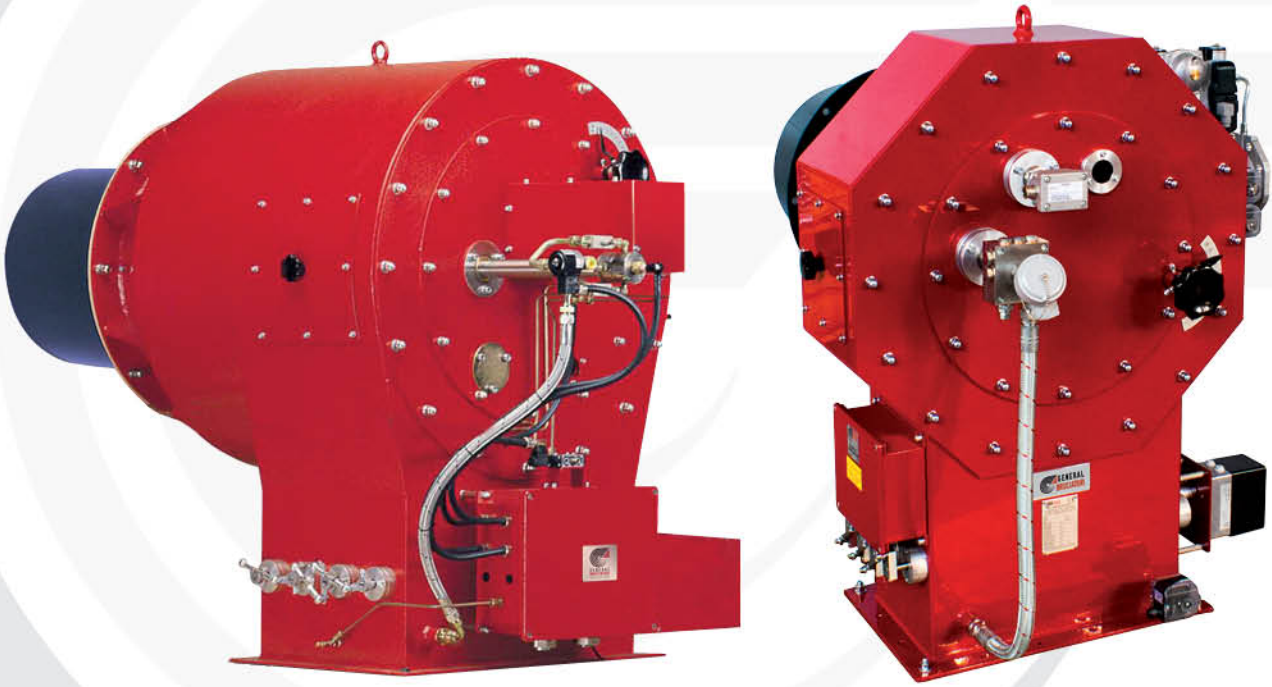
GENERAL BRUCIATORI
We tailor your heat

# INDUSTRIAL DUOBLOCK REGISTER BURNERS

AMR
AMRO



GAS DIESEL OIL LOWGAS ALCOHOL

FUEL

**General Bruciatori** was established in Parma in 1975 as a manufacturer of large capacity industrial burners for a variety of applications.
Our burners are used effectively on hot water boilers, steam boilers, diathermic boilers, incinerators, all types of dryers, industrial processes in energy-intensive industries.

For over **40 years** we have been making industrial burners with a single aim: to meet your specific needs.
Like a tailor who makes a suit to fit an individual's proportions, General Bruciatori listens to a customer's requirements, and on that basis rapidly and efficiently engineers solutions that are tailored in terms of technology as well as in terms of investment, offering highly customized products.
Thanks to the company's vast expertise, General Bruciatori can offer a complete service, from development of complex, articulated projects to supply of turnkey combustion systems, with the advantage of having a single partner throughout the entire project.

The General Bruciatori range covers a large number of industrial burner types and complementary products:

- Monoblock burners
- Burners with separate elements
- Burners with separate elements and flame register
- Dust burners
- Combustors

This brochure presents a detailed overview of our **AMR** and **AMRO** range of burners with flame register.

**General Bruciatori**
**Custom products built to your exact needs.**


DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificato No./Certificate No.: 74392-2010-AQ-ITA-SINCERT
Data prima emissione/Initial date: 31 gennaio 2010
Validità/Valid: 25 giugno 2015 - 25 giugno 2018

Si certifica che il sistema di gestione di/This is to certify that the management system of

**GENERAL BRUCIATORI S.r.l.**

Via Azzali, 10 - 43100 Parma (PR) - Italy

È conforme ai requisiti della norma per il Sistema di Gestione Qualità/ has been found to conform to the Quality Management System standard:

**UNI EN ISO 9001:2008 (ISO 9001:2008)**

Questa certificazione è valida per il seguente campo applicativo:
**Progettazione, produzione, installazione e assistenza post vendita di bruciatori industriali**
**(Settore EA : 18)**

This certificate is valid for the following scope:
**Design, manufacture, installation and after-sales servicing of industrial burners**
**(EA Sector : 18)**

Luogo e Data/Place and date:
**Vimercate, 18 settembre 2015**

ACCREDIA

Per l'Organismo di Certificazione/ For the Certification Body

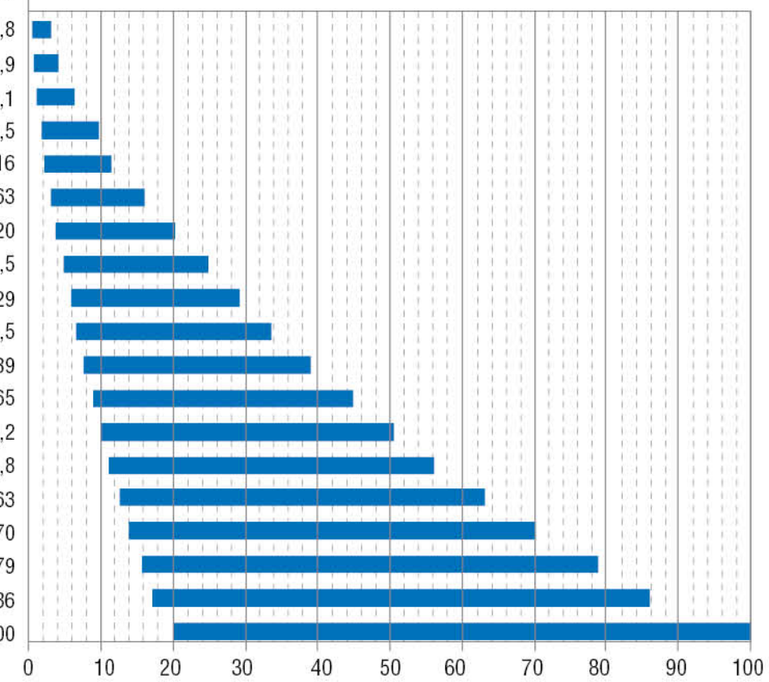
**Vittore Marangon**
**Management Representative**

# RANGE OVERVIEW

## Duoblock burner range overview

Rating AMR - AMRO series - Air temperature 20°C

| Modello | Capacity (MW) Min* | Max |
|---|---|---|
| AMR/AMRO - 3 | 0,56 | 2,8 |
| AMR/AMRO - 4 | 0,78 | 3,9 |
| AMR/AMRO - 5 | 1,22 | 6,1 |
| AMR/AMRO - 6 | 1,9 | 9,5 |
| AMR/AMRO - 7 | 2,25 | 11,16 |
| AMR/AMRO - 8 | 3,15 | 15,63 |
| AMR/AMRO - 9 | 4 | 20 |
| AMR/AMRO - 10 | 4,9 | 24,5 |
| AMR/AMRO - 11 | 6 | 29 |
| AMR/AMRO - 12 | 6,7 | 33,5 |
| AMR/AMRO - 13 | 7,8 | 39 |
| AMR/AMRO - 14 | 8,95 | 44,65 |
| AMR/AMRO - 15 | 10,1 | 50,2 |
| AMR/AMRO - 16 | 11,2 | 55,8 |
| AMR/AMRO - 17 | 12,6 | 63 |
| AMR/AMRO - 18 | 14 | 70 |
| AMR/AMRO - 19 | 15,8 | 79 |
| AMR/AMRO - 20 | 17,2 | 86 |
| AMR/AMRO - 21 | 20 | 100 |




**Min*: ref natural gas**





# BURNER DESIGNATION

| AMR | 12 | GN | EM | AC | A | LP | FGR | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | LOW NOx OPTION |
| | | | | | | | | FGR | Low NOx flue gas external recirculation |
| | | | | | | | | LX | Low NOx internal recirculation |
| | | | | | | | | LP | Low pressure fuel — SPECIAL VERSION |
| | | | | | | | | DF | Double air flow |
| | | | | | | | | V | Steam — ATOMIZING OPTION |
| | | | | | | | | A | Compressed air |
| | | | | | | | | AC | Combustion hot air |
| | | | | | | | | | BURNER OPERATION |
| | | | | | | | | /2 | Two stages |
| | | | | | | | | MC | Mechanical cam |
| | | | | | | | | EM | Electronic cam |
| | | | | | | | | | FUEL TYPE |
| | | | | | | | | D | Diesel oil |
| | | | | | | | | G | Natural Gas |
| | | | | | | | | N | Heavy oil |
| | | | | | | | | GN | Dual fuel gas / heavy oil |
| | | | | | | | | GD | Dual fuel gas / diesel oil |
| | | | | | | | | | MODEL IDENTIFICATION |
| | | | | | | | | | Size |
| | | | | | | | | | FAMILY TYPE |
| | | | | | | | | | Duoblock burner |
| | | | | | | | | AMR | Flame register |
| | | | | | | | | AMRO | Flame register octagonal shape |
| | | | | | | | | AMRP | Plate flame register |
| | | | | | | | | AMRPO | Plate flame register octagonal shape |

*The above listed LX option and special version, if required, might be installed simultaneously: LP + DF*

| | | | AMR AMRO 3 | AMR AMRO 4 | AMR AMRO 5 | AMR AMRO 6 | AMR AMRO 7 | AMR AMRO 8 | AMR AMRO 9 | AMR AMRO 10 | AMR AMRO 11 | AMR AMRO 12 | AMR AMRO 13 | AMR AMRO 14 | AMR AMRO 15 | AMR AMRO 16 | AMR AMRO 17 | AMR AMRO 18 | AMR AMRO 19 | AMR AMRO 20 | AMR AMRO 21 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **HEATING OUTPUT** | MODEL | | | | | | | | | | | | | | | | | | | | | |
| | OUTPUT | min*-max [kW] | 560 - 2800 | 780 - 3900 | 1220 - 6100 | 1900 - 9500 | 2250 - 11160 | 3150 - 15630 | 4000 - 20000 | 4900 - 24500 | 6000 - 29000 | 6700 - 33500 | 7800 - 39000 | 8950 - 44650 | 10100 - 50200 | 11200 - 55800 | 12600 - 63000 | 14000 - 70000 | 15000 - 79000 | 17200 - 86000 | 20000 - 100000 | min-max [kW] |
| **FUEL DATA** | CAPACITY HEAVY OIL | min-max [kg] | 85 - 250 | 120 - 350 | 180 - 550 | 285 - 850 | 335 - 1000 | 470 - 1400 | 600 - 1800 | 730 - 2195 | 870 - 2600 | 1000 - 3000 | 1165 - 3495 | 1335 - 4000 | 1500 - 4500 | 1670 - 5000 | 1880 - 5645 | 2090 - 6275 | 2360 - 7080 | 2570 - 7705 | 2990 - 8960 | min-max [kg] |
| | VISCOSITY FUEL (diesel oil) | °E - cSt | | | | 1.5 °E at 20°C - 6 cSt at 20°C | | | | | | | | | | | | | | | | °E - cSt |
| | VISCOSITY FUEL (heavy oil) | °E - cSt | | | | 60°E at 50°C - 450 cSt at 50 °C | | | | | | | | | | | | | | | | °E - cSt |
| | CAPACITY NATURAL GAS (G20) | min-max [m³n/h] | 60 - 280 | 80 - 395 | 125 - 620 | 190 - 960 | 230 - 1130 | 320 - 1580 | 405 - 2025 | 500 - 2480 | 605 - 2935 | 680 - 3390 | 790 - 3950 | 905 - 4520 | 1020 - 5080 | 1135 - 5650 | 1275 - 6375 | 1420 - 7085 | 1600 - 8000 | 1740 - 8700 | 2025 - 10120 | min-max [m³n/h] |
| | MAX GAS PRESSURE | mbar | | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | 450 | mbar |
| **GAS CONNECTION** | GAS BUTTERFLY VALVE | diameter | 1" 1/2 | 2" | DN65 | DN80 | DN80 | DN100 | DN100 | DN125 | DN125 | DN125 | DN150 | DN150 | DN150 | DN200 | DN200 | DN200 | DN200 | DN200 | DN200 | diameter |
| **BURNER OPERATION** | OPERATING CONDITION | | PROGRESSIVE 2 STAGE - Intermittent operation (min. 1 stop each 24hrs of operation) | | | | | | | | | | | | | | | | | | | |
| | MODULATING RATIO (at max output) | | 1 - 5 Gas 1 - 3 Diesel oil 1- 3 Heavy oil | | | | | | | | | | | | | | | | | | | |
| | WORKING TEMPERATURE | min-max [°C] | -15°C +50°C | | | | | | | | | | | | | | | | | | | min-max [°C] |
| **ELECTRICAL DATA** | ELECTRIC SUPPLY | V - Hz | 230 V - 50 Hz | | | | | | | | | | | | | | | | | | | V - Hz |
| | IGNITION TRANSFORMER OIL | V2 - I2mA | 2 x 6500 V- 35 mA | | | | | | | | | | | | | | | | | | | V2 - I2mA |
| | IGNITION TRANSFORMER GAS | V2 - I2mA | 8000 V - 20 mA | | | | | | | | | | | | | | | | | | | V2 - I2mA |
| | AUXILIARY ELECTRICAL POWER INSTALLED | kW | 0.65 | | | | | | | | | | | | | | | | | | | kW |
| | PROTECION LEVEL | IP | IP 40 | | | | | | | | | | | | | | | | | | | IP |
| **APPROVALS** | DIRECTIVE | | 89/336 - 72/23 - 98/37 - 2009/142/EC | | | | | | | | | | | | | | | | | | | |
| | CONFORMING TO | | EN 267 - EN 676 | | | | | | | | | | | | | | | | | | | |

*The whole range is available with Low NOx configuration:*

- *Gas fired in Class III in accordance with EN 676 and related specification about combustion chamber dimensions and thermal load. The NOx level refer to the average NOx among the burner's working curve.*
- *Diesel fired Low NOx in accordance to EN 267*

***Please note that fuel composition might also affect the NOx levels.***

*Min*: ref natural gas*
*Reference conditions:*
*Air temperature 20°C*
*Pressure 1013.5 mbar*
*Altitude 0 m a.s.l*

## Conversion of calorific values

1 kcal/kg = 4.186 kJ/kg
1 kWh/kg = 3600 kJ/kg
1 kcal/kg = 0.001163 kWh/kg

## Heating values of gaseous fuels

| Fuel | densità kg/m³ | LOWER HEATING VALUE MJ/kg | MJ/m³n | kcal/m³n | kWh/m³n |
|---|---|---|---|---|---|
| G20 nat gas | - | - | 35.58 | 8500 | 9.88 |
| Propano | 2.02 | 45.98 | 92.88 | 22188 | 25.80 |
| Butano | 2.71 | 45.70 | 123.84 | 29585 | 34.40 |

## Heating values of liquid fuels

| Fuel | densità kg/l | LOWER HEATING VALUE MJ/l | MJ/kg | kcal/kg | kWh/kg |
|---|---|---|---|---|---|
| Diesel oil | 0.84 | 35.86 | 42.70 | 10200 | 11.86 |
| HFO | 0.96 | 38.58 | 40.18 | 9600 | 11.16 |
| Kerosene | 0.81 | 34.68 | 42.81 | 10227 | 11.89 |

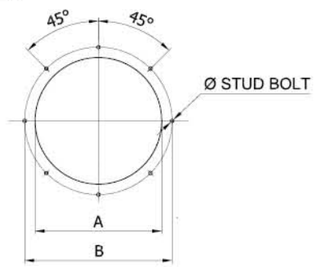
| Model | A | B | C | øD | E | øH | L | G | M | M1 | N | N1 | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AMR 3 | 270 | 356 | 240 | 16 | 395 | 14 | 500 | 608 | 372 | 220 | 472 | 302 | 304 | 600 | 494 |
| AMR 4 | 320 | 396 | 290 | 16 | 445 | 14 | 520 | 648 | 422 | 244 | 530 | 350 | 324 | 650 | 519 |
| AMR 5 | 380 | 466 | 350 | 16 | 485 | 14 | 530 | 718 | 532 | 312 | 632 | 412 | 359 | 700 | 574 |
| AMR 6 | 450 | 536 | 420 | 16 | 535 | 14 | 570 | 788 | 602 | 372 | 702 | 472 | 394 | 750 | 609 |
| AMR 7 | 510 | 602 | 480 | 16 | 555 | 14 | 610 | 848 | 642 | 402 | 742 | 502 | 424 | 800 | 629 |
| AMR 8 | 570 | 662 | 540 | 16 | 605 | 14 | 650 | 908 | 702 | 452 | 802 | 552 | 454 | 850 | 659 |
| AMR 9 | 630 | 722 | 600 | 18 | 655 | 14 | 660 | 968 | 762 | 502 | 862 | 602 | 484 | 900 | 689 |
| AMR 10 | 680 | 772 | 650 | 18 | 705 | 14 | 700 | 1018 | 792 | 552 | 892 | 652 | 509 | 950 | 704 |
| AMR 11 | 750 | 842 | 720 | 18 | 755 | 14 | 720 | 1088 | 852 | 602 | 952 | 702 | 544 | 1000 | 734 |
| AMR 12 | 830 | 912 | 800 | 18 | 845 | 14 | 710 | 1300 | 852 | 602 | 952 | 702 | 650 | 1100 | 734 |
| AMR 13 | 890 | 982 | 860 | 18 | 575 | 14 | 730 | 1210 | 852 | 622 | 952 | 722 | 605 | 1100 | 734 |
| AMR 14 | 950 | 1042 | 920 | 18 | 995 | 14 | 760 | 1270 | 902 | 602 | 1002 | 702 | 635 | 1150 | 759 |
| AMR 15 | 1010 | 1102 | 980 | 18 | 1049 | 14 | 780 | 1800 | 902 | 622 | 1002 | 722 | 900 | 1200 | 759 |
| AMR 16 | 1070 | 1162 | 1040 | 18 | 1095 | 14 | 810 | 1400 | 902 | 652 | 1002 | 752 | 700 | 1250 | 759 |
| AMR 17 | 1130 | 1220 | 1100 | 18 | 1115 | 14 | 870 | 1700 | 1102 | 752 | 1202 | 852 | 850 | 1300 | 859 |
| AMR 18 | 1180 | 1260 | 1150 | 18 | 1115 | 14 | 1000 | 1900 | 1202 | 802 | 1302 | 902 | 950 | 1350 | 909 |
| AMR 19 | 1250 | 1350 | 1220 | 18 | 1120 | 14 | 1080 | 2012 | 1252 | 852 | 1352 | 952 | 1006 | 1400 | 934 |
| AMR 20 | 1310 | 1380 | 1280 | 18 | 1170 | 14 | 1100 | 2100 | 1302 | 902 | 1402 | 1002 | 1050 | 1450 | 959 |
| AMR 21 | 1380 | 1410 | 1350 | 18 | 1220 | 14 | 1200 | 2200 | 1352 | 952 | 1452 | 1052 | 1100 | 1500 | 984 |

(**F**) Quota to be defined and specified at order confirmation

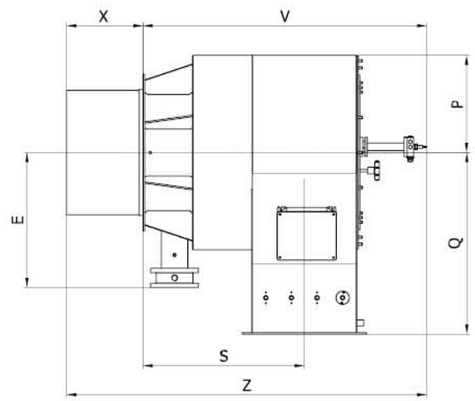
*Bottom view*



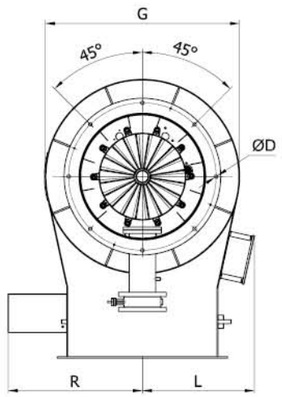

*Flange connection*




*Side view*




*Front view*

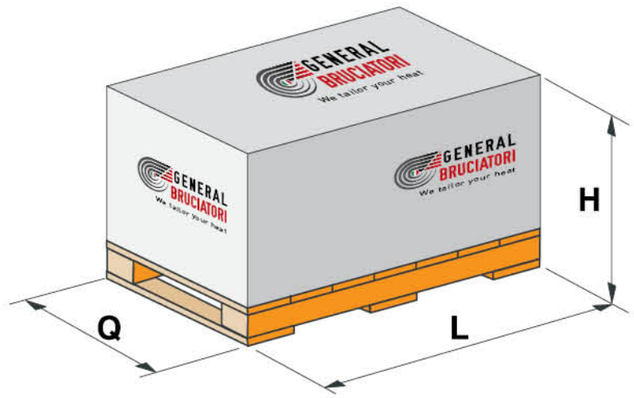



Quota are indicative and applicable to enteire AMR range.

| S | T | T1 | V | W | W1 | X* | Z | ø STUD BOLT | Model |
|---|---|---|---|---|---|---|---|---|---|
| 448 | 420 | 250 | 540 | 106 | 125 | 500 | 1040 | M14x50 | AMR 3 |
| 461 | 480 | 300 | 994 | 120 | 100 | 500 | 1494 | M14x50 | AMR 4 |
| 568 | 580 | 360 | 1136 | 145 | 120 | 500 | 1636 | M14x50 | AMR 5 |
| 696 | 650 | 420 | 1286 | 162,5 | 140 | 500 | 1786 | M14x50 | AMR 6 |
| 753 | 690 | 450 | 1366 | 115 | 90 | 500 | 1866 | M14x50 | AMR 7 |
| 793 | 750 | 500 | 1431 | 125 | 100 | 500 | 1931 | M14x50 | AMR 8 |
| 818 | 810 | 550 | 1481 | 135 | 110 | 500 | 1981 | M16x50 | AMR 9 |
| 844 | 840 | 600 | 1531 | 140 | 120 | 500 | 2031 | M16x50 | AMR 10 |
| 870 | 900 | 650 | 1586 | 150 | 130 | 500 | 2086 | M16x50 | AMR 11 |
| 907 | 900 | 650 | 1606 | 150 | 130 | 500 | 2106 | M16x50 | AMR 12 |
| 900 | 900 | 670 | 1626 | 150 | 134 | 500 | 2126 | M16x50 | AMR 13 |
| 920 | 950 | 650 | 1636 | 158,5 | 130 | 500 | 2136 | M16x50 | AMR 14 |
| 986 | 950 | 670 | 1665 | 158,5 | 134 | 500 | 2165 | M16x50 | AMR 15 |
| 950 | 950 | 700 | 1700 | 158,5 | 140 | 500 | 2200 | M16x50 | AMR 16 |
| 1000 | 1150 | 800 | 1750 | 230 | 160 | 500 | 2250 | M16x50 | AMR 17 |
| 1050 | 1250 | 850 | 1850 | 250 | 170 | 500 | 2350 | M16x50 | AMR 18 |
| 1100 | 1300 | 900 | 1900 | 221,5 | 186 | 500 | 2400 | M16x50 | AMR 19 |
| 1150 | 1350 | 950 | 1980 | 150 | 190 | 500 | 2480 | M16x50 | AMR 20 |
| 1200 | 1400 | 1000 | 2050 | 200 | 125 | 500 | 2550 | M16x50 | AMR 21 |

(**X***) The shown values refer to standard execution. In case different dimensions are required please contact our sales offices for evaluation

| Packaging dimensions | | | |
|---|---|---|---|
| Model | L mm | Q mm | H mm |
| AMR 3 | 1550 | 1100 | 1250 |
| AMR 4 | 1600 | 1150 | 1300 |
| AMR 5 | 1750 | 1250 | 1350 |
| AMR 6 | 1900 | 1350 | 1450 |
| AMR 7 | 2000 | 1350 | 1600 |
| AMR 8 | 2000 | 1450 | 1600 |
| AMR 9 | 2100 | 1450 | 1700 |
| AMR 10 | 2200 | 1500 | 1800 |
| AMR 11 | 2200 | 1600 | 1850 |
| AMR 12 | 2200 | 1600 | 1900 |
| AMR 13 | 2300 | 1600 | 2100 |
| AMR 14 | 2300 | 1700 | 2300 |
| AMR 15 | 2300 | 1700 | 2400 |
| AMR 16 | 2300 | 1700 | 2500 |
| AMR 17 | 2500 | 1800 | 2600 |
| AMR 18 | 2500 | 1800 | 2700 |
| AMR 19 | 2600 | 1800 | 2700 |
| AMR 20 | 2600 | 1800 | 2700 |
| AMR 21 | 2700 | 2100 | 2750 |




Above burner's dimensions refer to the gas range and are indicative only. Please contact our sales office for any further.

# AMRO - OVERALL DIMENSIONS AND PACKAGING

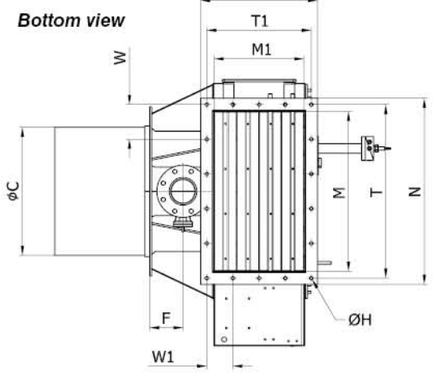
| Model | A | B | C | øD | E | øH | L | G | M | M1 | N | N1 | P | Q | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AMRO 3 | 270 | 356 | 240 | 16 | 374 | 14 | 500 | 600 | 400 | 220 | 500 | 320 | 300 | 600 | 508 |
| AMRO 4 | 310 | 396 | 290 | 16 | 404 | 14 | 520 | 648 | 430 | 250 | 530 | 350 | 324 | 650 | 523 |
| AMRO 5 | 380 | 466 | 350 | 16 | 453 | 14 | 530 | 718 | 450 | 250 | 550 | 350 | 359 | 700 | 533 |
| AMRO 6 | 450 | 536 | 420 | 16 | 498 | 14 | 570 | 788 | 530 | 310 | 630 | 410 | 394 | 750 | 573 |
| AMRO 7 | 510 | 602 | 480 | 16 | 548 | 14 | 610 | 848 | 600 | 340 | 700 | 440 | 424 | 800 | 608 |
| AMRO 8 | 570 | 662 | 540 | 16 | 605 | 14 | 650 | 908 | 680 | 390 | 780 | 490 | 454 | 850 | 648 |
| AMRO 9 | 630 | 722 | 600 | 18 | 654 | 14 | 660 | 968 | 700 | 450 | 800 | 550 | 484 | 900 | 658 |
| AMRO 10 | 680 | 842 | 650 | 18 | 705 | 14 | 700 | 1068 | 790 | 550 | 890 | 650 | 534 | 950 | 703 |
| AMRO 11 | 750 | 842 | 720 | 18 | 754 | 14 | 720 | 1242 | 820 | 550 | 920 | 650 | 621 | 1010 | 718 |
| AMRO 12 | 830 | 912 | 800 | 18 | 795 | 14 | 710 | 1292 | 804 | 602 | 904 | 702 | 646 | 1050 | 710 |
| AMRO 13 | 890 | 982 | 860 | 18 | 917 | 14 | 730 | 1344 | 852 | 622 | 952 | 722 | 672 | 1170 | 734 |
| AMRO 14 | 950 | 1042 | 920 | 18 | 995 | 14 | 760 | 1500 | 900 | 620 | 1000 | 720 | 750 | 1250 | 758 |
| AMRO 15 | 1010 | 1100 | 980 | 18 | 1045 | 14 | 780 | 1558 | 900 | 650 | 1000 | 750 | 779 | 1300 | 758 |
| AMRO 16 | 1070 | 1160 | 1040 | 18 | 1095 | 14 | 810 | 1600 | 1000 | 700 | 1100 | 800 | 800 | 1400 | 808 |
| AMRO 17 | 1130 | 1220 | 1100 | 18 | 1115 | 14 | 870 | 1708 | 1100 | 750 | 1200 | 850 | 854 | 1400 | 858 |
| AMRO 18 | 1180 | 1280 | 1150 | 18 | 1145 | 14 | 1000 | 1808 | 1200 | 800 | 1300 | 900 | 904 | 1400 | 908 |
| AMRO 19 | 1250 | 1350 | 1220 | 18 | 1196 | 14 | 1080 | 1908 | 1250 | 850 | 1350 | 950 | 954 | 1450 | 933 |
| AMRO 20 | 1370 | 1380 | 1280 | 18 | 1244 | 14 | 1100 | 2000 | 1300 | 900 | 1400 | 1000 | 1000 | 1500 | 958 |
| AMRO 21 | 1480 | 1410 | 1350 | 18 | 1292 | 14 | 1200 | 2100 | 1350 | 950 | 1450 | 1050 | 1050 | 1500 | 983 |

(**F**) Quota to be defined and specified at order confirmation

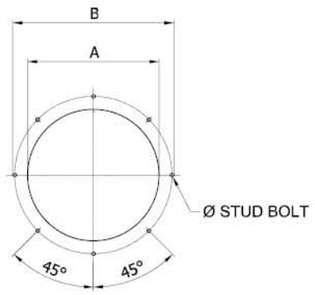
| S | T | T1 | V | W | W1 | X* | Z | ø STUD BOLT | Model |
|---|---|---|---|---|---|---|---|---|---|
| 290 | 450 | 270 | 540 | 150 | 135 | 500 | 1040 | M14x50 | AMRO 3 |
| 310 | 480 | 300 | 550 | 120 | 100 | 500 | 1050 | M14x50 | AMRO 4 |
| 330 | 500 | 300 | 560 | 100 | 100 | 500 | 1060 | M14x50 | AMRO 5 |
| 400 | 580 | 360 | 650 | 116 | 120 | 500 | 1150 | M14x50 | AMRO 6 |
| 435 | 650 | 390 | 720 | 130 | 130 | 500 | 1220 | M14x50 | AMRO 7 |
| 460 | 730 | 440 | 760 | 146 | 110 | 500 | 1260 | M14x50 | AMRO 8 |
| 505 | 750 | 500 | 840 | 150 | 125 | 500 | 1340 | M16x50 | AMRO 9 |
| 633 | 840 | 600 | 920 | 140 | 120 | 500 | 1420 | M16x50 | AMRO 10 |
| 675 | 870 | 600 | 1050 | 145 | 120 | 500 | 1550 | M16x50 | AMRO 11 |
| 700 | 854 | 652 | 1120 | 142 | 130 | 500 | 1620 | M16x50 | AMRO 12 |
| 710 | 902 | 672 | 1140 | 150 | 134 | 500 | 1640 | M16x50 | AMRO 13 |
| 760 | 950 | 670 | 1200 | 95 | 134 | 500 | 1700 | M16x50 | AMRO 14 |
| 790 | 950 | 700 | 1250 | 95 | 140 | 500 | 1750 | M16x50 | AMRO 15 |
| 820 | 1050 | 750 | 1300 | 105 | 125 | 500 | 1800 | M16x50 | AMRO 16 |
| 900 | 1150 | 800 | 1350 | 115 | 160 | 500 | 1850 | M16x50 | AMRO 17 |
| 1000 | 1250 | 850 | 1400 | 125 | 170 | 500 | 1900 | M16x50 | AMRO 18 |
| 1100 | 1300 | 900 | 1500 | 130 | 100 | 500 | 2000 | M16x50 | AMRO 19 |
| 1200 | 1350 | 950 | 1735 | 135 | 95 | 500 | 2235 | M16x50 | AMRO 20 |
| 1300 | 1400 | 1000 | 1950 | 140 | 100 | 500 | 2450 | M16x50 | AMRO 21 |

(**X***) The shown values refer to standard execution. In case different dimensions are required please contact our sales offices for evaluation

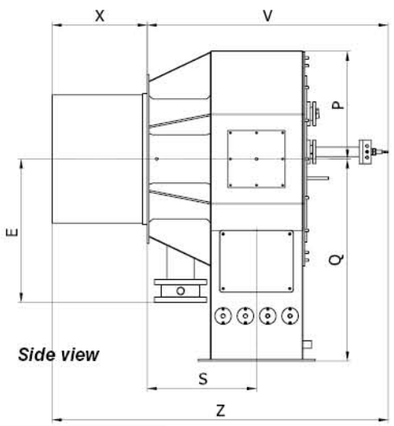
***Bottom view***



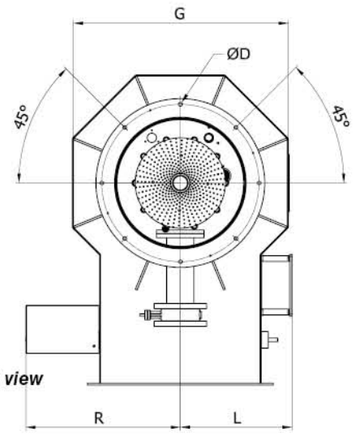

***Flange connection***




Quota are indicative and applicable to enteire AMR range.

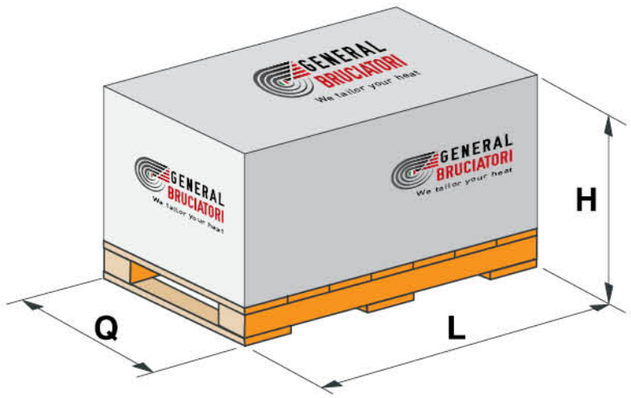



***Side view***




***Front view***

| Packaging dimensions | | | |
|---|---|---|---|
| Model | L mm | Q mm | H mm |
| AMRO 3 | 1550 | 1100 | 1250 |
| AMRO 4 | 1600 | 1150 | 1300 |
| AMRO 5 | 1750 | 1250 | 1350 |
| AMRO 6 | 1900 | 1350 | 1450 |
| AMRO 7 | 2000 | 1350 | 1600 |
| AMRO 8 | 2000 | 1450 | 1600 |
| AMRO 9 | 2100 | 1450 | 1700 |
| AMRO 10 | 2200 | 1500 | 1800 |
| AMRO 11 | 2200 | 1600 | 1850 |
| AMRO 12 | 2200 | 1600 | 1900 |
| AMRO 13 | 2300 | 1600 | 2100 |
| AMRO 14 | 2300 | 1700 | 2300 |
| AMRO 15 | 2300 | 1700 | 2400 |
| AMRO 16 | 2300 | 1700 | 2500 |
| AMRO 17 | 2500 | 1800 | 2600 |
| AMRO 18 | 2500 | 1800 | 2700 |
| AMRO 19 | 2600 | 1800 | 2700 |
| AMRO 20 | 2600 | 1800 | 2700 |
| AMRO 21 | 2700 | 2100 | 2750 |



## AMR / AMRO Burner specification - MC execution

| description | AMR-AMRO ...G | AMR-AMRO ...D | AMR-AMRO ...N | AMR-AMRO ...GD | AMR-AMRO ...GN |
|---|---|---|---|---|---|
| powder coated finish carbon steel body | ● | ● | ● | ● | ● |
| casing suitable for high temperature | ● | ● | ● | ● | ● |
| combustion head and flame stability disk made from stainless stell withstand of apporox. 1150°C | ● | ● | ● | ● | ● |
| air dampers | ● | ● | ● | ● | ● |
| minimum air pressure switch | ● | | | ● | ● |
| flame shape regulation device | ● | ● | ● | ● | ● |
| rear flame viewing port/flame inspection window | ● | ● | ● | ● | ● |
| progressive and continuous regulation group of the air/fuel | ● | ● | ● | ● | ● |
| electrical interface box with ignition transformer inside | ● | ● | ● | ● | ● |
| gas ignition tranformer | ● | | | ● | ● |
| diesel/ heavy oil ignition tranformer | | ● | ● | ● | ● |
| IP 40 electric protection level | ● | ● | ● | ● | ● |
| gas pilot burner with ignition electrode and cable | ● | ▲ | ▲ | ● | ● |
| gas pilot burner solenoid valves (igniter) | ● | ▲ | ▲ | ● | ● |
| gas flexible hose for ignition pilot burner | ● | ▲ | ▲ | ● | ● |
| gas feed gun with multiple pipes | ● | | | ● | ● |
| adjustable gas nozzles | ● | | | ● | ● |
| UV flame sensor | ● | 🔥 | 🔥 | ● | ● |
| gas butterfly valve controlled by air/ fuel servomotor linkage | ● | | | ● | ● |
| gas elbow 90° | ● | | | ● | ● |
| main shut-off valve gas train | ● | | | ● | ● |
| gas filter | ● | | | ● | ● |
| max gas pressure switch | ● | | | ● | ● |
| min gas pressure switch | ● | | | ● | ● |
| tightness control pressure switch | opt | | | opt | opt |
| tightness control box | opt | | | opt | opt |
| steel oil feed gun | | ● | ● | ● | ● |
| inox hardened spill back nozzle | | ● | ● | ● | ● |
| opening oil electro-magnet | | ● | ● | ● | ● |
| diesel/heavy oil flexible hoses for oil feed gun | | ● | ● | ● | ● |
| Y oil filter | | ● | ● | ● | ● |
| oil capacity regulator controlled by air/fuel cam | | ● | ● | ● | ● |
| photoresistive detectors | | ** | ** | | |
| oil pressure gauge | | ● | ● | ● | ● |

### STANDARD EQUIPMENT

| | | | | | |
|---|---|---|---|---|---|
| burner flange gasket | ● | ● | ● | ● | ● |
| self cleaning filter | | | ● | | ● |
| diesel oil filter | | ● | | ● | |
| diesel/heavy oil flexible hoses | | ● | ● | ● | ● |
| instruction manual | ● | ● | ● | ● | ● |
| spare part list | ● | ● | ● | ● | ● |

▲ From AMR/AMRO 11 model
🔥 From AMR/AMRO 11 model
** Up to AMR/AMRO 10 model
opt Optional





## Main features

### Suitable applications
The industrial burners of the AMR and AMRO ranges are particularly suitable for applications on water-tube boilers, with multiple burners, ovens, dryers, diathermic oil generators, incinerators, ovens for Industrial thermoprocessing equipment in general.
See application on page 54.
They can be installed horizontally, vertically with flame down and vertically with flame up.

### Fuels
Gas (G)
Diesel oil (D) with viscosity of 6mm2/s at 20°C (1.5°E at 20°C)
Heavy oil (N) with mechanic atomization for viscosity up to 60°E (450 cSt) at 50°C, steam or compressed air atomization up to 350°E (2650 cSt) at 50°C
Dual fuel gas-diesel oil
Dual fuel gas-heavy oil
Other fuels, such as biofuel, fuel from waste, industrial process fuel, animal fat, these fuels can be supported in gasseous, liquid or solid state request.
For versions with solid fuel (dust) please see specific documentation.

### Flame geometry
The main feature of AMR and AMRO range is the inbuilt device in the air box. This device controls the geometry of the flame to achieve a perfect match with the combustion chamber dimensions.
Please refer to flame size diagram (pag. 20).

### Modular concept design
AMR and AMRO burners are made up of separate units that are selected according to the specific application requirements.
The units available are:
- combustion head
- fan
- control panel
- gas train
- preheater and push unit

### Operating principle
The burners of the AMR and AMRO range as standard operates as two stage progressive. It's possible to upgrade into modulating execution with the installation of a PID control and relative probes (option). Please see dedicated section (Pag. 35)
Burner output is adjusted according to head demand.
The modulation signal is supplied from PID control (option) installed on the burner control panel or it can be supplied directly by the customer (3 point or 4-20mA).

**Modulation ratio**
Gas (G) 1/5 option up to 1/10
Diesel oil (D) 1/3 option up to 1/10
Heavy oil (N) 1/3 option up to 1/10

**Flame monitoring**
Flame monitoring for gas fuel is by means of a UV sensor while for diesel fuels and heavy oil with photo resistance or UV sensor. Continuous operation executions are available.
For "multiple burner" applications or incinerators special variable-frequency flame monitoring systems are used.
See flame monitoring page 30.

**Ignition**
Ignition is direct for Diesel oil (D) and heavy oil (N) up to AMR/AMRO 10. From AMR/AMRO 11 ignition is with gas pilot burner.
For gas fuel and all the other execution with compressed air/steam atomization, ignition is always with gas pilot burner.
Our pilot burners can run with both natural gas or LPG. Maximum pressure at pilot valves: 500 mbar
Diesel oil pilot ignition is available on request.

**Burner operation**
In the standard execution, burners feature 2 progressive stages with mechanic cam (MC). For the full modulating execution a modulation kit consisting of PID control and modulation probe needs to be installed; the probe will be chosen according to the process variable controlled.
Standard protection is IP 54. See MC on page 36.
Available on request is a execution with electronic cam (EM) with the various associated options, such as $O_2$ trim, CO trim, variable speed drive (VSD).
See EM on page 37.

**Emissions**
With environmental care approach the whole AMR/AMRO range is available with Low NOx (EN676 and EN267). In order to fulfil the stricter NOx emission on the AMR/AMRO range it's also available the external Flue Gas Recirculation (FGR) system.

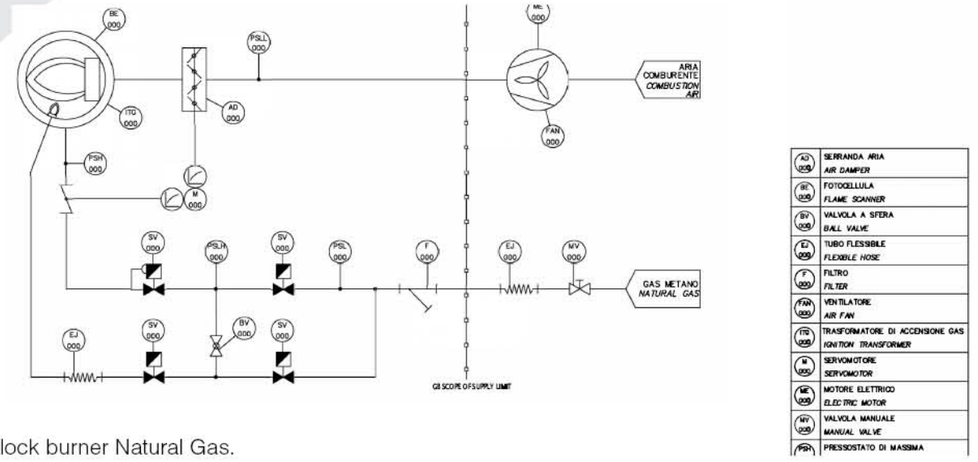
**Gas trains**
Gas trains and related components are made in compliance with EN 676.
Upon request Atex, ⟨Ex⟩, IP 65 execution are available.
See gas trains on page 46.

**Pushing Unit / preheating device**
According to customer needs the push and preheating unit can be supplied already assembled on a metallic frame or CKD (Completely Knock Down).
The preheating unit is available on different configuration also in accordance with the application. The unit can be with electrical resistance, combined electric / steam or electric / diathermic oil. (Pag. 49-51)

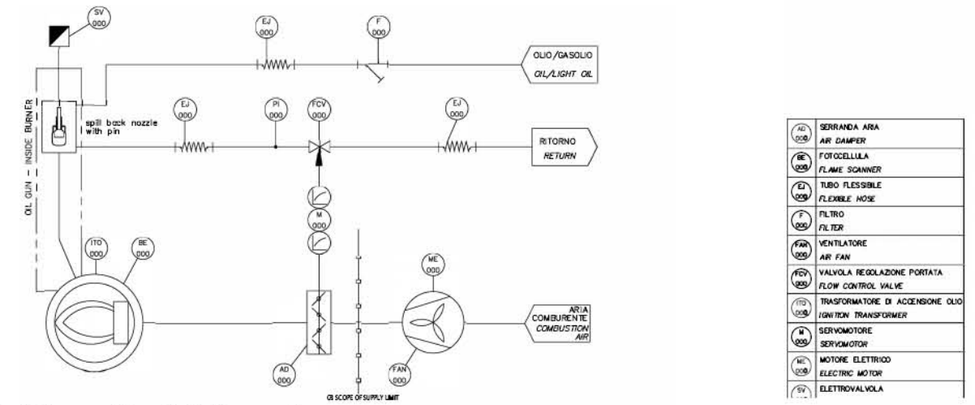
**Burner Wiring**
As standard the AMR/AMRO range is equipped with on board terminal box to facilitate het wiring between burner and main control panel. On demand it's also available a AMR range with complete on board control panel to include all wiring, BMS and electrical supply.



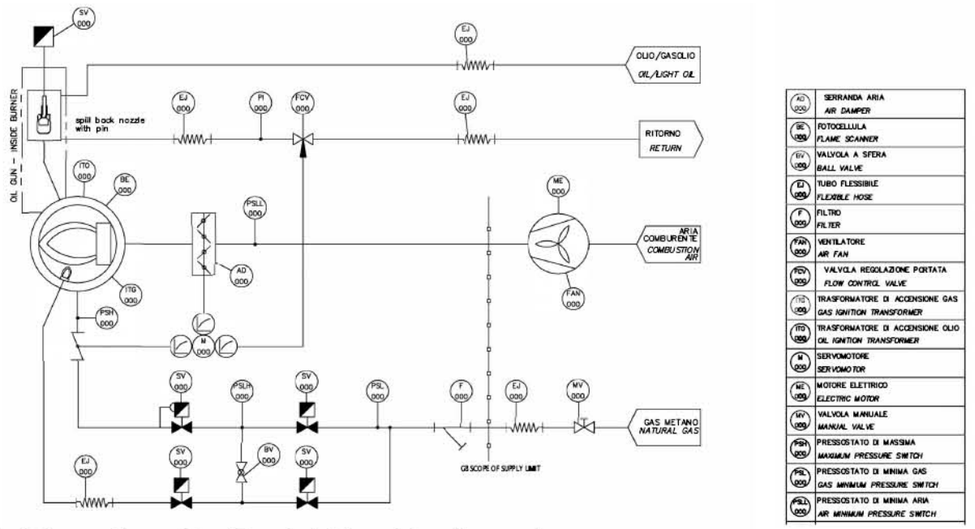




Duoblock burner Natural Gas.



Duoblock burner Diesel oil, Heavy oil

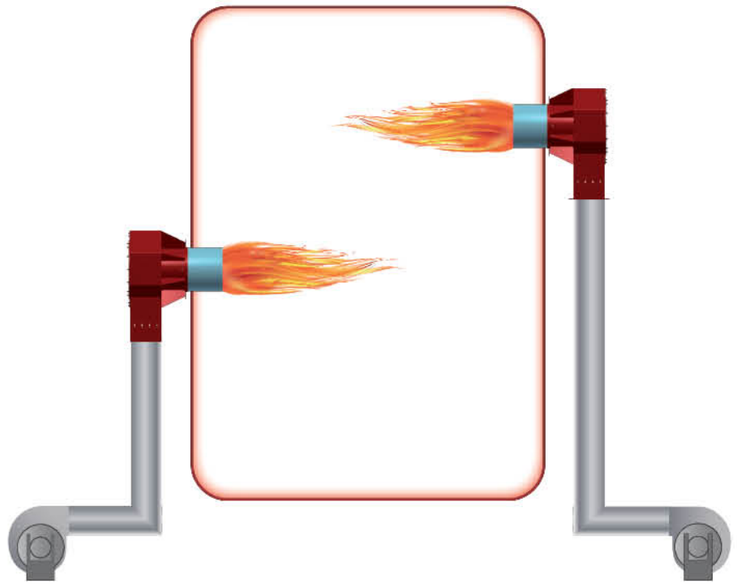


Duoblock burner Natural Gas/Diesel oil, Natural Gas/Heavy oil

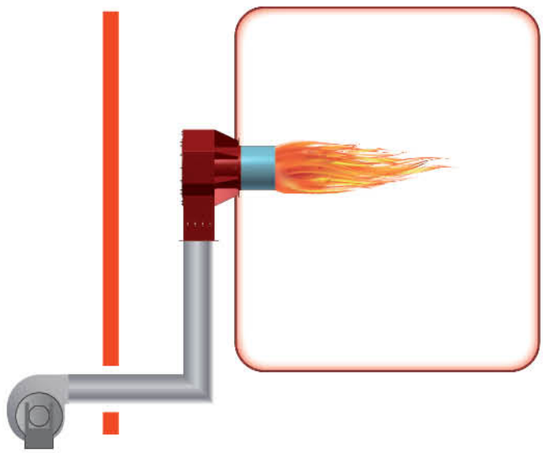
**Designing with modular concept for customized solutions**

As mentioned above, the burners of the AMR and AMRO ranges are composed of various functional units. This technical solution, combined with the several versions and the available options, enables to dimension and equip the burners down to the smallest details with the maximum flexibility.
Here are some examples of possible achievements.

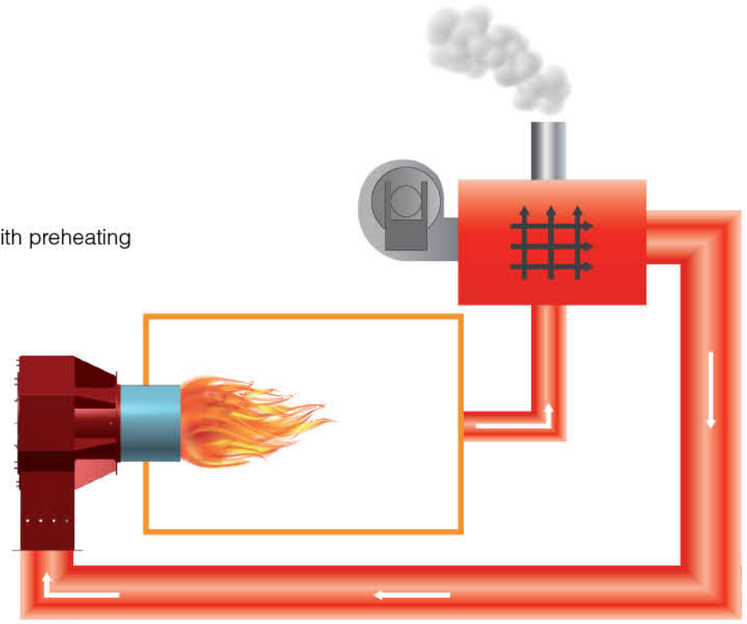
Multi-burner boiler



Burner with fan outside boiler room



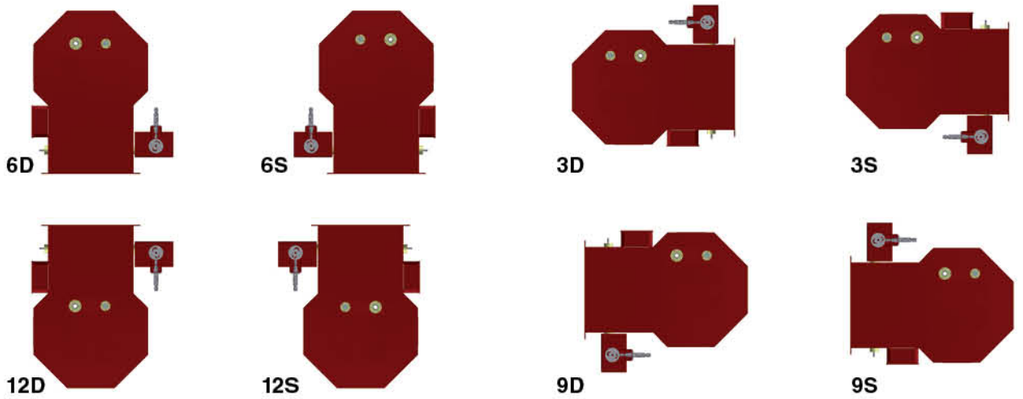
Hot air burner with preheating



As you can see, having a separate fan gives a number of advantages:

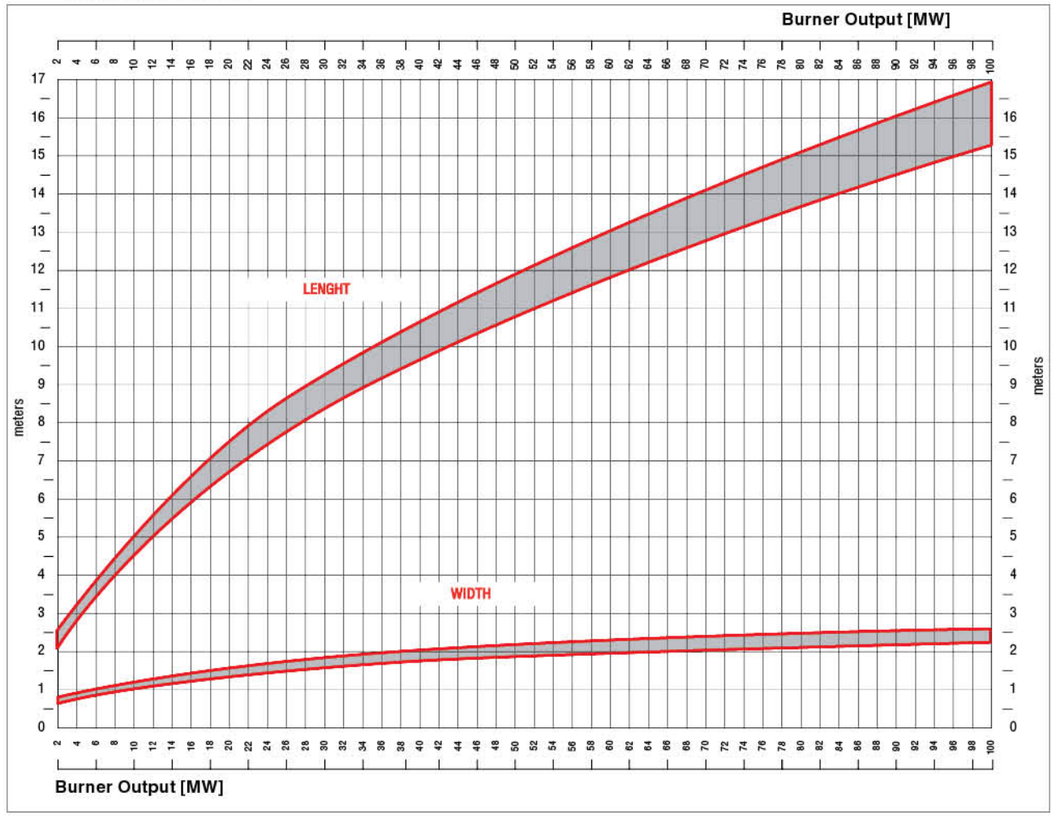
- it can be installed outside the thermal plant, in a separate room, thus reducing burner noise significantly.
- it can be sized to the exact needs of the system even on boilers with high back pressure values.
- less weight on the boiler front.
- a combustion air preheater can be used to increase efficiency (see one page 21).

**Burner orientation**




Indicate in the order form the required burner orientation.

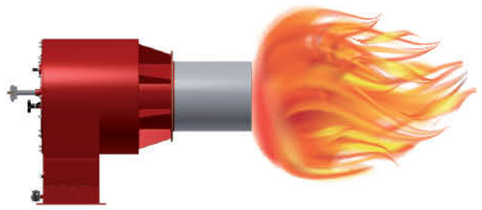
**Flame dimensions**




**Controlling flame geometry**

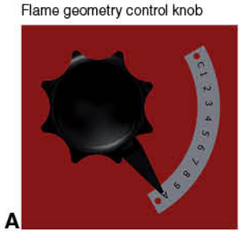
The burner is equipped with a manually (on request powered) adjustable device which makes it possible to vary the combustion air swirl.
By rotating the flame regulation knob (fig. A and B) we can adjust flame size for optimal combination with firebox dimensions.

**A)** Register open, minimum turbulence: long and narrow flame

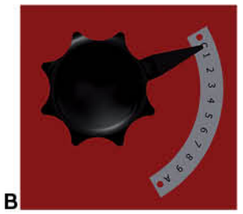


**B)** Register closed, maximum turbulence: short and wide flame

Flame geometry control knob



**A**



**B**

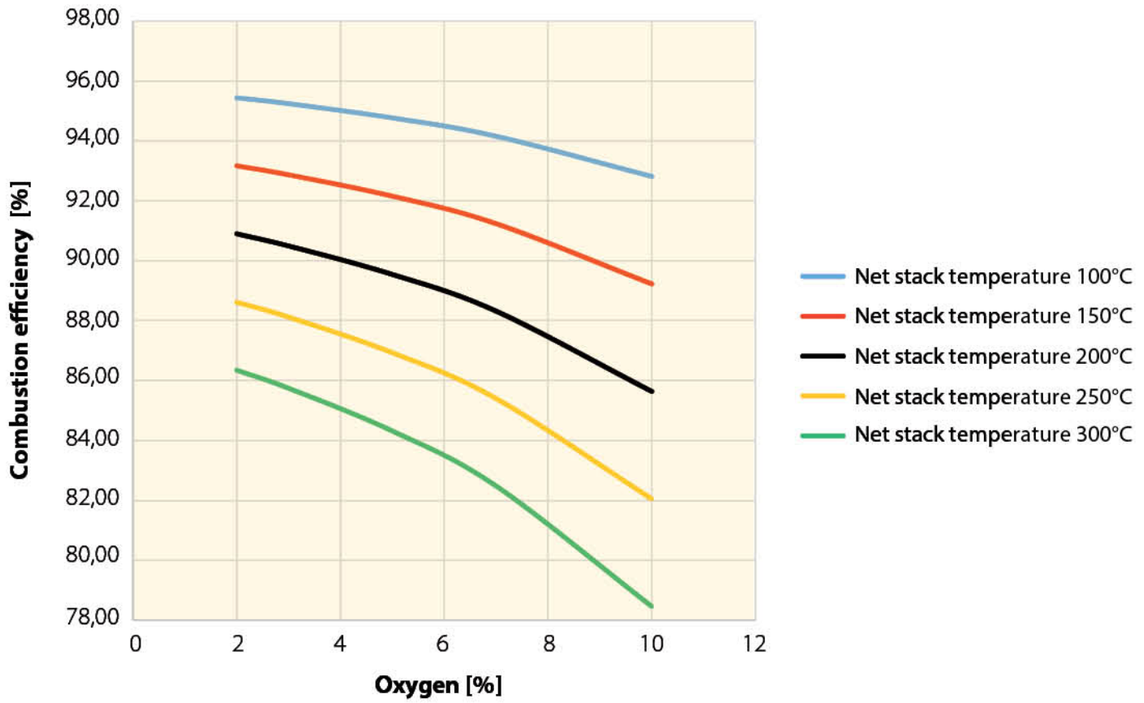




## Benefits at a glance

- Increase in efficiency
- Reduction in fuel consumption
- Short payback period

**Diagram of the combustion efficiency with natural gas.**



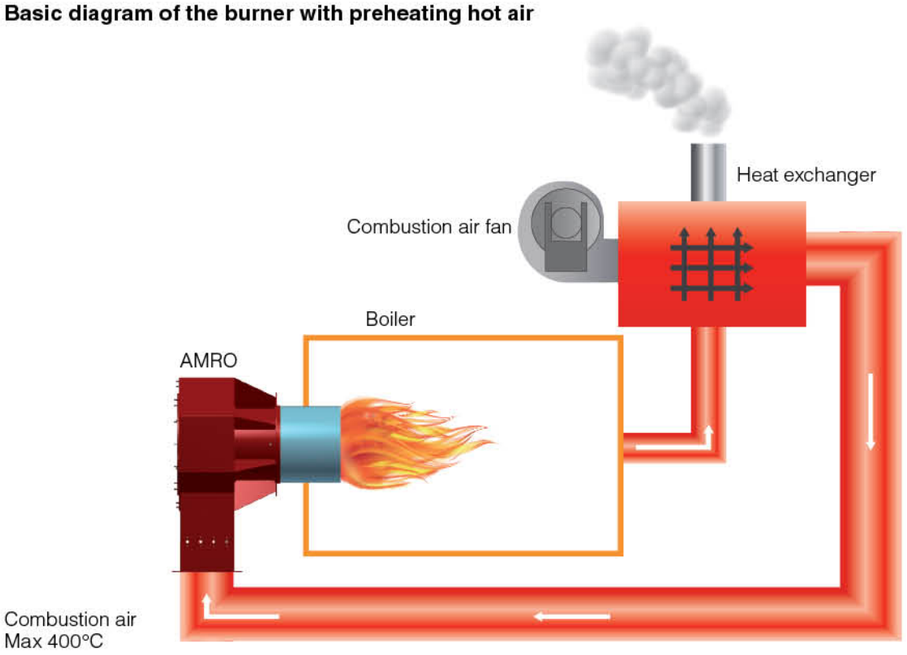
Therefore the exhaust fumes contain a large amount of heat that can, or better, must be recovered.
One of the most effective ways to reduce the consumption of fuel in industrial heat processes is to recover heat from the flue gases by preheating the combustion air inlet to the burners.
The heat recovery can be obtained by installing an heat exchanger just upstream the axhaust chimney. This heat exchanger, also named preheater, extract large portion of the thermal energy still in the exhaust and transfer it to the burner combustion air.
The inclusion of a preheating unit is very easy even in existing systems (retrofit) and it is an investment that pays back quite rapidly.

## Energy tips

**Air preheating is the ideal solution for increasing efficiency. It is an investment that pays for itself.**

The temperature of the flame increases, there is more heat available for heating and, with equal power, fuel consumption is reduced.
This is what a system with air preheater will normally look like.

**Basic diagram of the burner with preheating hot air**




To have a rough idea of the benefits of such a solution, consider that by reducing the temperature difference between the flue gas temperature and the combustion air temperature fed into the burner by about 25°C, the efficiency of the boiler will increase by 1%.

## Energy tips

Energy tips: Flue gas temperature is an indication of how combustion heat is actually transferred for use. If over time you notice a gradual increase of flue gas temperature, this is a sign of progressive deterioration of heat transfer. This could be cause by rust buildup on the heat exchange surfaces.
**A 100°C increase of flue gas temperature results in a 4% boiler efficiency decrease.**

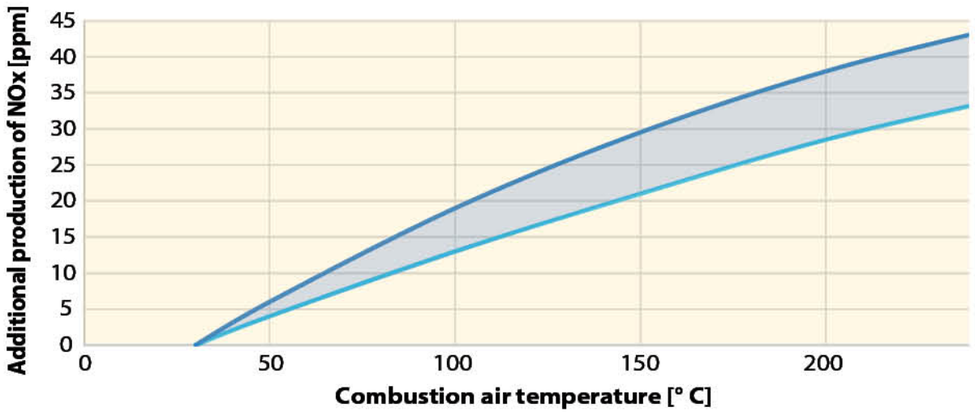
## Technical tip

Technical tip: For correct fan sizing bear in mind that it must be able to deal not only with the firebox counter pressure but also to the additional one due to the addition of air preheating in the flue gas duct.

AMR and AMRO burners are designed in standard configuration to function with air temperature up to 50°C. Hot air executions are available, designed to take temperatures up to 400°C (option).

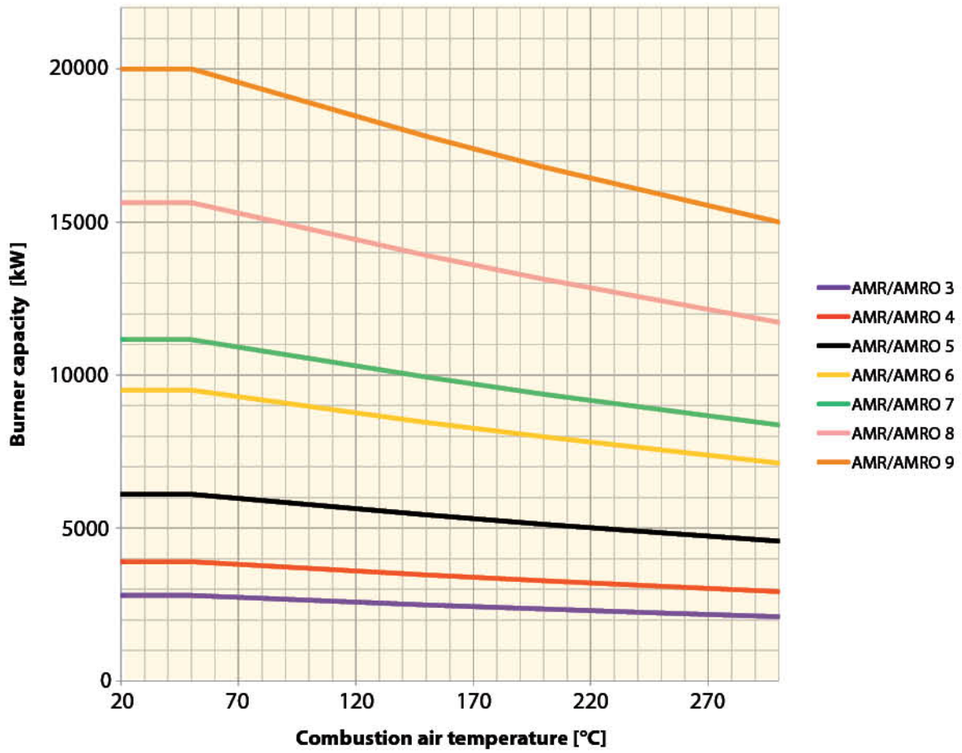
Any increase in combustion air temperature leads to an increase in the adiabatic flame temperature, which in turn increases the formation of NOx. The increase in NOx emissions as a function of combustion air preheating is shown in the graph below.

**NOx production as a function of the temperature of the combustion air**

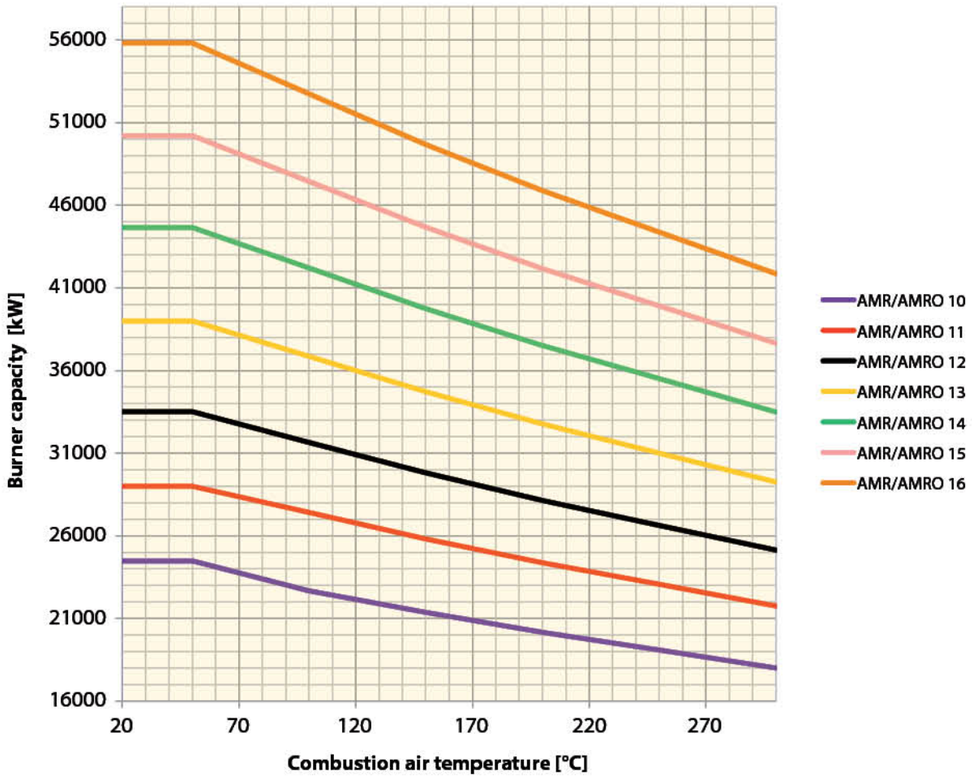



Hot combustion air reduced the maximum capacity point, as shown in the graph.

**Hot air operating range for AMR and AMRO from 3 to 9**




**Hot air operating range for AMR and AMRO from 10 to 16**




Please contact our technical department to receive additional information on the full range.

**Techniques for reduction of NOx emissions**

NOx is the generic terms used to indicate nitrogen oxides (NO + $NO_2$), produced by the reaction of nitrogen and oxygen during combustion, especially at high temperatures.
In conventional systems NOx consist of 95 - 98% nitrogen monoxide (NO), and 2 - 5% nitrogen dioxide ($NO_2$). However, when in the atmosphere, NO reacts with the oxygen in the air and forms $NO_2$.

The three main sources of NOx production are:

**$NO_X$ thermic**, derived from the nitrogen present in combustion air which, at temperatures >1300°C reacts with oxygen and oxidizes. It is certainly the largest fraction of NOx derived from combustion of gaseous fuels. Therefore the flame must be prevented from reaching excessively high temperatures and burnt gases from remaining in the hot area of the flame too long.

**$NO_X$ fuel** is produced starting from the nitrogen compounds chemically linked in the fuel that react into oxygen and oxidize, significant in liquid fuels.

**$NO_X$ prompt,** formed from the rapid reaction of atmospheric nitrogen with hydrocarbon radicals. NOx prompts are a minor source as they are generally a small part of the overall quantity of the NOx produced by combustion.

NOx production is influenced not only by flame temperature and oxygen content (air excess) but also by other factors not strictly related to the burner.

Such as for example the geometry and volume of the combustion chamber. The experience developed so far has clearly shown that the construction characteristics of combustion chambers and their operating principles affect the production of NOx.
In terms of NOx emission, there is a big difference in performance between a three-pass boiler and a reverse flame boiler! With equal volume, producing greater output means increasing the temperature in the chamber; in other words, high thermal loads result in higher flame temperature and consequently greater NOx emissions.

**Conversion factor for Nox emissions (as $NO_2$) for natural gas**

**G 20**

| $O_2$ rif (%) | | mg/kWh | mg/MJ |
|---|---|---|---|
| 0% | 1 ppm= | 1.764 | 0.490 |
| 3% | 1 ppm= | 2.059 | 0.572 |

**Conversion factor for Nox emissions (as $NO_2$) for natural gas**

**G 20**

| $O_2$ rif (%) | | mg/kWh | mg/MJ |
|---|---|---|---|
| 0% | 1 mg/m3n= | 0.859 | 0.239 |
| 3% | 1 mg/m3n= | 1.002 | 0.278 |

**Conversion from ppm to %**

| ppm | rate |
|---|---|
| 1.000.000 ppm | 100% |
| 100.000 ppm | 10% |
| 10.000 ppm | 1% |
| 1.000 ppm | 0.1% |
| 100 ppm | 0.01% |
| 10 ppm | 0.001% |
| 1 ppm | 0.0001% |

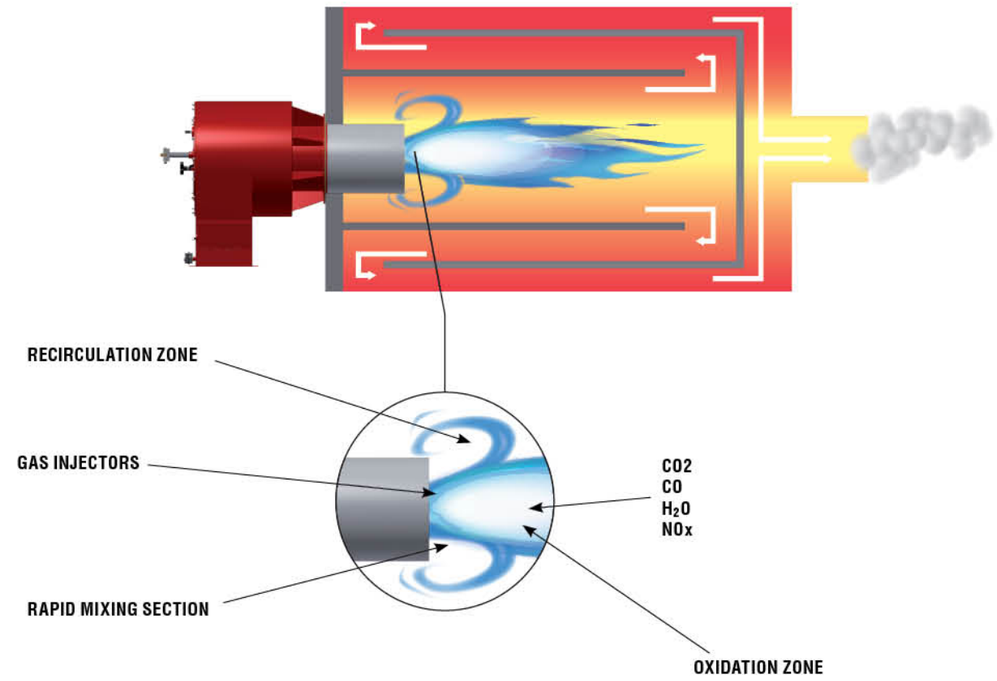
Flame temperature also depends on the temperature of combustion air (see paragraph on preheated air). The higher the temperature of combustion air the higher will the flame temperature be.

The temperature of boiler fluid, i.e. the superficial temperature of chamber walls, also affects NOx emission: the colder the walls, the greater the thermal exchange and the lower the average flame temperature the smaller the production of NOx.
For this reason, it is important, in order to correctly evaluate NOx emission, to know what kind of boiler is used, whether hot water, steam and steam pressure, diathermic oil, adiabatic furnace, etc.

The use of appropriate combustion technology makes it possible to limit the production of thermal NOx.

General Bruciatori uses mostly the combustion gas recirculation system.

**Burner with internal recirculation**

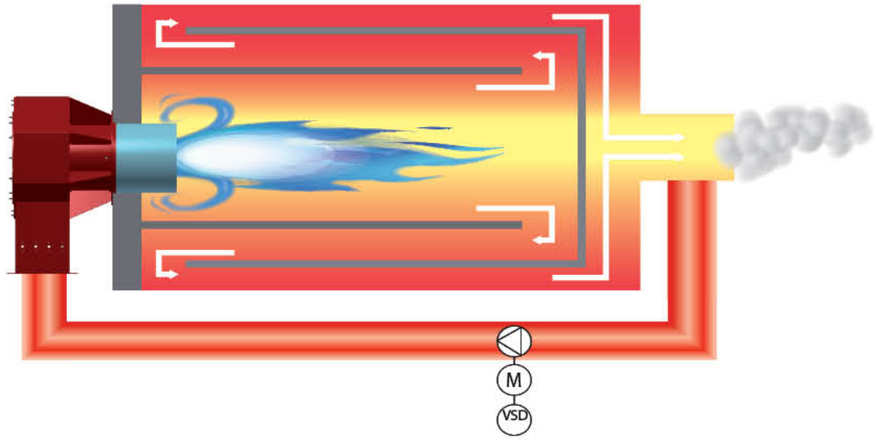


In the internal recirculation system, a fraction of the combustion gas is reintroduced in the flame, and it will absorb flame heat. This lower the average temperature; and causes a “dilution” of flame volume, which further lowers the temperature.

For higher outputs, flue gas recirculation is generally enhanced by adding to the above described recirculation, the system of external flue gas recirculation.

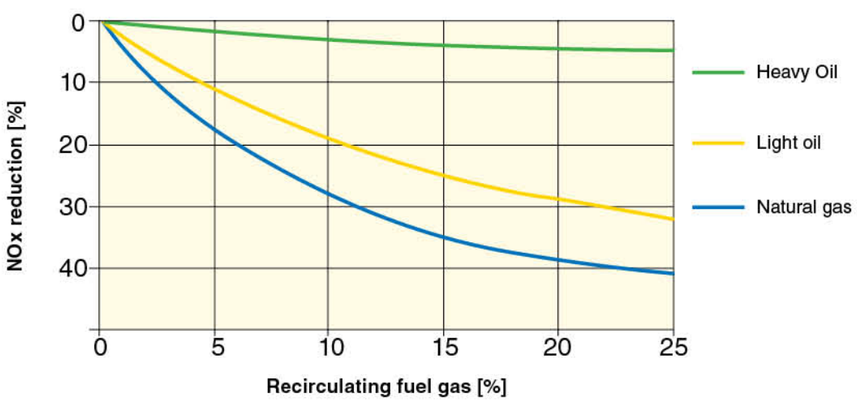
This system uses a fan to introduce a large quantity of combustion gas into the burner head. The flue gas is sucked up at the base of the flue and introduced into the burner by means of a flue gas distributor. The external flue gas recirculation fan, controlled by a variable speed drive, will enable flue gas to be introduced into a normally pressurized combustion chamber.

**Burner with external flue gas recirculation**

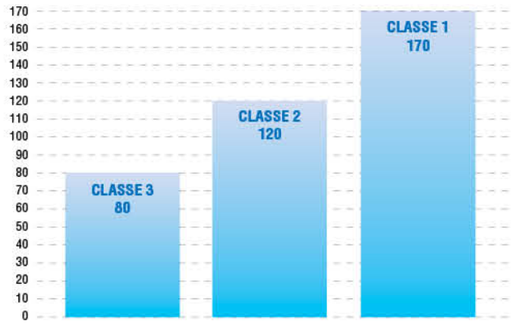



The average quantity of gas to be recirculated can be estimated at 10-25%. The graph below gives an indication of the value that can be obtained.

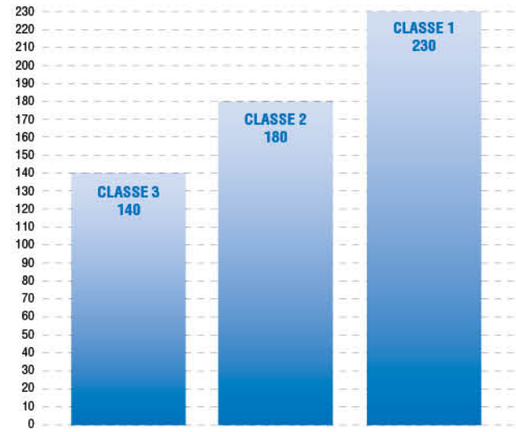
**Incidence of recirculating fuel gas in the combustion head**




**Classes defined by Regulation EN 676 for NOx emissions with natural gas**




**Classes defined by Regulation EN 676 for NOx emissions with propane**




**Classes defined by Regulation EN 267 for NOx emissions with Light oil**


**Conversion of emissions with $O_2$ reference**

$$E_{rif} = E_{mis} \times \left( \frac{21\% \text{ vol.} - O_{2\ rif}}{21\% \text{ vol.} - O_{2\ mis}} \right)$$

**Conversion from ppm to mg/m³n**

1 ppm CO = 1.25 mg/m³ $_n$ CO
1 ppm $CO_2$ = 1.96 mg/m³ $_n$ $CO_2$
1 ppm NO = 1.34 mg/m³ $_n$ NO
1 ppm $NO_2$ = 2.05 mg/m³ $_n$ $NO_2$
1 ppm $SO_2$ = 2.93 mg/m³ $_n$ $SO_2$

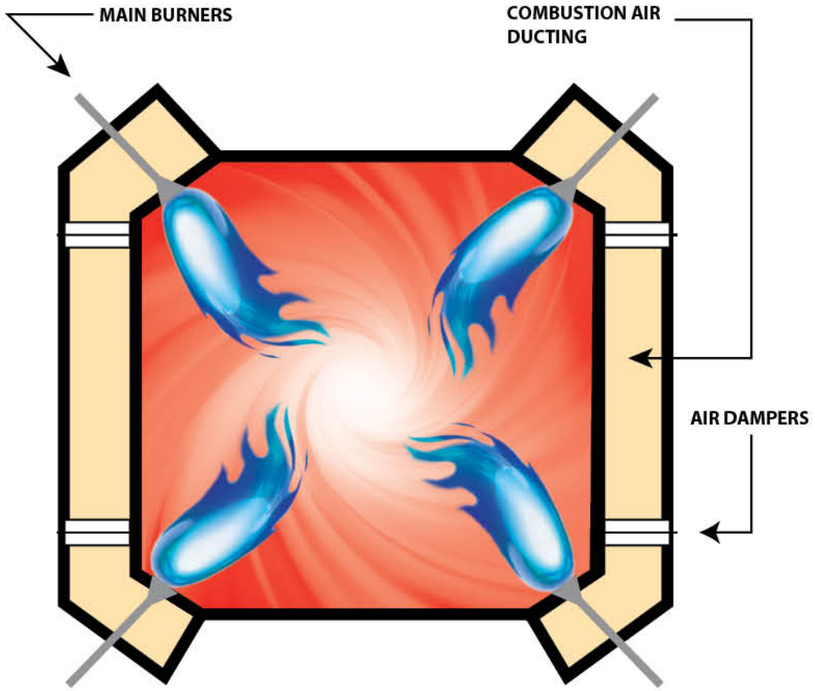
**Flame monitoring**

One of the key safety elements in combustion processes is the flame monitoring.
When a single burner is used the operation of flame monitoring is relatively simple and safe.

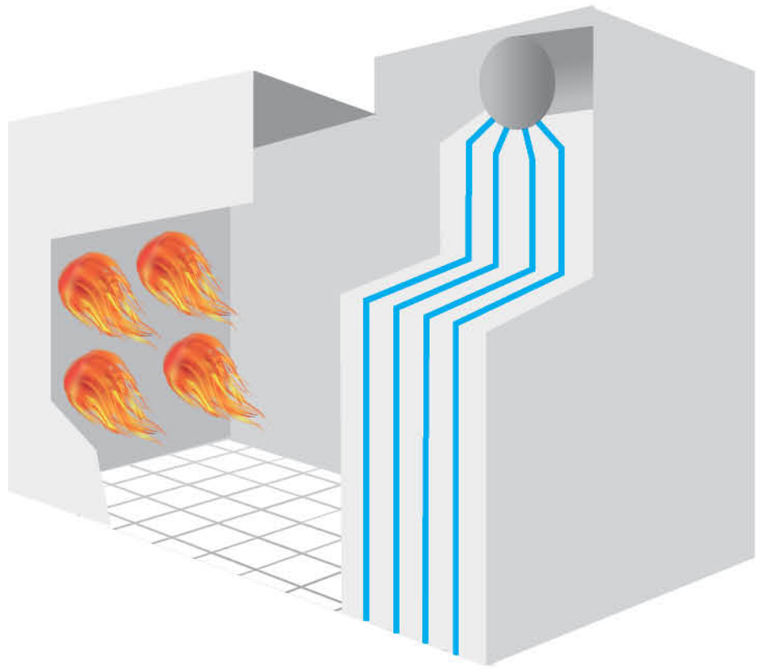
In the industrial field the systems used are often very complex in terms of flame monitoring. Let us consider for example an incinerator where, in addition to the burner flame there are other flames produced by waste combustion and all of these need to be monitored or multiburner applications where a number of burners operate simultaneously in a shared firebox sometimes with different fuels used simultaneously.

Let us look at some applications.

**Boiler with tangential flames**




**Water tube boiler with 4 burners**

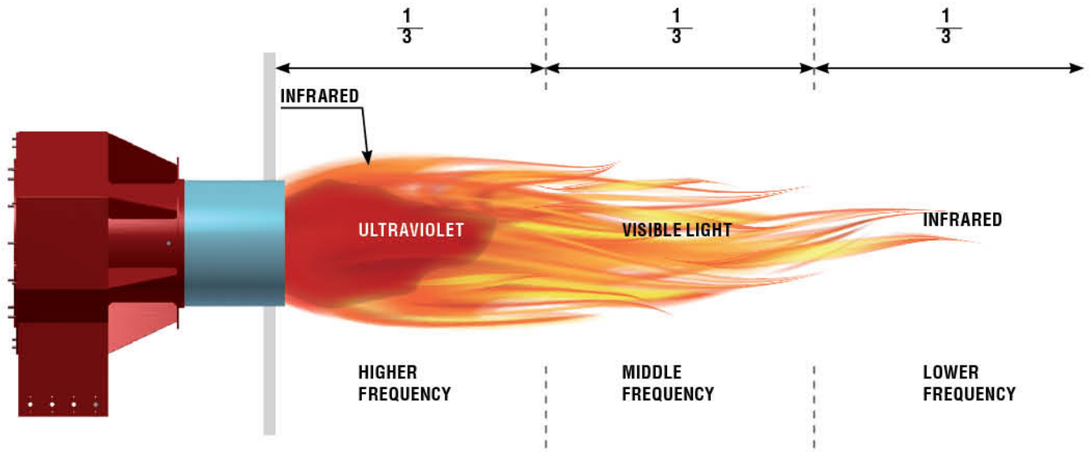


In these applications it is essential, in terms of safety, to discriminate with absolute certainty between burner flame and flames from waste or from an adjacent burner.
Various type of flame scanners depending on the sensor: photo resistance, IR, UV.
Flame radiation in the visible region is easy to identify because it is visible to the naked eye. Every time we can see a flame, it means it is irradiated visible light.
In gas flames, infrared radiation is stronger in the two end thirds of the flame.
Infrared radiation from a heavy oil flame is very similar to that from visible radiation except for the fact that it will also be present slightly beyond the flame.

The flame area irradiating UV rays is much smaller than the visible or infrared areas.
The following table shows the quantities for the different radiations regions for the most common fuels used in the industrial field.

| RADIANT ENERGY | | | |
|---|---|---|---|
| **Fuel** | **Visible** | **Dy namic infrared** | **Ultraviolet** |
| Gas | Medium | Medium | Medium |
| Premix Gas | Low | Low | High |
| Oil | High | High | Medium |
| Powder Coal | High | High | Medium |

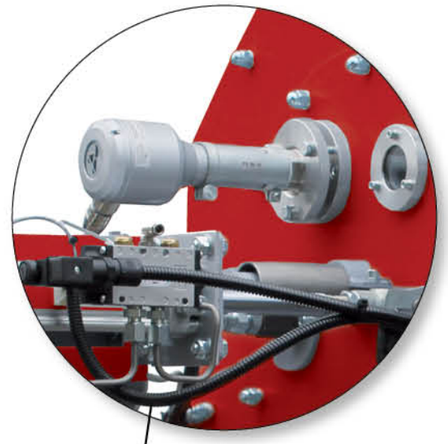
In order to separately monitor each of the flames present in the fire box and also ensuring a distinction of external sources, General Bruciatori uses special variable frequency flame monitoring sensors.
The flame monitoring system converts the burner's flame radiation into an electrical signal. As shown in the picture below, the flame has a variable frequency depending on the distance from the "root" of the flame which is the area with the highest frequency.



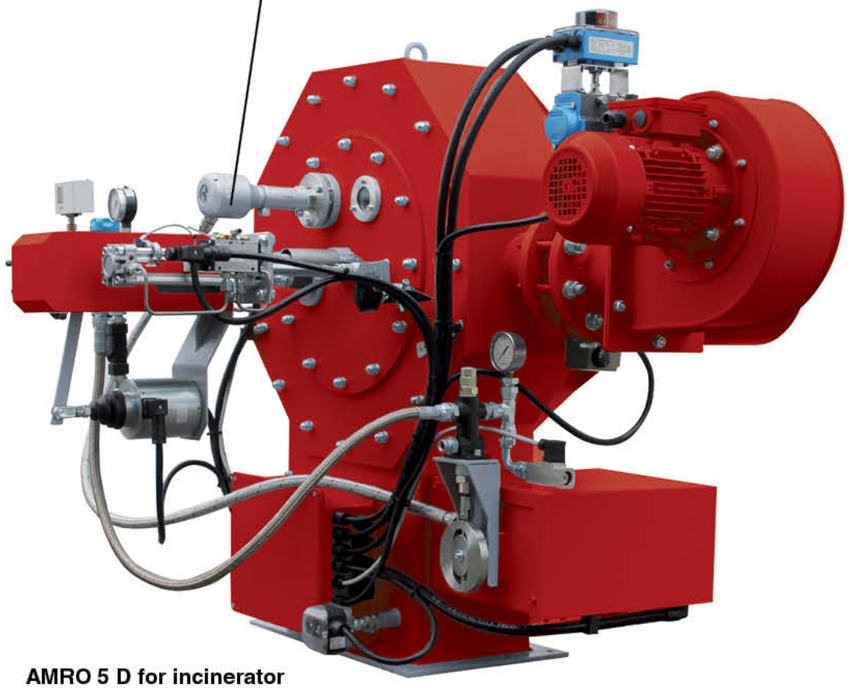

All the versions of variable frequency flame scanner are type-approved for continuous service.
NOTE: in hot air applications (see page 22) ensure that flame scanner temperature does not exceed 60°C. Overheating will cause a loss of sensitivity and, in the worst case, will result in damage to sensor parts.
In these cases air should be provided for cooling the flame scanner.
This will not only cool down the flame scanner, but also prevent dirt from building up on the lens damaging the sensor.

The complexity of the flame monitoring task together with the large variety of application types requires a lot care in the selection of the type of sensor to be used.
The consolidated experience that General Bruciatori have acquired in 40 years of industrial burner production, plays an essential role.

Thorough knowledge of the different flame characteristics means ability to select the right flame scanner that will recognize the burner flame regardless of adjacent burner flames or furnace conditions, ensuring totally safe operation.



**Detail of the UV flame scanner variable frequency**



**AMRO 5 D for incinerator**

Burner control and regulation equipment are assembled on a separate control panel.

**Standard scope of supply: MC execution control panel**

| description | AMR-AMRO ...G | AMR-AMRO ...D | AMR-AMRO ...N | AMR-AMRO ...GD | AMR-AMRO ...GN |
|---|---|---|---|---|---|
| main switch with door coupling | ● | ● | ● | ● | ● |
| control box | ● | ● | ● | ● | ● |
| fan control | ● | ● | ● | ● | ● |
| oil pump control | | | ● | | ● |
| preheater oil control | | | ● | | ● |
| oil preheater temperature controller | | | ● | | ● |
| overcurrent protection devices | ● | ● | ● | ● | ● |
| terminal strips | ● | ● | ● | ● | ● |
| signal lamps | ● | ● | ● | ● | ● |
| failure reset button | ● | ● | ● | ● | ● |
| burner control switch | ● | ● | ● | ● | ● |
| auxiliary relays | ● | ● | ● | ● | ● |
| PID capacity controller | opt | opt | opt | opt | opt |
| run hour counter for gas | opt | | | opt | opt |
| run hour counter for oil | | opt | opt | opt | opt |
| potential-free alarms | opt | opt | opt | opt | opt |
| remote start/stop | opt | opt | opt | opt | opt |
| soft starter | opt | opt | opt | opt | opt |
| elevated IP class | opt | opt | opt | opt | opt |
| alarm bell | opt | opt | opt | opt | opt |
| emergency stop pushbutton | opt | opt | opt | opt | opt |

● standard
opt optional

The flame control unit automatically performs all the burner functions and, in case of burner failure, the system automatically stops the burner.

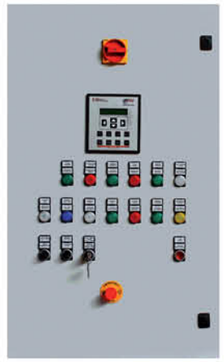
The standard burner configuration features 2 progressive stage operation with mechanical cam (MC version).

In modulating execution, the control panel also contains a wired PID load controller (option). If necessary, the modulating probe will be selected according to the process variable.

Upon request, the burner can also be supplied with electronic cam (EM version), with variable speed drive (VSD version), with $O_2$ control and CO control .

Standard control panel protection is IP54.

**Cabinets**



**Wall mounted**

**Desk type**

**FULL MODULATION ACCESSORIES (MC operation)**
In order to upgrade AMR/AMRO range from two stage progressive up to continuous/full modulation it's necessary to install PID regulator and probe feedback.
If PID is ordered together with burner the GB3M is pre-wired and already with probe configuration (Temperature or Pressure). In case PID is ordered once burner is already on site the Control Panel is already pre-set to host the GB3M for easy installation.

**GB3M PID load regulator**

**PT100 temperature probe**

**Pressure transmitter**

## Benefits at a glance

**Simple to use**
**Sturdy system,**
**long service life**

**Features execution MC**

The basic combustion control principle is to satisfy the boiler load requirements by controlling the quantity of fuel and air to obtain optima combustion and ensure safety conditions for operators and equipment.
The control system for combustion with mechanical cam consists in a servomotor which by means of mechanical gear moves regulation parts, such as gas butterfly valve and combustion air dampers.
The main disadvantage of mechanical control is the "slack" that inevitably develops over time. Depending on mechanical characteristics, these hystereses can cause control inaccuracy which, especially with minimal loads, will result in substantial fuel waste.
This mechanical control solution has the advantage of being simple to use and sturdy of construction but the disadvantage is that it cannot guarantee operation with low air excess.
It should also be considered that with multifuel burners there is only one combustion air setting for all of the fuels, which means that it will not be possible to diversity output curves. The turndown ratio will be the same.
Overall, mechanical cams are not suitable for the energy saving requirements of modern combustion systems, especially if we consider that, with its "open ring" control, $O_2$ and CO corrections are not possible.

## Did you know?

**A 20 mbar variation in atmospheric pressure changes the $0_2$ content by 0.4%.**

Mechanical cam

All the disadvantages of mechanical cam can be overcome by using combustion control with electronic cam.



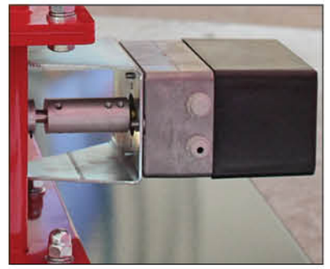


**Features execution EM**

In electronic cam combustion control all the control and safety functions of the burner are managed by a microprocessor based electronic device (fail safe). It features a display that shows all the data about to servomotor positions, operation sequence, shutdown codes in case of malfunction, boiler pressure or temperature, $O_2$ and CO values (if installed).
In addition, all control parts, butterfly, dampers, etc. have a dedicated servomotor, these movements can be individually set for each load points.
Unlike what happens with the mechanical cam, in case of multi-fuel burners with electronic cam (EM execution), we have dedicated servomotors, one for each fuel type and one for combustion air, which can be programmed individually for the different positions according to load. This way combustion air regulation can be different, with different ratios (and not the same as with mechanical modulation) depending on the fuel used and accurately adjusted to suit combustion needs.
A further advantage of the electronic cam is that servomotors are directly connected to regulation parts without the use of other gear or mechanical joints. This means the system has no mechanical hysteresis.
Electronic servomotors are very accurate (+/- 0.1°) and ensure high positioning repeatability. High positioning repeatability over time means guarantee that the combustion settings will be maintained which in turn means a guarantee of energy efficiency.

## Benefits at a glance

- **No mechanical hysteresis**
- **Performance is constant over time**
- **Individual setting of servomotor position**
- **Possibility of setting ignition point other than minimum load**
- **Built-in valve seal control**
- **Indication and description of shutdowns**
- **Open and easy-to-update system**
- **Optional VSD, $O_2$, CO, remote monitoring**



Detail air servomotor.

The electronic cam offers advantages that are definitely superior to those of the mechanical cam, more in line with the energy requirements of modern combustion systems.
Last but not least, the electronic cam is an open system, easy to implement with energy saving functions such as variable speed drive (VSD), $O_2$ control, CO control, or "utility" functions such as remote monitoring.
Let us see them in detail.

## Energy tips

**Increase the energy performance of an EM burner by installing:**

- VSD
- $O_2$ trim (please see on page 38)
- CO trim (please see on page 40)

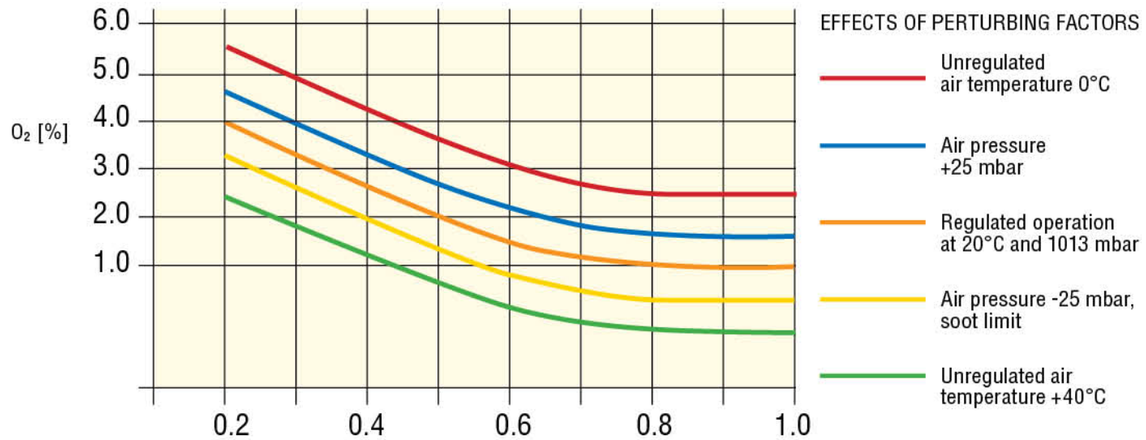
## Bonus tip

**Use a second setpoint in case the system does not function continuously, e.g. in period of reduced activity or night standby.**
**It can be used to set the boiler to a lower steam pressure value.**
**Our customers obtain savings up to 10%.**

## Benefits of a $O_2$ trim at a glance

- it can be used on all burners
- improvement of efficiency up to 3%
- lower losses to the chimney
- lower emissions
- low maintenance
- simple upgrade with CO trim

**Influence of air temperature and the atmospheric pressure to the combustion**




**$O_2$ trim**

Electronic cam combustion control (EM execution) in combination with modern flue gas sensor technology ($O_2$ sensors and CO sensors) offers to industrial burner users important energy saving applications.
The equally important aspect of safety is a further advantage with the possibility of having continuous combustion monitoring.

In terms of combustion efficiency, air excess management is the key point.
Air and fuel control is fundamental to maintain high level of energy efficiency.
Burners are often checked just once a year and the rest of the time are left as they are, even with great temperature variations (summer/winter) and changes in atmospheric barometric conditions.
It is important to remember that the quantity of oxygen in the air is directly correlated to air density and temperature. If the temperature goes down (thicker air), the content of oxygen increases; changes in barometric pressure also cause variations in oxygen content: the greater the atmospheric pressure the greater the content of oxygen in a given volume of air.
The influence of air temperature and pressure on residual oxygen in exhaust gas is shown in the graph below.

There are other perturbing factors that affect the achievement and maintenance of energy efficiency: there are changes in fuel temperature, viscosity and density, changes in heating capacity, firebox counter pressure, etc.
With mechanical cam control, as we saw above, these important perturbing factors cannot be compensated.
That is why air excess setting in mechanical cam burners needs to be high: we have to be absolutely sure that we can neutralize all unfavourable circumstances which can, at the same time, concur to have no residual oxygen in flue gas.
This air excess, which must be allowed for safety, is something that has a high cost, in both economic and environmental terms, as we are heating a considerable mass of air coming out of the flue and not providing any heating contribution. The higher the temperature of flue gas, the greater will be the efficiency loss.
This is the main source of energy waste and these losses can be up to 2-3%.
If the burner is fitted with an electronic cam (EM execution) the solution to the problem is very simple: it is called $O_2$ trim.

**$O_2$ trim: fuel saving rate up to 3%**

**Safety tip**

Set the minimum $O_2$ values: once these values are reached the burner will shut down.

**Did you know?**

Every 1% reduction in O2 you have an efficiency increase of:
0.6% for natural gas
0.7% for Diesel oil
0.75% for fuel oil

With the addition of a zirconium oxide oxygen sensor and a “bit of electronics” we can keep the air/fuel mixture set at optimal values even with the above perturbing factors as they will be immediately compensated to preserve combustion efficiency.
The sensor continuously monitors residual oxygen content in flue gas, sends a signal to the electronic system which, based on the control curves set during the commissioning stage ($O_2$ setpoint), will adjust the quantity of combustion air to the minimum necessary, over the entire operating range.

To have an idea of the efficiency improvement, consider that with flue temperatures above 200°C, a 1% oxygen reduction in combustion will produce an increase in efficiency between 0.6 and 0.75%, depending on the type of fuel used.

**Good news from CO trim**

Average return on investment (ROI) is less than 2 years.

**TIP:**

Install the sensor as close as possible to the combustion chamber outlet.
This gives you fast feedback on what is happing inside the firebox.

**Benefits of a CO trim at a glance**

- Minimum air excess in every point of the work curve
- Up to 0.5% combustion efficiency improvement compared to $O_2$ control
- Maximum accuracy in combustion control
- minimal air infiltrations in the flue will not affect the reliability of the readings and consequent control logic
- Totally safe combustion: any unburnt fuel is measured directly (not presumed)
- Low maintenance and servicing costs
- Average Return on investment (ROI) < 2 years

**CO control: Utmost efficiency and safety on gas fuel systems**

If you combine the $O_2$ control system with a CO monitoring sensor, you can further reduce air excess, and consequently flue losses as well.
At the core of this technology is direct (not presumed) measurement of unburnt fuel.
With a fully automatic mode, the system reduces combustion air in every point of the load curve until the volumetric content of carbon monoxide measured in flue gas is stabilized to a few tens per million.
This reduction in combustion agent is due not so much to a capacity damper, which does not have the necessary angular resolution, but rather to the use of a variable speed drive with much higher sensitivity.
At this point, the system will fix the final combustion setpoint to a slightly higher λ, thus obtaining an optimal operating point.
The energy saving achievable exceeds the potential supplied by the use of $O_2$ control alone; with a self-learning system, the CO system allows the burner to operate with very low air excess, as already mentioned, at the limit of CO emissions.
Compared to $O_2$ only control, an additional 0.5% energy efficiency improvement can be achieved and, in terms of safety, we can be certain that dangerous operating conditions will be avoided.





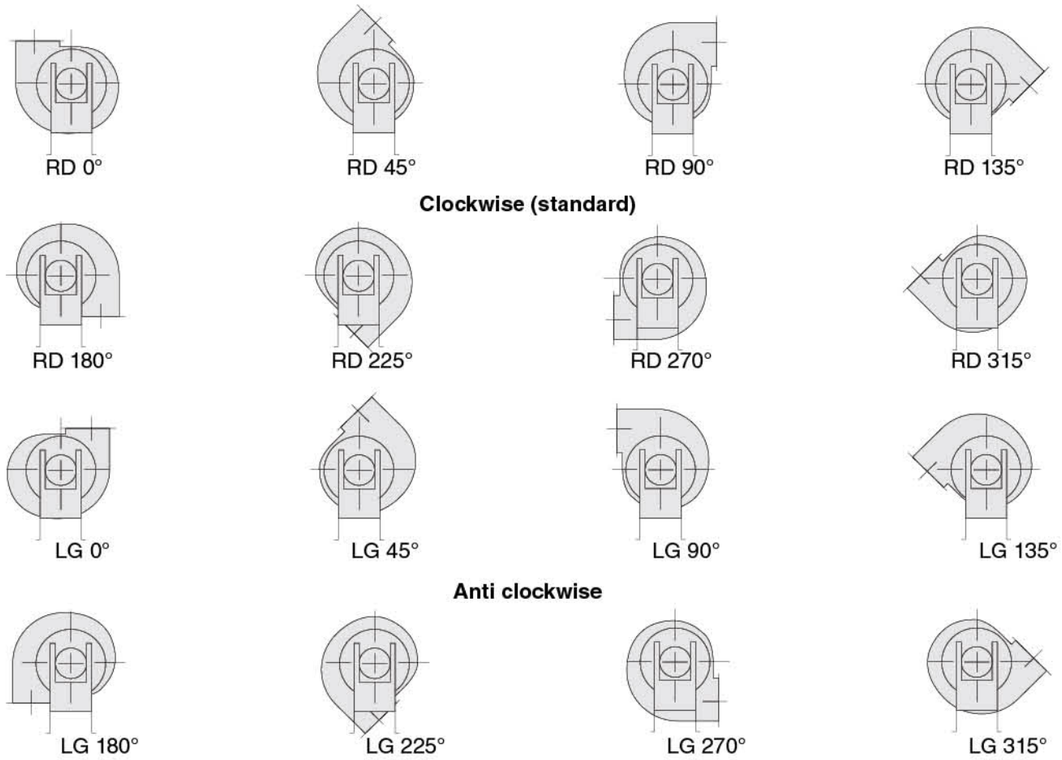
As previously mentioned, AMR and AMRO burners are made up of separate units that are selected according to the specific application requirements.

**Scope of supply:**

| description | |
|---|---|
| Electric motor | ● |
| Fan | ● |
| Protection grille on inlet side | ● |
| Delivery counter flange | ● |
| Flexible delivery coupling | opt |
| Soundproof casing on inlet side | opt |
| Complete fan casing | opt |

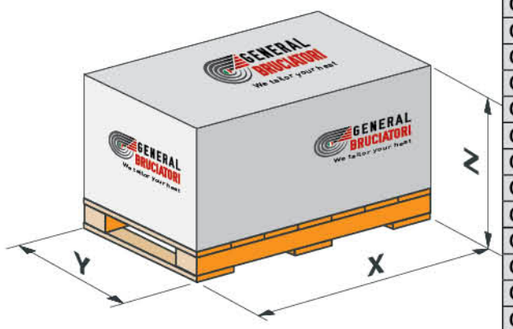
● standard
opt optional

**Fan orientation (view from motor side)***




* At order confirmation use the special form to indicate orientation of burner and fan.

| Technical characteristics | | | |
|---|---|---|---|
| Model | capacity m3n/h | electrical power kW | noise db(A) |
| GBM 501 | 1000 | 5,5 | 85 |
| GBM 562 | 2000 | 7,5 | 85 |
| GBM 561 | 3000 | 11 | 86 |
| GBM 561 | 4000 | 11 | 86 |
| GBM 632 | 5000 | 15 | 87 |
| GBM 632 | 6000 | 15 | 87 |
| GBM 631 | 7000 | 18,5 | 88 |
| GBM 631 | 8000 | 18,5 | 88 |
| GBT 632 | 9000 | 22 | 88 |
| GBT 631 | 10.000 | 30 | 91 |
| GBT 631 | 12.000 | 30 | 91 |
| GBT 712 | 14.000 | 37 | 92 |
| GBT 712 | 16.000 | 37 | 92 |
| GBT 711 | 18.000 | 45 | 93 |
| GBT 711 | 20.000 | 45 | 93 |
| GBT 711 | 22.000 | 45 | 94 |
| GBT 802 | 24.000 | 75 | 94 |
| GBT 802 | 26.000 | 75 | 95 |
| GBT 801 | 28.000 | 90 | 95 |
| GBT 801 | 30.000 | 90 | 95 |
| GBT 801 | 35.000 | 90 | 95 |
| GBT 902 | 40.000 | 132 | 97 |
| GBT 1121/4 | 40.000 | 55 | 91 |
| GBT 1252/4 | 45.000 | 75 | 93 |
| GBT 1251/4 | 50.000 | 110 | 94 |
| GBT 1402/4 | 55.000 | 132 | 96 |
| GBT 1401/4 | 60.000 | 200 | 97 |
| GBT 1401/4 | 100.000 | 200 | 97 |




| Packaging dimensions | | | | |
|---|---|---|---|---|
| Model | X mm | Y mm | Z mm | Weight Kg (max) |
| GBM 501 | 800 | 600 | 940 | 111 |
| GBM 562 | 890 | 650 | 1030 | 140 |
| GBM 561 | 890 | 700 | 1030 | 230 |
| GBM 632 | 990 | 810 | 1150 | 270 |
| GBM 631 | 990 | 850 | 1150 | 285 |
| GBT 502 | 1010 | 650 | 1100 | 150 |
| GBT 501 | 1010 | 750 | 1110 | 270 |
| GBT 562 | 1120 | 830 | 1220 | 310 |
| GBT 561 | 1120 | 830 | 1220 | 325 |
| GBT 632 | 1250 | 1000 | 1350 | 365 |
| GBT 631 | 1250 | 1100 | 1350 | 440 |
| GBT 712 | 1430 | 1200 | 1340 | 500 |
| GBT 711 | 1430 | 1300 | 1340 | 560 |
| GBT 802 | 1600 | 1500 | 1460 | 900 |
| GBT 801 | 1600 | 1600 | 1460 | 990 |
| GBT 902 | 1785 | 1500 | 1630 | 1420 |
| GBT 1121 | 2235 | 1450 | 2010 | 1050 |
| GBT 1251 | 2510 | 1650 | 2230 | 1700 |
| GBT 1402 | 2790 | 1720 | 2470 | 2160 |

* Orientation of the fan “RD0”

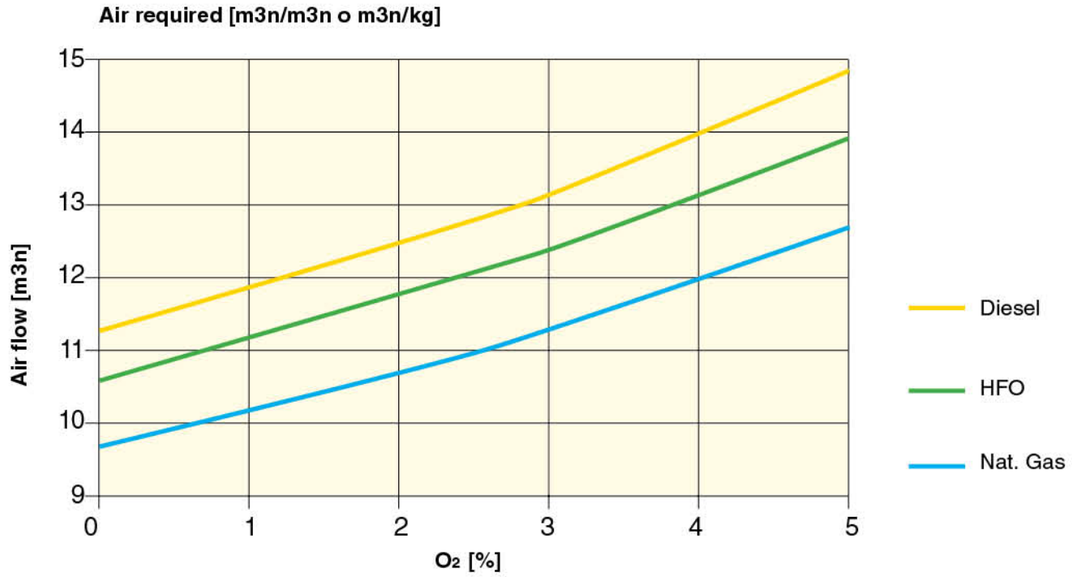
Correct sizing of the fan is extremely important for correct operation.
Depending on the required output, the fan will be selected taking into account the fuel type, the load loss associated with the air fuel pathway, the temperature of combustion air and altitude. Let see an example of calculations for fan sizing.

**Calculating firebox capacity:**

Boiler output: 20000 kW
Efficiency: 90%
Burner capacity: 20000/0.9 = 22220 kW
Fuel: Natural gas
Gas capacity: 22220 / 9.88* (gas PCI) = 2249 m3n/h
*See table page 8-9 for the PCI values of other fuels

**Calculation for fan air capacity:**

Based on the fuel used and the oxygen content considered, you can calculate the required air capacity.
The graph below can be used for these calculations.




Let us assume we want to size the fan for an oxygen value of 3%, the required quantity of air will be:
Q air: 2249 * 11.3 = 25414 m3n/h
This value must be corrected according to the temperature and altitude, due to the change in density.
See the tables below for the correction values to be applied.

**Corrective factor combustion air rate based on temperature and altitude**

| | Metres above sea level | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Air temperature in °C | 0 | 250 | 500 | 750 | 1000 | 1250 | 1500 | 1750 | 2000 | 2250 | 2500 | 2750 | 3000 |
| 0 | 1,071 | 1,040 | 1,009 | 0,978 | 0,950 | 0,920 | 0,895 | 0,867 | 0,841 | 0,813 | 0,791 | 0,765 | 0,741 |
| 5 | 1,052 | 1,021 | 0,991 | 0,960 | 0,933 | 0,904 | 0,879 | 0,851 | 0,826 | 0,798 | 0,776 | 0,751 | 0,728 |
| 10 | 1.033 | 1,003 | 0,973 | 0,943 | 0,916 | 0,888 | 0,863 | 0,836 | 0,812 | 0,784 | 0,763 | 0,738 | 0,715 |
| 15 | 1,015 | 0,986 | 0,956 | 0,927 | 0,900 | 0,872 | 0,848 | 0,822 | 0,797 | 0,771 | 0,749 | 0,725 | 0,723 |
| 20 | 0,998 | 0,969 | 0,940 | 0,911 | 0,885 | 0,857 | 0,834 | 0,807 | 0,784 | 0,758 | 0,737 | 0,713 | 0,691 |
| 25 | 0,981 | 0,953 | 0,924 | 0,896 | 0,870 | 0,843 | 0,820 | 0,794 | 0,771 | 0,745 | 0,724 | 0,701 | 0,679 |
| 30 | 0,965 | 0,937 | 0,909 | 0,881 | 0,856 | 0,829 | 0,806 | 0,781 | 0,758 | 0,733 | 0,712 | 0,689 | 0,668 |
| 40 | 0,934 | 0,907 | 0,880 | 0,853 | 0,828 | 0,803 | 0,781 | 0,756 | 0,734 | 0,709 | 0,690 | 0,667 | 0,647 |
| 50 | 0,905 | 0,879 | 0,853 | 0,827 | 0,803 | 0,778 | 0,756 | 0,733 | 0,711 | 0,687 | 0,668 | 0,647 | 0,627 |
| 60 | 0,878 | 0,853 | 0,827 | 0,802 | 0,779 | 0,754 | 0,734 | 0,711 | 0,690 | 0,667 | 0,648 | 0,627 | 0,608 |
| 80 | 0,828 | 0,804 | 0,780 | 0,756 | 0,735 | 0,712 | 0,692 | 0,670 | 0,651 | 0,629 | 0,611 | 0,592 | 0,573 |
| 100 | 0,784 | 0,761 | 0,739 | 0,716 | 0,695 | 0,674 | 0,655 | 0,634 | 0,616 | 0,595 | 0,579 | 0,560 | 0,543 |
| 150 | 0,691 | 0,671 | 0,651 | 0,631 | 0,613 | 0,594 | 0,578 | 0,559 | 0,543 | 0,525 | 0,510 | 0,494 | 0,478 |
| 200 | 0,618 | 0,600 | 0,582 | 0,565 | 0,548 | 0,531 | 0,517 | 0,500 | 0,486 | 0,469 | 0,456 | 0,442 | 0,428 |
| 250 | 0,559 | 0,543 | 0,527 | 0,511 | 0,496 | 0,480 | 0,467 | 0,452 | 0,439 | 0,425 | 0,413 | 0,400 | 0,387 |
| 300 | 0,510 | 0,496 | 0,481 | 0,466 | 0,453 | 0,439 | 0,426 | 0,413 | 0,401 | 0,387 | 0,377 | 0,365 | 0,353 |

**Factor**

A 5% safety factor is considered
Q air: 25414 * 1.05 = 26685 m3n/h

**Calculation of fan static pressure**

To calculate the static pressure of a fan, you need to consider all the load loss associated with the air fuel pathway:
Load loss in burner
Pressure in combustion chamber and flue
Loss in any air preheaters / economizer / filters etc.
Air channel loss

**Example of static pressure calculation**

Load loss in burner: 30 mbar
Pressure in combustion chamber and flue: 20 mbar
Loss in any air preheaters / economizer / filters etc. 15 mbar
Air channel loss: 5mbar
Total load loss: 30+20+15+5 = 70 mbar

A 5% safety factor is considered
Fan static pressure: 70 * 1.05 = 73.5 mbar

**To summarize, the data needed for fan selection are:**

Q air: 26685 m3n/h
Fan static pressure: 73.5 mbar

**Did you know?**
**Standard air density: 1.293 kg/m3 refers to 0°C and 1013 mbar**

| Pressure conversion table | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Unit | bar | mbar | Pa | kPa | MPa | mm Hg | mm WC | psi |
| 1 bar | 1 | 1000 | 100000 | 100 | 0.1 | 750.062 | 10197.16 | 14.5038 |
| 1 mbar | 0.001 | 1 | 100 | 0.1 | 0.0001 | 0.7501 | 10.1972 | 0.0145 |
| 1 Pa | 0.0001 | 0,01 | 1 | 0.001 | 0.000001 | 0.0075 | 0.10197 | 0.000145 |
| 1 kPa | 0.01 | 10 | 1000 | 1 | 0.001 | 7.5006 | 101.9716 | 0.145 |
| 1 MPa | 10 | 10000 | 1000000 | 1000 | 1 | 7500.62 | 101972 | 145.0377 |
| 1 mm Hg | 0.00133 | 1.333 | 133.63 | 0.13332 | 0.00013332 | 1 | 13.5951 | 0.01934 |
| 1 mm WC | 0.000098 | 0.098 | 9.807 | 0.009807 | 9.807106 | 0.07356 | 1 | 0.0012 |
| 1 psi | 0.068947 | 68.95 | 6894.76 | 6.8947 | 0.00689475 | 51.7149 | 703.0695 | 1 |

**TECHNICAL TIP:**
**We recommend use of round ducting for combustion air supply to minimize transmission of noise and vibrations. If that is not possible, the duct should be properly stiffened to prevent the "drum effect".**

### Mechanical cam (MC) gas train

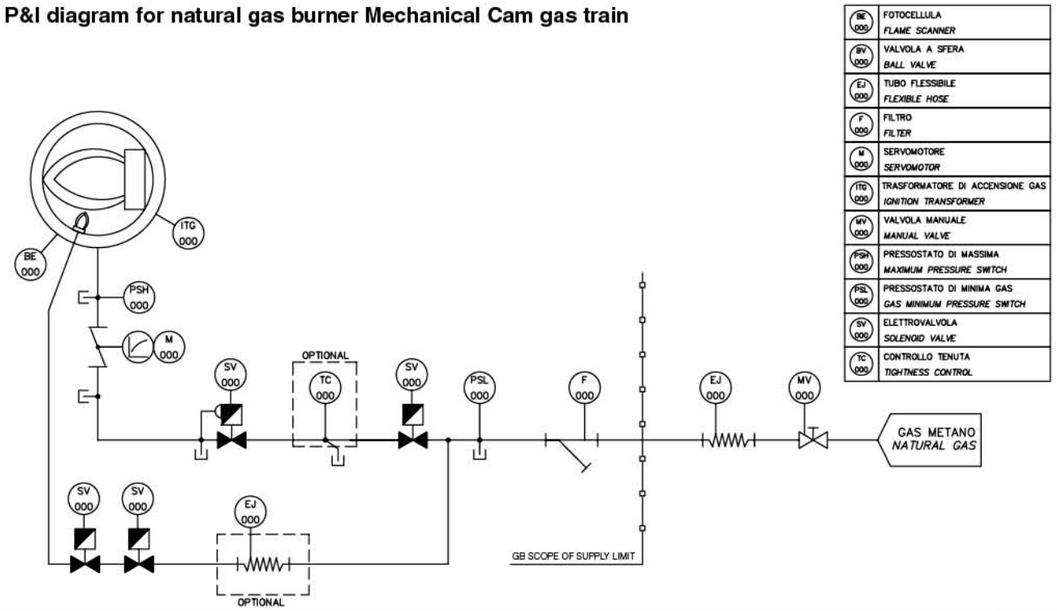
The valve tightness control it is perfomred by means of VPS system. The VPS is IP54 electrical protection and can be installed as indipendent kit.

### Electronic modulation (EM) gas train

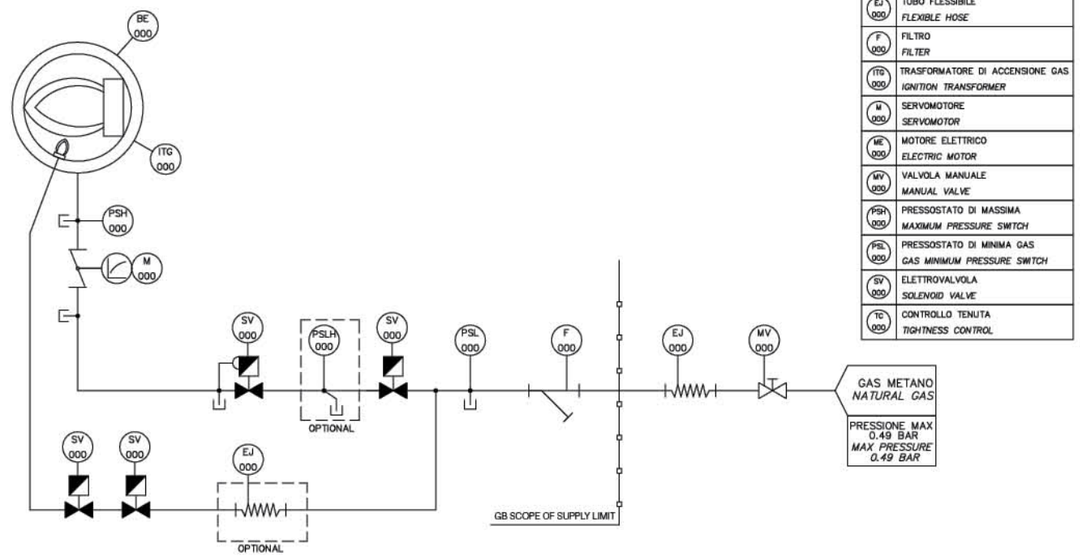
The valve tightness control is perfomed by the BMS by means of pressure switches installed on board of the gas train.
IP54 electrical protection.

Note: conforming to the European standard EN 676, the tightness control device is compulsory on gas trains of burners with a maximum output over 1200 kW

### P&I diagram for natural gas burner Mechanical Cam gas train



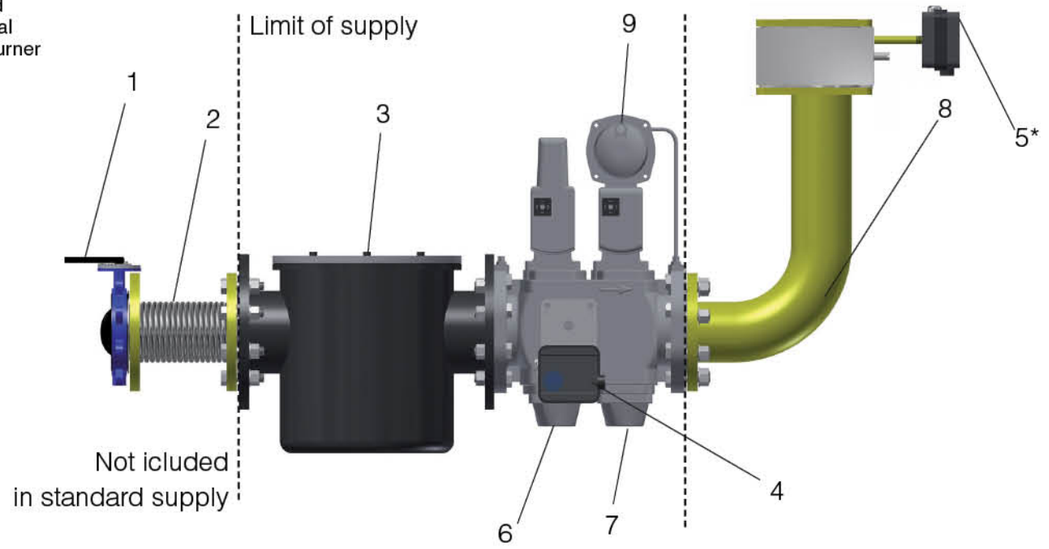

### P&I diagram for natural gas burner Electronic Modulation gas train




**Standard scope of supply**

| n°ref | description | |
|---|---|---|
| 1 | ball valve | opt |
| 2 | anti vibration joint | opt |
| 3 | gas fliter | ● |
| 4 | minimum gas pressure switch | ● |
| 5 | maximum gas pressure switch* | ● |
| 6-7 | main gas valve | ● |
| 8 | burner gas train adapter | ● |
| 9 | gas pressure regulator | ● |

● standard
opt optional
* on the burner




Note: conforming to the European standard EN 676, the tightness control device is compulsory on gas trains of burners with a maximum output over 1200 kW

# GAS TRAINS

| Size | Gas pressure available | | | | |
|---|---|---|---|---|---|
| | P.gas 20 mbar | P.gas 50 mbar | P.gas 100 mbar | P.gas 300 mbar | P.gas 450 mbar |
| | Burner capacity [ m3n/h ] | Burner capacity [ m3n/h ] | Burner capacity [ m3n/h ] | Burner capacity [ m3n/h ] | Burner capacity [ m3n/h ] |
| 1" (DN 25) | 15 | 30 | 40 | 90 | 120 |
| 1" 1/2 (DN 40) | 45 | 70 | 150 | 220 | 400 |
| 2" (DN 50) | 70 | 150 | 180 | 300 | 500 |
| DN 65 | 150 | 220 | 320 | 600 | 800 |
| DN 80 | 200 | 330 | 450 | 900 | 1200 |
| DN 100 | 280 | 450 | 650 | 1200 | 2000 |
| DN 125 | - | - | 1000 | 1800 | 2700 |
| DN 150 | - | - | - | 2500 | 3500 |
| DN 200 | - | - | - | 4500 | 6000 |
| DN 200 | - | - | - | - | 7000 |
| DN 200 | - | - | - | - | 8000 |
| DN 200 | - | - | - | - | 9000 |
| DN 200 | - | - | - | - | 10000 |

The maximum gas flow rate indicated in the table is reached when boiler back pressure is zero. Any pressure to the boiler back pressure must be subtracted to the available gas pressure.
Biogas, town gas and LPG options available.





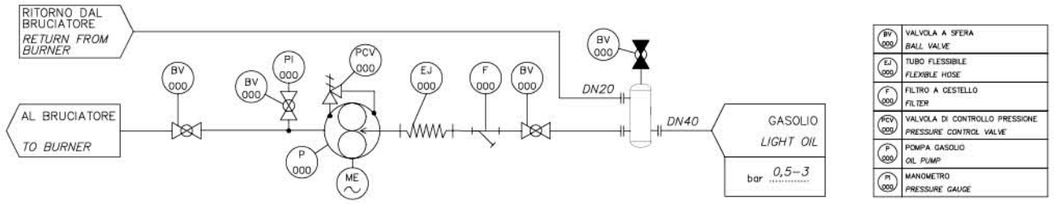
# DIESEL OIL PUSHING UNIT

**scope of standard supply DIESEL OIL push unit**

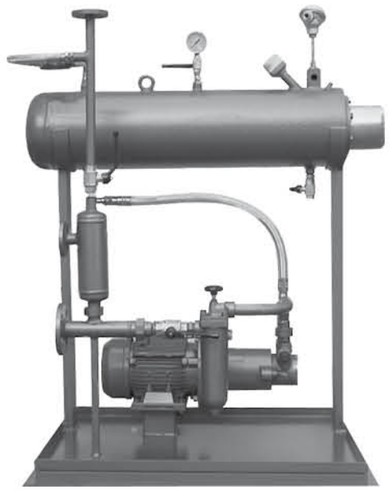
| description | | |
|---|---|---|
| containment tank in painted steel sheet | | ● |
| degasing tank | | ● |
| ball valve | | ● |
| oil filter | | ● |
| oil pressure gauge on the supply circuit | | ● |
| oil pump with pressure control valve | | ● |
| electric motor | | ● |
| flexible hose | | ● |
| selfcleaning filter | | opt |
| Kit low temperature * | thermostat bulbs<br>Electric heat tracing cable<br>heating basket filter | opt |
| oil inlet pressure gauge | | opt |
| min outlet oil pressure switch | | opt |
| min inlet oil pressure switch | | opt |
| shutoff electrovalve | | opt |
| electrical shunt box | | opt |
| control panel | | opt |
| double pumping group with filter | | opt |

| accessories to be ordered separately | |
|---|---|
| pumping unit for main ring | opt |
| control panel for pumping unit | opt |
| flow control valve | opt |

● standard
opt optional
*to use when the viscosity of diesel input is > 6mm2/s at 20°C.
Note: The pipe between the burner and push unit must be built on site by the installation.



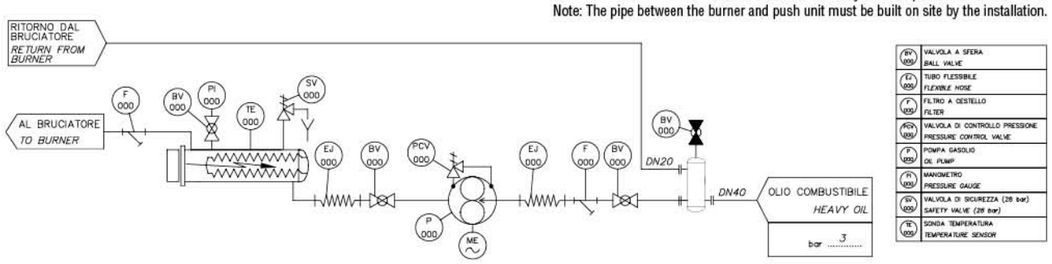

| Technical characteristics | | | |
|---|---|---|---|
| **Model** | max capacity nozzle [kg/h] | pump capacity [l/h] | motor [kW] |
| **CGS 150** | 150 | 450 | 1.1 |
| **CGS 250** | 250 | 600 | 1.1 |
| **CGS 350** | 350 | 1000 | 2.2 |
| **CGS 550** | 550 | 1500 | 2.2 |
| **CGS 850** | 850 | 2000 | 3 |
| **CGS 1000** | 1000 | 3000 | 4 |
| **CGS 1500** | 1500 | 4500 | 5.5 |
| **CGS 2600** | 2600 | 6000 | 7.5 |
| **CGS 3500** | 3500 | 8000 | 9.2 |
| **CGS 5000** | 5000 | 12000 | 15 |
| **CGS 7000** | 7000 | 17000 | 22 |
| **CGS 10000** | 10000 | 22000 | 30 |



**Scope of standard supply of heavy oil push unit**

| description | | |
|---|---|---|
| containment tank in painted steel sheet | | ● |
| degasing tank | | ● |
| ball valve | | ● |
| selfcleaning filter | | ● |
| oil pressure gauge on the delivery circuit | | ● |
| oil pump with pressure control valve | | ● |
| electric motor | | ● |
| flexible hose | | ● |
| electrical oil preheater | | ● |
| temperature sensor | | ● |
| safety valve | | ● |
| electrical and steam oil preheater | | opt |
| steam oil preheater | condensate drain<br>steam control valve<br>maximum thermostat oil temperature | opt |
| diathermic - oil preheater | | opt |
| electronic temperature control | | opt |
| Kit low temperature * | thermostat bulbs<br>Electric heat tracing cable<br>selfcleaning heating filter | opt |
| shutoff electrovalve | | opt |
| oil inlet pressure gauge | | opt |
| min oil supply pressure switch | | opt |
| min oil ring pressure switch | | opt |
| shunt box | | opt |
| control panel | | opt |
| double pumping group with filter | | opt |
| Steam control kit * | condensate drain<br>steam control valve | opt |
| **accessories to be ordered separately** | | |
| pumping unit for main ring | | opt |
| control panel for pumping unit | | opt |
| flow control valve | | opt |

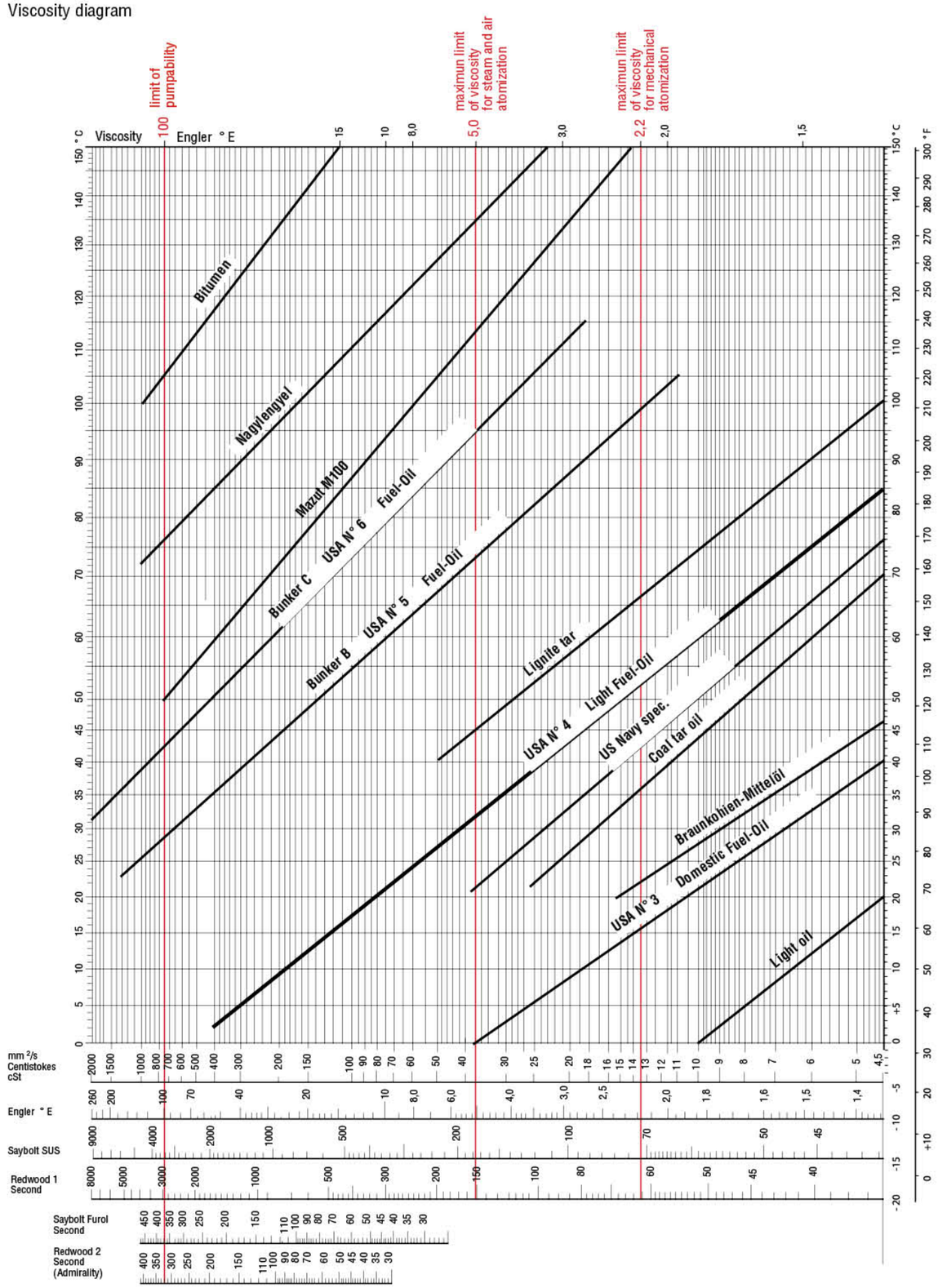
● standard
opt optional
*to use when the viscosity of fuel input is > of 15°E at 50°C.
Note: The pipe between the burner and push unit must be built on site by the installation.




**Technical characteristics**

| Model | max capacity nozzle [kg/h] | pump capacity [l/h] | motor [kW] | pre-heater [kW] |
|---|---|---|---|---|
| **CNS 150** | 150 | 450 | 1.1 | 8 |
| **CNS 250** | 250 | 600 | 1.1 | 10 |
| **CNS 350** | 350 | 1000 | 2.2 | 15 |
| **CNS 550** | 550 | 1500 | 2.2 | 30 |
| **CNS 850** | 850 | 2000 | 3 | 40 |
| **CNS 1000** | 1000 | 3000 | 4 | 40 |
| **CNS 1500** | 1500 | 4500 | 5.5 | 60 |
| **CNS 2200** | 2200 | 6000 | 7.5 | 90 |
| **CNS 2600** | 2600 | 6000 | 7.5 | 100 |
| **CNS 3500** | 3500 | 8000 | 11 | 160 |
| **CNS 5000** | 5000 | 12000 | 15 | 200 |
| **CNS 7000** | 7000 | 17000 | 22 | 290 |
| **CNS 10000** | 10000 | 22000 | 30 | 410 |

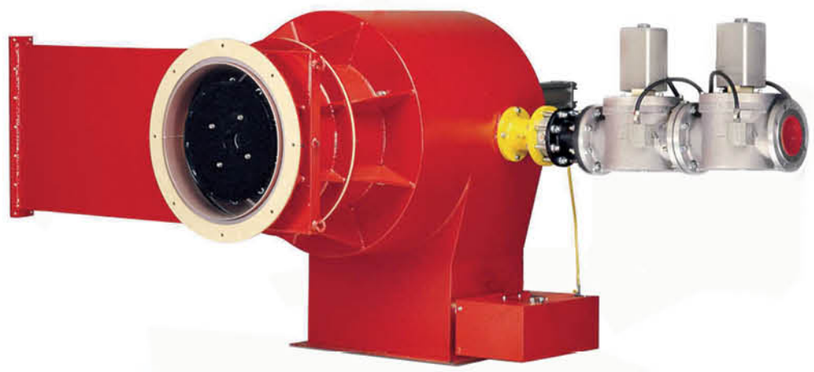
Viscosity diagram



**AMRP 14 GD LX Eexd**

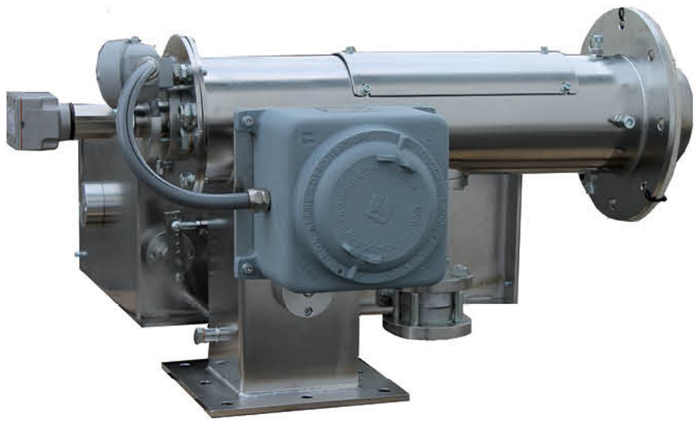
**Diesel oil pushing unit for low temperatures**

**AMR 8 G version for incinerator with refractory guillotine**



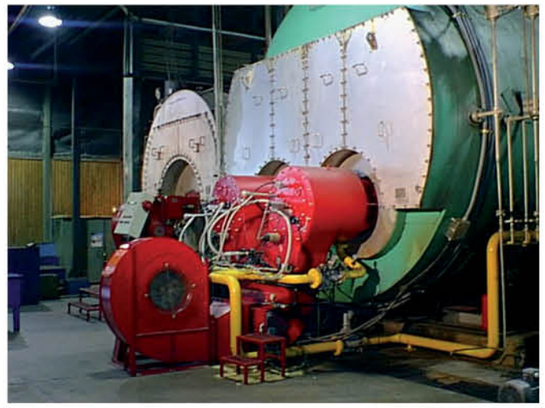
**AMP 7 GN Atex plate version**

**AM 09 G Eexd for petrochemical applications**

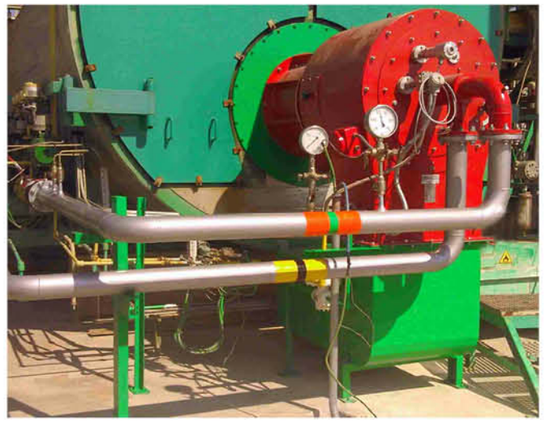


**Detail of the refractory guillotine in closed position**

- Air fan with INVERTER for air flow regulation to ensure low energy consumption.
- $O_2$ trim and/or CO control and For high combustion efficiency.
- IP 55 – IP 65 – ATEX - Eexd Execution for installation in hazardous at the highest electrical part protection.
- Burner for marine execution for shipping and offshore installation
- Double air flow and variable air flow system for high turn down ratio up to 1:10.
- AISI 304 - 316 Stainless steel execution.
- Special gas executions, such as hydrogen, biogas, singas to work with high T° up to 600°C.
- Execution for extra hot combustion air.
- Special exclusive GB "EMME - Emulsion Mechanical Multiple Effect" system that allows sharp dust reduction at the chimney.
- Retractable combustion head execution and automatic refractory head shut-off system particularly suitable for extremely high T° furnaces.
- Multi-burner execution on single combustion chamber, with adjustable flame turbolence, with optional Y type gas train, optional common oil pushing units, with BMS burner logic shared between burner and main system.
- Plate burners range on the whole existing output range for water tube and oil boilers with integrated pre-heated air unit.

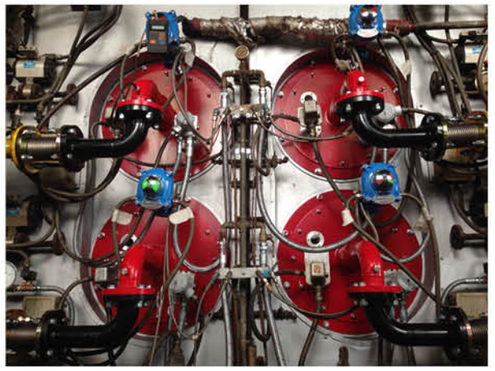


| | |
|---|---|
| Burners model | **AMR 8 GD** |
| Capacity plant | **15 MW x 2** |
| Fuel | **Nat.gas / Diesel oil** |
| Application | **Industrial process<br>Two flame-tubes boiler** |

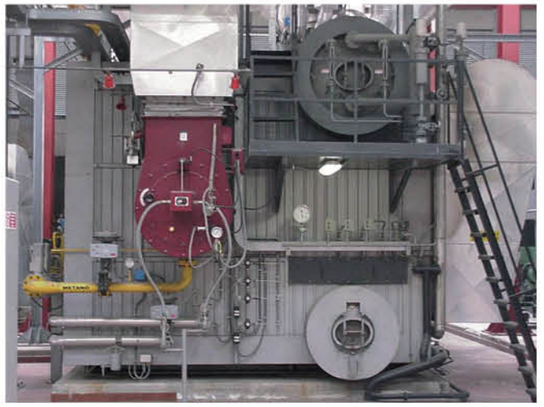


| | |
|---|---|
| Burners model | **AMR 9 GB LX FGR Eexd** |
| Capacity plant | **15 MW** |
| Fuel | **Nat.gas / Refinery gas** |
| Application | **20 t/h steam boiler** |

| | |
|---|---|
| Burners model | **AMR 9 G AC** |
| Capacity plant | **16 MW x 6** |
| Fuel | **Nat.gas** |
| Application | **Food industry<br>3 pass steam boiler** |



| | |
|---|---|
| Burners model | **AMR 8 G PAC LX ATEX** |
| Capacity plant | **12 MW** |
| Fuel | **Nat.gas** |
| Application | **Paper factory<br>Air temperature 200° c<br>Water tube boiler 44 T/h** |



| | |
|---|---|
| Burners model | **AMR 9 GN LX AC** |
| Capacity plant | **16 MW** |
| Fuel | **Nat.gas / Heavy oil** |
| Application | **Airport heating and hot water<br>Water tube boiler** |


| | |
|---|---|
| Burners model | **AMR 8 G EM LX AC** |
| Capacity plant | **12 MW** |
| Fuel | **Nat.gas** |
| Application | **Food factory 3 pass steam boiler** |

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