oilon®

# Oil, Gas and Dual Fuel Burners

## Burner series 400...2500 ME

Group
5
Capacity
4,095-100,660 MBtu/h

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# Oil, gas and dual fuel burners

## Burner series 400...2500 ME

**Comply with**

Oilon oil, gas, and dual fuel burners are fully automatic, safe, and reliable. The design and manufacturing of the burners is based on economy, safety, and service as well as environmental friendliness. The burners are in compliance with most North American and European applicable standards. We also supply burners complying with various marine classification society requirements, such as ABS, BV, CCS, DNV, GL, KR, LR, NKK, RINA and RS.

### Construction

A housing of welded steel sheets with a surface finish with durable, high-gloss paint. A removable cover located on top of the burner makes it easy to carry out maintenance on the nozzle and ignition electrodes as this does not require removal of the burner. The combustion head and diffuser disc, which are made from a stainless steel alloy, withstand a temperature of approx. 2,192 °F. The flow of air in the combustion head is automatically controlled (optimisation of the pressure loss at the combustion head) to achieve optimum combustion parameters throughout the capacity range. The burner contains a sight glass for flame observation. An air damper assembly on the suction side of the fan automatically controls, together with the servomotor, the fuel and air flows according to the required output.

### Suitable applications

The burners are suitable for warm and hot water boilers, steam boilers, hot air generators and various types of process heating equipment. They can be mounted in horizontal, vertical and upward-facing, or vertical and downward-facing orientation. The structure, materials and enclosure class of the burners require indoors operation.

### Fuels

Different fuels can be used depending on the burner model:
KP models:
- light fuel oil, viscosity 0.006 - 0.01 $in^2/s$, 68 °F

RP models:
- heavy fuel oil, viscosity max. 0.39 $in^2/s$, +122 °F
- heavy fuel oil, viscosity max. 0.697 $in^2/s$, +122 °F
  heating cartridge for pump and nozzle
- heavy fuel oil, viscosity max. 1 $in^2/s$, +122 °F
  heating cartridges as above + trace heating for the oil piping

GP models:
- Natural gas
- Propane

GKP and GRP dual fuel burners:
- fuel properties as above, natural gas/light fuel oil
- fuel properties as above, natural gas/heavy fuel oil

Burners using other fuels are available upon request.

### Capacity regulation methods

All burners are modulating. They are equipped with an air damper servomotor with a transition time of 60 s/90 °. The servomotor is connected to the oil regulator and compound regulator via an axle. The burner operates on the entire capacity range according to the load. The burners are controlled according to the flue gas analysis.

### Booster unit PKYK for light fuel oil

The models KP and GKP are equipped with a separate booster unit, which includes an oil filter and a booster pump with complete piping.

### Booster unit PKYR for heavy fuel oil

The models RP and GRP are equipped with a separate preheater and booster unit, which comprises an oil filter, booster pump and an electric mass preheater.

The preheater is made from a cast aluminium alloy, and includes embedded oil piping and electric resistance coils. The capacity of one preheater is 8 hp. The preheater is controlled by solid-state relays and by an electronic regulator, which keeps the oil temperature stable. A stable oil temperature helps to ensure that the oil mixes adequately with the combustion air, helping to obtain optimal combustion parameters. Depending on the model, the PKYR may have three or more preheating units.

In the heavy oil burners, the oil heated during the pre-purge phase flows to the nozzle through the preheater to ensure that the oil temperature is high enough in the nozzle during the ignition phase.

### Gas equipment

Gas-related components of the gas and dual fuel burners comply with North American and European applicable standards.

### Oil piping

The oil piping is installed mainly in the burner, and includes three solenoid valves. The oil regulator is located on the oil line returning from the nozzle. The piping between the burner and the PKYK/PKYR is to be built on site.

### Flame monitoring

All models are equipped with automatic flame monitoring. In KP and RP models, flame monitoring is carried out by a photocell; in GP, GKP, and GRP models, it is carried out by an UV cell.

### Control devices

The burner control automatics are assembled in a separate control cabinet, which contains a control unit, signal lamps, the capacity controller and operating switches. The control unit automatically carries out all the function phases of the burner.

In the event of a burner failure, the system automatically stops the burner. The modulating burners also incorporate a pre-installed capacity controller. If required, the burner can also be supplied with electronic fuel/air ratio control at an added cost.

### Accessories

Each of the fuel control valves and the air damper may be equipped with a servomotor (electronic fuel/air ratio control). An air distribution box should be installed under the burner, in case of air duct cannot be installed vertically (length of straight vertical part should be at least 4.9 ft) under the burner.

# How to choose a burner

**A. Procedure**

**1** Establish relevant boiler and application information
- boiler capacity and efficiency, or required burner capacity
- back pressure of the furnace
- fuel(s) to be used
- fuel inlet pressure to the burner
- capacity regulation method of the burner

**2** Calculate the burner capacity. Burner capacity = boiler capacity/efficiency. Example: boiler capacity = 1019 hp boiler (10,000 kW), efficiency = 90 % → Burner capacity = 34,121 MBtu/h (10,000 kW) / 0.9 = 37,909 MBtu/h (11,110 kW).

**3** Gas burners: Calculate the required gas flow [ft³/h]. The required gas flow [ft³/h] = (burner capacity [MBtu] x 3.6)/the calorific value of the gas [Btu/ft³]. Example: the required burner capacity = 37,909 MBtu/h (11,110 kW)→ the required gas flow = 37,909 MBtu/h (11,110 kW) x 3.6/ 961 Btu/ft³ = 39,446 ft³/h, where 961 Btu/ft³ is the calorific value of natural gas. Oil burners: Calculate the required oil flow [lb/h]. The required oil flow [lb/h] = (burner capacity [MBtu] x 3.6)/the calorific value of oil [Btu/lb]. Example: the required burner capacity = 37,909 MBtu/h (11,110 kW) → the required oil flow = 37,909 MBtu/h (11,110 kW) x 3.6/17,412 Btu/lb = 2,178 lb/h, where 17,412 Btu/lb is the calorific value of heavy fuel oil.

**4** See the brochure for a burner with a sufficient range of capacity. Example: A burner of 37,909 MBtu/h (11,110 kW) of capacity, firing natural gas and heavy fuel oil is needed. The appropriate burner for these specifications is GRP-1000 ME.

**5** Calculate the required combustion air flow and pressure. Example: the required burner capacity = 37,909 MBtu/h (11,110 kW), the pressure loss of the boiler and chimney at this burner capacity is 6 "WC.

Example: The combustion air flow required when using natural gas with a flue gas oxygen value of 3 % is calculated. To combust 35 ft³ of natural gas to produce a 3 % oxygen content in the flue gas, approximately 399 ft³ of air is required (see diagram 2, page 9). The required combustion air flow = 39,446 ft³/h x 399 ft³ = 445,671 ft³/h. The combustion air flow is also to be calculated when using heavy fuel oil. To combust 1 kg of heavy fuel oil producing a flue gas oxygen content of 3%, approximately ft³ of air is required (see diagram1, page 9). The required combustion air flow = 2,178 lb/h x 12.4 m³n/kg = 432,605 ft³/h. The required fan output is calculated by multiplying the required combustion air flow with the safety factor 1.05. The larger figure is selected for the combustion air flow, i.e. 445,671 ft³/h, and the fan output required for this flow is approximately 1.05 x m³n/h = 467,919 ft³/h. The required fan pressure is calculated using the max. air flow. The required pressure p ["WC] = (the pressure loss generated by the boiler and the chimney + the pressure loss of the air ducts + max. pressure loss in the burner, 14 "WC) x safety factor 1.05. Example: The pressure loss generated by the boiler and the chimney = 6 "WC, the pressure loss of the air ducts = 2 "WC, max. pressure loss of the burner = 15 "WC. The required fan pressure p = (6 "WC + 2 "WC + 15 "WC) x 1.05 = 23 "WC. A fan applicable in this case has to produce a flow of approximately 467,919 ft³/h at a pressure of 23 "WC.

N.B: The air duct to be connected with the burner should run directly from below the burner, and it should be straight for a distance of no less than 4.9 foot before the burner. If the duct cannot be installed in this way, an air distribution box should be used. For information on air distribution boxes, see page 9.

**6** Gas burners: From the selection table for gas valves, select a sufficient valve size according to the burner capacity. Note that the values in the selection table apply when the furnace back pressure is 0 "WC. Therefore you must subtract the furnace back pressure from the actual gas inlet pressure, and select the valve according to the value thus obtained. The ratings shown in the table apply to natural gas.

Example: The gas inlet pressure of the burner = 80 "WC, the boiler back pressure = 7 "WC and the required burner capacity = 37,909 MBtu/h (11,110 kW). The effective pressure is therefore 80 "WC – 7 "WC = 73 "WC. For the burner GRP-1000 ME, for example, a valve generating a capacity of no less than 37,909 MBtu/h (11,110 kW) with a gas inlet pressure of 73 "WC should be chosen. The valve NPT 3 is selected for this burner.

**7** Oil burners: Select an appropriate booster unit according to the burner capacity. The light fuel oil burners use the model PKYK and the heavy fuel oil burners PKYR. The booster unit for light fuel oil is selected using the diagram 3. The booster unit for heavy fuel oil is selected using the diagram 4. For burner capacity of 2,178 lb/h, for example, the required temperature difference in the booster unit is 113 °F. The diagram shows that the appropriate booster unit is PKYR3.

**8** Check that the external dimensions of the burner, particularly the length of the combustion head, are suitable for the application. The combustion head length should be such that the head is flush with the furnace wall or approx. 0.4-0.8 inch inside the furnace (see 'Masonry figure').

**9** Check the dimensions of the flame in the flame dimensions diagram. Note that the flame must not touch the furnace walls.

**10** Do not forget the accessories: gas pressure regulator, oil pumping and preheating unit, boiler thermostats/pressostats.

Our sales department will be happy to help you with any questions related to burner selection and operation.

**B. Equations and rules of thumb**

**1** Burner capacity = boiler capacity / 0.9 (when boiler efficiency is 90 %)

**2** Steam boilers: 1.1 ton(us)/h steam ≈ 71 hp (boiler) boiler capacity

**3** Light fuel oil: 1 lb/h ≈ 18,4 MBtu/h burner capacity with calorific value 42.7 MJ/kg

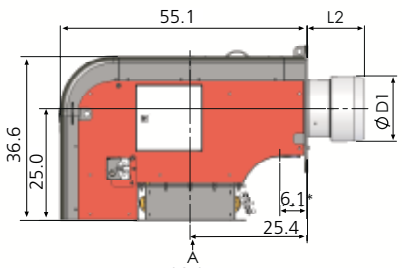
**4** Heavy fuel oil: 1 lb/h ≈ 17,4 MBtu/h burner capacity with calorific value 18,358 Btu/lb

**5** Natural gas: 1 ft³/h ≈ 0,971 MBtu/h burner capacity with calorific value 962 Btu//ft³

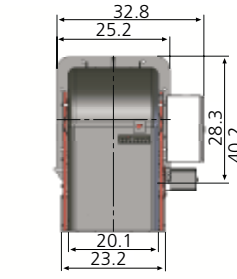
**6** Oil pumping, filtering, and preheating unit (Oilon Hot- Box) is required when firing heavy fuel oil. When the burner capacity is more than 6824 MBtu/h, a transfer pump unit (Oilon SPY) is always needed, even when firing light fuel oil. The required minimum pump output [lb/h] can be calculated as follows:

Required minimum output [lb/h] = (oil flow to be burned [lb/h] + 331 lb/h) x 1.2. The clause in brackets refers to the preheated oil flow to each burner.

## KP/RP/GP/GKP/GRP-400...600 ME

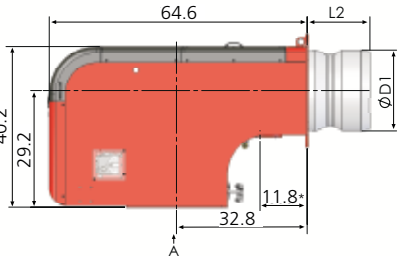



VIEWED FROM DIRECTION A
Air duct installation flange

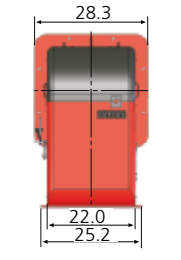



Installation of the burner to a boiler

## KP/RP/GP/GKP/GRP-800...1200 ME




VIEWED FROM DIRECTION A
Air duct installation flange

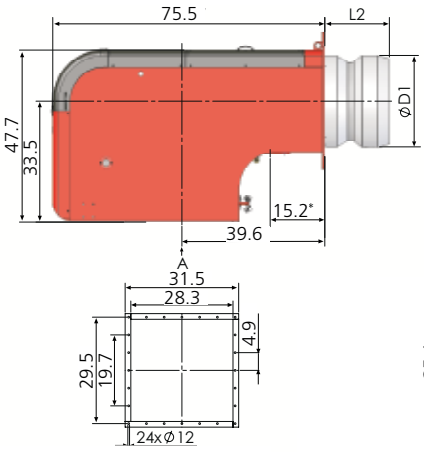



Installation of the burner to a boiler

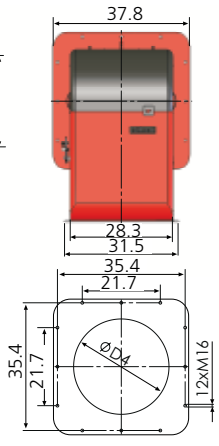
| BURNER | L2 | ØD1 | ØD4 |
|---|---|---|---|
| 400 ME | 12.8 | 14.6 | 16.9 |
| 600 ME | 13.2 | 15.6 | 17.9 |
| 800 ME | 14.2 | 16.6 | 19.0 |
| 1000 ME | 15.4 | 19.5 | 21.9 |
| 1200 ME | 15.7 | 20.5 | 22.8 |

* Only in gas and dual fuel burners

## KP/RP/GP/GKP/GRP-1600...2000 ME

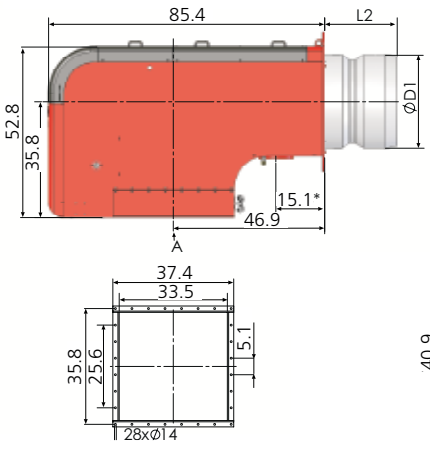



VIEWED FROM DIRECTION A
Air duct installation flange

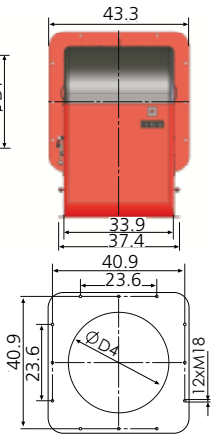



Installation of the burner to a boiler

## KP/RP/GP/GKP/GRP-2500 ME




VIEWED FROM DIRECTION A
Air duct installation flange




Installation of the burner to a boiler

| BURNER | L2 | ØD1 | ØD4 |
|---|---|---|---|
| 1600 ME | 17.7 | 23.4 | 25.7 |
| 2000 ME | 17.7 | 25.6 | 28.0 |
| 2500 ME | 22.4 | 29.1 | 31.5 |

* Only in gas and dual fuel burners

# KP/RP/GP/GKP/GRP-400...-2500 ME

## Technical data

| BURNER | KP-400 ME | KP-600 ME | KP-800 ME | KP-1000 ME | KP-1200 ME | KP-1600 ME | KP-2000 ME | KP-2500 ME |
|---|---|---|---|---|---|---|---|---|
| Capacity MMBtu/h | 4.1 – 17.1 | 5.8 – 23.2 | 8.2 – 32.4 | 10.2 – 40.9 | 11.9 – 47.8 | 14.3 – 56.3 | 19.1 – 76.8 | 25.2-100.7 |
| lb/h | 220 - 926 | 315 - 1263 | 441 - 1764 | 551 - 2205 | 661 - 2646 | 772 - 3086 | 1036 - 4189 | 1369 – 5490 |
| gal/h | 28.7 – 120.4 | 41.0 – 164.3 | 57.4 – 229.4 | 71.7 – 286.8 | 86.0 – 344.2 | 100.4 – 401.5 | 134.8 – 545.0 | 178.1 – 714.1 |
| Connections | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | Ø 22/28 |
| Pilot burner | | | | | | | | |
| - fuel | - | - | light fuel oil (LPG) | light fuel oil (LPG) | light fuel oil (LPG) | light fuel oil (LPG) | light fuel oil (LPG) | light fuel oil (LPG) |
| - connection | - | - | (Ø 22) | (Ø 22) | (Ø 22) | (Ø 22) | (Ø 22) | (Ø 22) |

| BURNER | RP-400 ME | RP-600 ME | RP-800 ME | RP-1000 ME | RP-1200 ME | RP-1600 ME | RP-2000 ME | RP-2500 ME |
|---|---|---|---|---|---|---|---|---|
| Capacity MMBtu/h | 4.1 – 16.0 | 5.8 – 23.2 | 7.5 – 30.7 | 9.6 – 37.5 | 11.6 – 44.4 | 13.3 – 52.9 | 18.1 – 71.7 | 27.3 – 95.5 |
| lb/h | 234 - 919 | 331 - 1323 | 441 - 1764 | 551 - 2205 | 661 - 2646 | 772 - 3086 | 1036 - 4189 | 1565 – 5578 |
| gal/h | 28.0 – 110.0 | 39.6 – 158.3 | 52.8 – 211.1 | 66.0 – 263.9 | 79.2 – 316.6 | 92.3 – 369.4 | 124.0 – 501.3 | 187.3 – 667.5 |
| Connections | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | Ø 22/28 |
| Pilot burner | | | | | | | | |
| - fuel | - | LPG | LPG (light fuel oil) | LPG (light fuel oil) | LPG (light fuel oil) | LPG (light fuel oil) | LPG (light fuel oil) | LPG (light fuel oil) |
| - connection | - | Ø 18 | Ø 22 (Ø 8) | Ø 22 (Ø 8) | Ø 22 (Ø 8) | Ø 22 (Ø 8) | Ø 22 (Ø 8) | Ø 22 (Ø 8) |

| BURNER | GP-400 ME | GP-600 ME | GP-800 ME | GP-1000 ME | GP-1200 ME | GP-1600 ME | GP-2000 ME | GP-2500 ME |
|---|---|---|---|---|---|---|---|---|
| Capacity MMBtu/h | 4.1 – 17.1 | 5.8 – 23.2 | 6.5 – 32.4 | 6.8 – 40.9 | 9.6 – 47.8 | 11.3 – 56.3 | 15.4 – 76.8 | 20.1 – 100.7 |
| - connection | NPT 2 - 4 | NPT 2 - 4 | NPT 2 ½ - 6 | NPT 2 ½ - 6 | NPT 3 - 6 | NPT 4 - 6 | NPT 4 - 6 | NPT 6 |
| Pilot burner | | | | | | | | |
| - connection | Ø 18 | Ø 18 | Ø 22 | Ø 22 | Ø 22 | Ø 22 | Ø 22 | Ø 22 |

| BURNER | GKP-400 ME | GKP-600 ME | GKP-800 ME | GKP-1000 ME | GKP-1200 ME | GKP-1600 ME | GKP-2000 ME | GKP-2500 ME |
|---|---|---|---|---|---|---|---|---|
| Capacity | | | | | | | | |
| - gas MMBtu/h | 4.1 – 17.1 | 5.8 – 23.2 | 6.5 – 32.4 | 6.8 – 40.9 | 9.6 – 47.8 | 11.3 – 56.3 | 15.4 – 76.8 | 20.1 – 100.7 |
| - oil MMBtu/h | 4.1 – 17.1 | 5.8 – 23.2 | 8.2 – 32.4 | 10.2 – 40.9 | 11.9 – 47.8 | 14.3 – 56.3 | 19.1 – 76.8 | 25.2 - 100.7 |
| lb/h | 220 - 926 | 315 - 1263 | 441 - 1764 | 551 - 2205 | 661 - 2646 | 772 - 3086 | 1036 - 4189 | 1369 – 5490 |
| gal/h | 28.7 – 120.4 | 41.0 – 164.3 | 57.4 – 229.4 | 71.7 – 286.8 | 86.0 – 344.2 | 100.4 – 401.5 | 134.8 – 545.0 | 178.1 – 714.1 |
| Connections | | | | | | | | |
| - gas | NPT 2 - 4 | NPT 2 - 4 | NPT 2 ½ - 6 | NPT 2 ½ - 6 | NPT 3 - 6 | NPT 4 - 6 | NPT 4 - 6 | NPT 6 |
| - oil | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | Ø 22/28 |
| Pilot burner | | | | | | | | |
| - fuel | natural gas | natural gas | natural gas/ light fuel oil (LPG) | natural gas/ light fuel oil (LPG) | natural gas/ light fuel oil (LPG) | natural gas/ light fuel oil (LPG) | natural gas/ light fuel oil (LPG) | natural gas/ light fuel oil (LPG) |
| - connection | Ø 18 | Ø 18 | (Ø 22) | (Ø 22) | (Ø 22) | (Ø 22) | (Ø 22) | (Ø 22) |

| BURNER | GRP-400 ME | GRP-600 ME | GRP-800 ME | GRP-1000 ME | GRP-1200 ME | GRP-1600 ME | GRP-2000 ME | GRP-2500 ME |
|---|---|---|---|---|---|---|---|---|
| Capacity | | | | | | | | |
| - gas MMBtu/h | 4.1 – 17.1 | 5.8 – 23.2 | 6.5 – 32.4 | 6.8 – 40.9 | 9.6 – 47.8 | 11.3 – 56.3 | 15.4 – 76.8 | 20.1 – 100.7 |
| - oil MMBtu/h | 4.1 – 16.0 | 5.8 – 23.2 | 7.5 – 30.7 | 9.6 – 37.5 | 11.6 – 44.4 | 13.3 – 52.9 | 18.1 – 71.7 | 27.3 – 95.5 |
| lb/h | 234 - 919 | 331 - 1323 | 441 - 1764 | 551 - 2205 | 661 - 2646 | 772 - 3086 | 1036 - 4189 | 1565 – 5578 |
| gal/h | 28.0 – 110.0 | 39.6 – 158.3 | 52.8 – 211.1 | 66.0 – 263.9 | 79.2 – 316.6 | 92.3 – 369.4 | 124.0 – 501.3 | 187.3 – 667.5 |
| Connections | | | | | | | | |
| - gas | NPT 2 - 4 | NPT 2 - 4 | NPT 2 ½ - 6 | NPT 2 ½ - 6 | NPT 3 - 6 | NPT 4 - 6 | NPT 4 - 6 | NPT 6 |
| - oil | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | 2 x Ø 22 | Ø 22/28 |
| Pilot burner | | | | | | | | |
| - fuel | natural/LPG | natural/LPG | light fuel oil (LPG) | light fuel oil (LPG) | light fuel oil (LPG) | light fuel oil (LPG) | light fuel oil (LPG) | light fuel oil (LPG) |
| - connection | Ø 18 | Ø 18 | Ø 22 (Ø 8) | Ø 22 (Ø 8) | Ø 22 (Ø 8) | Ø 22 (Ø 8) | Ø 22 (Ø 8) | Ø 22 (Ø 8) |

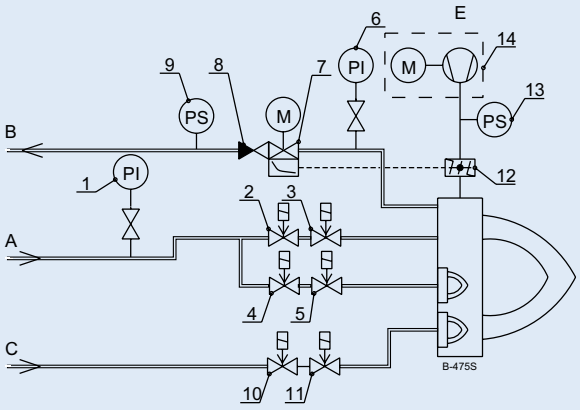
Light fuel oil: 1 lb/h = 18,4 MBtu/h
1 MBtu/h ≙ 253 kcal/h
Heavy fuel oil: 1 lb/h ≙ 17,4 MBtu/h
1 MBtu/h 253 kcal/h
Natural gas: caloric value Hμ = 9,5 kWh/m³n (34,3 MJ/m³n)
density p = 0,723 kg/m³n

Regulating range:
Light fuel oil: 1:3 (100 - 33 %)
Heavy fuel oil: 1:2,5 (100 - 40 %)
Gas: 1:5 (100 - 20 % , 1:4 /400/600)

Note! The outputs of the burners are based on the (LHV) low heating value of gas. When applying the (HHV) high heating value, the maximum outputs can be increased by 8%.

# PI diagrams*

## Light oil burners KP-400...2500 ME

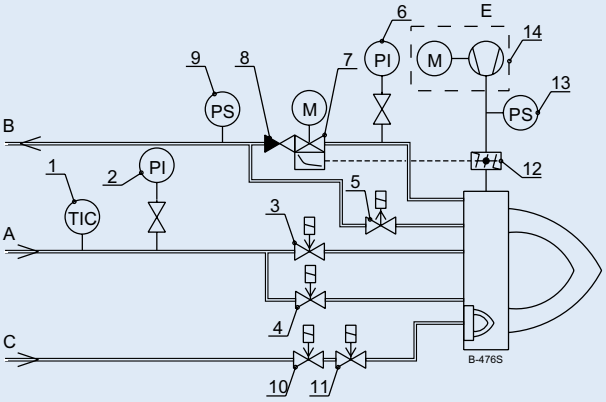



1. Pressure gauge
2. Solenoid valve, NC
3. Solenoid valve, NC
4. Solenoid valve, NC
5. Solenoid valve, NC
6. Pressure gauge
7. Oil regulator
8. Non-return valve
9. Oil presssure switch, max.
10. Solenoid valve, NC*
11. Solenoid valve, NC*
12. Air damper assembly
13. Air pressure switch
14. Separate combustion air fan

A Oil, inlet
B Oil, return
C LPG, inlet*
E Air to the burner

*) Alternative for light fuel oil ignition (optional)

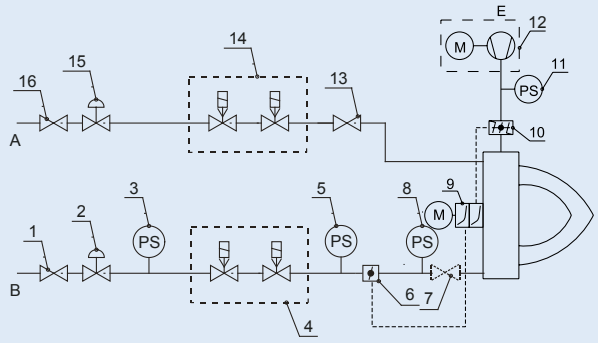
## Heavy oil burners RP-400...2500 ME




1. Temperature regulator
2. Pressure gauge
3. Solenoid valve, NC
4. Solenoid valve, NC
5. Solenoid valve, NO
6. Pressure gauge
7. Oil regulator
8. Non-return valve
9. Oil pressure switch, max.
10. Solenoid valve, NC
11. Solenoid valve, NC
12. Air damper assembly
13. Air pressure switch
14. Separate combustion air fan

A Oil, inlet
B Oil, return
C LPG, inlet
E Air to the burner

## Gas burners GP-400...2500 ME




1. Ball valve, blow-off
2. Pressure regulator
3. Low gas pressure switch
4. Main gas valves: 1 and 2 (safety shut-off valve)
5. Gas pressure switch
6. Gas butterfly valve
7. Ball valve (CGA)
8. High gas pressure switch
9. Controller unit
10. Air damper assembly
11. Air pressure switch
12. Separate combustion air fan
13. Ball valve
14. Pilot gas valves: 1 and 2 (safety shut-off valve)
15. Pilot gas pressure regulator
16. Ball valve, pilot gas

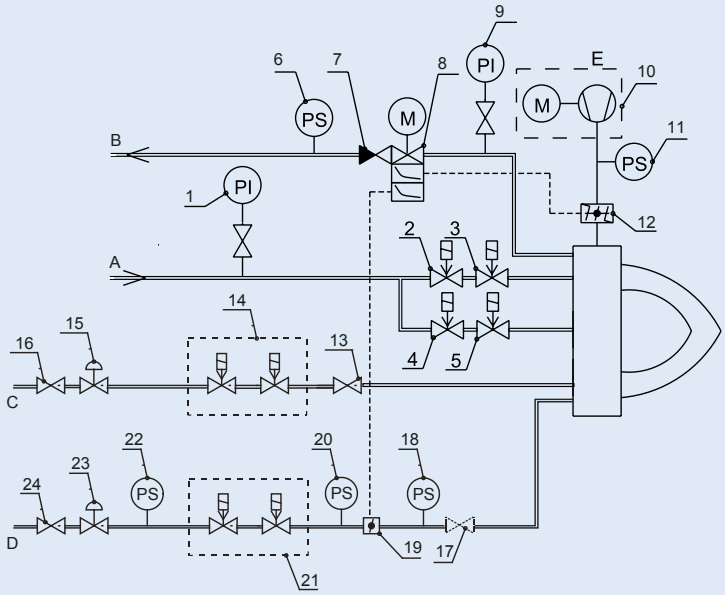
A Pilot gas
B Main gas
E Air to the burner

*) Typical configuration for UL gas valve train. The actual gas valve train delivered with the burner might have different configuration depending on the applicable code.

# PI diagrams*

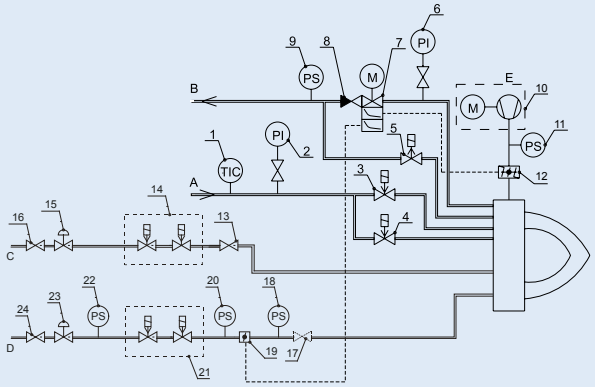
## Dual fuel burners, light fuel oil/gas
## GKP-400...2500 ME

1. Pressure gauge
2. Solenoid valve, NC
3. Solenoid valve, NC
4. Solenoid valve, NC
5. Solenoid valve, NC
6. Oil pressure switch, max.
7. Non-return valve
8. Oil regulator
9. Pressure gauge
10. Separate combustion air fan
11. Air pressure switch
12. Air damper assembly
13. Ball valve
14. Pilot gas valves: 1 and 2 (safety shut-off valve)
15. Pilot gas pressure regulator
16. Ball valve, pilot gas
17. Ball valve (CGA)
18. High gas pressure switch
19. Gas butterfly valve
20. Gas pressure switch
21. Main gas valves: 1 and 2 (safety shut-off valve)
22. Low gas pressure switch
23. Pressure regulator
24. Ball valve




A Oil, inlet
B Oil, return
C Pilot gas
D Main gas
E Air to the burner

## Dual fuel burners, heavy fuel oil/gas
## GRP-400...2500 ME




1. Temperature regulator
2. Pressure gauge
3. Solenoid valve, NC
4. Solenoid valve, NC
5. Solenoid valve, NO
6. Pressure gauge
7. Oil regulator
8. Non-return valve
9. Oil pressure switch, max.
10. Separate combustion air fan
11. Air pressure switch
12. Air damper assembly
13. Ball valve
14. Pilot gas valves: 1 and 2 (safety shut-off valve)
15. Pilot gas pressure regulator
16. Ball valve, pilot gas
17. Ball valve (CGA)
18. High gas pressure switch
19. Gas butterfly valve
20. Gas pressure switch
21. Main gas valves: 1 and 2 (safety shut-off valve)
22. Low gas pressure switch
23. Pressure regulator
24. Ball valve

A Oil, inlet
B Oil, return
C Pilot gas
D Main gas
E Air to the burner

*) Typical configuration for UL gas valve train. The actual gas valve train delivered with the burner might have different configuration depending on the applicable code.

# KP/RP/GP/GKP/GRP-400...-2500 ME

## Scope of delivery

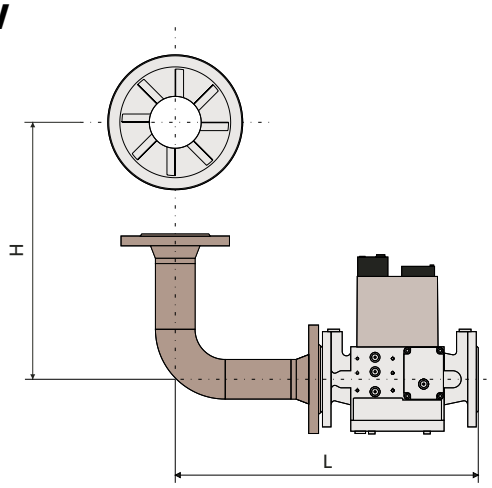
**Burners include following equipment:**

• standard delivery  o optional feature

| | KP-... ME | RP-... ME | GP-... ME | GKP-... ME | GRP-... ME |
|---|---|---|---|---|---|
| Burner flange gasket | • | • | • | • | • |
| Oil nozzle | • | • | | • | • |
| Heating cartridge for oil nozzle | | o | | | o |
| Solenoid valves for oil | • | • | | • | • |
| Heating cartridge for solenoid valves | | • | | | • |
| Non-return valve | • | • | | • | • |
| 2 pressure gauges for oil | • | • | | • | • |
| Thermometer | | • | | | • |
| Pressure switch for return oil | • | • | | • | • |
| Electric tracing cables for burner oil pipes | o | o | | o | o |
| Controller unit for regulating the air/oil ratio, incl.:<br>- oil regulator<br>- servomotor | • | • | | | |
| Controller unit for regulating the air/oil/gas ratio, incl.:<br>- oil regulator<br>- gas butterfly valve<br>- servomotor | | | | • | • |
| WiseDrive (electronic ratio control) for regulating the air/oil ratio, incl.:<br>- oil regulator<br>- servomotor for oil regulator<br>- servomotor for air dampers<br>- servomotor for combustion head regulation | o | o | | | |
| WiseDrive (electronic ratio control) for regulating the air/gas ratio, incl.:<br>- gas butterfly valve<br>- servomotor for gas butterfly valve<br>- servomotor for air dampers<br>- servomotor for combustion head regulation | | | o | | |
| WiseDrive (electronic ratio control) for regulating the air/oil/gas ratio, incl.:<br>- oil regulator<br>- gas butterfly valve<br>- servomotors for oil regulator and gas butterfly valve<br>- servomotor for air dampers<br>- servomotor for combustion head regulation | | | | o | o |
| Potentiometer fitted in servomotor | o | o | o | o | o |
| Gas nozzle | | | • | • | • |
| Pressure gauge for measuring the pressure in gas nozzle | | | o | o | o |
| Gas pressure switch, max. | | | • | • | • |
| Air pressure switch | • | • | • | • | • |
| Ignition transformer | • | • | • | • | • |
| Ignition cables and electrodes | • | • | • | • | • |
| Flame sensor | • | • | • | • | • |
| Air dampers | • | • | • | • | • |
| Pressure gauge for fan pressure | o | o | o | o | o |
| Elbow 90° | | | • | • | • |
| Double solenoid valve for gas incl.:<br>- gas pressure switch, min.<br>- 2 gas valves<br>- automatic valve leak tester<br>- ball valve, blow-off (loose) | | | • | • | • |
| Solenoid valve for ignition gas | | | • | • | • |
| Solenoid valves for ignition gas (LPG) | o | • | | | • |
| Solenoid valves for light fuel oil ignition | • | | | • | |
| Manual | • | • | • | • | • |

# Gas elbow

| | GAS ELBOW DIMENSIONS WITH DIFFERENT VALVES | | | | | |
|---|---|---|---|---|---|---|
| | | NPT2 | NPT 2½ | NPT3 | NPT4 | NPT5 |
| | H | L | L | L | L | L |
| GP/GKP/GRP-400/600 ME | 21.1 | 25.0 | 27.2 | 28.0 | 29.5 | - |
| GP/GKP/GRP-800 ME | 26.1 | - | 31.7 | 28.7 | 30.4 | 32.5 |
| GP/GKP/GRP-1000…1200 ME | 24.4 | - | 31.7 | 28.7 | 30.4 | 32.5 |
| GP/GKP/GRP-1600...2000 ME | 27.6 | - | - | - | 30.4 | 32.5 |
| GP/GKP/GRP-2500 ME | 29.1 | - | - | - | - | 32.5 |




Other dimensions available on special request

# Gas valve selection table

**Natural gas 35,6 MJ/m³ (956 MBtu/scf)**

| BURNER | GAS VALVE SIZE INCHES | TYPE | BURNER MAX. CAPACITY MBtu/h*) GAS INLET PRESSURE mbar (psi) | | | |
|---|---|---|---|---|---|---|
| | | | 100(1.45) | 150(2.18) | 200(2.90) | 250(3.60) |
| **GP/GKP/GRP-400 ME** | 2" | VGD40.050 | 14700 | 17100 | 17100 | 17100 |
| | 2 ½" | VGD40.065 | 17100 | 17100 | 17100 | 17100 |
| **GP/GKP/GRP-600 ME** | 2" | VGD40.050 | 14700 | 18100 | 23200 | 23200 |
| | 2 ½" | VGD40.065 | 23200 | 23200 | 23200 | 23200 |
| | 3" | VGD40.080 | 23200 | 23200 | 23200 | 23200 |
| **GP/GKP/GRP-800 ME** | 2 ½" | VGD40.065 | 24200 | 27000 | 32400 | 32400 |
| | 3" | VGD40.080 | 25700 | 31700 | 32400 | 32400 |
| **GP/GKP/GRP-1000 ME** | 2 ½" | VGD40.065 | 24200 | 27000 | 34100 | 41000 |
| | 3" | VGD40.080 | 27600 | 34500 | 41000 | 41000 |
| | 4" | VGD40.0100 | 36900 | 41000 | 41000 | 41000 |
| **GP/GKP/GRP-1200 ME** | 3" | VGD40.080 | 27600 | 34500 | 47800 | 47800 |
| | 4" | VGD40.0100 | 36900 | 45700 | 47800 | 47800 |
| | 6" | VGD40.0125 | 41000 | 47800 | 47800 | 47800 |
| **GP/GKP/GRP-1600 ME** | 4" | VGD40.0100 | 38900 | 46100 | 56300 | 56300 |
| | 6" | VGD40.0125 | 43700 | 56300 | 56300 | 56300 |
| **GP/GKP/GRP-2000 ME** | 4" | VGD40.0100 | 39600 | 47800 | 64800 | 76800 |
| | 6" | VGD40.0125 | 44400 | 56300 | 75100 | 76800 |
| **GP/GKP/GRP-2500 ME** | 6" | VGD40.0125 | 49800 | 62500 | 75100 | 81900 |

**NOTE!** The max. capacities shown in the table are achieved when the boiler back pressure is 0.
Natural gas: 1 ft³/h ≈ 0,971 MBtu/h
*) or corresponding type

# Combustion air fan

The burner series ME requires a separate combustion air fan.

Scope of the fan delivery:
- electric motor
- platform
- flexible connector, pressurised side
- 2 connector flanges
- vibration dampers
- surface finish
- suction noise silencer (optional)
- silencer for the entire fan (optional)
- PT-100 temperature sensors for the motor phases (optional)

## Required combustion air flow

Diagrams 1 and 2 indicate the required combustion air flow for each kilogram of oil or cubic meter of natural gas. For detailed calculation instructions, see page 2.

Diagram 1

Required combustion air flow, ft³n/2.2 lb of oil

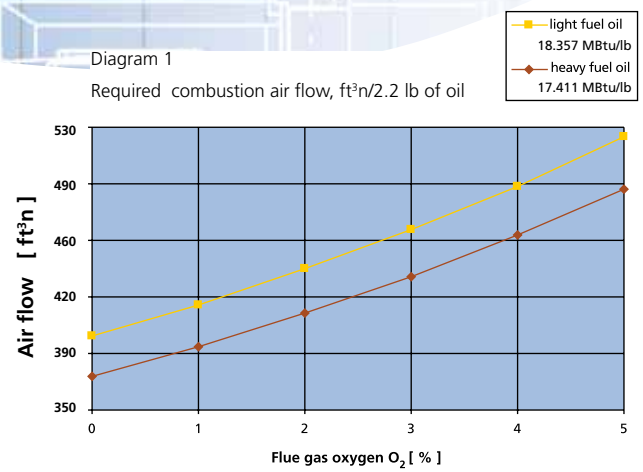
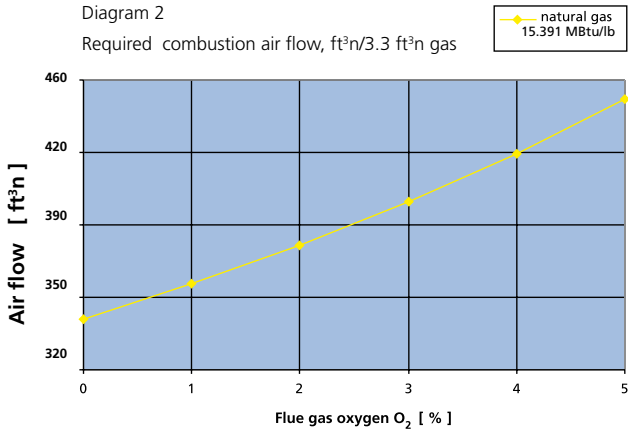


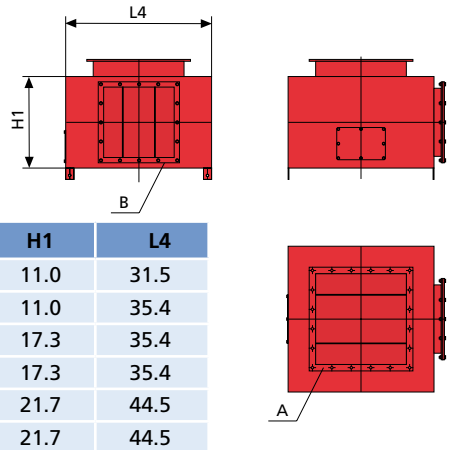

Diagram 2

Required combustion air flow, ft³n/3.3 ft³n gas




# Air distribution box for the ME series burners

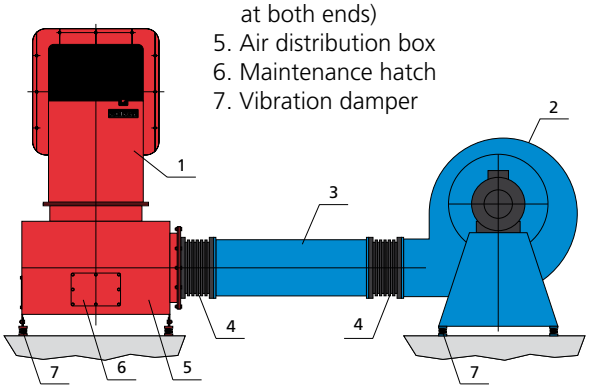
The air duct to be connected with the burner should run directly from below the burner, and it should be straight for a distance of no less than 4.9 foot before the burner. If the duct cannot be installed as instructed above, an air distribution box should be used.




| BURNER | H1 | L4 |
|---|---|---|
| 400/600 | 11.0 | 31.5 |
| 800 | 11.0 | 35.4 |
| 1000 | 17.3 | 35.4 |
| 1200 | 17.3 | 35.4 |
| 1600 | 21.7 | 44.5 |
| 2000 | 21.7 | 44.5 |
| 2500 | 25.6 | 44.5 |

*The dimensions H1 and L4 are recommended minimum values.*

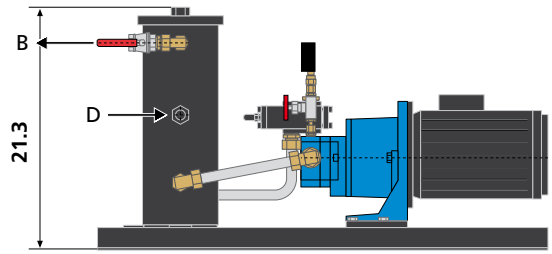
1. Burner
2. Fan
3. Air duct
4. Bellows (not necessary at both ends)
5. Air distribution box
6. Maintenance hatch
7. Vibration damper

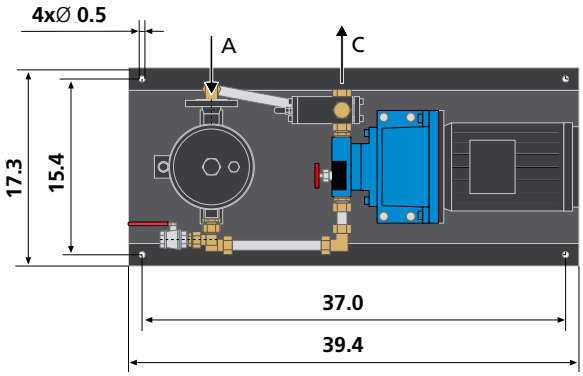


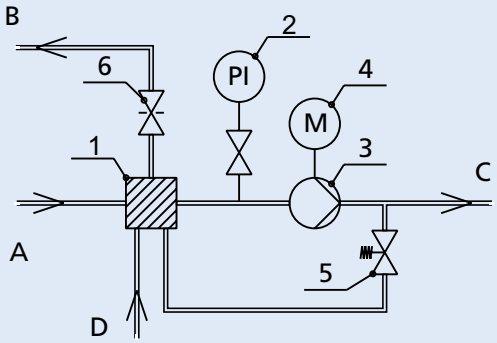

*A. To be dimensioned according to the air duct of the burner.*
*B. To be dimensioned as ordered.*

# Booster unit PKYK 1...5 for light fuel oil

The booster unit lends itself for pumping light fuel oil with viscosity of 0.006 - 0.019 in²/s, +68 °F. The oil coming to the booster unit must be filtered, max. filtration degree = 400 µm.




1. Oil filter
2. Pressure gauge
3. Oil pump
4. Electric motor
5. Pressure regulating valve
6. Drilled ball valve

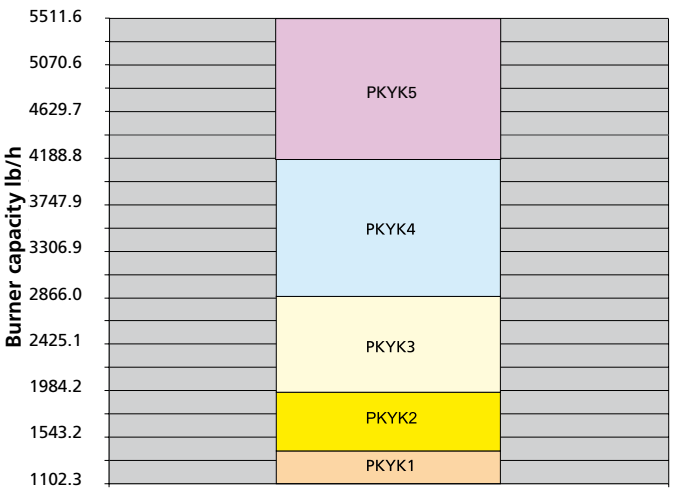
A. Inlet to the booster unit NPT 1, 400 - 2000 "WC 4...12 cSt
B. Return from the booster unit R 1/2"
C. Inlet to the burner Ø 1"
D. Return from the burner Ø 1"

| Booster unit | Motor 400 V/50 Hz hp | r/min | Oil pump Type | Pump output 0.019 in²/s 363 psi lb/h |
|---|---|---|---|---|
| PKYK 1 | 7.2 | 3000 | T3 C | 3130.6 |
| PKYK 2 | 7.2 | 3000 | T4 C | 4365.2 |
| PKYK 3 | 7.2 | 3000 | T5 C | 6393.4 |
| PKYK 4 | 9.9 | 3000 | AFI40R46 | 9325.6 |
| PKYK 5 | 9.9 | 3000 | AFI40R54 | 12125.4 |

The output has been calculated using a density of 174,1 lb/ft² for the light fuel oil.

**Diagram 3**

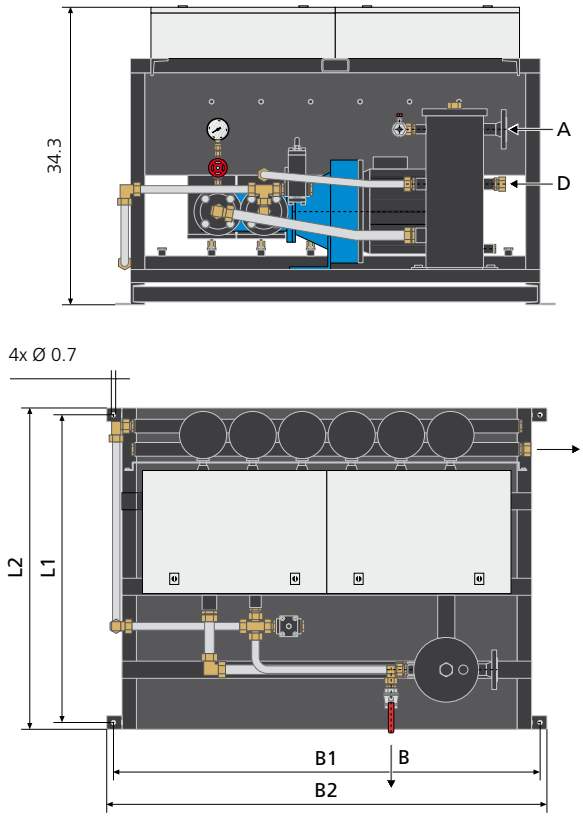
**Selection of the booster unit for light fuel oil**



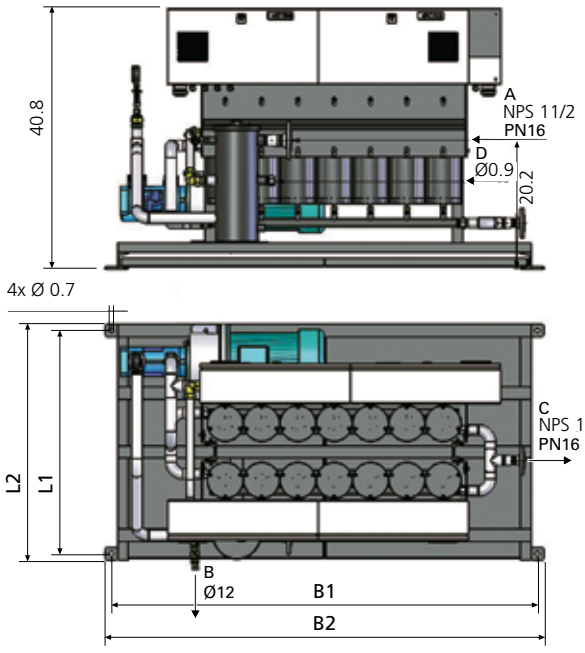

*PKYK booster units may be selected using the diagram 3.*

# Booster unit PKYR 1...8 for heavy fuel oil

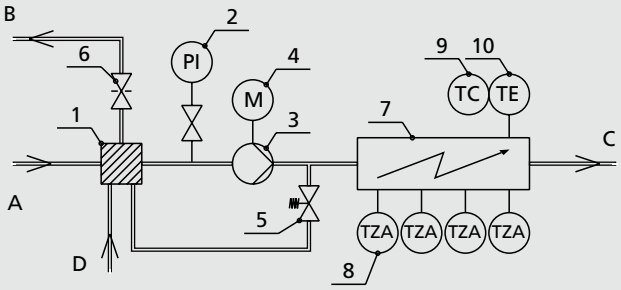
The booster unit lends itself for pumping and heating heavy fuel oil with a maximum viscosity of 1.007 in²/s, +122 °F. The oil coming to the booster unit must be filtered, max. filtration degree = 400 µm.




*PKYR 1...6*




*PKYR 7...8*

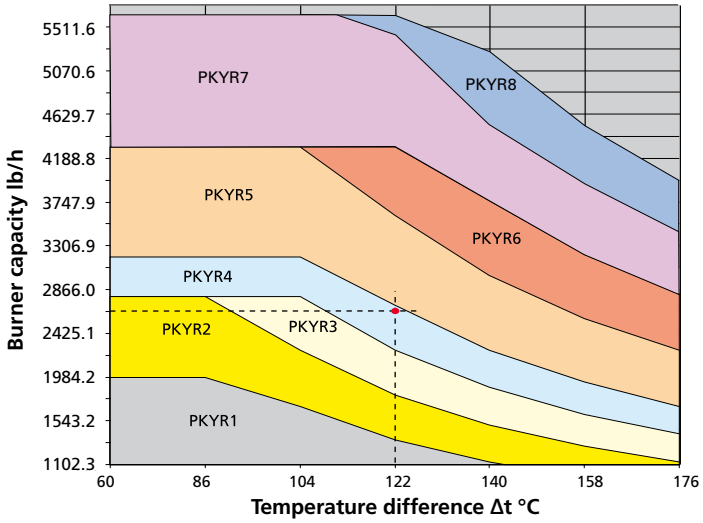



1. Oil filter
2. Pressure gauge
3. Oil pump
4. Electric motor
5. Pressure regulating valve
6. Drilled ball valve
7. Preheater
8. Limit thermostat
9. Temperature regulator and lower limit thermostat
10. Temperature sensor

A. Inlet to the booster unit NPT 1, 1204 - 2007 "WC 0.006 - 0.109 in²/s
B. Return from the booster unit R 1/2"
C. Inlet to the burner Ø 22
D. Return from the burner Ø 22

**Diagram 4**

**Selection of the booster unit for heavy fuel oil**




| Booster unit | L1 | L2 | B1 | B2 |
|---|---|---|---|---|
| PKYR 1 | 33.0 | 34.6 | 32.1 | 33.7 |
| PKYR 2 | 33.0 | 34.6 | 32.1 | 33.7 |
| PKYR 3 | 33.0 | 34.6 | 32.1 | 33.7 |
| PKYR 4 | 34.6 | 32.1 | 49.2 | 50.8 |
| PKYR 5 | 32.1 | 33.7 | 49.2 | 50.8 |
| PKYR 6 | 33.7 | 37.0 | 60.6 | 62.2 |
| PKYR 7 | 35.4 | 37.0 | 66.9 | 68.9 |
| PKYR 8 | 35.4 | 37.0 | 66.9 | 68.9 |

# Booster unit PKYR 1...8 for heavy fuel oil

| Booster unit | Heat exchanger 400 V/50 Hz hp | Motor 400 V/50 Hz hp | r/min | Oil pump Type | Pump output 0.019 in²/s 10046 "WC lb/h |
|---|---|---|---|---|---|
| PKYR 1 | 24.1 | 4 | 3000 | AFI20R46 | 4475.4 |
| PKYR 2 | 32.2 | 5.4 | 3000 | AFI20R56 | 6349.3 |
| PKYR 3 | 40.2 | 5.4 | 3000 | AFI20R56 | 6349.3 |
| PKYR 4 | 48.3 | 7.4 | 3000 | AFI40R38 | 7231.2 |
| PKYR 5 | 64.4 | 7.4 | 3000 | AFI40R46 | 9766.5 |
| PKYR 6 | 80.5 | 7.4 | 3000 | AFI40R46 | 9766.5 |
| PKYR 7 | 96.6 | 10 | 3000 | AFI40R54 | 12125.4 |
| PKYR 8 | 112.6 | 10 | 3000 | AFI40R54 | 12125.4 |

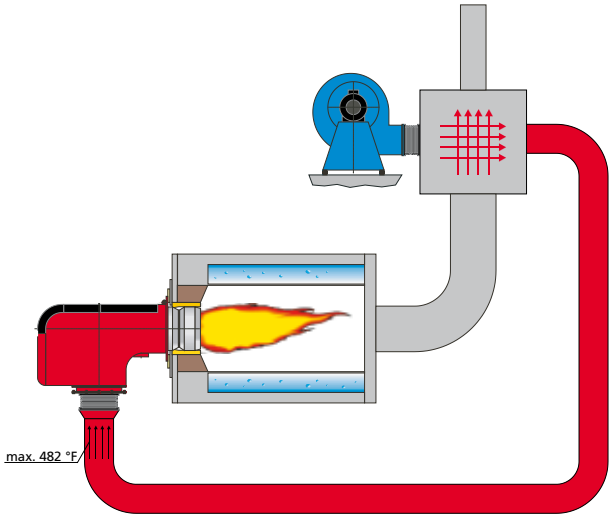
The output has been calculated using a density of 200,7 lb/ft² for the heavy fuel oil.

*PKYR booster units may be selected using the diagram 4.*

### Scope of delivery

Booster units include following equipment: • standard delivery o optional

| | PKYK | PKYR |
|---|---|---|
| Oil filter | • | • |
| Pressure gauge | • | • |
| Oil pump | • | • |
| Electric motor | • | • |
| Pressure regulating valve | • | • |
| Drilled ball valve | • | • |
| Preheater | | • |
| Limiter thermostats | | • |
| Temperature regulator and lower limit thermostat | | • |
| Temperature sensor | | • |
| Trace heating of the piping | | o |
| Pressure gauge for monitoring oil inlet pressure | o | o |
| Pressure switch | o | o |
| Operating and maintenance manual | • | • |




*Schematic drawing of the principle of a plant using preheated combustion air.*



# Burners for preheated combustion air

By using preheated combustion air, the overall efficiency rate of the plant improves remarkably.

Preheated combustion air can be used up to the temperature of +480 °F in ME series burners (optional). When a burner is built to use preheated combustion air, its electric and mechanical parts are to be protected from heat. The burners may use combustion air of up to +120 °F without modification.

**Diagram 5**

**Maximum capacities of the burners as a function of combustion air temperature**

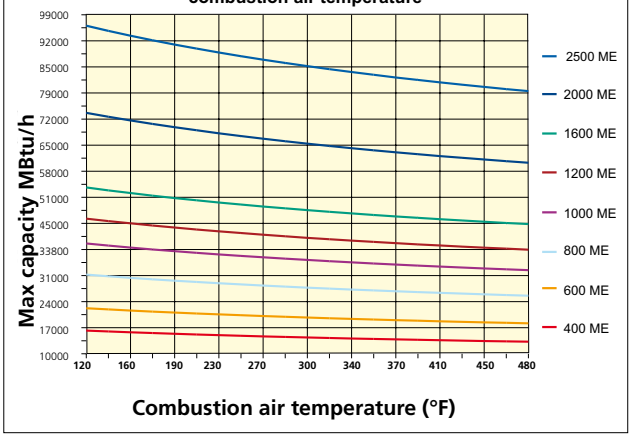
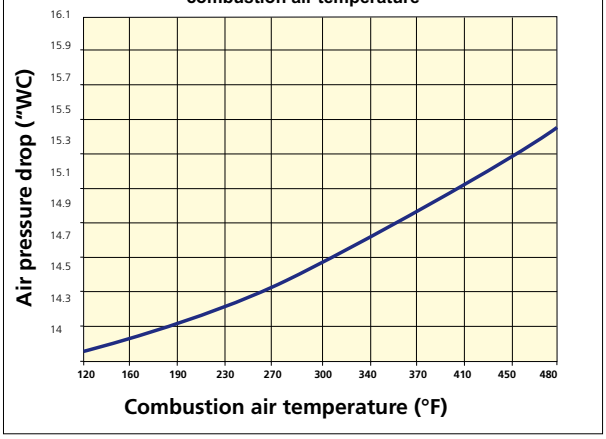
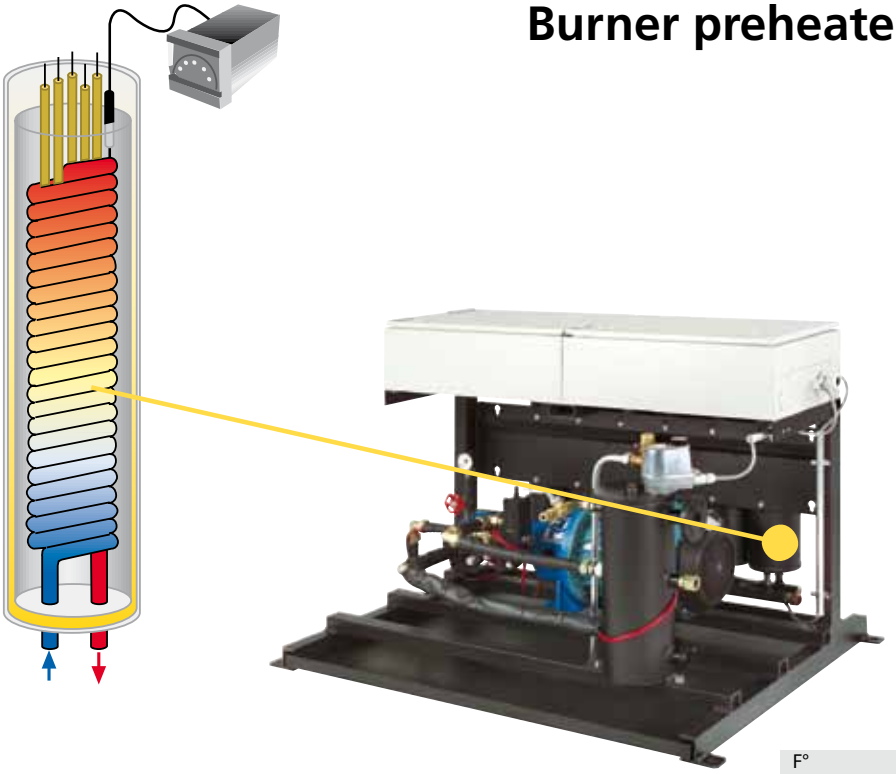



**Diagram 6**

**Air pressure drop of ME burners depending on combustion air temperature**



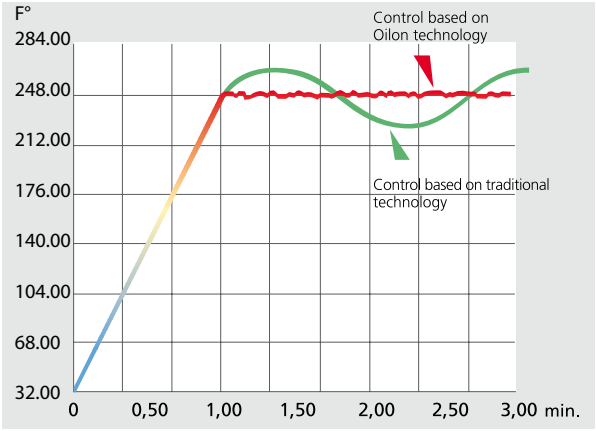
# Burner preheater



## Accurate temperature control guarantees good combustion

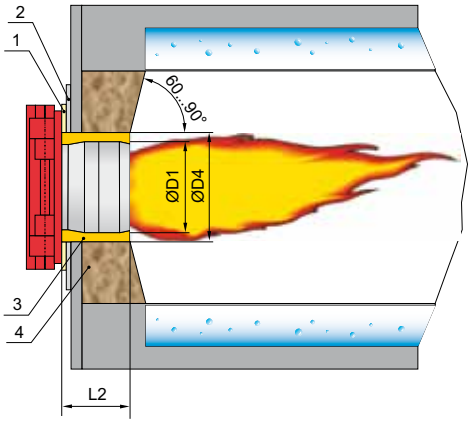
In burning heavy fuel oil, the right atomising viscosity of the oil is essential for good combustion and low combustion gas emissions. A prerequisite for stable atomising viscosity is that the oil temperature stays stable throughout the firing rate.

Oilon ML mass preheater keeps the oil temperature stable even if the incoming temperature fluctuates. On account of the construction and the electronic regulator, the temperature of the oil flowing to the nozzle remains stable. The burner may, depending on the capacity and model, have one or more 8 hp heaters equipped with a safety device to guard against overheating. The electronic regulator has an integrated minimum temperature limiter as well; this prevents the burner from starting if the oil is too cold.



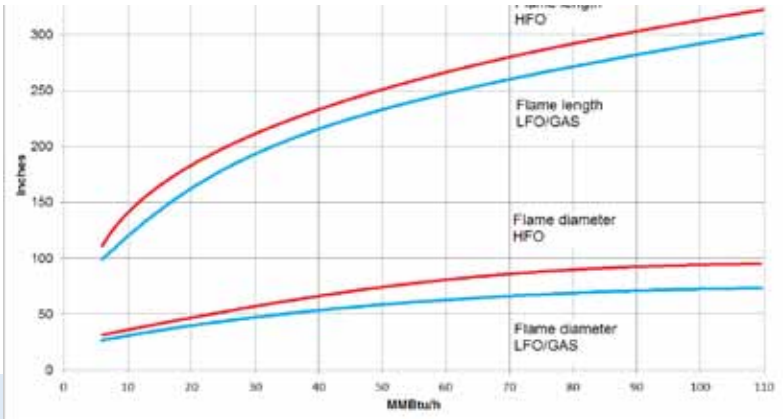



# Masonry figure




| | |
|---|---|
| ***1*** | *Gasket* |
| ***2*** | *Mounting panel* |
| ***3*** | *Ceramic wool or equivalent* |
| ***4*** | *Masonry* |
| ***Ø D1, Ø D4, L2*** | *See burner dimension diagram* |

# Flame dimensions




*Lower diagrams for light fuel oil and gas, upper diagrams for heavy fuel oil.*

## WiseDrive (WD), an electronic regulator for controlling the fuel/air ratio – an energy-efficient and environmentally friendly solution

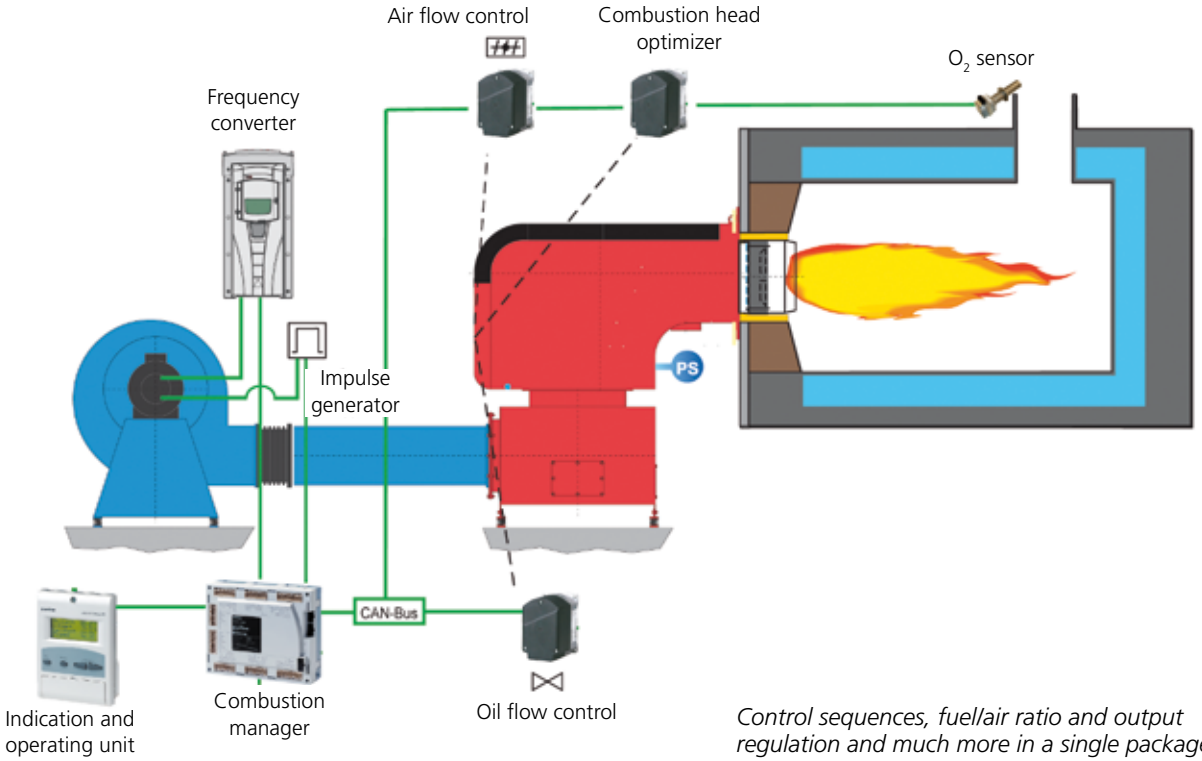
Electronic fuel/air ratio control of the burner (optional) brings the benefits of lower flue gas emissions, decreased consumption of energy and improved technical characteristics of the burner, such as more accurate regulation.

**Examples of the WiseDrive's functions:**

- Control sequences of the burner, conventional control unit deleted
- Fuel/air ratio control with dedicated servo motors, which can be set accurately for each control device
- Output regulator (PID) as standard, output regulation also by an external 4...20 mA signal
- When combusting gas, leak testing of the main gas valves carried out by the WiseDrive
- $O_2$ and fan motor RPM regulation according to the output
- Reading of the consumption signals from fuel gauges
- Can be connected with external plant automation via a ModBuss
- 4 operating levels
- Input of parameters via a character display panel and an operating panel. Also comes with a graphical touch screen at extra cost.



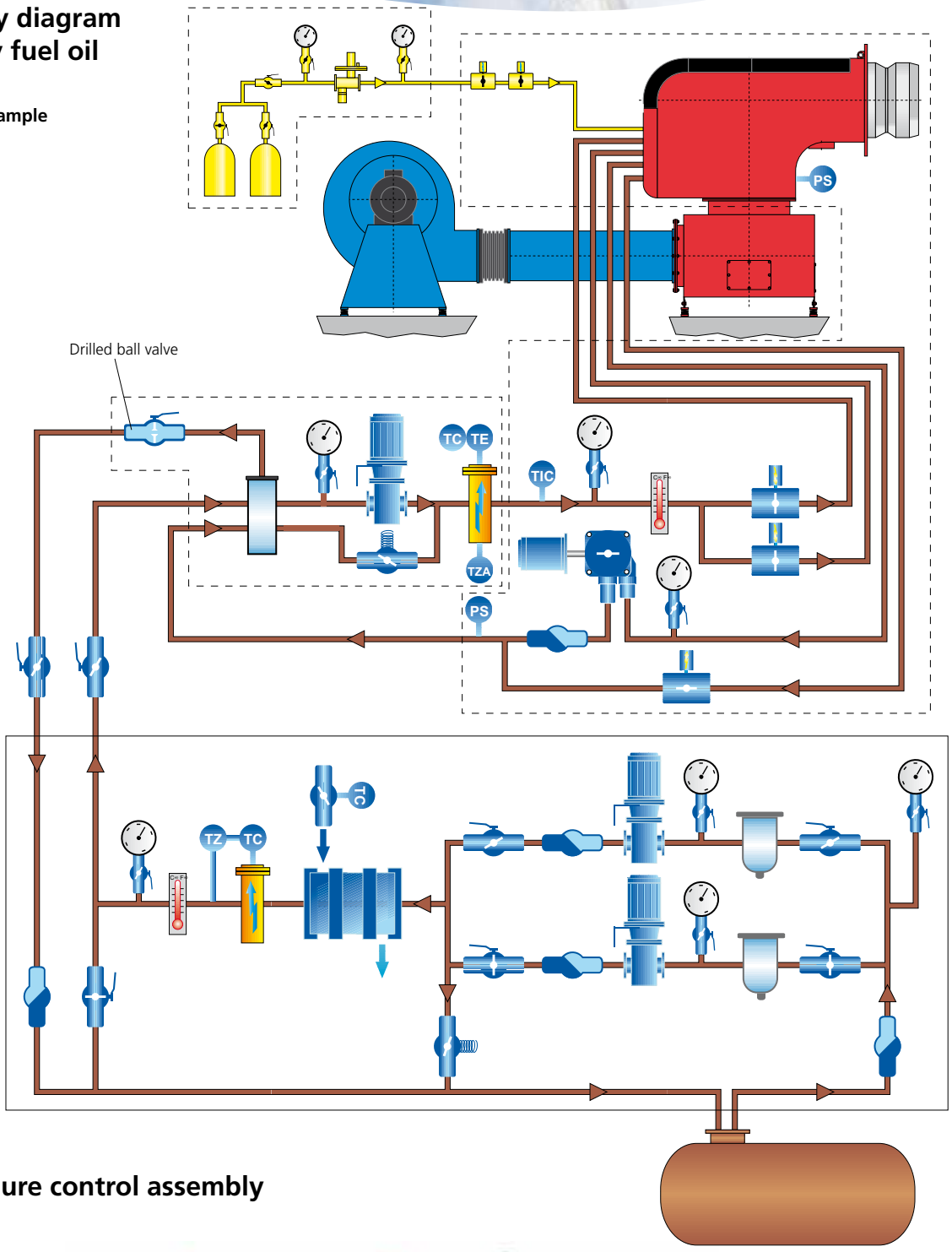
## Example
## WiseDrive 200
## + frequency converter




*Control sequences, fuel/air ratio and output regulation and much more in a single package.*

## Oil supply diagram for heavy fuel oil

**Example**




## Gas pressure control assembly

**Example**

*Oilon invests in product development and research. A modern product development centre meeting all European standards enables us to carry out a wide range of burning tests and accurate oil and gas measurements.*

*We supply burners for ships according to the requirements of classification societies such as ABS, BV, CCS, DNV, GL, KR, LR, NKK, RINA and RS.*


*Each year, we participate in various trade shows around the world.*

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