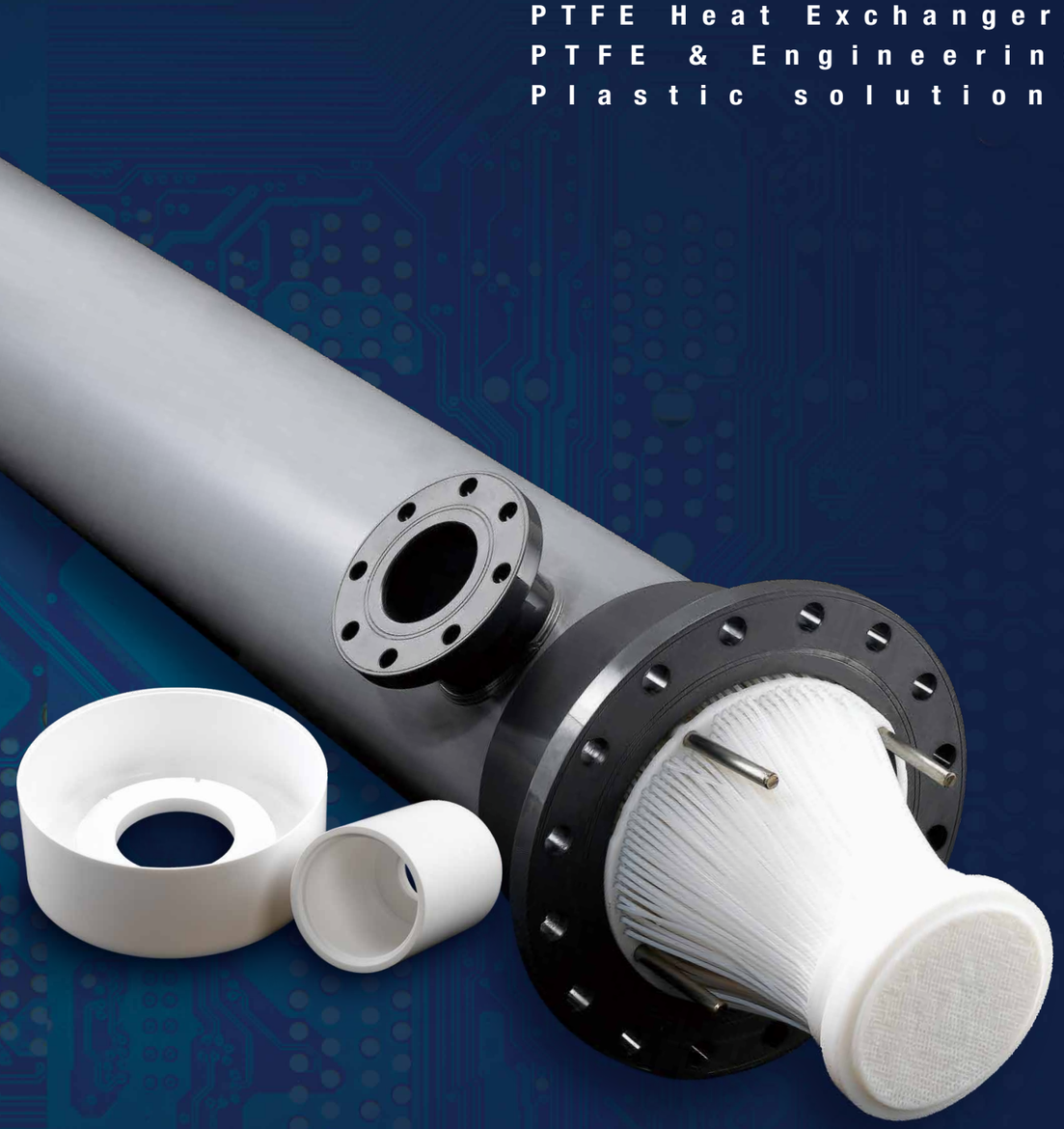
WOOAM SUPER POLYMER

PTFE Heat Exchangers
PTFE & Engineering
Plastic solutions



WOOAM SUPER POLYMER CO.,LTD.

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WOOAM SUPER POLYMER CO.,LTD.

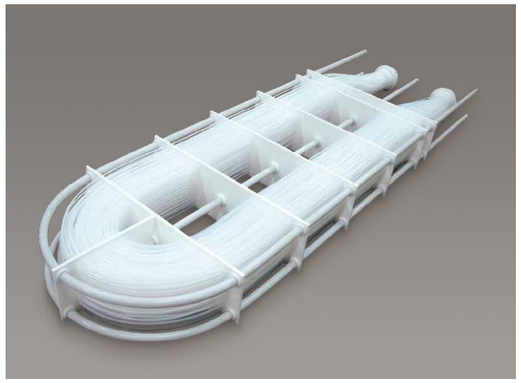
Wooam Super Polymer Co., Ltd. makes an effort to grow with customers and provide the best services

Thank you for visiting WOOAM SUPER POLYMER CO., LTD.

We are a leading manufacturer of PTFE heat exchangers, PTFE and engineering plastic solutions.

Our various products serve high temperature, high purity and highly-corrosive applications with exceptional performance and customized solutions for a wide array of industries such as semiconductor, fine chemical, metalworking and steelmakers. Our competitive products are highly attributed to our customers, assistance.

We continue to demonstrate leading edge innovations and world-class manufacturing skills for PTFE solutions to create more comfortable and brighter future.



Management policy

- Contribution to social progress and development
- Environmental conservation
- Energy conservation
- Contribution to create more comfortable life and brighter future

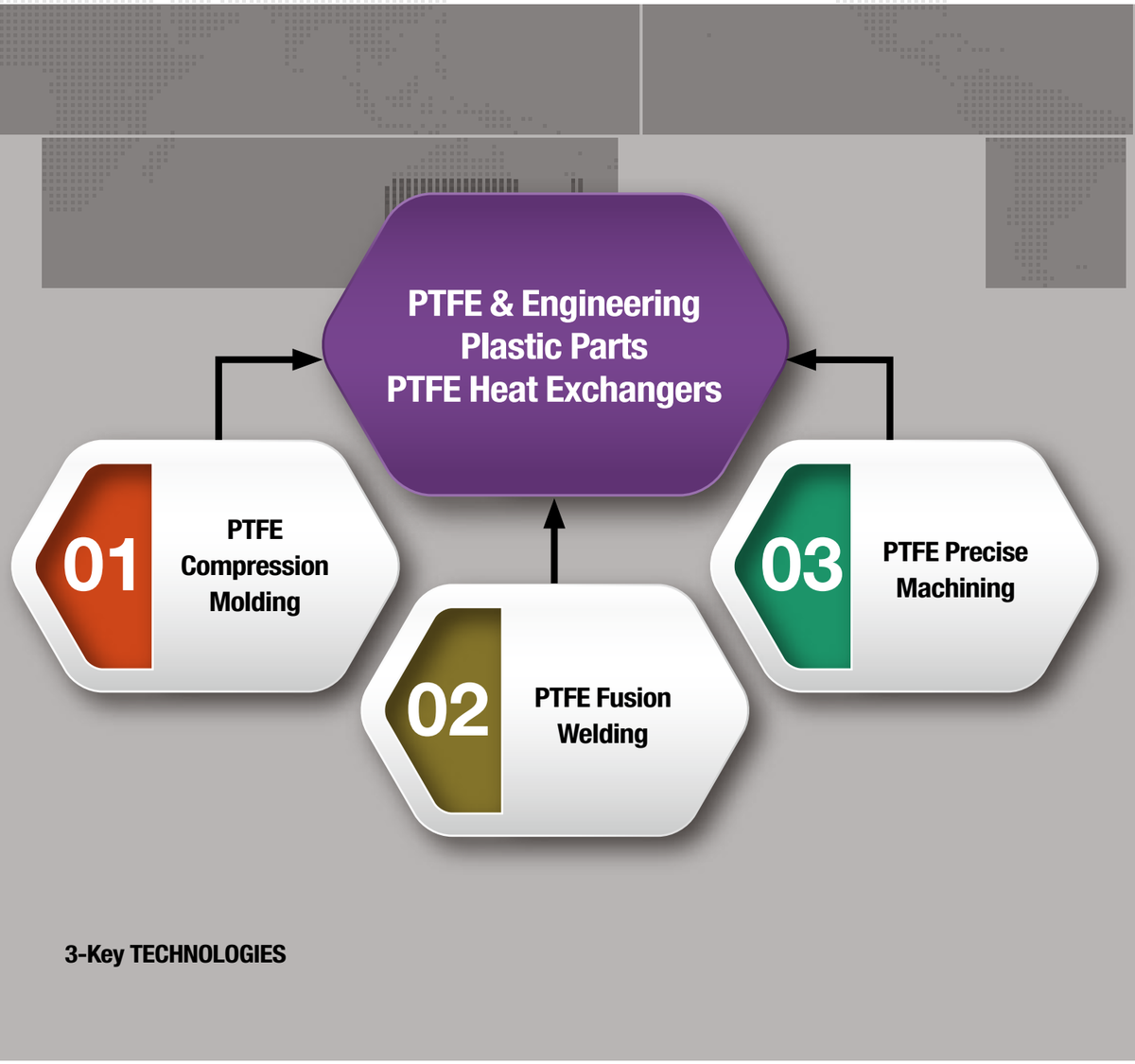
Management philosophy

- Customer satisfaction
- A leading manufacturer of PTFE & engineering plastic parts
- Exciting work environment

Contents

High purity & corrosion resistance fields

- Semiconductor, FPD/LCD and solar cell industry
- Petro & Fine chemical industry
- Energy & Environmental industry



3-Key TECHNOLOGIES

1. Compression molding

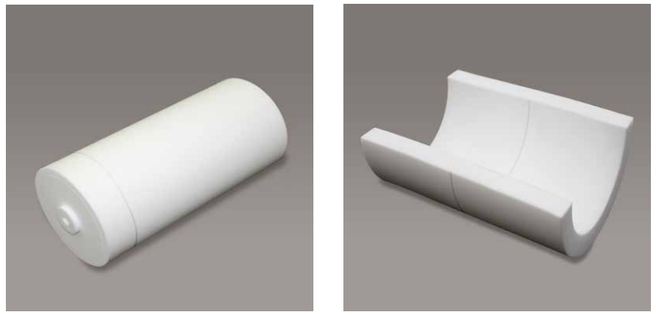
- WOOAM SUPER POLYMER CO.,LTD. has the ability to provide PTFE parts for your exact requirements.
- A wide range of customized shapes and sizes are available with the presses of 150 ton, 1000 ton and 1300 ton.
- Clean booth for critically clean applications.(class 1000)
- A variety of ovens and machines

PTFE bath (Max size : 2000mm(W)x500mm(D)x650mm(H))

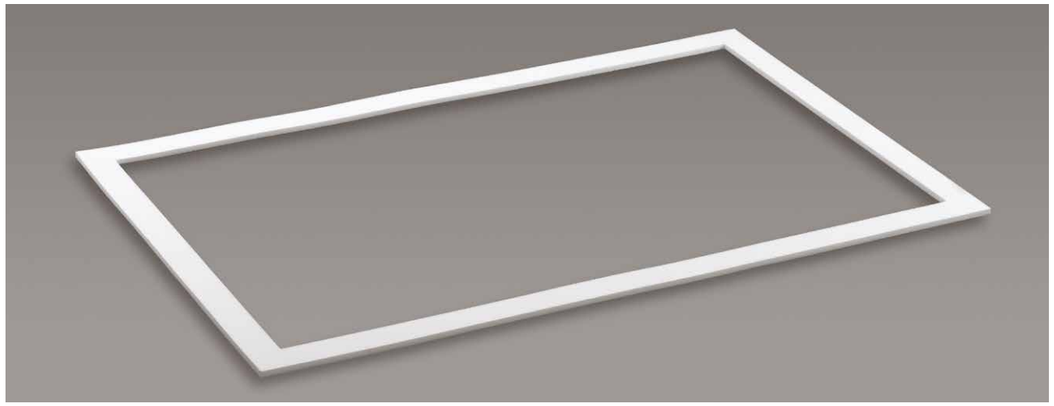
2. Fusion welding

PTFE fusion welding technique for

- PTFE heat exchanger tube sheet
- Large PTFE Gasket
- Pipe
- PTFE structure reinforced by metal



PTFE pipe



PTFE Gasket (Max size : T50mm x 3000mm(W) x 3000mm(D))

3. Machining technology

- We offer a full array of customized PTFE and engineering plastic parts for semiconductor wet processe.
- We specialize in very tight tolerance to machine accurate PTFE and engineering plastic parts with annealing and machining techniques.
- PTFE, PVDF, PFA, PEEK, PCTFE, PP, PVC, VESPEL
- Single wafer cleaner bowl, spin chucks,
  Wafer guide, wafer slot, PTFE bath, manifold,
  valve and PVC body etc.

1. PTFE heat exchanger (WHX)

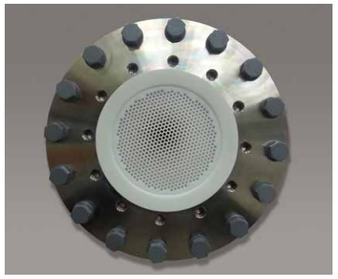
PTFE heat exchangers have excellent corrosion resistant qualities, these products are available in a wide variety of capacities and sizes to meet virtually any type of process heating and cooling a highly corrosive and high purity fluids.

❶ Competitive advantages of WHX

WHX is designed for heating and cooling ultra pure (single ppt) and highly corrosive fluids.

No Contamination

Robust Tube Sheet



No Leak

❷ Ultraclean WHX for single ppt purity

Clean Room (1,000 Class)

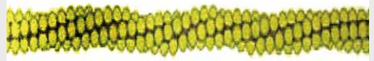
Clean Booth (1,000 Class)

DIW System

Solid PTFE lining for single ppt purity

❸ The best corrosion resistance

PTFE (PolyTetraFluoroEthylene)



$[CF_2\text{-}CF_2\text{-}CF_2\text{-}CF_2]$

PFA (PerFluoroAlkoxy)

$[CF_2\text{-}CF_2\text{-}CF(ORf)\text{-}CF_2]$

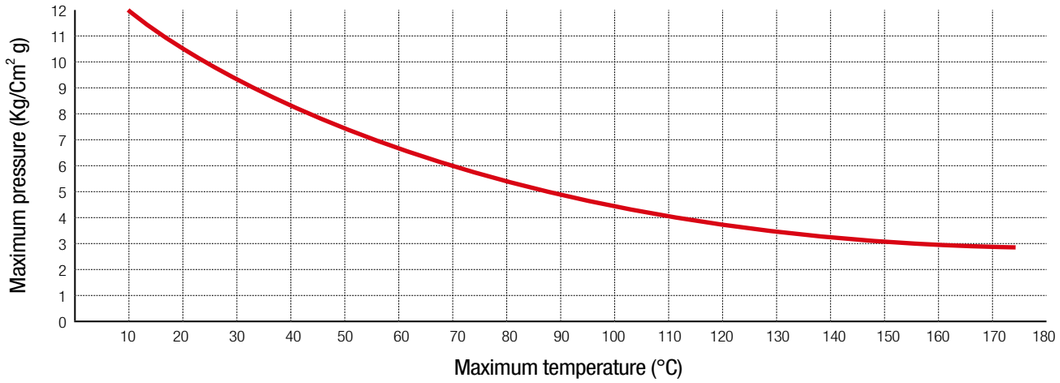
ORf (Alkoxy) radical is added to PTFE to increase only weldability and transparency.

PTFE is
- Better thermal conductivity
- Better corrosion resistance
- Better flex life
- Smoother
- Lower specific heat capacity than PFA

SULFURIC ACID 98%

PLASTICS	°C / °F	15/60	26/80	38/100	49/120	60/140	71/160	82/180	93/200	104/220	116/240	127/260	138/280	149/300	160/320	171/340	182/360	193/380	204/400	216/420	227/440	238/460
ABS		U																				
ACETAL		U																				
ACRYLICS		U																				
ASBESTOS REINFORCED EPOXY		U																				
ASBESTOS REINFORCED PHENOLIC		U																				
CHLORINATED POLYETHER (Penton)		U																				
CPVC		U																				
E-CTFE (Halar)		R	●	●	●	●	●															
EPOXY		U																				
ETFE (Tefzel)		R	●	●	●	●	●	●	●	●	●	●	●	●								
FEP		R	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
FURAN (FURFURAL ALCOHOL)		U																				
NORYL		R	●	●	●	●	●	●														
NYLON 6		U																				
NYLON 11		U																				
NYLON 66		U																				
PHENOLIC		U																				
PFA (Teflon)		R	●	●	●	●	●	●	●	●												
POLYAMIDE-IMIDE																						
POLYESTERS																						
Bisphenol A-fumarate		U																				
Halogenated		U																				
Hydrogenated Bisphenol A -Bisphenol A		U																				
Isophthalic		U																				
Terephthalate (PET)		U																				
POLYETHERIMIDE (ULTEM)																						
POLYETHERETHERKETONE (PEEK)																						
POLYETHERSULFONE (PES)																						
POLYETHYLENE HMW		U																				
POLYETHYLENE UHMW		U																				
POLYMETHYLPENTENE																						
POLYPROPYLENE (PP)		R	●	●	●	●																
POLYSTYRENE		U																				
POLYSULFONE		U																				
POLYVINYLIDENE CHLORIDE		U																				
PVC TYPE 1		U																				
PVC TYPE 2		U																				
PVDF (Kynar)		R	●	●	●	●	●															
RYTON																						
TFE (Teflon)		R	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
VINYL ESTER		U																				
	°F	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460
	°C	15	26	38	49	60	71	82	93	104	116	127	138	149	160	171	182	193	204	216	227	238

❹ Maximum temperature-pressure rating



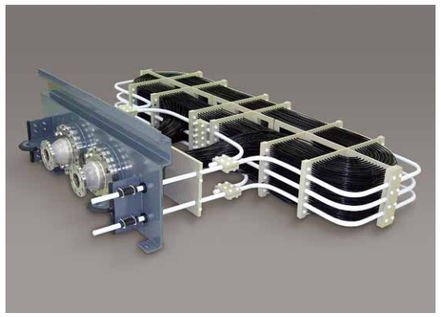
❺ PTFE heat exchanger

Shell & Tube type

- PTFE tube bundles : tube fusion welding of 30 to 2,000 tubes
- Tube diameter : 1/8 inch to 3/8 inch
- Shell diameter : 3 inch to 20 inch
- Material of shell : SUS, Carbon steel, PTFE lined carbon steel
- Application : semiconductor industry, fine chemical industry

Modular type

- Designed for immersion directly into the process vessel
- Module design in accordance with customers´ specification
- Maximum tube diameter : 10mm
- Various connection options
- Efficient baffle design minimizing sludge deposit
- Application : steelmaking industry and plating industry



2. Applications in semiconductor industry

Heaters and coolers are durably designed for corrosive chemical applications and have provided trouble free performance.

These products provide high purity in heating and cooling of chemicals for semiconductor and FPD

❶Waste acid disposal cooler

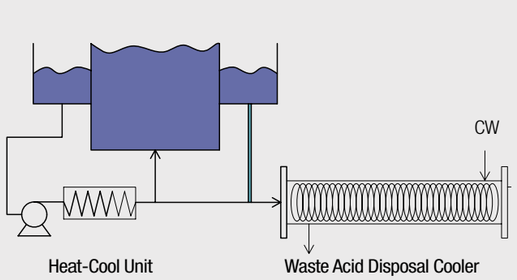
Significantly cut acid disposal cost by reducing water aspiration.
Unnecessary of additional buffering tank and heat exchanger for cooling.
Produces 50~70°C piping & tank safe waste chemical with gravity from 170°C

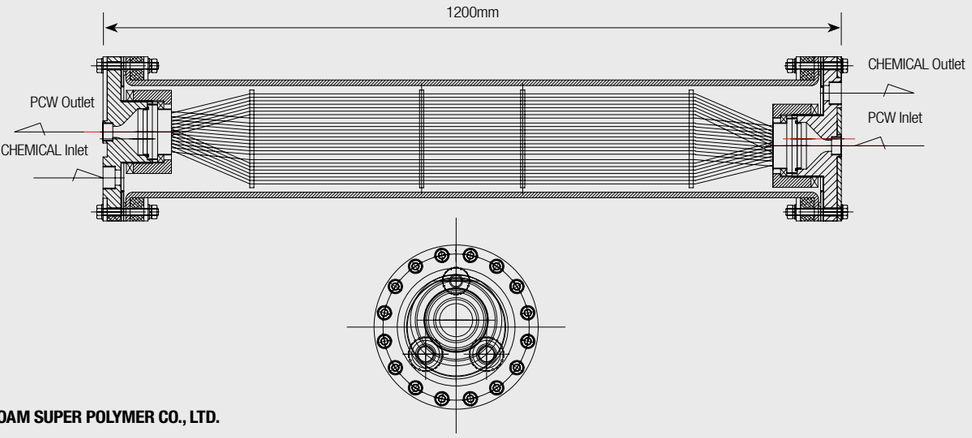
Features

- Batch cooling of process chemical
- Shell material : PTFE
- Flange equipped with PCW In/Out fittings in One-Body
- Heat transfer area : 5.5m^2
- Configuration : horizontal
- Dimension : Ø170×1000mm(L)
- Gravity feed rate : 50 L/2.5 Min
- Volume : 20 Liter
- Connection : 1inch for chemical, 1inch for PCW

Performance

- Capacity : 50L/batch
- Chemical In/Out temp : 170/70°C
- Cooling water flow rate : 50LPM
- Pressure drop of tube side (PCW) : 0.35KG



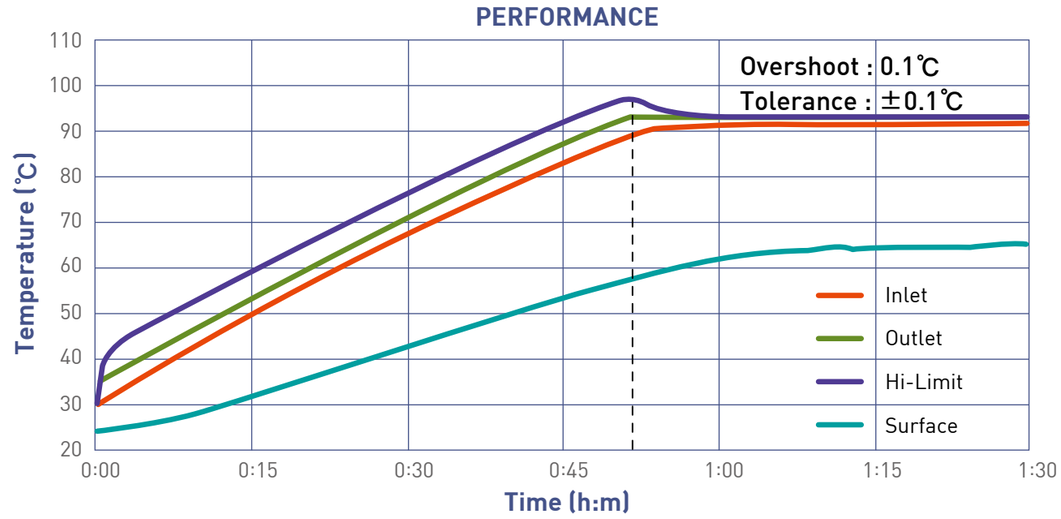


❷ DURAHEAT In-line heater

(2KW, 4KW, 6KW, 12KW, 18KW)

The DURAHEAT In-Line Heater provides high purity and reliability heating of chemicals for semiconductor. Special fusion welding of heater housing eliminates O-Rings and moving parts for only PTFE / PFA contact for wetted surfaces.

- One-Body PTFE Heater Housing
- PFA-jacketed heating element
- Power : 6.3 KW, 208V, 1Ø, 60Hz, 30.3 AMPS
- Ground Wire : Pt / Ir
- Process Inlet / Outlet Fitting : 1″ Pillar Super 300
- Air Vent : 1/4″ Flare
- Drain : 1/2″ Pillar Super 300
- Housing Dimension : 233 x 153 x 523mm(H)
- Maximum Operating Pressure : 5.0Kg / Cm^{2}G @ 120℃
- Process Temperature Sensor : PT 100Ω
- Hi-Limit Sensor : PT 100Ω
- Thermal Fuse: Set Point 167℃

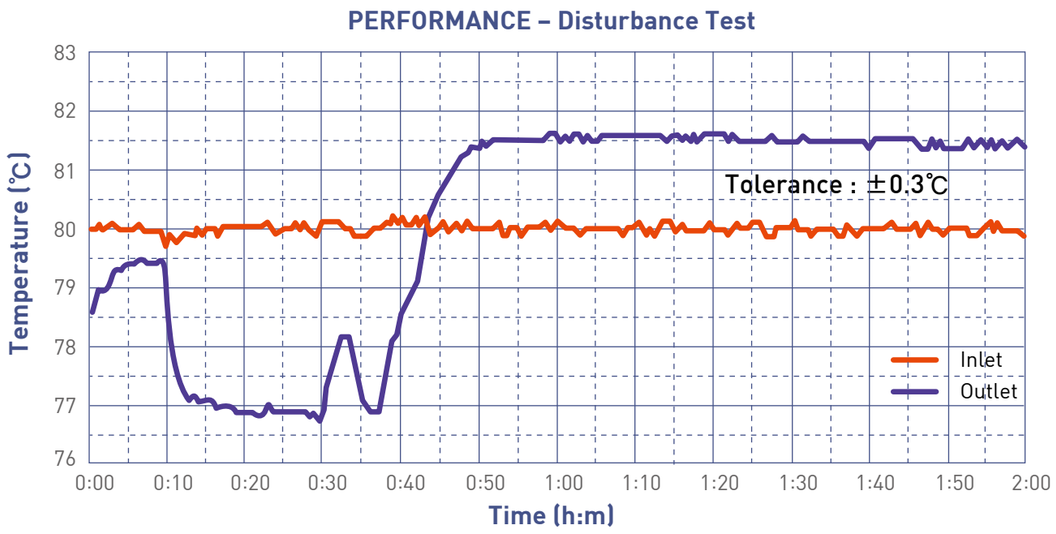


❸ DURAHEAT Heat-Cool Unit

(2.2KW, 6.0KW with Cooling Coil of 0.5m^2)

The DURAHEAT Heat-Cool Unit provides high purity and reliability heating / Cooling of chemicals for semiconductor. Special fusion welding of heater housing eliminates O-Rings and moving parts for only PTFE / PFA contact for wetted surfaces

- One-Body PTFE Heater Housing
- PVDF Shell
- PFA-jacketed heating element
- Power : 2.2KW, 6.3 KW, 208V, 1Ø, 60H
- Cooling Coil : 0.5m^2
  (Cooling Capacity : 5,700Kcal/Hr w/18℃ Chilling Water)
- Ground Wire : Pt / Ir
- Process Inlet / Outlet Fitting : 3/4″ Pillar Super 300
- Housing Dimension : Ø225 x 519mm(H)
- Maximum Operating Pressure : 5.0Kg/Cm^{2}G @ 120℃
- Process Temperature Sensor : PT 100Ω
- Hi-Limit Sensor : PT 100Ω
- Thermal Fuse : Set Point 167℃



❹ DURAHEAT ID In-line heater

(0.5KW, 6KW, 12KW)

The DURAHEAT IPA In-Line Heater provides high purity and safety heating of IPA and solvent through indirect contact for semiconductor.

- Size : Ø76 x 310mm(H)
- Heater : 0.50KW, 208V, 2.4 AMPS
- Ramp Up Time ≤ 6 min for IPA 0.135 LPM & ΔT 60℃
- Temp. Tolerance : ±0.5℃
- IPA Tube : PTFE, 1/8″, 3/8″ Custom connections available
- Housing Material : SUS 304
- Pressure Rating : 5Kg/Cm^{2}G@80℃
- ΔP≤0.2Kg/Cm^2 @ 0.135 LPM -1/8″
- High-limit TC : ″k: Type (175℃ Max)
- AL Body TC : Pt. 100Ω (125℃ Max)
- Fuse : 152℃
- Insulation : 15mm
- Surface Temp., : 58℃ Max

❺ Degassing module

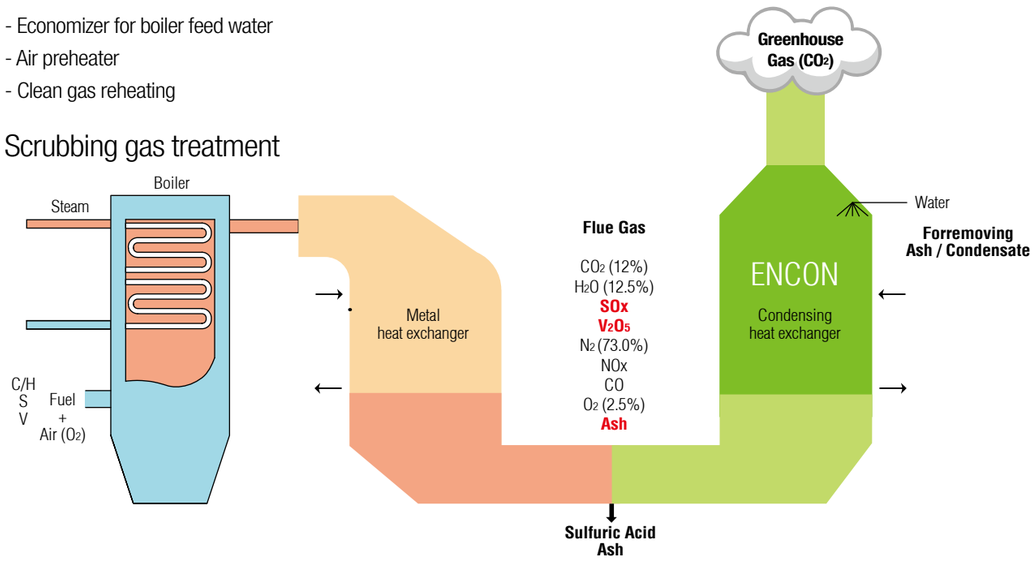
Size (mm)		Ø89.1×296(H)
Material	Body	SUS 304
	Hollow fiber	PTFE
Surface area of hollow fiber, m^2		1.32
Capacity (volume) of hollow fiber, CC		260
Degassing performance, %		≥92
Fluid(DIW)	Temp., °C	25
	Flow rate, mLPM	50
	Inlet DO, ppm	8.5
Pressure (Vacuum), kPa (abs)		5.4
Operation Condition	Tube side max, Temp., °C	40
	Tube side max, Press., Mpa	0.3
	Shell side Operation, Press., kPa	4.2~100
	Shell side max, Press., Mpa	0.2
Inspection items		Appearance, Dimension, Leak, Degassing performance

3. ENCON - Energy and environmental conservation

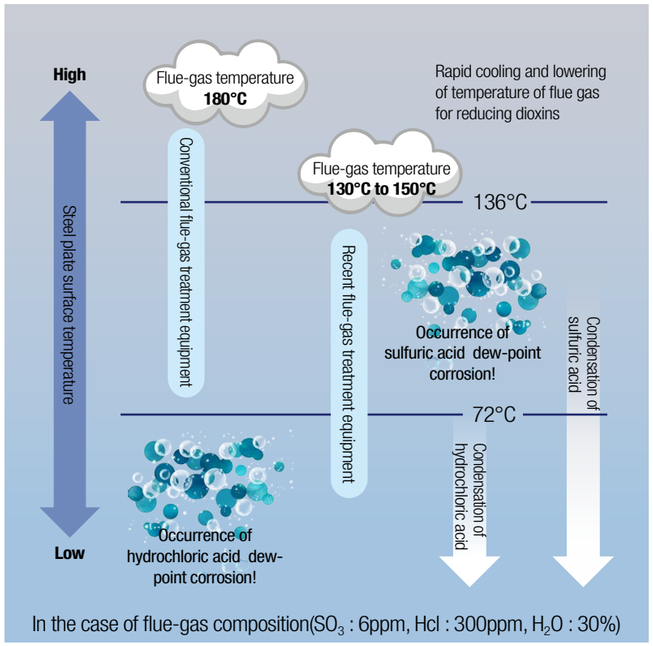
Waste heat recovery system

- Economizer for boiler feed water
- Air preheater
- Clean gas reheating

Scrubbing gas treatment

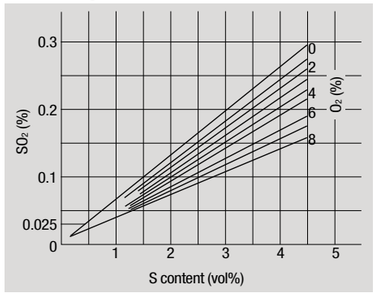


Waste incineration facility : Mechanism of sulfuric acid and hydrochloric acid dew-point corrosion occurring in flue-gas treatment system.

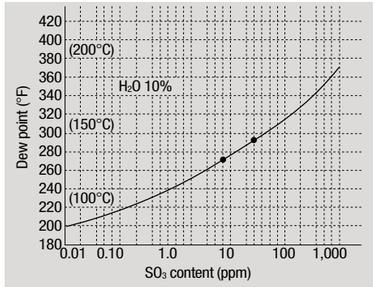


In the case of flue-gas composition(SO_3 : 6ppm, Hcl : 300ppm, H_2O : 30%)

Relation between sulfur content and SO_2 content in combustion gas



Relation between SO_3 content in combustion gas and dew point



Clean gas reheating