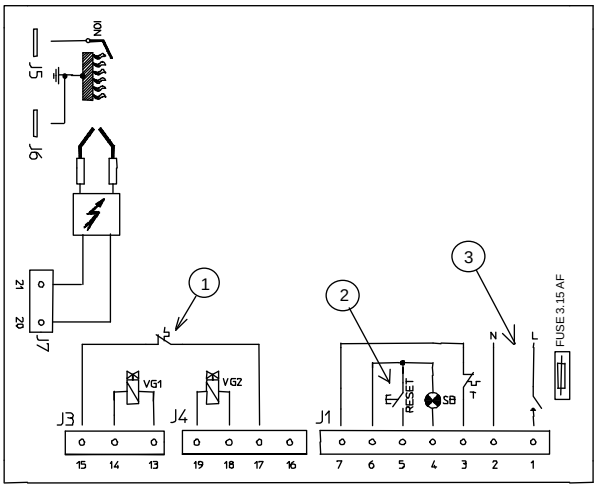
CONNECTION DIAGRAMS



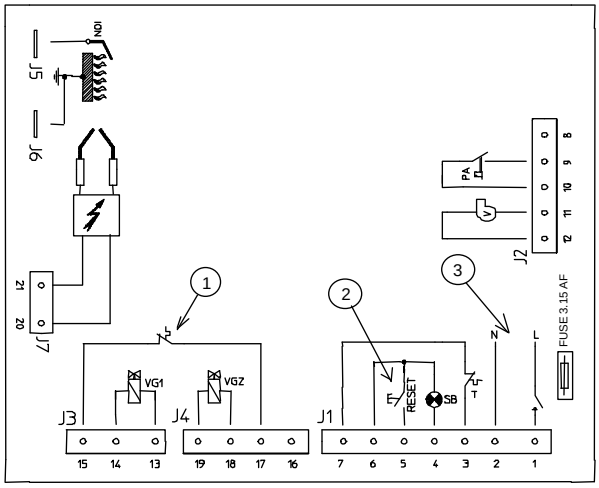
Type DTM11PR and DTE11PR



Type DTM31PR and DTE31PR



Type DTM12PR and DTE12PR

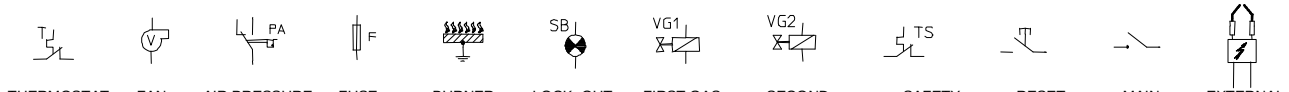


Type DTM32PR and DTE32PR

(1) In DM11PR, DM12PR, DM31PR, DM32PR and DE11PR, DE12PR, DE31PR, DE32PR types the safety thermostat is not wired

(2) In DTE11PR, DTE12PR, DTE31PR, DTE32PR a nd DE11PR, DE12PR, DE31PR, DE32PR types the RESET button is not wired

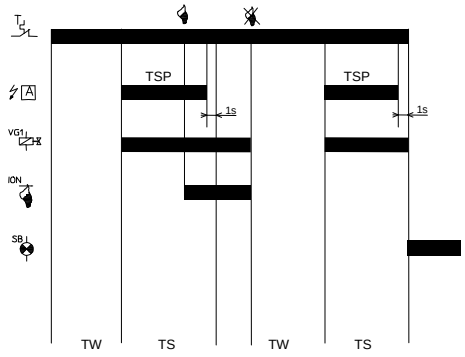
(3) In versions fitted with N2 option L- N connections on J1 are reversed



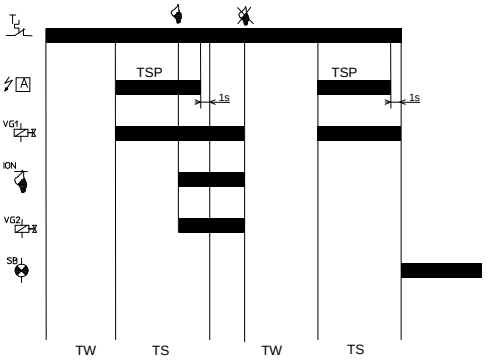
THERMOSTAT | FAN | AIR PRESSURE SWITCH | FUSE | BURNER | LOCK- OUT SIGNAL | FIRST GAS VALVE | SECOND GAS VALVE | SAFETY THERMOSTAT | RESET | MAIN SWITCH | EXTERNAL IGNITER

OPERATING CYCLES

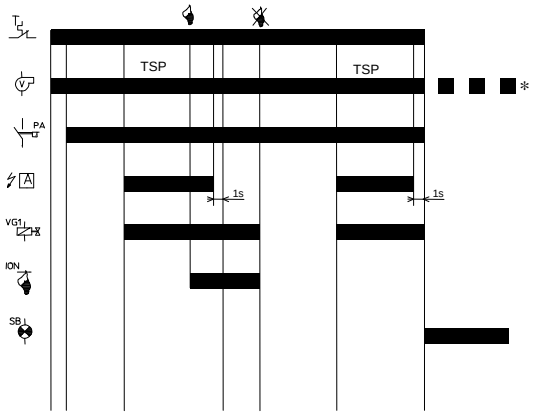
STANDARD VERSIONS WITHOUT SAFETY THERMOSTAT



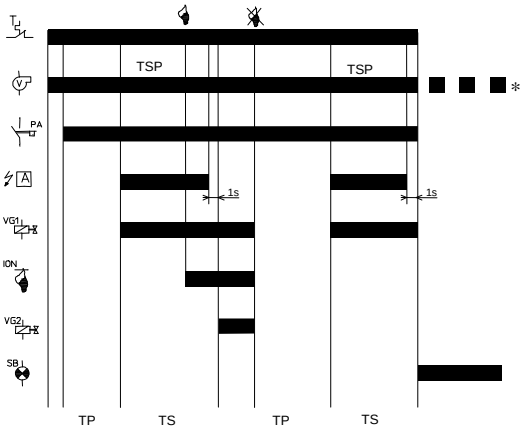
DM11PR and DE11PR



DM12PR and DE12PR

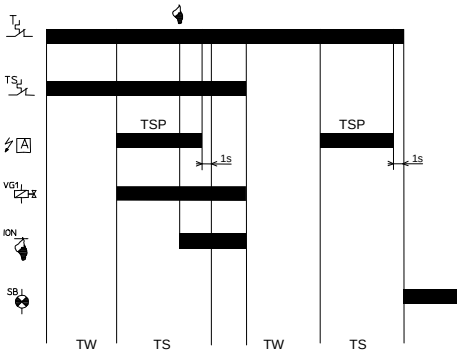


DM31PR and DE31PR

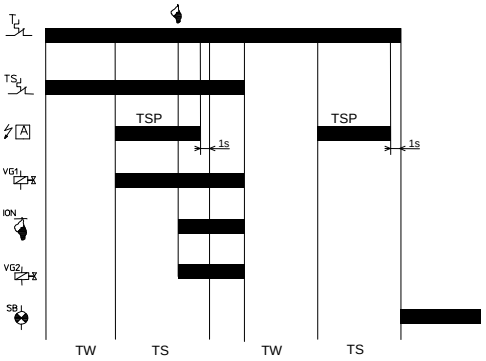


DM32PR and DE32PR (**)

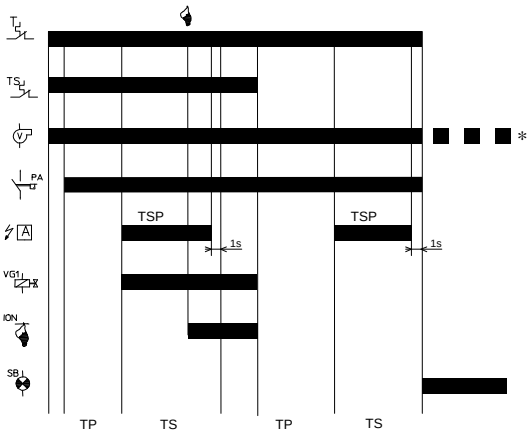
STANDARD VERSIONS WITH SAFETY THERMOSTAT



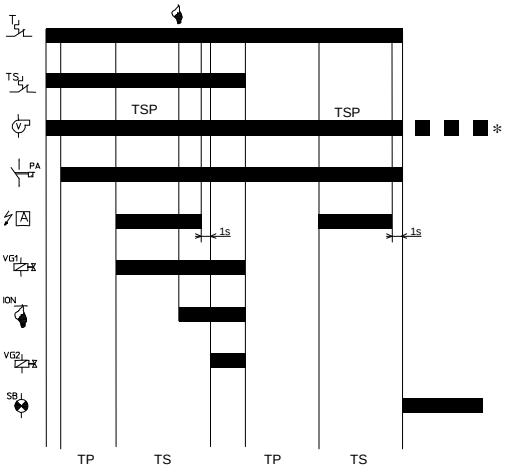
DTM11PR and DTE11PR



DTM12PR and DTE12PR



DTM31PR and DTE31PR



DTM32PR and DTE32PR (**)

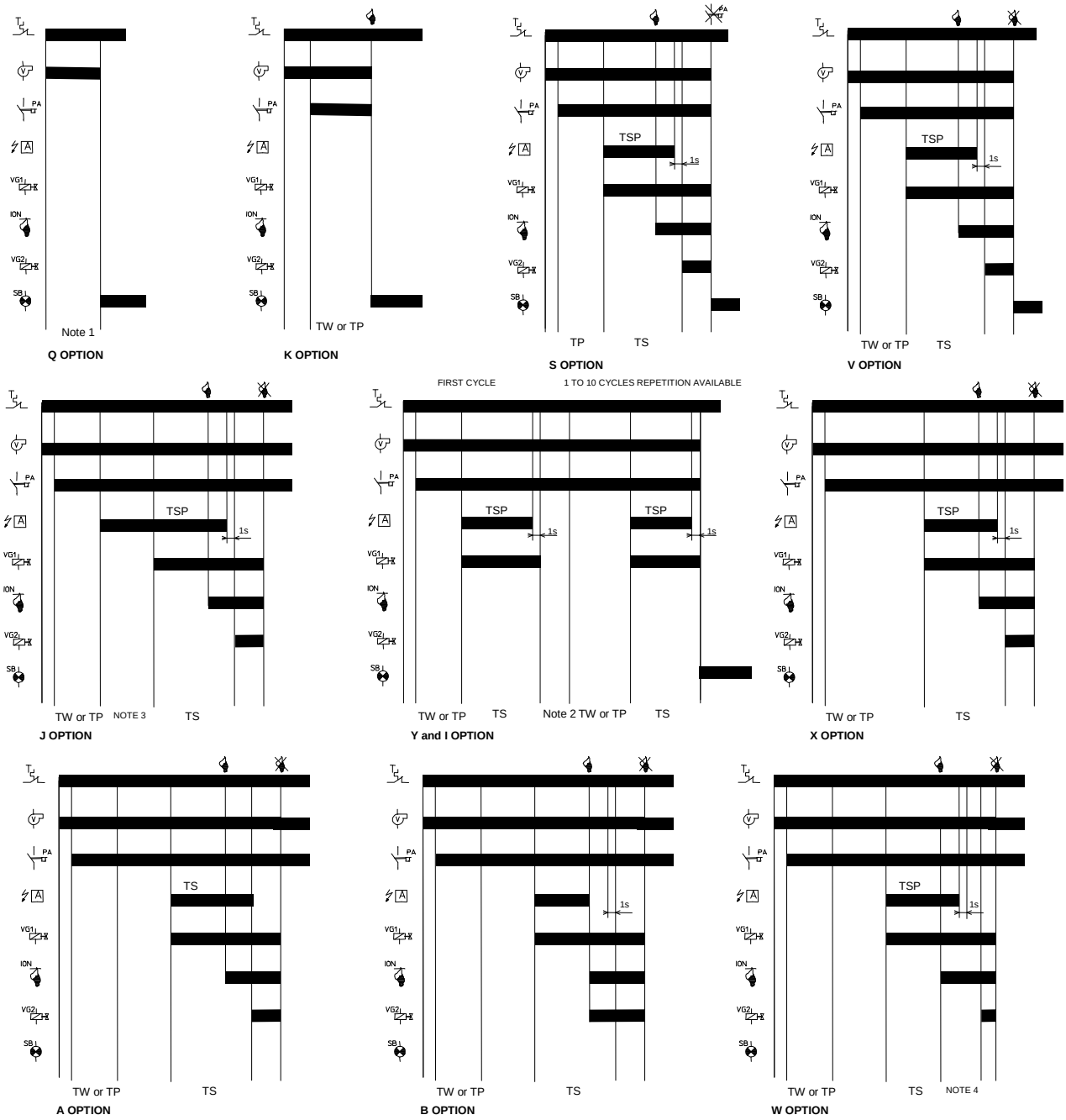
* Post-purge (see description Option 15 paragraph Variations on operating cycle)

** The standard version is provided with option X

THERMOSTAT	FAN	AIR PRESSURE SWITCH	IGNITION	FLAME SIGNAL	LOCK-OUT SIGNAL	FIRST GAS VALVE	SECOND GAS VALVE	SAFETY THERMOSTAT

OPERATING CYCLES

AVAILABLE OPTIONS



NOTES

1. Lock-out condition with delay is available
2. Inter-waiting or inter-purge time is available
   As special setting the waiting/pre-purge time of each ignition attempt may be replaced altogether by inter-waiting/inter-purge time, provided that this sequence is allowed by final appliance
3. Pre-ignition time is available
4. Second stage ignition delay time available.

WARNING: the limit thermostat has to be wired in series to the Phase



ATTENTION -> Brahma S.p.A. accepts no responsibility for any damage resulting from customer's tampering with the product.

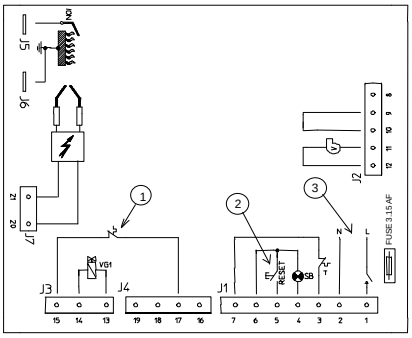
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26/11/2010 Subject to amendments without notice

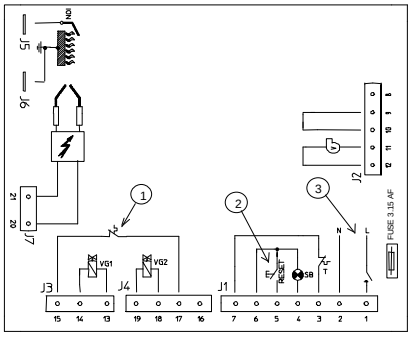
TYPES DM3XPR, DE3XPR, DTM3XPR, DTE3XPR WITH G OPTION

Controls with option “G” are intended for special applications in which a check of the air flow is not required by the appliance standard. In this version it is necessary to connect pin 9 and pin 10 externally (see attached connection diagrams)

CONNECTION DIAGRAM



Type DTM31PR and DTE31PR



Type DTM32PR and DTE32PR

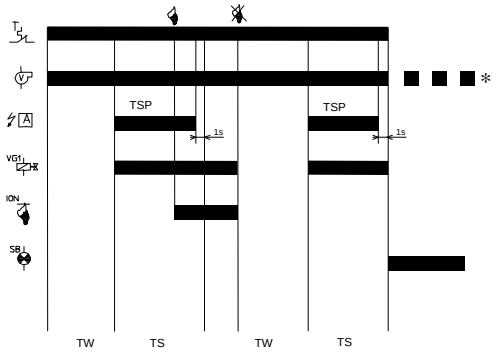
(1) In DM31PR, DM32PR and DE31PR, DE32PR types the safety thermostat is not wired

(2) In DTE31PR, DTE32PR and DE31PR, DE32PR types the RESET button is not wired

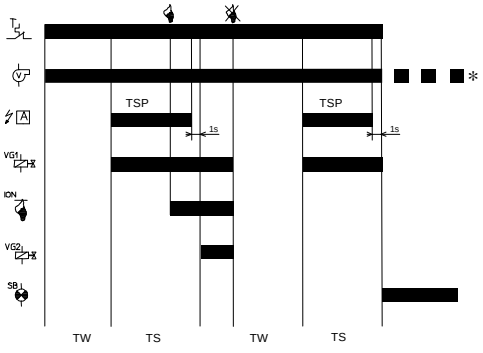
(3) In versions fitted with N2 option L- N connections on J1 are reversed

OPERATING CYCLES

STANDARD VERSIONS WITHOUT SAFETY THERMOSTAT

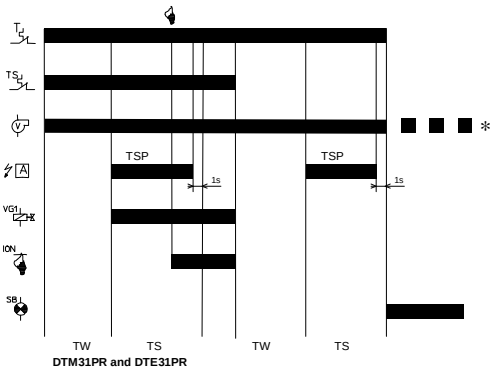


DM31PR and DE31PR

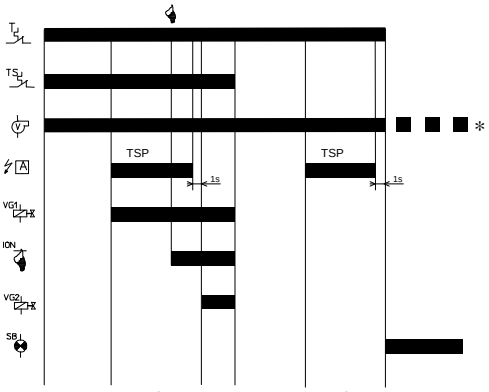


DM32PR and DE32PR (**)

STANDARD VERSIONS WITH SAFETY THERMOSTAT



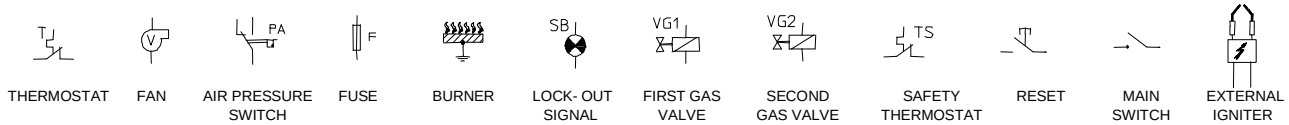
DTM31PR and DTE31PR



DTM32PR and DTE32PR (**)

* (V) Post-purge (see description Option 15 paragraph Variations on operating cycle)

** The standard version is provided with option X



THERMOSTAT | FAN | AIR PRESSURE SWITCH | FUSE | BURNER | LOCK- OUT SIGNAL | FIRST GAS VALVE | SECOND GAS VALVE | SAFETY THERMOSTAT | RESET | MAIN SWITCH | EXTERNAL IGNITER