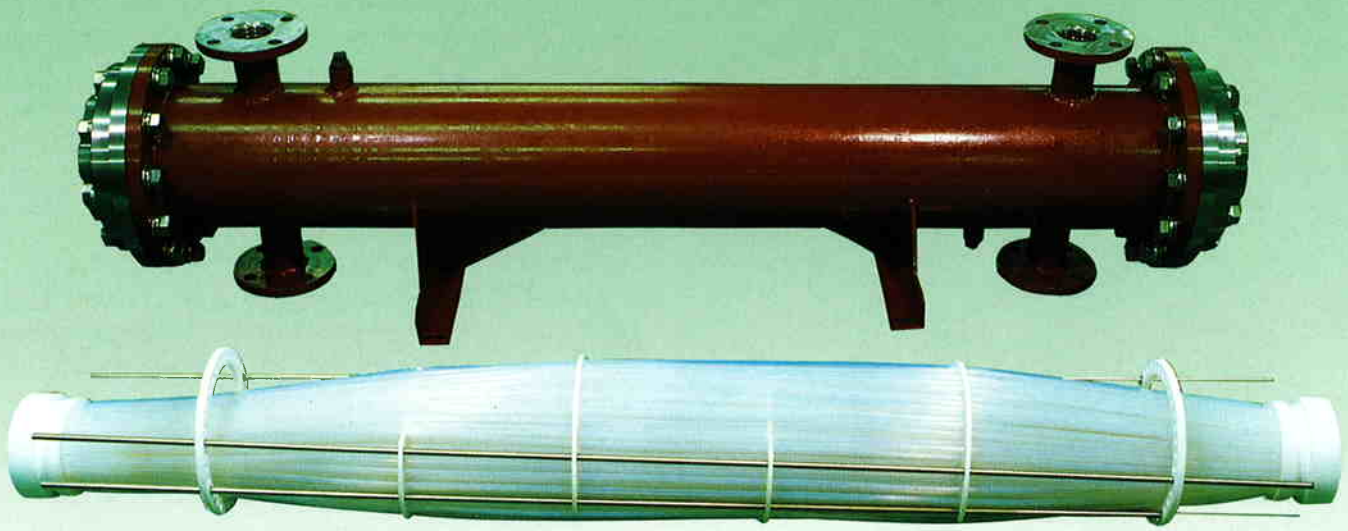
VALQUA

CATALOGUE No. ZP08

# FLUOROPLASTIC CHEMICAL-RESISTANT HEAT EXCHANGER

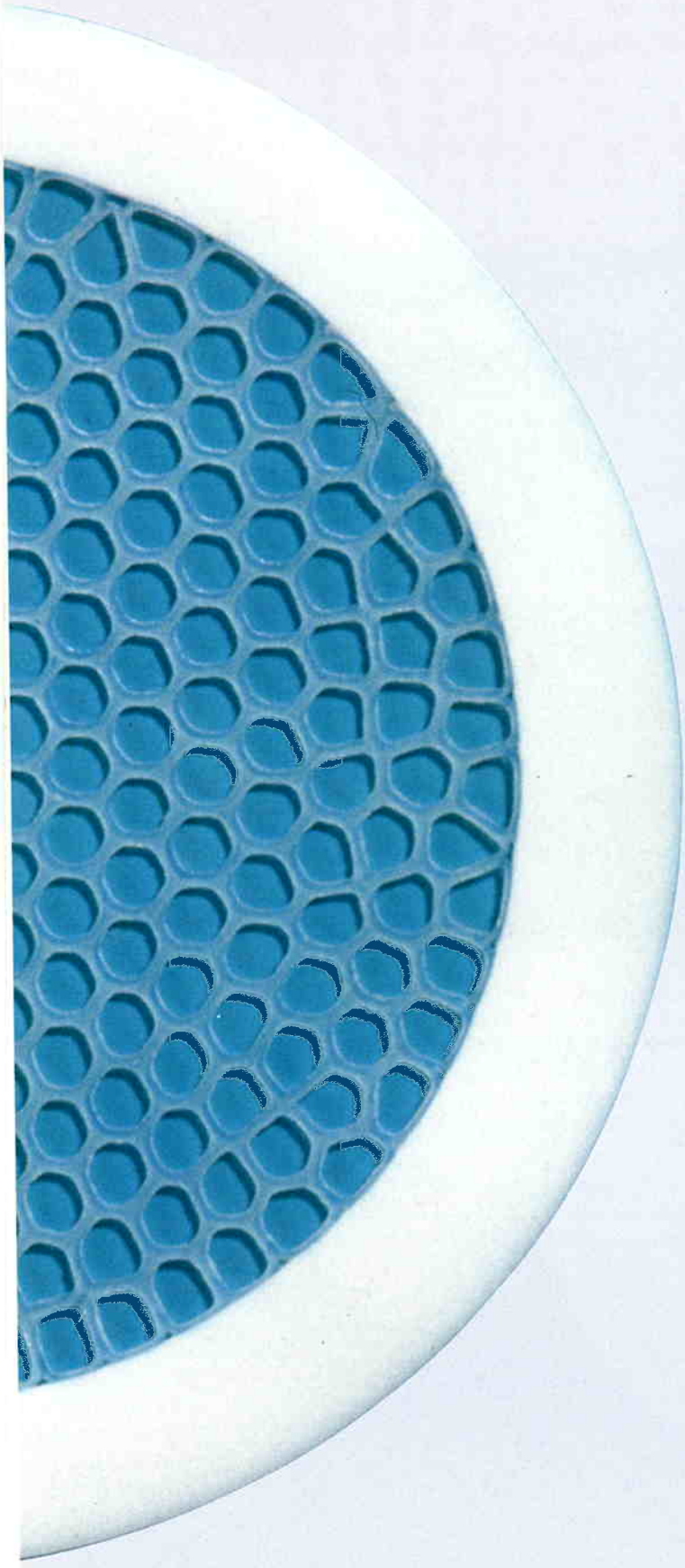
## Technical Data



VALQUA **NIPPON VALQUA INDUSTRIES, LTD.**

http://WWW.valqua.co.jp

# Fluoroplastic Chemical-Resistant Heat Exchanger



- Fluoroplastic, as with other plastics, is high in purity. As a result of this property, fluoroplastic is becoming increasingly important in high-tech industries, such as semiconductor manufacturing, in which high-purity chemical liquids and ultra-high-purity water are used.
- Fluoroplastic has excellent resistance to chemicals, heat, and stains. The fluoroplastic chemical-resistant heat exchanger, which makes the most of these resistance properties, is suitable for the cooling and heating of corrosive fluid and condensation of corrosive gas.
- Fluoroplastic has poor heat conductivity compared to metals. That has been a drawback when used for heat exchangers in the past. The fluoroplastic chemical-resistant heat exchanger has solved this problem by increasing the heat-exchanging surface area using a honeycomb structure binding together many small-diameter heat transfer tubes.
- The fluoroplastic chemical-resistant heat exchanger comes in two types, the shell tube type and the immersion type. You can choose the one suitable for your application in the semiconductor, chemistry, iron manufacture, plating, crystalline liquid, and various other industries.

## Features

- The principal feature is the flexible tube bundle consisting of fluoroplastic (PTFE, PFA) Valflon® tubes bound in an integral double-ended honeycomb structure. The honeycomb is finished with uniform quality through the use of our unique technology.
- Anti-static specifications are available for heating applications. (Pat. No. 1390535)
- An anti-static exchanger is also available for production.
- Clean specifications are available for applications in clean rooms.
- Resists up to a saturated steam pressure of 0.49 MPa {5 kgf/cm$^2$}.
- Has excellent chemical resistance.
- Non-adhesive. Sludge and scale hardly adhere to the heat exchanger, and can be easily removed.
- Produces no toxic substances.

Scope of Application

Maximum Temperature And Pressure Performance

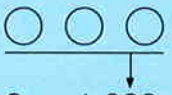
| | Tube size | |
|---|---|---|
| | ø5.8 x ø6.35 | ø2.4 x ø3.2 |
| Tube | 0.20 {2.0} (133°C) | 0.49 {5.0} (158°C) |
| Shell | 0.14 {1.4} (125°C) | 0.20 {2.0} (133°C) |

Saturated-steam usage limit pressure: MPa {kgf/cm$^2$ max}

▶ Plantex, Ltd. is responsible for the engineering, assembly, and service of the fluoroplastic chemical-resistant heat exchanger.

* Valflon® is the registered trademark of Nippon Valqua Industries, Ltd. for its fluoroplastic products.

# Heat Exchanger Types

| Type and Specification Coding | | | Tube Bundle Model Code and Effective Heat-Exchange Area (A) | | | Final code |
|---|---|---|---|---|---|---|
| Type | Type Code | Specification Code | Model Code | Standard Model | | Shell and Connector Materials |
| | | | | Code | A value ($m^2$) | |
| Shell Type | Shell tube<br>S T ○<br>Straight: S<br>U-shaped: U |  <br>General: OGO<br>Clean: OCO | 103 | 010–040 | 1.0–4.0 | (Shell material)<br>-CS (carbon steel)<br>-S (stainless steel)<br>-FL (fluoroplastic lining)<br>-PVC (rigid PVC pipe) |
| | | | 203 | 020–080 | 2.0–8.0 | |
| | | | 403 | 080–240 | 8.0–24 | |
| | | | 1003 | 200–700 | 20–70 | |
| | | | 106 | 020–080 | 2.0–8.0 | |
| | | | 306 | 080–240 | 4.0–24 | |
| | | | 506 | 100–700 | 10–70 | |
| Immersion Type | Loose random: LR<br>Tight module: TM | General: Anti-static: OGE<br>Clean: Anti-static: OCE | 23 | 002–010 | 0.2–1.0 | (Connector material)<br>-S (stainless steel)<br>-F (fluoroplastic) |
| | | | 43 | 004–010 | 0.4–1.0 | |
| | | | 103 | 010–040 | 1.0–4.0 | |
| | | | 203 | 020–080 | 2.0–8.0 | |
| | | | 403 | 080–240 | 4.0–24 | |
| | | | 1003 | 200–700 | 20–70 | |
| Coding example | STS-OCO-403-080-S | | | | | Straight shell tube, clean specifications, Model 403<br>A = 8 $m^2$, SUS shell |
| | LR-OGO-203-030-F | | | | | Loose random, general specifications, Model 203<br>A = 3 $m^2$, fluoroplastic connector |
| | TM-OGE-1003-300-S | | | | | Tight module, anti-static specifications, Model 1003<br>A = 30 $m^2$, SUS connector |
| Gasket Types: Fluoro Rubber (FPM), EPDM, Kalrez®, Crystal Rubber® | | | | | | |

## ▼ Honeycomb Specifications

| Model Code | Effective Heat-Exchange Area (A) $m^2$ | (A) $m^2/m$ | Effective Length (mm) per $m^2$ | Overall Sectional Area of the Flow Path ($m^2$) | Tube Bundle Setup | |
|---|---|---|---|---|---|---|
| | | | | | Number of tubes | Tube size |
| 23 | 0.2–1.0 | 0.167 | 5984 | 0.0000859 | 19 | Outer, inner, and effective diameters<br>3.2 x 2.4 x 2.8<br>Thickness: 0.4 t |
| 43 | 0.4–2.0 | 0.325 | 3073 | 0.000167 | 37 | |
| 103 | 1.0–4.0 | 0.950 | 1053 | 0.000488 | 108 | |
| 203 | 2.0–8.0 | 1.62 | 614.5 | 0.000836 | 185 | |
| 403 | 8.0–24.0 | 4.12 | 242.4 | 0.00212 | 469 | |
| 1003 | 20.0–70.0 | 9.03 | 110.7 | 0.00464 | 1027 | |
| 46 | 0.5–2.0 | 0.664 | 1516 | 0.000749 | 37 | Outer, inner, and effective diameters<br>6.35 x 5.08 x 5.715<br>Thickness: 0.635 t |
| 66 | 0.5–2.0 | 1.09 | 913.1 | 0.00123 | 61 | |
| 106 | 2.0–8.0 | 2.28 | 438.6 | 0.00257 | 127 | |
| 306 | 8.4–24.0 | 4.86 | 205.6 | 0.00549 | 271 | |
| 506 | 10.0–70.0 | 9.82 | 101.9 | 0.0110 | 547 | |

# ST (Shell Tube)

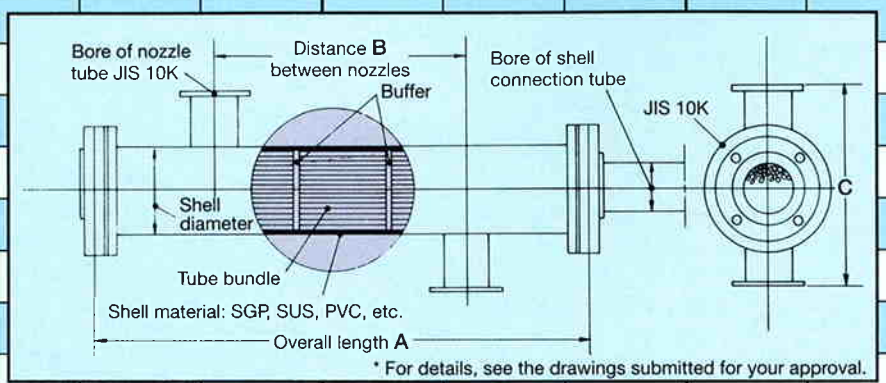
(In mm)

| Model Code | | 106 | | | 306 | | | 506 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Effective Heat-Exchange Surface Area (A) | Dimensions of Related Parts | Shell Connection Tube | Shell Diameter | Nozzle Tube | Shell Connection Tube | Shell Diameter | Nozzle Tube | Shell Connection Tube | Shell Diameter | Nozzle Tube |
| | | 80A | 125A | 50A | 100A | 200A | 100A | 150A | 300A | 100A |
| Code | $m^2$ | A | B | Weight (kg) of the Shell-Tube Type (C = 300) | A | B | Weight (kg) of the Shell-Tube Type (C = 440) | A | B | Weight (kg) of the Shell-Tube Type (C = 560) |
| 010 | 1.0 | | | | | | | | | |
| 015 | 1.5 | | | | | | | | | |
| 020 | 2.0 | 1250 | 880 | 90 | | | | | | |
| 025 | 2.5 | 1470 | 1100 | 95 | | | | | | |
| 030 | 3.0 | 1690 | 1320 | 100 | | | | | | |
| 035 | 3.5 | 1910 | 1540 | 105 | | | | | | |
| 040 | 4.0 | 2130 | 1760 | 110 | 1320 | 830 | 146 | | | |
| 050 | 5.0 | 2570 | 2200 | 120 | 1520 | 1030 | 153 | | | |
| 060 | 6.0 | 3010 | 2640 | 130 | 1730 | 1240 | 160 | | | |
| 065 | 6.5 | | | | | | | | | |
| 070 | 7.0 | 3440 | 3070 | 140 | 1930 | 1440 | 168 | | | |
| 080 | 8.0 | 3880 | 3510 | 150 | 2140 | 1650 | 175 | | | |
| 090 | 9.0 | | | | 2350 | 1860 | 183 | | | |
| 100 | 10.0 | | | | 2550 | 2060 | 190 | 1580 | 1020 | 340 |
| 120 | 12.0 | | | | 2960 | 2470 | 205 | 1790 | 1230 | 355 |
| 140 | 14.0 | | | | 3370 | 2880 | 220 | 1990 | 1430 | 370 |
| 160 | 16.0 | | | | 3780 | 3290 | 235 | 2200 | 1640 | 385 |
| 180 | 18.0 | | | | 4190 | 3700 | 250 | 2400 | 1840 | 400 |
| 190 | 19.0 | | | | | | | | | |
| 200 | 20.0 | | | | 4610 | 4120 | 265 | 2600 | 2040 | 415 |
| 220 | 22.0 | | | | 5020 | 4530 | 280 | 2810 | 2250 | 430 |
| 240 | 24.0 | | | | 5430 | 4940 | 295 | 3010 | 2450 | 445 |
| 260 | 26.0 | | | | | | | 3210 | 2650 | 460 |
| 280 | 28.0 | | | | | | | 3420 | 2860 | 475 |
| 300 | 30.0 | | | | | | | 3620 | 3060 | 490 |
| 350 | 35.0 | | | | | | | 4130 | 3570 | 530 |
| 400 | 40.0 | | | | | | | 4640 | 4080 | 565 |
| 500 | 50.0 | | | | | | | 5660 | 5100 | 640 |
| 600 | 60.0 | | | | | | | 6680 | 6120 | 680 |
| 700 | 70.0 | | | | | | | 7700 | 7140 | 715 |

# Type Sizing Table

Model codes with the final number of 6: 6.35 x 5.08 x 0.635 tubes are used
Model codes with the final number of 3: 3.20 x 2.40 x 0.4 tubes are used

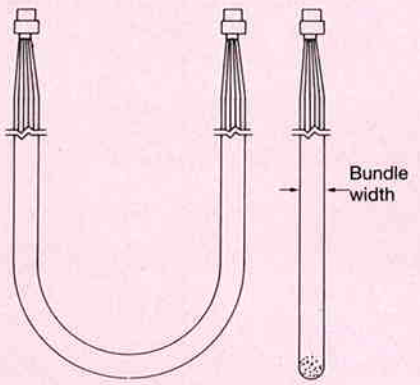
| 103 | | | 203 | | | 403 | | | 1003 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Shell Connection Tube | Shell Diameter | Nozzle Tube | Shell Connection Tube | Shell Diameter | Nozzle Tube | Shell Connection Tube | Shell Diameter | Nozzle Tube | Shell Connection Tube | Shell Diameter | Nozzle Tube |
| 40A | 80A | 25A | 50A | 125A | 50A | 80A | 150A | 80A | 100A | 250A | 100A |
| A | B | Weight (kg) of the Shell-Tube Type (C = 260) | A | B | Weight (kg) of the Shell-Tube Type (C = 300) | A | B | Weight (kg) of the Shell-Tube Type (C = 360) | A | B | Weight (kg) of the Shell-Tube Type (C = 440) |
| 1370 | 1060 | 35 | | | | | | | | | |
| 1890 | 1580 | 40 | | | | | | | | | |
| 2420 | 2110 | 45 | 1690 | 1230 | 70 | | | | | | |
| 2950 | 2640 | 50 | 1910 | 1540 | 75 | | | | | | |
| 3470 | 3160 | 55 | 2220 | 1850 | 80 | | | | | | |
| 4000 | 3690 | 60 | 2530 | 2160 | 85 | | | | | | |
| 4530 | 4220 | 65 | 2830 | 2460 | 90 | 1390 | 970 | 95 | | | |
| | | | 3450 | 3080 | 100 | 1640 | 1220 | 100 | | | |
| | | | 4060 | 3690 | 110 | 1880 | 1460 | 105 | | | |
| | | | | | | | | | | | |
| | | | 4680 | 4310 | 120 | 2120 | 1700 | 110 | | | |
| | | | 5290 | 4920 | 130 | 2360 | 1940 | 115 | | | |
| | | | | | | 2610 | 2190 | 120 | | | |
| | | | | | | 2850 | 2430 | 125 | | | |
| | | | | | | 3330 | 2910 | 135 | | | |
| | | | | | | 3820 | 3400 | 145 | | | |
| | | | | | | 4300 | 3880 | 155 | | | |
| | | | | | | 4790 | 4370 | 165 | | | |
| | | | | | | | | | | | |
| | | | | | | 5270 | 4850 | 175 | 2720 | 2220 | 300 |
| | | | | | | 5760 | 5340 | 185 | 2940 | 2440 | 310 |
| | | | | | | 6240 | 5820 | 195 | 3160 | 2660 | 320 |
| | | | | | | | | | 3380 | 2880 | 330 |
| | | | | | | | | | 3600 | 3100 | 340 |
| | | | | | | | | | 3830 | 3330 | 350 |
| | | | | | | | | | 4380 | 3880 | 375 |
| | | | | | | | | | 4930 | 4430 | 405 |
| | | | | | | | | | 6040 | 5540 | 460 |
| | | | | | | | | | 7150 | 6650 | 520 |
| | | | | | | | | | 8250 | 7750 | 580 |




* For details, see the drawings submitted for your approval.

# LR (Loose Random) and TM (Tight Module)

| Model / Code | 23 | | | 43 | | | 103 | | |
|---|---|---|---|---|---|---|---|---|---|
| Effective Heat-Exchange Surface Area A | Nominal length | Bundle (for LR) | Mass when unloaded | Nominal length | Bundle (for LR) | Mass when unloaded | Nominal length | Bundle (for LR) | Mass when unloaded |
| Code / $m^2$ | L mm | Width in mm | Kg | L mm | Width in mm | Kg | L mm | Width in mm | Kg |
| 002 / 0.2 | 1230 | 15–20 | 0.21 | | | | | | |
| 004 / 0.4 | 2430 | 15–20 | 0.38 | 1270 | 25–30 | 0.41 | | | |
| 006 / 0.6 | 3630 | 15–20 | 0.56 | 1890 | 25–30 | 0.59 | | | |
| 007 / 0.7 | | | | | | | | | |
| 008 / 0.8 | 4820 | 15–20 | 0.74 | 2500 | 25–30 | 0.70 | | | |
| 010 / 1.0 | 6020 | 15–20 | 0.91 | 3120 | 25–30 | 0.94 | 1110 | 45–50 | 1.13 |
| 015 / 1.5 | | | | 4650 | 25–30 | 1.38 | 1640 | 45–50 | 1.57 |
| 020 / 2.0 | | | | 6190 | 25–30 | 1.82 | 2160 | 45–50 | 2.01 |
| 025 / 2.5 | | | | | | | 2690 | 45–50 | 2.45 |
| 030 / 3.0 | | | | | | | 3220 | 45–50 | 2.88 |
| 040 / 4.0 | | | | | | | 4270 | 45–50 | 3.77 |



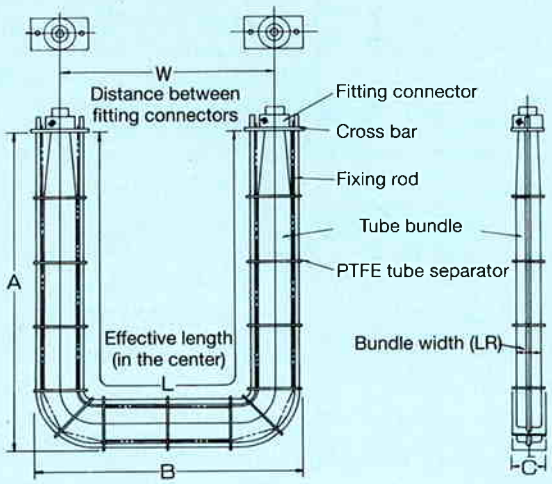

### ◀ LR <Loose Random> type

This is the basic unit of the tube bundle bound in the double-ended honeycomb structure. As shown to the left, the bundle can easily be bent into any shape when immersed in a tank.

Models 23, 43, 103, 203, 403, and 1003

The fitting connectors F and S are used for both the LR and TM types.

- Application: Semiconductor etching, chemical plating tank, etc.




### ◀ TM <Tight Module> Type

The tube bundle is divided by the specified number of PTFE tube separators and fixed with a rod that is also used as a sinker, as to the shown left.

- The symbols used for the dimensions are determined in accordance with the installation conditions.

* For details, see the drawings submitted for your approval.