

## Specifications of WIDE-RANGE® burners

Typical burner data										
Fuel: natural gas at 15°C with 10.9 kWh/Nm <sup>3</sup> HHV - sg = 0.6 [1]										
Combustion air: 15°C - 21% O <sub>2</sub> - 50% humidity - sg = 1.0 [1]										
Stated pressures are indicative. Actual pressures are a function of air humidity, altitude, type of fuel and gas quality.										
WIDE-RANGE® Burner Size			1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	6"	8"
Maximum capacities (kW) at various combustion air differential pressures (mbar)	Inlet air pressures in mbar	60	66	130	200	310	530	880	2200	3950
		42	56	110	165	275	470	775	1935	3370
		25	45	90	130	220	380	660	1540	2600
Minimum capacity	kW	4	7	9	12	18	29	73	100	
Maximum air flows [3]	m <sup>3</sup> (st)/h	64	127	191	297	510	850	2124	3823	
Fuel pressure	mbar	12								
Flame length @ max [2]	mm	900	1300	1400	1600	1800	2500	3300	4000	
Flame diameter @ max [2]	mm	180	230	230	300	330	400	560	750	

[1] sg (specific gravity) = relative density to air (density air = 1.293 kg/Nm<sup>3</sup>)

[2] Flame geometry is in quiet, inert environment and occurs at maximum fire rate

[3] Maximum air flow occurs at 60 mbar inlet pressure

### Pilot burner specifications

WIDE-RANGE® burners are ignited by means of an externally mounted gas pilot.

The burner body allows for the mounting of two pilot burner types: the sealed port pressure pilot and the boosted pilot. The boosted pilot option offers increased flexibility for most applications and is available for the 4" and 6" burner sizes. The pressure pilot is also available for the 8" WIDE-RANGE®.

Combustion air for the pilot can be compressed air which is reduced to the pressure stated in the table below by means of an adequate pressure regulator. An alternative and easier solution is to branch the pilot combustion air from the main burner combustion air blower.

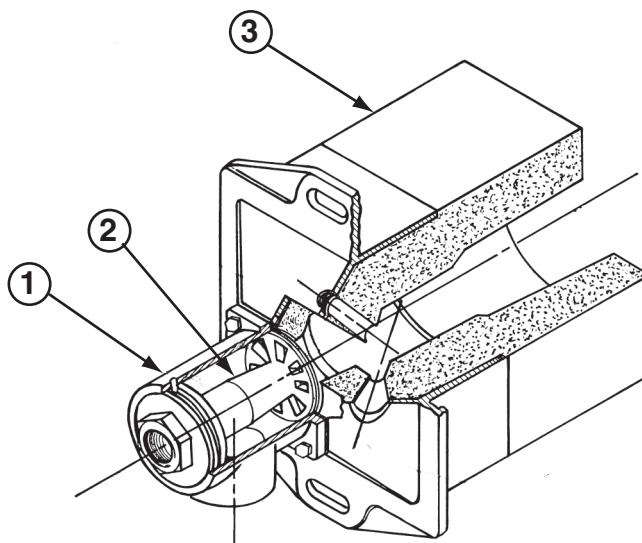
The pilot gas line should be equipped with a pilot gas pressure regulator.

Both pilot versions contain a fine adjustment gas needle valve for easy commissioning.

Refer to pages 3-11.2-15 and 16 for dimensional sketches on these pilot burners.

Burner size		1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	6"	8"
Sealed port pressure pilot	Gas pressure mbar	10-20						21	---
	Air pressure mbar	34 - 69						14	---
	Capacity kW	12						12	---
Boosted pilot	Gas pressure mbar	---						10 - 30	---
	Air pressure mbar	---						34 - 100	---
	Capacity kW	---						29	---
Pressure pilot for 8" WIDE-RANGE®	Gas pressure mbar	---						---	10-20
	Air pressure mbar	---						---	34 - 69
	Capacity kW	---						---	22

## Materials of construction



Item number	Burner part	Material
1	Housing	Class 3000 gray iron
2	Nozzle	Class 3000 gray iron
3	Standard block 1430°C	Low alumina / silica refractory
3	Optional block 1540°C	Moderate alumina / silica refractory
3	Optional block 1650°C	High alumina / silica refractory

## Selection criteria

### Application details

WIDE-RANGE® burners are typically used on furnaces, kilns, lehrs and other processes with temperatures up to 1650°C. With the ability to operate with a large variety of fuels, the WIDE-RANGE® is useful anywhere atmosphere control is desirable.

### Burner versions

The basic WIDE-RANGE® burner includes a refractory block which has been cast into a cast iron burner frame for use in furnaces or combustion chambers with an internal refractory wall. The burner block is inserted in the opening of the refractory wall and the gap around the block is rammed with castable refractory (see installation instructions).

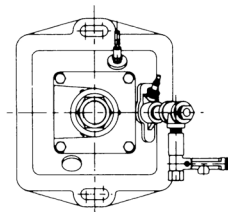
For constructions without internal refractory, such as thin wall process heating applications or ducts with soft wall ceramic insulation, WIDE-RANGE® burners with seal and support assemblies can be selected. Seal and support assemblies reinforce the burner block by use of a metallic cylinder surrounding a round cast block, providing additional strength and support.

### Air inlet arrangements

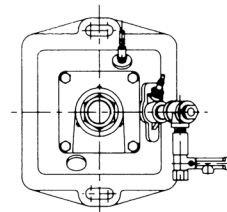
WIDE-RANGE® burners can be shipped in any of the piping configurations shown below. Arrangement "D" is always furnished unless specified otherwise.

Entire burner may be rotated to suit piping but positions which would allow dirt or debris to block flame supervision port should be avoided.

#### For burners with pilot and flame rod or UV scanner mounting

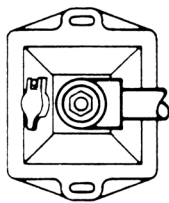


Arrangement  
"L"

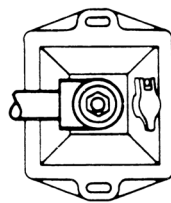


Standard  
Arrangement "D"

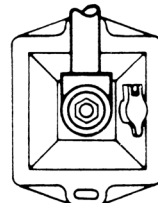
#### For burners with hinged lighter port cover



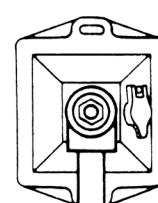
Arrangement  
"R"



Arrangement  
"L"



Arrangement  
"U"



Standard  
Arrangement "D"

## Process temperature

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Standard refractory block permits operation at combustion chamber temperatures of 1430°C. Special refractory block material is available which will extend the operation temperatures up to 1650°C.

When blocks with support sleeve are used in thin wall constructions and air heating applications, the temperatures of the upstream and downstream process air are limited.

Process air temperature limits for blocks with sleeve (°C)		
Sleeve material	Upstream	Downstream
Carbon steel	315	482
Stainless steel	538	815

## Preheated combustion air / reduced oxygen

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WIDE-RANGE® burners can accept up to 430°C preheated combustion air, resulting in lower fuel consumption and operating costs.

In applications where the process air is preheated, the maximum capacities shall be reduced. Preheated combustion air can have reduced O<sub>2</sub>, as low as 17% if combustion air temperature is 430°C. Mixing of some low O<sub>2</sub> flue gas allows to combine increased system thermal efficiency with best emissions.

## Process flows and oxygen content

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In high temperature furnaces, WIDE-RANGE® burners are not sensitive to oxygen levels within the firing chamber, although flame lengths will be affected by the application oxygen level and temperature.

WIDE-RANGE® burners are capable of firing in fresh air streams if sufficient attention is paid to the design of the system. In air heating applications, the flame should be protected by a short additional protection sleeve to avoid quenching of the flame by the air entering the combustion chamber. The flame needs to develop itself in a quiet air stream with sufficient oxygen. The additional protection sleeve should allow a part of the process air to flow across the flame within the sleeve at low velocity. In this way, the temperature within the sleeve is about 800°C to 900°C. Contact MAXON for more details.

## Piloting & ignition

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WIDE-RANGE® burners require an externally mounted gas pilot for easy pilot flame adjustment and maintenance. The spark ignitor is easily accessible.

Three types are available. Refer to page 3-11.2-5 for pilot capacities and required pilot gas and pilot air pressures. Refer to page 3-11.2-15 & 16 for dimensional sketches of these pilot burners.

Direct ignition is not possible. Pilots shall be used only for ignition of the main flame (interrupted pilot). Permanent pilot operation is not advised (no permanent or intermittent pilot). Use the main burner at minimum capacity for continuous operation.

Use minimal 5000 V/200 VA ignition transformers for sparking of the spark ignitor.

Every WIDE-RANGE® burner must be ordered with the appropriate pressure pilot or with the optional pilot port cover. Leaving the pilot port open is not recommended as hot gases may exit the port resulting in a hazard to people and equipment.

## Ratio control

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MAXON recommends the use of SMARTLINK® MRV or MICRO-RATIO® Valves for precise control of air and fuel feeds to WIDE-RANGE® burners.

WIDE-RANGE® burners can fire stable with air factors (n) between n=1.05 and 1.3 (5 to 30% excess air). Note that flame dimensions and emissions will be affected by the excess air amount. Changes in combustion air temperature, system back pressure and other parameters could influence gas/air ratio if the control system is not designed to compensate for these.

## Typical ignition sequence

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- Pre-purge of burner and installation, according to the applicable codes and the installation requirements.
- Combustion air control valve shall be in the minimum position to allow minimum combustion air flow to the burner.
- Pre-ignition (typically 2s sparking in air).
- Open pilot gas and continue to spark the ignitor (typically 5s).
- Stop sparking, continue to power the pilot gas valves and start flame check. Trip burner if no flame from here on.
- Check pilot flame stability (typical 5s to prove stable pilot).
- Open main gas valves and allow enough time to have main gas in the burner (typical 5s + time required to have main gas in the burner).
- Close the pilot gas valves.
- Release to modulation (allow modulation of the burner).

Above sequence shall be completed to include all required safety checks during the start-up of the burner (process & burner safeties).

Locate one pilot gas valve as close as possible to the pilot burner gas inlet, to have fast ignition of the pilot burner.

## Flame supervision

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MAXON advises the use of a UV scanner for flame supervision on all WIDE-RANGE® burner sizes and types.

Burner design incorporates one UV scanner port suitable for supervision of both pilot and main flames.

Pay attention to possible pick-up of strange flames (if any in the furnace) when using UV scanner for flame detection. Allow some purge or cooling air to the scanner connections (typically 2 m<sup>3</sup>(st)/h of fresh clean air).

Scanners should be installed as close to the burner as possible. Flame supervision by means of a flame rod is only possible on a limited range of low temperature applications.

## Piping

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Properly support all air and fuel piping independent of the burner. Do not hang piping weight from burner inlets. For best performance, fuel and air should include 3-6 diameters of straight pipe into the burner housing.

## Fuels

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The type of gas must be specified when ordering any WIDE-RANGE® burner. All nozzle inserts for WIDE-RANGE® burners are matched to the fuel gas to be fired. The WIDE-RANGE® burner will be drilled for natural gas unless specified differently on order.

## Process back pressures

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Process back pressures can range from -350 mbar to 350 mbar.

## Expected emissions

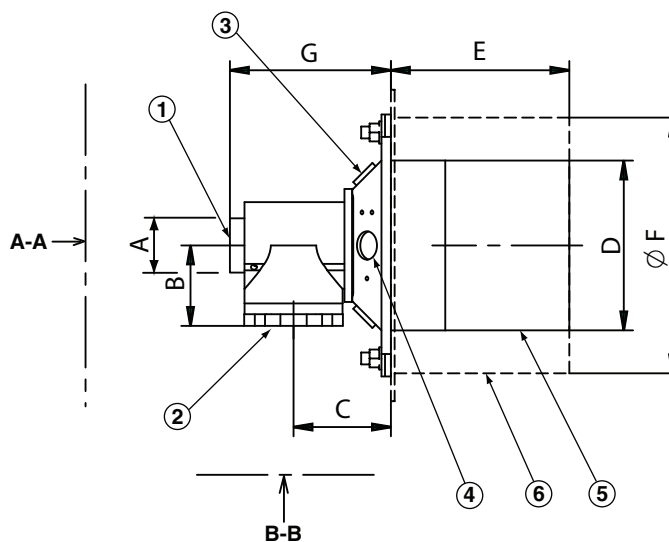
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WIDE-RANGE® burners offer moderate levels of NO<sub>x</sub> and CO production. With adequate fuel/air ratio control, such as provided by SMARTLINK®, the burner can produce NO<sub>x</sub> levels 20-40% less than conventional burners.

## Dimensions and weights

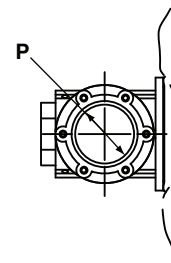
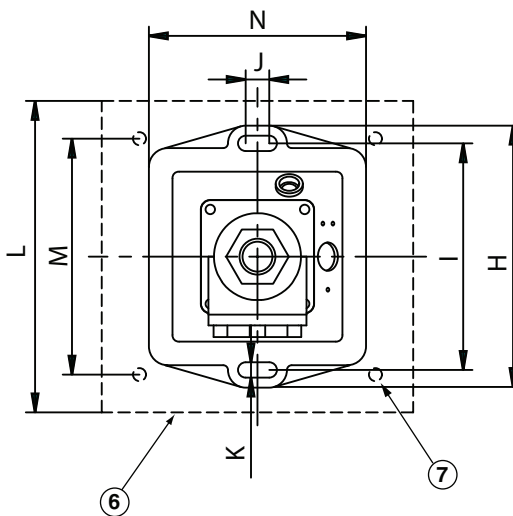
### 1-1/4" through 4" WIDE-RANGE® burners

- 1) Gas inlet
- 2) Combustion air inlet
- 3) Flame scanner connection
- 4) Pilot burner mounting port
- 5) Standard block (square)
- 6) Optional block with seal and support housing (round)
- 7) 18 mm diameter



View A-A

View B-B



Dimensions in mm unless stated otherwise								
Burner size (air inlet)	A [1] (gas inlet)	B	C	D sq.	E	F Ø	G	H
1-1/4"	3/4"	51	76	127	191	205	130	222
1-1/2"	1"	51	114	191	229	295	173	308
2"	1"	60	114	191	229	295	178	308
2-1/2"	1-1/4"	76	102	229	241	344	177	353
3"	1-1/2"	105	121	229	240	344	205	353
4"	2"	127	141	292	292	444	247	406

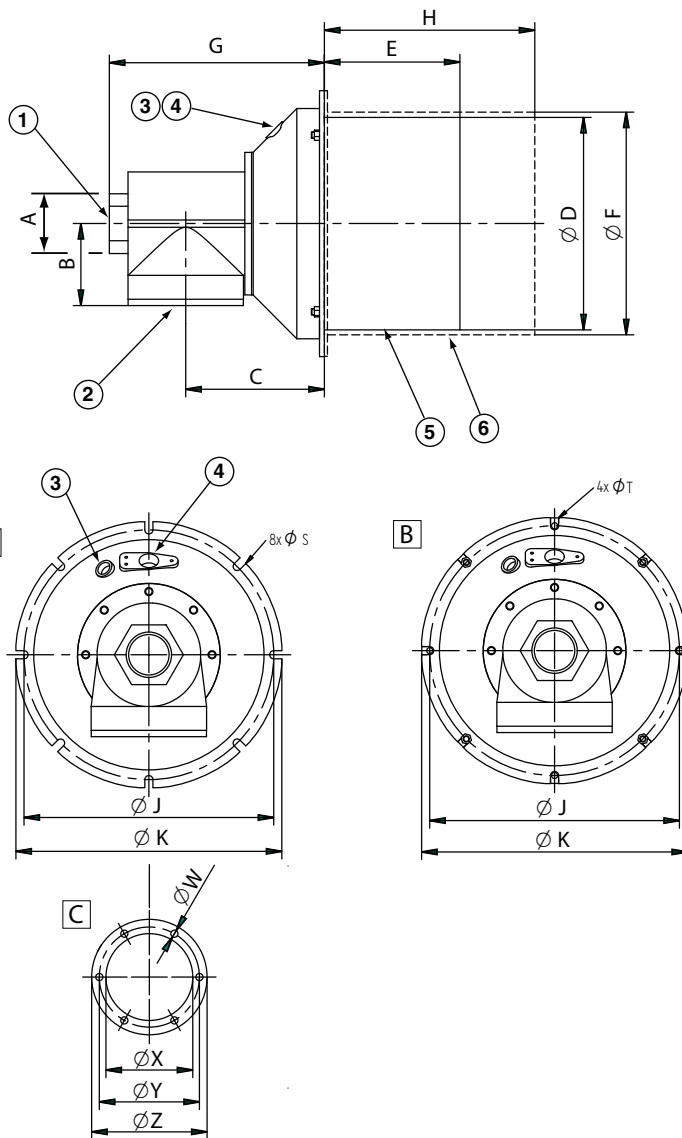
Burner size (air inlet)	I	J	K	L	M	N	P [1]	Weight kg
1-1/4"	190	22	13	279	190	162	1-1/4"	36
1-1/2"	266	25	16	368	266	229	1-1/2"	45
2"	266	25	16	368	266	229	2"	55
2-1/2"	304	32	19	419	318	292	2-1/2"	93
3"	304	32	19	419	318	292	3"	95
4"	356	25	19	521	394	343	4"	140

[1] Connections are threaded (NPT or ISO). All connections sized 3" or above have optional welding flanges available

6" WIDE-RANGE® burners

- 1) Gas inlet
- 2) Combustion air inlet
- 3) Flame scanner connection
- 4) Pilot burner mounting port
- 5) Standard block
- 6) Optional block with seal and support housing

- A: Standard block
- B: Block with seal and support
- C: Optional combustion air welding flange



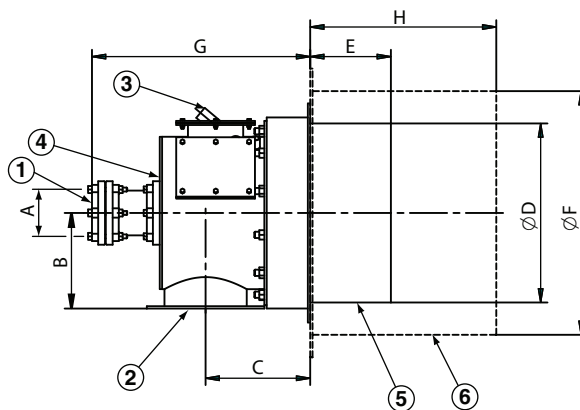
Dimensions in mm unless stated otherwise									
Burner size (Air inlet)	A [1] (Gas inlet)	B	C	D	E	F	G	H	J Ø
6"	3"	183	272	416	267	435	423	406	489

Burner size (Air inlet)	K Ø	S Ø	T Ø	W Ø	X [1]	Y Ø	Z Ø	Weight kg
6"	521	16	17	14	6"	197	225	193

[1] Connections are standard NPT or ISO threaded. For the air inlet, an optional welding flange is available.

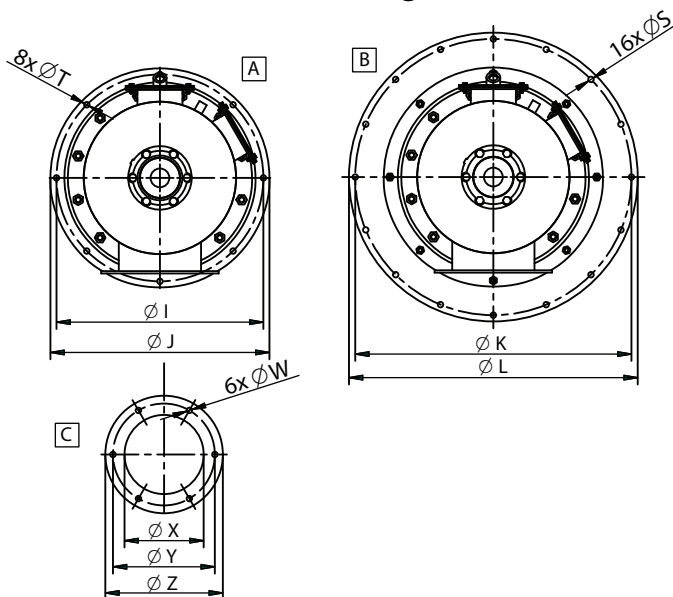


8" WIDE-RANGE® burners



- 1) Gas inlet
- 2) Combustion air inlet
- 3) Flame scanner connection
- 4) Pilot burner mounting port
- 5) Standard block
- 6) Optional block with seal and support housing

- A: Standard block
- B: Block with seal and support
- C: Optional combustion air welding flange



Dimensions in mm unless stated otherwise										
Burner size (Air inlet)	A [1] (Gas inlet)	B	C	D Ø	E	F Ø	G	H	I Ø	J Ø
8"	4"	244	268	457	206	622	557	475	528	558

Burner size (Air inlet)	K Ø	L Ø	S Ø	T Ø	W Ø	X Ø	Y Ø	Z Ø	Weight kg
8"	706	736	14	14	14	203	260	298	354

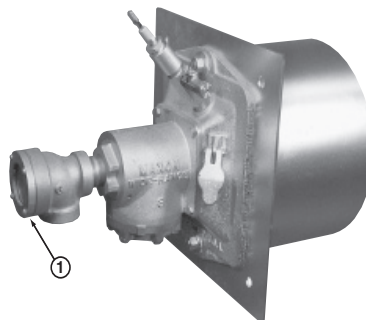
[1] Gas connection is standard NPT or ISO threaded.

## Accessories

### Observation tee assembly

Observation tee assembly (for 3" through 8" burners only) permits viewing of flame through what would normally be the gas inlet. Note that the inlet is turned 90° with this option. The observation tee assembly is only available in NPT version.

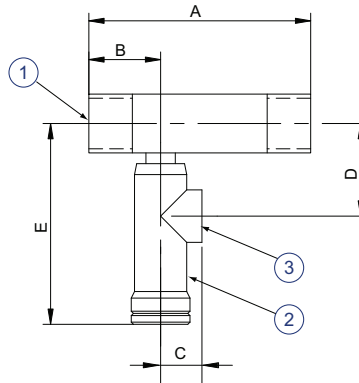
- 1) Observation tee assembly



### Optional cooling tee set

Cooling tee arrangements provide connection for a purge air supply to UV scanner/flame rod connection.

- 1) Scanner tube connection 3/4"
- 2) Adjustable orifice
- 3) Cooling air connection 3/8"

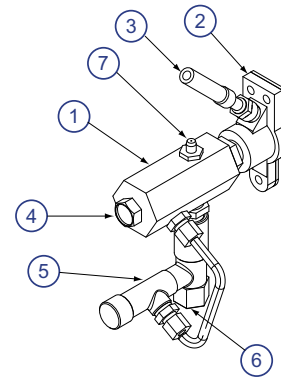
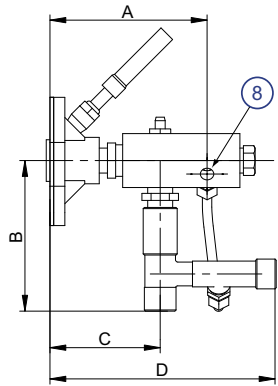


Dimensions in mm unless stated otherwise					
Burner size	A	B	C	D	E
2" to 6"	102	33	19	44	92
8"	190	33	19	44	92

### Boosted pilot

This pilot can be mounted directly onto the WIDE-RANGE® burner pilot connection. It includes the spark ignitor and mounting gasket and is suitable for 4" and 6" burner sizes.

- 1) Boosted pilot body
- 2) Pilot burner nozzle and mounting gasket
- 3) Spark ignitor and insulating cap
- 4) Sight glass
- 5) Premix air adjusting needle valve
- 6) Air connection 3/8" NPT
- 7) Pressure test nipple
- 8) Gas connection 1/4" NPT

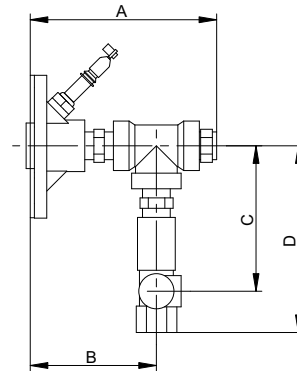
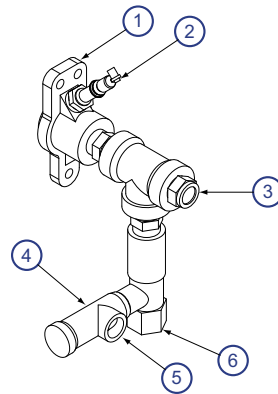


Dimensions in mm unless stated otherwise			
A	B	C	D
135	130	94	195

### Sealed port pressure pilot

This pilot can be mounted directly onto the WIDE-RANGE® burner pilot connection. It includes the spark ignitor and mounting gasket and is suitable for all burner sizes. It is not suitable for the 8" WIDE-RANGE® burner; for these burners, use pressure pilot for 8" WIDE-RANGE® burner.

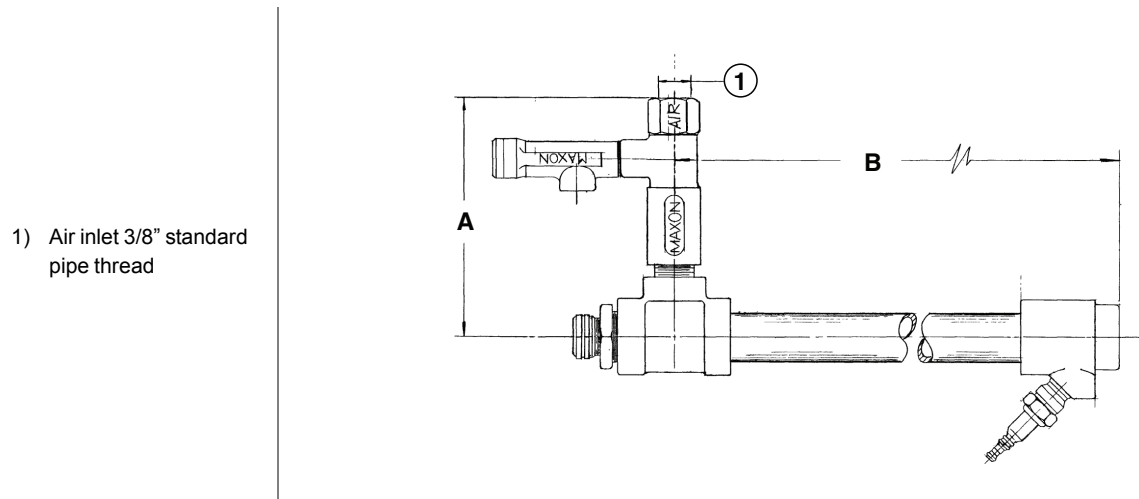
- 1) Pilot burner nozzle and mounting gasket
- 2) Spark ignitor
- 3) Sight glass
- 4) Gas adjusting needle valve
- 5) Gas connection 3/8" NPT
- 6) Air connection 3/8" NPT



Dimensions in mm unless stated otherwise			
A	B	C	D
145	97	112	142

**Pressure pilot for 8" WIDE-RANGE® burner**

This pilot can be mounted directly onto the WIDE-RANGE® burner pilot connection. It includes the spark ignitor and mounting gasket and is included as standard on all 8" WIDE-RANGE® burners.



Dimensions in mm unless stated otherwise	
A	B
127	362

## Model Numbers

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WIDE-RANGE® burner model number				
Model	Flame supervision	Burner size	Refractory block	Air inlet position
WR	F	0150	STD	D

### MODEL

WR - WIDE-RANGE® burner

### FLAME SUPERVISION

F - Arranged for flame supervision by flame rod or UV scanner

### BURNER SIZE

0125 - 1-1/4" burner  
 0150 - 1-1/2" burner  
 0200 - 2" burner  
 0250 - 2-1/2" burner  
 0300 - 3" burner  
 0400 - 4" burner  
 0600 - 6" burner  
 0800 - 8" burner

### REFRACTORY BLOCK

STD - Standard refractory block  
 CS S&S - Refractory block with carbon steel seal and support housing  
 SS S&S - Refractory block with stainless steel seal and support housing

### AIR INLET POSITION

D - Air inlet down (standard)  
 L - Air inlet left  
 R - Air inlet right  
 U - Air inlet up

## Installation and operating instructions

### Application requirements

#### View port

A view port to observe burner flame is essential to inspect flame aspect. Locate the view port downstream of the flame, looking back to the burner block. Make sure the complete flame can be evaluated.

#### Support burner air and gas piping

The WIDE-RANGE® burner shall not be used as support for the piping to the burner. Gas and air piping shall be supported in such a way that no additional loads will be created on the burner.

#### Burner mounting flange loads

Check burner weight and reinforce burner mounting flange or combustion chamber/furnace back wall if necessary to take complete burner weight.

## Installation instructions

### Storage of WIDE-RANGE® burners

WIDE-RANGE® burners shall be stored dry (inside). Burner blocks have been cured carefully before shipment and shall be kept dry. Wetting of the blocks could result in premature failure.

### Handling of WIDE-RANGE® burners

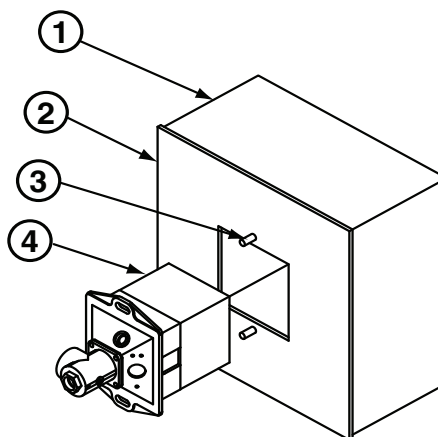
WIDE-RANGE® burners are shipped as complete units. Handle burners with care during unpacking, transport, lifting and installation. Use proper equipment. Any impact on the burner could result in damage.

### Flange the burner to the installation

Bolt the burner to the installation's burner mounting flange. Use proper gaskets between burner and burner mounting flange when applicable. Tighten the flange bolting with correct torque. Retighten all bolts after first firing and regularly after commissioning.

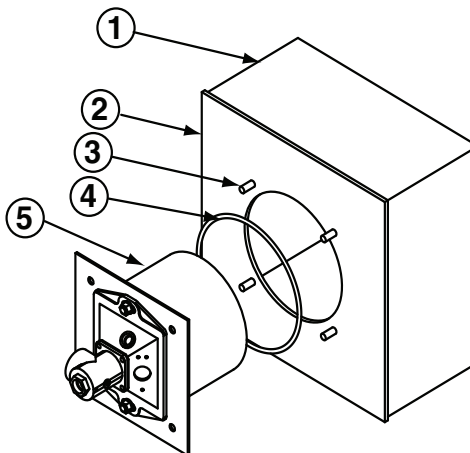
### WIDE-RANGE® with standard refractory block

- 1) High temperature refractory wall
- 2) Oven wall
- 3) Mounting studs
- 4) Burner



## WIDE-RANGE® with block with seal and support housing

- 1) Soft wall insulation
- 2) Sheet metal wall
- 3) Mounting studs
- 4) High temperature gasket (by others)
- 5) Burner



## Burner mounting

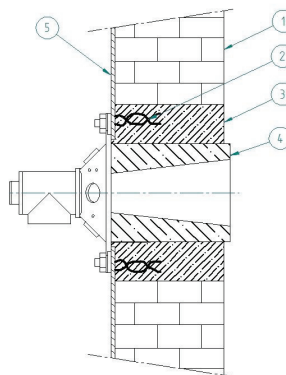


**Note: Slotted holes in the burner mounting frame are intended to allow for lateral expansion of furnace. Tighten mounting bolts only enough to hold the burner in position.**

## Refractory wall: standard blocks

WIDE-RANGE® burners with standard blocks (without supporting sleeve) require supporting of the burner block by the furnace wall. The mounting hole for the burner in the furnace shell should be 25 mm larger than the burner block diameter. A gap of approximately 80 mm around the burner block should be left free in the furnace refractory wall when mounting the burner. After fixing the burner on the furnace wall, this gap should be rammed with castable refractory, retained by anchors.

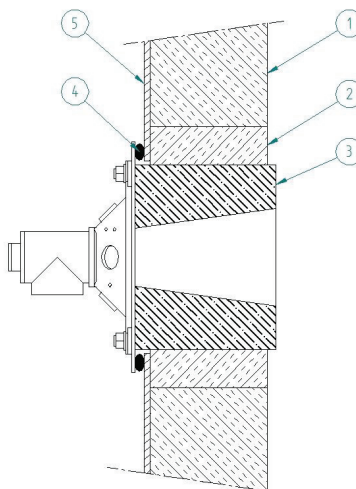
- 1) High temperature refractory wall
- 2) Anchors
- 3) Castable refractory
- 4) Burner block
- 5) Furnace shell



### Furnace wall with soft insulation: blocks with supporting sleeves

WIDE-RANGE® burners which are mounted in a furnace with no internal insulation or with soft internal insulation need to have a burner block sleeve (optional) specified. This sleeve makes the burner block self-supporting. Remaining space between burner block and insulated wall should be packed tightly with ceramic fiber insulation.

- 1) Furnace fiber insulation
- 2) Fiber insulation, fitted into the space around the block
- 3) Burner refractory block with supporting sleeve
- 4) High temperature gasket
- 5) Furnace shell

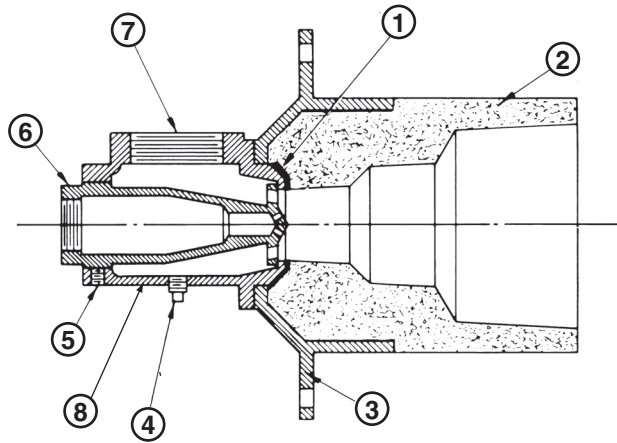




## Burner body rotation

WIDE-RANGE® gas burners can be ordered in any of the piping arrangements shown on page 3-11.2-7. If it becomes necessary to alter orientation for installation, burner main body may be rotated by referring to component identification drawing below, then following this procedure:

- 1) Refractory cement seal
- 2) Burner block
- 3) Mounting frame
- 4) Air test connection
- 5) Socket set screw
- 6) Gas nozzle insert
- 7) Combustion air inlet
- 8) Main body



- Loosen socket set screw then remove gas nozzle insert from main body.
- Unscrew the bolts which fasten main body to mounting frame, set aside and remove body (tapping lightly, if necessary to break refractory cement seal).
- Clean main body of any refractory which remains attached and remove any loose chips from mating block surface.
- Prepare a refractory cement mixture.
- Apply a coating of cement to those block surfaces which will mate with the burner body when it is reinstalled.
- Rotate main body to desired position, set in place and bolt finger-tight.
- Remove any excess refractory cement that is forced out between body and burner block. Observe the alignment illustration on page 3-11.2-23 and reposition body if necessary.
- Tighten main body firmly into position and clean throat with a narrow brush to insure smooth path for air and gas. Replace gas nozzle insert and tighten set screw.
- Allow reassembled burner to stand at least 48 hours so that refractory cement will set.



**Failure to properly cure refractory cement may result in a weak bond and early deterioration.**

## Start-up instructions for WIDE-RANGE® burners

Instructions provided by the company or individual responsible for the manufacture and/or overall installation of a complete system incorporating MAXON burners take precedence over the installation and operating instructions provided by MAXON. If any of the instructions provided by MAXON are in conflict with local codes or regulations, please contact MAXON before initial start-up of equipment.



**Read the combustion system manual carefully before initiating the start-up and adjustment procedure. Verify that all of the equipment associated with and necessary to the safe operation of the burner system has been installed correctly, that all pre-commissioning checks have been carried out successfully and that all safety related aspects of the installation are properly addressed.**

**Initial adjustment and light-off should be undertaken only by a trained commissioning engineer.**

### First firing or restart after shut-down

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During first start-up of the burner, and after every longer installation shut-down, the temperature rise shall be limited. Allow the burner to fire on low fire for some time to allow the parts to heat-up slowly.

### Checks during and after start-up

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During and after start-up, check the integrity of the system. Check all bolted connections after first firing (first time on temperature) and retighten if necessary.

### Pilot ignition

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Before ignition of the pilot, adjust the combustion air to the minimum burner air flow. Pilot will not ignite if too high an air flow. Set pilot gas flow to the correct value before pilot ignition attempt.

### Main burner ignition

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Set correct gas flow for burner minimum capacity before attempt of main burner ignition.

After ignition of main burner, allow some time on minimum capacity to allow the burner parts to heat up slowly.

### Adjust air/gas ratio, set maximum capacity

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Once the main flame is ignited, adjust air/gas ratio of the burner to have the required combustion quality and slowly increase capacity. (Do not increase capacity too fast to avoid damage to burner parts or furnace due to excessive temperature gradient.)

## Maintenance & inspection instructions

### Safety requirements

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Regular inspection, testing and recalibration of combustion equipment according to the installation manual is an integral part of its safety. Inspection activities and frequencies shall be carried out as specified in the installation manual.

### Visual inspections

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Regular visual inspection of all connections (air and gas piping to the burner, bolting of the burner to the furnace) and burner flame size and aspect are essential.

### Spare parts

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Keep local stock of spark ignitor. It is not recommended to keep local stock of other burner parts.

Consult installation manual for burner spare parts and system accessories.

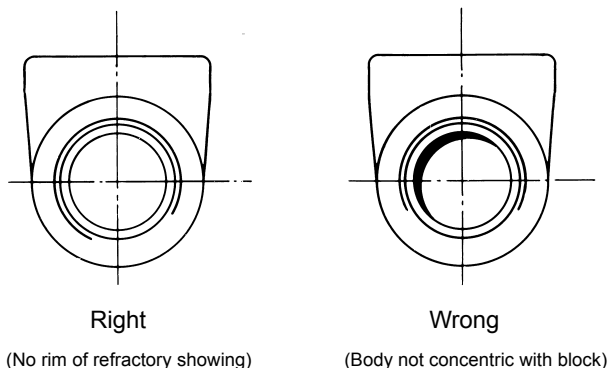
## Block replacement

If the refractory block of your WIDE-RANGE® burner ever requires replacement, MAXON can supply replacement block and frame sub-assemblies. To replace a burner with Seal and Support Housing, a complete frame/block/seal and support is available.

### To install a new block and frame assembly

- Shut off system and allow to cool.
- Disconnect piping, etc. and remove WIDE-RANGE® burner from installation.
- Loosen socket set screw and remove burner insert, then unscrew the bolts which fasten the main body to the mounting frame, set aside and remove body (tapping lightly if necessary to break bond).
- Clean all old refractory from main body to insure a proper seal when reassembling.
- Prepare a refractory cement mixture mixed to the consistency of thin peanut butter.
- Apply a generous coating of the refractory cement to those surfaces of the new block which will mate with the burner main body when it is installed.
- Put main body into position and bolt finger-tight.
- Remove any excess refractory cement that is forced out between body and burner block. Observe the accompanying alignment diagrams and reposition body if necessary.

#### Alignment

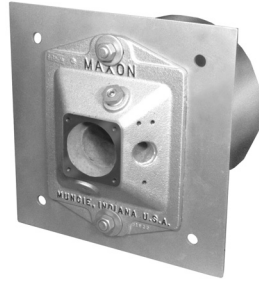


- Tighten main body firmly into position and clean throat with a narrow wet brush to insure a smooth path for air and gas. Replace gas nozzle insert and tighten set screw.
- Allow reassembled burner to stand at least 48 hours so that refractory cement will set.



**Failure to properly cure refractory cement may result in a weak bond and early deterioration.**

- Reinstall burner, following installation instructions.
- Dry refractory thoroughly by running burner at low fire for at least 15 minutes.
- Reconnect controls, etc., restoring burner to service following manufacturer's instructions.



Replacement frame/block/seal and support sub-assembly for WR-3" WIDE-RANGE® Burner