



The FRG range of burners offers a wide choice of options for operation up to 1600°C. At temperatures up to 1000°C, an alloy flame tube is available. Above this temperature the 'S' version is equipped with a silicon carbide flame tube for low, medium or high velocity. For temperatures above 1600°C please consult FivesNA.

The FRG burner with its alloy or silicon carbide flame tube is a highly versatile burner with the flame tube length variable to suit the application. Lengths from 120mm upwards are possible with the alloy flame tube and from 200mm for the silicon carbide unit.

Additionally the silicon carbide flame tube can be mounted to an alloy tube of variable length to enhance the flexibility of the FRG burner.

The medium velocity version, the FRG MVS, produces a stream of combustion products to promote rapid stirring within the furnace. This increases the heat transfer to a cold load by the reduction in thermal boundary layer thickness and at temperature further aids heat transfer by maintaining a homogeneous gas temperature throughout the furnace.

All burners in the range have spark ignition with ionisation flame monitoring. UV scanning may be employed under certain circumstances. Reference should be made to FivesNA.

### **Burner design / principles of operation**

The FRG range of burners is a series of nozzle mixing burners producing burner exhaust velocities

### **FRG – Features**

- High on-stoichiometric turn-down
- High velocity up to 145 m/s
- Preheated air up to 350°C standard (higher temperatures available – contact FivesNA)
- Choice of alloy or silicon carbide flame tube or refractory tile
- Various ignition and flame monitoring options

from a standard or low velocity of approximately 30 m/s to a high velocity of 145 m/s.

It should be noted that the high velocity of 145 m/s is achieved at the maximum capacity which requires higher air/gas provisions. At the nominal capacity the exhaust velocity achieved is approximately 100 m/s.

In addition, a wide range of air/fuel ratios can be accommodated from excess air levels, to give a diluted exhaust temperature for gentle drying applications, through to excess fuel operation for reducing atmosphere work. They are thus suited to a wide range of industrial processes with temperatures up to 1600°C.

An orifice plate is incorporated in the air inlet flange thus enabling an accurate measure of air flows to be obtained. It should be noted that in general if the orifice plate is removed, for example to reduce the air pressure required at the burner, then the gas pressure may exceed the air pressure. Therefore if a proportionator is used to control the air/fuel ratio it must be a multiplying proportionator – refer to FivesNA for further information if required.

By design, high on ratio turndown is achieved. The burner can operate with preheated air up to 350°C.

### **Burner options available**

All burners are supplied with direct spark ignition and flame rod. UV flame detection can be supplied as an option – reference should be made to FivesNA. Similarly special arrangements such as cranked flame tube outlets can be supplied. Again reference should be made to FivesNA.

## Specifications and Capacities

### Burner flame tube material choice

Application temperature (°C)	(LV) Alloy grade type 321	(LV) Alloy grade type 310	Siliconised silicon carbide (LVS/MVS)	Refractory
Up to 800°C	✓	-	-	-
800 < 1000°C	-	✓	-	-
1000 < 1400°C	-	-	✓	-
1400 < 1600°C	-	-	-	✓

The grade of material is selected in accordance with the table as a function of application temperature. However, note that all medium and high velocity versions use only silicon carbide regardless of the application temperature.

### Capacities and specifications

Model No.	Nominal capacity (kW)	* Air inlet Pressure (mbar) @ 15°C at nominal capacity	** Air Orifice Differential Pressure (mbar) @ 15°C at nominal capacity	*** Natural Gas inlet Pressure (mbar) @ 15°C at nominal capacity	Exit Velocity (m/s) at nominal capacity	Maximum capacity (kW)	Air inlet Pressure (mbar) @ 15°C at max. capacity	Air Orifice Differential Pressure (mbar) @ 15°C at max. capacity	Natural Gas inlet Pressure (mbar) @ 15°C at max. capacity	Exit Velocity (m/s) at max. capacity
FRG LV 1B	29	24	18	8	24	44	64	48	20	36
FRG LV 2B	58	30	22	8	29	87	71	50	14	44
FRG LV 3B	87	26	21	16	44	116	47	32	19	58
FRG LV 4B	116	27	21	15	41	175	56	43	30	62
FRG LV 5B	232	26	20	13	47	350	63	47	29	72
FRG LV 6B	440	26	14	13	58	656	55	30	24	87
FRG MV 1B	29	37	19	17	95	44	87	46	37	144
FRG MV 2B	58	32	24	14	96	87	80	52	30	144
FRG MV 3B	87	31	20	20	94	116	57	37	31	125
FRG MV 4B	116	32	20	22	95	175	66	43	42	143
FRG MV 5B	232	30	18	19	96	350	75	47	43	144
FRG MV 6B	440	33	14	22	97	656	68	30	43	145

#### Notes:

\* For impulse firing systems a flow distributor can be employed in the gas feed pipe and gas pressures may be higher than shown here – reference should be made to FivesNA.

\*\* Minimum required at the nominal rating – measured at the burner. The air pressure is the nominal static pressure measured upstream of the orifice plate.

\*\*\* The differential air pressure is measured from a tapping, immediately upstream of the orifice plate located in the air inlet flange, and on the burner body.

The heat release shown is based on natural gas nett CV 8320 kcal/nm<sup>3</sup>

### Typical performance characteristics

Model No.	* Approx Flame lengths (mm)	** Nominal Excess Air Capacity (%)	*** Nominal Excess Gas Capacity (%)
FRG LV 1B	250	480	21
FRG LV 2B	300	400	33
FRG LV 3B	400	570	15
FRG LV 4B	500	2200	29
FRG LV 5B	600	2800	55
FRG LV 6B	900	2150	82
FRG MV 1B	200	300	30
FRG MV 2B	300	650	25
FRG MV 3B	350	980	44
FRG MV 4B	400	2200	38
FRG MV 5B	500	3200	38
FRG MV 6B	600	2800	82

#### Notes:

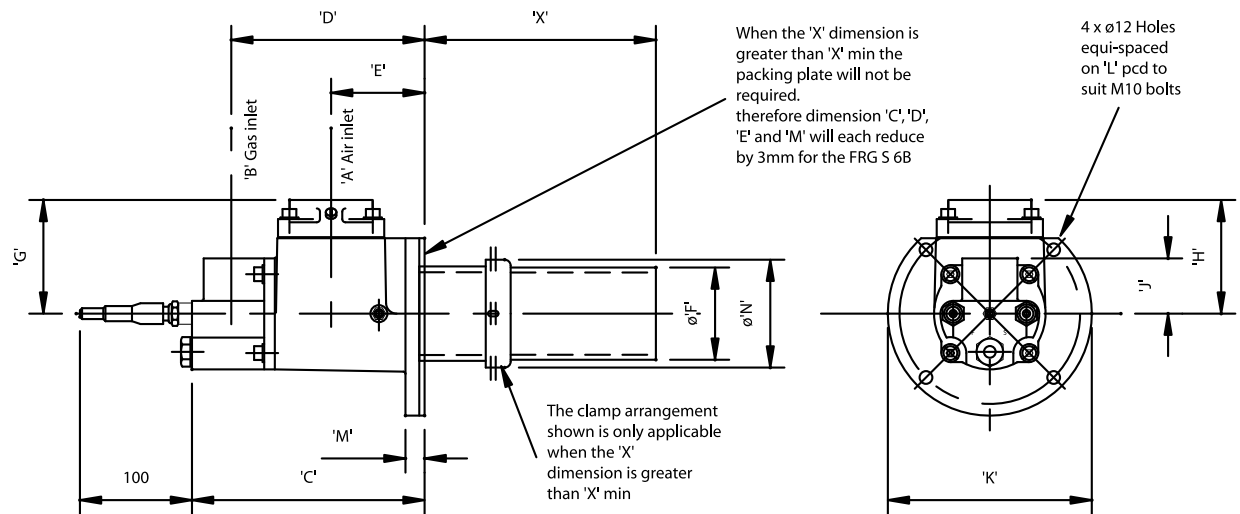
\* Based on nominal burner capacity

\*\* Based on air flow at nominal capacity with reduction in gas flow

\*\*\* Based on air flow at nominal capacity with increase in gas flow

## Dimensions

### Low Velocity Gas Burners FRG Series with Silicon Carbide Flame Tube

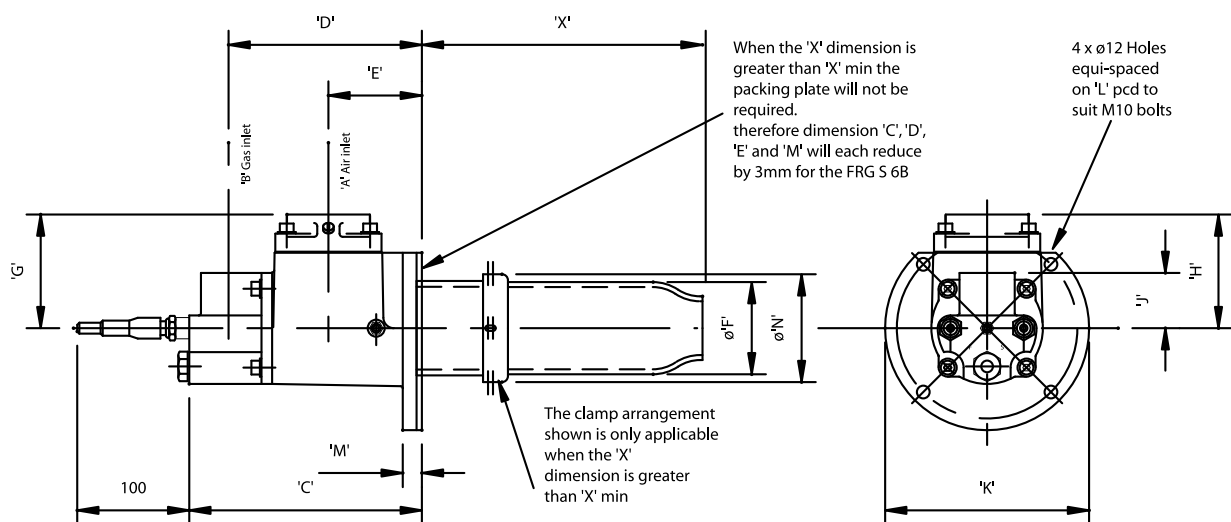


Model No.	Part No.	A	B	C	D	E	F	G	H	J	K	L	M	N	X min	Weight kg
FRG LVS 1B	2.27.448	Rp1	Rp1/2	144	124	62	65	74	93	35	$\phi 148$	125	16	80	200	8
FRG LVS 2B	2.27.449	Rp1 1/2	Rp3/4	186	156	71	80	94	101	47	$\phi 168$	145	16	95	200	10
FRG LVS 3B	2.27.450	Rp1 1/2	Rp3/4	186	156	71	80	94	101	47	$\phi 168$	145	16	95	200	10
FRG LVS 4B	2.27.451	Rp2	Rp1	219	182	86	93	105	111	52	$\phi 193$	170	16	108	200	12
FRG LVS 5B	2.27.452	Rp3	Rp1	257	227	105	119	126	150	63	+180	220	21	132	200	15
FRG LVS 6B	2.27.453	Rp4	Rp1 1/4	260	230	108	145	126	150	63	+180	220	22	160	200	20

Note: Dimension 'X' is dependent on the burner application and must be stated on order.

(+ Square flange)

### Medium Velocity Gas Burners FRG Series with Silicon Carbide Flame Tube



Model No.	Part No.	A	B	C	D	E	F	G	H	J	K	L	M	N	X min	Weight kg
FRG MVS 1B	2.27.454	Rp1	Rp1/2	144	124	62	65	74	93	35	$\phi 148$	125	16	80	250	8
FRG MVS 2B	2.27.455	Rp1 1/2	Rp3/4	186	156	71	80	94	101	47	$\phi 168$	145	16	95	250	10
FRG MVS 3B	2.27.456	Rp1 1/2	Rp3/4	186	156	71	80	94	101	47	$\phi 168$	145	16	95	250	10
FRG MVS 4B	2.27.457	Rp2	Rp1	219	182	86	93	105	111	52	$\phi 193$	170	16	108	250	12
FRG MVS 5B	2.27.458	Rp3	Rp1	257	227	105	119	126	150	63	+180	220	21	132	310	15
FRG MVS 6B	2.27.459	Rp4	Rp1 1/4	260	230	108	145	126	150	63	+180	220	22	160	310	21

Note: Dimension 'X' is dependent on the burner application and must be stated on order. (+ Square flange)

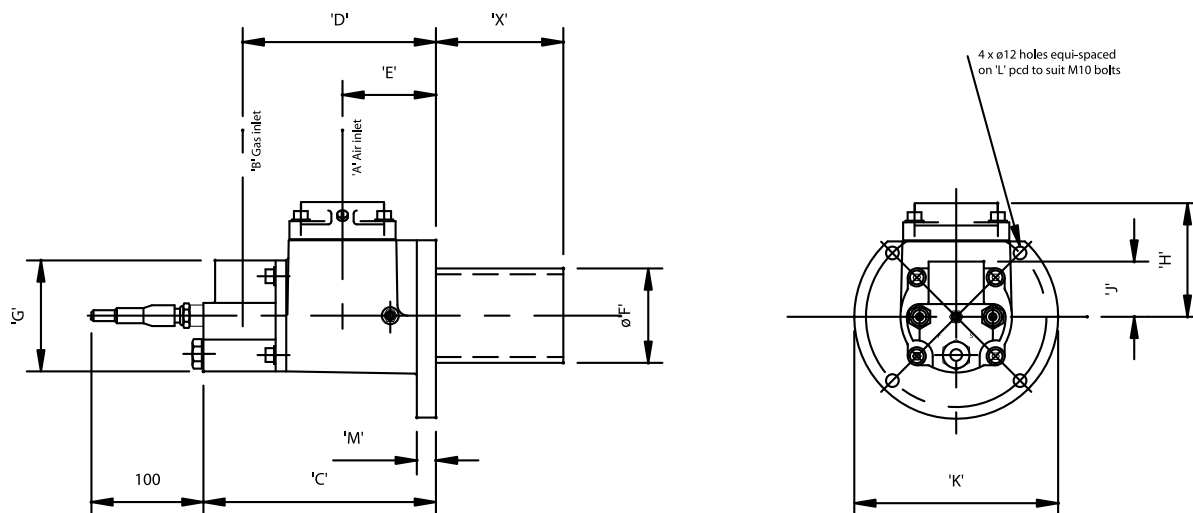
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## Dimensions

### Low Velocity Gas Burners FRG Series with Alloy Flame Tube

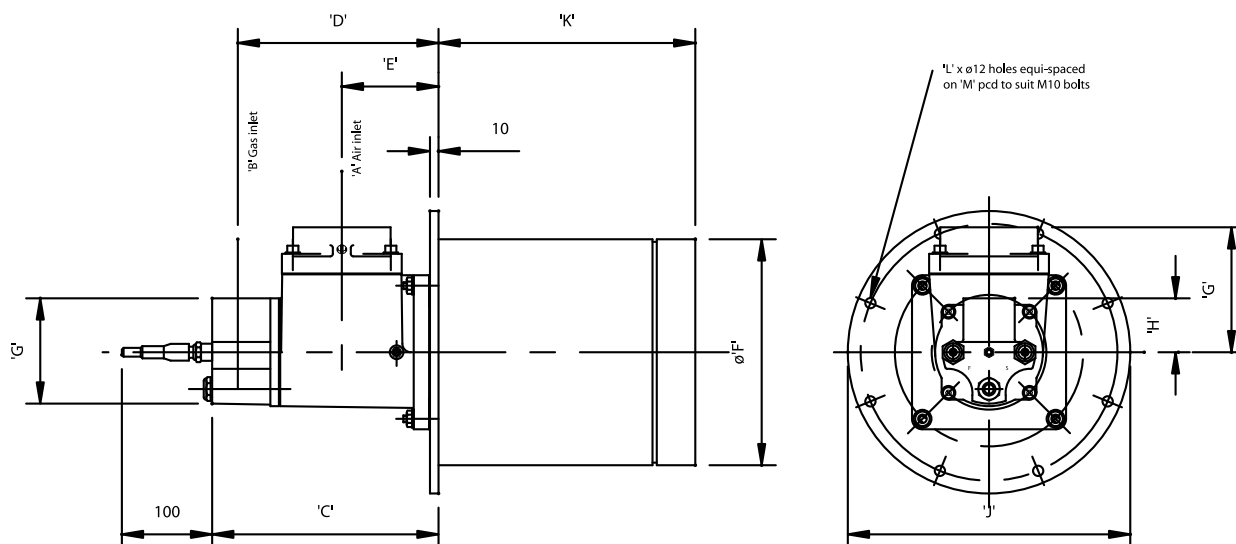


Model No.	Part No.	A	B	C	D	E	F	G	H	J	K	L	M	X min	Weight kg
FRG 1B	2.27.442	Rp1	Rp1/2	141	121	59	61	74	93	35	ø148	125	13	120	8.5
FRG 2B	2.27.443	Rp11/2	Rp3/4	183	153	68	77	94	101	47	ø168	145	13	120	10
FRG 3B	2.27.444	Rp11/2	Rp3/4	183	153	68	77	94	101	47	ø168	145	13	120	10
FRG 4B	2.27.445	Rp2	Rp1	216	179	83	89	105	111	52	ø193	170	13	120	13
FRG 5B	2.27.446	Rp3	Rp1	254	224	102	115	126	150	63	+180	220	18	120	20
FRG 6B	2.27.447	Rp4	Rp11/4	260	230	108	141	126	150	63	+180	220	22	150	23

Note: Dimension 'X' is dependent on the burner application and must be stated on order.

(+ Square flange)

### Low Velocity & Medium Velocity Gas Burners FRG Series with Refractory Tile



Model No.	Part No.	A	B	C	D	E	F	G	H	J	K	L	M	Weight kg
FRG LVR, MVR 1B	2.27.100.B	Rp1	Rp1/2	153	133	71	148	93	35	ø218	240	4	188	refer to NAS
FRG LVR, MVR 2B	2.27.101.B	Rp11/2	Rp3/4	195	165	80	168	101	47	ø238	240	4	208	refer to NAS
FRG LVR, MVR 3B	2.27.102.B	Rp11/2	Rp3/4	195	165	80	168	101	47	ø238	240	4	208	refer to NAS
FRG LVR, MVR 4B	2.27.103.B	Rp2	Rp1	228	191	95	192	111	52	ø262	240	4	232	refer to NAS
FRG LVR, MVR 5B	2.27.104.B	Rp3	Rp1	266	236	114	243	150	63	ø313	300	8	283	refer to NAS
FRG LVR, MVR 6B	2.27.281.B	Rp4	Rp11/4	269	239	117	264	150	63	ø330	300	8	300	refer to NAS

**WARNING:** The data outlined is for information only and does not form part of any contract. Our policy is one of continuous improvement and we therefore reserve the right to modify specifications or dimensions without prior warning. Situations dangerous to personnel and property can develop from incorrect installation and operation of combustion equipment. Fives North American Combustion UK, Ltd urges compliance with International, National and Local Safety Standards and that installation is carried out by properly qualified personnel.

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