

# How to select Heat Exchanger

You can select heat exchanger simply by the catalog. Please refer to the following instruction.

## STEP.1 Working condition check

Check item	Remarks
Type	Water-Cooled Shell and Tube type, Air-Cooled type
Heat exchange amount	If not specified, temperature of inlet and outlet at shell side should be set.
Working temperature	Shell side: inlet and outlet temperature Tube side: inlet temperature
Max working pressure	1 MPa for both Shell and Tube type and Air-Cooled type
Flow rate (normal/max)	Shell side: Should be specified Tube side: If not specified, set the same value as a shell side.

Heat exchanger selection is NOT possible if check item in **large character** is not specified.

Check item	Remarks
Fluid type	Shell side: Fluid type, density, and kinematic viscosity Tube side: Type of cooling water
Allowable pressure drop	If not specified, Shell side: $\leq 0.1$ MPa Tube side: $\leq 0.05$ MPa
Scale coefficient	If not specified, set $0 \text{ m}^2\text{C/W}$ for both shell side and tube side.
Pipe connection	Size and connection type (flange/thread) should be specified.

(Standard working condition in the catalog) Fluid: Corresponding to ISO VG46 / Inlet temperature at shell side: 55°C / Inlet temperature at tube side: 30°C

## STEP.2 Calculation of required condition

- A) If working condition checked at **STEP 1** is almost same with standard condition in the catalog ..... Go to **STEP.2-①**  
 B) If working condition checked at **STEP 1** is NOT same with standard condition in the catalog ..... Go to **STEP.6**

### ① Calculation of heat transfer area

i) Calculation of heat exchange amount [kW]  
 ( $\rho$ : specific gravity, C: specific heat)  
 Calculate working temperature by the following equation  
 if heat exchange amount and oil flow rate is determined.

$$Q = W_o \times 60 \times \rho_o \times C_o \times (T_1 - T_2)$$

$$= W_w \times 60 \times \rho_w \times C_w \times (t_2 - t_1)$$

ii) Calculation of logarithmic mean temperature difference  $\theta$  [°C]

$$\theta = \frac{(T_1 - t_2) - (T_2 - t_1)}{2.3 \log \frac{(T_1 - t_2)}{(T_2 - t_1)}}$$

iii) Calculation of required heat transfer area A [m<sup>2</sup>]  
 (K-value: Overall heat transfer coefficient [W/m<sup>2</sup>C])

$$A = \frac{Q \times 1000}{\theta \cdot K}$$

Fig.1 Although K-value depends on working condition, structure of heat exchanger, and so on, please select mean value of catalog products.

Type of cooling tube	K - Value
Products of $\phi 9$ low fin tube	350~450
Products of $\phi 12.7$ low fin tube	200~250

[W: Flow rate (l/min), T1/T2: Inlet and outlet temperature at shell side (°C), t1/t2: Inlet and outlet temperature at tube side (°C)]

## STEP.3 Base model selection

- ① Select a base model from P.8 - 9 "INDEX" that meets the requirements in **STEP 2**.  
 ② Refer to the production line-up page of the selected base model.

## STEP.4 Size selection

Refer to "PERFORMANCE GRAPH" of the selected model in **STEP 3**, and select the minimum size within the determined condition of heat exchange amount and allowable pressure drop.

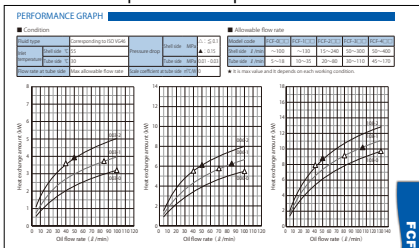


Fig.2 Oil quantity variation

Oil flow rate	Large	Small
CODE	0	1 2

Fig.3 How to check heat transfer area of heat exchanger

Type	How to check
FCF*1, FCD(B), FCX, FCW, FCU	Divide the last two numbers of MODEL CODE by 20
FCF*2, FPD	Divide the last two numbers of MODEL CODE by 2
FTC(B), FTS(B), TEMA	The number right after MODEL CODE (It is directly heat transfer area.)

(Ex.) In case of FCF-114-2 ==>  $14 \div 20 = 0.7 \text{ m}^2$

\* 1 FCF-003~FCF-390 \* 2 FCF-311~FCF-420

## STEP.5 Spec confirmation

○ Estimate K-value by back calculating in **STEP 2 - ①**, and confirm if the heat transfer area of selected model in **STEP 4** satisfies required specification.

- a) Estimated K-value equals to the one in **fig.1** ⇒ ○ Selected model is OK.  
 b) Estimated K-value does not equal to the one in **fig.1** ⇒ × Back to **STEP 4** and select again.

## STEP.6 Model selection for other conditions

○ If standard working condition on the catalog does not meet your requirement or if you request air-cooled type heat exchanger, please fill out necessary items from "Request (Filter/Heat Exchanger)" on our WEB site.

Download of drawing, CAD data (outline drawing), and operation manual is available on our WEB site\*.

\* User account registration is required (for free). [https://www.taiseikogyo.co.jp/en/request\\_cooler/](https://www.taiseikogyo.co.jp/en/request_cooler/)

# PERFORMANCE GRAPH

## Condition

Fluid type		Corresponding to ISO VG46		Pressure drop	Shell side MPa	△ : 0.1
Inlet temperature	Shell side °C	55			Tube side MPa	▲ : 0.15
	Tube side °C	30				0.01 - 0.03
Flow rate at tube side		Max allowable flow rate		Scale coefficient at tube side	m <sup>2</sup> C/W	0

## Allowable flow rate

Model code	FCU-1□□A	FCU-2□□A
Shell side ℓ/min	~150	15~240
Tube side ℓ/min	10~30	15~55

★ It is max value and it depends on each working condition.

