



## Off-line cooler ENK

Temperature is one of the key parameters in oil-hydraulic systems. Oils change their viscosity with the temperature, resulting in different lubricating and adhesion properties.

A carefully selected temperature level can also significantly extend the life of the oils.

In return condensers the temporary oil flow causes the cooling capacity to fluctuate. To prevent this effect, a bypass cooler consisting of oil/air cooler with built-in circulating pump is advisable. These combinations ensure a stable oil flow and constant cooling.

The ENK series is characterised by efficient cooling matrices made from high-strength aluminium as well as a compact, simple and affordable design. These are equipped with energy-efficient drive motors combined with sturdy gerotor pumps.

High cooling capacities

Compact design

System-compatible cooling matrix/flow rate ratio

Low noise emission

Rugged cooling matrix

Efficient high suction pump



## Planning information

### Set-up

The cooler must be set up so as not to interfere with air supply and exhaust. The distance to air obstacles behind the cooler should be at least half the cooler height (Dimension B).

Ensure adequate ventilation. During set-up, avoid exiting hot air or noise emission causing problems.

If the ambient air is dirty, excess deposit on the cooling matrix must be expected. This will reduce the cooling capacity. In this case, particularly in the case of air loaded with oil mist, the air ducts must be cleaned regularly.

When set up outdoors, adequately protect the motor from the weather.

Ensure easy access for inspection and maintenance.

### Mount

The coolers are secured to the mounting rails with four screws. Be sure the support structure is sized adequately. Install in any position.

### Connecting the oil circuit

The connection between the system and the cooling matrix should be connected stress and vibration free, which can be achieved by using conduit.

Follow the pertinent safety regulations to prevent environmental damage due to possible oil leaks (e.g. collection pans).

## Technical data

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#### Materials/surface protection

Cooling matrix:	Aluminium, powder-coated
Fan hub:	Aluminium, bare
Fan blades:	Glass-reinforced polypropylene (PPG), bare
Ventilation box, guard and motor brackets:	Steel, galvanised, powder-coated
Screw connections:	V2A stainless steel
Hydraulic screw fittings:	Steel, zinc-nickel coated
Hose:	synthetic rubber
Pump:	anodised aluminium, sintered steel
Motor:	Housing die-cast aluminium, painted

<b>Colour:</b>	Steel parts: RAL 9005, jet black Motor: RAL7031 blue grey (special colours on request)
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<b>Surface protection:</b>	Steel parts: ISO 12944, C3 medium Motor: ISO 12944, C3 medium (higher on request)
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<b>Operating fluids:</b>	Mineral oils per DIN 51524 Gear oil per DIN 51517-3
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<b>generated operating pressure, static:</b>	8/16/29/42 L/min – max. 6 bar 58/88 L/min – max. 8 bar
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<b>Suction pressure:</b>	max. -0.4 bar
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<b>Operating oil temperature:</b>	max. 80 °C (higher upon request)
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<b>max. viscosity:</b>	100 cSt medium viscosity (higher upon request)
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<b>Ambient temperature:</b>	-20 °C to +40 °C
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<b>max. set-up altitude:</b>	1000 m (higher on request)
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#### Electric motors (others available upon request)

<b>Voltage/frequency:</b>	230/400 V 50 Hz 460 V 60 Hz (special voltages/motor approvals on request)
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<b>Thermal stability:</b>	Class of insulating material F, utilisation per Class B (higher on request)
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<b>IP rating:</b>	IP55 (higher on request)
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The motors comply with standards  
IEC 60034, IEC 60072, IEC 60085, EU 2019/1781

## Calculation example and nomenclature

### Determination

An oil/air cooler is determined in two steps:

1. Determining or selecting the cooler size
2. Determining the actual pressure loss

$t_{OE}$ [°C]	Inlet oil temperature
$t_{LE}$ [°C]	Inlet air temperature
ETD [K]	Temperature differential: $ETD = t_{OE} - t_{LE}$
$P_{spez}$ [kW / K]	specific cooling performance (see performance curves): $P_{spez} = P / ETD$
P [kW]	Cooling performance in kW
Q [l/min]	Oil flow rate
$c_{oil}$ [kJ/kgK]	Specific heat capacity of the oil (approx. 2.0 kJ / kgK)
$\zeta$ [kg/dm <sup>3</sup> ]	Gravity of oil $\approx 0.9$ kg/dm <sup>3</sup>

### Calculation example

Assumptions:

Tank capacity	(V)	approx. 200 L
Start up temperature of oil	(T <sub>1</sub> )	15 °C ( $\approx 288$ K)
Oil heats up in approx. t = 25 min. (1500 s) to	(T <sub>2</sub> )	45 °C ( $\approx 318$ K)
Required oil temperature	(t <sub>OE</sub> )	60 °C
Inlet air temperature	(t <sub>LE</sub> )	30 °C

### Calculation

1st Calculating P from the tank warming

$$P = \frac{V \cdot \zeta \cdot c_{oil} (T_2 - T_1)}{t} = \frac{200 \text{ l} \cdot 0.9 \frac{\text{kg}}{\text{l}} \cdot 2 \frac{\text{kJ}}{\text{kg} \cdot \text{K}} \cdot (318 \text{ K} - 288 \text{ K})}{1500 \text{ s}} = 7.2 \text{ kW}$$

2.  $ETD = t_{OE} - t_{LE} = 60 \text{ °C} - 30 \text{ °C} = 30 \text{ K}$
3. Determining the cooler size:  $P_{spez} = P / ETD = 7.2 \text{ kW} / 30 \text{ K} = 0.24 \text{ kW/K}$
4. In performance curves with 80 L/min, select a cooler with  $P_{spez} 0.24 \text{ kW/K}$ . → ENK 300 with 30 L pump

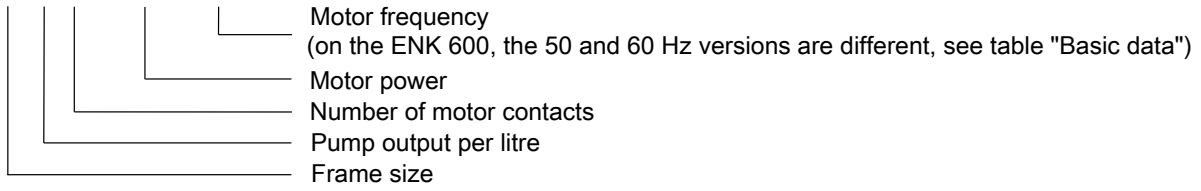
## Basic data

Item no.	Cooler model	spec. cooling capacity kW/K		Cooling capacity at ETD = 40 K (kW)		max. circulation rate (L/min)		Power output Number of contacts Rated current		Weight (kg)	Volume (L)	Noise db(A)*			
		50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	400 V 50 Hz	460 V 60 Hz			50/60 Hz	50/60 Hz	50 Hz	60 Hz
36ENK100406	ENK 100-8-4-0.75kW-50/60Hz	0.074	0.09	3	3.6	8	9.5	0.75 kW/4/1.77 A	0.87 kW/4/1.74 A	27	1.9	68	71		
36ENK100401	ENK 100-15-4-0.75kW-50/60Hz	0.086	0.1	3.4	4	16	19								
36ENK100402	ENK 100-30-4-0.75kW-50/60Hz	0.1	0.117	4	4.7	29	35								
36ENK200401	ENK 200-15-4-0.75kW-50/60Hz	0.137	0.16	5.5	6.4	16	19			2.2 kW/4/4.65 A	2.55 kW/4/4.58 A	31	2.0	69	72
36ENK200402	ENK 200-30-4-0.75kW-50/60Hz	0.164	0.19	6.6	7.6	29	35								
36ENK300401	ENK 300-15-4-0.75kW-50/60Hz	0.169	0.187	6.8	7.5	16	19								
36ENK300402	ENK 300-30-4-0.75kW-50/60Hz	0.255	0.277	10.2	11.1	29	35								
36ENK400402	ENK 400-30-4-0.75kW-50/60Hz	0.327	0.38	13.1	15.2	29	35	3.0 kW/4/6.26 A	-	59	3.7	74	78		
36ENK400403	ENK 400-60-4-2.2kW-50/60Hz	0.388	0.45	15.5	18	58	70								
36ENK400404	ENK 400-90-4-2.2kW-50/60Hz	0.43	0.49	17.2	19.6	88	105								
36ENK500403	ENK 500-60-4-2.2kW-50/60Hz	0.5	0.58	20	23.2	58	70			75	5	82	-		
36ENK500404	ENK 500-90-4-2.2kW-50/60Hz	0.53	0.61	21.2	24.4	88	105								
36ENK600413	ENK 600-60-4-3.0kW-50Hz	0.674	-	27	-	58	-			-	3.48 kW/4/6.1 A	75	5	82	-
36ENK600414	ENK 600-90-4-3.0kW-50Hz	0.731	-	29.2	-	88	-								
36ENK600423	ENK 600-70-4-3.48kW-60Hz	-	0.7	-	28	-	70	-	3.48 kW/4/6.1 A	75	5	-	84		
36ENK600424	ENK 600-105-4-3.48kW-60Hz	-	0.76	-	30.4	-	105								

\*DIN EN ISO 3744, Class 3

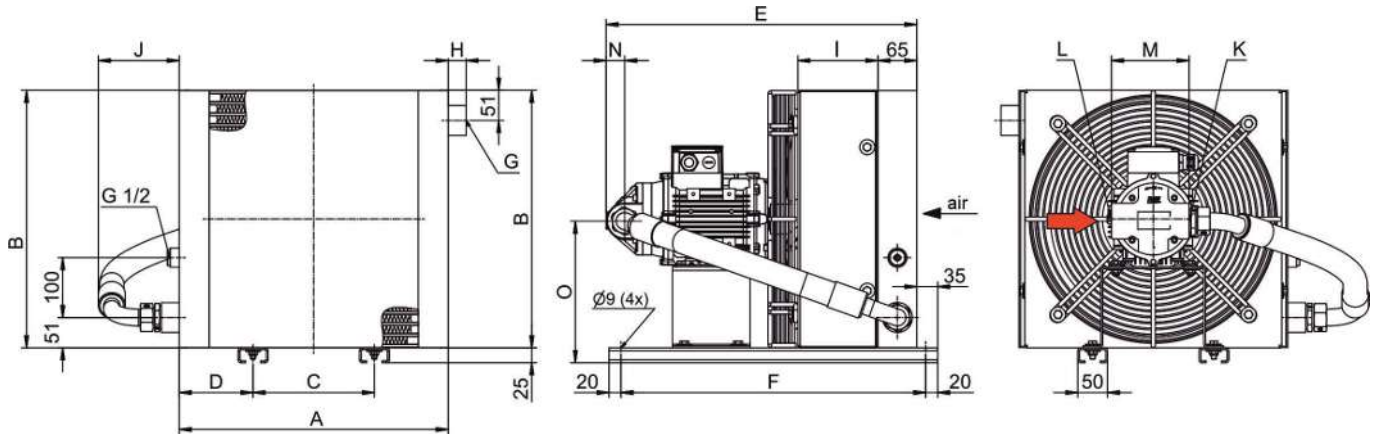
Model key

ENK 300-15-4-0.75kW-50/60Hz



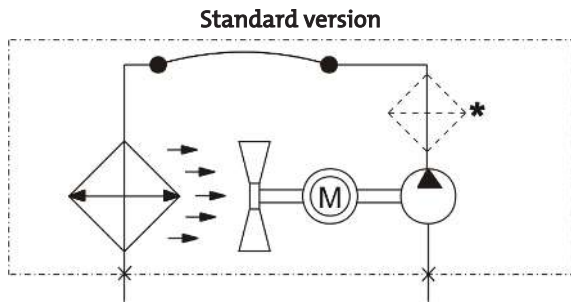
Dimensions

ENK 100-600

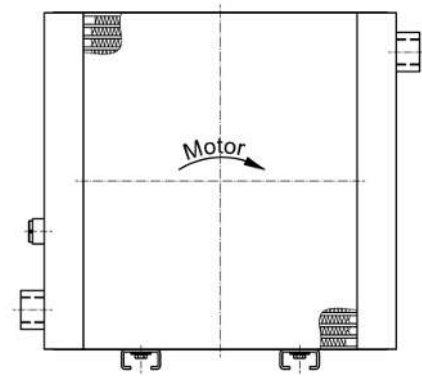


Type	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O		
ENK 100-8-4-0.75kW-50/60Hz												G 3/4	142				
ENK 100-15-4-0.75kW-50/60Hz	310	290		54	489										167		
ENK 100-30-4-0.75kW-50/60Hz					487		G 3/4	25	104	93							
ENK 200-15-4-0.75kW-50/60Hz	375	355	203	86	482	510					G1	G11/4	130	31	199		
ENK 200-30-4-0.75kW-50/60Hz					480												
ENK 300-15-4-0.75kW-50/60Hz	450	430		124	522				134	106					237		
ENK 300-30-4-0.75kW-50/60Hz					520												
ENK 400-30-4-0.75kW-50/60Hz					538												
ENK 400-60-4-2.2kW-50/60Hz	510	491		255	667				145						267		
ENK 400-90-4-2.2kW-50/60Hz					702									54			
ENK 500-60-4-2.2kW-50/60Hz	570	551		107	677		G1	30						31	297		
ENK 500-90-4-2.2kW-50/60Hz					712				160					54			
ENK 600-60-4-2.2kW-50/60Hz			356		707	610				121	G11/4	G11/2	135	31	327		
ENK 600-90-4-2.2kW-50/60Hz	630	611			742												
ENK 600-70-4-3.48kW-60Hz					137		707			175							31
ENK 600-105-4-3.48kW-60Hz							742										54

## Functional diagram



\* recommended position of additional oil filter



The oil inlet is on the left of the cooling matrix. The oil outlet is always on the opposite side.