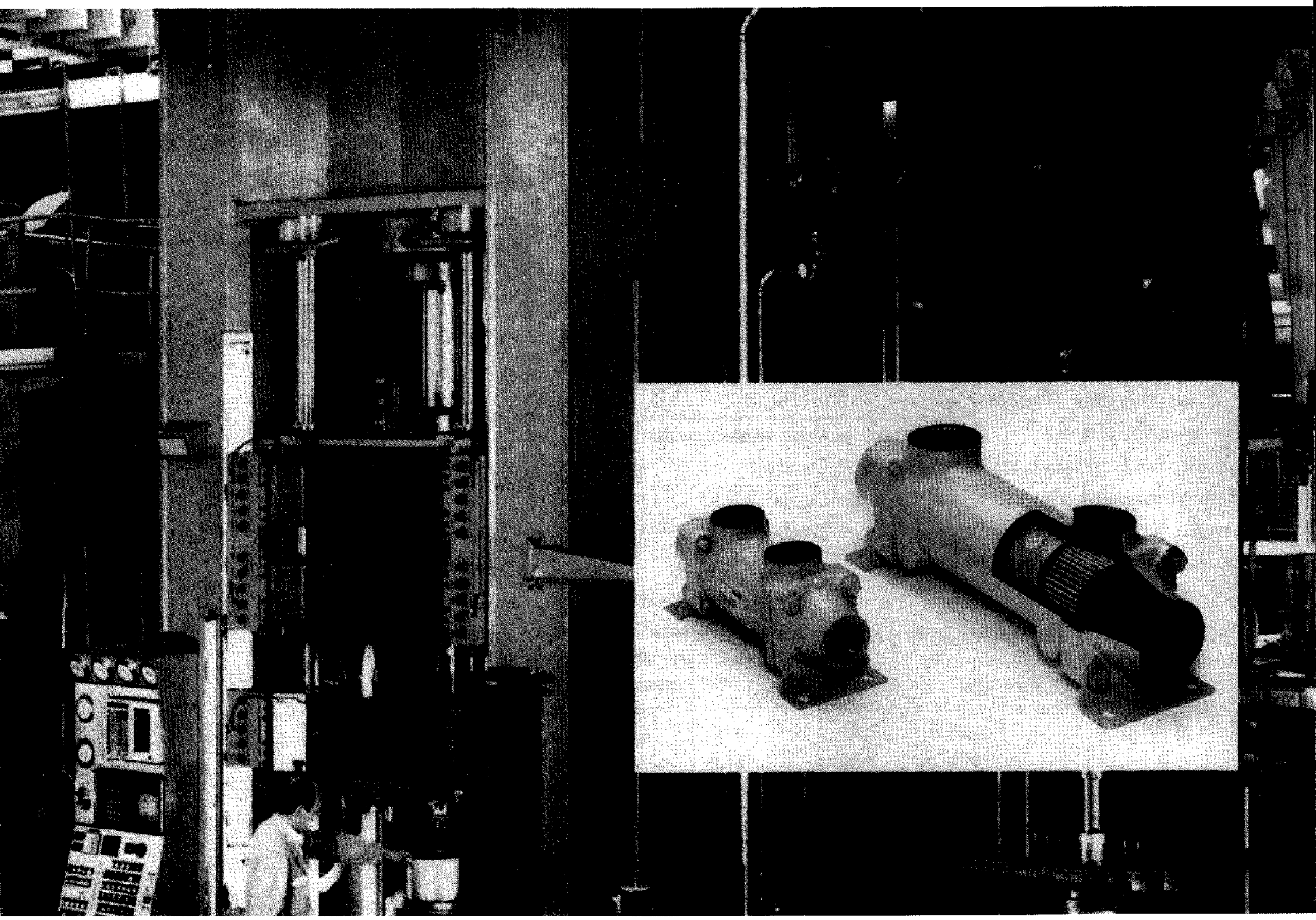
Type F heat exchangers for industrial applications



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Type F heat exchangers

- **compact, pressure-resistant design**
- **high transfer capacity**
- **sensible arrangement of heat exchanger sizes**
- **simple to install**
- **savings on maintenance costs through simple tube bundle construction**
- **temperature stability up to 130 °C**
- **maximum operating pressure 25 bar**

Areas of Application

For cooling hydraulic and lubricating oil, water, liquids which are hard to ignite, and oil-in-water emulsions. Fresh water (drinking water or industrial water and river water), sea-water or brackish water can all be used as the cooling medium.

Due to the heat exchangers' geometrically simple, cylindrical shape, they can easily be installed in engines, transmission systems, brakes or machine housings.

Heat exchangers can be supplied with tubes having an external diameter of 4 or 6 mm, to cater for various areas of application. The larger diameter tubes are installed whenever it is anticipated that the media will have a higher degree of contamination.

Design

The bundle of tubes floats inside the housing. The seal between the shell and the inner area is provided by flexible seals. This means that thermal expansion does not lead to any stress.

Material Qualities

1. for industrial applications:
   (i.e. freshwater cooling medium)
   housing and lid – grey cast iron
   bundle of tubes – CuZn 28 Sn 1
2. for seawater applications:
   housing – grey cast iron
   lid – red brass
   bundle of tubes – CuNi 30.

The normal industrial and seawater models are supplied with a plastic base and a buna N O-ring.

Both designs can be provided with a viton O-ring as a special option.

As a further option, the industrial model can be supplied with a welded base, making it suitable for special applications such as engine test beds which have high vibration levels.

The heat exchangers are painted and have a protective coating on the inside.

Model Designation

(Stock no.)

F 07 6 4 K –

Type F heat exchanger

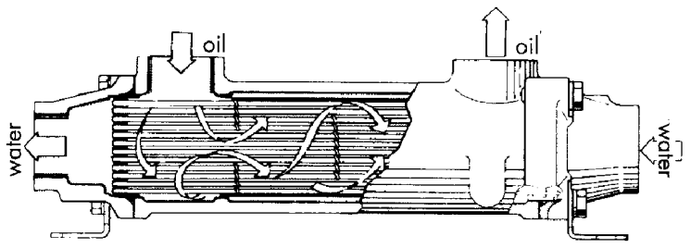
Diameter of casing x 10^{-1} in mm

Length of bundle of tubes x 10^{-2} in mm

Outer tube diameter of single tube in bundle in mm

Bundle design:
K = plastic base, industrial model
SK = plastic base, seawater model
H = welded base, industrial model (special option)

O-ring seal:
no specification = buna N
V = viton (special option)



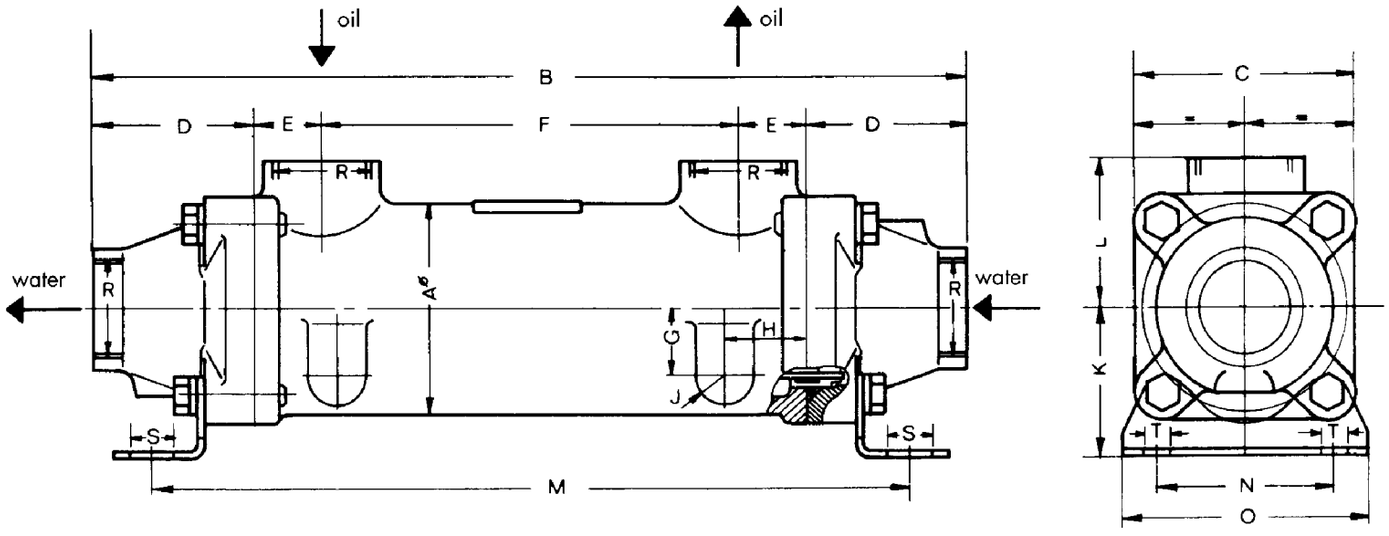


Table of Measurements

Heat exchanger type

Tube diameter	4 mm / 6 mm	F 0514 / F 0516	F 0524 / F 0526	F 0534 / F 0536	F 0544 / F 0546	F 0724 / F 0726	F 0734 / F 0736	F 0754 / F 0756	F 0764 / F 0766	F 1044 / F 1046	F 1054 / F 1056	F 1064 / F 1066
Main dimensions in mm	A	70	70	70	70	92	92	92	92	126	126	126
	B	248	298	398	498	327	427	627	727	563	663	763
	C	75	75	75	75	100	100	100	100	135	135	135
	D	55	55	55	55	70	70	70	70	90	90	90
	E	23	23	23	23	32	32	32	32	38	38	38
	F	92	142	242	342	123	223	423	523	307	407	507
	G	22	22	22	22	28	28	28	28	45	45	45
	H	28	28	28	28	36	36	36	36	38	38	38
	J	10	10	10	10	15	15	15	15	15	15	15
	K	50	50	50	50	65	65	65	65	80	80	80
	L	50	50	50	50	65	65	65	65	95	95	95
	M	208	258	358	458	267	367	567	667	473	573	673
	N	60	60	60	60	82	82	82	82	110	110	110
	O	85	85	85	85	110	110	110	110	145	145	145
	R	G1″	G1″	G1″	G1″	G11/2″	G11/2″	G11/2″	G11/2″	G2″	G2)	G2)
	S	15	15	15	15	15	15	15	15	17	17	17
	T	9	9	9	9	11	11	11	11	13	13	13
Approx. weight in kg		4.0	4.5	6.0	7.0	8.0	10.0	13.0	17.0	21	26	30

Specific Thermal Output $\frac{Q}{\Delta t_e}$

Validity Range:

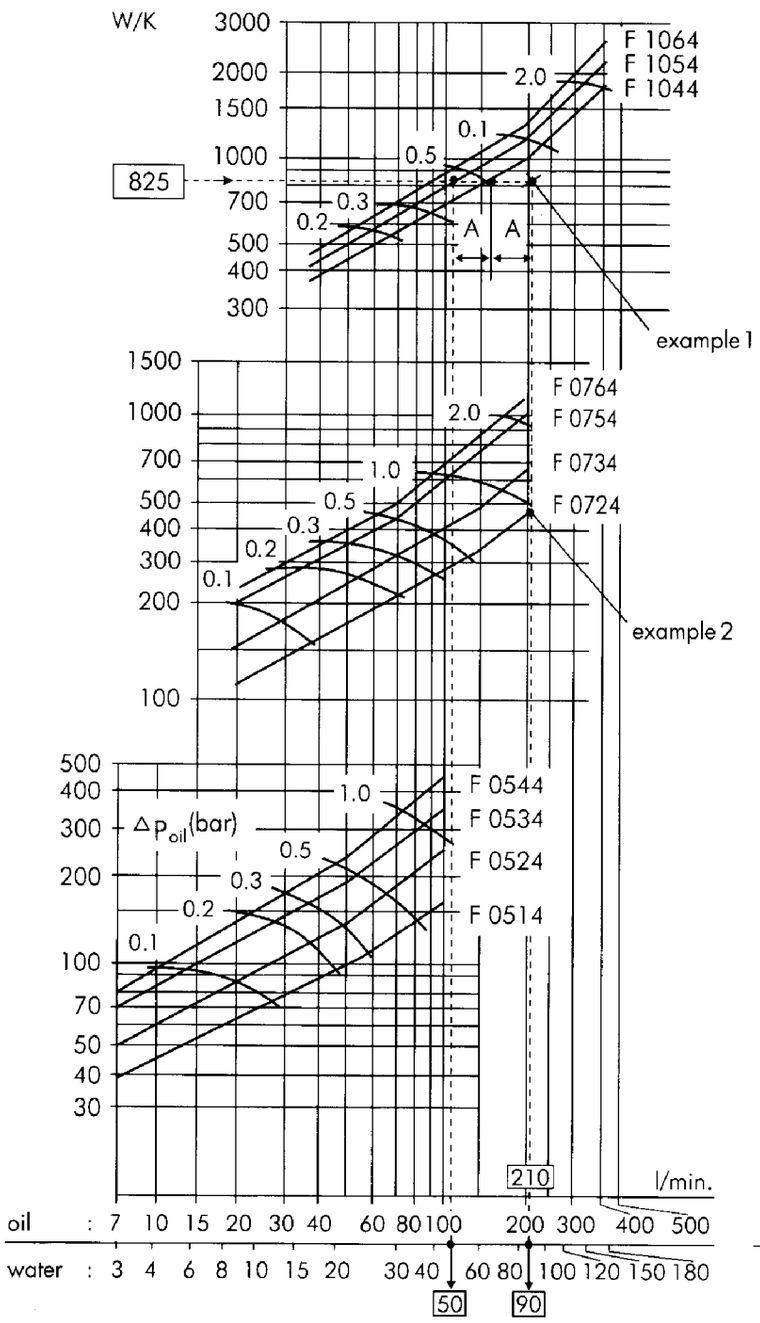
Ratio: oil/water (kg/s) 2 : 1

Oil: t_{e_1} = 60 °C, ISO VG 46, density 0.85 kg/dm³

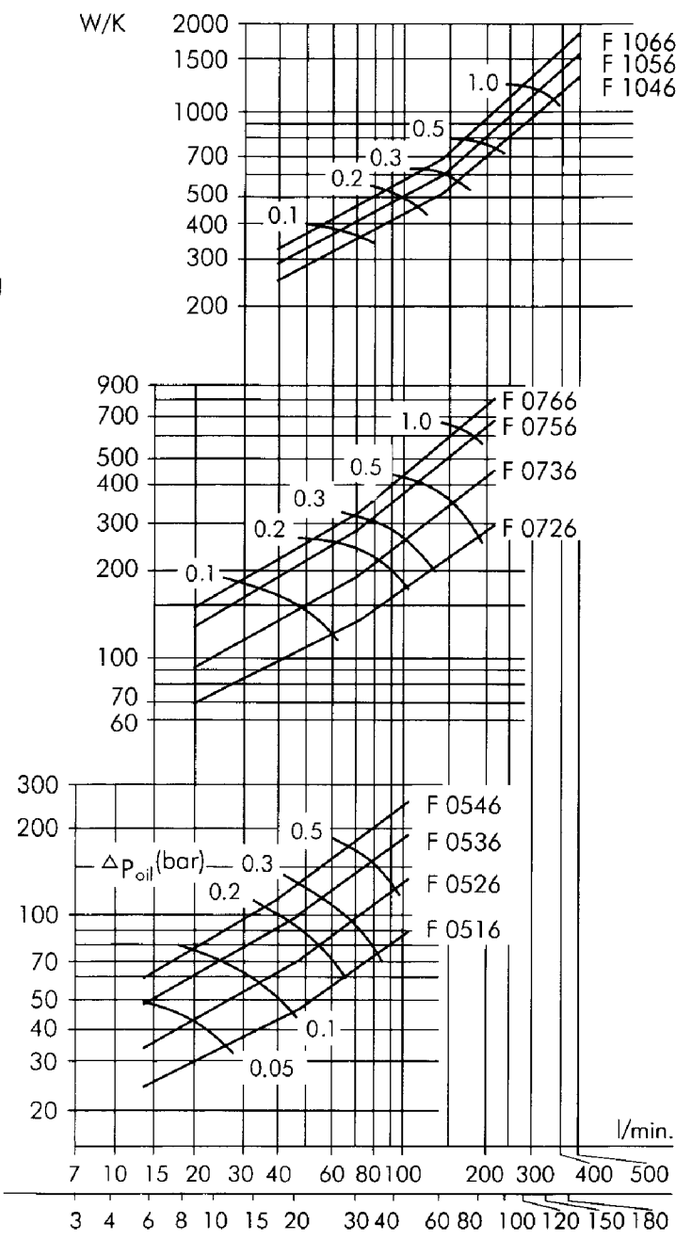
Water: t_{e_2} = 20 °C

$\Delta t_e = t_{e_1} - t_{e_2}$ = 40 K

4 mm tube diameter



6 mm tube diameter



Calculation example: oil/water

Given that:	Example 1	Example 2
thermal output to be eliminated (Q)	30 kW	30 kW
oil volume flow	210 l/min	210 l/min
oil inlet temperature	60 °C	80 °C
water inlet temperature	20 °C	20 °C
oil viscosity	ISO VG 46	ISO VG 22
max. oil pressure loss	1 bar	1 bar

Determining the required specific heat output:

$$\frac{Q}{\Delta t_e} = \frac{Q \cdot s}{b \cdot c(t_{e_1} - t_{e_2})}$$

Example 1:

$$\frac{Q}{\Delta t_e} = \frac{30000 \cdot 1.1}{1 \cdot 1(60-20)} = 825 \text{ W}$$

Selection:

find the point of intersection between 825 W/K und 210 l/min oil = ✖

The option higher than this, taking into account max. pressure loss of 1 bar, is F 1044.

Determining the required water volume flow:

Distance A (space from the point of intersection on the output ✖ curve for type F 1044) is doubled and this point is perpendicularly dropped on to the x-axis. This results in a volume flow of approx. 50 l/min.

Output correction factors: b, c, s

b	1.06	Δt_e = 60 K (oil t_{e_1} = 80 °C, water t_{e_2} = 20 °C)
	1	Δt_e = 40 K (oil t_{e_1} = 60 °C, water t_{e_2} = 20 °C)
	0.94	Δt_e = 20 K (oil t_{e_1} = 40 °C, water t_{e_2} = 20 °C)
	1.06	viscosity ISO VG 22
c	1	viscosity ISO VG 46
	0.94	viscosity ISO VG 100
s	1.1	selected safety margin

Example 2:

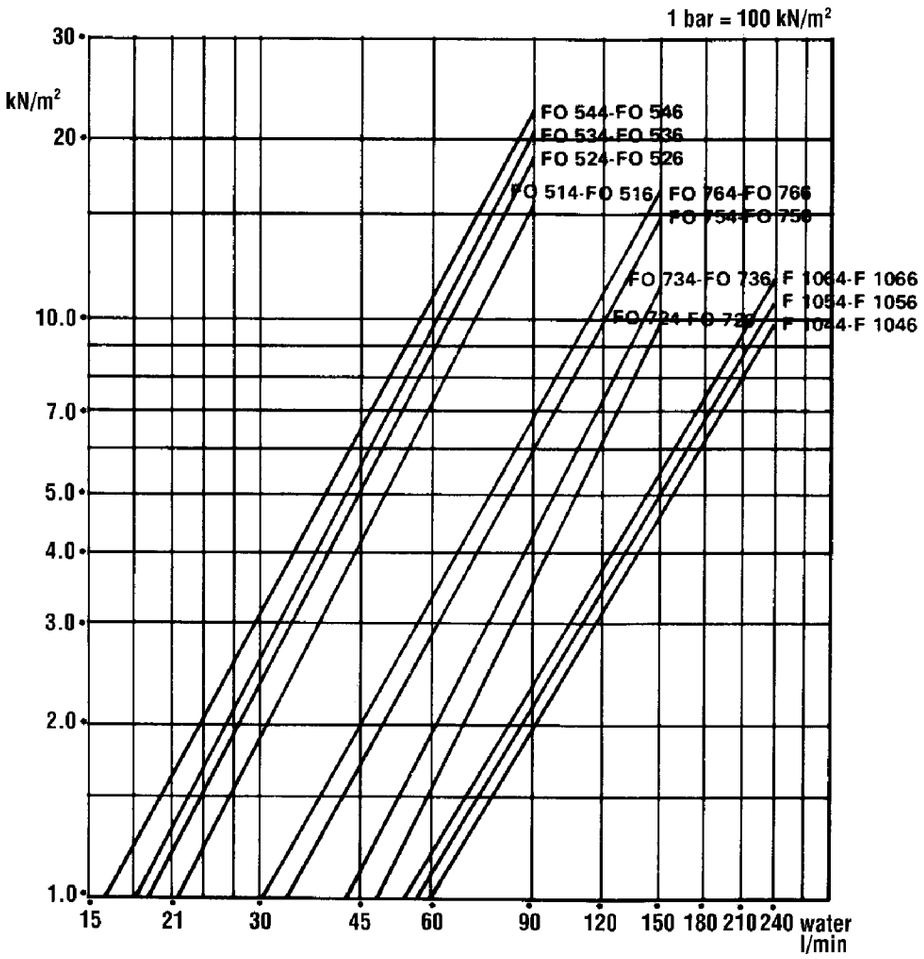
$$\frac{Q}{\Delta t_e} = \frac{30000 \cdot 1.1}{1.06 \cdot 1.06(80-20)}$$

$$\frac{Q}{\Delta t_e} = 489.5 \approx 490 \text{ W/K}$$

Selection:

Type F 0724 with 90 l/min cooling water

Pressure loss – water



Technical information

	Oil/water contents (l) (without threaded connection)		Cooling surface	Tube bundle dimensions	
	Shell side	Tube interior	m²	Dia. (mm)	Length (mm)
F 0514	0.2	0.2	0.14	48.5	162
0524	0.28	0.22	0.19	48.5	214
0534	0.38	0.3	0.28	48.5	314
0544	0.58	0.38	0.37	48.5	414
0724	0.5	0.54	0.38	68	214
0734	0.76	0.66	0.56	68	314
0754	1.24	0.96	0.94	68	514
0764	1.6	1.08	1.13	68	614
1044	1.92	1.76	1.60	98	414
1054	2.46	2.02	2.00	98	514
1064	2.92	2.4	2.40	98	614
F 0516	0.22	0.2	0.09	48.5	162
0526	0.3	0.22	0.12	48.5	214
0536	0.4	0.3	0.18	48.5	314
0546	0.66	0.34	0.23	48.5	414
0726	0.52	0.52	0.24	68	214
0736	0.8	0.64	0.36	68	314
0756	1.3	0.88	0.60	68	514
0766	1.62	1.08	0.73	68	614
1046	2.12	1.76	1.05	98	414
1056	2.52	2.0	1.31	98	514
1066	3.0	2.3	1.58	98	614

Our production programme

- Heat exchangers for cooling control boxes
- High performance vertical and horizontal condensers (using ammonia, half-CFCs, half-fluorohydrocarbons, mixtures, hydrocarbons, carbon dioxide)
- Condensers for hermetic, semi-hermetic and open compressor sets
- Condensers and evaporators for railway vehicles
- Heaters for refrigerators and deep freezes
- Evaporators for cooling cells
- Air coolers for water
- Special heat exchangers
- Pipe assembly heat exchangers for water and oil
- Wall and floor brackets to affix heat exchangers
- Fuel tanks for the motorbike industry
- Wheel rims for the motorbike industry

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