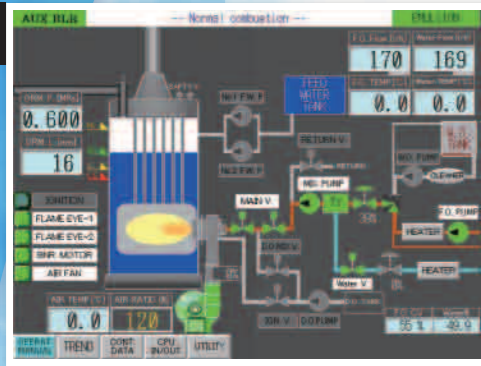


# NEW COMBUSTION CONTROL SYSTEM



SUNFLAME CO., LTD.

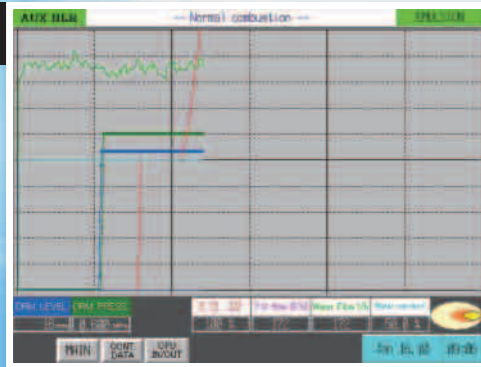
MAIN  
DISPLAY



Automatic control system tends to be more massive in function and more complicated in the system in order to improve safety and easy operation. We consider it as the key words that how easily we can handle this modern system.

We have developed graphical touch panel for burner control in order to meet needs of the age. New functions help ship crews supporting maintenance operation, running adjustment, early detection of trouble and decrease of trouble made by wrong operation and bad adjustment and also it enables improvement of the burner system control and burner combustion itself for easier operation. (Standard specification for SDR-350~SDR-1500 Option for other burner type)

TREND  
DISPLAY



## Operating Support

- Duplex control system by PLC & hard-wired relay
- Graphical Indication and Touch Panel Operation
- Running Indicator Lamps with LED
- Visualization of Abnormal Condition by Trend Indication
- Instruction Manual in Graphic Panel
- Option : Control for Water Hunting Prevention Based on Foreseeing Steam Consumption

## Maintenance Support

- Maintenance Instruction by Running Time
- Logging Function(Running Status/Alarm etc.)
- Reset Function to Initial setting
- Option : Automatic Adjusting Function (Oil Flow • Air/Fuel Ratio)

## SUNFLAME SERVICE STATION

Japan, China, Singapore, India, Greece, Croatia, Germany, Denmark, Sweden, Netherlands, U.S.A.

## ANOTHER PRODUCT

Marine Incinerator

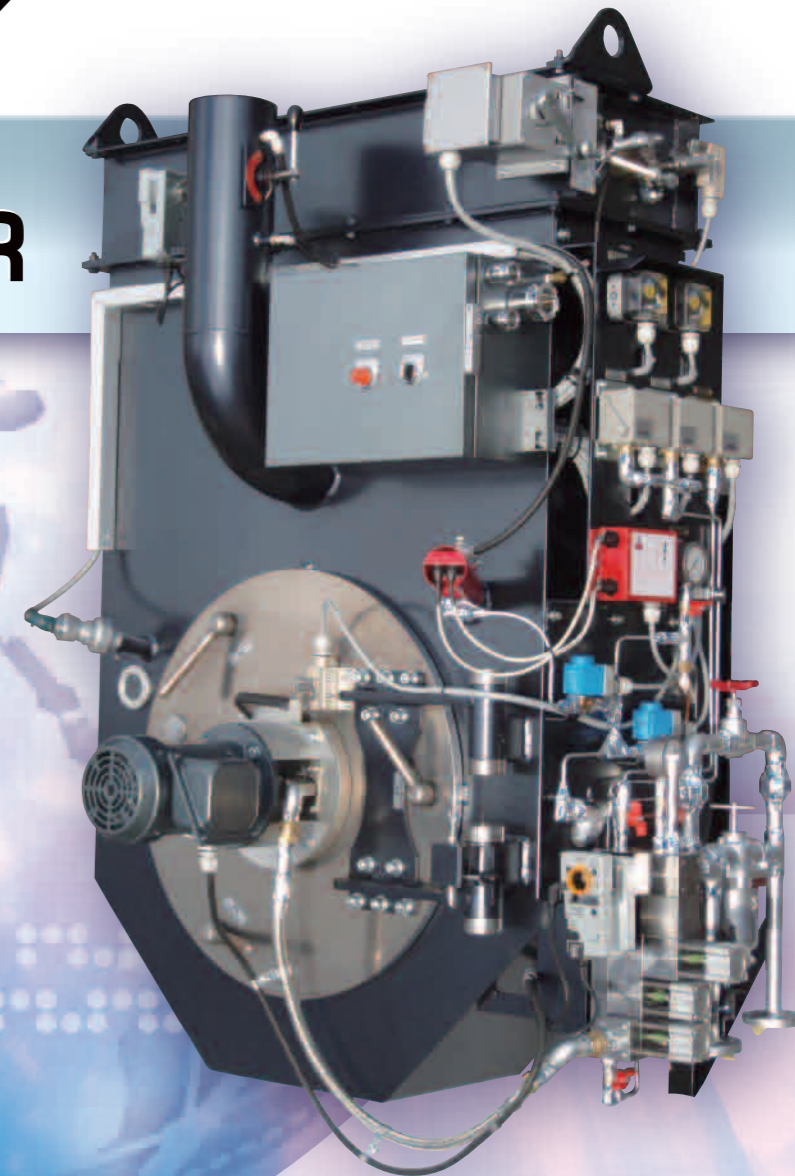
## HISTORY OF SUNFLAME

- 1968 ● Established "Osaka-Sunflame KK" for burner service company
- 1969 ● Start producing oil fired burners
- 1972 ● Production of waste oil incinerator
- 1980 ● Development of 2nd generation rotary cup burner Model "SSR" and "R" type
- 1982 ● New company name Sunflame Co., Ltd
- 1998 ● Development of new incinerator complying IMO Annex VI Reg. 16
- 2001 ● Development of 3rd generation rotary cup burner, Model "SDR" type
- 2005 ● Obtained ISO-9001:2000 certificate by NK  
Moved to new (present) factory/office in Kyoto
- 2006 ● Development of new combustion system for VLCC
- 2008 ● Development of new products  
•Direct driven 3rd generation rotary cup burner for middle range and large range  
•New combustion control system
- 2009 ● Development of emulsion combustion system



Marine Incinerator with Rotary Cup Burner

# ROTARY CUP BURNER



SUNFLAME CO., LTD.

1-30, NISHINOHATA, OKUBO-CHO, UJI, KYOTO 611-0033, JAPAN  
TEL : +81-774-41-3310 FAX : +81-774-41-3311  
E-mail : info@sunflame.net

<http://www.sunflame.net>

# SUNFLAME

# Why is "Sunflame rotary cup burner" required now and in the future ?

[What is demanded now ? What will be demanded in the future?]

These are what we have been focusing on since the beginning of our business and are our attitude toward production that does not change in the past, now and in the future.

Since our establishment of the company, we believe that Sunflame rotary cup burner, one of our highly recommended products, is the best choice for Aux. boiler in marine industry which consumes high viscosity fuel in terms of safety, efficiency and "combustion component needed in the future" which is the most suitable in circumstances of all the more severe aspects and safety aspect as well.

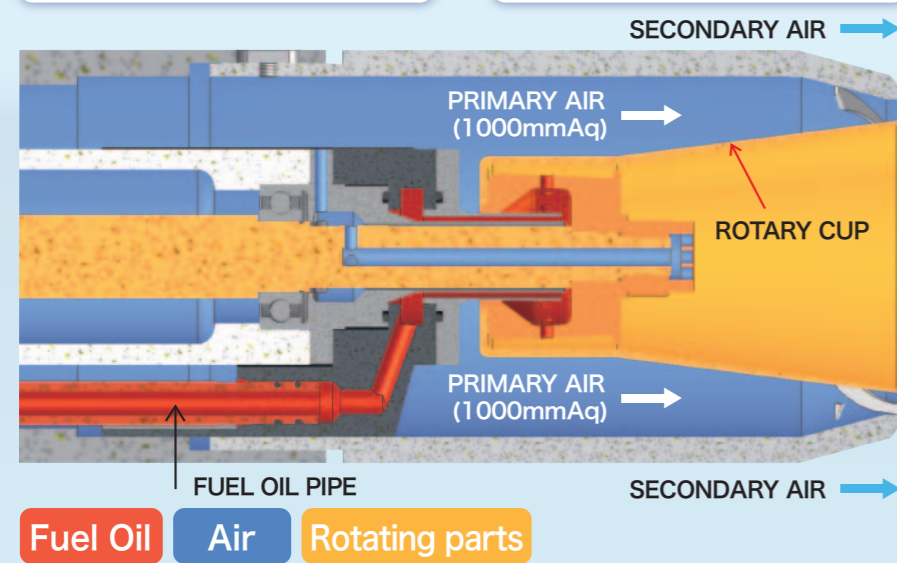
## What is rotary cup burner?

Fuel oil is guided to inside of the cup spinning in high speed, formed thin film by centrifugal power, hit by high air pressure for atomization. It is the mechanism of rotary cup burner.

The pressure jet burner atomizes fuel oil by high oil pressure through very small hole of nozzle tip. Comparing to it, the rotary cup burner does not need to have this small hole due to above mechanism, and can accept wide viscosity range of fuel. There is no concern of fuel oil stuck during heavy fuel oil burning and the rotary cup burner can obtain stable combustion for long period. Additionally one of big advantage is easy handling at start of burner in cold condition and while continuous running, in a range from small boiler to large boiler. Because it does not require any special procedures nor maintenance due to no assisting steam for combustion. Another advantage is to dispose waste oil which generates onboard.

Wider range of viscosity can be accepted for the fuel oil applying to the rotary cup burner. Recently we have to switch two fuel oils which have totally different characteristics: one is low-sulphur low-viscosity good-quality fuel oil used in emission control harbor areas and the other is high-viscosity heavy fuel oil used in other area. Because wider range of viscosity can be accepted in the fuel oil applying to the rotary cup burner and as it does not require oil pressure for atomization, the complicated adjustment or maintenance jobs are not required when you switchover the fuels. It would require only minimum adjustment and can be handled easily.

<b>CLOGGING BY SLUDGE</b> NO NOZZLE TIP, LESS CLOGGING	<b>OIL SPLASH</b> SAFE OPERATION DUE TO LOW OIL PRESSURE
<b>VISCOSITY</b> HANDLING WIDE RANGE OF FUEL FROM HFO TO MGO	<b>MAINTENANCE</b> EASY MAINTENANCE BY HINGE OPENING



## 3rd generation rotary cup burner

Some concerns that rotary cup burner requires much maintenance due to many components and also it seems difficult to adjust oil/air ratio in case unbalanced, although it is obvious that rotary cup burner is safe and high performance.

Sunflame rotary cup burner overcomes these anxieties by the results of continuous development such as simplified structure and new original control system which brings out maximum performance. The number of delivery of Sunflame rotary cup burner is increasing rapidly and we have received reputation of high reliability and the best burner for easy operation to high performance since development of 3rd generation rotary cup burner.

1st Generation	2nd Generation	3rd Generation
Belt drive system Primary fan is installed in the rotation shaft	Belt drive system Primary fan is installed separately	Motor direct drive system Primary fan is installed separately
High speed spinning & atomization air pressure are unstable.	Better for high speed spinning & Atomization air pressure.	Improved reliability & maintenance-ability. Revolution control is possible by reduction of torque on the rotation shaft.



# MGO The most suitable burner to burn "MGO"

We are entering into a new environmental protection requirement to burn low sulphur content fuel oil at certain restricted areas. It is MGO, extremely low viscosity oil and the ships shall fire two totally different kinds of fuels switching over with heavy fuel oil of high viscosity oil.

Sunflame rotary cup burner, capable to accept quite wide range of viscosity oils, does not need special counter-measures such as complicated operational procedures nor replacement of parts/components when switches over and burns these two different fuels safely.

In case you take Sunflame rotary cup burner now and you intend to fire MGO in the future, you do not require any special changes, and can still use the system as is. Hence it is simple, safe, eventually lower cost and the most suitable burner to meet and satisfy present environmental requirement.

### Easily switching over the fuels?

Sunflame rotary cup burner can manage this, same way as conventional use of diesel oil& heavy oil. It does not require replacing nozzle for different viscosity fuel, no need to use special pumps, nor necessary managing delicate adjustment of atomizing oil pressure to keep same capacity, different from the cases of other type of burners such as pressure atomizing burner and steam atomizing burner.

Rotary cup burner can accept wider range of oil viscosity, and can burn HFO at rather lower temperature than other type of burners. It results comparatively safer operation at changing fuels.

### Needs to change system to comply with MGO firing?

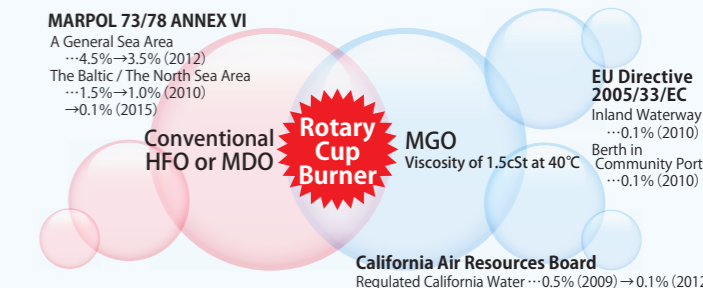
- One of the advantages of the rotary cup burner has been able to accept wider span of viscosity for firing and even for much lower viscosity oil use, it can accept without special conversion of parts/components.
- Fuel oil pump can handle oil at low pressure (0.15 ~0.5MPa) and can manage handling MGO/MDO and HFO by same pump.
- Rotary cup burner does not require steam for atomization and no need to redesign fuel oil supply line and high temp. steam supply line, nor apply special MGO compliance parts.

### Note :

Some cases of Sunflame rotary cup burners running now are using European screw pumps, which can accept MGO but in case viscosity goes down to below 4cSt, they recommend to replace core parts only for MGO.

### Can burn fuels safely?

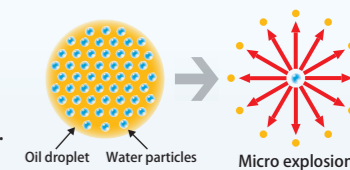
- No special extra procedures and counter-measures are required, hence crew can handle the burner, same way as usual meaning less chance to trigger mistakes.
- Not like pressure atomizing burner of which system requires high oil pressure (1.5~2.0MPa), we give low oil pressure (0.15~0.5MPa) and even if MGO splashes at leakage, it is not fatal.
- When two different quality fuels are mixed, there is a possibility of creating sludge, but as there is no nozzle in rotary cup burner, it is not probable to suffer from flame failure caused by choking of oil passage with sludge.
- Rotary cup burner does not use atomizing steam for MGO, by the way it is not allowed to use steam unless it is designed to do so, hence Sunflame rotary cup burner is safe in operation.



# EMULSION COMBUSTION SYSTEM (OPTION)

Emulsion combustion system as an optional devise, has successfully developed in order to bring out maximum performance of rotary cup burner from high viscosity oil combustion with accurate adjustment of air/fuel ratio. Also this system offers reduction of soaring fuel expenses and of environmental gas emission which will become more severe in the future.

This system, designed compact and used for marine Aux. Boiler, can be installed in the existing system & layout without changing much of F. O. operation arrangement. (Water supply line to be added) Automatic control system with graphical control panel is adopted to make operation / handling simpler. This control panel is a standard arrangement.

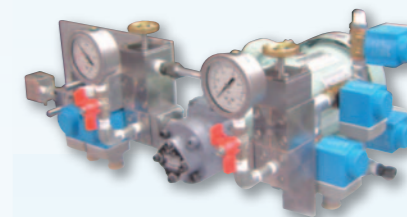
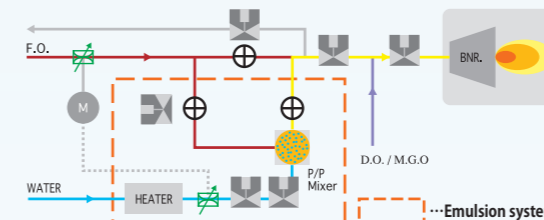


- Creating micro water particles in fuel oil.
- Water particles are evaporated in furnace high temp zone and made micro explosion, resulting better atomization.
- Finer oil particles expose wider surface to O2
- Due to nice atomization, we can reduce excess air very much resulting minimizing cooling affect to the furnace.

**Fuel saving : 7.4 %**

**Environment friendly**  
 CO<sub>2</sub> -7.4%  
 SO<sub>2</sub> -7.4%  
 NO<sub>x</sub> -40%  
 CO -50%

The data from actual record of our delivery. It may vary some at different boiler /working condition.



### Advantage of Sunflame Emulsion fuel burning system

#### No need to use surface active agent

•Not required surface active agent to avoid separation of oil & water, resulting lower running cost operation.

#### No additional expenses

#### No recirculation of emulsion fuel.

•No affects to emulsion fuel by heat, circulation such as viscosity increase and separation of oil/water.  
 •No waste and no circulation of fuel to tank or drain.

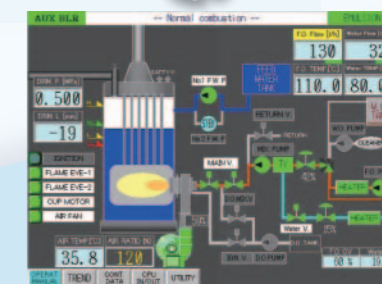
#### No waste of fuel

#### No tank for emulsion fuel storage.

•Mixing fuel/water at burner inlet, no storage tank needed  
 •By stopping water supply, can burn F.O. alone, hence no special piping is required for fuel oil line.

#### No additional tank

Emulsion combustion system is designed, considering maintenance-ability, durability and running cost.



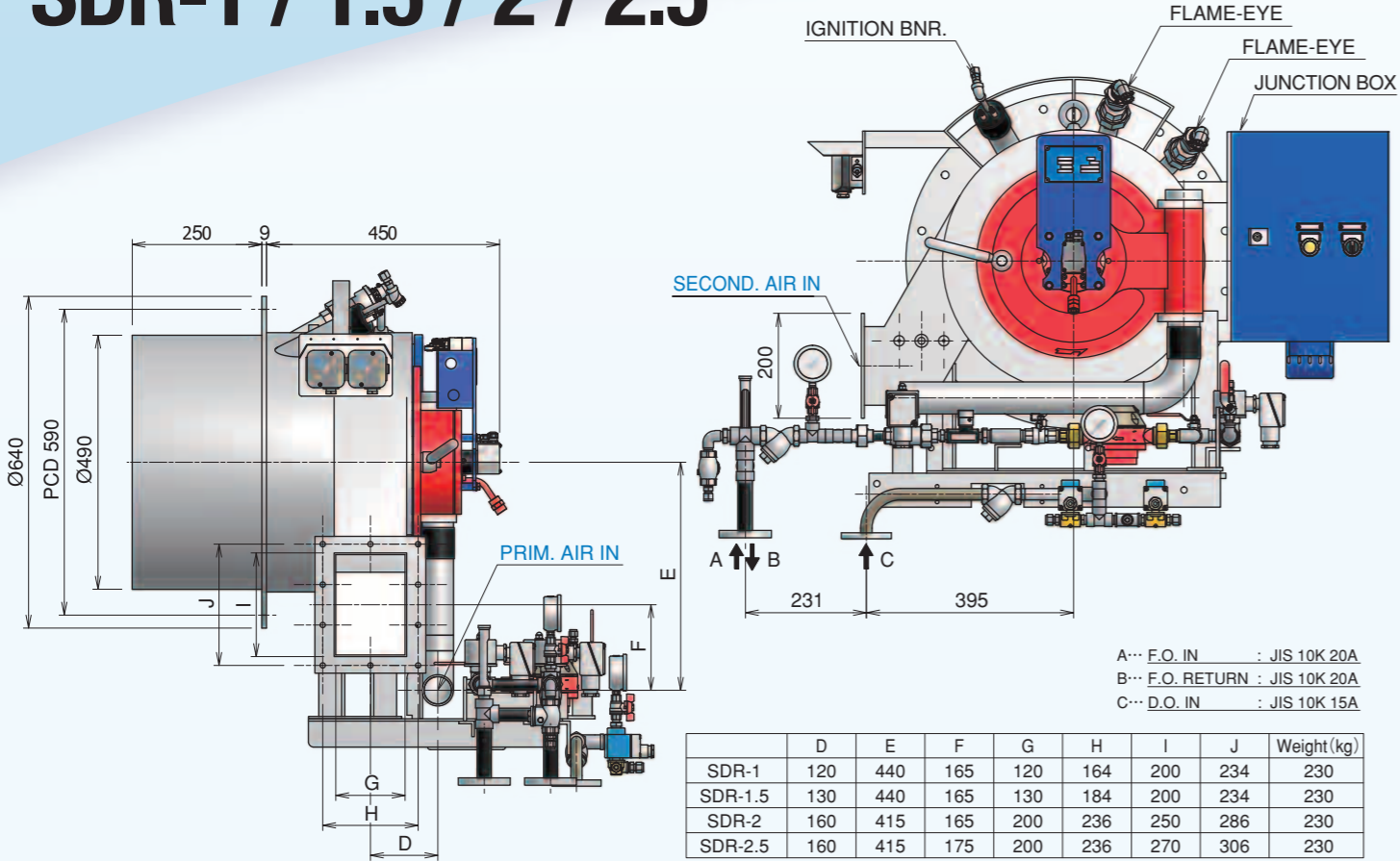
Graphical touch panel for ECS

..... SDR Type Burner      ..... R-Type Burner

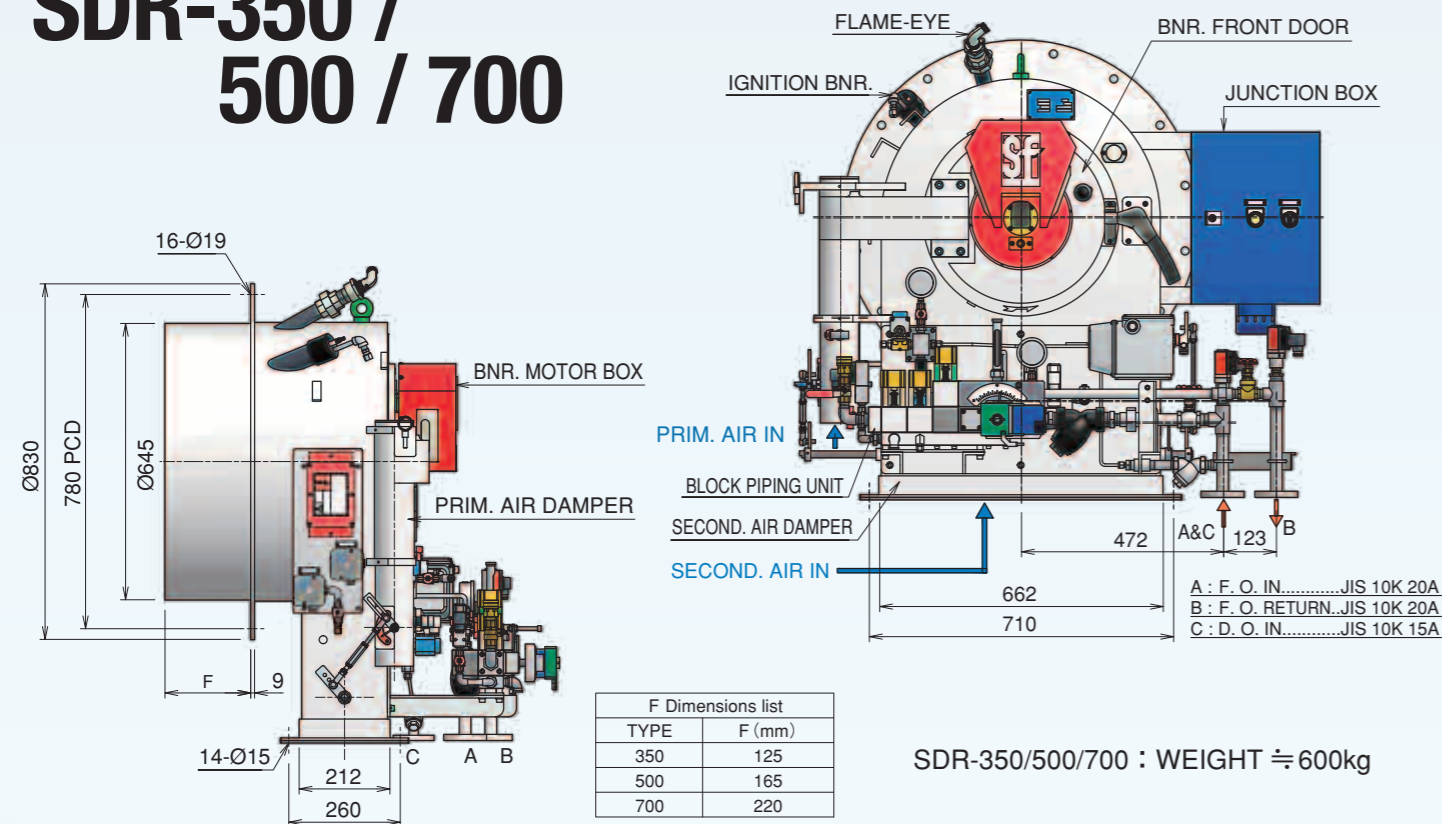
Rotary Cup Burner Type		SDR-1	SDR-1.5	SDR-2	SDR-2.5	SDR-350	SDR-500	SDR-700	SDR-1000	SDR-1500				
									R-9	R-15	R-25	R-40		
Rotary Cup Burner	Capacity kg/hr	45~100	50~150	50~200	50~250	50~350	50~500	70~700	100~1000	150~1500				
	Fuel Oil	Heavy oil Viscosity 700mm <sup>2</sup> /s at 50°C, MGO, MDO and Waste oil												
	Fuel Oil Pressure MPa	0.15					0.3				0.4	0.4~0.5		
	Revolution RPM	6000				3000~8000				3000~8000				
										6000		5000	4500	
	Rotary Cup Drive System	Motor Direct Drive System							Motor Direct Drive System					
									Belt Drive System					
	Automatic Control System	ON/OFF Control		ON/OFF & HIGH/LOW Control			ON/OFF & Proportional Control							
	Ignition System	MGO/MDO Pilot Burner												
Burner Motor	120W (DC24V)				250W (DC48V)				0.75kW×2P					
									1.5kW×2P		3.7kW×2P			
Main Accessories	Wind Box (Secondary Air Damper, Secondary Air Vane, Primary Air Duct, Peep Hole), Air Pressure Switch, Flame Eye, Pilot Burner for Ignition, Oil Control Valve, Control Motor and Linkage, Oil Pressure Gauge, Junction Box, Oil Flow Regulating Valve and Oil Flow Meter (This is standard for above SDR-350)													
Primary Air Blower	Type	Turbo Blower												
	Air Volume Nm/min	1	2.3	4	4	6	8	11	17	24	40	68		
	Air Pressure kPa	9.8						7.8						
	Motor kW×P	Common use with Secondary Air Fan						3.7×2P	3.7×2P	5.5×2P	7.5×2P	11×2P	18.5×2P	
Secondary Air Fan	Type	Turbo Fan and Blower (Primary & Secondary Air Fan motors are in Common use)						Turbo Fan						
	Air Volume Nm/min	24	34	50	60	85	120	160	185~220	260~355	400~645	645~970		
	Air Pressure kPa	1.96	2.45			3.43	2.94	2.45~3.43	2.94~3.92	3.14~4.9	4.4~6.0	5.4~7.4		
	Motor kW×P	3.7×2P	5.5×2P	7.5×2P	7.5×2P	15×2P	15×2P	15×2P~18.5×2P	22×2P~30×2P	30×2P~55×4P	55×4P~110×4P	110×4P~175×4P		
Diesel Oil Pump for Ignition Burner	Type	Trochoid Gear Pump (MDO, MGO)												
	Type No	GFH-V3L						GFH-V5L						
	Capacity kg/hr	100						170						
	Pressure MPa	0.7												
	Revolution RPM	3600												
	Motor kW×P	0.4×2P												
Heavy Oil Pump	Type	Trochoid Gear Pump (HFO, MDO, MGO)												
	Type No	TOP-210-OS				TOP-216-OS			FTP-N320H		FTP-N340H		FTP-N350H	
	Capacity kg/hr	600				1000			1400		2300		4500	6000
	Pressure MPa	0.5				0.5			0.5		0.6		0.6	
	Revolution RPM	1200				1200			1800		1800		1800	
	Motor kW×P	0.4×6P				0.75×6P			0.75×4P		2.2×4P		3.7×4P	
Heavy Oil Heater	Type	Electric Heater					Steam Heater							
	Specification	Sheath Heater					Steam Coil							
	Heating Capacity	Inlet Temperature 60 deg C-Outlet Temperature 130 deg C (70 deg C up) Heating capacity may be changed by oil specification												
	Electric Capacity kWh	3~12												
	Steam usage kg/hr						abt 26~250							
	Steam Pressure	Saturated Steam												
For Waste Oil Combustion Type (Option)	Combustion System	2 modes : FO & WO					3 modes : FO, WO & FO/WO mixing							
	Main Accessories	Pump, Electric Auto Cleaner, Press. Cont. Valve, FO/WO Change Over 3way Valve (SDR-1~2.5)、Oil Flow Meter (SDR-350~1500)、Oil Regulating Valve (SDR-350~1500、R-9~40)												
	Pump Type	Trochoidal Gear Pump TOP-210-OS Type 600kg/h × 0.5MPa 0.4kW×6P									TOP-216-OS Type 1000kg/h × 0.75MPa 0.75kW×6P			
Remarks	1. Standard Unit is One(1) Set. Due to ship class or capacity requirement, FO pump and FO Heater can be provided as extra unit. 2. Type of Rotary Cup Burner may be changed by necessary combustion capacity, furnace pressure and fuel oil specification.													



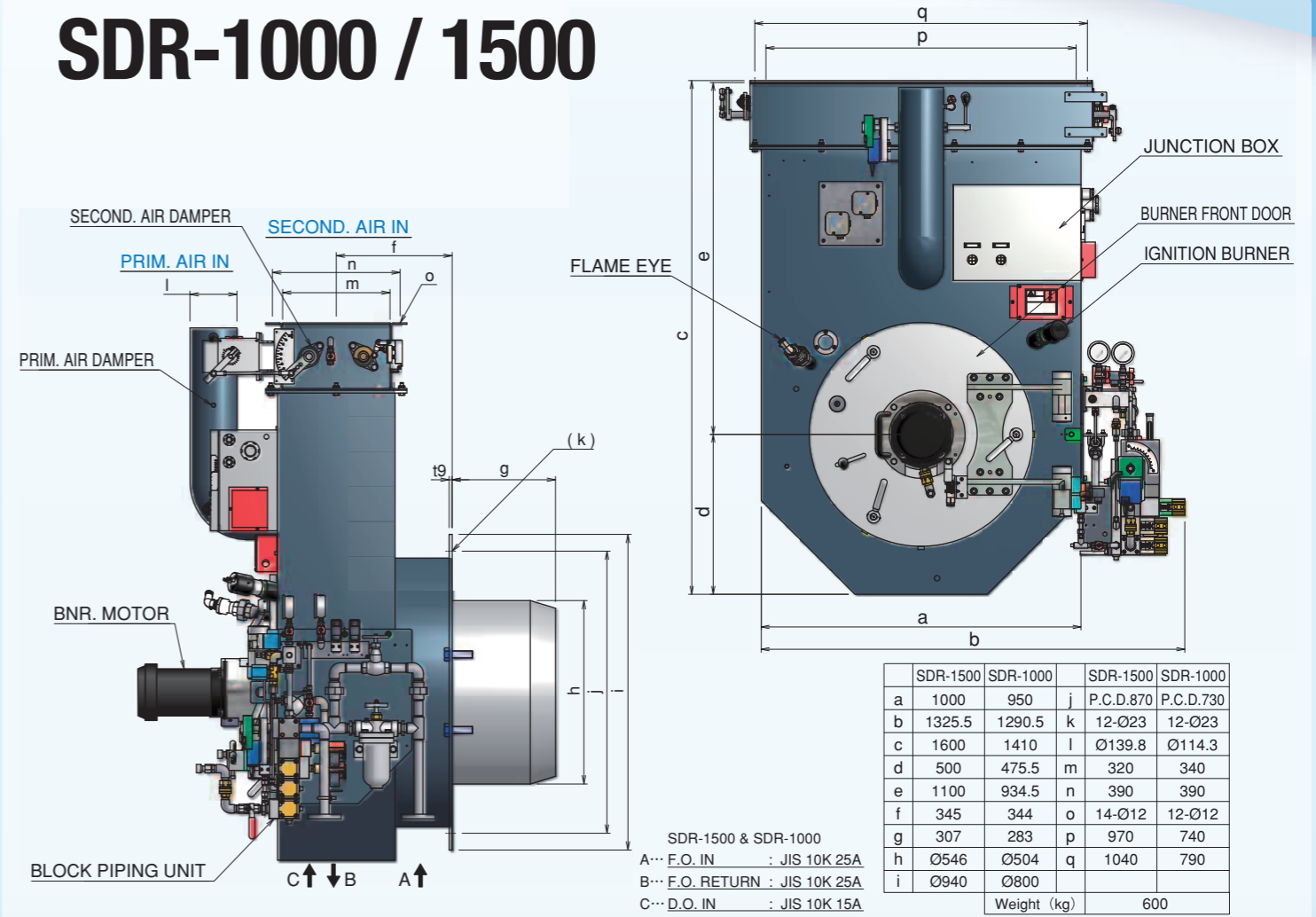
# SDR-1 / 1.5 / 2 / 2.5



# SDR-350 / 500 / 700



# SDR-1000 / 1500



# R-9 / 15 / 25 / 40

