

MICROPROCESSOR-BASED FLAME PRESENCE INDICATOR ESA REFLAM SERIES

FEATURES

- Supply voltage: 115 or 230 V +10-15%
- Supply frequency: 45÷65 Hz
- Max absorption: 4 VA max
- Operating temperature: 0÷60°C
- Storage temperature: -20÷80°C
- Maximum relative humidity: 75 %
- Mounting position: any
- Protection degree: IP54
(when wiring use adequate cable gland)
- Atmospheres: not suitable for use in explosive or corrosive atmospheres
- Casing: thermosetting
- Dimensions: 200×120×93 mm
- Weight: 1200 g
- Ignition transformer protection fuse: 3,15 A
- Device protection fuse: 1 A
- Maximum output capacity: 3 A @ 230 V cosφ= 0,5
- Ignition time: 1 ÷ 25 s
- Flame failure response time: 1 ÷ 9 s
- Remote start input absorption: max 5mA
- Filter for remote start input: RC 100Ω - 0,47 μF - 250 Vac
- Probe voltage: max 300 Vac
- Minimum ionisation current: 3 μA
- Flame current limitation: 3,2 mA
- Flame signal display: 0 ÷ 90 μA
- Flame controlling devices: rod or ESA UV-2 phototube
- Insulation among probe conductors: > 50 MΩ
(double-insulation or double-protection cables)
- Rod or UV tube line length: max 30 m
- Unirod probe line length with TAR-10 transformer: max 2 m

APPLICATIONS

- Flame presence indicator with signalling to remote devices by means of digital signals or ECS serial communication
- Flame detection with ignition device control for multi-nozzle or multi-flame burners
- Flame detection with electrode, mono-electrode and UV, and combinations of each.



E780101

DESCRIPTION

ESA REFLAM is a microprocessor-based flame presence indicator with outputs and inputs to control and signal flame presence for multiple-nozzle burners or all applications where the fuel cannot be directly controlled and where flame controls cannot be used. The instrument is used for remote signalling via two voltage-free outputs: the first is a voltage-free SPDT contact that is activated only in the presence of a flame, while the second is a N.O. contact that can behave differently according to programming. In addition, for multi-nozzle or multi-flame burners, the presence of an illegal flame can be monitored and the ignition transformer can be remotely controlled by means of the start input. Note that in these applications the solenoid valves for fuel interception must be controlled by certified flame control devices (see EN-746/2).

ESA REFLAM is equipped with an ECS serial interface that enables the ignition transformer to be activated and flame presence to be monitored remotely, permitting the control of several instruments by means of the serial communication. A local Start/Stop pushbutton is found on the front panel, together with a display showing the cycle, a bar graph flame signal indicator and two LEDs for configuration of



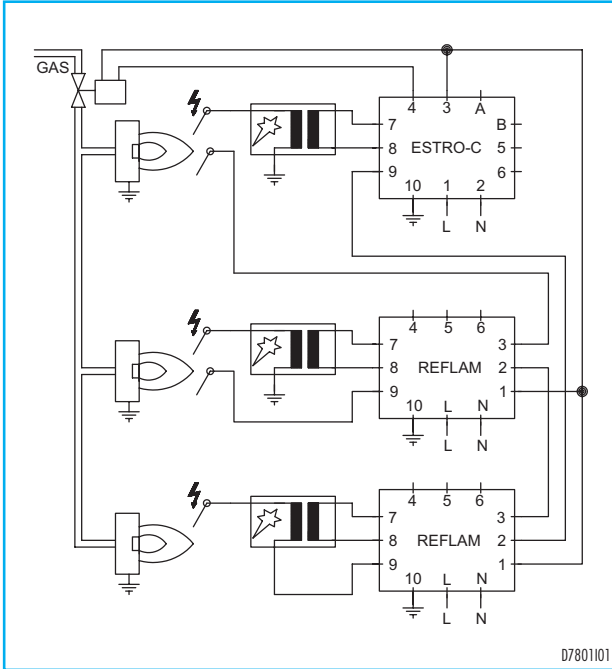
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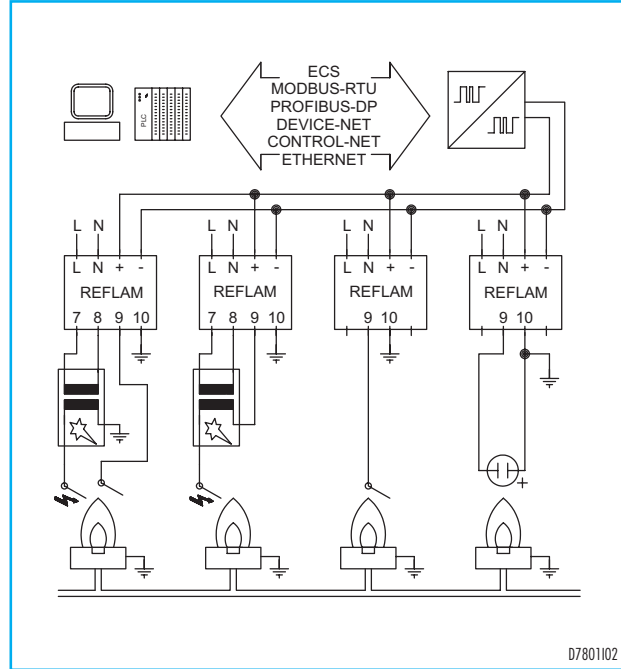
the serial address using infrared. The instrument also makes a Start/Stop input available for remote control. ESA REFLAM is supplied in a robust thermosetting casing designed for housing the TAR-10 ignition transformer and for the cable outlets,

that can be pre-wired on request. ESA REFLAM permits the parameters and modes of operation to be configured according to the requirements of the application using dedicated programming software.

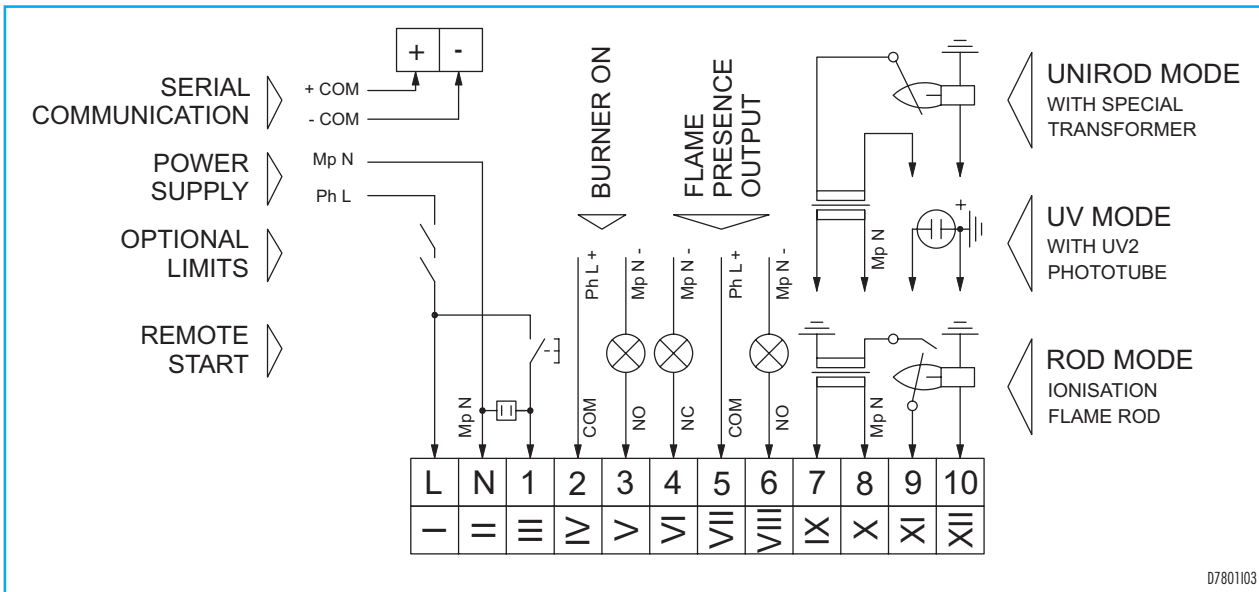
MULTI-NOZZLE OR MULTI-FLAME BURNERS



CONTROL BY SERIAL COMMUNICATION



ELECTRICAL CONNECTION



D7801103

Item	Description	Item	Description
L	Power supply phase	6	Flame presence output (N.O.)
N	Power supply neutral	7	Ignition transformer phase
1	Remote start / stop	8	Ignition transformer neutral
2	Ignited burner output (Com)	9	Rod or UV phototube negative end
3	Ignited burner output (N.O.)	10	Protection ground, UV phototube positive end or burner frame
4	Flame presence output (N.C.)	+	Communication input positive end
5	Flame presence output (Com)	-	Communication input negative end

OPERATION


















ESA REFLAM is a configurable flame presence indicator that can operate in different modes according to the configuration selected. The main modes of operation are as follows:

- Mode 1: Flame presence indicator for multi-nozzle or multi-flame burners with continuous ignition command
- Mode 2: Only a flame presence indicator
- Mode 3: Flame presence indicator with semi-continuous ignition command
- Mode 4: Flame presence indicator with pulsed ignition command

ESA REFLAM also offers other configurable parameters, such as monitoring the presence of an illegal flame, the activation time of the ignition devices, the flame failure response time and others; according to the mode of operation selected, only those required can be modified.

In all modes, the local Start/Stop push-button is equivalent to the remote Start/Stop input.

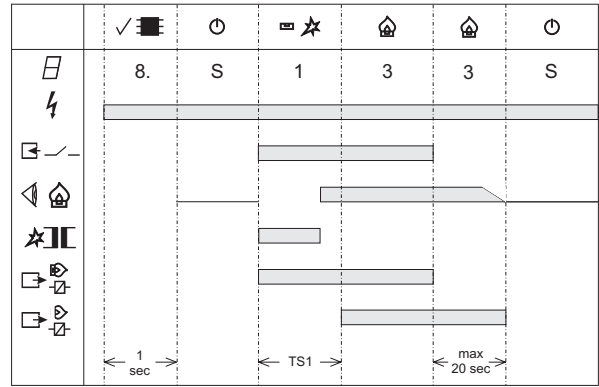
SYMBOL LEGEND

	Display indications		Device self-check	TS1	Ignition time
	Power supply		Waiting	TR	Flame loss response time
	Start / Stop digital command		Ignition cycle	TC	Com-timeout time
	Flame signal detection		Steady burner on		Serial communication enable
	Ignition transformer		Illegal flame detection		Serial commands absence
	Ignited burner output		Ignition failure		Com -Timeout stop
	Flame presence output		Flame loss		

D7801E15

MODE 1 OPERATION

ESA REFLAM is configured with this mode of operation when used to detect flame presence and to activate ignition devices in multi-nozzle or multi-flame burners. In these applications, the gas solenoid valve must be controlled by a certified flame control (ESA-ESTRO), from which ESA REFLAM receives the ignition command and to which it signals flame presence using the ignited burner output. By enabling the Start/Stop command, ESA REFLAM activates the ignition transformer and ignited burner output for the ignition time. It then deactivates the transformer and checks for flame presence holding the ignited burner output and enabling the flame presence output. In this mode of operation, the Start/Stop command must always be enabled; if not ESA REFLAM will disable the ignited burner output and wait until the flame extinguishes. The ignited burner output is also disabled in the absence of a flame signal, signalling the anomaly to the main flame control. The flame presence output is enabled or disabled according to the detection of a flame, independently of the status of the Start/Stop command.

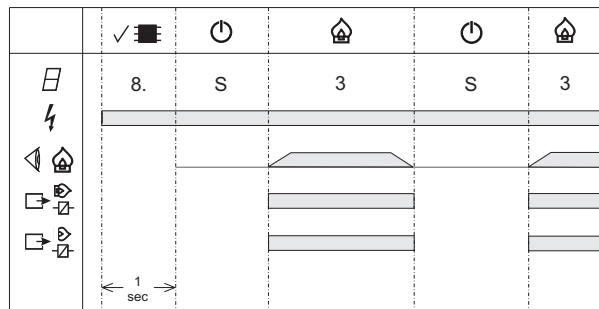


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In this mode of operation, the automatic start function of the ignition cycle is not available, but the ignition devices can be controlled and the status of the device can be checked by means of serial communication.

MODE 2 OPERATION

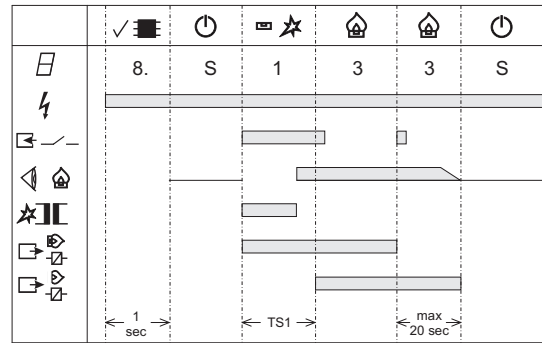
ESA REFLAM is configured with this mode of operation when used for flame detection only. In this mode of operation, the Start/Stop command has no effect and the ignited burner outputs and flame presence outputs are enabled or disabled simultaneously according to whether the flame is detected. In this mode of operation, only the flame failure response time can be modified, while, using serial communication, only the status of the device can be checked.



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MODE 3 OPERATION

ESA REFLAM is configured with this mode of operation when used to detect flame presence and to activate the ignition devices with semi-continuous command. By enabling the Start/Stop command, ESA REFLAM activates the ignition transformer and ignited burner output for the ignition time. It then deactivates the transformer and checks for flame presence holding the ignited burner output and enabling the flame presence output. In this mode of operation, the Start/Stop command must remain activated until the device detects the presence of the flame; it can then be deactivated. With flame detection active and the instrument in operation, it will disable the ignited burner output as soon as the Start/Stop command is enabled and wait until the flame is extinguished. In addition, the ignited burner output is disabled in the absence of a flame signal, signalling the anomaly. The flame presence output is enabled or disabled according to the detection of a flame, independently of the status of the Start/Stop command.

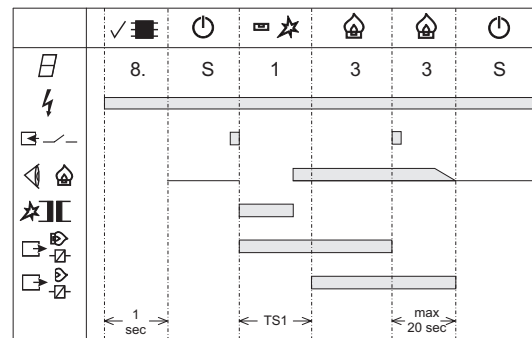


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In this mode of operation, the automatic start function of the ignition cycle is not available, but the ignition devices can be controlled and the status of the device can be checked by means of the serial communication.

MODE 4 OPERATION

ESA REFLAM is configured with this mode of operation when used to detect flame presence and to activate the ignition devices with pulsed command. By enabling the Start/Stop command, ESA REFLAM activates the ignition transformer and ignited burner output for the ignition time. It then deactivates the transformer and checks for flame presence holding the ignited burner output and enabling the flame presence output. In this mode of operation, the ignition devices are activated when the Start/Stop command is released, which must be an impulse. With flame detection active and the instrument in operation, it will disable the ignited burner output as soon as the Start/Stop command is enabled and wait until the flame is extinguished. In addition, the ignited burner output is disabled in the absence of a flame signal, signalling the anomaly. The flame presence output is enabled or disabled according to the detection of a flame, independently of the status of the Start/Stop command.

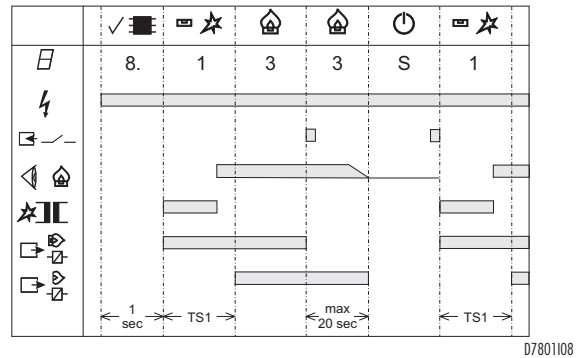


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In this mode of operation, the automatic start function of the ignition cycle is also available when the device is powered, and the ignition devices can be controlled and the status of the device can be checked by means of serial communication.

AUTOMATIC START OF THE IGNITION CYCLE

ESA REFLAM enables the ignition cycle to be automatically activated at power-on without waiting for the Start/Stop command or the ignition command from the serial communication. This function can only be selected with MODE 4 operation. By selecting automatic start, the instrument activates the ignition devices as soon as it is powered, but only if the power supply was previously cut without a lockout; otherwise the specific lockout would be indicated. If the Start/Stop command is enabled with flame detection active and the instrument in operation, the instrument will disable the ignited burner output and wait until the flame is extinguished. At this point, in order to carry out another ignition cycle, it is sufficient to enable the Start/Stop command or switch off and switch on the instrument again.

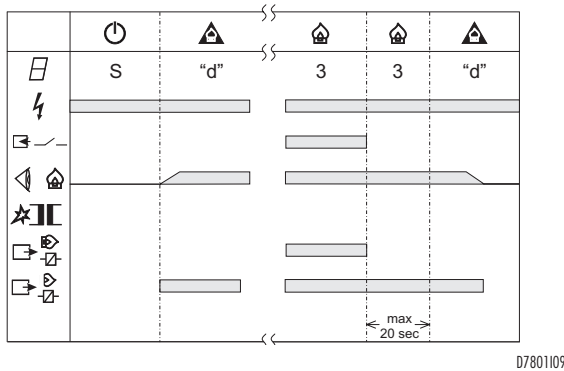


ILLEGAL FLAME PRESENCE

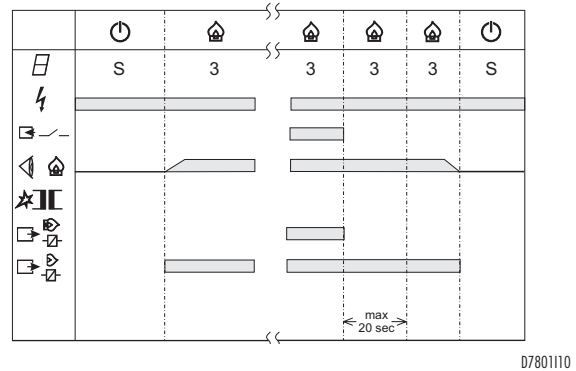
ESA REFLAM enables behaviour to be configured if an illegal flame is detected, selecting either shutdown in lockout with activation of an alarm, or an indication of flame presence and enabling of the relevant output. This function cannot be selected in MODE 2 operation.

The illegal flame presence can be signalled during the waiting phase or following a command to shut down after the twenty seconds allowed for the flame to extinguish.

ILLEGAL DETECTION LOCKOUT

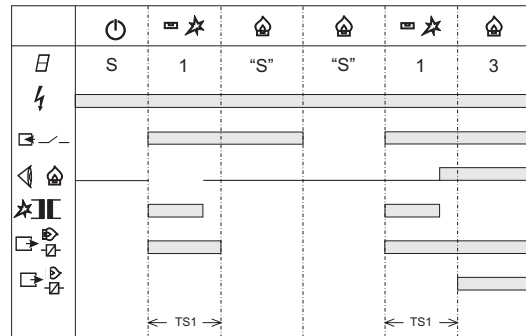


ILLEGAL DETECTION INDICATION



IGNITION FAILURE

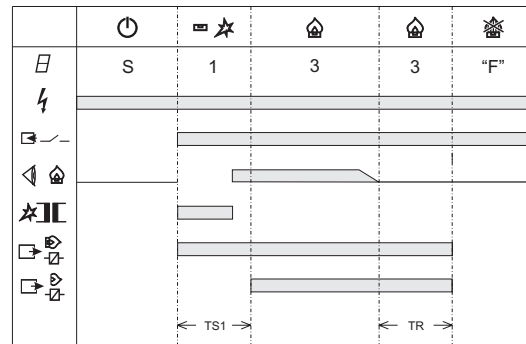
ESA REFLAM, at the end of every ignition cycle, deactivates the transformer and checks for flame presence, holding the ignited burner output until the ignition time has expired. If the flame is not detected during this phase, the device disables the ignited burner output and shuts down in lockout, displaying the relevant code. In order to start the ignition cycle again, the Start/Stop command must be given again or an "unlock" and "ignition" command sent by serial communication. This alarm is not available in MODE 2 operation.



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FLAME LOSS

ESA REFLAM, during steady operation, continuously checks for flame presence and if the flame signal is absent for a time greater than the response time, it disables the outputs and shuts down in lockout, displaying the relevant code. In order to start the ignition cycle again, the Start/Stop command must be given again or an "unlock" and "ignition" command sent by serial communication. This alarm is not available in MODE 2 operation.



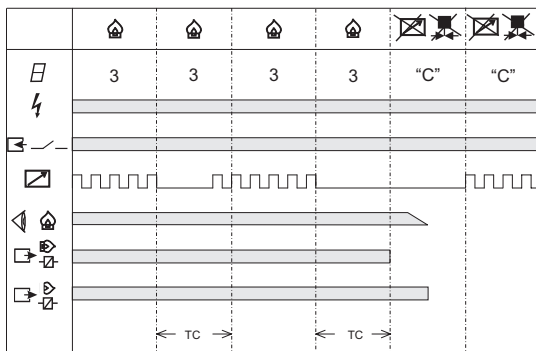
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COM-TIMEOUT ALARM

ESA REFLAM, if serial communication is absent, enables a Com-timeout alarm to be activated. This function can be used to stop the

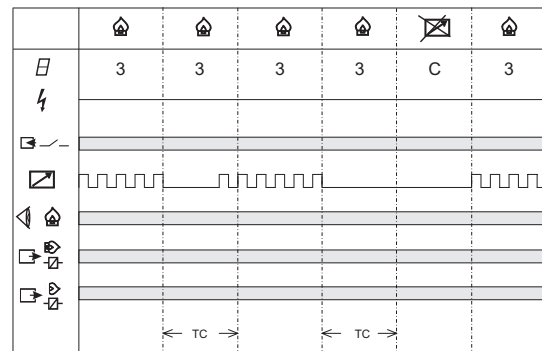
device, putting it in lockout or simply to display the anomaly. This function cannot be selected in MODE 2 operation.

COM-TIMEOUT LOCKOUT



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COM-TIMEOUT INDICATION



D7801114

STATUS DISPLAY

The display provides the operator with information concerning the device's operation. Fixed characters indicate normal operating conditions, while flashing characters indicate a lockout condition and require operator intervention.

DISPLAY	INDICATION	DESCRIPTION
8	FIXED	Self-diagnosis phase: the instrument checks the working order of its components. This occurs whenever the instrument is powered (duration approximately 1 sec).
S	FIXED	Phase waiting for the Start/Stop command or ignition command by serial communication when operating in MODEs 1, 3 and 4. Phase waiting for flame signal detection when operating in MODE 2.
d	BLINKING	Lockout due to flame signal detection during the waiting phase when illegal flame presence detection is enabled. The causes could be found in the detection system (faulty probe) or in the fuel control system. In this case, the flame presence output is enabled.
I	FIXED	Activation phase of the ignition devices, such as the ignition transformer and the ignited burner output.
S	BLINKING	Lockout due to flame not ignited at the end of the ignition phase. The causes could be found in the starting system: faulty electrode or transformers, or in the air and gas flows adjustment or in the detection system.
3	FIXED	Steady operation with flame detection. In this phase, the flame presence output is enabled and the ignited burner output held until shutdown is requested following a Start/Stop command or a serial command.
F	BLINKING	Lockout due to loss of flame signal during steady operation. The causes could be due to air or gas flow adjustment or the detection system.
H	FIXED	Waiting phase that appears if the device has received a stop command by serial communication.
C	BLINKING	Lockout due to prolonged lack of serial communication from the remote supervisor when the Com-timeout alarm is enabled. This condition occurs when the output disabling function is selected when the alarm is active.
C	FIXED	This indicates the prolonged lack of serial communication from the remote supervisor when the Com-timeout alarm is enabled. This condition occurs when the alarm indication function only is selected without the output disabling function.
b	FIXED	The forcing phase of the ignited burner output, which is independent of the status of the Start/Stop input and the detected flame. This condition occurs following a specific serial command.
0	BLINKING	Lockout due to a malfunction of the flame detection circuit caused by a short-circuited probe or by strong currents on the burner or furnace earth (e.g. welders, etc).
-	FIXED	The device is being configured via the serial input. During this phase, no operation can be performed.
11	FIXED	The device is being configured via the infrared input. During this phase, no operation can be performed.

CONFIGURATION PARAMETERS

The configuration determines ESA REFLAM operation, adjusting it to the requirements of the system. The parameters are modified using the dedicated ESA ELBP-100 software communicating via the ESA ECS-DRIVER interface. The modification is accepted by the device when in the waiting phase ("S" fixed). During configuration, only the instrument to be modified must be connected to the interface, discon-

necting all other devices connected to the ECS bus. Certain parameters are factory-determined and blocked by the manufacturer, while others can be modified by the user and then blocked, with a restriction that the block can only be removed by the manufacturer or whoever added them.

The software enables the following parameters to be modified:

PARAMETER	ACCESS	DESCRIPTION
Mode of operation	YES	Selection of the Mode of operation from the four available.
Ignition cycle start	YES	Power supply device behaviour: wait for the ignition commands or automatic start of the ignition cycle. This option can only be selected in MODE 4 operation
Ignition time	NO	Activation time of the ignition devices: can be set from 1 to 25 seconds, at the end of which the ignition transformer is deactivated and the flame presence is checked.
Illegal flame presence	YES	Flame detection behaviour in the waiting phase: Lockout, activating an illegal flame presence alarm, or an indication of flame presence with activation of the relevant output. This option cannot be selected in MODE 2 operation
Flame loss response time	NO	The time taken between the flame extinguishing and interception of the outputs. This time can be set from 1 to 9 secs.
Com-timeout time	YES	The maximum time that serial communication can be absent before the instrument activates the Com-timeout alarm; this can be set from 0 to 992 secs. By setting this parameter on 0, the Com-timeout alarms is disabled.
Com-timeout alarm	YES	Behaviour in presence of the Com-timeout alarm: lockout with disabling of the outputs or only anomaly displayed.
Communication baud rate	YES	Reception speed of data from the bus ECS, which must be equal to that selected for the transmission devices (4800 bauds or 9600 bauds). If changing the current speed, it will only have effect at the end of the configuration.
Serial segment	YES	For the serial communication, this identifies the device as a zone or unit of origin. All alphanumeric characters are considered valid (0-9 and A-Z upper-case)
Serial node	YES	For the serial communication, this identifies the device as a unit within a group or a zone. All alphanumeric characters are considered valid (0-9 and A-Z upper-case)

The serial address of the device can also be configured by means of the infrared programmer ESA PROG-1.

SERIAL COMMUNICATION

ESA REFLAM enables serial communication with the control devices (PC, PLC, DCS) by means of the ECS protocol and interface, and using suitable interface and/or protocol converters, communication with the instrument can occur by making use of the most common protocols such as Profibus-DP, Device-Net, etc. The device in the network is Slave and responds only to a request from the Master. The ECS communication protocol involves the use of strings consisting 7 ASCII cha-

acters and is configured for 8 data bits, no parity, 1 or 2 stop bits, 4800 or 9600 bauds. ESA REFLAM responds when it receives a command from the control device, giving the current status and then carries out the requested command. Only if using cumulative commands with several instruments ESA REFLAM does it carry out the command but not respond.

COMMANDS FROM THE CONTROL DEVICE TO ESA REFLAM

Below are the commands accepted by the ESA REFLAM device.

COMAND	ASCII VALUE	HEX VALUE	DESCRIPTION
Ignition	R	52	Command to activate the ignition devices that is accepted by the instrument when in the waiting phase (S fixed or H)
Remote stop	H	48	Command to shut down that determines the interception of the ignited burner and the ignition transformer outputs This command is accepted by the device when in the ignition phase or in steady operation (1, 3, b, S fixed)
Unlock	B	42	Unlock command that puts the device into the waiting phase. This command is accepted by the device when in lockout (d, S flashing, F, C, etc)
Status request	S	53	Device status request command; the device responds giving the current status
Ignited burner output activation	L	4C	Forcing command of the ignited burner output that determines the direct activating of the output. This command is accepted by the device in every status: steady operation, waiting phase, lockout (1, 3, H, S fixed, d, etc).
Ignited burner output deactivation	I	6C	Command to deactivate the ignited burner output previously forced. This command is accepted by the device when forcing of the ignited burner output is in progress (b)

Note that by activating the forcing command of the ignited burner output, in order to maintain this condition, it is necessary to send the same command to the device, as all other commands including status request will disable the output.

RESPONSES FROM ESA REFLAM TO THE CONTROL DEVICE

Below, the responses given by the ESA REFLAM device are listed.

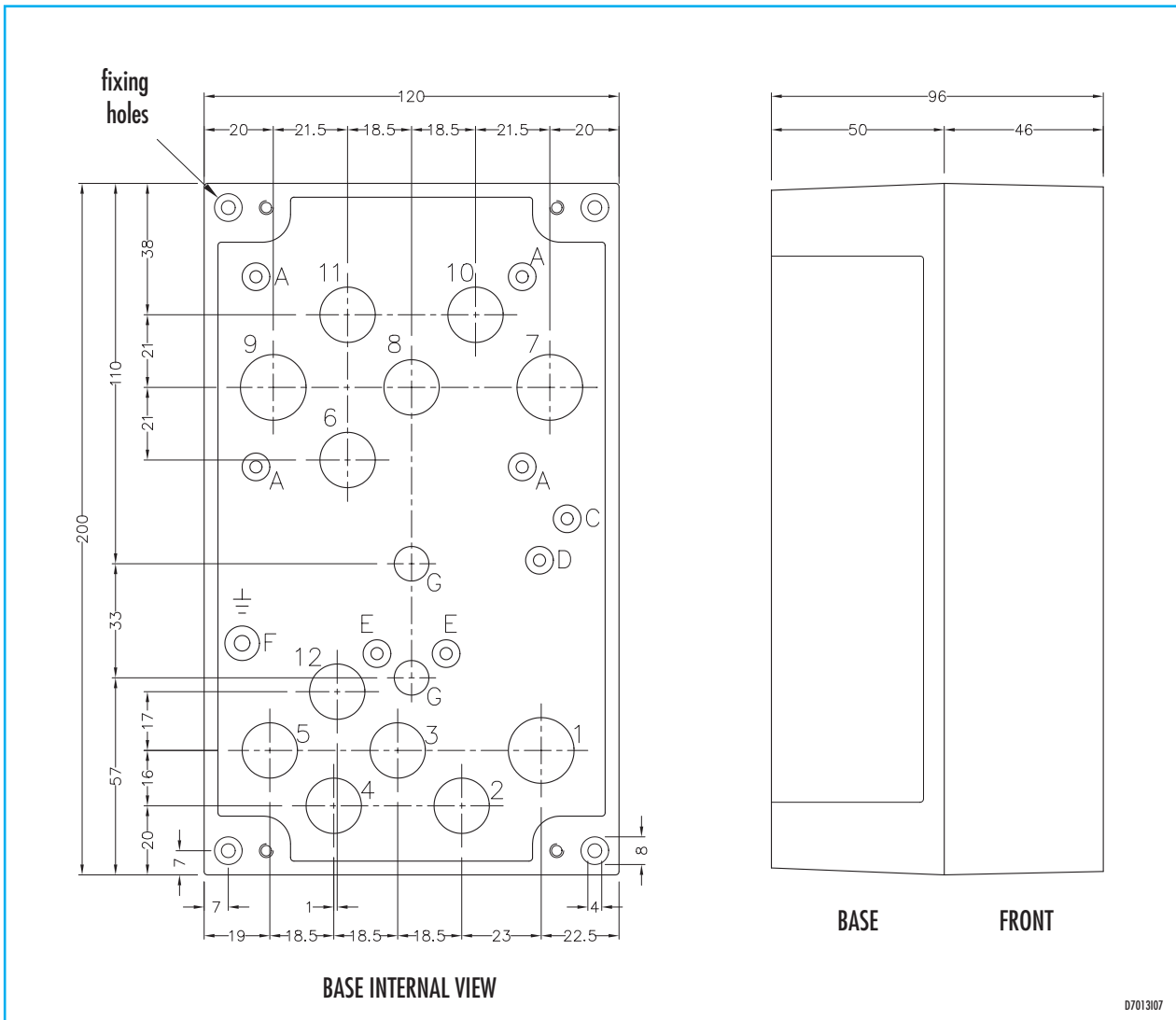
STATUS	ASCII VALUE	HEX VALUE	DESCRIPTION
Wait	V	56	Waiting status of the ignition or flame detection command. This status is given when the device is powered or following shutdown or unlock commands sent using the Start/Stop command.
Remote stop	H	48	Waiting status of the ignition or flame detection command. This status is shown following a previous Remote stop command.
Ignition	I	31	Activation status of the ignition transformer and the ignited burner output.
Steady operation	3	33	Steady operation status with flame detection.
Generic lockout	S	53	Generic lockout status of the device.
Ignition failure	U	55	Lockout status due to flame not detected at the end of the ignition phase.
Flame loss	F	46	Lockout status due to the loss of the flame signal during steady operation.
Illegal detection	D	44	Lockout status due to detection of a flame signal during the waiting phase when the lockout for the illegal flame presence is enabled.
Forcing ignited burner output	L	4C	Forcing status of the ignited burner output with flame detection.
Forcing ignited burner output	I	6C	Forcing status of the ignited burner output without flame detection.

INSTALLATION

Follow these instructions to install the device correctly:

- Avoid placing the ESA REFLAM near intense magnetic or electric fields and in conditions where it may be exposed to direct sources of heat or products from combustion, corrosive liquids, solvents or gases.
- Installation must be performed by qualified staff in compliance with regulations in force at the time and in the place of installation.
- A minimum protection class of IP40 on the casing must be always guaranteed when installing the device.
- Electrical connection of this device is considered permanent. Check that it is connected correctly after installation. Inversion of the phase/neutral connection could compromise the safety of the instrument.
- Before powering the instrument, ensure that the voltage, frequency and capacity are correct, and check that the users do not have an absorption greater than the maximum capacity of the output contacts.
- When carrying out the electrical connection, refer to the technical documentation, observing the polarity between the phase and neutral. The terminals for the electric connection are of the screw type and can accept conductors with a cross section 0.5 to 2.5mm²; the choice of the conductors and the positioning must be suitable for the application.
- The flame detection cables must be laid separately from the other conductors and therefore the use of multi-polar cables is not permitted, nor is the use of shielded cables.
- The detection probes and any connectors must be insulated and made inaccessible by using suitable guards, thereby allowing access only to authorised staff; if needed, warnings should be placed near the probes.
- Always make sure that the protection earth is connected to the appropriate terminals and to all the metals casings of the elements connected with suitable conductors.
- When using the remote Start/Stop input, the RC filter supplied must be connected.
- If used with several burners, do not carry out parallel connection between the outputs of the instruments. If the system is controlled by the serial communication, follow the specific wiring instructions.
- The laying of the communication line must always be carried out separately from the power supply lines, motor control (inverter) and the mains voltage and in particular, neither MULTIPOLAR nor SHIELDED cables must be used.
- Use the ECS CABLE or unipolar cables with a cross section greater than 0.5mm² for communication lines; as an alternative, we recommend using the busway system, bearing in mind that a maximum length of cable of 1 m must be used between the busway and the instrument for both communication and power supply lines.
- Before any operation, ensure that the instrument is disconnected, remembering to number the conductors.
- If REFLAM does not work, it should be sent back to the manufacturer for repair. Modifications or repairs by third parties are not permitted.

DIMENSIONS



Preformed holes	Diameter mm	Connector
1	19	M20x1 - PG 11
2 - 3 - 4 - 5 - 12	16	M16x1 - PG 9
6 - 8 - 10 - 11 *	16	M16x1 - PG 9
7 - 9 *	19	M20x1 - PG 11

* When transformer is present, it is not possible to use preformed holes No. 6÷11

Item	Description
A	Plugs for transformer TAR-10
C	available
D	available
E-E	available
F	terminal for grounding
G-G	fixing holes for collar (pipes Ø 1/2") - screw M6

ORDERING CODE

ESA REFLAM



OPERATION MODE	
Continuous start command (Mode 1)	1
Flame detection only (Mode 2)	2
Semi-continuous start command (Mode 3)	3
Pulse start command (Mode 4)	4

START OF THE IGNITION CYCLE AT POWER-ON	
Wait for start command	S
Automatic ignition (only for mode 4)	A

IGNITION TIME	
From 1 to 25 second	(*)

ILLEGAL FLAME PRESENCE	
Not checked	N
Lockout stop	Y

SUPPLY VOLTAGE	
115 V ac +10 -15%	115
230 V ac +10 -15%	230

SPECIAL VERSION	
Standard	/
Internal ignition transformer	T
Rack version	R
Pre wiring	C
ESA TRAF0 coupled box	A

COMMUNICATION BAUD RATE	
4800 baud	4
9600 baud	9

COM-TIMEOUT ALLARM	
Only indication	/
Lockout stop	S

COM-TIMEOUT TIME	
From 0 to 992 second	(*)

FLAME FAILURE RESPONSE TIME	
From 1 to 9 second	(*)

(*) Please, write time value (in second)



NOTE: Based on the company's policy aimed at a continuous improvement on product quality, ESA-PYRONICS reserves the right to bring changes to the technical characteristics of this device without previous notice. Our catalog updated to the latest version is available on our web site www.esapyronics.com and it is possible to download modified documents

WARNING: When operating, this combustion system can be dangerous and cause harm to persons or damage to equipment. Every burner must be provided with a protection device that monitors the combustion. The installation, adjustment and maintenance operations should only be performed by trained and qualified personnel.