



SureFire II™ Pilot Forced Draught Gas Pilot type SP-32-xx-FD Instruction Manual

1. INTRODUCTION

This Instruction Manual contains a description of the type SP-32-xx-FD gas pilot construction, operation principle and the instructions for installation, start-up and service, including the industrial health & safety recommendations.

The SP-32-xx-FD forced draught (xx = NG - Natural gas or PG - Propane gas) gas pilot is a reliable and effective source of ignition for oil and gas burners.

The pilot is constructed of high quality materials and each unit is checked and tested before dispatch.

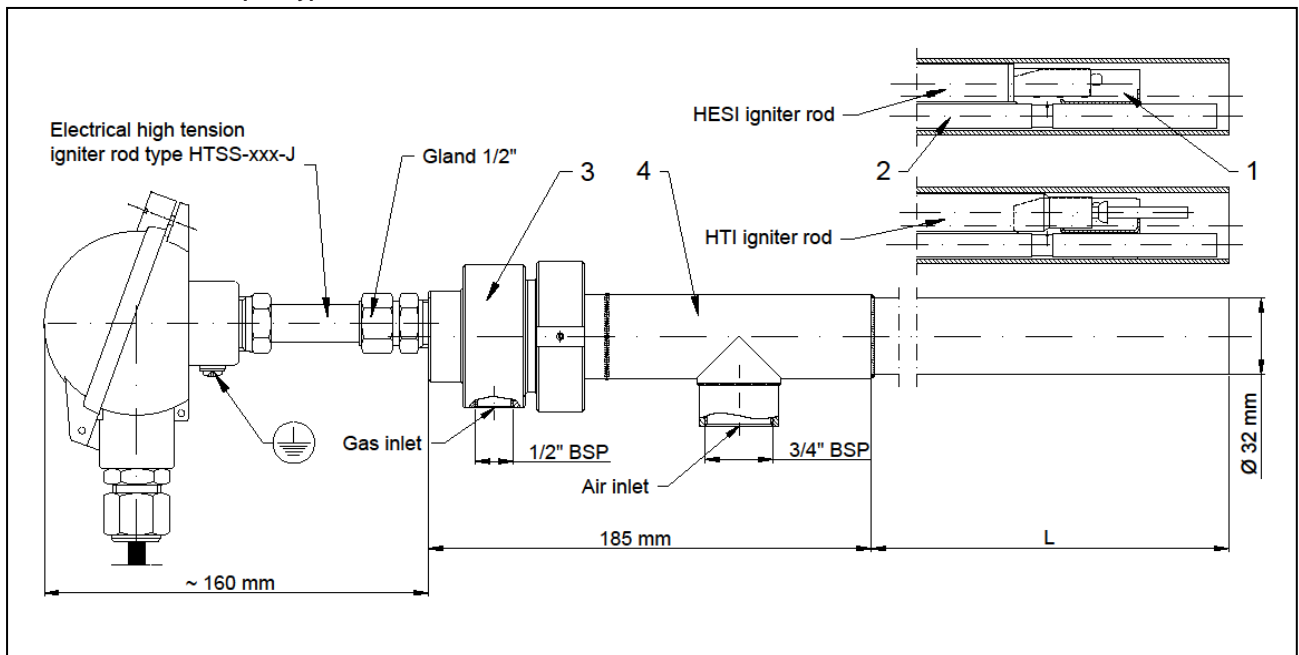
Acquaintance with the following instructions and strict attention to the indications reduce the possibility of equipment failure to a minimum and ensure safety during normal operation.

2. OPERATION PRINCIPLE AND TECHNICAL SPECIFICATION

Unit construction provides a stable flame, ignition repeatability, low demand for combustion and cooling air. No moving parts ensures long, trouble-free operation with low maintenance costs.

SP-32-xx-FD can operate as an intermittent (light-off), or as a continuous pilot.

FIGURE 1. Gas pilot type SP-32-xx-FD.



Main parts of SP-32-xx-FD pilot are: air tube (pos. 4 on Fig. 1) and gas part assembly including gas head (pos. 3) with gas inlet (1/2" BSP) and ignition rod hole (1/2" BSP) with igniter rod holding gland together with the fixed gas tube (pos. 2). The orifice-stabilizer assembly (pos. 1) is fixed at the end of gas tube. Gas part assembly is mounted in the air tube by means of the thread joint with mounting ring equipped with the small locking screw.

In many applications SP-32-xx-FD is mounted on the main burner using the mounting tube (see p.3).

The source of ignition is an electrical high energy spark igniter (HESI) or high tension arc igniter (HTI) for safe or hazardous area (depending on the application) equipped with the ignition rods of outer diameter of 16 mm and coaxial electrode arrangement.

The ignition rod is mounted in the gas head and goes through air tube to the mounting bracket of orifice-stabilizer assembly. The rod tip end should be placed as on drawing Fig. 4 (depending on the kind of ignition device), to provide a successful ignition of air-gas mixture.

Gas pilot SP-32-xx-FD can be supplied together with electrical ignition device selected depending on the application. Ignition device is not in gas pilot scope of supply and should be ordered separately.

SP-32-xx-FD pilot principle of use: gas is supplied through the inlet 1/2" BSP to the gas head and to the gas tube and orifice-stabilizer assembly. Gas exits the main nozzle to the primary combustion zone. At the same time a small amount of gas leaves through the bleed orifice between the stabilizer wings, passing into the zone where it mixes with air to form a combustible mixture.

Ignition is initiated by a spark or an electric arc generated at the tip of the igniter rod in stabilizer zone. The main flame stabilizes in the primary combustion zone, at the outlet of the air tube.

Thanks to this principle of design, the pilot combustion zone is protected, the main combustion zone is outside the pilot, and hence the air tube does not become hot and there is no need for retraction of the ignition device rod.

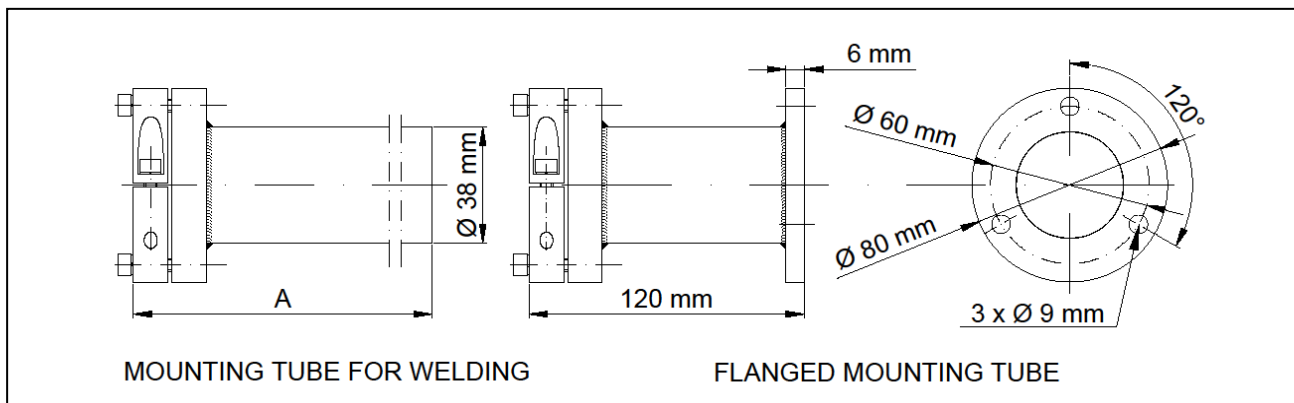
The flame length is 0.3 – 0.5 m depending on the kind of gas and air and gas pressures.

In addition, using high tension igniter for ignition, it is possible to use an integrated ionization detector to confirm the presence of flame. The center electrode is extended into the primary combustion zone.

The HT igniter creates the electric arc to ignite the gas, and then the electric circuit switches the operating mode for ionization detection, confirming the presence of the igniter flame.

3. MOUNTING TUBES

FIGURE 2. Pilot mounting tubes: for welding and flanged



For fixing the pilot burner to a burner plate there are two types of mounting tubes available (material: carbon steel, grease protected), offered as an optional accessory, to be ordered separately:

- a flange mounting tube allowing the fixing of a gas pilot without the use of welding (Fig. 2), to be fixed with the bolts to the burner plate. After inserting the pilot into the mounting tube its position is determined and secured with a clamping ring located at the end of the tube assembly. This ring also provides the necessary sealing for the connection,
- pilot mounting tube for welding (Fig. 2), should be welded to the burner plate. Igniter fixing inside mounting tube as in p. 7.1. There are two lengths A available: 150 and 600 mm

4. IGNITION SOURCES FOR GAS PILOT LIGHT-OFF. (SETTING METHOD)

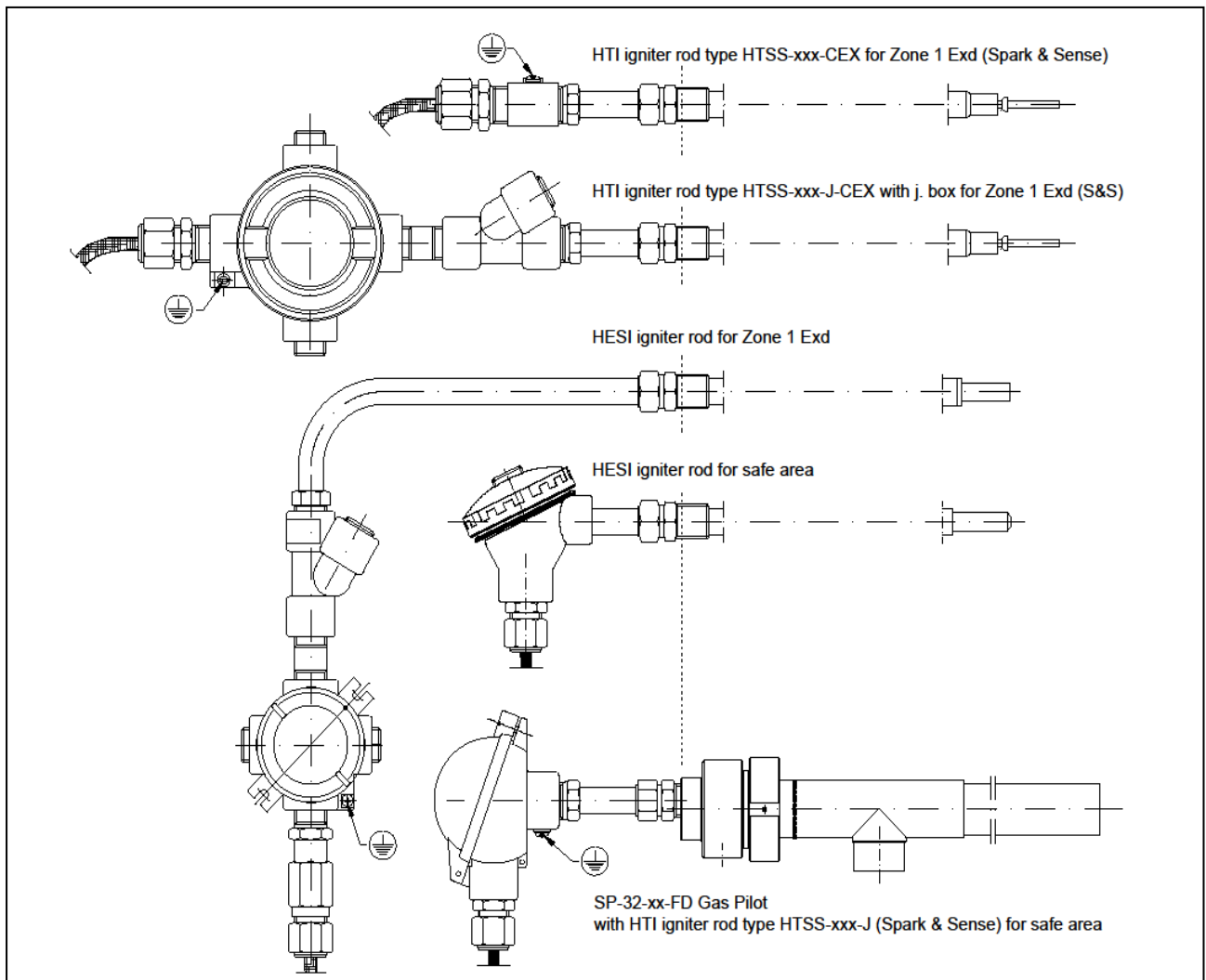
Sources of ignition of the gas in the gas pilot SP-32-xx-FD are electrical high energy spark igniters (HESI) or high tension igniters (HTI) equipped with the ignition rods of outer diameter up to 16 mm and coaxial electrode arrangement:

- high energy spark igniter (HESI): this type of device creates single sparks of a high energy of 12J. With frequency of 4 to 5 sparks per second it ensures reliable ignition of a gas/air mixture under all conditions. The secondary circuit voltage is nominally 2000 VDC at primary supply 230VAC or 110 VAC,
- high tension igniter (HTI): this type of device creates an electrical arc of low energy which allows for ignition of a gas/air mixture in clean environment and repeatable conditions. The secondary circuit voltage is 8 000 VAC at primary supply 230VAC or 110 VAC.

Using the Fireye High Energy Spark Igniter, the rod must be pushed up to contact of the edge of the outer rod tip tube with the wings of the stabilizer. In all applications, the sparking surface should be downstream of the bleed orifice outlet (see Fig.1 and 4).

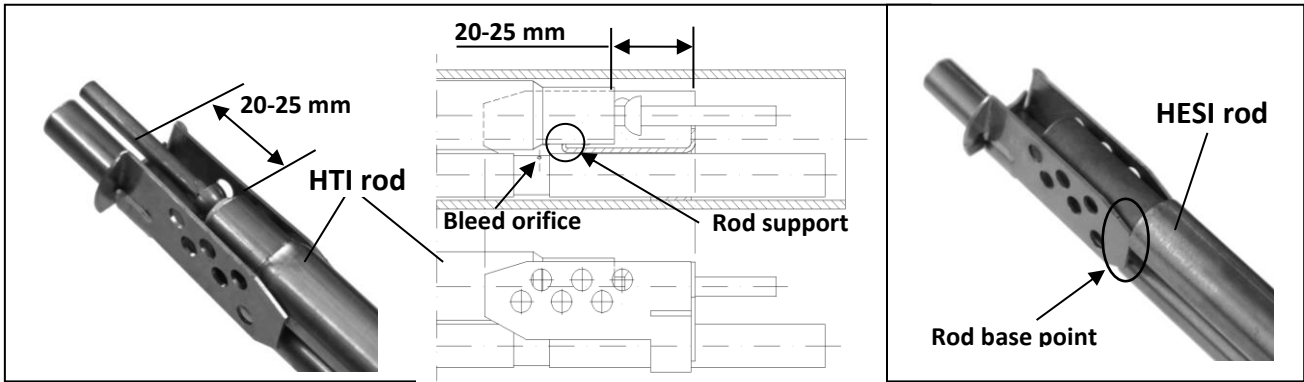
In case of the High Tension Igniter mounting, the end of the rod tip should be placed at a distance of 20-25 mm back from the stabilizer front plate (see Fig.1 and 4) also the way that the electrical arc should be downstream the bleeding orifice outlet. The outer tube of HTI rod should rest on the small metal ledge of stabilizer assembly to prevent HTI central electrode contacting the body of the gas igniter

FIGURE 3. Gas pilot type SP-32-xx-FD with examples of electrical ignition devices



The rods of both types of devices are mounted in gas head by means of the holding gland 1/2" BSP. Ignition device is not in gas igniter scope of supply, it is specified and ordered separately.

FIGURE 4. Rod tip position of electrical igniters in stabilizer assembly of igniter type SP-32-xx-FD



5. TECHNICAL DATA

Fuel	Natural Gas / Propane Gas - other fuel gases upon request						
Outer diameter of the air tube	32.0 mm						
Outer diameter of the mounting tube	38.0 mm						
Outer diameter of the ignition rod	≤16.0 mm						
Capacity range:	<table border="0"> <tr> <td>Natural Gas</td> <td>19 ÷ 37 kW at 20 ÷ 80 kPa (see Appendix 1)</td> </tr> <tr> <td>Propane Gas</td> <td>28 ÷ 52 kW at 20 ÷ 80 kPa (see Appendix 1)</td> </tr> <tr> <td></td> <td>- other fuels and capacities upon request</td> </tr> </table>	Natural Gas	19 ÷ 37 kW at 20 ÷ 80 kPa (see Appendix 1)	Propane Gas	28 ÷ 52 kW at 20 ÷ 80 kPa (see Appendix 1)		- other fuels and capacities upon request
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	- other fuels and capacities upon request						
Air flow	max. ~ 30 m ³ /h – adjust to capacity as in p. 8.11						
Air pressure range	0.5-1.0 (max. 1.2 kPa)						
Air connection	3/4" BSP (inner thread)						
Gas connection	1/2" BSP (inner thread)						
Igniter rod length range	500÷3000 mm - longer upon request						
Material used for pilot construction	all parts 304/316 SS, heat-resistant steel						

- Notes:**
1. If the above parameters are different than those required please contact Fireye
 2. For Imperial Units please refer to the Appendix 3 Unit Conversion Table
 3. Device comply with the requirements of the European Directive 2002/95/EC (RoHS)

6. OPERATIONAL SAFETY

When operating and handling the pilot burner please follow the rules below:

- 6.1 Use pilot only for its intended purpose.
- 6.2 At the time of installation, operation and maintenance follow the procedures described in the instructions and documentation of the pilot, ignition device and the main burner.
- 6.3 Follow the warnings contained in the documentation.
- 6.4 Do not make any modifications or changes to the pilot construction.
- 6.5 Before starting, make sure that all parts of the pilot and electric ignition device are in good condition.
- 6.6 Circuits of power packs as well as igniter rods, enclosures and junction boxes must be properly grounded.
- 6.7 Before igniting, check the tightness of gas tube connections
- 6.8 During the observation of the pilot flame wear special goggles to protect the eyes from UV radiation of the flame.



- 6.9 Do not remove the protective ground when the ignition device is energized.
- 6.10 Before working on the ignition device, ensure the power is disconnected.
- 6.11 Before maintenance or repair works check that the gas shut-off valve is closed.
- 6.12 During installation, start-up or maintenance works on the pilot or burner/ heater always wear protective clothing and use protective gloves.

WARNING: ALL ACTIONS RELATED TO THE INSTALLATION, SERVICE AND OPERATION OF GAS PILOT MAY ONLY BE CARRIED OUT BY A TRAINED AND QUALIFIED PERSONNEL.

7. INSTALLATION

During the installation, all components have to be protected from impact or bending.

Pilot SP-32-xx-FD is designed such that it can be welded directly to the burner plate, or placed in the mounting tube (see Figure 2.)

It should be noted that the distance from the gas head with mounting ring to the burner plate should be not less than 150mm.

Pilot air tube is made of stainless steel, mounting tube is made of carbon steel which must be noted for welding.

REMARK: IN CASE OF ANY DOUBTS REGARDING INSTALLATION OF THE PILOT CONSULT WITH THE MANUFACTURER.

7.1 MOUNTING TUBE

The mounting tube, if used, should be attached to the burner plate using bolts or welding (see Fig. 2). If it is not possible to use one of mounting tubes proposed above, a different type can be used, bearing in mind that its inner diameter should be properly matched to the outer diameter of the pilot air tube to be able to fit and fix the pilot in a tube with proper clearance.

In the case of application including a mounting tube proceed the following way:

- a) Based on assembly drawings mark and cut a hole in the burner plate with a diameter slightly larger than the diameter of the mounting tube.
- b) The mounting tube for welding: slide the mounting tube in the hole and set it in the correct position (insertion depth and proper angle relative to the main burner nozzle position).
- c) The mounting tube for welding: weld using the electrode appropriate for the material.
- d) If the flanged mounting tube is used, bolt it to the burner plate after drilling the correct sized holes.
- e) For both types of mounting tube the clamp assembly with screws provides a fast and reliable mounting and dismounting of the pilot.

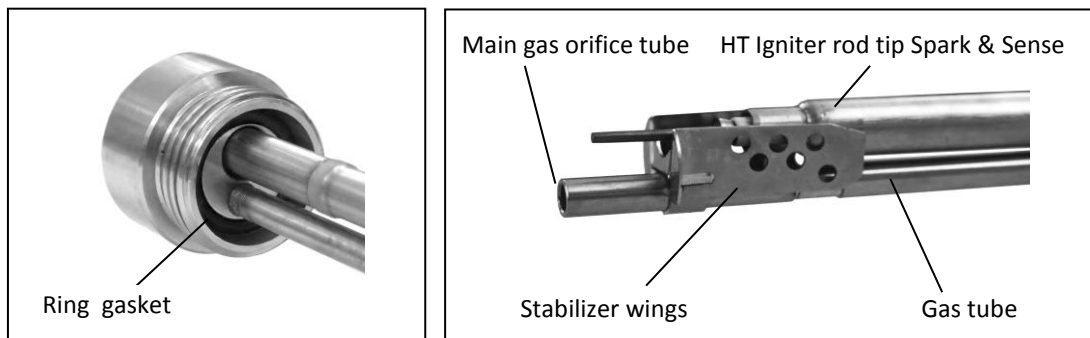
7.2 GAS ASSEMBLY AND AIR TUBE

- a) The position of the electrical igniter rod tip in relation with the orifice-stabilizer assembly of pilot should be checked following information in p.4. The correct position for different types of electrical igniter rods should be taken into consideration. The rod tip should be placed between the bleed orifice and the stabilizer plate (see Fig. 1 and 4).
- b) In case of necessary corrections loosen the rod holding gland and set the appropriate position. If the rod of electrical igniter is supplied separately, insert the rod in rod holding gland and then in gas part assembly and set the appropriate tip position following the above instructions. If there are problems sliding the rod through fixing gland apply a small amount of high temperature resistant grease or grind slightly the gland ring inner surface.

After setting the correct position, fasten the rod fixing gland in the gas head and the complete gas tube assembly can be slid into the air tube.

- c) Gas part assembly and air tube should be fastened by the mounting ring thread joint. Ensure that the ring gasket is correctly fitted in the gas head seat (see Fig. 5). The mounting ring small locking screw should be tightened to prevent the ring from accidentally unfastening.
- d) The complete pilot (air tube) can be inserted into the mounting tube. In order to make the air tube slide-in easier apply a small amount of high temperature resistant grease.
- e) The insertion depth of SP-32-xx-FD pilot is determined by the design of the main burner. If an existing pilot has to be replaced, the insertion length and pilot tip position should be the same. In case of any doubts, the position of the pilot should be consulted with the pilot and burner manufacturer.
- f) After determining the position of the complete pilot relative to the mounting tube, the mounting tube clamping screws should be tightened to prevent the device from moving.

FIGURE 5. Gas head with ring gasket and orifice-stabilizer assembly



7.3 GAS AND AIR SUPPLY INSTALLATION

- a) The pilot must be set in the mounting tube such that the air and gas connections are in the desired positions.
- b) Connect the air and gas hoses to the appropriate pilot inputs. Hoses cannot be tangled or twisted. If necessary, additional connectors may be used.
- c) To ensure a long and trouble-free operation of the pilot it should be kept clean. Take care of the air and gas tube and orifice-stabilizer assembly patency. Hoses should be dry and not cracked.
- d) During maintenance or service works, secure the disconnected ends of the hoses by closing the ends with a plug or a tape.
- e) Use the automatic shutoff valves of the appropriate size and the respective closing rate (compliant with the requirements of relevant standards concerning the shut-off safety fuel valves) to be sure that the gas delivered to the pilot is of an adequate pressure and can be quickly and effectively shut off.
- f) Use manual shut-off valves on air and gas lines for each pilot in case of maintenance or replacement and for adjustment of pressure and flow on each pilot separately.

REMARK: AT DESIGN STAGE DETERMINE LENGTH OF CABLES AND FLEXIBLE AIR AND GAS CONNECTIONS TO ACCOMMODATE ANY EXPECTED HEATER OR BOILER CONSTRUCTION MOVEMENT

7.4 CABLING

Wiring and electrical connections design and layout should be in accordance with the requirements for burner installation devices specified in their instructions and the relevant regulations.

8. PILOT START-UP, OPERATIONAL TESTS

Before proceeding with the start-up and operational tests of SP-32-xx-FD pilot check the following:

- 8.1 Gas and air installations are correctly mounted, tight and functionally checked, including: valves, flaps, strainers, fittings and joints (flanged and screwed), control and interlock devices.
- 8.2 Gas and air connections to the pilot are made in accordance with the above instructions and the assembly drawing.
- 8.3 Electrical components and circuit of the ignition device are properly connected, grounded and tested.
- 8.4 Power supply to the electrical circuit of the ignition device and spark or arc release should be allowed only after assembly of the device, and when installed in the operating position on the burner or outside the burner only to validate the operation strictly according to the device instructions.

Then perform next steps:

- 8.5 Select one pilot as a representative for tests.
- 8.6 Prepare the burner control system to enable manual trials in a safe way.
- 8.7 Install for the trial period appropriate gauge and manual valve on the igniter gas supply line. This will allow for fine adjustment of the gas pressure.
- 8.8 After verification of ignition device mounting and wiring, the electric igniter can be powered up. Check for the spark or arc presence.
- 8.9 At presence of a spark or an electric arc from ignition device, slowly open the pilot manual shut-off gas valve without opening the air manual shut-off valve. At a certain degree of opening the pilot flame should establish.
- 8.10 Adjust the gas pressure slowly up to the working pressure. Pilot flame may be yellow and bushy due to too little combustion air.
- 8.11 Slowly open the air valve manually until the flame stabilizes at the end of the air tube and is a blue-yellow color. If the air is too little the end of the air tube may start to glow as the main flame burns inside the igniter. Further opening of the air valve should stabilize the flame outside the air tube. This will stop the overheating of the air tube. Flame should be as stable as possible.

Notes:

 1. Pilot flame should be blue near the igniter tip and yellow at his end. With some gases the flame color may stay yellow.
 2. In some applications e.g. on up-fired burners, when the draught of the furnace is significant, it may be necessary to limit the amount of air by closing the air valve accordingly in order to keep stable pilot flame.
 3. Gas pilot has turn-down ratio is 1:1. It should ignite repetitively and burn with a stable flame in each nominal pressure point throughout the whole range after proper adjustments.
- 8.12 In case of insufficient pilot capacity, the amount of gas and air can be further adjusted bearing in mind the above principles.
- 8.13 In case of multiple burner and pilot applications on one heater/boiler with a similar gas and air supply installation and similar layout on the main burner, set the other pilots gas and air valves to be in the same position.
- 8.14 Then carry out light-off tests. In case of differences in the quality of combustion adjust manual valves so that the flame is similar to that on the test pilot. In some cases the main burner air should be adjusted.
- 8.15 Repeat the light-off tests several times on each pilot to confirm the repeatability of ignition. Flame should be stable, in proper position and of desired shape.

If the SP-32-xx-FD gas pilot has been correctly commissioned and the settings were optimized, with correct maintenance, the igniter will operate trouble free.



9. OPERATION

After installing and completion of pilot start up and tests SP-32-xx-FD is ready for operation.

General description of activities performed by the burner/boiler control system or manually by the operator:

- 9.1 Preparation the furnace/boiler for firing up.
- 9.2 Opening of air to the burner and pilot.
- 9.3 Preparation of gas installation for operation.
- 9.4 Setting the gas pressure at the correct level.
- 9.5 Starting of pilot trial for ignition sequence performed by the controller or in some cases by the operator:
 - a) The correct setting of the main burner combustion air.
 - b) Checking the interlock conditions before firing up.
 - c) Providing power to the ignition source.
 - d) Optionally, carrying out the gas line leakage test.
 - e) Closing the purge valves and opening of gas shut off valves.
 - f) The ignition should take place within the time specified by the standards, which should be confirmed by the relay output of the flame detector.
 - g) Electrical igniter power off after confirming the presence of the pilot flame, closing the pilot shut off valves (in case of continuous pilot operation they stay open).
 - h) In case of the absence of the flame after trial for ignition - the valves are closed and electrical igniter is switched off.
 - i) Eventual repeating of trial for ignition sequence (depends on the application). Details of sequence, timings are dependent on application and standard applied.

In the case of a manually controlled gas pilot, the operator has to close the gas supply to the pilot himself at the right time if the flame is not detected.

10. SERVICE, MAINTENANCE AND REPAIRS

To remove the igniter for inspection or repair the gas and electrical supply must be shut off first. Check that the gas and air manual shut off valves are closed and that the power for ignition device is disconnected.

WARNING: DO NOT PERFORM ANY MODIFICATION OF THIS PRODUCT ON YOUR OWN AND DO NOT USE OTHER PARTS THAN ORIGINAL. DANGER TO LIFE AND HEALTH!

WARNING: WHEN THE HEATER/BOILER IS IN OPERATION, DURING SERVICE WORKS ON BURNER INSTALLATION ALWAYS USE PROTECTIVE CLOTHING, GLOVES AND GOGGLES!

REMARK: EVERY 12 MONTHS MAKE AN INSPECTION OF AIR TUBE. IF YOU SEE ANY TRACES OF TOO HIGH TEMPERATURE DURING OPERATION INCREASE THE COOLING-COMBUSTION AIR FLOW OR RETRACT THE GAS PILOT A LITTLE FROM THE COMBUSTION CHAMBER. INCREASING THE AMOUNT OF AIR REMEMBER THAT IT MAY HAVE THE BAD EFFECT ON THE FLAME QUALITY.

10.1 INSPECTION AND MAINTENANCE

SP-32-xx-FD pilot because of its simple design does not require complicated maintenance procedures.

Checking and cleaning of gas tube and orifice-stabilizer assembly:

- a) Close the manual gas valve and disconnect the pilot gas line.
- b) Disconnect the ignition rod electric supply cable.
- c) Unscrew the locking screw and the mounting ring.
- d) Carefully slide out the gas part assembly from the air tube.
- e) Pull out the electrical igniter rod by loosening the ignition rod holding gland.
- f) Check and clean the bleed orifice and main nozzle. For cleaning use a soft copper wire.
- g) To remove heavy dirt use a soft wire brush e.g. copper wire brush.
- h) Blow compressed air through the whole gas part assembly.
- i) To check the air tube condition loosen the mounting tube clamp assembly screws and pull out air tube. Check for overheating traces and clean it.
- j) Assemble all the elements back to obtain the original configuration.

Checking of ignition device:

- k) Remove and check the ignition rod at least every 12 months. Follow the instructions in the ignition device User's Manual.

10.2 TROUBLESHOOTING

If the gas pilot does not work properly check first:

- a) All manual gas valves on gas supply line were open and there is gas available.
- b) All valves in the supply line are functioning properly.
- c) The preset gas pressure is correct.
- d) The correct pilot air pressure is maintained.
- e) Gas and air supply lines are clear - check strainers.
- f) Bleeding orifice and the main orifice in orifice-stabilizer assembly are clear.
- g) Electric ignition device is working correctly and its rod is correctly positioned in gas part assembly. If it is not working properly - follow the ignition device manual.
- h) The power parameters for ignition device are correct.

If the gas lights but the flame is unstable, or goes out when main burner goes into operation, check that:

- i) The gas pressure does not drop during pilot light-off (trial for ignition).
- j) The air pressure is always at the correct level.
- k) The air from the main burner does not blow out the pilot flame or does not move it out of the field of view of the flame scanner (if applied).
- l) Flame monitoring system works correctly and the flame is not obscured.

Improper operation of the whole installation requires the detailed checking of the power line, all components, including the temporary use of override switches or bridges.

Be aware of all connections to be later restored to normal state, to allow safe operation.

11. STORAGE

SP-32-xx-FD gas pilot should be stored in a clean and dry place and in its original packaging.

In case of long length pilots, always keep them in a horizontal position by supporting both ends and in the middle. It should also be protected from contamination using caps on gas and air inlet and pilot outlet and covering with foil.

Storage over 30 days: relative humidity of no more than 85%, temperature below 50°C.

12. ORDERING INFORMATION

Before ordering, please provide the data as in Appendix 2.

The Table 1 below shows examples of the Part Numbers every 0.5 metre and the fuel options of Natural Gas or Propane Gas.

Pilots can be ordered in size increments of 0.1 metre lengths, from 0.5 to 3.0 metres.

Part Number coding samples:

SP-32-NG-FD-1.5 or **SP-32-PG-FD-1.5**

which means: SureFire II Pilot - 32 mm OD - Natural Gas (NG) or Propane Gas (PG) - Forced Draught - 1.5 metre insertion length

Table 1: SureFire II Forced Draught Pilot selection Table, showing only the 0.5 metre intervals, 0.1 metre intervals may be ordered (See Price List).

REMARK: Select required kind of fuel. Select Electrical Igniter rod and power pack separately

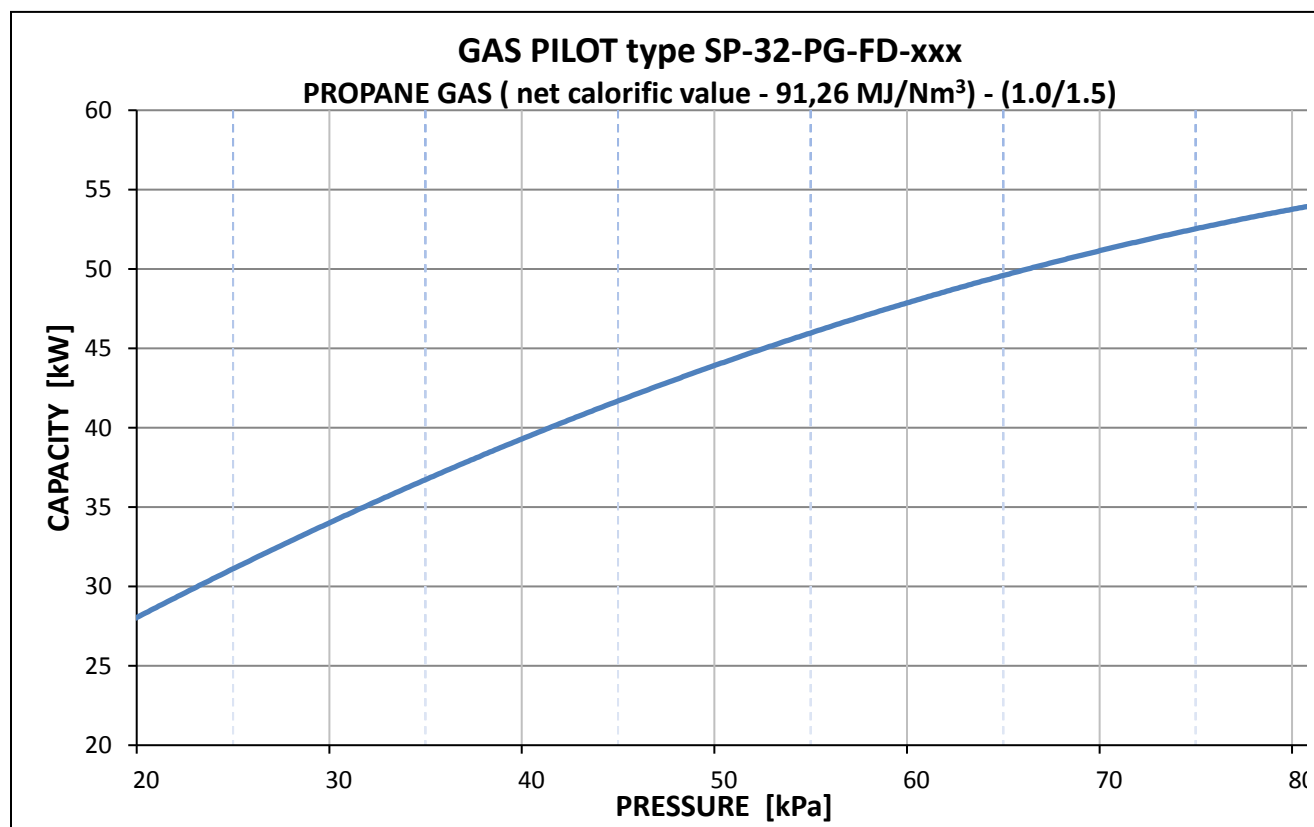
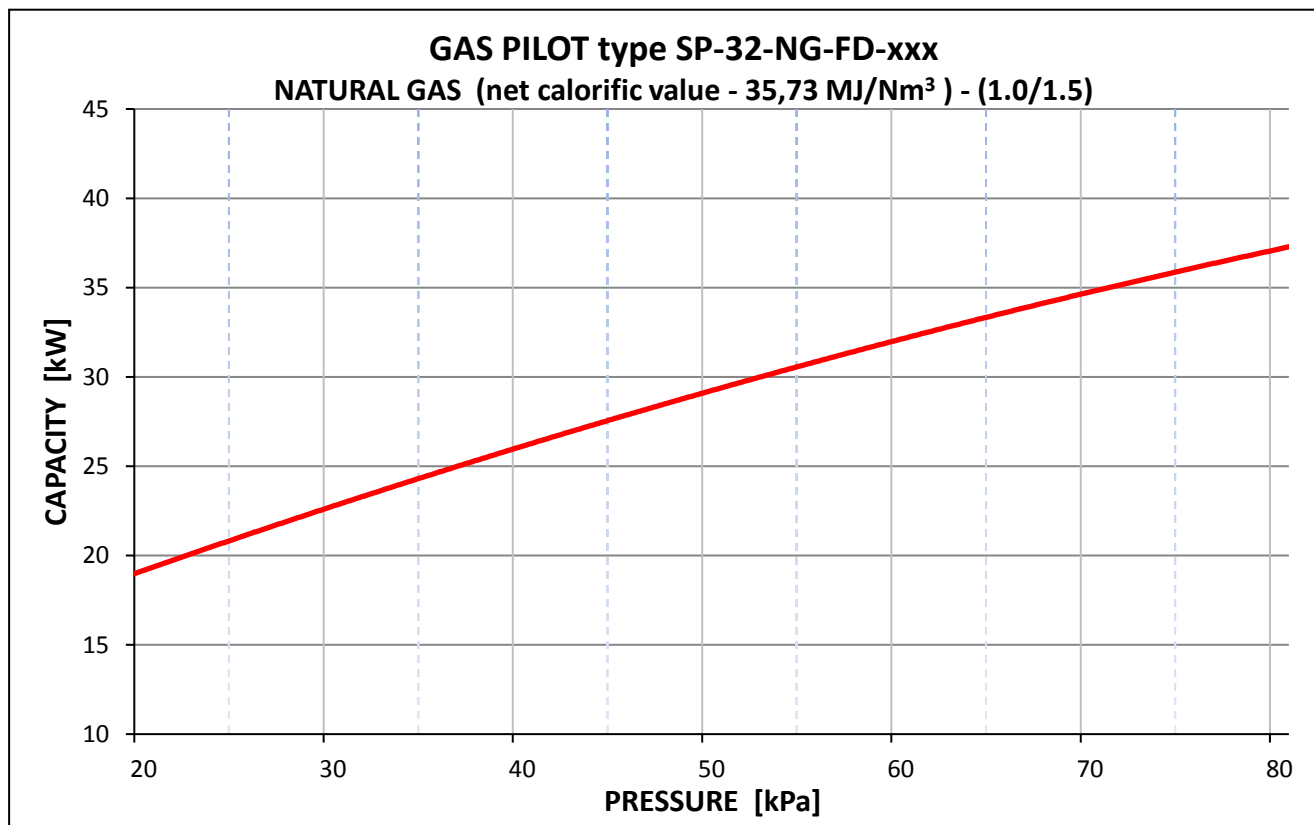
Part No	Description
SP-32-NG/PG-FD-0.5	SureFire II Pilot, 32 mm OD, Natural Gas or Propane Gas, Forced Draught, 0.5 m Insertion length
SP-32-NG/PG-FD-1.0	SureFire II Pilot, 32 mm OD, Natural Gas or Propane Gas, Forced Draught, 1.0 m insertion length
SP-32-NG/PG-FD-1.5	SureFire II Pilot, 32 mm OD, Natural Gas or Propane Gas, Forced Draught, 1.5 m insertion length
SP-32-NG/PG-FD-2.0	SureFire II Pilot, 32 mm OD, Natural Gas or Propane Gas, Forced Draught, 2.0 m insertion length
SP-32-NG/PG-FD-2.5	SureFire II Pilot, 32 mm OD, Natural Gas or Propane Gas, Forced Draught, 2.5 m insertion length
SP-32-NG/PG-FD-3.0	SureFire II Pilot, 32 mm OD, Natural Gas or Propane Gas, Forced Draught, 3.0 m insertion length

The Table 2 below show Part Numbers of gas igniter mounting tubes.

Table 2: SureFire II Pilot Mounting Tubes.

Part No	Description
SP-32-MTF	Mounting Tube Flanged, flange OD 80, length 120mm
SP-32-MTW-150	Mounting Tube for Welding, length 150 mm
SP-32-MTW-600	Mounting Tube for Welding, length 600 mm

APPENDIX No 1





APPENDIX No 2

Proposal Data Sheet

SureFire II™ Pilot - Forced Draught Gas Pilot
type SP-32-xx-FD-xxx

Please provide the following data before placing the Order for gas pilot:

1.	Information about End User		
	— Plant Name:	.....
	— Owner:	.....
	— Country:	.....
	— Localization (address):	.....
2.	Gas pilot mode of operation:	— intermittent light-off	<input type="checkbox"/>
		— continuous pilot	<input type="checkbox"/>
3.	Insertion length “L”: <i>(see Fig. 1)</i>	.....	[mm]
4.	Fuel gas for pilot:		
	— Natural Gas, Propane Gas, other Fuel Gas:	NG <input type="checkbox"/> PG <input type="checkbox"/> FG <input type="checkbox"/>	
	— if other Fuel Gas – specify the type of gas: <i>enclose gas composition sheet</i>	.....
5.	Gas net calorific value:	.....	[MJ/Nm ³]
6.	Required pilot heat input (capacity):	.....	[kW]
7.	Gas pressure range available for pilot:	.....	[kPa]
8.	Main burner nominal (or max.) capacity: <i>capacity of burner to be lit</i>	.....	[kW]
9.	Air for pilot <i>cooling and combustion air</i>		
	— air pressure:	.....	[kPa]
	— air flow:	.....	[m ³ /min]

APPENDIX No 3

UNIT CONVERSION TABLE

Quantity	Metric Units	Imperial Units	
Length	1 millimetre [mm]	x 0.003281 = foot [ft; ']	x 0.03937 = inch [in; "]
	1 metre [m]	x 3.281 = foot [ft; ']	x 39.370 = inch [in; "]
Volume	1 cubic metre [m ³]	x 35.315 = cubic foot [ft ³]	
Air flow rate	1 cubic metre/hour [m ³ /h]	x 0.589 = standard cubic foot/min [SCFM]	
Weight	1 kilogram [kg]	x 2.2046 = pound [lb]	
Pressure	1 kilopascal [kPa]	x 6.895 = pound square inch gauge [psig]	x 4.015 = inch H ₂ O
Power (capacity)	1 kilowatt [kW]	x 293.1 = million BTU/hr [mmBTU/Hr]	
Calorific value	1 megajoule/cubic metre [MJ/m ³]	x 26.839 = BTU/ cubic foot [BTU/ft ³]	
Temperature	Deg. Celsius [°C]	<i>Formula: °C x 1.8 + 32 = Deg. Fahrenheit [°F]</i>	



NOTICE

When Fireeye products are combined with equipment manufactured by others and/or integrated into systems designed or manufactured by others, the Fireeye warranty, as stated in its General Terms and Conditions of Sale, pertains only to the Fireeye products and not to any other equipment or to the combined system or its overall performance.

WARRANTIES

FIREYE guarantees for *one year from the date of installation or 18 months from date of manufacture* of its products to replace, or, at its option, to repair any product or part thereof (except lamps, electronic tubes and photocells) which is found defective in material or workmanship or which otherwise fails to conform to the description of the product on the face of its sales order. **THE FOREGOING IS IN LIEU OF ALL OTHER WARRANTIES AND FIREYE MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED.** Except as specifically stated in these general terms and conditions of sale, remedies with respect to any product or part number manufactured or sold by Fireeye shall be limited exclusively to the right to replacement or repair as above provided. In no event shall Fireeye be liable for consequential or special damages of any nature that may arise in connection with such product or part.



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