# Air Oil Coolers

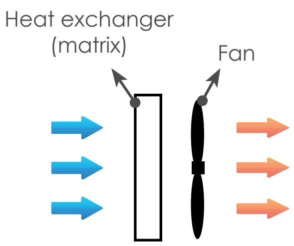
HLA2 Series - AC Motor Driven
HLD Series - DC Motor Driven
HLH2 Series - Hydraulic Motor Driven
HLO3 Series - Offline Circulation Pump Driven
HLAX Series - Axial Motor Driven



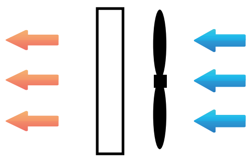
## What is an air oil cooler?

In a hydraulic system, managing the temperature of the working fluid is an important maintenance point that can affect system performance. If the temperature is too low, the viscosity increases, which can lead to damage to the hydraulic device due to increased friction. On the other hand, if the oil temperature rises above 60 °C, thermal degradation occurs, and viscosity changes as well. As a result, cylinder speed decreases, the life of the oil is shortened, and it can also affect the sealing, leading to leakage. In other words, if the temperature of the oil is not managed properly, the hydraulic system's performance can be degraded, and maintenance costs can increase.

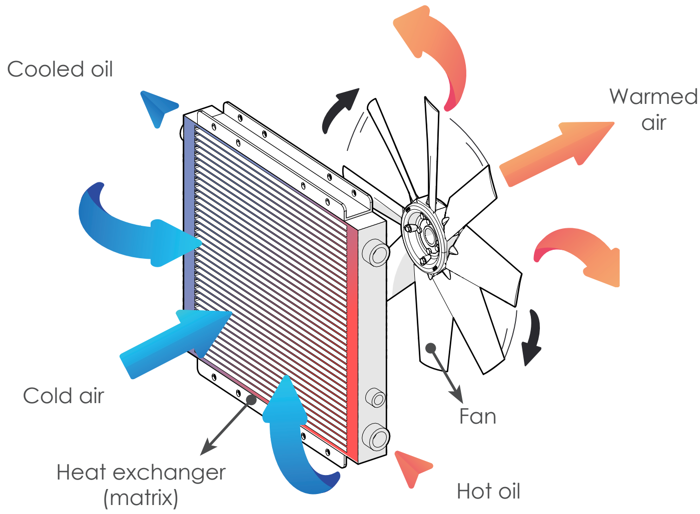
An air-cooled cooler is a device that cools high-temperature oil to maintain proper viscosity in a hydraulic system. An air oil cooler consists of heat exchanger plates (matrix) through which high-temperature oil passes, and a fan that blows air over the matrix to cool them. Depending on the direction of the airflow over the matrix, they can be classified as suction or blow types, with the suction type generally having better cooling efficiency.




**Suction**



**Blow**




**Suction-type cooling**

## Driving method

Depending on the method of driving the fan, the types of air oil coolers are determined, and typically include AC motors, DC motors, hydraulic motors, offline circulation pumps, and axial motor methods.

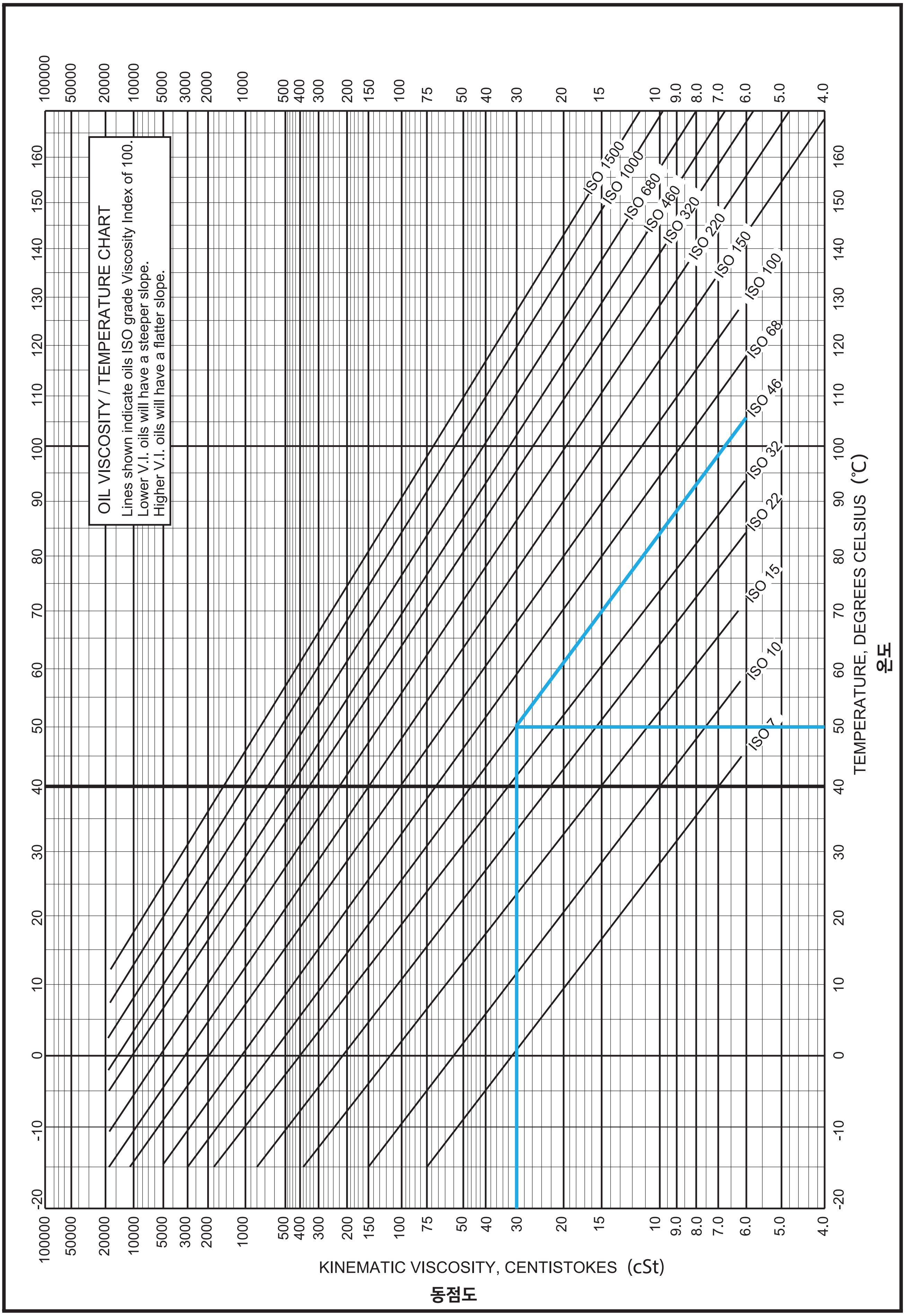
**HLA2 Series**
**AC motor driven**

**HLD Series**
**DC motor driven**

**HLH2 Series**
**Hydraulic motor driven**

**HLO3 Series**
**Offline circulation pump driven**

**HLAX Series**
**Axial motor driven**


OIL VISCOSITY / TEMPERATURE CHART
Lines shown indicate oils ISO grade Viscosity Index of 100.
Lower V.I. oils will have a steeper slope.
Higher V.I. oils will have a flatter slope.
ISO 1500
ISO 1000
ISO 680
ISO 460
ISO 320
ISO 220
ISO 150
ISO 100
ISO 68
ISO 46
ISO 32
ISO 22
ISO 15
ISO 10
ISO 7
100000 50000 20000 10000 5000 3000 2000 1000 500 400 300 200 150 100 75 50 40 30 20 15 10 9.0 8.0 7.0 6.0 5.0 4.0
-20 -10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
KINEMATIC VISCOSITY, CENTISTOKES (cSt)
동점도
TEMPERATURE, DEGREES CELSIUS (℃)
온도

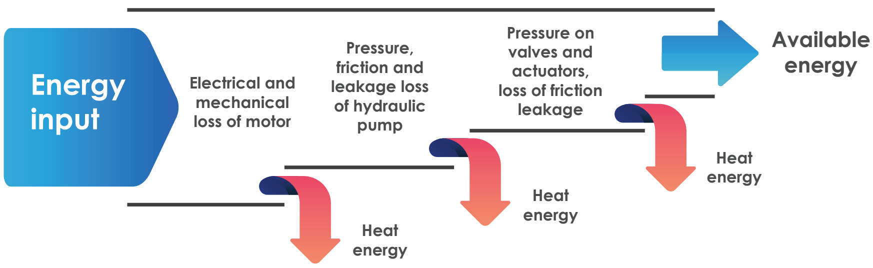
## Management of oil viscosity

If the oil temperature is constant, the viscosity also remains constant, ensuring consistent valve response and cylinder speed. Please refer to the Kinematic Viscosity chart on the left page for the recommended kinematic viscosity and temperature control that should be maintained depending on the type of operating fluid used in the hydraulic system.

| ISO Viscosity Grade (ISO VG) | Kinematic Viscosity @40 ℃ (cTs) | | |
|---|---|---|---|
| | Minimum | Maximum | Mid-point |
| 22 | 19.8 | 24.2 | 22.0 |
| 32 | 28.8 | 35.2 | 32.0 |
| 46 | 41.4 | 50.6 | 46.0 |
| 68 | 61.2 | 74.8 | 68.0 |
| 100 | 90.0 | 110 | 100 |
| 150 | 135 | 165 | 150 |
| 220 | 198 | 242 | 220 |
| 320 | 288 | 352 | 320 |
| 460 | 414 | 506 | 460 |
| 680 | 612 | 748 | 680 |

## Purpose of use of cooler

In all hydraulic systems, there are various forms of energy loss, such as pressure, friction, and leakage to varying degrees. Energy is lost due to pressure drop in the lines caused by friction and flow bias, pressure drop in accessories such as valves, filters, and coolers, high throttling in pressure regulation systems, and leakage losses at sealing points. All of these losses are converted into heat that is absorbed by the oil and the housing.




The purpose of using a cooler is to maintain the heat generated by the energy loss at a constant level, thereby increasing the efficiency of the system and reducing maintenance costs. The heat generated by the loss of energy can damage the pump, hose, sealing, and bearings installed in the hydraulic system, shortening their lifespan. As mentioned earlier, the decrease in viscosity makes it difficult to control the valve and cylinder precisely, and the overall efficiency of the system decreases, resulting in a significant increase in maintenance costs.

## Selection of Cooler

The selection of a cooler is to achieve the goal by using a cooler with a cooling capacity equal to or greater than the heat energy converted from the input energy, as shown in the figure above. Therefore, to select a cooler, it is necessary to first accurately understand the heat load factors generated in the system. Machinery and hydraulic systems are used to generate and transmit power, but mechanical efficiency, friction, pressure, and other power losses generate heat. If this heat energy is defined as $P_H$ the formula for calculating it can be expressed as follows:

**When the specific heat unit is (kJ/kg°C)**

$$P_H = (T_2 - T_1) \times SG \times SH \times Q /60 \ \ [kW]$$

**When the specific heat unit is (Kcal/kg°C)**

$$P_H = (T_2 - T_1) \times SG \times SH \times Q /60 \ \ [Kcal/h]$$

$$P_H = \frac{(T_2 - T_1) \times SG \times SH \times Q /60}{860} \ \ [kW]$$

| | |
|---|---|
| $P_H$ | System heat dissipation (kW) |
| $T_1$ | Oil temperature before system operation (°C) |
| $T_2$ | Oil temperature after system operation (°C) |
| $Q$ | Flow rate of oil(l/min) |
| $SG$ | Specific gravity of the oil (kg/l) |
| $SH$ | Specific heat of oil |

To maintain a certain temperature in the system, the cooling heat exchange amount $P_C$ of the cooler must be equal to or greater than the heat generated by the system $P_H$ under the maximum temperature conditions of the flow rate flowing into the cooler and the surrounding environment. The cooling heat exchange amount of the cooler is defined by the calculation formula of the inlet and outlet temperatures of the cooler, the ambient air temperature, the flow rate, and the fluid properties, as shown below.

**When the specific heat unit is (kJ/kg°C)**

$$P_C = (T_{in} - T_{out}) \times SG \times SH \times Q_C /60 \ \ [kW]$$

**When the specific heat unit is (Kcal/kg°C)**

$$P_C = (T_{in} - T_{out}) \times SG \times SH \times Q_C /60 \ \ [Kcal/h]$$

$$P_C = \frac{(T_{in} - T_{out}) \times SG \times SH \times Q_C /60}{860} \ [kW]$$

| | |
|---|---|
| $P_H$ | Cooler heat dissipation (kW) |
| $T_{in}$ | Cooler inlet oil temperature (°C) |
| $T_{out}$ | Cooler outlet oil temperature (°C) |
| $Q$ | Flow rate of oil(l/min) |
| $SG$ | Specific gravity of the oil (kg/l) |
| $SH$ | Specific heat of oil |

ETD(Entrance Temperature Difference) refers to the difference between the cooler's maximum ambient temperature and the oil temperature at the cooler inlet. In other words, it is expressed as follows:

$$ETD = T_{inmax} - T_{ambientmax}$$

| | |
|---|---|
| $T_{inmax}$ | Cooler inlet max. oil temperature (°C) |
| $T_{ambientmax}$ | Cooler max. ambient temperature (°C) |

For example, if the oil temperature at the cooler inlet is 60°C and the maximum ambient temperature is 20°C, the ETD is 40°C. By dividing the cooling heat exchange amount PC defined above by the ETD, we define the cooling capacity (kW/°C). In this product selection guide, the cooling capacity is used as a unit to allow users to select the product.

$$\text{Cooling Capacity} = P_C \ / \ ETD \ (kW/ °C)$$

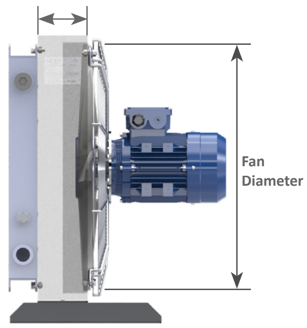
## HydroLync Design Theory

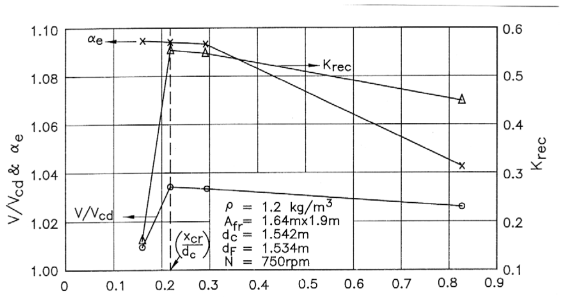
HydroLync's product design is based on thoroughly proven scientific research and incorporates design concepts derived from that research. We strive to continuously create stable and optimized products by using CFD (Computational Fluid Dynamics) simulations to review both production efficiency and durability.

### Fan Positioning

The main components of an air oil cooler are the heat exchanger, fan, and the driving mechanism that drives the fan. When designing the product, the shape and angle of the fan blade, as well as the distance between the heat exchanger and the fan, are important factors for maximizing the cooler's performance.

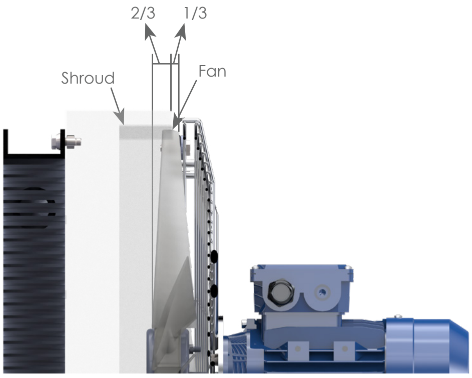
**Distance between matrix and fan**

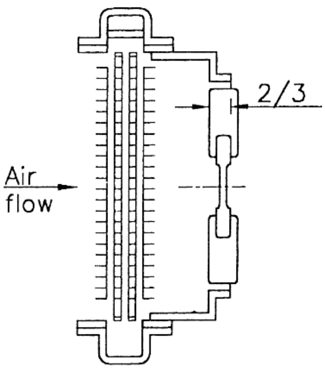



**The performance of heat exchange on the position of the fan**

The performance graph shows how heat exchange performance varies depending on the position of the fan. HydroLync's air oil cooler is positioned according to these calculations to optimize performance.

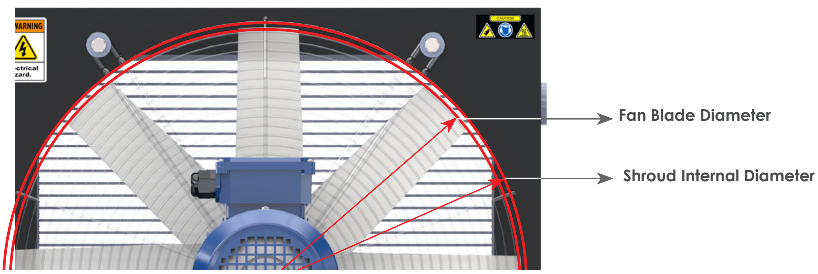



### Tip Clearance

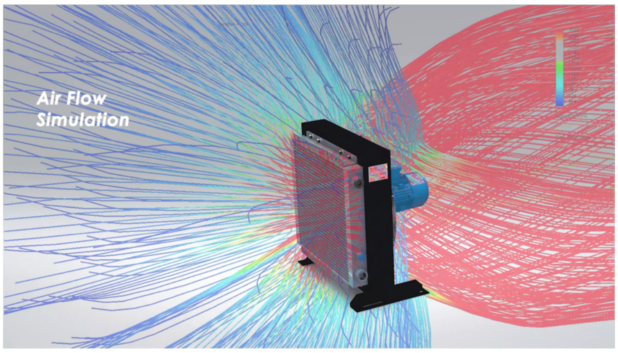
The distance between the surrounding surface and the blade tip of the fan called "tip clearance" around the fan called Shroud has a significant impact on the performance of the cooler. The design of the hydroLync applies the API (American Petroleum Institute) Standard 661, which states that the maximum airflow is achieved when the tip clearance is 0.5-1% of the fan blade diameter, and the theory that the fan blade should be located 1/3 outside of the shroud for optimal performance, as stated in the Military Vehicle Power Plant Cooling Handbook: AMCP 706-361 used by the US military.

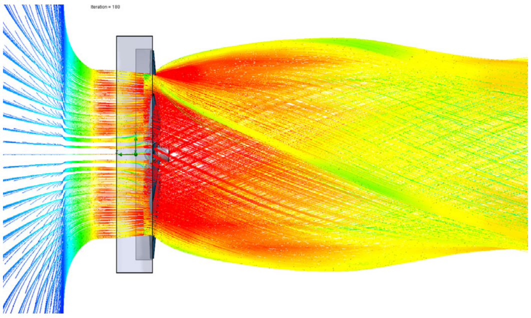
**Tip Clearance = Shroud Internal Diameter - Fan Blade Diameter**



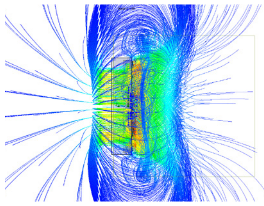
### Simulation Analysis

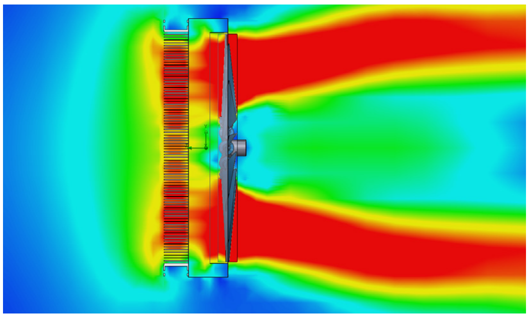
The use of CFD (Computation Fluid Dynamics) analysis has significantly reduced development costs by predicting the state of products under various conditions before applying them to mass production, and has greatly improved the productivity of developing new products. In an air oil cooler, the fan generates airflow, which passes through the oil flowing over the matrix, extracting heat and cooling it down. Therefore, the airflow is determined by the position of the fan, the shape of the blades, and their angles, which are directly linked to the performance of the cooler. During the product development phase, CFD simulation can be used to determine if the ideal performance is possible before creating a prototype. Any necessary improvements can be made immediately and reflected in the development process, allowing for a very rapid development process.



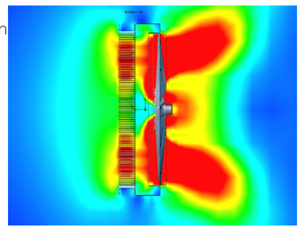



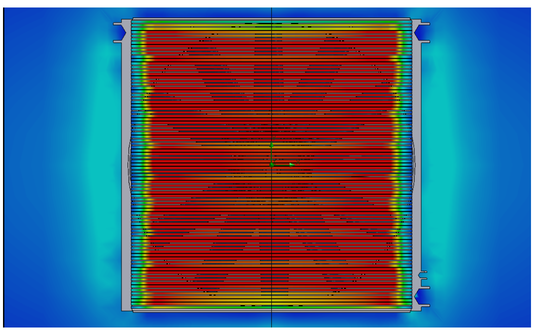
The ideal airflow shape formed by the rotation of the fan blades should be streamlined, as shown on the left side of the image. The shape shown below is the result of incorrect positioning of the fan and blade settings, resulting in significant turbulence in the airflow, which leads to increased power consumption and decreased cooling performance.



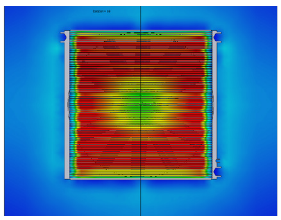


A fast airflow helps to quickly dissipate heat from the matrix, resulting in improved cooling performance. By setting the fan in an ideal position, the airflow can be formed as quickly as possible over the entire surface of the matrix. On the other hand, incorrect settings result in uneven airflow over the matrix, leading to decreased cooling performance.





When the fan is not ideally positioned, a dead zone can occur where little or no airflow is formed over some areas of the matrix. The ideal state is to minimize the dead zone over the entire surface, as shown on the left side of the image. However, if the fan position is incorrectly set, a dead zone can occur as shown below, leading to decreased cooling performance of the cooler.

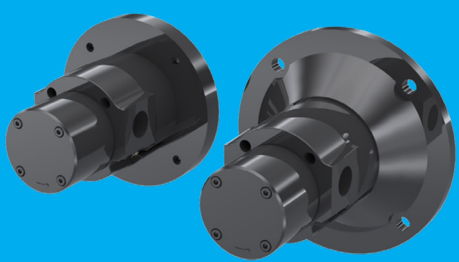


# HLO3 Series

## Offline Circulation Pump




## Features



- Applied Gerotor pump
- Smooth, low pulsation flow and compact design
- Low noise and vibration
- Performs well at low speeds (good suction capability)

## Quick Overview

Hydraulic offline circulation pump oil cooler, HLO3 Series from HydroLync, provides a wide range of specifications. You can quickly check the cooling performance, heat dissipation, and maximum flow rate of each model in ISO VG 46 oil based on ETD 40℃.

| No. | Model-Poles(discharge)_Cooling Performance(KW/℃) ( Heat Dissipation KW, Kcal/h) / Max. Flow rate(LPM)@1,710rpm/60Hz |
|---|---|
| 1 | HLO3 07-4 (13.8cm3/rev. Pump) _ 0.09KW/℃ (3.6KW, 3,096Kcal/h) / Approx. 24LPM |
| 2 | HLO3 07-4 (27.5cm3/rev. Pump) _ 0.17KW/℃ (6.8W, 5,848Kcal/h) / Approx. 47LPM |
| 3 | HLO3 07-4 (41.0cm3/rev. Pump) _ 0.21KW/℃ (8.4KW, 7,224Kcal/h) / Approx. 70LPM |
| 4 | HLO3 07-4 (55.0cm3/rev. Pump) _ 0.23KW/℃ (9.2KW, 7,912Kcal/h) / Approx. 94LPM |
| 5 | HLO3 11-4 (13.8cm3/rev. Pump) _ 0.13KW/℃ (5.2KW, 4,472Kcal/h) / Approx. 24LPM |
| 6 | HLO3 11-4 (27.5cm3/rev. Pump) _ 0.25KW/℃ (10.0KW, 8,600Kcal/h) / Approx. 47LPM |
| 7 | HLO3 11-4 (41.0cm3/rev. Pump) _ 0.32KW/℃(12.8KW, 11,008Kcal/h) / Approx. 70LPM |
| 8 | HLO3 11-4 (55.0cm3/rev. Pump) _ 0.35KW/℃(14.0KW, 12,040Kcal/h) / Approx. 94LPM |
| 9 | HLO3 16-4 (13.8cm3/rev. Pump) _ 0.19KW/℃ (7.6KW, 6,536Kcal/h) / Approx. 24LPM |
| 10 | HLO3 16-4 (27.5cm3/rev. Pump) _ 0.36KW/℃ (14.4KW, 12,384Kcal/h) / Approx. 47LPM |
| 11 | HLO3 16-4 (41.0cm3/rev. Pump) _ 0.45KW/℃ (18.0KW, 15,480Kcal/h) / Approx. 70LPM |
| 12 | HLO3 16-4 (55.0cm3/rev. Pump) _ 0.50KW/℃ (20.0KW, 17,200Kcal/h) / Approx. 94LPM |
| 13 | HLO3 23-4 (13.8cm3/rev. Pump) _ 0.23KW/℃ (9.2KW, 7,912Kcal/h) / Approx. 24LPM |
| 14 | HLO3 23-4 (27.5cm3/rev. Pump) _ 0.45KW/℃ (18.0KW, 15,480Kcal/h) / Approx. 47LPM |
| 15 | HLO3 23-4 (41.0cm3/rev. Pump) _ 0.58KW/℃(23.2KW, 19,952Kcal/h) / Approx. 70LPM |
| 16 | HLO3 23-4 (55.0cm3/rev. Pump) _ 0.65KW/℃ (26.0KW, 22,360Kcal/h) / Approx. 94LPM |
| 17 | HLO3 33-4 (13.8cm3/rev. Pump) _ 0.25KW/℃ (10.0KW, 8,600Kcal/h) / Approx. 24LPM |
| 18 | HLO3 33-4 (27.5cm3/rev. Pump) _ 0.49KW/℃ (19.6KW, 16,856Kcal/h) / Approx. 47LPM |
| 19 | HLO3 33-4 (41.0cm3/rev. Pump) _ 0.63KW/℃ (25.2KW, 21,672Kcal/h) / Approx. 70LPM |
| 20 | HLO3 33-4 (55.0cm3/rev. Pump) _ 0.72KW/℃ (28.8KW, 24,768Kcal/h) / Approx. 95LPM |
| 21 | HLO3 35-4 (13.8cm3/rev. Pump) _ 0.27KW/℃ (10.8KW, 9,288Kcal/h) / Approx. 24LPM |
| 22 | HLO3 35-4 (27.5cm3/rev. Pump) _ 0.52KW/℃ (20.8KW, 17,888Kcal/h) / Approx. 47LPM |
| 23 | HLO3 35-4 (41.0cm3/rev. Pump) _ 0.68KW/℃ (27.2KW, 23,392Kcal/h) / Approx. 70LPM |
| 24 | HLO3 35-4 (55.0cm3/rev. Pump) _ 0.77KW/℃ (30.8KW, 26,488Kcal/h) / Approx. 94LPM |

**[Remark]** Output Flow Rate for Circulation Pump (Lit/min) = (v • Ns) / 1000
v : Hydraulic Motor Volume (cm3/rev)
Ns : RPM for AC Motor

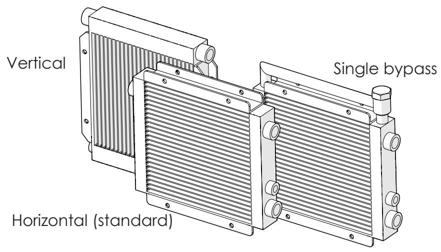
* Based On ETD 40℃ / ISO VG 46 *

## Ordering code

**Example:** HLO3 [ ] [07] - [4] - [220/380V, 60hz] - [D] - [ ]

1 2 3 4 5 6

| 1 | Matrix types |
|---|---|
| | Horizontal (Standard) |
| **V** | Vertical |
| **SB** | Single Bypass |

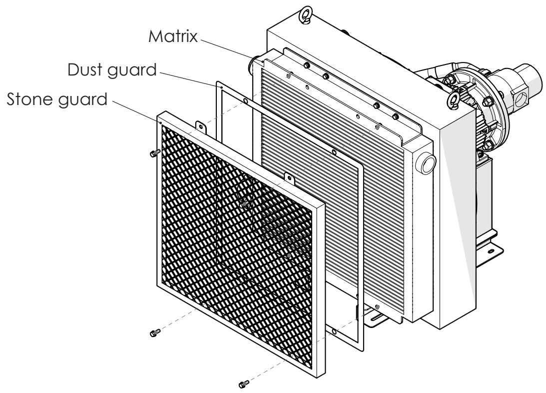



| 2 | Matrix size | |
|---|---|---|
| **Code** | **Size** | **Port** |
| **07** | 335x322x63 | G1" |
| **11** | 405x390x63 | G1" |
| **16** | 464x458x63 | G1" |
| **23** | 545x540x63 | G1" |
| **33** | 640x648x63 | G1" |
| **35** | 640x648x83 | G1 1/2" |

| 3 | Motor poles | |
|---|---|---|
| **Poles** | **Hertz** | **Max. Speed (RPM)** |
| **4** | 50Hz | 1,500 |
| | 60Hz | 1,720 |
| | Applicable | HLO3 07 ~ 35 |

| 4 | Power supply | |
|---|---|---|
| **Phase** | **Power supply** | **Applicable model** |
| Three | **220/380V 50/60Hz** | HLO3 07 ~ 35 |
| Three | **240/420V 50Hz** | HLO3 07 ~ 35 |
| Three | **280/480V 60Hz** | HLO3 07 ~ 35 |
| Three | **440V 60Hz** | HLO3 07 ~ 35 |

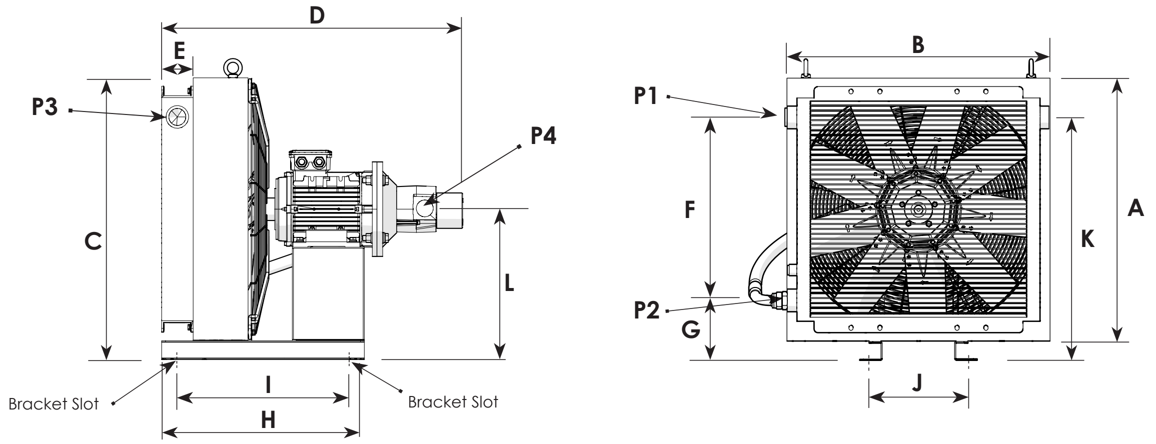
| 5 | Matrix protection accessories |
|---|---|
| | None (standard) |
| **D** | Dust Guard |
| **S** | Stone Guard |
| **A** | Dust Guard + Stone Guard |




| 6 | Production type |
|---|---|
| | Standard |
| **C** | Customization |

Air Oil Coolers

## HLO3 07 ~ 35



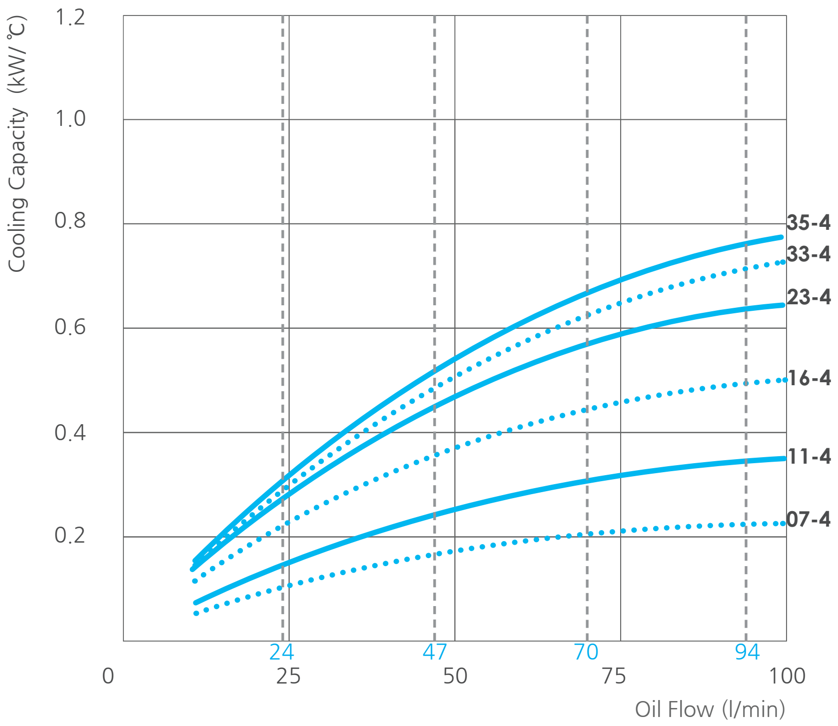

| HLO3 Model | A | B | C | D | E | F | G | H | I | J | K | L | P1,2,3 | Slot Hole | Weight (kg) | Noise Level (dB) 1m |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **07** | 365 | 365 | 405 | (582) | 63 | 160 | 143 | 385 | (295) | 230 | 303 | 225 | G1" | ø10x90 ø10x19 | 33.5 | 65 |
| **11** | 440 | 440 | 480 | (600) | 63 | 228 | 146 | 400 | (310) | 230 | 374 | 262 | G1" | ø10x90 ø10x19 | 38.5 | 70 |
| **16** | 496 | 496 | 536 | (610) | 63 | 296 | 143 | 410 | (310) | 230 | 439 | 290 | G1" | ø10x90 ø10x19 | 42.5 | 74 |
| **23** | 579 | 579 | 619 | (676) | 63 | 378 | 140 | 455 | (355) | 260 | 518 | 332 | G1" | ø10x90 ø10x19 | 59.5 | 77 |
| **33** | 692 | 692 | 742 | (735) | 63 | 482 | 157 | 534 | (434) | 260 | 639 | 398 | G1 1/4" | ø10x90 ø10x19 | 73.5 | 85 |
| **35** | 692 | 692 | 742 | (754) | 83 | 482 | 157 | 534 | (434) | 260 | 649 | 398 | G1 1/2" | ø10x90 ø10x19 | 82.5 | 86 |

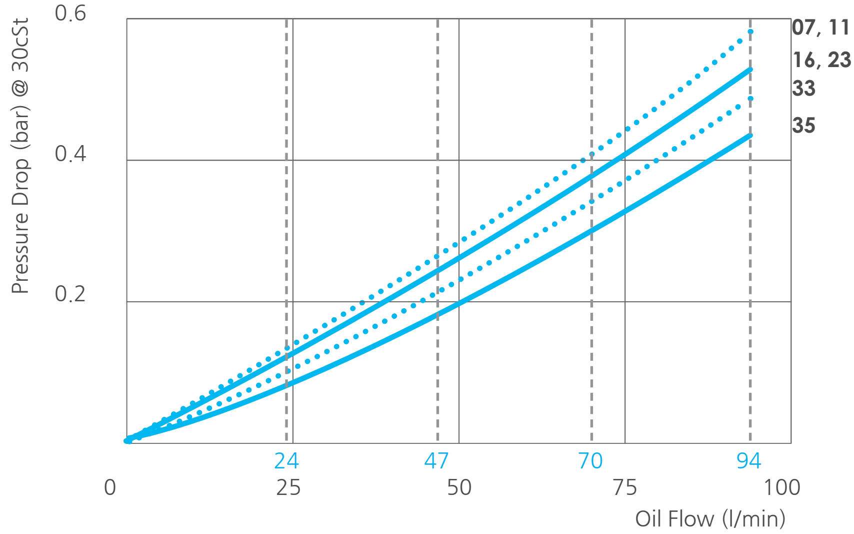
*** The above dimensions are based on 20L pump. As the pump capacity increases, the length of D increases by 12.7mm and the weight increases by 0.5Kg per size increment. Please refer to the approved drawing for detailed specification information.**

| Type | Oil Flow (cm³/rev) | Oil Flow (l/min) @1710 RPM | P4 (Pump Inlet) | Cooling Capacity (kW/ ˚C) | Motor Power (kW) | Motor Frame | Voltage |
|---|---|---|---|---|---|---|---|
| HLO3 07-4-20L | 13.8 | 24 | G 1 1/2" | 0.09 | 2.2 | 90L | 220/380/440V |
| HLO3 07-4-40L | 27.5 | 47 | G 1 1/2" | 0.17 | 2.2 | 90L | 220/380/440V |
| HLO3 07-4-60L | 41.0 | 70 | G 1 1/2" | 0.21 | 2.2 | 90L | 220/380/440V |
| HLO3 07-4-80L | 55.0 | 94 | G 1 1/2" | 0.23 | 2.2 | 90L | 220/380/440V |
| HLO3 11-4-20L | 13.8 | 24 | G 1 1/2" | 0.13 | 2.2 | 90L | 220/380/440V |
| HLO3 11-4-40L | 27.5 | 47 | G 1 1/2" | 0.25 | 2.2 | 90L | 220/380/440V |
| HLO3 11-4-60L | 41.0 | 70 | G 1 1/2" | 0.32 | 2.2 | 90L | 220/380/440V |
| HLO3 11-4-80L | 55.0 | 94 | G 1 1/2" | 0.35 | 2.2 | 90L | 220/380/440V |
| HLO3 16-4-20L | 13.8 | 24 | G 1 1/2" | 0.19 | 2.2 | 90L | 220/380/440V |
| HLO3 16-4-40L | 27.5 | 47 | G 1 1/2" | 0.36 | 2.2 | 90L | 220/380/440V |
| HLO3 16-4-60L | 41.0 | 70 | G 1 1/2" | 0.45 | 2.2 | 90L | 220/380/440V |
| HLO3 16-4-80L | 55.0 | 94 | G 1 1/2" | 0.50 | 2.2 | 90L | 220/380/440V |
| HLO3 23-4-20L | 13.8 | 24 | G 1 1/2" | 0.23 | 4.0 | 100L | 220/380/440V |
| HLO3 23-4-40L | 27.5 | 47 | G 1 1/2" | 0.45 | 4.0 | 100L | 220/380/440V |
| HLO3 23-4-60L | 41.0 | 70 | G 1 1/2" | 0.58 | 4.0 | 100L | 220/380/440V |
| HLO3 23-4-80L | 55.0 | 94 | G 1 1/2" | 0.65 | 4.0 | 100L | 220/380/440V |
| HLO3 33-4-20L | 13.8 | 24 | G 1 1/2" | 0.25 | 4.0 | 100L | 220/380/440V |
| HLO3 33-4-40L | 27.5 | 47 | G 1 1/2" | 0.49 | 4.0 | 100L | 220/380/440V |
| HLO3 33-4-60L | 41.0 | 70 | G 1 1/2" | 0.63 | 4.0 | 100L | 220/380/440V |
| HLO3 33-4-80L | 55.0 | 94 | G 1 1/2" | 0.72 | 4.0 | 100L | 220/380/440V |
| HLO3 35-4-20L | 13.8 | 24 | G 1 1/2" | 0.27 | 4.0 | 100L | 220/380/440V |
| HLO3 35-4-40L | 27.5 | 47 | G 1 1/2" | 0.52 | 4.0 | 100L | 220/380/440V |
| HLO3 35-4-60L | 41.0 | 70 | G 1 1/2" | 0.68 | 4.0 | 100L | 220/380/440V |
| HLO3 35-4-80L | 55.0 | 94 | G 1 1/2" | 0.77 | 4.0 | 100L | 220/380/440V |

**[Remark]** Output Flow Rate for Circulation Pump (Lit/min) = (v • Ns) / 1000
v : Hydraulic Motor Volume (cm3/rev)
Ns : RPM for AC Motor

* Based On ETD 40℃ / ISO VG 46 *

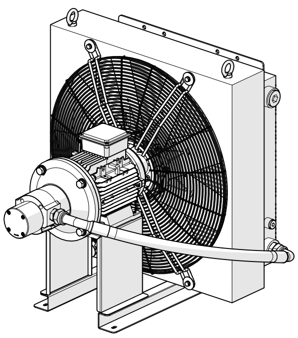


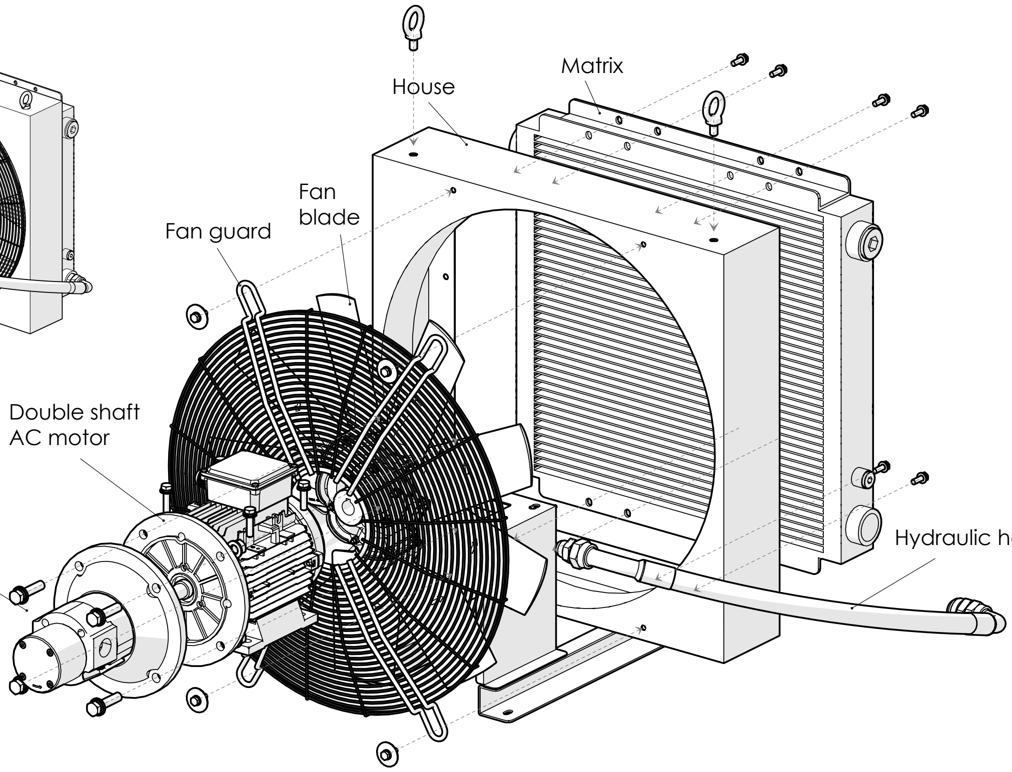




The cooling capacity curve is based on the oil temperature and the ambient air temperature entering the cooler. An oil temperature of +60℃ ($T_{inlet}$) and an ambient air temperature of +20℃ ($T_{ambientmax}$) provide a temperature difference (ETD) of +40℃. To obtain the total cooling capacity, multiply the cooling performance (kW/℃) by ETD (℃) as follows:

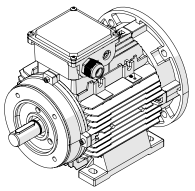
$ETD = T_{inlet} - T_{ambientmax}$ Cooling performance (kW/℃) x ETD (℃) = Cooling capacity (kW)

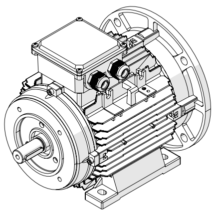
## Specifications

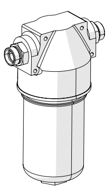


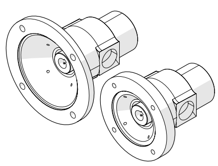










### Aluminum matrix

Hydrolync provides various aluminum matrices, and customers can choose between horizontal and vertical types to meet their requirements.

- Material:  3003/4004/5052
- Test pressure: 21 bar
- Test standard: ISO/DIS 10771-1
- Max. Working pressure: 14 bar
- Max. Working temperature: 120 ℃
- Paint: Epoxy / Polyester powder coatings - coating thickness 60 μm
- Paint color: RAL 9006 / silver

### Fan

- Fan blade material: Glass Reinforced Poly-amide (**PAG**) Working temperature: -40 ~ 120 ℃
- Fan boss material: Aluminum

### House

- Material: steel
- Paint: powder coating
- Color: black, white (option)

### Three phase AC motor

- IE3 certified motor (standard)
- Color: RAL 5010
- Insulation grade: F
- Ingress protection rating: IP55

### Fan guard

- Material: steel
- Surface treatment: zinc plating

### Filtration

- The acceptable fluid contamination NAS grade is Class 8 per 1638 or 17/14 per ISO DIS 4406
- Recommended filtration β 25 ≥ 75

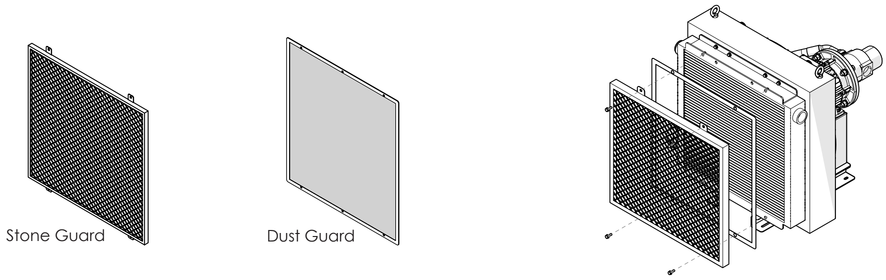
### Circulation pump

- Gerotor pump
- Flow rate : 24 ~ 94L / min (@ 1,710 RPM)
- Viscosity : 10 ~ 15,000 cSt
- Outlet pressure : 0 ~ 15 bar
- Inlet pressure : Min. -0.5 ~ 1.5 bar

## Accessories

### Protection of the matrix

Coolers installed in harsh environments with dust, oil, and other contaminants may cause damage to the surface of the matrix or decrease heat exchange performance due to oil and dust sticking to the fins. In this case, if the surface is damaged or oil and dust cannot be cleaned from the fins, the matrix must be replaced. To reduce such losses, Stone Guard or Dust Guard can be installed on the matrix to protect it and reduce maintenance costs. It is important to note that when installing a Dust Guard, regular cleaning is necessary to maintain performance, as failure to do so may reduce the airflow and cause the motor to overload.




**Attention**

- To maintain the cooler's optimal cooling performance, the Dust Guard should be cleaned twice a week.
- The cleaning cycle for Stone Guard is approximately once every three months.
- If the environmental pollution conditions are severe, reduce the cleaning cycle.

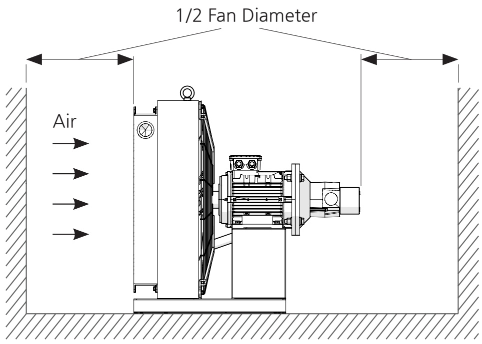
## Installation and Maintenance

***Please refer to the product manual for more detailed information.**

### Installation

The cooler has a very sturdy structure and can be mounted on both the face and foot. When installing it on the front of a duct or ventilation shaft, use the 4 to 8 mounting holes in the U-channel of the matrix. Place the cooler so that the airflow is not restricted. The distance to the nearest wall should be at least half the diameter of the fan.

| HLO3 Model | 1/2 Fan Diameter |
|---|---|
| 07 | 162.5 |
| 11 | 200 |
| 16 | 228 |
| 23 | 269 |
| 33, 35 | 325 |

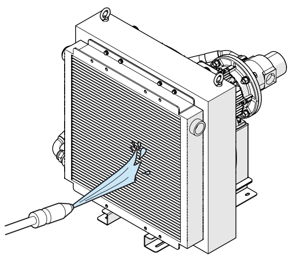



### Cleaning the inside of the matrix

To clean the inside of the matrix, connect the cooler to a closed circuit and circulate perchloroethylene. After cleaning, flush the matrix with oil before reconnecting it to the hydraulic system.

### Cleaning the outside of the matrix

The easiest way to clean the fins is to use compressed air or wash them with water. Grease removers and high-pressure cleaning systems can also be used to remove foreign matter. When using a high-pressure cleaning system, make sure that the water stream is parallel to the fins and at least 3cm away from them. Be careful not to damage the fins with a strong water stream.



*"Engineering Excellence! We are always prepared to promptly address our customers' needs."*

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