

Specifications of DELTA-TE™ III burners

DELTA-TE™ III burners firing on natural gas

Typical burner data										
60° F - 21 % O ₂ combustion air - 50 % humidity - natural gas with 1000 Btu/ft ³ HHV - sg = 0.6 [1]										
Stated pressures are indicative - actual pressures are function of air humidity, altitude, type of fuel, gas quality										
Capacity per linear burner unit of 1 ft	[2]	MBtu/h	0.068	0.17	0.34	0.68	1.0	1.3	1.7	2.0
Max. flame length (fresh process air - 21Vol.% O ₂ - 60° F) [3]		ft	(NA)	1.6	3.3	5.74	7.2	8.2	8.9	9.8
Max. flame length (recirculating process air - O ₂ < 10 Vol.% - T < 660° F) [3]		ft	(NA)	2.6	4.9	8.2	10.8	12.1	13.1	14.7
(Optimal) combustion air flow	[4]	scfm	39.8	63.9	85.3	136	205	273	341	409
Optimal air factor "n"	[5]		3.5	2.25	1.5	1.2	1.2	1.2	1.2	1.2
Natural gas pressure differential	[6]	"wc	0.044	0.22	0.89	3.11	6.24	11.1	16.5	23.6
Combustion air pressure differential	[7]	"wc	0.16	0.4	0.8	1.6	3.6	6.4	10	14

[1] sg (specific gravity) = relative density to air (density air = 0.0763 lb/ft³(st)).

[2] 0.07 MBtu/h is the absolute minimum capacity for natural gas firing on single shorter burners (<10 ft). The max. capacity (n = 1.2) is set at 2 MBtu/h. Min. capacity will be higher when burner is mounted vertically (plug on top - 0.1 MBtu/h) or for longer burners (>10 ft). Multiple burners on common control valve can have higher minimum capacity too.

[3] Typical flame length for shown combustion air amount and capacity. For 2 MBtu/h flame length varies from 9.8 ft (fresh air mode) to 14.7 ft (recirculation mode).

[4] Corresponds with above capacity and below air factor "n".

[5] Advised air factor for best burner performance and emissions (NO_x and CO).

[6] Pressure at burner test connection for burner commissioning.

[7] Combustion air pressure required at burner test connection for commissioning (combustion air 60° F).

Add 5 % on ratings at max. fire for air pressure at burner air inlet flange for blower sizing.

DELTA-TE™ III burners firing on propane or butane

Typical burner data										
60° F - 50 % humidity - 21 % O ₂ combustion air										
propane with 2500 Btu/ft ³ HHV - sg = 1.52 [1] and butane with 3270 Btu/ft ³ HHV - sg = 2.0 [1]										
Stated pressures are indicative - actual pressures are function of air humidity, altitude, type of fuel, gas quality										
Capacity per linear burner unit of 1 ft	[2]	MBtu/h	0.13	0.34	0.68	1.0	1.3	1.7	2.0	
Max. flame length - propane	[3]	ft	1	2	4.9	9.8	11.5	12.13	13.1	
Max. flame length - butane	[3]	ft	0.7	2.3	5.6	7.2	10.2	10.8	11.5	
Combustion air flow	[4]	scfm	74	85.3	136	205	273	341	409	
Optimal air factor "n"	[5]		3.25	1.5	1.2	1.2	1.2	1.2	1.2	
Propane pressure test connection	[6]	"wc	0.3	0.4	1.0	2.4	4.0	6.4	8.8	
Butane pressure test connection	[7]	"wc	0.2	0.3	0.8	2	3.2	5.2	7.2	
Combustion air pressure differential	[8]	"wc	0.5	0.8	1.6	3.6	6.4	10	14	

[1] sg (specific gravity) = relative density to air (density air = 0.0763 lb/ft³(st)).

[2] 0.13 MBtu/h is the absolute minimum capacity for propane or butane firing. The maximum capacity is set at 2 MBtu/h.

The minimum capacity will be higher when burner is mounted vertically (plug on top : propane -> 0.2 MBtu/h butane -> 0.2 MBtu/h or for longer burners (>10 ft). Multiple burners on common control valve can have higher minimum capacity too.

[3] Typical flame length for propane or butane firing with shown air factor.

[4] Corresponds with above capacity and below air factor "n".

[5] Advised air factor for best burner performance and emissions (NO_x and CO).

[6] For standard propane - pressure at burner test connection for burner commissioning.

[7] For standard butane - pressure at burner test connection for burner commissioning.

[8] Combustion air pressure required at burner test connection for commissioning (comb. air 60° F). Add 5 % on ratings at max. fire for air pressure at burner air inlet flange for blower sizing.

Contact MAXON for applications on other gases than specified here.

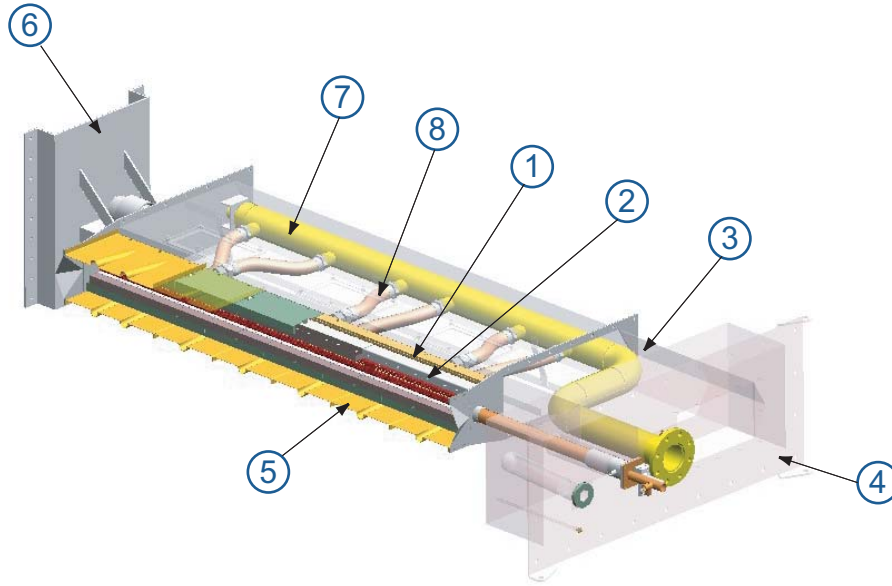
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COMBUSTION SYSTEMS FOR INDUSTRY

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Materials of construction



1) Air/ gas-body	AISI 304 (1.4301)
2) Air orifice plate	AISI 304 (1.4301)
3) Air box	AISI 304 (1.4301)
4) Mounting plate/plug	AISI 304 (1.4301)
5) Protection plates	AISI 310 (1.4845)
6) Burner support	AISI 304 (1.4301)
7) Gas manifold [1]	ST 37 (1.0037)
8) Gas flexibles [1]	ST 37 (1.0037)

[1] Burner gas manifold and gas flexibles contain ST37 - this limits max. upstream temperature to 660° F.
Special stainless steel version is optional - contact MAXON.

Selection criteria

Application details

The DELTA-TE™ III burner has been especially designed for firing in low oxygen inert process air. It combines excellent flame stability and flexibility with extreme low emissions for direct firing. Typical applications are DeNOx and all process firing applications with low oxygen and/or high moisture (such as recirculating dryers).

Process temperature

Max. upstream process air temperature	660° F
Max. downstream process air temperature at low fire	930° F
Max. downstream process air temperature at high fire	1470° F

Process upstream temperature is limited to approximately 660° F because of the use of carbon steel piping for the gas manifold. Special stainless steel manifold is available for higher upstream temperatures. Contact MAXON for detailed information.

Downstream temperature has to be limited when firing on low capacities to avoid overheating of burner parts. However, on high fire burner parts are better cooled by the combustion air flow, allowing much higher downstream temperatures.

Process flows and oxygen content

Max. process air flow	65 ft/s
Max. process air flow for best emissions	26 ft/s
Min. process air flow	6.5 ft/s
Min. process air oxygen level	3 Vol.%

Even with process air velocities of 65 ft/s and higher MAXON DELTA-TE™ III burners will perform well with a stable flame and high flexibility. However, it is advisable to limit the max. velocity to 65 ft/s for process technical reasons .

Best emissions – especially CO – will be realized if low and uniform process air velocity around the flame, without turbulences or vortexes that may quench the flame.

DELTA-TE™ III burners can heat up process air with very low oxygen levels. Depending on temperature, capacity and air factor, almost inert process air is possible.

Contact MAXON for more information.

Process back pressure

The DELTA-TE™ III burner is standard designed for a max. back pressure of 40 "wc (over- and underpressure).

On special request, burner can be reinforced for higher process back pressure. Contact MAXON for more information.

Preheated combustion air

Max. combustion air temperature at high fire	660° F
Max. combustion air temperature at low fire	390° F

At absolute minimum of the burner, the combustion air temperature is limited to max. 390° F to prevent overheating of the burner parts in contact with the flame. However, increased burner minimum will allow higher combustion air temperatures.

On high fire, the carbon steel gas manifold and gas flexibles will limit the max. combustion air temperature.

Ratio control

Best performance of DELTA-TE™ III burners is realized when the burner is adjusted with excess air levels as indicated in table on page 4-21.7-7. Accurate gas/air ratio-control can be achieved with MAXON SMARTLINK® MRV, SMARTFIRE® or MICRO-RATIO® valves.

Changes of combustion air temperature, system back pressure and other parameters could influence gas/air-ratio if the control system is not designed for compensation.

An equal combustion air distribution at the burner inlet flange is essential for correct operation of the burner. Installing the air and, to some extent, the gas control valve directly on the burner or just in front of the burner may cause an uneven air velocity and disturb the air distribution in the burner.

The control valve shall be:

- located at least 10x the piping diameter upstream of the burner air inlet (advised)
- separated from the burner air inlet by a perforated plate, which will correct the uneven air distribution, should the burner be firing at lower capacities with partly closed control valves. This will, however, require a significant extra pressure drop and is not advised.

Piloting & ignition

Direct ignition of DELTA-TE™ III burners is not possible. All DELTA-TE™ III burners will be equipped with a MAXON LVDT pilot burner to ignite the main flame. The pilot burner 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.

Please refer to section 30-60.3 - LVDT pilots.

Contact MAXON for more information.

Typical ignition sequence

- Pre-purge of burner and combustion chamber, according to the applicable codes and the installation's requirements.
- Combustion air control valve shall be in the minimum position to allow minimum combustion air flow to the burner.
- Pre-ignition (typically 2 s sparking in air).
- Open pilot gas and continue to spark the ignitor (typically 5 s to 10 s depending on local code requirement).
- 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 5 s to 10 s to prove stable pilot)
- Open main gas valves and allow enough time to have main gas in the burner (typical 5 s + 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).

Position 1 pilot gas valve as close as possible to the pilot burner gas inlet for fast ignition of the pilot burner.

Flame supervision

The flame of a DELTA-TE™ III burner shall be supervised by a flame scanner. Scanners will be mounted on the 1" scanner tube of the LVDT pilot burner, which is the only correct position for safe supervision of both the pilot-flame and main flame (burner is always operated with interrupted pilot). It is not possible to distinguish pilot and main flame.

Allow some purge or cooling air to the scanner tube connection of the LVDT pilot burner. (typically 2.3 scfm fresh clean air)

Flame development

The flame of DELTA-TE™ III burners is influenced by excess air factor, process oxygen level and temperature. Typical flame at typical conditions is rather voluminous and radiant. This should be taken into consideration for proper combustion chamber layout. Consult MAXON for more information and assistance.



Fuels

DELTA-TE™ III burners can fire on natural gas, propane, butane and are able to fire multiple fuels simultaneous if the control system is properly designed for. Contact MAXON for alternative fuels such as hydrogen, biogas etc.

Expected Emissions

Data below are typical emissions for given air factor and fresh combustion air (natural gas)

Typical emissions – combustion air 60° F – 50 % humidity – 21 Vol.% O ₂ / natural gas 1053 BTU/ft³ HHV and sg = 0.60 [1]							
Capacity per linear burner unit of 1 ft	MBtu/h	0.34	0.68	1.0	1.3	1.7	2.0
Air factor “n”		1.5	1.2	1.2	1.2	1.2	1.2
Typical NO _x - fresh process air (21 % O ₂ , 60°F) [2]	lb/MBtu	0.115	0.115	0.115	0.115	0.115	0.115
Typical NO _x - recirculating process air (O ₂ < 10 Vol.%, T < 660° F) [2]	lb/MBtu	0.094	0.094	0.094	0.094	0.094	0.094
Typical CO - fresh & recirculating firing [3]	lb/MBtu	0.032	0.032	0.032	0.032	0.032	0.032

[1] sg (specific gravity) = relative density to air (density air = 0.0763 lb/ft³(st)).

[2] Typical burner NO_x if the burner is firing in typical conditions - air velocity over the burner between 23 ft/s and 29.5 ft/s (cold combustion air, ambient air upstream of the burner and normal downstream temperatures, low process air velocity...) for above shown capacities and air factors.

[3] Typical CO - same remark [1] - higher process air velocities will give higher CO. Recirculation firing will give slightly higher CO, around shown limits.

The production of pollutants can be highly dependant upon burner application and installation. Differing temperatures, process velocities, oxygen levels, fuels and other process related factors such as unequal process air distribution can all influence the actual level of emissions produced.

No guarantee of emissions is intended or implied on the above.

Contact MAXON for evaluation of expected emissions on your typical application.

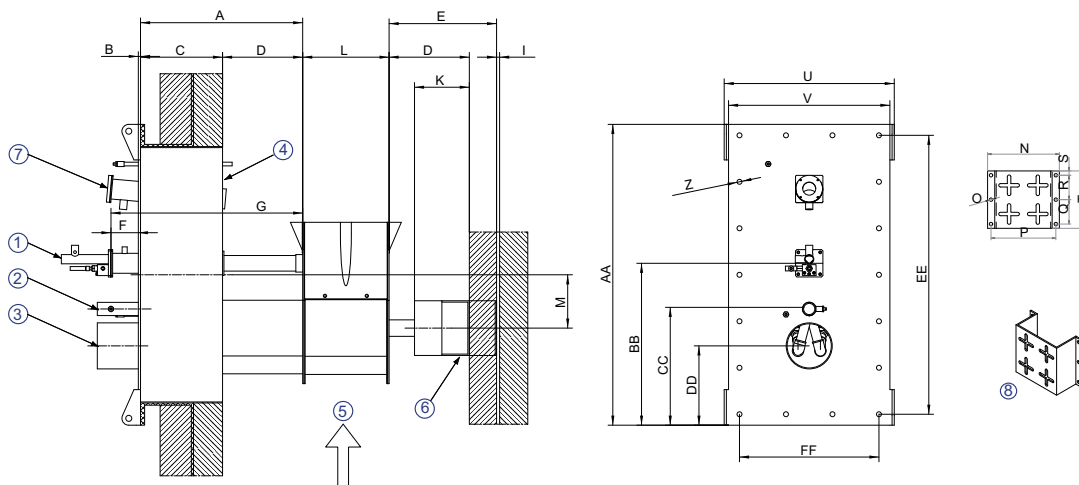
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Dimensions and weights

Drawing of DELTA-TE™ III burner size 1 ft to 1.5 ft with plug



- | | |
|--|-----------------------------------|
| 1) Pilot burner / UV-scanner | 5) Process air flow |
| 2) Gas inlet | 6) Burner mounting support |
| 3) Combustion air inlet | 7) View port |
| 4) Plug to be mounted in opening duct wall | 8) Detail burner mounting support |

Dimensions in inches, unless stated otherwise														
Size	A [1]	B	E	K	L	M	N	O	P	Q	R	S	T	U
1	>7.87	0.31	>7.87"	7.87	12.44	7.68	9.84	0.47	8.90	3.35	3.35	0.59	7.87	24.49
1.5	>7.87	0.31	>7.87"	7.87	18.46	7.68	9.84	0.47	8.90	3.35	3.35	0.59	7.87	24.49
Size	V	Z	AA	BB	CC	DD	EE	FF	Burner length L	Opening duct wall	Weight			
1	23.23	0.71	43.31	23.31	16.73	11.42	40.16	20.08	12.44	17 x 37	337 lbs			
1.5	23.23	0.71	43.31	23.31	16.73	11.42	40.16	20.08	18.46	17 x 37	377 lbs			

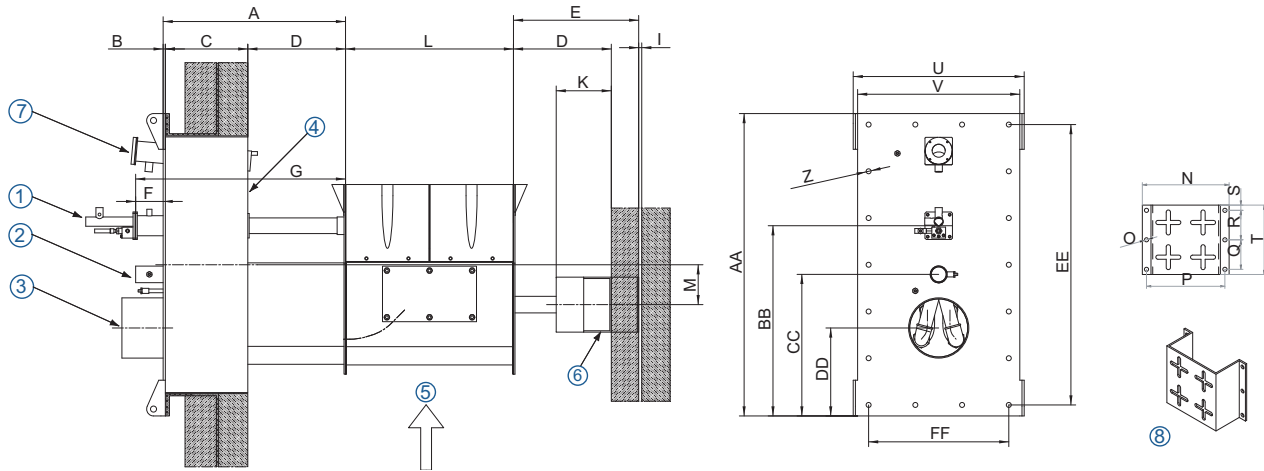
[1] min. 7.87"without plug or insulation

Following dimensions are specific to each system :

- C = default 1 ft (customer's flange elevation + customer's internal and external insulation thickness)
- D = distance between wall and burner
- F = pilot burner elevation flange LG = 2" to 5.9"
- G = pilot length = F + B + C+ D
- I = duct wall thickness

	ISO	ANSI
Gas inlet	Rc 1 -1/2"	1-1/2" NPT
Combustion air inlet	6"	6"
UV connection	Rp1	1" NPT

Drawing of DELTA-TE™ III burner size 2 ft to 3 ft with plug



- 1) Pilot burner / UV-scanner
- 2) Gas inlet
- 3) Combustion air inlet
- 4) Plug to be mounted in opening duct wall
- 5) Process air flow
- 6) Burner mounting support
- 7) View port
- 8) Detail burner mounting support

Dimensions in inches, unless stated otherwise														
Size	A [1]	B	E	K	L	M	N	O	P	Q	R	S	T	U
2	>11.81	0.31	11.81	7.87	24.49	5.71	9.84	0.47	8.90	3.35	3.35	0.59	7.87	24.49
2.5	>11.81	0.31	11.81	7.87	30.51	5.71	9.84	0.47	8.90	3.35	3.35	0.59	7.87	24.49
3	>11.81	0.31	11.81	7.87	36.54	5.71	9.84	0.47	8.90	3.35	3.35	0.59	7.87	24.49
Size	V	Z	AA	BB	CC	DD	EE	FF	Burner length L	Opening duct wall	Weight			
2	23.23	0.71	43.31	27.24	20.28	12.60	40.16	20.08	24.49	17 x 37	417 lbs			
2.5	23.23	0.71	43.31	27.24	20.28	12.60	40.16	20.08	30.51	17 x 37	456 lbs			
3	23.23	0.71	43.31	27.24	20.28	12.60	40.16	20.08	36.54	17 x 37	496 lbs			

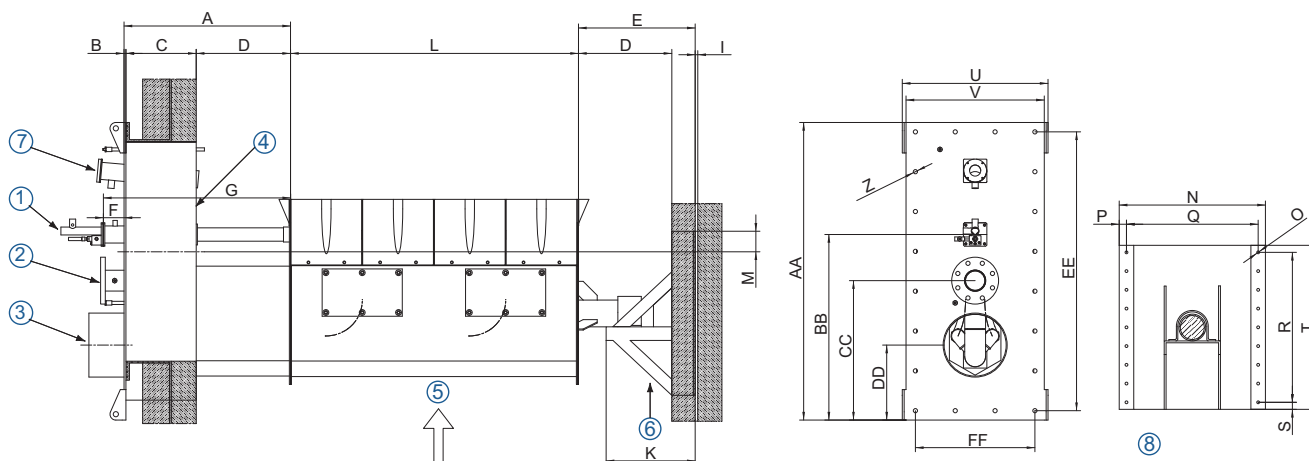
[1] min.11.81" without plug or insulation

Following dimensions are specific to each system :

- C = default 1 ft (customer's flange elevation + customer's internal and external insulation thickness)
- D = distance between wall and burner
- F = pilot burner elevation flange LG = 2" to 5.9"
- G = pilot length = F + B + C+ D
- I = duct wall thickness

	ISO	ANSI
Gas inlet	Rc 2	2" NPT
Combustion air inlet	8"	8"
UV connection	Rp1	1" NPT

Drawing of DELTA-TE™ III burner size 3.5 ft to 6 ft with plug



- 1) Pilot burner / UV-scanner
- 2) Gas inlet
- 3) Combustion air inlet
- 4) Plug to be mounted in opening duct wall
- 5) Process air flow
- 6) Burner mounting support
- 7) View port
- 8) Detail mounting support

Dimensions in inches, unless stated otherwise

Size	A [1]	B	E	K	L	M	N	O	P	Q	R	S	T	U
3.5	>11.81	0.31	11.81	14.96	42.56	3.46	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49
4	>11.81	0.31	11.81	14.96	48.58	3.46	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49
4.5	>11.81	0.31	11.81	14.96	54.61	3.46	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49
5	>11.81	0.31	11.81	14.96	60.63	3.46	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49
5.5	>11.81	0.31	11.81	14.96	66.65	3.46	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49
6	>11.81	0.31	11.81	14.96	72.68	3.46	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49
Size	V	Z	AA	BB	CC	DD	EE	FF	Burner length L	Opening duct wall	Weight			
3.5	23.23	0.71	50	31.18	23.43	12.60	46.85	20.08	42.56	17 x 43.7	536 lbs			
4	23.23	0.71	50	31.18	23.43	12.60	46.85	20.08	48.58	17 x 43.7	633 lbs			
4.5	23.23	0.71	50	31.18	23.43	12.60	46.85	20.08	54.61	17 x 43.7	672 lbs			
5	23.23	0.71	50	31.18	23.43	12.60	46.85	20.08	60.63	17 x 43.7	712 lbs			
5.5	23.23	0.71	50	31.18	23.43	12.60	46.85	20.08	66.65	17 x 43.7	752 lbs			
6	23.23	0.71	50	31.18	23.43	12.60	46.85	20.08	72.68	17 x 43.7	791 lbs			

[1] min.11.81" without plug or insulation

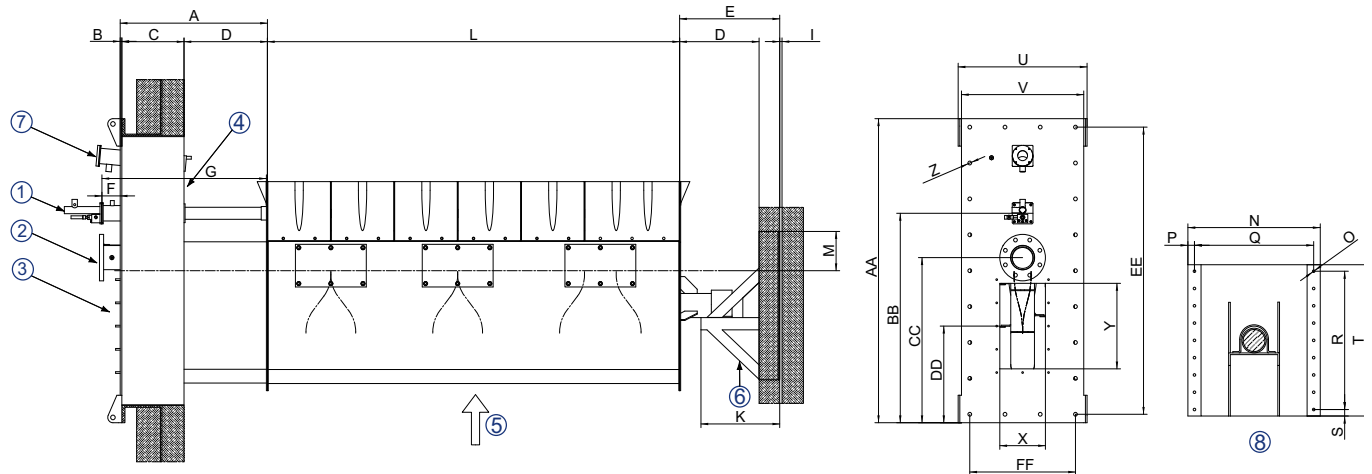
Following dimensions are specific to each system :

- C = default 1 ft (customer's flange elevation + customer's internal and external insulation thickness)
- D = distance between wall and burner
- F = pilot burner elevation flange LG = 2" to 5.9"
- G = pilot length = F + B + C + D
- I = duct wall thickness

	ISO	ANSI
Gas inlet	DN 80 DIN PN10 (ISO 7005 PN10)	3" ANSI 150 lbs (ISO 7005 PN 20)
Combustion air inlet	10"	10"
UV connection	Rp 1	1" NPT



Drawing of DELTA-TE™ III burner size 6.5 ft to 9 ft with plug



- 1) Pilot burner / UV-scanner
- 2) Gas inlet
- 3) Combustion air inlet
- 4) Plug to be mounted in opening duct wall
- 5) Process air flow
- 6) Burner mounting support
- 7) View port
- 8) Detail burner mounting support

Dimensions in inches, unless stated otherwise																
Size	A [1]	B	E	K	L	M	N	O	P	Q	R	S	T	U	V	Z
6.5	>15.75	0.31	>15.75	14.96	78.70	7.32	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49	23.23	0.71
7	>15.75	0.31	>15.75	14.96	84.72	7.32	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49	23.23	0.71
7.5	>15.75	0.31	>15.75	14.96	90.75	7.32	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49	23.23	0.71
8	>15.75	0.31	>15.75	14.96	96.77	7.32	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49	23.23	0.71
8.5	>15.75	0.31	>15.75	14.96	102.80	7.32	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49	23.23	0.71
9	>15.75	0.31	>15.75	14.96	108.82	7.32	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49	23.23	0.71
Size	AA	BB	CC	DD	EE	FF	Burner length L	Combustion air inlet X Y		Opening duct wall		Weight				
6.5	56.69	39.06	30.79	18.03	53.54	20.08	78.70	8.66 15.94		17 x 50.4		831 lbs				
7	56.69	39.06	30.79	18.03	53.54	20.08	84.72	8.66 15.94		17 x 50.4		871 lbs				
7.5	56.69	39.06	30.79	18.03	53.54	20.08	90.75	8.66 15.94		17 x 50.4		910 lbs				
8	56.69	39.06	30.79	18.03	53.54	20.08	96.77	8.66 15.94		17 x 50.4		950 lbs				
8.5	56.69	39.06	30.79	18.03	53.54	20.08	102.80	8.66 15.94		17 x 50.4		990 lbs				
9	56.69	39.06	30.79	18.03	53.54	20.08	108.82	8.66 15.94		17 x 50.4		1029 lbs				

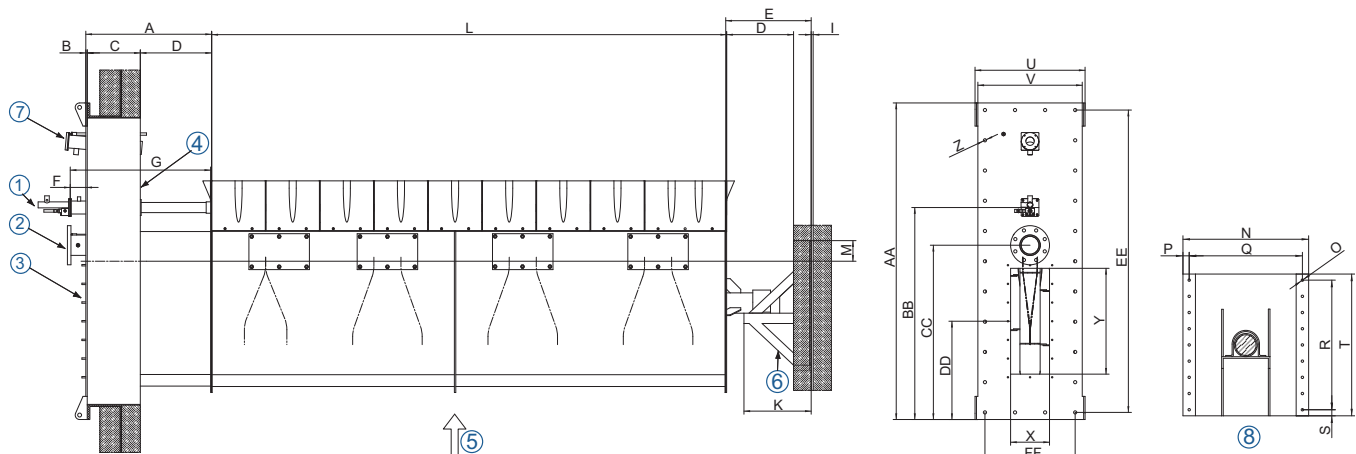
[1] min. 15.75" without plug or insulation

Following dimensions are specific to each system :

- C = default 15.75 ft (customer's flange elevation + customer's internal and external insulation thickness)
- D = distance between wall and burner
- F = pilot burner elevation flange LG = 2" to 5.9"
- G = pilot length = F + B + C + D
- I = duct wall thickness

	ISO	ANSI
Gas inlet	DN 100 DIN PN10 (ISO 7005 PN10)	4" ANSI 150 lbs (ISO 7005 PN 20)
UV connection	Rc 1	1" NPT

Drawing of DELTA-TE™ III burner size 9.5 ft to 12 ft with plug



- 1) Pilot burner / UV-scanner
- 2) Gas inlet
- 3) Combustion air inlet
- 4) Plug to be mounted in opening duct wall
- 5) Process air flow
- 6) Burner mounting support
- 7) View port
- 8) Detail burner mounting support

Dimensions in inches, unless stated otherwise																
Size	A [1]	B	E	K	L	M	N	O	P	Q	R	S	T	U	V	Z
9.5	>15.75	0.31	>15.75	14.96	114.84	4.57	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49	23.23	0.71
10	>15.75	0.31	>15.75	14.96	120.87	4.57	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49	23.23	0.71
10.5	>15.75	0.31	>15.75	14.96	126.89	4.57	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49	23.23	0.71
11	>15.75	0.31	>15.75	14.96	132.91	4.57	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49	23.23	0.71
11.5	>15.75	0.31	>15.75	14.96	138.94	4.57	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49	23.23	0.71
12	>15.75	0.31	>15.75	14.96	144.96	4.57	24.57	0.47	1.22	22.13	25.20	1.18	27.56	24.49	23.23	0.71
Size	AA	BB	CC	DD	EE	FF	Burner length L	Combustion air inlet X Y		Opening duct wall	Weight					
9.5	70.08	46.93	38.58	21.77	66.93	20.08	114.84	8.66	23.43	17 x 63.8	1069 lbs					
10	70.08	46.93	38.58	21.77	66.93	20.08	120.87	8.66	23.43	17 x 63.8	1109 lbs					
10.5	70.08	46.93	38.58	21.77	66.93	20.08	126.89	8.66	23.43	17 x 63.8	1148 lbs					
11	70.08	46.93	38.58	21.77	66.93	20.08	132.91	8.66	23.43	17 x 63.8	1188 lbs					
11.5	70.08	46.93	38.58	21.77	66.93	20.08	138.94	8.66	23.43	17 x 63.8	1228 lbs					
12	70.08	46.93	38.58	21.77	66.93		144.96	8.66	23.43	17 x 63.8	1267 lbs					

[1] min.15.75" without plug or insulation

Following dimensions are specific to each system :

- C = default 1 ft (customer's flange elevation + customer's internal and external insulation thickness)
- D = distance between wall and burner
- F = pilot burner elevation flange LG = 2" to 5.9"
- G = pilot length = F + B + C+ D
- I = duct wall thickness

	ISO	ANSI
Gas inlet	DN 100 DIN PN10 (ISO 7005 PN10)	4" ANSI 150 lbs (ISO 7005 PN 20)
UV connection	Rc 1	1" NPT

