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: ≦ 0.1MPa Tube side: ≦ 0.05MPa
Scale coefficient	If not specified, set 0 m^2℃/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℃／Inlet temperature at tube side: 30℃**

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**

①Calculation of heat transfer area

i) Calculation of heat exchange amount [kW]
(ρ: 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 θ [℃]

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

iii) Calculation of required heat transfer area A [m^2]
(K-value: Overall heat transfer coefficient[W/m^2℃])

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

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

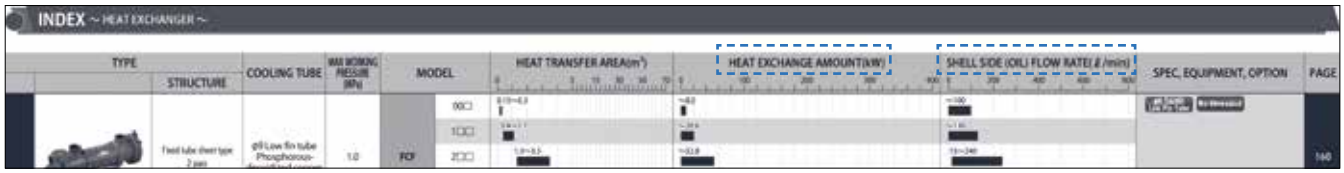
Type of cooling tube	K - Value
Products of Φ9 low fin tube	350～450
Products of Φ12.7 low fin tube	200～250

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

STEP.3 Base model selection

①Select a base model from P.8 – 9 "INDEX" that meets the requirements in **STEP 2**.

②Refer 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.

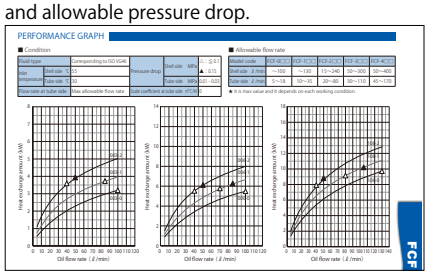


Fig.2 Oil quantity variation

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-1<u>14</u>-2 ==> <u>14</u> ÷ 20 = 0.7m^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/

PERFORMANCE GRAPH

■ Condition

Fluid type		Corresponding to ISO VG46	Pressure drop	Shell side MPa	◆ : 0.05 △ : 0.1
Inlet temperature	Shell side ℃	55			
	Tube side ℃	30		Tube side MPa	0.01 - 0.03
Flow rate at tube side		Max allowable flow rate	Scale coefficient at tube side	㎡℃/W	0

■ Allowable flow rate

Model code	FCW-3□□A
Shell side ℓ/min	50～300
Tube side ℓ/min	30～100

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